Lake Michigan Chinook Salmon Diets: Annual Evaluation, 2013

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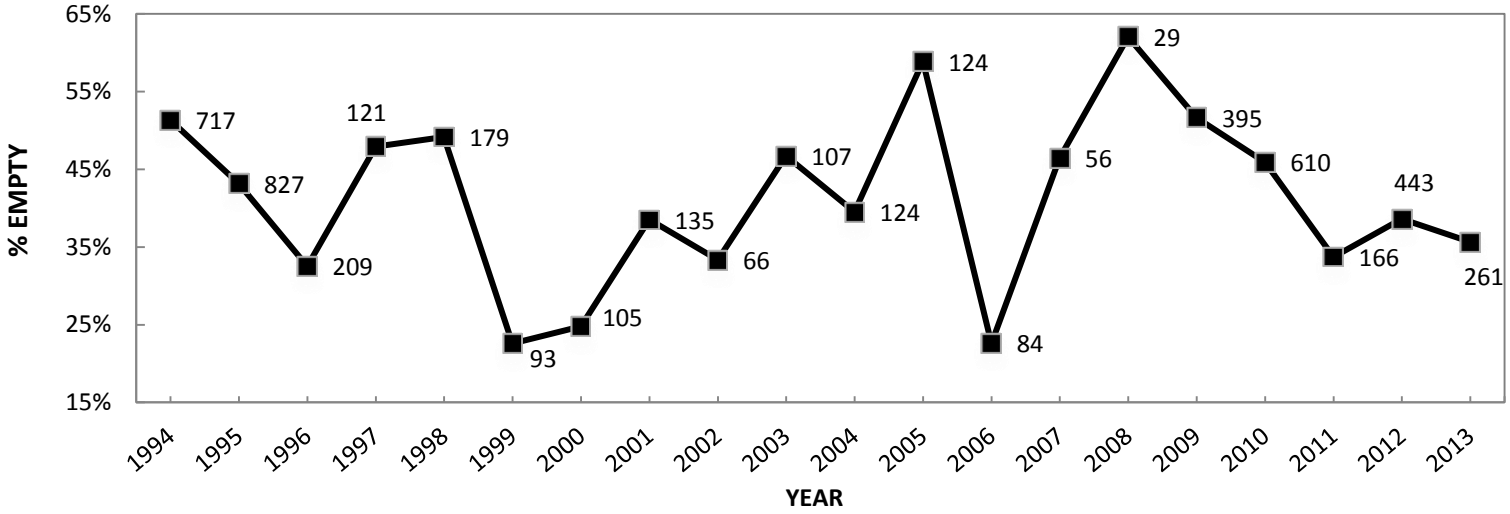
Background:

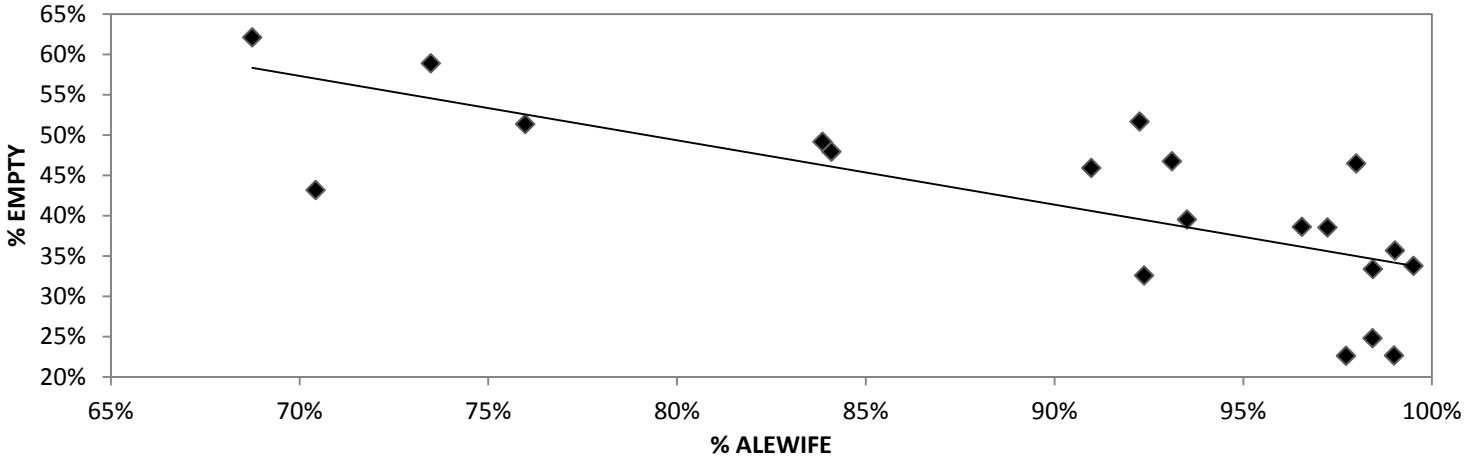
Chinook Salmon *Oncorhyncus tshawytscha* were introduced into Lake Michigan in the late 1960s as a way to control the rising Alewife *Alosa pseudoharengus* populations as well as create a viable sports fishery. Maintaining salmon populations, which was the successful solution to the overabundant Alewife problem in the 1960s, has now become the challenge of today. An annual assessment of diet contents is important because it can show the ongoing relationship between Chinook Salmon and Alewife. Chinook Salmon are important to Lake Michigan and knowing the status of their prey availability and feeding habits can help us better manage them in the future.

Major Findings:

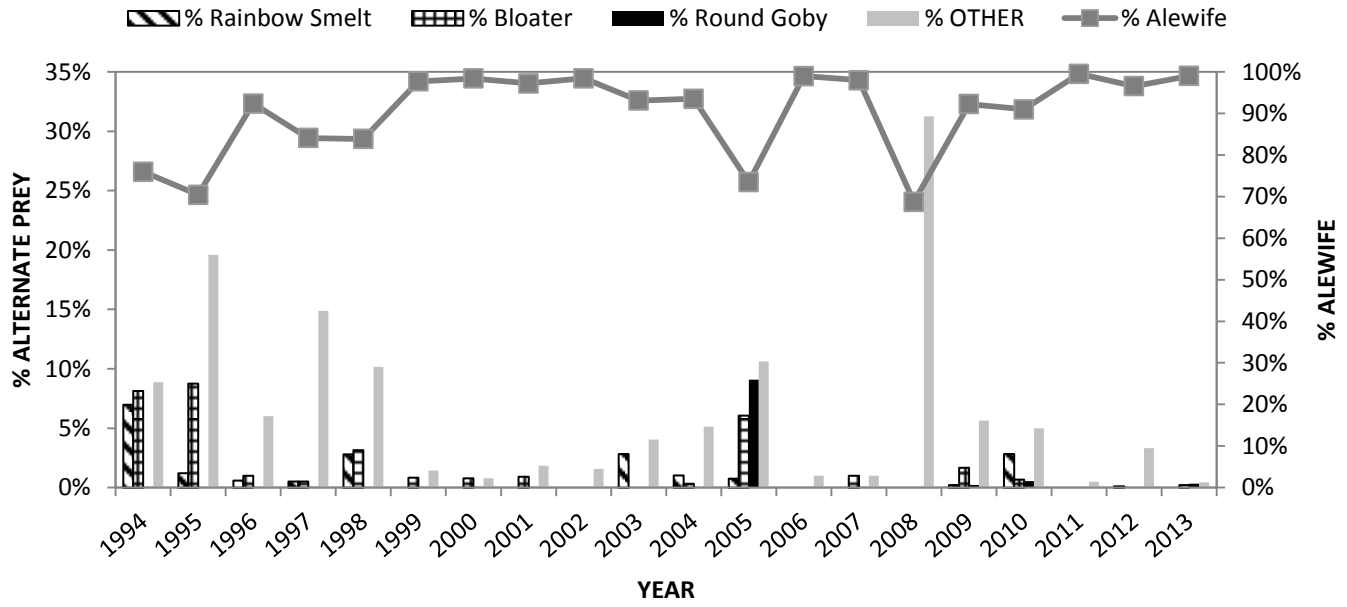
1. Prey Availability: Simple diet indices, such as the average **percent of empty stomachs** in a given year, can be a good indicator of Alewife year class strength. For example, the lowest percentages of empty stomachs were in years following the 1998, 2005, and 2010 Alewife year classes. In 2013, the percent of empty stomachs decreased, likely as a result of the 2012 year class of Alewives, which was estimated to be moderate-to-high in abundance.



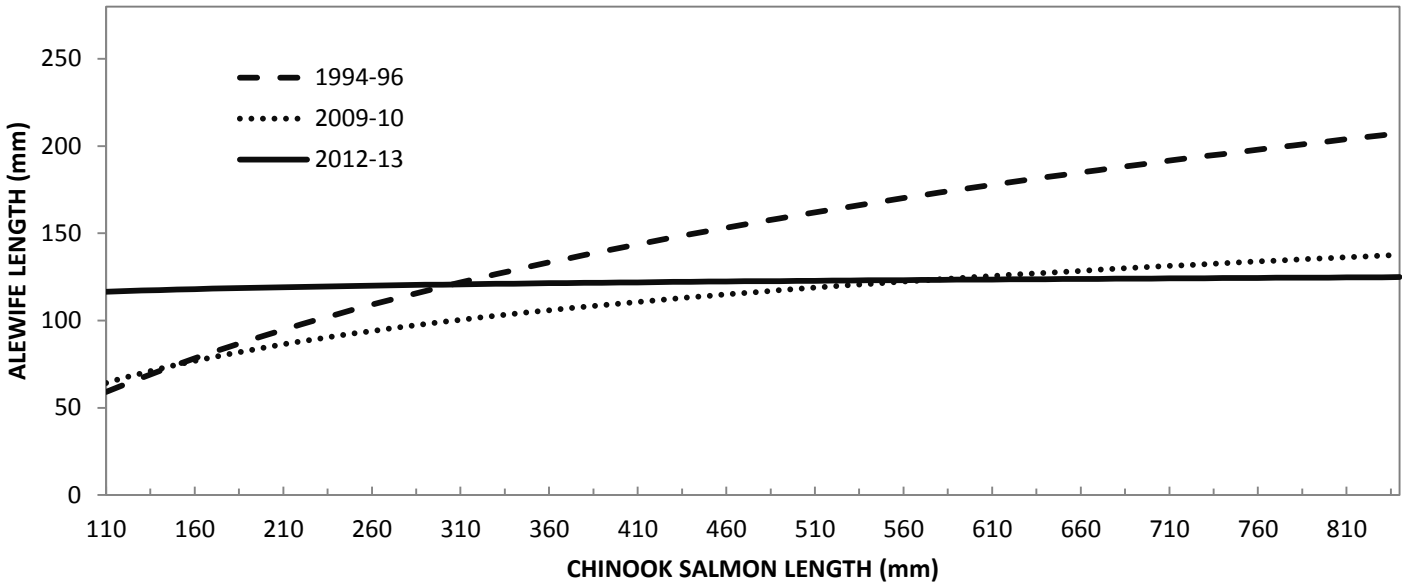
2. Comparing the percentage of empty stomachs to the percentage of Alewives in non-empty stomachs, a trend emerges showing that as the percentage of Alewives in the stomachs increase, the percentage of empty stomachs for that year decreases. This also can be a good indicator of the preference and the reliance that Chinook Salmon have for Alewives. When Alewives are abundant, then Chinook Salmon tend to have less empty stomachs.



3. Prey Fish Community: Even though Chinook Salmon prefer to eat Alewives, the relative **abundance of other prey species** (e.g., **Rainbow Smelt** or B**loaters**) can be indexed by tracking the percent of the diet that consists of alternate prey items. This index suggests that Bloaters can be a good alternate prey when Alewives are in low abundance and Bloater abundance is relatively high (e.g., 1994-1995 and 2005). In addition, feeding on **other** non-fish prey items, such as Mysis and *Bythotrephes longimanus*, can be an indicator of very poor salmon feeding conditions (e.g., 1995, 1997, and 2008).



4. Prey Quality: By comparing **Salmon size to the size of alewives consumed** by Chinook Salmon, fisheries managers have a good index of the health of the prey fish population. Historically, the average size of Alewife consumed tended to increase with Chinook Salmon size. However, recently (2012-2013) there is little relationship between predator and prey size, suggesting that large Alewives are scarce in the Lake Michigan prey fish population.



Findings from the 2013 Chinook Salmon diet analyses:

- Prey availability in Lake Michigan improved from 2012 to 2013 based on a decrease in percent of empty stomachs
- However, prey size continued to decrease suggesting that larger Alewives are less abundant or available to adult Chinook Salmon
- Chinook Salmon in Lake Michigan are highly selective for Alewives and in 2013 they comprised over 99% of the diet composition suggesting that alternate prey fish are less of a factor due to a higher abundance of Alewives.