

## Job Report

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Project Name: Migration Study on Brown Shrimp in Bay Area M-6 and Gulf Area 20  
Period Covered: June 5, 1961 to October 5, 1961 Job No. 1

### Migration Study on Brown Shrimp in Bay Area M-6 and Gulf Area 20

Abstract: Shrimp stained June 5 through June 8 in Aransas Bay moved as predicted out of the bay and into the inshore Gulf. First returns from the Gulf were on July 5, a month after staining; however, at the rate of movement displayed through the bay and channels toward the Gulf, the first stained shrimp probably moved into the Gulf within three or four days of being released. The greatest distance moved was 59 miles in about 28 days. The fastest rate of movement was about 5 miles per day. A rough mileage rate, estimated from the first week's movement in the bays, was about two miles per day.

Assuming brown shrimp of a mode of 80 mm. in June start moving to the Gulf at a certain speed, it can be predicted about when a certain group will enter the inshore waters which are closed for a certain period during the summer for conservation purposes. Knowledge of the rate and direction of movement will allow a more accurate regulation of this closed season.

Objective: To determine the movement and migration patterns of the brown shrimp, Penaeus aztecus, through Aransas Bay into the Gulf of Mexico.

Procedure: Brown shrimp were caught from the Game and Fish Commission boat Goby using a 20-foot otter trawl of 1-1/2 inch stretch mesh. Standard live bait shrimping procedures were followed. All of the shrimp to be stained were taken in the southern part of Aransas Bay, and the majority were caught in the Intracoastal Waterway between markers 65 and 75. In a large live bait box containing circulated bay water the shrimp were transported a minimum distance to the staining station set up on board a floating barge anchored off Mud Island at the south end of Aransas Bay. The shrimp were held in wire bait cages suspended around the sides of the barge, both before and after staining.

On the barge two tables with running water troughs comprised the staining platform. As the shrimp were stained they were placed into the troughs and carried overboard into a waiting bait cage. Two workers transported fresh shrimp from other cages to the staining tables in plastic trays. Six workers injected stain, one kept the hypodermic needles filled, and one counted the stained shrimp moving through the troughs.

A .5 percent solution of Fast Green FCF dye, C. I. No. 42053, produced by the National Aniline Division of the Allied Chemical Corporation, was injected in the amount of .03 cubic centimeters into each shrimp through the dorsal artery between the fifth and sixth abdominal somites.

Stained shrimp were retained for from eight to twelve hours in the holding cages before release in order to determine staining mortality. They

were released at night in order to take advantage of the lessened numbers of natural predators present.

Biological samples and returns from commercial bay and Gulf shrimpers were utilized to trace the movements of the shrimp. Printed posters, with a sample stained shrimp attached, explaining the program and seeking cooperation on returns were distributed from Port Lavaca south to Brownsville and Port Isabel for display in the various bait stands and sea food concerns. Handbills containing information similiar to that on the posters were printed for distribution to individual fishing crews. Publicity efforts were greatest in the Rockport-Aransas Pass-Port Aransas area since most returns could be expected from boats working out of these ports.

Prior to the shrimp staining operation the following dealers were visited and given posters and handbills:

Port Lavaca Area

1. Clegg Shrimp Co.
2. Evelyn's Fish Mkt.
3. Key Fish Mkt.
4. Lavaca Shrimp Co.

Rockport-Fulton-Copano Area

5. Mom's Bait Stand
6. Fleming's Bait
7. Johnson's Fish Co.
8. Dee's Bait Stand
9. Bill's Bait Stand
10. Charlie's Bait Stand
11. Jackson Seafood Co.
12. Bob's Bait
13. Fulton Basin Bait
14. Harvey's Pier
15. Goodluck Pier
16. Mill's Wharf
17. Adams Lodges
18. Big Tree Lodge
19. Fulton Fish Co.
20. Port Bay Fishing Camp
21. Lenoir's Landing Camp
22. Rattlesnake Point
23. Redfish Camp

Aransas Pass Area

24. Gulf Shores, Inc.
25. Duque Seafood Co.
26. Surf Seafood Co.
27. Hogan's Bait
28. Marnot Mac's Place
29. Ransom Island Bait
30. Webster Seafood Co.
31. Gulf King Shrimp Co.
32. Coastal Freezing Co.
33. Aransas Shrimp Co.
34. Independent Seafood Co.
35. Johnson & Johnson Co.
36. Causeway Bait Stand
37. Holiday Club
38. National Seafood Co.
39. Beach Shrimp Co.

Port Aransas Area

40. Woody's Boat Basin
41. Mathew's Tackle Shop
42. Fisherman's Wharf
43. Island Charter Service
44. Hayter Boat Basin
45. Mayfield's Baits
46. Milana Bait Stand

Corpus Christi Area

47. Right Spot Bait Stand
48. Indian Point Bait Stand
49. One Stop Bait Stand
50. Red Tyler's Bait Stand
51. Chapa's Shrimp Co.
52. Oso Pier Bait Stand
53. Sanitary Fish Mkt.
54. Benny's Fish Mkt.
55. Lone Star Fish and Oyster Co.
56. Bay Fish and Oyster Co.
57. Nueces Provisions

Brownsville Area

58. Shrimp Port Companies
59. Gavito Seafood Co.
60. Tony Fenack
61. Southmost Shrimp Co.

Port Isabel Area

62. Callaway's Seafood Co.
63. Brazos Fisheries
64. Ewing Fish Co.
65. W. B. P. Shrimp Prod. Co.

Plus a great number of individual shrimpers, both bay and Gulf, from other states as well as Texas. Many of these boats land shrimp at various dealers, and some returns were obtained by the courtesy of the boat captain.

Where possible, returned shrimp were picked up personally from the dealers or crews involved.

Results: Growth Estimate - The program was not planned for the estimation of growth rate; it was planned solely to gain knowledge of movement and migration patterns of brown shrimp in one area. However, the shrimp stained were of a fairly uniform size since the majority of browns in Aransas Bay in early June lie within the limits of a rather narrow predictable population mode. Spot checks during the staining operation showed that probably 90 percent of the shrimp stained were from 70 to 90 mm. in length. No shrimp below 60 mm., nor above 110 mm., were injected.

Staining and Mortality - Between June 5 and June 8 there were 39,459 brown shrimp injected with Fast Green dye. Each stainer averaged between 350 and 400 shrimp per hour. The total number of shrimp released alive was 38,765. The total staining mortality for the program was an exceptionally low 1.76 percent. The following is a daily chart of the staining activity:

| <u>DATE</u> | <u>NUMBER<br/>STAINED</u> | <u>NUMBER<br/>RELEASED</u> | <u>STAINING<br/>MORTALITY</u> | <u>PERCENT<br/>MORTALITY</u> | <u>AREA<br/>OF RELEASE</u> |
|-------------|---------------------------|----------------------------|-------------------------------|------------------------------|----------------------------|
| 6/5/61      | 7,353                     | 7,079                      | 274                           | 3.73                         | All shrimp were re-        |
| 6/6/61      | 13,329                    | 13,209                     | 120                           | 0.90                         | leased just offshore       |
| 6/7/61      | 5,285                     | 5,160                      | 125                           | 2.37                         | of Mud Island at the       |
| 6/8/61      | <u>13,492</u>             | <u>13,317</u>              | <u>175</u>                    | <u>1.30</u>                  | south end of Aransas       |
|             |                           |                            |                               |                              | Bay in nine feet of        |
| Total       | 39,459                    | 38,765                     | 694                           | 1.76                         | water.                     |

The highest mortality from staining was recorded on the first day. This was probably due to the fact that the shrimp were stained shortly after being transported to the barge. On the following days the majority of shrimp were held for from four to twelve hours before being injected. On those days in which comparatively few shrimp were stained the difficulty lay in obtaining the shrimp.

Low staining mortality was due in part to minimum handling of the shrimp and in part to the use of Fast Green dye, a low toxicity stain.

Shrimp Returns - The staining and releasing site was approximately 12 miles from an access to the inshore Gulf as measured along a predicted most probable route taken by shrimp leaving the bay. (See Figure 1.) Most recoveries were made during the week of staining and in the following week in the Intracoastal Waterway at the south end of Aransas Bay by commercial bay boats. Presumably these shrimp were moving to the Gulf. A few shrimp moved north in the bay and were so reported. Some shrimp moved away from the Gulf pass and were returned from channels leading into Corpus Christi Bay. Some shrimp were returned from the Gulf.

One June 6, 7, and 8, on all outgoing tides, a tide net was lowered at the edge of the ship channel from the pier of the Institute of Marine Science at Port Aransas. No stained shrimp were taken by this method, although the net is known to have been effective in the past.

To date there have been 166 recorded shrimp returns, the first being on June 7, 1961, and the most recent on August 14, 1961. Of these 153 have been from the bays and bay channels; 13 have been from the Gulf. The most northerly return has been from Aransas Bay east of Rockport, about 3.5 miles from the release site. In the bays, the most southerly returns were from the Corpus Christi Ship Channel about 18.75 miles to the south and west of

the release site. In the Gulf the most southerly return was from 11 fathoms east of Yarbrough Pass on Padre Island, a distance of about 59 miles from point of release. The greatest depth from which a return was received was 23 fathoms southeast of Port Aransas, a distance of about 25 miles offshore or 44 miles from point of release.

No marked shrimp have been reported from the Gulf waters north of the bar at Port Aransas.

Table 1 shows the stained shrimp returns. Figure 1 is a chart of the movement patterns to date.

Recommendations: Better reports of stained shrimp would be obtained if, on each poster, there were placed a folder of post cards that the shrimper could fill out and mail as to the number of shrimp taken, date, and location. This would be easier than for the fisherman to save the shrimp or to try to remember it for later report.

More individual boat captains and crews should be contacted and given handbills and postcards for returns. A poster at a shrimp house is occasionally missed by transient crews.

In staining to trace movements into and within the Gulf at least two commercial shrimpers should be chartered to work the inshore waters beginning no later than a day or two after staining begins.

There should definitely be some sort of reward offered for the report of stained shrimp, or for their return. This would increase the amount of returns by offering some incentive.

Summary: A staining program, in which small brown shrimp were dyed green and released to check migratory patterns, was completed in Aransas Bay in June. Returns of the colored shrimp showed that they moved at a rate of two to five miles per day from the place of release in the bay out to the inshore Gulf of Mexico waters by way of the Intracoastal Waterway and the Aransas Ship Channel, a distance of about 12 miles.

This movement was southward in the bay, due in part to the main Gulf access being south of Aransas Bay. Shrimp moving out of the upper Laguna Madre and Corpus Christi Bay, for instance, would move north and east. In the Gulf the general movement followed previous speculation and was all southward. No shrimp were returned from north of the Aransas Channel bar. One return indicated a migration south of almost 60 miles.

Although the percentage of returns, 0.43 percent, might seem rather low, for the time and place of staining it is reasonable. It is difficult to obtain Gulf returns in any abundance, especially on brown shrimp. Gulf shrimpers, working under lights at night, cull out undersized shrimp in shovelfuls and are very apt to miss a stained green shrimp under these conditions. In the bay the bait shrimp may be handled a number of times and a marked specimen stands greater possibility of detection.

This confirmation of a general southward movement or migratory characteristic is interesting and will be of aid in later bay and Gulf work; however, of more importance is information on which to base the rate of movement of a wave of brown shrimp out of Aransas Bay in June.

At an estimated rate of two to five miles per day the majority of a wave of browns passing through south Aransas Bay on June 1 would travel the 12 miles to the inshore Gulf by at least June 7. This knowledge is important since from June 1 through July 15 the inshore Gulf is closed to shrimping out to about 12 fathoms or three marine leagues, and the Commission has the authority to regulate to some extent the dates of this closed season. If it can be considered that when the brown shrimp start moving from the bay into the Gulf in early summer they will reach their destination within three to seven days after passing

Note: For those shrimp which were returned on the 6th, 7th, and 8th, it was subjectively considered that they were stained and released on the 5th; for those shrimp which were returned from the 9th on, it was considered that they were stained on the 7th. In this way the estimated days out display some effort at averaging.

Table 1. Shrimp Returns

| DATE | TIME    | NUMBER<br>OF<br>SHRIMP | SIZE<br>OF<br>SHRIMP<br>mm | AREA CAUGHT          | DEPTH<br>CAUGHT | DAYS<br>OUT | DISTANCE<br>MOVED | MILES |     | SOURCE   |
|------|---------|------------------------|----------------------------|----------------------|-----------------|-------------|-------------------|-------|-----|--|
|      |         |                        |                            |                      |                 |             |                   | PER   | DAY |  |
| 6-7  | 6 am    | 4                      | 71,76,<br>76,81            | Aran. Bay Mkr. 69-73 | 12 ft.          | 2           | 3.25 mi.          | 1.62  |     | Goby   |
| 6-7  | 6:30 am | 1                      | 73                         | Aran. Bay Mkr. 75    | 12 ft.          | 2           | 4.50 mi.          | 2.25  |     | Goby   |
| 6-7  | 7 am    | 4                      | ?                          | Aran. Bay Mkr. 65-75 | 12 ft.          | 2           | 3.25 mi.          | 1.62  |     | Joe Everett - <u>Little Judy</u>   |
| 6-7  | am      | 14                     | ?                          | Aran. Bay Mkr. 65-75 | 12 ft.          | 2           | 3.25 mi.          | 1.62  |     | Mom's Bait Stand   |
| 6-7  | 11 am   | 3                      | 66,61,<br>71               | Aran. Bay Mkr. 65-75 | 12 ft.          | 2           | 3.25 mi.          | 1.62  |     | Goby   |
| 6-8  | am      | 1                      | ?                          | Aran. Bay Channel    | ?               | 3           | ?                 | ?     |     | Mom's Bait Stand   |
| 6-8  | am      | 1                      | ?                          | Aran. Bay Channel    | ?               | 3           | ?                 | ?     |     | Bought in bait - Mom's by<br>Bill Bardwell, Mr. & Mrs.<br>Jack Williamson, tourists. |
| 6-8  | am      | 21                     | 70-90                      | Aran. Bay Mkr. 69-73 | 12 ft.          | 3           | 3.25 mi.          | 1.08  |     | Goby   |
| 6-8  | am      | 1                      | 73                         | Aran. Bay Mkr. 49    | 5 ft.           | 3           | 3.50 mi.          | 1.16  |     | Goby   |
| 6-9  | 5:30 am | 17                     | 70-85                      | Aran. Bay Mkr. 73-75 | 12 ft.          | 2           | 4.25 mi.          | 2.12  |     | Goby   |
| 6-9  | am      | 4                      | ?                          | Aran. Bay Mkr. 53    | 5 ft.           | 2           | 3.25 mi.          | 1.62  |     | George Adolphus - <u>Didder</u>  |
| 6-9  | am      | 12                     | ?                          | Aran. Bay Mkr. 69-75 | 12 ft.          | 2           | 3.25 mi.          | 1.62  |     | R. H. Fleming - <u>Elizabeth</u>   |

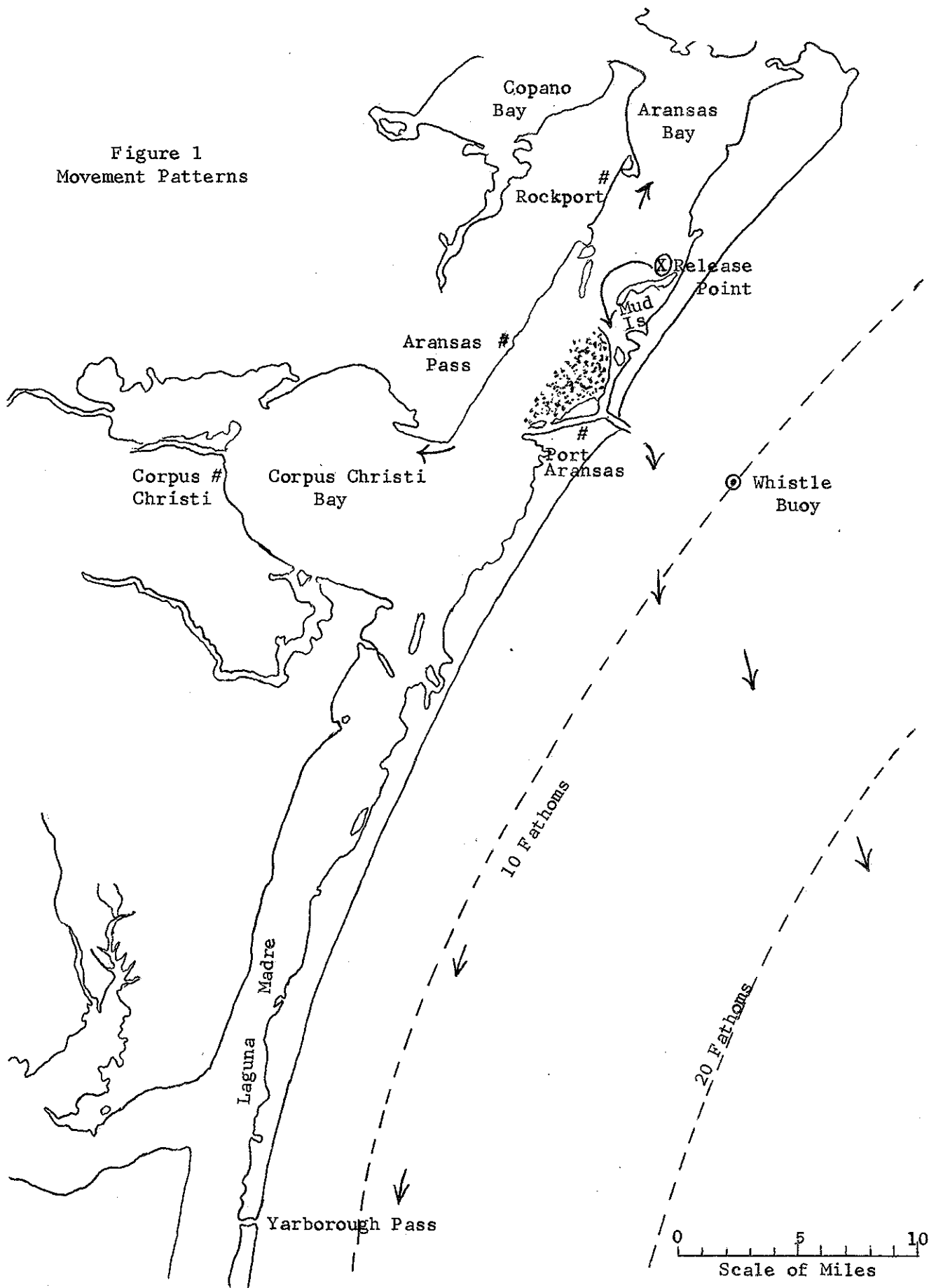
| DATE | TIME    | NUMBER OF SHRIMP |  | SIZE OF SHRIMP                           | AREA CAUGHT                                  | DEPTH CAUGHT | DAYS OUT | DISTANCE MOVED |  | MILES PER DAY | SOURCE   |
|------|---------|------------------|--|--|--|--------------|----------|----------------|--|---------------|--|
|      |         |                  |  |  |  |              |          |                |  |               |  |
| 6-9  | am      | 1                |  | 89                                       | Off Humble Dock-Port Aransas Channel         | 18 ft.       | 2        | 10.50 mi.      |  | 5.25          | Yancey Gillespie - Shrimper                            |
| 6-9  | am      | 3                |  | ?  | Aran. Bay Mkr. 72                            | 5 ft.        | 2        | 3.50 mi.       |  | 1.75          | J. D. Derrough - Bayside                               |
| 6-10 | 5:30 am | 2                |  | 87,91                                    | Off Humble Dock-Port Aransas Channel         | 18 ft.       | 3        | 10.50 mi.      |  | 3.50          | Bozo Renell - out of Woody's Boat Basin                |
| 6-10 | ?       | 4                |  | ?  | ?  | ?            |          |                |  |               | Reported without information by tourist.               |
| 6-10 | am      | 12               |  | ?  | Aran. Bay Mkr. 51                            | 5 ft.        | 3        | 3.50 mi.       |  | 1.16          | George Adolphus - Diddy                                |
| 6-10 | am      | 1                |  | ?  | Corpus Chan. Mkr. 15-16                      | 12 ft.       | 3        | 15 mi.         |  | 5.00          | Dewey Updegrove - Causeway Bait Stand                  |
| 6-10 | pm      | 12               |  | 67,69, 72,73, 74,78, 79,80, 83,84, 92,92 | Aran. Channel off Humble Oil Docks           | 12 ft.       | 3        | 10.50 mi.      |  | 3.50          | Turned into Marine Institute                           |
| 6-11 | am      | 2                |  | ?  | Aran. Bay Mkr. 55                            | 12 ft.       | 4        | 3.25 mi.       |  | .81           | J. D. Derrough - Bayside                               |
| 6-12 | am      | 1                |  | 114                                      | Aran. Bay Mkr. 49-55                         | 12 ft.       | 5        | 3.50 mi.       |  | .70           | Charley Cady - Shrimper                                |
| 6-12 | am      | 2                |  | 84,102                                   | Aran. Channel off Humble Oil Docks           | 18 ft.       | 5        | 10.50 mi.      |  | 2.10          | Turned in to Marine Institute by Mayfield's Bait Stand |
| 6-13 | am      | 2                |  | ?  | Corpus Chan. Mkr. 19-20                      | 42 ft.       | 6        | 16 mi.         |  | 2.66          | Dewey Updegrove - Causeway Bait Stand                  |
| 6-13 | am      | 8                |  | 75-85                                    | Harbor Island to Ingleside in Corpus Channel | 12 ft.       | 6        | 15 mi.         |  | 2.50          | Island Charter Service                                 |
| 6-14 | am      | 2                |  | 65,83                                    | Same as above                                | 16 ft.       | 7        | 15 mi.         |  | 2.14          | Dewey Updegrove  |

| DATE | TIME     | NUMBER<br>OF<br>SHRIMP | SIZE<br>OF<br>SHRIMP | AREA CAUGHT                                      | DEPTH<br>CAUGHT | DAYS<br>OUT | DISTANCE<br>MOVED | MILES<br>PER<br>DAY | SOURCE   |
|------|----------|------------------------|----------------------|--|-----------------|-------------|-------------------|---------------------|--|
| 6-14 | am       | 1                      | 80                   | Corpus Channel-Ingle-<br>side area-Sun Oil Docks | ?               | 7           | 20.25 mi.         | 2.89                | Turned into Marine Institute<br>by Mayfield's Bait Stand |
| 6-15 | am       | 1                      | ?                    | Aran. Bay Mkr. 65-73                             | 12 ft.          | 8           | 3 mi.             | .37                 | L. E. Grimm - Shrimper                                   |
| 6-17 | 10:30 am | 4                      | ?                    | Aran. Bay Mkr. 55                                | 5 ft.           | 10          | 3.25 mi.          | .32                 | George Adolphus - <u>Didder</u>                          |
| 6-20 | am       | 2                      | 75, 85               | Aran. Bay Mkr. 55                                | 5 ft.           | 13          | 3.25 mi.          | .25                 | <u>Goby</u>  |
| 6-28 | ?        | 1                      | 85                   | Corpus Channel-Ingle-<br>side area               | ?               | 21          | 18.75 mi.         | .89                 | J. D. Littleton - Shrimper                               |
| 6-29 | am       | 1                      | 84                   | Aran. Bay Mkr. 55-65                             | 12 ft.          | 22          | 3.25 mi.          | .14                 | <u>Goby</u>  |
| 7-5  | am       | 1                      | ?                    | Gulf: Off Bell Buoy<br>Port Aransas              | 6 fms           | 28          | 13 mi.            | .46                 | McCormick - Mr. Mac<br>Causeway Bait Stand               |
| 7-5  | night    | 1                      | ?                    | Gulf: Off Green Light<br>at Yarbrough Pass       | 11 fms          | 28          | 59 mi.            | 2.10                | Aransas Shrimp Co.<br>Tampa, Fla. Shrimper               |
| 7-6  | 9 am     | 1                      | 71                   | Gulf: Due east of Wells<br>off Mustang Island    | 14 fms          | 29          | 24.50 mi.         | .84                 | <u>Goby</u>  |
| 7-6  | night    | 1                      | 109                  | Gulf: 1-1/2 hrs. SE of<br>Port Aransas Bar       | 13 fms          | 29          | 27 mi.            | .93                 | Gulf King Shrimp Co.                                     |
| 7-7  | am       | 8                      | ?                    | Corpus Channel-Harbor<br>Island to Ingleside     | 12 ft.          | 30          | 15 mi.            | .50                 | Causeway Bait Stand<br>McCormick Bait Boat               |
| 7-8  | night    | 1                      | 116                  | Gulf: South of Port<br>Aransas Bar               | 14 fms          | 31          | 24.50 mi.         | .79                 | Casterline Fish House                                    |
| 7-11 | night    | 1                      | 87                   | ESE of Pt. Aran. Bar                             | 13 fms          | 34          | 22 mi.            | .64                 | Gulf King Shrimp Co.                                     |
| 7-17 | night    | 1                      | 116                  | SE of oil platforms<br>off Padre Island          | 10 fms          | 40          | 35 mi.            | .87                 | Tommy T. - Key West boat<br>Jackson's Fish House         |

| <u>DATE</u> | <u>TIME</u> | <u>NUMBER OF SHRIMP</u> | <u>SIZE OF SHRIMP</u> | <u>AREA CAUGHT</u>        | <u>DEPTH CAUGHT</u> | <u>DAYS OUT</u> | <u>DISTANCE MOVED</u> | <u>MILES PER DAY</u> | <u>SOURCE</u>                                    |
|-------------|-------------|-------------------------|-----------------------|---------------------------|---------------------|-----------------|-----------------------|----------------------|--|
| 7-17        | night       | 1                       | 126                   | Off Sea Buoy-Port Aransas | 11 fms              | 40              | 17.50 mi.             | .43                  | Beach Shrimp Co.                                 |
| 7-17        | night       | 1                       | ?                     | SSE of Port Aran. Bar     | 16 fms              | 40              | 31 mi.                | .77                  | Duque Seafood Co.                                |
| 7-18        | am          | 2                       | ?                     | South of Bell Buoy        | 7 fms               | 41              | 16.50 mi.             | .40                  | F. West bought at Mom's                          |
| 7-27        | night       | 1                       | 133                   | South of Pt. Aran. Bar    | 10 fms              | 50              | 20 mi.                | .40                  | Tommy T. - Key West boat<br>Jackson's Fish House |
| 8-14        | night       | 1                       | 157                   | SE of Pt. Aran. Bar       | 23 fms              | 68              | 44 mi.                | .64                  | Wild Goose - Gulf King<br>Shrimp Co.             |



Figure 1  
Movement Patterns



the southern part of Aransas Bay, the dates of the closed season can be altered each year to fit the situation.

The time which a wave of browns might spend in these closed inshore waters before moving beyond 12 fathoms and entering the fishery is without doubt influenced entirely by current patterns, temperature, and available food. The first stained shrimp appearing in offshore waters was returned on July 6, almost exactly a month from date of staining and release. No movement rate can be calculated for these waters as the shrimp do not immediately head for deep water upon entering the Gulf. In the first part of July other returns were coming from depths under 12 fathoms but from areas well to the south of the pass. For the purpose of speculation in this report it is assumed that these shrimp would spend about a month in the inshore waters before moving offshore.

Brown shrimp begin moving out of Aransas Bay when they reach generally 3 to 3-1/2 inches in length, about 1-1/2 inches below legal size by count law. It has been previously estimated by this Department that brown shrimp have a bay growth rate in June of 1.5 millimeters per day or almost two inches per month. Although growth rate in the Gulf probably drops, an overall rate of about two inches per month is probably average. Thus, a wave of browns measuring 3 to 3-1/2 inches on June 1 would attain legal size by the end of June or early July, regardless of whether at that time they were in closed waters or had moved offshore.

If only one wave of shrimp were to be considered, regulation would be a simple matter. Sampling in the spring could indicate at least a month in advance the probable date of the shrimp migration, and the inshore Gulf could be closed accordingly. Under the same theory the Gulf could be opened a month later for harvest.

This unfortunately is not the case. In actuality many successive waves of Gulf-bound shrimp are involved throughout the summer. Both before and after the present 45-day closed season undercount browns are taken in water less than 12 fathoms deep. Also, all of the undersized browns moving into the inshore Gulf do not confine themselves to these shallow waters for any particular time period, as demonstrated by the commercial catch during the Gulf closed season. Small shrimp are taken at least out to 16 and 18 fathoms, at times in abundance.


Successive waves of small browns are moving out of the bays into the Gulf from May through July in abundance. If it is assumed that any given wave passing through southern Aransas Bay on a certain date will enter offshore waters at legal size one month later, there is a practical basis on which to set a time for the Gulf closed season. A continual check of the size of browns in this bay and their movements, both by biologists and by observation of the area being worked by the commercial bay bait fleet from the middle of April through July, should indicate exactly when to expect the first wave out and when the last sizable wave has or will be gone.

At present the Gulf closed season is neither long enough nor does it embrace depths sufficient for proper protection of undercount browns. This preliminary staining program has suggested ways and means of at least properly setting the dates of this closed season. Future migration work in other bays and in the Gulf will greatly increase the possibility of more efficient regulation of the shrimp fishery.

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