

Lake Huron's foodweb change: Implications to salmonine recruitment

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Great Lakes Science



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- Federal Aid to Sport fish Restoration F-80-R Michigan, Study 482;
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- Mi DNR Charlevoix Fishery Research Station;
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- Lake Huron Sportfishing, Inc.;



Objective:

- Use brown trout and Chinook salmon stocking experiments to make inferences about lake trout stocking success;
- Relative to recent changes in foodweb;
- Specifically, test hypothesis that alewives provided a buffer between stocked fish and potential predators
 - E.g.. Stocking success is a positive function of alewife biomass

Survival Rates of 1-and 2-Year-Old Hatchery-Reared Lake Trout in the West Arm of Grand Traverse Bay, Lake Michigan

Ronald W. Rybicki

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Abstract.-The objectives of the study were to determine the survival rate of hatchery-reared lake trout (*Salvelinus namaycush*) stocked as yearlings in the West Arm of Grand Traverse Bay, Lake Michigan during the 10-day period following planting, and the annual survival rate as 1-, 2-, and 3-year -old fish. Average survival of the yearling lake trout during the 10-day period following planting was estimate to have been 68%, which included removals by experimental fishing. The annual survival rate (including post-planting losses) of yearlings was determined to have averaged 40%. For 2-year-old lake trout the mean annual survival rate was estimate to have been 59%. The annual survival rate of 3-year-old lake trout could not be determined because 4-year-old lake trout were not fully vulnerable to the trawl. In the West Arm of Grand Traverse Bay, lake trout planted as fall fingerlings survived to 2 years of age at one-half the rate of the same year class planted as spring yearlings.

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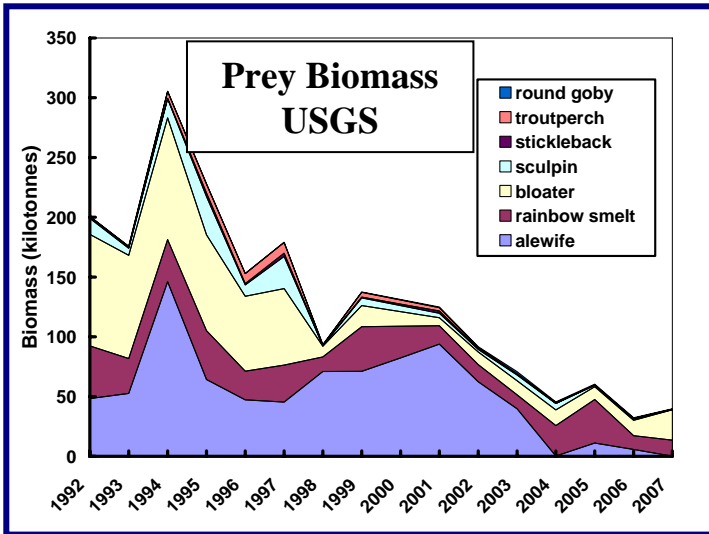
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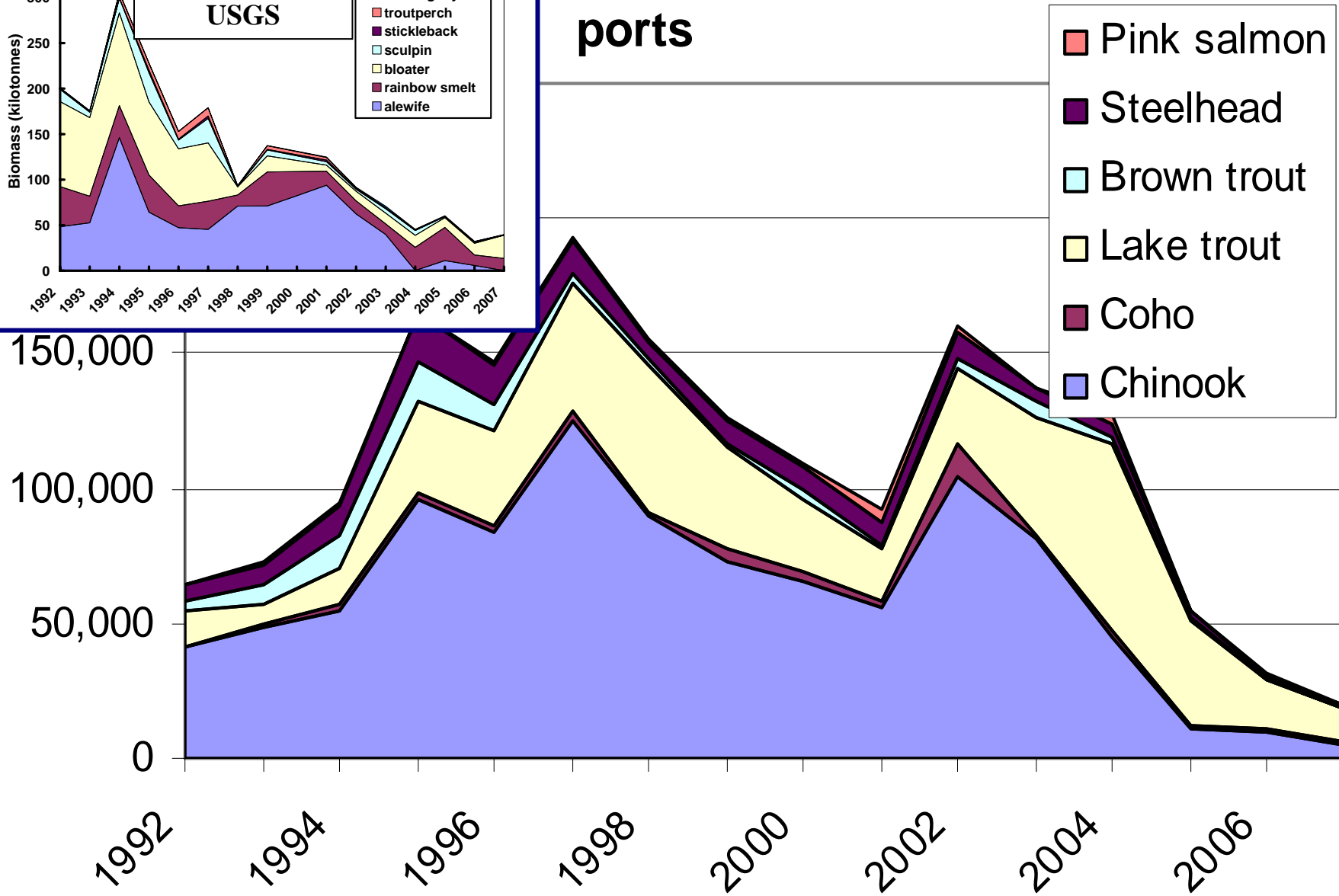
Premise:

The days of such exceptionally high post-stocking survival rates are over, at least for Lake Huron

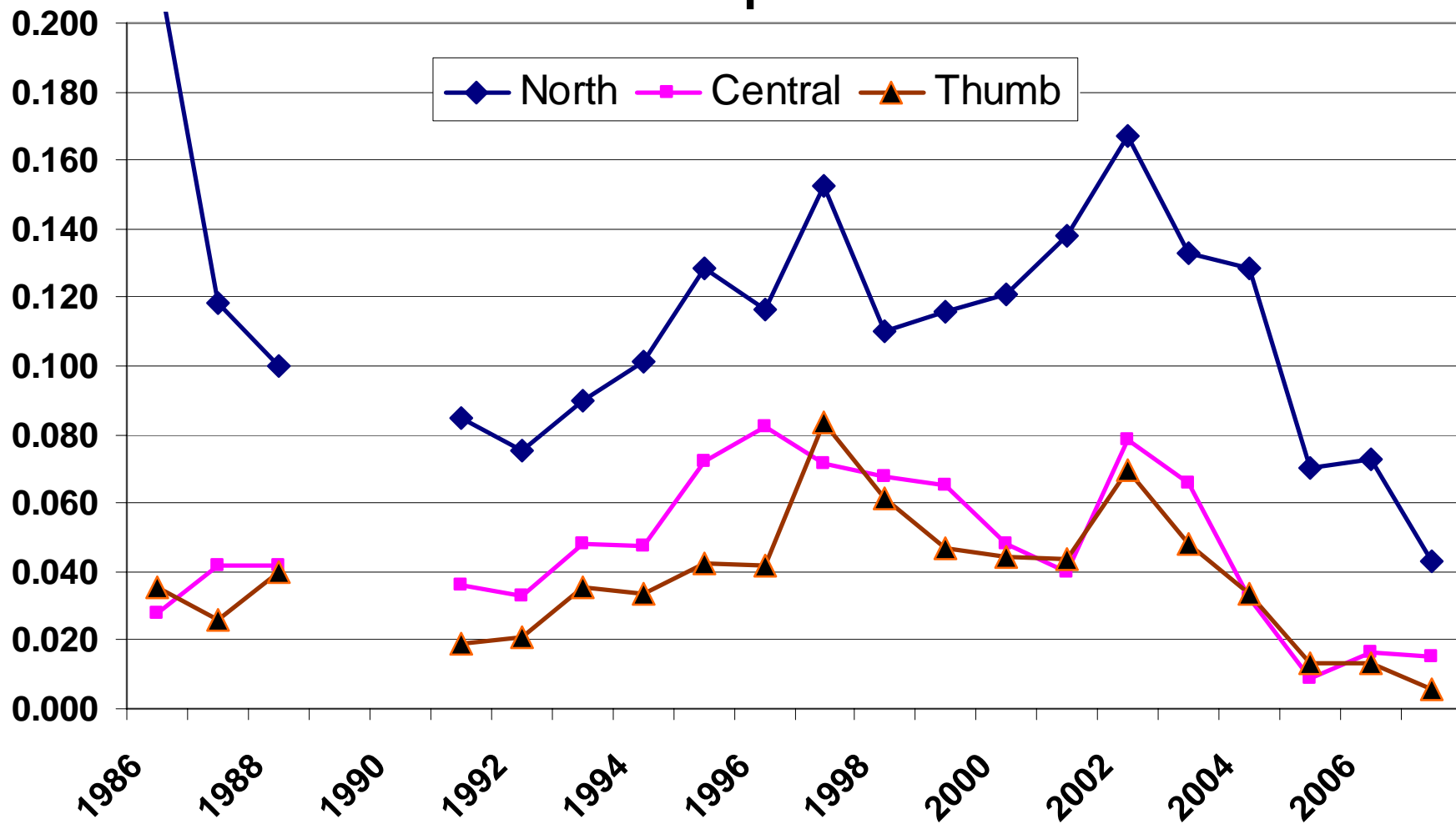
ends, Lake Huron's 10 index ports



Number harvested

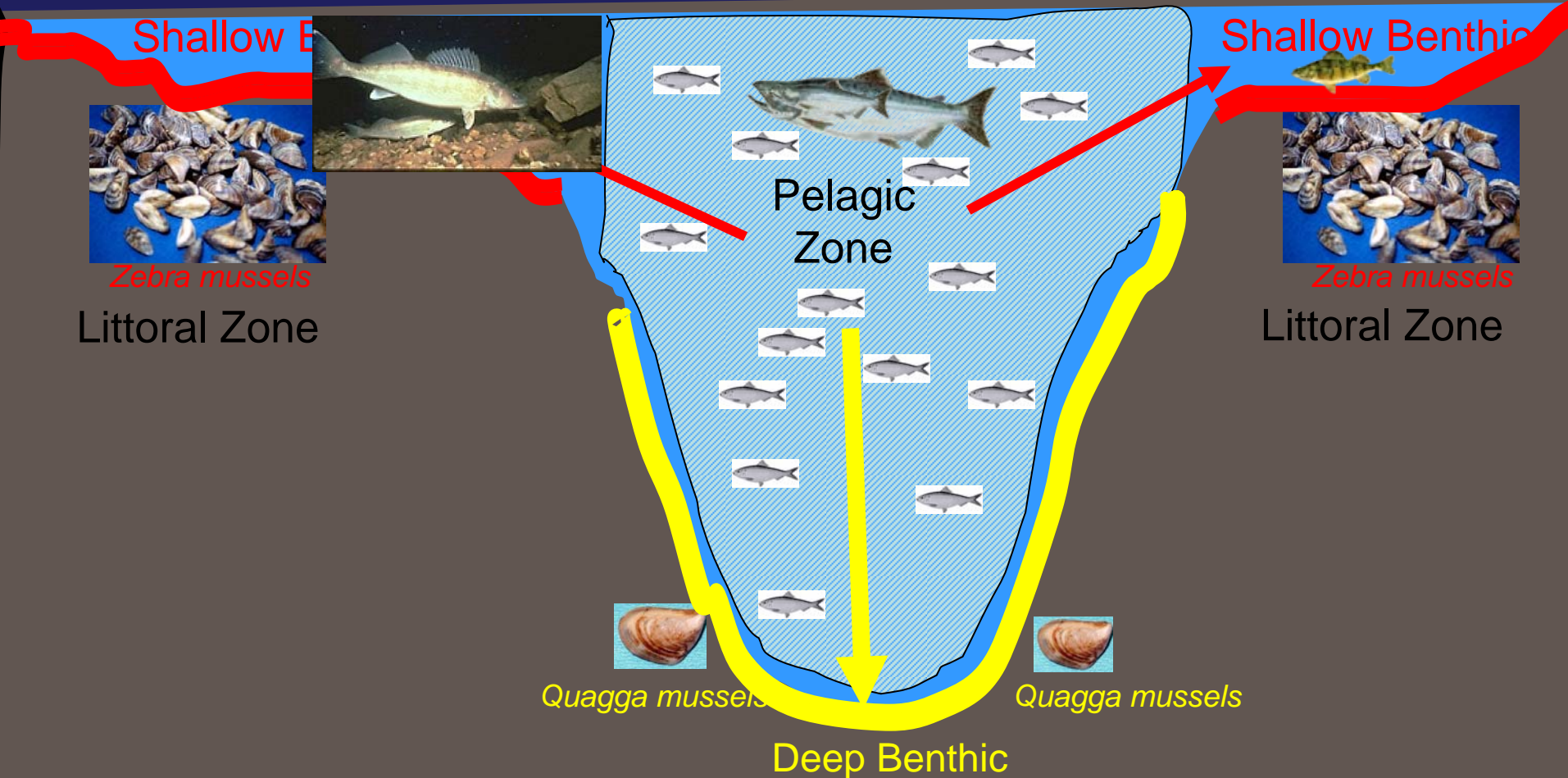


Chinook Catch Rates (number/hr), 10 Main Basin index ports



Mini Docu-drama of Foodweb change

Lake Zones



Inadequate Prey Base → Salmonid failures:

- ***Starvation***



- ***Predation*** on juvenile fish



Two studies:

- Survival of stocked brown trout (Alpena)
- Survival of stocked Chinook salmon (lakewide)

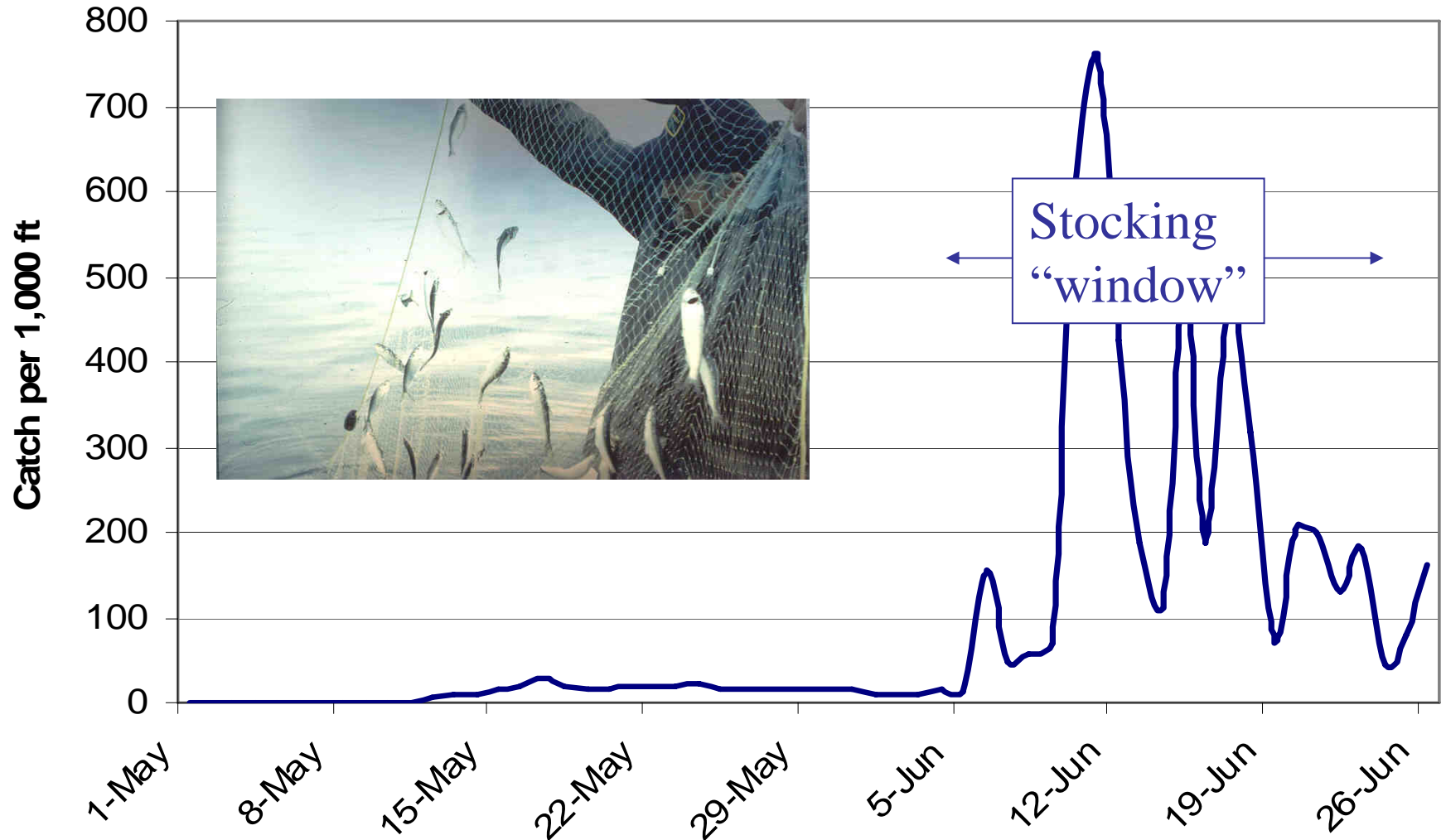


Brown Trout Study

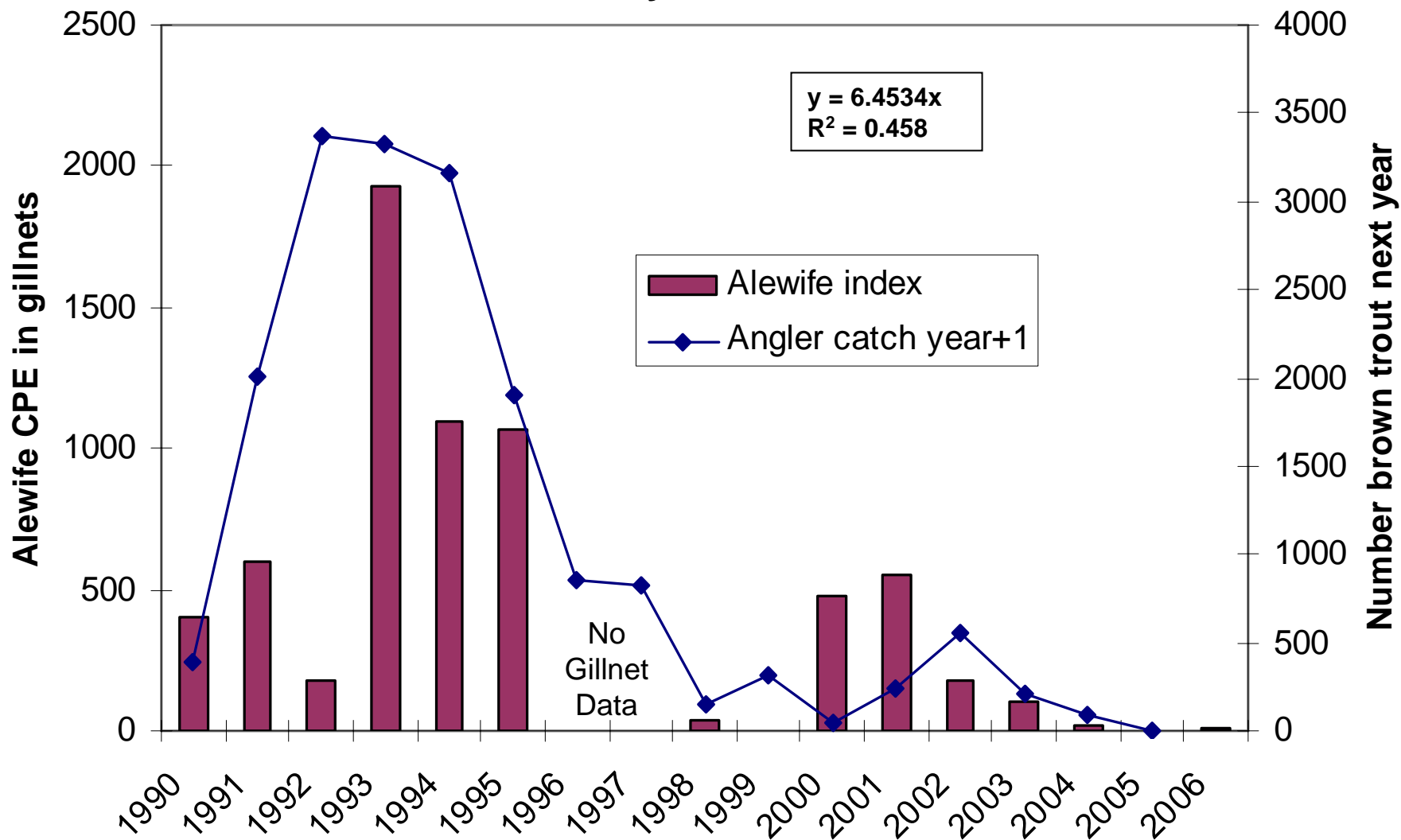


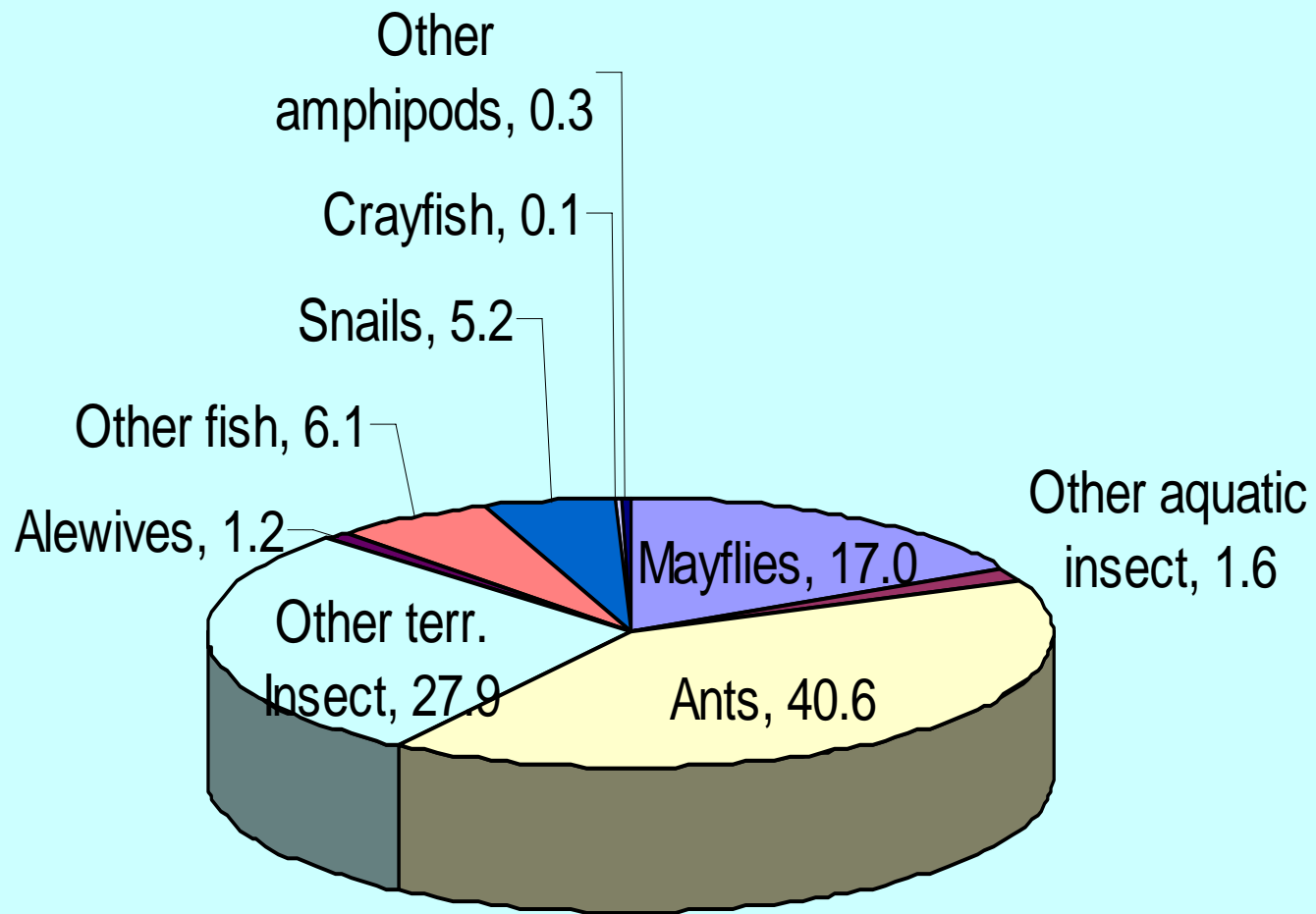
ADULT ALEWIFE CATCHES IN GILLNETS THUNDER BAY, 1990

Alewife CPE in gillnets, May 1-June 25



Alewife gillnet CPE vs Angler catch of brown trout the next year





Diet of recently stocked brown trout, 1990-98, Thunder Bay

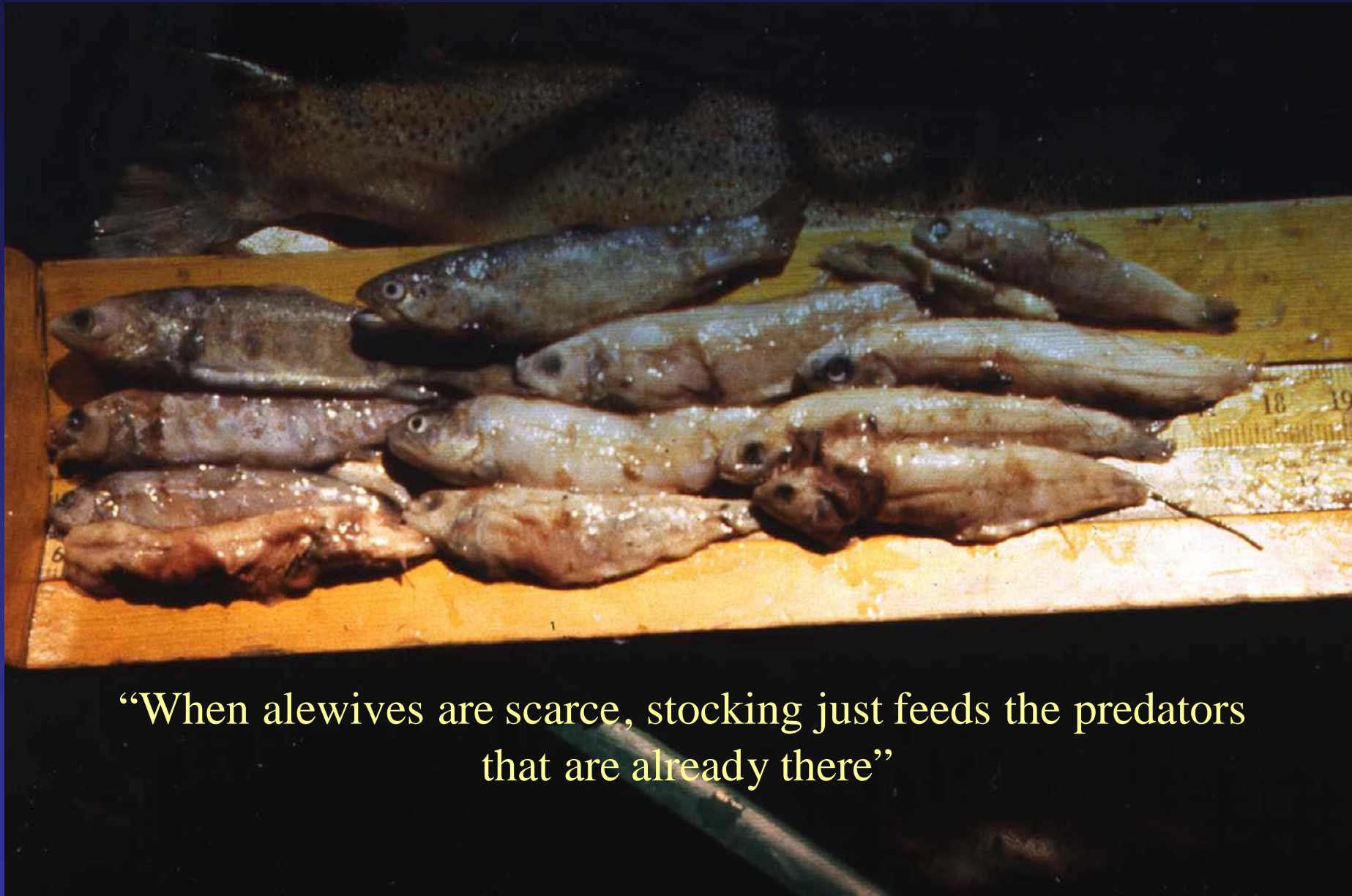
Predators sampled in gillnets, Thunder Bay, spring 1990-2001

Species	Total catch
Walleye	971
Channel catfish	245
Burbot	63
Adult brown trout	62
Lake trout	45
Northern pike	7

Day after stocking brown trout
on Alpena breakwall, June 14, 2002

Brown trout stocking site





“When alewives are scarce, stocking just feeds the predators that are already there”

Chinook salmon



Dave Kenyon photo

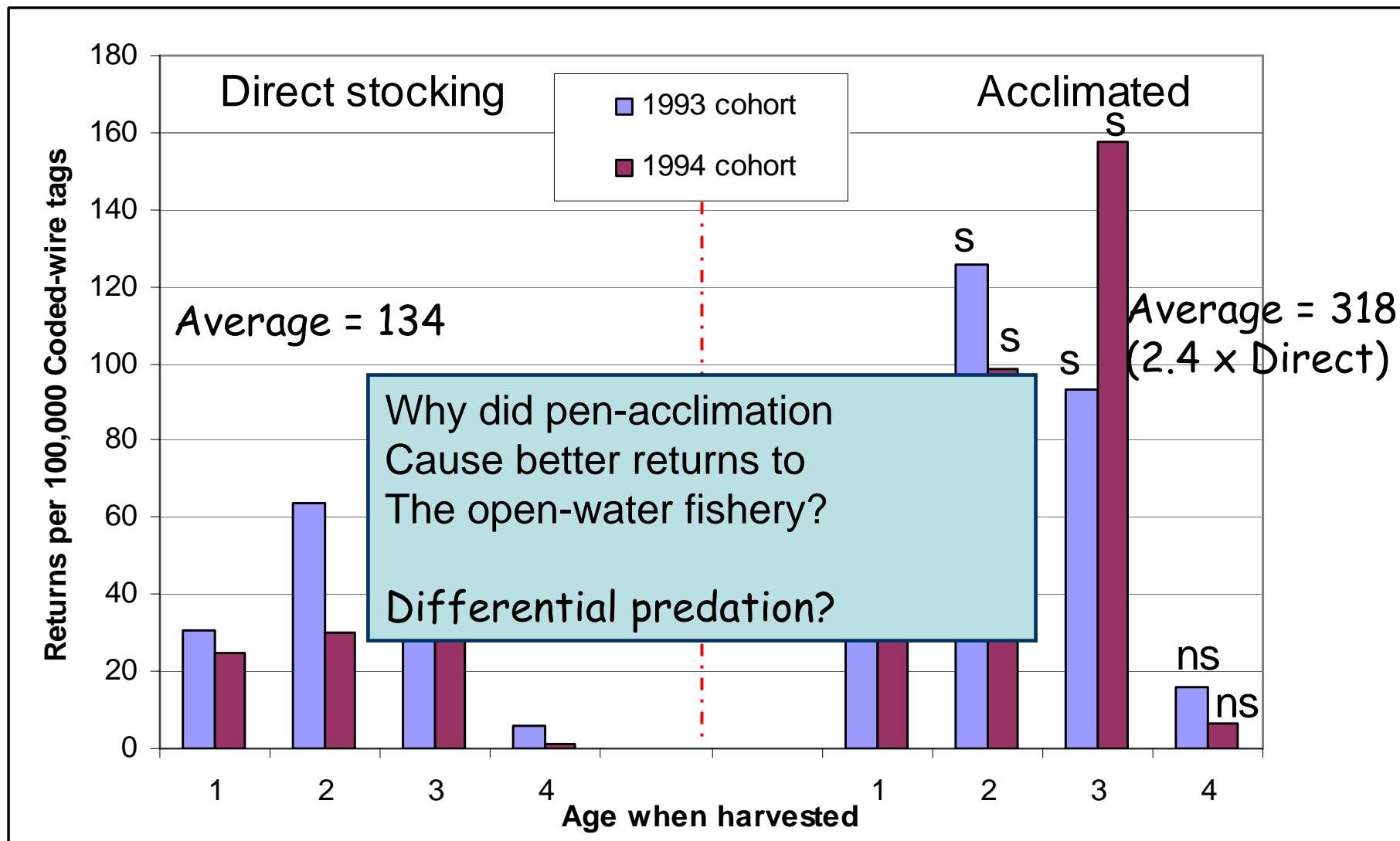




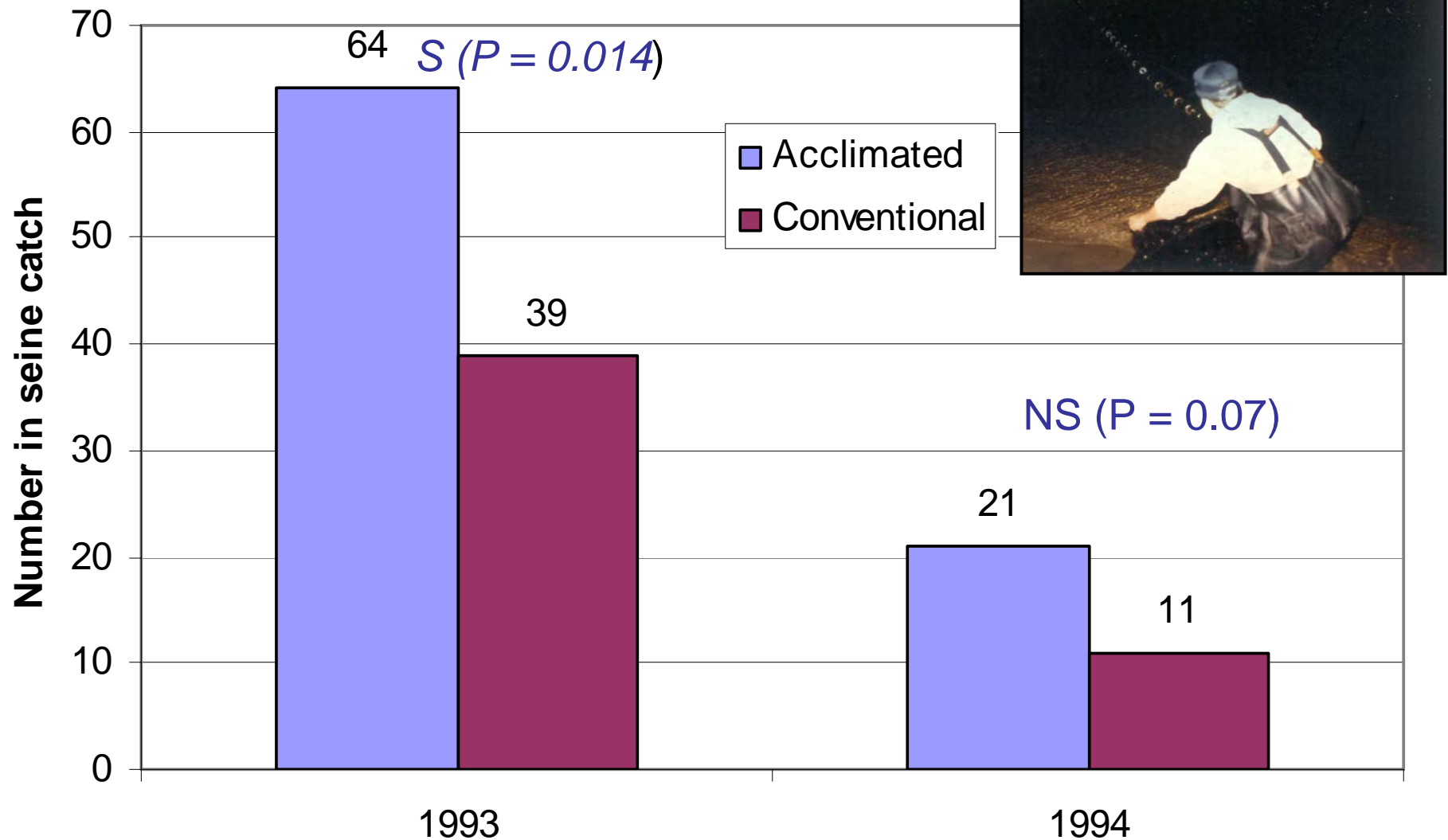
Background:

The Acclimation Pen
Project for Chinook
salmon at Oscoda

Conventionally stocked vs pen-acclimated Chinooks stocked in the AuSable River based on returns of CWT from recreational fishery

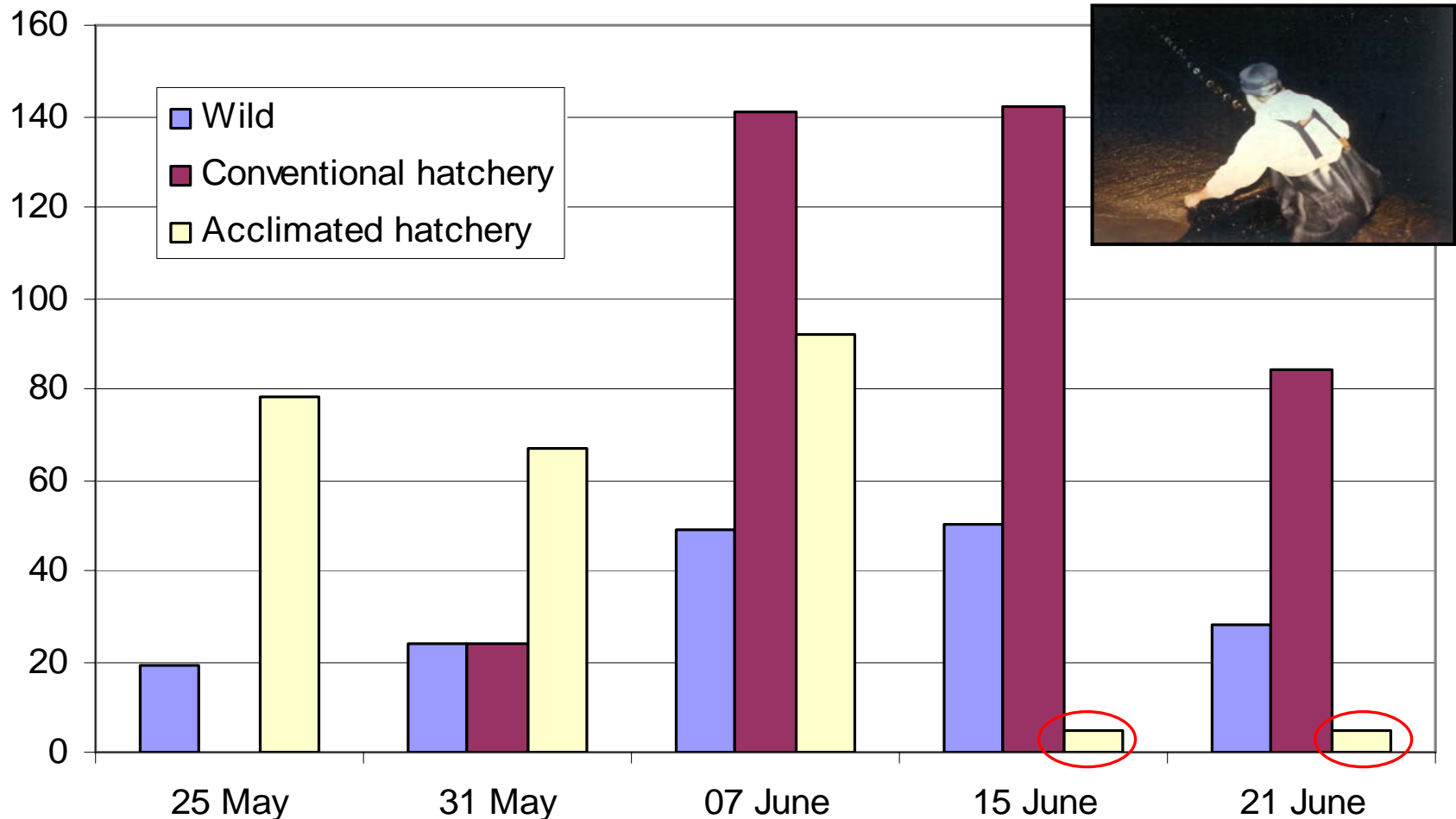


Beach seine catches



Time on beach

Number Chinook parr caught by date, 1995, Oscoda



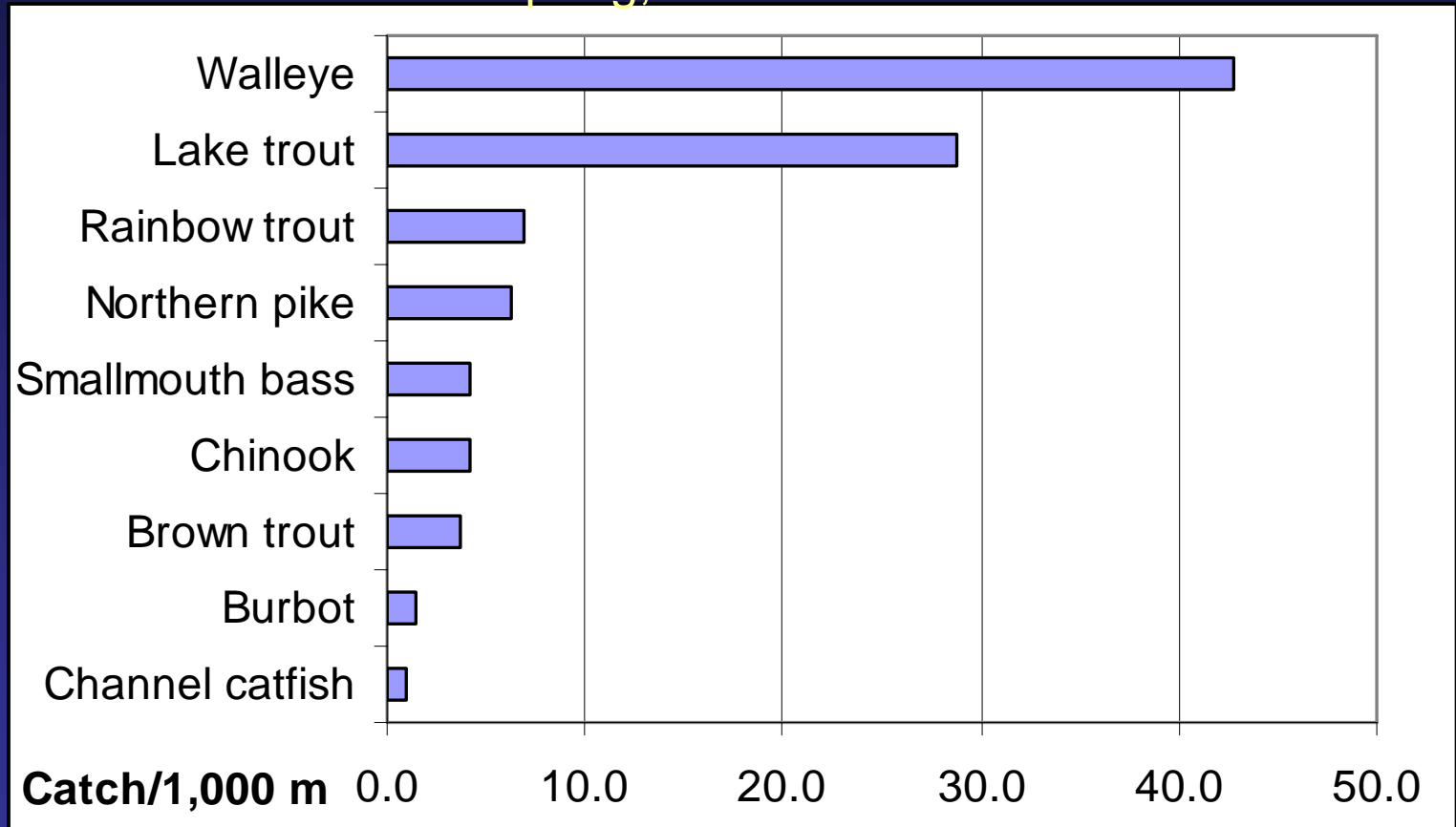
We also set
large,
graded-
mesh nets to
assess
predator
distribution
and diets in
the Beach
Zone



Predator netting, May-June 1995-97

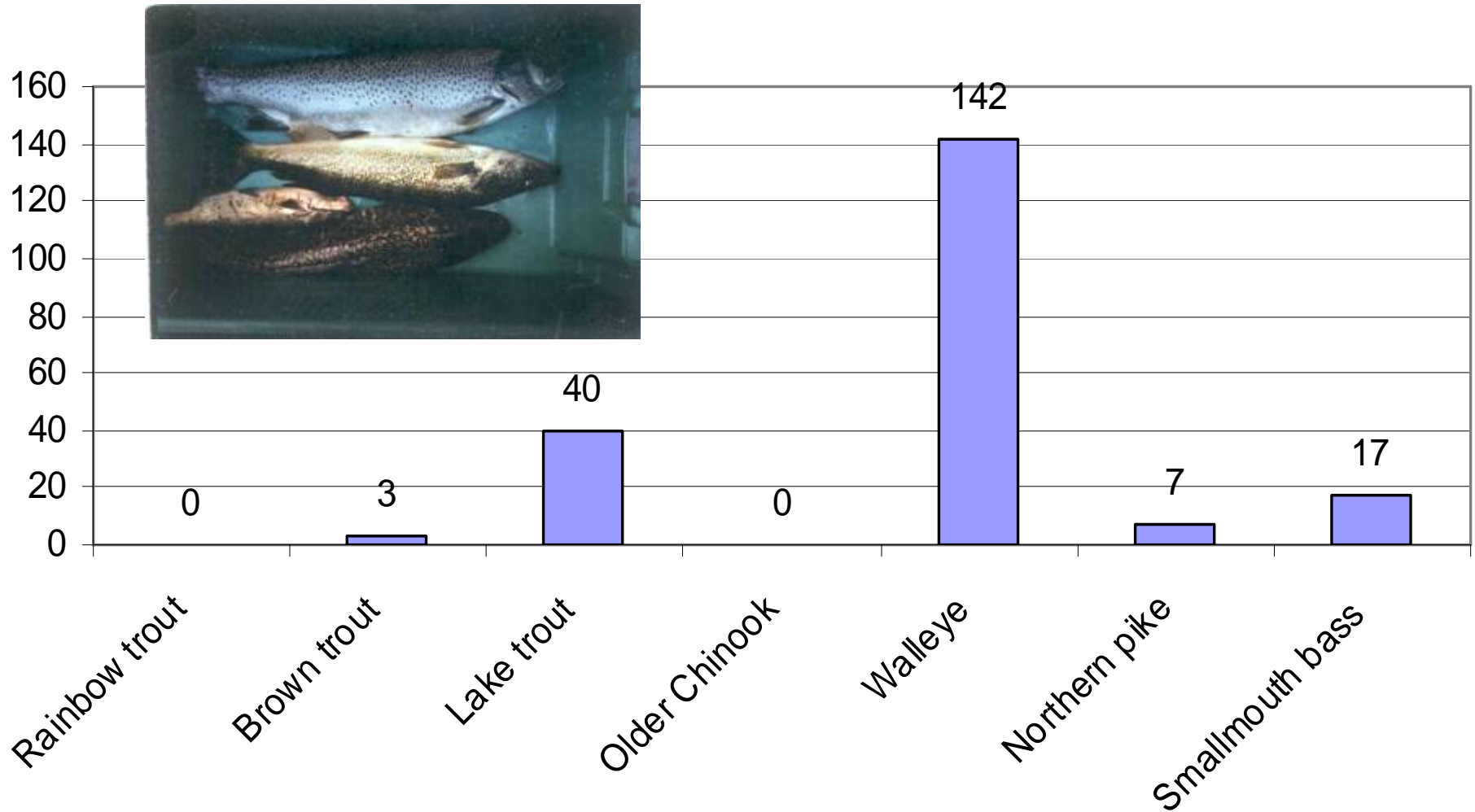


Catch of predator species
graded-mesh gillnets set at beach seining sites,
Spring, 1995-1997.

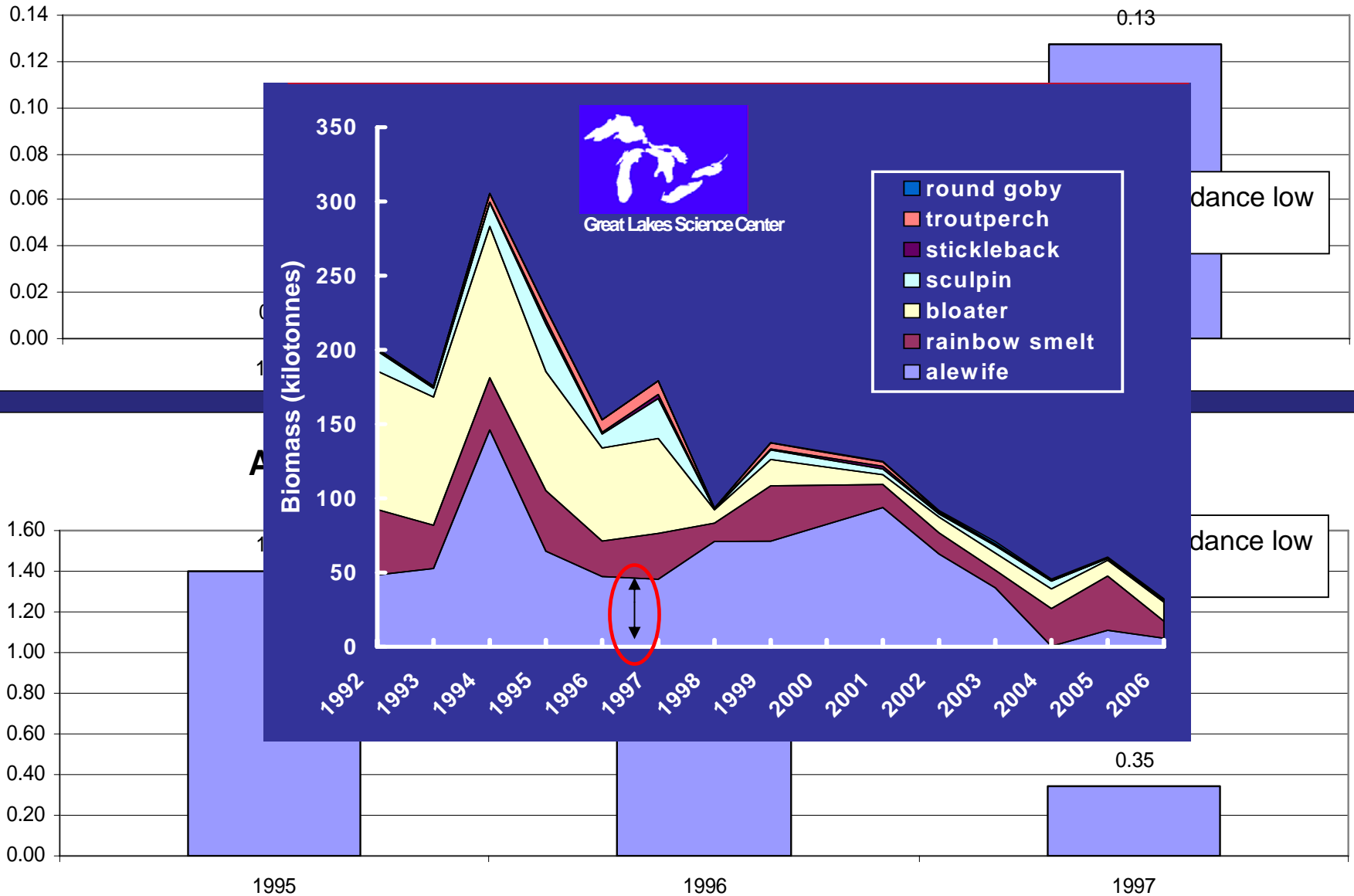


Total of 48 76-m units of effort
Average depth fished = 2.9 m

Number of Chinooks seen in 537 nearshore predators sampled during 1995-1997

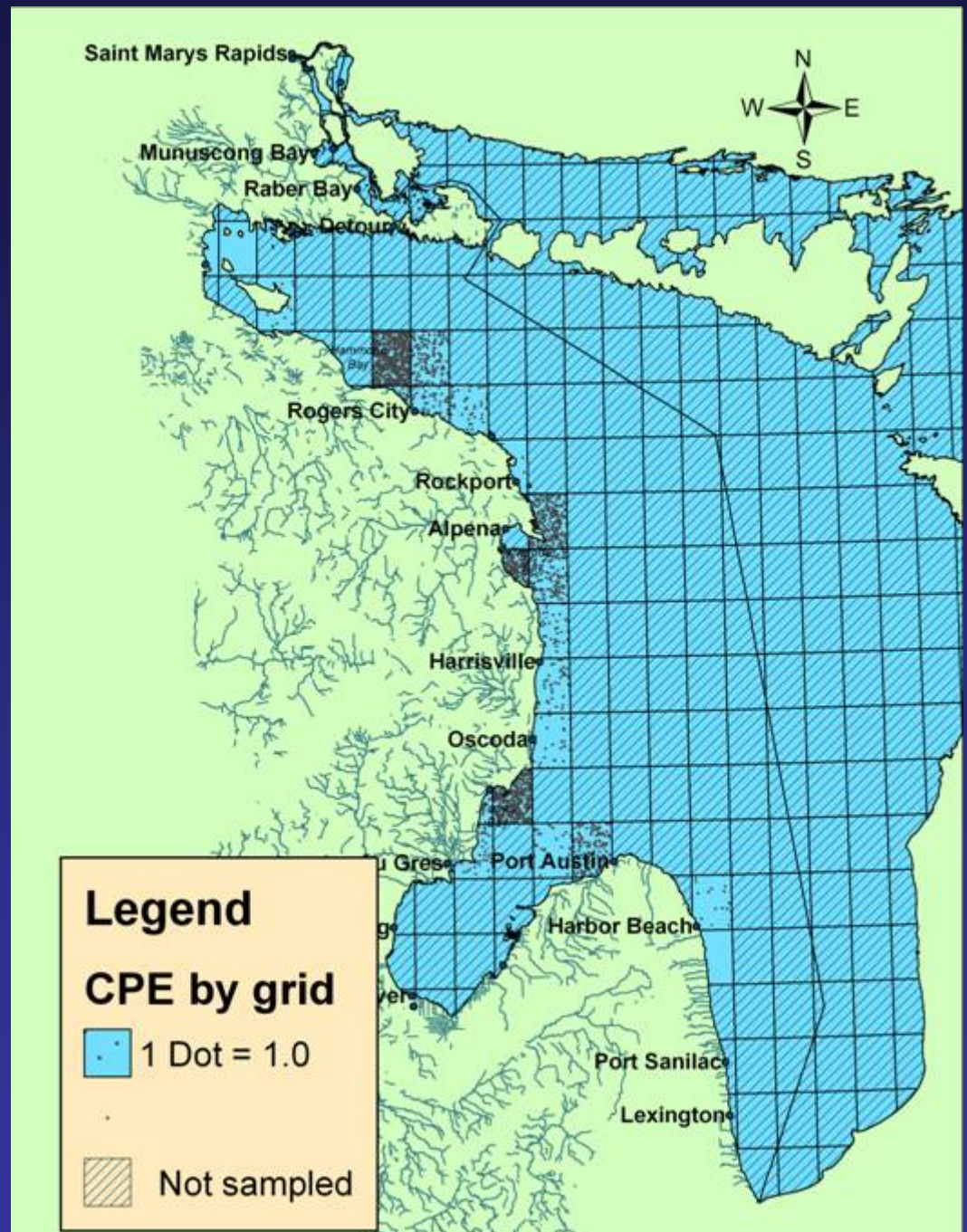


Age-0 Chinooks consumed per predator stomach, 1995-1997



Distribution of age-0
Chinook catch in small-
Mesh gillnets, western
Lake Huron
1991-1996.

N = 1,542 collected



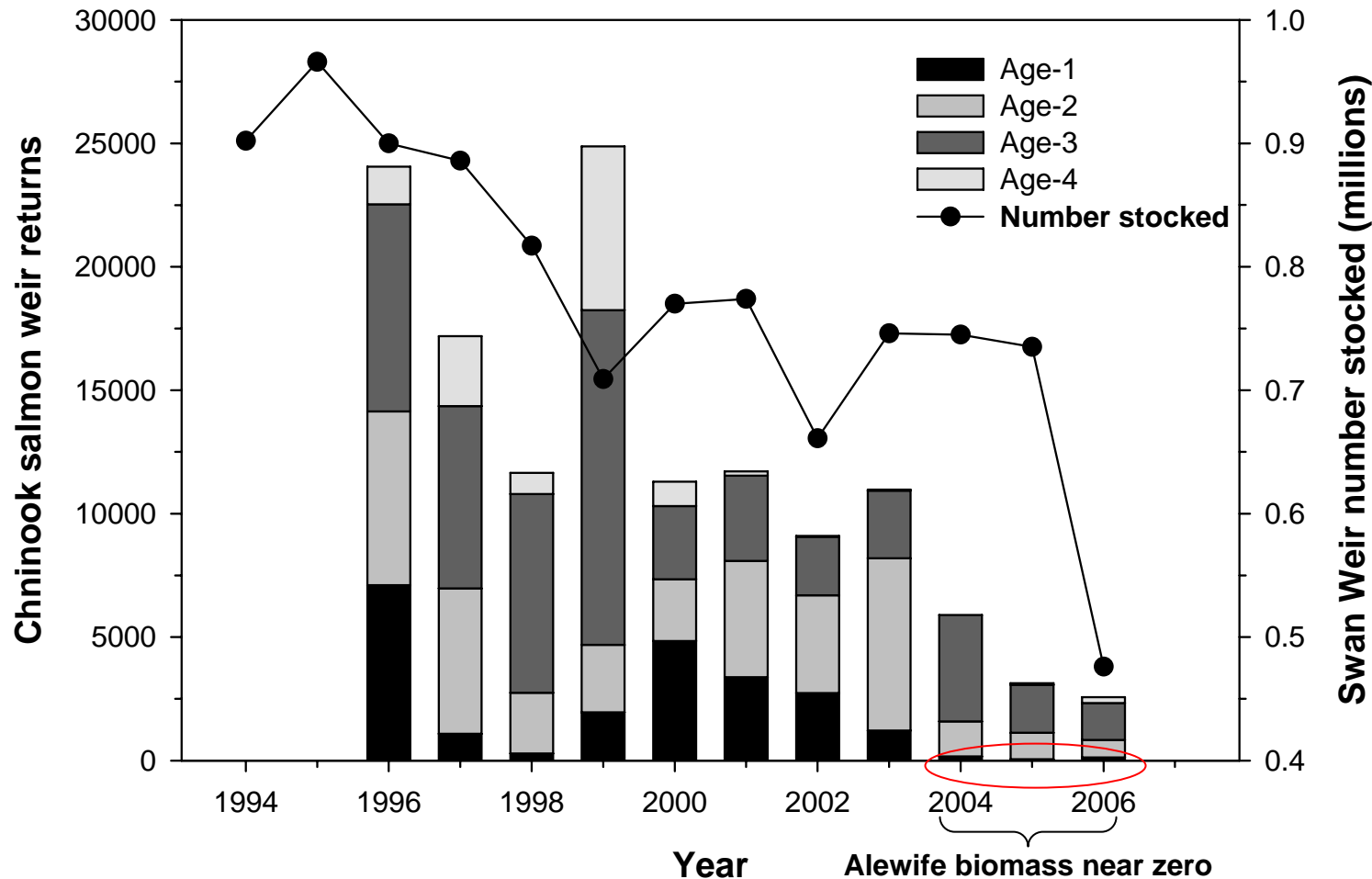
Other juvenile salmonids (<300mm)

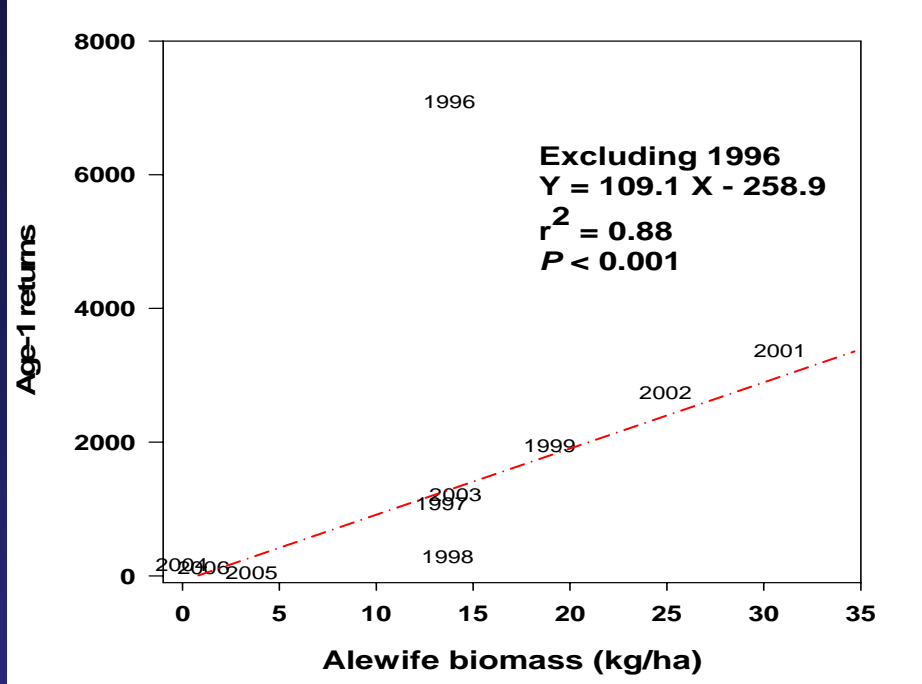
associated with
age-0 Chinook in the bay/near-
shore Zone, July-October,
1993-1996

Species	Number
Age-0 Chinook	1,295
Brown trout yearlings	43
Rainbow trout	6
Lake trout	1



Escapement to Swan Weir, North West Lake Huron

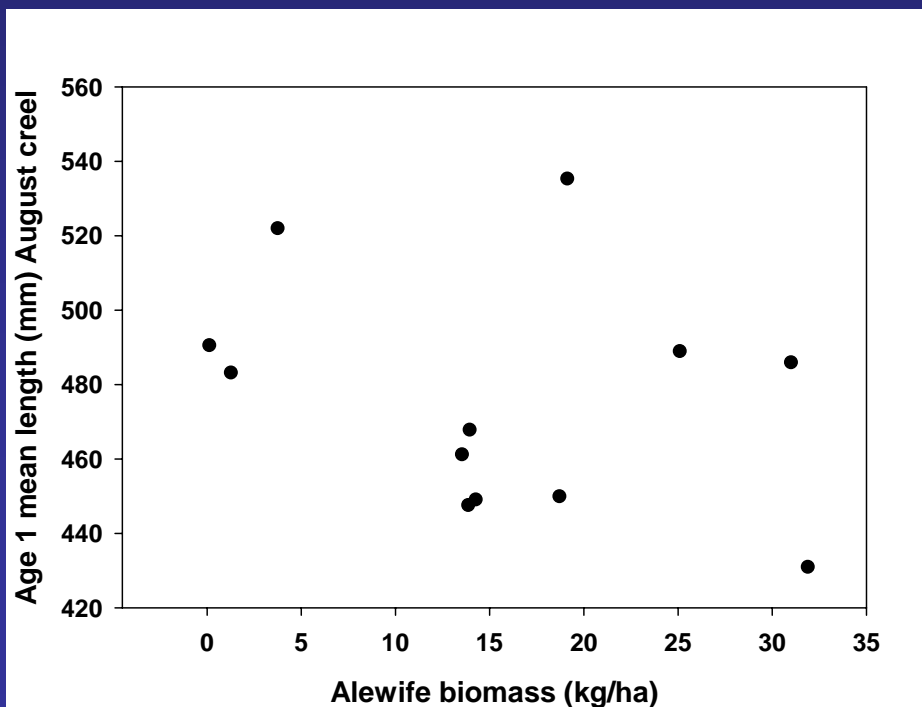




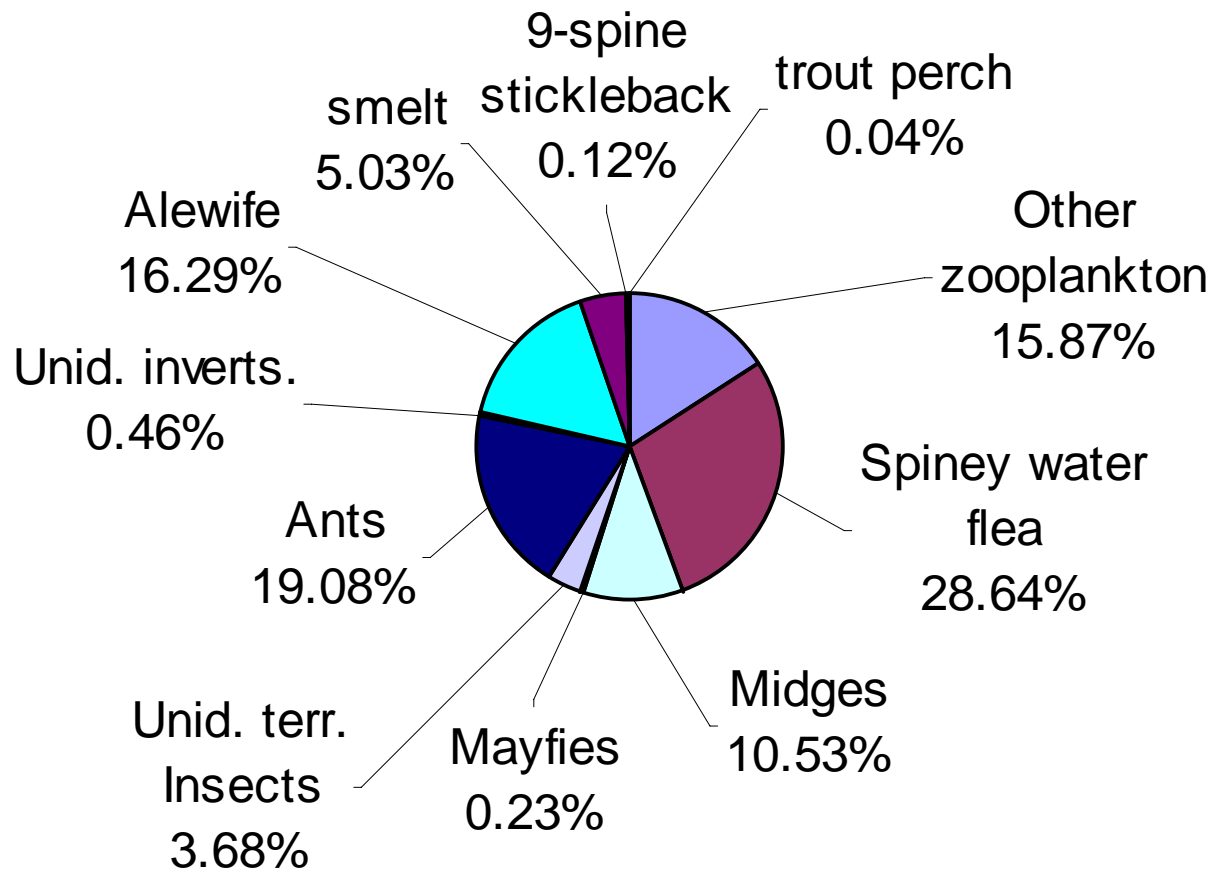
Swan Weir, North West Lake Huron



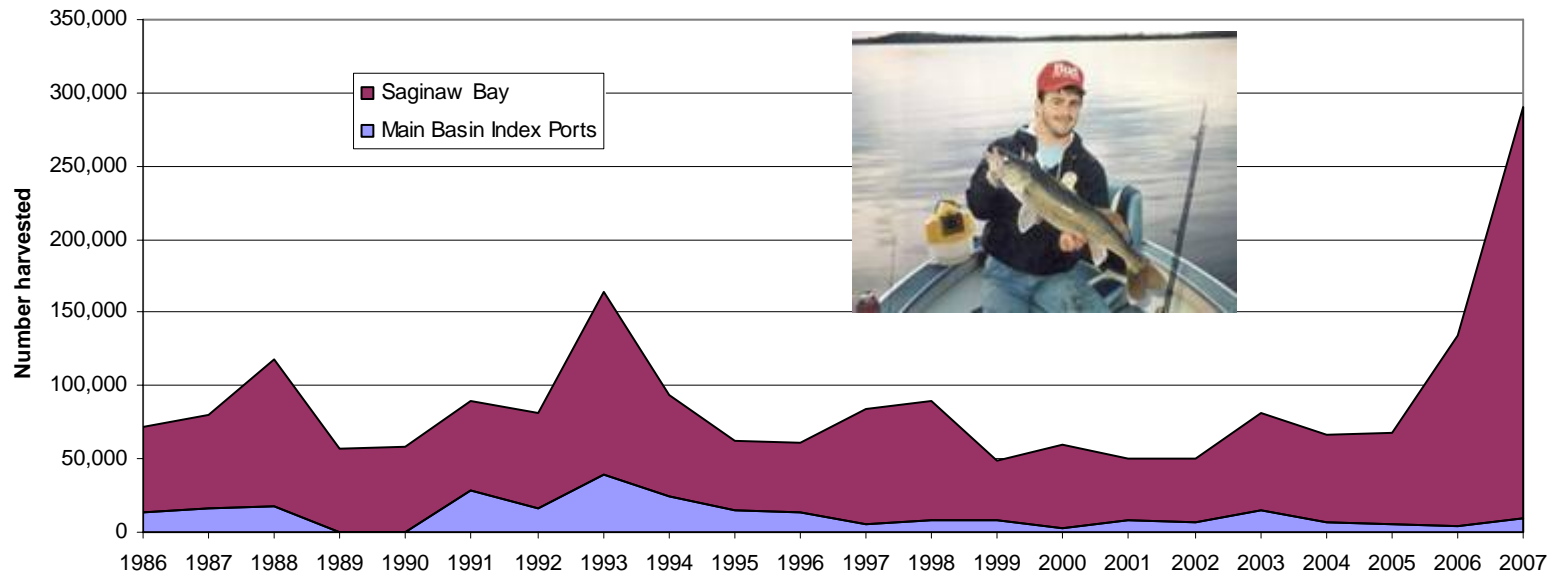
Dave Kenyon photo



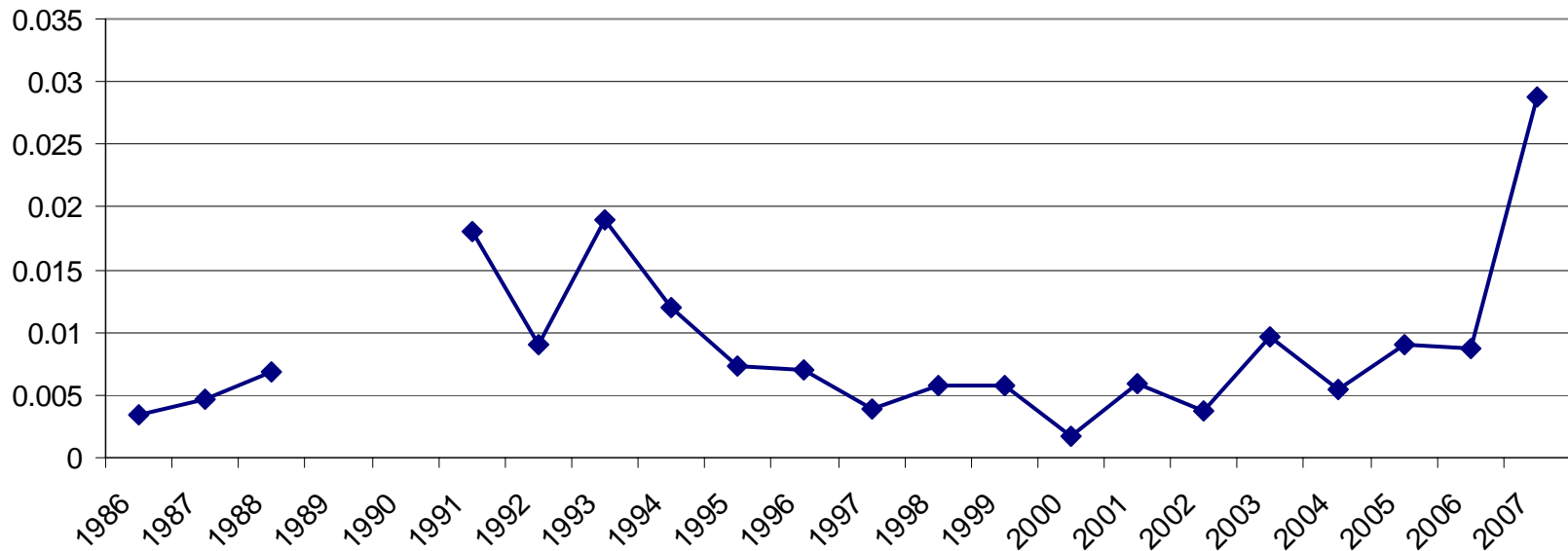
Prey consumed (percent by number) by 1,133 age-0 Chinooks Sampled from July-October, 1993-96



Walleye harvest during open-water fishing season, Michigan waters of Lake Huron



Catch per hour of walleyes, 10 Main Basin (Chinook) Ports, Lake Huron



Early life distribution of stocked trout and salmon:

- Age-0 Chinooks: Nearshore, warm
- Age-1 brown trout: Nearshore, warm
- Age-1 steelhead: Offshore, surface
- Age-1 lake trout: Offshore, deep (>120 ft)

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Early life distribution of stocked trout and salmon:

- Age-0 Chinooks: Nearshore, warm
- Age-1 brown trout: Nearshore, warm
- Age-1 steelhead: Offshore, surface
- Age-1 lake trout: Offshore, deep (>35 m)
- Adult walleyes – near shore, warm
- Adult lake trout – offshore, deep

Conclusions

- Foodweb change causing recruitment failure;
- Chinook and brown trout stocking success has been alewife dependent;
- Age-0 Chinooks look same, occupy same locations as adult alewives;
- Alewife decline caused predators to increasingly take juvenile salmon and brown trout;
- Now walleye abundance is exceptionally high (except in north);
- Brown trout & Chinook stocking strategies are being reviewed

Relevance to lake trout:

- Diet of adult lake trout was once dominated by alewives;
- Lake trout had to switch to alternative prey – presumably including stocked fish
- Until recently, at least, adult lake trout biomass (and therefore consumption) has been high;
- Walleyes not a serious impediment to lake trout stocking success - juvenile lake trout habitat is deep.
- Adult lake trout are now found in domain of juvenile lake trout, increasing opportunity to consume stocked fish.

Recommendations:

- Revise assumptions about first-year survival of stocked lake trout in stock assessment models;
- Continue offshore stocking of lake trout;
- Investigate survival of stocked lake trout over range of stocking depths (how deep can you go??);
- Enhance availability of offshore, large-bodied prey (reintroduce cisco where they are absent);
- Evaluate pulse (fallowing period) stocking strategies.



Your purchase of fishing equipment
and motor boat fuel supports boating
access and Sport Fish Restoration.