Iowa Army Ammunition Plant, Middletown, Iowa: 1994 Stream Survey Results

by Konrad Schmidt

The Iowa Army Ammunition Plant (IAAP) encompasses approximately 19,000 acres and is located in Des Moines County in southeastern Iowa (Fig. 1). Streams include headwater reaches of Brush, Long, and Spring Creeks, which all begin within the plant's boundaries. In 1987, I assisted the U.S. Fish and Wildlife Service with IAAP stream surveys which confirmed the suspected occurrence of the state-threatened orangethroat darter (*Etheostoma spectabile*) in Brush and Spring Creeks. None, however, were found in Long Creek (Milligan, 1987).

In 1994, the Nature Conservancy funded additional surveys to continue monitoring the darter's presence, abundance and distribution at IAAP.

Methods and Materials

Stream surveys were conducted at 15 stations during the week of July 4, 1994, and included all stations on Brush and Spring Creeks sampled in 1987, but only three on Long Creek below the Mathes Lake Dam. Sampling gear consisted of a Smith-Root Model 12 backpack electroshocker set at 300 volts and 120 Hz. Streams were surveyed in an upstream direction. All species collected were identified, tallied and released. When orangethroat darters were sampled, a total length range in mm was recorded for the station. At least one specimen of each species sampled at every station was preserved in 10% formalin buffered with borax and deposited in the fish collection at the University of Minnesota's James Ford Bell Museum of Natural History in Minneapolis, Minnesota. Catch-per-effort (CPE)—the total number (catch) of fish was sampled over a period of time (effort)—was recorded in seconds at each station to measure each species' relative abundance. Survey information was compiled on an IBM compatible computer using Dbase 3 Plus software, which generated field data record print-outs and a series of reports summarizing both the 1987 and 1994 results. Copies have been provided to Diana Horton at the University of Iowa in Iowa City, Iowa.

Results and Discussion

The 1994 surveys sampled 2,428 fish representing 26 species in five families (Table 1).

In 1994, 26 orangethroat darters were sampled at two stations on Brush Creek and three on Spring Creek. Stations B7 and S4 had the largest catches at nine specimens each, and Station S5 had the smallest catch at only one (Table 2). Station B7 had the greatest catch rates of orangethroat darters at 65 fish per hour; S5 had the lowest at 12 fish per hour.

In 1987, 30 orangethroat darters were sampled at three stations on Brush Creek and two on Spring Creek (Table 3). Station B6 had both the largest catch at 11



Figure 1. Iowa Army Ammunition Plant Stream Survey Stations

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Family Common Name	Scientific Name	Sample Stations	Total Catch	Percent Composition	Percent Occurrence
Cyprinidae (minnows)					
central stoneroller	Campostoma anomalum	12	479	19.7	80.0
red shiner	Cyprinella lutrensis	3	16	0.7	20.0
spotfin shiner	Cyprinella spiloptera	4	34	1.4	26.7
common carp	Cyprinus carpio	1	1	<0.1	6.7
Mississippi silvery minnow	Hybognathus nuchalis	1	1	<0.1	6.7
common shiner	Luxilus cornutus	4	9	0.4	26.7
hornyhead chub	Nocomis biguttatus	4	8	0.3	26.7
bigmouth shiner	Notropis dorsalis	8	108	4.4	53.3
sand shiner	Notropis stramineus	4	7	0.3	26.7
suckermouth minnow	Phenacobius mirabilis	7	62	2.6	46.7
bluntnose minnow	Pimephales notatus	11	88	3.6	73.3
fathead minnow	Pimephales promelas	2	4	0.2	13.3
creek chub	Semotilus atromaculatus	14	709	29.2	93.3
Catostomidae (suckers)					
white sucker	Catostomus commersoni	10	106	4.4	66.7
smallmouth buffalo	Ictiobus bubalus	1	2	0.1	6.7
Ictaluridae (bullhead catfis	shes)				
black bullhead	Ameiurus melas	2	3	0.1	13.3
yellow bullhead	Ameiurus natalis	5	10	0.4	33.3
slender madtom	Noturus exilis	2	24	1.0	13.3
Centrarchidae (sunfishes)	. Brite a	1.00	1		
green sunfish	Lepomis cyanellus	5	45	1.9	33.3
orangespotted sunfish	Lepomis humilis	1	1	< 0.1	6.7
bluegill	Lepomis macrochirus	1	2	0.1	6.7
smallmouth bass	Micropterus dolomieu	1	1	<0.1	6.7
largemouth bass	Micropterus salmoides	3	10	0.4	20.0
Percidae (perches)		0	205	150	(0.0
tantail darter	Etheostoma flabellare	9	385	15.9	60.0
johnny darter	Etheostoma nigrum	11	287	11.8	73.3
orangethroat darter	Etheostoma spectabile	5	26	1.1	33.3
	Totals:	131	2428	100.0	

Table 1. Iowa Army Ammunition Plant 1994 fish survey results.

specimens and greatest rate at 132 fish per hour. Stations B7 and S2 had the smallest catches at three and two specimens, and the lowest rates at 36 and 34 fish per hour, respectively.

In the 1987 and 1994 surveys, the overall number of sampled orangethroat darters at seven stations (three on Brush Creek and four on Spring Creek), remained constant; so did the species composition, at approximately 1% of the total catch. In 1994, orangethroats were found at two new stations on Spring Creek (S4 and S5), but absent from two stations sampled in 1987 (B6 and S3). Both sites had relatively diverse communities for a headwater reach, and there were no visible indications of degraded habitat or poor water quality (although a strong chlorine odor was present at station S3, source unknown). Catch rates were generally higher

Station	Location	Length Range	Catch	CPE	Date
B5	Brush Creek	26-48 mm T69N-R3W-S16 Bridge H12	3	35	94-07-06
B7	Brush Creek	26-57 mm T69N-R3W-S26 Hunt Road	9	65	94-07-06
S2	Spring Creek	27-52 mm T69N-R3W-S4 Exp. Disp. Area	4	47	94-07-07
S4	Spring Creek	26-53 mm T69N-R3W-S15 Bridge H18	9	54	94-07-06
S5	Spring Creek	27 mm T69N-R3W-S23 Hunt Road	1	12	94-07-06

 Table 2. Iowa Army Ammunition Plant 1994 orangethroat darter survey results and catch per effort (CPE) as fish per hour. Station locations in Fig. 1.

in 1987. However, these surveys were conducted during a severe drought which often concentrates fish communities into confined habitats.

In 1987 and 1994, 19 fishes representing five families were found with the orangethroat darter at the

Table 3. Iowa Army Ammunition Plant 1987 orangethroat darter survey results and catch per effort (CPE) as fish per hour. Station locations in Fig. 1.

Location	Catch	CPE	
Brush Creek T69N-R3W-S16 Bridge H12	7	105	
Brush Creek T69N-R3W-S22 Bridge H13	11	132	
Brush Creek T69N-R3W-S26 Hunt Road	3	36	
Spring Creek T69N-R3W-S4 Exp.Disp.Area	2	34	
Spring Creek T69N-R3W-S3,10 Bridge H16	7	84	
	Location Brush Creek T69N-R3W-S16 Bridge H12 Brush Creek T69N-R3W-S22 Bridge H13 Brush Creek T69N-R3W-S26 Hunt Road Spring Creek T69N-R3W-S4 Exp.Disp.Area Spring Creek T69N-R3W-S4 Exp.Disp.Area	LocationCatchBrush Creek7T69N-R3W-S167Bridge H1211Brush Creek11T69N-R3W-S223Bridge H133Brush Creek3T69N-R3W-S264Hunt Road2Spring Creek2T69N-R3W-S42Exp.Disp.Area7Spring Creek7T69N-R3W-S3,108Bridge H1610	

seven sampling stations (Table 4). The central stoneroller (*Campostoma anomalum*), bigmouth shiner (*Notropis dorsalis*), bluntnose minnow (*Pimephales notatus*), creek chub (*Semotilus atromaculatus*), fantail darter (*Etheostoma flabellare*), and johnny darter (*E. nigrum*) were the most common species associates, present with the orangethroat in every collection.

No stream gauge information was available for this report, but all three streams appeared to be at summer base flows. In addition, there were no indications in riparian areas or stream banks of any recent high water events. Very few impacts were observed during the survey. However, Brush Creek, upstream from station B5 (where 10 species were sampled, including the most upstream distribution of the orangethroat darter), was the most turbid and visibly deteriorated. Only four species were found at station B4. The extremely tolerant creek chub was the only species present at stations B1 through B3. The effluent from the sewage disposal plant at station B4 was not a source of the turbidity. The water at the outfall was clear to the bottom, and most of the fish sampled at this station were found concentrated in the confined "plume." However, effluent from Line 1 at station B1 was extremely turbid; it also comprised most of Brush Creek's flow. Long Creek should be

Family Common Name	Scientific Name	# times Sampled	Total Catch	Percent Composition	Percent Occurrence
Cyprinidae (minnows)					
central stoneroller	Campostoma anomalum	10	545	27.5	100.0
red shiner	Cyprinella lutrensis	4	11	0.6	40.0
spotfin shiner	Cyprinella spiloptera	2	3	0.2	20.0
common carp	Cyprinus carpio	1	1	0.1	10.0
common shiner	Luxilus cornutus	6	76	3.8	60.0
hornyhead chub	Nocomis biguttatus	7	80	4.0	70.0
emerald shiner	Notropis atherinoides	1	2	0.1	10.0
bigmouth shiner	Notropis dorsalis	10	175	8.8	100.0
sand shiner	Notropis stramineus	2	2	0.1	20.0
suckermouth minnow	Phenacobius mirabilis	7	70	3.5	70.0
bluntnose minnow	Pimephales notatus	10	96	4.8	100.0
creek chub	Semotilus atromaculatus	10	421	21.2	00.0
Catostomidae (suckers	5)				
white sucker	Catostomus commersoni	6	76	3.8	60.0
Ictaluridae (bullhead o	catfishes)				
yellow bullhead	Ameiurus natalis	5	9	0.5	50.0
slender madtom	Noturus exilis	1	1	0.1	10.0
Centrarchidae (sunfish	nes)				
green sunfish	Lepomis cyanellus	4	15	0.8	40.0
Percidae (perches)					
fantail darter	Etheostoma flabellare	10	181	9.1	100.0
johnny darter	Etheostoma nigrum	10	163	8.2	100.0
orangethroat darter	Etheostoma spectabile	10	56	2.8	100.0
	Totals:		1983	100.0	Case of the

Table 4. Iowa Army Ammunition Plant 1987 and 1994 orangethroat darter-associated species summary.

accessible to the orangethroat darter upstream to the Mathes Lake Dam; this creek appears to have the best water clarity, substrates, habitat and flow of the three streams, but none were sampled in 1987 or 1994.

Five subspecies of orangethroat darters are recognized across the entire range (Robison and Buchanan, 1988). Generally, the orangethroat is more tolerant, common, and widespread than many darter species, but is listed Special Concern in Colorado and Threatened in Iowa (Schmidt, 1996). In the latter state, the orangethroat darter is a peripheral species which reaches the extreme northern edge of its range (Lee et al, 1980). Historical data on nongame species is generally incomplete and often non-existent, but the orangethroat was probably never abundant anywhere at these latitudes. Pflieger (1975) reported the orangethroat is moderately tolerant of turbidity, but is sensitive to heavy siltation and avoids streams with continuous, strong flows. Smith (1979) referred to the orangethroat as a pioneering species which quickly occupies formerly dry streams and ascends far into headwater reaches.

The altered, more regular flow regime below the Mathes Lake Dam *may be* the cause or contributing factor to the orangethroat's absence in Long Creek. Trautman (1981) described the species preferred habitat as small to medium streams with low to moderate gradients, sand-gravel substrates, riffles 0.9-6.1 m wide, with an average depth of 13 cm. He also noted population declines did occur following excessive pollution or siltation events.

Recommendations

• Stream surveys should continue, perhaps every 10 years, to monitor the distribution and abundance of the orangethroat darter in IAAP streams.

• Historical drainage patterns and riparian zones should be protected or properly managed to prevent the degradation of water quality and instream cover.

• Dams, water control structures, and road culverts can impede or prevent the upstream movement of fishes, seriously impacting spawning success, access to rearing habitats, and isolating populations. Therefore, proposed new structures and replacements should be reviewed for alternatives, or mitigated to eliminate potential impacts.

• The sources of Brush Creek's turbidity and heavy siltation of substrates in the upper stream reaches should be identified and corrected to improve both water quality and habitat.

• A walking survey should be conducted on Long Creek to assess habitats suitable for the orangethroat darter, and to locate potential fish barriers between the Mathes Lake Dam and the mouth.

• Finally, either through existing data or the collection of new data, basic water chemistry parameters and flow regimes of Brush, Long and Spring Creeks should be examined for additional possibilities explaining the orangethroat darter's absence in Long Creek.

Acknowledgments

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Endangered, Threatened, and Special Status Fishes of North America

Georgia Supplement to the 1996 Edition

These changes to Georgia's list are from "Georgia's Protected Species," a document of the Georgia Natural Heritage Program, Georgia Department of Natural Resources, 15 May 1997:

scientific name

Moxostoma robustum^{*} Fundulus bifax Etheostoma brevirostrum Etheostoma chuckwachattee Etheostoma etowahae Etheostoma scotti Etheostoma tallapoosae Etheostoma vulneratum Percina sp. cf. macrocephala

original author(s)

(Cope, 1870) Cashner and Rogers, 1988 Suttkus and Etnier, 1991 Wood and Mayden, 1993 Wood and Mayden, 1993 Bauer, Etnier and Burkhead, 1995 Suttkus and Etnier, 1991 (Cope, 1870) (undescribed) common name robust redhorse stippled studfish holiday, Ellijay darter lipstick darter Etowah darter Cherokee darter Tallapoosa darter wounded darter Muscadine darter

status

Endangered Endangered Threatened Endangered Threatened Rare Endangered Rare

* previously identified as South Atlantic slope form of river redhorse, Moxostoma carinatum