WF4313-Fisheries Management

Lecture 29 Fisheries & Evolution

Announcements

0 class left…

Briefs Due By Final Exam

Final Exam December 5th @ 8am

Grades on BB

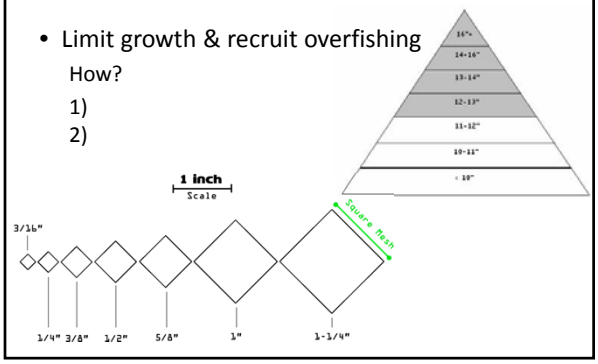
Catch process

- Limit growth & recruit overfishing

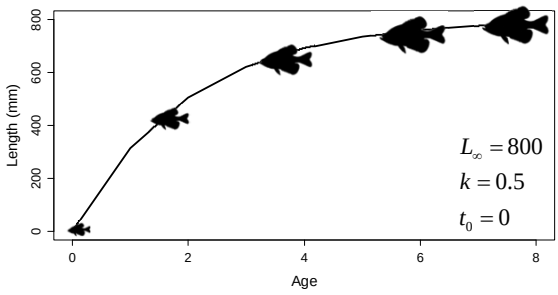
  How?

  1)

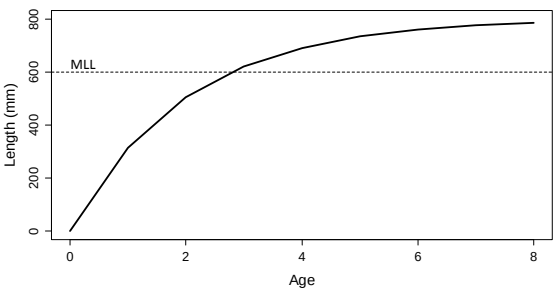
  2)



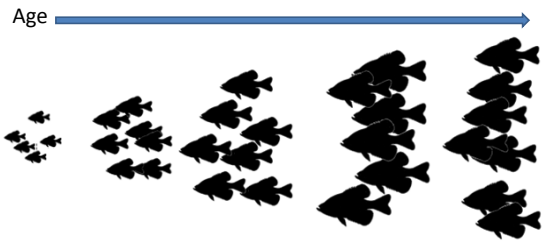
Population growth



Population growth



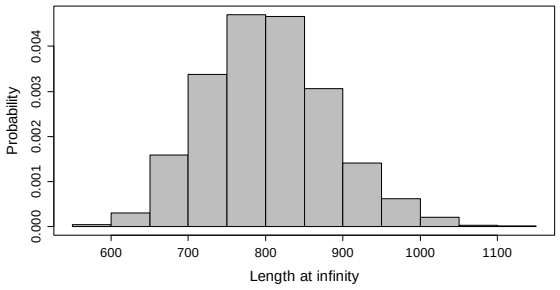
Population versus individuals



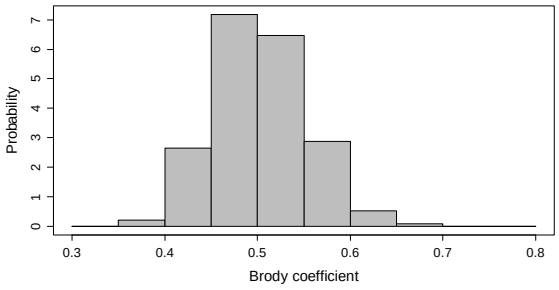
A population…

- 5000 individuals
- Variable
  - Length at infinity: expected 800 mm
  - Brody growth coefficient : expected 0.5
  - Natural mortality: 0.3
  - Fishing mortality: 0.2

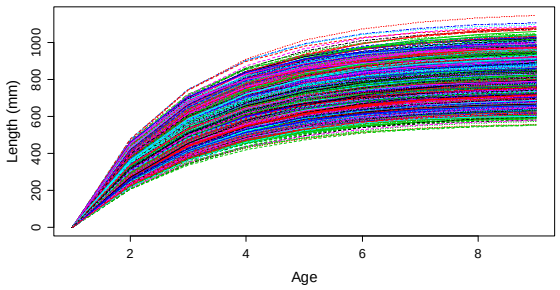
Individual variability



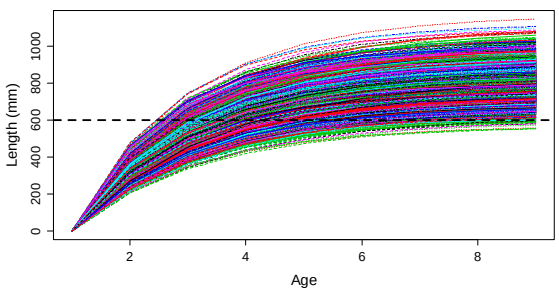
Individual variability



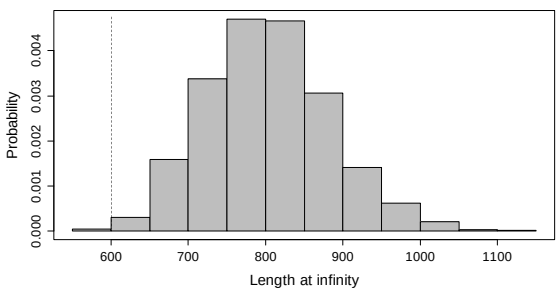
Individual growth



Size selective harvest

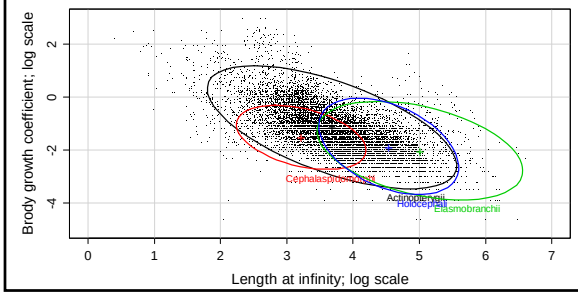


Individual variability

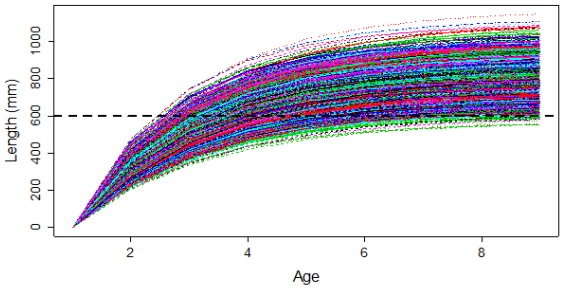


Relationship of L_∞ and k

- Inversely related,
- Fish with larger L_∞ have a lower k

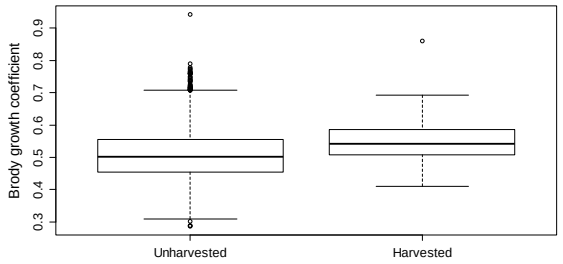


What can happen to population?

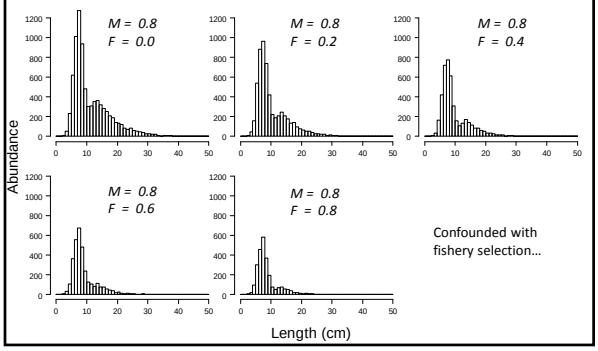


Harvest process…

Harvest process…



Size structure and fishing



Increased fishing and size?

- Mean size decrease with increased fishing mortality
- What is the effect of fishery induced selection?
- How do you tease them apart?

NEWS

Trawling makes for skinny flatfish

Trawling the seabed doesn't just remove some of the fishes living there; it also makes some of the survivors thinner and less healthy by forcing them to use more energy finding less nutritious food.

That's the conclusion of a new paper published in *Proceedings of the Royal Society B*, based on the work Dr Andrew Frederick Johnson undertook while studying for his PhD at Bangor University.

'We already knew that some species of bottom-dwelling fish in trawled areas were skinnier than those elsewhere, but until now it was assumed this was because they couldn't find enough food and went hungry,' he says.

Johnson's work sampling fish in the Irish Sea on Bangor University's research vessel Prince Madog shows that's not true; the stomachs of fish in trawled areas are as full as elsewhere, but they're full of different and less nutritious prey that the fish have to put more energy into finding. For instance, a fish with a bellyful of shellfish may feel full, but a lot of their meal is shell with no nutritional value. Much better to fill up on juicy worms - but these suffer more from the effects of trawling.

Plaice.

:DINGS B

rypublishing.org

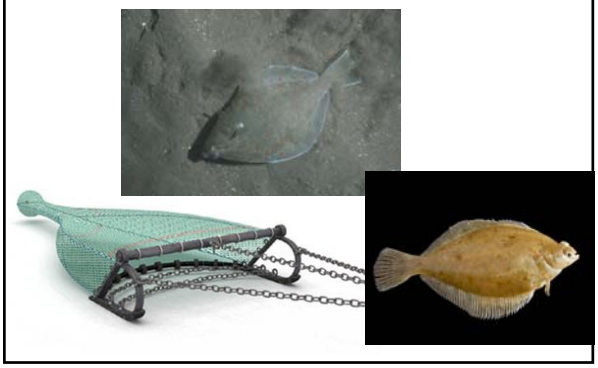
Effects of bottom trawling on fish foraging and feeding

Andrew Frederick Johnson, Giulia Gorelli, Stuart Rees Jenkins, Jan Geert Hiddink and Hilmar Hinz

Subject Areas:

Keywords:

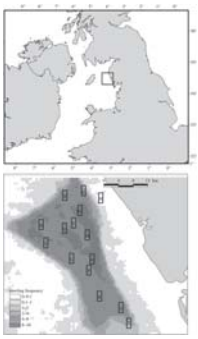
Flatfish: Plaice



N.E. Irish Sea

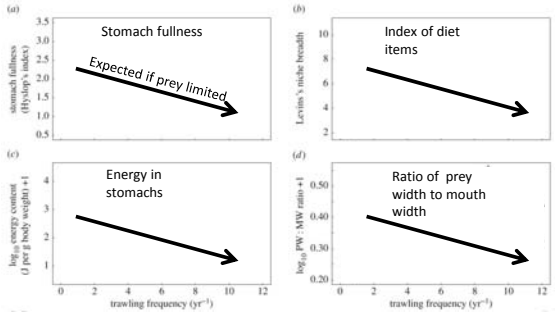
'We already knew that some species of bottom-dwelling fish in trawled areas were skinnier than those elsewhere, but until now it was assumed this was because they couldn't find enough food and went hungry,' he says.

Read more at: http://phys.org/news/2014-12-trawling-skinny-flatfish.html#jCp

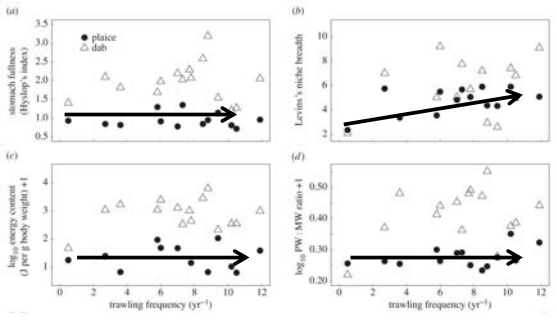


Results

Expected relationship assuming forage is limiting



Results



Other selection considerations

Large fast growing fish

- Fecundity
- Maturity
- Other traits…

One major question… are traits heritable?

Super Catchable Trout?

Unnatural selection

- Spring chinook return to the Imnaha
- June to September

North American Journal of Fisheries Management 28:148–164, 2008
© Copyright by the American Fisheries Society 2008
DOI: 10.1577/M05-145.1

[Article]

Run Timing, Spawn Timing, and Spawning Distribution of Hatchery- and Natural-Origin Spring Chinook Salmon in the Imnaha River, Oregon

TIMOTHY L. HOFFNAGLE,* RICHARD W. CARMICHAEL, KATHRYN A. FRENYEA,[1] AND PATRICK J. KENNY
Oregon Department of Fish and Wildlife, Northeast Oregon Fisheries Research and Development, 203 Badgley Hall, Eastern Oregon University, La Grande, Oregon 97850, USA

Abstract.—We evaluated 16 years (1990–2005) of weir collection and spawning ground survey data to examine differences in run timing, spawn timing, and spawning distribution between naturally and hatchery-reared Chinook salmon *Oncorhynchus tshawytscha* in the Imnaha River, Oregon, and to look for changes in

Study area

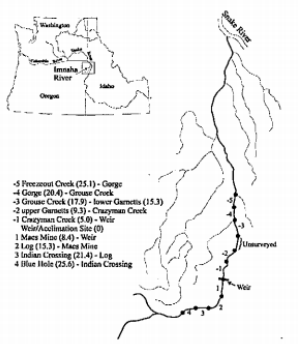


FIGURE 2.—Map of the Imnaha River, Oregon, with study reaches and boundaries (boundary locations are designated as RKM above or below the weir site at which hatchery spawned Chinook salmon were acclimated before release).

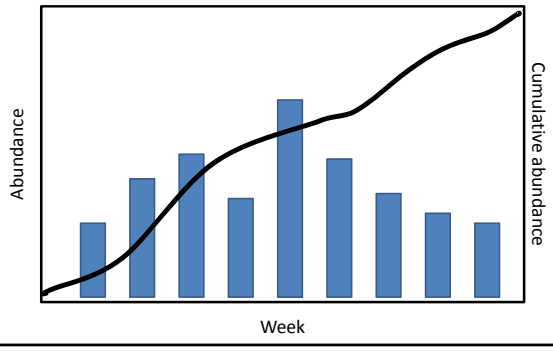
Process

Spawning run:
Week 23-37
June – mid September

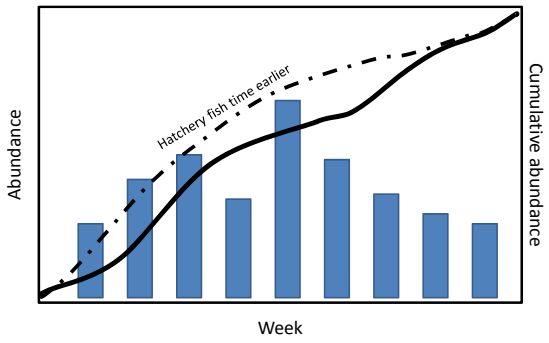
Objectives
- Get sufficient number of fish to meet hatchery quotas

Spawning

Expectation: no selection effect

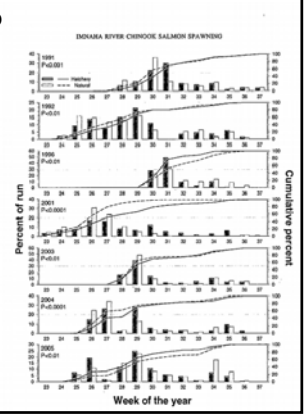


Expectation: selection effect



Hatchery effects?

- In some years, hatchery fish arrived earlier
- In others natural origin fish returned earlier
- Below wier



Consequences above wier

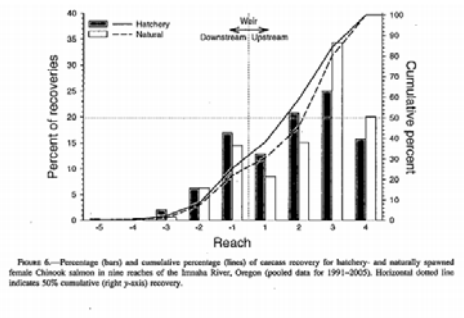


FIGURE 6.—Percentage (bars) and cumulative percentage (lines) of carcass recovery for hatchery- and naturally spawned female Chinook salmon in nine reaches of the Imnaha River, Oregon (pooled data for 1991–2005). Horizontal dotted line indicates 50% cumulative (right *y*-axis) recovery.

What about environmental drivers

- Can exhibit strong effects on phenology
  - Fish return earlier in warmer years
  - Fish spawn earlier
  - So on…

Is fishery selection just environmental selection, or do they both occur?

Environmental vs fishery effects?

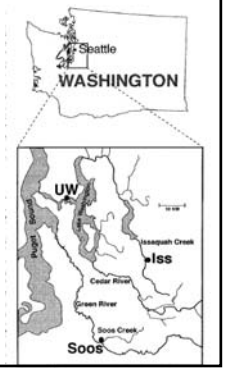
Transactions of the American Fisheries Society 131:591–598, 2002

Artificial Selection and Environmental Change: Countervailing Factors Affecting the Timing of Spawning by Coho and Chinook Salmon

THOMAS P. QUINN,* JERAMIE A. PETERSON, VINCENT F. GALLUCCI, WILLIAM K. HERSHBERGER,[1] AND ERNEST L. BRANNON[2]

School of Aquatic and Fishery Sciences, Box 355020, University of Washington, Seattle, Washington 98195, USA

Study area and species



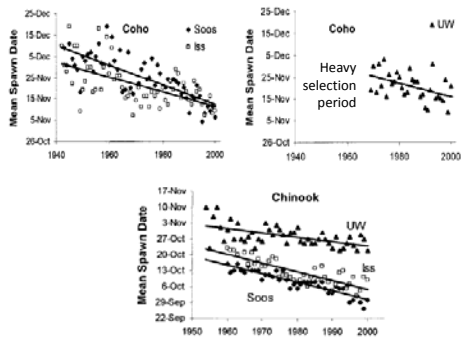
What did they do?

- U. Washington hatchery- selective practices from 1953-1972.
  - Early maturation age, rapid growth, fecundity, survival of offspring
- No selection post 1972
- Compared U. Washington hatchery returns with WDFW hatcheries (Soos & Issaquah)

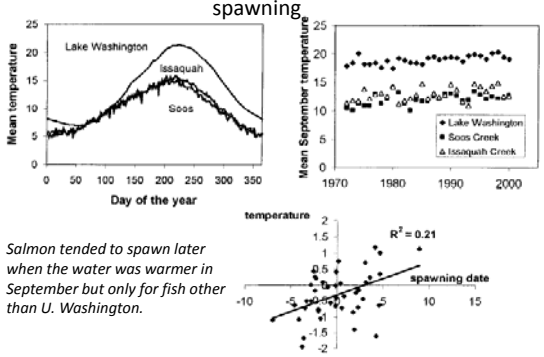
Study objectives

1. Test the hypothesis that the timing of spawning by coho and chinook salmon has become earlier since the 1950s,
2. Determine whether timing patterns are consistent with salmon avoidance of warm temperatures during spawning,
3. Compare the spawning timing of chinook and coho salmon populations

Timing of spawning by coho and chinook salmon has become earlier since the 1950s

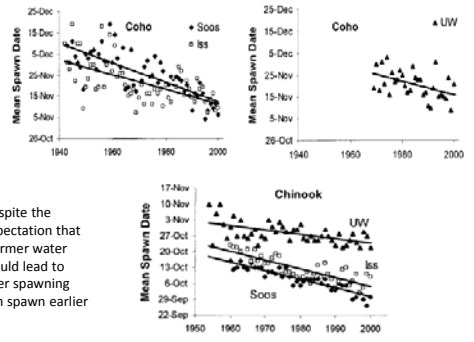


Determine whether timing patterns are consistent with salmon avoidance of warm temperatures during spawning



Salmon tended to spawn later when the water was warmer in September but only for fish other than U. Washington.

compare the spawning timing of chinook and coho salmon populations



Despite the expectation that warmer water would lead to later spawning fish spawn earlier