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Gill nets are among the most effective gear for collecting many species of lake fishes. In scientific investigations we usually use gill nets with several sizes of mesh to sample fish of various sizes. The standard experimental gill net usually consists of 25-foot lengths of the following stretch measure mesh sizes: 1.5, 2, 2.5, 3, and 4 inches. These nets will catch, with little size selection, walleyes and suckers from 6 to 23 inches, and yellow perch, yellow bass, white bass, and bullheads from 4.5 inches to their maximum sizes.

Standard experimental gill nets, five feet deep, have been used in the Clear Lake, Iowa, investigations since the summer of 1947. The first three years, the nets also included a 6-inch mesh but this mesh caught so few fish that it has been discontinued.

The gill nets were set primarily to take samples for age and growth studies. The present report is an attempt to derive, from the catch records, information on changes in abundance of the various species of fishes. Everyone that uses gill nets realizes that the catch bears some relationship to the abundance of the fish but that other factors also affect the catch so that interpretation of the catch data to derive abundance indices is subject to considerable error (Moyle, 1950). The gill nets used in Clear Lake from 1947 through 1952 have been made of linen; those to be used in the future will probably all be of nylon which is reported to fish more efficiently than linen or cotton (Lawler, 1950; Hewson, 1951; Molin, 1951; Peterson, 1952). Now is therefore an opportune time to summarize the catch results.

Gill nets depend upon the movement of the fish and therefore the catch per hour is a function of the activity of the fish in the vicinity of the nets as well as their abundance. Fish move about more at certain times of the day than at other and each species appears to have a characteristic activity cycle (Carlander and Cleary 1949, Sieh and Parsons 1950). In the Clear Lake studies, the nets were usually lifted at two-hour intervals, thereby giving information on the catch per net at different hours of the day (Fig-

[1]From Project 39 of Iowa Cooperative Fisheries Research Unit, sponsored by the Iowa State Conservation Commission and by the Industrial Science Research Institute of Iowa State College, with the cooperation of the U. S. Fish and Wildlife Service.

ures 1 and 2). Walleyes (*Stizostedion vitreum*), yellow bass (*Morone interrupta*), white bass (*Morone chrysops*), and black bullheads (*Ameiurus melas*) move around more at night than during the daylight hours. The peak of activity usually appears to be soon after dusk. Moore (1944) found that the eye structure of walleyes did not permit adaptation to bright light, which may account for the little movement during the day. Yellow perch (*Perca flavescens*), northern pike (*Esox lucius*), bluegills (*Lepomis macrochirus*), and pumpkinseeds (*L. gibbosus*) move around most during the daytime and are relatively inactive at night. The hour of the day has no clearly marked effect on the movements of crappies (*Pomoxis nigromaculatus* and *P. annularis*), white suckers (*Catostomus commersoni*), and carp (*Cyprinus carpio*). Spoor and

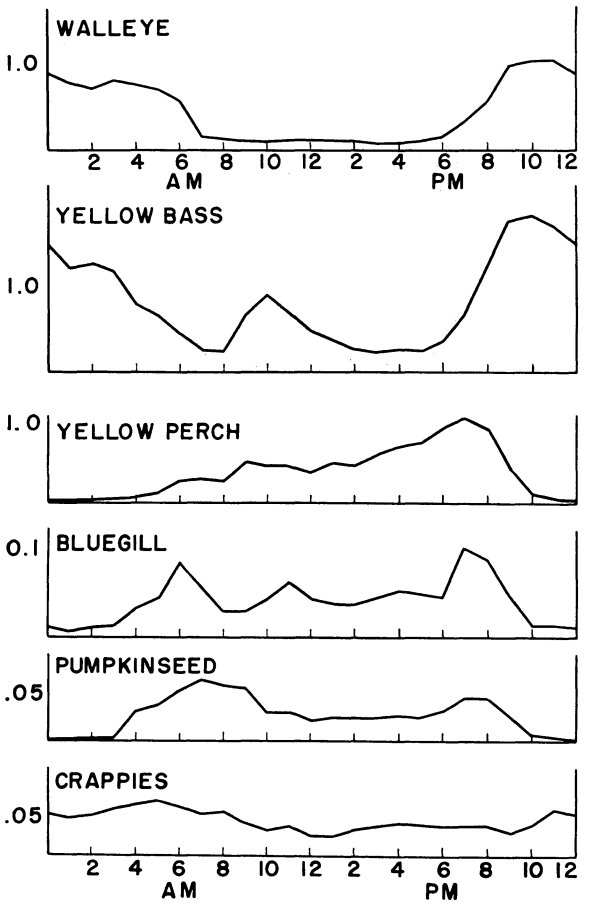

Figure 1. Numbers of fish caught per 125-foot experimental gill net at various hours of the day, Clear Lake, Iowa, 1947-1952.

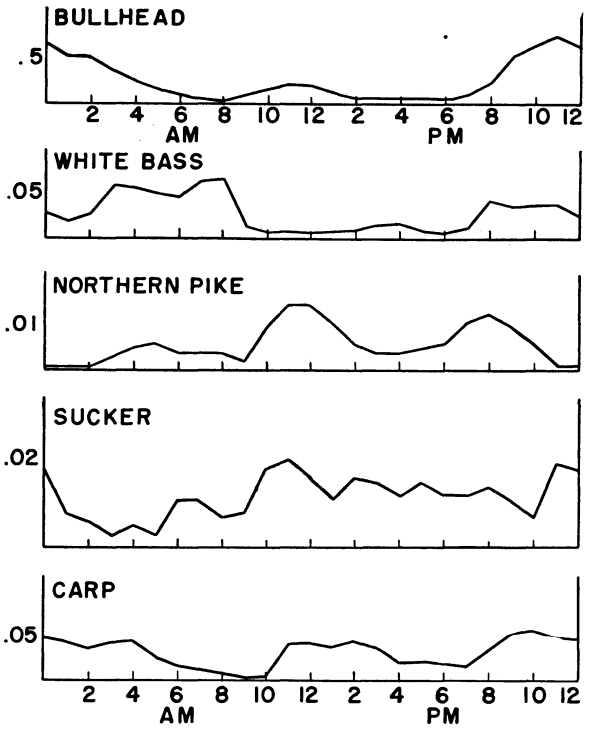

Figure 2. Numbers of fish caught per 125-foot experimental gill net at various hours of the day, Clear Lake, Iowa, 1947-1952 (continued).

Schloemer (1939) and Carlander and Cleary (1949) found that suckers in Muskellunge Lake, Wisconsin and in Lake of the Woods, Minnesota were caught in deeper water mostly in the daytime and in shallow water at night. No such migration was evident in the Clear Lake investigations. The catch of suckers at different hours in water less than 6 feet deep was similar to that in deeper waters.

The activity patterns for each species of fish for which sufficient data were collected were essentially the same each year indicating that the observed phenomena are constant at least during the summer months.

With such pronounced hourly changes in the catch per net it is obvious that some adjustments must be made if the catch per net is to be used as a measure of abundance of fish. One method would be to always set the nets for 24 hours to cover all activity periods equally. Since this was not done, the data were adjusted as follows: the mean catch per net for each hour of the day was determined and then these means were added together to give the twenty-four hour catch, as if the same number of nets had been fished each hour.

Table 1

Mean catch per 24-hour period of 125-foot experimental gill nets in Clear Lake, Iowa, 1947 to 1952.

Species	Year					
	1947	1948	1949	1950	1951	1952
Walleye	4.4	4.4	13.9	18.0	5.1	14.8
Yellow perch	23.8	6.2	0.1	3.7	9.1	17.4
Yellow bass	9.3	14.0	17.6	51.0	26.7	19.9
White bass	0.2	0.1	1.9	2.9	0.3	0.3
Black bullhead	4.8	1.4	0.4	13.4	9.5	16.1
Channel catfish	0	0.02	0	0.1	1.0	0.5
Northern pike	0.2	0.2	0.1	0	0.3	0.2
Carp	10.1	0.8	0.8	0.4	0.1	0.3
White sucker	0.05	0	0	0.05	0.6	0.4
Crappies	0.4	0.7	0.8	0.6	0.3	2.3
Bluegill	0.4	0.1	0.2	0	0.1	2.3
Pumpkinseed	0.8	0.2	0.1	0	0	6.8
Hours netted	240.5	1,084.5	543.0	496.0	895.0	674.0

In deriving the relative measures of abundance (Table 1) only the nets set in June through August in the vicinity of the State Fish Hatchery on the north shore were included. Most of the netting each summer was in this location which is fairly typical of much of the lake. It is difficult, with the information now at hand, to evaluate these measures of abundance. It may be possible to determine more about their validity when age and growth studies are completed. Studies on the yellow bass (Carlander, Lewis, Ruhr, and Cleary 1953) indicate that the 1948 and 1949 year classes of yellow bass were particularly abundant while few of the 1950 year class survived the first year. These differences in the year class abundance might cause a greater population in 1951 than in the next two years as the gill-net catches indicate. The low gill-net catch of walleyes in 1951 immediately followed an unusually successful angling period in May and early June of that year. It is possible that the abundance of larger walleyes was somewhat lower during that summer until younger walleyes reached catchable size. The extremely low gill-net catch of perch in 1949 was associated with a great decline in the angling success for this species. The angler's catch of perch per hour in 1949 was only one-tenth that of 1948 (Parsons 1950).

The recent increase in several of the species not usually taken in gill nets, the bluegill, pumpkinseed, crappie, and channel catfish may indicate an increase in the abundance of these fishes.

Although questions are raised about the validity of these popula-

tion indices, it is probable that the trends they show indicate real changes in population abundance. The gill nets were fished in much the same fashion each year; only the nets in the same portion of the lake were compared, and corrections have been made for the marked differences in catch at various hours. We thus have measures of relative abundance from the gill net catches, which probably represent changes in the fish population. The validity of the measures can be tested only with additional data.

One final word of caution. The gill nets probably do not give a measure which can be used for comparing the relative abundance of different species of fishes. Some species are much more suseptible to capture in gill nets than others. In general, the largemouth bass, crappies, and sunfishes avoid gill nets and may be much more abundant than their rate of capture in gill nets would indicate.

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Literature Cited

Carlander, Kenneth D., and Robert E. Cleary. 1949. The daily activity patterns of some freshwater fishes. Amer. Midl. Nat. 41(2):447-452.

Carlander, Kenneth D., William M. Lewis, C. E. Ruhr, and Robert E. Cleary. 1953. Abundance, growth, and condition of yellow bass, *Morone interrupta* Gill, in Clear Lake, Iowa, 1941 to 1951. Trans. Amer. Fish. Soc. 1952, 83: 91-103.

Hewson, L. C. 1951. A comparison of nylon and cotton gill nets used in the Lake Winnipeg winter fishery. Canad. Fish Cult. 11:7-9.

Lawler, G. H. 1950. The use of nylon netting in the gill-net fishery of the Lake Erie whitefish. Canad. Fish Cult. 7:22-24.

Molin, Gosta. 1951. Nylon contra cotton. Rept. Inst. Freshwater Res., Drottningholm, 32:59-65.

Moore, George A. 1944. The retinae of two North American teleosts, with special reference to their tapeta lucida Jour. Comp. Neurology 80(3): 369-379.

Moyle, John B. 1950. Gill nets for sampling fish populations in Minnesota waters. Trans. Amer. Fish. Soc. 1949, 79:195-204.

Parsons, John W. 1950. Life history of the yellow perch, *Perca flavescens* (Mitchill), of Clear Lake, Iowa. Iowa St. Coll. J. Sci. 25(1):83-97.

Peterson, Kenneth L. 1952. From report on study of nylon and linen gill nets. Progr. Fish Cult. 14(1):18.

Sieh, James G. and John Parsons. 1950. Activity patterns of some Clear Lake, Iowa, fishes. Proc. Iowa Acad. Sci. 57:511-518.

Spoor, W. A., and Clarence L. Schloemer. 1939. Daily activity of the common sucker, *Catosomus commersonni* (Lacépède), and the rock bass, *Ambloplites rupestris* (Rafinesque), in Muskellunge Lake. Trans. Amer. Fish. Soc. 1938. 68:211-220.

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