Scioto Madtom Survey - 1984-85
Report on the Status of the Endangered Species, *Noturus trautmani*.

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SUMMARY

Again in 1984-85 as in two previous project years no Scioto madtoms were located after searching a variety of riffle madtom habitats in Ohio. During 60 separate collections 708 madtoms were checked (611 in 1984, 97 in 1985). This brought the total to 2417 madtoms observed over the course of this study. Twenty two percent (542 individuals) of this total were riffle madtoms of the subgenus Rabida (Noturus eleutherus and N. stigmosus) which also includes the Scioto madtom, *Noturus trautmani.*

Big Darby Creek was carefully searched as in previous years, especially the type locality of the Scioto madtom. Madtom production at the type locality was 15 per sample in 1984-85 which was down from 32 per sample in 1983 but still better than at any other Ohio site studied. Migratory behavior was similar to previous years at the type locality. Young-of-the-year *Rabida* began to swarm on Nov. 5, 1984 after a heavy rain when water temperature was 53° F.

Species richness at the type locality of the Scioto madtom continued to be exceptionally high and stable with 33 species recorded per sample even though madtom production dropped. Data on madtom abundance gathered during the project show that individual madtom populations vary independently according to species and locality. It is probably a characteristic of all madtom species in Ohio to exhibit extreme fluctuations in their population size. No explanation for this behavior was found.

Although the Scioto River contains excellent riffle madtom habitat it is one of the poorest streams in Ohio for madtom production. Point source pollution of the aquatic environment continues to be the main problem. The Scioto River showed a recovery in fish species richness in 1984 but, except for stonecat, madtom species avoided all parts of the river mainstem. The Muskingum River mainstem continued to produce madtoms of four species. One new locality was found for Noturus eleutherus and two new localities were found for *N. stigmosus*.

Four sites in Southern and Central Ohio that formerly produced riffle madtoms of the subgenus *Rabida* were searched in 1984-85 without success. These localities were on the lower Whitewater River, lower Shade River, lower Little Miami River and in the Walhonding River. In addition, several sites in Deer Creek and Scioto Brush Creek that offered suitable habitat for *Rabida* madtoms were sampled without finding any riffle madtoms except stonecat.

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INTRODUCTION

In the final (third) report on this project to locate the Scioto madtom catfish,data are presented on 50 collections made in 1984 and an additional 10 more made in the first part of 1985. As results show the Scioto madtom was not found among the 611 madtom individuals recorded in 1984 of the 97 listed for 1985. The 1984 season was not a good one for madtom production judging from the total number observed and the average number seen per sample (12). This was down from 1983 when an average of 20 madtoms were recorded per collection.

The principal objectives for 1984 were to continue searching in Big Darby Creek at the type locality of the Scioto madtom as well as in other similar habitats within the drainage and to sample at other Ohio localities within the Ohio River basin where riffle madtoms of the subgenus *Rabida* (*eleutherus*, *stigmosus*, *trautmani*) had been previously reported. Beyond this, two streams (Deer Creek and Scioto Brush Creek) that possess what appeared to be good madtom habitat, were also sampled in 1984-85. Although two new localities for *Noturus stigmosus* were discovered in the Muskingum River, results for the Scioto and Walhonding Rivers were particularly disappointing.

Work on the Scioto Madtom project was extended over into the first half of 1985 for three reasons: 1) a closer look at the Scioto River was necessary to determine the severity of problems madtoms are experiencing in that environment, 2) to complete sampling in Scioto Brush Creek (a tributary of the lower Scioto River) not finished in 1984, and 3) to take one final survey of Big Darby Creek including the type locality of the Scioto madtom.

OBJECTIVES

The map (Fig. 1) locates sites in Ohio where a search was rnade in 1984 and during the two previous years for riffle madtoms of the subgenus *Rabida.* The proposed plan of work for 1984 was as follows:

1.) Continue searching in Big Darby Creek both at the type locality of the Scioto madtom and at localities not yet investigated such as the section of Big Darby Creek below the barrier dam on Galbreath's Darby Dan Farm and the confluence of Big Darby Creek and the Scioto River.

2.) Continue searching at other localities in Ohio, namely; the lower Scioto River and its tributaries, the lower Little Miami River, lower Whitewater River, lower Shade River and lower Muskingum River.

3.) Attempt to use underwater methods to observe and capture madtoms in Big Darby Creek and Scioto Brush Creek when the water clears in October - November.

METHODS

Seining was the primary sampling technique employed in the 1984-85 study period. For most collecting a special 6 ft. deep x 10 ft. long, 3/16" ace mesh seine was used that was equipped with a triple weighted lead line (the seine held three times as many lead weights as when originally purchased). River habitats such as those in the Scioto were sampled with this net as well as with a 6 ft. x 30 ft. bag seine that had a bag of 3/16" mesh. The bag net was also triple weighted. Much more nighttime seining was done in the 1984 year than in previous years which, in addition to taking more madtoms overall, resulted in several more locality records for *Noturus stigmosus* and *Noturus eleutherus* in the Muskingum River. Electroshocking was used in combination with seining on one occasion at the type locality of the Scioto madtom in Big Darby Creek (SMS-10 upstream and downstream from Rte. 104 bridge). This work was done in conjunction with the Big Darby Creek sampling program of the Ohio EPA. Two electrofishing units were employed. Both had AC gasoline powered alternators with alternating current converted to DC. The larger unit could produce 4500 watts. The smaller unit about half that amount. Both were relatively ineffective at taking madtoms. After a full days'electrofishing 15 madtoms, all *Noturus flavus*, were recorded. In contrast seining at the type locality for two hour periods the week prior to and the week following the electrofishing sample produced 30 madtoms of three different species.

Turbidity in Big Darby Creek resulting from heavy rainfall during the fall months of 1984 prevented observations utilizing a diving mask. Conditions were finally favorable on November 21, 23, and 30 at which times underwater observations were attempted. Snorkeling on November 30, when the water temp. was 40° F proved impractical even with a good wet suit. After three years of continued unfavorable conditions it was determined that snorkeling as a madtom sampling and study method could not be successfully applied in Big Darby Creek.

Capture data, except for a very few samples, were always recorded on location from live fish in the net. The specimens were then immediately released, typically in good condition. Although the seine can injure fish, the number that are damaged or killed is far fewer than with the electrofishing sampling method.

Also, seining has the advantage of taking young of the year individuals thus providing information on reproduction. Seining is much less efficient in taking adult fish when compared to electrofishing. Comparing work conducted on Big Darby Creek, seining failed to take adult river redhorse (*Moxostoma carinatum*) which were consistently found by electrofishing. On the other hand, electrofishing surveys overlooked at least four species in Big Darby Creek that were located by seining. Data transfer from field notebook to file was assisted by a microcomputer, word processing program and printer. Each locality sampled was described in report form accompanied by a listing of the fish species captured, their numbers, and estimated age group determined from observation.

RESULTS

A list of collecting sites with a Key to field numbers is given in Appendix Table 1. Numerical data on madtoms recorded from field samples in 1984 are given in Appendix Table 2. As mentioned previously, fewer numbers of madtoms were encountered in 1984 than in the previous two years of this project. Comparison of catch data by year are listed in Table 1.

Table 1 Number of madtoms recorded per year during the Scioto Madtom Survey

Project Year No.	Madtoms Recorded	No. Samples Made	$\bar{X}$ Madtoms/Sample
1981	426	9	47.3
1982	267	17	15.7
1981-82 (combined)	693	26	26.7
1983	1016	50	20.3
1984	611	50	12.2
1985	97	10	9.7
1984-85 (combined)	708	60	11.8

The figures in Table 1 reflect a downward trend in madtom population size since the beginning of the project. Because most madtom individuals were recorded from Big Darby Creek at the type locality of the Scioto madtorn a similar compilation of catch data for this site is given in Table lA. Records listed for separate collections in 1984-85 are given in Table lC.

Table lA Number of madtoms recorded per year at the type locality of the Scioto madtom.

Project Year No.	Madtoms Recorded	No. Samples Made	X Madtoms/Sample
1981	342	5	68.4
1982	189	11	17.2
1981-82 (combined)	531	16	33.2
1983	509	16	31.8
1984	279	18	15.5
1985	43	3	14.3

What is most significant in Table lA are the sharp drop in madtom production at the type locality between 1983 and 1984. If abundance of individual madtom species living in Big Darby Creek is examined the results are more revealing. The 1984-85 madtom records for Big Darby Creek are shown in Table 2 (A, B, C, D) and a comparison of total numbers for each species is given in Table lB. The information reveals a dramatic drop in *Noturus flavus* abundance following 1982. Part of this result may be due to reduced effort in sampling N. flavus habitat in 1983 and 1984 but, without doubt, the numbers describe a real reduction in population size for Big Darby Creek. A second species, *Noturus stigmosus*¸ also had marked population reduction both in 1983 and 1984. *Noturus miurus* reversed the trend seen in the other two species by showing a substantial increase in numbers during 1983 and then falling back to a level in 1984 that was only slightly below that determined in the 1981-82 sampling period. *Noturus gyrinus* (data shown in Appendix Table 2) actually increased in numbers for 1984 to l985.

Table lB Comparison of total numbers of three madtom species recorded from Big Darby Creek over the survey period.

	Year	No. Recorded	No. Samples	$\bar{X}$/Sample
Noturus flavus	1981-82	269	26	10.3
	1983	41	21	2.0
	1984	63	23	2.7
Noturus miurus	1981-82	263	26	10.1
	1983	455	21	21.7
	1984	183	23	8.0
Noturus stigmosus	1981-82	161	26	6.2
	1983	84	21	4.0
	1984	40	23	1.7

As suggested in last year's report (Cavender 1984) the health of the Scioto River is probably critical to the survival of the Scioto madtom. In terms of physical characteristics the Scioto River offers the largest areas of riffle madtom habitat in Ohio. There are a whole series of splendid

Table lC Madtoms Collected at the Type Locality of the Scioto Madtom in 1984 - 85

No. Madtoms Recorded	Field No.	Date	Total No. Species Recorded	Total No. Fish Recorded - All Species	% Madtoms
4	SMS 1984-4	May 8	34	2270	0.18
7	SMS 1984-9	Sept. 21	37	1180	0.59
16	SMS 1984-10	Sept. 28	54	1286	1.24
23	SMS 1984-11	Oct. 5	40	1004	2.29
10	SMS 1984-12	Oct. 12	40	2713	0.39
7	SMS 1984-13	Oct. 16	25	396	1.77
1	SMS 1984-14	Oct. 19	25	169	0.59
13	SMS 1984-16	Oct. 22	30	655	1.53
12	SMS 1984-21	Oct. 30	33	462	2.60
13	SMS 1984-22	Nov. 2	34	890	1.46
42	SMS 1984-24	Nov. 5	31	607	6.92
45	SMS 1984-26	Nov. 19	34	1057	4.26
19	SMS 1984-27	Nov. 21	31	547	3.47
10	SMS 1984-29	Nov. 23	29	196	5.10
1	SMS 1984-30	Nov. 23	16	262	0.38
O	SMS 1984-31	Nov. 23	24	1467	0.00
19	SMS 1984-36	Nov. 30	36	936	2.03
37	SMS 1984-40	Dec. 12	33	2697	1.37
6	SMS 1985-2	**March 23**	25	785	0.76
30	SMS 1985-3	March 26	41	2722	1.10
7	SMS 1985-9	April 30	47	1150	0.61

322 Total Madtoms
TABLE 2 A, B, C, D. Madtom records for Big Darby Creek in 1984 - 85 Period.

A. *Noturus flavus* recorded from Big Darby Creek, 1984 - 85

Date Recorded	No. Specimens	Growth Stage
4 April	3	ad.
1 May	4	ad.
8 May	3	ad.
28 Sept.	16	12 ad., 4 yy
5 Oct.	6	5 ad., 1 yy
12 Oct.	6	5 ad,, 1 yy
19 Oct.	1	yy
22 Oct.	3	ad.
30 Oct.	2	ad.
2 Nov.	5	ad.
5 Nov.	5	3 ad., 2 yy
19 Nov.	1	ad.
21 Nov.	3	1 ad., 2 yy
23 Nov.	1	yy
30 Nov.	3	yy
12 Dec.	1	yy
26 March 1985	11	10 ad., 1 yy
23 April 1985	5	ad.
29 April 1985	1	yy
30 April 1985	6	ad.

B. *Noturus stigmosus* recorded from Big Darby Creek, 1984 - 85

Date Recorded	No. Specimens	Growth Stage
21 Sept.	1	ad.
5 Oct.	1	ad.
30 Oct.	4	ad.
2 Nov.	3	ad.
5 Nov.	15	2 ad., 13 yy
19 Nov.	6	5 ad., 1 yy
21 Nov.	2	yy
23 Nov.	1	yy
30 Nov.	3	1 ad., 2 yy
12 Dec.	4	2 ad., 2 yy
26 March 1985	1	ad.

C. *Noturus miurus* recorded from Big Darby Creek, 1984 - 85

Date Recorded	No. Specimens	Growth Stage
8 May	1	ad.
21 Sept.	6	1 ad., 5 yy
5 Oct.	16	1 ad., 15 yy
12 Oct.	4	2 ad., 2 yy
16 Oct.	7	3 ad., 4 yy
22 Oct.	10	5 ad., 5 yy
30 Oct.	6	4 ad., 2 yy
2 Nov.	5	ad.
5 Nov.	22	4 ad., 18 yy
19 Nov.	38	31 ad., 7 yy
21 Nov.	14	4 ad., 10 yy
23 Nov.	8	4 ad., 4 yy
23 Nov.	1	ad.
30 Nov.	13	8 ad., 5 yy
12 Dec.	32	17 ad., 15 yy
23 March 1985	6	5 ad., 1 yy
26 March 1985	18	17 ad., 1 yy
27 April 1985	4	ad.
29 April 1985	23	22 ad., 1 yy
30 April 1985	1	ad.

D. *Noturus gyrinus* recorded from Big Darby Creek, 1984 - 85

Date Recorded	No. Specimens	Growth Stage
4 April	1	ad.
27 April 1985	11	ad.

riffles found at intervals along the full length of the River from the Franklin County line to Portsmouth. These areas of rapidly flowing water have a wide variety of substrates with rock particles ranging in size from boulders to small pea gravel. The rock constituent of the riffle is either derived from the glacial drift or, in the case of the lower Scioto, from bedrock over which the river and its tributaries flow. Old museum records show the Scioto River contained populations of *Noturus eleutherus*, *N. stigmosus*, *N. miurus*, and *N. flavus*. Most likely *N. trautmani* also was found there. The recent work done on this project shows that today only *Noturus flavus* resides in the Scioto River. The other species have been eliminated from more than 150 miles of mainstem water containing excellent madtom habitat. Collection data given in Table 3 shows only 16 stonecats were recorded from the Scioto River in 1984-85. This number can be added to the five individuals recorded in 1983. There is no doubt that today the Scioto is one of the worst rivers for madtoms in Ohio. Even more alarming is the lack of recovery of madtom species in the Scioto River between 1983 and 1985, even though other fish species showed a remarkable comeback (compare Table 3 in this project with Table 3 in Cavender,1984). Total numbers of fish species taken per collection in the Scioto River in 1983 was 16 while in 1984--85 it was 30. The section of the river that improved the most was that between Circleville and the Columbus Wastewaster Treatment Plant. The sample site upstream from the Rte. 22 bridge at Circleville yielded a number of riffle species in 1984-85 (Oct. 84 - March 85) not encountered in 1983. Improvement here probably reflects a change in sewage sludge disposal by the Treatment Plant. Sludge is no longer dumped in the river. A discussion of this plant's impact on Scioto River water quality can be found in OEPA (1981, 1983).

The Muskingum River, even though it contains extremely limited riffle habitat (Cavender and Ciola 1981), is a much better madtom River than the Scioto. The Muskingum yielded 23 madtoms per sample while the Scioto produced 3 per collection. *Noturus flavus*, *N. miurus*, *N. stigmosus* and *N. eleutherus* all have self-sustaining populations in Muskingurn. Survival has been dependent on small riffle areas immediately downstream from the navigation dams. In addition there are several important riffles upstream from Ellis Dam where madtoms can survive.

Where conditions in the Muskingum Kiver have improved somewhat for madtoms since 1981, future outlook for the Scioto River looks dim with respect to its madtom populations. Recovery in the mainstem would depend on those populations now contained in the Scioto tributary systems. *Noturus miurus* is common in most Scioto River tributaries. Good populations were found in Scioto Brush Creek, Salt Creek, Paint Creek, Deer Creek and Big Darby Creek. *Noturus stigmosus* survives as small populations in only two short stream sections. One in Paint Creek, Ross County and one in Big Darby Creek, Pickaway County. These two populations are isolated from one another and could easily be extirpated without a large reservoir of individuals in the Scioto River to repopulate the tributaries. *Noturus eleutherus* is only known to be a mainstem species in the Scioto drainage. The last specimen recorded from the Scioto River was taken in 1963 almost a quarter century ago. It is obvious that the low water quality in the Scioto River is affecting not only the riffle madtom species such as *Noturus eleutherus* but also the slackwater species like *Noturus miurus. Noturus flavus* has demonstrated its high degree of tolerance to polluted water by its continued

TABLE 3. COMPARISON OF COLLECTION DATA RECORDED FOR MUSKINGUM AND SCIOTO RIVERS IN 1984-85

Muskingum River				Scioto River			
	# Species	# Individuals	# Madtoms		# Species	# Individuals	# Madtoms
SMS 1984-5	19	639	0	SMS 1984-17	30	1281	7
SMS 1984-6	13	1081	2	SMS 1984-32	21	2962	8
SMS 1984-11A	22	569	15	SMS 1984-41	30	679	1
SMS 1984-11B	20	393	14	SMS 1985-4	39	753	0
SMS 1984-18	25	767	39	SMS 1985-10	30	1284	0
SMS 1984-19	28	1394	50				
SMS 1984-20	20	2251	10				
SMS 1984-35	19	383	57				
Totals	166	7477	187		150	6959	16
	$\bar{x}$ = 21	$\bar{x}$ = 935	$\bar{x}$ = 23.4		$\bar{x}$ = 30	$\bar{x}$ = 1392	$\bar{x}$ = 3.2

success in Western Lake Erie through the worst phases of degradation of that large body of water.

South Fork of Scioto Brush Creek was sampled for fishes by the OEPA surveillance crew in 1984. Electrofishing revealed a fauna of 30 species including *Noturus miurus*. Our own collecting in 1985 with seines yielded 28 species, also showing *Noturus miurus*, but no other madtom species. Together the 1984-85 samples totaled 34 species. The only significant difference from surveys done many years earlier was the apparent loss of the bigeye chub, *Hvbopsis amblops.* The latter species has also been extirpated from Paint, Deer and Big Darby Creeks.

Big Darby Creek is probably the best madtorn stream of its size in Ohio. Of the six madtom species known from ()hio waters only *Noturus eleutherus* has not been recorded from Big Darby. Four madtom species show healthy populations, some in very large nunbers. *Noturus miurus* has excellent representation throughout most of the length of the stream from its mouth upstream beyond River Mile 77 (see OEPA 1982 for River Mile Points). Only the extreme upper end (3rd order) lacks brindled madtoms. *Noturus flavus* is similar to *Noturus miurus* in its mainstem distribution being found throughout the length of the mainstem from the rnouth upstream to River Mile 77 in Logan County. It differs in being restricted to riffles and stream sections immediately downstream and upstream from riffle habitat. The tadpole madtom *Noturus flavus* does well in only a limited section of Upper Big Darby Creek where the channel meadners, the stream is lower in gradient, and a mud bottom is present. Such as areas exists upstrearn from Plain City beyond River Mile 53. *Noturus stigmosus* is restricted to the lower three to four mile stretch of Big 3arby Creek. All syecies except *Noturus gyrinus* overlapped in distribution the section of stream that prodllced the Scioto madtom, *Notuurus trautmani*.

Other streams investigated during 1984 were a big disappointment in reference to madtoms. Deer Creek is similar to Big Darby Creek in the number and type of riffles it possesses. Repeated attempts to find *Noturus stigmosus* in Deer Creek have failed. However, it does have good populations of *Noturus miurus* and *Noturus flavus*.

Scioto Brush Creek is a high quality tributary of the lower Scioto River that also seems to have adequate habitat for *Noturus stigmosus*. Madtom populations of both *Noturus miurus* and *N. flavus* were found to be low in this stream system. No *Noturus stigmosus* have ever been reported from Scioto Brush Creek.

The Shade River, a tributary of the Ohio River, in the past has yielded records of both *N. stigmosus* and *N. eleutherus*. After searching the same area that produced these species only *N. flavus* and *N. miurus* could be located. Water quality and habitat appear unchanged, however, and this strearn May yet produce the endangered *Rabida* madtoms.

In southwestern ()hio, the Whitewater River at the Indiana State line was found to be heavily silted and suffering from lowered water quality. No madtoms of any kind were found although at one time in the past *Noturus stigmosus*, *N. flavus* and *N. miurus* were recorded there. Likewise the lower Little Miami River at Newton bridge had formerly produced *Noturus flavus*, *N. miurus*, *N. stigmosus* and *N. eleutherus*, but today the fabulous riffle at Newton bridge contains no madtoms.

Probably the biggest disappointment during this project, other than not locating the Scioto madtom, was the failure to find either *N. stigmosus* or *N. eleutherus* in the Walhonding River. There are past records of both species from this stream but in 1984 only *Noturus miurus* and *N. flavus* could be found. Other rare £ish species tllat formerly occupied Walhonding River habitats are also absent from recent collections. These species are

Etheostoma maculatum, *E. tippecanoe* and *Percina macrocephala*. Riffle development is excellent in this strean and its physical features appear unchanged from forrner years. The absence of high water quality indicator species such *Noturus stigmosus* and *Etheostoma maculatum* indicate there are problems with pollution in the Wlalhonding.

ENDANGERED OHIO SPECIES

During sampling efforts made in 1984 locality data were obtained for a number of fish species considered to be endangered by the Ohio Department of Natural Resources, Division of Wildlife. Table 4 lists the species name, field number and locality for the endangered forrns.

Table 4 Ohio Endangered Species Recorded in 1984 Samples

Species	Field No.	Locality
Noturus eleutherus	SMS-6	Muskingum R. below dam at Lowell, Washington Co.
	SMS-llB, 35	Muskingum R. below dam at Duncan Falls, Muskingum Co.
	SMS-18	Muskingum R. at Adams Mills, Muskingum Co.
	SMS-19	Muskingum R. at R.R. bridge, Zanesville Muskingum Co.
	*SMS-20	Muskingum R. at Luke's Chute, Morgan Co.
Noturus stigmosus	SMS-9, 11, 21 22, 24, 26, 27, 29, 36, 40	Big Darby Cr. at Rte. 104, Pickaway Co.
	SMS-15	Paint Cr. at Rte. 772, Ross Co.
	*SMS-19	Muskingum R. at R.R. bridge, Zanesville, Muskingum Co.
	*SMS-35	Muskingum R. below dam at Duncan Falls, Muskingum Co.
Ammocrypta pellucida	SMS-11A, 19	Muskingum R. at R.R. bridge, Zanesville, Muskingum Co.
	SMS-15	Paint Cr. at Rte. 772, Ross Co.
	SMS-20	Muskingum R. at Luke's Chute, Morgan Co.
Etheostoma maculatum	- Recorded in Big Darby Cr. at Rte. 104, Pickaway Co., nearly every sample at this locality	
Etheostoma tippecanoe	SMS-3	Big Darby Cr. at Battelle-Darby Metro Park, Franklin Co.
	SMS-17	Scioto R. ust. Rte. 22 bridge, Pickaway Co.
	SMS-17A	Deer Cr. ust. Rte. 104, Ross Co.
	- Recorded in Big Darby Cr. at Rte. 104, Pickaway Co., nearly	

every sample at this locality

Percina phoxocephala	SMS-5	Muskingum R. below dam at Beverly, Washington Co.
	SMS-6	Muskingum R. below dam at Lowell, Washington Co.
	SMS-11A	Muskingum R. at R.R. bridge, Zanesville, Muskingum Co.
	SMS-11B, 35	Muskingum R. below dam at Duncan Falls, Muskingum Co.
	*SMS-17A	Deer Cr. ust. Rte. 104, Ross Co.
	SMS-20	Muskingum R. at Luke's Chute, Morgan Co.

* New Locality Record

One important point concerning this list of f ish species is the association between the riffle madtoms of the subgenus *Rabida* (*eleutherus*, *stigmosus*, *trautmani*) and the other endangered forms. In almost every case where the Rabida madtoms have been found several other endangered species have also been located. This is true for streams in the Scioto River drainage (Paint Creek and Big Darby Creek) as well as in the Muskingum River mainstem.

CONCLUSIONS

1.) A total of 611 madtoms were recorded in 1934 and 97 in the first part of 1985. No Scioto madtoms were found among 279 individual madtoms observed at the type locality of *Noturus trautmani* in Big Darby Creek.

2.) Based on catch data, madtom production dropped to about 50-60% of what it was during 19~3 in Big Darby Creek and elsewhere in Ohio. The best stream segment for madtom abundance continued to be the one mile section downstrearn from Fox, 0hio in Big Darby Creek tllat averaged 15 madtorns per sample. This was down frorm 32 madtoms per sample in 1983.

3.) Fish species diversity was exceptionally high at the type locality of the Scioto madtom with an average of 33 species recorded per sample and a total of over 60 species observed during the year. There was no indication conditions were other than ideal for both pool and riffle species at this locality.

4.) Although one adult *Noturus stigmosus* was seined at the type locality as early as Sept. 17, 1984, no young of the year were found until late in October. The pattern of movement of northern madtoms into this particular one mile stretch of lower BIg Darby Creek was judged to be the same as observed in previous years. Madtorns become most numerous following heavy rainfall and accumulation of leaf litter on the bottom in late October and early November. *Noturus stigrnosus* was never very abundant in 1934 (only 40 observed). Elsewhere, in the Muskingum River mainstem, nurnbers of the mountain madtom, N*oturus eleutherus*, were also fewer in 1984 than in 1983.

5.) Continued sampling of the Scioto River rnainstem confirmed results found in 1983. Only one species of madtom (*Noturus flavus*) is able to survive in the polluted waters of the Scioto despite numerous fine riffles

which should serve as habitat for the species *Noturus stigmosus*, *Noturus eleutherus* and probably also *Noturus trautmani*. The Scioto River showed some recovery in the section below the Columbus Southern Wastewater Treatment Plant and Circleville, 0hio, based on an increase in fish species richness. However, no increase in madtom numbers or species was observed.

6.) The Muskingum River mainstem continued to produce madtoms of four species, *Noturus flavus*, *N. miurus*, *N. stigmosus* and *N. eleutherus*. One new locality in the mainstem was found for *N. eleutherus* and two new localities were found for *N. stigmosus*.

7.) Four sites in Ohio that forrnerly produced riffle madtoms of the subgenus *Rabida* were searched in 1984. These localities were on the lower Whitewater River, lower Shade River, lower Little Miami River and in the Walhonding River. None proved successful in yielding *Rabida* madtoms. Of the four sites the lower Little Miami River was in the worst shape judging from low species diversity. No madtoms of any species were taken. The lower Shade River offered good water quality and apparent unchanged conditions since *Rabida* madtoms were first found there. Good riffle habitat, however, is scarce in the lower Shade River. The Walhonding River contains *Noturus flavus* and *Noturus miurus* populations but no *Rabida* in otherwise favorable conditions. It should be pointed out, though, that several riffle darters have also disappeared from the Walhonding along with the riffle madtoms.

8.) Several sites were searched on Deer Creek and on Scioto Brush Creek that offered suitable habitat for *Rabida* madtoms. All conditions appeared favorable but no riffle madtoms of the subgenus *Rabida* were found.

9.) Riffle madtom localities searched in 1934 yielded records on a variety of State endangered fish species other than madtomns. These were: *Ammocrypta pellucida*, *Etheostoma maculatum*, *Etheostoma tippecanoe*, *Percina phoxocephala*. The association of a number of rare species with the *Rabida* madtoms underlines the high water quality requirements of these catfishes. They make excellent hihh water quality indicator species.

10.) **Underwater ~snorkeling) and electroshocking sampling techniques were** attempted in 1984. **Electroshocking proved inferior to seining in taking madtoms and snorkeling proved impractical in Big Darby Creek** because of high turbidity levels sustained. Clearing of water did not take place in l984 until water temperatures dropped to 40° F.

11.) Tlle section Big Darby Creek at the dam site on the Galbreath farm, Franklin County, Ohio was not investigated due to problems in obtaining access to the site. This area was investigated in 1985 with negative results by the ODNR Division of Natural Areas in cooperation with the Nature Conservancv.

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APPENDIX TABLE I. SCIOTO MADTOM SURVEY - 1984 - KEY TO FIELD NUMBERS

No. of Madtoms	Field No.	Date	Time	Locality Sampled for Madtoms
8	SMS 1984-1	17 Apr. 1984	Daylight	Alum Cr. at Delaware Co. Rd. 34 bridge
4	SMS 1984-1A	21 Apr. 1984	Daylight	Big Darby Cr. at Rte. U.S. 42 bridge, Union Co.
0	SMS 1984-2	21 Apr. 1984	Daylight	Little Darby Cr. at Mechanicsburg riffle, Champaig Co.
4	SMS 1984-3	01 May 1984	Daylight	Big Darby Cr. at Battelle-Darby Metro Park, Franklin Co.
4	SMS 1984-4	08 May 1984	Daylight	Big Darby Cr. at Rte. 104, Pickaway Co.
0	R&P SMS 1984-5	30 Aug. 1984	Night	Muskingum R. below dam at Beverly, Washington Co.
2	R&P SMS 1984-6	30 Aug. 1984	Night	Muskingum R. below dam at Lowell, Washington Co.
18	R&MSMS 1984-7	17 Sep. 1984	Night	Walhonding R. below 6 mile dam, Coshocton Co.
4	R&MSMS 1984-8	17 Sep. 1984	Night	Walhonding R. below Mohawk dam
7	SMS 1984-9	21 Sep. 1984	Night	Big Darby Cr. at Rte. 104, Ross Co.
4	R&MSMS 1984-9A	21 Sep. 1984	Daylight	Deer Cr. ust. Rte. 104, Ross Co.
5	R&MSMS 1984-9B	21 Sep. 1984	Daylight	Deer Cr. at Williamsport
16	SMS 1984-10	28 Sep. 1984	Daylight	Big Darby Cr. at Rte. 104, Pickaway Co.
23	SMS 1984-11	05 Oct. 1984	Night	Big Darby Cr. at Rte. 104, Pickaway Co.
15	R&MSMS 1984-11A	05 Oct. 1984	Daylight	Muskingum R. at R.R. bridge Zanesville, Muskingum Co.
14	SMS 1984-11B	05 Oct. 1984	Daylight	Muskingum R. at Duncan Falls, below dam, Muskingum Co.
10	SMS 1984-12	12 Oct. 1984	Night	Big Darby Cr. at Rte. 104, Pickaway Co.
7	SMS 1984-13	16 Oct. 1984	Night	Big Darby Cr. ust. Rte. 104, Pickaway Co.
1	SMS 1984-14	19 Oct. 1984	Night	Big Darby Cr. ust. Rte. 104, Pickaway Co.
34	SMS 1984-15	21 Oct. 1984	Day-Night	Paint Cr. at Rte. 772, Ross Co.
13	SMS 1984-16	22 Oct. 1984	Night	Big Darby Cr. ust. Rte. 104, Pickaway Co.
7	SMS 1984-17	26 Oct. 1984	Night	Scioto R. ust. Rte. 22 bridge, Pickaway Co.
20	SMS 1984-17A	26 Oct. 1984	Night	Deer Cr. ust. Rte. 104, Ross Co.
39	SMS 1984-18	29 Oct. 1984	Daylight	Muskingum R. at Adams Mills, Muskingum Co.
50	SMS 1984-19	29 Oct. 1984	Night	Muskingum R. at R.R. bridge Zanesville, Muskingum Co.
10	SMS 1984-20	29 Oct. 1984	Night	Muskingum R. at Luke's Chute, Morgan Co.
12	SMS 1984-21	30 Oct. 1984	Night	Big Darby Cr. ust. Rte. 104, Pickaway Co.
13	SMS 1984-22	02 Nov. 1984	Night	Big Darby Creek ust. Rte. 104, Pickaway Co.
0	SMS 1984-23	05 Nov. 1984	Night	Big Darby Cr. at confluence with Scioto R.
42	SMS 1984-24	05 Nov. 1984	Night	Big Darby Cr. dst. Rte. 104, Pickaway Co.
17	SMS 1984-25	07 Nov. 1984	Night	Deer Cr. 0.5 mi. ust. Rte. 104 & dst. Rte. 104, Ross Co.
45	SMS 1984-26	19 Nov. 1984	Night	Big Darby Cr. ust. Rte. 104, Pickaway Co.
19	SMS 1984-27	21 Nov. 1984	Night	Big Darby Cr. dst. Rte. 104, Pickaway Co.
0	SMS 1984-28	21 Nov. 1984	Night	Big Darby Cr. riffle below McClean Mill Rd. bridge at Fox
10	SMS 1984-29	23 Nov. 1984	Night	Big Darby Cr. dst. Rte. 104, Pickaway Co.
1	SMS 1984-30	23 Nov. 1984	Night	Big Darby Cr. ust. Rte. 104, Pickaway Co.
0	SMS 1984-31	23 Nov. 1984	Night	Big Darby Cr. at Rte. 104 bridge, Pickaway Co.
8	SMS 1984-32	24 Nov. 1984	Night	Scioto R. dst. Rte. 335 bridge, Pike Co.
0	SMS 1984-33	26 Nov. 1984	Night	Little Miami R. at Newton Rd. bridge, Hamilton Co.
0	SMS 1984-34	26 Nov. 1984	Night	Whitewater R. at Harrison bridge, Dearborn Co., IN
57	SMS 1984-35	28 Nov. 1984	Night	Muskingum R. below Duncan Falls dam, Muskingum Co.
19	SMS 1984-36	30 Nov. 1984	Night	Big Darby Cr. ust. Rte. 104, Pickaway Co.
0	SMS 1984-37	04 Dec. 1984	Daylight	Hellbranch Run, Franklin Co., Pleasant Twp.
0	SMS 1984-38	04 Dec. 1984	Night	Big Darby Cr. at confluence with Hellbranch Run
0	SMS 1984-39	10 Dec. 1984	Night	Walhonding R. below 6 mile dam, Coshocton Co.
2	SMS 1984-39A	10 Dec. 1984	Night	Walhonding R. dst. Rte. 36 bridge, Coshocton Co.
37	SMS 1984-40	12 Dec. 1984	Night	Big Darby Cr. ust. Rte. 104, Pickaway Co.
1	SMS 1984-41	17 Dec. 1984	Night	Scioto R. ust. Rte. 22 bridge at Circleville, Pickaway Co.
0	SMS 1984-42	17 Dec. 1984	Night	Shade R. at confluence with East Br., Meigs Co.
9	SMS 1984-43	17 Dec. 1984	Night	E. Br. Shade R. at Rte. 248 bridge, Meigs Co.
10	SMS 1985-1	20 Mar. 1985	Daylight	Scioto Brush Creek, Scioto Co., Brush Creek Twp.
6	SMS 1985-2	23 Mar. 1985	Night	Big Darby Creek at Rte. 104, Pickaway Co.
30	SMS 1985-3	26 Mar. 1985	Day & Night	Big Darby Creek ust. Rte. 104, Pickaway Co.
0	SMS 1985-4	28 Mar. 1985	Daylight	Scioto River ust. Rte. 22, Circleville, Pickway Co.
5	SMS 1985-5	23 April, 1985	Daylight	Big Darby Cr. at Battelle-Darby Metro Park, Franklin Co.
15	SMS 1985-6	27 April 1985	Daylight	Big Darby Cr. at Rte. 42, Union Co.
0	SMS 1985-7	27 April 1985	Daylight	Big Darby Cr. at Rte. 287 bridge, Logan Co.
24	SMS 1985-8	29 April 1985	Daylight	Big Darby Cr. at Co. Rd. 164, Union Co., Allen Twp.
7	SMS 1985-9	30 April 1985	Daylight	Big Darby Creek at Rte. 104, Pickaway Co.
0	SMS 1985-10	14 May 1985	Daylight	Scioto River ust. Rte. 22, Circleville, Pickaway Co.

APPENDIX TABLE 2
MADTOM COLLECITON DATA FOR 1984
(collections shown by date & field no.)

	SMS1 4/17	SMS1A 4/21	SMS2 4/21	SMS3 5/1	SMS4 5/22	SMS5 8/30	SMS6 8/30	SMS7 9/17	SMS8 9/17	SMS9 9/21	SMS9A 9/21	SMS9B 9/21	SMS10 9/28	SMS11 10/5	SMS11A 10/5	SMS11B 10/12	SMS12 10/16	SMS13 10/19	SMS14 10/21	SMS15 10/22
Noturus flavus																				
adult	5	3	-	4	3	-	-	14	4	-	4	5	12	5	-	-	5	-	-	8
yoy	-	-	-	-	-	-	-	-	-	-	-	-	4	1	15	7	1	-	1	11
Total	5	3	-	4	3	-	-	14	4	-	4	5	16	6	15	7	6	-	1	19
Noturus miurus																				
adult	3	-	-	-	1	-	-	4	-	1	-	-	-	1	-	-	2	3	-	5
yoy	-	-	-	-	-	-	-	-	-	5	-	-	-	15	-	-	2	4	-	8
Total	3	-	-	-	1	-	-	4	-	6	-	-	-	16	-	-	4	7	-	13
N. stigmosus																				
adult	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	1
yoy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Total	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	2
N. eleutherus																				
adult	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
yoy	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	7	-	-	-	-
Total	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	7	-	-	-	-
N. gyrinus																				
adult	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
yoy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total for Collection	8	4	-	4	4	-	2	18	4	7	4	5	16	23	15	14	10	7	1	34
Total # Fish Recorded	425	586	158	2201	2270	639	1081	299	147	1180	219	167	1286		569	393	2713	396	169	718
% madtoms	1.89	0.68	-	0.18	0.18	-	0.19	6.02	2.72	0.59	1.83	2.99	1.24	2.29	2.64	3.56	0.39	1.77	0.59	4.74

APPENDIX TABLE 2
MADTOM COLLECTON DATA FOR 1984
(collectons shown by date & field no.)

	SMS16	SMS17	SMS17A	SMS18	SMS19	SMS20	SMS21	SMS22	SMS23	SMS24	SMS25	SMS26	SMS27	SMS28	SMS29	SMS30	SMS31	SMS32	SMS33	SMS34
Noturus flavus																				
adult	3	2	15	-	6	-	2	5	-	3	1	1	1	-	-	-	-	4	-	-
yoy	-	5	5	2	26	4	-	-	-	2	1	-	2	-	1	-	-	4	-	-
Total	3	7	20	2	32	4	2	5	-	5	2	1	3	-	1	-	-	8	-	-
Noturus miurus																				
adult	5	-	-	-	-	-	4	5	-	4	9	31	4	-	4	1	-	-	-	-
yoy	5	-	-	-	4	3	2	-	-	18	6	7	10	-	4	-	-	-	-	-
Total	10	-	-	-	4	3	6	5	-	22	15	38	14	-	8	1	-	-	-	-
Noturus stigmosus																				
adult	-	-	-	-	-	-	4	3	-	2	-	5	-	-	-	-	-	-	-	-
yoy	-	-	-	-	7	-	-	-	-	13	-	1	2	-	1	-	-	-	-	-
Total	-	-	-	-	7	-	4	3	-	15	-	6	2	-	1	-	-	-	-	-
Noturus eleutherus																				
adult	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
yoy	-	-	-	36	7	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	37	7	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Noturus gyrinus																				
adult-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
yoy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total for Collection	13	7	20	39	50	10	12	13	-	42	17	45	91	-	01	1	-	8	-	-
Total # Fish Recorded	655	1281	1038	767	1394	2251	462	890	830	607	1063	1057	547	78	196	262	1467	2926	239	1952
% Madtoms	1.53`	9.55	1.93	5.08	3.59	0.44	2.60	1.46	-	6.92	1.58	4.26	3.47	-	5.10	0.38	-	0.27	-	-

APPENDIX TABLE 2
MADTOM COLLECTON DATA FOR 1984
(collectons shown by date & field no.)

	SMS35	SMS36	SMS37	SMS38	SMS39	SMS39A	SMS40	SMS41	SMS42	SMS43
Noturus flavus										
adult	4	-	-	-	-	-	-	-	-	-
yoy	21	3	-	-	-	2	1	1	-	-
Total	25	3	-	-	-	2	1	1	-	-
Noturus miurus										
adult	-	8	-	-	-	-	17	-	-	3
yoy	-	5	-	-	-	-	15	-	-	6
Total	-	13	-	-	-	-	32	-	-	9
Noturus stigmosus										
adult	1	1	-	-	-	-	2	-	-	-
yoy	1	2	-	-	-	-	2	-	-	-
Total	2	3	-	-	-	-	4	-	-	-
Noturus eleutherus										
adult	5	-	-	-	-	-	-	-	-	-
yoy	25	-	-	-	-	-	-	-	-	-
Total	30	-	-	-	-	-	-	-	-	-
Noturus gyrinus										
adult	-	-	-	-	-	-	-	-	-	-
yoy	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-	-	-
Total for Collection	57	19	-	-	-	2	37	1	-	9
Total # Fish Recorded	383	936	328	294	113	115	2697	679	787	317
% Madtoms	14.88	2.03	-	-	-	1.74	1.37	0.15	-	2.84

APPENDIX TABLE 3
MADTOM COLLECTION DATA FOR 1985
(Records shown by date and field no.)

	SMS1 3/20	SMS2 3/23	SMS3 3/26	SMS4 3/28	SMS5 4/23	SMS6 4/27	SMS7 4/27	SMS8 4/29	SMS9 4/30	SMS10 5/14
Noturus flavus										
adult	-	-	10	-	5	-	-	-	6	-
yoy	-	-	1	-	-	-	-	1	-	-
Total	-	-	11	-	5	-	-	1	6	-
Noturus miurus										
adult	4	5	17`	-	-	4	-	22	1	-
yoy	6	1	1	-	-	-	-	1	-	-
Total	10	6	18	-	-	4	-	23	1	-
Noturus stigmosus										
adult	-	-	1	-	-	-	-	-	-	-
yoy	-	-	-	-	-	-	-	-	-	-
Total	-	-	1	-	-	-	-	-	-	-
Noturus eleutherus										
adult	-	-	-	-	-	-	-	-	-	-
yoy	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-	-	-
Noturus gyrinus										
adult	-	-	-	-	-	11	-	-	-	-
yoy	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	11	-	-	-	-
Total for Collection	10	6	30	0	5	15	0	24	7	0
Total # Fish Recorded	1041	785	1016	753	1480	614	451	1540	1150	1284
% Madtoms	0.71	0.76	2.95	-	0.34	2.44	-	1.56	0.61	-

yoy refers to 1984 season