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Comparison of the Distribution of Minnows and Darters Collected in 1947 and 1972 in Boone County, Iowa

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Comparison of the Distribution of Minnows and Darters Collected in 1947 and 1972 in Boone County, Iowa[1]

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SYNOPSIS: If the entire watershed of Boone County, Iowa, is considered, the same species of minnows and darters were found in the prairie streams and Des Moines River in 1972 as in 1947. Specific changes in relative abundance of minnows and darters over the 25-year period were generally correlated with habitat alteration. Habitat alteration resulting in change of bottom type allowed increase in abundance of several minnow species. Increase in water temperature and change of bottom type has contributed to the disappearance of the fantail darter from Bluff Creek. The similarity in relative abundance of fishes in 1947 and 1972 indicates that there have been few significant cases of stream habitat alteration in Boone County.

INDEX DESCRIPTORS: Fishes; Species composition changes; Stream changes; Iowa, Boone County; Fantail Darter.

During the summer of 1972, fishes were collected from Boone County, Iowa, streams, with emphasis on habitat ecology of minnows and darters. My data were compared with those recorded by Starrett (1950) in 1947, to observe changes in relative abundance of minnows and darters that may have occurred over the 25-year period. Although man-made changes on the Des Moines River and prairie creeks in Boone County have been relatively minor, the changes in species composition probably reflect changes in environmental conditions initiated by man.

Boone County, in central Iowa, has an area of 569 square miles, over 90% of which is rich farm soil. The Des Moines River flows in a north-south direction through the county, roughly dividing it in half. Most prairie creeks in the county drain into the Des Moines River. Since 1947, farmers in Boone County have made extensive use of networks of subsoil piping that increase water drainage from the soil. Between 1950 and 1970, there has been a considerable increase in use of fertilizers, insecticides, and herbicides. Approximately 18 of 300 miles of streams in the county have been channelized as recorded by the Soil Conservation Service. In these areas, meandering streams providing pool-riffle habitat have been replaced by straightened channels with uniform stream beds composed mostly of sand and sand-silt. Stream channelization was extensive only in upper Bluff Creek. In 1968, Don Williams Lake, a recreational facility, was constructed on Bluff Creek about 5 miles upstream from its mouth. Thus, environmental changes of creeks in Boone County since 1947 have involved extensive tiling of the land, some stream channelization, water impoundment in one instance, and addition of chemicals to the watershed. There have been few, if any, man-made changes involving the Des Moines River other than probable increases in previously mentioned chemical compounds.

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METHODS AND MATERIALS

A 15-foot, ¼-inch mesh common sense minnow seine was used to collect fish from April through August 1972. Attempts were made to collect at the stations visited by Starrett (1950) except where environmental alteration made sampling impossible. A collection involved a single seine haul over one bottom type, and we usually made three or four collections per seining site. Fishes were preserved in the field and identified in the laboratory. Percentage of occurrence was found to be a more accurate estimate of relative abundance of fishes than actual counts of numbers of individuals.

Comparisons of percentage of occurrence of species were made within these categories: prairie streams less than 10 ft in width, or streams 10 to 50 ft wide, and the Des Moines River.

RESULTS AND DISCUSSION

In streams less than 10 ft wide, Starrett made 50 collections, and we made 52. The percentages of occurrence for the most abundant species (the bigmouth shiner, *Notropis dorsalis*, and the creek chub, *Semotilus atromaculatus*) were generally similar in 1947 and 1972 (Fig. 1). The most common bottom type was sand or sand-gravel and sand-silt in both years. We recorded greater percentages of occurrence for the bluntnose minnow, *Pimephales notatus*, the sand shiner, *Notropis stramineus*, and the stoneroller minnow, *Campostoma anomalum*, than Starrett had noted. The indication is that these species are more successful at present in small streams than they were previously. This difference in abundance may be due, in part, to differing stream flows in 1972 and 1947. Total monthly precipitation in July, August, and September 1972 was greater than precipitation for corresponding months in 1947. In streams less than 10 ft wide, we found the bluntnose minnow associated with the sand shiner while the creek chub occurs with the bigmouth shiner.

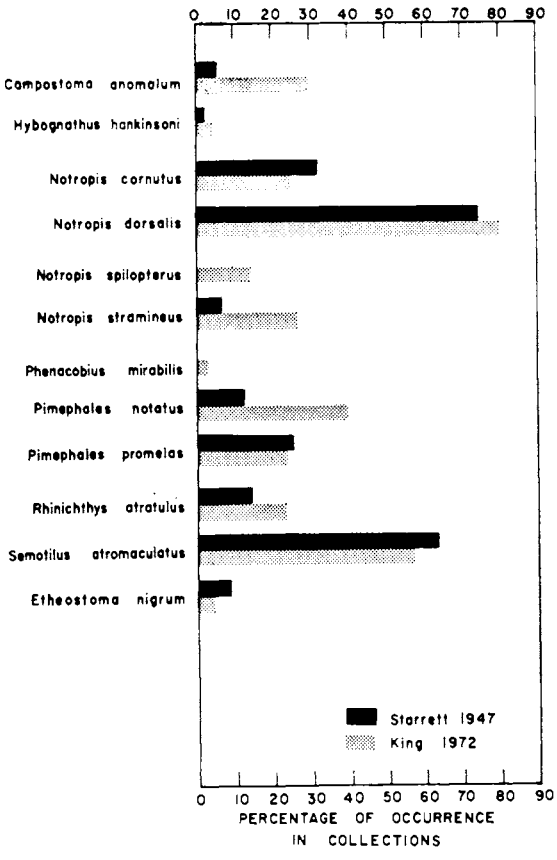

Figure 1. Comparison of collections in streams less than 10 ft. in width, Boone County, Iowa.

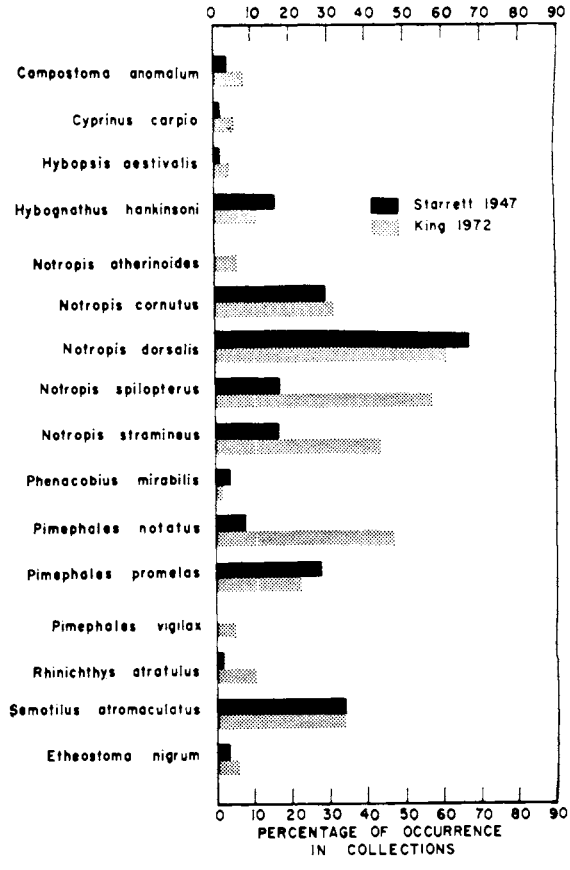

Figure 2. Comparison of collections in streams 10 to 50 ft. in width, Boone County, Iowa.

We made 83 collections and Starrett recorded 58 in streams 10 to 50 ft wide. The bigmouth shiner was most common in 1972 and in 1947 (Fig. 2). The creek chub and common shiner, *Notropis cornutus*, also were common during both sampling periods. Notable differences involved recent increases in the spotfin shiner, *Notropis spilopterus*, the sand shiner, and the bluntnose minnow. In our collections, when these species were present, they tended to occur together. Generally, when the bigmouth shiner was abundant, there were very few spotfin shiners, sand shiners, or bluntnose minnows. The predominant bottom type in streams 10 to 50 ft wide has changed over the 25-year period from mostly sand-rubble and sand-gravel to sand and sand-silt. This increase in finer particulate matter probably is a result of the runoff from more intensive row-cropping after extensive tiling and channelization.

The spotfin shiner, sand shiner, and bluntnose minnow were recorded by Starrett as common in the river, whereas our study indicates that these species are now becoming more common in the larger streams. This probably is true because the sandy habitat type that these species prefer seems more common in large streams now than in 1947.

The fantail darter, *Etheostoma flabellare*, commonly was found only in upper Bluff Creek according to Starrett (1950), Seifert (1963), and Karr (1964). In the early 1960's, upper Bluff Creek was extensively rechannelized. In 1968, Don Williams Lake was built on Bluff Creek. The combined effects of substrate alteration due to channelization and lake construction, with corresponding increases in water temperature of the outflow, has made the habitat unsuitable for the fantail darter. Where it was once common, we failed to collect any specimens.

Sampling in the Des Moines River in 1972 was hindered by high water levels. We were able to make only 41 collections as compared with Starrett's 619 collections over a 2-year period. The spotfin shiner is the most abundant river species in both years (Fig. 3). The sand shiner and bluntnose minnow were also common in river collections both in 1972 and 1947. The slenderhead darter, *Percina phoxocephala*, showed an increase in percentage of occurrence in river collections over that recorded by Starrett. He reported that occurrence of this species in any collection usually was limited to a single specimen, although we frequently captured two slenderheads in riffle collection. There are, however, comparatively few typically riffle species in the Des Moines River other than darters and madtoms. Because of their ecology, they are not captured in large numbers.

CONCLUSIONS

The same species dominated the prairie streams and Des Moines River in 1972 as did in 1947 for Boone County. Al-

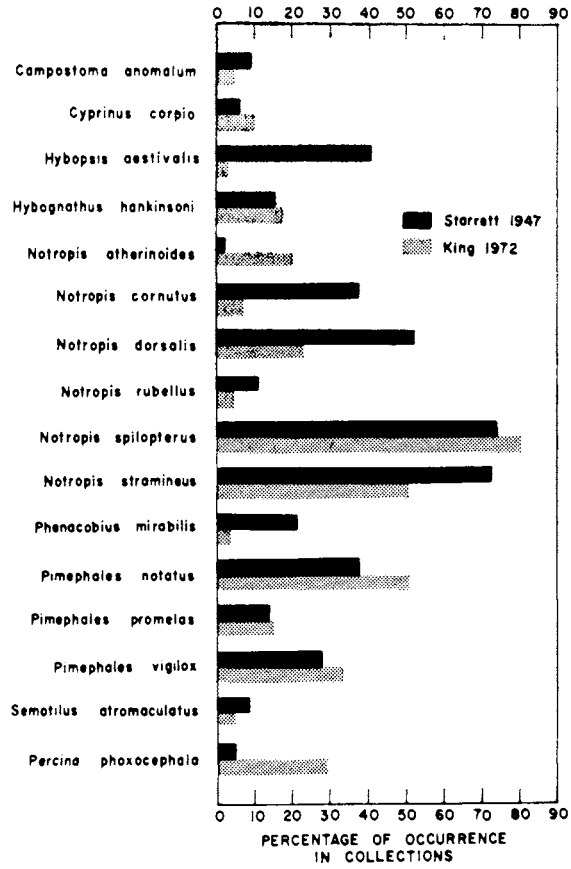

Figure 3. Comparison of collections in the Des Moines River, Boone County, Iowa.

teration of the habitat in prairie streams resulting in change of bottom type has probably allowed several species of minnow to become more abundant in recent times, but substrate alteration and increase in water temperature contributed to the disappearance of the fantail darter from Bluff Creek. In the past 10 years, however, there has been no extensive channelization of streams, and the extent of siltation due to row cropping should remain the same because the maximum developmental potential of this type of farming probably has been achieved. Lack of significant change in species composition indicates that the fertilizers and pesticides have not had major effects on the fish in the area. In spite of significant habitat loss due to channelization and other activities of man, the dominant species remain the same.

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