

STANDING CROPS OF FISHES OF AN ESTUARINE AREA IN SOUTHWEST LOUISIANA

by

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ABSTRACT

Standing crop of estuarine fisheries, as determined by extensive rotenone sampling, ranged from 17.6 to 1,605 kg/ha; overall average was 393.8. The most abundant species in numbers were gulf menhaden, Brevoortia patronus (54.6%); anchovies, Anchoa sp. (10.7%); and striped mullet, Mugil cephalus (6.6%). Of the 8,322 kg of fish collected during the study, red drum, Sciaenops ocellata, represented 32.2%, followed by menhaden (16%) and striped mullet (11.5%). First day rotenone samples were not sufficient for quantitating species abundance. Rotenone collections indicated that trawls were highly selective ($P < .01$).

Fisheries investigations began in coastal Louisiana in the early 1930's. Gunter (1936) reported on the destruction of fish by shrimp trawlers. Later studies documented the association of Louisiana's coastal fishes with its wetlands (Darnell 1958; Norden 1966; Perret et al. 1971; Herke 1971; and Wagner 1973). These studies documented seasonal movements, growth, distribution, abundance, food habits, and effects of various marsh management practices upon fishes. Most data were collected by trawls, seines, and gill nets. Therefore, much of the data is qualitative rather than quantitative because of gear selectivity.

More estimates of species composition, distribution, and standing crop are necessary for the protection and management of coastal fisheries. Unlike in freshwater, few attempts have been made to document actual standing crop of fishes in coastal waters. Kelley (1965) and Carver (1965) studied Delta National Wildlife Refuge near the mouth of the Mississippi River. This has been followed by recent studies of abandoned oilfield canals (Kilgen, Harris, and Kraemer 1973; and Adkin and Bowman 1976).

Objectives of this study were to: (1) obtain standing crop estimates of fishes in several southwest Louisiana estuarine marsh types, (2) compare 1 and 2-day rotenone collection data, and (3) compare trawl and rotenone sampling selectivity in an estuary.

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MATERIALS AND METHODS

This study was conducted on the 34,000 ha Rockefeller Wildlife Refuge, a state-owned area in southwest Louisiana between the Grand Chenier-Pecan Island beach ridge complex and the Gulf of Mexico (Joanen 1969). Twelve sample stations were established in 1971 (Table 1, Fig. 1). Through 1974 each station was sampled annually during July or August. Three were sampled in 1975 to compare trawl and rotenone selectivity.

Each station was surrounded with block off nets of 1.3 cm bar mesh walls and 0.6 cm bar mesh netting over the float lines specially constructed to reach from the station bottom to several centimeters above the water (Lambou 1959). Noxfish (5% rotenone) was applied at each station at a concentration of 2 ppm. Dying fish were captured with 0.5 cm bar mesh dip nets as they surfaced. Collection of fish on the first day continued for approximately 3 hours. The block-off nets were left overnight and fish which surfaced were picked up the second day. Fish were identified to species and grouped into 1.3 cm total length intervals, counted, and weighed. Occasionally it was necessary to sub-sample when a large kill was experienced.

Table 1. Sample station location and description, Rockefeller Wildlife Refuge, Grand Chenier, Louisiana.

Station No.	Location	Size (ha)	Habitat Type	Average Depth (m)	Average Salinity (ppt)
1	West Price Lake	0.2	Lake	0.4	12.9 (6.7-23.3)
2	East Price Lake	0.2	Lake	0.4	11.5 (7.1-18.7)
3	Royalite Canal	0.4	Canal	1.2	17.6 (4.0-28.5)
4	Deep Lake	0.4	Canal	1.3	13.7 (3.3-22.4)
5	Bertrand Canal	0.4	Canal	1.7	10.9 (4.8-20.8)
6	East End Locks	0.4	Canal	1.5	4.2 (1.7- 9.4)
7	North Island Canal	0.2	Canal	1.1	7.7 (0.7-15.0)
8	Grassy Lake	0.4	Lake	0.6	5.7 (1.7-10.7)
9	Superior Canal	0.4	Canal	1.8	6.8 (3.2-14.0)
10	Lake 8 Pump	0.4	Canal	1.7	4.0 (1.2- 6.6)
11	Flat Lake	0.4	Canal	1.2	15.5 (10.3-21.6)
12	Lake 14	0.4	Canal	0.5	8.5 (4.3-12.2)

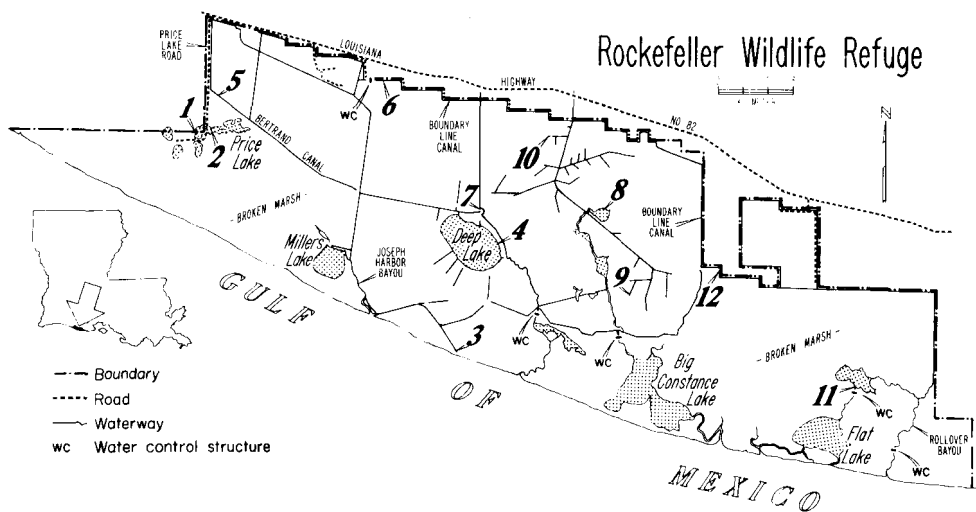


FIGURE 1. Location of sample stations on Rockefeller Wildlife Refuge, Grand Chenier, Louisiana.

In 1975, one continuous 10-minute trawl sample was taken at each of Stations 3, 4, and 7. Immediately after block-off nets were in place, a 4.9 m by 1.9 cm bar mesh flat otter trawl with a 6 mm bar mesh bag was towed with a 25 horsepower outboard inside the net (approximately 3 knots). After trawling, rotenone was applied to the area.

Statistical analysis of the data considered of an analysis of variance which: (1) compared the difference between sample stations and years for total weight of fish collected, (2) compared the number of each species obtained from 1 and 2-day fish collections following application of rotenone, and (3) compared trawl and rotenone collections of species using a model including effects of station and method. A chi-square analysis was used to determine if a difference exists between trawl and rotenone methods in species catch distribution.

RESULTS AND DISCUSSION

The checklist observed included two classes, 16 orders, 38 families, 65 genera, and 77 species (Table 2). Sciaenidae, represented by 10 species, was the dominant family. Centrarchidae, Gobiidae, and Clupeidae followed with 7, 6, and 5 species respectively.

Statistical analysis indicated no difference between years ($P>.05$), but difference between stations approached significance ($P<.10$). Therefore, standing crops are presented by station with all years combined, followed by length-frequency histograms and a discussion of species abundance when all stations and years are combined.

Table 2. Taxonomic checklist of fish collected in standing crop studies, Rockefeller Wildlife Refuge, Grand Chenier, Louisiana.

DASYATIDAE—stingrays
Atlantic stingray— <i>Dasyatis sabina</i> (Lesueur)
LEPISOSTEIDAE—gars
Spotted gar— <i>Lepisosteus oculatus</i> (Winchell)
Alligator gar— <i>L. spatula</i> Lacepede
AMIIDAE—bowfins
Bowfin— <i>Amia calva</i> Linnaeus
ELOPIDAE—tarpons
Ladyfish— <i>Elops saurus</i> Linnaeus
ANGUILLIDAE—freshwater eels
American eel— <i>Anguilla rostrata</i> (Lesueur)
OPHICHTHIDAE—snake eels
Speckled worm eel— <i>Myrophis punctatus</i> Lutken
CLUPEIDAE—herrings
Gulf menhaden— <i>Brevoortia patronus</i> Goode
Atlantic herring— <i>Clupea harengus harengus</i> Linnaeus
Gizzard shad— <i>Dorosoma cepedianum</i> (Lesueur)
Threadfin shad— <i>D. petenense</i> (Gunther)
Scaled sardine— <i>Harengula pensacolatae</i> Goode and Bean
ENGRAULIDAE—anchovies
Anchovy— <i>Anchoa</i> sp.
SYNODONTIDAE—lizardfishes
Inshore lizardfish— <i>Synodus foetens</i> (Linnaeus)
CYPRINIDAE—minnows and carps
Carp— <i>Cyprinus carpio</i> Linnaeus
Golden shiner— <i>Notemigonus crysoleucas</i> (Mitchill)
ICTALURIDAE—freshwater catfishes
Blue catfish— <i>Ictalurus furcatus</i> (Lesueur)
Yellow bullhead— <i>I. natalis</i> (Lesueur)
Channel catfish— <i>I. punctatus</i> (Rafinesque)
ARIIDAE—sea catfishes
Sea catfish— <i>Arius felis</i> (Linnaeus)
Gafftopsail catfish— <i>Bagre marinus</i> (Mitchill)
BATRACHOIDIDAE—toadfishes
Atlantic midshipman— <i>Porichthys porosissimus</i> (Valenciennes)
GOBIESCOCIDAE—clingfishes
Skilletfish— <i>Gobiesox strumosus</i> Cope
BELONIDAE—needlefishes
Atlantic needlefish— <i>Strongylura marina</i> (Walbaum)

Table 2. (Continued) Taxonomic checklist of fish collected in standing crop studies, Rockefeller Wildlife Refuge, Grand Chenier, Louisiana.

CYPRINODONTIDAE—killifishes
Sheephead minnow— <i>Cyprinodon variegatus</i> Lacepede
Killifish— <i>Fundulus</i> sp.
Rainwater killifish— <i>Lucania parva</i> (Baird)
POECILIIDAE—livebearers
Mosquitofish— <i>Gambusia affinis</i> (Baird and Girard)
Sailfin molly— <i>Poecilia latipinna</i> (Lesueur)
ATHERINIDAE—silversides
Tidewater silverside— <i>Menidia beryllina</i> (Cope)
SYNGNATHIDAE—pipefishes and seahorses
Gulf pipefish— <i>Syngnathus scovelli</i> (Evermann and Kendall)
PERCICHTHYIDAE—temperate basses
Yellow bass— <i>Morone mississippiensis</i> Jordan and Eigenmann
CENTRARCHIDAE—sunfishes
Warmouth— <i>Lepomis gulosus</i> (Cuvier)
Bluegill— <i>L. macrochirus</i> Rafinesque
Redear sunfish— <i>L. microlophus</i> (Gunther)
Spotted sunfish— <i>L. punctatus</i> (Valenciennes)
Largemouth bass— <i>Micropterus salmoides</i> (Lacepede)
White crappie— <i>Pomoxis annularis</i> Rafinesque
Black crappie— <i>P. nigromaculatus</i> (Lesueur)
CARANGIDAE—jacks and pompanos
Crevalle jack— <i>Caranx hippos</i> (Linnaeus)
Atlantic bumper— <i>Chloroscombrus chrysurus</i> (Linnaeus)
Leatherjacket— <i>Oligoplites saurus</i> (Bloch and Schneider)
Atlantic moonfish— <i>Vomer setapinnis</i> (Mitchill)
LUTJANIDAE—snappers
Lane snapper— <i>Lutjanus synagris</i> (Linnaeus)
SPARIDAE—porgies
Sheepshead— <i>Archosargus probatocephalus</i> (Walbaum)
Pinfish— <i>Lagodon rhomboides</i> (Linnaeus)
SCIAENIDAE—drums
Freshwater drum— <i>Aplodinotus grunniens</i> Rafinesque
Silver perch— <i>Bairdiella chrysura</i> (Lacepede)
Sand seatrout— <i>Cynoscion arenarius</i> Ginsburg
Spotted seatrout— <i>C. nebulosus</i> (Cuvier)
Banded drum— <i>Larimus fasciatus</i> Holbrook
Spot— <i>Leiostomus xanthurus</i> Lacepede
Southern kingfish— <i>Menticirrhus americanus</i> (Linnaeus)
Atlantic croaker— <i>Micropogon undulatus</i> (Linnaeus)
Black drum— <i>Pogonias cromis</i> (Linnaeus)
Red drum— <i>Sciaenops ocellata</i> (Linnaeus)
EPHIPPIDAE—spadefishes
Atlantic spadefish— <i>Chaetodipterus faber</i> (Broussonet)
MUGILIDAE—mulletts
Striped mullet— <i>Mugil cephalus</i> Linnaeus
White mullet— <i>M. curema</i> Valenciennes
POLYNEMIDAE—threadfins
Atlantic threadfin— <i>Polydactylus octonemus</i> (Girard)

Table 2. (Continued) Taxonomic checklist of fish collected in standing crop studies, Rockefeller Wildlife Refuge, Grand Chenier, Louisiana.

BLENNIIDAE—combt tooth blennies
Freckled blenny— <i>Hypsoblennius ionthas</i> (Jordan and Gilbert)
ELEOTRIDAE—sleepers
Fat sleeper— <i>Dormitator maculatus</i> (Bloch)
Spinycheek sleeper— <i>Eleotris pisonis</i> (Gmelin)
GOBIIDAE—gobies
Lyre goby— <i>Evorthodus lyricus</i> (Girard)
Violet goby— <i>Gobioides broussonneti</i> Lacepede
Sharptail goby— <i>Gobionellus hastatus</i> Girard
Freshwater goby— <i>G. shufeldti</i> (Jordan and Eigenmann)
Naked goby— <i>Gobiosoma bosci</i> (Lacepede)
Clown goby— <i>Microgobius gulosus</i> (Girard)
TRICHIURIDAE—cutlassfishes
Atlantic cutlassfish— <i>Trichiurus lepturus</i> Linnaeus
STROMATEIDAE—butterfishes
Harvestfish— <i>Peprilus aepidodus</i> (Linnaeus)
Gulf butterfish— <i>P. burti</i> Fowler
TRIGLIDAE—searobins
Searobin— <i>Prionotus</i> sp.
BOTHIDAE—lefteye flounders
Southern flounder— <i>Paralichthys lethostigma</i> Jordan and Gilbert
SOLEIDAE—soles
Hogchoker— <i>Trinectes maculatus</i> (Bloch and Schneider)
CYNOGLOSSIDAE—tonguefishes
Blackcheek tonguefish— <i>Symphurus plagiusa</i> (Linnaeus)
TETRAODONTIDAE—puffers
Southern puffer— <i>Sphoeroides nephelus</i> (Goode and Bean)

STANDING CROP

Standing crop estimates averaged by station ranged from 17.7 (Station 1) to 1,605 kg/ha (Station 11, Table 3). The low values were generally for shallow lake areas. Station 1 is cut off from tidal influence and fish recruitment by Price Lake Road and a flapgate-type water control structure that permits water flow in one direction. Station 2 is practically identical to Station 1 except for the structure. Average standing crop for Station 2 was 64.1 kg/ha greater as the results of larger crops of striped mullet¹, gizzard shad, and alligator gar. The deeper, more saline sets of Stations 3, 4, and 11 produced the highest estimates of 669.3, 740.5, and 1,605 kg respectively. In some instances, this was due to the presence of marine species such as red drum, striped mullet, sand seatrout, and menhaden in the canal areas. The largest collection recorded of a single species was of red drum. In 1971, 2,408 kg were collected at Station 4 and in 1974, 2,755 kg were recorded for Station 11. Three hundred eighteen red drum, ranging from 200 g to 6.8 kg, were picked up in 1974 at Station 11. Also, the single highest standing crop estimate of 4,375 kg/ha occurred at Station 11 (1974). Codominant species in this sample were menhaden (568 kg) and flounder (287 kg).

Station 11 is just north of the Flat Lake water control structure which governs drainage of several thousand hectares of marsh into the gulf. These unusually large standing crops are the result of the trapping of schools of seasonally migratory species. Also, some small fishes are attracted to this area because the structures permit a small quantity of water to

Table 3. Average standing crop in kilograms per hectare of fishes collected at Rockefeller Wildlife Refuge, Grand Chenier, Louisiana.

Species	Station Number											
	1	2	3	4	5	6	7	8	9	10	11	12
Red drum	4.3	0.4	158.0	558.2	3.5	1.1	4.6	14.9	0.2	0	725.1	0.1
Gulf menhaden	0.3	6.4	43.9	58.2	81.5	24.8	94.4	0.6	50.5	116.0	233.4	60.1
Striped mullet	5.2	40.5	191.1	25.3	8.4	3.0	11.9	36.7	7.7	20.3	171.0	11.3
Southern flounder	0	0.3	55.6	10.4	3.5	15.6	20.3	5.8	2.6	0.7	115.1	4.5
Threadfin shad	0	0	1.2	0.7	209.0	4.0	0.8	0	4.1	9.4	26.9	0.4
Spotted gar	0	0	11.0	22.2	13.7	8.2	24.3	0	13.9	65.3	1.0	11.0
Gizzard shad	0	8.5	5.4	24.5	12.9	24.3	13.1	20.4	7.2	7.3	6.9	23.7
Atlantic croaker	1.5	0	12.4	8.6	3.6	9.1	5.5	5.8	7.4	2.0	63.6	8.1
Sand seatrout	0	0	70.1	3.8	0.9	2.1	2.0	0	1.6	0.1	22.8	0.9
Blue catfish	0	0	0	0	2.2	34.3	4.7	0	15.3	63.5	0	2.7
Alligator gar	0	9.2	48.6	3.8	0	0	3.9	0	0	16.9	0	27.1
Anchovy	0.2	1.1	12.4	1.8	1.6	10.9	2.9	1.2	19.3	11.4	26.3	4.7
Sheepshead	0	0	1.2	3.8	0.9	0.7	0.8	11.9	3.1	0.1	53.4	0.3
Silver perch	0	0	1.6	0	0	0	0.8	0	0.6	0	78.5	0.3
Sharptail goby	0	0	21.6	2.2	0	0	21.9	0	0	0	0.7	0
Freshwater drum	0	0	0	0.8	0	5.8	3.7	11.4	5.3	11.9	2.3	3.7
Black drum	3.6	0	1.3	8.5	0	0	0	3.4	1.9	0	26.2	0
Spot	0.1	2.0	6.9	0.1	0	1.3	0.7	11.5	4.1	0.4	18.5	0
Channel catfish	0	0	0	0	0.7	7.4	2.0	2.9	9.3	7.5	0	0.2
Miscellaneous*	2.5	13.4	27.0	7.6	5.3	14.1	9.7	14.9	19.9	40.0	32.7	8.4
TOTAL	17.7	81.8	669.3	740.5	438.7	186.7	228.0	141.4	174.0	372.8	1,604.9	167.5

*Those species comprising less than 0.5% by weight of the total.

flow through during tidal fluctuation. Some fish are attracted to this flow. Predatory fish are subsequently attracted to this large assemblage of forage.

Average annual standing crops for all stations were 339.4, 295.7, 524.2, 479.4, and 328.2 kg/ha for 1971-1975 respectively. The grand mean was 393.4 kg/ha. Of course, since many species are seasonally migratory these figures represent the relative abundance and standing crop for one specific time and not for the entire year.

When data for the 12 stations and 5 years were combined, the number of individual fish recorded totaled 1,028,892. Gulf menhaden constituted 54.6% of the total catch, anchovy 10.7%, striped mullet 6.6%, and threadfin shad 6.3% (Fig. 2). The remaining species, which each made up less than 5% of the total, were as follows: Atlantic croaker 4.3%, gizzard

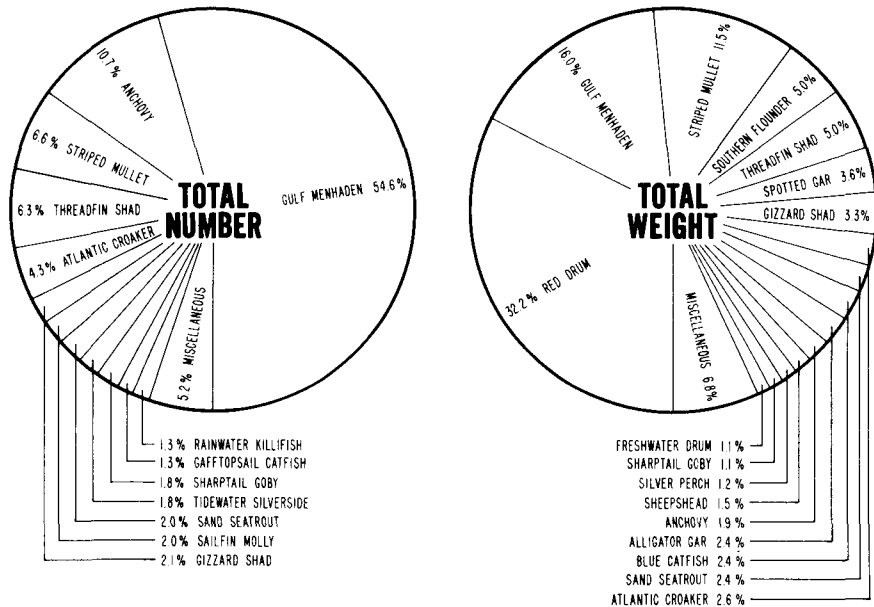


FIGURE 2. Species composition of all fishes collected in standing crop studies by percent total numbers and percent total weight.

shad 2.1%, sailfin molly and sand seatrout 2.0% each, tidewater silverside and sharptail goby 1.8% each, and gafftopsail catfish and rainwater killifish 1.3% each. Species constituting less than 1% of the total were grouped into the miscellaneous category.

The species composition by weight was also analyzed (Fig. 2). Although, red drum made up 32.2% of the total weight of fish, this species was included in miscellaneous category according to numerical abundance. Only 1,247 individuals or 0.1% of the total catch was made up of red drum. Relative weight (16%) of gulf menhaden was approximately half that of the red drum. Striped mullet followed with 11.5% and southern flounder and threadfin shad each made up 5%. The remainder of the major species were: spotted gar 3.6%, gizzard shad 3.3%, Atlantic croaker 2.6%, sand seatrout 2.4%, blue catfish 2.4%, alligator gar 2.4%, anchovy 1.9%, sheepshead 1.5%, silver perch 1.2%, sharptail goby 1.1%, and freshwater drum 1.1%. A length-frequency histogram for 33 of the more important species (Fig. 3) graphically illustrates the size ranges of the species.

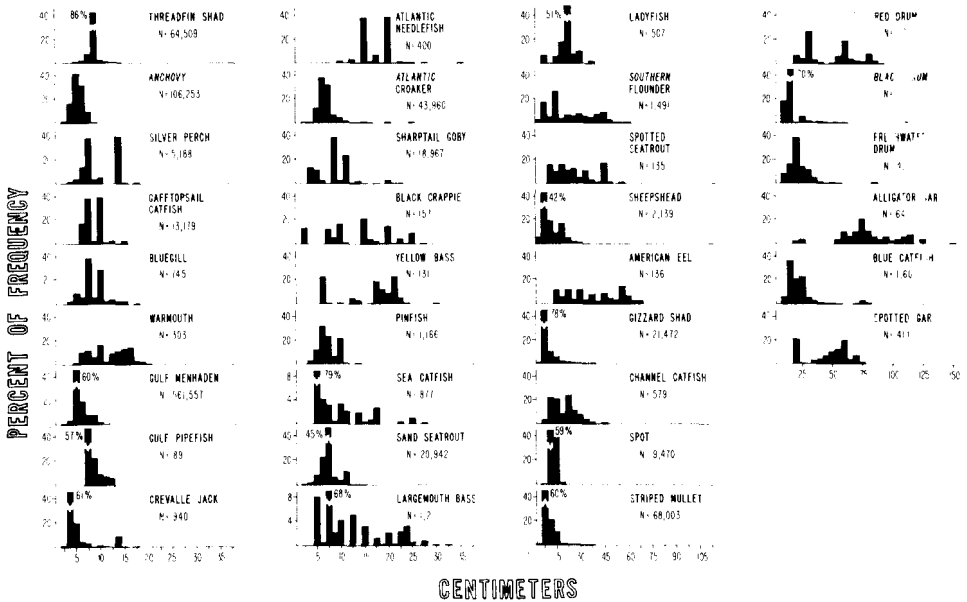


FIGURE 3. Length-frequency of major fishes collected in standing crop studies, Rockefeller Wildlife Refuge, Grand Chenier, Louisiana.

Standing crop estimates derived from this study agree in general with those reported for southeast Louisiana. However, as just discussed, variation was considerably greater in the present study. Some of this variation may be due to the necessity for Kelley (1965) to make mostly 1-day sets because of destruction of nets by crabs. Though his standing stock estimates were often considerable, he may have reported less than 50% of the actual standing crop for some areas. His standing crop estimates ranged from 1.5 to 289.8 kg/ha. Averages for his three pond areas ranged from 52.6 to 129.9 kg/ha, most of which were constituted of sciaenid fishes. Kilgen et al. (1973) concluded that standing crops in pipeline canals were apparently higher than in surrounding marshes and ranged from 132.2 to 395.4 kg/ha. Gulf menhaden, sheepshead, and red drum were dominant. Adkins and Bowman (1976), who used rotenone to complement seine and trawl samples in dredged canals, reported that rotenone samples included four species not taken by nets. Their standing crop estimates ranged from 383.3 to 662.1 kg/ha, with striped mullet constituting the largest percent of total poundage in both areas. Mullet, gizzard shad, and sheepshead

composed 69.6% of total weight and 19% of total individuals collected at one of their sites. In another sample, striped mullet alone made up 39.6% of the total weight. Combined with red drum and flounder, these species made up 57.9% of the total standing crop.

Comparison of Collections on First and Second Days

Analysis of variance of the number of fish of 53 species recovered on each day indicates that 23 species were statistically different between days ($P < .05$, Table 4). Of these, 11 were highly significant ($P < .01$). Collections on the first day recovered only 5% of the total picked up (Table 4). Two species were not represented at all on the first day; one collected on the first day was not found later. Fish collected for standing crop estimates should be retrieved at least over a 2-day period under conditions such as those experienced in this study (Lambou 1962, Parker 1970).

Table 4. Number of fish collected on Day 1 and Day 2, Standing Crop Study, Rockefeller Wildlife Refuge, Grand Chenier, Louisiana, 1971-75*

Species	Day 1 Total	Day 2 Total	Statistical Test**	Species	Day 1 Total	Day 2 Total	Statistical Test**
Spotted gar	89	303	$P < .10$	Spotted sunfish	5	218	$P > .05$
Alligator gar	5	33	$P < .10$	Largemouth bass	22	1,178	$P > .05$
Bowfin	2	7	$P > .05$	Black crappie	20	137	$P < .01$
Ladyfish	188	288	$P < .05$	Creveleae jack	97	832	$P > .05$
American eel	6	128	$P > .05$	Atlantic bumper	2	36	$P < .01$
Speckled worm eel	28	4,577	$P < .05$	Leatherjacket	36	145	$P > .05$
Gulf menhaden	17,540	531,141	$P < .01$	Atlantic needlefish	17	383	$P > .05$
Gizzard shad	1,593	17,321	$P > .05$	Pinfish	34	882	$P < .05$
Threadfin shad	2,757	60,520	$P > .05$	Freshwater drum	124	360	$P < .05$
Anchovy	14,118	92,403	$P < .01$	Silver perch	246	4,938	$P < .05$
Blue catfish	1,001	563	$P > .05$	Sand seatrout	1,099	19,477	$P < .05$
Yellow bullhead	3	0	No test	Spotted seatrout	37	70	$P > .05$
Channel catfish	235	322	$P < .05$	Spot	132	9,138	$P > .05$
Sea catfish	86	115	$P > .05$	Atlantic croaker	2,426	39,956	$P < .01$
Gafftopsail catfish	90	12,842	$P < .10$	Black drum	23	769	$P > .05$
Atlantic midshipman	4	26	$P < .05$	Red drum	217	652	$P > .05$
Skilletfish	11	3,457	$P > .05$	Atlantic spadefish	14	2,310	$P > .05$
Sheepshead minnow	24	1,065	$P < .05$	Sheepshead	188	1,741	$P < .10$
Killifish	159	2,033	$P < .01$	Striped mullet	790	62,875	$P < .01$
Rainwater killifish	68	13,318	$P > .05$	Atlantic threadfin	1	1,922	$P > .05$
Mosquitofish	54	120	$P > .05$	Freckled blenny	0	62	No test
Sailfin molly	330	20,194	$P < .01$	Sharptail goby	32	4,601	$P > .05$
Tidewater silverside	790	17,681	$P < .05$	Naked goby	315	4,132	$P > .05$
Gulf pipefish	19	68	$P < .01$	Clown goby	9	366	$P > .05$
Yellow bass	48	80	$P > .05$	Atlantic cutlassfish	4	2	$P < .01$
Wormmouth	100	203	$P > .05$	Harvestfish	5	5	$P > .05$
Bluegill	19	725	$P < .05$	Southern flounder	438	735	$P < .05$
Redear sunfish	1	3	$P < .01$	Southern puffer	0	8	No test

* Data does not include nine sets for which date of capture was omitted on field data sheets.

** Probability denoting difference between days, $P > .05$ = non significant at the 0.05 level of probability, $P < .05$ = significant at the 0.05 level of probability and $P < .01$ = highly significant at the 0.01 level, $P < .10$ = approaching significance at the 0.10 level.

Several difficulties are encountered when nets are left overnight in estuarine waters. Animals, such as otters, coons, alligators, gulls, and grackles, were observed feeding upon surfacing fish. Also, crabs are destructive to the nylon nets. Initially, the insecticide ethyl parathion was applied around the perimeter of the nets; however, the killing effect on crabs was short lived and others moved in. Better results were obtained by treating nets with black asphaltum paint. Predation by larger fish inside the sample area was also observed since they were more resistant to the rotenone and meanwhile fed on weakened forage.

Trawl and Rotenone Data Comparison

In 1975, Stations 3, 4, and 7 were sampled with rotenone and by trawling to determine gear selectivity on distribution and relative abundance. Trawl samples showed selectivity (Table 5). This gear completely missed 15 species or 34% of the species collected from the area. In addition, species such as menhaden, threadfin shad, striped mullet, and sharptail goby were poorly represented in the trawl catches. Considering all specimens collected with each gear (Figure 4), conclusions drawn from trawl data only would be misleading. Trawl catches indicated Atlantic croaker and anchovy were codominant species totaling 51.2% of all individuals in the sets. However, rotenone data indicated menhaden and sharptail gobies were codominant representing 57.7% of the total species, whereas anchovy and Atlantic croaker made up only 11.9%, collectively.

Table 5. Number of individuals captured by method from three 0.4 hectare block off sets, Rockefeller Wildlife Refuge, Grand Chenier, Louisiana*

<i>Species</i>	<i>Rotenone</i>	<i>Trawl**</i>	<i>Species</i>	<i>Rotenone</i>	<i>Trawl**</i>
Spotted gar	9	1	Pinfish	325	14
Alligator gar	18	5	Atlantic moonfish	0	1
Ladyfish	6	1	Freshwater drum	7	1
American eel	1	0	Silver perch	4	0
Speckled worm eel	486	0	Sand seatrout	641	88
Gulf menhaden	13,341	310	Spot	166	18
Gizzard shad	5,329	292	Atlantic croaker	2,531	567
Threadfin shad	1,090	49	Black drum	0	1
Scaled sardine	478	12	Red drum	50	2
Anchovy	3,273	495	Atlantic spadefish	18	5
Blue catfish	17	3	Striped mullet	4,340	103
Channel catfish	8	0	White mullet	14	0
Sea catfish	697	27	Fat sleeper	1	0
Gafftopsail catfish	259	41	Lyre goby	53	0
Skilletfish	78	1	Sharptail goby	14,992	3
Killifish	108	0	Freshwater goby	20	0
Rainwater killifish	20	0	Naked goby	103	6
Sailfin molly	22	0	Gulf butterfish	0	1
Tidewater silverside	39	0	Southern flounder	53	12
Gulf pipefish	2	0	Hogchoker	3	0
Largemouth bass	1	0	Blackcheek tonguefish	8	3
Crevalle jack	2	10			
Sheepshead	238	1			

* Chi-square (X^2) = 3,775.60 c 43 d.f., $P < .01$.

** A grand total for each species collected in one 10-minute tow at each station.

An analysis of variance, using a model including the effects of station and method suggested that the sea catfish was the only species indicating station effect ($P < .01$). Method of capture was significantly different ($P < .05$) for the number of alligator gar, tidewater silversides, sharptail goby, and flounder caught. Spotted gar, pipefish, freshwater drum, and red drum collections were greatly influenced by method of collection. A highly significant chi-square ($P < .01$) test of the species catch distribution indicated that a difference existed between the two methods.

The empirical data, with the support of statistical evaluations clearly illustrate the selectivity of the trawl under these conditions. These findings agree with Lambou (1962) who reported that rotenone poisoning yielded the most complete estimate of fish populations and considered other gear selective, and Kilgen and Kilgen (unpublished as cited by Adkins and Bowman 1976) who used a similar trawl in dredged canals. The latter found that only one-third of the species in one area were collected by the trawl and many sizes of several species not represented. On the other hand, Adkins and Bowman (1976) reported the trawl to be efficient and only four fish (American eel, southern kingfish, warmouth, and bowfin) were taken by rotenone and not by trawl.

SUMMARY

Results obtained over five years in coastal southwest Louisiana indicated that:

1. Average standing crops ranged from 17.6 to 1,605 kg/ha. The results suggest that caution be used in extrapolation from marsh values for fisheries since many hectares of wetland are not necessarily optimum habitat. Because many species are seasonally abundant, relative abundance for the entire year is not determined.

¹ Common names are used in the text and any reference to scientific names should be made with Table 2.

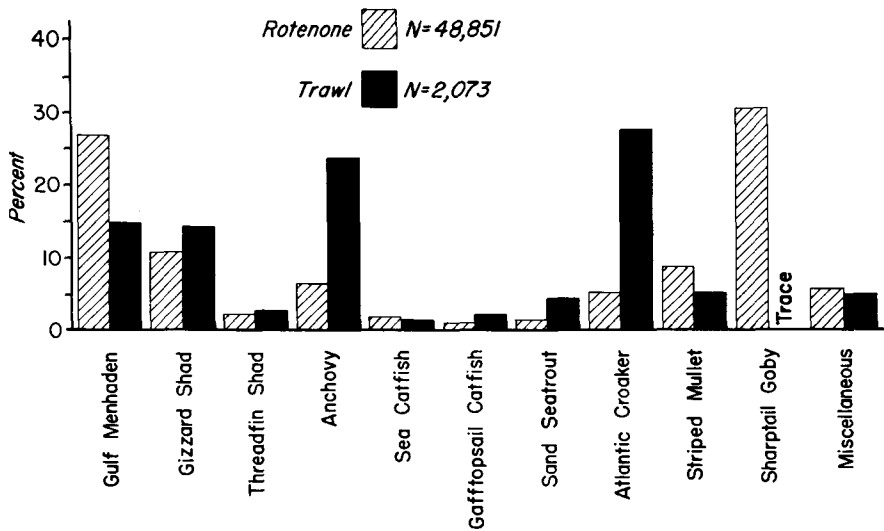


FIGURE 4. Relative abundance of fishes expressed as percent of total number taken by each capture method, from three 0.4 hectare block off sets. Figure includes only those species comprising at least 1% of the catch by that method.

2. Of the 1,028,892 individuals collected, 54.6% were gulf menhaden, 10.7% anchovies, and 6.6% striped mullet.
3. Red drum made up 32.2% of the 8,322 kg of fish collected. Menhaden made up 16% and striped mullet 11.5% of the total weight.
4. Only 5% of the total number of fish were obtained on the first day.
5. The trawling methods used were a poor means of describing relative abundance and distribution of fish. It is suggested that rotenone and trawling be used as complements in estuarine inventories.

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