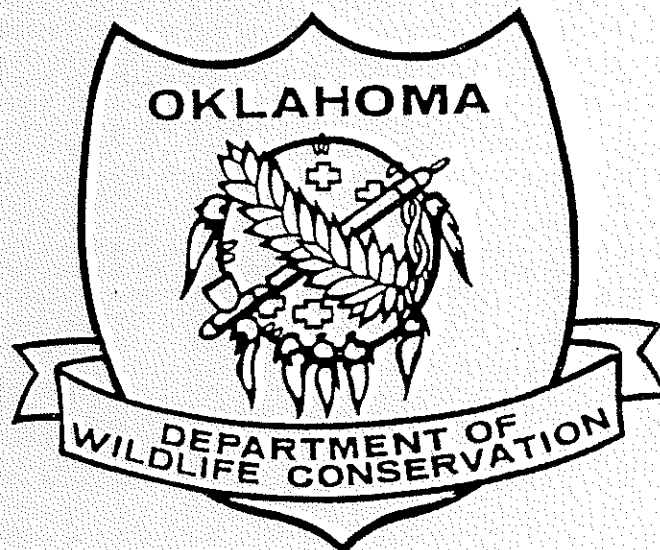# FINAL REPORT

FEDERAL AID GRANT NO. T-13-P-1

DIGITAL ATLAS OF OKLAHOMA FISHES: PREPARATION OF DATA FROM THE SAM NOBLE OKLAHOMA MUSEUM OF NATURAL HISTORY

OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

October 1, 2003 through March 31, 2007

FINAL REPORT

State: Oklahoma   **Grant Number:** T-13-P-1

Grant Program: State Wildlife Grants Program

Grant Name: Digital Atlas of Oklahoma Fishes: Preparation of
Data from the Sam Noble Oklahoma Museum of Natural History

Grant Period: October 1, 2003 - March 31, 2007

A. ABSTRACT

 The project, which was carried out from October 2003 through
March 2007, provided a database based on the holdings of fish
specimens at SNOMNH for use in a web-based atlas of the
distribution of fish species in Oklahoma. To assure that data
entered into the database were complete and correct, all records
of Oklahoma fishes archived at the Sam Noble Oklahoma Museum of
Natural History (SNOMNH) were examined for accurate locality
data. Many of the collections had incomplete geographic data,
and those collections were geo-referenced. In addition, species
identifications were updated and corrected to reflect the
currently valid species names. At the outset of the project, the
fish collection data were in two separate databases that were
merged, allowing easy access to all data for inclusion in the
Digital Atlas. Throughout the project, we worked closely with
Oklahoma State University to develop data standards for both
contributors to the final version of the Digital Atlas. All data
from SNOMNH are now complete and correct and ready for inclusion
in the final version that will be online through the Department
of Geography at Oklahoma State University in the near future.

B. BACKGROUND

General information on the range and abundance patterns of
individual fish species in Oklahoma is available in the
scientific and popular literature, but, prior to this project,
there was no comprehensive, detailed database for all fish
species in the state. This project was initiated to compile a
comprehensive database that includes distribution and abundance
data for all collections of fishes from Oklahoma that are
archived in the Sam Noble Oklahoma Museum of Natural History at
the University of Oklahoma in Norman. The SNOMNH database is
compatible with a similar database produced at Oklahoma State
University, and the two will be merged to produce a single,
comprehensive database on Oklahoma fishes that will be used to

produce a Digital Atlas of Oklahoma Fishes. The comprehensive
database and the resultant Digital Atlas will be invaluable
tools for management and conservation plans and will assist in
identifying areas of the state where field sampling is needed to
fill data gaps. These tools also will be useful to assist
conservation educators working with both the adult and school-
aged public. Additionally, the database and digital atlas will
assist the scientific and resource management communities with
basic ecological and biogeographical research.

C. OBJECTIVE

To prepare a database of Oklahoma fishes based on specimens
archived in the Sam Noble Oklahoma Museum of Natural History,
and to use that database, in combination with that based on the
Oklahoma State Collection of Vertebrates, in the production of a
GIS-based, digital atlas of fishes in Oklahoma.

D. APPROACH

Preparation of data from the Sam Noble Oklahoma Museum of
Natural History involved the following major activities: geo-
referencing of all collection localities in the SNOMNH catalog
of fishes; merging of the two fish catalogs (old and new) that
were in separate databases; corrections of spelling errors
within the catalogs; updating of fish species nomenclature;
production of species distribution maps using GIS software
(ARCINFO); preparation of short descriptions of species to
accompany maps in the final production of the Digital Atlas of
Oklahoma Fishes.

Georeferencing of collection sites was done using the program
GEOLocate 2.01 which was developed by the Tulane University
Museum of Natural History. Locality data (latitude and
longitude) for all collection sites were designated in decimal
degrees. In addition, all collections were assigned a
Hydrologic Unit Code (HUC) based on designations by the US
Geological Survey.

Merger of the two catalogs that had been previously separate
involved restructuring the old catalog (which had been a simple
table) to conform to the relational format of the new catalog.
All collections in the old catalog had to be assigned a field
number (if not already present) to serve as the linking field in
the relational database. Assignment of a field number required
examination of field notes (for those collections that had
accompanying field notes) or designation of a working field
number. If a working field number was assigned, it was based on

the initials of the collector and the date and/or site of the collection.

Once the databases were merged, all entries were checked for spelling and typographical errors. There were numerous errors in the names of rivers, counties and fish names.

Fish species names were corrected to reflect current taxonomy. Many entries in the old catalog had species assigned to a different genus than is currently recognized. All names were updated to conform to nomenclature as published in Miller and Robison (2004) and Nelson et al. (2004). In addition, the speckled chub (*Macrhybopsis aestivalis*) was recently split into several distinct species, with the result that two taxa are now recognized in Oklahoma (*M. australis* and *M. hyostoma*). All holdings in the fish collection at SNOMNH were examined to assign the correct name to specimens previously catalogued as *M. aestivalis*.

A distribution map for each species in the database was produced using GIS software ARCINFO. Each map was examined for obvious outliers and those outlier points were checked. In some cases, the locality data had been incorrectly entered; in other cases the species identification was incorrect. All outlier points were either resolved or omitted from the final database.

Throughout the process of correcting locality and species information, holdings in the collection were checked and inventoried to assure that specimens were in place to verify the data in the database. During this process, if discrepancies were found such that the specimens in the jar did not match the data in the database, those discrepancies were resolved.

Short descriptions of many species were produced to accompany the locality information. These will be added to the descriptions produced by the team at Oklahoma State University in the in the final production of the Digital Atlas of Oklahoma Fishes.

The following personnel worked on this project: Edie Marsh-Matthews, Principal Investigator; Chad Hargrave, Graduate Research Assistant; Melody Brooks, Graduate Research Assistant; Allison Fortner, Graduate Research Assistant; Ruediger Riesch, Graduate Research Assistant, Paulette Reneau, Temporary Graduate Assistant, and Jeff Wesner, Temporary Graduate Assistant. Dr. Jason Freund, who had been the post-doctoral association on the Oklahoma State Digital Atlas Grant, was hired as a consultant to assist with merging the OU database with that of OSU.

E. RESULTS AND DISCUSSION

We georeferenced 4355 collections (38,400 lots) from the SNOMNH fish catalogs. We found 273 collections (1004 lots) to be unidentifiable, and 736 collections from states other than Oklahoma (1345 lots). These collections were removed from the SNOMNH Digital Atlas database.

During the collection inventory, each jar in the collection was examined to compare the information on the label in the jar to information in the database. We inventoried 29,673 lots, and changed duplicate catalog numbers where appropriate.

The *Macrhybopsis* species complex was separated from one species into five. The 357 lots in the SNOMNH collection were split into 17 *Macrhybopsis aestivalis*, 157 *M. australis*, 203 *M. hyostoma*, 1 *M. marconis*, 26 *M. tetranema*, and 7 *M.* species. The lots totaled 411 after identification because some lots contained multiple species that were separated into their own jars. Each specimen (n = 5810) was examined for key characteristics of each species, species name was determined, and information was updated in the database.

Screening of species distribution maps identified approximately 100 questionable lots. These lots were inspected to verify identification, and the species name was changed on 59 of those lots.

A total of 102 species descriptions were prepared for inclusion in the online version of the Digital Atlas of Oklahoma Fishes. These included natural history information, worldwide and state distribution, habitat, diet, and spawning habits.

The preparation of data from the Sam Noble Oklahoma Museum of Natural History is now complete and ready to be merged with data from the Oklahoma State University database for final production of the Digital Atlas of Oklahoma Fishes.

When complete, the "Digital Atlas of Oklahoma Fishes" will provide an information infrastructure for multiple users and purposes. The data compiled in this comprehensive and accessible document will be available for assessment, management, and conservation of habitat for each individual species and for entire watersheds, because information will be available in a GIS format. The Atlas will make information available on both current and historic distributions, and will therefore be invaluable for determining trends of species abundance and distribution throughout the state. Comprehensive maps will allow identification of watersheds that have not been

thoroughly or recently collected. The Atlas also will provide a resource for public information and education. Distributional data will be available to the scientific community for use in analyses of large-scale biogeographic patterns and changes in range sizes for widespread species (monitoring range changes will be particularly important in the context of global climate change). Links to archived specimen records in the database will be available to researchers interested in examining museum specimens housed at the SNOMNH or the OSU Vertebrate Research Collections.
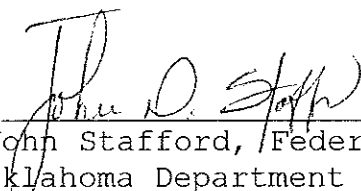
The initial version of the Digital Atlas will provide data for the distribution and abundance of Oklahoma fishes, but the format will allow for the future addition of information regarding habitat, conservation status and life history notes and inclusion of color photographs of the species as funding for those additions is identified. The Digital Atlas also will be developed so that new information can be readily added as new specimens are collected, and distributional maps will be based on the entire available database and therefore be dynamic summaries of archived fish records in the state. Because the Digital Atlas will be in a standard GIS format, it will be compatible with distributional records for other species or landscape features in Oklahoma, and will therefore contribute to the overall understanding and management of Oklahoma's natural resources.

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H. DATE: 14 May 2007

I. APPROVED BY: _____
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      Fisheries Division Administration

K. LITERATURE CITED:

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