It is important to understand the mechanisms regulating fish community stability in light of the growing human population and our impacts on natural systems. Ecological perturbations, whether through anthropogenic or natural cause, are common throughout all aquatic systems, but may be especially profound throughout the Finger Lakes and Great Lakes drainages, due to high levels of water-borne commerce and aquatic tourism. Perturbations such as changes in nutrient loading, exotic species introductions, water level regulation, and global warming, have the capacity to disrupt aquatic community structure and food web relationships by altering species composition and energy flow through the system.

In an effort to gain a greater understanding of fish community stability in relation to multiple perturbations, we conducted a study of the St. Lawrence River fish community stability using a 28 year (1977-2004) New York State Department of Environmental Conservation gill-netting data set (Warm-Water Assessment). We examined both size structure and species assembly stability. Size-structure serves as a proxy for trophic relationships directly related to ecosystem services such as fish production, while species assembly examines biodiversity. Both trophic relationships and biodiversity are intricately linked to community stability, however, we hypothesis that species assembly is a community attribute nested within the overriding processes of community size structure, such that community size-structure should be more stable over time than species assembly.

We evaluated community size-structure stability by comparing the annual slope of log relative abundance (CPUE) against log mean weight of 7 size classes (100mm total length incremented classes) with all species pooled using a homogeneity of slopes test and analysis of covariance. Species assembly stability was tested at three levels using χ² contingency analyses for absolute abundance, Kendall’s W test of accordance for rank abundance, and null models of co-occurrence for species presence/absence. Changes in species occurrence and abundance relative to ecological perturbations will be examined using regression and multivariate procedures.

Forty species were caught over the 28 year period, 21 of which were considered extremely rare (<10 over all years, out of 34,664 fish) and were removed from the analyses. Of the 19 remaining species, only the seven most abundant species were caught in every year (Fig. 1). Several major ecological perturbations originated during the study period, and we highlight the onset of the cormorant and zebra mussel invasion in the early 1990’s which corresponded with a dramatic change in the catch per unit effort of all species (Fig. 2). The overall average catch per net night over the 28 years was 43.77 fish, but from 1977 to 1990 the mean was 53.02 fish and from 1991 to 2004 the mean significantly decreased to 34.51 fish per net night (t = 7.39, P < 0.0001). The mean weight of fish caught decreased slightly during the same period but the difference was not significant (1977-1990 mean = 292.00g, 1991-2004 mean = 278.14, t = 1.71, P = 0.4000), suggesting that although total catch decreased, the distribution of biomass across size classes remained consistent.

Preliminarily, we found that the fish community size-structure was indeed more stable than the species assembly over the last 28 years. The mean annual slope of the log relative abundance (CPUE)
versus log mean wet weight of the community was -1.0545 ($r^2 = 0.9200$, $F_{28,167} = 68.63$, $P < 0.0001$, Fig. 3.) and was statistically consistent among all years ($F_{27} = 0.47$, $P = 0.9871$). Species assembly was unstable in comparison. Absolute abundance was highly unstable ($\chi^2_{459} = 228,351.0$, $P < 0.0001$) as was rank relative abundance ($W = 0.0292$, $P = 0.9810$). We found similar results in species assembly stability when we examined only the 7 most abundant species that were caught in all 28 years.

It should be noted that this is a work in progress. We will discuss details of species assembly within individual size classes in an effort to reconcile species assembly and size-structure stability. We will also provide details of species and community responses to ecological perturbations in the St. Lawrence River. In conclusion, understanding community dynamics within a hierarchical framework based on size structure will help managers predict fish community responses to perturbations and disturbances, enhancing our ability to mitigate damage to and conserve fish populations.

![Figure 1](image-url)  
**Figure 1.** Overall 28 year mean CPUE of each species used in analyses. The asterisks indicate the seven most abundant species that were caught in every year.
Figure 2. Annual total catch (CPUE) of all species. The dashed line indicates the 28 year mean.

Figure 3. Size-structure stability of the St. Lawrence River fish community. Individual data points represent mean values for a given size class and a regression line was fit for each year through the means for the seven size classes.