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David J. Behmer
Iowa State University

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Movement and Angler Harvest of Fishes in the Des Moines River, Boone County, Iowa[1]

DAVID J. BEHMER[2]

Abstract. Fish tagging returns of the Iowa Cooperative Fisheries Research Unit from 1955 to the end of 1963 are summarized. Tag returns give minimum estimates of angler harvest as 4.6% for channel catfish, *Ictalurus punctatus*, and 12.0% for walleyes, *Stizostedion vitreum*. Very few flathead catfish, *Pylodictis olivaris*, and smallmouth bass, *Micropterus dolomieui*, were reported caught by anglers. Channel catfish showed greatest movement of the species studied with downstream movement predominating. Walleyes moved as far as 18 miles. Smallmouth bass showed very little movement, except for one individual that moved about 40 miles. Data on both angler harvest and movement must be interpreted in the light of biases inherent in the study.

Since 1955, various species of fish (Table 1) have been tagged in the Des Moines River as part of the investigations of the Iowa Cooperative Fisheries Research Unit at Iowa State University. A few additional fish were tagged in 1954, but no returns were recorded. All other years yielded at least some information, and all tag returns to the end of 1963 are considered in this report.

Most of the fish tagged were of a size considered catchable by anglers. Hoop nets and electric shocking gear were used to capture the fish for tagging. Hoop nets were the most effective method for capture of catfish. Almost all walleyes and small mouth bass were captured by electric shocking. Recaptures were made using the same methods plus recaptures made by anglers.

Table 1. Numbers of fish of each species tagged in the Des Moines River, Boone County, 1955-1962.

Species	Numbers
Channel catfish, *Ictalurus punctatus* (Rafinesque)	3,339
Walleye, *Stizostedion vitreum* (Mitchill)	184
Flathead catfish, *Pylodictis olivaris* (Rafinesque)	194
Smallmouth bass, *Micropterus dolomieui* (Lacépède)	141
Carp, *Cyprinus carpio* (Linnaeus)	...
Northern pike, *Esox lucius* (Linnaeus)	...
Green sunfish, *Lepomus cyanellus* (Rafinesque)	...
White crappie, *Pomoxis annularis* (Rafinesque)	...

* Tagged only in insignificant numbers; no returns have been recorded.

METHODS OF TAGGING

Metal strap tags with individual identification numbers were placed on the opercles of channel and flathead catfish and on

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[2] Graduate Assistant, Iowa State University, Ames.

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the jaws of walleyes and smallmouth bass. A few smallmouth bass were tagged on the opercle rather than the jaw (James Reynolds, personal communication), but not enough recaptures were made of this species to determine which method of tagging was more favorable. Muncy (1957) also tried a streamer-type tag applied behind the dorsal spine of catfish but abandoned this method because the fish evidently lost the tags (no fish with these tags were recovered after 20 days from the date of tagging).

Data on angler harvest and movement are interpreted on the assumptions that tagging does not affect catchability, mortality, or movement behavior. Muncy (1957) noted only a few catfish which had lost tags, and in general, injury to any of the fish from tagging is not believed to be significant.

Angler Harvest

From the tag reports of anglers, we can get estimates of the percentages harvested (Tables 2 and 3). All estimates are considered minimal, since not all tagged fish caught by anglers were reported. Although Muncy (1957) publicized the tagging of catfish in 1955 and 1956, no special publicity has been given the tagging since. The overall estimated harvest percentage of channel catfish is 4.6%. If we consider only the channel catfish 9 inches and longer at the time of tagging, the minimum harvest estimate is 6.6%. Muncy (1957) had found these percentages to be 3% and 4.6%, respectively, based on tag returns to the end of 1956. No fish were reported caught after 4 years from the year of tagging. McCammon (1956) reported a 20% angler harvest of

Table 2. Percentage of tagged channel catfish caught by anglers.

Year	Number tagged	Per cent return by years				Total per cent harvested
		0*	1	2	3	
1955	1328	2.4	0.5	0.2	0.1	3.2
1956	1749	3.0	2.4	0.3	0	5.7
1957	64	0	1.6	0	0	1.6
1958	198	4.0	0	0	0	4.0
Combined						4.6

*Recaptured in same year as tagged.

Table 3. Percentage of tagged walleyes caught by anglers.

Year	Number tagged	Per cent return by years			Total per cent harvested
		0*	1	2	
1957	4	0	0	0	0
1958	39	10.2	0	0	10.2
1960	32	9.4	6.3	3.1	18.7
1961	56	0	7.1	1.8	8.9
1962	53	5.7	7.5		13.2
Combined					12.0

*Recaptured in same year as tagged.

channel catfish tagged on the Colorado River, but, in Oklahoma, only a 3% angler return of this species was noted (Houser, 1955). Fishing intensity and publicity of the tagging project are possible reasons for these differences.

Although the number of walleyes tagged in any one year was small, the harvest estimates are reasonably consistent and average 12.0%. Eschmeyer and Crowe (1955), from an intensive study with 11,354 tagged walleyes in Michigan, reported a 12.2% return to anglers. In two separate tagging studies on Spirit Lake, Iowa, Rose (1959) obtained walleye harvest estimates of 44.8% and 26.5%. In the first study returns were reported for 9 years after tagging. Of the 194 flathead catfish and 141 smallmouth bass that were tagged in the period, only 2 and 4 respectively were reported caught by anglers.

These harvest rates may be more meaningful when the rate of catch of these species is considered. Schmulbach (1959) conducted a creel census on the Des Moines River in 1957 and 1958. He found the average catch of channel catfish ranged from 0.05 to 0.20 fish per man hour and that of walleyes, from 0.01 to 0.05 fish per man hour. Channel catfish represented 23.0% to 46.6% of the total catch per man hour of all species in this study. Walleyes constituted only 3.7% to 16.5% of the total catch per man hour.

Movement

Movement of channel catfish (Table 4) was tabulated only for recaptures made after the end of 1956 because Muncy (1957) had summarized the earlier data. Distances traveled were calculated with the aid of a map measurer. The small scale of the map used and the relatively large area covered by each release station on the map limit the accuracy of the calculated distances.

Table 4. Summary of data on movement of tagged fish.

Species	No.	Range in time interval	Distance traveled (miles)	Direction		
				up-stream	down-stream	neither
Channel catfish	42	2 days-27 months	0-5.5	11	30	1
	2	9-10 months	18-20	2	0	0
	1	23 months	40	0	1	0
Totals	45			13	31	1
Walleyes	31	2 days-26 months	0-5	14	9	8
	1	17 months	12	0	1	0
	2	65-95 days	18	1	1	0
Totals	34			15	11	8
Smallmouth bass	21	2 days-21 months	0-0.75	4	9	8
	1	46 days	1.5	1	0	0
	1	21 months	40	1	0	0
Totals	23			6	9	8

One channel catfish had moved 40 miles, and two others about 20 miles, but none of the others showed more than about 5.5 miles movement. From the 1955 and 1956 returns, Muncy (1957) found five channel catfish which had moved more than 4 miles, the maximum distance traveled being 26 miles. Greater downstream than upstream movement is apparent for this species. Muncy's records also showed this to be true. Other studies show even greater movement. Hubley (1963), in a study of channel catfish on the Mississippi River, noted 19 fish that had moved more than 100 miles. Downstream movement was also predominant in his study.

Three walleyes showed movement of more than 5 miles. Two had moved 18 miles and, the other, about 12 miles. Cleary (1958) found much greater movement of walleyes and saugers, *Stizostedion canadense* (Smith) in the Mississippi River, the average distance traveled by fish which moved out of home pools being 50 miles.

Except for one fish, smallmouth bass showed very little movement. No reason is speculated for the great movement (40 miles) of this individual. The movement of smallmouth bass compares well with Brown's study (1960). He found that more than 90% of the native smallmouth bass moved less than 0.5 mile, but that one bass had moved 19 miles. Reynolds (1963) observed a tendency to "home" in the smallmouth bass when released away from their point of capture. This phenomenon has been described for many species and is discussed at length by Gerking (1959).

Only one tag return of flathead catfish secured after 1956 was useful to determine movement, but Muncy had received 23 hoopnet recaptures of this species during 1955 and 1956. The maximum movement shown was 0.5 mile, and most fish showed no movement.

The data on movement may be biased because most angler recaptures are made at favorite fishing spots and two lowhead dams in the area prevent at least some upstream movement. Effort in recapture was concentrated within a few miles in either direction of the tagging area, and this factor should also be considered. Another factor which could introduce bias is the fact that, if fish were recovered more than once they were treated as separate releases and recaptures each time.

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Paper Chromatograms of Body Mucus of Some Suckers *(Family Catostomidae)*[1]

GENE R. HUNTSMAN

Abstract. Phenol:water and butanol:acetic acid:water solvent systems were used with horizontal and descending paper chromatography of the body mucuses of *Carpiodes, Catostomus, Ictiobus, Moxostoma,* and *Hypentelium.* Mucus could be sampled in the field, applied to the chromatography paper, allowed to dry, and kept for several days without refrigeration. Chromatograms of fresh and dried mucus appeared the same. Horizontal runs were faster but were abandoned for the greater separation possible with descending techniques. Ninhydrin-stained descending chromatograms showed differences between some genera within a run. Descending chromatograms run in butanol:acetic acid:water and viewed with short wave ultraviolet light showed differences between most genera studied. The pattern seen depended on the mucus and the intensity and the wavelength of the ultraviolet light. There seemed to be no effect of age, sex, or area of collection of the fishes on the pattern. Chromatograms of the mucuses of *Catostomus, Hypentelium,* and *Moxostoma,* members of the subfamily Catostominae, all showed prominent fluorescent spots under ultraviolet light, while the chromatograms of the *Carpiodes* species studied (subfamily Ictiobinae) lacked this fluorescence.

Morphological characteristics are often insufficient for distinguishing the four species of *Carpiodes,* the carpsuckers, espec-

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