



10

Sac Roe Herring in SE
Alaska



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Presentations



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Questions

The module will cover four main areas:

1. Biology (Life History)
2. Management
3. Fisheries
4. Research

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There are self-check quizzes at the end of each section. After answering the questions you will return to the presentations slide to continue to the next section.

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By the end of this module, you should be able to:

1. Describe the role Pacific Herring in the Alaskan ecosystem
2. Describe the basic life history of Pacific Herring
3. Describe the Sac Roe Herring regulatory framework in Southeast Alaska
4. Describe the dynamics of the opening and closing of the Sac Roe fishery
5. Describe how Pacific Herring are processed



Fisheries Technology



Read pp. 1-11 in
Herring.pdf in iBooks

A vertical stack of five fish illustrations: a salmon, a herring, a cod, a crab, and a shrimp.

Fisheries Technology

About the Presenter

Meet Jim Seeland...

Biology

Life history of Pacific herring (27 minutes)

Management Part 1

Regulation, management and population assessment (20 minutes)

Fisheries

Processing the fish (2 minutes)

Management Part 2

Stock assessment post spawn (10 minutes)

Research

Directed questions about research (10 minutes)



Jim Seeland

Adjunct - Fisheries Technology
UAS Sitka Campus

Jim Seeland grew up in Missouri and pursued his passion for “all things fish” by graduating from the University of Missouri with a B.Sc. in Fish and Wildlife Management. Moving to Alaska in 1980, Jim and his family lived at a remote salmon hatchery in Prince William Sound for two years and then moved to Sitka to begin working for the Northern SE Regional Aquaculture Association (NSRAA). He gradually worked his way up to manager of the Medvejie Salmon Hatchery where he worked for 25 years.



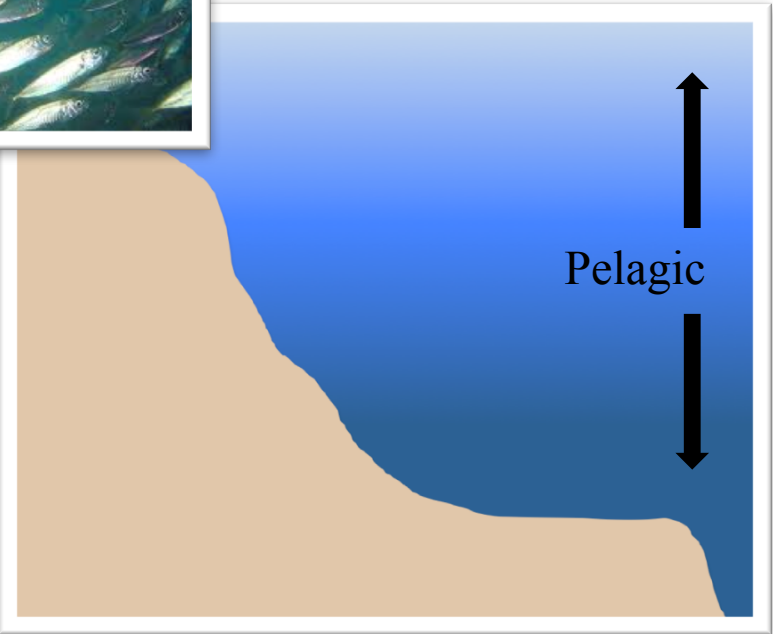
In 2006 Jim began working part time for the UAS Fisheries Technology Program as instructor of Finfish Culture. After leaving NSRAA in 2007, Jim was able to dedicate more time to the Fisheries Technology Program and became an Assistant Professor. Currently he enjoys teaching and developing new programs for the Fish Tech program and working closely with the AK fisheries industry to provide up to date material for students.



Pacific Herring *Clupea pallasii*

- Complex life cycle.
- Critically important to marine animals, fish, shoreline dwellers, and humans.
- Traditional forage fish.

- Family Clupeidae
- Schooling
- Pelagic
- Typically planktivorous
- Body features
 - Compressed
 - Soft fins
 - Forked tail



Atlantic Herring and Related Fishes

Note: While not to actual scale, the illustrations below are accurately sized relative to one another. Note that the much larger tarpon and wolf herring are provided with background images for sizing.

Atlantic Herring (*Clupea harengus*)
Side View | Top View | Mouth | Spineless Fins

Blueback Herring (*Alosa aestivalis*)

Alewife (*Pomolobus pseudoharengus*)

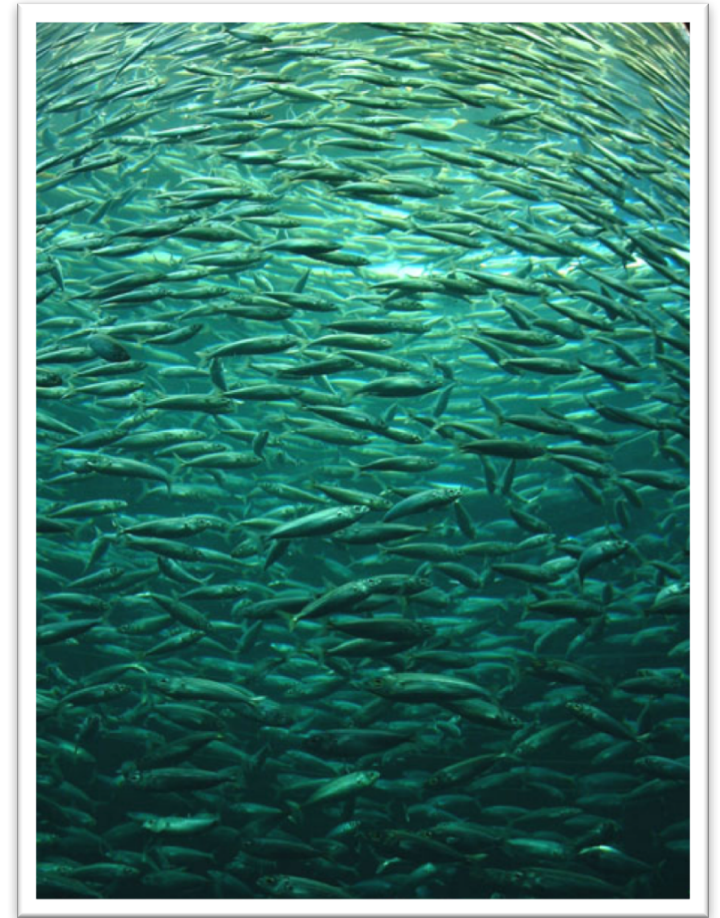
Tarpon (*Tarpon atlanticus*)

Wolf Herring (*Chirocentrus dorab*)



Pacific Herring Basics

- Schooling species
- Live from surface to 1300 ft.
- Countershading
- Up to 18" long
- Sexually mature 3yr, avg. 10yr life

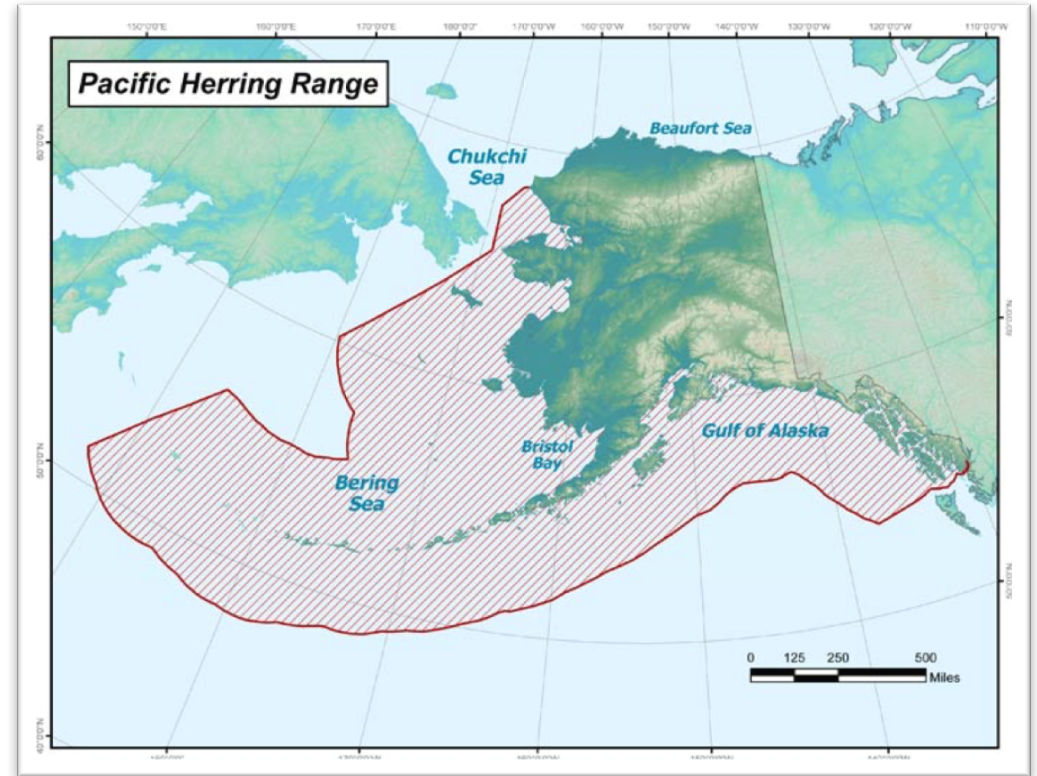




Range and Habitat

Pacific herring are found throughout coastal waters of the Pacific Ocean. In the western North Pacific, they are found in the western Bering Sea to Kamchatka, in the Okhotsk Sea, and around Hokkaido, Japan southeast to the Yellow Sea. In the eastern North Pacific, they range from Baja California north to the Beaufort Sea. They also occur in the Russian Arctic from the Chukchi Sea to the White Sea.

Pacific herring spawn in inshore waters and feed in offshore waters. They occupy the water column from the surface to depths of 1300 feet.





Broadcast Spawning



Miles and miles of coastal waters turn milky white.



Bladder kelp covered with eggs.





Preferred Spawning Habitat



Macrocystis, long leaf kelp



Fucus, rockweed, bladder kelp



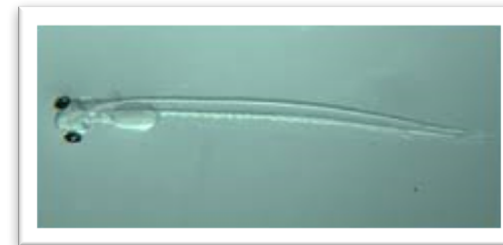
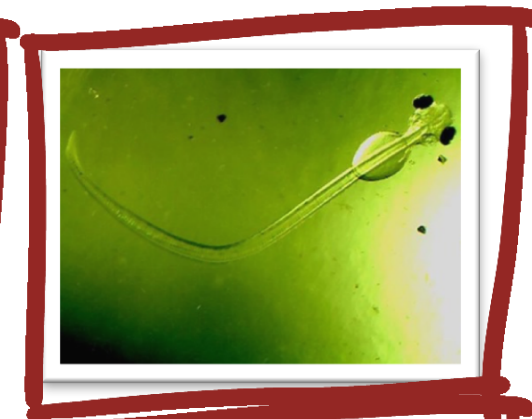
Eelgrass





Early Life Stages

- Spawn spring, shallow, intertidal and subtidal
- Broadcast spawning
- Hatch 2 weeks
- Larvae drift with current - zooplankton
- Juveniles move into shallows
- Feed on crustaceans, larval mollusks





What Do Herring Eat?

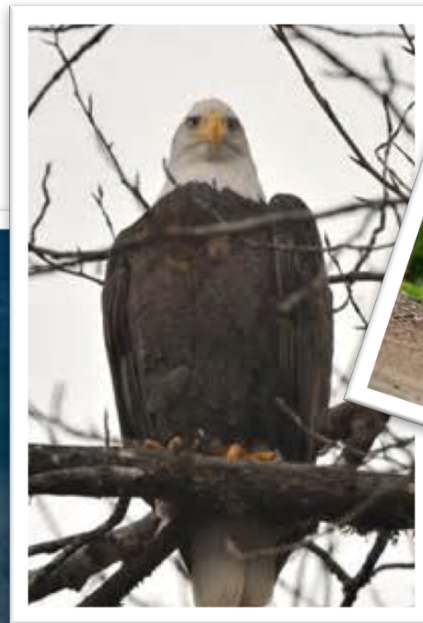
- Larval forms stay near shore
 - Eat larval crustaceans and decapods
- Juveniles (2-3 mos.)
 - School in shallow bays 1st summer
- Young adults move offshore
 - Feed on crustaceans, mollusks, small fish





What Eats Herring?

- The better questions is: “what DOESN’T eat herring?”
- As eggs: diving ducks, gulls, scoters, shoreline dwellers
- As larvae: jellyfish, juvenile Salmon
- As adults: salmon, seals, sea lions, killer whales, HB whales, dogfish, birds, hake, sablefish, P cod, lots of other fish species!





Defense Mechanisms

- Schooling
- Coloration
- Farting!





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Herring Break Wind to Communicate, Study Suggests

James Owen in England
for National Geographic News
November 10, 2003

In polite society, flatulence is often a social faux pas—especially when issued deliberately. But in the world of fish, group "raspberry-blowing" sessions appear to perform an important social role.

This intriguing idea comes from scientists who discovered that herring create a mysterious underwater noise by farting. Researchers suspect herring hear the bubbles as they're expelled, helping the fish form protective shoals at night. It's the first ever study to suggest fish communicate by breaking wind.

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The study's findings, now published online in the U.K. science journal *Biology Letters*, reveal that Atlantic and Pacific herring create high-frequency sounds by releasing air from their anuses.

"We know [herring] have excellent hearing but little about what they actually use it for," said research team leader Ben Wilson, a marine biologist at the Bamfield Marine Science Centre, British Columbia, Canada. "It turns out that herring make unusual farting sounds at night."

Wilson and his colleagues named the phenomenon Fast Repetitive Tick, which makes for the rather mischievous acronym, FRT. But unlike the human version, these FRTs are thought to bring the fish closer together.

Two teams carried out the research in Canada and Britain. One team studied Pacific herring in Bamfield, British Columbia, while the other focused on Atlantic herring in Oban, Scotland. The fish were caught locally and transferred to

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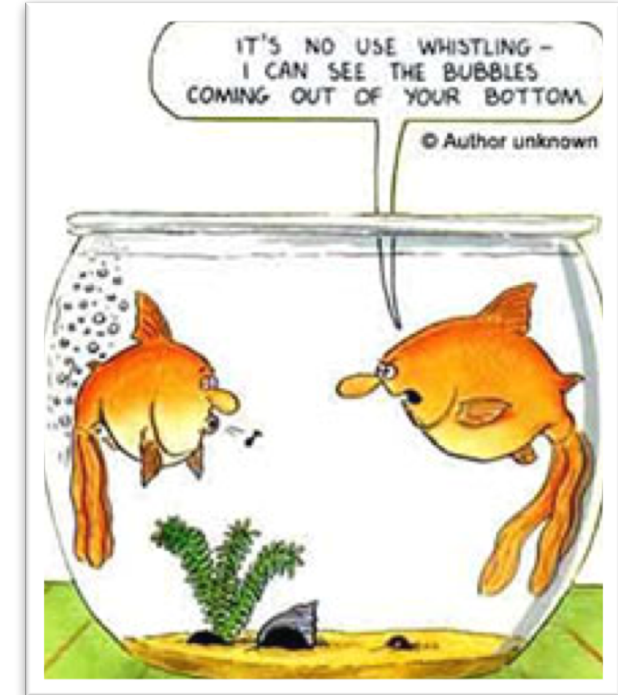
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Conclusion

- Critical to marine ecosystem
- Complex animal
- Relatively long life cycle
- ADFG: population status:
 - Southeast increasing
 - PWS – recovering after 1993 collapse due to oil spill
- ADFG: threats to herring include:
 - Habitat degradation
 - Global warming
 - Recovery of predator species





Herring Life History

Quiz - 3 questions

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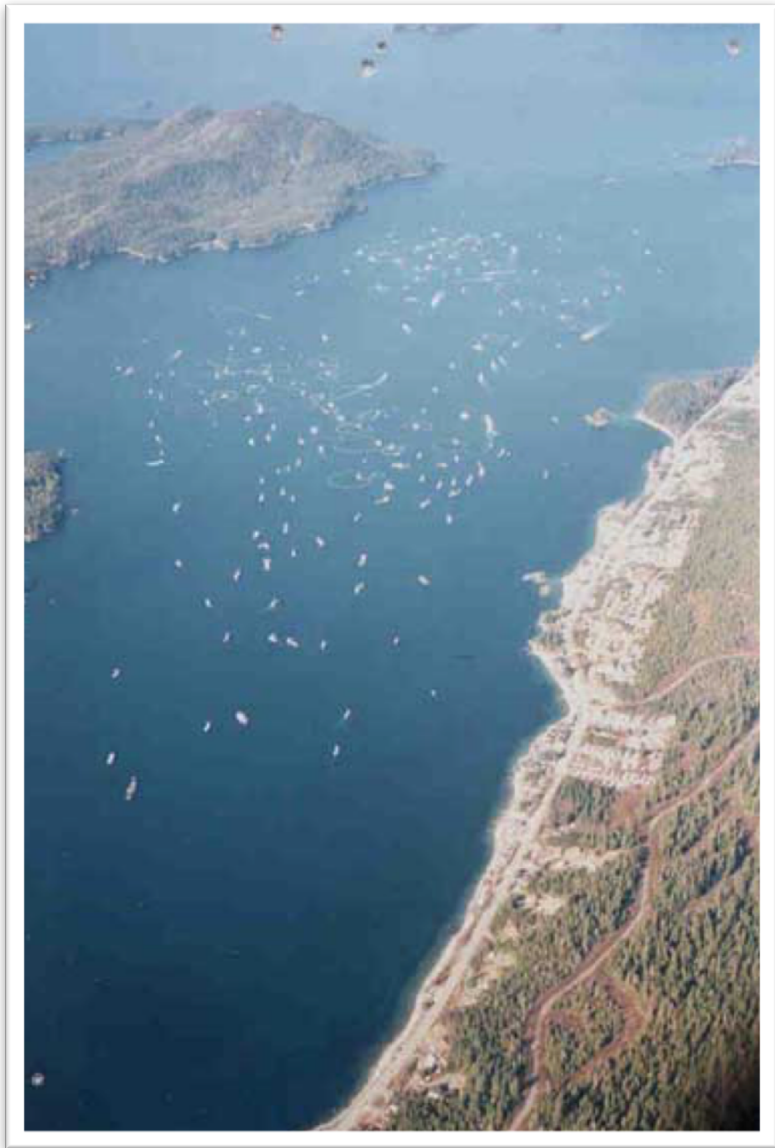
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Sitka Sound Herring Sac Roe Fishery

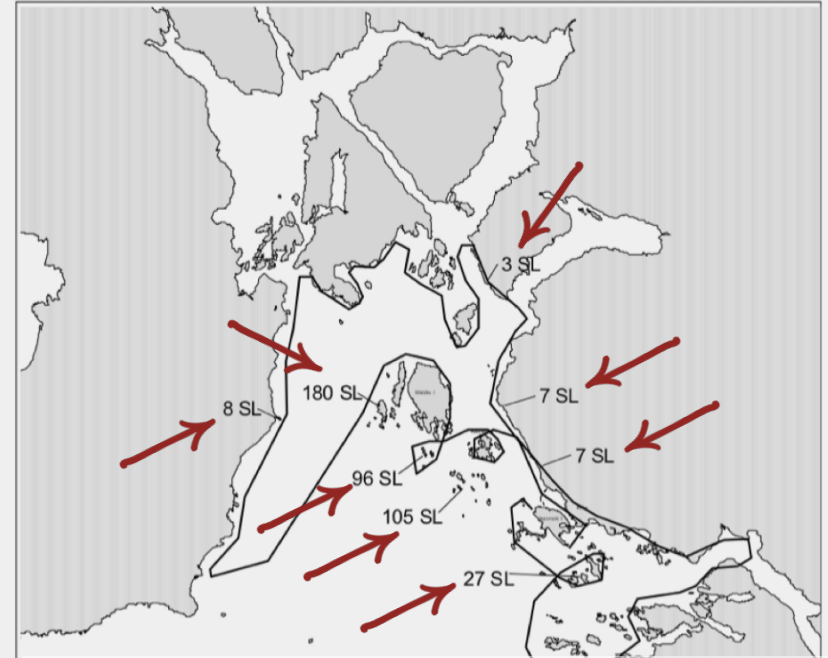


David Gordon
Area Management Biologist
ADFG



Basic Regulatory Framework

- Limited Entry – 48 Permits
- Gear – Purse Seine: 200 fms/1700 meshes
- Season – Emergency Order in Section 13-B north of Aspid Cape and Section 13-A south of Point Kakul.
- Sliding Harvest Rate 12-20% from 25,000-45,000 tons. No harvest below 25,000 tons.
- Manage for Sac Roe Recovery of at least 10%
- Management Plan for consideration of Subsistence
 - Disperse if necessary to provide reasonable opportunity to harvest the amount necessary for subsistence.
 - Closed waters to commercial harvest.



March 17 Aerial Survey.

9:10-10:05.

Davidson/Gordon.

Partly cloudy.

Sea lions distributed throughout the northern areas of Sitka Sound much the same as the previous survey with the largest concentration off Bieli Rk. South – 27 sea lions in the islands south of runway, and one whale off Samsing.

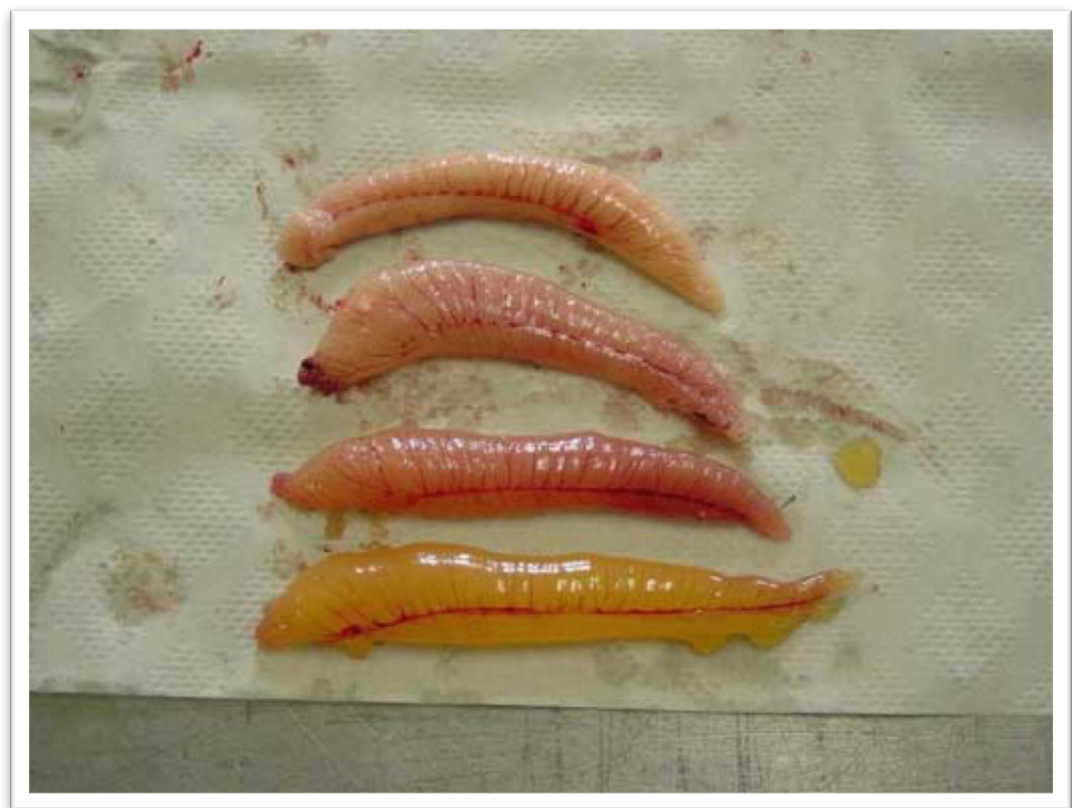












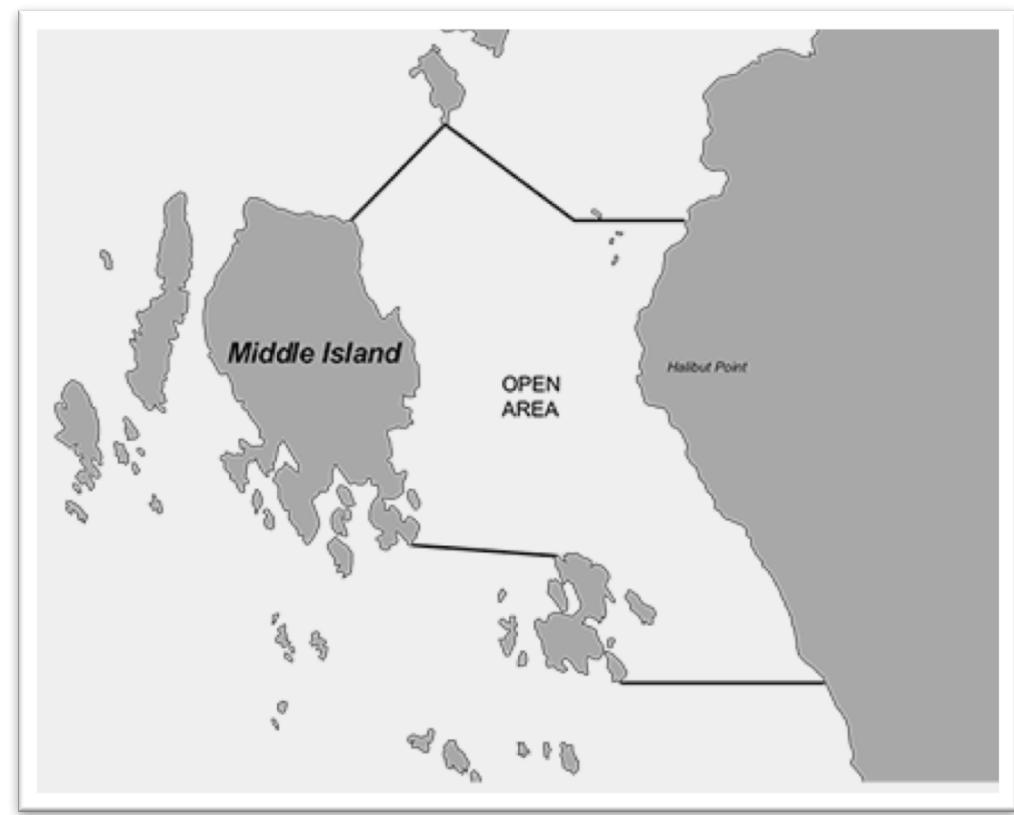




Image credit: shobestudios.com ©









Herring Fisheries Management

Quiz - 2 questions

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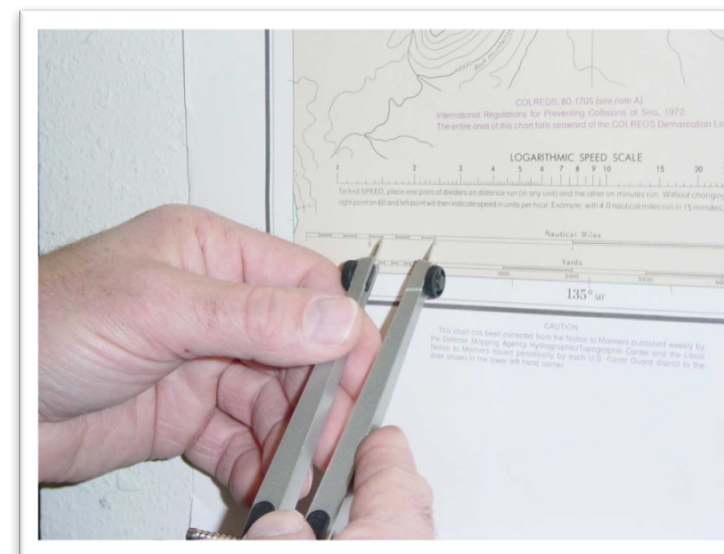
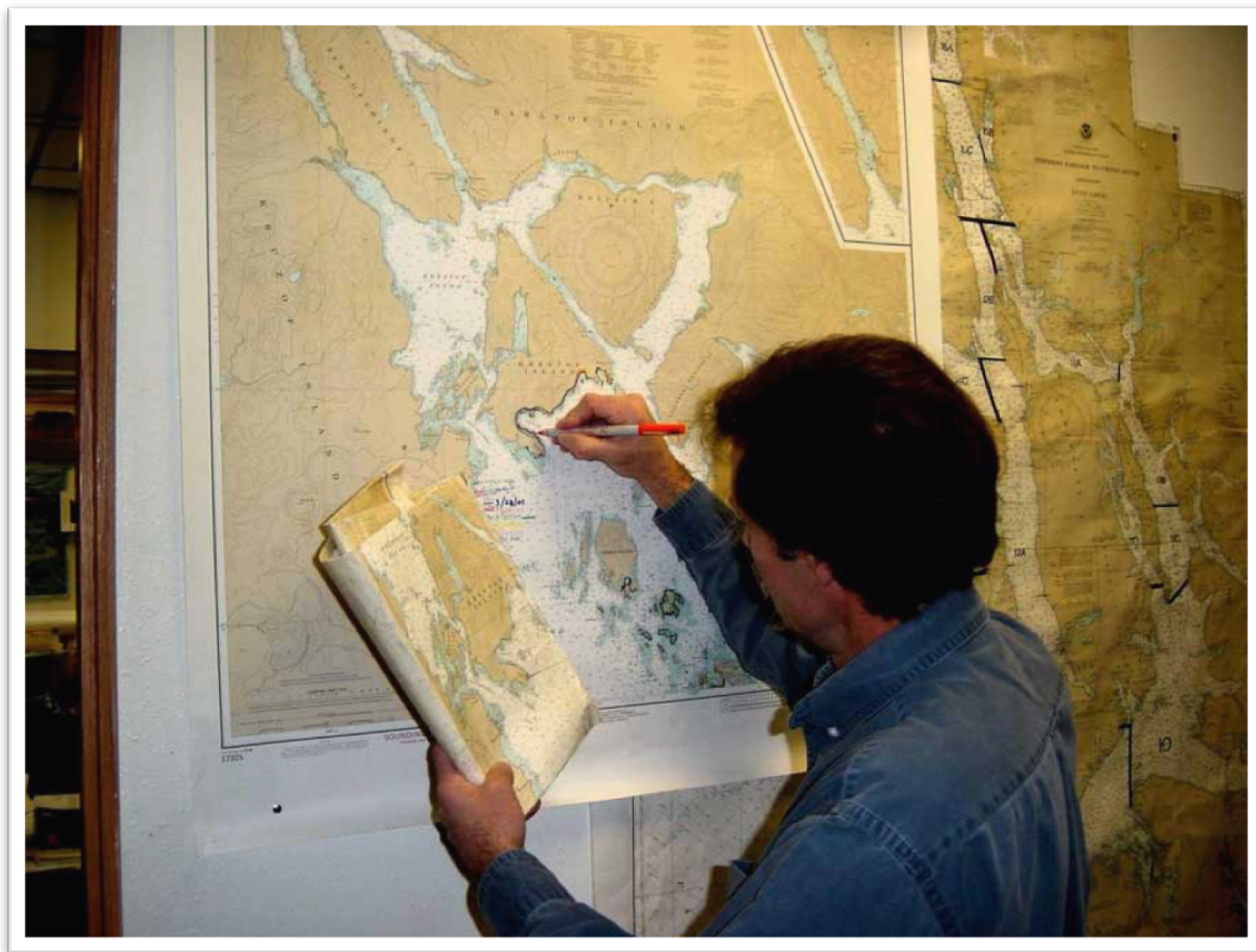
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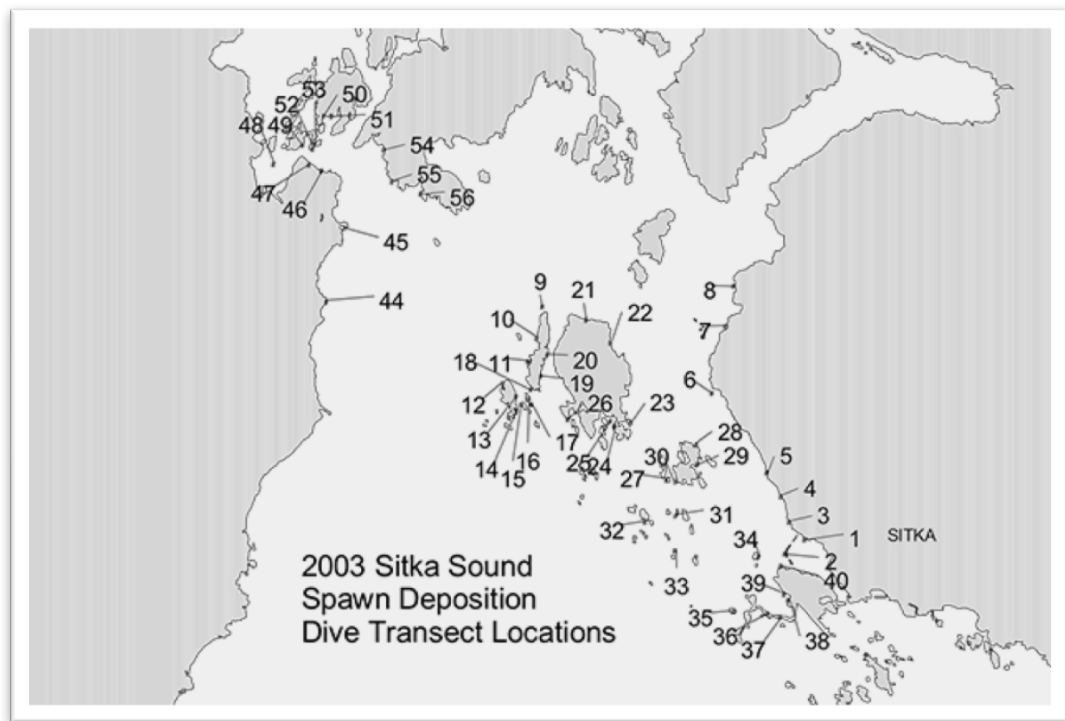




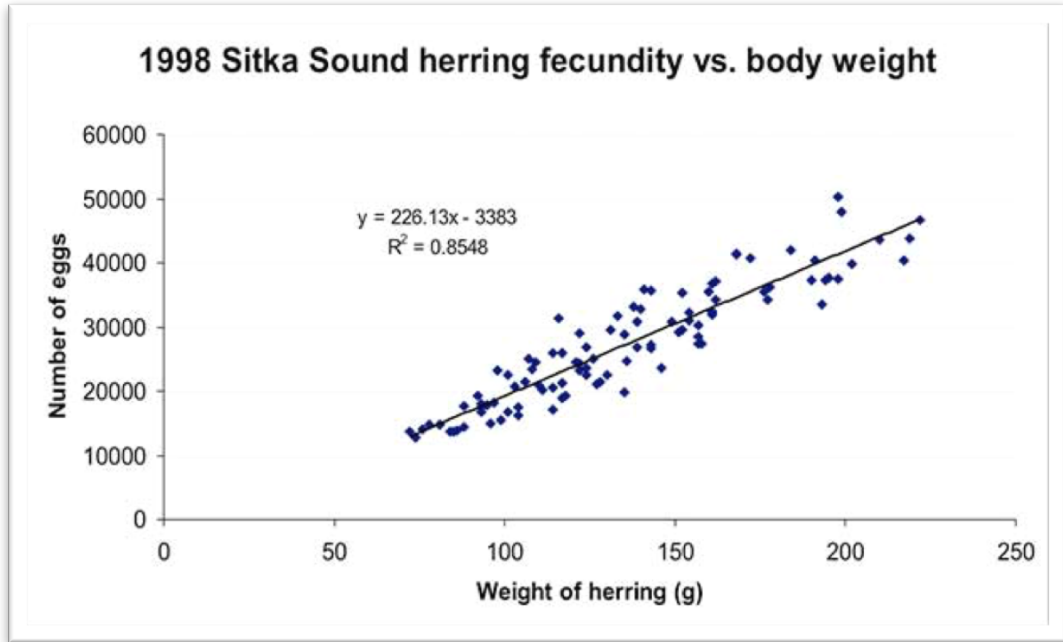












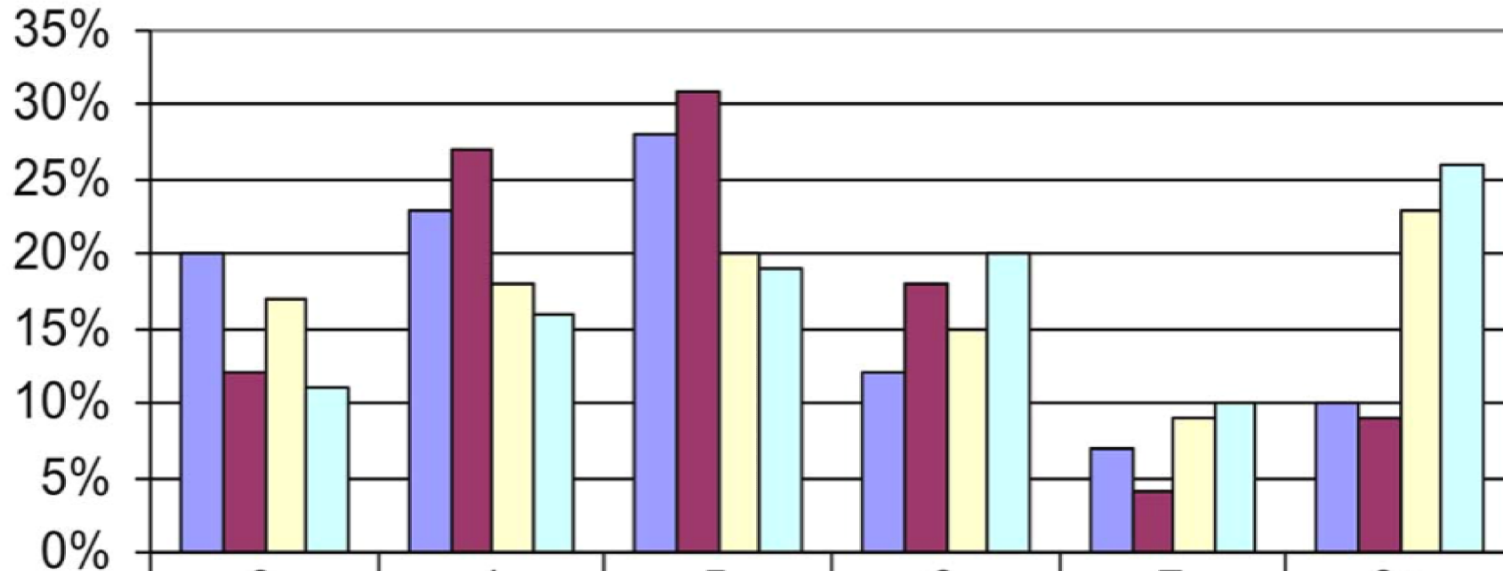
| Transect | Calibrated Egg Count (1000s) | Length of Transect (m) | Depth of Transect (m) |
|----------|------------------------------|------------------------|-----------------------|
| 1 | 870 | 85 | 11 |
| 2 | 1591 | 215 | 54 |
| 3 | 933 | 100 | 20 |
| 4 | 2745 | 165 | 26 |
| 5 | 2613 | 135 | 34 |
| 6 | 8724 | 155 | 58 |
| 7 | 3315 | 120 | 49 |
| 8 | 688 | 58 | 63 |
| 9 | 228 | 50 | 57 |
| 10 | 1332 | 215 | 67 |
| 11 | 740 | 90 | 34 |
| 12 | 4377 | 255 | 53 |
| 13 | 580 | 70 | 58 |
| 14 | 1301 | 80 | 36 |
| 15 | 179 | 70 | 25 |
| 16 | 239 | 95 | 38 |
| 17 | 2139 | 110 | 62 |
| 18 | 2120 | 150 | 49 |
| 19 | 229 | 115 | 62 |
| 20 | 53 | 40 | 55 |
| 21 | 352 | 75 | 50 |
| 22 | 819 | 80 | 62 |
| 23 | 110 | 35 | 52 |
| 24 | 212 | 50 | 15 |
| 25 | 61 | 45 | 19 |
| 26 | 552 | 30 | 15 |
| 27 | 2606 | 210 | 36 |
| 28 | 542 | 110 | 62 |
| 29 | 1096 | 155 | 25 |
| 30 | 2935 | 100 | 24 |
| 31 | 83 | 140 | 34 |
| 32 | 576 | 130 | 21 |
| 33 | 4369 | 330 | 60 |
| 34 | 5328 | 255 | 44 |
| 35 | 992 | 150 | 26 |
| 36 | 1090 | 165 | 40 |
| 37 | 308 | 95 | 47 |
| 38 | 142 | 70 | 20 |
| 39 | 1117 | 125 | 22 |
| 40 | 680 | 155 | 35 |
| 44 | 0 | 290 | 35 |
| 45 | 236 | 55 | 1 |
| 46 | 864 | 225 | 6 |
| 47 | 38 | 155 | 38 |
| 48 | 36 | 65 | 20 |
| 49 | 11 | 55 | 18 |
| 50 | 140 | 30 | 30 |
| 51 | 201 | 40 | 28 |
| 52 | 35 | 50 | 29 |
| 53 | 386 | 50 | 9 |
| 54 | 2240 | 195 | 9 |
| 55 | 0 | 20 | 24 |
| 56 | 1140 | 120 | 25 |

| Sitka Sound Herring Spawn Deposition Survey Calculations | |
|--|-------------------|
| Nautical Miles of Spawn | 44.5 |
| Linear Meters of Spawn | 82,414 |
| Number of Transects | 53 |
| Sum of Calibrated Egg Count (1000s) | 64,231 |
| Count of Diver Estimates (Quadrat) | 1,237 |
| Average Length of Transect (m) | 116.7 |
| Area of Survey in Square Meters | 9,617,558 |
| Average Density Eggs/Quadrat | 51,925 |
| Average Density of Eggs/Sq Meter | 519,250 |
| Total Eggs in Survey Area | 4,993,919,091,981 |
| Post Survey Nautical Miles Spawn | 2.6 |
| Linear Meters of Spawn | 4,815 |
| Area of Survey in Square Meters | 561,925 |
| Post Survey Total Eggs | 145,889,771,226 |
| Total Eggs in Survey Area | 5,139,808,863,208 |
| 10% Adjusted for Egg Loss | 5,653,789,749,528 |
| 2003 Spawning Biomass in Tons | 54,875 |





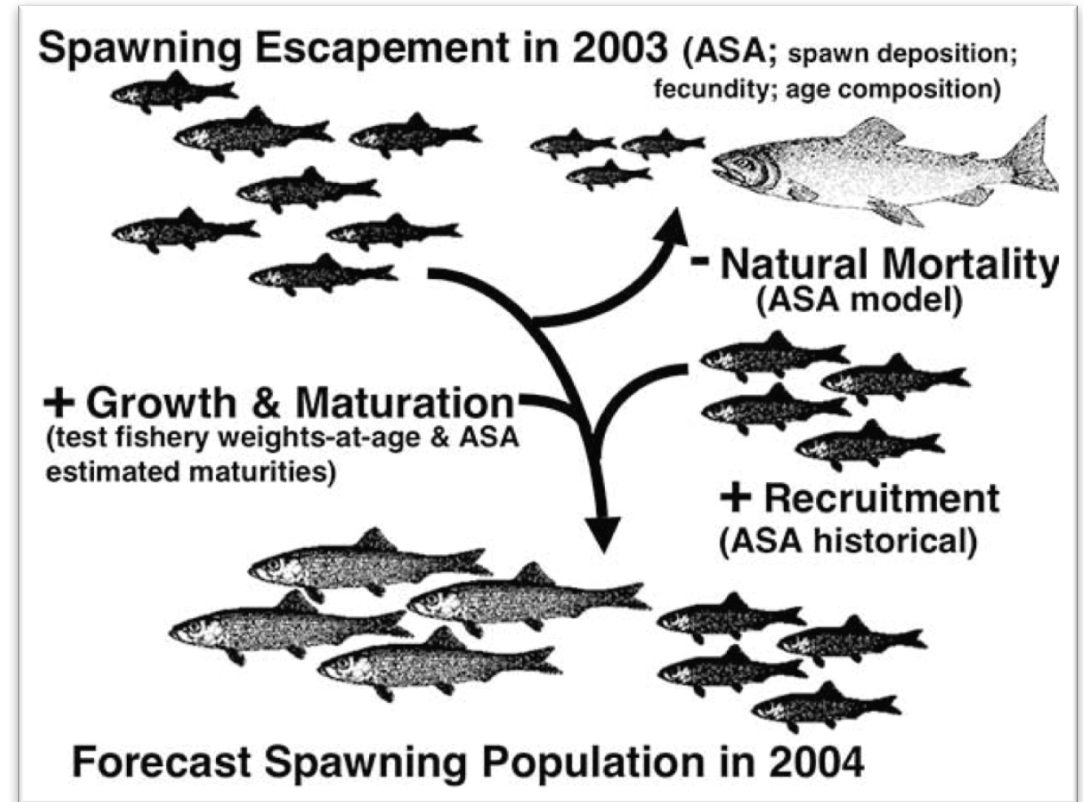
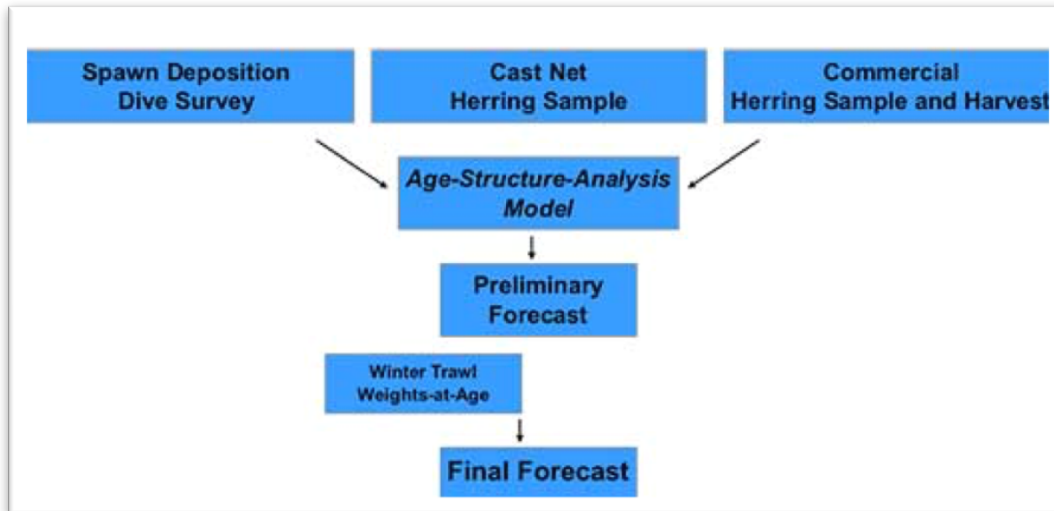
2003 Sitka Sound Age Composition



| | 3 | 4 | 5 | 6 | 7 | 8+ |
|------------|-----|-----|-----|-----|-----|-----|
| Winter | 20% | 23% | 28% | 12% | 7% | 10% |
| Forecast | 12% | 27% | 31% | 18% | 4% | 9% |
| Cast Net | 17% | 18% | 20% | 15% | 9% | 23% |
| Commercial | 11% | 16% | 19% | 20% | 10% | 26% |



Data Inputs ASA Herring Forecasting Model





Herring Fisheries Management 2

Quiz - 2 questions

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Herring Research

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