Using Charterboat Catch Records for Fisheries Management

HAROLD A. BRUSHER, MARK L. WILLIAMS, LEE TRENT, and BARBARA J. PALKO

Introduction

The Magnuson Fishery Conservation and Management Act of 1976 (Public Law 94-265) established a mandate and mechanism for managing commercial and recreational fishery resources of the United States. Since procedures for developing Fishery Management Plans and the Plans' roles as regulatory guidelines for U.S. fisheries are important parts of the Act, fishery management is becoming more common throughout the nation. Although managers have developed strategies for establishing optimum yields, the landings data being accumulated by State and Federal agencies are in most instances not adequate for determining catch quotas or catch levels within necessary time frames.

Commercial and recreational catch records of fishes in the United States are collected in various ways and reported by several organiztions, including the National Marine Fisheries Service (NMFS), state agencies, the U.S. Department of Agriculture, and foreign countries fishing in the Fisheries Conservation Zone. The data are reported by month, region, gear type, and species, e.g., "Fisheries of the United States, 1982" (NMFS, 1983). These data are necessary for managing our fisheries but are not produced such that catch quotas or levels can be monitored in a timely manner.

Fisheries with large recreational components pose special problems for managers, because real-time estimates of either total catch or total effort and catch per unit of effort (CPUE) must be made to determine closure points. Although many efforts have been made to generate such statistics (NMFS, 1980; McEachron and Matlock, 1983), most researchers agree that estimating totals for recreational fisheries is very costly and difficult and cannot be accomplished within acceptable time frames. Clearly, another approach is needed to manage mixed or recreational fisheries.

In efforts to learn more about obtaining recreational fishery data on a real-time basis, personnel at the NMFS Southeast Fisheries Center's Panama City Laboratory conducted a pilot survey in 1982. This report describes the survey, highlights its results, and illustrates the uses to which long-term CPUE surveys can be put.

Methods

Our pilot survey was designed to determine the efficiency and feasibility of contracting with selected charterboat captains to provide catch and effort data. Charterboat captains were chosen because: 1) They are an easily identified, efficient component of recreational fisheries; 2) their livelihood depends on a high frequency of fishing trips and angling success; and 3) accurately documenting recreational fishing activity is in the captains' best interests. In February 1982, nine captains were selected from five ports along the south Atlantic and Gulf of Mexico coasts (Fig. 1). These ports were selected to represent the variety of recreational hook-and-line catch and effort within the survey area.

The survey began on 28 March and ended on 30 November in all areas except Key West, Fla., where the survey was continued through 31 December. The collected data contained dates, fishing zones, fishing methods, fishing hours, and numbers of each species that were caught. Fishing zones were recorded as 1) estuarine or bay waters, 2) oceanic waters less than 10 fathoms, or 3) oceanic waters greater than 10 fathoms (Fig. 1). If more than one zone was fished, captains recorded all pertinent numbers. When logs were returned to the Panama City Laboratory, fishing zones were coded as follows: Fishing zone 1—estuarine or bay areas; fishing zone 2—oceanic waters less than 10 fathoms; fishing zone 3—oceanic waters greater than 10

ABSTRACT—A pilot survey to study the feasibility of using catch records from charterboats for obtaining daily catch and effort data was initiated on 28 March 1982. Nine charterboat captains produced records for 39,410 marine fishes caught in 4,392.0 trolling hours and in 919.5 hours using other fishing techniques. Captains were contracted to supply daily records of fishing zones, fishing method, and all species in their respective catches. Response rate (i.e., weekly submission of logs) was 90.4 percent for all boat fishing weeks between 28 March and 31 December 1982. The potential use of this type of recreational data is discussed.

The authors are with the Panama City Laboratory, Southeast Fisheries Center, National Marine Fisheries Service, NOAA, 3500 Delwood Beach Road, Panama City, FL 32407-7499.

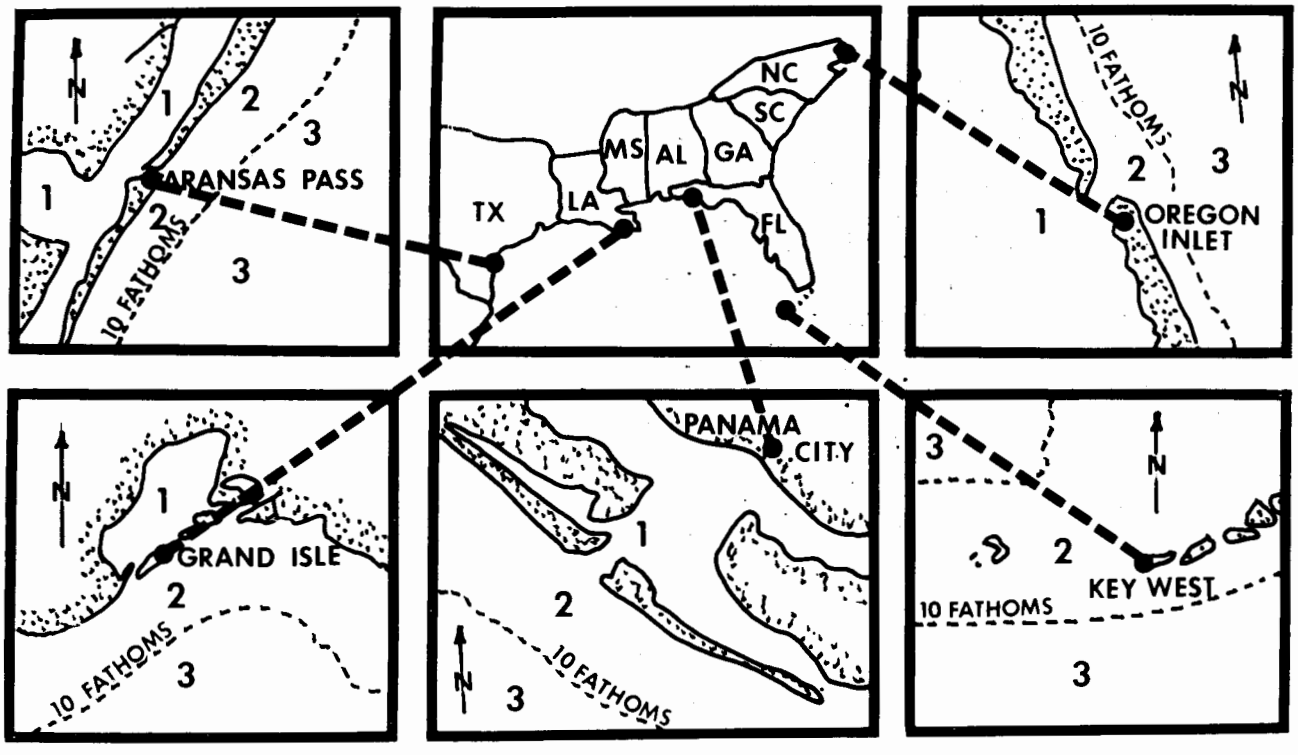


Figure 1.—1982 charterboat sampling ports showing 1) estuarine zone, 2) oceanic zone less than 10 fathoms, and 3) oceanic zone greater than 10 fathoms.

Table 1.—Total fishing hours by area, fishing zone, and method of fishing during the 1982 charterboat survey off the southeastern United States.

	Fishing zones					
	1	2	3	4	6	
Region	Estuarine	Oceanic (< 10 fm)	Oceanic (> 10 fm)	Est. & oceanic (< 10 fm)	Oceanic (all depths)	Total
	Hours trolling and bottom fishing ( )					
North Carolina	4.0	64.5	1,280.0		19.5	1,368.0
South Carolina		95.0 (23.5)	1,039.5 (34.0)		239.5	1,374.0 (57.5)
Northwest Florida	59.5	289.5	60.5	141.5	25.5	576.5
Louisiana	2.0	7.5	282.0 (775.5)		11.0 (10.0)	302.5 (785.5)
South Texas	6.0 (68.5)	550.0 (8.0)	129.5		85.5	771.0 (76.5)
Total	71.5 (68.5)	1,006.5 (31.5)	2,791.5 (809.5)	141.5	381.0 (10.0)	4,392.0 (919.5)

fathoms; fishing zone 4—combination of fishing in zones 1 and 2; fishing zone 5—combination of fishing in zones 1 and 3; fishing zone 6—combination of fishing in zones 2 and 3; fishing zone 7—combination of fishing in zones 1, 2, and 3. Fishing methods were categorized as "trolling," during which lines were fished at any depth while the vessel was moving under its own power, or "bottomfishing," which included all other effort. No running times were included in the "fishing hours." Catches of all species were reported.

Since each log form contained data from a fishing week (Sunday through Saturday), captains usually mailed the postage-paid self-addressed log forms early in the next week. Within 10 days after the fishing week in question, reponse rate was about 70 percent; within 20 days above 80 percent; and by 30 days over 90 percent.

Results

In 1982, we obtained 90.4 percent of the catch and effort records for which we originally contracted. Eight of the nine captains that contracted with us kept records throughout the survey; one captain resigned from the survey after 6 months. Survey respondents reported fishing activity on 1,043 of the 2,324 potential boat-fishing days and logged 5,311.5 boat-fishing hours (Table 1).

Table 2.—Number of each species or species group caught by trolling in relation to area and fishing zone[1] during the 1982 charterboat survey of the southeastern United States.

		North Carolina				South Florida			Northwest Florida				Louisiana				South Texas				Total
Common name	Scientific name	1	2	3	C	2	3	C	1	2	3	C	1	2	3	C	1	2	3	C	Catch
Dolphin	*Coryphaena hippurus*			5,238		35	2,229	69		156	21	31			2,779			32	65	11	10,666
Bluefish	*Pomatomus saltatrix*	250	1,045	944	71				235	1		78		1	51	1		3			2,680
King mackerel	*Scomberomorus cavalla*			475		34	89	24		244	128	41			32			641	217	130	2,055
Spanish mackerel	*Scomberomorus maculatus*					1		1	239	275	1	455	9	15	327	13		393	2	8	1,739
Little tunny	*Euthynnus alletteratus*			262		31	86	13	98	431	6	113		2	162	32		20	1		1,257
Blue runner	*Caranx crysos*					1	2	2	6	406	2	629		1	139	5					1,193
Yellowfin tuna	*Thunnus albacares*			1,078			1								12						1,091
Great barracuda	*Sphyraena barracuda*					185	213	416				1			10						825
Atlantic bonito	*Sarda sarda*			26		1	81	12		42	1	74									237
Red drum	*Sciaenops ocellatus*								17				9	43	134	13			1		217
Crevalle jack	*Caranx hippos*						4	7				4		1	65	11		85	1		178
Yellowtail snapper	*Ocyurus chrysurus*					38	26	110													172
Wahoo	*Acanthocybium solanderi*			52		2	43	2							57						156
Cero	*Scomberomorus regalis*					30	63	59													152
Skipjack tuna	*Euthynnus pelamis*			114			1														115
Greater amberjack	*Seriola dumerili*						10	1		35	9	10			20			4			89
Blackfin tuna	*Thunnus atlanticus*			46		3	16	1				1			14	1					82
Cobia	*Rachycentron canadum*									2	1	4			8			37	1	19	72
White marlin	*Tetrapturus albidus*			70			1								1						72
Ladyfish	*Elops saurus*									37		24									61
Black grouper	*Mycteroperca bonaci*					6	7	29		8											50
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*																	23	13	10	46
Sailfish	*Istiophorus platypterus*			3		1	28	6										1			39
Blacktip shark	*Carcharhinus limbatus*						1								3			20	8	3	35
Red snapper	*Lutjanus campechanus*																	6	22	3	31
Unident. sharks	*Squaliformes*			1			6								10			8			25
Bluefin tuna	*Thunnus thynnus*			20																	20
Gray triggerfish	*Balistes capriscus*			1					1	8	3	5						1			19
Albacore	*Thunnus alalunga*		5	4	9																18
Hutton snapper	*Lutjanus analis*					4	3	10													17
Blue marlin	*Makaira nigricans*			10			4														14
Spinner shark	*Carcharhinus brevipinna*														7					1	8
Tripletail	*Lobotes surinamensis*						4								3			1			8
Almaco jack	*Seriola rivoliana*														7						7
Silky shark	*Carcharhinus falciformis*						6														6
Red grouper	*Epinephelus morio*							5													5
Bar jack	*Caranx ruber*					1		3													4
Gag	*Mycteroperca microlepis*					2		1													3
Horse-eye jack	*Caranx latus*							3													3
Seatrout	*Cynoscion* sp.																3				3
Lesser amberjack	*Seriola fasciata*																	2			2
Gray snapper	*Lutjanus griseus*						1			1											2
Hammerhead shark	*Sphyrna* sp.			2																	2
Mako	*Isrus* sp.		1	1																	2
Rainbow runner	*Elagatis bipinnulata*					1		1													2
Dusky shark	*Carcharhinus obscurus*					1		1													2
Unident. triggerfish	Balistidae														2						2
Houndfish	*Tylosurus crocodilus*														1						1
Scamp	*Mycteroperca phenax*									1											1
Spadefish	*Chaetodipterus faber*																	1			1
Tarpon	*Megalops atlanticus*						1														1
Total		250	1,051	8,347	80	375	2,926	776	596	1,647	172	1,470	18	63	3,844	76	3	1,278	331	185	23,488

[1] 1 = Estuarine, 2 = Oceanic (< 10 fm), 3 = Oceanic (> 10 fm), and C = Combination of 1, 2, and/or 3.

Of the reported effort, 82.7 percent was spent trolling and 17.3 percent was spent bottomfishing (Table 1). Captains from all regions trolled, but only six of the nine survey captains reported bottomfishing (neither North Carolina (NC) nor the northwest Florida (NWF) captains reported bottomfishing). Evaluation of effort by fishing zone showed that 67.8 percent of the total effort was expended in zone three, 19.5 percent in zone two, 7.4 percent in zone six (combined oceanic waters), and the remainder in zones one and four (combined estuarine and oceanic waters less than 10 fathoms). Most of the regional effort was: NC—93.6 percent trolling in zone three; South Florida (SF)—72.6 percent trolling in zone three; NWF—50.2 percent trolling in zone two; Louisiana (LA)—71.3 percent bottomfishing in zone three; and Texas (TX)—64.9 percent trolling in zone two. Results from all fishing zones were combined throughout the rest of this report.

Fishes of at least 71 species (39,410 individuals) were caught (Tables 2 and 3). Numbers of species were about the same between trolling and bottomfishing. At least 27 species were caught by both methods with about 20 others specific to each method.

Catches per boat hour (CPH) for trolling effort (Table 4) showed dolphin, little tunny, and king mackerel among the top 10 in all regions. Atlantic bonito, bluefish, Spanish mackerel, and wahoo CPH were in the top 10 in three or four regions. Dolphin, the most abundant species in three of the five regions, showed CPH from 0.14 (TX) to 9.19 (LA); king mackerel, actively sought in most regions, supported CPH from 0.11 (SF and LA) to 1.28 (TX).

Bottomfishing was reported from only three regions (Table 5). Highest CPH's in SF were found for snappers, groupers, and amberjack. In LA, dolphin, Atlantic croaker, red snapper, and sand seatrout were dominant. Annual bottomfishing CPH was higher than trolling (CPH in LA for bluefish (0.37 vs. 0.18), blue runner (0.65 vs. 0.48), and king mackerel (0.52 vs. 0.11). In TX, the catch consisted mostly of red snapper.

Monthly CPH's for each species in each region were computed; the results for each region's five most abundant species caught by trolling are presented in Table 6. Highest CPH's of king mackerel occurred from June through August off TX, from August through October off NWF, in October off NC, and in December off SF. Off LA, the only region where king mackerel was not among the top five, CPH's for this species were low (0.00-0.19) from April through October, but jumped to 0.88 in November. Peak dolphin

Table 3.—Number of each species or species group caught by methods other than trolling in relation to area and fishing zone during the 1982 charterboat survey of the southeastern United States.

		Region and zone[1]						
		South Florida		Louisiana		South Texas		
Common name	Scientific name	2	3	3	C	1	2	Total catch
Atlantic croaker	*Micropogonias undulatus*			4,868				4,868
Red snapper	*Lutjanus campechanus*			2,900			106	3,006
Sand seatrout	*Cynoscion arenarius*			2,056				2,056
Dolphin	*Coryphaena hippurus*			1,991				1,991
Unident. seatrout	*Cynoscion* sp.			628		16		644
Blue runner	*Caranx crysos*			495	18			513
Gray triggerfish	*Balistes capriscus*			493				493
King mackerel	*Scomberomorus cavalla*			410				410
Greater amberjack	*Seriola dumerili*	5	101	157	30			293
Bluefish	*Pomatomus saltatrix*			287				287
Blacktip shark	*Carcharhinus limbatus*			162				162
Yellowtail snapper	*Ocyurus chrysurus*	152						152
Red drum	*Sciaenops ocellatus*			69		62		131
Cobia	*Rachycentron canadum*	1		130				131
Little tunny	*Euthynnus alletteratus*			96	6			102
Gafftopsail catfish	*Bagre marinus*			97				97
Pinfish	*Lagodon rhomboides*			92				92
Crevalle jack	*Caranx hippos*			58	1			59
Lane snapper	*Lutjanus synagris*	33		24				57
Almaco jack	*Seriola rivoliana*			36				36
Blackfin tuna	*Thunnus atlanticus*			33	3			36
Gray snapper	*Lutjanus griseus*	15		18				33
Spinner shark	*Carcharhinus brevipinna*			31				31
Red grouper	*Epinephelus morio*	23		7				30
Scamp	*Mycteroperca phenax*			30				30
Spotted seatrout	*Cynoscion nebulosus*					23		23
Gag	*Mycteroperca microlepis*			20				20
Atlantic bonito	*Sarda sarda*		1	15				16
Spanish mackerel	*Scomberomorus maculatus*			14				14
Rainbow runner	*Elagatis bipinnulata*			13				13
Spadefish	*Chaetodipterus faber*			13				13
Great barracuda	*Sphyraena barracuda*	5		5				10
Rock sea bass	*Centropristis philadelphica*			9				9
Unident. sharks	*Squaliformes* sp.			8				8
Yellowfin grouper	*Mycteroperca venenosa*			6				6
Sheepshead	*Archosargus probatocephalus*					6		6
Porgies	Sparidae			6				6
Conger eels	Congridae			5				5
Cusk-eels	Ophidiidae			5				5
Black drum	*Pogonias cromis*			4				4
Lookdown	*Selene vomer*			4				4
Ladyfish	*Elops saurus*			1		3		4
Toadfish	*Opsanus* sp.			4				4
Vermilion snapper	*Rhomboplites aurorubens*			2				2
Warsaw grouper	*Epinephelus nigritus*		1				1	2
Banded rudderfish	*Seriola zonata*			1				1
Flounder	*Paralichthys* sp.			1				1
Hammerhead shark	*Sphyrna* sp.			1				1
Jewfish	*Epinephelus itajara*	1						1
Kingfish	*Menticirrhus* sp.			1				1
Morays	Muraenidae			1				1
Searobins	Triglidae			1				1
Soapfish	*Rypticus* sp.			1				1
Total		235	103	15,309	58	110	107	15,922

[1]1 = Estuarine, 2 = Oceanic (< 10 fm), 3 = Oceanic (> 10 fm), and C = Combination of 1, 2, and/or 3.

CPH (Table 6, Fig. 2) occurred in June off LA (the highest monthly CPH for any species caught by either fishing method), in July off SF and NWF, and in August off NC and TX.

Monthly CPH's for bottomfishing are shown in Table 7. Off SF, yellowtail snapper, the most abundant species, was most abundant during July. Off LA, Atlantic croaker was most abundant from August through October. Off TX, red snapper CPH was highest in August.

Interpretation of Results

Although the survey's data were too limited to support extensive analysis, two results need comment. First, the effort distribution by fishing zone and method is not necessarily representative of the overall charterboat fishery in any region. In the 1982 survey, with each region being represented by only one or two boats, captains' specialties strongly influenced reported effort. For instance, Table 1 shows that trolling was the only fishing method used in NWF. Only one captain from NWF was in the survey and he specialized in trolling for king and Spanish mackerel. Since those species are found primarily in estuarine and near-shore Gulf waters off NWF, his fishing activities usually occur there, too. However, not all NWF charterboat captains are so specialized. Caution must be exercised in generalizing the 1982 survey effort results.

Secondly, the influence of effort classification must not be overlooked, since our definition of fishing method caused some apparently unusual results. In LA, bottomfishing CPH's were higher for several pelagic species than were corresponding trolling CPH's. Most coastal pelagics caught off LA were taken by "fly-lining," in which a live bait was fished on an unweighted line while the boat was tied to an offshore structure. Since such boats were not moving under power, we categorized "fly-lining" as "bottomfishing." Although a more accurate term for our bottomfishing category would be "non-trolling activities," we retained the term that was used on the survey log form. The reader should be aware of this in assessing the 1982 survey results.

Table 4.—The ten most abundant species caught by trolling in each area during the 1982 charterboat survey of the southeastern United States.

Region and species	Number	CPH	Percent w/i region
North Carolina			
Dolphin	5,238	3.83	53.84
Bluefish	2,310	1.69	23.75
Yellowfin tuna	1,078	0.79	11.08
King mackerel	475	0.35	4.88
Little tunny	262	0.19	2.69
White marlin	70	0.05	0.72
Wahoo	52	0.04	0.53
Blackfin tuna	46	0.03	0.47
Atlantic bonito	26	0.02	0.27
Albacore	18	0.01	0.19
	9,575		98.43
South Florida			
Dolphin	2,333	1.70	57.22
Great barracuda	814	0.59	19.97
Yellowtail snapper	172	0.13	4.22
Cero	152	0.11	3.73
King mackerel	147	0.11	3.61
Little tunny	130	0.10	3.19
Atlantic bonito	94	0.07	2.31
Wahoo	47	0.03	1.15
Black grouper	42	0.03	1.03
Sailfish	35	0.03	0.86
	3,966		97.28
Northwest Florida			
Blue runner	1,043	1.81	26.85
Spanish mackerel	970	1.68	24.97
Little tunny	648	1.12	16.68
King mackerel	413	0.72	10.63
Bluefish	314	0.55	8.08
Dolphin	208	0.36	5.35
Atlantic bonito	117	0.20	3.01
Ladyfish	61	0.11	1.57
Greater amberjack	54	0.09	1.39
Red drum	17	0.03	0.44
	3,845		98.97
Louisiana			
Dolphin	2,779	9.19	69.46
Spanish mackerel	364	1.20	9.10
Red drum	199	0.66	4.97
Little tunny	196	0.65	4.90
Blue runner	145	0.48	3.62
Crevalle jack	77	0.25	1.92
Wahoo	57	0.19	1.43
Bluefish	53	0.18	1.32
King mackerel	32	0.11	0.80
Cobia	8	0.03	0.20
	3,910		97.73
South Texas			
King mackerel	988	1.28	54.98
Spanish mackerel	403	0.52	22.43
Dolphin	108	0.14	6.01
Crevalle jack	86	0.11	4.79
Cobia	57	0.07	3.17
Atlantic sharpnose shark	46	0.06	2.56
Red snapper	31	0.04	1.73
Blacktip shark	31	0.04	1.73
Little tunny	21	0.03	1.17
Unident. sharks	8	0.01	0.45
	1,779		99.00

Table 5.—The ten most abundant species caught by methods other than trolling in each region[1] during the 1982 charterboat survey of the southeastern United States.

Region and species	Number	CPH	Percent w/i region
South Florida			
Yellowtail snapper	152	2.64	44.97
Greater amberjack	106	1.84	31.36
Lane snapper	33	0.57	9.76
Red grouper	23	0.40	6.80
Gray snapper	15	0.26	4.44
Great barracuda	5	0.09	1.48
Cobia	1	0.02	0.30
Atlantic bonito	1	0.02	0.30
Warsaw grouper	1	0.02	0.30
Jewfish	1	0.02	0.30
	338		100.00
Louisiana			
Atlantic croaker	4,868	6.20	34.02
Red snapper	2,900	3.69	20.26
Sand seatrout	2,056	2.62	14.36
Dolphin	1,991	2.54	13.91
Seatrout	628	0.80	4.39
Blue runner	513	0.65	3.59
Gray triggerfish	493	0.63	3.45
King mackerel	410	0.52	2.87
Bluefish	287	0.37	2.01
Blacktip shark	162	0.21	1.13
	14,308		99.99
South Texas			
Red snapper	106	1.39	49.76
Red drum	62	0.81	29.10
Spotted seatrout	23	0.30	10.79
Unident. seatrout	16	0.21	7.51
Sheepshead	6	0.08	2.81
Ladyfish	3	0.04	1.38
Warsaw grouper	1	0.01	0.46
	217		100.00

[1]No fishing hours for methods other than trolling were logged in North Carolina or in northwest Florida.

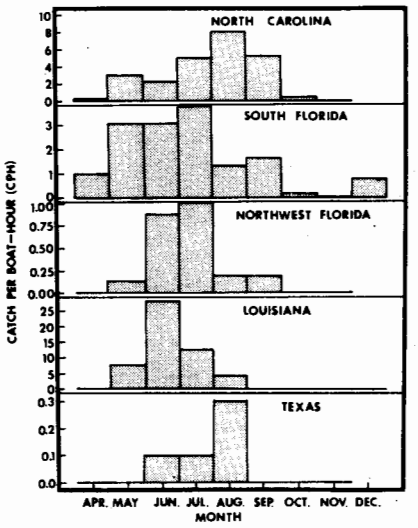


Figure 2.—Monthly catch per boat hour of dolphin caught by trolling in each region during 1982 charterboat survey of southeastern United States.

Discussion

The main success of the 1982 survey was its unusual efficiency in

Table 6.—Mean catch per boat-hour by month for the five most abundant species caught by trolling within each region during the 1982 charterboat survey of the southeastern United States.

Region and species	Mean catch/boat-hour								
	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
North Carolina									
Dolphin	0.03	3.11	2.30	5.05	7.92	5.55	3.35	—[1]	—
Bluefish	10.55	3.92	0.06	0.20	0.00	0.00	0.18	—	—
Yellowfin tuna	0.01	0.03	2.44	0.35	0.28	0.62	0.53	—	—
King mackerel	0.04	0.31	0.08	0.02	0.02	0.04	4.25	—	—
Little tunny	1.27	0.01	0.02	0.13	0.00	0.04	0.75	—	—
South Florida									
Dolphin	0.97	3.14	3.18	4.19	1.26	1.55	0.08	0.41	1.00
Great barracuda	0.30	0.07	0.16	0.19	0.95	1.11	0.87	1.48	0.53
Yellowtail snapper	0.20	0.00	0.01	0.03	0.04	0.15	0.41	0.18	0.00
Cero	0.14	0.00	0.00	0.03	0.17	0.06	0.06	0.23	0.39
King mackerel	0.04	0.00	0.00	0.01	0.20	0.02	0.00	0.06	0.71
Northwest Florida									
Blue runner	0.52	5.60	4.03	0.31	0.32	0.62	0.28	—	—
Spanish mackerel	2.54	0.49	0.04	0.21	2.28	4.97	0.24	—	—
Little tunny	0.05	0.80	1.62	1.91	1.88	0.61	0.32	—	—
King mackerel	0.00	0.02	0.47	0.22	1.18	1.45	1.11	—	—
Bluefish	5.53	0.87	0.03	0.00	0.00	0.00	0.05	—	—
Louisiana									
Dolphin	0.00	7.28	29.51	10.92	2.36	0.50	0.00	0.00	—
Spanish mackerel	0.00	0.49	1.07	0.00	3.49	2.36	0.00	0.00	—
Red drum	0.00	0.00	0.00	0.00	2.38	1.36	0.00	0.00	—
Little tunny	0.00	0.82	0.86	0.18	0.80	1.43	2.00	0.50	—
Blue runner	0.00	1.15	1.07	0.19	0.56	0.21	0.00	0.63	—
South Texas									
King mackerel	0.17	0.20	1.16	1.67	1.25	0.14	—	—	—
Spanish mackerel	0.00	0.00	0.00	0.00	0.04	11.21	—	—	—
Dolphin	0.00	0.00	0.07	0.11	0.27	0.00	—	—	—
Crevalle jack	0.17	0.72	0.07	0.03	0.16	0.00	—	—	—
Cobia	0.00	0.00	0.17	0.08	0.02	0.03	—	—	—

[1]Dash indicates zero fishing effort.

Table 7.—Mean catch per boat-hour by month for the five most abundant species caught by methods other than trolling in each region[1] during the 1982 charterboat survey of the southeastern United States.

Region and species	Mean catch/boat-hour								
	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
South Florida									
Yellowtail snapper	0.00	0.00	0.00	18.91	0.00	3.00	—[2]	—	—
Greater amberjack	3.11	3.67	2.00	0.00	1.33	0.00	—	—	—
Lane snapper	0.00	0.00	0.00	0.00	0.00	0.00	—	—	—
Red grouper	0.00	0.00	0.00	0.00	0.00	1.44	—	—	—
Great barracuda	0.00	0.00	0.00	0.00	0.00	0.31	—	—	—
Louisiana									
Atlantic croaker	0.97	2.36	1.73	4.31	11.84	14.77	9.44	3.76	0.00
Red snapper	5.70	4.17	4.05	5.40	3.15	3.16	2.98	2.41	2.40
Sand seatrout	0.42	1.11	0.13	0.21	0.22	0.47	3.79	13.60	0.00
Dolphin	0.00	1.52	13.86	0.01	0.00	0.00	0.00	0.00	0.00
Unident. seatrout	0.00	0.00	0.00	0.00	0.00	0.00	2.36	3.42	0.00
South Texas									
Red snapper	0.00	0.61	0.00	—	23.75	0.00	0.00	—	—
Red drum	0.89	0.72	0.56	—	0.00	1.08	0.94	—	—
Spotted seatrout	0.11	0.00	0.00	—	0.00	1.83	0.00	—	—
Unident. seatrout	0.00	0.33	1.11	—	0.00	0.00	0.00	—	—
Sheepshead	0.00	0.11	0.00	—	0.00	0.08	0.12	—	—

[1]No hours were logged in North Carolina or in northwest Florida.
[2]Dash indicates zero fishing effort.

collecting and reporting recreational fishery data. Our response rate (90.4 percent) is substantially higher than others reported for mailed questionnaires or log forms, including Browder et al. (1981), 31.25 percent; Rose and Hassler (1969), 20 percent and 39 percent in 1961 and 1962, respectively; and Brusher et al. (1978), 58.2 percent. Historically, response to mailed questionnaires has been poor enough that Rose and Hassler (1969) noted, that "postcard surveys should probably be based on an expected return of no greater than 33 percent." The obvious difference between our study and those cited was the contracting. Respondents seemed strongly influenced by a signed agreement and monetary consideration for their efforts. No other marine recreational fishing survey with which we are familiar has attempted to produce results in "real time," and many (Ellis et al., 1958; Irby, 1974; Ditton et al., 1978; McEachron and Matlock, 1983; Manooch and Laws, 1979; Manooch et al., 1981; and Rose and Hassler, 1969) only published annual results. Our survey allows us to provide reasonably complete CPUE reports for any calendar week within approximately 2 weeks of the end of that week, making it the fastest recreational fishery statistics reporting mechanism with which we are familiar.

Our 1982 survey procedures have been continued in 1983 (Fig. 3) and have enabled us to produce CPUE reports in our laboratory within two days of receiving captains' log forms. We typically receive 70-80 percent of the forms from our frame of 100 captains within 10 days after each fishing week, so computer-generated CPUE reports can be produced within 2 weeks of fishing activity. Reports issued from our laboratory by the tenth of each month usually include 72 percent of the expected responses for the previous fishing month.

Since we presented few analytical treatments of the 1982 survey, examples of other CPUE analyses will help illustrate the uses to which charterboat CPUE data may be put. Many applications appeared in Fable et al. (1981), whose Figures 3, 4, 5, and 10 are reproduced in this paper (Fig. 4-7). The mean catch per hour (Fig. 4) can be modified to show values for a single species through time and space, or to show relative species abundance by location (Fig.

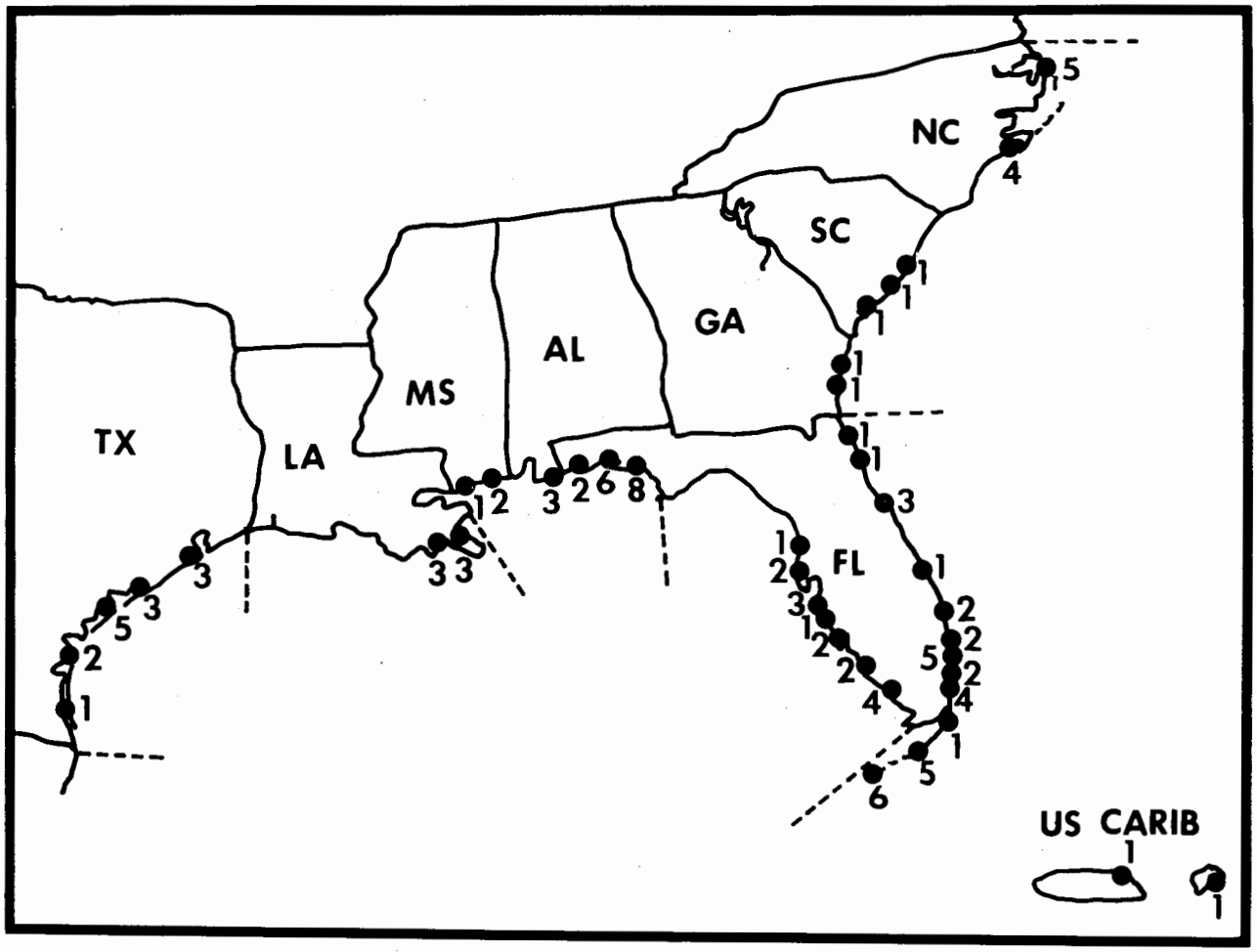


Figure 3.—1983 charterboat survey ports showing initial number of contracted vessels in each port.

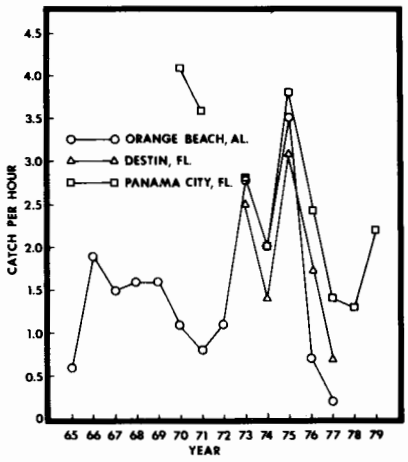


Figure 4.—King mackerel catch per hour from three areas of the northeastern Gulf of Mexico (from Fable et al., 1981, Fig. 3).

5). Monthly CPUE through time is illustrated in Figure 6, which resembles our Figure 2 but presents data by year rather than by location, Finally, environmental effects on CPUE can be investigated, as in Figure 7.

Perhaps the most important potential use of charterboat CPUE data is estimating the relative abundance of species through time and space. It is very difficult to obtain rigorous recreational fishery indicators for management. Our success with the 1982 survey shows that charterboat CPUE is obtainable. The management question is, "How reliably does charter-

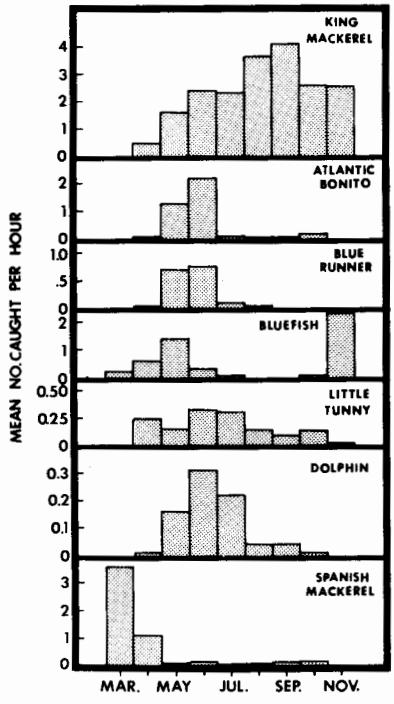
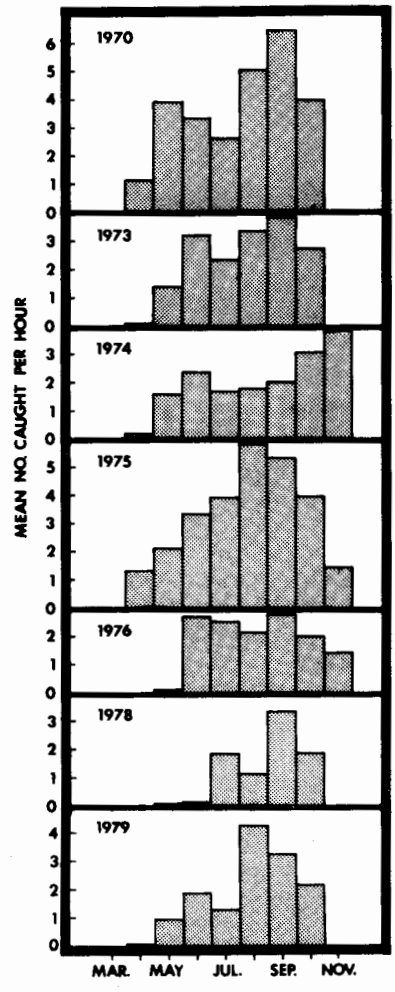


Figure 5.—Average monthly catch per hour of the seven most abundant species caught in Panama City, Fla. (from Fable et al., 1981, Fig. 4).



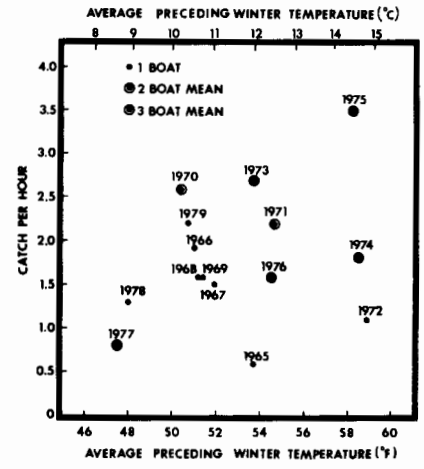


Figure 7.—King mackerel catch per hour plotted against preceding winter average air temperature (from Fable et al., 1981, Fig. 10).

boat CPUE indicate relative species abundance?" Further research and planning are underway to determine the best ways in which to assess abundance from CPUE data. Possible alternatives include surveys of relative effort through time and space, thus establishing an indexing factor for adjusting raw CPUE values, and investigations of "replacement of mean C/f [CPUE] with a less biased index of abundance" (Bannerot, 1982). However, without fundamental data collected in restricted spatio-temporal increments, no abundance estimates are possible. We believe that contracting with charterboat captains of the marine fishery constituency provides a key to the proper representation of recreational fishing interests and a foundation for effective, equitable management decisions.

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Marine Fisheries REVIEW

On the cover: Sea surface temperature image from an infrared sensor on NOAA-7 satellite, 25 May 1982. Warmer waters and land appear dark, colder water and clouds are lighter. Note the plume of warm surface water from the Columbia River and the jets of cold upwelled water to the south.

Articles — *46(3), 1984*

Fisheries Applications of Satellite Data in the Eastern North Pacific — *Paul C. Fiedler, Gary B. Smith* and *R. Michael Laurs* 1

Marine Bivalve Mollusks as Reservoirs of Viral Finfish Pathogens: Significance to Marine and Anadromous Finfish Aquaculture — *Theodore R. Meyers* 14

The "Tuna-Porpoise" Problem: NMFS Dolphin Mortality Reduction Research, 1970-81 — *James M. Coe, David B. Holts,* and *Richard W. Butler* 18

History of Artificial Propagation of Coho Salmon, *Oncorhynchus kisutch,* in the Mid-Columbia River System — *Roy J. Wahle* and *Roger E. Pearson* 34

Norwegian Salmon and Trout Farming — *Robert J. Ford* 44

Using Charterboat Catch Records for Fisheries Management — *Harold A. Brusher, Mark L. Williams, Lee Trent,* and *Barbara J. Palko* 48

The Incidental Capture of Sea Turtles in the Atlantic U.S. Fishery Conservation Zone by the Japanese Tuna Longline Fleet, 1978-81 — *W. N. Witzell* 56

Encounters of Hawaiian Monk Seals With Fishing Gear at Lisianski Island, 1982 — *John R. Henderson* 59

Paired Open Beach Seines to Study Estuarine Migrations of Juvenile Salmon — *Herbert W. Jaenicke, Adrian G. Celewycz, Jack E. Bailey,* and *Joseph A. Orsi* 62

Nonselectivity of Gillnet Fishery on Jaw-Tagged Adult Steelhead, *Salmo gairdneri* — *Emil Slatick* and *Larry Basham* 68

Proximate Composition of Certain Red Sea Fishes — *Rifaat G. M. Hanna* 71

Assessing the Accuracy of a Method to Determine the Amount of Minced Fish in Mixed Mince-Fillet Fish Blocks — *J. Perry Lane, John J. Ryan,* and *Robert J. Learson* 76

Departments

NOAA/NMFS Developments 80

Foreign Fishery Developments 86

Publications 96

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Editor: W. Hobart

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