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The Population of Northern Pike (Esox lucius) in Morris Lake,
University of Notre Dame Environmental Research Center (UNDERC),
Land o' Lakes, Wisconsin, June, 1979

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Morris Lake is a small, round lake located at the northern end of the Notre Dame properties (UNDERC) outside Land o' Lakes, Wisconsin. It is partially lined by a bog mat and is surrounded by both conifers and hardwood trees. The lake was stratified in early June, 1979, with a thermocline falling between two and three meters depth. The smell of hydrogen sulfide was not present in any samples taken and, in the absence of a working oxygen meter, indicated that oxygen was present in the hypolimnion. The pH in the epilimnion was 6.4 and pH in the hypolimnion was 5.6. Acidity in both epilimnion and hypolimnion was 150 mg/liter while alkalinity and hardness were both low. Nitrate and phosphorus contents varied slightly between the epilimnion and hypolimnion, averaging about 0.5 mg/liter. Pike remain unaffected by these slightly acidic conditions and ample oxygen supply. There are many inlets and many macrophytes lining the shore of Morris Lake which provide room for fish to feed and hide from predators.

In the 1950's, Morris Lake was largely populated by bass. In the mid 50's, trout were introduced and proceeded to prey on and wipe out the bass population. After the trout died off, the lake was empty. Northern pike were introduced in 1965, to fulfill the need for a fast-growing game fish that was fun to catch. The pike population has since increased to the point where fish growth has been stunted and is only now, due to increased fishing-out of pike, being decreased to more favorable levels.

In Wisconsin, pike spawning occurs in mid-April. Female pike scatter eggs in shallow water where eggs are then fertilized by the male. Development occurs without parental care. Pike fry feed on fish and insect larvae. Mature pike are almost exclusively predatory with fish as the primary food source, although some have been known to eat frogs, crayfish and waterfowl (Carlander, 1969).

The pike may feed on herbivores or other carnivores and are the top carnivores in Morris lake, occupying the highest trophic level in that lake.

It should be noted that ages given for the pike (Table 1) are subject to some error due to the use of scales to age fish. False annuli may appear within the first year of growth as a result of change from insects to fish as food (Carlander, 1969). Considerable variation in growth in pike that are the same age may also occur.

Condition factors have been used to compare and contrast fish populations in different lakes.

$$\text{Condition factor} = K = \frac{\text{weight (grams)}}{\text{total length}^3 (\text{mm})^3}$$

Of the six fish from Morris Lake examined, the youngest fish (1+) had a higher condition factor ($K = 0.65$) than the five fish of higher age classes (4+, 5+) which all had similar K values (average $K = 0.56$) (Table 1). The decrease in condition factor values with increase in length may be due to crowding conditions during the growing season in Morris Lake during the height of the pike population.

The young fish put more energy into growth than the more mature fish. The young fish have higher weight:length ratios and are "plumper" than the older fish; they are living under better conditions than fish of ^{older} earlier year classes. Food is more plentiful and more breeding area is available for pike and other fish, for example, the yellow perch (Perca flavescens). It is interesting to note that only large perch were found in Morris Lake, being the only ones that were able to survive predation by pike. Fry fall as easy prey to the pike.

When compared with data taken from Carlander, 1969, the longer, older age-class fish have weights falling within Carlander's range, but the weight is usually lower than the central 50 % weight values given by Carlander for comparably-sized fish. For the young fish (1+), the weight obtained is higher than Carlander's central 50 % weight value for a comparably-sized fish, indicating that these fish weigh more per unit length which is also seen in the condition factor (Table 1).

A length-frequency histogram of the total pike population of Morris Lake that was sampled by the "UNDERC fishermen" from 5/28/79 to 6/21/79, indicates preponderance of fish in the 17 to 19 inch size class (Figure 1). It would have been interesting to have kept a record of the lengths and weights of these fish and thus come up with more statistically reliable values for condition factors to compare and contrast with Carlander's values.

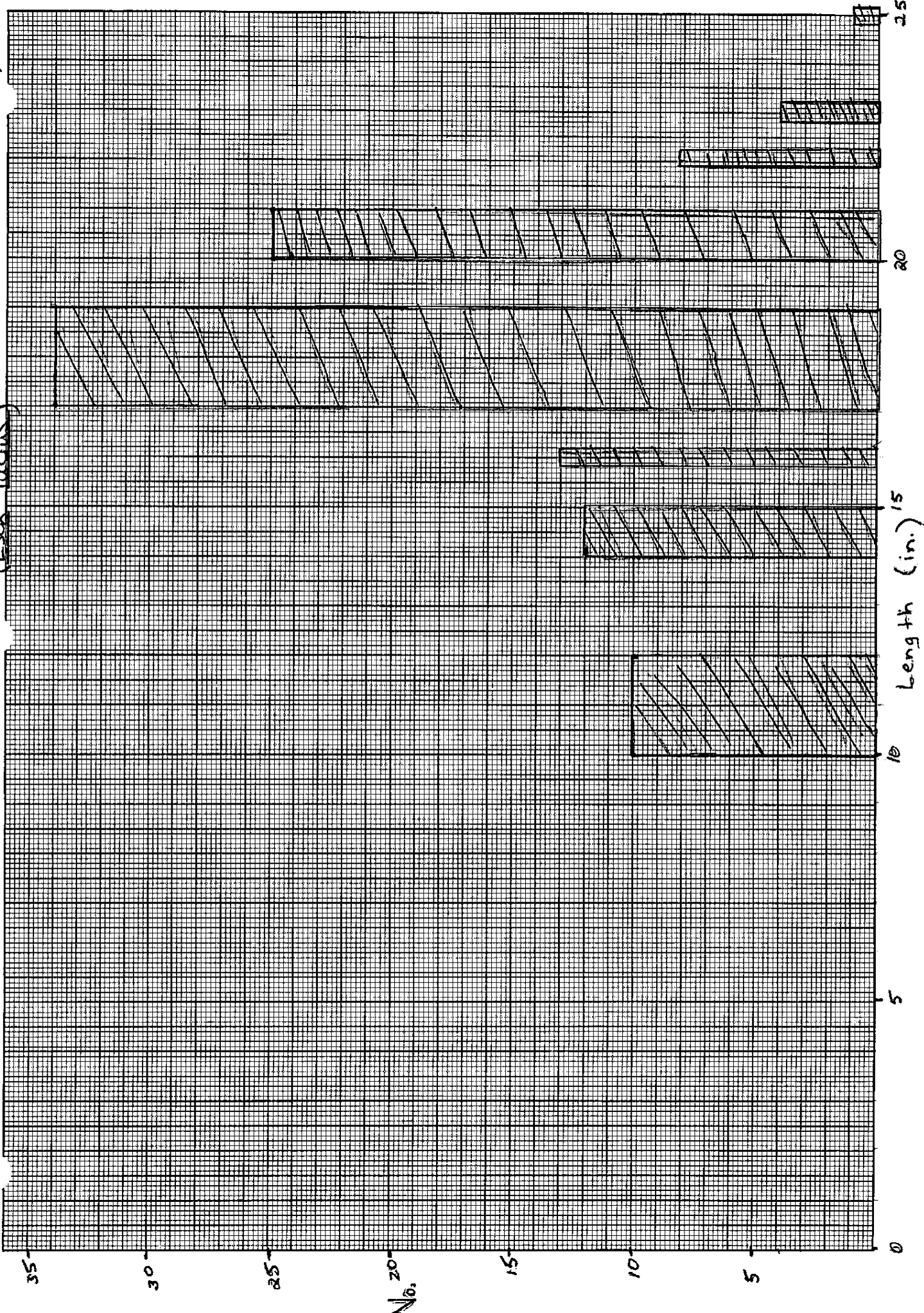
As indicated by the condition factors obtained, the present pike population in Morris Lake is living under better conditions than those of earlier year-classes did. It may be wise to continue to fish out the pike, but not as strongly as has previously been done. From the data accumulated from water samples taken from Morris Lake, it can be seen that there are more than sufficient zooplankton and phytoplankton on which fish may feed. It may be a good idea to introduce some intermediate feeder such as the minnow to avoid an interruption in the food chain since pike don't feed directly on zooplankton or phytoplankton; this would serve to make the food chain more efficient. On the other hand, perhaps it would be best to let the lake reestablish its own equilibrium instead of introducing any new species of fish.

Table 1. Length, weight, age, condition factors and gut contents of northern pike (Esox lucius) collected in Morris Lake, UNDERC, Land o' Lakes, Wisconsin, June, 1979.

(mm.) Length total/forked/standard	(grams) Weight	(years) Age	(K) Condition factor	Gut contents
550/523/490	960	5+	0.58	flukes, tapeworm, well-digested food
* 533/500/459	range: 567-2722 central 50%: 1098-1157	-	-	-
525/495/460	800	5+	0.55	-
480/450/415	580	4+	0.52	insect larvae
* 457/429/393	range: 481-1361 central 50%: 712-794	-	-	-
450/420/390	530	5+	0.58	small fish, leech
405/380/350	375	4+	0.57	-
305/285/265	185	1+	0.65	several small fish
* 305/287/262	range: 50-340 central 50%: 100-159	-	-	-

* indicates data taken from Carlander, 1969. Additional Carlander data: total length = 305-450 grams, K = 0.47; total length = 495-538 grams, K = 0.56.

Figure 1. LENGTH FREQUENCY GRAPH FOR PINE FROM MORRIS LAKE (6/2-2-74)



Literature Cited

Carlander, K.D. 1969. Handbook of Freshwater Fishery Biology.
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