

**State Agency:** Louisiana Department of Wildlife and Fisheries

**Grant Title:** Collection and analysis of American Eels (*Anguilla rostrata*) in Louisiana

**Grant Number:**

**Grant Period:** 11/1/2017 – 10/31/2019

**Grant Costs:** Federal Share: \$29,965

State Share: \$16,135

Total Cost: \$46,100

**Grant Funding:** State Wildlife Grants

**Grant Coordinator:**

Sam Holcomb

2000 Quail Drive

Baton Rouge, LA 70898

[sholcomb@wlf.la.gov](mailto:sholcomb@wlf.la.gov)

225-765-0239

**Grant Description:** This grant will provide funding for morphometric and ecological research of American Eel (*Anguilla rostrata*), a Species of Greatest Conservation Need (SGCN) in Louisiana. Morphological characteristics will be recorded, including length, weight, sex, life stage (i.e. yellow, silver), and age (determined by otoliths), and stomach contents will be collected. Eels will be checked for presence of the parasite *Anguillicoloides crassus* on the air bladder. Additionally, gonads for future histological study and fin clips for future population genetics studies will be collected. Locality, habitat, water quality, and collection method data will be recorded for each specimen to help inform future research and to help ensure this species is not listed under the Endangered Species Act. This information will allow resource managers to make more informed management decisions concerning American Eel at the state and regional levels.

**Need:** The American Eel (*Anguilla rostrata*) has received increased conservation attention in recent years due to pressure on United States stocks from markets in Europe and Asia (Shiraishi and Cook 2015), impacts from passage barriers, habitat loss, possible effects of *Anguillicoloides crassus* infections, and the lack of available life history information (USFWS 2014). The Atlantic State Marine Fisheries Commission (2012) determined that Atlantic Seaboard eel stocks have been declining over the past few decades, and Dekker and Casselman (2014) have called for increased research and management of eel stocks. American Eels are listed as “endangered” by the IUCN. Despite these findings, the status of the American Eel was reviewed in 2007 and 2015, and the USFWS did not deem listing necessary. There has been no stock assessment conducted on American Eels in Gulf of Mexico states, and there is very little information on populations in the region.

American Eels have a complex catadromous life cycle, and show an affinity for different habitat types based on life stage and even sex (Hansen and Eversole 1984, Helfman et al. 1984, Helfman et al. 1987, Krueger and Oliveira 1997, Krueger and Oliveira 1999, Oliveira and McCleave 2000, Goodwin and Angermeier 2003, Whiteford and Rinehimer 2008). Louisiana populations have been understudied (Savoie and Casanova 1982, Bio-West 2010, Maxwell unpublished data), and it is unknown which habitats are critical to the different cohorts of the population in the state. Habitat degradation or loss in any critical area of the state could have severe implications for the health of the state’s eel stocks. In addition to habitat issues, the nematode *Anguillicoloides crassus* infects and damages the

air bladders of American Eels. This is significant for a number of reasons, notably because of the effects on the eels' ability to migrate to spawning grounds. While the threats to American Eels on the Atlantic Seaboard are well studied, not much information exists on local stocks.

Shepard (2015) makes the contradictory statements that eel densities are low across the Gulf Coast, and "eels are commonly found among backwater fish communities within lakes, oxbows, and impoundments... are particularly abundant in the Pearl River and estuary." Vale (pers. comm.) stated that CPUE of American Eels electroshocking below the Toledo Bend Reservoir Dam were comparable to southern Atlantic drainage numbers. This suggests that Louisiana stocks are more significant than would be indicated by the attention they been given in recent research and management decisions (Cairns 2014, Shepard 2015).

The statewide issues regarding American Eels, including increased inquiries regarding commercial markets, span across North American Gulf of Mexico drainages. To complicate matters, there is speculation, contrary to the long-standing Sargasso Sea spawning grounds theory, of either sporadic or regular spawning somewhere in the Gulf or Caribbean (Cantrell and McLarney pers. comm.). Genetic analysis needs to be performed on eel stocks Gulf-wide to look for differences between Gulf and Atlantic stocks so as to further inform management decisions.

### **Objectives:**

1. Collect American Eels (as many as possible, up to 300 per year) caught during fisheries sampling by LDWF Inland and Marine Fisheries throughout the state.
2. Collect American Eel otoliths and record length, weight, *Anguillicoloides crassus* presence in air bladder, sex, stomach contents, and life stage data.
3. Process and analyze otoliths to obtain accurate age information for each eel sampled.
4. Look for links between habitat data and population characteristics.
5. Collect and archive fin clips from every American Eel sampled for future genetic analyses.
6. Collect and archive gonads from every American Eel sampled for future histological analyses.
7. Gain insight, as a pilot project, into feasibility and methods of researching American Eel in Louisiana.

**Expected Benefits:** The project funded by this grant will provide much needed information about local stocks of American Eel, a little-studied SGCN, which faces significant commercial utilization and threats from habitat degradation and loss. With this project, a better understanding of population structure and habitat associations within the state may be gained. This project will provide data to inform future research, management, and conservation, hopefully leading to proactive instead of reactive decisions. Beyond the state, Gulf of Mexico American Eel stocks are only recently being investigated in-depth. Research in Louisiana will complement the body of work currently being developed in the region. The fin clips gathered, when combined with other samples from across the region, will help answer population questions, potentially impacting federal listing determinations. Attendance of conferences and workshops concerning American eel research will not only benefit Eel research in Louisiana, but also the other Gulf states.

**Approach:** American Eels collected during LDWF fisheries sampling (i.e. electrofishing, lead nets, hoop nets, trawls) will be frozen and saved until Inland Fisheries District 5 staff (the PIs of the project) retrieve them. Upon retrieval, the eels will be worked up in the lab, gathering otoliths, fin clips, gonads, length, weight, and sex data, and recording the presence/absence of *Anguillicoloides crassus*. Otoliths will be sent to the LDWF Age and Growth Lab for processing and age determination. Fin clips will be stored in 90% ethanol, and gonads will be stored in a 10% buffered formalin solution. Habitat, locality, and water quality data will be attached to each specimen. Two biologists from the Fisheries Age and Growth Laboratory in Baton Rouge will attend an American Eel Aging Workshop at South Carolina Department of Natural Resources, Charleston, SC in early 2018.

### Literature Cited:

- Barras, J., S. Beville, D. Britsch, S. Hartley, S. Hawes, J. Johnston, P. Kemp, Q. Kinler, A. Martucci, J. Porthouse, D. Reed, K. RRoy, S. Sapkota, and J. Suhayda. 2004. Historical and projected coastal Louisiana land changes: 1978-2050. USGS, Department of the Interior. 39 pp.
- Bio-West. 2010. Toledo Bend relicensing project Lower Sabine River fishery study, final American eel data update. Bio-West, Round Rock, Tx. 5pp.
- Cairns, D.K., G Chaput, L.A. Poirier, T.S. Avery, M. Castonguay, A. Mathers, J.M. Casselman, R.G. Bradford, T. Pratt, G. Verreault, K. Clarke, G. Veinott, and L. Bernatchez. 2014. Recovery Potential Assessment for the American eel (*Anguilla rostrata*) for eastern Canada: life history, distribution, reported landings, status indicators, and demographic parameters. DFO Can. Sci. Advis. Sec. Res. Doc. 2013/134. xiv + 157 pp.
- Dekker, W. and J.M. Casselman (coordinators). 2014. The 2003 Quebec Declaration of Concern About Eel Declines - 11 Years Later: Are Eels Climbing Back up the Slippery Slope? *Fisheries* 39(12): 613-614.
- Goodwin, K.R. and P.L. Angermeier. 2003. Demographic characteristics of American eel in Potomac River drainage, Virginia. *Transactions of the American Fisheries Society*. 132:524-535.
- Guerrero, R.D. and W.L. Shelton. 1974. An aceto-carmines squash method for sexing juvenile fishes. *The Progressive Fish Culturist*. 36(1):56.
- Hansen, R.A. and A.G. Eversole. 1984. Age, growth, and sex ratio of American eels in brackish-water portions of a South Carolina River. *Transactions of the American Fisheries Society*. 113(6):744-749.
- Helfman, G.S. and E.L. Bozeman. 1984. Size, age, and sex of American eels in a Georgia river. *Transactions of the American Fisheries Society*. 113:132-141.
- Helfman, G.S., D.E. Facey, L.S. Hales Jr., and E.L. Bozeman Jr. 1987. Reproductive ecology of the American eel. *American Fisheries Society Symposium*. 1:42-56.
- ICES (International Council for the Exploration of the Sea). 2009. Workshop on age reading of European and American eel (WKAREA). ICES WKAREA Report 2009. 20-24 April, 2009, Bourdeaux, France. 63 pp.
- Kreuger, W.H. and K. Oliveira. 1997. Sex, size, and gonad morphology of silver American eels *Anguilla rostrata*. *Copeia*. 2:415-420.
- Kreuger, W.H. and K. Oliveira. 1999. Evidence for environmental sex determination in the American eel, *Anguilla rostrata*. *Environmental Biology of Fishes*. 55:381-389.
- Oliveira, K and J.D. McCleave. 2000. Variation in population and life history traits of the American eel, *Anguilla rostrata*, in four rivers in Maine. *Environmental Biology of Fishes*. 59:141-151.
- Savoie, L.B. and K.L. Casanova. 1982. A study of areal and seasonal abundance of the American eel (*Anguilla rostrate*) at selected sites in southeastern Coastal Louisiana. Technical Bulletin No. 34. Louisiana Department of Wildlife and Fisheries, New Orleans. 27 pp.
- Shepard, S.L. 2015. American eel biological species report. U.S. Fish and Wildlife Service. Hadley, Massachusetts. xii + 120 pp.

Shiraishi, H. and V. Cook. 2015. Eel market dynamics: An analysis of *Anguilla* production, trade and consumption in East Asia. TRAFFIC. Tokyo, Japan.

Stirrat, H.M. 2001. Proceedings of the workshop on aging and sexing American eel. Atlantic States Marine Fisheries Council. Special Report No. 72, Laurel Maryland. 20pp.

University of New Hampshire. 2014. KML Tools. <http://extension.unh.edu/kmlTools/>. Accessed August 20, 2014.

USFWS (U.S. Fish and Wildlife Service). 2014. The American Eel. <http://www.fws.gov/northeast/newsroom/eels.html>. U.S. Fish and Wildlife Service Northeast Region. Accessed July 23, 2014.

Whiteford, K. and M. Rinehimer. 2008. Maryland American eel population study. Maryland Department of Natural Resources. 81 pp.

**Useful Life:** N/A

**Geographic Location:** Statewide

**Principal Investigators:**

Robby Maxwell, LDWF Inland Fisheries, Biologist III (rmaxwell@wlf.la.gov)  
 Sean Kinney, LDWF Inland Fisheries, Biologist Manager (skinney@wlf.la.gov)  
 Isis Longo, LDWF Fisheries Age and Growth Lab, Biologist (ilongo@wlf.la.gov)

**Program Income:** N/A

**Budget Narrative:** This proposed budget allows for the processing of eels in the LDWF Inland Fisheries District 5 office and the Age and Growth Lab. Travel is comprised of costs for biologists to attend conferences to share information, sit on the American Eel Subcommittee of the AFS Warmwater Streams Committee, and receive training. Supplies and equipment will be fuel, chemicals, tools, and other lab equipment used in the processing of eels. The Age and Growth Lab at LDWF has agreed to age the otoliths. Matching funds will be from state Conservation funds.

	2017-2018	2018-2019	Total
Salary	\$8,000.00	\$8,000.00	\$16,000.00
Travel	\$4,000.00	\$3,800.00	\$7,800.00
Supplies/Equipment	\$2,250.00	\$2,250.00	\$4,500.00
A&G Lab salary	\$7,800.00	\$7,800.00	\$15,600.00
A&G Lab Training Travel	\$2, 200.00		\$2,200.00
<b>Total</b>	<b>\$24,250.00</b>	<b>\$21,850.00</b>	<b>\$46,100.00</b>
		Federal Share	\$29,965.00
		State Share	\$16,135.00

**Relationship with other Grants:** N/A

**Timeline:**

Email LDWF Fisheries Districts with request for eels - June 2017

Process eels - November 2017 – September 2019

Report Preparation - October 2019

**Key Personnel Qualifications and Experience:**

Robby Maxwell and Sean Kinney have a combined 23 years of fisheries experience. They began pursuing eel research in 2015. They have been making contacts regarding eels across the Gulf States, and are actively sharing information and working to improve data collection methods with biologists of the region. Isis Longo has 16 years of experience in Fisheries Age and Growth and will act as point person for the Age and Growth Lab. The Age and Growth Lab has a combined 49 years of experience aging marine and freshwater otoliths. The lab has participated in annual GSMFC otolith processors workshops since 2002, and consistently scores well in their Gulf-wide QA/QC reference set circulations.