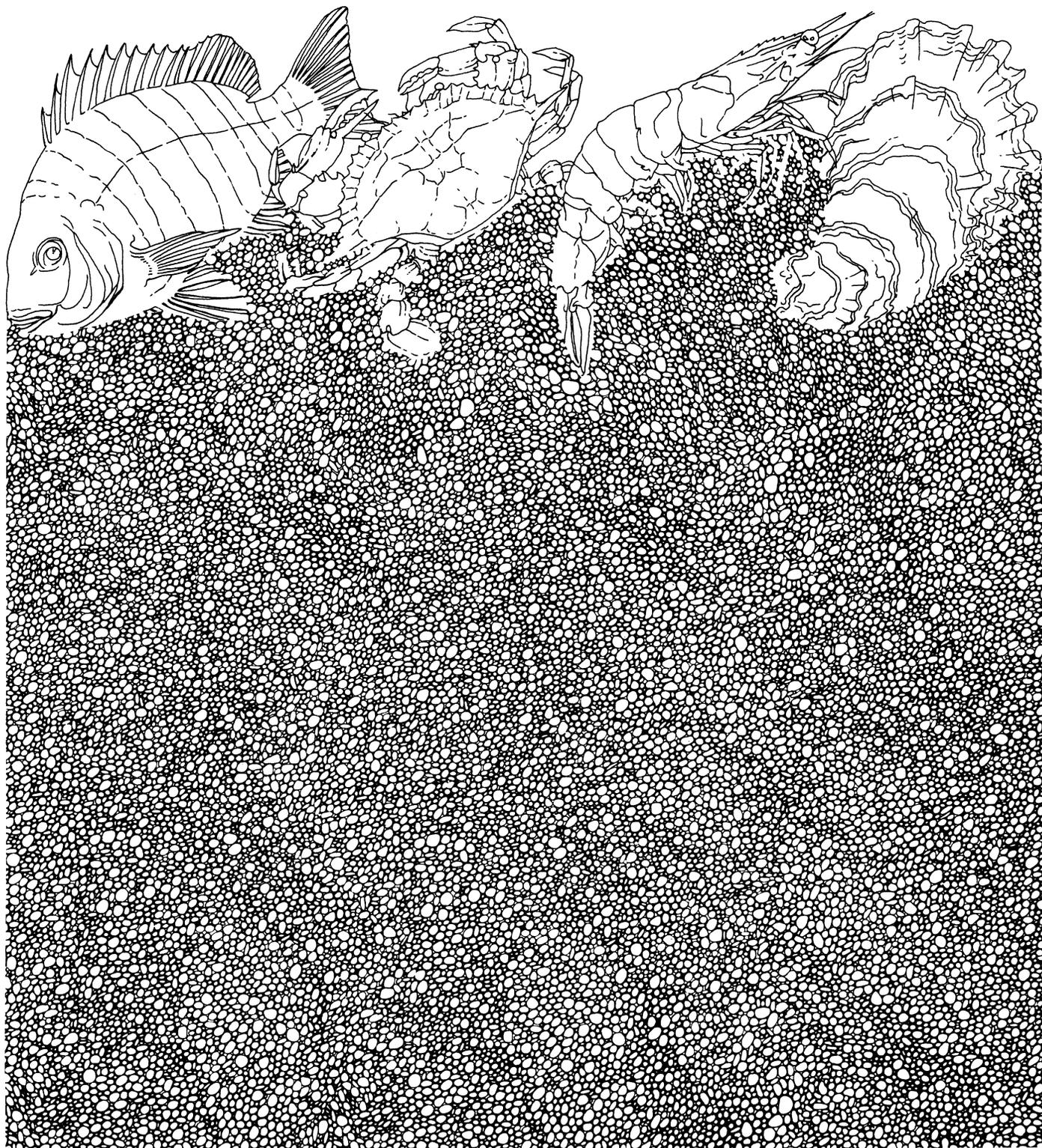


# Survival of Unmarked Red Drum Stocked Into Two Texas Bays

by J.A. Dailey and L.W. McEachron

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Texas Parks and Wildlife Department  
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## ABSTRACT

Unmarked red drum (Sciaenops ocellatus) fingerlings (28 mm long TL) were stocked into San Antonio Bay during summers 1983 and 1984 and into Nueces Bay during fall 1983 and January 1984. Almost 13 million fish were stocked; 8 million in San Antonio Bay and 5 million in Nueces Bay. Fingerling red drum were caught in bag seines from summer releases 1.5 months after stocking; thus indicating survival of stocked fish.

## INTRODUCTION

The red drum (Sciaenops ocellatus) is one of the most important recreational species found on the Texas Gulf coast (Simmons and Breuer 1962, Perret et al. 1980). Declining stocks of this species (Matlock 1982) and the development of red drum spawning and rearing techniques (Colura et al. 1976, Arnold et al. 1977) made estuarine stocking feasible.

From October 1975 through 1982 Texas bays were stocked with red drum eggs (8.5 million), fry (45.1 million), and fingerlings (2.8 million) to enhance existing populations (Matlock 1984). Survival and migration of stocked red drum fingerlings was monitored by a tagging study. A total of 4942 jaw tagged red drum were released in Matagorda Bay (Matlock et al. 1984) and 38,236 magnetic nose tagged red drum were released into St. Charles Bay (Matlock et al. 1986). Tag returns were limited but verified that some stocked fingerlings survived.

Tagging small fishes is time consuming and expensive. It would be cost efficient if unmarked fingerlings can be used to verify survival of stocked red drum. The objective of this study was to determine if unmarked red drum stocked in San Antonio and Nueces Bays could be distinguished from natural fish and thus be used to determine if fish survive stocking.

## MATERIALS AND METHODS

In the San Antonio Bay system, 2,319,005 red drum fingerlings were stocked at 5 sites in May 1983 and 5,769,795 fish were stocked at 11 sites in May and July 1984 (Table 1). In Nueces Bay (Corpus Christi Bay system), 4,712,416 red drum fingerlings were stocked at 4 sites in September and November 1983 and 259,776 were stocked at one site in January 1985 (Table 1). Bag seining began one week after the end of each stocking period and was conducted every 14 days thereafter through 77 days in San Antonio Bay and through 35 days in Nueces Bay (Table 2). Bag seine samples were collected at one randomly selected stocking site and at 0.4 and 0.8 km from the stocking site. Length and mesh dimensions (18.3m long: 1.8-m deep with 1.3-cm stretched nylon multifilament mesh in the 1.8m wide central bag with remaining webbing 1.9-cm stretch mesh) bag seines were pulled 15.2 m parallel to shore and encompassed 0.03 ha (McEachron and Green 1986).

## RESULTS

Stocked unmarked red drum were conclusively captured during summer in San Antonio Bay (N = 94) based on the mean length of naturally occurring red drum during the same period (Table 3). Unmarked red drum captured in Nueces Bay (N = 38) were generally similar in size to naturally occurring fish (Table 3). Red drum were recaptured up to about 1.5 months after stocking and exhibited growth through time (Table 2).

## DISCUSSION

Studies by Matlock et al. (1984, 1986) and the present study conclusively prove that red drum stocked into three bay systems (Matagorda, San Antonio and Aransas Bays) survived and that they probably survived in a fourth (Nueces Bay). Red drum were stocked in San Antonio Bay and Aransas Bay at a time (summer) when no small red drum ( $\leq 100$  mm) normally occurred in the bay (McEachron and Green 1986). In Nueces Bay, fingerlings were stocked in fall and they were similar in size to naturally occurring fish. Bag seines in this study only captured red drum for a short period after stocking. Red drum probably avoid capture with bag seines as the size of the fish increases so it is possible that stocked fish eluded capture as they grew. Gill nets were used to capture stocked red drum up to 9 months in St. Charles Bay (Matlock et al. 1986). The Texas Parks and Wildlife Department conducts routine gill netting during spring and fall and routine bag seining monthly (McEachron and Green 1986). Increases in relative abundance of populations due to stocking should be detected during routine bag seine and gill net sampling and special follow-up sampling is not warranted in the future.

None of the studies conducted to date determined survival rate of all stocked fish, only that stocked fish survive. Studies verifying survival rates and optimum time to stock to insure highest survival rates need to be conducted.

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Table 1. Number and mean total length (mm) of red drum stocked in San Antonio and Nueces Bays during 1983 and 1984.

Year Bay	Date stocked	Latitude	Longitude	No. released	Mean total length	
<b>1983</b>						
San Antonio	May 17	28°25'18"	96°26'06"	126,749	27	
		28°25'18"	96°26'06"	179,270	23	
	18	28°19'50"	96°39'05"	195,000	25	
		28°20'05"	96°38'45"	197,626	24	
	19	28°25'18"	96°26'06"	187,921	30	
		28°25'18"	96°26'06"	185,506	30	
	24	28°25'18"	96°26'06"	196,859	24	
		28°25'18"	96°26'06"	87,067	24	
	25	28°24'48"	96°27'12"	179,785	24	
	26	28°20'05"	96°38'45"	238,316	26	
		28°19'50"	96°39'05"	48,585	26	
	27	28°24'13"	96°28'18"	211,520	25	
		28°24'13"	96°28'18"	284,801	31	
	Nueces	Sep 07	27°51'52"	97°20'37"	320,184	31
27°51'40"			97°28'30"	131,059	42	
08		27°51'52"	97°20'37"	354,762	29	
		27°51'40"	97°28'30"	409,827	31	
11		27°51'52"	97°20'37"	353,202	29	
12		27°51'40"	97°28'30"	73,030	56	
13		27°51'40"	97°28'30"	204,527	22	
Nov 09		27°51'40"	97°28'30"	717,112	32	
		27°51'52"	97°21'00"	94,056	33	
		12	27°52'12"	97°25'05"	292,500	25
		27°51'25"	97°21'15"	527,716	32	
		13	27°51'52"	97°21'00"	170,181	31
			27°52'00"	97°20'00"	189,019	31
		14	27°51'40"	97°28'30"	536,153	26
16	27°51'40"	97°28'30"	339,088	22		
<b>1984</b>						
San Antonio	May 08	28°20'05"	96°38'45"	26,000	31	
		28°15'18"	96°26'06"	258,817	29	
	16	28°23'50"	96°29'12"	181,510	30	
	17	28°24'48"	96°27'25"	296,316	28	
	18	28°21'45"	96°33'52"	87,000	29	
	19	28°15'18"	96°26'06"	352,000	24	
	20	28°24'13"	96°28'18"	342,905	29	
	22	28°15'18"	96°26'06"	393,056	30	
	23	28°24'48"	96°27'25"	285,000	31	
	24	28°15'18"	96°26'06"	231,861	24	

Table 1. (Cont'd.).

Year Bay	Date stocked	Latitude	Longitude	No. released	Mean total length
<b>1984 (Cont'd.).</b>					
San Antonio (Cont'd.).	Jul 03	28°23'15"	96°30'10"	288,590	36
	04	28°23'00"	96°27'09"	179,000	40
	05	28°22'40"	96°27'20"	519,162	30
	06	28°23'00"	96°27'09"	401,632	32
	07	28°25'54"	96°25'00"	208,175	33
	08	28°25'54"	96°25'00"	307,365	32
	10	28°25'54"	96°25'00"	451,901	33
	12	28°23'00"	96°27'09"	420,566	30
	13	28°25'54"	96°25'00"	538,939	22
	<b>1985</b>				
Nueces	Jan 07	27°51'35"	97°29'00"	167,052	31
	08	27°51'35"	97°29'00"	92,724	27
<b>Combined Total</b>				13,060,992	

Table 2. Number and mean total length (mm  $\pm$  1SE) of red drum captured during follow-up bag seining in San Antonio and Nueces Bays during 1983-1985.

Year Bay	Date sampled	Latitude	Longitude	No. captured	Mean length
<b>1983</b>					
San Antonio	Jun 07	28°24'13"	96°28'18"	7	30 $\pm$ 3
	22	28°15'18"	96°26'06"	10	38 $\pm$ 2
		28°24'13"	96°28'18"	2	38 $\pm$ 1
	30	28°15'18"	96°26'06"	2	36 $\pm$ 3
	Jul 08	28°24'13"	96°28'18"	7	40 $\pm$ 3
		28°24'48"	96°27'12"	0	
	11	28°25'18"	96°26'06"	0	
	26	28°25'18"	96°26'06"	0	
		28°24'48"	96°27'12"	0	
		28°24'13"	96°28'18"	0	
	Aug 03	28°24'13	96°28'18"	0	
		28°24'48"	96°27'12"	0	
		28°15'18"	96°26'06"	0	
	23	28°24'13"	96°28'18"	0	
		28°24'48"	96°27'12"	0	
		28°15'18"	96°26'06"	0	
	Sep 06	28°24'13"	96°28'18"	0	
		28°24'48"	96°27'12"	0	
		28°15'18"	96°26'06"	0	
	Nueces	Sep 25	27°51'52"	97°20'37"	10
		27°51'40"	97°28'30"	3	39 $\pm$ 3
27		27°51'40"	97°28'30"	0	
Oct 13		27°51'52"	97°20'37"	14	61 $\pm$ 3
		27°51'40"	97°28'30"	0	
14		27°51'52"	97°20'37"	6	57 $\pm$ 2
Nov 23		27°52'12"	97°25'05"	1	46
		27°51'40"	97°28'30"	1	25
		27°51'52"	97°20'37"	0	
Dec 05		27°52'12"	97°25'05"	1	20
		27°51'40"	97°28'30"	1	20
		27°51'14"	97°21'31"	0	
<b>1984</b>					
San Antonio	May 31	28°25'18"	96°26'06"	0	
		28°25'18"	96°26'06"	0	
		28°25'18"	96°26'06"	0	

Table 2. (Cont'd.).

Year Bay	Date sampled	Latitude	Longitude	No. captured	Mean length
<b>1984 (Cont'd.).</b>					
San Antonio (Cont'd.).	Jun 14	28°23'50"	96°29'12"	0	
		28°23'50"	96°29'12"	0	
	27	28°23'50"	96°29'12"	0	
		28°23'50"	96°29'12"	0	
		28°23'50"	96°29'12"	0	
		28°23'50"	96°29'12"	0	
	Jul 11	28°24'48"	96°27'25"	5	39 ± 3
		28°24'48"	96°27'25"	1	30
		28°24'48"	96°27'25"	27	32 ± 1
	19	28°25'54"	96°25'00"	0	
		28°25'54"	96°25'00"	0	
		28°25'54"	96°25'00"	0	
	26	28°24'13"	96°28'18"	1	47
		28°24'13"	96°28'18"	0	
		28°24'13"	96°28'18"	0	
	Aug 02	28°25'54"	96°25'00"	31	40 ± 1
		28°25'54"	96°25'00"	1	38
		28°25'54"	96°25'00"	0	
	09	28°24'48"	96°27'12"	0	
		28°24'48"	96°27'12"	0	
		28°24'48"	96°27'12"	0	
	16	28°23'15"	96°30'10"	0	
		28°23'15"	96°30'10"	0	
		28°23'15"	96°30'10"	0	
	30	28°23'15"	96°30'10"	0	
		28°23'15"	96°30'10"	0	
		28°23'15"	96°30'10"	0	
Sep 13	28°25'54"	96°25'00"	0		
	28°25'54"	96°25'00"	0		
	28°25'54"	96°25'00"	0		
27	28°25'54"	96°25'00"	0		
	28°25'54"	96°25'00"	0		
	28°25'54"	96°25'00"	0		
<b>1985</b>					
Nueces	Jan 15	27°15'45"	97°29'10"	0	
		27°15'45"	97°29'10"	0	
	16	27°51'40"	97°29'25"	0	
		27°51'35"	97°28'45"	0	
	29	27°51'40"	97°29'05"	0	
		27°51'45"	97°29'10"	1	50
	Feb 12	27°51'40"	97°29'05"	0	
		27°51'35"	97°28'45"	0	
		27°51'40"	97°28'25"	0	

Table 3. Seven-year combined monthly mean total length (mm  $\pm$  1SE) of red drum caught in bag seines during routine Texas Parks and Wildlife Department sampling in San Antonio and Corpus Christi Bays during 1978-1984, and combined monthly red drum mean lengths caught in follow up bag seining.

Bay	Month	Routine	Follow-up
		Mean length	Mean length
San Antonio	Jun	233 $\pm$ 90	35 $\pm$ 2
	Jul	210 $\pm$ 55	32 $\pm$ 1
	Aug	290 $\pm$ 144	44 $\pm$ 1
Corpus Christi	Sep	246 $\pm$ 0	44 $\pm$ 2
	Oct	86 $\pm$ 94	60 $\pm$ 3
	Nov	39 $\pm$ 5	35 $\pm$ 10
	Dec	49 $\pm$ 7	20
	Jan	69 $\pm$ 16	50

