

Cyanobacteria Effects on White Perch Health in Missisquoi Bay, Vermont



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Introduction

- Cyanobacteria blooms occur in Lake Champlain every summer.
- Although the blooms receive much attention, little research has been done on their effect on fish populations.
- We monitored indicators of white perch health before, during, and after blooms in Missisquoi Bay in 2013.
- We hypothesized that white perch health indicators would worsen during cyanobacteria blooms in Missisquoi Bay.

Methods

- White perch from Missisquoi Bay were sampled with gill nets on 10 Jul, 21 Aug, and 10 Oct 2013.
- Fish health (Adams *et al.* 1993; Table 1), Fulton's relative condition factor (K), and the hepatosomatic index (HSI; liver mass/fish mass) were compared across sampling dates.
- HSI and K of Missisquoi Bay white perch were also compared to fish captured at three other sites in Lake Champlain where we expected less intense blooms.

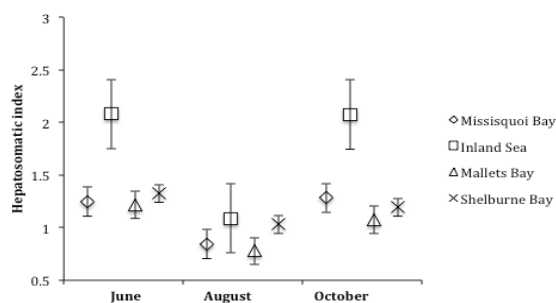


Fig. 1. Mean ($\pm$ SE) hepatosomatic index (HSI) of white perch from Missisquoi Bay, Inland Sea, Mallets Bay, and Shelburne Bay in 2013.

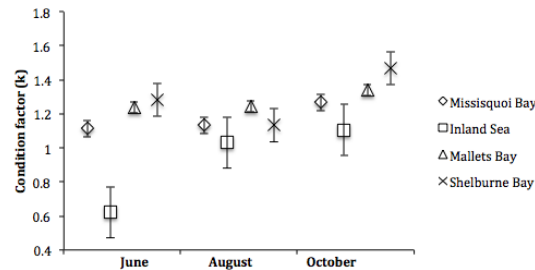


Fig. 2. Mean ($\pm$ SE) relative condition factor (K) of white perch from Missisquoi Bay, Inland Sea, Mallets Bay, and Shelburne Bay in 2013.

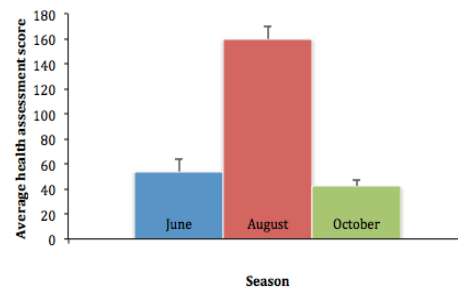


Fig. 3. Mean ($\pm$ SE) health assessment score of Lake Champlain white perch sampled from Missisquoi Bay, Vermont using gill nets during summer 2013.

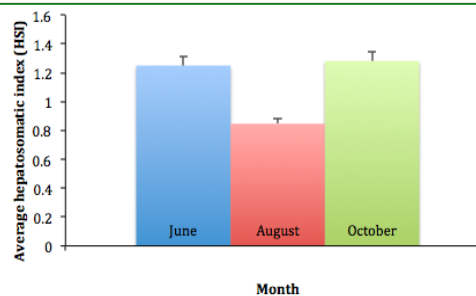


Fig. 4. Mean hepatosomatic index (HSI) ($\pm$ SE) of Lake Champlain white perch sampled from Missisquoi Bay, Vermont using gill nets during summer 2013.

Table 1. Fish examination assessment for fish S182-10

Body Part	Head	Body Surface	Eye	Gills	Opercles	Fins	Liver	Bile	Spleen	Parasites
Description	Bulged	Normal	Normal	Frayed	Normal	Normal	Dark red and nodules	Light Green	Red to black	Few observed
Score	60	0	0	60	0	0	30	10	0	10
Total = 160										

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Results

- HSI was significantly different among locations and date ($F = 28.9$, $p < 0.0001$).
- K was not significantly different among locations and date ($F = 1.7$, $p = 0.1346$).
- Inland Sea white perch had higher HSI in both June and October and lower K in June compared to other sites (Figs. 1 and 2).
- Health assessment scores in Missisquoi Bay were significantly different across months ($F = 3.1$, $p = 0.05$). The health assessment score in August was 160 compared to 54 and 42 in June and October, respectively (Fig. 3).

Conclusions

- White perch in Lake Champlain had a lower HSI in August than in June or October regardless of location (Fig. 1).
- Therefore, HSI does not appear to be related to presumed differences in cyanobacteria blooms. Lower HSI in Missisquoi Bay (Fig. 4), however, may be an indicator of lower condition in August as seen in health assessment scores (Fig. 3).
- White perch had a significantly higher HSI in June and October in the Inland Sea compared to other sites, suggesting that other factors contribute to liver condition (Fig. 1).
- Future studies should attempt to explain lower HSI in Lake Champlain during August; this information could help indicate the types of conditions that cause this change.
- Applying the modified health assessment to white perch from across the lake would provide a stronger test of the potential for cyanobacteria to negatively impact white perch health.



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