

## Job Report

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Project Name: Studies of Blue Crab Populations of the Texas Coast.

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### Experimental Crab Tagging

Abstract: Blue crabs tagged by various methods were placed in holding pens for observations. With the information obtained from these experiments and a literature survey, it was decided to use two types of tags on crabs: (1) a Petersen disc attached either through the split line of the crab or to its carapace and (2) a spaghetti dart tag in the muscular portion of the swimming leg.

Three hundred and forty-one crabs were tagged and released at four different locations in the Galveston Bay system for life - history studies. Of these crabs, 122 were tagged with Petersen disc, 219 with spaghetti dart tags. There were eleven recoveries, all males. Eight of these were tagged with Petersen disc and three with spaghetti dart tags.

Tag returns indicated random movement in the bay during the summer with some Gulfward movement. Fall returns in all cases indicated Gulfward movement.

Objective: To determine a suitable method for tagging blue crabs, Callinectes sapidus Rathbun, and to tag and release crabs at various locations in Galveston Bay for life-history studies.

Procedures: Chesapeake Bay type crab traps, baited with trash fish from trawl collections, were placed at various locations in Galveston Bay to catch blue crabs for tagging. The method of tagging crabs was determined through literature research and experimentation. Some of the tagged crabs were placed in holding pens for observation. This was done so the effects of the various tags and the most suitable position of the tags could be determined. Whether the crab could retain the tag through molting was also studied at this time.

Tagged crabs were released at different locations in upper Galveston, Trinity, East, and West Bays to study migration patterns. The job was planned for tagging only adult female crabs as their chances of shedding are minimal according to Cargo (1958), but due to the limited number caught, it was decided to tag all crabs.

The crabs were measured in millimeters by carapace width, sexed, tagged, and released. The data were recorded in a permanent log book along with the date, the area where the tagged crabs were released, and the method of tagging. Tag returns furnished data on the distance the crabs traveled, direction of travel, the number of days the crabs were free, the type tag used, and other related information.

Handbills were distributed to bait camps in the Galveston Bay area asking fishermen to watch for tagged blue crabs in their catch. (See Figure 1.)

They were asked to send information on when and where these tagged crabs were caught, and the measurement of the crab's shell width, along with the tag to the Texas Game and Fish Commission in Seabrook, Texas.

Results: Background information was obtained from available literature in the Texas Game and Fish Commission library in Rockport; the U. S. Fish and Wildlife Service library in Galveston; and from inquiries to the Virginia Fisheries Laboratory, the Fish Commission Laboratory in Oregon, and the U. S. Fisheries Laboratory in Beaufort, North Carolina.

In Virginia a red Nesbit plastic disc tag (Cronin 1949) attached to the exterior of the crab with monel fishing line, 16 pound test was used. Loops were made in the ends of the wire and these loops placed over the lateral spines of the carapace.

In Oregon spaghetti and dart tags with stoppers were placed 1-inch anterior of the point where the abdominal flap joins the body. Also used were darts without stoppers and found indications of the darts working into the gill and body cavities.

The U. S. Fish and Wildlife Service experimented with streamer tags attached through the flattened distal segment of the 5th persipod by nylon thread, however the crabs at molting did not retain this tag. Various stains, fast green and trypan blue, were injected in different parts of the crab during the studies.

Two types of tags were used for our marking experiments: (1) a Petersen disc attached with monel wire and (2) a spaghetti dart tag. Figure 2 shows these two tags. Dyes were eliminated as a marking method as they are not readily recognized by fishermen. Costello (1962) found this to be true for mark-recapture experiments on shrimp. Such experiments would require a great deal of publicity to be successful.

Petersen discs: Some of the crabs were tagged across the carapace with monel wire and Petersen disc, as described in the Virginia studies. (See Figure 3, Method 1A.) This proved to be the best method for tagging crabs, for the tag did not seem to hamper their movement or normal activities. However, this tag is lost at molting; and, hence, should be restricted to adult female crabs as their chances of shedding are minimal.

A second method, used by Van Ingle (1953), was also tested. The crabs were tagged on the under surface of the shell along its split line (See Figure 3, Method 1B.) Crabs tagged by this method were supposed to retain the tags during molting. Ten of these crabs were held in pens for over a month, but none survived molting. This method of tagging requires a great deal of time and patience and is not recommended if the tagger intends to mark a large number of crabs in a short period of time.

Spaghetti dart tag: On the first few tests with this tag no stoppers were used and, as described in the Oregon report, the tag worked into the body cavity of the crab and killed it in a few days. A rubber stopper cut from an automobile inner tube was devised to hold the spaghetti dart tag in place.

The first method used was to insert the tag through the split line on the under surface of the shell. (See Figure 3, Method 2A.) Although some of the crabs were able to retain the tag over an extended period of time, they were not able to molt with it. This tagging method was abandoned after some of the crabs pulled the tags loose.

A second method, used by Marine Biologist Ray Childress, was to tag the crab in the posterior lateral suture. (See Figure 3, Method 2B.) Childress was successful in getting several crabs to shed and retain the tag while held in an aquaria. Field tests in holding pens in Seabrook were not as successful. This method requires time and skill as the tagger has to be very careful to avoid any vital internal organs of the crab when inserting the tag.

Next we tried an insertion of a spaghetti tag in the muscular portion of a swimming leg between the carapace and the coxa. (See Figure 3, Method 2C.)

Ten crabs that were tagged by this method were held for observation. The tags seemed to irritate the crabs at first, but they soon adjusted to it and survived for over a month in holding pens; however, all the crabs died in the process of shedding. Laboratory experiments are still in progress in an attempt to induce a crab to shed while carrying this tag. To date this seems to be the best method of tagging crabs as it is fastest and easiest, although at present it is only recommended for studies on crab movement during a single season.

See Table 1 for a summarization of all the above methods.

### The 1962 Migration Study of the Blue Crab in Galveston Bay

In upper Galveston Bay 247 crabs were tagged and released at the Texas Game and Fish Commission Boat Basin in Seabrook. (See Table 2.) Two were tagged by Method 1A, 120 were tagged by Method 1B, 37 were tagged by Method 2A, and 88 were tagged by Method 2C. Eight of the tagged crabs were caught. One of the returns was tagged across the carapace using the Petersen disc (Method 1A), and seven were tagged in the split line using the Petersen disc (Method 1B). For more details refer to crab tag returns in Table 6 and map of movement patterns in Figure 4.

Eighty-three crabs were tagged and released at Lone Oak Bayou in Trinity Bay. (See Table 3.) All of these crabs were tagged with spaghetti dart tags in the swimming leg as in Method 2C. Three of these crabs were returned. Refer to Table 6 and Figure 4 for details on movement.

Eight crabs were tagged with spaghetti dart tags by Method 2C and were released at Elm Grove Point in East Bay, and three crabs were tagged with spaghetti dart tags by Method 2C and released at Mud Cut in West Bay. (See Tables 4 and 5.) There were no returns from these crabs.

A total of 341 blue crabs were tagged and released at four sites in the Galveston System from April 1962 to November 1962. One hundred and twenty-two were tagged with Petersen discs and 219 with spaghetti dart tags. The recoveries, all males, were 3.2 per cent of the total number released. (See Table 6.) Eight of the recoveries were tagged with Petersen discs and three with spaghetti dart tags.

The tag returns indicated mostly random movement within the bay during the summer with some movement Gulfward. Fall returns in all cases showed movement towards the Gulf. Figure 4 shows the migration patterns observed during this study.

The per cent of returns tends to indicate that large numbers of crabs tagged at one location yields better returns than random tagging of a few crabs throughout the bay. This is varified by the number of returns of 20 or more crabs as compared to random tagging of less than 20 crabs.

Average returns for all crabs tagged	3.2 per cent	Variation from the total number of crabs caught
Average returns for 20 or more crabs tagged	4.4 per cent	+ 1.2 per cent
Average returns for less than 20 crabs tagged	1.1 per cent	- 2.1 per cent

Recommendations for Future Crab Tagging

1. The method of securing crabs for tagging should not be limited to traps as, from past experience, they are easily robbed unless constant surveillance is maintained. The traps appeared to be selective in capturing mostly adult male crabs. In this study 284 males and 57 females were caught.
2. Crabs should be placed in holding pens until 20 or more crabs are caught before they are tagged and released.
3. A tagging method needs to be devised so that crabs can retain the tag during molting.

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Table 1

## Tagging Methods

Description	Application	Size	Number of		Evaluation
			Tagged	Returns	
Paired colored plastic discs attached to the crab with monel wire. (Method 1A)	The discs were attached to the carapace from lateral spine to lateral spine with monel wire.	170-185 mm	2	1	Crabs appeared to carry the tag without difficulty. This method is recommended for single season experiments as the tag is lost at shedding. Adult females should be tagged by this method as their chances of shedding are minimal.
Paired colored plastic discs attached through the split line of the shell (Van Ingle, 1953). (Method 1B)	Monel wire was passed through the split line of the shell and attached to the discs.	90-195 mm	120	7	Crabs were able to retain this tag for over 80 days but were not able to survive shedding in holding pens. This appears to be a good tagging method, although it requires time and skill. It is recommended for single season experiments where large numbers of crabs are not to be tagged.
Spaghetti dart tag with stopper inserted into crab with metal applicator. (Method 2A.)	Spaghetti dart tag inserted through the split line of shell. Rubber stopper used to prevent tag from working into the crab.	100-190 mm	37	-	Crabs tagged this method were able to survive for over a month in holding pens but died in the process of molting. Some of the crabs pulled the tags loose. This method is not recommended.
Spaghetti dart tag with stopper inserted with metal applicator. (Method 2B)	Spaghetti dart tag inserted through the posterior lateral suture of the crab.	-	-	-	Childress was able to get several crabs to shed while held in the aquaria. Field tests at Seabrook were not successful. More aquaria and field tests need to be made before adopting this method. The tagger has to be extremely careful to avoid inserting the tag in vital internal organs of the crab.
Spaghetti dart tag with stopper inserted with applicator. (Method 2C)	Spaghetti dart tag inserted in muscular portion of swimming leg between the carapace and the coxa.	140-205 mm	88	3	At first the tag irritated the crab, but it soon adjusted to the tag. Crabs survived over a month in holding pens but died during molting. This method is also recommended for single season experiments.

Table 2

## Number of Blue Crabs Tagged and Returned in Upper Galveston Bay

Date	Number Tagged	Method of Tagging	Number Captured	Per cent of Recaptures
4/19/62	29	Method 1B	3	10%
	1	Method 1A	0	0
4/24/62	20	Method 1B	1	5%
4/25/62	5	Method 1B	0	0
4/30/62	23	Method 1B	1	4%
5/2/62	14	Method 1B	0	0
5/3/62	25	Method 1B	2	8%
	1	Method 1A	1	100%
6/13/62	5	Method 2A	0	0
	2	Method 1B	0	0
6/19/62	32	Method 2A	0	0
6/20/62	23	Method 2C	0	0
7/5/62	12	Method 2C	0	0
7/9/62	7	Method 2C	0	0
7/13/62	13	Method 2C	0	0
7/27/62	24	Method 2C	0	0
8/1/62	4	Method 2C	0	0
8/3/62	1	Method 2C	0	0
9/6/62	1	Method 2C	0	0
10/3/62	1	Method 2C	0	0
10/16/62	1	Method 2C	0	0
10/29/62	2	Method 1B	0	0
	<u>1</u>	Method 2C	<u>0</u>	<u>0</u>
Totals	247		8	3.2%

Table 3

Number of Blue Crabs Tagged and Returned in Trinity Bay

Date	Number Tagged	Method of Tagging	Number Captured	Per cent of Recoveries
8/24/62	7	Method 2C	0	0
10/5/62	<u>76</u>	Method 2C	<u>3</u>	<u>3.9%</u>
Total	83		3	3.9%

Table 4

Number of Blue Crabs Tagged and Returned in East Bay

Date	Number Tagged	Method of Tagging	Number Captured	Per cent of Recoveries
10/29/62	8	Method 2C	0	0

Table 5

Number of Blue Crabs Tagged and Returned in West Bay

Date	Number Tagged	Method of Tagging	Number Captured	Per cent of Recoveries
9/20/62	3	Method 2C	0	0



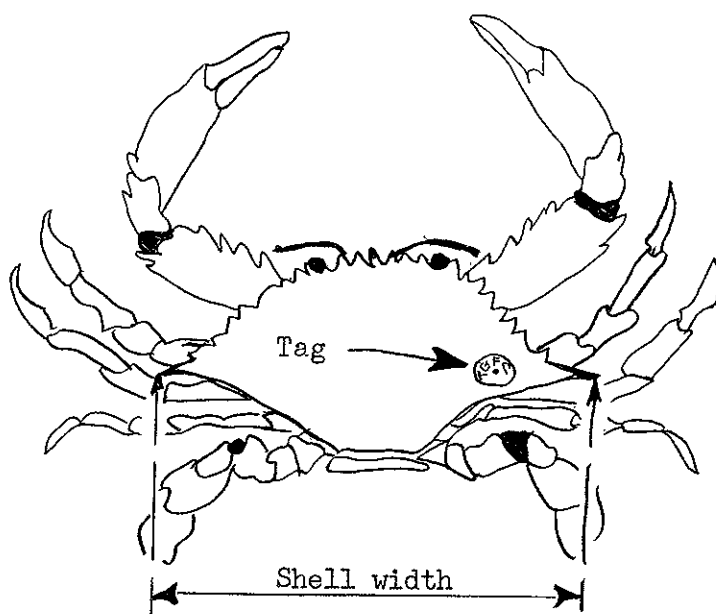
Table 6

Tag Number	Location Tagged & Released	Type Tag	Male	Female	Carapace Width MM	Date of Release	Date Caught	Days Out	Miles Travel	Miles Per Day	Area Caught
2060	Seabrook	Petersen Disc (Line)	X		170	4/19/62	5/29/62	40	2 mi.	0.05	Clear Lake
11488	Seabrook	Petersen Disc (Line)	X		115	4/19/62	7/14/62	86	20 mi.	0.23	Rollover Pass East Bay
7809	Seabrook	Petersen Disc (Line)	X		169	4/19/62	5/4/62	15	-	-	(Mueckes) Seabrook
8316	Seabrook	Petersen Disc (Line)	X		130	4/24/62	6/15/62	52	2 mi.	0.04	Clear Lake
2047	Seabrook	Petersen Disc (Line)	X		169	4/30/62	5/11/62	11	1 mi.	0.09	Red Beacon Off Seabrook
7971	Seabrook	Petersen Disc (Back)	X		184	5/2/62	5/10/62	8	2 mi.	0.25	Clear Lake
11573	Seabrook	Petersen Disc (Line)	X		123	5/2/62	?	?	?	?	No Date
11543	Seabrook	Petersen Disc (Line)	X		136	5/3/62	6/62	-	1 mi.	-	Clear Lake
1272	Lone Oak Bayou Trinity Bay	Spaghetti (Flipper)	X		180	10/5/62	10/11/62	6	9 mi.	1.50	San Leon
1259	Lone Oak Bayou Trinity Bay	Spaghetti (Flipper)	X		205	10/5/62	10/15/62	10	20 mi.	2.00	Light House Jetties Galveston Island
1214	Lone Oak Bayou	Spaghetti (Flipper)	X		200	10/5/62	10/62	?	?	?	West Bay

Figure 1

CRAB FISHERMEN

Watch For Tagged Blue Crabs



Send the information on when and where the crab was caught,  
a measurement of the shell width, along with the tag to:

TEXAS GAME AND FISH COMMISSION

SEABROOK, TEXAS

and

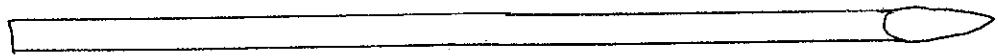
You will receive a copy of the booklet:

THE CRABS OF TEXAS

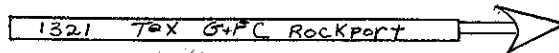
Figure 2



Petersen Disc



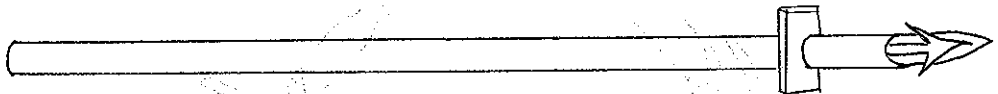
Inserters for Spaghetti Dart Tag



Spaghetti Dart Tag

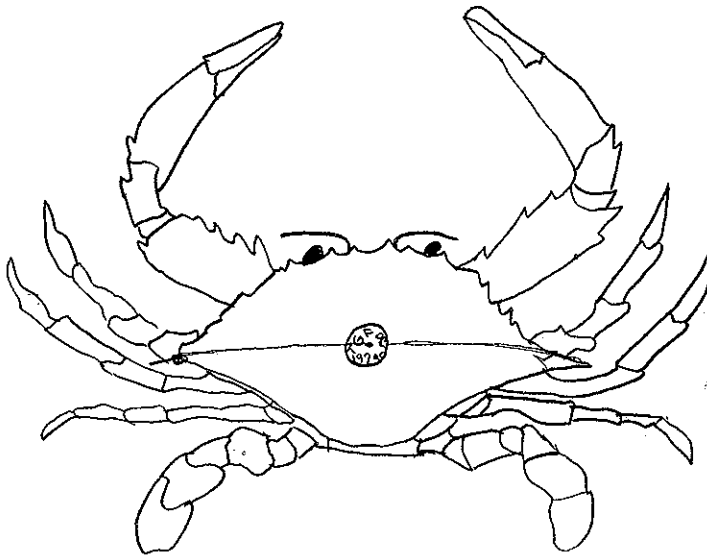


Rubber Stopper

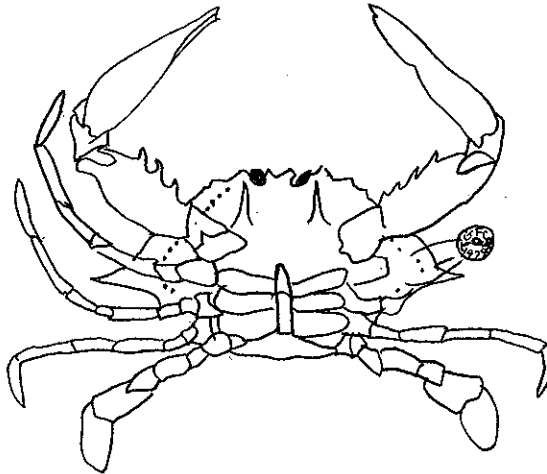


After the tag is inserted into a crab the stopper is slipped over the tag at the neck of the dart.

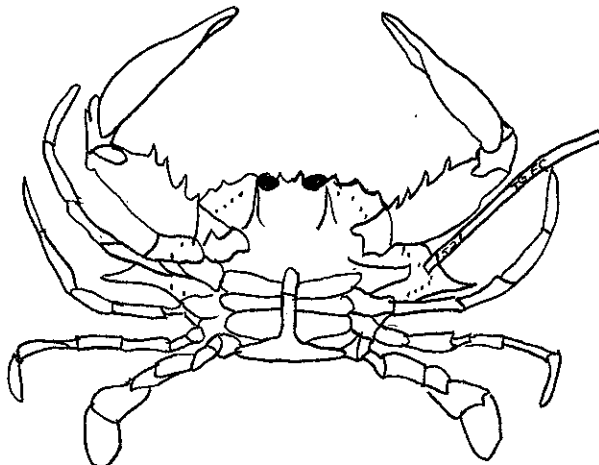
Figure 3



Method 1A

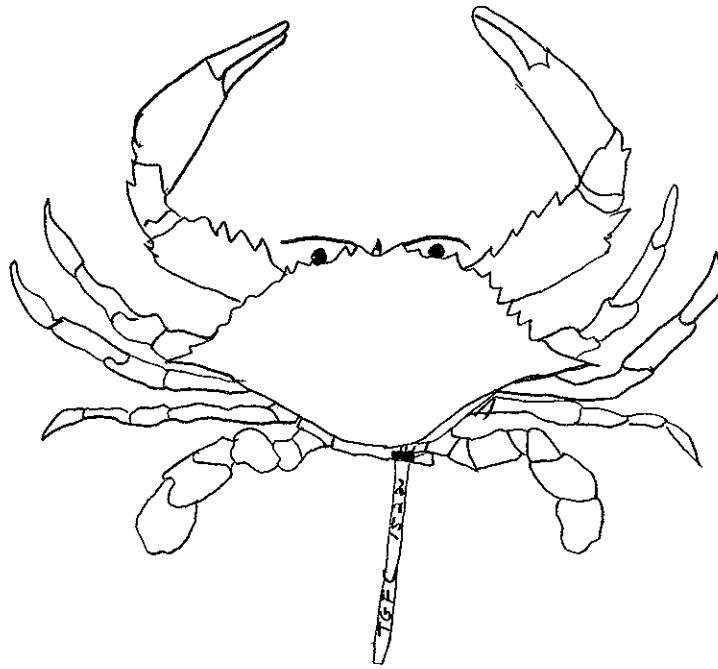


Method 1B

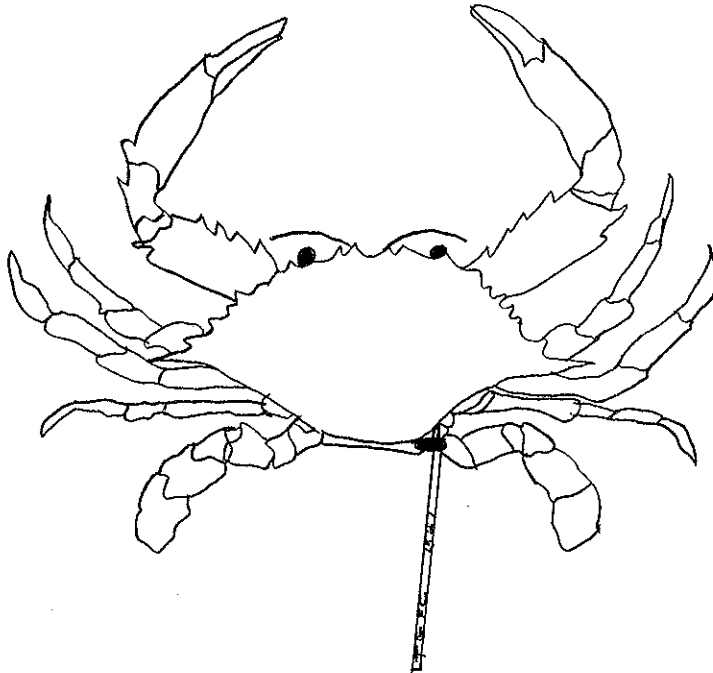


Method 2A

Figure 3 (cont)



Method 2B



Method 2C

Figure 4

Movement Patterns of Blue Crabs

