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BURBOT MAY BE A POTENTIALLY SIGNIFICANT THREAT TO LAKE TROUT IN LAKE MICHIGAN

The burbot (*Lota lota*) may be a significant predator and competitor of lake trout (*Salvelinus namaycush*) and other coldwater fishes in the Great Lakes. Burbot are large, nocturnal predators whose role in the coldwater fish community of the Great Lakes is not well described. Because burbot and lake trout occur sympatrically in the Great Lakes, some level of interaction may occur. A low to moderate level of diet overlap between burbot and lake trout has been shown in Wisconsin waters of Green Bay and Lake Michigan. Studies in smaller inland lakes also showed burbot and lake trout diets often overlapped. A modeling study indicated that competition for food may limit the production of lake trout in inland lakes where burbot are abundant. Burbot may also prey on lake trout under certain conditions. Studies in Lakes Superior, Huron, and Michigan indicated burbot fed on naturally spawned lake trout eggs and fry and also on recently stocked juvenile lake trout.

BURBOT ARE ABUNDANT ON HISTORICAL LAKE TROUT SPAWNING REEF

Side-scan sonar and a remotely operated submersible equipped with a color video camera was used to document the distribution and abundance of burbot on a 156-ha portion of Julian's Reef in August of 1990. This reef was used historically for spawning by native lake trout and is now intensively managed as a lake trout refuge. The density of adult burbot on the portion of the reef we studied averaged 139/ha. Burbot were most abundant at 23–28 m, which included the crest of the reef. The substrate there was bedrock and rubble, and the water temperature was 8–13°C. Small fish and the opossum shrimp (*Mysis relicta*), which are typically eaten by burbot in Lake Michigan, were not seen in abundance where burbot density was highest. I saw no lake

trout on the reef, although large numbers of juvenile lake trout are stocked there annually, and water temperatures were suitable for both juvenile lake trout and burbot.

BURBOT DOMINATE THE FISH COMMUNITY OF JULIAN'S REEF

The forage requirements of the large population of burbot on Julian's Reef are unknown but may be substantial. Other researchers have shown that adult burbot held at 6–7°C in the laboratory consumed about 10% of their body weight weekly in free-swimming lake trout fry. To arrive at an approximation of the weekly forage consumption of the burbot population in the study area during the growing season, I calculated the product of the feeding rate, the size of the study area, and the mean density and estimated mean weight of burbot in the study area:

$$\begin{aligned} &[(0.1 \text{ body weight/week}) \times (156 \text{ hectares}) \\ &\times (139 \text{ burbot/hectare}) \\ &\times (0.916 \text{ kg/burbot})] = 1,986 \text{ kg/week.} \end{aligned}$$

Higher consumption would be expected by burbot at 8–13°C, but the amount actually eaten by burbot on the reef would be influenced by the availability of other food and would likely be less than measured under conditions of ad libitum feeding in the laboratory.

Most of the annual forage requirement of burbot on Julian's Reef is probably met with small fish and macroinvertebrates seen on the reef. Although the distribution of burbot on Julian's Reef did not coincide well with that of the small fish and opossum shrimp on the reef in August, a diel, horizontal

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movement of only a few hundred meters by either burbot or their presumed prey would have brought them more closely together and facilitated predation.

BURBOT ARE PREDATION RISK FOR LAKE TROUT

Other studies in the Great Lakes suggest that recently stocked lake trout, and eggs and fry produced from natural spawnings, could also help meet the forage requirements of burbot on Julian's Reef. There are no data that permit the estimation of the potential contribution of lake trout eggs and fry to the maintenance of burbots on Julian's Reef. However, the 103,000 yearling lake trout (average weight 26.4 g, total weight 2,716 kg) that were stocked on Julian's Reef in 1989 were equal by weight to only 73% of the weekly forage consumption estimated above for burbot on the 156-ha portion of Julian's Reef that was studied. The availability of newly stocked lake trout to burbot is also unknown, but the preferred summer temperatures of burbot and young lake trout overlap and the potential for predation by burbot could be high unless the young lake trout stocked on the reef quickly leave the reef or are able to avoid burbot at night, when burbot feed most extensively.

This study provides no direct evidence linking the large population of burbot on Julian's Reef with the reported failure of stocked lake trout to reproduce on the reef, but the situation warrants further attention. Study of prey availability and burbot diet on Julian's Reef or other such reefs in fall-spring when egg or fry life stages of lake trout might be present and whenever juvenile lake trout are stocked there would further define the role of burbot in the fish community of the reef. That information would also help evaluate the effect of burbot on efforts to reestablish self-sustaining populations of lake trout in the Great Lakes.

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