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## Maximum Total Length and Age of Black Drum *Pogonias cromis* (Osteichthyes: Sciaenidae) Off Texas

Gary C. Matlock  
*Texas Parks and Wildlife Department*

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## MAXIMUM TOTAL LENGTH AND AGE OF BLACK DRUM

*Pogonias cromis*

(Osteichthyes: Sciaenidae)

OFF TEXAS

Black drum (*Pogonias cromis*) support economically important fisheries throughout their range (Doerzbacher *et al.* 1988). Reliable stock assessments and sustainable yield predictions are required to sustain these fisheries in the face of increasing recreational and commercial demands. Yield models, such as the Beverton-Holt model (Gulland 1969), require an estimate of maximum length and age. Doerzbacher *et al.* (1988) estimated black drum maximum total length ( $L_{\infty}$ ) in Texas as  $798 \pm 42$  mm by fitting a temperature compensated von Bertalanffy growth model to tag release and recapture data. However, their estimate may have been biased low because their data were skewed toward fish 300 to 700 mm free less than 200 days. Further,  $L_{\infty}$  is defined mathematically as the absolute maximum attainable length (Vaughn and Kanciruk 1982). While  $L_{\infty}$  is of interest, the value most often used as a proxy for  $L_{\infty}$  is the average maximum length ( $\bar{L}$ ) as described by Alverson and Carney (1975) especially for heavily exploited species. This study reports average maximum total length ( $\bar{L}$ ) and age ( $t_L$ ) that black drum reach in Texas estuarine and Gulf of Mexico waters.

### MATERIALS AND METHODS

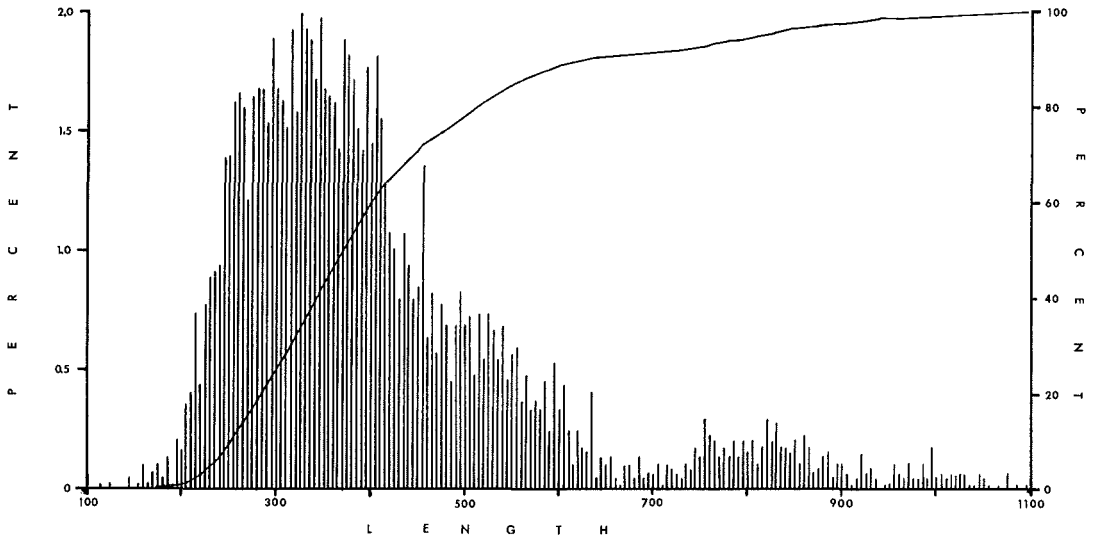
The  $\bar{L}$  that black drum reach in Texas was determined from total length (TL) frequency data following Alverson and Carney's (1975) definition that only 0.5-1.0% of the catch exceeds  $\bar{L}$ . Length frequencies of fish caught by anglers from privately owned boats fishing in Texas bays and the adjacent Gulf of Mexico during the period 1983-1988 were used to estimate  $\bar{L}$  as above. Collection

procedures are described in Osburn and Ferguson (1987). Tagged fish free at least 3 years (Green 1986) were used to determine a range for  $\bar{L}$  and its corresponding  $t_L$  in the sense of  $t_L$  in the Beverton-Holt model (Gulland 1969). The  $\bar{L}$  estimates were compared to an estimate made based upon length frequencies of fish caught in trammel nets in bays only during October 1976-1980 ( $\bar{L}$ ). Collection procedures are described in Matlock (1984).

### RESULTS AND DISCUSSION

The  $\bar{L}$  that black drum typically reach off Texas appears to be about 1000 to 1200 mm. This conclusion is based on the following: 1) until 1988, the state angling record was a fish 1185 mm long based upon the weight reported by Texas Parks and Wildlife Department (1988) and conversion equations in Harrington *et al.* (1979); 2) the newest state angling record is a fish 1300 mm long (Texas Parks and Wildlife Department unpublished data); 3) none of the 4349 black drum caught and landed by private boat anglers in Texas bays and the Gulf of Mexico off Texas and measured by Texas Parks and Wildlife Department (TPWD) were larger than 1200 mm; 99.5% of the fish were  $\leq 1020$  mm (Figure 1); and 4) three tagged fish recaptured in Texas after 10 years at large reached 686-965 mm (Table 1).

The  $t_L$  that black drum typically reach in Texas is at least 13 years. Four black drum recoveries were from fish free 10.42, 10.48, 11.34, and 11.77 years (Table 1). Each fish was at least 1 year old at tagging because their lengths equalled or exceeded the estimated length (<250 mm) of 1-year old fish (Doerzbacher *et al.* 1988, Richards 1973, Simmons and Breuer 1962, Pearson 1929). The  $t_L$  estimated from four tag recoveries is about 30% less than that estimated for black drum in Louisiana (43 years) using otoliths (Beckman *et al.*



**Figure 1.** Total length (mm) frequency and cumulative percentage of 4349 black drum landed by private sport-boat anglers in Texas bays and the adjacent Gulf of Mexico, May 1983 - May 1988.

1988).

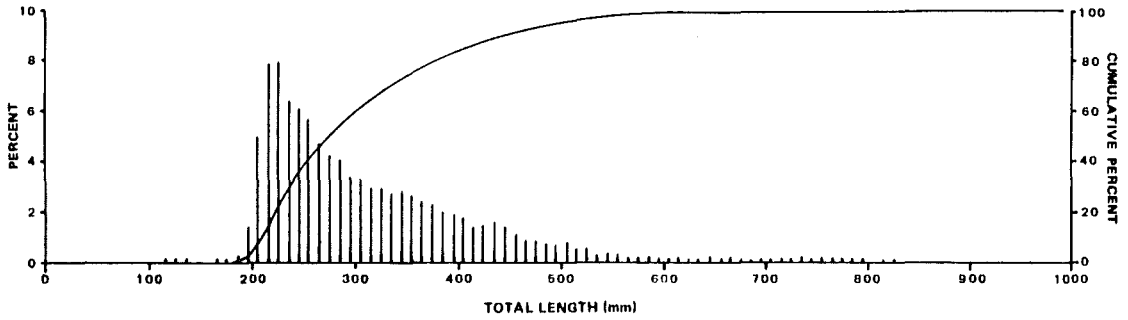
The  $q_L$  of black drum in Texas bays typically is at least 755 mm. During the period October 1976 - April 1980, 99.5% of the 7244 fish captured in TPWD trammel nets were smaller than 755 mm

(Figure 2). The average maximum size ( $q_L^*$ ) estimated for bay fish (755 mm) agrees well with the  $798 \pm 42$  mm  $L_\infty$  appears to be an underestimate because the estimate of  $q_L^*$  for bay fish underestimates  $q_L$  for angler-caught bay fish.

**Table 1.** Summary of data for black drum tagged and released in Texas bays during the 1960's and recaptured at least 3 years later. Blanks indicate no data available. (Data from Green 1986).

At Tagging			At Recapture				
Date	Location	Total length (mm)	Date	Location	Total length (mm)	Estimated age (years) <sup>a</sup>	Time free (years)
7-6-59	Upper Laguna Madre, West of Marker 69	265	12-21-62	Upper Laguna Madre; Marker 96	381	3.84	3.46
7-62	Aransas Bay, Turtle Bayou	210	2-5-66	Aransas Bay; Canal near Carbon Black Plant	480	3.60	3.60
12-6-62	Galveston Bay, Mud Cut	280	11-19-66	Galveston Bay; West Bay Causeway	559	4.43	3.95
7-15-66	Aransas Bay, Turtle Pen	220	7-30-69	Aransas Bay; Copano Bay upper end	470	3.11	3.04
10-14-66	Upper Laguna Madre, East of Marker 89		3-18-77	Lower Laguna Madre; Port Mansfield	965		10.42
10-14-66	Upper Laguna Madre, East of Marker 89	340	7-21-78	Upper Laguna Madre; Starvation Point, Baffin Bay		12.66	11.77
12-13-67	Upper Laguna Madre, South Bird Island	440	6-6-78	Upper Laguna Madre; Marker 115	711	12.06	10.48
12-18-67	Upper Laguna Madre, Yerbia Annis Windmill	355	4-22-79	Upper Laguna Madre; Petronilla Creek	686	12.33	11.34
7-15-68	Upper Laguna Madre, Marker 75	440	1-2-76	Upper Laguna Madre; West of Point of Rocks			7.47

<sup>a</sup>Age was estimated by summing the time free and the estimated age at tagging using the TL at tagging and the growth equation of Doerzbacher *et al.* (1988).



**Figure 2.** Total length frequency and cumulative percentage of 7244 black drum collected in trammel nets in Texas bays, October 1976 - April 1980 (from Matlock 1985).

Over 99.5% of the fish landed by anglers from Texas bays and measured by TPWD were  $\leq 1015$  mm. Estimates for  $L_{\infty}$  of black drum in Louisiana and Virginia were 1745 mm (fork length) and 1474 mm (fork length), respectively (Beckman *et al.* 1988, Richards, 1973). Their data bases included many fish  $>750$  mm. Growth data from fish in Texas larger than 750 mm are needed to estimate better the von Bertalanffy parameters.

**Table 2.** Record size of black drum landed by anglers in the Gulf of Mexico and southern Atlantic Ocean.

State	Weight (kg)	Year caught	Reference
Alabama	24.2	1986	Alabama Department of Conservation and Natural Resources (1988)
Florida	42.2	1957	Roy Williams, Florida Marine Fisheries Commission, Tallahassee, Florida
Georgia	36.7	1983	Henry Ansley, Georgia Department of Natural Resources, Brunswick, Georgia
Louisiana	34.9	1975	Gerald Adkins, Louisiana Department of Wildlife and Fisheries Sciences, Baton Rouge, Louisiana
Mississippi	24.3	1984	Fred Deegan, Mississippi Department of Wildlife Conservation, Long Beach, Mississippi
South Carolina	40.4	1978	Don Hammond, South Carolina Wildlife and Marine Resources Department
Texas	36.7	1988	Texas Parks and Wildlife Department (unpublished data), Austin, Texas

Maximum sizes of black drum occupying the cold temperate waters of the Atlantic Ocean near and north of Cape Hatteras, North Carolina, appear greater than those in the warm temperate waters of the Carolinian Province south of that general area and extending into the Gulf of Mexico. In contrast to records of 24.2 to 42.2 kg from the Carolinian Province states south of North Carolina (Table 2), the record in Delaware is 51.3 kg (International Game Fish Association 1988). Fish larger than 35 kg are commonly caught in the northeast United States (Richards 1973). The estimate of  $L_{\infty}$  for black drum in Virginia is 1474 mm (Richards 1973). The difference in sizes north and south of Cape Hatteras suggests that there is a zoogeographic variation in the population dynamics of black drum, as has been suggested for several other species (Matlock 1987).

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Gary C. Matlock, Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, Texas 78744

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