Determining Marine Migration Patterns and Behavior of Gulf Sturgeon in the Gulf of Mexico off Eglin Air Force Base, Florida (Legacy 10-428)

Abstract

Over the course of three years, 120 adult Gulf sturgeon were tagged with acoustic transmitters from four different river systems surrounding Eglin AFB. Their movements were tracked with Vemco VR2W receivers placed in strategic locations in the marine, estuarine, and riverine areas near Eglin AFB, including the Gulf of Mexico (GOM), Santa Rosa Sound (SRS), Pensacola Bay, and Yellow, Blackwater, and Escambia Rivers. This configuration provided data on Gulf sturgeon occurrence in critical habitat areas heavily utilized for military testing and training activities. The receivers detected Gulf sturgeon tagged by Eglin in 2008, 2009, and 2010. Sturgeon tagged by other researchers utilizing the same acoustic technology were also detected. Our data found that Gulf sturgeon typically occur within 1,000 meters (m) of the shoreline in the GOM. Our data also indicates that sturgeon activity in critical habitat areas of the Eglin Gulf Test and Training Range (EGTTR) begins in November, peaks in December and January, and lasts through April. These findings will allow more accurate assessments of potential impacts to Gulf sturgeon from military activities in the EGTTR and development of effective mitigation measures. Our study also identified movement patterns of Gulf sturgeon from different river systems, overwintering locations in the GOM, level of river fidelity, and level of performance of the VR2W receivers in a harsh marine environment.

Project Specifics

Description of geographic setting: Eglin AFB spans across three counties in the northwest Florida panhandle: Okaloosa, Santa Rosa, and Walton. Eglin's property includes a 17-mile stretch of land on Santa Rosa Island (SRI), 0.5-mile wide barrier island located in the southern portion of Eglin AFB in Okaloosa and Santa Rosa counties. It is separated from mainland northwest Florida on the north by Choctawhatchee Bay and SRS and bordered to the south by the GOM. In addition, Eglin AFB contains over 124,000 square miles of over-water air space in the GOM, collectively referred to as the EGTTR. The EGTTR is divided into several air space units, or warning areas. The only warning areas that contain Gulf sturgeon critical habitat are Warning Area (W)-155 and W-151. This study mainly focused on the nearshore waters of the GOM off the coast of SRI in W-151 because more military actions are scheduled in W-151 than in W-155.

Principal investigators:

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Funding and support

- **Eglin Natural Resources Section:** Provided support and funding
- **DoD Legacy Resource Management Program:** Provided funding
- **Florida Fish and Wildlife Conservation Commission:** Provided boat transportation

Technical Expertise and Collaboration

- **U.S. Geological Survey:** Ken Sulak and Mike Randall
- **U.S. Fish and Wildlife Service:** Frank Parauka and Glenn Constant
- **National Marine Fisheries Service:** Dr. Stephania Bolden
- **Delaware State University:** Dewayne Fox and Kate Fleming

Service branch: Air Force

Project location: Eglin AFB, Florida

Installation size: 464,000 acres of land; 124,000 square miles of over-water airspace

Installation primary mission: Testing and training

Project dates: August 2009 – September 2011

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Purpose/Need

The Gulf sturgeon, *Acipenser oxyrinchus desotoi*, is an anadromous fish occurring in riverine, estuarine, and nearshore marine environments of coastal states along the GOM. The species' freshwater range encompasses seven river systems from Lake Pontchartrain in LA to the Suwannee River in FL. Adult Gulf sturgeon occur in fresh water during warm months when spawning occurs, and migrate into estuarine and marine environments in the fall to forage and overwinter. Most subadult and adult Gulf sturgeon generally do not feed in the riverine habitats. Instead, feeding occurs on the bottom sediments of marine and estuarine habitats during fall and winter.

The Gulf sturgeon was listed as a threatened species in 1991 under the federal Endangered Species Act of 1973 (ESA) and critical habitat was designated in 2003. Critical habitat around Eglin includes Choctawhatchee Bay, SRS, Yellow River, Shoal River, Blackwater Bay, East Bay, and the GOM out to 1 nautical mile (NM) offshore of SRI and Cape San Blas. Under Section 7 of the ESA, all federal actions must not jeopardize the continued existence of an endangered or threatened species or result in the destruction or adverse modification of critical habitat. As a federal agency, the DoD complies with these requirements by conducting Section 7 consultations with the NMFS and/or the USFWS when military activities have the potential to impact Gulf sturgeon or adversely modify critical habitat. Since Eglin AFB regularly schedules military activities in areas that could impact Gulf sturgeon and their designated critical habitat, consultations with the Services will continue to be required.

Lack of Scientific Data

Gulf sturgeon distribution and behavior in riverine habitats are understood well enough to reasonably evaluate the effects of human activities in these areas. However, the

occurrence, spatial distribution, and movement patterns of Gulf sturgeon in the GOM was relatively unknown. This gap in knowledge resulted in a scarcity of scientific data available for use during Section 7 consultations, thus delaying the permit process and putting military missions at risk.

Solution

In response to the lack of information, Eglin AFB conducted a Pilot Study in 2008 utilizing acoustic telemetry technology to determine the presence or absence, location, and movement patterns of Gulf sturgeon in GOM critical habitat near Eglin. The project relied on cooperative efforts between the Air Force, USFWS, USGS, and FWC. Based on the results of the 2008 Pilot Study, Eglin AFB received funding from the DoD Legacy Resource Management Program in 2009 to continue the study for two more years.

Approach

Acoustic Tagging

Adult Gulf sturgeon from four rivers near Eglin AFB were tagged with Vemco V16 coded acoustic transmitters, or tags. Each tag was surgically implanted into the abdominal cavity and was set to emit a transmission approximately once every 60 seconds. The Vemco V16 tags are about three inches long and have a battery life of around three to five years. Adult Gulf sturgeon weighing at least 50 lbs were targeted because they are most likely to overwinter in the GOM. All fish captures and tagging occurred in the rivers before the fall out-migration from the rivers began.

Between 2008 and 2010, 40 Gulf sturgeon were tagged each year. Tagging efforts for the 2008 Pilot Study were focused in the Choctawhatchee River. Since other Gulf sturgeon tagging studies were already being conducted in this area, tagging efforts for this 2-year Legacy project were shifted to the Yellow River, Blackwater River, and Escambia River.

All tagging activities were conducted and/or supervised by a USFWS biologist with over 30 years of experience in tagging Gulf sturgeon utilizing the proper and established protocols. In addition, all personnel who participated in tagging attended a two-day tagging workshop sponsored by the USFWS.

Receiver Arrays

Vemco VR2W receivers were placed in areas that would track sturgeon movements as they left the rivers, transited through bays and sounds, and entered the GOM where they spent the winter. VR2Ws deployed in the GOM were set up to monitor sturgeon activities in the nearshore waters off Eglin's property on SRI. In 2010, the USFWS deployed a separate array of VR2Ws in the GOM from Lake Pontchartrain, LA to Cedar Key, FL. Detection data of our fish on this array was provided to us and we were able to capture eastern and western extent of sturgeon movement in the GOM.

VR2W Range Testing in the Gulf

Range testing and performance of the VR2Ws deployed in the GOM was also conducted as part of this project. A separate sentinel tag was deployed at the bottom of the GOM between two VR2Ws to simulate a stationary fish emitting a transmission once every 15 minutes. One VR2W was 350 m away and one was 500 m away. Rate of detection success from each receiver was compared with weather data to determine what wind speeds would compromise the receiver's ability to detect a transmission from a nearby tag.

Results

2009 Legacy Study

- Received 161,569 detections from 86 tagged sturgeon (includes sturgeon tagged for other studies)
- Sturgeon activity documented from November to April in nearshore waters off SRI
- 80% of detections occurred within 1,000 m from the shore
- Most sturgeon headed west once they entered the GOM
- Majority of sturgeon activity offshore of Eglin's property were from Choctawhatchee River sturgeon
- Many sturgeon were detected in rivers where they were not originally tagged

2010 Legacy Study

- Received 422,340 detections from 126 tagged sturgeon
- Not all sturgeon entered the GOM – some overwintered in the SRS
- 62% detections in the GOM occurred outside 1,000 m from shore (different from previous year)
- Western extent of winter migration was to Biloxi, MS
- Eastern extent of winter migration was to Dog Island, FL
- While constant activity in nearshore waters of the EGTTR was documented, Alabama Gulf coasts seemed to be a more desirable overwintering location
- More documentation of sturgeon "river swapping" between Blackwater, Yellow, and Escambia Rivers

VR2W Range Testing in the Gulf

- 350 m is a more appropriate range for VR2Ws deployed in the Gulf
- Tag detection significantly decreases when wind speeds exceed 9 mph
- On average only 68% of all tag transmissions were actually detected
- Results from this study may underestimate actual level of sturgeon activity

Benefit

The results of this study provide an abundance of data and analyses that can be utilized for ESA Section 7 consultations, National Environmental Policy Act, and a multitude of other environmental management applications. These findings are not only applicable to Eglin AFB, but may also benefit other DoD installations around the Gulf Coast such as Tyndall AFB, Naval Air Station Pensacola, Naval Station Pascagoula, and Keesler AFB. A greater understanding of Gulf sturgeon seasonal movements and spatial distribution in the GOM will allow environmental managers to advise mission planners so that adverse impacts can be avoided.

Recommendations/Lessons learned

Activities that involve disturbing the bottom of the Gulf, such as dredging or underwater detonations, may affect Gulf sturgeon and their critical habitat. To avoid impacts and lengthy consultations, these activities should be conducted either during the summer months in the GOM when sturgeon are spawning in the rivers or outside 1 NM from the shore. When these measures are not possible, planners should investigate the possibility of using the eastern areas of the GOM where sturgeon activity is relatively low in the winter.

Continued tagging and monitoring of Gulf sturgeon in the GOM would provide opportunities to better understand marine habitat utilization and possibly calculate density estimates for different areas of the GOM. Providing take estimates of Gulf sturgeon will improve a proponent's ability to determine a more precise level of impact from an activity and perhaps reduce consultation timelines.

Communications

The findings from this project have been presented at the 2010 American Fisheries Society Conference, the 2010 Annual Gulf Sturgeon Workshop, and the 2011 Annual Gulf Sturgeon Workshop.