

SURINAM FISHERY EXPLORATIONS, MAY 11-JULY 31, 1957

By James B. Higman*

SUMMARY

Shrimp explorations in Surinam coastal waters, by the Surinam Fisheries Department from April to October 1957, resulted in the location of four species of commercially-desirable shrimp. A Florida-type shrimp trawler was chartered for the work.

Commercial quantities of pink-spotted shrimp ranging from 10 to 25 individuals per pound (heads-off) were caught at rates between 195 and 470 pounds per night, in depths of about 23 to 40 fathoms, using 68- and 89-foot trawls. In 10 to 18 fathoms, brown shrimp and sea bobs were taken in mixed catches. Commercial quantities of those two species of shrimp were scattered and were mixed with considerable quantities of fish. Catches of *Penaeus schmitti*, a shrimp closely related to the white shrimp of the southern United States, were not of commercial quantity.

BACKGROUND

The 1957 Surinam exploratory fishing program was carried out as a direct result of an encouraging preliminary trawling survey made by the Surinam Fisheries Department in 1953 (F&WS 1954a). The 1953 survey demonstrated the presence of shrimp and fish potentials in the offshore waters, and it led the Surinam Government to contract for further exploratory fishing in 1957. A Florida-built shrimp trawler was chartered to carry out trawling operations from April through June 1957. Results were highly satisfactory, and the vessel was re-chartered for a period extending from mid-July through October.

This entire program was planned and supervised by the Surinam Fisheries Department. The primary objective of the portion of the survey extending from April through June 1957 was to determine the species of fish and shellfish present in waters inside the 40-fathom curve and to survey the distribution and availability of these species. Most drags were made with a 10½-foot try net because of the belief that use of this gear could most rapidly give a comprehensive knowledge of the fauna. A secondary objective, during the same period, was to make production-type drags for shrimp and fish with 68- and 89-foot shrimp trawls. The primary objective of the second portion of the survey, from July through October, was to determine the availability of commercial quantities of shrimp and fish. This was attempted by means of production-type fishing.

At the invitation of the Surinam Government an observer from the U. S. Bureau of Commercial Fisheries accompanied the exploratory fishing vessel during all cruises carried out from May 11 to July 31, 1957. This report covers activities observed and results obtained during that period.

AREA INVESTIGATED

Surinam, formerly Dutch Guiana, is situated on the northeast coast of South America (fig. 1). Paramaribo, the capital and base of exploration, is located 18 miles upstream from the mouth of the Surinam River. Four other large rivers empty into the South Atlantic Ocean along the Surinam coast. Of these, the Corentyne on the west and the Maroni on the east, form natural boundaries between Surinam and British and French Guiana. The coastline is flat with unbroken expanses of forest and mangrove swamp; and the lack of bays, lagoons, or other distinct features except river mouths, causes an appearance of uniformity when the Guianas are approached from the sea. This lack of landmarks, and the absence of navigational aids other

* Formerly Fishery Methods and Equipment Specialist, Branch of Exploratory Fishing and Gear Research, Division of Industrial Research and Services, U. S. Bureau of Commercial Fisheries, Washington, D. C.

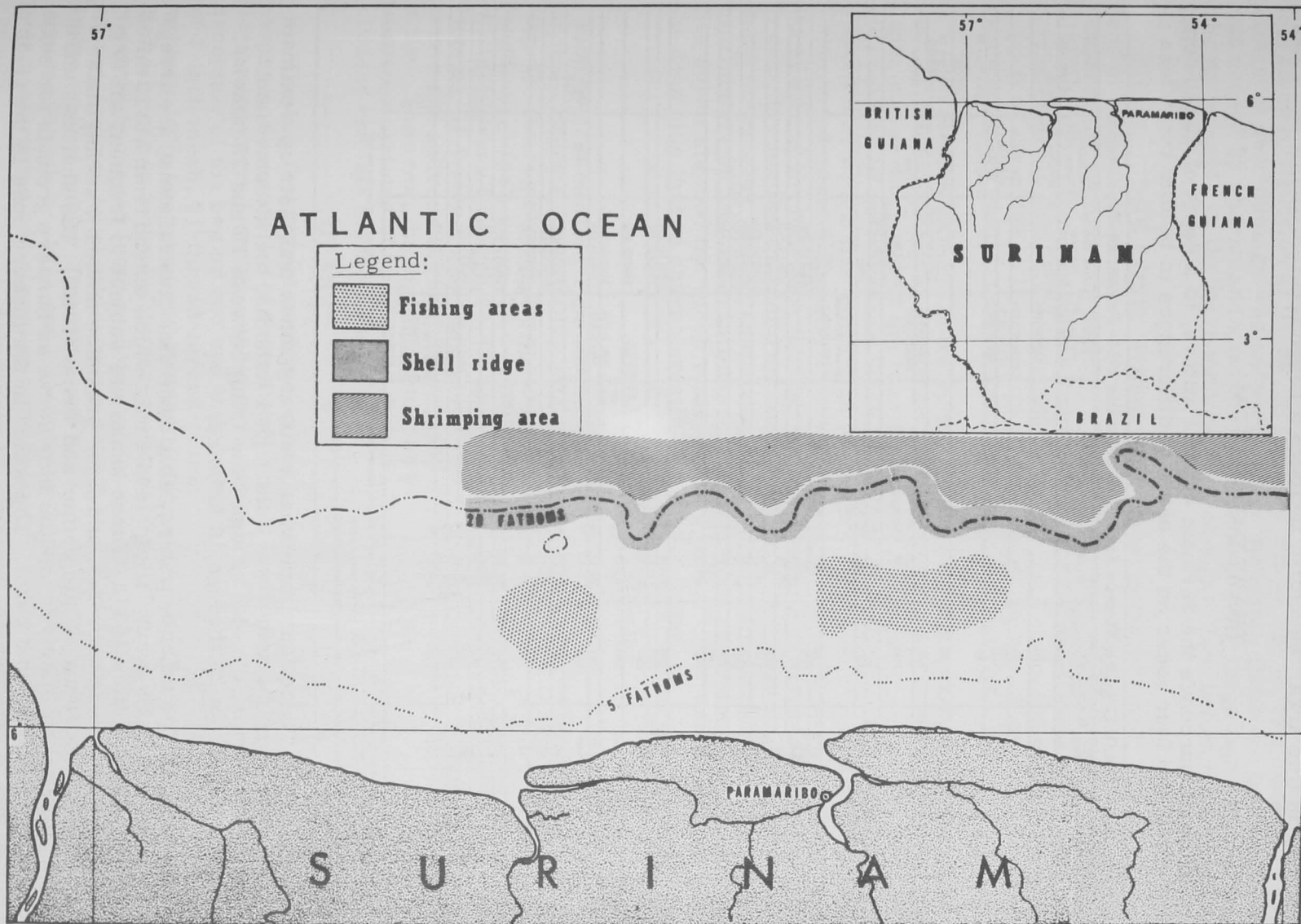


Fig. 1 - General areas of potentially commercial fish and shrimp concentrations found off Surinam.

than the Surinam River light vessel and the radiodirection-finder station at Paramaribo, causes difficulties in position finding for fishing vessels. Equipment essential to operating in this area, therefore, includes a radiodirection-finder and a depth recorder.

TRAWLING BOTTOM

For orientation purposes the Surinam coastal waters, to a depth of 40 fathoms, have been divided into four zones on the basis of differences in bottom conditions

Table 1 - Fishing Log M/V *Coquette*, Surinam Fisheries Explorations 1957--Production-Type Drags^{1/}

Index No.	Station No.	Starting Position		Date 1957	Fishing Time		Depth Fathoms	Bottom Type	Gear Used	Brown Shrimp 2/ (Heads off)	Pink-Spotted Shrimp (Heads off)	Sea Bobs 2/ (Heads off)	Miscellaneous Shrimp (Heads off)
		No. Lat.	W. Long.		Time on Bottom	Duration of Drag (Minutes)							
1	140	06°24'	54°55'	5/30	0830	90	14	M	68-Foot Flat Trawl	3#(40-50)	-	-	-
2	145	06°31'	54°59'	"	1058	90	14	M	"	42#(30-35)	-	10# (Lg.)	-
3	150	06°20'	54°54'	"	1245	120	13-11	M	"	18#(30-35)	-	25# (Lg.)	-
4	155	06°23'	54°47'	"	1600	90	13	M	"	6#(30-35)	-	5# (Lg.)	-
5	203	06°22'	54°56'	6/11	1100	90	13-14	M	"	-	-	120# (Lg.)	Less than 1# P. schmitti (21-25)
6	208	06°22'	55°03'	"	1350	90	13	M	"	-	-	80# (Lg.)	Less than 1# P. schmitti
7	241	06°20'	54°45'	6/16	0805	90	13-15	M, Sh	"	1#(36-40)	-	-	-
8	245	06°23'	54°43'	"	1050	65	12-13	M	"	60#(26-30)	-	"Few"	-
9	260	06°40'	55°28'	6/20	1830	180	23-24	M, S, Sh	"	-	163# (No count recorded)	-	-
10	267	06°42'	55°43'	"	2205	180	24	M, S, Sh	"	-	115# (10-15)	-	-
11	273	06°41'	55°41'	6/21	0120	210	24	M, S, Sh	"	-	8#	-	-
12	293	06°27'	55°05'	6/28	1010	90	14	M, Sh	"	160# Whole Mixed Browns & Sea Bobs	-	-	2# P. schmitti
13	297	06°45'	55°17'	"	1900	180	24	M, S, Sh	"	-	180# (?)	-	-
14	311	06°38'	55°33'	7/19	2010	215	24	M, S	"	-	160#(15-20)	-	-
15	316	06°40'	55°39'	7/20	0010	215	25-26	M, S, Sh, Sp	"	-	130#(15-25)	-	-
16	322	06°48'	55°35'	"	0400	210	27-29	M, S, Sh	"	-	85#(15-20)	-	-
17	328	06°52'	55°27'	"	1305	235	28	M, S, Sh	"	-	130#(15-25)	-	-
18	327	06°49'	55°21'	7/21	2330	230	29-27	M, S, Sh	"	-	175#(15-25)	-	-
19	341	06°48'	55°17'	"	0340	180	27-25	M, S	"	-	175#(15-25)	-	-
20	347	06°47'	55°16'	"	1915	235	25-24	M, S	"	-	250#(15-25)	-	-
21	254	06°44'	55°14'	"	2326	270	24-25	M, S	"	-	225#(15-25)	-	-
22	360	06°19'	55°15'	7/22	0820	150	14	M, Sh	"	-	-	-	-
23	361	06°49'	55°21'	7/24	2210	190	24-25	-	89-Ft. Western Jib Trawl	3/	3/	3/	-
24	368	06°48'	55°48'	7/25	1905	200	25-24	M, Sh	"	-	150#(15-25)	-	-
25	374	06°45'	55°47'	"	2250	225	24-25	M, Sh	"	-	75#(15-25)	-	-
26	381	06°46'	55°59'	7/26	0300	210	25-26	M, Sh	"	-	-	-	-
27	386	06°37'	55°55'	"	1908	210	20-17	M, Sh	68-Foot Flat Trawl	-	60#(15-25)	-	-
28	392	06°33'	55°54'	"	2305	210	18-17	M, Sh	89-Ft. Western Jib Trawl	5#(15-25)	10#(15-25)	-	-
29	393	06°19'	55°48'	7/27	0405	180	14-12	M	"	5#(15-25)	5#(15-25)	4#Tails	4 1/2# P. schmitti (12-13)
30	394	06°50'	55°28'	"	2015	210	25-26	M, Sh	"	-	150#(15-25)	-	-
31	400	06°50'	55°18'	7/28	2400	210	26-25	M, Sh	"	-	100#(15-20)	-	-
32	406	06°50'	55°18'	"	0445	150	25-25	M, Sh	"	-	50#(15-25)	-	-
33	409	06°50'	55°13'	"	1903	210	26-28	M, Sh	68-Foot Flat Trawl	2#(10-15)	210#(15-25)	-	-
34	416	06°50'	55°03'	"	2250	240	28-29	M	"	-	180#(15-25)	-	-
35	421	06°50'	54°49'	7/29	0310	210	29-27	M	"	-	80#(15-25)	-	-
36	426	06°50'	54°39'	"	1900	240	28-30	M	"	-	115#(15-25)	-	-
37	433	06°51'	54°33'	"	2325	240	30-35	M	"	55#(15-25)	55#(15-25)	-	-
38	439	06°57.5'	54°24'	7/30	0345	180	4/36-40	M	"	5/1#(15-25)	5/1#(15-25)	-	-
39	444	07°03'	54°23'	"	1655	240	4/37-30	M, S	"	10#(15-25)	10#(15-25)	-	-
40	453	06°25'	55°57'	7/31	0530	180	13-8	M	"	Mixed Brown & Sea Bobs	25# whole Shrimp	-	-

1/ Trawling stations were numbered in sequence, from Station 1 through Station 453. Try-net drags are not included in the table, causing a break in the continuity. To preserve the original station designation and still provide continuity, arbitrary index numbers, starting with number one, have been provided.
 2/ Numbers followed by a # sign indicate pounds of shrimp. Numbers in parentheses refer to the heads-off count per pound.
 3/ Trawl lost on unidentified obstruction--no catch.
 4/ The depth-sounder used during the survey possessed a maximum range of 220 feet (approximately 36.6 fathoms). Depths in excess of this are, therefore, estimated.
 5/ Trawl badly damaged by sawfish--part of catch lost.

and faunal groupings. These four somewhat arbitrary zones and their approximate depth limits are: the inshore zone from 0 through 4 fathoms, the intermediate zone from 5 through 18 fathoms, the shell-ridge zone lying between 19 and 23 fathoms, and the offshore zone from 23 through 40 fathoms.

INSHORE ZONE: The inshore waters, shallower than five fathoms, are irregularly obstructed by extensive soft "sling" mud banks which extend from 2 to 12 miles offshore (Hydrographic Office 1935). These banks are subject to frequent shifting by tides and strong westerly currents, and their presence makes trawling inside 5 fathoms extremely hazardous (Whiteleather and Brown 1945). The shallows and the marshy areas adjacent to the river mouths may serve as nursery grounds for some species of shrimp found off that coast. The water in the inshore zone is the color of creamed coffee due to considerable material in suspension.

INTERMEDIATE ZONE: Beyond five fathoms, trawlable bottom, largely consisting of soft, sticky, gray mud, extends out to approximately 18 or 19 fathoms where it gives way to rougher, dead shell bottom. With the exception of one try net, lost on an obstruction at $06^{\circ}22'$ N. latitude and $55^{\circ}06'$ W. longitude in 14 fathoms, no extensive gear damage was encountered in the zone. Some net damage, however, was caused by sharks and sawfish; particularly when large fish catches were made. The water color in the intermediate zone changes from brown on the inshore side to milky green offshore.

SHELL RIDGE ZONE: Within the general depth interval, 19 to 23 fathoms, a zone of rough bottom apparently parallels most of the Surinam Coast. This is unsuitable shrimp trawling bottom; responsible for some torn gear but no net losses. Although the ridge is narrow along the eastern and central Surinam coast, exploratory operations indicate a widening in the vicinity of the Coppename River and disruption of the ridge in the vicinity of the Maroni River. Try-net catches included dead encrusted shells, dead coral, gorgonids, and sponge.

OFFSHORE ZONE: In water deeper than 23 fathoms hard trawlable bottom, consisting predominately of gray mud and fine shell, extends to at least the 40-fathom depth curve--the limit of the trawling gear. Scattered through this zone are extensive patches of soft blue and black mud. Large expanses of the gray mud bottom are covered with a fine moss-like gorgonids growth which clogged the trawl meshes. This caused some difficulty in trawling, because the additional drag reduced the fishing ability of the net. Sun-drying the net, followed by vigorous brushing, was the only effective method of removing the material. Five-hour drags in one direction were made in the zone without gear damage, but it is not entirely free from snags. At approximately $06^{\circ}50'$ north latitude and $55^{\circ}26'$ west longitude a hang-up on an unidentified object stopped the winch while "hauling back." The water color in this zone is the deep blue that is characteristic of the open ocean.

VESSEL AND PERSONNEL

A typical Florida-type shrimp trawler, the *Coquette*, was used in this survey (fig. 2). Its registered dimensions are: length, 61.4 feet; beam, 18.4 feet; draft, 8.5 feet; gross tonnage, 64.82; and net tonnage, 31.0 tons. The vessel is Diesel-driven and delivers 120 shaft hp. at 1,000 r.p.m. The crew, during the exploratory survey, consisted of two United States citizens and one Surinam national.

GEAR

The $10\frac{1}{2}$ -foot try net used during this survey was constructed of 2-inch mesh $\frac{1}{1}$, 15-thread-tarred-cotton webbing with the exception of the bag or cod end which was of 1-inch mesh, 21-thread-tarred-cotton webbing. The headrope and footrope were tied directly to 2- by 1-foot try-net doors which were rigged from a 15-foot chain bridle, secured by shackles and a swivel, to the try-net cable. Try-net drags were also made with 8-, $13\frac{1}{2}$ - and $17\frac{1}{2}$ -foot try nets constructed and rigged in similar fashion.



Fig. 2 - Florida-type shrimp trawler *Coquette* used in 1957 Surinam explorations.

A 400-mesh flat trawl, with a headrope measuring 68-feet 7-inches long

^{1/1} All mesh sizes refer to stretched-mesh measure.

and a footrope measuring 78 feet 7 inches long, was used for most production-type drags (fig. 3). The body was made of 2-inch mesh, 15-thread-tarred-cotton webbing;



Fig. 3 - Retrieving the cod-end of the 68-foot shrimp trawl aboard the *Coquette*.

100 to over 300 individuals per pound (heads on). The total weight of individual try-net catches ranged from 2 to 20 pounds. Sea catfish, small sea trout, and croakers comprised the bulk of the weight of the catches. No production-type fishing was attempted in this zone.

INTERMEDIATE ZONE, 5 THROUGH 18 FATHOMS: Shrimp catches: Daytime try-net coverage in the intermediate zone from the mouth of the Surinam River west to the Coppename River and east to the Maroni River was extensive. The portion of the zone lying west of the Coppename was not investigated during the 1957 survey. Results of the try-net work indicated a discontinuous distribution of brown shrimp. Even with this interrupted distribution pattern, catches of commercially-valuable quantities of brown shrimp were made in two instances with the 68-foot trawl. At station number 145, in 14 fathoms, 42 pounds of brown shrimp (heads off) resulted from a drag of approximately $1\frac{1}{2}$ hours, and at station 245, 90 pounds of brown shrimp (heads off) were obtained in 65 minutes. The shrimp ranged in size from 26 to 35 tails per pound.

Sea bobs were obtained from try-net drags at depths shallower than 16 fathoms. Peak abundance occurred between 10 and 15 fathoms. Although large sea bobs were occasionally met within a moderate quantity, most catches of this species were small and consisted of individuals ranging in size from 100 to 500 shrimp per pound (heads on). Commercial quantities of sea bobs resulted from two drags with the 68-foot trawl. These two 13-fathom drags (Stations 203 and 208) each lasting approximately $1\frac{1}{2}$ hours, caught 120 and 80 pounds of heads-off sea bobs, respectively, ranging in size from 60 to 65 shrimp (heads off) per pound.

and the bag was of $1\frac{3}{4}$ -inch mesh 42-thread-tarred-cotton webbing. The bag was protected by chafing gear. Six-foot extensions of the headrope and footrope were used in attaching the trawl to the 10-foot by 42-inch trawl doors. A tickler chain measuring 6 feet shorter than the headline was used when fishing this net.

A few offshore drags were made with a 450-mesh western jib trawl which measured $89\frac{1}{2}$ feet on the headrope. The body was made of $2\frac{1}{4}$ -inch mesh, 18-thread-tarred-cotton webbing and the bag was of $1\frac{3}{4}$ -inch-42-thread-cotton webbing. This net was fished with 7-foot extensions and a $101\frac{1}{2}$ -foot tickler chain.

FISHING RESULTS

INSHORE ZONE, 0 THROUGH 4 FATHOMS: Trawling in depths shallower than five fathoms was risky because of the danger of bogging the trawl doors and the net in the extremely soft mud bottom. Eight 15-minute try-net drags were attempted in the zone in a restricted area east of the mouth of the Surinam River. Shrimp catches consisted entirely of small numbers of sea bobs ranging from

Try-net drags were also made off the coast of French Guiana and promising indications of brown shrimp were found in depths of 16 to 18 fathoms. Strong currents were encountered in the area and, in some instances, they caused fouling of the try-net gear. Time was not available for production work with the 68- and 89-foot trawls.



Fig. 4 - Large catch of fish made northeast of the Surinam River by the Coquette.

P. schmitti, its near-relative, may behave similarly, and thus be available in larger quantities along the Surinam coast at other times of the year.

Blue-colored shrimp, resembling the white shrimp (*Penaeus setiferus*) of the Atlantic and Gulf coasts of the United States, were taken at 4 stations off the Surinam and Coppename Rivers. In all instances the catch of that species (*Penaeus schmitti*) was less than 5 pounds. *Penaeus setiferus* is known to appear in a definite seasonal pattern and to migrate in concentrated schools. It is possible that

Table 2 - Scientific and Common Names of Fish and Shrimp

Fish		Shrimp	
Scientific Name	Common Name	Scientific Name	Common Name
<i>Micropogon</i> sp.	Croaker	<i>Penaeus brasiliensis</i>	
<i>Lonchurus</i> sp.	"	Latreille	Pink-spotted
<i>Paralanchurus</i> sp.	"	<i>Penaeus aztecus</i> Ives	Brown
Family Ariidae	Sea Cat Fishes	<i>Penaeus schmitti</i>	
<i>Nebris</i> sp.	Surinam Butterfish	Burkenroad	-
<i>Cynoscion</i> sp.	Sea Trout	<i>Xiphopeneus kroyeri</i>	
<i>Macrodon</i> sp.	"	(Heller)	Sea-bob

Fish Catches: Trawling efforts with the 68-foot shrimp trawl, conducted north and northeast of the mouth of the Surinam River at depths of 12 to 14 fathoms, showed that substantial quantities of commercially-desirable species of fish could be taken consistently (fig. 4). Except for one instance, all drags in this area and depth range, made with the 68-foot shrimp trawl, caught from 330 to 840 pounds of commercially-desirable fish an hour; mainly sea trout, sea catfish, Surinam-butterfish, and croaker-like species (table 1). These catches also contained considerable quantities of fish which are not utilized commercially at present (fig. 5).

Although the catches were made in only one area, it has been reported that trawlers from other countries have been making good catches of commercial species of fish off the Coppename River. In addition, try-net catches of sea trout, croakers, and sea catfish indicate wide distribution of the fish throughout the intermediate zone. This portion of the work added considerably to the knowledge of the abundance and distribution of fish stocks initially gained during preliminary explorations by the Surinam Fisheries Department (F&WS 1954a).

SHELL RIDGE ZONE, 20 THROUGH 22 FATHOMS: As previously stated, no catches of commercial value resulted from trawl sets made on the shell ridge.

OFFSHORE ZONE, 23 THROUGH 40 FATHOMS: Excellent catches of especially large pink-spotted shrimp (10 to 25 shrimp per pounds, heads-off) were made in extensive areas within the offshore zone by means of the 68- and 89-foot shrimp trawls. Most extensive coverage was obtained in the offshore area between the mouth of the Surinam River and the mouth of the Coppename River. During June, one full night of trawling (9½ hours) resulted in a total 366 pounds (heads-off) of pink-spotted shrimp averaging 10 to 15 shrimp per pound (heads-off); and a partial night of trawling (3 hours) yielded 180 pounds (heads off) of the same species. Based mainly on these successful June fishing efforts, an attempt was made to determine the maximum possible production from the same area in July. A total of 1,310 pounds of pink spotted shrimp (heads-off) averaging 15 to 25 per pound (heads-off) was taken in three successive nights of fishing. The average hourly catch rate for this period was 44 pounds. Two additional nights of trawling, which almost completely traversed the geographic limits mentioned above, yielded a total of 585 pounds (heads-off) of pink-spotted shrimp.

Trawling efforts in the offshore zone between the mouth of the Surinam River and the mouth of the Marone River were not extensive enough to provide adequate information regarding the shrimp production potential. Excellent results, however, were obtained during one night of trawling. Trawling operations, in this instance, commenced off the mouth of the Surinam River and extended eastward. A total of 470 pounds of pink-spotted shrimp (heads off) was taken in 11 hours of fishing. During an additional night of trawling, farther east, a four-hour drag made in 30 to 35 fathoms caught 110 pounds of heads-off shrimp consisting of equal quantities of pink-spotted shrimp and brown shrimp. Both species averaged 15 to 25 shrimp per pound (heads-off). Considerable damage to the cod end of the net was caused by sawfish during one drag in this area; and the shrimp catch, therefore, was poor. These trawling results indicate that commercial quantities of marketable shrimp are widespread in the offshore zone.



Fig. 5 - A 65-minute trawling catch estimated at 5,000 pounds. Commercially-valuable components included 150 pounds of brown shrimp and 910 pounds of fish.

WEATHER CONDITIONS

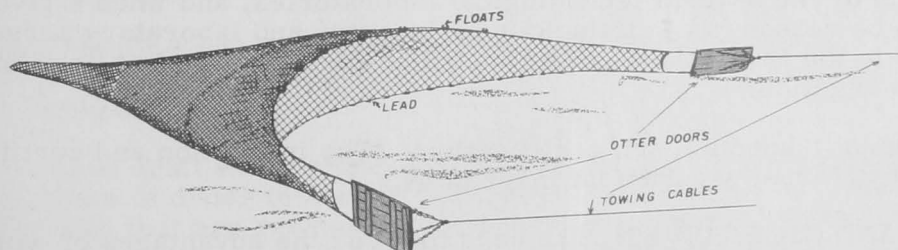
The Surinam trawling grounds lying beyond the 20-fathom contour are exposed to prevailing easterly winds for most of the year. Particularly during the winter season, winds of moderate to fresh velocity can be expected along with correspondingly increased sea conditions. There are no offshore reefs, islands, or shallow banks to provide a lee shore, and suitable inshore anchoring grounds are often ten hours away on a round-trip basis. There are, thus, problems associated with commercial-fishing operations that are somewhat different from those of the Gulf of Mexico and the South Atlantic coast of the United States.

During the winter months of January through March, the trade winds blow regularly and persistently from the northeast. However, the regularity of these trade winds provides a partial solution insofar as fishing efforts are concerned. Seas generated under these conditions may occasionally cause some crew discomfort, but trawling operations are feasible especially if trawling is carried out into the wind; i.e. in a northeasterly direction. Although the winter season is the period of heaviest weather, there is some compensation for this. Sudden damaging squalls (of the type encountered in Southeastern United States) are notably absent, at that time, on the Guianan Coast. In addition, the Guianas are singularly free from hurricanes which disrupt shrimping in other areas.

General consideration of the weather conditions of the area indicates that trawling can be carried out over an appreciable portion of the January to March period. With minor exceptions, such as summer tropical rain squalls, the remainder of the year is favorable for fishing. Because of the distance from the coast of the best shrimp grounds, and the absence of shelter, particular attention should be given to providing adequate ground tackle.

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PRINTERS' INK FROM FISH

Pakistani fish technologists have produced printers' ink of good quality by mixing Puntis fish oil with linseed oil. Puntis, Barbus stigma, (Puntius) is a fish which is abundantly available at a low price. Shark-liver oil is also used in the manufacture of black printers' ink. (Australian Fisheries Newsletter, February 1959.)