ANGLING VULNERABILITY OF ESOCIDAE

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ABSTRACT

Five yearling northern pike (Esox lucius), *muskellunge* (Esox masquinongy), *or their* F_1 *hybrid ("tiger muskie") were stocked in duplicate 0.2-ha ponds in April, 1974. Two additional ponds were stocked with a combination of five fish of each of the three forms. In 58 hours of angling from April to September, northern pike were 3.1 and 4.2 times more vulnerable than tiger muskies and muskellunge, respectively. No fish were caught in 18 hours of fishing from 15 June to 13 August. Repeat catches accounted for 35.6% of the total catch; hooking mortality was negligible (1.7%).*

Anderson (1973) recommended the addition of a predator to midcontinental reservoirs to consume an overabundance of gizzard shad (*Dorosoma cepedianum*) and to provide a species for a trophy fishery. Northern pike (*Esox lucius*), muskellunge (*Esox masquinongy*), and the F_1 hybrid (here termed the tiger muskie) have been introduced for these purposes (Snow 1968, Vasey 1968).

In the absence of significant natural reproduction, success of a predator stocking program depends on maintenance stocking. Special harvest regulations may be needed to increase survival, production, and total angling benefits. The importance of regulations may be influenced by the vulnerability of the predator stocked and the degree of hooking mortality from catch and release fishing. Therefore, as part of a comparison of northern pike, muskellunge, and tiger muskies, we examine here the relative angling vulnerability and hooking mortality of these three predators.

MATERIALS AND METHODS

All experiments were conducted in 0.2-ha ponds (maximum depth, 2 m; average depth, 1 m) at Millersburg, Missouri, 21 km east of Columbia. Ponds had clay basins and banks covered with fescue.

In 1974, eight ponds were stocked with yearling esocids 245 to 280 mm in total length. Ponds 1 through 6 were each initially stocked on 5 April as follows: ponds 1 and 2, five northern pike; ponds 3 and 4, five muskellunge; and ponds 5 and 6, five tiger muskies. Ponds 7 and 8 were stocked 5 and 20 April respectively, with five fish of each form (Table 1). Esocids stocked were marked by partial fin clips so that individual fish could be recognized. Ponds were periodically stocked with equal weights of prey for each predator—primarily goldfish (*Carassius auratus*), supplemented occasionally with fathead minnows (*Pimephales promelas*). Two grass carp (*Ctenopharyngodon idella*) weighing 0.9 to 1.4 kg each were stocked in each pond to control vegetation and thus facilitate seining.

Ponds 7 and 8 were used in an angling vulnerability study from 26 April to 12 September. Both ponds were fished at the rate of 1 hour per week for either one 60-min or two 30-min periods. Ponds 1 to 6 were fished 1 hour per week for the final 3 weeks of the study period. All fishing was conducted during daylight with light spinning tackle and artificial lures (Mepps spinners).[2] Each catch was recorded and individual fish were identified. Fish were unhooked with the aid of long-nose pliers and released immediately after capture. Ponds were seined monthly and drained at the end of the study to determine the incidence of mortality.

RESULTS

In 58 angling hours a total of 59 catches were made—38 pike, 9 muskellunge, and 12 tiger muskies. The combined catch rate for both species and the hybrid for the entire

[1] A cooperative program of the U.S. Fish and Wildlife Service, Missouri Department of Conservation, and University of Missouri-Columbia.

Table 1. Number of fish stocked in experimental ponds, April 1974.

Pond	Northern Pike	Muskellunge	Tiger Muskie	Grass Carp[A]
1	5	—	—	2
2	5	—	—	2
3	—	5	—	2
4	—	5	—	2
5	—	—	5	2
6	—	—	5	2
7	5	5	5	2
8	5	5	5	2
Total	20	20	20	16

[A]Grass carp were not part of the experiment, but were stocked to control aquatic vegetation.

Table 2. Frequency of catch (I = initial, R = repeat) and seasonal variability in angling vulnerability of esocids (P = northern pike, M = muskellunge, T = tiger muskie) in eight Missouri ponds, 1974.

Ponds	Dates	Hours of Fishing	Number of Catches					
			P		M		T	
			I	R	I	R	I	R
7,8	26 Apr-14 Jun	14	5	4	3	0	2	1
7,8	15 Jun-13 Aug	18	0	0	0	0	0	0
7,8	14 Aug-12 Sep	8	5	12	2	1	3	1
1-6	29 Aug-12 Sep	18	10	2	3	0	5	0
1-8	26 Apr-12 Sep	58	20	18	8	1	10	2

season was thus about 1 fish per hour. Northern pike made up most of the repeat as well as initial catches in individual as well as combination ponds (Table 2). One northern pike was caught seven times and all 20 were caught at least once. Using an index of 1.0 to indicate vulnerability to angling of muskellunge, northern pike were 4.2 and tiger muskies 1.3 times as vulnerable. Northern pike were 3.2 times as vulnerable as tiger muskies in our study, as compared with the value of 2.6 published by Beyerle (1973) for certain Michigan waters.

Seasonal and temperature influences were critical in terms of angling success. All esocids were caught when the temperature was between 15 and 23 C in late spring (26 April-14 June) or early fall (14 August-12 September; Table 2, Fig. 1). These periods corresponded to periods of maximum feeding and growth (Weithman 1975). For the period 15 June-13 August, when temperatures ranged between 21 and 30 C, no fish were captured in a total of 18 hours of angling.

Besides seasonal and temperature influences on angling success, time of day, weather conditions, and turbidity were apparently important. Fishing success was best between 0700 and 1100 hours; only a few fish were caught in the early and late afternoon. Fishing on cloudy days and periods immediately preceeding rainstorms was especially good. On 17 and 22 May, the catch rate was 6 and 7 fish per hour for 1 hour of fishing each day in pond 8. Turbidity may have influenced vulnerability to angling. More catches were made in pond 8 (28 fish, average turbidity 25 Nephelometric Turbidity Units, NTU) than in pond 7 (11 fish, average turbidity 54 NTU; Fig. 1). All catches in pond 7 were made in the fall after turbidity had decreased to less than 30 NTU and Secchi disc transparency had increased to more than 30 cm.

Although the fish were handled 6 to 13 times, survival was excellent. Natural mortalities, estimated on the basis of last capture by seine, occurred as follows: 5 April-26 June, 0; 27 June-17 July, 1; 18 July-11 August, 2; 12 August-20 September, 6. We assumed these losses were not caused by hooking, because the fish in question either never

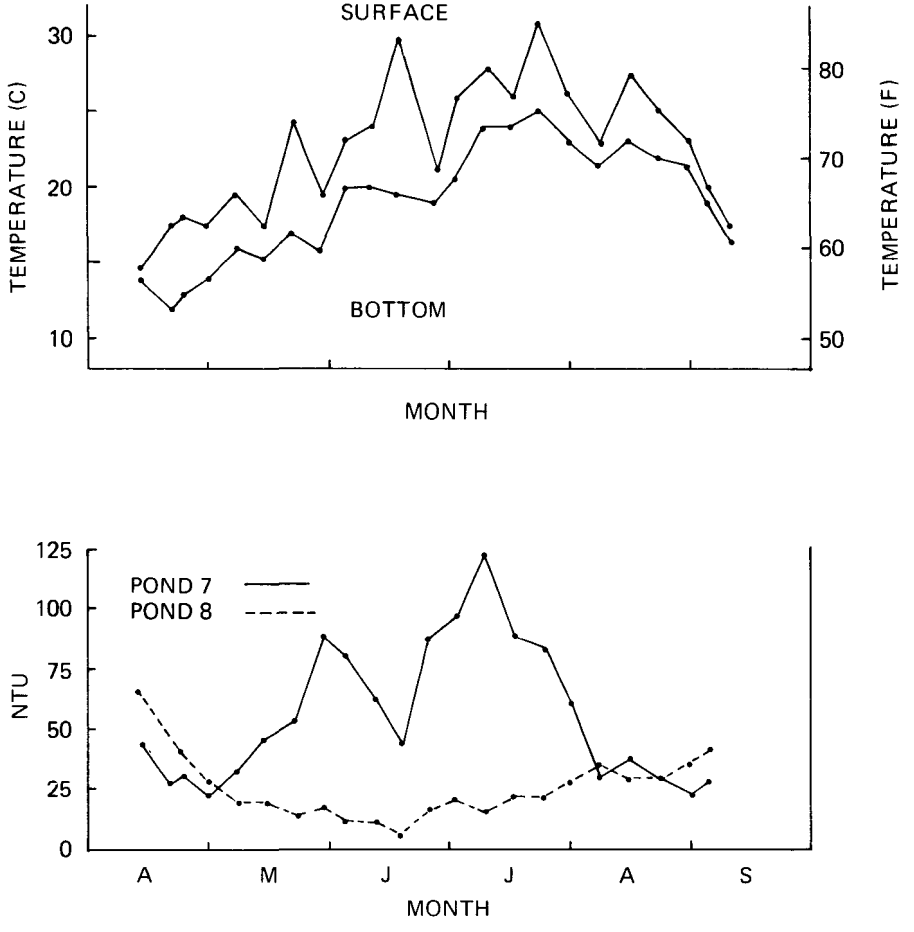

Figure 1. Temperature and turbidity of ponds 7 and 8 during the study period.

were taken by angling, or they were taken by seine a week or more after they were captured by angling. Only 1 of 59 fish captured (1.7%) is known to have been lost due to hooking mortality. This northern pike was found dead on 19 May, two days after being deeply hooked. Three other fish that were severely hooked—two in the gills and one in the esophagus—survived and were recovered later by seining. A northern pike that was gill-hooked on 17 May was caught again in 5 days and appeared to have fully recovered. Generally the hook penetrated tissue surrounding the maxillary and premaxillary, and caused little damage.

DISCUSSION

Introduction of an esocid to midcontinental reservoirs should create a spring and fall fishery. In our study and others (Trautman and Hubbs 1948, Threinen et al. 1966) northern pike were caught most frequently in the spring and fall. Hacker (1966) reported that more muskellunge were caught in May, June, and August than in the rest of the

season combined at Little Green Lake, Wisconsin. It is typical in northern states for esocid anglers to experience a slump in July when water temperatures are at a maximum. In central states, esocid fishing will still be best in the spring and fall—the mid-summer slump, however, may last up to two months because of high water temperatures.

Once the decision is made to stock an esocid, the fishery manager must choose the appropriate form. In waters suitable for natural reproduction, northern pike or muskellunge would be the logical choice. However, in waters unsuitable for natural reproduction, tiger muskies may best be stocked. Compared to other esocids, they have a significantly higher growth potential, adaptability, and they are more feasible to propogate (Weithman 1975). Since the hybrid is closer to the muskellunge than northern pike in appearance and behavior, the trophy or esthetic value to anglers of the hybrid may be comparable to that of the muskellunge.

The rate of recruitment to catchable size (number per hectare per year), annual mortality, and relative vulnerability to angling of northern pike, muskellunge, and tiger muskies influence the need for special regulations. In our study, every northern pike was caught at least once. Hill (1974) reported that the northern pike population of Brown's Lake was reduced by 85% in 4 weeks of intensive angling. Appropriate regulations may be necessary to prevent overharvest of northern pike since this species did not learn to avoid lures—even after they were hooked repeatedly. Where reproductive success is limited or where catchable populations are sustained by stocking, high minimum length limits and low bag limits may improve benefits through catch and release fishing, predation of overabundant prey species, and a better harvest of large fish.

Esocids in our ponds, like those of Lawler (1964) were hardy. Even fish that were bleeding when released survived. Since hooking mortality was apparently insignificant for the size of esocids in our study (25-50 cm), length limits may be effective. This conclusion is speculative because larger esocids, which are difficult to handle, will probably have a higher hooking mortality. A management program should include angler education in techniques for handling and releasing fish. Protected fish could then continue to serve as important predators and again be available to anglers.

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[2] Reference to trade names does not imply endorsement by the U.S. Fish and Wildlife Service.