



# LOUISIANA SEAFOOD PRODUCTION ECONOMICS

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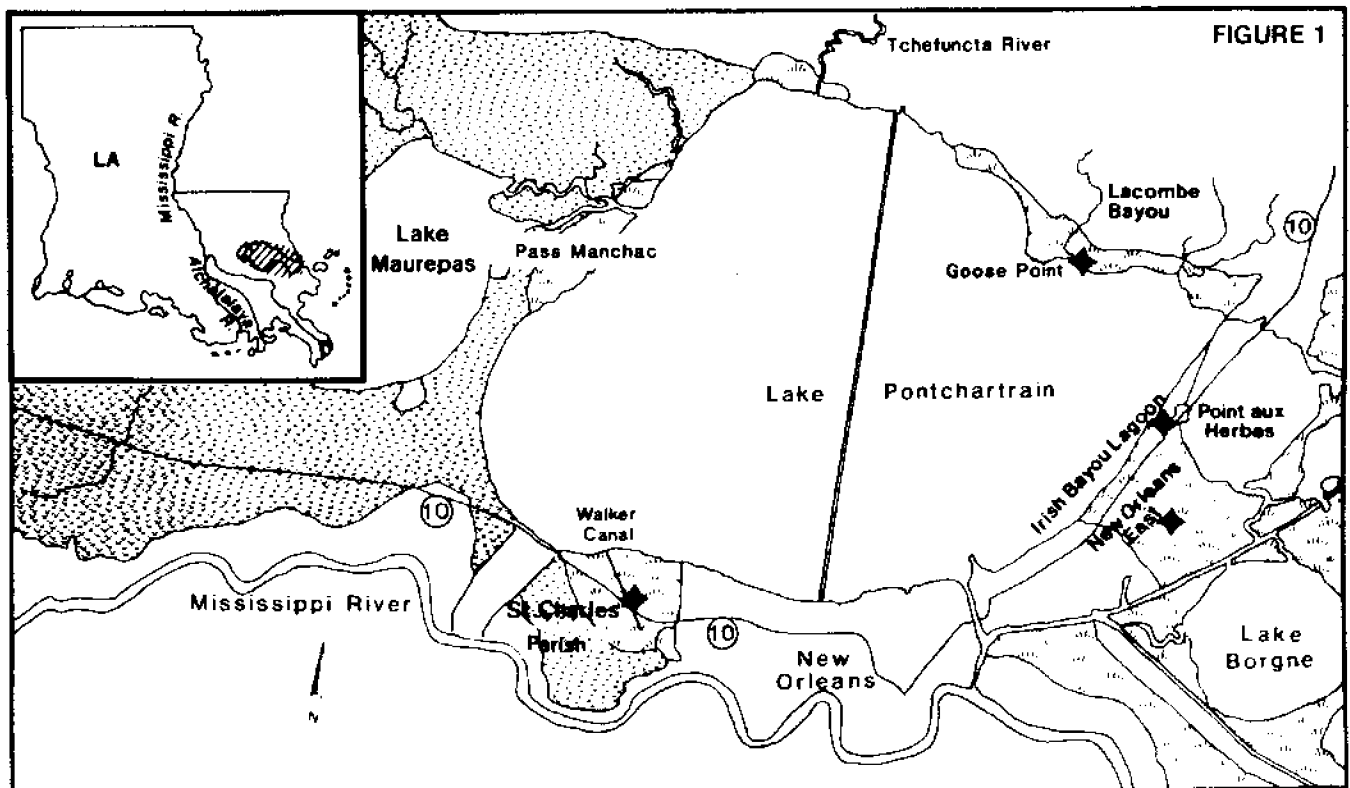
# Economic Elements of Commercial Crabbing in Lake Pontchartrain and Lake Borgne

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## Introduction

Over the past three decades, the landings and prices of the commercial blue crab in Louisiana have increased until the blue crab is now the state's third largest food fishery. During this period of growth, significant changes took place within the fishery, though data on landings, price, catch by gear, and numbers of fishermen indicate that these changes were normal. An important change was the major loss in

production ranking (Figure 1) by Lake Pontchartrain and Lake Borgne, major crab-producing areas adjacent to New Orleans. This report will provide an economic study of this area, as well as identify other important changes statewide. Thus, the reader will have the background against which to view local changes. In many cases, the data from secondary sources are not area specific, so that consideration of statewide data is necessary to understand local activity.



# Landings & Price

The blue crab fishery in Louisiana doubled in size between the early 1950s and 1980. This growth occurred when blue crab landings in the United States increased about 50 percent (Table 1 and Figure 2). In the U.S., dockside value increased 400 percent during the period, while the Louisiana blue crab fishery increased 900 percent in dockside value, thus surpassing the fishery as a whole.

Between 1952 and 1962, ex-vessel crab prices in Louisiana were below the national average, but since then, they have exceeded the national average in 13 of 18 years. Improved grading, packaging, and transportation are in large part responsible for the relative price gains. The record landings year for Louisiana fishermen was

1973, in which the price fell below the national average even though it increased from 1972. By 1980, however, ex-vessel crab prices more than doubled.

The monthly landings during the three five-year periods clearly indicate the major growth that occurred in the fishery between 1972 and 1976 (Table 2, Figure 3). The month of lowest landings was different for each period. December was the low month for the early period, while March was the low month for the 1967-71 period and February was the low production month during the most recent period. The holiday period in December, with the advent of cold, windy weather, explains in part the low landings. In each period, the end of March signals an increase in production, which peaked in July or August. The production of crabs then generally fell until a second peak was reached in October.

FIGURE 2

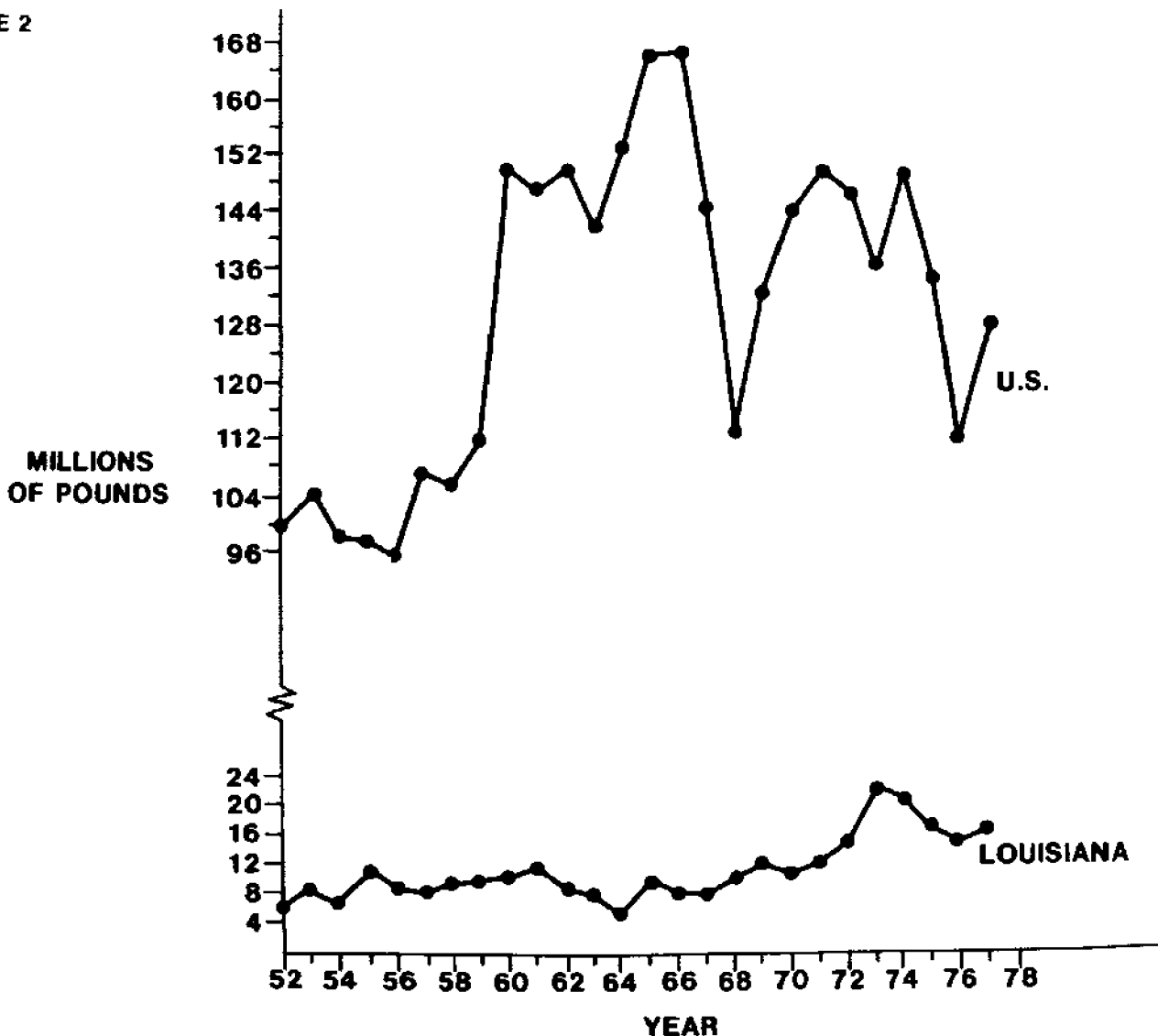


Table 1. Quantity and value of hard blue crabs landed in Louisiana and the United States, 1952-1977.

year	Louisiana			United States			Percent of U.S.	
	pounds (000's)	\$ (000's)	¢/lb	pounds (000's)	\$ (000's)	¢/lb	pounds (000's)	\$ (000's)
1952	7,334	314	4.3	99,825	4,255	4.3	7.3	7.4
1953	8,131	333	4.1	105,385	4,792	4.5	7.7	6.9
1954	7,085	294	4.2	97,780	4,255	4.4	7.3	6.9
1955	10,811	449	4.2	97,654	5,163	5.3	11.1	8.7
1956	9,402	433	4.6	94,003	5,734	6.1	10.0	7.6
1957	8,559	419	4.9	107,978	6,232	5.8	7.9	6.7
1958	9,336	403	4.3	105,641	5,667	5.4	8.8	7.1
1959	9,570	461	4.8	112,531	6,942	6.2	8.5	6.6
1960	10,049	497	5.0	149,646	7,810	5.2	6.7	6.4
1961	11,910	514	4.3	147,652	6,737	4.6	8.1	7.6
1962	9,523	463	4.9	149,374	7,539	5.0	6.4	6.1
1963	7,982	447	5.6	141,743	7,719	5.4	5.6	5.8
1964	5,692	379	6.7	152,292	9,267	6.1	3.7	4.1
1965	9,284	635	6.8	166,996	11,236	6.7	5.6	5.7
1966	7,986	537	6.7	166,827	9,963	6.0	4.8	5.4
1967	7,559	520	6.9	145,027	8,603	6.0	5.2	6.0
1968	9,551	807	8.4	113,619	11,143	10.0	8.4	7.2
1969	11,602	1,702	9.2	132,255	12,459	9.4	8.8	8.6
1970	10,254	928	9.1	145,410	10,317	7.1	7.1	9.0
1971	12,186	1,256	10.3	149,081	12,921	8.7	8.2	9.7
1972	15,083	1,777	11.8	147,468	14,671	10.0	10.2	12.1
1973	23,080	2,811	12.2	136,516	17,661	13.0	16.9	15.9
1974	20,640	2,701	13.1	149,176	19,259	13.0	13.8	14.0
1975	17,144	2,510	14.6	130,816	18,793	14.4	13.1	13.4
1976	15,211	3,061	20.1	113,152	22,966	20.3	13.4	13.3
1977	16,154	3,765	23.3	128,860	27,454	21.3	12.5	13.7
1978	14,862	3,091	20.8					
1979*	19,847	4,442	22.4					
1980*	16,026	3,765	23.5					

\* Preliminary

Source: Fisheries of the United States and Louisiana Landings, National Marine Fisheries Service, U.S.D.C., 1952-78.

FIGURE 3

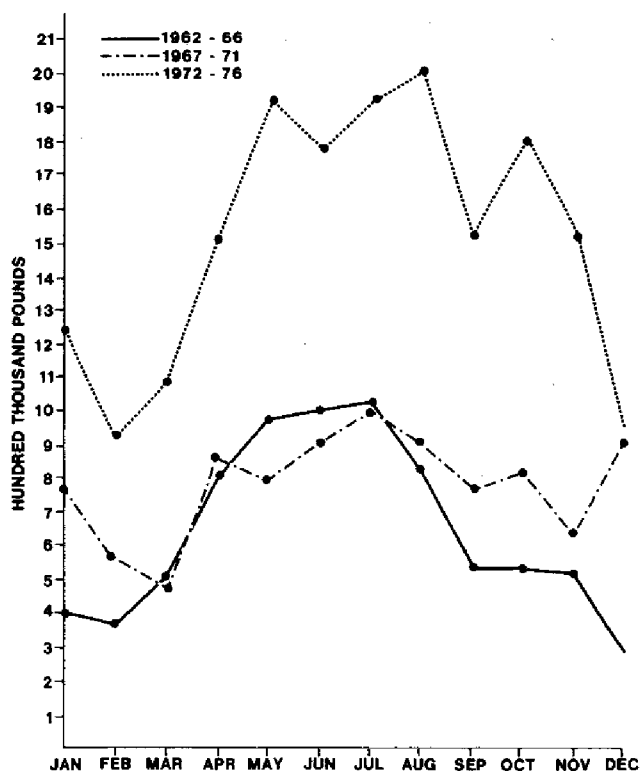


Table 2. Monthly hard blue crab landings, Louisiana, 1962-78.

	January	February	March	April	May	June	July	August	September	October	November	December
	----- (000 pounds) -----											
1962	273	204	362	683	911	530	1,136	1,080	1,023	902	546	128
1963	218	319	561	1,127	1,133	1,253	1,213	716	433	474	330	205
1964	170	63	131	470	921	1,015	961	637	451	162	441	271
1965	755	557	432	943	1,009	1,113	1,036	1,036	372	739	923	376
1966	583	724	1,018	808	969	1,069	721	607	403	393	302	389
1962-66 average	400	373	501	806	989	996	1,013	815	536	534	508	274
1967	308	213	248	722	237	274	312	377	260	299	309	240
1968	515	352	346	620	845	484	954	1,595	1,127	1,286	784	643
1969	1,114	940	1,049	1,077	1,099	1,311	1,244	739	750	725	610	946
1970	605	831	513	738	677	1,220	1,107	820	677	861	779	1,425
1971	1,278	502	589	1,092	1,120	1,248	1,202	1,004	1,132	934	740	1,346
1967-71 average	764	568	489	850	796	907	964	907	789	821	644	920
1972	794	544	1,084	1,125	1,153	1,118	1,427	2,335	1,610	1,516	1,304	1,072
1973	1,585	1,144	1,108	2,032	3,094	2,563	2,067	2,020	1,756	2,330	2,187	1,195
1974	2,059	1,097	1,430	1,619	2,125	1,592	2,184	2,415	1,406	2,190	1,629	895
1975	1,069	945	984	1,416	1,858	1,934	2,080	1,680	1,400	1,494	1,393	890
1976	703	836	829	1,376	1,423	1,666	1,887	1,690	1,378	1,551	1,152	721
1972-76 average	1,242	913	1,087	1,514	1,931	1,775	1,929	2,028	1,510	1,816	1,533	955
1977	328	647	1,124	1,373	1,457	1,777	1,601	1,452	1,640	1,948	1,910	897
1978	309	372	1,455	660	642	808	1,421	1,485	1,737	1,425	1,817	944

Source: National Marine Fisheries Service, Louisiana Landings, U.S.D.C., 1962-78.

# Gear & Catch by gear

Prior to the midsixties, the predominant method of harvesting hard blue crabs was the trotline. Baited with beef lips or ear strips, the trotlines were especially effective in the warm months (Jaworski 1972). A crabber would harvest several trotlines by midafternoon, then return to shore to begin the grading and marketing process. In the 1960s approximately 500 full-time crabbers were using the trotline (Fisheries Statistics of the U.S.). Throughout the sixties, these crabbers, along with part-time crabbers, utilized about 400,000 bait locations on the trotlines annually, a method that yielded about 75 percent of the state's landings through 1963 (Table 3). The use of the trotline began to decline in 1964, and this continued through 1977. There is no indication that trotline use increased between 1977, when the last data were reported, and 1981.

The use of trawls and dipnets, identified as "other gear" in Table 3, also declined during the 1960-77 period. Though there were instances when crabs were harvested by a directed trawl fishery, most crab landings attributable to trawl gear were incidental to the shrimp fishery.

The right-hand column of Table 3 shows that the percentage of catch attributable to "other gear" fell 50 percent from 1965 to 1966. In 1966, the crab trap became the second most important gear type. Traps produced 39 percent of the harvest, compared with the previous year's 12 percent. The major impact of the switch to traps in 1966 was a decline in the role of trawls and dipnets in the blue crab fishery. Appendix Table 1 depicts the tripling of crabbers using traps and the major increase in the number of traps used. The number of crabbers using traps increased each year after 1966, as did the number of traps committed to the fishery. The use of traps in the fishery increased notably again in

Table 3. Quantity of Louisiana hard blue crabs landed by gear type, 1960-77.

year	trot lines		traps		other	
	pounds (000's)	%	pounds (000's)	%	pounds (000's)	%
1960	7,557	75	38	*	2,455	24
1961	8,613	72	38	*	3,259	27
1962	6,812	71	57	1	2,654	28
1963	5,902	74	82	1	1,998	25
1964	3,368	59	297	5	2,027	36
1965	4,640	50	1,119	12	3,525	38
1966	3,476	44	3,126	39	1,384	17
1967	2,263	30	4,279	57	1,017	13
1968	2,869	30	5,414	57	1,268	13
1969	3,199	27	6,686	58	1,717	15
1970	2,568	25	5,728	56	1,958	19
1971	1,734	14	9,386	77	1,066	9
1972	2,916	19	11,307	75	860	6
1973	2,622	11	19,157	83	1,301	6
1974	833	4	19,601	95	206	1
1975	1,089	6	15,788	92	267	2
1976	130	1	14,713	97	368	2
1977	202	1	15,794	98	158	1

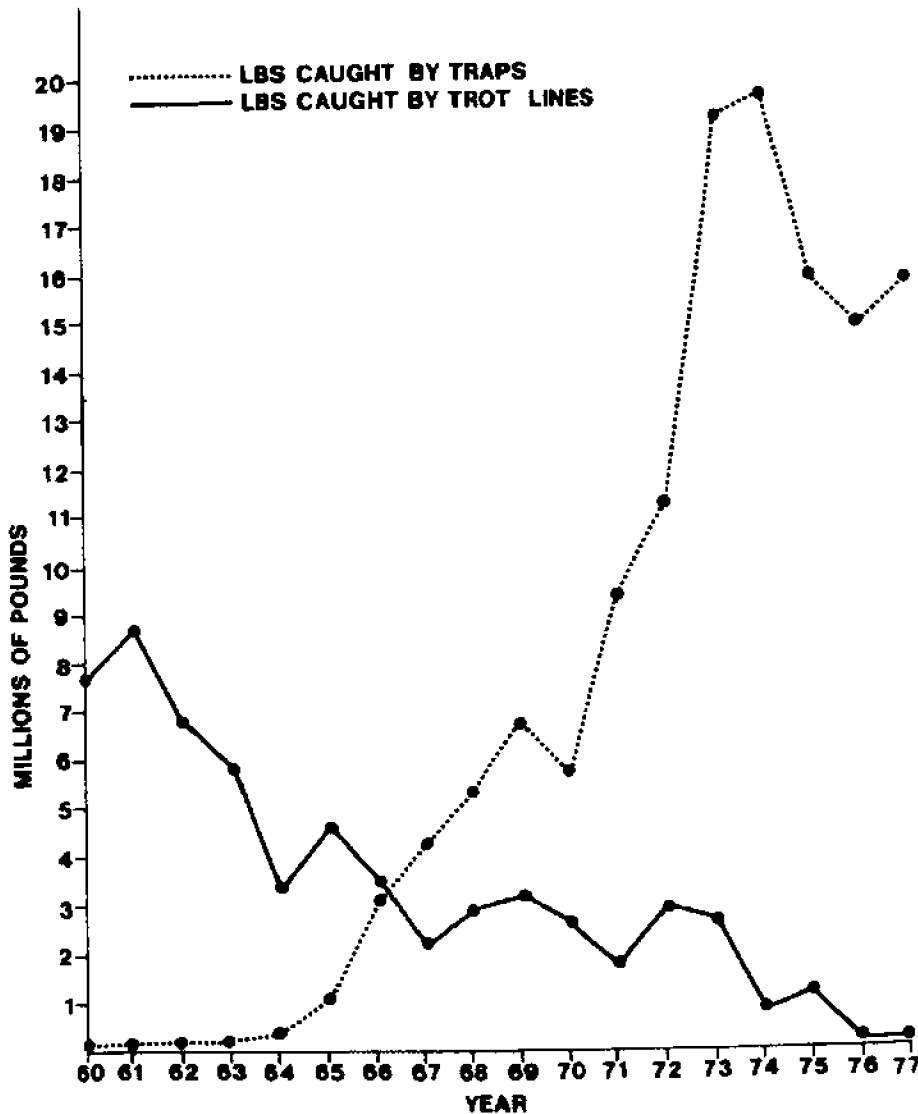
\* Less than one percent.

Source: National Marine Fisheries Service, blue crab and effort computer tapes.

1967. In that year, trap-caught crabs exceeded 50 percent of the state's harvest. In 1966, trotline contribution to the total catch began a steady decline (Table 3). Thus, it followed by one year the downward trend of the "other gear" classification. Figure 4 shows that the absolute catch by trotlines leveled off somewhat from 1967 to 1973 before dropping to fewer than one million pounds after 1975. The declining percentage of total catch taken by trotline since 1972 corresponds to a decrease in the number of crabbers using trotlines (Appendix Table 2).

The last four years of data indicate that traps are essentially the only technique used to harvest crabs commercially in Louisiana (Table 3), and economic growth in the crab fishery definitely depends on improvements in trap fishing techniques. In 1978, the Louisiana Department of Wildlife and Fisheries (LDWF) recognized the importance of crab traps and instituted a commercial crab trap fisherman's license. Crabbers using traps had complained of trap theft, trap robbing, and crowding in certain areas. The license limits crabbers to a maximum of 300 traps. Since the license was initiated in 1978 and NMFS statistics on the number of crabbers are not available after 1976, the number of crabbers in Appendix Table 1 reflects the 1978-80 LDWF license sales. In recent years, the number

FIGURE 4



of crabbers appears to have stabilized near the 800 level.

The National Marine Fisheries Service data for 1952-76 (Table 4) indicate the presence of part-time crabbers in the fishery. These individuals used traps rather than trotlines for the most part. During the last three years of the data set, part-time crabbers accounted for about 22 percent of the commercial crabbers.

Using the annual grand totals of crabbers from Table 4 as well as catch statistics permits an estimate of catch per crabber (Table 5). The catch per crabber for the period was highest in 1973, a peak that would probably remain, even when the actual data for the 1977-80 period become available. Production during the 1977-80 period was below the 1973 level (Table 1),

though the number of crabbers in the period was slightly above the 1973 level (Appendix Table 1). Thus, catch per crabber for 1952-80 in all likelihood was highest in 1973. Catch per crabber was about 16,500 pounds during the 1950s and early 1960s. A trend downward began in 1963 and continued through 1967. An upward increase in average catch followed for the period of 1968 to 1973. With landings generally lower after 1973 and crabbers more numerous, catch per crabber declined again. In spite of a major shift to traps in 1966 and 1967, the productivity per crabber did not rise significantly. This result is surprising in view of the data on catch per trap (Table 5). Catch per trap during the three years (1967-69) when traps became prominent increased each year. After an interruption in 1970, catch per trap again rose to a

Table 4. Full-time and part-time blue crab fishermen by gear type, Louisiana, 1952-76.

year	trot lines			traps			total		grand total
	full time	part time	subtotal	full time	part time	subtotal	full time	part time	
1952	555	148	703	49	28	77	604	176	780
1953	562	154	716	40	26	65	566	179	745
1954	506	89	595	NA	NA	--	--	--	--
1955	495	108	603	NA	NA	--	--	--	--
1956	429	109	538	NA	NA	--	--	--	--
1957	409	98	507	3	10	13	412	108	520
1958	451	93	544	3	8	11	454	101	555
1959	443	87	530	3	8	11	446	95	541
1960	492	95	587	5	7	12	497	102	599
1961	498	132	630	5	7	12	503	139	642
1962	496	147	643	13	12	25	509	159	668
1963	587	122	709	21	12	33	608	134	742
1964	590	104	694	25	9	34	615	113	728
1965	578	122	700	101	21	122	679	143	822
1966	524	125	649	321	76	397	845	201	1,046
1967	388	120	508	470	89	559	858	209	1,067
1968	416	146	562	474	103	577	890	249	1,139
1969	412	159	571	489	105	594	901	264	1,165
1970	308	34	342	490	67	557	798	101	899
1971	292	49	341	530	136	666	822	185	1,007
1972	289	44	333	571	123	694	860	167	1,027
1973	151	50	201	609	148	757	760	198	958
1974	132	30	162	630	179	809	762	209	971
1975	102	30	132	687	212	899	789	242	1,031
1976	75	20	95	789	226	1,015	864	246	1,110

Source: Fisheries of the United States, U.S.D.C., National Marine Fisheries Service, 1952-76.

peak in 1973. Catch per trap fell from 1973 to 1976, as the number of traps used increased by 53 percent (Table 5 and Appendix Table 1). The decrease in efficiency per trap during the 1973-76 period was evidently large enough to offset the tendency to increase catch per crabber by fishing 53 percent more traps.

## Soft Crabs

When processed immediately after molting, the blue crab has high value, especially with restaurants, which are the major market for soft crabs. The production of soft crabs begins with the capture of "green" or "buster" crabs. Green crabs are those that will not molt for a week and buster crabs are those in an advanced stage

of molt. Blue crabs seeking protective cover before molting are attracted to clumps of seria bushes placed in the water by crabbers. The crabbers run the lines of bushes and collect the crabs. Peak production during the 1959-80 period occurred in 1961 (Table 6). The record value to crabbers was \$569,539 in 1977. Average ex-vessel prices exceeded \$2 per pound after 1976, but in spite of this price during the 1976-80 period, annual production was about 128,000 pounds. The initial five-year period covered in Table 6 (1959-63) had an average annual production of 482,000 pounds. The production of soft crabs has been poor in recent years.

Discussion with wholesale seafood dealers and restaurant managers in the New Orleans area during 1981 revealed that

Table 5. Hard blue crab catch per fisherman and per trap, Louisiana 1952-76.

year	fishermen	catch	catch per	traps	trapcatch	catch/trap
	no.	thd. lbs.	fisherman lbs.	no.	thd. lbs.	lbs.
1952	780	7,334	9,403	4,070	NA	--
53	745	8,131	10,914	3,575	NA	--
54	NA	7,085	--	NA	NA	--
55	NA	10,811	--	NA	NA	--
56	NA	9,402	--	NA	NA	--
57	520	8,559	16,460	325	NA	--
58	555	9,336	16,822	275	NA	--
59	541	9,570	17,689	275	NA	--
1960	599	10,049	16,776	300	38	127
61	642	11,910	18,551	300	38	127
62	668	9,523	14,256	2,010	57	28
63	742	7,982	10,757	3,010	82	27
64	728	5,692	7,819	3,250	297	91
65	822	9,284	11,294	11,500	1,119	97
66	1,046	7,986	7,635	40,200	3,126	78
67	1,067	7,559	7,084	58,800	4,279	73
68	1,139	9,551	8,385	65,600	5,414	83
69	1,165	11,602	9,959	67,900	6,686	98
1970	899	10,254	11,406	75,800	5,728	76
71	1,007	12,186	12,101	84,100	9,386	112
72	1,027	15,083	14,686	87,600	11,307	129
73	958	23,080	24,092	93,600	19,157	205
74	971	20,640	21,256	108,100	19,601	181
75	1,031	17,144	16,629	122,800	15,788	129
76	1,015	15,211	14,986	144,000	14,713	102

NA = not available.

Source: Fisheries of the United States, U.S. D.C., National Marine Fisheries Service, 1952-76.

frozen soft-shelled crabs are imported from the Chesapeake Bay area. Louisiana is a net importer of soft-shelled crabs. Thus, a major market is available for re-entry by soft-shelled crabs from Louisiana. Revitalization of the soft-shelled crab industry is perhaps limited by a scarcity of waterfront locations with suitable water quality.

## Lake Pontchartrain and Lake Borgne Commercial Crabbers: an economic survey

Table 6.  
Pounds and value of soft-shelled crabs landed in Louisiana, 1959-78.

year	pounds	value	value/lb.
1959	605,100	302,550	.5
1960	513,600	255,517	.5
1961	620,300	310,200	.5
1962	343,800	171,900	.50
1963	328,700	164,350	.50
1964	199,900	126,940	.64
1965	203,800	140,686	.69
1966	127,700	84,844	.66
1967	146,300	121,331	.83
1968	284,000	206,398	.73
1969	196,600	161,236	.82
1970	89,600	79,492	.89
1971	126,800	125,741	.99
1972	102,100	109,119	1.07
1973	119,600	131,552	1.10
1974	95,600	126,934	1.33
1975	110,500	155,087	1.40
1976	88,000	145,000	1.65
1977	224,749	569,539	2.53
1978	130,300	272,993	2.10
1979*	118,951	271,550	2.28
1980*	78,222	180,729	2.31

Source: National Marine Fisheries Service, blue crab catch and effort computer tapes and personal communication from N.M.F.S. fisheries statistics office in New Orleans.

\*Preliminary

Economic information could not be obtained through personal surveys for all crab-producing areas in Louisiana. Budget constraints dictated that the interviews of crabbers be limited to one area. This approach permitted the collection of detailed economic data from a sample of crabbers stratified by location. The areas of crab production chosen for the study were Lake Pontchartrain and Lake Borgne. The lakes, as they will be called in this report, had several attributes that made the area important. The Bonnet Carre Floodway exists to divert massive volumes of Mississippi River water into the southwestern corner of Lake Pontchartrain. The diversion of river water through Lake Pontchartrain and then to Lake Borgne reduces the threat of flooding from river water in metropolitan New Orleans. It was necessary to use the floodway twice during the decade of the 1970s (1974, 1978), which temporarily affected the crab fishery of the lakes.

Additional undesired impacts have occurred through the discharge of effluents from urban storm sewers and treatment plants into Lake Pontchartrain. Crabbers around the lakes have contended that pumping the contents of storm and sanitary sewers into Lake Pontchartrain has at times caused the reduction or total absence of dissolved oxygen in the water. Scientists from Louisiana State University did identify areas that totally lacked dissolved oxygen in 1980 (Aquanotes 1981). Additional research was proposed to identify the source and scope of the problem.

A 1980 ship collision in a navigation channel adjacent to Lake Borgne resulted in the spillage of the pesticide PCP into the water. A large area of the marsh and Lake Borgne was closed to commercial fishing for several weeks. On this occasion, as with other instances when problems in the lakes were reported in the news media, the sale of seafood was adversely affected.



The prospect that the urban area will continue to affect the lakes and, consequently, the crab fishery heightened the potential payoff from an economic survey in the area. Jaworski (1972) was the first to depict the declining crab production in the lake system. The updated information on the lakes through 1978 shows a continued decline (Table 7). The blue crab catch in the initial five-year period (1959-63) averaged 2.6 million pounds annually. Approximately 27 percent of the state's blue crab catch originated from the lake system. Annual catch from the lakes was down to less than 9 percent of the state total by the end of the period. Average annual catch for the 1974-78 period was 1.4 million pounds. The decline originally reported in Jaworski (1972) was not reversed.

Table 7.  
Hard blue crab landings and value from Lake Pontchartrain and Lake Borgne, 1959-77.

year	pounds	value	% of state lbs.
1959	2,848,000	136,704	30
1960	2,661,300	133,065	26
1961	2,961,800	127,357	25
1962	2,551,300	125,014	27
1963	2,069,480	115,891	26
1964	1,598,400	107,093	28
1965	1,887,200	128,330	20
1966	1,624,000	108,808	20
1967	1,933,700	133,425	26
1968	2,144,500	180,138	23
1969	2,377,100	218,693	21
1970	2,119,200	192,847	21
1971	1,615,100	210,007	13
1972	1,799,000	230,531	12
1973	2,687,000	378,370	12
1974	1,402,900	234,386	7
1975	1,189,800	211,055	7
1976	1,294,000	283,814	9
1977	1,586,900	445,604	10
1978	1,418,700	346,450	10

Source. National Marine Fisheries Service, blue crab catch and effort tapes and personal communication from N.M.F.S. fisheries statistics office in New Orleans.

A similar situation developed in the soft crab fishery. During the 1959-63 period the lakes yielded about 197,000 pounds of soft crabs annually (Table 8).

During the last five years of reported data (1974-78), annual production averaged 31,000 pounds. Thus, the most recent reported data indicate that soft crab production was down to only 16 percent of historical levels. The last year reported in Table 8, 1978, had inconsequential soft crab production from the lakes. In 1978, the floodwaters of the Mississippi River were diverted through the Bonnet Carre Floodway to relieve pressure on levees in the New Orleans area. The diversion occurred in the spring. Soft-shelled crab production begins in April and peaks in July. Hard crab landings in 1978 were above the five-year average. Crabbers questioned during the survey indicated the catch rate was high, as the crabs became concentrated in areas of higher salinity.

Table 8.  
Soft blue crab landings and value from Lake Pontchartrain and Lake Borgne, 1959-77.

year	pounds	value	% of state lbs.
1959	209,300	104,650	35
1960	255,200	127,600	50
1961	278,100	139,050	45
1962	117,100	58,550	34
1963	126,420	63,210	39
1964	58,600	37,504	29
1965	57,000	39,300	28
1966	45,300	29,898	35
1967	54,500	45,235	37
1968	94,500	68,985	33
1969	75,800	62,156	39
1970	25,700	22,873	29
1971	55,600	52,068	44
1972	42,600	46,070	42
1973	57,800	65,934	48
1974	34,600	48,440	36
1975	30,600	42,940	28
1976	26,500	42,881	30
1977	64,000	169,092	28
1978	1,200	3,150	1

Source. National Marine Fisheries Service, soft blue crab catch and effort tapes and personal communication from N.M.F.S. fisheries statistics office in New Orleans.

The economic survey of crabbers was initiated as a result of the unstable blue crab production system. No attempt was made to evaluate the economic impacts of a

particular event. Rather, a thorough economic description of owner-operated crab harvesting businesses was developed. This approach effectively provides information on crabbing businesses operating in an area subject to frequent disruption in the production system.

## Survey Procedure

The breadth and detail of the information sought required the use of personal interviews and questionnaires. The license files of the Louisiana Department of Wildlife and Fisheries were consulted in order to determine the number and residences of crabbers around the lakes. Budget constraints dictated that 37 questionnaires (a 20% sample) could be completed by personal interviews with these crabbers. The sample was allocated to parishes bordering the lakes on the basis of the proportion of crab license sales in those parishes. The interviews were conducted in February and March of 1981. The responses from crabbers concerned their activities during the calendar year 1980.

The questionnaire required approximately 45 minutes to complete. All respondents were randomly selected by name from the list of licensees. No opportunistic interviews were conducted. Thirty-seven usable questionnaires with detailed information were collected.

Since the foundation of a commercial crabbing business is the boat, a complete description of a crabber's boat was acquired. Information on such characteristics as size, horsepower, hull material, age, cost, value, type of fuel, and fuel consumption was collected. Crabbers also answered questions about investment, debt, operating costs, fishing effort, distribution of effort, catch, and catch disposition. Also identified was the relationship of crabbing to other commercial fishing and business pursuits of the respondent.

## The Business Unit

The crab harvesting operation is a business. Questions were asked that ascertained the crabber's business relationships in the industry. That is, a

crabber was classed as a full-time crabber, a full-time fisherman for whom crabbing was one of several enterprises, a part-time crabber, or a recreational crabber. The last class included licensees who purchased the commercial license in order to use more traps than the number allowed sport crabbers.

Twenty-three of the 37 licensees indicated that in 1980 they were full-time commercial fishermen. Nine of these composed the group that fished only for crabs. The remaining 14 crabbed as one part of their overall commercial fishing activity.

Thirteen respondents indicated that they crabbed part-time only, to supplement their income, and that this was their only association with the commercial fishing industry. A single respondent said that he had purchased his license so that he could use more than the five traps permitted a sport crabber. For 1980 the combination of part-time and sport crabbers accounted for 38 percent of the individuals purchasing commercial crab licenses.

The full-time crabbers provided the most definitive picture of crab business operations. Over the 1976-80 period, business units in the crab harvesting industry became more diversified (Table 9). Licensed crabbers during the period relied to an increasing extent on fisheries other than blue crab. By 1980, the percentage of commercial, full-time crabbers who fished other species increased to 61 percent. The most popular fishery combination was that of crab and shrimp. Lakes Pontchartrain and Borgne provide good shallow-water fishing grounds for shrimpers with small boats. The crabbing business unit in the area consists of independent owner-operators who harvest crabs and other species.

The characteristics of the fishing platforms used by the respondents define the physical aspects of the business units. A wooden boat with an inboard gasoline engine was the typical unit in use. The average length was 26 feet with a bottom width of nine feet (Table 10). The appreciation in boat value during the period of boat ownership was approximately 33 percent. Appreciation would have been higher had a larger percentage of the boats been equipped with diesel engines. The gasoline

inboard engines prevalent in the small boat fleet are marine conversions of eight-cylinder automobile engines. Gasoline engines rapidly lose value, while diesel engines enhance boat values. A prospective crabber in the winter of 1981 when the survey was conducted faced a typical used-boat value of about \$10,500. Perhaps this entry cost for commercial crabbers in part explains the large percentage of part-time crabbers (35 percent) discovered in the sample. Part-timers face even lower investment levels for entry because they use smaller boats and engines.

Table 9 provides insight to the employment stability experienced by the commercial crabbers interviewed in 1981. Twenty-one of the 23 who crabbled in 1980 also crabbled in each of the four previous years. Two individuals began their crab-

Table 9.

Percent of sampled commercial crabbers involved in multi-species fisheries, 1976-80.

	Crab Only %	Crab & Fish %	Crab & Shrimp %	Crab, Fish & Shrimp %
1976 (n=21)	52	10	28	10
1977 (n=21)	48	14	19	19
1978 (n=21)	43	10	24	23
1979 (n=21)	43	10	29	18
1980 (n=23)	39	13	35	13

Table 10.

Characteristics of commercial crab boats involved in commercial crabbing, 1980.

Average length	26 ft.	inboard h.p.	270
Average width	9 ft.	outboard h.p.	90
Inboard powered	87 pct.	average age	7 yrs.
Outboard powered	13 pct.	market value	\$10,500
Gasoline powered	87 pct.	purchase price	\$ 7,900
Diesel powered	13 pct.	appreciation	\$ 2,600

bing business in 1980, the most recent year to which the survey applied. In spite of their recent entry to the crabbing business, these crabbers incurred no debt on the boat or engine. None of the other commercial crabbers surveyed had a loan on his boat or engine. The basic crabbing business unit was free of boat debt and the related cost of interest. This may result more from the tight credit situation facing small boat crabbers than from high earnings. Small boats of wood construction, powered by gasoline, are very costly to insure. A lender making loans for such boats would surely require insurance, which is often not available and always expensive, and this prerequisite drives crabbers out of credit markets. Equity for investment generally comes from retained net earnings from the crab business. Additional cost and earnings information is presented in a later section.

## Crabbing Gear and Effort

The gear used by the respondents in the lakes area was limited to traps. Trot-lines, trawls, and brush lines were not used in the lakes by any of the respondents during the 1976-80 period. Crabbers were questioned about the traps, their cost, useful life, number fished, frequency of lifts, and monthly distribution of effort. The responses discussed represent those of the 23 crabbers who indicated they were full-time crabbers or full-time fishermen that crabbled as one enterprise.

All respondents used traps made of vinyl-coated poultry wire. Sixty-one percent had "rebar" rods in the traps. Rebar is the steel rod commonly used in reinforced concrete construction. It stiffens the traps and adds sufficient weight to prevent their movement in areas of strong tides or

wind. Only three of the 23 crabbers constructed all of their traps. Three crabbers made some traps and purchased others. The majority (74 percent) purchased traps from commercial trap builders. In 1980 the average trap price was \$8.21. A float (\$.58) and 22 feet of line (\$.66) were added to bring the total cost to \$9.45 per water-ready trap. Slightly over half (52 percent) of the crabbers preferred the "two-barrel" (two access doors) traps. The "four-barrel" traps are slightly more costly.

The crabbers cited a high replacement rate for traps. A mean useful life of 16 months was estimated by the respondents. However, significant losses of traps occurred as a result of theft, storms, damage by vessels, and encounters with dredges in the lakes area. The losses are so high that crabbers annually replace 77 percent of their traps. The mean number of traps fished was 218, and ranged from 65 to 600. Traps are a major expense of production in light of such high losses. This cost and the cost of bait for the trapping activity will be analyzed in a later section.

The crabbers' fishing effort for 1980 was estimated. No difference in effort between two- and four-barrel traps could be noted. Components of effort were the number of traps in the water each month and the number of lifts of those traps. The product of these two components for each month for each crabber provided a measurement of effort for the sample, termed total trap-days. Average annual trap-days for each crabber were derived from total trap-days divided by 23. The average annual number of trap-days per crabber was 32,112.

Involvement of crabbers in other fishing enterprises and the vagaries of weather in the lakes suggested that the fishing effort would not be evenly distributed over the year. Trap-days were lowest in January and February (Table 11). March marked the initiation of major crabbing activity, which was maintained through October. Crabbing declined during the holiday months of November and December. The columns showing the percentage of annual lifts by month give a more accurate indication of fishing effort. During the May to November period the number of traps in the lakes are the best indicators of

Table 11.

Percentage of blue crab trap-days and lifts of surveyed commercial crabbers in Lakes Pontchartrain and Borgne, 1980.

	Trap-Days		Lifts	
	%	%	%	%
January	3	5	July	10
February	3	5	August	11
March	8	7	September	11
April	11	9	October	10
May	11	10	November	8
June	10	10	December	4

Note: A trap-day was defined as any part of a calendar day in which a baited blue crab trap remains in the water. A lift was defined as an event when the crabber removes the trap from the water for emptying.

fishing effort. For the other months, lifts per month best portray fishing effort. The distinction is due to the fact that some traps are removed from the lakes during the December-February period. Thus, the number of traps fished declines more than the number of lifts. This explains why the period from December through February had a higher percentage of lifts than trap-days. Severe winter weather evidently fosters inactivity. Fourteen of 23 crabbers did not fish during the winter months. The nine remaining crabbers reduced the number of traps fished more than they reduced lifting cycles.

The mean number of days fished for the sample of commercial crabbers was 156. As noted above, crabbers averaged 218 active traps in their crabbing operations. The product, 34,008 trap-days, is slightly higher than the weighted mean trap-days (32,112) per crabber compiled from the survey for 1980. Nine of the 23 crabbers in the survey crabbed in all twelve months. As a group they crabbed 208 days in 1980, an increase of one-third over the average of all commercial crabbers.

## Crabbing as a Business

Commercial crabbing yields economic benefits to crabbers and produces impacts on ancillary businesses. Revenues and costs are the dynamic variables that produce these impacts. Portrayal of typical costs and revenues related to a commercial

crabbing business was accomplished through an enterprise budget. An enterprise budget is a model that reveals the distinguishing characteristics of a particular type of business. When based on average conditions as defined by a survey profile, the enterprise budget provides a useful reference point for analysis of real businesses. Individuals can then adjust an enterprise budget to more nearly reflect a larger or smaller crabbing business.

An enterprise budget includes revenue, variable cost, and overhead (fixed) cost components. Variable costs for a crabbing business result from the purchase of expendable supplies to keep the operation functioning. Bait, traps, fuel, hardware, and parts for repairs are the major expendables. Typical fixed costs are insurance, license fees, loan interest, and depreciation. Fixed costs have the common attribute of not varying as crabbing effort fluctuates.

The crab boat on which the budget was developed was the major item of fixed cost. Depreciation of the boat and engine was calculated from the average survey value of \$10,500. A useful life of eight years and a salvage value of 25 percent were assumed for calculation of the annual depreciation charge. Thus, \$7,875 is the depreciation over an eight-year period. Use of the average boat value--as opposed to purchase price--in the enterprise budget corresponds to the typical 1980 entrant's situation. An unexpected finding from the survey was the absence of debt on boat and engine among crabbers. None of the commercial crabbers surveyed was financing the cost of his crabbing platforms. The enterprise budget for the lakes fishery then will not reflect any expense for interest on debt. More generally, this would be a normal cost of acquiring the boat needed to operate this type of business. An interest charge could be added to the budget in order to reflect the business' opportunity to use the equity in the form of a debt-free boat in lieu of some other interest-earning investment. Nine of the 23 crabbers did incur interest expenses during 1980. However, the interest payments resulted from debt on trucks used in the business. The mean cost of interest in 1980 was \$864. Annual license fees and truck insurance were other fixed costs tabulated.

The variable costs category was found to be eight times larger than fixed costs. Bait was the major expense item. The enterprise budget estimate was obtained by averaging responses to the question: how many traps can be baited per 60-pound basket of bait? Recalling that there were 32,112 total trap-days, the average of 55.3 traps baited per basket when multiplied by \$11.30 per basket yielded \$6,562 as the bait expense. Boat fuel ranked second in terms of variable costs. Daily fuel costs of \$23.28 for an average of 156 operating days amounted to \$3,632 in 1980. Fuel, depreciation, and repairs were the major expenses of operating a truck for the business. Using a charge of \$.19 per mile for the average of 15,710 business miles driven in 1980 yielded a cost of \$2,985.

The loss of traps to vandals and foul weather accounts for the need to replace 77 percent of the crabber's traps annually. Annual trap costs were based on \$9.45 per trap for 167 traps. The remaining 51 traps fished have an average useful life of 16 months. On a 12-month basis, these 51 traps cost \$3.61. The total annual trap expense of \$1,939 resulted from the combination of trap losses and deterioration. Boat and engine repairs are often performed by crabbers themselves. The average of \$1,142 for repairs reflects actual costs. No allowance was made to account for the value of contributed labor on the part of the crabber.

The final component of an enterprise budget is the gross revenue earned. Average annual catch was estimated to be 1,781 standard 40-pound bushels. Since the larger male crabs are more highly valued, the proportion of number-one crabs in the catch had to be ascertained. Respondents indicated that 76 percent of the culled catch offered for sale consisted of number ones, and the remainder were lower priced number-two crabs. The weighted price for the 71,240 pounds of crabs was \$.40 per pound. Gross revenue for 1980 averaged \$28,496. Accounting for variable and fixed costs leaves a residual of slightly over \$10,000. This serves as the base on which to calculate self-employment (Social Security) tax at the rate of 8.1 percent. The summary of enterprise budget entries appears in Table 12. Returns above variable and fixed costs and after self-employment tax reflect net return to a

crabber's investment and labor. Income available for family living expenses would be higher in those instances where the crabber harvests other species. Table 9 indicates that a combination of fishing enterprises was the typical method of operating a business. Thus, total income would generally be larger than that derived from crabbing alone.

## Part-time Crabbers

The proximity of the lakes to the New Orleans metropolitan area, which has over one million people, was reason to speculate that the part-time fishery would be large. Thirty-five percent of the surveyed crab licenses indicated they participated in the crab fishery on a part-time basis. Referring to Table 10 for comparison, part-time

crabbers operated smaller boats that were outboard-powered for the most part. The typical boat was of fiberglass construction, approximately 19 feet in length. Investment in boat and motor was \$3,231, less than half of the amount invested by the 23 commercial crabbers surveyed. A large difference was also evident in the number of traps fished, 145 vs. 218 for the commercial crabbers. Part-time crabbers devoted 119 days to the fishery compared with 156 for the commercial crabbers. The combination of traps and days fished indicated that the part-time crabbers' distribution of effort over the year, in terms of lifts, over the year was different from that of the 23 commercial crabbers, Table 13.

A budget similar to Table 12 for commercial crabbers was not prepared.

Table 12. Cost and return budget for a commercial blue crab enterprise in Lakes Pontchartrain and Borgne, 1980.

<u>Description</u>		
Average experience of crabber	20 yrs.	
Average boat length	26 ft.	
Average horsepower	240	
Average number of traps fished	218	
Average number of lifts per year	32,112	
Average annual catch	1,781 bushels	
Average annual catch in pounds	71,240	
<u>Gross returns</u>		\$28,496
<u>Variable costs</u>		
Bait	6,562	
Boat fuel	3,632	
Truck operation	2,985	
Traps	1,939	
Boat and engine repair	1,142	
Oil	63	
Sub-total		16,323
<u>Overhead costs</u>		
Depreciation: boat and engine	984	
Licenses	95	
Truck insurance	180	
Loan interest	864	
Sub-total		2,123
<u>Self-employment tax (8.1% of \$10,050)</u>		814
Total costs		19,260
Net returns		9,236

Table 13.  
Comparison of crabbing effort between part-time and commercial crabbers, Lakes Pontchartrain and Borgne, 1980.

	Commercial Crabber Lifts as % of Year	Part-Time Crabber Lifts as % of Year
January	5	0
February	5	1
March	7	6
April	9	10
May	10	12
June	10	17
July	10	15
August	10	16
September	10	12
October	10	7
November	8	3
December	6	1

Part-time crabbers comprise a group for which it is difficult to portray business costs. They do not regard depreciation of equipment as a cost, often use self-made items, and contribute the considerable labor of family and friends to the pursuit. A few items similar to the components of Table 12 could be evaluated. Part-time crabbers fished fewer traps (145) for fewer days (119), resulting in a crab catch of 598 bushels. The average catch per trap-day differed considerably between the two groups. Commercial crabbers averaged approximately 2.5 pounds of crabs per trap-day compared with the part-time crabbers' average of 1.4 pounds. This difference must be noted along with differences in market channels when estimating the economic impact from crabbing in the lakes area.

## Marketing

Two characteristics of the blue crab fishery in the lakes area are important to the development of marketing channels. The blue crab fishery is interwoven with the economic fabric of a highly populated area. Other crabbing locations in the state are more isolated from major population centers. Isolation from consumers creates an important role for the crab dealer as a stable, reliable purchaser of crabs. Population centers around the lakes offer the crabber the opportunity to directly

participate in marketing through retailers, restaurants, and the general public. The second characteristic is the presence of a large percentage of part-time crabbers. These crabbers handle smaller volumes that are far easier to sell to markets other than the large crab buyer.

Survey respondents were asked to indicate which of four market channels they used. The percentages of their annual sales going directly to crab dealers, out-of-state buyers, the general public, and the restaurant or retail trade were tabulated. None of the 23 commercial crabbers sold through all four market channels. Ten sold their entire catch through a single channel. Nine sold through two channels, while the remaining four sold in three markets.

This marketing pattern indicates that economic impacts from commercial crabbing in the lakes area can be grossly underestimated. The foundation of an impact estimate is the quantity of product harvested and marketed. The economic value of the harvest serves as the basis on which to estimate the total impact that results from providing the product to consumers. Seafood harvest statistical reporting systems are structured to collect catch data only at the initial dockside dealer level. To the extent that seafood is marketed through other channels, published statistics will underestimate the catch and economic impact.

The extent to which economic impact could have been underestimated in 1980 can be ascertained from Table 14. Direct sale to restaurants and retail stores was the most frequently used marketing channel. This channel, along with the out-of-state and public sales channels, was used by 70 percent of the crabbers. These nonsurveyed channels accounted for 60 percent of the crabs harvested in the lakes during 1980. The remaining 40 percent was distributed through crab dealers. Note that crab dealers comprised the largest single market channel in terms of volume. Even in the metropolitan New Orleans area, crab dealers served as the most important method of marketing crabs. It was evident that in 1980 the larger producers preferred the certainty and ease of marketing through crab dealers. The 40 percent of the catch marketed through dealers was harvested by

Table 14.

Number of surveyed commercial crabbers and volume of catch sold to various market channels, Lakes Pontchartrain and Borgne, 1980.

Market Channel	# of Surveyed Crabbers <sup>1</sup>	% of Surveyed Crabbers	% of Catch Moving in Channel
Out-of-state	5	12.5	14
Public	7	17.5	10
Restaurants & retail	16	40.0	36
Crab dealers	12	30.0	40

<sup>1</sup>Several of the 23 crabbers sold to more than one channel.

only 30 percent of the crabbers. Of ten crabbers selling all of their catch to one channel, six restricted their sales to dealers. The three highest producers in the survey sold 100 percent of their crabs to dealers. The conclusion follows from Table 14 that 70 percent of the crabbers used unsurveyed market channels in 1980 for 60 percent of the crabs harvested in the lakes. If 1980 was typical of catch potential and all crab dealers--but only crab dealers--were surveyed by government statisticians, the blue crab harvest in the lakes would be approximately 2.5 times larger than that reported. In the event that the survey of dealers by government port samplers covers less than 100 percent

Table 15.

Number of surveyed part-time crabbers and volume of catch sold to various market channels, Lakes Pontchartrain and Borgne, 1980.

Market Channel	# of Surveyed Crabbers <sup>1</sup>	% of Surveyed Crabbers	% of Catch Moving in Channel
Out-of-state	2	11	13
Public	7	39	19
Restaurants & retail	3	17	22
Crab dealers	6	33	46

<sup>1</sup>Several of the 13 part-time crabbers sold to more than one market.

of the dealers, the actual catch would be even larger.

The contribution of the large number of part-time crabbers complicated the task of depicting the lakes' catch. Part-time crabbers marketed their catch through the same channels as commercial crabbers in approximately the same proportions. The most popular channel was direct sale to the public. In many cases, this was done through sales to friends or through roadside markets. Table 15 portrays the marketing information for part-time crabbers. Markets other than dealers accounted for the majority of sales by part-time crabbers.

## Economic Impact of Crabbing in the Lakes

As evidenced by the proportion of the crab catch marketed through channels not sampled by government data collectors, the crab catch in the lakes can be grossly underestimated. A gross sales multiplier can serve as a suitable measure of gross economic activity associated with crabbing. However, a dockside estimate that accurately reflects the magnitude of the crab catch is a necessary prerequisite to application of the multiplier.

A catch estimate for the lakes was developed from the license sales information of the Louisiana Department of Wildlife and Fisheries. Crab licenses in the survey area were divided among commercial (62 percent), part-time (35

percent), and recreational (3 percent), based on responses to the personal interviews of crabbers. The average catch of the commercial and part-time groups in our survey was applied to the estimated total number of crabbers. This procedure resulted in an estimate of 9.8 million pounds of crabs for 1980. The highest crab catch on record for the lakes was 2,961,800 pounds in 1961 (Table 7). The average reported catch, based on the most recent three years for which lake data were available, was 1,433,000 pounds (Table 7).

Statistics for the 1976-78 period show that Lakes Pontchartrain and Borgne produced 9.7 percent of the state's reported crab catch. This percentage of the re-



ported statewide harvest of 1980 (16,026,000 lbs.) yields an estimated catch of 1.6 million pounds. The catch estimate of 9.8 million pounds developed from sample data for 1980 stands in marked contrast to the catch of approximately 1.4 to 1.6 million pounds reported by government port samplers.

A price of \$.40 per pound was taken as an estimate for the 1980 price received by lakes crabbers. This price exceeds the statewide average price of \$.24 per pound (Table 1). The high proportion of the catch from the lakes that is in the premium grade category can account for some of the difference. The fact that up to 60 percent of the lakes catch bypasses the initial dockside dealer suggests that crabbers are able to capture some of the normal markup taken between dealers and the restaurants or public. At \$.40 per pound, the estimated catch of 9.8 million pounds from the lakes in 1980 resulted in gross revenue of \$3.9 million. This would compare with an estimated value of the lakes catch totaling approximately \$600,000 when derived from published catch statistics.

The economic impact of crabbing on sales and income was estimated by use of multipliers. Sales and income multipliers for commercial fishing businesses in nearby coastal Mississippi served as the basis for the estimate (Nissan 1978). There were no comparable multipliers for fisheries businesses in Louisiana. The multiplier for sales or output from fishing businesses was 3.43; that for income was 2.37. These multipliers simply show the growth in sales and income that result throughout the economy as a result of a stimulus or impulse in the fishing business sector. A one-dollar increase in final demand for the products of the fishing sector of an economy increases total sales in the economy by \$3.43. A one-dollar increase in fishing sector income will generate a total of \$2.37 in income within the overall economy. Crabbing in the lakes area economy generates an estimated \$13.4 million of sales or output. In addition, \$2.37 of income was generated from each dollar of crabber income. Budget results in Table 10 indicate commercial crabber income from crabbing alone averaged approximately \$10,000 in 1980. Each commercial crabber, then, was responsible for producing 2.37 times that amount of income (\$23,700) in the lakes economy.

Additional impacts from soft-shelled crab production and marketing occur. The magnitude of production in 1980 was not clearly established via the field survey of crabbers. Ninety-one percent of the commercial crabbers and 69 percent of the part-time crabbers indicated that they produced soft-shelled crabs. Production occurs from April through October. At peak periods the respondents indicated a catch of slightly more than one peeler crab per trap lift. The duration of this peak could not be satisfactorily determined. A few respondents gave specific responses that indicate the extent of their own soft crab production during 1980. The low figure was 66 dozen, while the highest response was 300 dozen. Use of the low figure for the number of crabbers that indicated they produced soft-shelled crabs yields an estimate of 39,864 pounds for the lakes crab fishery as a whole. This figure is 33 percent above the recent three-year average of reported soft crab statistics (Table 8). The high figure for soft-shelled crab production by an individual crabber would lead to a soft crab production estimate of 181,200 pounds for the lakes fishery. This figure exceeds the most recent three-year landings average by a factor of six. Valuing the soft crab at the \$2.31 per pound (4 lbs/dozen) state average price for 1980 results in a value range from \$92,000 to \$419,000. Considering that only two crabbers indicated that they marketed soft-shelled crabs through dealers, the average lakes price would surely be higher. Direct sales to restaurants, retail stores, and the public were the standard marketing practice for the lakes industry.

## Summary

Because Lakes Pontchartrain and Borgne are adjacent, they can be analyzed as a single crab fishery. Their proximity to the New Orleans metropolitan area gives this fishery a complex character. On one hand, the lakes receive effluents from sewage treatment plants and untreated storm sewer discharge along with occasional major floodwater diversions from the Mississippi River. Natural systems in general operate under unfavorable conditions in such circumstances. On the other hand, the lakes' proximity to the metropolitan area facilitates use of the natural production system

by part-time crabbers seeking to supplement their income from other jobs. The survey of crabbers indicated that 35 percent of the licensed crabbers were part-time operators. From Table 4 it was noted that the crab fishery statewide employs only 22 percent part-timers. The personal survey of licensed crabbers revealed that commercial and part-time crabbers market about 60 percent of the lakes catch through market channels that are not included in government statistical surveys.

By means of the Sea Grant survey of crabbers, the lakes catch in 1980 was determined to be 9.8 million pounds. This estimate was nearly six times larger than published catch statistics for the lakes. The proximity of the lakes to the metropolitan area has led to a marketing pattern that bypasses the dockside crab dealer. Not only does this affect the accuracy of government catch statistics but it also results in crabbers receiving higher average prices than their counterparts in the rest of Louisiana.

Crabbing effort can expand rapidly within a calendar year. Thirty-five percent of the commercial crabbers surveyed in the lakes area also shrimped. If conditions in the shrimp fishery are unfavorable during a given period, many crabbers can rapidly switch their effort to crabbing (Table 9).

The increase in crabbers' net income that results from direct sale to urban buyers was discussed. The average price received was \$.16 per pound higher than the state average. A comparison of the average earnings budget (Table 12) with a similar 1980 budget for South Carolina crabbers (Rhodes 1981) indicated that the typical lakes crabber worked fewer days but fished far more traps and landed crabs worth \$.16 per pound more than their South Carolina counterparts. The average net income realized from this source by crabbers in the lakes area approached \$10,000, or about \$64 per day fished. The net income figure was also found to be potentially misleading. All commercial crabbers surveyed were free of debt on their boats and engines. As this crabbing platform wears out, funds should be put aside annually for equipment replacement. This would reduce the amount of net income actually available for family living expenses below that

reported in Table 12.

The subject of economic impact from crabbing in the lakes was addressed. Consideration was given to the prospect that the impact could be underestimated because of a large unreported catch, which was found to exist in 1980. The discrepancy occurred because 60 percent of the crab catch was sold through market channels that were not listed by government port samples. Additional poundage moves through established crab dealers who are not contacted by the government port samplers. The estimated 1980 crab catch from the lakes was 9.8 million pounds, though the reported catch was approximately 1.5 million pounds.

The economic impacts associated with lake crabbing, according to the Sea Grant survey, amounted to \$3.9 million of direct gross revenue. Indirect and induced impacts triggered by the value of the catch, when added to the direct impact, amounted to a total impact of \$13.4 million. Each commercial crabber generated \$23,700 of income within the economy of the area. The total sales and income resulting from the direct, indirect, and induced effects of the hard crab catch must be recognized in the future as far larger than that reflected by reported landings. A similar, overly conservative and inaccurate measure of the soft crab fishery results from the use of published data series. Soft-shelled crab production in 1980 was estimated to contribute up to \$1.4 million to the area economy.

Hard and soft crab production, value, and economic impact in 1980 should be regarded as indices of a major food producing industry in the metropolitan area, to the extent that 1980 figures are representative.

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Appendix Table 1.

Number of crabbers, boats, and traps associated with the trap harvest of crabs, Louisiana, 1952-80.

	Full-Time	Part-Time	Boats	No. of Baits
1952	49	28	77	NA
3	40	25	65	NA
4	NA	NA	NA	NA
5	NA	NA	NA	NA
6	NA	NA	NA	NA
7	3	10	13	325
8	3	8	11	275
9	3	8	11	275
1960	5	7	12	300
1	5	7	12	300
2	13	12	25	2,010
3	21	12	33	3,010
4	25	9	34	3,250
5	101	21	120	11,500
6	321	76	272	40,200
7	470	89	381	58,800
8	474	103	391	65,600
9	489	105	480	67,900
1970	490	67	542	75,800
1	530	136	601	84,100
2	571	123	646	87,600
3	609	148	730	93,600
4	630	179	790	108,100
5	687	212	880	122,800
6	789	226	997	144,000
7	NA	NA	NA	NA
8	832	NA	NA	NA
9	751	NA	NA	NA
1980	823	NA	NA	NA

Source: Fisheries Statistics of U.S., 1952-76; Louisiana Dept. of Wildlife and Fisheries, 1978-80.

Appendix Table 2.

Number of crabbers, boats, and baits associated with trotline technique of harvesting crabs, Louisiana, 1952-76.

	Full Time	Part-Time	Boats	No. of Baits
1952	555	148	703	315,400
3	562	154	716	313,360
4	506	89	595	263,450
5	495	108	598	271,800
6	429	109	538	252,300
7	409	98	507	239,600
8	451	93	544	278,400
9	443	87	530	271,500
1960	492	95	587	321,800
1	498	132	621	382,700
2	496	147	643	424,700
3	587	122	664	456,800
4	590	104	693	427,000
5	578	122	700	414,600
6	524	125	649	387,000
7	388	120	508	325,500
8	416	146	537	350,600
9	412	159	571	375,500
1970	308	34	342	217,600
1	292	49	325	NA
2	289	44	317	NA
3	151	50	201	NA
4	132	30	162	NA
5	102	30	132	NA
6	75	20	95	NA

Source: Fisheries Statistics of U.S.

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