FINAL PERFORMANCE REPORT

Federal Aid Grant No. F17AP00040 (E-81-R-4)

Processing and Vouchering of Fish Samples Collected from Annual Monitoring Efforts for the Arkansas River Shiner (Notropis girardi) in the Canadian River

Oklahoma Department of Wildlife Conservation

January 1, 2017 through December 31, 2018
A. ABSTRACT

The Arkansas River Shiner (Notropis girardi) is a federally threatened Great Plains cyprinid that is monitored biannually by the U.S. Fish and Wildlife Service (USFWS). Our objective was to enumerate and analyze fish collections made by USFWS to determine the number and relative abundance of Arkansas River Shiners and associated fish species in the Canadian river system. The abundance of Arkansas River Shiners at sample locations varied substantially among years. As expected, the size distribution of individuals sampled was skewed toward larger fish in the spring compared to autumn size distributions. Compared with earlier years, very few Arkansas River Shiners were collected in 2017 and 2018, but water levels prevented sampling at several sites. We recommend USFWS consider pairing sites for spring and autumn samples so the proportion of juveniles and adults at each of the sites might be compared and related to discharge conditions. It is difficult to recommend a sampling period (spring or autumn) because sites were not all sampled during both periods and spring samples likely reflect more adult fishes whereas fall sampling picks up more juveniles (i.e., the choice depends on the objective of the agency). Some of the sites may be more important spawning than rearing locations and vice versa.

B. BACKGROUND

The large, sandy-bottom rivers of western and central Oklahoma support populations of the Arkansas River Shiner (Notropis girardi) a pelagic-spawning minnow that is currently listed as threatened under the Endangered Species Act. While historically found throughout the Arkansas River watershed, the only extant population in Oklahoma occurs in the Canadian River, from the Oklahoma/Texas state line north of Roll, OK downstream to Lake Eufaula reservoir. The Oklahoma Ecological Services Field Office of the U.S. Fish and Wildlife Service (USFWS) conducts annual monitoring surveys for the Arkansas River Shiner in the Canadian river in Oklahoma and adjacent states. Under a separate Section 6 grant, biologists from the Oklahoma Department of Wildlife Conservation (ODWC) assist USFWS staff with fish collection by conducting standardized seine hauls at each monitoring station along the river (usually access
points near bridges). These potentially complex samples of cyprinid fish are then preserved in the field for later sorting and analysis. The processing of large numbers of small fish, particularly small cyprinids, is a time-consuming process, and because of limited wildlife agency staff resources, the results of each year’s monitoring efforts can be delayed by a year or more until biologists have the time to process the collected samples. Under this grant, the Oklahoma Cooperative Fish and Wildlife Unit (OCFWRU) processed the fish that were collected by the ODWC and the USFWS during their fish population monitoring surveys in the Canadian River. The Principal Investigator, Dr. Shannon Brewer, has extensive experience identifying small fish species from streams and rivers in the central United States.

Data regarding the relative abundance of Arkansas River Shiners in the Canadian River is essential for long term monitoring and trend analysis. As in previous years, monitoring and comparing annual fluctuations in the population of *N. girardi* has been important in terms of measuring changes resulting from stochastic events; these include extreme weather, drought, and/or anthropogenic activities. Lastly, processing of these samples can detect the presence of invasive species in the Canadian River that have the potential to negatively impact *N. girardi*, such as the Red River Shiner (*N. bairdi*).

C. OBJECTIVE:

Enumerate and analyze one year of fish collections provided by the U.S. Fish and Wildlife Service to determine the number and relative abundance of Arkansas River Shiners and associated fish species in the Canadian river system.

D. PROCEDURES

Fish samples were brought to OSU for identification. Samples that were still in formalin were rinsed in water and transferred to 70% ethanol. Fish were identified using published keys and several other keys developed at the OSU lab.

We developed an Access® database that includes fish count data and the physical attributes of each study site. The datasheets were provided to us from the USFWS and often gave multiple descriptions for the same site, so a map was used to determine which sites were ‘the same’ and then each site was given a unique description and name (Table 1). The latitude and longitude of each site was used to create a map showing standard locations of the sampling sites (Figure 1). Each species of fish identified was also given a unique abbreviation (Table 2). If latitude and longitude were not provided, Google Maps® was used to find the latitude and longitude based on the description. We refer to ‘spring samples’ if they were collected before July and ‘fall samples’ if they were collected after July (no samples have been collected in July to date). We also provided directions to ODWC and USFWS on how to link the tables together in Access (see Appendix A). Data from previously identified fishes (prior to 2011) were provided by the USFWS and also entered into the Access database for consistency. The spring samples for 2016 were retained and identified by the USFWS due to extremely low abundances, and we have not yet received those data to include in the database (thus, not included in this report). We completed the processing of spring 2018 samples and those data are included in this report. USFWS did sample in fall 2018, but we have not yet received those samples for processing. We
provide comparisons across years in the results given the overall interest in trends. The sample ID indicates the year within the sample code (the first two numbers). For example, BAB1127 is a 2011 sample whereas BAB1207 is a 2012 sample and 18DBF02 is a 2018 sample.

E. RESULTS AND DISCUSSION

A total of 36 species have been identified since the database began in 2013 (Figure 2). We also included six additional categories in our identifications: 1) unknown (UNK), which generally contained cyprinids too small to identify with high confidence 2) *Carpiodes* spp, 3) *Pimephales* spp, 4) *Lepisosteus* spp, 5) *Cyprinidae* spp, and 6) *Lepomis* spp. Collectively, Red Shiner (*Cyprinella lutrensis*) comprised the majority of the catch. In samples identified in 2018, we identified 19 fish species, with Red Shiner again comprising the majority of the catch (Figure 3). Arkansas River Shiner (*Notropis girard*) was most abundant at Camargo, Mustang, Caddo Jake Bridge, Bridgeport, and, in recent samples, Amarillo and Ada (Table 3). However, the abundance of Arkansas River Shiner at those sites varied substantially among years (Table 4). As expected, the size distribution of individuals sampled was skewed toward larger fish in the spring collections (Figure 4). However, larger fish were sampled more often at downstream sites of the Canadian River (downstream of Oakwood, Figure 5). We would have expected to sample larger fish upstream but given the drought in 2011-2013, fish migrations may have been restricted during some periods. However, the Arkansas River Shiners collected from the upstream sites in spring 2018 were large, but no downstream sites were sampled for appropriate comparison (Figure 6).

F. RECOMMENDATIONS

The project is completed. We recommend USFWS consider pairing sites for spring and autumn samples so the proportion of juveniles and adults at each of the sites might be compared and related to discharge conditions. It is difficult to recommend a sampling period (spring or autumn) based on abundance at sample sites (Table 5) because sites were not all sampled during both periods and spring samples likely reflect more adult fishes while fall sampling picks up more juveniles (i.e., the choice depends on the objective of the agency). Some of the sites may be more important spawning than rearing locations and vice versa.

G. SIGNIFICANT DEVIATIONS

No significant deviations.

H. EQUIPMENT

No equipment purchased during this period.

I. PREPARED BY:  
Dr. Shannon Brewer, PhD  
Oklahoma Cooperative Fish and Wildlife Research Unit  
Oklahoma State University Stillwater, Oklahoma
DATE: 27 February 2018

APPROVED BY: [Signature]
Wildlife Division Administration
Oklahoma Department of Wildlife Conservation

[Signature]
Andrea Crews, Federal Aid Coordinator
Oklahoma Department of Wildlife Conservation
Table 1. Location of each site where the USFWS-collected Canadian River fish samples were collected.

<table>
<thead>
<tr>
<th>County</th>
<th>River</th>
<th>Description</th>
<th>Site Name</th>
<th>Lat.</th>
<th>Long.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pontotoc</td>
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<td>US 377, 7 miles N. of Ada, OK</td>
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<td>Potter</td>
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<td>US 287, 20 miles N. of Amarillo, TX</td>
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<td>Canadian</td>
<td>Asher, OK</td>
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<td>-96.929</td>
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<td>Dickson Cr.</td>
<td>FM 2277, N. of Borger, TX</td>
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<td>US 385, near Boys Ranch, TX</td>
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<td>US 281, near Bridgeport, OK</td>
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<td>CCF</td>
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<td>FC</td>
<td>Flathead Chub</td>
<td><em>Platygobio gracilis</em></td>
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<td>Logperch</td>
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<td>PK</td>
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<td>White Bass</td>
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<td>YB</td>
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<td><em>Ameiurus natalis</em></td>
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Table 3.- Summary of collections identified by OSU that contained the federally-threatened Arkansas River Shiner (ARS). The Field number links back to a database that we created for the USFWS and ODWC that contains all identified fishes from these collections. These results include data collected from 2011 to spring 2018. Blanks reflect information that was missing from data sheets provided to OSU.

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<thead>
<tr>
<th>Field No.</th>
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<th>County</th>
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Table 4.- Summary of the number of Arkansas River Shiner collected at each site by year. Some sites were sampled twice during a year (combined in this table). NA indicates that OSU did not identify samples from that site in that year whereas 0 reflects the species was not collected in the sampling effort. These results reflect data collected from 2011 to spring 2018.

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Table 5. Summary of the number of Arkansas River Shiner collected at each site during spring and fall sampling. NA indicates that OSU did not identify samples from that site in that year. The USFWS did not sample in fall of 2011 and spring in 2012. Spring samples in 2016 were retained by the USFWS. Some sites were not sampled in other years due to extreme low or high water.

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Figure 1.—Map showing the sites sampled by the USFWS on the Cimarron and Canadian rivers in Oklahoma and Texas. Only sites that had collections identified by OSU are shown. *Note: no collections from the Cimarron River were processed in 2018.
Figure 2.- Abundance of fishes collected via USFWS from 2011 to 2018 (BAB1105-18DBF08). Red Shiner and Western Mosquitofish were removed to better reflect abundances of the assemblage. From 2011-2018, there were 98,465 Red Shiner and 26,181 Western mosquitofish collected. There were 12,446 Northern Plains Killifish collected during the sample period, but this value was cut off by the scale used on the figure to show abundances of less common fishes. Fish species abbreviations are defined in ‘design view’ of the Access Database (see instructions in Appendix A) and in Table 2 of this report.
Figure 3.- Abundance of fishes collected via the Canadian River in 2017-2018 (17DBF01-18DBF08). Red Shiner was removed from this figure due to their high abundance (3,312 in 2016 and 4,501 in 2017) to better show the abundance of less common fishes. Fish species abbreviations are defined in ‘design view’ of the Access Database (see instructions in Appendix A) and in Table 2 of the report.
Figure 4.- Size distribution of all Arkansas River Shiner collected 2011-2018. The frequency distribution is divided by spring and fall sampling periods.
Figure 5.-Size distribution of Arkansas River Shiner for all samples collected in spring (2011-2018). The samples were divided into upstream and downstream sites. The upstream sites were: Boys Ranch, Amarillo, Borger 1 and 2, Canadian, Durham, Roll, Camargo, Taloga, and Oakwood. The downstream sites were: Thomas, Bridgeport, Caddo Jake Bridge, Union City, Mustang, Norman, Wanette, Asher, Ada, and Calvin. Site locations are identified in Figure 1 of the report.
**Figure 6.** Length-frequency distribution of Arkansas River Shiner sampled in spring 2018. All samples were from upstream sites: Boys Ranch, Amarillo, Canadian, Durham, Roll, Camargo, and Taloga. Site locations are identified in Figure 1 of the report.
Appendix A. Directions for linking the tables of fish samples and data in Microsoft Access. These data have been provided to USFWS and ODWC.

Using Microsoft Access
1. Open the database.
2. Double click either field info or fish counts to open the table you want to view (located on the left-hand side of the page).
3. To close the table you are viewing right click the tab above the table (it has the table name on it) and click close.
4. To obtain further information about either table, open the table and click the picture of a pencil and ruler above where it says view (located in the top left-hand corner under file).
   \textbf{Note:} This is where the abbreviations from the fish count table are defined.
5. Column headers can be changed by right clicking on the header and selecting your desired option.
6. Linking tables allows you to take some or all of the data from either table and put it together in a single table. To link the tables:
   a. Click database tools (located on the top of the page by file, home, etc.)
   b. Click relationships, a pop-up box will appear.
   c. Click field info, then click add.
   d. Repeat for fish counts, then click close.
   e. There will be boxes for both field info and fish counts.
      i. In those boxes field no. should have a key by it, click on field no. in one box and drag it to field no. in the other box, a pop-up box will appear.
      ii. Choose the option that says join type, select option three, then click create.
7. To make a new table from existing tables:
   \textbf{Note:} Make sure the tables are linked that you want to combine
   a. Choose the create option (located at the top of the page by file, home, etc.).
   b. Click query wizard, a pop-up box will appear to guide you through the wizard.
   c. Select simple query wizard, then click ok.
   d. There will be an option that says tables/queries and under that should be a drop-down box.
      i. If you click the down arrow that is on the box it will allow you to select which information you want to pull from each table.
   e. As an example I will create a table with the field no, Arkansas River Shiner counts, the longitude, and the latitude.
      i. Choose field info in the drop-down box.
      ii. Select field no. in the options under available fields.
      iii. Click the top button located between available fields and selected fields (a single angle bracket pointing toward the right of the screen).
      iv. Choose latitude and repeat.
      v. Same for longitude. (The button located under the one we are using allows you to select all the data from whichever table you are using.)
   f. Now go back to the drop-down box and select fish counts.
      i. Choose ARS (Arkansas River Shiner)
   g. Select finish.
8. Now you have a new table with the field number, latitude, longitude, and the count for Arkansas River Shiners. You can make tables using any combination of information you like; you can even import other tables made in access or excel, link those to the already linked tables, and use information from them.