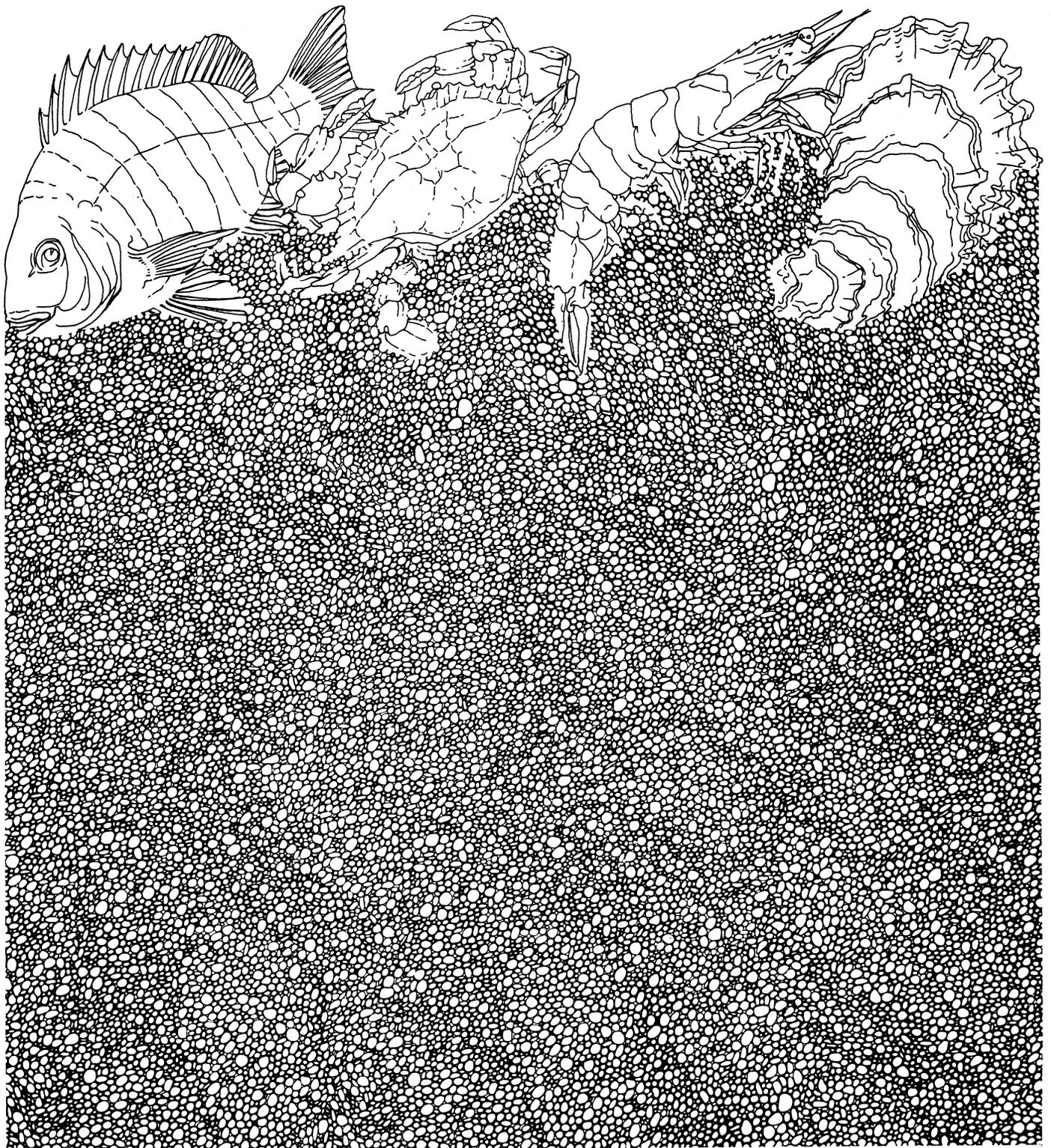


Red Drum Sex Ratio and Size at Sexual Maturity

by Gary C. Matlock

Management Data Series Number 85
1985

Texas Parks and Wildlife Department
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ACKNOWLEDGMENTS

I am deeply indebted to Dr. Mark Chittenden for his assistance in developing this manuscript. Lynn Benefield, Tom Heffernan, Larry McEachron, and Gary Saul reviewed the manuscript and their suggestions were also helpful.

ABSTRACT

Gonads of red drum (Sciaenops ocellatus) collected with gill nets in Texas bays during October 1976-September 1977 were examined macroscopically to determine sex and maturity stage. The sex ratio (male to female) for all bays combined was not significantly different from 1, but it varied from 0.1 in Aransas Bay to 2.9 in Galveston Bay. The size at which red drum reach sexual maturity in Texas may be at least 500 to 700 mm total length. Additional research using microscopic examination of gonads of fish collected in bays and the Gulf of Mexico is needed to improve accuracy.

INTRODUCTION

The male-female ratio and size at sexual maturity for red drum (Sciaenops ocellatus) are poorly known. Fifty fish from the Gulf of Mexico off Louisiana (Boothby and Avault 1971; NMFS, unpublished data) and 18 off Texas (Cody et al. 1977, Cody and Avent 1980) were sexed. But, this did not represent all fish caught, gear selection bias was not considered, nor was the catch randomly sampled. Estimates of size when sexual maturity is reached (Perret et al. 1980) are based on few fish, definitions of maturity stages are often not clear, and few details are presented.

The objectives of this study were to present estimates of sex ratios in bays and determine minimum size when sexual maturity is reached.

MATERIALS AND METHODS

The sex and maturity stage of sub-adults collected with gill nets during October 1976-September 1977 in all bay systems except Sabine Lake and Matagorda Bay were determined by macroscopic inspection of gonads. Details of the collection procedures were given by Matlock et al. (1978) and Matlock and Weaver (1979). An abbreviated version of the gonad classification of the Food and Agricultural Organization of the United Nations (1965) was used; even numbered categories were excluded (Table 1). Fish were measured to the nearest mm total length (TL). A chi-square test (Sokal and Rohlf 1969) was used to determine if the male to female ratios were significantly ($P = 0.05$) different from 1.

RESULTS AND DISCUSSION

The sex ratio of red drum may vary greatly. The sex ratio for all bays combined was not significantly different from 1 (Table 2). However, it varied from 0.1 in Aransas Bay to 2.9 in Galveston Bay. Males were significantly more abundant in Galveston Bay and females were significantly more abundant in Aransas and Corpus Christi Bays. These findings are not conclusive because they vary greatly, they were not randomly selected from the catch, and only 228 of 2,206 fish were examined.

The size at which red drum reach sexual maturity is not clear but may be at least 500-700 mm TL off Texas. None of the 81 fish (310-740 mm) for which maturity stage could be determined were gravid (Table 3). Only one male (730 mm TL) and two females (530 and 660 mm TL) were developing. These results agree with other poorly described estimates for Texas fish (Table 4). Fish in Alabama and Mississippi apparently mature at 300-400 mm TL (Table 4), but the reason for the intra-gulf difference is not obvious if it is real.

Sex ratios of fish recruiting to the spawning population should be determined to predict spawning success if courtship requires a 1:1 ratio. The sex ratio of sub-adults should be determined in summer, just prior

to or during emigration to the gulf using trammel nets (to maximize size range caught) set near bay-gulf passes or at randomly selected stations along shorelines. Sex ratio estimates for gulf fish could be obtained in fall from fishery-independent longline collections, recreational catches or beach seine collections. Microscopic examination of gonads (Simpson 1959, Lagler et al. 1962) may improve accuracy of sex determination.

Fish collected throughout the year with trammel nets in bays and hook and line; longlines, or fish trawls in the gulf should be used to determine the size and time at which fish first spawn. Sex and gonad maturity stage should be determined using FAO (1969) and Standard and Chittenden (1984) to determine size and time of maturation. Length frequencies should be constructed for each sex and maturity stage similar to Geoghegan and Chittenden (1982) to determine size at sexual maturity. Size composition, gonad stage, and ovary weight for bay caught fish should be compared to gulf fish to determine time and size of emigration to gulf by sexually mature fish.

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Table 1. Description of gonad maturity stages assigned to red drum.

Stage	Classification	Description
0	Immature	Gonads barely or not visible.
1	Virgin	Gonads very small, close under the vertebral column. Testis and ovary transparent, colorless to gray. Eggs invisible to naked eye.
3	Developing	Gonads opaque, reddish with blood capillaries and occupy about half of ventral cavity.
5	Gravid	Gonads fill ventral cavity. Testies white, drops of milt fall with pressure. Eggs completely round, some already translucent.
7	Spent	Gonads not yet fully empty. No opaque eggs left in ovary.

Table 2. Summary of sex ratios for sub-adult red drum, October 1976-September 1977, and results of X^2 test comparing to a 1 to 1 sex ratio.

Bay system	Number examined	Sex not determined	Male	Female	Male/Female ratio	X^2
Galveston	47	16	23	8	2.9	7.258**
East Matagorda	15	12	1	2	0.5	0.333NS
San Antonio	21	0	7	14	0.5	2.333NS
Aransas	49	24	3	22	0.1	14.440**
Corpus Christi	59	38	5	16	0.3	5.762*
Upper Laguna Madre	11	0	3	8	0.4	2.273NS
Lower Laguna Madre	26	7	13	6	2.2	2.579NS
All bays combined	228	97	55	76	0.7	3.366NS

Table 3. Number of male and female red drum with each maturity stage caught in gill nets, October 1976-September 1977 (Blank = 0 fish; ND = not determined). See Table 1 for maturity stage descriptions.

Bay system	Number examined	Total length range (mm)	Male					Female					Unknown sex
			Number		Maturity stage			Number		Maturity stage			
			ND	1	3	5	ND	1	3	5	ND	1	
Galveston	47	328-729	23	21	1	1	1	1	8	2	6	16	
East Matagorda	15	344-542	1	1	1	1	2	2	12				
San Antonio	21	323-378	7	7	7	14	14	14					
Aransas	49	306-712	3	1	2	22	11	11	24				
Corpus Christi	59	260-660	5	2	3	16	2	12	38				
Upper Laguna Madre	11	480-660	3	3	8	8	8						
Lower Laguna Madre	26	343-740	13	13	6	6	6	7					
All bays	228	260-740	55	27	27	1	76	23	51	2	97		

Table 4. Summary of available information on total length at sexual maturity in red drum.

Author	State	Sex	Length at sexual maturity (mm)	Matlock's comments
Tokel (1966)	Florida	Female	630	No details given.
Tatum (personal communication in Perret et al. 1980)	Alabama	Not given	305- 381	No details given.
Overstreet (personal communi- cation in Perret et al. 1980)	Mississippi	Male	320- 395	No details given.
Boothby and Avault (1971)	Louisiana	Female	840-1087	No details given.
Pearson (1929)	Texas	Not given	740- 960	One of 80 fish was sexually mature; no other details given.
Miles (1950)	Texas	Male	760- 850	No details given.
Gunter (1950)	Texas	Not given	406- 432	No details given.
Simmons and Breuer (1962)	Texas	Not given	700- 800	No details given.
Simmons and Breuer (1962)	Texas	Male	500	Based on capture of males in upper Laguna Madre; no other details given.
Simmons and Breuer (1962)	Texas	Female	550	Based on capture of ripe females in upper Laguna Madre; no other details given.

PWD Report 3400-213
January 1986