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WINTER ULTRASONIC TRACKING OF CARP IN LAKES KEGONSA, KOSHKONONG AND PUCKAWAY, WISCONSIN

By Gordon R. Priegel, Madison

ABSTRACT

Winter ultrasonic tracking of carp (Cyprinus carpio Linnaeus) was conducted on Lake Kegonsa during 1976-77 and on Lakes Puckaway and Koshkonong during 1977-78 to determine if sonic-tagged carp would join major carp aggregations and reveal areas which could be fished commercially for the most efficient harvest.

In Lake Kegonsa where the maximum depth is 31 ft, some carp aggregation was noted in deeper water (15-21 ft) but it was never sufficient to warrant harvest. As ice conditions improved and snowmobile activities increased, the tagged carp scattered to various areas and depths in the lake. Excessive snowmobile noise under the ice probably was responsible for this scattering.

On Lakes Puckaway and Koshkonong where maximum depths are 5.2 ft and 7 ft, respectively, no aggregation was noted. The sonic tag did not seem to be the best telemetry hardware for tracking carp in shallow lakes, and signal loss was common. Bottom types, irregularity in depth, turbid water and submergent vegetation contributed to signal loss in the shallow lakes.

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INTRODUCTION

State and contract commercial fishermen have often noted schooling of carp (Cyprinus carpio Linnaeus) just before freeze-up. Others have also reported that large concentrations of carp form in deeper water during winter (McCrimmon 1968, Strand and Scidmore 1969). Thus, tagging carp to reveal major carp aggregations would allow efficient carp harvest.

In 1974, the Wisconsin Department of Natural Resources entered into a contract with the University of Wisconsin-Madison Laboratory of Limnology to determine if a few carp tagged with ultrasonic transmitters would join major carp aggregations in Lake Mendota, Dane County. Seventeen sonic-tagged carp were monitored daily during the autumn and winter of 1974-75 and 1975-76. Each year the sonic-tagged fish joined concentrations of carp in two areas of Lake Mendota before freeze-up. Commercial fishermen, advised of these locations, harvested 52,000 lb of fish. Thus, Johnson and Hasler (1977) concluded that the use of carp tagged with ultrasonic transmitters to locate large carp concentrations could serve as both a commercial fishing and management technique.

Based on the positive results of the Lake Mendota study, the Southern District initiated similar studies on Lakes Kegonsa (1976-77), Koshkonong (1977-78), and Puckaway (1977-78). Ten carp with surgically implanted ultrasonic transmitters were tracked in each lake during the winter to determine if they would join major carp aggregations. This report describes the results of these studies.

DESCRIPTION OF STUDY AREAS

Lake Kegonsa is a natural lake formed by moraine damming of the preglacial Yahara River Valley; it is augmented by a structure maintaining a 2-ft head. The lake has a surface area of 2,716 acres and a maximum depth of 31 ft. The Yahara River enters the lake along the northwest shore and exits through a lock and dam on the lake's eastern shore. Rough fish, especially carp, are a major problem. Large growths of macrophytes and recurrent algae blooms throughout the summer demonstrate the lake's eutrophic condition.

Originally, Lake Koshkonong was a widespread of the Rock River and consisted of deep and shallow marshlands. The Indianford Dam (6 miles below the lake outlet) changed much of the marshland into a shallow lake. The head of the original dam was about 4 ft. It was rebuilt in 1917 to a new height of 6 ft. The present surface area of Lake Koshkonong is 10,480 acres, with a maximum depth of 7.0 ft and an average depth of 5.3 ft. The lake is extremely fertile, unstratified, and very turbid with an unstable shoreline. It has intensive algae blooms and a prolific fish population dominated by carp. Carp control was initiated in 1923.

Lake Puckaway is a shallow widening of the upper Fox River. Lake levels are primarily maintained by the Princeton Dam, a low head structure in the Fox River channel, approximately 5 miles below Lake Puckaway. The lake surface area is 5,433 acres with a maximum depth of 5.3 ft and an average depth of 3.0 ft. Before 1950, aquatic vegetation was abundant and the water was clear. Only 47 percent of the lake's surface water was classified as open water (Kabat 1954). Since 1950 there has been a tremendous decrease in vegetation, particularly in the shallow portions of the lake, and turbidity has increased greatly. Carp are a major problem in Lake Puckaway, and measures were taken to control carp as early as 1915.

METHODS

Ultrasonic transmitters were constructed at the University of Wisconsin. Transmitters were 3 inches long, had a diameter of 0.5 inches, and weighed 10 g in water. Each transmitter was powered by a lithium cell, which provided a high power-to-weight ratio and did not have voltage drops at low temperatures (a problem with conventional mercury cells). The transmitters had an average operational life of 90 days and a range of 4.5 miles in open water.

Ultrasonic transmitters were surgically implanted in the body cavities of fish captured individually by seining or electrofishing in the respective lakes. Each fish was anesthetized in 2-phenoxyethanol. After removing several scales anterior to the cloaca and lateral to the midline, a small incision (1.5-2.0 inches) was made with a scalpel. The transmitter was inserted in the body cavity with its longitudinal axis parallel with the fish's. The incision was then closed with four and five nylon sutures, and the fish was held in a recovery tank at least 24 hours before it was released.

In Lake Kegonsa, implanted fish were released at five sites (two fish per site) on 22 November 1976 (Fig. 1). Five sonic-tagged carp were released near the outlet in Lake Koshkonong and five near its inlet 9 November 1977 (Fig. 2). In Lake Puckaway, sonic-tagged carp were released at three sites on 16 November 1977 (Fig. 3). Four fish were released off the south shore, three off the north shore and three near the inlet. The sonic-tagged fish in Lake Puckaway were also tagged with Floy FD-68 anchor tags inserted below the dorsal fin.

A Smith-Root TA-50 receiver and hydrophone were used for tracking carp implanted with ultrasonic transmitters (as described by Henderson et al. 1966). Fish were tracked by boat, airboat, or snowmobile at least once a week for a month and then at less frequent intervals. Individual fish were identified by differences in the pulse rate of each transmitter -- a stopwatch was used to time the interval of 10 pulses. Not all fish were located in each search.

RESULTS

LAKE KEGONSA

December 6, 9, 15, 22, 1976.

Five to nine fish were tracked on each date. The carp were scattered throughout the lake, with none found at the release sites.

January 6, 1977.

Trackers identified seven sonic-tagged carp in the eastern basin of the lake. Six of these carp were found in water 20-30 ft deep.

January 19, 25, 1977.

Seven tagged carp were located together in 10-20 ft of water in bays along the southwest and southeast shores.

February 2, 1977.

On the last sampling day, five carp were encountered along the south shore in 15-20 ft of water.

LAKE KOSHKONONG

November 14, 1977.

On the first sampling day, eight of the ten sonic-tagged carp were located. Six were found at the lake's outlet, including five of the carp released at that site on 9 November 1977. The sixth fish had been released near the inlet. The other two carp encountered had moved from the inlet release site along the south shore to a bay along the north shore.

November 30, 1977.

Three carp were found. Two were in a bay along the north shore (the same bay where two different fish were tracked on 14 November), and the third carp was found at the outlet where it was released.

December 12, 15, 1977.

No carp were located.

December 23, 1977.

One carp was located in the bay along the north shore. This fish had been located there previously on 14 November. Also, three sonic-tagged carp were found at the outlet where they had been released.

December 29, 1977.

Three carp were found at the outlet release site (same three carp as identified on 23 December).

January 1978.

No sampling was done in January because of bad weather conditions and equipment failure.

February 1, 2, 3, 1978.

No sonic-tagged carp were found in Lake Koshkonong or in the Rock River above and below the lake.

LAKE PUCKAWAY

November 1977 - January 1978.

Contact was made with five to eight fish with active transmitters, from their release on 16 November 1977 through mid-January 1978. However, the reliability of two transmitters originally released in carp was questionable because they overlapped in frequency.

Only two fish were located together, though, and they demonstrated a counterclockwise movement pattern in the lake. All fish were encountered in 3 ft of water or less. No contacts were made in the deeper, 5-6 ft contours of the west half of the lake basin.

Four of the ten tagged carp that were tracked in Lake Puckaway were eventually recaptured by a commercial fisherman in July 1978. The fisherman spotted two tagged carp in the catch from his seining operation, while two others were recovered in Omaha, Nebraska, where the tags were noted by the processor. The processor returned these two carp to us and we examined the fish for effects of the implanted transmitters. The sutures had been absorbed; the incisions were completely healed, and scales had formed over the incision on one carp. There was no negative internal pathology related to the ultrasonic transmitters. In fact, both fish had formed a membrane surrounding the transmitter within the body cavity. These were the first recaptured fish examined after inserting ultrasonic transmitters, and there were no apparent ill effects. The plastic dart tag, on the other hand, showed continuous irritation and open skin areas where the tags were inserted on the carp.

DISCUSSION

Johnson and Hasler (1977) noted in the Lake Mendota study that carp aggregated in the autumn and winter both years at the same two locations. This did not occur on Lakes Kegonsa, Koshkonong and Puckaway in these studies.

In Lake Mendota, carp aggregated in areas that had similar depths (15-21 ft) and were adjacent to large beds of macrophytes. These conditions did not exist in Lakes Puckaway or Koshkonong -- which had maximum depths of 5.2 and 7.0 ft, respectively. In the past, carp harvest on Lake Puckaway occurred when carp aggregated just prior to freeze-up. But this did not occur in 1977, nor does it occur every year. In Lake Kegonsa (maximum depth is 31 ft) some indication of carp aggregation was noted in deeper water (15-21 ft), but no mass aggregation of the majority of tagged carp was noted.

As soon as ice conditions on Lake Kegonsa were suitable, snowmobile activities increased on the lake and any indication of carp aggregating was quickly lost as the tagged carp scattered to various areas and depths in the lake. Excessive snowmobile noise under the ice was probably responsible for this scattering. Little snowmobiling activity occurs on Lake Mendota because a City of Madison ordinance prohibits the use of snowmobiles on Lake Mendota without flotation. Thus, the Lake Mendota study did not observe a scattering of carp.

Although the sonic tag worked well in the Lake Mendota study and for our study of Lake Kegonsa carp, it does not seem to be the best telemetry hardware for tracking carp in shallow lakes -- such as Lakes Kegonsa and Puckaway. Signal loss is common due to bottom types, irregularity in depth, turbid water and submergent vegetation.

Other problems were encountered with the transmitters. With some -- no definite pulse rates were detectable. With others -- the pulse frequencies were very similar making it difficult to identify individual fish (e.g., 9.0, 9.1, and 9.3 pulses, based on number of seconds/10 transmitter beats Therefore, we had to depend on the sensitivity of the hydrophone and the experience of the trackers. In order to be as consistent as possible, it was important to use the same individuals as trackers.

Thus, the use of ultrasonic transmitters to track carp may be a useful commercial fishing and management technique on some waters. Although certain lake characteristics (e.g., depth) and use characteristics (e.g., snowmobiling) may limit its applicability for other waters.

LITERATURE CITED

Henderson, H. F., A. D. Hasler, and G. G. Chipman
1966. An ultrasonic transmitter for use in studies of movements of fishes. Trans. Am. Fish. Soc. 95(4):350-56.

Johnson, P. B. and A. D. Hasler
1977. Winter aggregations of carp (Cyprinus carpio) as revealed by ultrasonic tracking. Trans. Am. Fish. Soc. 106(6):556-59.

Kabat, C. (ed.)
1954. Report to Governor Kohler on Upper Fox River. Wis. Cons. Dep., Madison (mimeo).

McCrimmon, H. R.
1968. Carp in Canada. Fish. Res. Board Can. Bull. 165. 94 pp.

Strand, R. F. and W. J. Scidmore
1969. Sonar - an aid to under-ice rough fish seining. Minn. Dep. Cons. Spec. Publ. 68. 35 pp.

Lori Goodspeed, Editor
Richard Burton, Graphic Artist

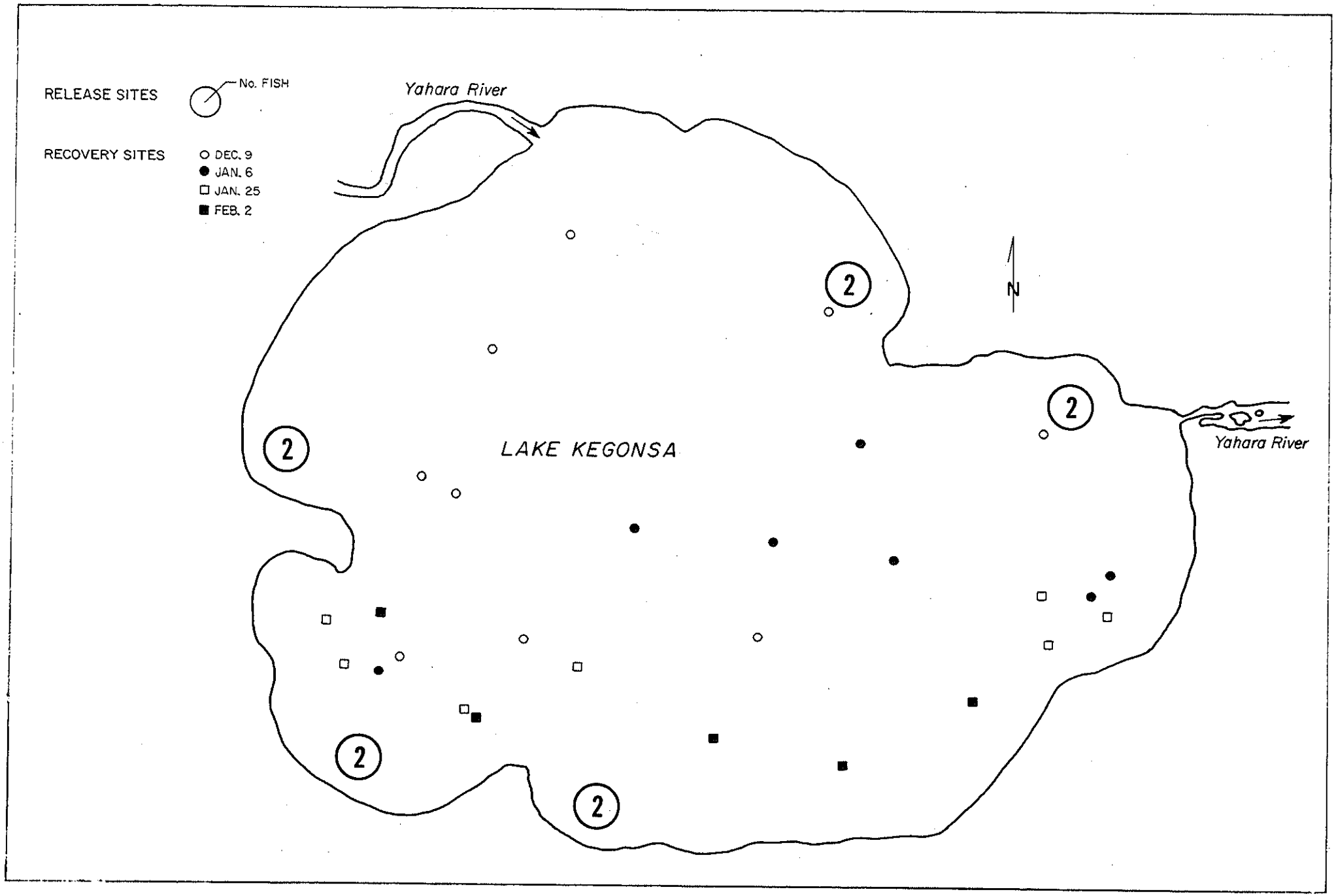

FIGURE 1. Release and recovery sites of sonic-tagged carp in Lake Kegonsa.

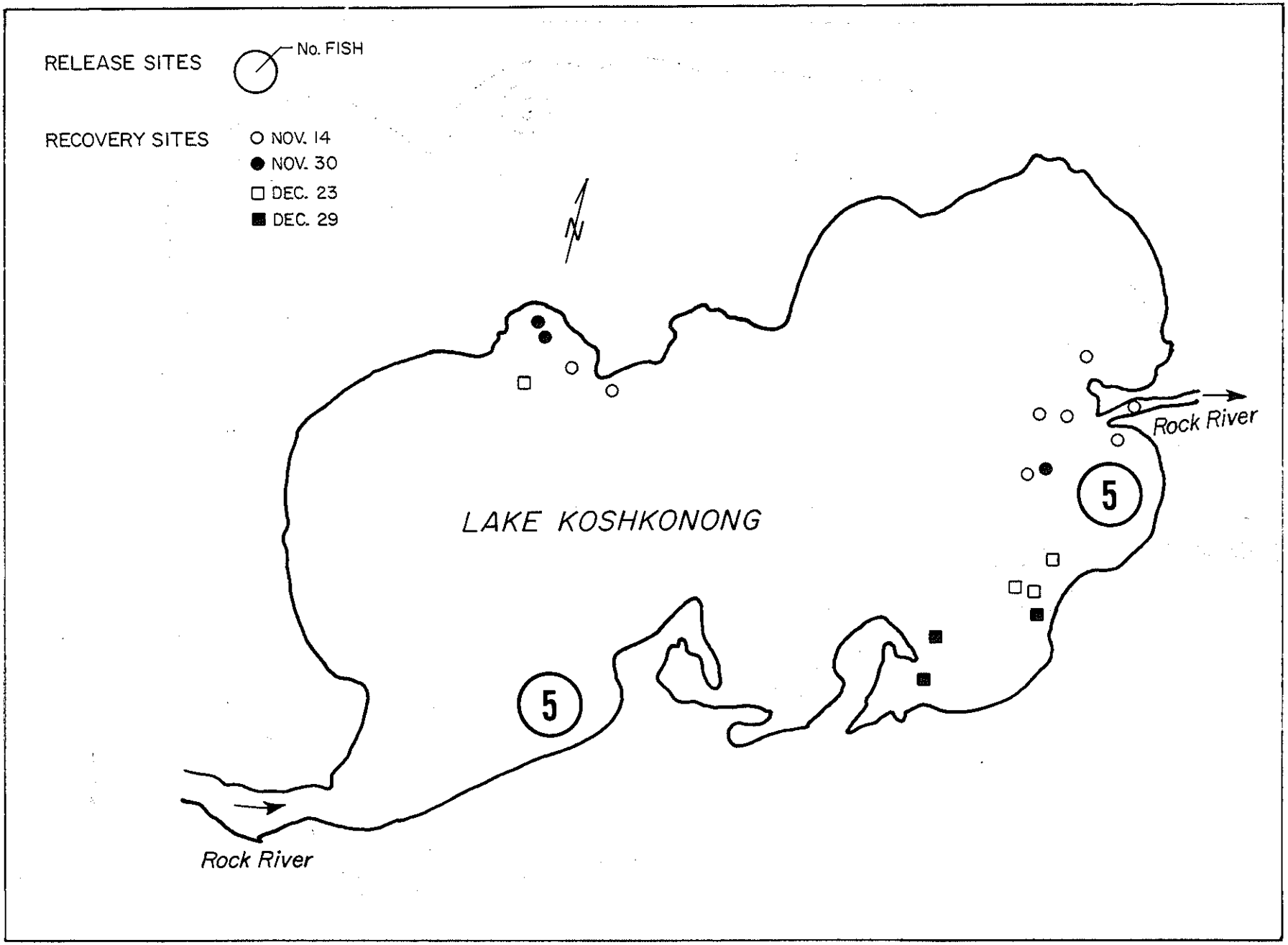

FIGURE 2. Release and recovery sites of sonic-tagged carp in Lake Koshkonong.

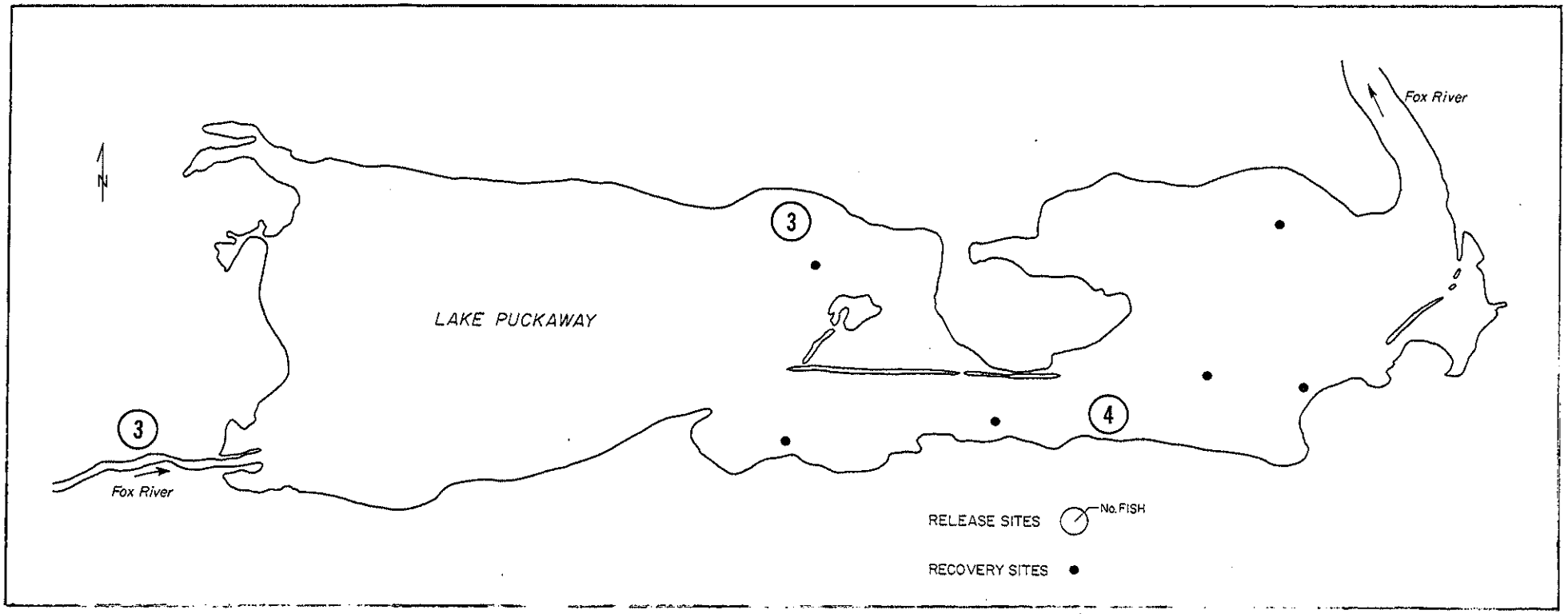

FIGURE 3. Release and recovery sites of sonic-tagged carp in Lake Puckaway.