

## Tab G, No. 5(e)

From: Eric Porche [eric.porche@DMR.state.ms.us]  
Sent: Tuesday, April 06, 2004 10:24 AM  
To: VanderKooy, Steve  
Cc: Buck Buchanan  
Subject: Red Drum version 5 escape

Red Drum Escapement in Mississippi

James 'Tut' Warren, Michael 'Buck' Buchanan, G. Erick Porche Jr.

In response to the Gulf of Mexico Fishery Management Council's recent request for Gulf States to provide estimates of red drum escapement from inshore waters, the Mississippi Department of Marine Resources in conjunction with the Center for Fisheries Research and Development at the University of Southern Mississippi's Gulf Coast Research Laboratory have revisited this question with respect to Mississippi's population of sub-adult red drum. Both fishery dependent data and fishery independent data were evaluated for appropriateness to address this question and an estimate of escapement from fishery independent data is provided. A synopsis of the data analysis follows.

Fishery dependent data in Mississippi includes the Marine Recreational Fishery Statistical Survey (MRFSS) data and commercial landings data. For approximately the last fifteen years Mississippi has had a 40,000 pound quota for commercially landed fish. This amount of catch is only a small fraction of what is estimated to be landed by the recreational fishery. Each of these databases need age distribution data of the catch in order to assemble a catch at age table. The commercial data only contains some in house measurements that were taken during the late 1980's. The MRFSS data has estimates of the length distributions of the catch for each year back to 1981. In each case the length distributions could be converted to age distributions by the use of an age-length key.

Fishery independent data in Mississippi includes a 1987-2003 monitoring program conducted in Mississippi's inshore bays and along the mainland beach. Nine stations were sampled monthly using a multi-mesh gill net from 1987-1995. In 1996 sampling frequency of the same nine stations was reduced to three months in the spring (March, April and May) and three months in the late fall (October, November and December). These data provide the relative abundance of the inshore population of red drum in Mississippi's inshore areas by size. The observed fish in these samples are mostly young fish less than 22 inches TL (<2 years of age) and belonged to two cohorts. The rate of growth of these young fish is sufficient that the lengths between each cohort are distinct and can be identified in length frequency scatter plots.

Recent reported catches of fish in the recreational fishery, as well as those observed in the commercial catch during times for which we have data indicate that red drum landed in Mississippi consist of both fish 2 years old and less ( $\leq 22$  inches total length) along with many fish that are considerably above 22 inches in length. The length range over which these larger fish are observed in the catch suggest that the ages that are being landed could range from 2+ up to 30+ years of age. Much of the recreational catch is composed of these older fish ( $>22$  inches TL,  $> 2$  years of age) and are angled near or outside our barrier islands. Many are landed by the charter boat fleet which target larger red drum outside the islands and in the island passes. These 2+ older fish are probably a mixture of fish that have migrated offshore from inshore areas in Louisiana, Mississippi, Alabama and the panhandle of Florida. Louisiana is understandably the greatest contributor to the offshore stock of red drum. Because our landings data are a mixture of young fish from Mississippi's territorial waters and larger fish originating from multiple states the use of strictly Mississippi landings data probably does not provide a true continuity of abundance between ages observed in the catch. Therefore, the use of Mississippi landings data to provide an estimate of escapement of young fish in Mississippi would not be feasible. Using landing data for estimating rates of escapement from inshore areas to the offshore spawning stock probably should include, at the very least, a regional approach by combining landings data over a large area to achieve a better relationship between abundances at age. Landings data from the area east of the mouth of the Mississippi river to approximately Panama City, Florida would be appropriate to estimate escapement of red drum to the Mississippi Bight.

The independent data which is specific to Mississippi provides the best opportunity for estimating escapement from the inshore waters. The data were grouped into two time periods. The period from 1991-1994 (P22) is when a 22 inch minimum size limit was in place in Mississippi state waters. We have assumed that most fishermen adhered to this minimum size limit and most fish less than 22 inches that have been reported by the MRFSS for this same time period can probably be attributed to fish caught in adjacent Louisiana waters (16 inch TL minimum size) and landed in Mississippi. This is not to preclude that a minor amount of sub-legal fish may have been caught in Mississippi state waters but are assumed to be insignificant. The second time period from 1995-2001 (P18) is the most current period during which an 18 inch minimum size limit has been in place.

Fish from each year class were separated using scatter plots. Numbers per month were then plotted from the month of first occurrence in samples (June for most years) through the month that they were no longer present, usually a period of approximately 24 months. The monthly abundance was strikingly similar for each year class over the 15 years available for analysis. Generally fish first appeared in samples during June of each year, at approximately 10 inches in length. As the young-of-the-year increased in size they became more abundant in samples. This early increase was probably due to an increase in catchability as they were recruited to the sampling gear. Peaks of abundance were observed during each fall and following spring. As their second summer approached numbers of this cohort decreased rapidly. Onset of this disappearance began in May for most years. Up to 80% disappearance was observed

by September when fish reached approximately 22 inches TL and 2 years of age. Fish over this size were very scarce in samples.

Since red drum smaller than 22 inches were protected by regulation, the pooled data for P22 represents a period when only natural mortality and emigration should account for the dramatic drop in abundance from our samples inshore in Mississippi as red drum approach an age of 1.5 years. This disappearance (less a small amount of natural mortality,  $M = .3$ ) during this post 1.5 years of age time period is considered equivalent to escapement out the "inshore" areas of Mississippi. Commercial and recreational catch length frequencies substantiate the disappearance as movement out of the area. The pooled data for P18 indicated the same dramatic disappearance of fish for the same time period. Lowering the minimum size to 18 inches TL effectively would have moved the availability of legal fish to earlier in the year; therefore, the disappearance during this period would be expected to have included some fishing mortality.

While the dramatic decrease is probably principally due to mass escapement, the difference between P22 and P18 over the first four months after the onset of escapement provides an estimate of 10.6% for fishing mortality. Subtracting a 2% monthly natural mortality rate and an 10.6% monthly fishing mortality rate from the over all disappearance rate provides an escapement rate of approximately 67-68% for red drum by the time each cohort reaches age 2. This escapement estimate applies only to the emigration out of the inshore bays and mainland marsh areas.

It is unknown where these post 1.5 year old fish migrate to. Tag/recapture studies from 1987 through 1989 indicated that most fish remain in the inshore areas where they were tagged and recaptured prior to escapement. Reported recaptures included very few fish larger than 18 inches TL. Some movement eastward with only minor movement toward the Gulf was noted for all sizes recaptured. Some fish 18-22 inches TL are taken in areas around our barrier islands, outside our barrier islands and around offshore structures many miles offshore. Some of this area is in state waters but no linkage to our inshore population is available. Ultimately these fish have been reported to join the large offshore spawning schools beginning at about age 3.