

GEOLOGICAL SURVEY OF ALABAMA

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**PADDLEFISH (*Polyodon spathula*) MOVEMENTS
IN THE ALABAMA AND TOMBIGBEE RIVERS
AND THE MOBILE-TENSAW RIVER DELTA,
2001-2006**

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by

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Prepared in cooperation with the
Alabama Department of Conservation and Natural Resources,
Wildlife and Freshwater Fisheries Division

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ABSTRACT

A total of 341 paddlefish were anchor tagged during the study. Ultrasonic tags were surgically implanted in 103 fish collected below Millers Ferry Lock and Dam in the Alabama River from 2001-05 and 10 fish collected in Mobile Bay in 2006. One hundred fish were detected 528 times, from 1 to 677 days following release and up to 200 miles away from their original release point. Sixty fish released below Millers Ferry Lock and Dam were detected in a 50-mile-long section of the Alabama River between Millers Ferry and Claiborne Locks and Dams. One fish moved upstream through Millers Ferry lock chamber and inhabited the lower 10 to 12 miles of Dannelly Reservoir. Remaining fish were detected below Claiborne Lock and Dam in the Alabama River, below Coffeerville Lock and Dam in the Tombigbee River, and in the Mobile-Tensaw River Delta. Nine fish exhibited spawning site fidelity by returning to Millers Ferry tailwater during March of the following year. Eight of these individuals returned to the same section of river they had inhabited the previous summer. Seven fish released in Mobile Bay moved upstream into the Tensaw River. One fish continued upstream into the Alabama River and was detected a few miles upstream of Claiborne Lock and Dam.

INTRODUCTION

The paddlefish (*Polyodon spathula*) originally inhabited many large river tributaries to the Mississippi and Mobile basins. Overfishing, dam construction, habitat modification, and pollution have dramatically reduced the distribution and abundance of this species (Burr, 1978; Robison and Buchanan, 1988; Williams and others, 1989; Etnier and Starnes, 1993; Mettee and others, 1996; Ross, 2001). Graham (1997) reported the paddlefish has been extirpated from four states and is listed as endangered, threatened, or of special concern in 11 others. The Wildlife and Freshwater Fisheries Division (WFFD) of the Alabama Department of Conservation and Natural Resources (ADCNR) banned paddlefish harvest in all Alabama rivers in 1988. Recent increased paddlefish sightings have renewed public interest in re-opening the season. The WFFD

is currently involved in a study to determine the size of paddlefish populations inhabiting the Alabama and Tombigbee Rivers and Mobile-Tensaw River Delta in anticipation of possibly re-opening a limited paddlefish season. Paddlefish were abundant in the Tennessee River from the later 1890s to the early 1900s, but populations were subsequently overfished and since their numbers have not recovered (Hoxmeier and DeVries, 1996), the harvest ban on paddlefish will probably remain in effect across northern Alabama for the foreseeable future.

Paddlefish life history and movements are well documented in the upper Mississippi River (Rosen and others, 1982; Southall and Hubert, 1984; Moen and others, 1992; Lyons, 1993; Zeigler and others, 1999, 2003; Runstron and others, 2001), but relatively little information has been published on populations inhabiting Alabama rivers. Hoxmeier and DeVries (1997) reported that juvenile Alabama River paddlefish used oxbow lakes as nursery areas until they reached sexual maturity at around 650 millimeters (mm) eye to fork length (EFL). Adults and juveniles remain in backwater habitats during the summer and fall and then move into main channel habitats in the winter and spring. Alabama River paddlefish appear to have shorter life spans, higher fecundity rates, and the EFL lengths for various age classes are generally shorter than for individuals that inhabit northern rivers. Lein and DeVries (1998) reported that paddlefish populations in the Cahaba and Tallapoosa Rivers were functionally discrete units that resided in adjacent, non-connected reservoirs. Differences in population characteristics between these rivers were possibly influenced by a combination of factors, including flow, habitat size, and water temperature. The recapture of some anchor tagged individuals in the same spawning area in successive years suggested spawning site fidelity. Paddlefish growth was greatest during the first year of life, decreased with age, and was lowest in older, mature fish. The estimated ages of the oldest fish collected in the Tallapoosa and Cahaba Rivers were 11 years and 9 years, respectively. Alabama paddlefish matured quicker, grew faster, possibly spawned more frequently, and produced more eggs than individuals in Louisiana (Reed and others, 1992) and Missouri (Rosen and Hales, 1981).

In 2001, the WFFD contracted the Geological Survey of Alabama (GSA) to sonic tag and monitor paddlefish movements in the lower 134 miles of the Alabama River below Millers Ferry Lock and Dam. The study area was subsequently increased to include the Mobile-Tensaw River Delta and the lower Tombigbee River below Coffeeville Lock and Dam. Ten paddlefish were

sonic tagged in Mobile Bay in 2006 in order to monitor their upstream movements as the bay transitioned from a winter freshwater environment to a summer estuarine environment.

ACKNOWLEDGMENTS

We thank the following agencies and individuals for their collective contributions to the success of this project. Section 6 funding was provided by the WFFD, USFWS, and GSA. The Mobile District Office of the U.S. Army Corps of Engineers (USCOE) altered the hydroelectric generation schedule at Millers Ferry Lock and Dam to accommodate netting operations for the study. Ed Tybergein (retired from Alabama Power Company) and Greg Lein (ADCNR) shared information from their previous studies on paddlefish populations in the Tallapoosa and Cahaba Rivers. Dennis DeVries (Auburn University) supplied a thesis by Hoxmeier (1996) and published papers by Hoxmeier and DeVries (1997) and Lein and DeVries (1998). Alicia Norris, a graduate student at Auburn University, provided GPS coordinates for paddlefish locations in the Tensaw River. Dave Armstrong, Jerry Moss, Phillip Kilpatrick (retired), Ken Weathers, and Steve Rider from the WFFD participated in numerous paddlefish collecting trips and shared their thoughts with us concerning paddlefish movements in Alabama rivers. Jerry Moss and Dave Armstrong allowed us to store our work boats at their respective WFFD offices.

THE STUDY AREA

The Alabama River is formed by the junction of the Coosa and Tallapoosa Rivers. Collectively, these rivers drain approximately 22,617 square miles in eastern Alabama, northwestern Georgia, and a small section of southern Tennessee. The Alabama and Tombigbee Rivers join to form the Mobile-Tensaw River Delta, which extends about 30 miles (mi) before entering Mobile Bay (Mettee and others, 1996).

The USCOE operates three locks and dams on the Alabama River. Robert F. Henry Lock and Dam at Alabama River mile (ARM) 236 and Millers Ferry Lock and Dam at ARM 133 each have a gated spillway, a lock chamber, and hydroelectric generating facilities. The powerhouse at Henry Lock and Dam is located on the west bank of the river; the lock chamber is on the east bank. The powerhouse at Millers Ferry was constructed as a separate facility on the east bank of the river about 0.5 mi downstream of the gated spillway and lock chamber. Claiborne Lock and Dam, located at ARM 73, has a combined crested and gated spillway and a lock chamber but no hydroelectric generating facility.

Forest production and agriculture are the dominant land uses throughout much of the Alabama River watershed. Montgomery and Selma are the largest municipal dischargers into the Alabama River although the Cahaba River, its largest tributary, receives substantial municipal discharge and nonpoint runoff from the Birmingham metropolitan area and the town of Centreville. Other permitted dischargers in the area are paper mills near Montgomery, Selma, Camden, and Monroeville. Depth and flow in the Alabama River fluctuate daily due to hydroelectric discharges at Henry and Millers Ferry Locks and Dams. Commercial barge traffic has declined significantly over the past 10 to 20 years, but the USCOE still maintains a 9-foot (ft)-deep navigational channel throughout the entire 299 mi of the river. Most dredging activities are confined to the lower 73 mi of the river downstream of Claiborne Lock and Dam. Fishing and boating are popular recreational activities throughout the Alabama River system.

METHODS

Paddlefish were collected below Millers Ferry Lock and Dam in the Alabama River from 2001-05 and in Mobile Bay in 2006 (fig. 1). All fish were collected with monofilament and multi-filament gill nets that were 200 ft long, ranged from 8 to 18 ft in depth, had a 2.0- to 2.5-inch (in.) bar mesh, a foamcore float line, and leadcore bottom lines. Varying numbers of nets were deployed, usually fished for 60 minutes or less, and retrieved each day. Non-target fishes were removed, identified, tallied, and immediately released. All paddlefish collected were placed in large aerated tanks for processing.

The EFL (in mm) of each fish was measured and a betadine-soaked Sonotronics ultrasonic tag (Model CT-82-3) having a 36- to 48-month operating life was inserted into the abdominal cavity through a 2.0- to 2.5-in.-long incision made near the ventral midline. A numbered internal anchor tag was inserted through a small vertical incision made on the lower left side of the body. Both incision areas were treated with Betadine. Each fish was placed in a livewell and observed for several minutes before release.

Followup detection trips were conducted yearly during the summer and fall months. A Sonotronics DH-2 directional hydrophone and USR-5W sonic receiver were used to detect sonic tagged fish. During each trip, the boat was stopped at about 0.3-mi intervals, the hydrophone was lowered into the water, and a minimum of two 360° sweeps were completed to detect tag signals in the 69-83 kilohertz (kHz) range used during the study. Once detected, the location of each fish was georeferenced with a Lowrance LCX-15MT global positioning system (GPS) unit when the

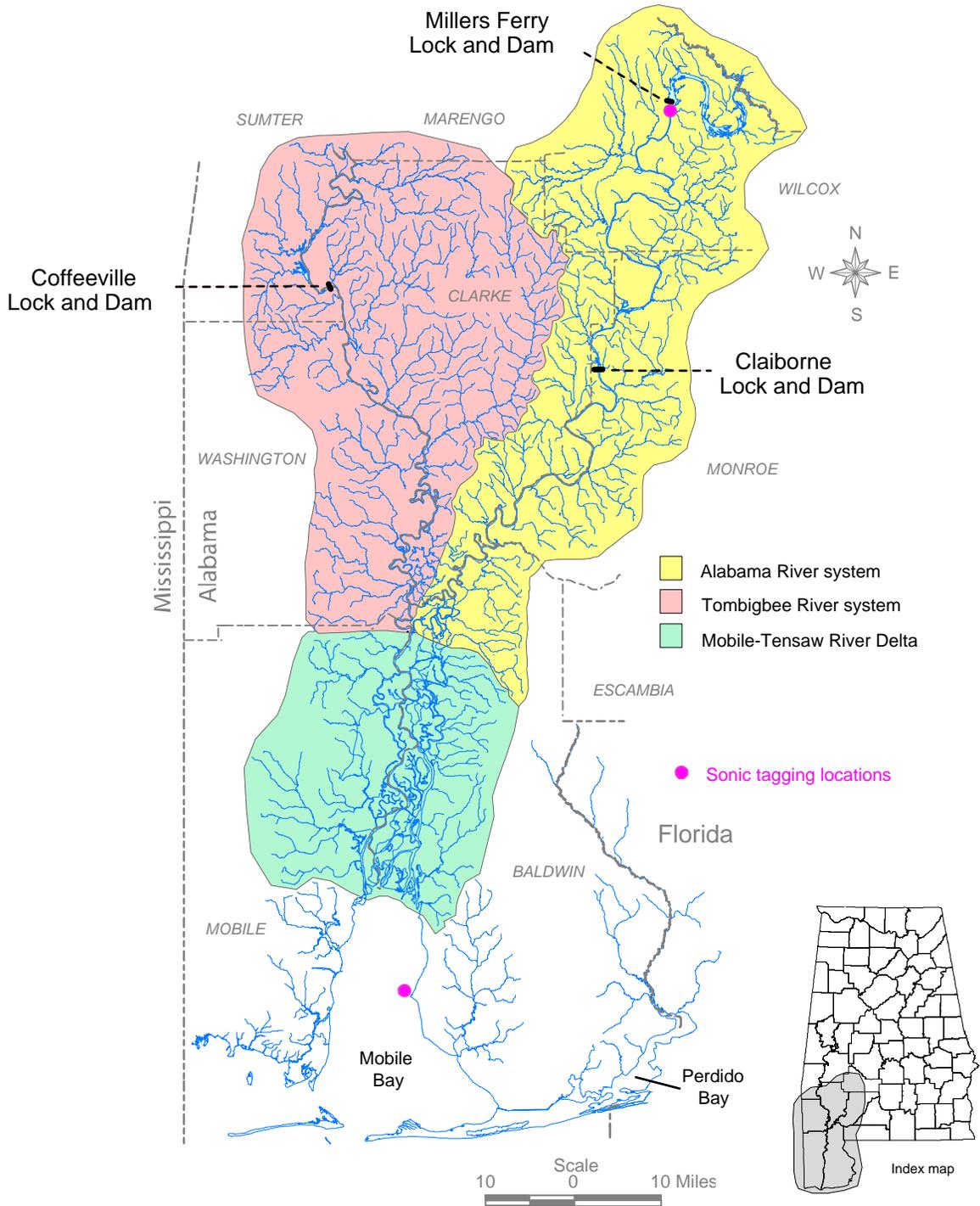


Figure 1. The study area.

sonic signal was equally audible in all directions. Detection data were recorded on field sheets that are archived in the GSA fish collection in Tuscaloosa. Figure 2 shows the major rivers and associated tributaries where fish were detected in the Mobile-Tensaw River Delta.

RESULTS AND DISCUSSION

Anchor tags were implanted in 341 paddlefish to assist the WFFD in their efforts to estimate paddlefish population size in the Alabama River. Collection dates, anchor tag numbers, and EFL data for individual fish are located in appendix A. Eye-to-fork lengths for anchor tagged fish ranged from 321 to 1080 mm (fig. 3). Hoxmeier and DeVries (1996) suggested that lower Alabama River paddlefish reached sexual maturity at around 650 mm EFL. Using this estimate, 25 of the 341 tagged fish were immature and 316 were mature.

Efforts to distinguish male from female paddlefish using rostral tubercles and body girth (Hoxmeier and DeVries 1996; Lein and DeVries, 1998) were usually inconclusive. To help resolve this problem, we consulted several paddlefish publications and state fish books, none of which provided reliable characteristics to consistently distinguish male from female paddlefish. We also contacted several biologists involved in paddlefish studies in other states, and most responded that external characteristics were not consistently reliable to distinguish males from females, even on gravid individuals. Based on these findings, gender was not recorded unless eggs or milt were observed during the handling or tagging process.

Ultrasonic tags were implanted in 103 paddlefish collected in the Alabama River from 2001-05 and 10 fish collected in Mobile Bay in 2006. The number of fish tagged per year varied from five in 2001 to 38 in 2004 (table 1). One hundred fish were detected 583 times during the study, from 1 to 677 days following release (appendix B) and from 1 to about 200 mi away from their release area. Thirteen fish were not detected. Field observations suggest some of these fish could have drowned after being caught on trotlines or in hoop nets.

We were pleased with the 89 percent detection rate, but we were disappointed by our inability to detect fish across the 36- to 48-month advertised battery life of the tags, even though several tracking trips were completed during each year of the study. Fifty-six fish were detected in one year, 41 were detected in two years, and only three fish were detected across three years. Three factors probably contributed to this observation. First, the expanded study, including main river channels, oxbow lakes, and larger tributaries, could not be thoroughly searched with existing project funds. Second, all of the tags placed in fish in 2003 stopped working in 2005

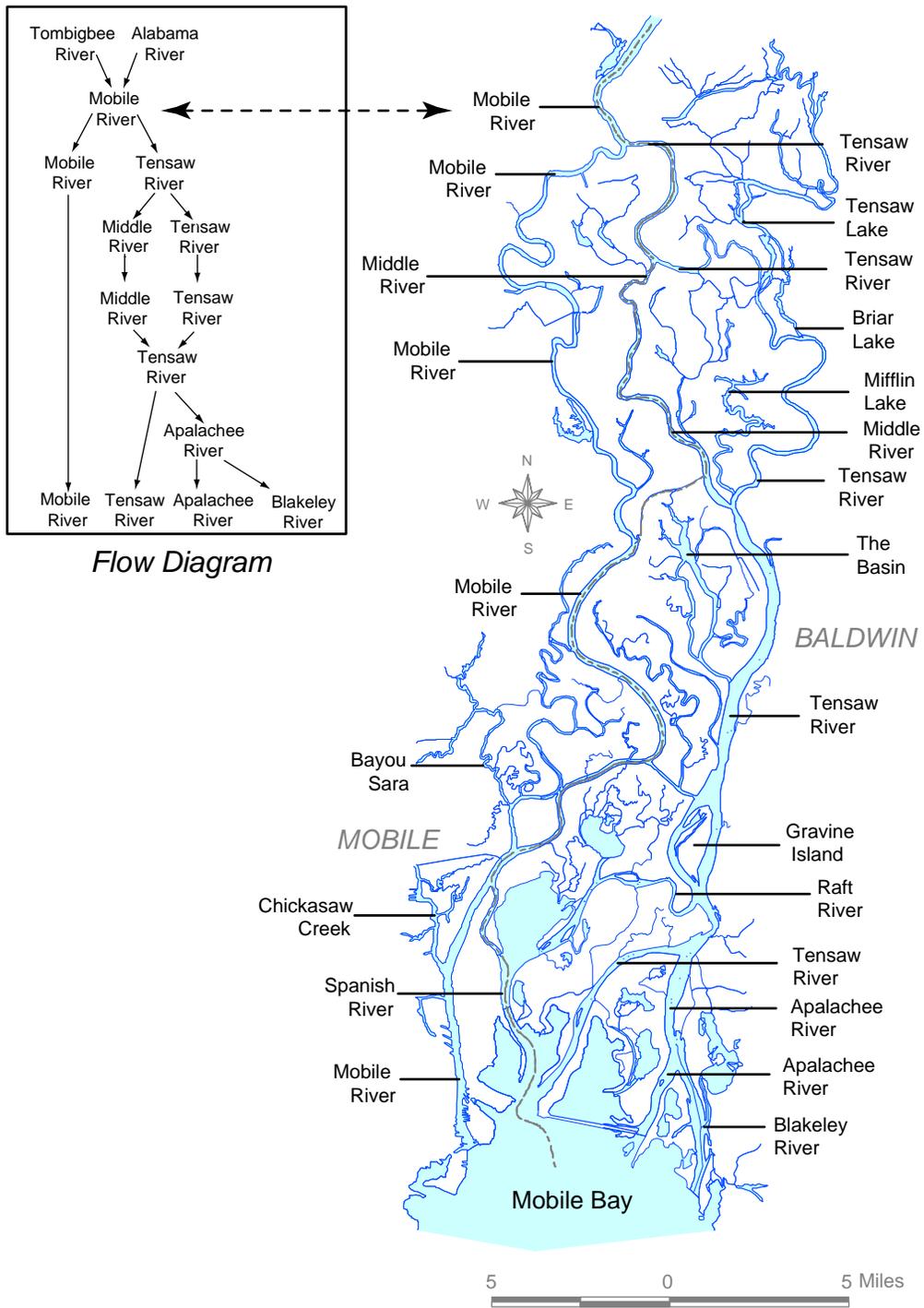


Figure 2. Geography of the Mobile-Tensaw River Delta.

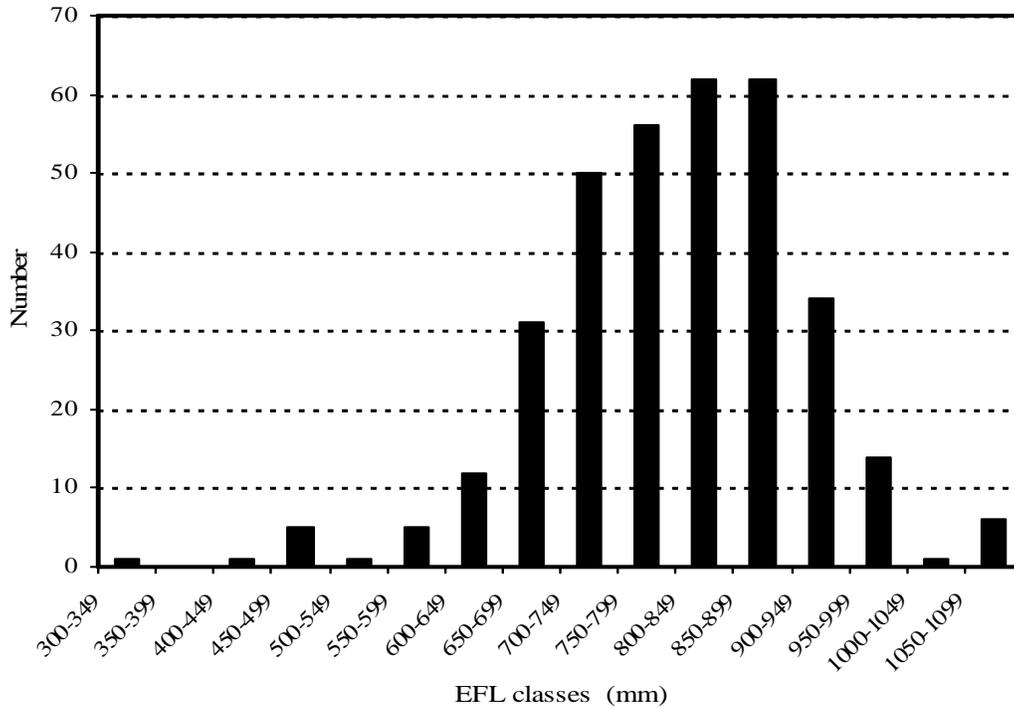


Figure 3. Eye to fork length (EFL) classes for 341 paddlefish anchor tagged in the Alabama River, 2002-05, and Mobile Bay, 2006.

Tag Year	No. of Fish Tagged	Detection Year						Tag Year	
		2001	2002	2003	2004	2005	2006	Detected	Not Detected
2001	5	2						2	3
2002	17		15	8	1 ¹			15	2
2003	24			17	13 ²			21 ³	3
2004	38				36	14	4 ⁴	36	2
2005	19					18	12	18	1
2006	10						8	8	2
Total	113	2	15	25	50	32	24	100	13

1 One fish tagged in 2002 was found in 2002 and 2004, but not in 2003.

2 Three fish tagged in 2003 were found in 2004, but not in 2003.

3. None of the fish tagged in 2003 were detected in 2005 because the supplier installed incorrect batteries.

4. One fish tagged in 2004 was found in 2004 and 2006, but not in 2005.

because the supplier installed the wrong batteries. Third, some fish simply eluded detection for one or more years. Sonic fish 3367 (76 kHz) (fig. 4), 3376 (78 kHz) (fig. 5), and 3445 (73 kHz) (fig. 6) were not detected in 2003, the first summer after they were released, but each was detected several times in 2004. Sonic fish 3498 (80kHz) was detected 2002 and 2004, but not in 2003 (fig. 7); and sonic fish 4556 (75 kHz) was detected in 2004 and 2006, but not in 2005 (fig. 8).

Sixty paddlefish released in Millers Ferry tailwater remained in the 60-mile-long section of the Alabama River between Millers Ferry Lock and Dam at ARM 133 and Claiborne Lock and Dam at ARM 73 (table 2). One fish moved upstream through Millers Ferry lock chamber and resided in Dannelly Reservoir for two years. A total of 31 fish moved downstream past Claiborne Lock and Dam. Fifteen fish resided in 20 mi of the Alabama River from Claiborne tailwater downstream to ARM 53. Two fish left the Alabama River and moved 52 to 56 mi upstream toward Coffeerville Lock and Dam in the Tombigbee River. Fourteen fish continued downstream past the Alabama and Tombigbee River junction and into the Tensaw River section of the Mobile-Tensaw River Delta. Seven of 10 fish tagged in Mobile Bay in 2006 moved upstream into the Tensaw River and several of its major tributaries. One fish continued into the Alabama River and was detected twice several miles upstream of Claiborne Lock and Dam.

Table 2. Major detection areas for 92 paddlefish sonic tagged in the Alabama River from 2001-05, and 8 fish sonic tagged in Mobile Bay in 2006.					
Tag Year	Dannelly Reservoir	Millers Ferry to Claiborne	ARM 73- 53	Tombigbee River	Mobile-Tensaw River Delta
2001		2			
2002		13	1		1
2003		12	5		4
2004	1	23	6	2	4
2005		11	2		5
2006		1			7
Total	1	61	15	2	21

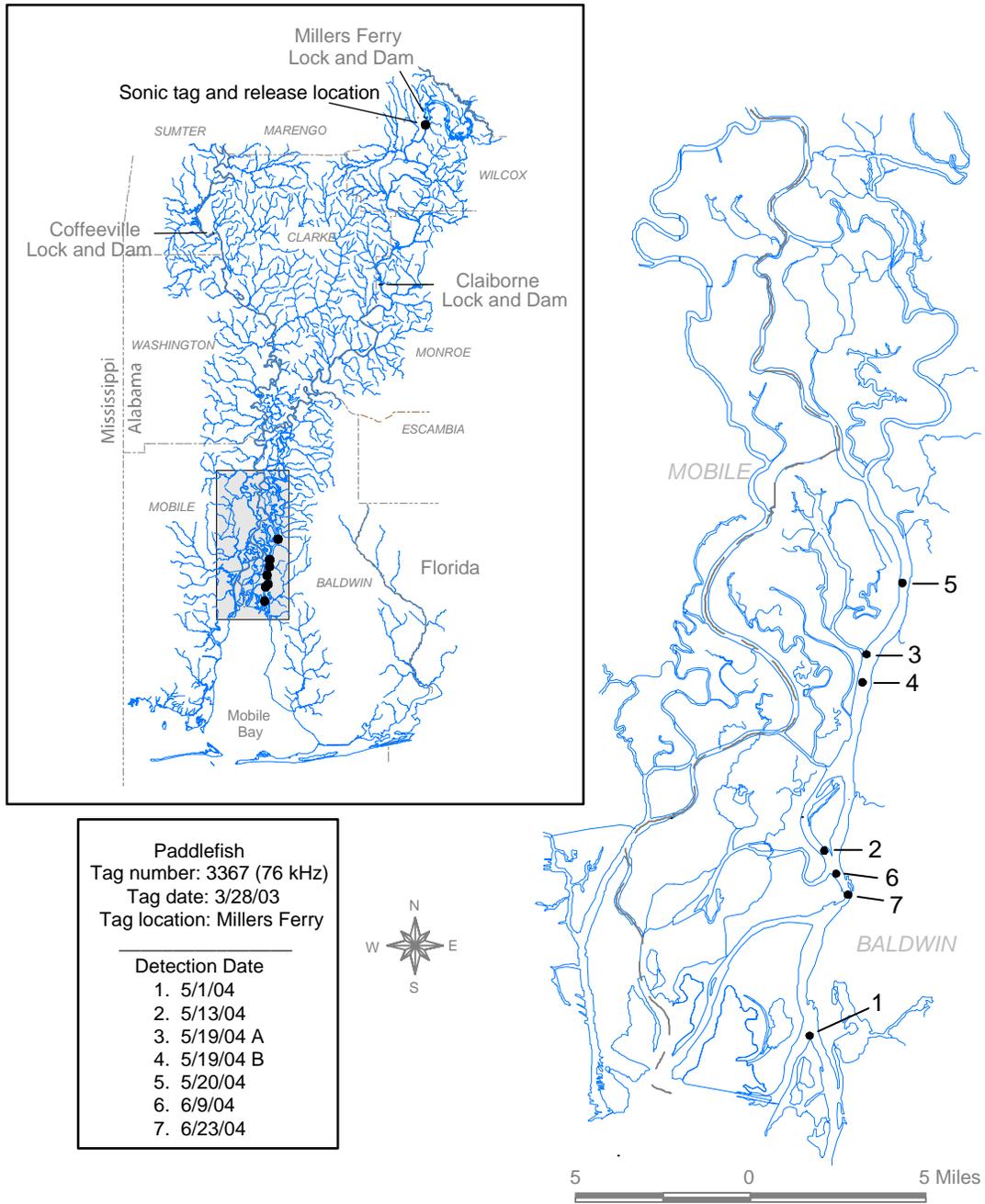


Figure 4. Detection locations for sonic paddlefish 3367 (76 kHz), 2003-04.

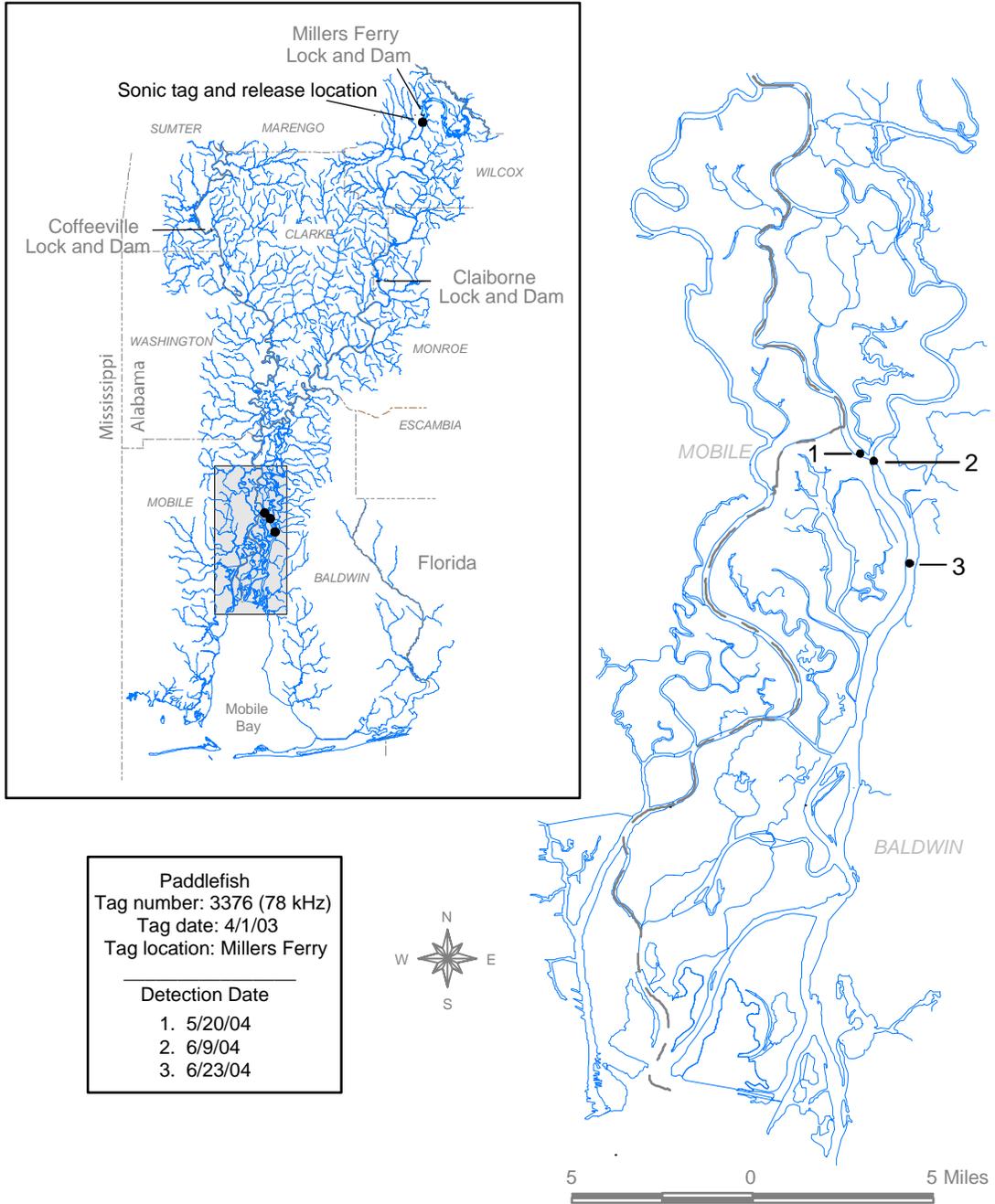


Figure 5. Detection locations for sonic paddlefish 3376 (78 kHz), 2003-04.

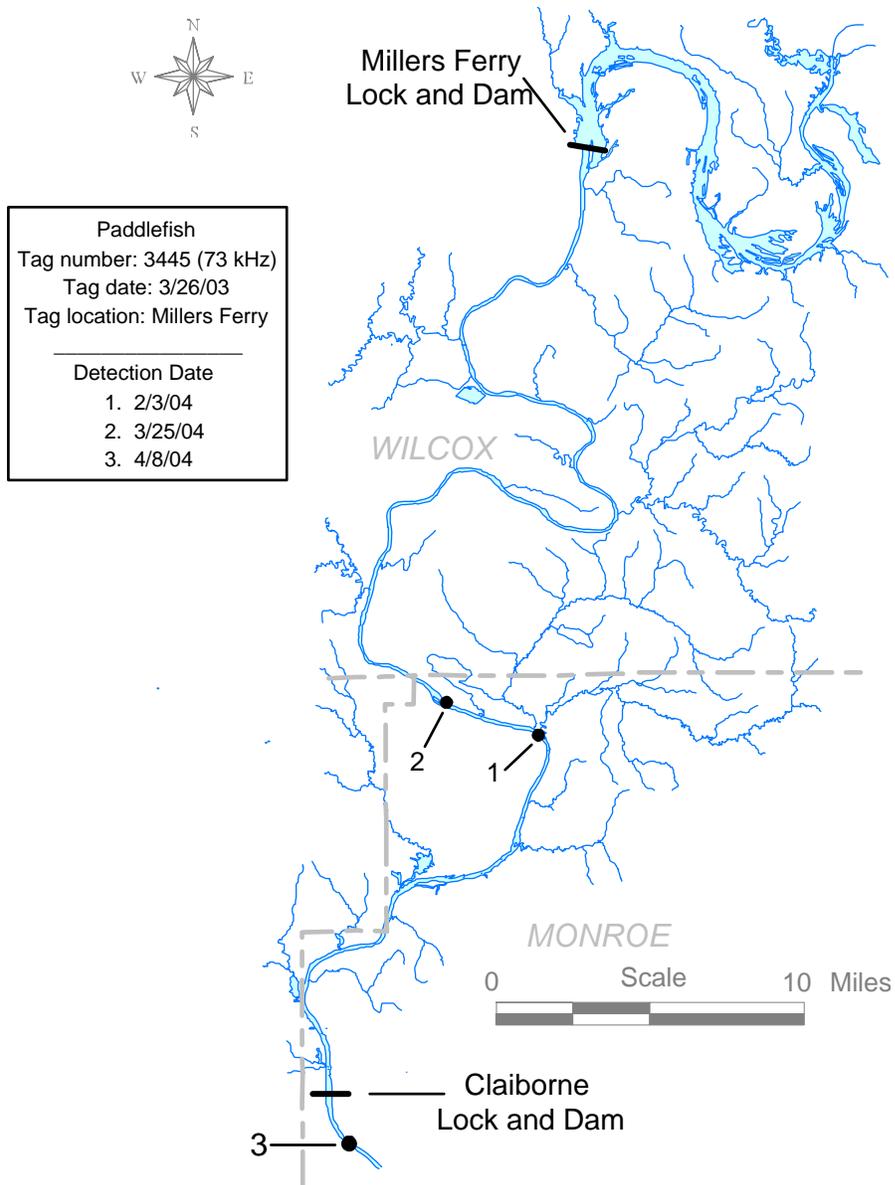


Figure 6. Detection locations for sonic paddlefish 3445 (73 kHz), 2003-04.

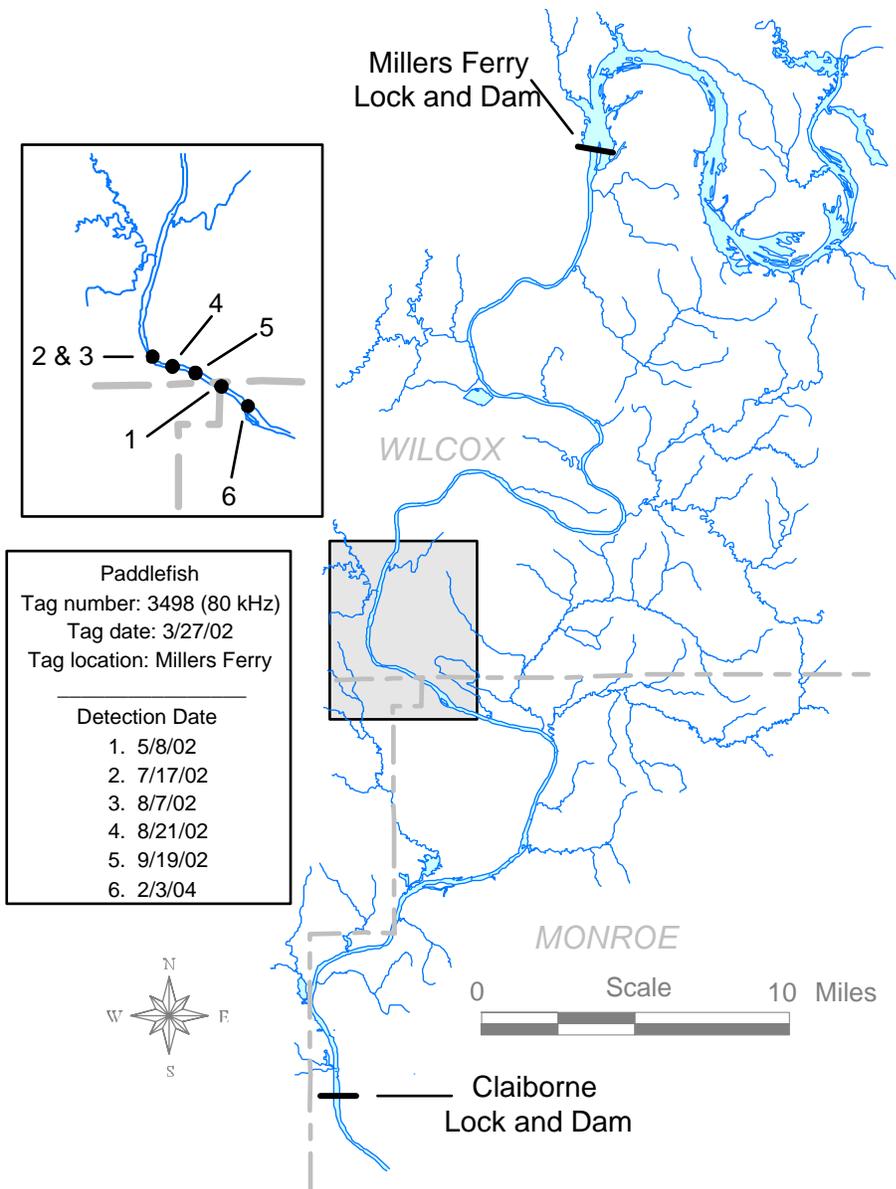


Figure 7. Detection locations for sonic paddlefish 3498 (80 kHz), 2002-04.

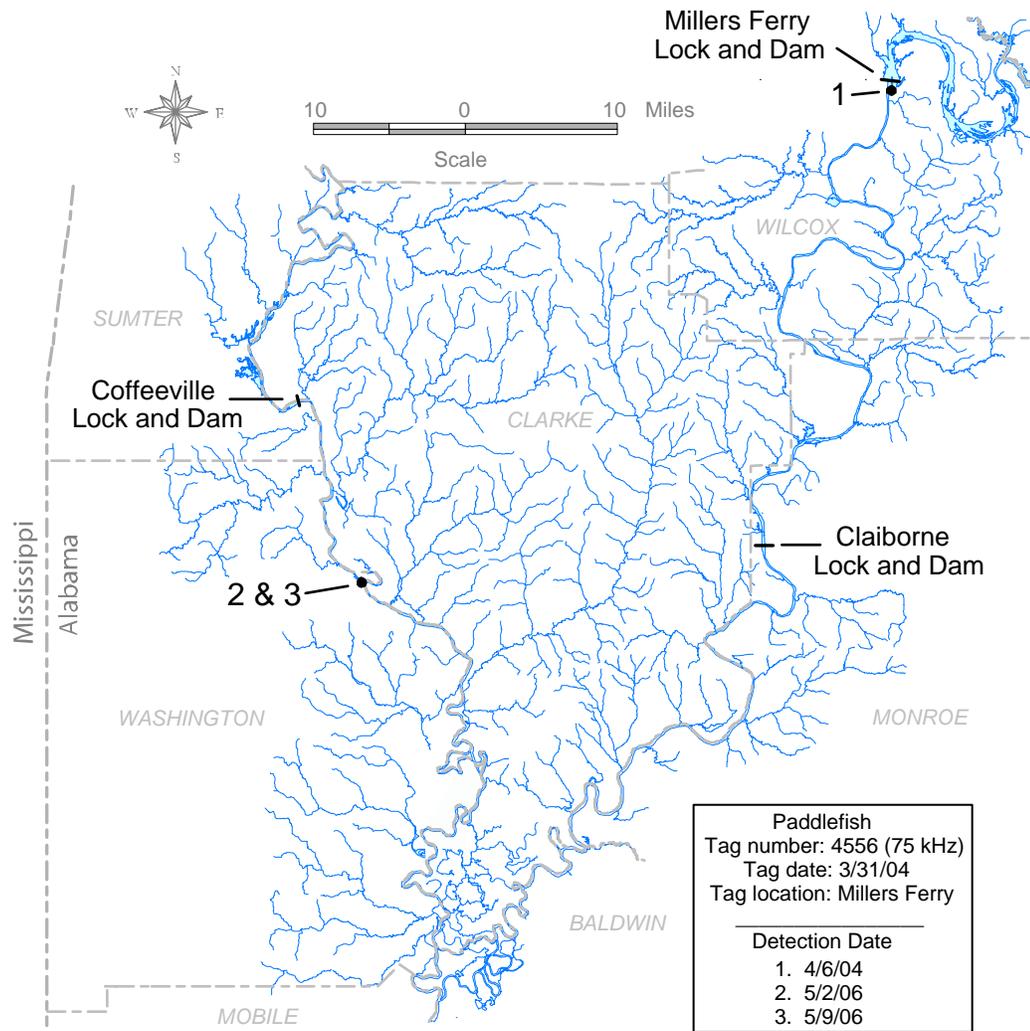


Figure 8. Detection locations for sonic paddlefish 4556 (75 kHz), 2004-06.

Paddlefish movements through lock chambers have not been well studied in the Mississippi River (Zigler and others, 2004) or in Alabama. One paddlefish moved through Millers Ferry lock chamber shortly after it was released in 2004. This is the first record of this behavior pattern in an Alabama river. Sonic fish 4475 (74 kHz) was tagged below Millers Ferry on March 23 and detected near the closed gated spillway below the dam on March 26 and March 30 (fig. 9). When rediscovered on June 14, it was moving upstream about 3 mi above Millers Ferry Lock and Dam. On June 30, it was located inside the upper end of the pool that supplies the Miller Ferry powerhouse. Within a few minutes, it swam upstream around the point that separates the powerhouse pool from the reservoir above the gated spillway and began moving downstream along the rip-rap toward the upper lock approach. It swam across the navigation channel in front of the upstream lock approach and then moved out into the reservoir above the gated spillway.

Tracking operations had to be suspended due to an impending lightning storm, but when relocated the next morning (July 1), the fish was swimming upstream about 4 mi above Miller Ferry Lock and Dam. A simple time and travel study determined its swimming speed was about 1 mi per hour (mph). Assuming paddlefish can maintain this or a slightly faster speed for several days, then fish living in the lower Alabama River or Mobile-Tensaw River Delta could easily move upstream to spawn in the Millers Ferry tailwater in a few days, provided they could navigate past Claiborne spillway during winter flooding.

Paddlefish movement between the Alabama and Tombigbee Rivers was unknown in Alabama until two fish tagged downstream of Millers Ferry Lock and Dam in 2004 were detected a few miles downstream of Coffeeville Lock and Dam in 2006. Sonic fish 4447 (71 kHz) was detected between Millers Ferry and Claiborne in 2004, downstream of Claiborne Lock and Dam in 2005, and near the mouth of Jackson Creek in the Tombigbee River in 2006 (fig. 10). This location is about 186 miles from Millers Ferry tailwater. Sonic fish 4556 (75 kHz) was detected once in 2004 and twice in 2006 (fig. 8). Both 2006 detections occurred in a long tortuous bend of the original Tombigbee River channel that was subsequently severed when the USCOE dredged a bypass canal to improve the inland waterway system. The immediate detection site was located upstream of Lock and Dam No. 1, which was completed in 1903 and is the first navigational lock and dam built in Alabama by the USCOE. This location is around 191 miles from Millers Ferry tailwater.

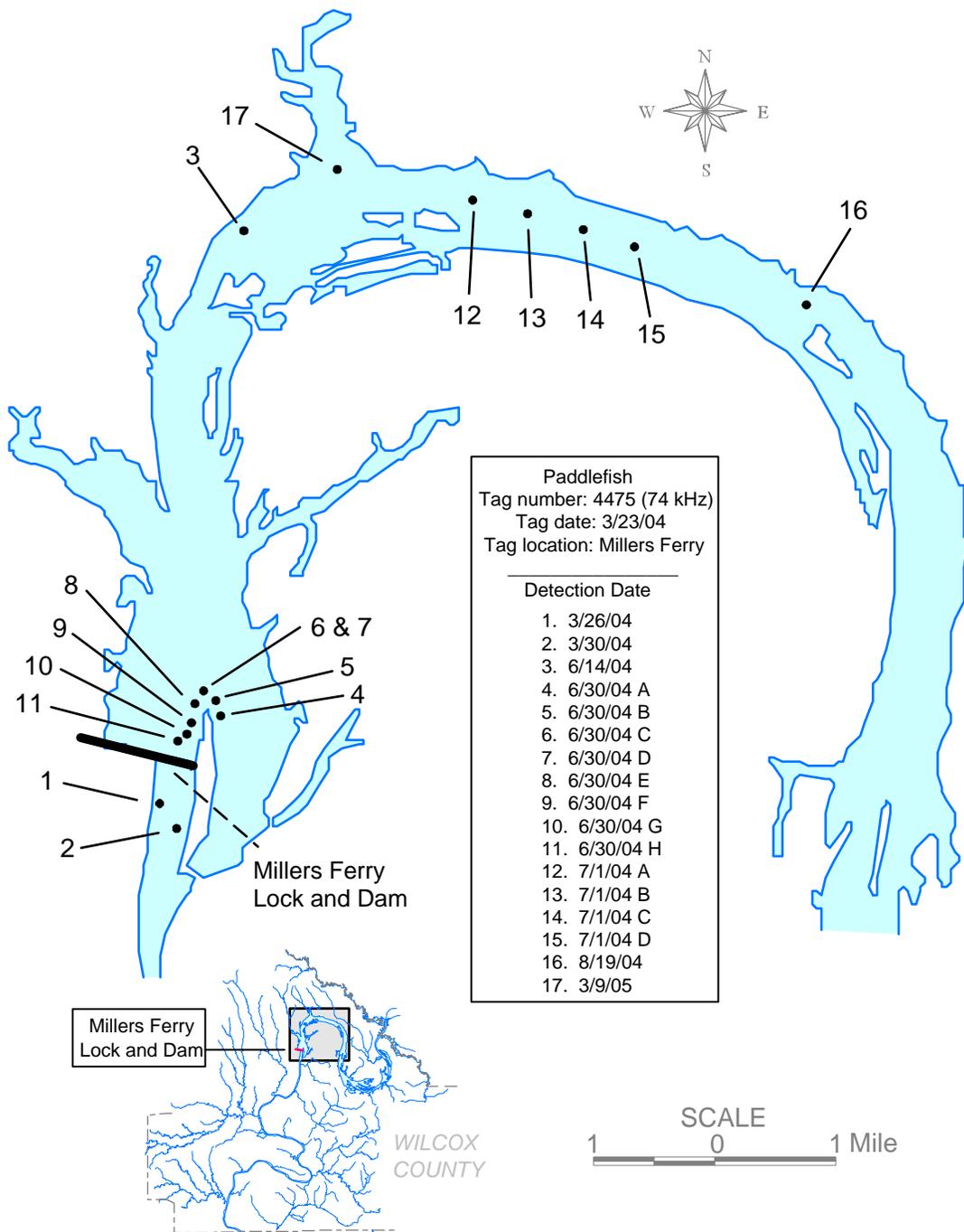


Figure 9. Detection locations for sonic paddlefish 4475 (74 kHz), 2004-05.

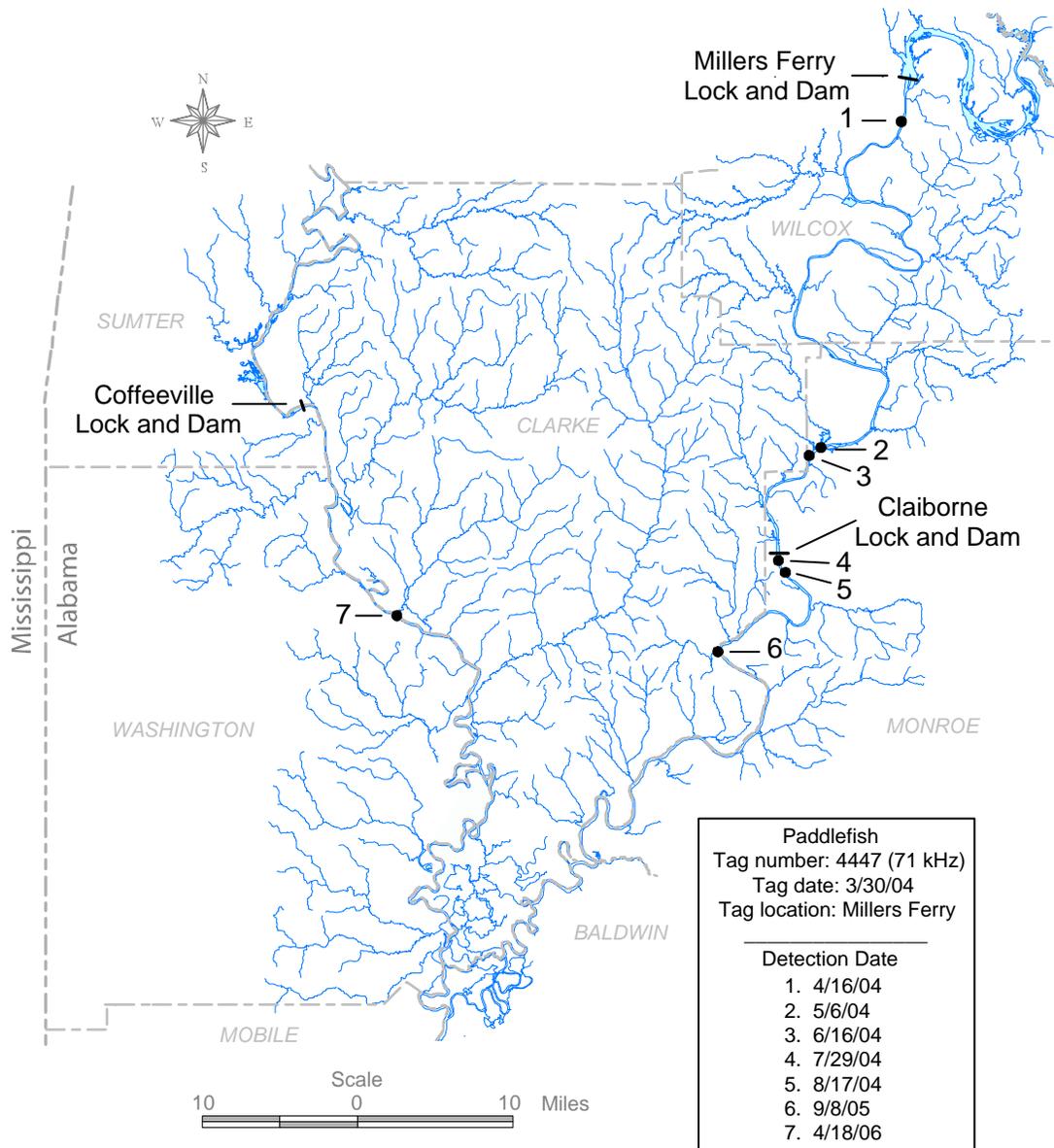


Figure 10. Detection locations for sonic paddlefish 4447 (71 kHz), 2004-06.

Nine fish exhibited spawning site fidelity (Hoxmeier and DeVries, 1996; Lein and DeVries, 1998) by returning to Millers Ferry tailwater in March following their release. Eight of these fish returned to almost the same section of river they occupied the previous summer. Sonic fish 4578 (78 kHz), 4675 (74 kHz), and 3364 (71 kHz) (figs. 11-13, respectively) inhabited essentially the same section of Claiborne Reservoir for two consecutive summers and returned to Millers Ferry. Sonic fish 4567 (77 kHz) was sonic tagged on March 31, 2004, and it remained between Millers Ferry and Claiborne Locks and Dams during its first summer following release. After returning to Millers Ferry in March 2005, it moved downstream to the Tensaw River (fig. 14).

Sonic fish 3336 (69 kHz) is an example of a fish that inhabited Claiborne tailwater for two consecutive summers and returned to within a few miles of Millers Ferry tailwater during the intervening spring (fig. 15). Sonic fish 4458 (74 kHz) remained in Claiborne tailwater its first summer (fig. 16) and then it returned to Millers Ferry tailwater the following spring. Instead of moving back to Claiborne tailwater, it continued downstream to the Tensaw River during its second summer.

Six fish moved directly into the Tensaw River within a matter of weeks after they were released below Millers Ferry Lock and Dam. Sonic fish 4688 (74 kHz) left Millers Ferry tailwater in early to mid-April 2004. It was detected in the Tensaw River, near the mouth of Dennis Lake, on November 15, 2004 (fig. 17). When last detected on June 23, 2005, it was near the mouth of Blakeley River which drains directly into the upper end of Mobile Bay. Sonic fish 344 (71 kHz) moved from Millers Ferry tailwater downstream to the Middle-Tensaw River junction, a distance of around 190 miles, in less than two months (fig. 18). Sonic fish 4568 (77 kHz) remained near Millers Ferry Lock and Dam for over three weeks before it moved downstream into The Basin, a major tributary to the western side of the Tensaw River (fig. 19). This fish apparently left The Basin in November 2004, and although we never detected it elsewhere in the Tensaw River, it re-appeared in The Basin in May 2005. Sonic fish 5567 (74 kHz) was detected near the mouth of Beaver Creek (fig. 20) within a few days following its release, and then it disappeared until we rediscovered it near the south end of Gravine Island. When last detected, this fish had moved several miles upstream to near Cliff's Boat Landing. Sonic fish 5568 (75 kHz) reached ARM 109 two weeks after its release, and then it disappeared until we detected it about 2 mi downstream of Squirrel Bayou in Mifflin Lake (fig. 21).

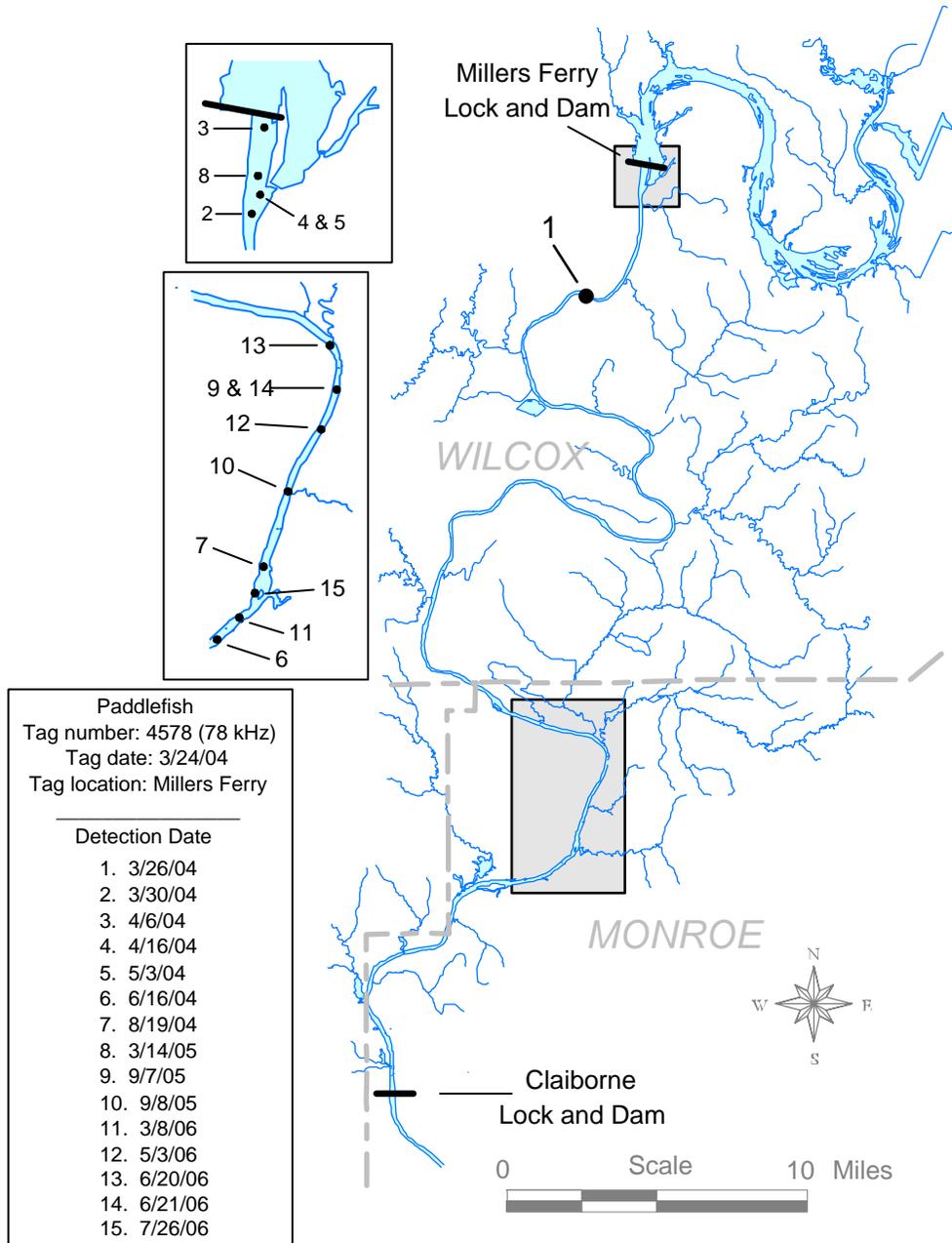


Figure 11. Detection locations for sonic paddlefish 4578 (78 kHz), 2004-06.

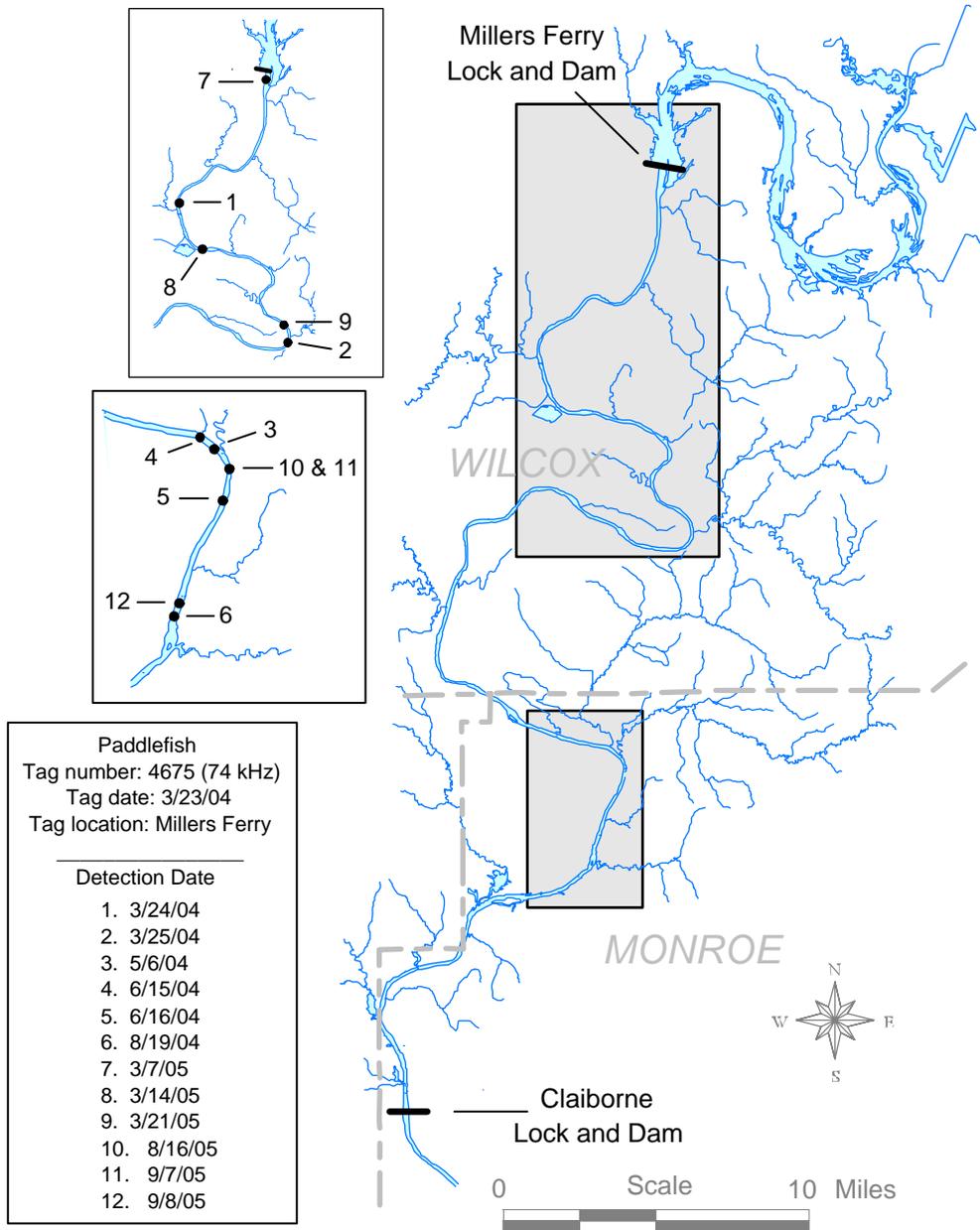


Figure 12. Detection locations for sonic paddlefish 4675 (74 kHz), 2004-05.

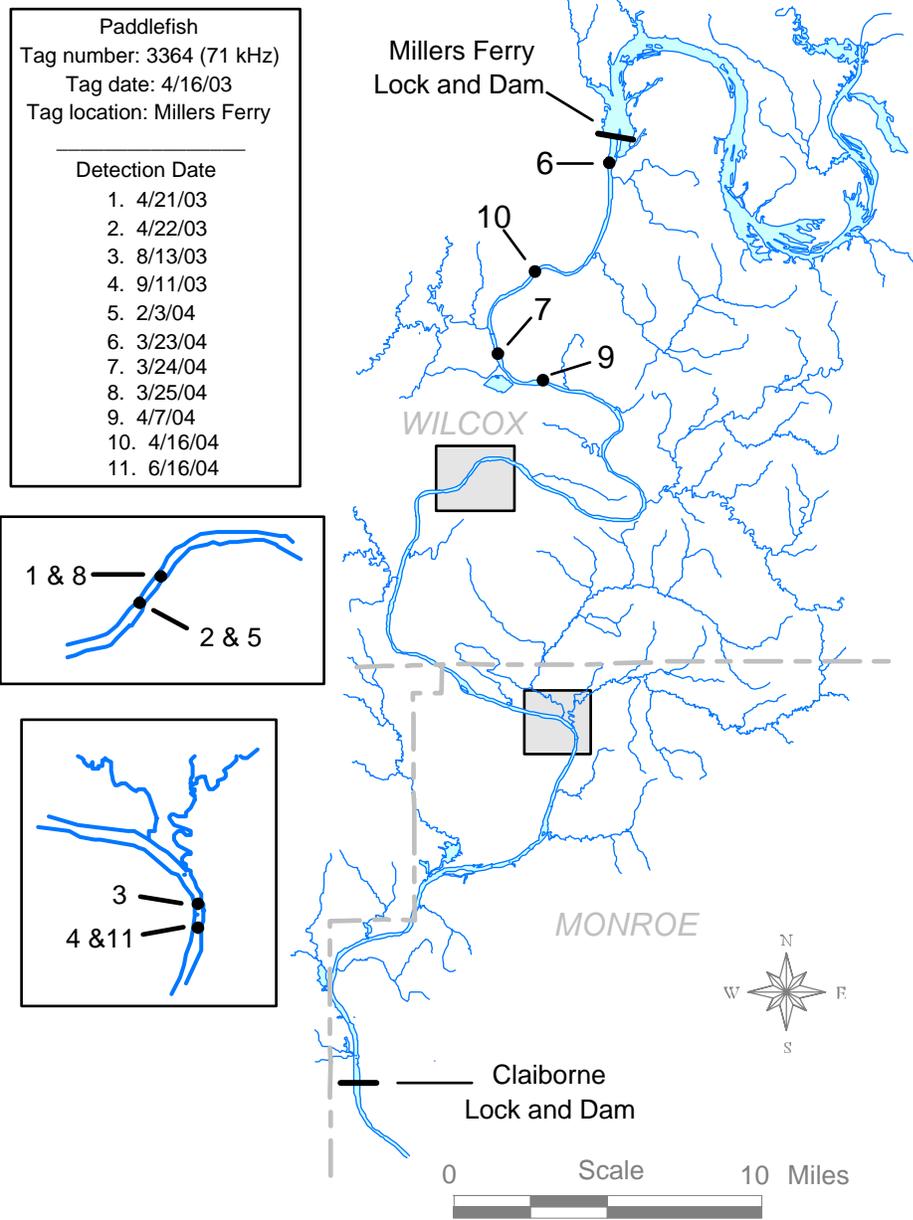


Figure 13. Detection locations for sonic paddlefish 3364 (71 kHz), 2003-04.

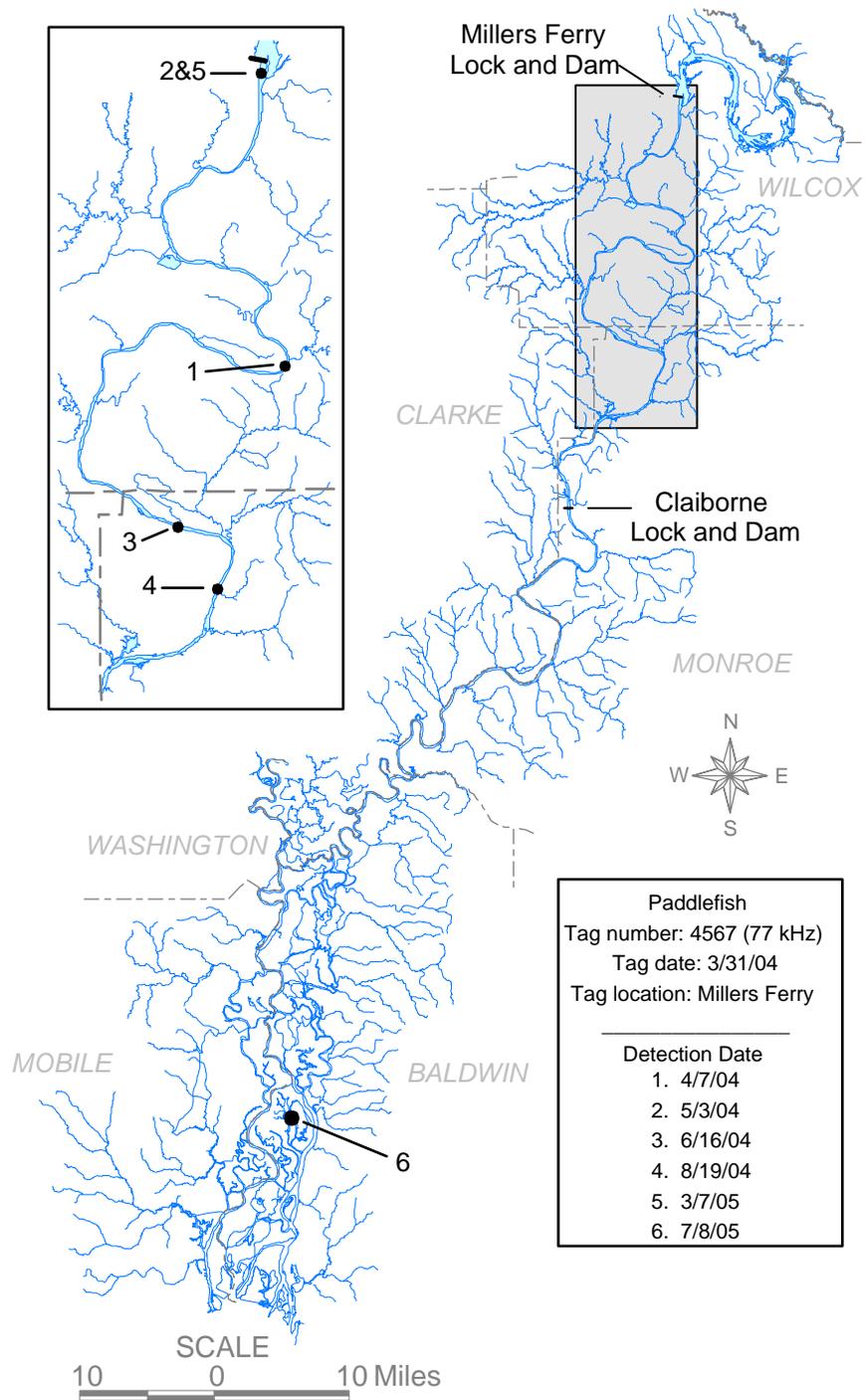


Figure 14. Detection locations for sonic paddlefish 4567 (77 kHz), 2004-05.

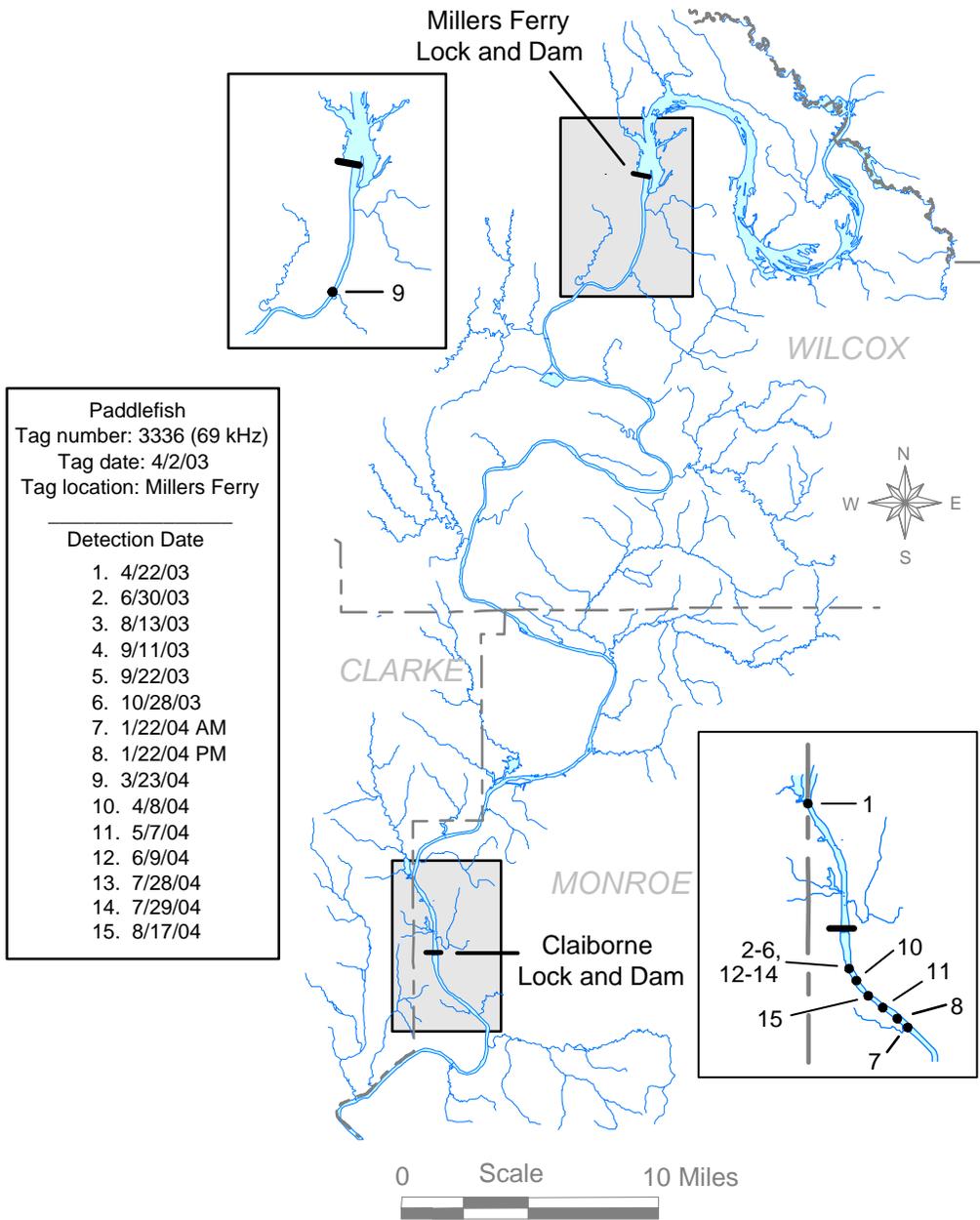


Figure 15. Detection locations for sonic paddlefish 3336 (69 kHz), 2003-04.

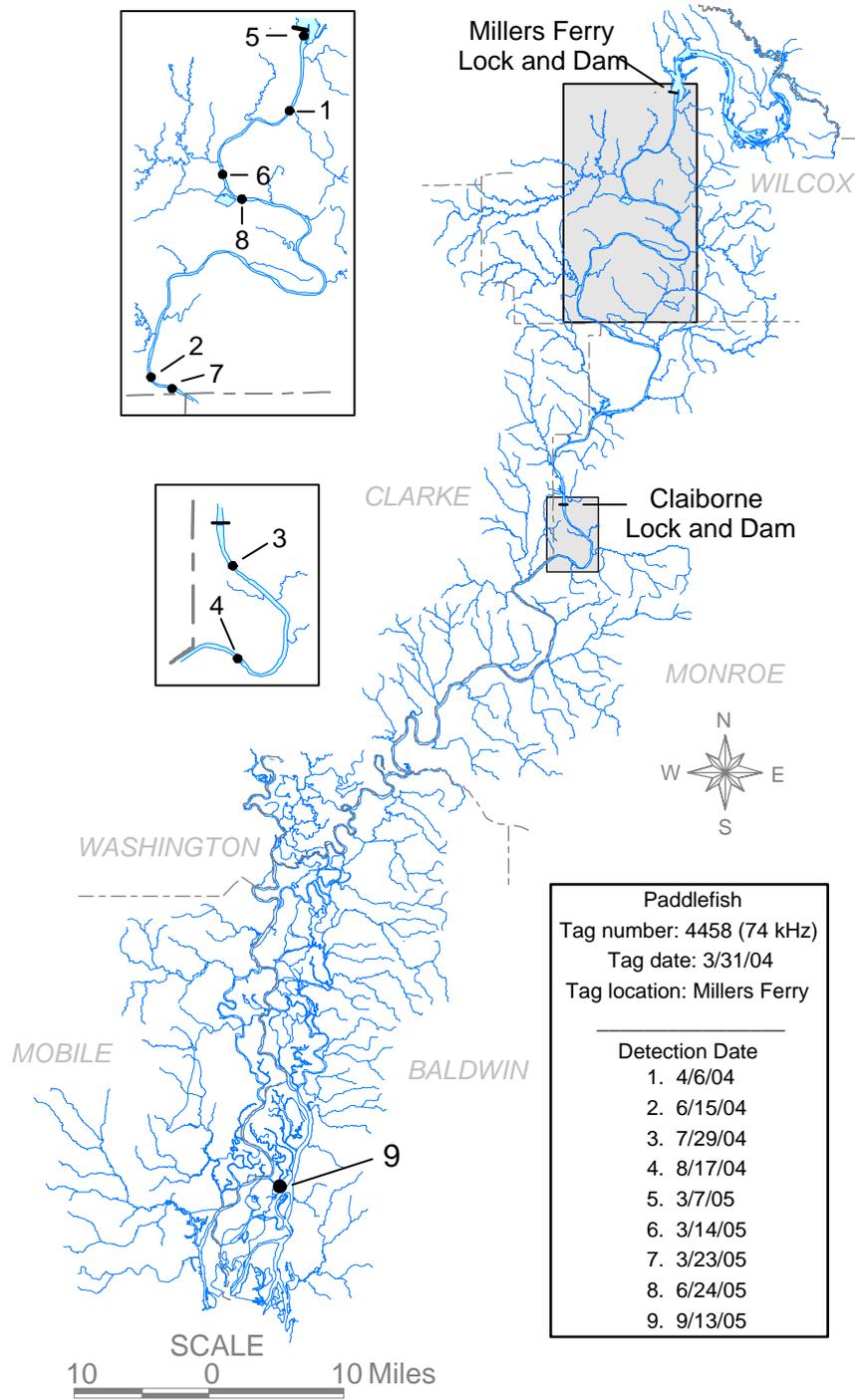


Figure 16. Detection locations for sonic paddlefish 4458 (74 kHz), 2004-05.

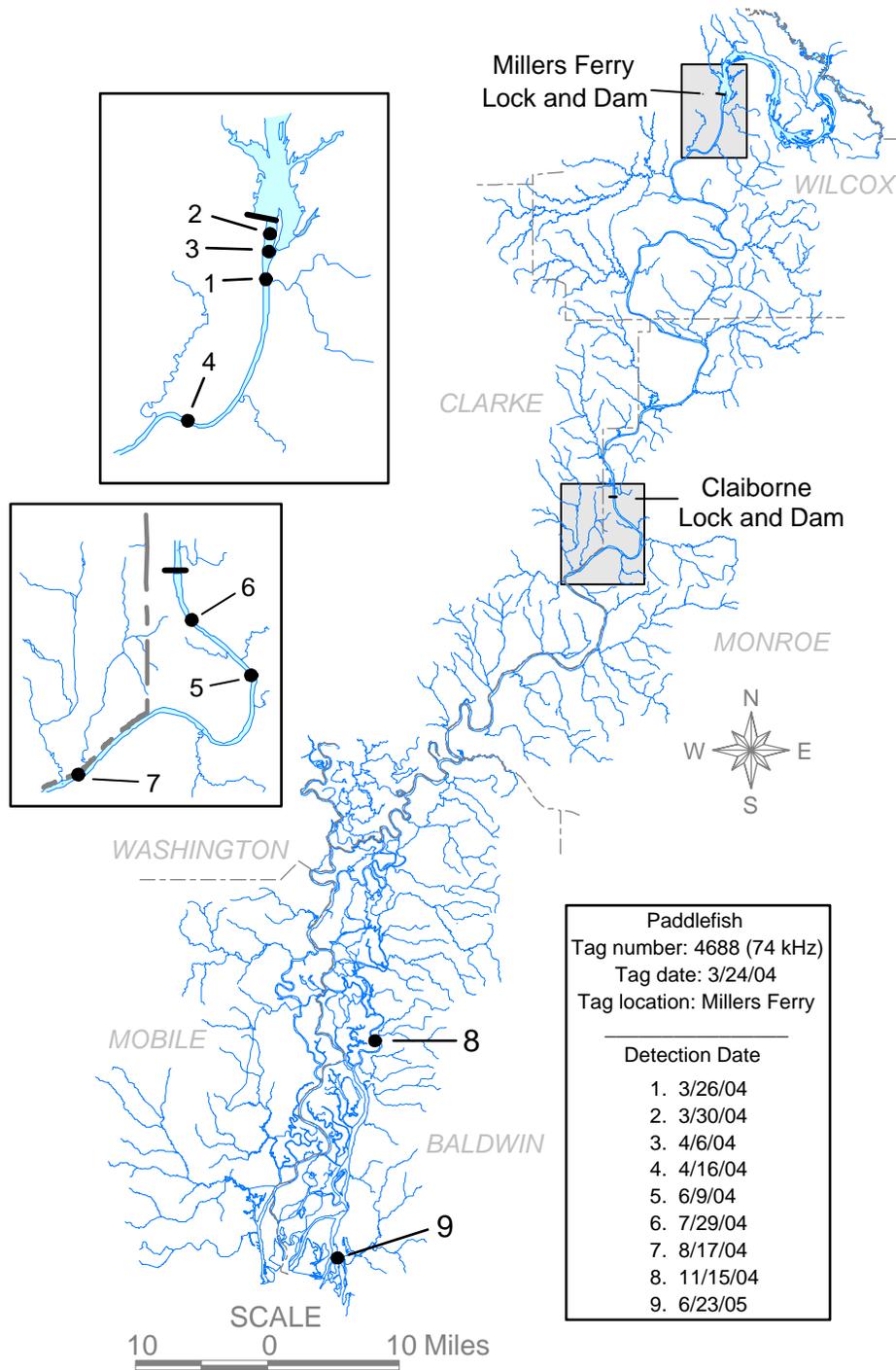


Figure 17. Detection locations for sonic paddlefish 4688 (74 kHz), 2004-05.

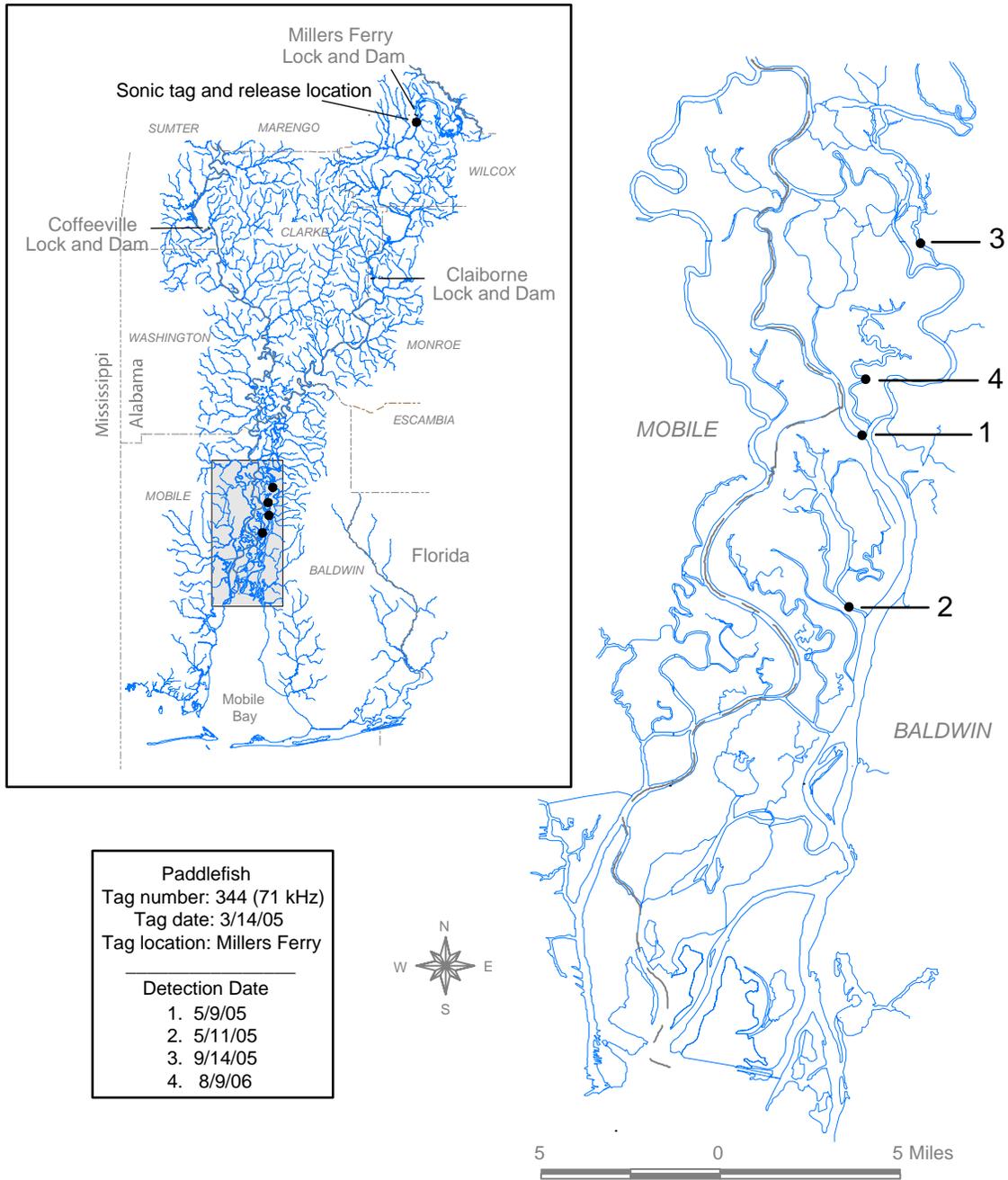


Figure 18. Detection locations for sonic paddlefish 344 (71 kHz), 2005-06.

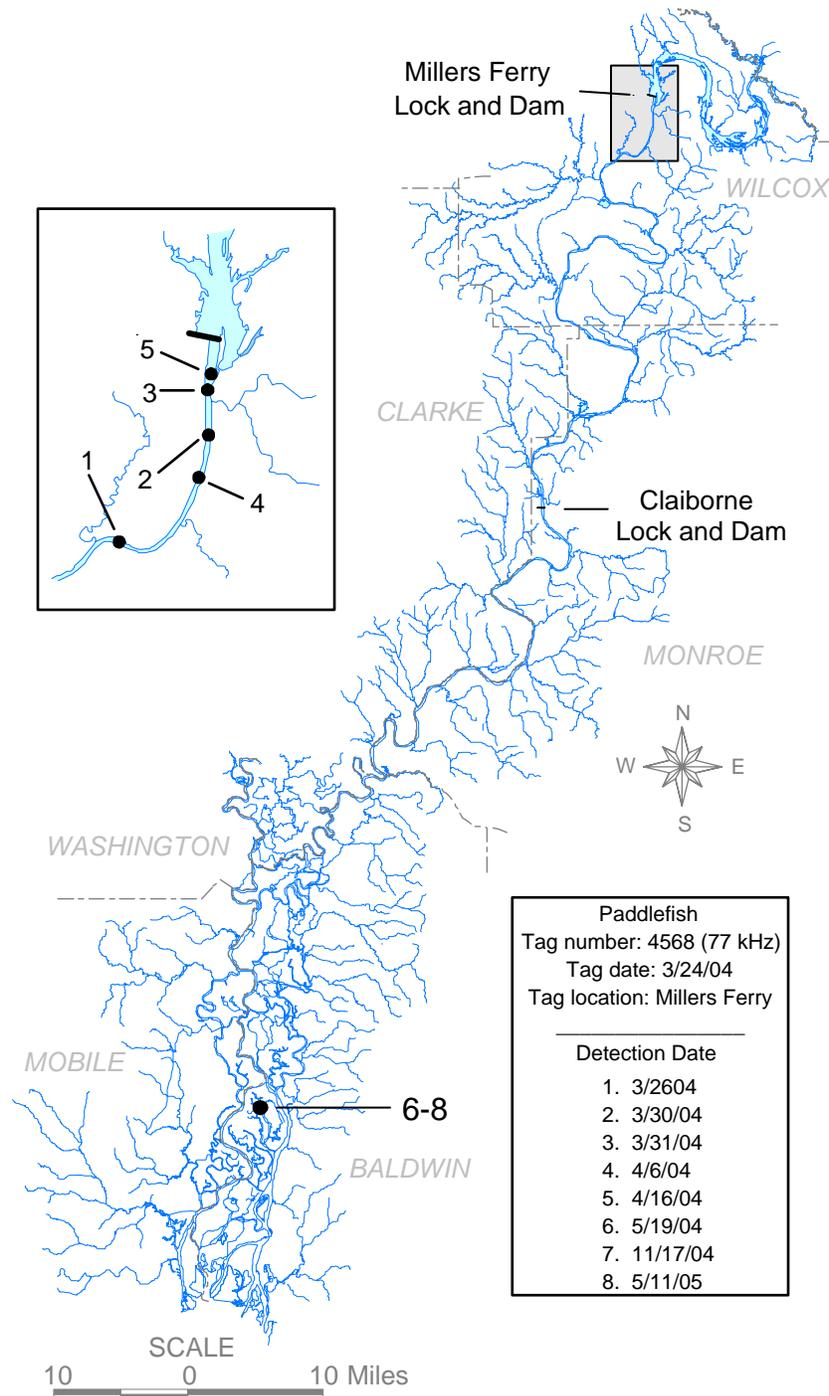


Figure 19. Detection locations for sonic paddlefish 4568 (77 kHz), 2004-05.

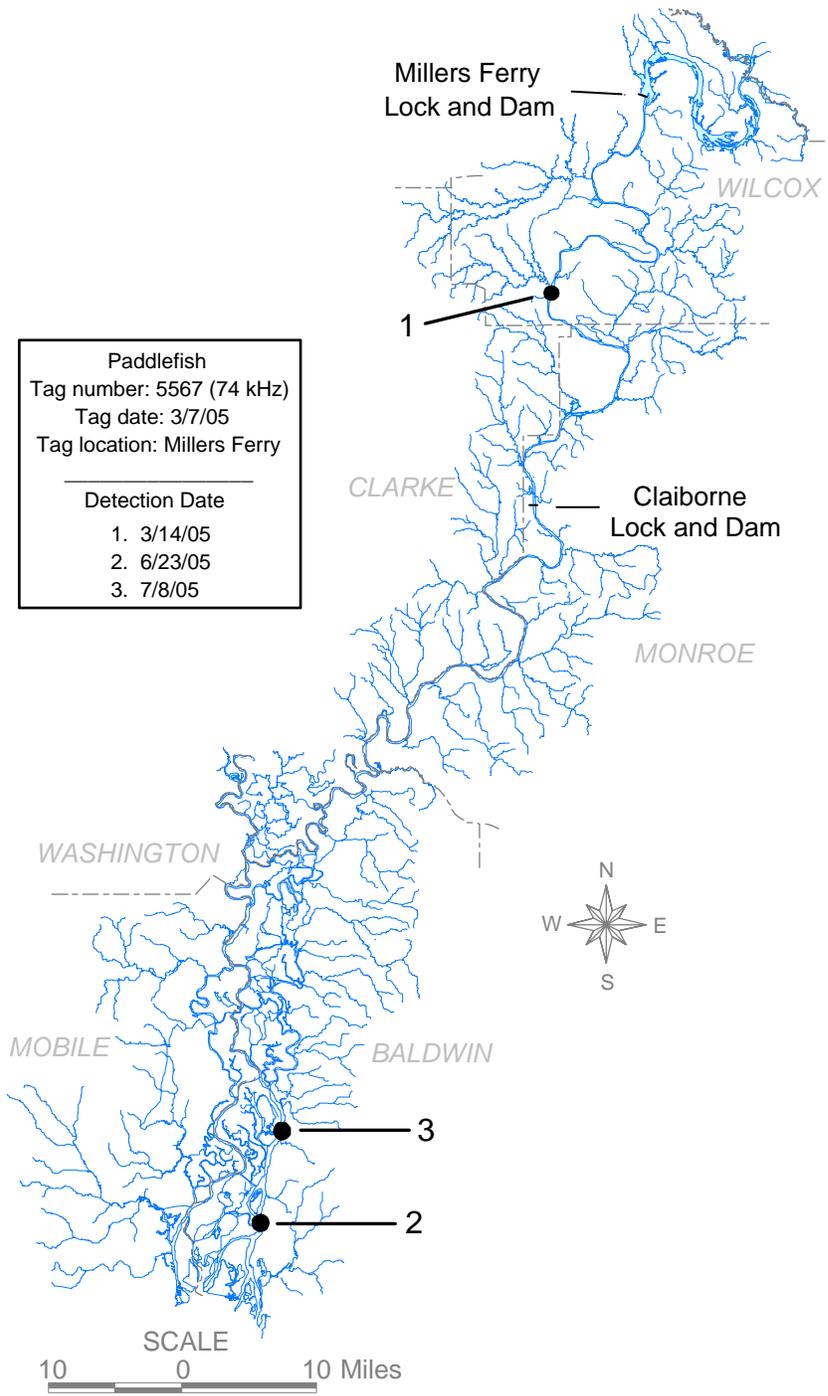


Figure 20. Detection locations for sonic paddlefish 5567 (74 kHz), 2005.

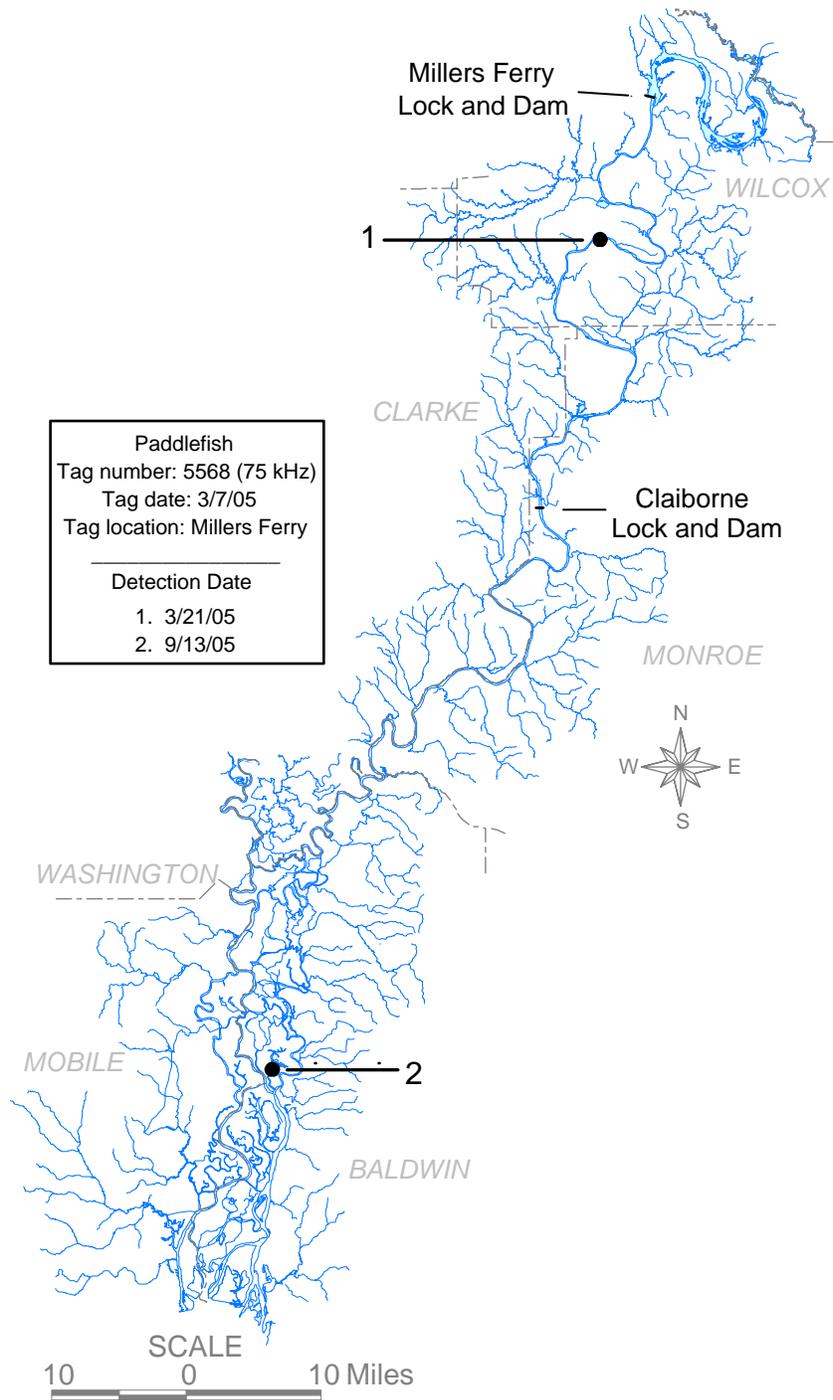


Figure 21. Detection locations for sonic paddlefish 5568 (75 kHz), 2005.

Sonic fish 5566 (73 kHz) remained below Millers Ferry Lock and Dam two weeks after its release, but it subsequently disappeared. We found this fish again in June and July 2005, near Cloverleaf Landing in the Tensaw River (fig. 22).

Study results suggest that the Tensaw River section of the Mobile-Tensaw River Delta is an important summer habitat for paddlefish that spawn below Millers Ferry Lock and Dam and overwinter in Mobile Bay. Thirteen paddlefish released in Millers Ferry tailwater from 2003-05 were detected 36 times in the Tensaw, Raft, and lower Tensaw Rivers, Tensaw and Mifflin Lakes, and The Basin (fig. 23). Seven of 10 paddlefish that were released in Mobile Bay in 2006 were detected 24 times in Tensaw River and its major tributaries. Instead of remaining in the Tensaw River, sonic fish 345 (71 kHz) moved into the Alabama River, where it was discovered upstream of Claiborne Lock and Dam on two separate occasions (fig,24).

Sonic fish 555 (70 kHz) is the only fish that spent two consecutive summers in the Tensaw River and returned to Millers Ferry tailwater during the intervening spring. This fish was released below Millers Ferry on March 14, 2005, and we detected it in the lower Tensaw River from June through September of the same year (fig. 25). It returned to Claiborne Reservoir and was detected near U.S. Highway 10, which is about 16 miles downstream of Millers Ferry Lock and Dam and 44 miles upstream of Claiborne Lock and Dam, on March 7, 2006. The only way this fish could have moved upstream past Claiborne Lock and Dam was to swim over the crested spillway from March 1-3, when upper and lower pool water levels were essentially equal for the first time in 2006. The only other option to move past Claiborne is to move through the lock chamber. This possibility seems remote since commercial and recreational use of Alabama River lock chambers, particularly during winter months, has declined to near zero in the last 10 years.

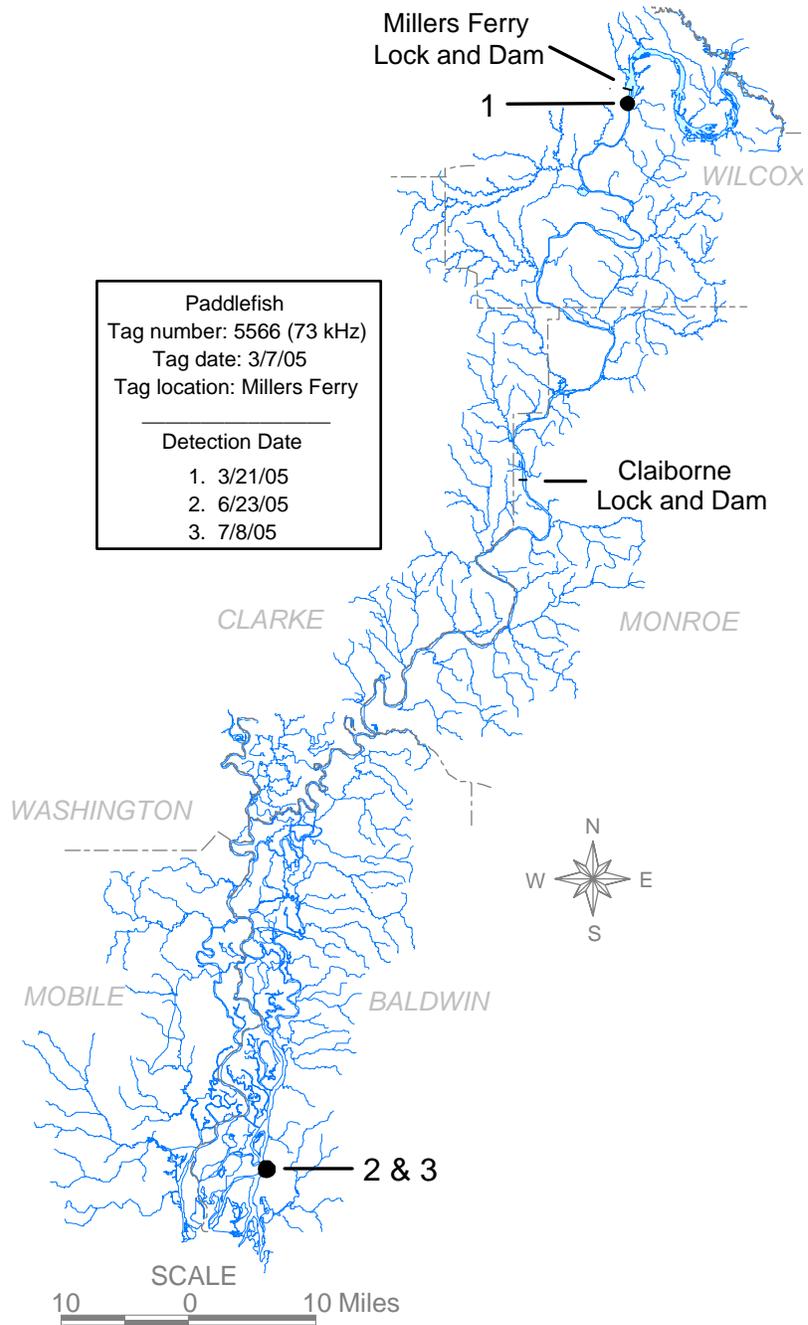


Figure 22. Detection locations for sonic paddlefish 5566 (73 kHz), 2005.

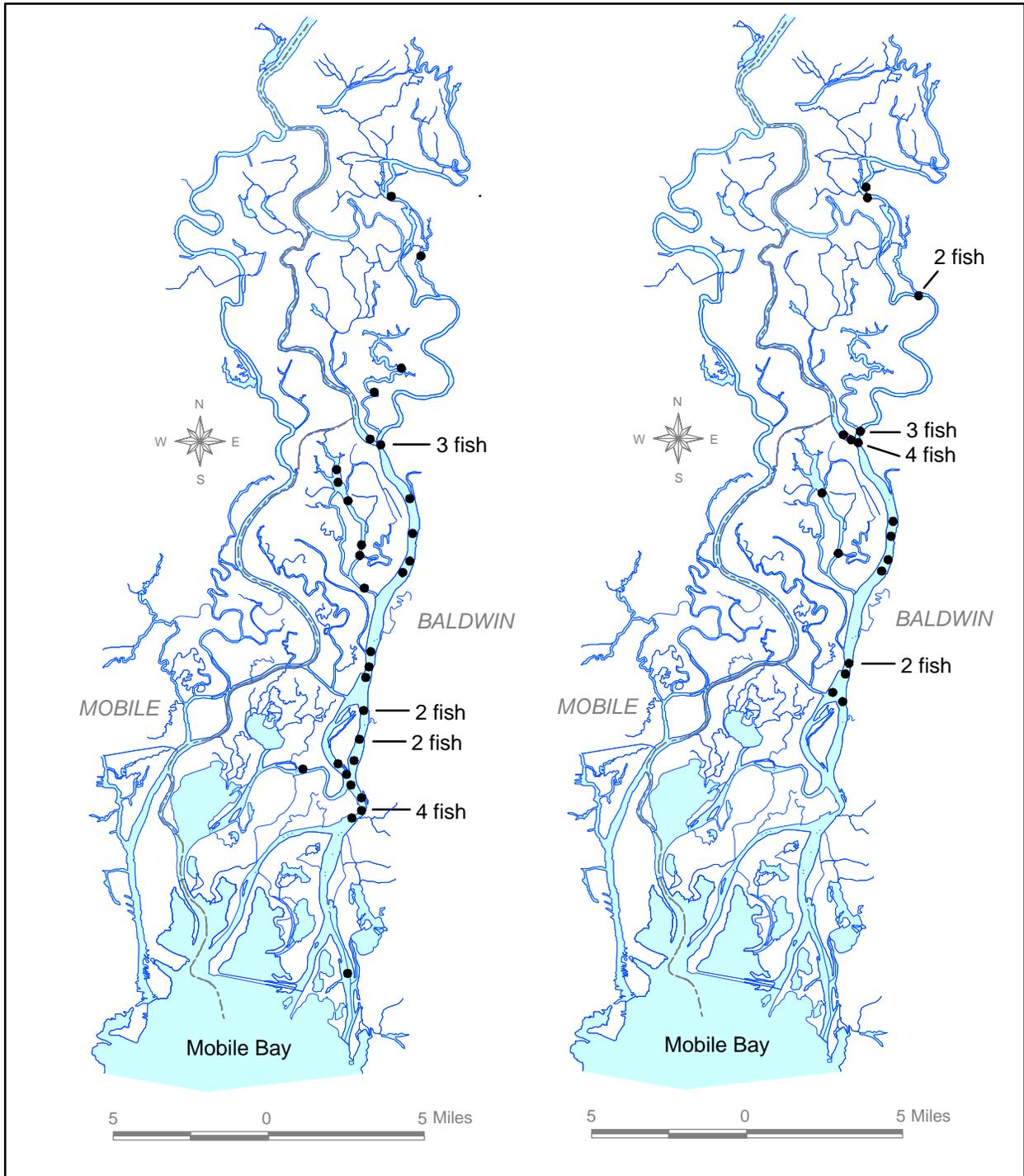


Figure 23. Mobile-Tensaw River Delta detection locations for 14 paddlefish sonic tagged below Millers Ferry Lock and Dam from 2003-05 (left), and 7 paddlefish sonic tagged in Mobile Bay in 2006 (right).

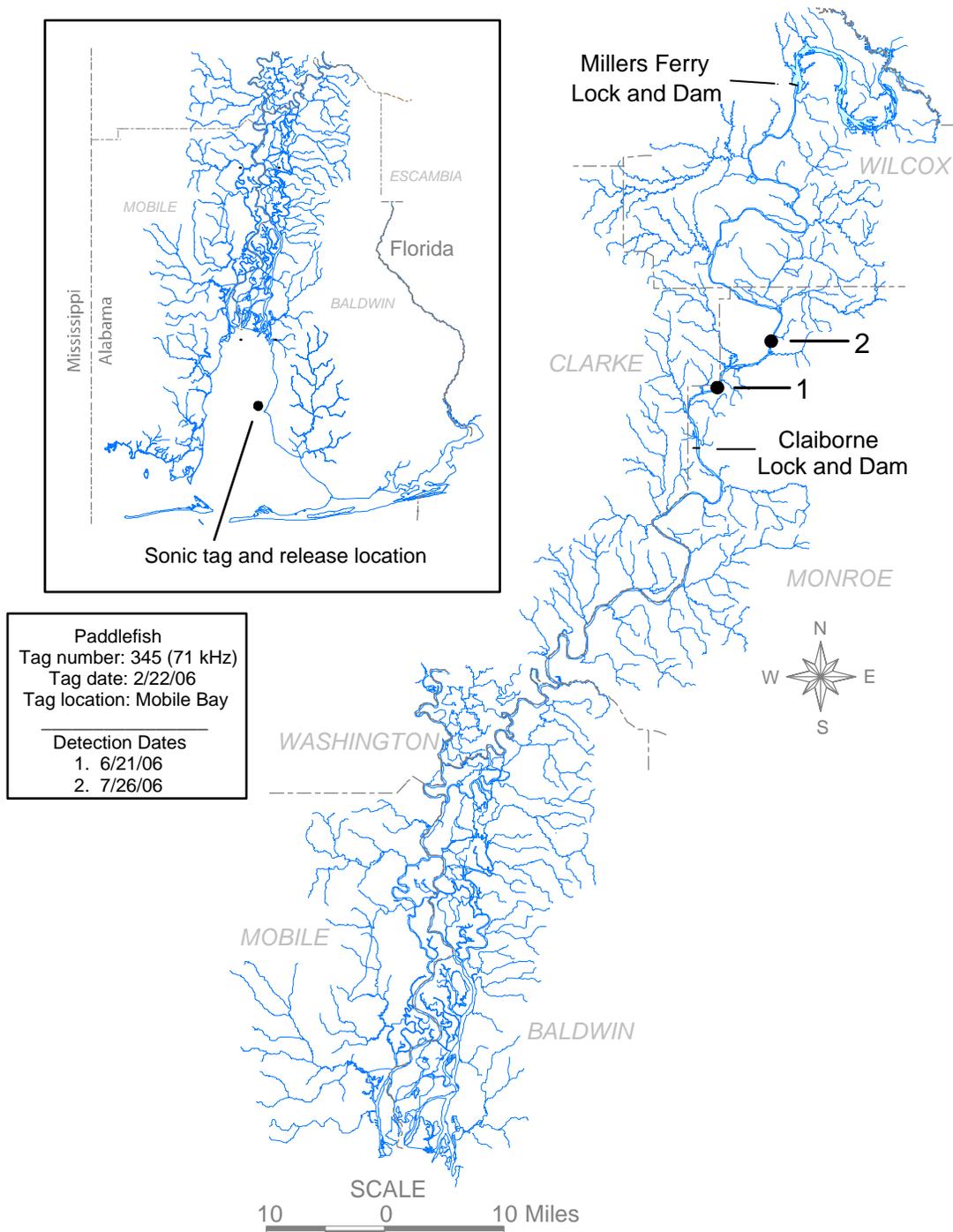


Figure 24. Detection locations for sonic paddlefish 345 (71 kHz), 2006.

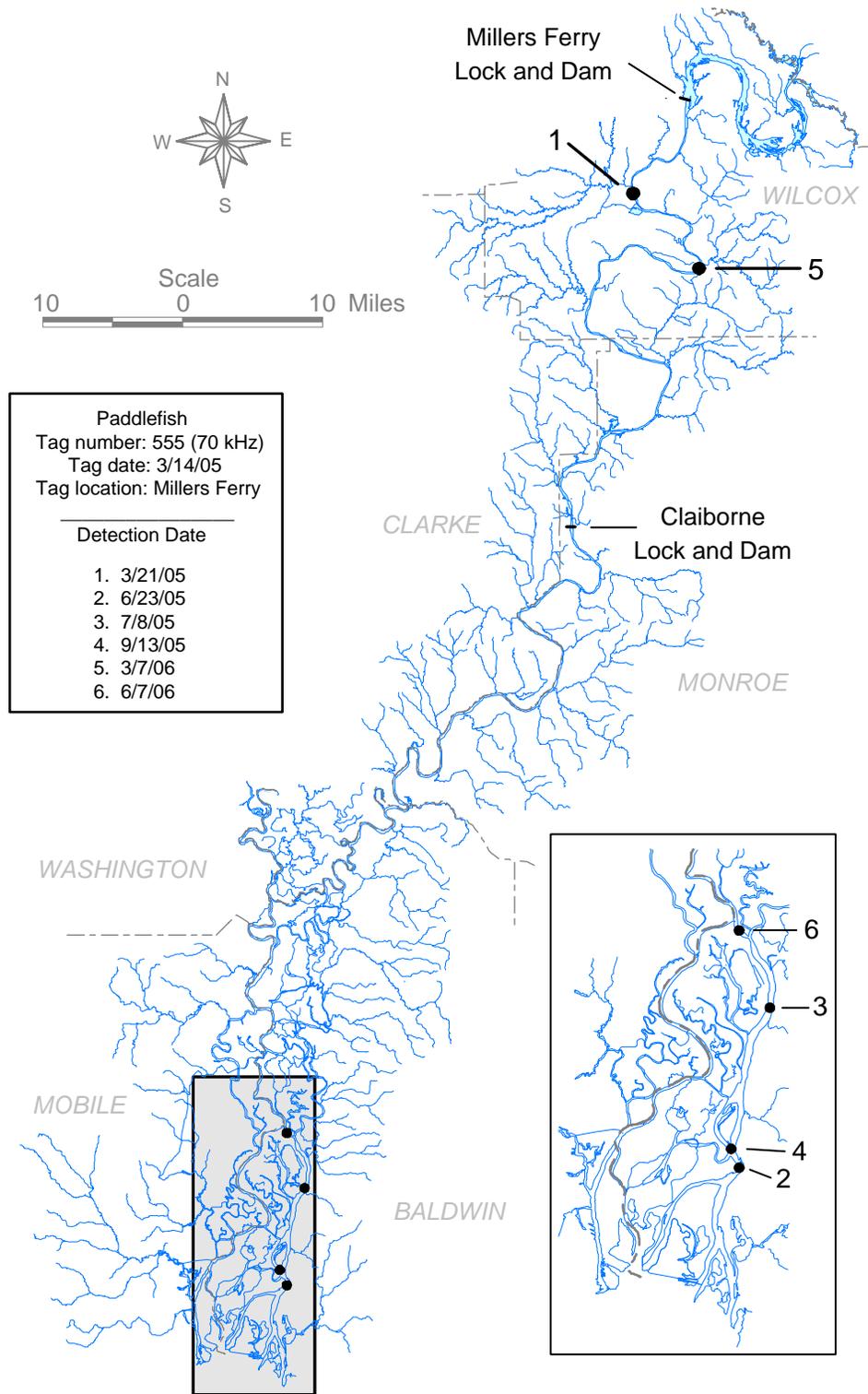


Figure 25. Detection locations for sonic paddlefish 555 (70 kHz), 2005-06.

CONCLUSIONS

Tracking data collected during this study infer two different movement patterns in Alabama River paddlefish. Large numbers of individuals, herein called resident fish, have apparently adapted to the reservoirs created by completion of Claiborne, Millers Ferry, and R.L. Henry Locks and Dams on the Alabama River in the late 1960s and early 1970s. Individuals in this group exhibited spawning site fidelity (Lein and DeVries, 1998) by returning to Millers Ferry tailwater each spring. Of more interest to us is a second, smaller group, herein called transient fish. After spawning, transient fish move up to 200 miles downstream and spend their summers in the lower reaches of the Alabama, Tombigbee, and Tensaw Rivers. Spawning site fidelity (Lein and DeVries, 1997) was only documented for a few transient fish, but lock sampling work by Mettee and others (2006) suggests that many more paddlefish would likely complete this trip if suitable conditions existed. Mettee and others (2006) collected 146 paddlefish inside Claiborne Lock and Dam on April 14-15, 2004, and 38 paddlefish inside Millers Ferry lock chamber on May 4-5, 2004. Opportunities for upstream spawning migration past Claiborne are currently limited to a few days each year when the crested spillway at this facility is inundated by winter floods. Essentially no upstream movement occurs at Millers Ferry because the gated spillway at this facility is almost always closed to conserve reservoir water for hydroelectric generation. The single record of a sonic tagged fish moving through Millers Ferry lock chamber obtained during this study was exceptional because the lock chambers at all three Alabama River locks and dams remain idle during most of the year, particularly during the winter months, when riverine fishes are involved in spawning migrations.

The unexpected collection of 46 paddlefish, 198 smallmouth buffalo (*Ictiobus bubalus*), and 57 blue catfish (*Ictalurus furcatus*) in Mobile Bay in February 2006 suggests that this area may be a winter feeding ground for several commercially important freshwater fish species. Ten paddlefish were sonic tagged and released to monitor their upstream movements as Mobile Bay transitioned from a freshwater to an estuarine environment during the summer months. Seven of the eight fish from this group moved upstream and were detected on several occasions in the Tensaw River and several of its major tributaries. One fish was detected upstream of Claiborne Lock and Dam on two occasions. We suspect that it probably moved past the dam sometime before March 26, the last day that the crested spillway at Claiborne was completely inundated by winter flood water.

For unknown reasons, no sonic tagged paddlefish were detected in the lower 50 miles of the Alabama River. Only one fish was detected in the Mobile River from the Alabama-Tombigbee River junction downstream to Interstate 65. None were detected in the Tensaw River from its upstream junction with the Mobile River near Mt. Vernon down to its junction with Tensaw Lake. None were detected in the Middle River until its downstream junction with the Tensaw River. Failure to find any sonic fish in these areas could be due to a combination of factors, including a small tagging sample size, insufficient tracking effort due to budget limitations, relatively short travel times between spawning and summer habitats, lack of sufficient plankton supplies due to high turbidity levels, poor habitat, and unacceptable water-quality conditions.

RECOMMENDATION FOR FUTURE STUDY

Although paddlefish occur throughout large sections of the Mississippi River basin, sonic tracking studies are difficult to complete in the lower Mississippi River due to high discharge, excessive river width, and fast-moving commercial boat traffic (Paul Hartfield, 2005, personal communication). Therefore, the downstream, free flowing sections of the Alabama and Tombigbee Rivers, Mobile-Tensaw River Delta, and upper Mobile Bay may be one of the few places where new scientific data can be gathered on the seasonal movements and ecology of this primitive species. The following three proposed studies should obtain information that would help the WFFD properly manage existing paddlefish populations in south Alabama and assist them in their ongoing efforts to manage paddlefish populations in isolated impoundments created by Millers Ferry and R.L. Henry Locks and Dams.

1. Additional sonic tracking work is needed to document movement patterns between the lower Tombigbee River and Mobile-Tensaw River Delta.
2. The upstream movements of paddlefish tagged in Mobile Bay have never been studied. Ten paddlefish were tagged and released in Mobile Bay in 2006. Eight fish were found, one of which moved upstream to Claiborne Reservoir. Additional funding is needed to document seasonal paddlefish movements from inland rivers into Mobile Bay.
3. A report by Mettee and others (2006) indicated that upstream spawning movements of paddlefish and other commercial, game, and non-game fish species could be greatly improved by implementation of fish bypass operations at Claiborne and

Millers Ferry Locks and Dams. Fish passage at Claiborne Lock and Dam is limited to a few days each year when the crested spillway at this facility is inundated by winter floods. Fish passage is completely blocked by the gated spillways at Millers Ferry and R.L. Henry Locks. More work is needed to document the effectiveness of using existing USCOE lock chambers and staff to increase fish passage in the Alabama River.

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Appendix A. Eye to fork lengths (EFL) (mm) and anchor tag numbers (ATN) of 323 paddlefish tagged in the Alabama River, 2002-05, and 16 paddlefish tagged in Mobile Bay, 2006.								
Date	EFL (mm)	ATN	Date	EFL (mm)	ATN	Date	EFL (mm)	ATN
3/12/02	900	618	4/1/03	735	956	3/30/04	830	2556
3/19/02	835	689	4/1/03	815	981	3/30/04	860	2465
3/19/02	610	654	4/1/03	740	982	3/30/04	860	2638
3/19/02	840	691	4/1/03	710	984	3/30/04	800	2601
3/19/02	603	675	4/1/03	850	989	3/31/04	725	2612
3/19/02	865	570	4/1/03	770	979	3/31/04	475	2623
3/19/02	890	668	4/1/03	755	978	3/31/04	950	2630
3/19/02	655	686	4/2/03	752	2003	3/31/04	475	2625
3/20/02	950	712	4/2/03	754	2022	3/31/04	820	2632
3/27/02	805	738	4/2/03	683	2024	3/31/04	735	2639
3/27/05	728	737	4/2/03	1080	2040	3/31/04	735	2953
4/9/02	920	719	4/16/03	900	2013	3/31/04	710	2954
4/9/02	890	699	3/15/04	947	2541	3/31/04	810	2567
4/9/02	740	725	3/15/04	882	2540	4/6/04	812	2658
4/10/02	735	757	3/16/04	742	2559	4/6/04	981	2659
4/10/02	639	754	3/16/04	949	2565	4/6/04	637	2664
4/10/02	640	756	3/16/04	862	2568	4/6/04	749	2665
4/10/02	560	763	3/16/04	730	2590	4/6/04	838	2666
3/26/03	940	869	3/23/04	760	2650	4/6/04	926	2667
3/26/05	760	864	3/23/04	1045	2636	4/6/04	742	2669
3/26/05	706	868	3/23/04	943	2637	4/6/04	832	2670
3/28/03	930	967	3/23/04	839	2645	4/6/04	837	2674
3/28/03	890	970	3/23/04	862	2647	4/6/04	744	2675
3/28/03	840	971	3/23/04	865	2459	4/6/04	789	2652
3/28/03	845	975	3/24/04	488	2552	4/7/04	931	2686
3/28/03	845	964/966	3/24/04	800	2554	4/7/04	623	2688
4/1/03	855	900	3/24/04	720	2644	4/7/04	698	2700
4/1/03	603	957	3/24/04	748	2560	4/7/04	916	2690
4/1/03	845	914	3/24/04	935	2479	4/8/04	750	2735
4/1/03	655	927	3/24/04	860	2465	4/8/04	856	2712
4/1/03	830	954	3/24/04	865	2459	4/8/04	719	2726
4/8/04	553	2727	3/30/04	820	2684	4/15/04	690	2756
4/8/03	757	2725	3/30/04	775	2687	4/15/04	868	2757

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Date	EFL (mm)	ATN	Date	EFL (mm)	ATN	Date	EFL (mm)	ATN
4/8/03	760	2731	4/14/04	836	2693	4/15/04	855	2758
4/8/03	932	2733	4/14/04	852	2703	4/15/04	955	2759
4/8/04	620	2736	4/14/04	778	2704	4/15/04	758	2760
4/8/04	523	2737	4/14/04	810	2707	4/15/04	756	2761
4/8/04	630	2740	4/14/04	826	2713	4/15/04	880	2762
4/8/04	702	2744	4/14/04	855	2714	4/15/04	765	2763
4/8/04	491	2747	4/14/04	974	2697	4/15/04	991	2764
4/8/04	609	2749	4/14/04	857	2720	4/15/04	772	2765
4/8/04	560	2750	4/14/04	964	2721	4/15/04	732	2766
4/8/04	656	2724	4/14/04	857	2722	4/15/04	728	2767
4/8/04	1068	2734	4/14/04	792	2723	4/15/04	738	2768
4/14/04	997	2678	4/14/04	898	2728	4/15/04	583	2769
4/14/04	686	2679	4/14/04	746	2729	4/15/04	834	2770
4/14/04	887	2680	4/14/04	847	2730	4/15/04	782	2771
4/14/04	855	2682	4/14/04	898	2732	4/15/04	690	2772
4/14/04	651	2891	4/14/04	845	2738	4/15/04	840	2773
4/14/04	897	2695	4/14/04	910	2739	4/15/04	936	2774
4/14/04	690	2698	4/14/04	940	2741	4/15/04	859	2775
4/14/04	663	2699	4/14/04	738	2745	4/15/04	715	2776
4/14/04	804	2701	4/14/04	871	2746	4/15/04	713	2777
4/14/04	903	2702	4/14/04	904	2709	4/15/04	858	2778
4/14/04	670	2706	4/15/04	787	2657	4/15/04	727	2779
4/14/04	812	2710	4/15/04	816	2692	4/15/04	861	2780
4/14/04	872	2715	4/15/04	787	2697	4/15/04	1078	2782
4/14/04	450	2716	4/15/04	700	2705	4/15/04	613	2784
4/14/04	798	2717	4/15/04	745	2708	4/15/04	868	2785
4/14/04	824	2718	4/15/04	895	2711	4/15/04	894	2787
4/14/04	694	2673	4/15/04	986	2751	4/15/04	964	2788
4/14/04	915	2676	4/15/04	751	2753	4/15/04	816	2789
4/14/04	888	2677	4/15/04	672	2754	4/15/04	893	2790
4/14/04	674	2683	4/15/04	865	2755	4/15/04	758	2791
4/15/04	810	2792	4/15/04	885	2831	5/4/04	915	2874
4/15/04	870	2793	4/15/04	791	2832	5/4/04	915	2875
4/15/04	805	2794	4/15/04	840	2781	5/4/04	656	2877

Appendix A. Eye to fork lengths (EFL) (mm) and anchor tag numbers (ATN) of 323 paddlefish tagged in the Alabama River, 2002-05, and 16 paddlefish tagged in Mobile Bay, 2006.								
Date	EFL (mm)	ATN	Date	EFL (mm)	ATN	Date	EFL (mm)	ATN
4/15/04	738	2795	4/15/04	770	2804	5/4/04	752	2878
4/15/04	762	2797	4/15/04	735	2834	5/4/04	321	2879
4/15/04	802	2798	4/15/04	725	2837	5/4/04	690	2880
4/15/04	694	2799	4/15/04	1065	2838	5/4/04	698	2883
4/15/04	903	2800	4/15/04	775	2842	5/4/04	816	2885
4/15/04	782	2801	4/15/04	745	2844	5/4/04	803	2886
4/15/04	710	2802	4/15/04	825	2845	5/4/04	881	2803
4/15/04	855	2807	4/15/04	965	2846	5/4/04	827	2876
4/15/04	665	2808	4/15/04	720	2847	5/4/04	704	2884
4/15/04	775	2809	4/15/04	965	2850	5/4/04	820	2887
4/15/04	867	2810	4/15/04	772	2783	5/4/04	762	2890
4/15/04	680	2811	4/15/04	760	2833	5/4/04	807	2891
4/15/04	700	2812	4/15/04	810	2849	5/4/04	713	2892
4/15/04	862	2813	4/15/04	830	2836	5/4/04	824	2893
4/15/04	790	2814	4/15/04	921	2839	5/4/04	680	2895
4/15/04	900	2815	4/15/04	708	2840	5/4/04	829	2898
4/15/04	798	2816	4/15/04	868	2841	5/4/04	687	2742
4/15/04	740	2817	4/15/04	640	2843	5/4/04	758	2806
4/15/04	740	2818	4/15/04	685	2835	5/4/04	652	2854
4/15/04	796	2819	4/15/04	880	2899	5/4/04	743	2871
4/15/04	743	2820	4/15/04	768	2824	5/4/04	707	2873
4/15/04	755	2821	5/4/04	663	2855	5/4/04	670	2888
4/15/04	845	2822	5/4/04	904	2858	5/4/04	912	2896
4/15/04	860	2823	5/4/04	740	2859	3/7/05	765	2862
4/15/04	865	2825	5/4/04	553	2865	3/7/05	804	2866
4/15/04	987	2826	5/4/04	754	2867	3/7/05	828	3851
4/15/04	770	2827	5/4/04	751	2868	3/7/05	921	2857
4/15/04	1066	2828	5/4/04	903	2869	3/7/05	872	2860
4/15/04	732	2829	5/4/04	660	2870	3/7/05	933	2861
4/15/04	755	2830	5/4/04	689	2872	3/8/05	823	2685
3/8/05	907	2856	3/15/05	882	2981	3/21/05	845	2989
3/14/05	845	2966	3/15/05	798	2985	3/21/05	815	2978
3/14/05	835	2967	3/15/05	820	2992	3/21/05	400	3903
3/14/05	824	2970	3/15/05	785	2988	3/24/05	748	2560

Appendix A. Eye to fork lengths (EFL) (mm) and anchor tag numbers (ATN) of 323 paddlefish tagged in the Alabama River, 2002-05, and 16 paddlefish tagged in Mobile Bay, 2006.								
Date	EFL (mm)	ATN	Date	EFL (mm)	ATN	Date	EFL (mm)	ATN
3/14/05	750	2944	3/21/05	865	3919	2/21/06	840	3000
3/14/05	725	2940	3/24/05	935	2479	2/21/06	840	3916
3/21/05	715	2921	5/9/05	775	2999	2/21/06	890	3007
3/14/05	850	2939	5/15/05	775	2999	2/21/06	820	3002
3/14/05	845	2941	5/19/05	830	3917	2/21/06	826	3006
3/14/05	760	2920	5/19/05	865	3926	2/21/06	900	2964
3/14/05	890	2922	5/19/05	769	2962	2/22/06	880	3012
3/15/05	785	2991	2/16/06	870	3003	2/22/06	690	3024
3/15/05	750	2987	2/16/06	850	3001	2/22/06	886	3021
3/21/05	875	3947	2/21/06	910	3004	2/22/06	952	3020
3/21/05	775	2986	2/21/06	1020	3914	2/22/06	872	3014
3/21/05	898	2996	2/21/06	770	3005	2/22/06	860	3023
3/21/05	775	2998	2/21/06	920	2966			

Appendix B. Tagging and tracking data for 103 paddlefish sonic tagged below Henry (H), Millers Ferry (MF), and Claiborne (CL) Locks and Dams in the Alabama River, 2001-05, and 10 paddlefish sonic tagged in Mobile Bay (MB), 2006. ND = not detected.

Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
2001	1	4/25/01	H	ND		
	2	4/24/01	MF	ND		
	3	4/16/01	MF	ND		
	4	4/16/01	MF	4/24/01	32.03921307	87.41374876
	5	4/24/01	MF	5/30/01	31.64763043	87.55753009
				7/25/01	31.64847440	87.55733179
				8/15/01	31.65208834	87.56068477
				9/26/01	31.65208834	87.55989159
				11/15/01	31.66225714	87.56108136
				3/7/02	31.64802176	87.55772838
2002	6	3/12/02	MF	ND		
	7	4/9/02	MF	5/9/02	31.76047774	87.43474992
				7/17/02	31.74416800	87.44164515
				8/7/02	31.75690640	87.43685905
				8/21/02	31.75290572	87.43829217
				9/19/02	31.74297992	87.44030216
				4/22/03	31.74755465	87.43876988
				8/13/03	31.74618388	87.43952701
				9/11/03	31.7583373	87.43566027
	8	4/10/02	MF	5/9/02	31.73608871	87.44807168
				7/16/02	31.97435281	87.45457934
				8/8/02	32.03269549	87.43380351
				8/22/02	32.03081577	87.43004494
				9/20/02	32.03092275	87.43019816
				1/22/03	32.03451404	87.44077085
				3/6/03	32.03329913	87.43636331
				4/22/03	31.80339202	87.43281204
				8/14/03	31.90693701	87.51772703
	9	4/9/02	MF	ND		
	10	4/9/02	MF	4/10/02	32.08483842	87.40247303
				4/26/02	32.08625120	87.40190519
				7/16/02	31.97429929	87.45315528

Appendix B. Tagging and tracking data for 103 paddlefish sonic tagged below Henry (H), Millers Ferry (MF), and Claiborne (CL) Locks and Dams in the Alabama River, 2001-05, and 10 paddlefish sonic tagged in Mobile Bay (MB), 2006. ND = not detected.						
Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
				8/8/02	31.97462041	87.45681466
				8/22/02	31.97517092	87.45809455
				9/20/02	31.97474275	87.45629188
				1/22/03	31.97439104	87.45150578
				4/21/03	31.97098090	87.42669196
				8/19/03	31.94134712	87.40401431
	11	4/10/02	MF	8/28/02	31.07823112	87.97384878
	12	4/10/02	MF	4/26/02	32.03328385	87.43487610
				5/20/02	32.03342902	87.43530875
				7/16/02	32.03371174	87.43505637
				8/8/02	32.03358949	87.43531776
				8/22/02	32.03367354	87.43668779
				1/22/03	32.03412435	87.43733676
				3/6/03	32.01880301	87.46804532
				4/21/03	32.00577977	87.47376881
	13	3/27/02	MF	4/9/02	32.08080615	87.40241895
	14	3/19/02	MF	3/26/02	32.01204705	87.47369670
				4/26/02	32.03074700	87.42536700
				5/8/02	31.69047428	87.53893550
				8/1/02	31.55575459	87.56063970
				8/7/02	31.55565474	87.56072984
				8/20/02	31.61412406	87.55156323
				9/18/02	31.61408549	87.55214910
	15	3/19/02	MF	3/28/02	31.83519902	87.52015163
				7/16/02	31.90998227	87.51797039
				8/7/02	31.90938547	87.51733946
				8/21/02	31.90841374	87.51730340
				9/19/02	31.91891852	87.50131368
				4/22/03	31.88736999	87.52412653
				8/14/03	31.91129828	87.51806053
				9/10/03	31.91130593	87.51799743
	16	3/19/02	MF	3/26/02	32.09441433	87.39908400
				3/27/02	32.09147446	87.40117510

Appendix B. Tagging and tracking data for 103 paddlefish sonic tagged below Henry (H), Millers Ferry (MF), and Claiborne (CL) Locks and Dams in the Alabama River, 2001-05, and 10 paddlefish sonic tagged in Mobile Bay (MB), 2006. ND = not detected.						
Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
				4/9/02	31.98861897	87.46942436
				5/20/02	31.98892476	87.46786505
				7/16/02	31.98935286	87.46822559
				8/8/02	31.98917703	87.46823460
				8/22/02	31.98971216	87.46829769
				9/20/02	31.99011732	87.46855908
				1/22/03	31.98791565	87.46741438
	17	3/19/02	MF	3/26/02	31.93450897	87.40445597
				7/17/02	31.81346453	87.47796003
				8/7/02	31.81292072	87.47718488
				8/21/02	31.81335730	87.47721192
				9/19/02	31.81421514	87.47904163
				3/25/03	31.81272924	87.47788792
				8/14/03	31.81102119	87.47019050
				9/11/03	31.81112076	87.47056906
	18	3/19/02	MF	3/26/02	32.00354790	87.47549938
				5/8/02	31.92006609	87.49263380
				7/16/02	31.91976007	87.49580651
				8/7/02	31.92008139	87.49587861
				8/21/02	31.91979067	87.49587861
				9/19/02	31.89891852	87.50131368
	19	3/19/02	MF	5/8/02	31.83581162	87.52024176
				7/17/02	31.83576567	87.52019670
				8/7/02	31.83562018	87.52168390
				8/21/02	31.83572738	87.51985419
				9/19/02	31.83472425	87.51261645
				3/25/03	31.83472425	87.51261645
				9/10/03	31.82603256	87.49566229
	20	3/20/02	MF	3/26/02	31.91213990	87.38036322
	21	3/19/02	MF	7/16/02	32.03282538	87.44529556
				7/17/02	31.79295069	87.42104959
				8/7/02	31.75443857	87.43815697
				9/19/02	31.81537933	87.48328693

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Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
				8/21/02	31.72625311	87.49038947
				8/13/03	31.72522579	87.47801411
				9/11/03	31.79522598	87.42161743
	22	3/27/02	MF	5/8/02	31.83555892	87.51970096
				7/17/02	31.83606431	87.52345052
				8/7/02	31.83607963	87.52412653
				8/21/02	31.83421120	87.51283277
				9/19/02	31,83342247	87.51176919
				2/3/04	31.82108520	87.48841554
2003	23	4/3/03	MF	4/22/03	31.65808048	87.56567818
				6/30/03	31.39363518	87.54308165
				8/13/03	31.59361215	87.54431648
				9/11/03	31.59274459	87.54332501
				9/22/03	31.59323596	87.54386581
				10/28/03	31.59340486	87.54380272
				1/22/04am	31.58705537	87.53405025
				1/22/04pm	31.58843740	87.53467217
				3/23/04	32.08292922	87.40267132
				4/8/04	31.59083287	87.53978276
				5/7/04	31.58918983	87.53715986
				6/9/04	31.59371196	87.54354133
				7/28/04	31.59317454	87.54337008
				7/29/04	31.59376570	87.54411819
				8/17/04	31.59252962	87.54253183
	24	4/2/03	MF	4/21/03	32.03343667	87.44497108
				7/30/03	31.97443691	87.45652623
	25	4/2/03	MF	ND		
	26	4/2/03	MF	4/22/03	31.74874391	87.43887804
	27	4/16/03	MF	4/21/03	31.92200163	87.49116462
				4/22/03	31.90837549	87.51684421
				8/13/03	31.78358849	87.42235653
				9/11/03	31.78191822	87.42326688
				2/3/04	31.90924009	87.51772703

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Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
				3/23/04	32.08836650	87.40188716
				3/24/04	31.98618791	87.46734228
				3/25/04	31.92039506	87.49460773
				4/7/04	31.96589604	87.40832271
				4/16/04	32.03180912	87.44573722
				6/16/04	31.78332033	87.42304155
	28	3/28/03	MF	4/22/03	31.86371107	87.53107469
				8/17/03	31.60746894	87.47403921
	29	4/1/03	MF	4/22/03	31.83530622	87.52093579
				5/13/03	30.79641417	87.91911958
				5/19/03	30.79583123	87.91891227
				6/11/03	30.79499504	87.91918268
				6/23/04	30.79655127	87.91873201
	30	3/28/03	MF	5/1/04	30.69956753	87.93546984
				5/13/04	30.77599299	87.93576728
				5/19/04am	30.82685801	87.91831739
				5/19/04pm	30.81802630	87.91799291
				5/20/04	30.88127772	87.89490065
				6/11/04	30.76308278	87.92426622
				6/23/04	30.75418325	87.91902945
	31	4/1/03	MF	4/22/03	31.87975479	87.52698377
				6/4/03	31.83539046	87.52130534
				8/14/03	31.91128297	87.51806954
				2/3/04	31.91139009	87.51762788
				3/25/04	31.91058672	87.51703300
				4/7/04	31.86152168	87.53146341
				5/6/04	31.72911267	87.46018566
				6/15/04	31.87426687	87.52881348
				8/17/04	31.52654078	87.60158746
	32	4/1/03	MF	ND		
	33	4/1/03	MF	5/20/04	30.92280100	87.91342313
				6/9/04	30.92080607	87.91202606
				6/23/04	30.87777344	87.89337739

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Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
	34	3/28/03	MF	4/22/03	31.73665597	87.44803563
				8/13/03	31.69450833	87.52011558
				9/11/03	31.79092051	87.42082426
				2/3/04	31.83535983	87.51944859
				3/25/04	31.94432240	87.40391517
				4/7/04	31.91508552	87.38169720
				5/6/04	31.66632766	87.56654346
				6/16/04	31.71473730	87.51388733
	35	4/1/03	MF	4/16/03	32.03331441	87.41954436
				5/13/03	30.77140066	87.92517657
				5/19/03am	30.87816797	87.92022823
				5/19/03pm	30.82185786	87.91745211
				6/9/04	30.87170061	87.92179655
				6/23/04	30.76000018	87.92055271
	36	3/28/03	MF	4/1/03	32.08822141	87.40133734
				4/16/03	32.03417020	87.43859863
	37	4/1/03	MF	4/22/03	31.84259585	87.53278838
				10/28/03	31.61298037	87.55067992
				4/15/04	32.03817395	87.41567762
	38	3/26/03	MF	4/22/03	31.73705459	87.44760299
	39	4/1/03	MF	4/21/03	32.01620462	87.47069525
	40	3/26/03	MF	2/3/04	31.87064634	87.52924612
				3/25/04	31.81204755	87.47469719
				4/8/04	31.61229721	87.55142803
	41	4/1/03	MF	4/16/03	32.09305513	87.40153564
				4/21/03	32.09319258	87.39985014
				3/25/04	31.97088150	87.42723276
	42	3/26/03	MF	3/27/03	32.03466686	87.44184344
				4/21/03	31.92725721	87.48690130
				8/14/03	31.92673702	87.48717170
				9/10/03	31.92712716	87.48721676
				2/3/04	31.92726486	87.48713564
				3/25/04	31.92682647	87.48745111

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Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
				4/7/04	31.92685942	87.48722578
				5/5/04	31.92648457	87.48765842
				6/16/04	31.92677527	87.48741506
	43	4/1/03	MF	4/21/03	32.02527573	87.45296594
	44	4/1/03	MF	4/21/03	32.09349038	87.40180604
				8/12/03	32.03375759	87.43695819
				8/21/03	32.03329913	87.43688609
				3/15/04	32.09200136	87.40043601
				3/16/04	32.09753736	87.39893979
				3/24/04	31.98097393	87.46555763
				3/30/04	31.97556850	87.45827482
				4/6/04	32.03080813	87.44739568
				4/16/04	32.10027851	87.40085062
				5/7/04	31.58478266	87.53079642
	45	3/28/03	MF	4/1/03	32.09761371	87.39874149
	46	4/1/03	MF	ND		
2004	47	3/16/04	MF	3/23/04	32.09717085	87.40056219
				3/26/04	32.08997013	87.40061627
				3/30/04	32.07727778	87.40179702
				4/6/04	32.08472387	87.40231980
				4/7/04	32.09117665	87.40068838
				5/13/04	30.76542952	87.92610495
	48	3/30/04	MF	4/6/04	32.07540662	87.40165281
				5/7/04	31.54772804	87.57551177
				6/9/04	31.57088410	87.51282376
				7/29/04	31.74092250	87.56255955
				8/17/04	31.46812419	87.56334371
	49	3/16/04	MF	3/25/04	31.83607197	87.52458621
				5/6/04	31.80672412	87.45349773
				6/16/04	31.74155419	87.44150093
				9/7/04	31.83599539	87.52761470
	50	3/15/04	MF	3/24/04	32.08315069	87.40146353
				2/26/04	32.08315069	87.40146353

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Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
				4/9/04	31.65701404	87.56505625
				5/6/04	31.65769687	87.56461460
				6/16/04	31.65652302	87.56392958
	51	3/31/04	MF	4/6/04	32.04148227	87.41207227
				4/16/04	32.03172504	87.42143717
				5/5/04	32.01591421	87.46998319
				6/14/04	32.03100680	87.43072995
				7/30/04	32.07021298	87.40135537
	52	3/16/04	MF	3/23/04	32.09786569	87.40122918
				3/26/04	32.09795732	87.40168886
				3/30/04	32.10023269	87.39866938
				4/9/04	31.82138389	87.49018216
	53	3/23/04	MF	3/26/04	32.07920236	87.40240092
				3/31/04	32.08786250	87.40155366
				4/6/04	32.09744573	87.40139142
				5/3/04	32.08657193	87.40248204
	54	3/16/04	MF	3/16/04	32.09762135	87.39882261
				4/6/04	32.08854214	87.40198631
				4/7/04	32.07883578	87.40186012
				6/15/04	31.79261361	87.42095044
				6/16/04	31.80554449	87.45024391
				8/19/04	31.76883077	87.43278500
	55	3/30/04	MF	4/16/04	32.05750261	87.40428472
				5/6/04	31.71915365	87.50904715
				6/16/04	31.71057377	87.51500499
				7/29/04	31.61261960	87.55146409
				8/17/04	31.59170044	87.54159444
				9/8/05	31.51151166	87.61960519
				4/18/06	31.54933341	87.00789230
	56	4/6/04	MF	4/9/04	31.83578864	87.52067440
				6/15/04	31.83557424	87.52232385
				8/19/05	31.83523731	87.51858330
	57	4/6/04	MF	5/6/04	31.77892236	87.42501547

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Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
				6/15/04	31.81355644	87.47891545
				8/19/04	31.80431889	87.44182542
				3/23/05	31.83468597	87.51788927
	58	3/30/04	MF	4/6/04	32.03455224	87.44171726
	59	3/23/04	MF	3/24/04	31.99413829	87.47084848
				3/25/04	31.97228074	87.43278500
				4/7/04	31.92194807	87.49107449
	60	3/31/04	MF	4/6/04	32.04440846	87.41078336
				6/15/04	31.84362186	87.53341030
				7/29/04	31.59104785	87.54055791
				8/17/04	31.54165198	87.53067024
				3/7/05	32.09780460	87.39944453
				3/14/05	31.99156976	87.47018149
				3/23/05	31.83374409	87.51422083
				6/24/05	31.97686828	87.46027579
				9/13/05	30.77291080	87.94517724
	61	3/23/04	MF	3/26/04	32.09800313	87.40085062
				3/30/04	32.09652945	87.39918315
				6/14/04	32.14552996	87.39503699
				6/30/04a	32.10418011	87.39479363
				6/30/04b	32.10517267	87.39525332
				6/30/04c	32.10605832	87.39592031
				6/30/04d	32.10601251	87.39666842
				6/30/04e	32.10499706	87.39698388
				6/30/04f	32.10287451	87.39760581
				6/30/04g	32.10230187	87.39820069
				6/30/04h	32.10196592	87.39914709
				7/1/04a	32.14969673	87.36833938
				7/1/04b	32.14876571	87.36467094
				7/1/04c	32.14744547	87.36087631
				7/1/04c	32.14596496	87.35721688
				8/19/04	32.14054637	87.33425081
				3/9/05	32.15107034	87.38329257

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Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
	62	3/24/04	MF	4/7/04	31.91852968	87.43131582
				4/16/04	32.08776322	87.40216657
				6/14/04	31.97449043	87.45140663
				6/15/04	31.97427635	87.45078471
				7/1/04	31.97426870	87.45488579
				7/30/04	31.97605018	87.45949163
	63	3/31/04	MF	4/6/04	32.08917596	87.40070641
				5/2/06	31.57591393	88.01719410
				5/9/06	31.57596768	88.01745548
	64	3/31/04	MF	4/6/04	32.03233636	87.43285711
				4/16/04	32.09808712	87.39915611
				5/2/04	32.09157373	87.40090470
				6/14/04	32.01199355	87.47308379
				7/1/04	32.07476506	87.40195025
				7/30/04	32.01365202	87.47187600
	65	3/31/04	MF	4/6/04	32.03106029	87.42455579
				4/16/04	32.03064766	87.42808002
				5/5/04	32.03696673	87.41545229
				6/14/04	32.03197723	87.42236554
				7/1/04	32.03047956	87.42586273
				7/30/04	32.03371938	87.44423199
	66	3/31/04	MF	5/6/04	31.83549766	87.52226076
				6/16/04	31.76014054	87.43538005
	67	3/31/04	MF	4/7/04	31.90691406	87.38422996
				5/3/04	32.09786569	87.40030080
				6/16/04	31.80781181	87.45909504
				8/19/04	31.75513600	87.43727366
				3/7/05	32.09727011	87.39908400
				7/8/05	30.88366798	87.91956124
	68	3/24/04	MF	3/26/04	32.03198487	87.43283908
				3/30/04	32.07656750	87.40172492
				3/31/04	32.08984795	87.40098582
				4/6/04	32.05861025	87.40423965

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Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
				4/16/04	32.09349038	87.40103990
				5/19/04	30.90905986	87.93596558
				11/17/04	30.90700278	87.93385645
				5/11/05	30.91073798	87.93418093
	69	3/23/04	MF	3/26/04	32.03459809	87.43939180
				3/30/04	31.97472746	87.45676959
				4/7/04	31.90488638	87.39537950
				5/5/04	31.97520914	87.45876154
				6/15/04	31.91526914	87.38139976
				7/1/04	31.97457454	87.45616559
	70	3/24/04	MF	3/26/04	32.03031145	87.42708855
				3/30/04	32.08510406	87.40283356
				4/6/04	32.09901866	87.40002139
				4/16/04	32.08903087	87.40003040
				5/3/04	32.08874068	87.39956171
				6/16/04	31.69128724	87.52982298
				8/19/04	31.73158118	87.45497593
				3/14/05	32.09035958	87.40079654
				9/7/05	31.76813343	87.43308244
				9/8/05	31.75082100	87.43884199
				3/8/06	31.68802002	87.54922877
				5/3/06	31.78740397	87.42187882
				6/20/06	31.79357123	87.42105860
				6/21/06	31.78944956	87.42142815
				7/26/06	31.72600011	87.49172345
	71	3/31/04	MF	4/6/04	32.03191610	87.42232048
				4/16/04	32.09817875	87.39921019
				5/2/04	32.08978686	87.40163478
				6/14/04	32.09798022	87.39942651
				7/1/04	32.09558261	87.39883163
				7/30/04	32.09740755	87.39937243
				3/14/05	32.09345220	87.40140044
				3/21/05	32.09161955	87.40116609

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Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
				6/24/05	32.09740212	87.40034587
	72	3/15/04	MF	3/16/04	32.09991964	87.40011152
				3/23/04	32.08977923	87.40078753
				3/26/04	32.08977159	87.40008448
				3/30/04	32.08795414	87.40058923
				4/6/04	32.09923245	87.39955269
				4/16/04	32.09915610	87.39961579
	73	3/24/04	MF	3/26/04	32.06168867	87.40391517
				3/30/04	32.04935909	87.40719604
				4/9/04	31.70048239	87.51864640
				5/6/04	31.63062550	87.55190574
				6/16/04	31.67649179	87.56416393
				7/28/04	31.59841812	87.54775959
				7/29/04	31.54634541	87.51781717
	74	3/31/04	MF	4/6/04	32.03093803	87.42571852
				7/1/04	32.03070115	87.42570049
				7/30/04	32.03412435	87.44317742
				3/7/05	32.09843072	87.39860629
				3/14/05	32.09663635	87.40124721
				3/21/05	32.09704870	87.39929131
				6/24/05	32.09142101	87.40060165
				8/15/05	32.09609421	87.39996731
				3/7/06	32.09739228	87.39843504
				3/16/06	32.08919123	87.40119313
	75	3/30/04	MF	4/6/04	31.97462806	87.44086098
				3/22/05	31.60985624	87.55002195
	76	3/23/04	MF	3/24/04	32.00948669	87.47374177
				3/25/04	31.91026536	87.38117443
				5/6/04	31.79933207	87.42562838
				6/15/04	31.80061902	87.42747613
				6/16/04	31.78580272	87.42231146
				8/19/04	31.75036880	87.43894114
				3/7/05	32.09965240	87.39975099

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Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
				3/14/05	31.97422283	87.45139762
				3/21/05	31.92275900	87.38650133
				8/16/05	31.79724840	87.42240160
				9/7/05	31.79744758	87.52257285
				9/8/05	31.75100495	87.43886903
	77	3/24/04	MF	3/26/04	32.08742722	87.40161676
				3/30/04	32.09736937	87.39974198
				4/6/04	32.09582696	87.40072443
				4/16/04	32.03360477	87.43714747
				6/9/04	31.57172882	87.51366200
				7/29/04	31.59357376	87.54379627
				8/17/04	31.52684042	87.60031657
				11/15/04	30.89659293	87.89358470
				6/23/05	30.68825157	87.92860165
	78	4/14/04	CL	5/7/04	31.59895551	87.54780466
				7/28/04	31.59359680	87.54327093
				7/29/04	31.59301331	87.54324389
				8/17/04	31.55636903	87.55919756
	79	4/14/04	CL	5/7/04	31.61284988	87.55119369
				6/9/04	31.59265247	87.54272112
				7/29/04	31.47450483	87.56201875
				8/17/04	31.47447408	87.56201875
	80	4/14/04	CL	ND		
	81	5/4/04	MF	6/15/04	31.83337652	87.51236407
	82	4/14/04	CL	ND		
	83	4/14/04	CL	4/14/04	31.59044131	87.53885438
				8/17/04	31.61343324	87.55206798
	84	5/2/04	MF	6/14/04	31.97444456	87.45213671
				6/15/04	31.97471981	87.45595838
				7/1/04	32.03060946	87.42596188
				7/30/04	31.97438339	87.45664340
				3/8/05	32.09631565	87.39932736
				3/14/05am	32.09885068	87.39964283

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Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
				3/14/05pm	32.05422543	87.40565476
				3/21/05	32.03336790	87.43575942
2005	85	3/15/05	MF	3/21/05	31.97057565	87.42067103
				8/16/05	31.76486126	87.43342495
				9/7/05	31.76828669	87.43276698
				9/8/05	31.75287506	87.43809388
				5/3/06	31.76587281	87.43374943
				6/21/06	31.77147446	87.43118964
				7/26/06	31.73140486	87.45502099
	86	3/15/05	MF	3/23/05	31.89152556	87.52001643
				8/16/05	31.75982632	87.43494821
				9/8/05	31.64413915	87.55493424
				3/8/06	31.78303685	87.42295141
				5/3/06	31.66449417	87.56765211
				6/20/06	31.84897380	87.53389702
				7/21/06	31.84682234	87.53405025
				7/25/06	31.91218581	87.51742959
	87	3/14/05	MF	3/21/05	32.03459045	87.43881495
				3/9/06	31.57180562	87.51376115
				3/14/06	31.57021600	87.51258040
	88	3/14/05	MF	6/24/05	32.06119216	87.40274343
				8/15/05	32.09709449	87.40148156
				9/7/05	32.07455885	87.40127425
				3/7/06	32.03339846	87.43460570
				5/4/06	32.05450044	87.40065233
				6/20/06	32.03065530	87.42695353
				7/25/06	32.03408615	87.41940014
	89	3/14/05	MF	3/21/05	32.09996546	87.39998534
	90	3/14/05	MF	5/9/05	30.92344277	87.91537002
				5/11/05	30.85658260	87.92036343
				9/14/05	31.00772484	87.89172794
				8/9/06	30.94604122	87.91351326
	91	3/15/05	MF	6/24/05	32.03034960	87.44766608

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Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
				8/16/05	31.72560912	87.47720291
				9/8/05	31.75459951	87.43768828
				3/7/06	32.08313542	87.40189617
				3/16/06	32.09454414	87.40022870
				4/6/06	31.61475347	87.55257273
	92	3/14/05	MF	3/21/05	32.06253655	87.40231079
				9/7/05	31.80821777	87.45777909
				3/7/06	31.97967421	87.46415154
	93	3/14/05	MF	3/21/05	31.98108861	87.46520611
				6/23/05	30.75585633	87.91981361
				7/8/05	30.87012238	87.89465729
				9/13/05	30.76897662	87.92503236
				3/7/06	31.90930895	87.38176030
				6/7/06	30.92398402	87.91803798
	94	3/8/05	MF	3/14/05	30.05422543	87.40565475
	95	3/14/05	MF	3/21/05am	32.07617936	87.40173393
				3/21/05pm	31.98166965	87.46567480
				6/24/05	32.08934396	87.40112102
				9/7/05	32.09289477	87.40031822
				3/7/06	32.07911836	87.40178801
				3/16/06	32.09103157	87.40000336
				5/4/06	32.05523380	87.40540237
				7/25/06	32.07548299	87.40182407
	96	3/14/05	MF	ND		
	97	3/14/05	MF	3/21/05	32.08580064	87.40247303
				9/8/05	31.47010761	87.56298318
	98	3/14/05	MF	8/16/05	31.74733360	87.44050946
				9/7/05	31.83576567	87.52127830
				3/7/06	32.06181089	87.40290567
				5/4/06	32.08777850	87.40065233
				6/20/06	31.91980597	87.49557216
				7/25/06	31.91981362	87.49541893
	99	3/7/05	MF	3/21/05	32.09953023	87.39914709

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Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
				6/23/05	30.75576338	87.91920972
				7/8/05	30.75310658	87.91966038
	100	3/7/05	MF	3/14/05	32.00136184	87.47390401
				6/23/05	30.76599489	87.92617705
				7/8/05	30.86704321	87.89572087
	101	3/7/05	MF	3/21/05	31.91858954	87.43250559
				9/13/05	30.95153733	87.91208915
	102	3/7/05	MF	3/14/05	32.03077756	87.42772850
				3/21/05	31.97151613	87.42904445
				6/23/05	32.03455988	87.44070776
				8/15/05	32.09873614	87.40017462
				9/7/05	31.90612595	87.38493300
				5/3/06	31.81339560	87.47798707
	103	3/7/05	MF	3/14/05	32.08659484	87.40150860
				3/15/05	32.08971050	87.39909301
				3/21/05	32.08920650	87.40195025
				8/16/05	31.71832560	87.51045324
				9/8/05	31.72599245	87.48484539
				3/8/06	31.72636810	87.47279537
2006	104	2/16/06	MB	6/7/06	30.81729094	87.91735296
				7/21/06	30.80810999	87.91841654
				8/9/06	30.98296406	87.89246704
				8/10/06	30.88139376	87.89341344
	105	2/16/06	MB	6/7/06	30.81520092	87.90267919
				7/20/06	30.92307163	87.91297646
				8/8/06	30.92615672	87.91169256
	106	2/21/06	MB	6/6/06	31.03752456	87.90152082
				8/9/06	31.04278372	87.90901559
	107	2/22/06	MB	6/21/06	31.69823546	87.51896186
				7/26/06	31.75494440	87.43717451
	108	2/21/06	MB	ND		
	109	2/21/06	MB	ND		
	110	2/21/06	MB	3/15/06	30.87170061	87.92184162

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Tag Year	Fish	Tag Date	Tag Location	Detection Date	Detection Locations	
					Latitude N	Longitude W
				6/7/06	30.88472772	87.89138543
				7/20/06	30.92522115	87.91204408
				8/8/06	30.92771856	87.91128696
				8/9/06	30.92682940	87.91058302
	111	2/21/06	MB	3/15/06	30.89452784	87.92798874
				6/7/06	30.85769680	87.90267919
				8/9/06	30.99003217	87.88089387
	112	2/21/06	MB	6/7/06	30.81499965	87.91728085
				7/20/06	30.81822756	87.91332398
				8/8/06	30.92336545	87.91231449
				8/9/06	30.92344277	87.91235955
	113	2/21/06	MB	6/7/06	30.92185766	87.91217027
				7/20/06	30.92212056	87.91332398
				8/9/06	30.99082029	87.88080373

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