

Seasonal Distribution and Abundance of Small Fishes in the Offshore Waters of Lake Winnipeg

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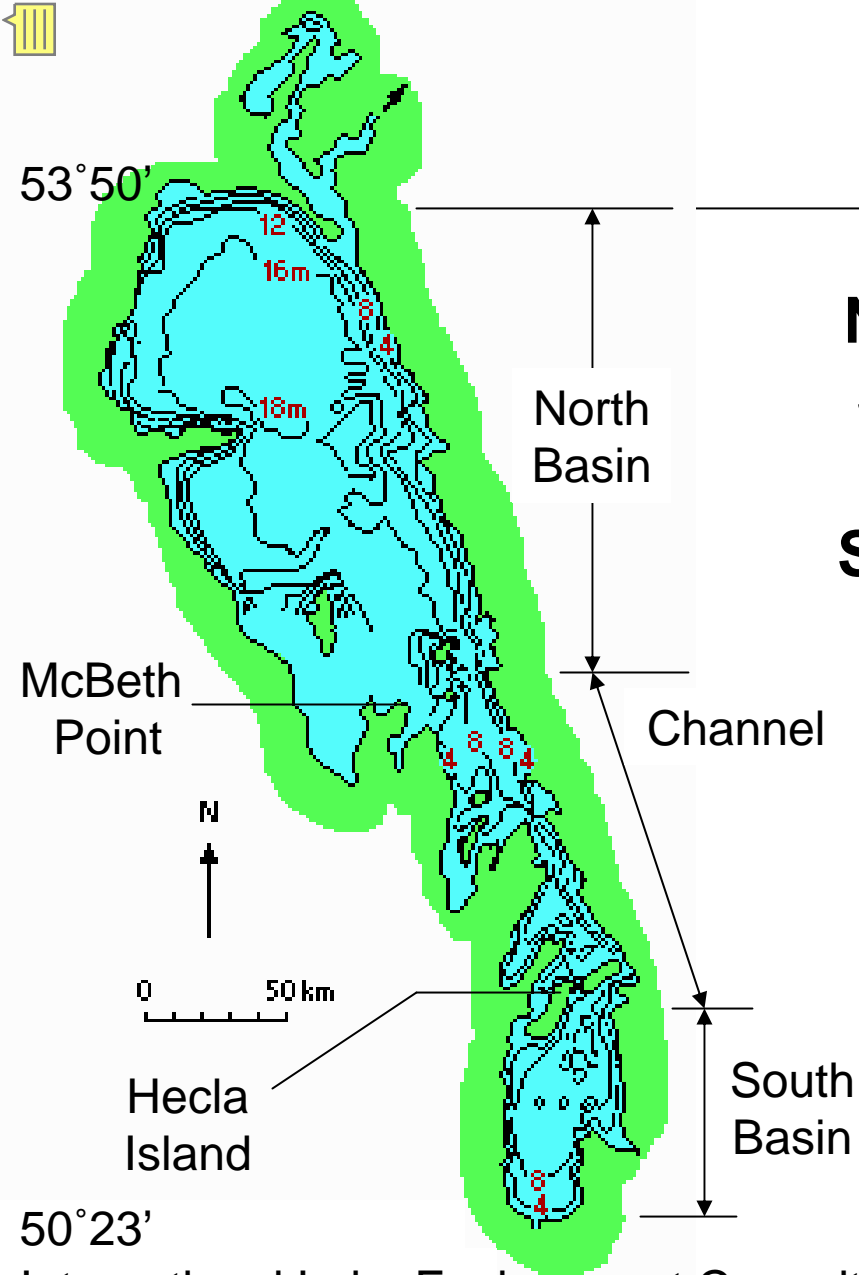
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Hecla Island
Lake Winnipeg

Lake Winnipeg

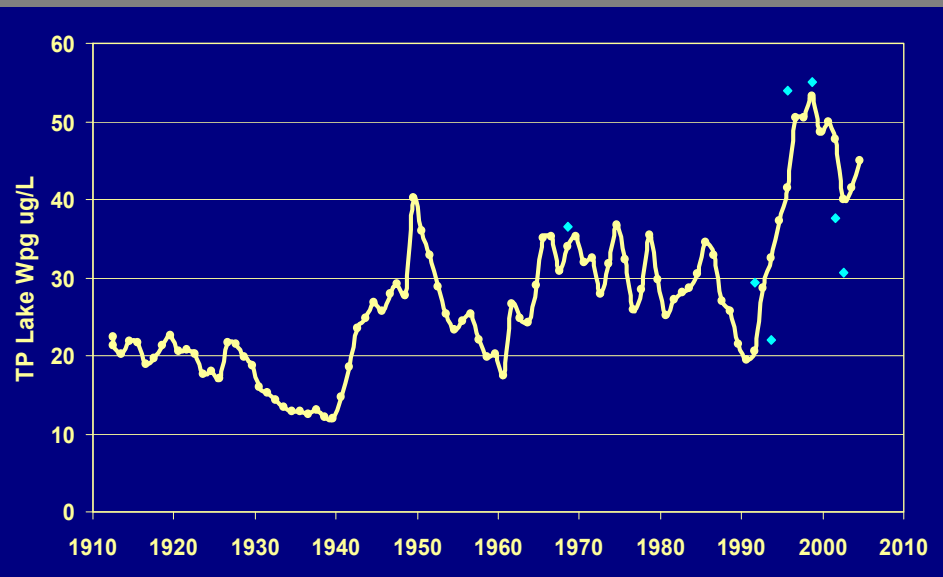
North basin mean depth = 13.3m
South basin mean depth = 9.7m

Shallow, turbid lake that does not typically thermally stratify

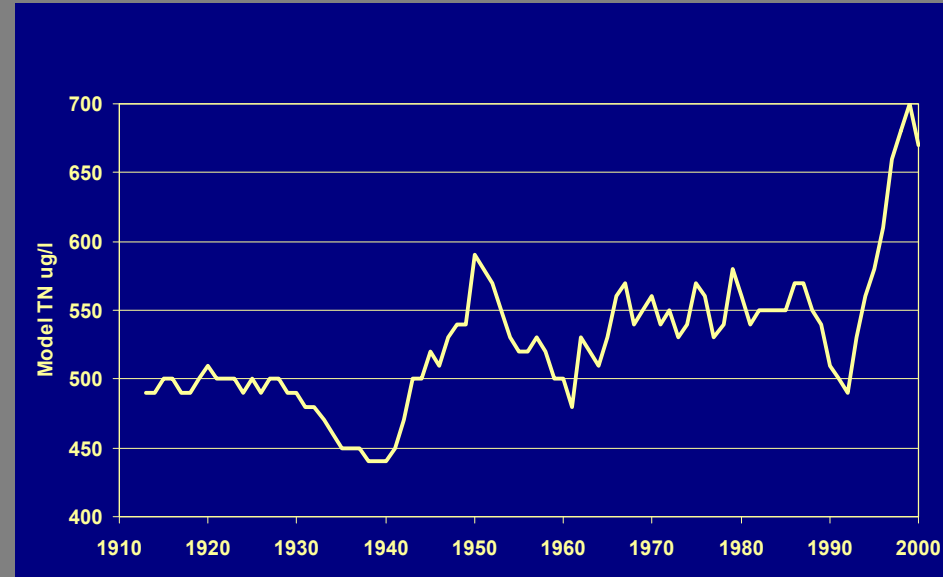


Lake Winnipeg Modelled Nutrient Levels

Total Phosphorous Lake concentrations



Total Nitrogen Lake concentrations



Mike Stainton

**Fisheries and Oceans Canada
Freshwater Institute, Winnipeg MB**

Ray Hesslein

**Fisheries and Oceans Canada
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Objectives

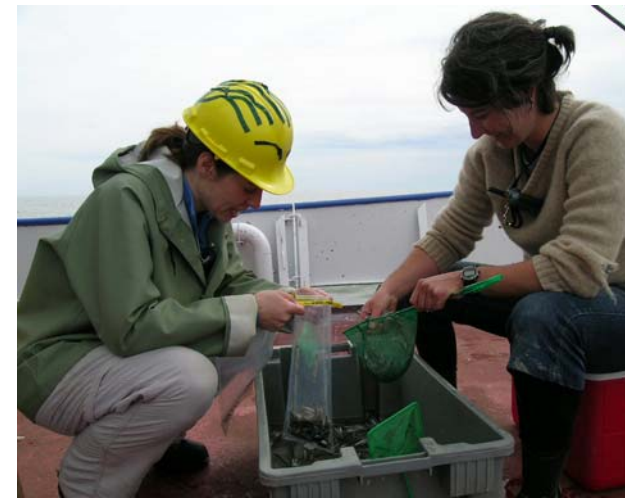
- 1. Describe seasonal distribution and abundance of small fishes in offshore waters of Lake Winnipeg**
- 2. Graphically represent geographic patterns of estimated age-0 walleye densities (No./1000m³)**



North Basin, spring 2007

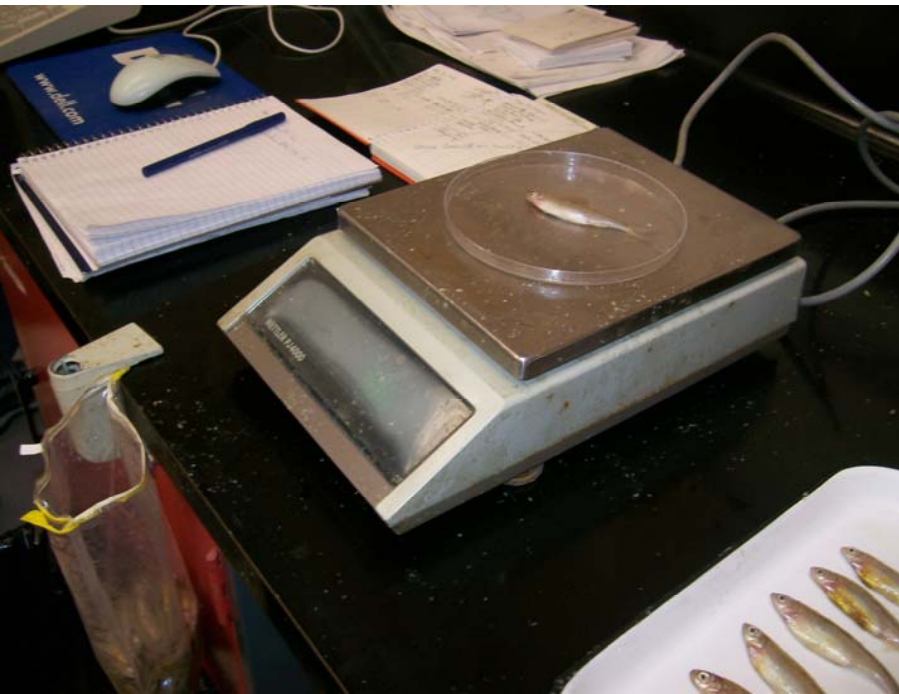
Trawling Methods

- **Offshore waters sampled for fish spring, summer and fall using a 3-meter square beam trawl with small mesh net**
 - **Trawl towed at 2 knots (3.7 Km/h) for 30 minutes**
- **Incidental catch of larger fish measured (fork length) and returned to lake**
- **Smaller fish sorted by species and frozen in labeled bags for further processing**



Lab Processing Methods

- Fork length and weight of first 100 fish of a species individually measured
- If > 100 fish of the same species, then remaining fish counted and bulk weighed
- Ageing structures collected from walleye and sauger starting in 2007



Photos courtesy
of J. P. Madrid



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North Basin, spring 2007



Summarizing Species Abundance

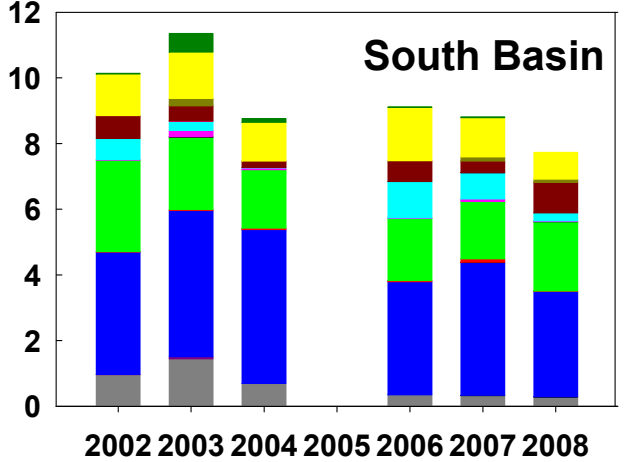
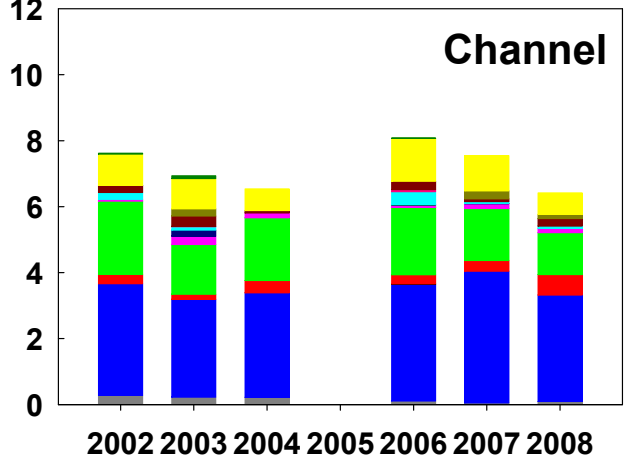
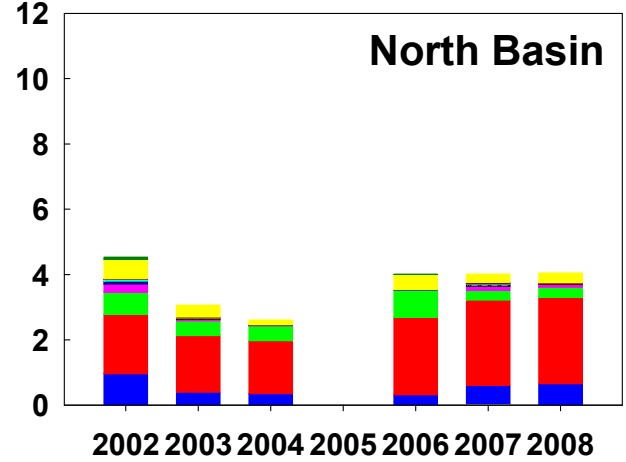
- 1. Biomass density (g/m^3) = $\frac{\text{sum biomass of species (g)}}{\text{volume of water sampled (m}^3\text{)}}$**
- 2. Biomass density data were standardized (to 1000m^3) and transformed (natural log ($x + 1$))**
- 3. Mean biomass density was calculated for each species by year, season, basin, and trawl type**
- 4. Weighted mean biomass density of each species was calculated for each year, season, and basin, using sample size of trawl type as the weight factor**
(Roseman *et al.* 2005, Bunnell *et al.* 2006, Jůza and Kubečka 2007)



Species Abundance by Basin

- Goldeye
- Mooneye
- Common Carp
- Emerald Shiner
- Rainbow Smelt
- Cisco
- Lake Whitefish
- Troutperch
- Burbot
- Ninespine Stickleback
- Spoonhead Sculpin
- White Bass
- Black Crappie
- Yellow Perch
- Logperch
- Sauger
- Walleye
- Freshwater Drum

Mean biomass density (g/1000m³)





Effects of Season and Basin on Species Biomass Density

Analysis of variance (ANOVA) was used to determine whether species biomass density varied significantly by season or by basin (Johnson *et al.* 2004, Yule *et al.* 2007, Yule *et al.* 2008)

**ANOVA *P*-values for factors affecting biomass density estimates
* indicates significance at the $\alpha < 0.05$ level**

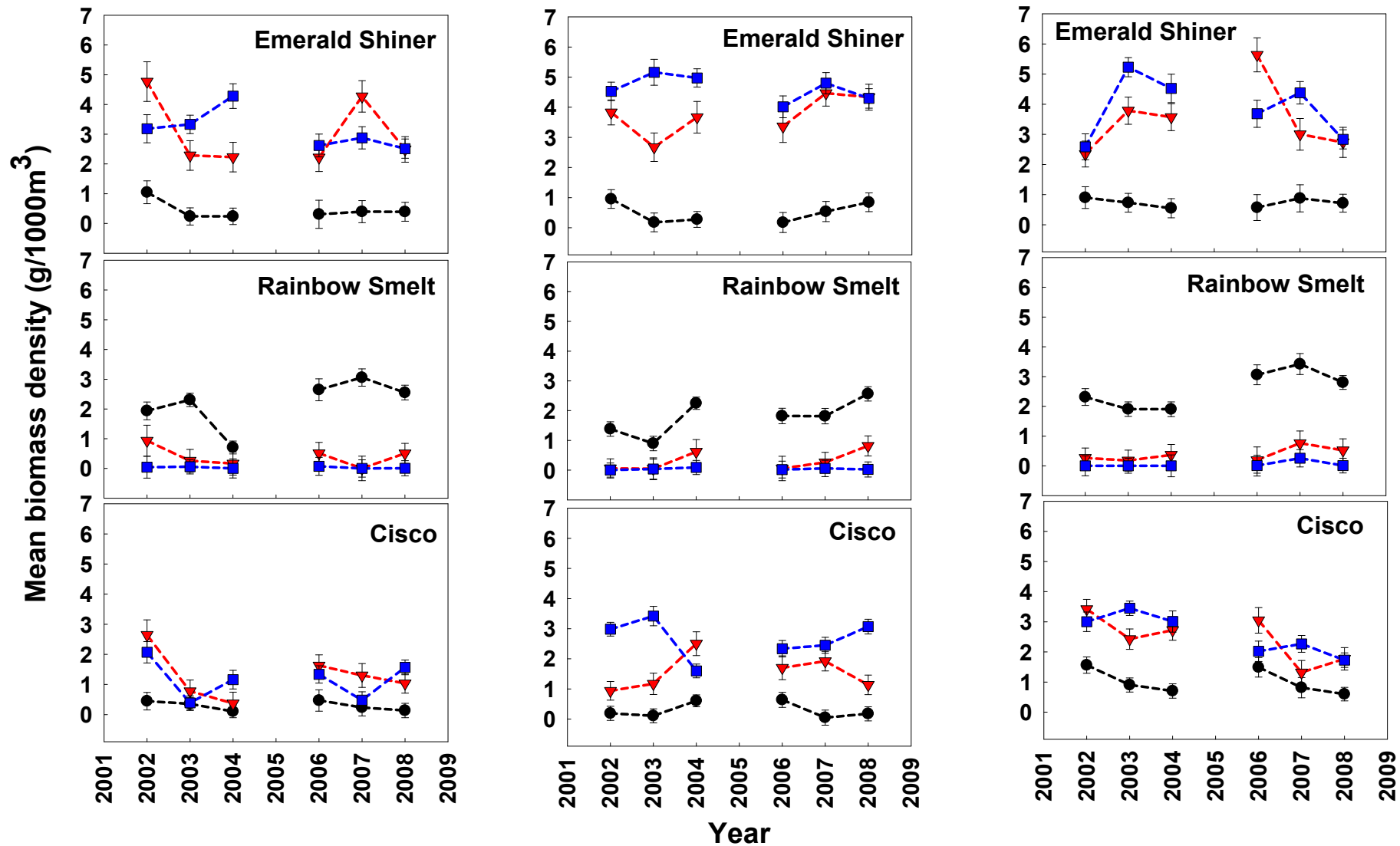
Species	Main Factors		Factor Interaction
	Season	Basin	Season×Basin
Emerald Shiner	0.078	<0.001*	0.021*
Rainbow Smelt	0.234	<0.001*	0.078
Cisco	0.002*	<0.001*	0.031*
White Bass	0.030*	0.006*	0.002*
Yellow Perch	0.001*	<0.001*	<0.001*
Walleye	0.004*	<0.001*	<0.001*



SPRING

SUMMER

FALL

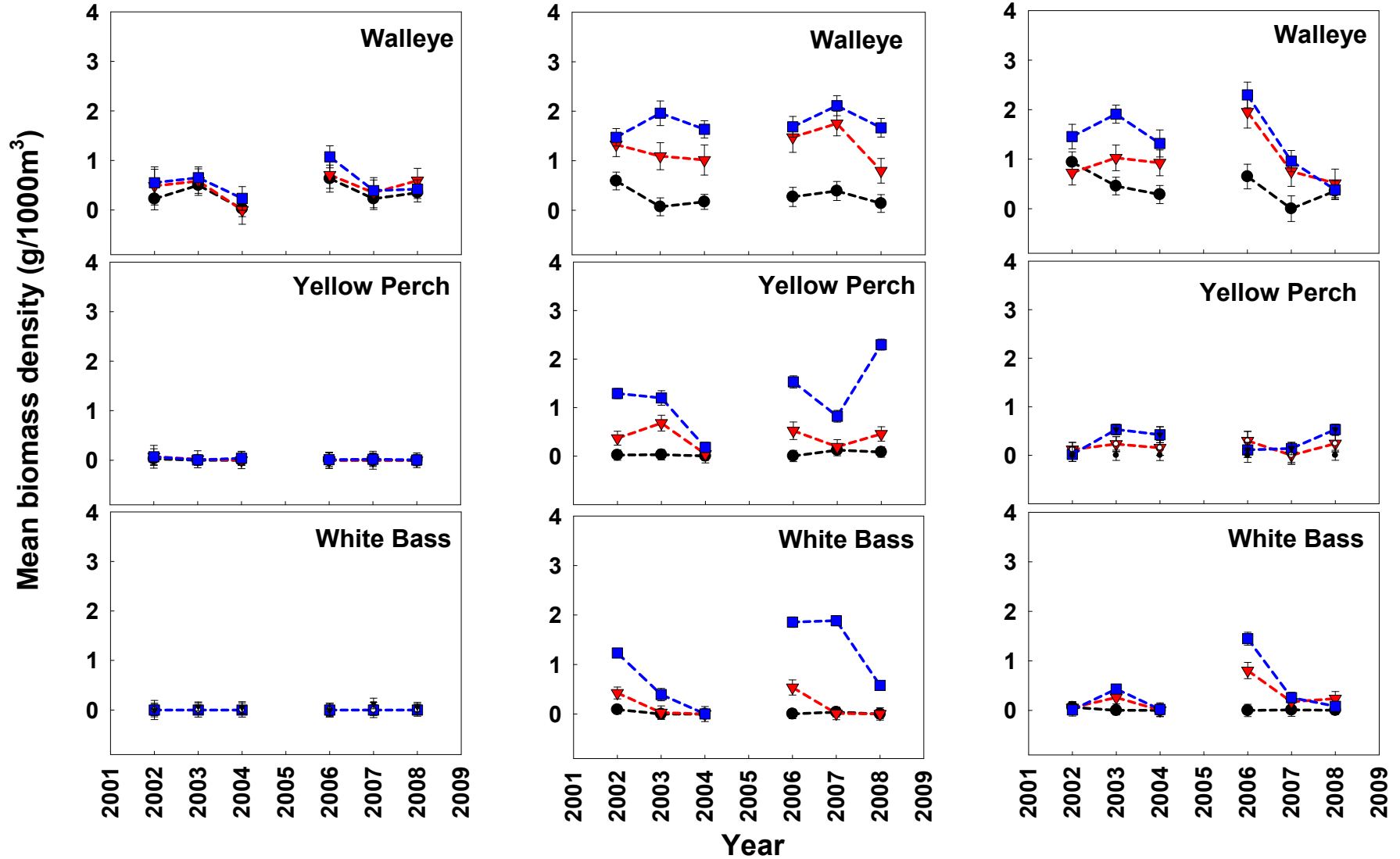




SPRING

SUMMER

FALL





Objectives

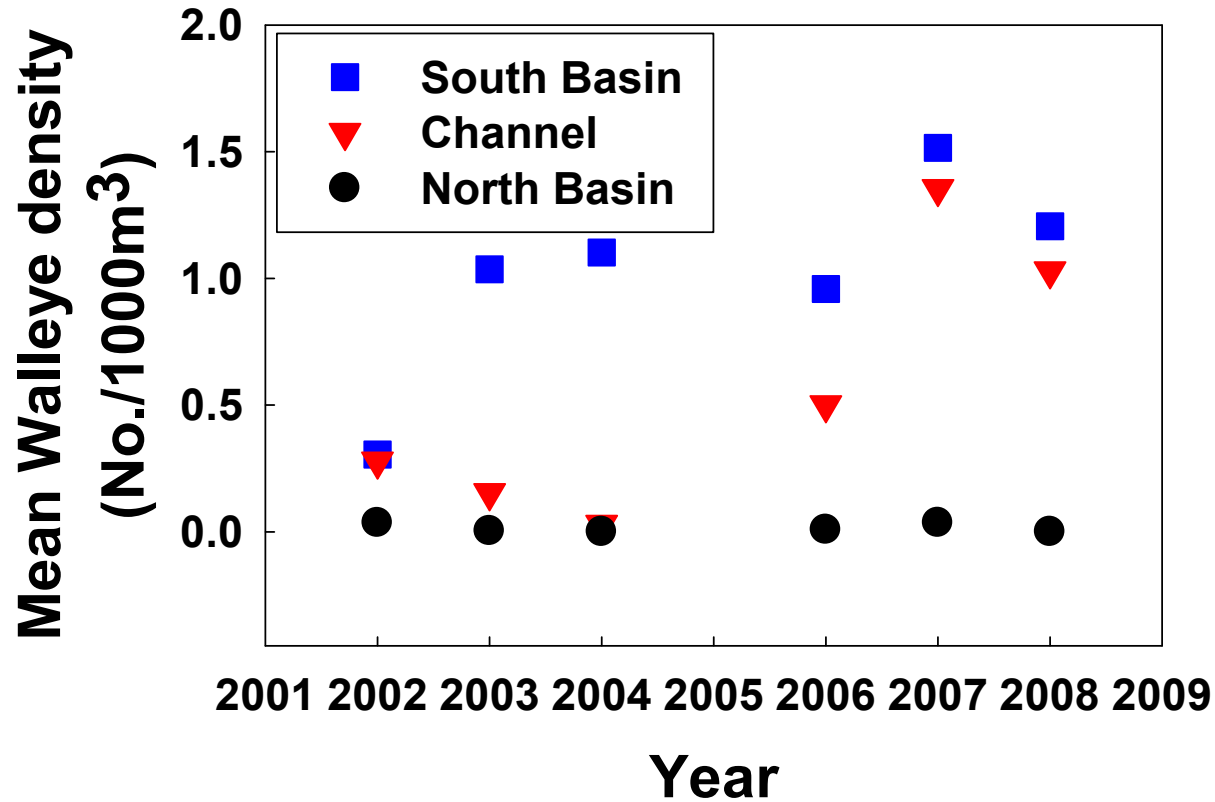
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North Basin, spring 2007

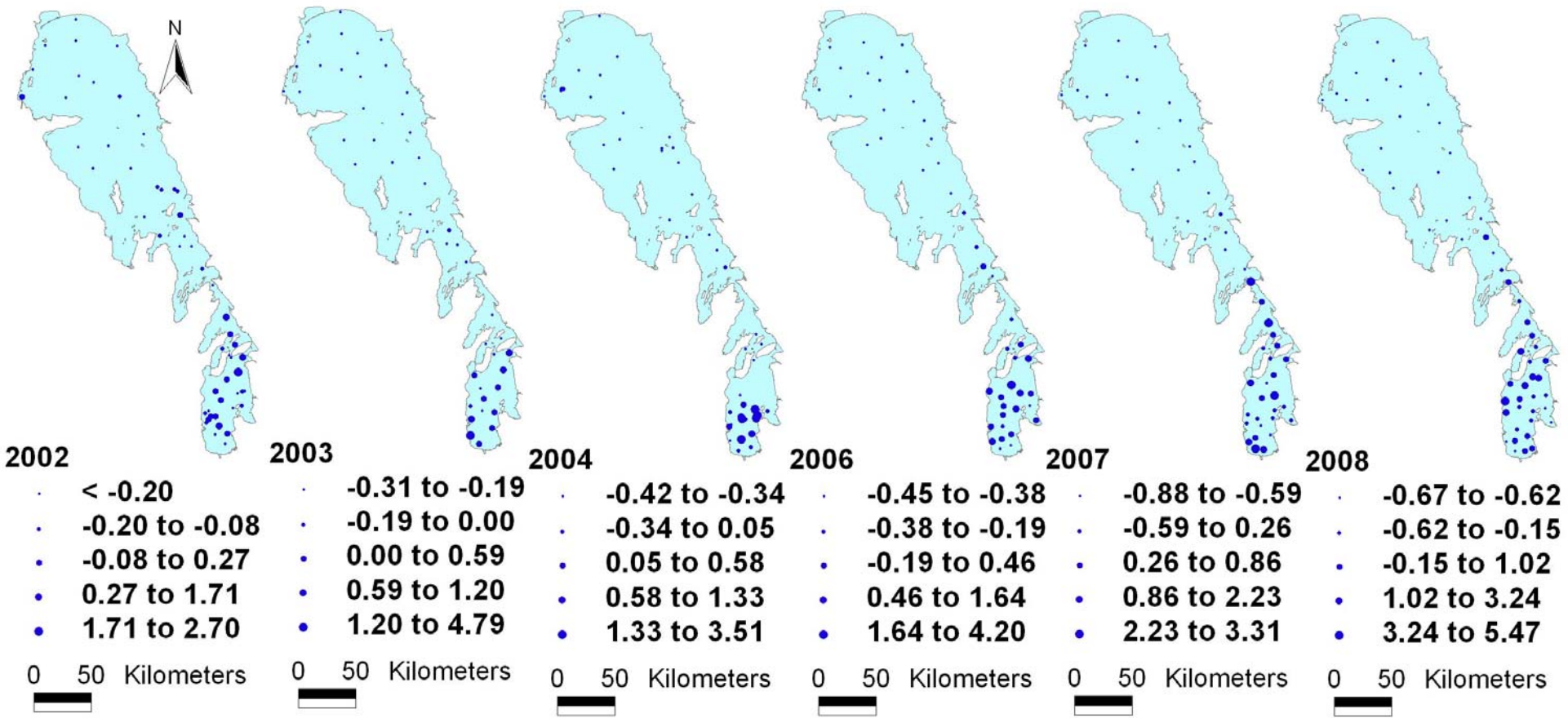


Estimated Age-0 Walleye Density (No./1000 m³) Summer 2002 to 2008





Estimated Age-0 Walleye Density (No./1000 m³) Summer 2002 to 2008





Summary

Greatest number of species and greatest biomass in trawl catches found in the south basin

Prey fish assemblage composed of Emerald Shiner, Rainbow Smelt, Cisco, White Bass, Yellow Perch and Walleye

Emerald Shiner and Cisco biomass were generally greater in the south basin and the channel compared to the north basin

Rainbow Smelt biomass was significantly greater in the north basin compared to the channel and the south basin

In the summer, greater estimated age-0 walleye densities found in the south basin compared to the north basin



Acknowledgements

Fisheries Enhancement Fund

Trawling Program staff

L. Heuring and Fisheries Branch staff

Lake Winnipeg Research Consortium



M.V. Namao
Hecla Island

A scenic view of a rocky shoreline at dusk or dawn. The foreground is dominated by a calm body of water with gentle ripples. In the middle ground, a rocky peninsula or shoreline extends into the water, with several large, smooth boulders. The background features a dense forest of trees on a low island or headland, silhouetted against a soft, hazy sky. The overall atmosphere is peaceful and natural.

Thank you

**George Island
North Basin
Spring 2007**