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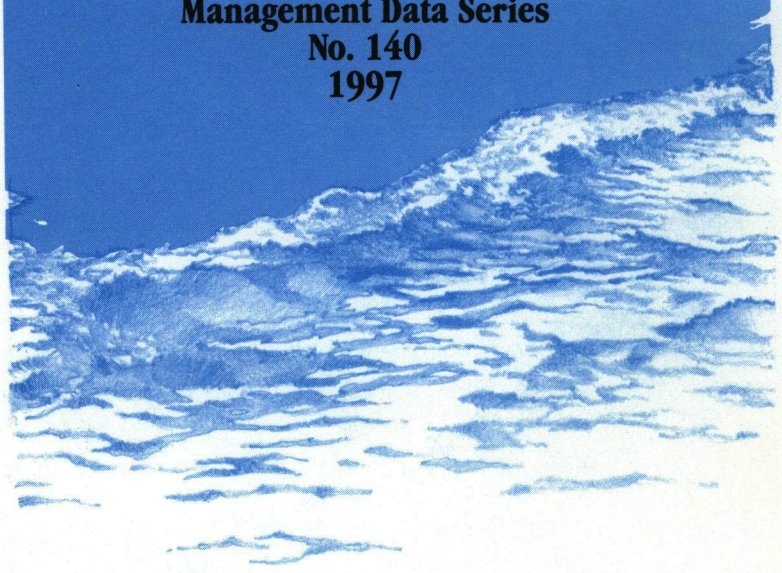

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ABSTRACT

Use of salt-boxes to separate bycatch from shrimp (Penaeus spp.) by the Texas bay shrimping industry was characterized. During 1995, commercial bait and bay shrimp fishermen from each of eight Texas bays were interviewed. Salt-boxes were used most often in Matagorda and San Antonio Bays where 90% and 100%, respectively, of the fishermen interviewed reported using salt-boxes. Zero to 58% of shrimp fishermen from other Texas bays reported using salt-boxes. Most salt-boxes were constructed of wood, with dimensions ranging from 0.6 m x 0.6 m x 0.9 m to 1.2 m x 2.4 m x 0.9 m. Salinities maintained in salt-boxes averaged 67 0/00.

Introduction

Shrimp (Penaeus spp.) is the most important commercial seafood product in Texas, accounting for more than 80% by weight of all Texas commercial fisheries landings (Robinson et al. 1996). Trawling for shrimp results in bycatch of non-target species. Bycatch removal, referred to as "culling" by fishermen, is time consuming. Shrimpers frequently utilize salt-boxes to assist in rapid separation of bycatch from shrimp. Salt-boxes are on-board tanks in which a hypersaline solution of seawater and food-grade salt (NaCl) is held. The catch is placed in the solution, where most fish species float while shrimp sink. Floating bycatch is skimmed from the surface and discarded. Shrimp are then dipped from the tank and any remaining bycatch removed and discarded. Although use of salt-boxes is known to fisheries managers, many facets of the practice are unknown. For instance, time of year salt-boxes are most frequently used, areas of the coast where salt-boxes are used most often, and salinities used are unknown. The authors are not aware of any reports on the use of salt-boxes.

Objectives of this study were to describe use of salt-boxes by the Texas bay shrimp industry. Specifically, the extent of salt-box usage in each Texas bay system was determined and methods employed in the use of salt-boxes are described.

Methods

Commercial shrimpers (bait and bay shrimp license holders) operating in each Texas bay (Figure 1) were interviewed. Interviews were conducted by Texas Parks and Wildlife (TPW) personnel from each of eight ecosystem monitoring teams for their respective bay. Shrimpers were arbitrarily selected by individual interviewers. Interviews were conducted by telephone or in person from January to April, 1995. Interviews consisted of eight questions (Figure 2). Shrimpers were classified as either bait or bay shrimpers by the type of shrimping license they purchased. Under Texas law, bait shrimpers catch shrimp to be sold as bait and must keep 50% of the catch alive. Bay shrimpers catch shrimp to sell as an edible aquatic product and are not required to maintain any of the catch in a live condition. If the individual interviewed had both bait and bay licenses they could be interviewed as both a bait and a bay shrimper at the discretion of the interviewer. Target number for each bay system was 15 interviews in each group.

Salt-box use was calculated coastwide for each group based on total responses; use within bay systems was calculated using interview responses from individuals shrimping in each bay system. Instances of refusal to participate in the survey were not recorded. Reasons for not using salt-boxes were tabulated. Seasonality and frequency of use, conditions prompting use, physical description of salt-boxes, volume of salt used, average "cull" time and time saved by using a salt-box were summarized. Salinity was measured in 14 salt-boxes using a refractometer.

Results and Discussion

Salt-box use in all Texas bays combined was 7% for bait shrimpers and 37% for bay shrimpers. Use within individual bays ranged from 0 to 100% for both bait and bay shrimpers (Table 1). Salt-boxes were most commonly used in Matagorda (90%) and San Antonio (100%) Bays. Although number of fishermen responding to the survey in San Antonio Bay was low, observations by TPW personnel indicate almost all bay shrimpers in San Antonio Bay use a salt-box. Bay shrimp fishermen in Sabine Lake also frequently use salt-boxes (58%) but indicated they use them most often when fishing in the Gulf; in the bay they use the salt-box as a live-box (contains ambient salinity water). The target survey number was not reached for bait shrimpers or for bay shrimpers in five of the eight bays. The primary reason for low survey responses was lack of shrimpers operating in the system, most probably due to low shrimp densities in the system. However, TPW personnel from one bay system indicated local shrimpers were reluctant to cooperate and some individuals refused to answer survey questions.

The most common reason for not using a salt-box by bait shrimpers was that they were keeping live shrimp and a salt-box would reduce shrimp survival (43 responses). The most common reason for not using a salt-box given by bay shrimpers was 1) don't need a salt-box (n=19), 2) thought salt-boxes were illegal (n=14) and 3) use a live box instead of a salt-box (n=11). Other reasons for not using salt-boxes are listed in Table 2.

Bait shrimpers who used a salt-box used it in the spring 60-100% of the time. Bay shrimpers using salt-boxes also used them primarily in the spring. Mean use by all shrimpers was 55% of the time when using salt-boxes with a range from 5 to 100% (Table 3). The most common condition that prompted salt-box use for bait and bay shrimpers was bycatch volume. Other reasons for use by bay shrimpers included: 1) small shrimp size (n=8), 2)always use salt-box (n=1), 3) freshwater in bays (n=1), 4) deck hand not available (n=1), and 5) time of year (n=1). One individual had no response.

Most salt-boxes were wood with dimensions ranging from 0.6 m x 0.6 m x 0.9 m to 1.2 m x 2.4 m x 0.9 m (n=36), a few shrimpers reported using plastic 209-liter (55 gallon) barrels (n=6). Amount of salt used ranged from 0.5 to 22.7 kg (1 to 50 lbs). Reported time required to "cull" a catch using a salt-box ranged from 5 minutes to 2 hours and averaged±SD 40±23 minutes for bay shrimpers and 45±36 minutes for bait shrimpers. Estimated time saved by using a salt-box ranged from 20% to 89% and averaged 43±15% for bait shrimpers and 65±16% for bay shrimpers. Salinity in salt-boxes on 14 shrimp boats actively using salt-boxes to "cull" catch ranged 35 to 92 o/oo and averaged±SD 67±18 o/oo.

Use of salt boxes is limited to the upper Texas coast, primarily Matagorda and San Antonio bays. Salt box use resulted in a reported time savings of over 50% in these two bay systems which have accounted for an average of 38% of bay shrimp landings for the last 10 years (Robinson et al. 1996). The exception to the pattern of salt-box use on the upper coast is Galveston Bay, where limited use of salt-boxes is reportedly due to lack of need for salt-boxes or

because shrimpers have the misconception that salt-box use is illegal.

Literature Cited

Robinson L., P. Campbell, and L. Butler. 1996. Trends in Texas commercial fishery landings, 1972-1995. Management Data Series No. 127. Texas Parks and Wildlife Department. Coastal Fisheries Division. Austin, Texas.

Table 1. Salt-box use in Texas bays by bait and bay shrimpers.

	Bait		Bay	
Bay System	n	(%)	n	(%)
Sabine Lake	3	33	12	58[a]
Galveston	15	13	11	9
Matagorda	18	6	21	90
San Antonio	1	100	8	100
Aransas	7	0	21	10
Corpus Christi	4	0	20	0
Upper Laguna Madre	15	0	7	0
Lower Laguna Madre	10	0	0	-
Total	73	-	100	-
Weighted Mean	-	7	-	37

[a] Most respondents used salt-box without adding salt or as a "live box" most of the time.

Table 2. Reasons given by Texas bait and bay shrimp fishermen for not using a salt-box.

License Type	Reason	Responses (No.)
Bait		
	Don't want to kill live shrimp	43
	Too much trouble to use	7
	Thought salt-boxes were illegal	7
	Use a live box not a salt-box	7
	Concerned about bycatch survival	2
	Boat too small; not enough space	2
	Too expensive to use	1
	Don't know what a salt-box is	1
	No response	5
	Total	**75**
Bay		
	Don't need a salt-box	19
	Thought salt-boxes were illegal	14
	Use a live box not a salt-box	11
	Concerned about bycatch mortality	8
	Use reduces shrimp quality	7
	Too expensive to use	7
	Use a bycatch excluder	4
	Keep shrimp alive	3
	Not enough space on boat	3
	Don't know what a salt-box is	3
	Only use a salt-box in the gulf	2
	Other	5
	No response	1
	Total	**87**

Table 3. Seasonality and percent time salt-boxes used as reported by individual bait and bay shrimp fishermen using salt-boxes. n is the number of shrimpers using salt-boxes at the indicated season and level of use. NR indicates no response to the question.

Type License	Bay	Season	Use (%)	n
Bait				
	Sabine Lake	Spring	60	1
	Galveston	Spring	100	2
	Matagorda	Spring	100	1
	San Antonio	Spring	NR	1
		Weighted Mean	90	
Bay				
	Sabine Lake	Spring	50	1
	Sabine Lake	NR	10[a]	1
	Sabine Lake	Spring, Fall	10[a]	1
	Sabine Lake	Spring	50[a]	1
	Sabine Lake	All year	5[a]	1
	Sabine Lake	Fall	5[a]	1
	Sabine Lake	NR	NR	1
		Weighted Mean	22	
	Galveston	Spring	10	1
		Mean	10	

[a] Shrimp fishermen reported using the salt-box without salt, or as a "live box" the majority of the time, with salt added to the water infrequently.

Continued

Type License	Bay	Season	Use (%)	n
Bay				
	Matagorda	All year	100	1
	Matagorda	All year	50	1
	Matagorda	Spring	100	2
	Matagorda	Spring	90	1
	Matagorda	Spring	60	3
	Matagorda	Spring	50	7
	Matagorda	Spring	30	2
	Matagorda	Spring	25	1
	Matagorda	Spring	20	1
		Weighted Mean	57	
	San Antonio	Spring	100	2
	San Antonio	Spring	90	2
	San Antonio	Spring	80	1
	San Antonio	Spring	75	1
	San Antonio	Spring	50	1
	San Antonio	Spring, Fall	75	1
		Weighted Mean	83	
	Aransas	Spring	NR	2
		Grand Mean	55	

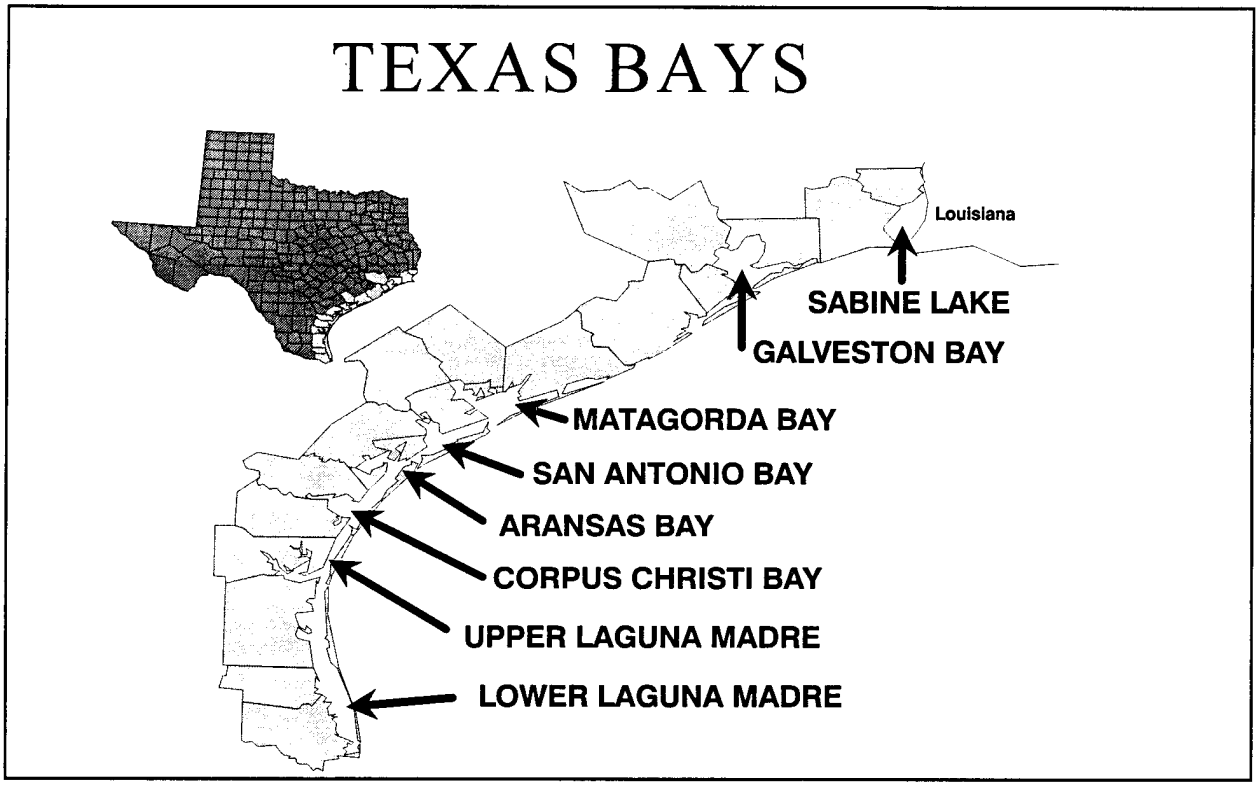

Figure 1. Texas bay systems where salt-box use interviews were conducted.

SURVEY OF Salt-box USAGE

Bay System_____

Date_____

Commercial shrimper _____ Bait shrimper _____ (Check one)

1. Do you ever use a salt-box?
   Yes_____ No_____
   If answer to question 1 is no, ask the following:
2. Why do you choose to not use a salt-box?

_____

   If answer to question 1 is yes, ask the following:
3. What months of the year do you use a salt-box?

_____

   a) During the months you use a salt-box, do you use it at all times?
   Yes_____ No_____
   If answer is no, ask the following:

   b) During the months you use a salt-box, what percentage of the time do you use a salt-box?

_____

4. What conditions do you use to determine when to use a salt-box?

_____

5. What size salt-box do you use? (Either volume or dimensions)

_____

6. Approximately how many pounds of salt do you use in your salt-box?

_____

7. How long do you estimate it takes to cull an average catch using a salt-box?

_____

8. How much time do you estimate that you save by using a salt-box?

_____

Figure 2. Salt-box use questionnaire.

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