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Invasion of Gulf Menhaden in the Alabama River

Invasion of Gulf Menhaden in the Alabama River

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ABSTRACT

Our recent survey of the Alabama River (river miles 22.9 – 72) for fishes has revealed the presence of Gulf Menhaden in extremely large numbers throughout the study area. Historical records of this marine species are confined to coastal areas. Typically this species migrates to open Gulf waters in the winter and spring for spawning. Our samples suggest that large numbers of young adult Gulf Menhaden migrated up the Alabama River instead, where we found them in both summer and fall samples. We also collected Gulf Menhaden during day and night samples on sand/gravel bars. The presence of larval individuals in our samples suggests that spawning may have occurred in the river. The presence of this planktivorous fish in such large numbers has the potential to profoundly affect the aquatic ecosystem of the Alabama River, and needs to be monitored.

INTRODUCTION

Gulf Menhaden (*Brevoortia patronus* Goode), is a marine species common to the central Gulf of Mexico (Hoese and Moore, 1977; McEachran and Fechhelm, 1998). The species forms large schools near the surface that support purse seine fisheries throughout the Gulf of Mexico. The Gulf Menhaden fishery is one of the largest by weight and most valuable in the United States (Christmas et al., 1982; Ross, 2001; Vaughan et al., 2000). This commercially important species is tolerant of a wide range of salinities, and can be found from offshore areas of the Gulf of Mexico to the lower reaches of major Gulf drainages, including the Tombigbee and Tensaw Delta (Lassuy, 1983; Mettee et al., 1996; Ross, 2001; Boschung and Mayden, 2004). Typically, spawning takes place in open waters of the Gulf in fall and spring (Ahrenholz, 1991). After hatching from pelagic eggs, larvae are carried to inshore marshes via currents. Juveniles spend a variable amount of time in estuarine habitat before migrating offshore (Lassuy, 1983; Ahrenholz, 1991). Menhaden selectively predate on zooplankton and phytoplankton as larvae, and then transition to non-selective filter feeders as adults (Ross, 2001).

Although many marine species are commonly found in the Alabama River as far upstream as Claiborne Lock and Dam (eg., Hogchocker, *Trinectes maculatus* (Bloch and Schneider); Southern Flounder, *Paralichthys lethostigma* Jordan and Gilbert; Striped Mullet, *Mugil cephalus* Linnaeus; Atlantic Needlefish, *Strongylura marina* (Walbaum); Boschung and Mayden, 2004), this is the first record of Gulf Menhaden in this portion of the Alabama River. Our objective is to report the numbers of individuals and collection localities of Gulf Menhaden collected in the Alabama River during a 2010 survey.

MATERIALS AND METHODS

Nineteen sand/ gravel bars were sampled from river mile 22.9 – 72 during June-August and October 2010 (Fig. 1; Appendix). Fishes were collected on these habitats using 30, 15, and 9 m seines (5-10 efforts per site). The length of each haul was dictated by depth of the reach and presence of obstructions, but generally ranged between 30 - 100 m. Selected sites were re-sampled at night and during the fall to document diurnal and seasonal assemblage changes (41 samples total). Species that were easily identified and those of conservation concern were returned to the river. Others were preserved and taken back to the lab for identification. These specimens were anesthetized in MS 222 (tricaine methanesulfonate) and preserved in a 10% formalin solution.

Due to the extremely high numbers of Gulf Menhaden collected, subsampling was used to approximate total numbers per haul. In these circumstances Gulf Menhaden were distributed evenly in a square and divided into proportionate fractions until a reasonable subsample could be counted. Subsamples ranged from 1/4 to 1/64 of the total catch. Standard length (SL) of preserved specimens was measured in millimeters (mm) to assess age structure.

RESULTS AND DISCUSSION

Gulf Menhaden were collected at 12 of 19 sites during our survey (Table 1). The species was absent from the lowermost sample sites of our survey (Fig. 1; Table 1).

Numbers of individuals ranged from 1 to over 144,000 and was greater during the fall sample, likely related to lower water levels. Gulf Menhaden were also present in night samples (Table 1).

Lengths of Gulf Menhaden suggest that two age classes were present in the summer samples. While most individuals were age 0 (mean = 54 mm SL, $n = 94$), larval specimens were also collected in summer samples (mean = 21 mm SL, $n = 13$). These lengths fall into year classes described by Lassuy (1983). While the age 0 class also dominated fall samples, larger individuals (90-100 mm SL) were present in small numbers ($n = 10$). These larger individuals either grew to this size class over this summer or were missed in earlier samples.

The presence of extremely large numbers of Gulf Menhaden upstream to river mile 72 in the Alabama River is clearly a rare occurrence. It is possible that inshore movement was a result of some stimulus in their typical marine habitat. Although the timing and length of use of marsh habitat is labile for this species, certainly by fall these individuals should have migrated offshore for spawning (Fore and Baxter, 1972). The presence of very small individuals may be an indication that Gulf Menhaden spawned in the Alabama River. By 21 mm SL, individuals ordinarily move into marsh habitat using offshore currents (Christmas et al., 1982; Ross, 2001; Vaughan et al. 2000).

Predicting the impact of such large numbers of planktivorous fish on the ecosystem of the Alabama River is difficult, and should be the topic of future work. Of special concern is their impact on other filter feeding fishes, including Alabama Shad. If large numbers of this species persist in the river, there will undoubtedly be an impact on the existing food web. Our future work is aimed at monitoring the potential migration, abundance, and distribution of Gulf Menhaden in the Alabama River, as well as monitoring the entire fish assemblage.

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LITERATURE CITED

- Ahrenholz, D. W. 1991. Population biology and life history of the North American menhadens, *Brevoortia* spp. Marine Fisheries Review 53:3-19.
- Boschung, H.T., and R.L. Mayden. 2004. Fishes of Alabama. Smithsonian Books, Washington D.C. 736 pp.
- Christmas, J.Y., J.T. McBee, R. S. Waller, and F.C. Sutter, III. 1982. Habitat suitability index models: Gulf Menhaden. U.S. Department of Interior, Fish and Wildlife Service. FWS/OBS-82/10.23. 23 pp.
- Fore, P.L., and K.N. Baxter. 1972. Diel fluctuations in the catch of larval Gulf Menhaden, *Brevoortia patronus*, at Galveston Entrance, Texas. Transactions of the American Fisheries Society 101:729-732.
- Hoese, H.D., and R.H. Moore. 1977. Fishes of the Gulf of Mexico, Texas, Louisiana, and Adjacent Waters. W.L. Moody, Jr. Natural History Series; No.1. Texas A&M University Press. College Station, TX. 327 pp.
- Lassuy, D.R. 1983. Species profiles: life histories and environmental requirements (Gulf of Mexico): Gulf Menhaden. U.S. Fish and Wildlife Service, Division of Biological Services, FWS/OBS-82/11. U.S. Army Corps of Engineers, TR EL-82-4. 13 pp.
- McEachran, J.D., and J.D. Fechhelm. 1998. Fishes of the Gulf of Mexico, Vol 1. University of Texas Press. Austin, TX. 1112 pp.
- Mettee, M.F., P.E. O'Neil, and J.M. Pierson. 1996. Fishes of Alabama and the Mobile Basin. Oxmoor House, Inc. Birmingham, AL. 820 pp.
- Ross, S.T. 2001. Inland Fishes of Mississippi. University Press of Mississippi. Jackson, MS. 624 pp.
- Vaughan, D.S., J.W. Smith, and M.H. Prager. 2000. Population characteristics of Gulf Menhaden, *Brevoortia patronus*. NOAA Technical Report NMFS 149. U.S. Department of Commerce. Seattle, WA. 19 pp.

TABLE 1. Number of Gulf Menhaden collected in sand/gravel bar samples in the Alabama River in 2010. Site numbers correspond to locality data in the Appendix and to the map (Fig. 1).

| Site # | Number of individuals | | | |
|--------|-----------------------|--------------|------------|--------------|
| | Summer | | Fall | |
| | <u>Day</u> | <u>Night</u> | <u>Day</u> | <u>Night</u> |
| 1 | 5,649 | 8,159 | 18,590 | 493 |
| 2 | 8 | - | - | - |
| 3 | 1 | - | - | - |
| 4 | 4 | 1 | 144,464 | 29,776 |
| 5 | 0 | - | 109,052 | - |
| 6 | 1 | - | - | - |
| 7 | 1,200 | - | - | - |
| 8 | 321 | 0 | 0 | - |
| 9 | 12,279 | 0 | 420 | 71 |
| 10 | 0 | 0 | 0 | 36 |
| 11 | 14 | - | 14,067 | - |
| 12 | 0 | - | 690 | - |
| 13 | 808 | - | 2,472 | - |
| 14 | 29,195 | - | - | - |
| 15 | 8,520 | - | - | - |
| 16 | 2,616 | - | - | - |
| 17 | 0 | - | - | - |
| 18 | 0 | - | - | - |
| 19 | 0 | - | - | - |

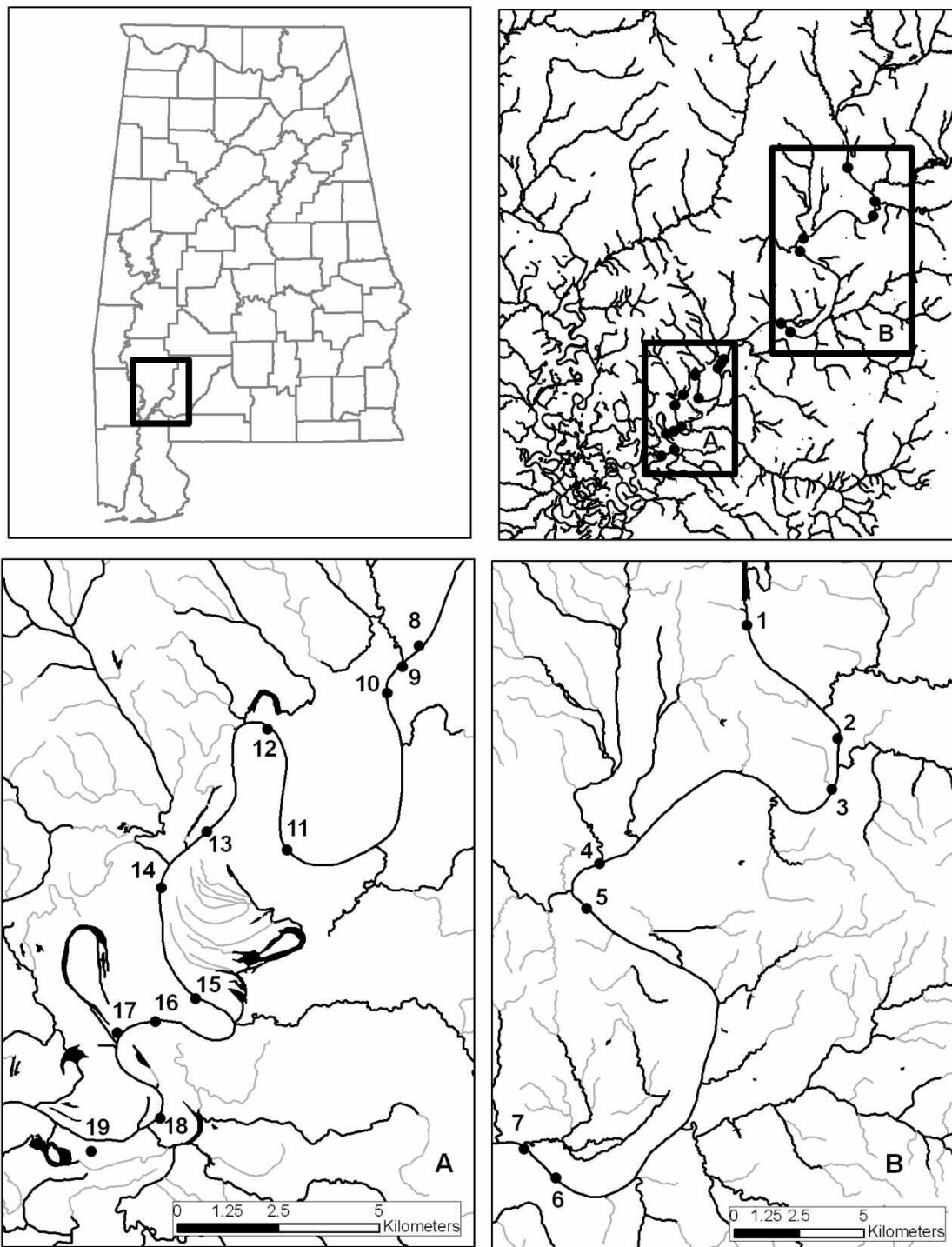


FIGURE 1. Collection sites in the Alabama River, Alabama. Site numbers correspond to locality data in the Appendix.

Appendix. Sites sampled in the Alabama River.

| Site | Latitude | Longitude | AI River Mile | Site Description | Date |
|------|-----------|-----------|---------------|--|----------|
| 1 | 31.606766 | 87.550967 | 72 | Sandbar directly below Claiborne Dam | 6/28/10 |
| 1a | 31.608425 | 87.551257 | 72.1 | Sandbar directly below Claiborne Dam | 7/8/10 |
| 1b | 31.607965 | 87.551087 | 72 | Sandbar directly below Claiborne Dam | 7/27/10 |
| 1c | 31.607564 | 87.550947 | 72 | Sandbar directly below Claiborne Dam | 10/14/10 |
| 1d | 31.608583 | 87.550989 | 72 | Sandbar directly below Claiborne Dam | 10/15/10 |
| 2 | 31.567631 | 87.513743 | 68.3 | Sandbar downriver of paper plant | 6/28/10 |
| 2a | 31.567598 | 87.513762 | 68.3 | Sandbar downriver of paper plant | 7/8/10 |
| 3 | 31.549879 | 87.516141 | 66.9 | Directly above Hwy 84 bridge | 7/8/10 |
| 3a | 31.547998 | 87.517645 | 66.7 | Directly below Hwy 84 bridge, small sand bar between jetties | 7/8/10 |
| 4 | 31.523702 | 87.610241 | 60 | 3 pile Jetty's gravel bar near Nancy Hill Landing across from Pigeon Creek | 7/8/10 |
| 4a | 31.523725 | 87.610925 | 60 | 3 pile Jetty's gravel bar near Nancy Hill Landing across from Pigeon Creek | 8/2/10 |
| 4b | 31.523681 | 87.610989 | 60 | 3 pile Jetty's gravel bar near Nancy Hill Landing across from Pigeon Creek | 10/14/10 |
| 4c | 31.523841 | 87.610255 | 60 | 3 pile Jetty's gravel bar near Nancy Hill Landing across from Pigeon Creek | 10/15/10 |
| 5 | 31.508194 | 87.615469 | 58.3 | Mrs. Grey's Bar right bank (downriver) | 7/8/10 |
| 5a | 31.50848 | 87.615571 | 58.3 | Mrs. Grey's Bar right bank (downriver) | 10/14/10 |
| 6 | 31.414326 | 87.627276 | 47 | Sandbar divided by jetties between Shackleford Bar and English Landing | 7/26/10 |
| 6a | 31.416228 | 87.630366 | 47 | Sandbar divided by jetties between Shackleford Bar and English Landing | 7/26/110 |
| 7 | 31.424393 | 87.640235 | 46.4 | Sandbar / Disposal area between Frenchs Landing and English Landing | 7/26/10 |
| 8 | 31.382167 | 87.717499 | 40.3 | Sandbar across and downriver from Euryka Landing (near Irvin Creek) | 7/9/10 |
| 9 | 31.377482 | 87.721757 | 39.6 | Sandbar near Irvin Creek (Directly above mouth of creek) | 7/26/110 |

Appendix, cont.

| | | | | | |
|-----|-----------|-----------|------|--|----------|
| 9a | 31.380454 | 87.718138 | 39.6 | Sandbar near Irvin Creek (Directly above mouth of creek) | 8/9/10 |
| 9b | 31.380648 | 87.717944 | 39.6 | Sandbar near Irvin Creek (Directly above mouth of creek) | 8/10/10 |
| 9c | 31.379762 | 87.718719 | 39.6 | Sandbar near Irvin Creek (Directly above mouth of creek) | 10/15/10 |
| 9d | 31.379856 | 87.718624 | 39.6 | Sandbar near Irvin Creek (Directly above mouth of creek) | 10/16/10 |
| 10 | 31.371523 | 87.725739 | 39.3 | Sandbar downriver and opposite of Irvin Creek | 7/9/10 |
| 10a | 31.369525 | 87.726053 | 39.2 | Sandbar downriver and opposite of Irvin Creek | 8/10/10 |
| 10b | 31.369839 | 87.7261 | 39.2 | Sandbar downriver and opposite of Irvin Creek | 8/10/10 |
| 10c | 31.370694 | 87.726122 | 39.2 | Sandbar downriver and opposite of Irvin Creek | 10/15/10 |
| 10d | 31.370718 | 87.726146 | 39.2 | Sandbar downriver and opposite of Irvin Creek | 10/16/10 |
| 11 | 31.336299 | 87.75164 | 35.4 | Sandbar above (upriver) Choctaw Bluff | 7/9/10 |
| 11a | 31.336819 | 87.752356 | 35.4 | Sandbar above (upriver) Choctaw Bluff | 10/15/10 |
| 12 | 31.363272 | 87.756877 | 33.3 | Sandbar across Choctaw Bluff (east bank) | 7/9/10 |
| 12a | 31.363176 | 87.755872 | 33.3 | Sandbar across Choctaw Bluff (east bank) | 10/16/10 |
| 13 | 31.340333 | 87.772578 | 31.6 | Sandbar (Island) \approx 1.3mi below Choctaw Bluff | 7/27/10 |
| 13a | 31.3396 | 87.77209 | 31.6 | Sandbar (Island) \approx 1.3mi below Choctaw Bluff | 10/16/10 |
| 14 | 31.327761 | 87.784254 | 29.9 | Sandbar 0.8mi down from Matthews Bar | 7/27/10 |
| 15 | 31.303009 | 87.775094 | 28.4 | Sandbar upriver of Dixie Landing | 7/27/10 |
| 16 | 31.297774 | 87.785475 | 26.3 | Sandbar near Dixie Cutoff and Monroe Point | 7/27/10 |
| 17 | 31.295258 | 87.795414 | 25.5 | Sandbar Below Monroe Point | 8/2/10 |
| 18 | 31.276208 | 87.78405 | 24 | Alabama River Sandbar | 8/2/10 |
| 19 | 31.26872 | 87.802023 | 22.9 | Sandbar @ Earl Bar | 8/2/10 |