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SOUTHERN CALIFORNIA COMMERCIAL PASSENGER FISHING VESSEL SAMPLING STUDY QUARTERLY REPORT NO. 14

October 1 - December 31, 1978

bу

Stephen J. Crooke

MARINE RESOURCES

Administrative Report No. 79-17

December 1979

SOUTHERN CALIFORNIA COMMERCIAL PASSENGER FISHING VESSEL SAMPLING STUDY

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ABSTRACT

Between October 1 and December 31, 1978, Departmental personnel sampled catches during 132 trips aboard commercial passenger fishing vessels (partyboats) operating in southern California. A total of 25,571 fishes belonging to 87 species were identified and measured. In addition, six long-range trips originating in San Diego and fishing in Mexican waters were sampled. A total of 1,225 fishes comprising 20 species was identified and measured at dockside from these vessels.

The 10 most commonly taken species during the quarter accounted for 76.3% of the southern California catch. The most frequently sampled species were bocaccio, Sebastes paucispinis (24.7%); Pacific mackerel, Scomber japonicus (15.8%); chilipepper, Sebastes goodei (8.7%); kelp bass, Paralabrax clathratus (7.4%); Pacific bonito, Sarda chiliensis (5.7%); olive rockfish, Sebastes serranoides (4.1%); blue rockfish, S. mystinus (4.0%); squarespot rockfish, S. hopkinsi (2.1%); greenspotted rockfish, S. chlorostictus (2.1%); and vermilion rockfish, S. miniatus (1.9%). Samples gathered from long-range trips showed the top five species accounted for 90.4% of the fishes sampled. The most frequently sampled species were yellowtail, Seriola lalandi (28.8%); yellowfin tuna, Thunnus albacares (20.7%); wahoo, Acanthocybium solanderi (16.2%); snowy grouper, Epinephelus niveatus (12.4%); and dolphinfish, Coryphaena hippurus (12.3%).

December marked the final month in which partyboats were sampled off southern California.

Marine Resources Administrative Report No. 79-17, December 1979. This study is being performed as part of Dingell-Johnson Project California F-35-P, "Southern California Marine Sportfish Research" supported by Federal aid to Fish Restoration Funds. Field work was conducted in cooperation with the Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, under a contract entitled Collection and Compilation of Southern California Partyboat Fishery Statistics, Project 868.

Marine Resources Branch, California State Fisheries Laboratory, 350 Golden Shore, Long Beach, California 90802.

SOUTHERN CALIFORNIA COMMERCIAL PASSENGER FISHING VESSEL SAMPLING STUDY

QUARTERLY REPORT NO. 14

INTRODUCTION

Between October 1 and December 31, 1978, Departmental personnel sampled catches during 132 trips aboard commercial passenger fishing vessels (partyboats) operating in southern California. A total of 25,571 fishes belonging to 87 species were identified and measured. 3/ In addition, six long-range trips originating in San Diego and fishing in Mexican waters were sampled. A total of 1,225 fishes comprising 20 species was identified and measured at dockside from these vessels.

The 10 most commonly taken species during the quarter accounted for 76.3% of the southern California catch (Table 1). The most frequently sampled species were bocaccio, Sebastes paucispinis (24.7%); Pacific mackerel, Scomber japonicus (15.8%); chilipepper, Sebastes goodei (8.7%); kelp bass, Paralabrax clathratus (7.4%); Pacific bonito, Sarda chiliensis (5.7%); olive rockfish, Sebastes serranoides (4.1%); blue rockfish, S. mystinus (4.0%); squarespot rockfish, S. hopkinsi (2.1%); greenspotted rockfish, S. chlorostictus (2.1%); and vermilion rockfish, S. miniatus (1.9%). Samples gathered from long-range trips showed the top five species accounted for 90.4% of the fishes sampled (Table 2). The most frequently sampled species were yellowtail, Seriola lalandi (28.8%); yellowfin tuna, Thunnus albacares (20.7%); wahoo, Acanthocybium solanderi (16.2%); snowy grouper, Epinephelus niveatus (12.4%); and dolphinfish, Coryphaena hippurus (12.3%).

For definition of length measurements see Maxwell and Schultze, Administrative Report 76-3.

OPERATIONS

December marked the final month which partyboats were sampled in southern California. Manpower limitations brought about by Governor Brown's June hiring freeze prevented us from hiring new personnel when previous appointments expired. Permanent personnel were used to "salvage" the last quarter since no temporary help was available after October 1, 1978. Long-range sampling was not affected since it could be easily handled by permanent personnel.

ROCKFISHES

During the quarter 14,834 rockfish representing 38 species were identified and measured (Table 3). The group accounted for 58.0% of the fish sampled. Last quarter rockfishes (Sebastes spp.) accounted for 26.0% of the take while during the same quarter in 1977 they accounted for 55.8%. The 2.2% difference between years reflects the consistent contribution rockfishes make to the fishery during the fall months. Rockfishes increased in importance by 114.6% when compared with the previous quarter. This can be attributed to the seasonal switch from "surface" to "rockcod" fishing. The top 10 species accounted for 88.7% of the rockfish catch, down 0.9% from the previous quarter (89.6%) and up 3.7% from the same quarter in 1977 (85.0%).

Bocaccio was the most abundant rockfish accounting for 42.5% of the fish measured. This is a dramatic increase over the same quarter in 1977 when they represented only 18.0%. Likewise, it is also a significant increase over last quarter when they accounted for 25.2% of the rockfish caught. Bocaccio (Figures 1-3) taken this quarter averaged 37.4 cm in length while those taken during the fall of 1977 averaged 46.2 cm. The decrease in average size is attributable to the strong 1976 year class

represented by a mode at 25-35 cm. Fish taken the previous quarter were 1.9 cm shorter (x length = 35.6 cm) than those measured this term.

Chilipepper landed this quarter averaged 36.6 cm in length (Figures 4-6) while those taken a year ago averaged 37.3 cm. Fish taken the previous quarter were smaller, averaging 33.6 cm in length. The average length for olive rockfish (Figures 7-9) was 29.1 cm, a decline of 1.4 cm from the previous quarter when they averaged 30.5 cm. Olive rockfish taken during the same quarter in 1977 were 0.7 cm shorter, averaging 28.4 cm in length. Data on blue rockfish (Figures 10-12) shows they were 3.1 cm longer (\bar{x} length = 27.9 cm) than those taken during the same quarter last year (\bar{x} length = 24.8 cm). However, there was a 0.4 cm decline in average size from the previous quarter when they averaged 28.3 cm in length. Squarespot rockfish taken this quarter averaged 22.6 cm in length (Figures 13-15) while greenspotted rockfish averaged 30.5 cm in length (Figures 16-18). No data are available from previous quarters for either species. Vermilion rockfish landed this quarter averaged 41.3 cm in length (Figures 19-21). No data are available on this species from previous quarters.

SURFACE GAMEFISHES

Three surface gamefishes were among the top 10 fishes measured this quarter. They accounted for 28.8 of the total catch while during the same quarter in 1977 they accounted for 26.0%. Increased catches of bonito (up 249%) are responsible for the 2.8% gain although it might have been larger if kelp bass catches had not dropped 33.0%.

Pacific mackerel landings continued to reflect the dominance of the 1976 year class (Figures 22-24) which is represented by a mode at 30-31 cm. The 1974 year class, which has dominated the fishery in the past, is now

noticeable as only a slight mode at 40-41 cm during October. There was a 3.2 cm decline in the average size of kelp bass (Figures 25-27) when comparing those taken this quarter (\bar{x} length = 27.5 cm) with the previous one (\bar{x} length = 30.7 cm). Likewise, there was a 5.5 cm decline in average length when looking at the same quarter last year (\bar{x} length = 33.0 cm). The decline in average length could possibly be attributed to increased catches of "shorts" or the number of legal fish available may have actually declined. Pacific bonito catches were dominated by the 1978 year class as evidenced by a mode at 42-45 cm (Figures 28-30). This is a continuation of a trend established during August. Barracuda, Sphyraena argentea, catches (Figures 31-33) were dominated by the 1976 year class (59-61 cm mode) during October and the 1975 year class (65-67 cm mode) during

November. The average size of fish (\bar{x} length = 62.9 cm) declined 2.8 cm from the previous quarter (\bar{x} length = 65.7 cm) and 2.2 cm from the same quarter last year (\bar{x} length = 65.1 cm).

BAJA CALIFORNIA FISHERY

Yellowtail showed a marked decline in size (\bar{x} length = 76.2 cm) from the previous quarter when they averaged 81.7 cm in length (Figures 34-35). There was also a 0.7 cm decline from the same quarter in 1977 when the fish averaged 77.5 cm. The 1976 and 1974 year classes appear to be well represented as evidenced by modes at 60-61 cm and 75-77 cm. Unfortunately, the 1975 year class is absent as evidenced by the lack of a mode at 65-67 cm. Yellowfin tuna (Figures 36-38) sampled this quarter (\bar{x} length = 85.4 cm) averaged 20.3 cm longer than those taken the same quarter last year (\bar{x} length = 65.1 cm). They were 0.2 cm smaller than those taken last quarter (\bar{x} length = 85.6 cm). However, the highest average monthly mean length ever recorded (\bar{x} length = 104.2 cm) in the program was noted in December - the

results of excellent fishing on large individuals at the Revilla Gigedo Islands. Data on wahoo (Figures 39-41) shows the fish averaged 138.3 cm in length, 7.9 cm longer than for the same quarter last year (\bar{x} length = 130.4). Fish taken the previous quarter (\bar{x} length = 137.5 cm) were 0.8 cm shorter than those landed this quarter. Snowy grouper measured this period averaged 71.6 cm in length (Figures 42-44). No data are available from previous quarters for this species. Dolphinfish (Figures 45-47) taken this quarter averaged 85.9 cm, up 12.2 cm from the same period last year (\bar{x} length = 73.7 cm). No data are available from the previous quarter for comparison.

EFFORT AND CATCH-PER-UNIT-EFFORT

There was a steady decline in the number of anglers by month during the quarter (Table 4); a fact which was to be expected as winter approached. During December, the average number of passengers reached an all time low (Table 5) when the vessels sampled averaged only 19 anglers. Poor weather during this period was probably responsible for the low turnout. Angler success was high (3.29 fish/hr) during December so it is apparent that poor fishing was not the fault.

Catch-per-unit-effort increased substantially during the quarter with December representing an all time high. From October to December there was an 80% increase in the catch rate. Improved "rock" fishing was responsible for the increase although continued elevated catches of Pacific mackerel helped to keep the CPUE high.

REFERENCES

Crooke, Stephen J. 1978. Southern California partyboat sampling study, quarterly report no. 10. Calif. Dept. Fish and Game, Mar. Res.

Admin. Rept., 78-11:1-65.

. 1979. Southern California commercial passenger fishing vessel sampling study, quarterly report no. 13. Calif. Dept. Fish and Game, Mar. Res. Admin. Rept., 79-15:1-57.

TABLE 1. Number of Fishes Measured from Southern California Commercial Passenger Fishing Vessels, October Through December 1978.

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Pacific Scomber japonicus 4,034 Dogfish, spiny 239 Sea bass, glant 239 Sea bass, glant Scorpaenichthys marmoratus 14 Lizardfish, California telp Sebastes atrovirens 48 Albacore 5. auriculatus 38 Tuna, yellowfin redbanded 5. baboocki 2 Mackerel, jack silvergrey 5. brevispinis 2 Croaker, yellowfin	Sandinops sagax caeruleus . 2		Sphyraena argent ea	245
Scorpaena guttata 239 Sea bass, glant Scorpaenichthys marmoratus 14 Lizardfish, California kelp Sebastes atrovirens 48 Albacore brown S. auriculatus 38 Tuna, yellowfin redbanded S. baboocki 2 Mackerel, jack silvergrey S. brevispinis 2 Croaker, yellowfin	Scomber japonicus 4,034	Dogfish, apiny	Squalus acanthias	20
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redbanded S. babcocki 2 Mackerel, jack silvergrey S. brevispinis 2 Croaker, yellowfin	S. auriculatus	Tuna, yellowfin	I. albacares	152
silvergrey S. brevispinis 2 Croaker, yellowfin	S. babcocki	Mackerel, jack	Trachurus symmetricus	336
	grey S. brevispinis 2	er,	Umbrina roncador	17
Rockfish, gopher S. cannatus 118 TOTAL	S. camatus 118	TOTAL		25,571

TABLE 2. Number of Fishes Measured from Long-Range Commercial Passenger Fishing Vessels, October Through December 1978.

Common name	Scientific name	Number measured
•••		100
Wahoo	Acanthocybium solanderi	199
Sea bass, white	Atractoscion nobilis	4
Jack, socorro	Carangoides jordani	1
Jack, black	Caranx lugubris	6
Hawkfish	Cirrhite rivulates	3
Dolphinfish, common	Coryphaena hippurus	151
Runner, rainbow	Elagatis bipinnulata	5
Cabrilla, spotted	Epinephelus analogus	13
Grouper, snowy	E. niveatus	152
Cabrilla, flag	E. labriformis	4
Tuna, skipjack	Euthynnus pelamis	15
Dorade	Gnathanodon speciosus	1
Snapper	Lutjanus peru	6
Grouper, gulf	Mycteroperca jordani	1
Sierra	Scomberomorus sierra	.3
Amberjack, Pacific	Seriola colburni	10
Yellowtail	S. lalandi	353
Sea bass, giant	Stereolepis gigas	44
Marlin, striped	Tetrapturus audax	1
Tuna, yellowfin	Thunnus albacares	253
	TOTAL	1,225

TABLE 3. Species Composition of the Rockfish (Sebastes spp.) Catch from Partyboat Samples, October through December 1978.

Common name	Scientific name	Frequency of occurrence (%)
Bocaccio	Sebastes paucispinis	42.5
Chilipepper	S. goodei	14.9
Olive	S. serranoides	7.0
Blue	S. mystinus	7.0
Squarespot	S. hopkinsi	3.6
Greenspotted	S. chlorostictus	3.6
Vermilion	S. miniatus	3.2
Copper	S. caurinus	2.6
Speckled	S. ovalis	2.3
Starry	S. constellatus	2.0
Flag	S. rubrivinctus	1.6
Rosy	S. rosaceus	1.3
Honeycomb	S. umbrosus	1.0
Greenstriped	S. elongatus	1.0
Gopher	S. carnatus	0.8
Calico	S. dallii	0.7
Greenblotched	S. rosenblatti	0.7
Bank	S. rufus	0.7
Cowcod	S. levis	0.6
Widow	S. entomelas	0.4
Treefish	S. serriceps	0.4
Kelp	S. atrovirens	0.3
Pink	S. eos	0.3
Canary	S. pinniger	0.3
Brown	S. auriculatus	0.3
Grass	S. rastrelliger	0.2
Yellowtail	S. flavidus	0.2
Swordspine	S. ensifer	0.1
Mexican	S. macdonaldi	0.1
Bronzespotted	S. gilli	0.1
Halfbanded	S. semicinctus	0.1
Black & Yellow	S. chrysomelas	<0.1
Rosethorn	S. helvomaculatus	<0.1
Redbanded	S. babcocki	<0.1
Silvergrey	S. brevispinis	<0.1
Shortbelly	S. jordani	<0.1
Yelloweye	S. ruberrimus	<0.1

Effort and Catch Per-Unit-Effort Values Determined from Commercial Passenger Fishing Vessel Samples for Each Port Complex and Month, January through December 1978. TABLE 4.

	Port												
	complex.	x Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No. trips/month		ı											
	-1	œ	10	17	4	4	14	21	54	16	œ	^	4
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	4	9	10	9	6	6	6	13	7	9	10	7	9
	'n	6	6	œ	10	6	15	7	12	œ	12	12	13
	9	11	10	12	11	6	12	11	13	6	9	6	10
TOTAL		41	50	50	39	41	68	89	67	50	77	97	42
Avg. no. anglers/trip													
	ч	22.87	•	•		32.75	26.79	•			•	•	
	7	16.60		•		32.17	28.80	•		•	•	•	
	က	23.00		•		25.00	34.25	•		•	•		
	4	24.83	28.90	•	33.44	44.67	37.11	35.08	40.71	38.00	25.40	24.86	
	5	.25.78		•		29.22	22.60	•		•	•	•	
	9	24.45	22.30	20.33	27.82	33.33	28.25	27.18		24.78	25.83	23.89	23.00
Average		23.00	25.00	•	25.00	33.00	29.00	32.00	36.00	30.00	23.00	20.00	
No. fish caught/angler							_						
hour fished	H	1.74	•	1.69	1.68	3.28	1.74	0.94	0.79	0.92		•	3.05
	,	2.74	•	0.79	5:64	1.48	1.44	1.99	2.79	2.98		•	2.52
	က	1.26	•	0.83	1.31	1.78	1.95	1.61	1.54	1.42		•	1.70
	4	2.56	•	2.23	1.70	1.18	1.64	1.62	1.87	2.37	1.18	2,55	4.94
	2	2.90	•	1.66	1.25	1.88	2.10	1.49	1.51	1.75		٠.	2.86
	9	1.78	2.00	2.66	2.55	2.33	1.15	1.42	1.49	1.39		•	3.66
Average		2.20	٠.	1.76	1.85	1.79	1.63	1.41	1.38	1.61	1.82	2.72	3.29

TABLE 5. Effort and Catch per-Unit-Effort Values Determined from Commercial Passenger Fishing Vessel Samples for Each Port Complex and Month, January 1976 Through December 1977.

1976

•	•	Port complex	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No. trips/month		-				*****								
• •		1 .	7	8	8	10	10	11	0	4	12	8	14	11
		2	7	5	7	7	10	9	5	7	5	2	4	6
		3	3	2	2	2	3	4	3	2	2	4	6	4
•		4	7	. 5	6	9	10	8	13	9	. 8	9	7	8
•		.5	11	16	12	11	9	8	12	13	6	7	14	12
		6	10		12	9	9	. 8	10	16	10	13	15	15
	TOTAL		45	47	47	48	51	48	43	51	43	43	60	56
Avg. no. anglers	/trip			10.00	20 (2	20 50	/0.10	,,			20			
	•	. 1	29.71	19.25	28.63	20.50	48.10	44.55		46.00	28.66	23.88	15.64	18.30
		2	26.57	23.00	20.57	21.57	30.20	36.89	51.20	45.71	29.60	21.50	18.50	19.70
		3	22.33	22.00	11.50	23.00	21.67	45.50	44.33	36.50	38.50	19.50	33.17	23.30
•		4	30.57 22.00	29.00 23.44	26.17 29.58	25.33 29.00	26.20 31.56	39.38	43.23	49.11 39.92	30.75 25.83	27.20 23.70	25.28 24.21	27.50
		3	16.40	25.64	23.83	22.89	26.22	35.38 27.13	43.30	38.44	24.00	21.46	18.00	21.90 19.60
	Average		24.91	23.32	23.38	24.06	31.96	37.90	43.26	42.22	28.14	23.30	21.30	21.50
No. fish caught/	•		24.71	23.32	23.30	24.00	.31.90	37.30	43.20	72.22	20.14	23.30	21.50	21.50
	fished	1	1.20	1.36	1.20	0.95	1.28	2.07		0.40	0.70	1.14	2.45	2.21
	LIBREA	2	1.47	1.16	1.16	0.73	0.92	1.13	0.92	0.44	0.39	1.21	2.09	1.66
		3	1.25	0.50	2.16	1.47	0.67	0.70	0.43	0.55	0.55	0.89	1.61	1.00
	•.	Ă	1.87	1.77	1.48	1.67	0.80	0.94	0.76	0.80	1.18	2.07	2.19	2.19
• •		5	3.28	2.77	2.51	1.97	1.47	0.74	0.69	1.05	1.09	1.00	1.66	2.54
	•	6	3.55	1.80	1.92	1.41	2.33	1.03	0.58	0.87	1.43	1.96	3.19	2.92
	Average		2.15	1.69	1.74	1.42	1.23	1.13	0.70	0.77	0.96	1.62	2.24	2.28
	•					•								
•		•						1977			•			
		Port complex	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No. trips/month														
	•.	1	1	3	7	10	8	10	12	9	8	9	8	5
•	•	2	6	2	2 .	2	3	5	9	11	12	7	7	6
		3	4	3	2	2	. 3	5	5	5	4	5	4	3

	•						13//						
•	Port												
	complex	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No. trips/month .													
	1	1	3	. 7	10	8	10	12	9	8	9	8	5
•	2	6	2	2 .	2	3	5.	9	11	12	7	7	6
•	3	4	3	2	2	. 3	5	5	5	4	5	4	3
	. 4	7	4	· 4	7	12	10	11	13	11	12	13	10
•	5	10	5	8	7	8	6	9	12	16	13	16	9
	6	14	11	7	10	7	10	10	11	16	14	13	12
TOTAL		42	28	30	38	41	46	56	61	67	60	61	45
Avg. no. anglers/trip						•							
	1 ·	17.00	56.00	24.00	30.30	18.62	27.70	42.58	50.00	36.87	17.44	23.00	17.60
	2	18.33	32.50	23.00	24.00	19.67	30.40	40.78	40.55	22.00	27.29	21.57	28.67
-	3	25.75	27.67	22.00	15.00	27.33	35.20	36.20	32.80	23.50	21.60	32.50	20.00
	4	28.57	32.50	24.00	33.00	31.17	42.80	41.27	29.54	28.27	23.58	35.08	27.90
	5	21.60	36.00	22.87	33.29	17.50	20.50	28.00	24.50	22.75	21.08	18.94	18.00
	6	19.00	30.45	26.14	25.50	23.14	12.30	31.20	41.82	22.75	14.40	18.62	13.50
Average	:	21.00	34.00	22.00	28.00	23.00	32.00	37.00	36.00	26.00	20.00	24.00	22.00
No. fish caught/angler													
hour fished	1	1.85	1.35		0.98	1.29	0.98	1.10	0.98	1.30	1.61	2.41	2.82
•	2	1.11	0.48	1.77	0.22	0.96	2.18	0.87	1.02	1.13	0.89	1.48	1.45
	3	1.03	0.66	1.86	0.60	1.00	1.20		1.29	1.06	2.07	1.98	1.33
·	. 4	2.95	2.30	1.19	1.55	1.70	1.60	1.11	1.50	1.58	2.22	1.48	2.77
•	• 5	2.40	0.88	2.30	1.07	0.47	1.00	0.96	1.74	1.70	2.24	1.82	1.78
,	6	4.04	1.54	1.11	1.64	1.05	0.59	1.29	1.40	2.36	2.50	2.34	2.05
Average		2.61	1.29	1.44	1.21	1.21	1.25	1.04	1.30	1.63	1.98	1.83	2.13

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· FIGURE 1. Length frequencies of bocaccio for October 1978.

THE Y AXES = FREQUENCY (NUMBER OF FISH)
. MULTIPLICATION FACTOR = 7

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FIGURE 2. Length frequencies of bocaccio for November 1978.

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FIGURE 4. Length frequencies of chilipepper for October 1978.

FIGURE 5. Length frequencies of chilipepper for November 1978.

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Length frequencies of chilipepper for December 1978. Total No. Quarter 2,216 Mean Length Quarter 36.614 cm FIGURE 6.

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FIGURE 7. Length frequencies of olive rockfish for October 1978.

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FIGURE 8. Length frequencies of olive rockfish for November 1978.

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Mean Length Quarter 29.082 cm -- FIGURE 9. Length frequencies of olive rockfish for December 1978. Total No. Quarter 1,036 Mean Length Quarter 29.082

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FIGURE 10. Length frequencies of blue rockfish for October 1978.

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FIGURE 11. Length frequencies of blue rockfish for November 1978.

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FIGURE 13. Length frequencies of squarespot rockfish for October 1978.

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FIGURE 14. Length frequencies of squarespot rockfish for November 1978.

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Length frequencies of squarespot rockfish for December 1978. Total No. Quarter 535 Mean Length Quarter 22.563 cm Mean Length Quarter 22.563 cm FIGURE 15.

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FIGURE 16. Length frequencies of greenspotted rockfish for October 1978.

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FIGURE 17. Length frequencies of greenspotted rockfish for November 1978.

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Length frequencies of greenspotted rockfish for December 1978. Total No. Quarter 533 Mean Length Quarter 30.475 cm FIGURE 18.

FIGURE 19. Length frequencies of vermilion rockfish for October 1978,

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FIGURE 20. Length frequencies of vermilion rockfish for November 1978.

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FIGURE 21. Length frequencies of vermillion rockfish for December 1978. Total No. Quarter 476 Mean Length Quarter 41.318

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FIGURE 22. Length frequencies of Pacific mackerel for October 1978.

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FIGURE 23. Length frequencies of Pacific mackerel for November 1978.

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FIGURE 24. Length frequencies of Pacific mackerel for December 1978. Total No. Quarter 4,034 Mean Length Quarter 31.499 cm

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FIGURE 25. Length frequencies of kelp bass for October 1978.

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FIGURE 26. Length frequencies of kelp bass for November 1978.

Mean Length Quarter 27.511 cm FIGURE 27. Length frequencies of kelp bass for December 1978. Total No. Quarter 1884

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FIGURE 28. Length frequencies of Pacific bonito for October 1978.

FIGURE 29. Length frequencies of Pacific bonito for November 1978.

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Length frequencies of Pacific bonito for December 1978. Total No. Quarter 1,451 Mean Length Quarter 42.067 cm FIGURE 30.

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FIGURE 31. Length frequencies of California barracuda for October 1978.

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FIGURE 32. Length frequencies of California barracuda for November 1978.

Length frequencies of California barracuda for December 1978. Total No. Quarter 245 Mean Length Quarter 62.865 cm FIGURE 33.

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FIGURE 34. Length frequencies of yellowtail for October 1978.

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Length frequencies of yellowtail for November 1978. Total No. Quarter 353 Mean Length Quarter 76.178 cm FIGURE 35.

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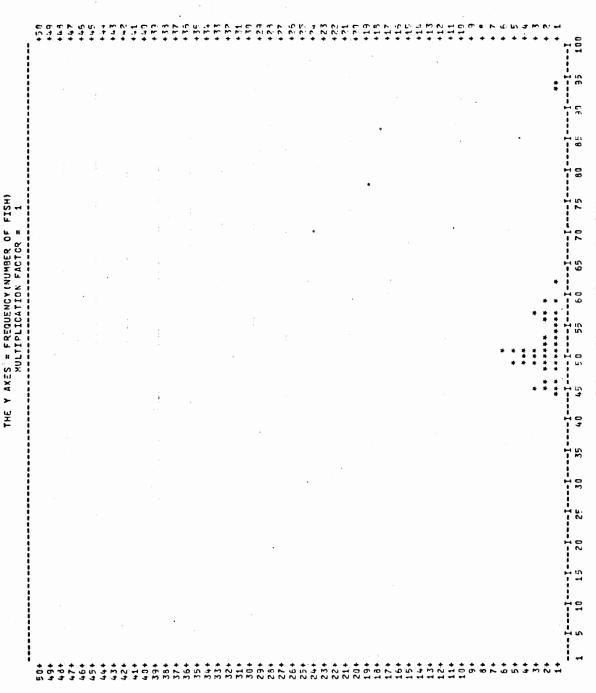
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DUFING CCTOBER 1978.

TOTAL NO. = 90 HEAN = 77.57.
THE Y AXES = FREQUENCY (NUMMER OF FISH)
MULTIPLICATION FACTOR = 1
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FIGURE 36. Length frequencies of yellowfin tuna for October 1978.

STANDARD DEVIATION = 22.878



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STANDARD DEVIATION = 12.600
                               THE X-AXIS = LENGTH (CENTIMETERS)

LENGTH HISTOGRAM FOR YELLOWFIN TUNA (THUNNUS ALBAGARES)

CUFINS NOVEMBER 1978.

TOTAL NO. = 40 MEAN = 61, 715
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THE Y AXES = FREQUENCY (NUMBER OF FISH)
MULTIPLICATION FACTOR = 1

FIGURE 37. Length frequencies of yellowfin tuna for November 1978.

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105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 130 195 THE X-AXIS = LENGTH (CENTIMETERS)
CUFING GECEMBER 1978,
TOTAL NO. = 122 HEAN = 104.197 STAINTON [---- [---- [---- [---- [---- [----- [----* ** **** ****

THE Y AXES = FREQUENCY(NUMBER OF FISH)
MULTIPLICATION FACTOR = 1

Length frequencies of yellowfin tuna for December 1978. Total No. Quarter 253 Mean Length Quarter 85.409 cm FIGURE 38.

STANDARD DEVIATION = 26.108

STANDARD DEVIATION = 9.951 THE X-AXIS = LENGTH (CENTIMETERS)
LUFING OCTOBER 1978.
TOTAL NO. = 117 MEAN = 142.963

FIGURE 39. Length frequencies of wahoo for October 1978.

STANDARD DEVIATION = 14.341 THE X-AXIS = LENGTH (CENTIMETERS)

CUFINS NOVEMBER 1978.

TOTAL NO. = 7 MEAN = 152.574

THE Y AXES = FREQUENCY (NUMBER OF FISH)
MULTIPLICATION FACTOR = 1

FIGURE 40. Length frequencies of wahoo for November 1978.

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Length frequencies of wahoo for December 1978. Total No. Quarter 199 Mean Length Quarter 138.319 cm FIGURE 41.

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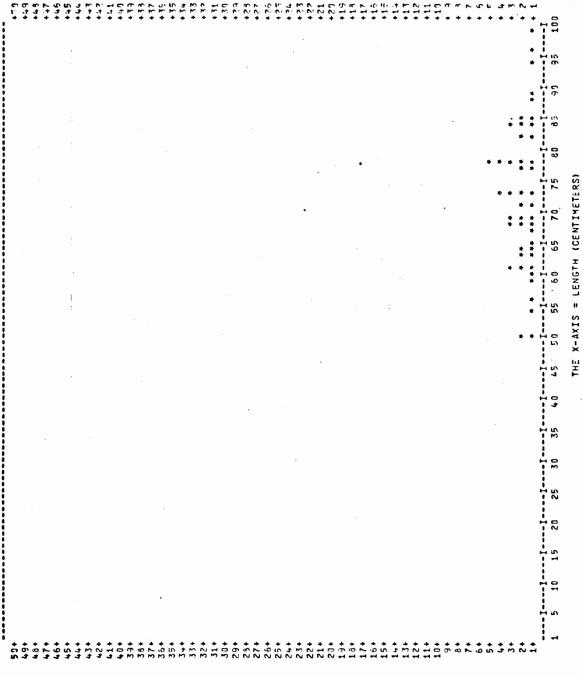
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STANDARD DEVIATION = 12.074
                         THE X-AXIS = LENGTH (CENTIMETERS)

CUFING OCTOBER 1978.

TOTAL NO. = 81 MEAN = 74 72.7
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THE Y AXES = FREQUENCY (NUMBER OF FISH)
MULTIPLICATION FACTOR = 1

FIGURE 42. Length frequencies of snowy grouper for October 1978.



THE Y AXES = FREGUENCY(NUMBER OF FISH)
MULTIPLICATION FACTOR = 1

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STANDARD DEVIATION = 12,879
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LEFGTH HISTOGRAM FOR SNOWY GROUDER (FPINEPHELUS NIVEATUS)
CUFING HOVEMBER 1978,
TOTAL NO. = 48 MEAN = 77 BEN
THE Y AXES = FREQUENCY(NUMBER OF FISH)
MULTIPLICATION FACTOR = 1
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FIGURE 43. Length frequencies of snowy grouper for November 1978.

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FIGURE 44. Length frequencies of snowy grouper for December 1978. Total No. Quarter 152 Mean Length Quarter 71.585 cm

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LUFING OCTOBER 1978.
TOTAL NO. = 61 MEAN = 81 MEAN
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MULTIPLICATION FACTOR = 1
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FIGURE 45. Length frequencies of dolphinfish for October 1978.

STANDARD DEVIATION = 13.288

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FIGURE 46. Length frequencies of dolphinfish for November 1978.

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THE Y AXES = FREQUENCY(NUMBER OF FISH)
MULTIPLICATION FACTOR = 1

Length frequencies of dolphinfish for December 1978. Total No. Quarter 151 Mean Length Quarter 85.907 cm FIGURE 47.