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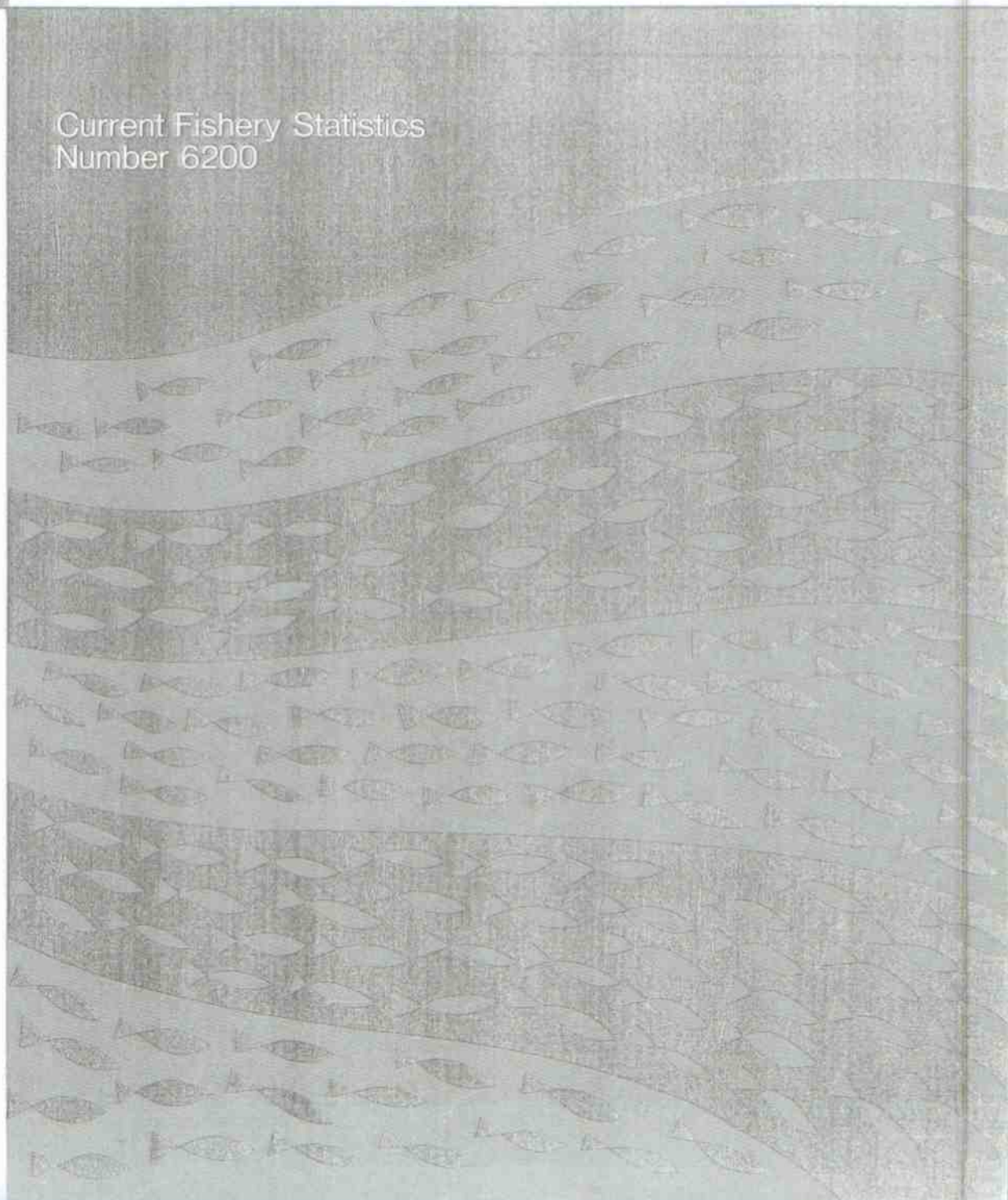
1970 Salt-Water Angling Survey

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

Current Fishery Statistics
Number 6200

WASHINGTON, D.C.

APRIL 1973





U.S. DEPARTMENT OF COMMERCE

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Current Fishery Statistics No. 6200

1970 Salt-Water Angling Survey

Prepared by

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STATISTICS AND MARKET NEWS DIVISION

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1970 SALT-WATER ANGLING SURVEY

By David G. Deuel ^{1/}

INTRODUCTION

Catch and effort statistics are fundamental prerequisites needed to assess the influence of fishing on any stock of fish. The quantities taken, the effort expended, and the seasonal and geographical distribution of the catch are required for the development of rational management policies. Accurate catch statistics, continuous in time and space and coupled with biological studies, will allow conservation agencies to plan for sound management of fishery resources.

Until recent years, commercial fisheries took the greatest part of the total marine finfish catch in the United States, and because records of catch and effort have been maintained for most commercial fisheries, the needs for catch statistics were reasonably well satisfied. However, salt-water angling has reached proportions that are no longer inconsequential. Most species of fish in shore and estuarine areas, as well as the open ocean, now are harvested by both sport and commercial fishermen. Catch and effort data on marine sport fishing are now needed to provide complete statistics on the harvest of finfish in U.S. waters.

Collection of catch statistics on the marine sport fisheries has been attempted only in recent years, largely because collecting such statistics is difficult and expensive. Anglers are dispersed along the coast, fishing from boats, piers, jetties, docks, and the open beach. They may fish day or night, several days a week throughout the year. The few coastal States that collect catch statistics have used a variety of methods, and most surveys are incomplete in time and space. Only the Pacific States collect catch data continuously, and they do so for only part of their marine sport fisheries. Until 1960, no catch statistics were available on marine sport fish for the nation as a whole.

The Bureau of Sport Fisheries and Wildlife (BSFW), U.S. Department of the Interior, has requested the U.S. Bureau of the Census to make a National Survey of Fishing and Hunting every 5 years since 1960. These surveys collected a wide range of information on hunters and fishermen, type and extent of participation, and expenditures. As part of this survey, the Bureau of the Census has collected information, by species, on the number and weights of fish caught by salt-water sport fishermen. Federal responsibility for marine sport fisheries was transferred to the National Marine Fisheries Service (NMFS) in 1970 when its parent agency, the National Oceanic and Atmospheric Administration (NOAA), was created within the Department of Commerce. Accordingly, the 1970 Salt-Water Angling Survey, which was similar to the previous surveys, was carried out under the auspices of the Statistics and Market News Division of NMFS. (*The 1960 Salt-Water Angling Survey* (Clark, 1962), *The 1965 Salt-Water Angling Survey* (Deuel and Clark, 1968), and *1970 Salt-Water Angling Survey* are hereafter referred to as Angling Surveys.)

Salt-water fishing was defined for the purposes of the 1970 Angling Survey as all fishing in the oceans, bays, estuaries, and tidal portions of rivers. Included were catches of river-spawning salt-water fishes such as river herring, Atlantic salmon, steelhead, smelt, striped bass, shad, and Pacific salmon when caught in the above waters. Fresh-water fishing, excluded from this survey, was defined as all fishing for fresh-water species upstream from tidal areas and in any inland stream, lake or reservoir.

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REGIONS

The number of geographical divisions for reporting the catches was limited to seven, which were chosen to coincide where possible with biogeographical areas rather than political subdivisions. For the 1960, 1965, and 1970 Angling Surveys, the Atlantic coast was divided into three regions and the Pacific coast into two regions. The Gulf of Mexico, which was taken as one sampling region in the 1960 Angling Survey, was divided into East Gulf and West Gulf of Mexico for the 1965 and 1970 Angling Surveys, with the Mississippi River as the boundary. Hawaii could not be included because statistics on its unique kinds of fish could not be combined with those of any other region, and because a proportionate sample of its small population would be inadequate for preparing reliable catch statistics on this State alone.

The regions used for the 1970 Angling Survey were:

- | | |
|------------|--|
| Region I | North Atlantic: Atlantic coast from Maine to and including New York. |
| Region II | Middle Atlantic: Atlantic coast from New Jersey to Cape Hatteras, N.C. |
| Region III | South Atlantic: Atlantic coast from Cape Hatteras, N.C., to southern Florida including the Florida Keys. |
| Region IV | East Gulf of Mexico: Gulf coast from the Florida Keys to and including the Mississippi River delta. |
| Region V | West Gulf of Mexico: Gulf coast from the Mississippi River delta to the Mexican border. |
| Region VI | South Pacific: Pacific coast from the Mexican border to Point Conception, Calif. |
| Region VII | North Pacific: Pacific coast from Point Conception, Calif., north to Washington and including Alaska. |

THE SAMPLE ^{2/}

To provide as accurate a cross section of the population as possible, the sample for the 1970 National Survey of Fishing and Hunting (U.S. Department of the Interior, 1972) and the 1970 Angling Survey was based on a subsample of persons previously selected for the Current Population Survey (CPS) which is conducted monthly by the Bureau of the Census. CPS is an area probability sample distributed over 449 Primary Sampling Units (PSUs), each being a county or group of counties and cities in the 50 States and the District of Columbia. ^{3/} Within each of the 449 PSUs, the sample in 1970 consisted of clusters of addresses averaging six households per cluster. The sample size within each PSU is determined by a ratio rather than a fixed quota. The sample is thus self-weighting; that is, each person has the same probability of being selected for the survey. This technique is also self-adjusting for changes in size and distribution of the population.

^{2/} Parts of this Section were originally prepared for The 1965 Angling Survey by the Demographic Surveys Division, U.S. Bureau of the Census, under the direction of Earle J. Gerson. Necessary revisions and changes have been made with the assistance of John Cannon, Demographic Surveys Division.

^{3/} The sampling plan for the Current Population Survey is described in *Current Population Reports*, Series P-23, Number 22, June 1967, issued by the Bureau of the Census.

One-half the CPS sample, or about 24,000 households with some 60,000 persons 9 years of age and older, were screened for the National Survey of Fishing and Hunting. About 1,100 of the 24,000 households were not left questionnaires because the occupants were not found at home after repeated calls or were unavailable for some other reason. Another 3,000 interviewed households did not complete and mail in their questionnaires. In an effort to reduce the nonresponse rate, about 1,200 of these 3,000 households were revisited and detailed interviews were obtained from household members identified as fishermen and hunters.

The procedure for estimating salt-water catch and effort involved expansion of weighted sample results to estimates for the civilian noninstitutional population of the United States.

SCREENING AND INTERVIEWING

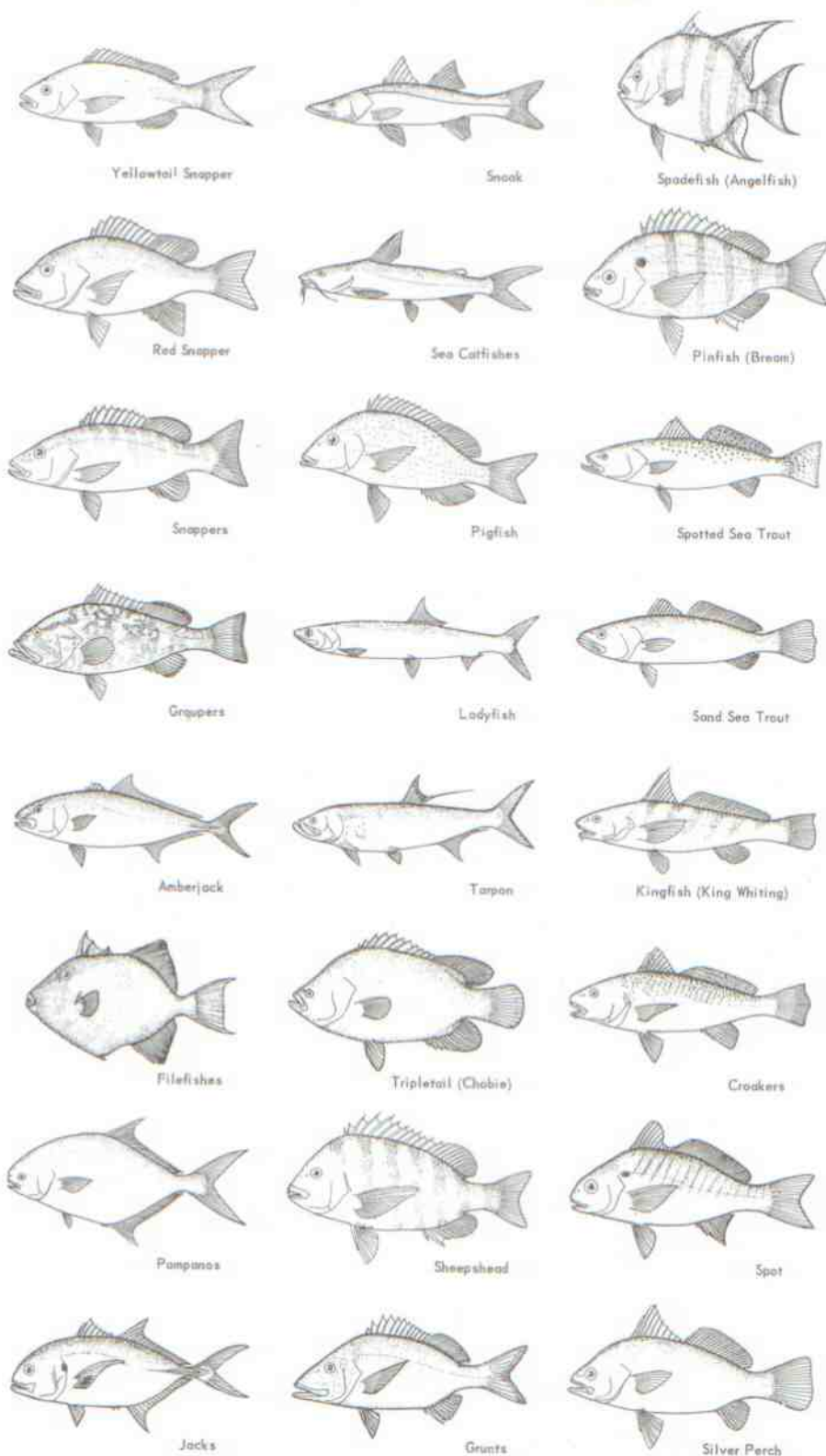
The procedures for identifying sportsmen for the 1970 National Survey of Fishing and Hunting differed slightly from those in the 1960 and 1965 Surveys. In the 1960 Survey a responsible household member provided the information as part of the CPS interview. In 1965, each person himself indicated whether he fished or hunted. In 1970, a short questionnaire covering a number of outdoor recreational activities was left with each family to complete and mail in. Part of the questionnaire concerned the extent of the fishing and hunting participation for each household member.

From the questionnaire, households were screened into four classes of participation: one class of nonparticipation, one of incidental and two levels of substantial participation. Only those who had fished during parts of at least 3 days or spent at least \$7.50 on the sport during 1970 were classified as substantial participants. A subsample of the households in the three levels of participation was taken, and household members identified as fishermen and hunters on this screening questionnaire were revisited and interviewed in greater detail concerning their fishing and hunting participation. The subsampling rates differed for each of the three levels of participation, with one-third of the households in the lowest level revisited, 70 percent of the households in the next highest level, and all the households in the highest level. The interviews were made during the first part of February. Altogether over 8,700 sportsmen were interviewed, of whom 5,200 fished only, 600 hunted only, and 2,900 both fished and hunted.

Although the screening survey included persons 9 years of age and older, the tabulated results of the 1970 Angling Survey are only for civilians 12 years or older. Members of the armed forces, persons in institutions, and commercial fishermen and their catches were excluded from the survey.

Following completion of the interviewing for the 1970 National Survey of Fishing and Hunting, additional questions were asked of those persons who had indicated they had fished in salt water during 1970. These anglers were asked to report, for each species, the number and average weight of fish caught, where caught, and the principal area and method of fishing. Complete interview records were obtained from 1,947 persons classified as substantial participants in salt-water angling for sport. Information from this sample was used to estimate the number of anglers and their total catch. Data summarized in the tables are comparable with the data in the 1960 and 1965 Angling Surveys.

ATLANTIC and/or GULF OF MEXICO FISHES



FORM F14-B (12-22-70)

Figure 1.--Sample of illustration guide used with the interview form for the 1970 Angling Survey.

Interviewing Procedure

Personnel used for the survey were the experienced interviewers employed on the CPS and other regular programs of the Bureau of the Census. Field supervisors and interviewers were trained for the survey. To help the sportsman recall information, the interviewers used calendars, lists of equipment items, booklets, and types of State licenses. Because the methodical step-by-step interviewing procedure required maximum stimulation of recall, the average interview for the National Survey of Fishing and Hunting and the 1970 Angling Survey lasted about 45 minutes. When the interview for each group of households was completed, the results were checked for completeness and consistency.

Illustration Guide

The interview form provided space for only 20 species or species groups to be listed for each region of the survey. To help anglers identify the fish they caught as well as recall other species of fish they may have caught, a four-page guide with 95 line drawings of fishes was given to each interviewee. Figure 1 shows a sample page of the guide. Each line drawing was of a single species, although some were used to represent a species group of two or more closely related species. The drawings were arranged by occurrence on the Atlantic, Gulf of Mexico, and Pacific coasts, and similar appearing and related species were located adjacent to each other. Most illustrations were identified by a single common name, although two names were used when more than one name was in common usage. When a single species was used to represent a species group, it was identified by a name denoting the group.

Interview Form

The design of the interview form is an important part of a personal interview survey. The same format was used for the 1960, 1965, and 1970 Angling Surveys. (See figure 2 for a sample page of the interview form used for the 1970 Angling Survey.) The 1965 interview form was changed by the addition of a column for the average weight of each species caught and a revised section on principal area and method of fishing. On the 1970 form, the number of days fished was requested for each region in which the interviewee had fished. It was assumed that these changes would not bias the reporting of catches and that the relative position of a species group on the list of 20 species for each region would not affect the reporting of catches of a species group. However, some changes were made in the regional species group listed from 1960 to 1965 and again from 1965 to 1970, and the inclusion or exclusion of a species group from the list may have affected the reporting of catches for certain species groups. The list of species groups used for each region in 1970 was based on the reported catches in that region in the two previous surveys. The species groups listed on the interview form, for all regions, accounted for 96 percent of the total number of fish reported.

On the 1965 interview form, a suggested list of two or three additional species appeared after the 20th species group for each region except the North Pacific. These species were selected to serve as a guide to nonlisted species which the interviewee may have caught, and the catches of these or any other species were entered in the three blank spaces at the bottom of the form. The interview form in 1970 did not list additional species because the illustration guide served as a reminder of other species the interviewee may have caught.

Please read . . . Enter the requested information for each of the areas in which YOU did SALT WATER fishing in 1970. If you do not have exact figures, a careful estimate is acceptable. If you do not recall some of the information, please enter "DK" (Don't know) in the appropriate column.

B. Area 2 - NEW JERSEY TO CAPE HATTERAS, NORTH CAROLINA

1. How many days did you spent salt water fishing in the New Jersey to Cape Hatteras, North Carolina area during 1970? 002

2. Mark the kinds of salt water fish you caught in 1970	3. Total number caught in 1970	4. Average weight of fish caught in 1970	5. Principal area of fishing <i>Mark only one</i>		6. Principal type of fishing <i>Mark only one</i>					
			Sounds, rivers, bays	Ocean	Party or charter boat	Private rented boat	Bridge, pier, jetty	Beach or bank		
1. White Perch 251			☐	☐	☐	☐	☐	☐	☐	☐
2. Seabass (Black Seabass) 204			☐	☐	☐	☐	☐	☐	☐	☐
3. Bluefish 207			☐	☐	☐	☐	☐	☐	☐	☐
4. Porgy (Scup) 257			☐	☐	☐	☐	☐	☐	☐	☐
5. Striped Bass (Rockfish) 284			☐	☐	☐	☐	☐	☐	☐	☐
6. Whiting (Silver Hake) 232			☐	☐	☐	☐	☐	☐	☐	☐
7. Kingfish (King Whiting) 240			☐	☐	☐	☐	☐	☐	☐	☐
8. Sea Catfish 213			☐	☐	☐	☐	☐	☐	☐	☐
9. Spanish Mackerel 247			☐	☐	☐	☐	☐	☐	☐	☐
10. Atlantic Mackerel 244			☐	☐	☐	☐	☐	☐	☐	☐
11. Weakfish (Sea Trout) 298			☐	☐	☐	☐	☐	☐	☐	☐
12. Spot (Lafayette) 282			☐	☐	☐	☐	☐	☐	☐	☐
13. Croaker (Hardhead) 216			☐	☐	☐	☐	☐	☐	☐	☐
14. Flounder (Winter Flounder, Blackback) 225			☐	☐	☐	☐	☐	☐	☐	☐
15. Fluke (Summer Flounder) 224			☐	☐	☐	☐	☐	☐	☐	☐
16. Blackfish (Tautog) 288			☐	☐	☐	☐	☐	☐	☐	☐
17. Sea Robin 267			☐	☐	☐	☐	☐	☐	☐	☐
18. Channel Bass (Redfish, Red Drum) 221			☐	☐	☐	☐	☐	☐	☐	☐
19. Shad 271			☐	☐	☐	☐	☐	☐	☐	☐
20. Blowfish (Swelltoad, Puffer) 258			☐	☐	☐	☐	☐	☐	☐	☐
Any others - Specify	OFFICE USE									
21.			☐	☐	☐	☐	☐	☐	☐	☐
22.			☐	☐	☐	☐	☐	☐	☐	☐
23.			☐	☐	☐	☐	☐	☐	☐	☐

Figure 2.--Sample page of interview form used for the 1970 Angling Survey.

Species grouping

A difficult problem in designing the interview procedure and in analyzing the survey results arose from lack of uniformity in the names that anglers use for fishes. For example, the species *Cynoscion regalis* is known as squeteague in New England, weakfish along the middle Atlantic coast, and seatrout or trout along the southern Atlantic coast. Seatrout may refer also to *Cynoscion nebulosus*, a related species, or to one of the sea-run fresh-water trouts, or on the Pacific coast to the white seabass; and the white seabass in turn may be called weakfish.

Anglers often identify fishes only in broad categories such as "flounders", "shark" or "rockfish". They also often use such catch-all designations as "shiner" or "perch" or any of a number of local names; for example, snowshoe flounder is used in Rhode Island for large winter flounder (*Pseudopleuronectes americanus*).

Because of limitations of the interview procedure, only 20 species or groups of species could be listed on the interview form for each region (fig. 2). It appeared not practicable to confine the listings to uniform taxonomic levels. Thus the categories used for reporting catches, termed "species groups", consist of orders, families, genera, and species. Some categories represent only part of a taxonomic grouping, e.g., several genera within a family. All closely related fishes that fishermen do not readily recognize as separate species were usually combined into a single species group. For each species group listed for a region, the fish name was selected that appeared to be in the most common usage for that region and synonyms were added for clarification when appropriate. However, in preparing the tables for this report we used the standard names listed in *A List of Common and Scientific Names of Fishes from the United States and Canada* (American Fisheries Society, 1970). A coded list of 100 species groups was prepared representing nearly all species caught by anglers on all three coasts of the United States. All species groups appearing on the interview form were coded by region and species group. Those names entered in the blank spaces at the bottom of the forms were later coded in a similar manner.

In preparing the species list for each region, an attempt was made to list in sequence species groups that were taxonomically similar or had similar common names so that the comparison was immediately obvious to the respondent. Anglers using other names of limited local usage would usually be familiar with one of the listed common names for that species and thereby identify it with the appropriate group. To minimize misidentification within certain groups of fishes such as groupers, grunts, and rockfishes, we did not list species separately.

The decision as to which species groups to include on the interview list for each region was based primarily on the catches reported in the 1960 and 1965 Angling Surveys. The selections of species groups were made separately for each region, and each decision was based primarily upon special circumstances affecting that region. For all regions except the North Pacific, it was necessary to shorten the list by combining fishes into categories of closely related species or eliminating species of minor importance. The final arrangement was based upon a judgement as to which species groups would result in the most useful information and would facilitate comparisons with the 1960 and 1965 Angling Surveys, between regions of the survey and for the Nation as a whole.

If an interviewee could not associate his catch with a species group listed, or shown on the illustration guide, he was instructed to enter his catch with the name he did use in one of the blank spaces below the species list. In most cases, it was possible to identify these entries and include them in a species group. If not, or if the interviewee did not know any name for the species caught, it was entered in the miscellaneous category. Also included in the miscellaneous category were species groups for which the reported catches were too low to be tabulated separately. (See Classification of Species Groups for those species included in the miscellaneous category.)

Area and method of fishing

The following categories were used for principal area of fishing and method of fishing for each species group in both the 1965 and 1970 Angling Surveys.

Area of fishing

1. Ocean
2. Sounds, rivers, or bays

Method of fishing

1. Private or rented boat
2. Party or charter boat
3. Bridge, pier, or jetty
4. Beach or bank

Respondents were instructed to indicate the area most frequently fished and the method of fishing chiefly used for each species group during 1970.

This represents a change from the 1960 Angling Survey for which the area and method of fishing were recorded as follows:

1. Still fishing from boats
2. Motion fishing from boats
3. Still fishing from shore
4. Motion fishing from shore

Weight of catch

For the 1965 and 1970 Angling Survey, each interviewee was asked to record the total number and the average weight for each species group caught. These average weight data were used to compute the total weight of fish caught. This method differed from the 1960 Angling Survey, wherein the weight of the catch was estimated from average weight data supplied by State conservation agencies, other organizations, and knowledgeable individuals.

RESULTS

Table 1 summarizes, by geographical regions, the results of the 1960, 1965, and 1970 Angling Surveys. In 1955, an estimated 4,557,000 anglers fished in U.S. waters (U.S. Department of the Interior, 1956), and by 1970 the number has more than doubled to 9,392,000. The increase from 1965 to 1970, however, was only 1,156,000 anglers. The 1970 catch was 817 million fish, an 11-percent increase over the 1965 catch of 737 million fish. The estimated weight of the catch rose from 1.47 billion pounds in 1965 to 1.58 billion pounds in 1970, a 7-percent increase.

The detailed results of the 1970 Angling Survey are shown in tables 2 to 6. Included among the estimated 9,392,000 substantial anglers are 1,587,000 persons who fished during 1970 but did not catch any fish. Table 2 summarizes the catches by region, area, and method of fishing. The number of fish caught, number of anglers, and total weight of fish by species group for each region is given in tables 3, 4, and 5, respectively. Table 6 gives number of fish caught in each species group by region, area, and method of fishing. The section, Classification of Species Groups, shows the composition of each species group. Listed in table 7 are the catch estimates of 16 species categories for which the total catch exceeded 10 million fish in all three Angling Surveys. The total catch of these species categories represents over 81 percent of the total catch of all species groups in 1970.

Table J.--Estimated number of salt-water anglers and their catches in the United States in 1960, 1965, and 1970, by survey region

Region	Number of anglers			Number of fish caught			Weight of fish caught		
	1960	1965	1970	1960	1965	1970	1960	1965	1970
I. North Atlantic (New England and New York)	1,160	1,530	1,666	97,383	172,660	117,014	183,740	316,360	267,451
II. Middle Atlantic (New Jersey to Cape Hatteras)	1,344	1,375	1,767	114,502	92,126	168,209	178,000	128,288	246,267
III. South Atlantic (Cape Hatteras to Florida Keys)	1,024	1,720	1,808	156,942	190,802	184,177	370,112	391,833	403,913
Gulf of Mexico/ (Florida West Coast to Texas)	1,412	--	--	184,582	--	--	411,110	--	--
IV. East Gulf of Mexico (Florida West Coast to Mississippi River)	--	1,234	1,478	--	104,551	188,888	--	187,957	334,120
V. West Gulf of Mexico (Mississippi River to Texas)	--	738	872	--	89,550	97,708	--	187,618	151,608
VI. South Pacific (Pt. Conception South)	687	978	894	50,064	48,542	37,221	154,120	176,828	94,234
VII. North Pacific (Pt. Conception North)	714	999	1,311	29,399	38,508	24,100	83,219	85,469	79,230
ALL REGIONS	6,198 ² / ₂	8,236 ² / ₂	9,392 ² / ₂	632,872	736,739	817,317	1,380,301	1,474,353	1,576,823

1/ The Gulf of Mexico was not separated into East and West sampling regions for the 1960 Angling Survey.

2/ These figures are less than the sum of anglers for the individual regions because some anglers fished in more than one region.

Table 2.--Salt-water fishermen and their catches^{1/} in 1970 by regions and principal area and method of fishing

Region	Principal area of fishing		Principal method of fishing			
	Ocean	Sounds, rivers, and bays	Private or rented boat	Party or charter boat	Bridge, pier, or jetty	Beach or bank
- - - - - Thousands - - - - -						
I. North Atlantic:						
Number of fishermen...	705	983	760	364	370	302
Number of fish caught.	35,311	81,703	78,887	18,216	13,117	6,794
Total weight.....	102,477	164,974	183,263	55,131	17,357	11,700
II. Middle Atlantic:						
Number of fishermen...	807	934	803	507	179	377
Number of fish caught.	69,541	98,668	91,830	45,009	7,822	23,548
Total weight.....	128,189	118,078	123,678	87,304	10,303	24,982
III. South Atlantic:						
Number of fishermen...	1,127	773	505	450	565	488
Number of fish caught.	112,203	71,974	74,214	19,545	47,555	42,863
Total weight.....	287,385	116,528	224,476	56,417	69,363	53,657
IV. East Gulf of Mexico:						
Number of fishermen...	633	915	607	323	413	266
Number of fish caught.	42,352	146,536	87,328	39,892	40,735	20,933
Total weight.....	111,177	222,943	167,875	75,638	69,793	20,814
V. West Gulf of Mexico:						
Number of fishermen...	341	477	284	101	288	198
Number of fish caught.	47,173	50,535	56,684	4,425	23,236	13,363
Total weight.....	64,800	86,808	85,805	8,579	33,024	24,200
VI. South Pacific:						
Number of fishermen...	726	94	269	269	307	73
Number of fish caught.	34,719	2,502	10,419	8,339	17,527	936
Total weight.....	92,172	2,062	29,843	29,578	33,317	1,496
VII. North Pacific:						
Number of fishermen...	537	556	509	270	204	190
Number of fish caught.	8,256	15,844	9,584	1,719	7,777	5,020
Total weight.....	42,585	36,645	48,550	11,078	7,616	11,986
All Regions:						
Number of fishermen...	4,713	4,654	3,633	2,222	2,305	1,879
Number of fish caught.	349,555	467,762	408,946	137,145	157,769	113,457
Total weight.....	828,785	748,038	863,490	323,725	240,773	148,835

^{1/} The number of fish caught and the weight of fish caught in the two principal areas of fishing are equal to the total catch for a particular region, and the number and weight caught by the four methods of fishing are equal to the total catch for a particular region. However, the number of anglers is not additive as some anglers fished in both areas and by more than one method for certain species groups in a particular region.

Table 3.--Number of fish caught by U.S. salt-water anglers in 1970, by species and region

Species group	Region							All Regions
	I North Atlantic	II Middle Atlantic	III South Atlantic	IV East Gulf	V West Gulf	VI South Pacific	VII North Pacific	
	Thousands							
1. Barracudas.....	--	--	325	4	--	1,688	--	2,017
2. Basses, black sea.....	286	3,844	7,218	1,248	12	--	--	12,608
3. Basses, Pacific.....	--	--	--	--	--	7,109	--	7,109
4. Billfishes.....	--	13	214	8	--	8	--	243
5. Bluefish.....	10,693	12,351	12,851	86	477	--	--	36,458
6. Bonitos.....	--	54	323	282	12	4,140	--	4,811
7. California corbina.....	--	--	--	--	--	2,865	--	2,865
8. California sheephead.....	--	--	--	--	--	117	--	117
9. Catfishes.....	--	2,368	11,207	27,300	15,390	--	--	56,265
10. Cobia.....	--	--	26	8	85	--	--	119
11. Cods.....	3,690	154	--	--	--	--	509	4,353
12. Croakers.....	--	4,617	8,521	36,033	13,893	2,530	422	66,016
13. Cunner.....	2,511	--	--	--	--	--	--	2,511
14. Dolphins.....	--	31	2,166	268	--	--	--	2,465
15. Drum, black.....	--	26	5,195	4,402	5,087	--	--	14,710
16. Drum, red.....	--	97	4,883	7,273	5,911	--	--	18,164
17. Eel, American.....	2,489	367	162	76	17	--	--	3,111
18. Flatfishes, Pacific.....	--	--	--	--	--	469	2,174	2,643
19. Flounders, summer.....	8,489	4,191	3,724	4,421	2,176	--	--	23,001
20. Flounder, winter.....	21,581	7,496	--	--	--	--	--	29,077
21. Greenlings.....	--	--	--	--	--	92	79	171
22. Groupers.....	--	--	4,198	3,138	438	--	--	7,774
23. Grunts.....	--	--	21,800	8,820	11,825	--	--	42,445
24. Haddock.....	501	--	--	--	--	--	--	501
25. Hake, red.....	--	497	--	--	--	--	--	497
26. Hake, silver.....	--	--	--	--	--	--	--	--
27. Halibut, California.....	395	912	--	--	--	2,469	54	1,307
28. Halibut, Pacific.....	--	--	--	--	--	--	202	2,523
29. Jacks.....	--	--	7,254	1,146	145	--	--	8,545
30. Jack mackerel.....	--	--	--	--	--	580	119	699

Table 3.--Number of fish caught by U.S. salt-water anglers in 1970, by species and region-Continued

Species group	Region							All Regions
	I North Atlantic	II Middle Atlantic	III South Atlantic	IV East Gulf	V West Gulf	VI South Pacific	VII North Pacific	
					Thousands			
31. Kingfishes.....	2,736	1,911	15,035	11,959	3,243	--	--	34,884
32. Ladyfish.....	--	--	547	1,607	--	--	--	2,154
33. Lingcod.....	--	--	--	--	--	--	738	767
34. Mackerels, Atlantic.....	33,573	18,441	--	--	--	--	--	52,014
35. Mackerel, king.....	--	45	4,165	2,813	259	--	--	7,282
36. Mackerel, Pacific.....	--	--	--	--	--	222	--	222
37. Mackerels, Spanish.....	--	350	4,967	2,314	479	--	--	8,110
38. Mulllets.....	--	--	461	3,565	257	--	--	4,283
39. Ocean whitefish.....	--	--	--	--	--	174	--	174
40. Opaleye.....	--	--	--	--	--	176	--	176
41. Perches.....	32	15,072	389	769	688	--	--	16,950
42. Perch, yellow.....	--	3,324	--	158	--	--	--	3,482
43. Pollock.....	2,451	--	--	--	--	--	--	2,451
44. Pompanos.....	--	--	143	546	135	--	--	824
45. Porgies.....	2,850	1,188	16,230	13,234	1,968	--	--	35,470
46. Puffers.....	10,962	27,608	9,102	208	25	--	--	47,905
47. Rockfishes.....	--	--	--	--	--	3,504	2,802	6,306
48. Sabelfish.....	--	--	--	--	--	--	477	477
49. Salmon, chinook.....	--	--	--	--	--	--	912	912
50. Salmon, coho.....	--	--	--	--	--	--	1,447	1,447
51. Salmon, pink.....	--	--	--	--	--	--	162	162
52. Sculpins and cabezon.....	--	--	--	--	--	923	1,936	2,859
53. Seabass, white.....	--	--	--	--	--	215	7	222
54. Seabroins.....	2,820	5,831	4	34	4	--	--	8,693
55. Seatrout, sand.....	--	--	47	21,818	8,189	--	--	30,054
56. Seatrout, spotted.....	--	--	13,992	28,481	24,298	--	--	66,771
57. Shad, American.....	173	1,541	--	--	--	--	69	1,783
58. Sharks.....	419	92	20	137	68	32	15	783
59. Sharks, dogfish.....	129	153	67	220	58	258	180	1,065
60. Skates and rays.....	154	53	105	163	271	--	4	750

Table 3.--Number of fish caught by U.S. salt-water anglers in 1970, by species and region-Continued

Species group	Region							All Regions
	I North Atlantic	II Middle Atlantic	III South Atlantic	IV East Gulf	V West Gulf	VI South Pacific	VII North Pacific	
					Thousands			
61. Smelts.....	649	--	--	--	--	432	4,380	5,461
62. Snappers.....	--	--	613	126	1,215	--	--	1,954
63. Snapper, red.....	--	--	1,797	3,557	119	--	--	5,473
64. Snapper, yellowtail.....	--	--	10,843	581	--	--	--	11,424
65. Snook.....	--	--	2,529	401	--	--	--	2,930
66. Spadefish, Atlantic.....	--	--	56	1,042	190	--	--	1,288
67. Spot.....	--	32,952	12,110	--	--	--	--	45,062
68. Steelhead.....	--	--	--	--	--	--	724	724
69. Striped bass.....	4,309	9,857	71	--	--	--	2,031	16,268
70. Surperches.....	--	--	--	--	--	6,726	1,685	8,411
71. Tautog.....	4,234	383	--	--	--	--	--	4,617
72. Toadfish, oyster.....	--	133	--	--	--	--	--	133
73. Trout, cutthroat.....	--	--	--	--	--	--	1,100	1,100
74. Trout, Dolly Varden.....	--	--	--	--	--	--	199	199
75. Tunas.....	28	54	354	12	--	873	44	1,365
76. Wahoo.....	--	172	82	--	--	--	--	254
77. Weakfish.....	745	9,397	--	--	--	--	--	10,142
78. Yellowtail, California..	--	--	--	--	--	618	--	618
79. Miscellaneous.....	115	2,634	381	630	774	972	1,629	7,135
Total.....	117,014	168,209	184,177	188,888	97,708	37,221	24,100	817,317

Table 4.--Number of U.S. salt-water anglers in 1970, by species caught and by region

Species group	Region							All Regions
	I North Atlantic	II Middle Atlantic	III South Atlantic	IV East Gulf	V West Gulf	VI South Pacific	VII North Pacific	
	Thousands							
1. Barracudas.....	--	--	36	4	--	152	--	192
2. Basses, black sea.....	74	206	278	24	4	--	--	586
3. Basses, Pacific.....	--	--	--	--	--	279	--	279
4. Billfishes.....	--	10	49	4	--	8	--	71
5. Bluefish.....	498	591	292	35	24	--	--	1,440
6. Bonitos.....	--	22	54	16	6	402	--	500
7. California corbina.....	--	--	--	--	--	91	--	91
8. California sheephead.....	--	--	--	--	--	62	--	62
9. Catfishes.....	--	129	391	501	279	--	--	1,300
10. Cobia.....	--	--	9	4	3	--	--	16
11. Cods.....	260	18	--	--	--	--	23	301
12. Croakers.....	--	175	272	370	403	98	54	1,372
13. Cunner.....	57	--	--	--	--	--	--	57
14. Dolphins.....	--	7	118	20	--	--	--	145
15. Drum, black.....	--	3	160	130	185	--	--	478
16. Drum, red.....	--	8	164	390	302	--	--	864
17. Eel, American.....	227	38	63	18	17	--	--	363
18. Flatfishes, Pacific.....	--	--	--	--	--	55	233	288
19. Flounders, summer.....	415	339	278	340	211	--	--	1,583
20. Flounder, winter.....	563	402	--	--	--	--	--	965
21. Greenlings.....	--	--	--	--	--	9	24	33
22. Groupers.....	--	--	292	261	40	--	--	593
23. Grunts.....	--	--	361	171	32	--	--	564
24. Haddock.....	65	--	--	--	--	--	--	65
25. Hake, red.....	--	36	--	--	--	--	--	36
26. Hake, silver.....	15	66	--	--	--	--	--	81
27. Halibut, California.....	--	--	--	--	--	231	15	246
28. Halibut, Pacific.....	--	--	--	--	--	--	43	43
29. Jacks.....	--	--	223	143	40	--	--	406
30. Jack mackerel.....	--	--	--	--	--	42	25	67

Table 4.--Number of U.S. salt-water anglers in 1970, by species caught and by region--Continued

Species group	Region							All Regions
	I North Atlantic	II Middle Atlantic	III South Atlantic	IV East Gulf	V West Gulf	VI South Pacific	VII North Pacific	
	Thousands							
31. Kingfishes.....	226	183	317	192	90	--	--	1,008
32. Ladyfish.....	--	--	36	92	--	--	--	128
33. Lingcod.....	--	--	--	--	--	12	130	142
34. Mackerels, Atlantic....	479	126	--	--	--	--	--	605
35. Mackerel, king.....	--	4	240	185	39	--	--	468
36. Mackerel, Pacific.....	--	--	--	--	--	55	--	55
37. Mackerels, Spanish.....	--	32	245	228	31	--	--	536
38. Mullet.....	--	--	25	30	16	--	--	71
39. Ocean whitefish.....	--	--	--	--	--	25	--	25
40. Opaleye.....	--	--	--	--	--	23	--	23
41. Perches.....	5	363	8	70	58	--	--	504
42. Perch, yellow.....	--	53	--	3	--	--	--	56
43. Poilock.....	140	--	--	--	--	--	--	140
44. Pompanos.....	--	--	39	59	45	--	--	143
45. Porgies.....	202	117	488	532	174	--	--	1,513
46. Puffers.....	416	653	252	34	12	--	--	1,367
47. Rockfishes.....	--	--	--	--	--	144	286	430
48. Sablefish.....	--	--	--	--	--	--	39	39
49. Salmon, chinook.....	--	--	--	--	--	--	218	218
50. Salmon, coho.....	--	--	--	--	--	--	321	321
51. Salmon, pink.....	--	--	--	--	--	--	54	54
52. Sculpins and cabeson....	--	--	--	--	--	79	134	213
53. Seabass, white.....	--	--	--	--	--	78	3	81
54. Seabrobs.....	263	367	4	11	4	--	--	649
55. Seatrout, sand.....	--	--	4	158	200	--	--	362
56. Seatrout, spotted.....	--	--	432	606	406	--	--	1,444
57. Shad, American.....	17	52	--	--	--	--	3	72
58. Sharks.....	40	35	15	22	12	13	7	144
59. Sharks, dogfish.....	15	34	38	32	25	34	29	207
60. Skates and rays.....	13	7	46	42	29	--	4	141

Table 4.--Number of U.S. salt-water anglers in 1970, by species caught and by region-Continued

Species group	Region							All Regions
	I North Atlantic	II Middle Atlantic	III South Atlantic	IV East Gulf	V West Gulf	VI South Pacific	VII North Pacific	
					Thousands			
61. Smelts.....	4	--	--	--	--	46	58	108
62. Snappers.....	--	--	40	22	49	--	--	111
63. Snapper, red.....	--	--	77	303	12	--	--	392
64. Snapper, yellowtail.....	--	--	339	51	--	--	--	390
65. Snook.....	--	--	159	58	--	--	--	217
66. Spadefish, Atlantic.....	--	--	14	56	30	--	--	100
67. Spot.....	--	374	366	--	--	--	--	740
68. Steelhead.....	--	--	--	--	--	--	116	116
69. Striped bass.....	368	415	10	--	--	--	153	946
70. Surfperches.....	--	--	--	--	--	197	152	349
71. Tautog.....	197	61	--	--	--	--	--	258
72. Toadfish, oyster.....	--	21	--	--	--	--	21	21
73. Trout, cutthroat.....	--	--	--	--	--	--	48	48
74. Trout, Dolly Varden.....	--	--	--	--	--	--	27	27
75. Tunas.....	9	22	50	4	--	98	4	187
76. Wahoo.....	--	8	25	--	--	--	--	33
77. Weakfish.....	81	325	--	--	--	--	--	406
78. Yellowtail, California..	--	--	--	--	--	108	--	108
79. Miscellaneous.....	39	67	54	69	45	39	70	383

Note:--The number of anglers is not additive because of duplication of anglers among species groups.

Table 5.--Estimated weights of salt-water anglers' catches in 1970, by species and region

Species group	Region							All Regions
	I North Atlantic	II Middle Atlantic	III South Atlantic	IV East Gulf	V West Gulf	VI South Pacific	VII North Pacific	
	Thousand pounds							
1. Barracudas.....	--	--	3,746	112	--	5,524	--	9,382
2. Basses, black sea.....	615	6,710	12,381	1,762	24	--	--	21,492
3. Basses, Pacific.....	--	--	--	--	--	18,917	--	18,917
4. Billfishes.....	--	717	12,489	551	--	1,361	--	15,118
5. Bluefish.....	50,161	49,720	19,271	351	1,308	--	--	120,811
6. Bonitos.....	--	282	2,295	2,955	37	15,659	--	21,228
7. California corbina.....	--	--	--	--	--	7,450	--	7,450
8. California sheephead.....	--	--	--	--	--	455	--	455
9. Catfishes.....	--	6,151	16,570	31,989	17,800	--	--	72,510
10. Cobia.....	--	--	775	82	43	--	--	900
1. Cods.....	35,688	230	--	--	--	--	990	36,908
2. Croakers.....	--	3,831	5,947	48,051	14,743	2,254	610	75,436
3. Cunner.....	1,914	--	--	--	--	--	--	1,914
4. Dolphins.....	--	419	27,806	2,133	--	--	--	30,358
5. Drum, black.....	--	1,454	12,123	16,096	13,004	--	--	42,677
6. Drum, red.....	--	83	13,358	27,525	25,520	--	--	66,486
7. Eel, American.....	3,166	740	122	76	19	--	--	4,123
8. Flatfishes, Pacific.....	--	--	--	--	--	1,113	3,058	4,171
9. Flounders, summer.....	11,611	7,742	8,938	8,042	2,985	--	--	39,318
10. Flounder, winter.....	24,684	12,881	--	--	--	--	--	37,565
11. Greenlings.....	--	--	--	--	--	138	139	277
12. Groupers.....	--	--	24,121	15,934	922	--	--	40,977
13. Grunts.....	--	--	25,962	7,114	4,316	--	--	37,392
14. Haddock.....	2,528	--	--	--	--	--	--	2,528
15. Hake, red.....	--	904	--	--	--	--	--	904
16. Hake, silver.....	--	--	--	--	--	--	--	2,095
17. Halibut, California.....	659	1,436	--	--	--	9,243	173	9,416
18. Halibut, Pacific.....	--	--	--	--	--	--	2,815	2,815
19. Jacks.....	--	--	33,149	3,369	1,223	--	--	37,741
20. Jack mackerel.....	--	--	--	--	--	887	337	1,224

Table 5.--Estimated weights of salt-water anglers' catches in 1970, by species and region-Continued

Species group	Region							All Regions
	I North Atlantic	II Middle Atlantic	III South Atlantic	IV East Gulf	V West Gulf	VI South Pacific	VII North Pacific	
					Thousand pounds			
31. Kingfishes.....	3,457	2,402	14,533	12,678	3,107	--	--	36,177
32. Ladyfish.....	--	--	1,910	1,916	--	--	--	3,826
33. Lingcod.....	--	--	--	--	--	241	5,192	5,433
34. Mackerels, Atlantic.....	41,482	29,250	--	--	--	--	--	70,732
35. Mackerel, king.....	--	225	34,942	24,481	2,978	--	--	62,626
36. Mackerel, Pacific.....	--	--	--	--	--	530	--	530
37. Mackerels, Spanish.....	--	946	14,623	7,200	608	--	--	23,377
38. Mulllets.....	--	--	341	1,845	95	--	--	2,281
39. Ocean whitefish.....	--	--	--	--	--	654	--	654
40. Opaleye.....	--	--	--	--	--	348	--	348
41. Perches.....	32	12,592	226	809	584	--	--	14,243
42. Perch, yellow.....	--	2,581	--	111	--	--	--	2,692
43. Pollock.....	5,584	--	--	--	--	--	--	5,584
44. Pompanos.....	--	--	153	787	179	--	--	1,119
45. Porgies.....	2,296	2,127	24,059	21,320	5,675	--	--	55,477
46. Puffers.....	7,899	16,568	4,440	99	8	--	--	29,014
47. Rockfishes.....	--	--	--	--	--	6,519	7,238	13,757
48. Sablefish.....	--	--	--	--	--	--	1,035	1,035
49. Salmon, chinook.....	--	--	--	--	--	--	15,171	15,171
50. Salmon, coho.....	--	--	--	--	--	--	14,356	14,356
51. Salmon, pink.....	--	--	--	--	--	--	1,188	1,188
52. Sculpins and cabezon.....	--	--	--	--	--	1,142	2,353	3,495
53. Sebass, white.....	--	--	--	--	--	1,009	7	1,016
54. Seatrout.....	2,343	6,741	4	10	1	--	--	9,099
55. Seatrout, sand.....	--	--	23	21,124	9,345	--	--	30,492
56. Seatrout, spotted.....	--	--	25,040	40,869	40,487	--	--	106,396
57. Shad, American.....	625	4,231	--	--	--	--	--	4,994
58. Sharks.....	4,795	1,276	669	13,823	1,167	503	138	22,336
59. Sharks, dogfish.....	468	404	214	629	54	702	559	3,030
60. Skates and rays.....	185	180	470	1,193	1,603	--	60	3,691

Table 5.--Estimated weights of salt-water anglers' catches in 1970, by species and region--Continued

Species group	Region							All Regions
	I North Atlantic	II Middle Atlantic	III South Atlantic	IV East Gulf	V West Gulf	VI South Pacific	VII North Pacific	
	--	--	--	--	Thousand pounds	--	--	--
61. Smelts.....	195	--	--	--	--	367	1,802	2,364
62. Snappers.....	--	--	735	90	2,554	--	--	3,379
63. Snapper, red.....	--	--	5,682	11,360	278	--	--	17,320
64. Snapper, yellowtail.....	--	--	20,163	814	--	--	--	20,977
65. Snook.....	--	--	17,957	3,487	--	--	--	21,444
66. Spadefish, Atlantic.....	--	--	51	1,793	283	--	--	2,127
67. Spot.....	--	21,573	9,840	--	--	--	--	31,413
68. Steelhead.....	--	--	--	--	--	--	4,441	4,441
69. Striped bass.....	45,844	27,262	189	--	--	--	10,488	83,783
70. Surfpereches.....	--	--	--	--	--	5,092	2,738	7,830
71. Tautog.....	15,629	1,619	--	--	--	--	--	17,248
72. Toadfish, oyster.....	--	133	--	--	--	--	--	133
73. Trout, cutthroat.....	--	--	--	--	--	--	1,238	1,238
74. Trout, Dolly Varden.....	--	--	--	--	--	--	637	637
75. Tunas.....	3,711	886	5,943	827	--	7,346	660	19,373
76. Wahoo.....	--	3,985	1,571	--	--	--	--	5,556
77. Weakfish.....	1,645	14,039	--	--	--	--	--	15,684
78. Yellowtail, California..	--	--	--	--	--	5,629	--	5,629
79. Miscellaneous.....	235	3,947	1,082	713	658	1,151	1,704	9,490
Total.....	267,451	246,267	403,913	334,120	151,608	94,234	79,230	1,576,823

Note:--These total weight estimates contain both sampling errors and response errors. Sampling errors (standard errors) were not calculated, and no attempt was made to measure response errors in this survey.

Table 6.--Number of fish caught^{1/} by U.S. salt-water anglers in 1970, by region and species and by principal area and method of fishing

Region and species group	Principal area of fishing		Principal method of fishing			
	Ocean	Sounds, rivers, and bays	Private or rented boat	Party or charter boat	Bridge, pier, or jetty	Beach or bank
----- Thousands -----						
Region I, North Atlantic:						
2. Basses, black sea....	178	108	207	16	17	46
5. Bluefish.....	3,147	7,546	6,705	949	2,958	81
11. Cods.....	3,077	613	2,016	1,576	90	8
13. Cunner.....	710	1,801	422	--	1,986	103
17. Eel, American.....	183	2,306	1,761	109	159	460
19. Flounders, summer....	3,176	5,313	6,597	525	1,086	281
20. Flounder, winter....	2,949	18,632	17,264	627	972	2,718
24. Haddock.....	501	--	137	353	11	--
26. Hake, silver.....	71	324	337	58	--	--
31. Kingfishes.....	1,388	1,348	1,254	80	380	1,022
34. Mackerels, Atlantic..	12,662	20,911	20,845	9,668	2,848	212
41. Perches.....	--	32	--	--	--	32
43. Pollock.....	2,224	227	507	1,413	384	147
45. Porgies.....	661	2,189	2,204	412	199	35
46. Puffers.....	1,531	9,431	8,181	960	1,603	218
54. Searobins.....	1,010	1,810	1,964	592	177	87
57. Shad, American.....	--	173	160	--	13	--
58. Sharks.....	338	81	122	99	--	198
59. Sharks, dogfish.....	88	41	85	44	--	--
60. Skates and rays.....	154	--	154	--	--	--
61. Smelts.....	--	649	--	--	--	649
69. Striped bass.....	496	3,813	3,154	575	162	418
71. Tautog.....	644	3,590	4,088	75	47	24
75. Tunas.....	12	16	16	12	--	--
77. Weakfish.....	81	664	677	68	--	--
79. Miscellaneous.....	30	85	30	5	25	55
Total.....	35,311	81,703	78,887	18,216	13,117	6,794
Region II, Middle Atlantic:						
2. Basses, black sea....	1,773	2,071	2,081	1,530	144	89
4. Billfishes.....	13	--	6	7	--	--
5. Bluefish.....	9,004	3,347	4,423	6,485	428	1,015
6. Bonitos.....	54	--	28	26	--	--
9. Catfishes.....	34	2,334	1,651	162	71	484
11. Cods.....	154	--	--	154	--	--
12. Croakers.....	1,466	3,151	2,687	389	572	969
14. Dolphins.....	31	--	10	21	--	--
15. Drum, black.....	--	26	26	--	--	--
16. Drum, red.....	51	46	46	--	--	51

Table 6.--Number of fish caught^{1/} by U.S. salt-water anglers in 1970, by region and species and by principal area and method of fishing--Continued

Region and species group	Principal area of fishing		Principal method of fishing			
	Ocean	Sounds, rivers, and bays	Private or rented boat	Party or charter boat	Bridge, pier, or jetty	Beach or bank
-- -- -- -- -- Thousands -- -- -- -- --						
17. Eel, American.....	4	363	352	--	15	--
19. Flounders, summer....	2,470	1,721	1,737	1,376	175	903
20. Flounder, winter.....	2,660	4,836	3,941	2,052	467	1,036
25. Hake, red.....	480	17	85	412	--	--
26. Hake, silver.....	912	--	129	484	169	130
31. Kingfishes.....	1,297	614	497	850	--	564
34. Mackerels, Atlantic..	13,377	64	6,781	11,584	63	13
35. Mackerel, king.....	45	--	--	45	--	--
37. Mackerels, Spanish...	346	4	40	300	--	10
41. Perches.....	928	14,144	11,972	1,026	784	1,290
42. Perch, yellow.....	--	3,324	3,066	--	--	258
45. Porgies.....	803	385	191	557	358	82
46. Puffers.....	17,261	10,347	9,339	3,686	815	13,768
54. Searobins.....	4,398	1,433	2,374	2,820	188	449
57. Shad, American.....	84	1,457	1,036	65	8	432
58. Sharks.....	64	28	23	45	--	24
59. Sharks, dogfish.....	82	71	71	--	--	82
60. Skates and rays.....	53	--	--	--	--	53
67. Spot.....	1,880	31,072	21,769	7,764	2,882	537
69. Striped bass.....	961	8,896	7,784	1,164	177	732
71. Tautog.....	316	67	42	225	116	--
72. Toadfish, oyster....	33	100	100	--	--	33
75. Tunas.....	54	--	54	--	--	--
76. Wahoo.....	172	--	3	169	--	--
77. Weakfish.....	3,281	6,116	7,159	1,461	265	512
79. Miscellaneous.....	--	2,634	2,327	150	125	32
Total.....	69,541	98,668	91,830	45,009	7,822	23,548
Region III, South Atlantic:						
1. Barracudas.....	325	--	81	240	4	--
2. Basses, black sea....	5,367	1,851	1,433	3,895	1,399	491
4. Billfishes.....	214	--	132	82	--	--
5. Bluefish.....	9,778	3,073	2,181	1,163	1,356	8,151
6. Bonitos.....	278	45	211	108	4	--
9. Catfishes.....	5,543	5,664	4,080	1,407	4,340	1,380
10. Cobia.....	26	--	26	--	--	--
12. Croakers.....	3,253	5,268	4,595	840	1,430	1,656
14. Dolphins.....	2,166	--	1,571	595	--	--
15. Drum, black.....	453	4,742	2,671	792	1,608	124
16. Drum, red.....	1,032	3,851	3,839	276	287	481
17. Eel, American.....	30	132	--	--	137	25
19. Flounders, summer....	2,450	1,274	1,421	427	497	1,379
22. Groupers.....	3,933	265	3,150	334	506	208
23. Grunts.....	14,234	7,566	13,430	160	7,382	828

Table 6.--Number of fish caught^{1/} by U.S. salt-water anglers in 1970, by region and species and by principal area and method of fishing--Continued

Region and species group	Principal area of fishing		Principal method of fishing			
	Ocean	Sounds, rivers, and bays	Private or rented boat	Party or charter boat	Bridge, pier, or jetty	Beach or bank
----- Thousands -----						
29. Jacks.....	5,703	1,551	3,937	326	1,610	1,381
31. Kingfishes.....	12,265	2,770	548	620	2,732	11,135
32. Ladyfish.....	14	533	531	4	12	--
35. Mackerel, king.....	4,106	59	2,106	2,005	44	10
37. Mackerels, Spanish...	3,919	1,048	3,447	317	628	575
38. Mulletts.....	316	145	69	--	39	353
41. Perches.....	--	389	--	--	389	--
44. Pompanos.....	134	9	7	--	12	124
45. Porgies.....	6,266	9,964	4,989	1,068	7,499	2,674
46. Puffers.....	6,485	2,617	2,160	213	2,290	4,439
54. Searobins.....	--	4	--	--	--	4
55. Seatrout, sand.....	--	47	--	--	--	47
56. Seatrout, spotted....	4,374	9,618	7,686	2,187	3,433	686
58. Sharks.....	15	5	11	9	--	--
59. Sharks, dogfish.....	39	28	34	4	14	15
60. Skates and rays.....	33	72	32	--	50	23
62. Snappers.....	112	501	402	54	132	25
63. Snapper, red.....	1,481	316	853	484	444	16
64. Snapper, yellowtail..	8,505	2,338	5,802	505	3,866	670
65. Snook.....	1,662	867	2,265	11	141	112
66. Spadefish, Atlantic..	--	56	--	--	15	41
67. Spot.....	7,063	5,047	138	1,150	5,143	5,679
69. Striped bass.....	--	71	46	--	25	--
75. Tunas.....	306	48	273	42	39	--
76. Wahoo.....	82	--	53	29	--	--
79. Miscellaneous.....	241	140	4	198	48	131
Total.....	112,203	71,974	74,214	19,545	47,555	42,863
Region IV, East Gulf:						
1. Barracudas.....	4	--	4	--	--	--
2. Basses, black sea....	--	1,248	1,248	--	--	--
4. Billfishes.....	8	--	8	--	--	--
5. Bluefish.....	66	20	50	--	--	36
6. Bonitos.....	202	80	23	80	179	--
9. Catfishes.....	2,545	24,755	16,687	659	7,551	2,403
10. Cobia.....	--	8	8	--	--	--
12. Croakers.....	2,457	33,576	11,785	17,370	4,332	2,546
14. Dolphins.....	268	--	268	--	--	--
15. Drum, black.....	121	4,281	617	--	3,707	78
16. Drum, red.....	2,694	4,579	3,524	1,539	1,276	934
17. Eel, American.....	--	76	--	--	73	3
19. Flounders, summer....	1,806	2,615	1,930	1,173	469	849
22. Groupers.....	2,393	745	2,327	608	203	--
23. Grunts.....	2,129	6,691	4,740	130	3,576	374

Table 6.--Number of fish caught^{1/} by U.S. salt-water anglers in 1970, by region and species and by principal area and method of fishing--Continued

Region and species group	Principal area of fishing		Principal method of fishing			
	Ocean	Sounds, rivers, and bays	Private or rented boat	Party or charter boat	Bridge, pier, or jetty	Beach or bank
----- Thousands -----						
29. Jacks.....	757	389	347	11	674	114
31. Kingfishes.....	6,527	5,432	6,375	38	2,151	3,395
32. Ladyfish.....	132	1,475	1,177	146	215	69
35. Mackerel, king.....	2,552	261	1,766	887	160	--
37. Mackerels, Spanish...	1,701	613	1,188	534	488	104
38. Mulletts.....	3,439	126	--	--	126	3,439
41. Perches.....	184	585	346	80	154	189
42. Perch, yellow.....	--	158	158	--	--	--
44. Pompanos.....	98	448	226	33	251	36
45. Porgies.....	905	12,329	6,579	128	4,587	1,940
46. Puffers.....	4	204	19	4	81	104
54. Searobins.....	--	34	--	--	34	--
55. Seatrout, sand.....	3,151	18,667	2,231	12,838	5,577	1,172
56. Seatrout, spotted....	5,137	23,344	20,884	1,833	3,095	2,669
58. Sharks.....	109	28	124	--	13	--
59. Sharks, dogfish.....	3	217	209	--	8	3
60. Skates and rays.....	3	160	52	--	108	3
62. Snappers.....	11	115	--	11	115	--
63. Snapper, red.....	2,365	1,192	1,690	1,654	166	47
64. Snapper, yellowtail..	294	287	304	43	--	234
65. Snook.....	137	264	351	--	50	--
66. Spadefish, Atlantic..	17	1,025	62	--	918	62
75. Tunas.....	12	--	12	--	--	--
79. Miscellaneous.....	121	509	9	93	398	130
Total.....	42,352	146,536	87,328	39,892	40,735	20,933
Region V, West Gulf:						
2. Basses, black sea....	--	12	12	--	--	--
5. Bluefish.....	468	9	355	77	12	33
6. Bonitos.....	--	12	--	12	--	--
9. Catfishes.....	3,083	12,307	4,512	725	7,661	2,492
10. Cobia.....	85	--	--	--	85	--
12. Croakers.....	5,476	8,417	3,384	892	6,237	3,380
15. Drum, black.....	724	4,363	4,435	16	457	179
16. Drum, red.....	2,366	3,545	4,131	47	418	1,315
17. Eel, American.....	--	17	4	--	--	13
19. Flounders, summer....	984	1,192	1,714	124	185	153
22. Groupers.....	289	149	108	--	68	262
23. Grunts.....	11,805	20	11,555	--	270	--
29. Jacks.....	114	31	108	4	12	21
31. Kingfishes.....	2,712	531	541	163	2,279	260
35. Mackerel, king.....	240	19	123	117	19	--
37. Mackerels, Spanish...	371	108	218	189	8	64
38. Mulletts.....	--	257	--	--	--	257
41. Perches.....	85	603	40	19	467	162
44. Pompanos.....	111	24	46	--	89	--
45. Porgies.....	470	1,498	1,107	163	225	473

Table 6.--Number of fish caught^{1/} by U.S. salt-water anglers in 1970, by region and species and by principal area and method of fishing--Continued

Region and species group	Principal area of fishing		Principal method of fishing			
	Ocean	Sounds, rivers, and bays	Private or rented boat	Party or charter boat	Bridge, pier, or jetty	Beach or bank
----- Thousands -----						
46. Puffers.....	8	17	--	--	25	--
54. Searobins.....	4	--	--	--	4	--
55. Seatrout, sand.....	5,282	2,907	5,645	450	1,515	579
56. Seatrout, spotted....	11,185	13,113	17,615	985	2,599	3,099
58. Sharks.....	30	38	30	--	38	--
59. Sharks, dogfish.....	10	48	43	--	--	15
60. Skates and rays.....	8	263	245	5	12	9
62. Snappers.....	1,047	168	537	390	288	--
63. Snapper, red.....	--	119	119	--	--	--
66. Spadefish, Atlantic..	91	99	57	19	114	--
79. Miscellaneous.....	125	649	--	28	149	597
Total.....	47,173	50,535	56,684	4,425	23,236	13,363
Region VI, South Pacific:						
1. Barracudas.....	1,675	13	361	1,260	67	--
3. Basses, Pacific.....	7,060	49	440	1,256	5,410	3
4. Billfishes.....	8	--	8	--	--	--
6. Bonitos.....	4,131	9	1,214	2,122	705	99
7. California corbina...	2,762	103	2,208	18	478	161
8. California sheephead.	117	--	16	33	68	--
12. Croakers.....	1,418	1,112	1,558	226	746	--
18. Flatfishes, Pacific..	458	11	5	22	395	47
21. Greenlings.....	92	--	--	--	92	--
27. Halibut, California..	2,469	--	1,695	260	462	52
30. Jack mackerel.....	580	--	73	210	297	--
33. Lingcod.....	29	--	--	29	--	--
36. Mackerel, Pacific....	222	--	23	78	121	--
39. Ocean whitefish.....	174	--	123	20	31	--
40. Opaleye.....	176	--	13	--	84	79
47. Rockfishes.....	3,436	68	560	1,075	1,869	--
52. Sculpins and cabezon.	923	--	92	353	457	21
53. Seabass, white.....	209	6	59	91	50	15
58. Sharks.....	28	4	4	--	28	--
59. Sharks, dogfish.....	246	12	12	--	181	65
61. Smelts.....	432	--	8	24	400	--
70. Surfperches.....	5,631	1,095	785	586	4,961	394
75. Tunas.....	873	--	571	302	--	--
78. Yellowtail, California.....	618	--	317	234	67	--
79. Miscellaneous.....	952	20	274	140	558	--
Total.....	34,719	2,502	10,419	8,339	17,527	936

Table 6.--Number of fish caught^{1/} by U.S. salt-water anglers in 1970, by regions and species and by principal area and method of fishing--Continued

Region and species group	Principal area of fishing		Principal method of fishing			
	Ocean	Sounds, rivers, and bays	Private or rented boat	Party or charter boat	Bridge, pier, or jetty	Beach or bank
- - - - - Thousands - - - - -						
Region VII, North Pacific:						
11. Cods.....	451	58	44	--	44	421
12. Croakers.....	235	187	151	13	258	--
18. Flatfishes, Pacific..	937	1,237	1,270	74	769	61
21. Greenlings.....	25	54	25	--	54	--
27. Halibut, California..	46	8	46	--	--	8
28. Halibut, Pacific.....	121	81	194	8	--	--
30. Jack mackerel.....	50	69	18	65	36	--
33. Lingcod.....	574	164	518	83	133	4
47. Rockfishes.....	1,296	1,506	1,699	509	454	140
48. Sablefish.....	101	376	106	88	283	--
49. Salmon, chinook.....	482	430	677	213	4	18
50. Salmon, coho.....	958	489	909	398	22	118
51. Salmon, pink.....	69	93	65	25	15	57
52. Sculpins and cabezon..	456	1,480	625	17	1,159	135
53. Seabass, white.....	7	--	--	--	7	--
57. Shad, American.....	--	69	--	--	--	69
58. Sharks.....	8	7	8	--	7	--
59. Sharks, dogfish.....	23	157	175	--	5	--
60. Skates and rays.....	--	4	--	--	4	--
61. Smelts.....	287	4,093	313	--	3,112	955
68. Steelhead.....	73	651	77	13	76	558
69. Striped bass.....	457	1,574	1,426	--	298	307
70. Surfperches.....	997	688	421	21	648	595
73. Trout, cutthroat.....	12	1,088	608	8	12	472
74. Trout, Dolly Varden..	--	199	30	--	--	169
75. Tunas.....	44	--	--	44	--	--
79. Miscellaneous.....	547	1,082	179	140	377	933
Total.....	8,256	15,844	9,584	1,719	7,777	5,020

^{1/} The number of fish caught in the two principal areas of fishing is equal to the total catch for a species group in a region, and the number of fish caught by the four methods of fishing is equal to the total catch for a species group in a region.

Table 7.--Number of salt-water anglers and number of fish caught in 1960, 1965, and 1970 for species categories with over 10 million fish caught in each year.

Species category ^{1/}	Number of anglers ^{2/}			Number of fish caught		
	1960	1965	1970	1960	1965	1970
----- Thousands -----						
Seatrouts (55, 56, 77) . . .	1,269	1,593	2,212 ^{4/}	83,836	89,414	106,967
Flatfishes (18, 19, 20, 27, 28)	2,271	2,734	3,125	50,646	54,645	57,434
Croakers (12)	933	1,200	1,372	45,577	51,134	66,016
Porgies (45)	983	1,228	1,513	37,189	36,563	35,470
Catfishes (9)	803	679	1,300	32,695	41,739	56,265
Spot (67)	541	485	740	30,229	21,504	45,062 ^{4/}
Kingfishes (31)	718	684	1,008	29,621	13,122 ^{3/}	34,884 ^{4/}
Bluefish (5)	899	955	1,440 ^{4/}	23,814	30,525	36,458
Grunts (23)	391	411	564	21,617	26,318	42,445
Snappers (62, 63, 64) . . .	461	794 ^{3/}	893	16,098	31,644	18,851
Perches (41)	287	405	504	15,714	20,204	16,950
Red drum (16)	639	777 ^{3/}	864	15,277	11,195	18,164
Spanish mackerels (35, 37)	432	816 ^{3/}	1,004	12,529	17,925	15,392
Striped bass (69)	687	866	946	12,402	18,251	16,268
Atlantic mackerels (34) . .	235	220	605 ^{4/}	10,847	22,745	52,014 ^{4/}
Puffers (46)	346	1,065 ^{3/}	1,367	10,711	42,712 ^{3/}	47,905
TOTAL				448,802	529,640	666,545

1/ The numbers in parentheses following the species categories refer to the species groups as used in the 1970 Angling Survey. (See Classification of Species Groups for species included in each species group.) For comparison purposes, it was necessary to combine several species groups from each survey.

2/ For species categories in which more than one species group is included, the number of anglers for each group is greater than the actual number for that group, as some anglers may have caught more than one species group in that category. The number of anglers is not additive because of duplication of anglers among species categories.

3/ Difference between 1960 and 1965 significant (at 95 percent level).

4/ Difference between 1965 and 1970 significant (at 95 percent level).

DISCUSSION

Both response-bias errors and sampling errors were recognized and discussed in the 1965 Angling Survey, and similar errors are known to exist in the 1970 Angling Survey. Response-bias errors that result from interviewee's failure to provide accurate accounts of his fishing activity, such as prestige-bias and memory-bias errors, are inherent in a household survey with a 1-year recall period. The size of these errors cannot be determined, nor can they be reduced or eliminated by increasing the sample size. Most response-bias errors tend to be positive and cause overestimation of catches. Survey methodology was similar for all three Angling Surveys, and, thus, response-bias errors should have had the same biasing effect in each Survey.

Sampling Design

The 1970 National Survey of Fishing and Hunting was designed specifically to obtain information on the number of fishermen and hunters in the United States and on their participation and expenditures, but not to obtain data on the catches of salt-water anglers. Thus, the number of anglers interviewed was determined primarily by the sample size for the 1970 National Survey of Fishing and Hunting. For the specific purpose of obtaining catch data, a different sampling design of the same size could have resulted in a larger sample of salt-water anglers and therefore in more reliable data. The sampling errors present in the 1970 Angling Survey should be nondirectional, and thus nonbiasing. As approximately 95 percent of those persons (in the sample) identified as salt-water anglers in the 1970 National Survey of Fishing and Hunting were subsequently interviewed for the 1970 Angling Survey, nonresponse is not considered as a source of bias.

Standard Error

The standard error is primarily a measure of sampling variability, that is, variations that occur by chance because a sample rather than the whole of the population is surveyed. As calculated for this survey, the standard error also partially includes the effect of response and enumeration errors, but it does not measure, as such, any systematic biases in the data. The chances are about 68 out of 100 that an estimate from the sample would differ from a complete census figure by less than the standard error. The chances are about 90 out of 100 that this difference would be less than 1.6 times the standard error, and the chances are about 95 out of 100 that the difference would be less than twice the standard error.

The figures presented in tables 8 through 12 are approximations to the standard errors of various estimates shown in this survey. In order to derive standard errors that would be applicable to a wide variety of items and could be prepared at a moderate cost, a number of approximations were required. As a result, the tables of standard errors provide an indication of the order of magnitude of the standard errors rather than the precise standard error for any specific item. Table 8 contains standard errors for major findings of the 1970 Angling Survey, table 9 contains the standard errors of estimated number of anglers, and table 10 contains the standard errors of estimated number of fish caught.

The reliability of an estimated percentage, computed by using sample data for both numerator and denominator, depends upon both the size of the percentage and the size of the total upon which the percentage is based. Estimated percentages are relatively more reliable than the corresponding estimates of the numerators of the percentages, particularly if the percentages are 50 percent or more. Tables 11 and 12 contain the standard errors of estimated percentages.

For estimates less than 250,000 anglers or 20,000,000 fish caught, the relative errors are rather large. Estimated percentages would be an improvement; however, because of the large standard errors involved, there is little chance that percentages would reveal useful information when computed on a base smaller than 250,000 anglers or 20,000,000 fish. Estimated totals are shown, however, even though the relative standard errors of these totals are larger than those for the corresponding percentages. The estimates for less than 250,000 anglers or 20,000,000 fish caught are provided primarily to permit such combinations of the categories as serve each user's needs.

The following examples illustrate the use of the tables of standard errors. The tabulations show that 864,000 anglers caught red drum, species group 16. Table 9 shows the standard error of an estimate of this size to be approximately 132,000. The chances are 68 out of 100 that the estimate would have been a figure differing from a complete census figure by less than 132,000. The chances are 95 out of 100 that the estimate would have differed from a complete census figure by less than 264,000.

Of these 864,000 anglers, 390,000 or 45.1 percent caught red drum in the East Gulf region. Table 11 shows the standard error of 45.1 percent on a base of 864,000 to be approximately 7.7 percent. Consequently, chances are 68 out of 100 that the estimated 45.1 percent would be within 7.7 percentage points of a complete census figure, and chances are 95 out of 100 that the estimate would be within 15.4 percentage points of a census figure; i.e., this 95 percent confidence interval would be from 29.7 to 60.5 percent.

For a difference between two sample estimates, the standard error is approximately equal to the square root of the sum of the squares of the standard errors of each estimate considered separately. This formula will represent the actual standard error quite accurately for the difference between two estimates of the same characteristic in two different areas, or for the difference between separate and uncorrelated characteristics in the same area. If, however, there is a high positive correlation between the two characteristics, the formula will overestimate the true standard error. The following illustrates the computation of the standard error of a difference. The tabulations show that there were 649,000 anglers who caught searobins, species group 54. Thus, the apparent difference between the number of anglers catching red drum (864,000) and searobins is 215,000. The standard error of 864,000 is 132,000, as shown above. Table 9 shows the standard error of an estimate of 649,000 to be approximately 115,000. The standard error of the estimated difference of 215,000 is about $175,000 = \sqrt{(132,000)^2 + (115,000)^2}$. The chances are 68 out of 100 that the estimated difference based on the samples would be less than 175,000 from the difference derived using complete census figures. The 68 percent confidence interval around the 215,000 difference is from 40,000 to 390,000, i.e., $215,000 \pm 175,000$. This confidence interval *does not* include negative values and a conclusion that the number of anglers catching searobins was less than the number catching red drum would be correct for roughly 68 percent of all samples. The 95 percent confidence interval, from -135,000 to 565,000 ($215,000 \pm 350,000$) *does* include negative values and hence we cannot conclude with 95 percent confidence that the number of anglers catching searobins was less than the number catching red drum.

Table 8.--Standard error estimates for the major findings of the 1970 Angling Survey

	Size of estimate	Stand. error of estimates (68 chances out of 100)	Confidence interval (68 percent probability)
----- Thousands -----			
Total number of anglers.	9,392	430	8,962-9,822
Number of anglers fishing in:			
Region			
I. North Atlantic	1,666	285	1,381-1,951
II. Middle Atlantic.	1,767	295	1,472-2,062
III. South Atlantic	1,808	300	1,508-2,108
IV. East Gulf.	1,478	270	1,208-1,748
V. West Gulf.	872	205	667-1,077
VI. South Pacific.	894	210	684-1,104
VII. North Pacific.	1,311	255	1,056-1,566
Total number of fish caught	817,317	102,350	714,967-919,667
Number of fish caught in:			
Region			
I. North Atlantic	117,014	28,760	88,254-145,774
II. Middle Atlantic.	168,209	38,500	129,709-206,709
III. South Atlantic	184,177	41,510	142,667-225,687
IV. East Gulf.	188,888	42,390	146,498-231,278
V. West Gulf.	97,708	25,030	72,678-122,738
VI. South Pacific.	37,221	12,730	24,491-49,951
VII. North Pacific.	24,100	9,700	14,400-33,800
Total number caught of:			
Species group			
Spotted seatrout (56).	66,771	12,180	54,591-78,951
Croakers (12).	66,016	12,080	53,936-78,096
Catfishes (9).	56,265	10,800	45,465-67,065
Atlantic mackerels (34).	52,014	10,240	41,774-62,254
Puffers (46).	47,905	9,680	38,225-57,585
Spot (67).	45,062	9,290	35,772-54,352
Grunts (23).	42,445	8,930	33,515-51,375
Bluefish (5).	36,458	8,090	28,368-44,548

Table 9.--Standard errors of estimated number of anglers

U.S. total number of anglers and total number of anglers catching a species group

(68 chances out of 100)

Size of estimate	Standard error
----- Thousands -----	-----
100	45
250	70
500	100
750	125
1,000	140
2,000	200
5,000	315
7,500	395
9,000	415

Total number of anglers fishing in a region and number of anglers catching a species group in less than the total number of regions in which the species group was reported

(68 chances out of 100)

Size of estimate	Standard error
----- Thousands -----	-----
100	70
250	110
500	155
750	190
1,000	220
2,000	315

Table 10.--Standard errors of estimated number of fish caught

U.S. total number of fish caught and total catch of a species group

(68 chances out of 100)

Size of estimate	Standard error
----- Thousands -----	-----
1,000	1,140
5,000	2,600
10,000	3,770
20,000	5,590
30,000	7,150
50,000	9,960
75,000	13,240
100,000	16,410
200,000	28,650
400,000	52,640
600,000	76,490
800,000	100,290

Total number of fish caught (all species groups) in a region and catch of a species group in less than the total number of regions in which the species group was caught

(68 chances out of 100)

Size of estimate	Standard error
----- Thousands -----	-----
1,000	1,770
5,000	4,030
10,000	5,850
20,000	8,680
30,000	11,100
50,000	15,470
75,000	20,560
100,000	25,470
200,000	44,480

Table 11.--Standard errors of estimated percentages of anglers

U.S. total number of anglers and total number of anglers catching a species group

(68 chances out of 100)

Estimated percentage	Base of percentage (thousands)							
	250	500	750	1,000	2,000	5,000	7,500	9,000
2 or 98 . . .	4.0	2.8	2.3	2.0	1.4	0.9	0.7	0.7
5 or 95 . . .	6.2	4.4	3.6	3.1	2.2	1.4	1.1	1.0
10 or 90 . . .	8.6	6.1	5.0	4.3	3.0	1.9	1.6	1.4
20 or 80 . . .	11.4	8.1	6.6	5.7	4.1	2.6	2.1	1.9
35 or 65 . . .	13.7	9.7	7.9	6.8	4.8	3.1	2.5	2.3
50	14.3	10.1	8.3	7.2	5.1	3.2	2.6	2.4

Total number of anglers fishing in a region and number of anglers catching a species group in less than the total number of regions in which the species group was reported

(68 chances out of 100)

Estimated percentage	Base of percentage (thousands)				
	250	500	750	1,000	2,000
2 or 98 . . .	6.2	4.4	3.6	3.1	2.2
5 or 95 . . .	9.7	6.9	5.6	4.8	3.4
10 or 90 . . .	13.3	9.4	7.7	6.7	4.7
20 or 80 . . .	17.8	12.6	10.2	8.9	6.3
35 or 65 . . .	21.2	15.0	12.2	10.6	7.5
50	22.2	15.7	12.8	11.1	7.8

Table 12.--Standard errors of estimated percentages of fish caught

U.S. total number of fish caught and total catch of a species group

(68 chances out of 100)

Estimated percentage	Base of percentage (thousands)								
	20,000	30,000	50,000	75,000	100,000	200,000	400,000	600,000	800,000
2 or 98 .	3.5	2.9	2.2	1.8	1.6	1.1	0.8	0.6	0.6
5 or 95 .	5.6	4.5	3.5	2.8	2.5	1.7	1.2	1.0	0.9
10 or 90 .	7.6	6.2	5.0	3.9	3.4	3.0	1.7	1.4	1.2
20 or 80 .	10.1	8.3	6.4	5.2	4.5	3.2	2.3	1.8	1.6
35 or 65 .	12.1	9.9	7.6	6.2	5.4	3.8	2.7	2.2	1.9
50	12.6	10.3	8.0	6.5	5.7	4.0	2.8	2.3	2.0

Total number of fish caught (all species groups) in a region and catch of a species group in less than the total number of regions in which the species group was caught

(68 chances out of 100)

Estimated percentage	Base of percentage (thousands)					
	20,000	30,000	50,000	75,000	100,000	200,000
2 or 98 .	5.5	4.5	3.5	2.8	2.5	1.7
5 or 95 .	8.6	7.0	5.4	4.4	3.8	2.7
10 or 90 .	11.8	9.6	7.5	6.1	5.3	3.7
20 or 80 .	15.7	12.8	9.9	8.1	7.0	5.0
35 or 65 .	18.7	15.3	11.8	9.7	8.4	5.9
50	19.6	16.0	12.4	10.1	8.8	6.2

Improved Screening of Data

For both the 1960 and 1965 Angling Survey it was necessary to hand code to species groups the names of fish written in at the end of the listed species on the interview forms. In coding the write-ins for the 1965 Angling Survey, a problem with reported average weights became evident, as some anglers reported total weight for a species instead of average weight. In most cases, an angler reporting total weight for one species would report total weight for all species caught. Therefore, all interview forms were examined for reports of total weight and those identified were changed to average weight by dividing the total weight by the number of fish. Additionally, and prior to preparing the tabular results of the survey, the Bureau of the Census screened all reported weights based on an empirically derived maximum average weight for each species group.

In 1970, the interview forms were similarly examined to encode the fish names entered at the end of the listed species. As NMFS prepared the tabular results of the 1970 Angling Survey from the raw data, additional screening of the average weight reports was possible. Reported weights were screened for each species in each region and total weights detected were changed to average weights. In addition, a few average weights deemed excessive for a species in a region were replaced with the mean weight of all reports for that species in the region.

Comparison with State Surveys

The only data available for direct comparison with the results of the Angling Surveys are the California Fish and Game Department's party boat logbook records for southern California (Region VI of the Angling Surveys). All California party boats are required by State law to keep logbooks. Although not perfect, these records are the best continuous set of marine sport fish catch statistics in the country. The Angling Survey total catch estimate for southern California was higher than the logbook figure in both 1965 and 1970. The 1965 Angling Survey estimate of 11,541,000 fish was 305 percent higher than the logbook catch of 3,783,000, while the 1970 Angling Survey estimate of 8,339,000 was 193 percent higher than the logbook value of 4,322,000.

However, as the Angling Surveys are based on samples rather than complete censuses, the chances are about 95 in 100 that a sampling estimate would differ from a complete census by less than two standard errors. The approximate standard error of the catch estimate of the Angling Survey for 1965 is 4,300,000 fish, indicating the true catch would be within the range of 2,941,000 to 20,141,000 fish in 95 to 100 cases. Similarly, the approximate standard error of the 1970 catch estimate is 5,300,000 fish, with the true catch between zero and 18,939,000. Thus, the catches from the logbooks lie within two standard errors of the estimates from the Angling Surveys, although the positive differences between the Angling Survey and logbook catches in southern California (Region VI) certainly indicate an overestimation by the Angling Surveys.

Improving Sampling Methods

NMFS has recognized the inadequacies of the data from the Angling Surveys and has made efforts to develop improved methods for collecting catch statistics. Audits and Surveys, Inc., was engaged in 1971 to: 1) develop methods of reducing response bias associated with household surveys and 2) apply these methods in a 2-month pilot household personal interview survey in California. The response bias study indicated that a substantial reduction of bias would result by having respondents recall catches on a trip-by-trip basis from the most recent trip extending backward and by limiting the total recall period to 2 months or less. Improved interviewing techniques, including questionnaire design and methods of reducing species identification problems, would reduce response bias.

Pilot household survey

The pilot household survey, using a stratified area probability sampling plan, estimated a Statewide party boat catch for October and November 1971 of 749,900 fish, an overestimate of 31 percent compared with the California party boat logbook figure of 571,800. The coefficient of variation (c.v., the standard error divided by the estimate) of the pilot survey estimate was 0.088, and the overestimate was statistically significant. (If an estimate deviates from the true catch by more than 1.96 c.v., it is significant at the 95 percent level.) However, this overestimate results largely from an overestimation of 80 percent for northern California (household estimate of 259,100 fish compared to logbook estimate of 144,100). A c.v. could not be computed for the northern California estimate because of small sample sizes. The 2-month southern California estimate of 490,800 (c.v. = 0.101), an overestimation of 15 percent compared with 427,700 from the logbooks, is within two c.v. of the logbook catch. The pilot survey overestimated angler days by 6 percent (85,000 vs 80,300) statewide and by 21 percent for northern California (34,600 vs 28,500). However, for southern California, the pilot survey estimate of 50,400 angler days was a 3-percent underestimate compared with 51,800 from the logbooks.

Field survey

A field survey was made in California in October 1971 by NMFS Tiburon Laboratory to obtain length and weight data for comparison with the pilot household survey. Based on averages taken over all species and all fishing methods except party boats, anglers were able to estimate average lengths better than average weights. Statewide, anglers overestimated average lengths by 8 percent and average weights by 204 percent. Lengths were underestimated by 4 percent in northern California and overestimated by 13 percent in southern California, whereas weights were overestimated by 158 percent in the north and 231 percent in the south. Comparisons for individual species varied widely; anglers were able to estimate lengths and weights more easily for some species. For most species, conversion of average lengths to average weights by use of length-weight relationships would provide better estimates of weight than direct estimation by anglers.

The results of the pilot household survey in California indicate that a properly designed household survey is a feasible method of obtaining statistics on marine sport fisheries. Accordingly, NMFS is initiating a program to collect data that will result in annual estimates of catch and effort by coastal regions of the United States, with expansion to annual estimates by State, as funding becomes available.

CLASSIFICATION OF SPECIES GROUPS 4/

The 1970 Angling Survey catches were categorized into the 79 species groups listed below. The common and scientific names listed agree with the standard names in *A List of Common and Scientific Names of Fishes from the United States and Canada* (American Fisheries Society, 1970). For a list of other common names used for fishes included in these species groups, see Common Name Index.

1. Barracudas Includes members of the family Sphyraenidae, the barracudas.
2. Basses, black sea Includes primarily the species *Centropristis striata* the black sea bass, but also includes the species *C. melana*, the southern sea bass, *C. philadelphica*, the rock sea bass, and *C. ocyurus*, the bank sea bass.
3. Basses, Pacific Includes members of the genus *Paralabrax*, rock basses.
4. Billfishes Includes members of the family Istiophoridae, the billfishes.
5. Bluefish Includes members of the species *Pomatomus saltatrix*.
6. Bonitos Includes members of the genus, *Sarda*, the bonitos.
7. California corbina Includes only the species *Menticirrhus undulatus*.
8. California sheephead Includes only the species *Pimelometopon pulchrum*.
9. Catfishes Includes members of the family Ariidae, the sea catfishes, although may include some members of the family Ictaluridae, the fresh-water catfishes.
10. Cobia. Includes only the species *Rachycentron canadum*.
11. Cods Includes primarily the species *Gadus morhua*, the Atlantic cod, *Gadus macrocephalus*, the Pacific cod, and *Theragra chalcogramma*, the walleye pollock; but also includes the species *Microgadus tomcod*, the Atlantic tomcod, and *Microgadus proximus*, the Pacific tomcod.
12. Croakers Includes those members of the drum family Sciaenidae, which are commonly known as croakers.
13. Cunner Includes only the species *Tautoglabrus adspersus*.
14. Dolphins Includes members of the family Coryphaenidae, the dolphins.
15. Drum, black Includes only the species *Pogonias cromis*.

4/ A detailed discussion of species grouping is included under SCREENING AND INTERVIEWING.

16. Drum, red Includes only the species *Sciaenops ocellata*.
17. Eel, American Includes only the species *Anguilla rostrata*.
18. Flatfishes, Pacific Includes members of the order Pleuronectiformes, the flounders occurring on the Pacific coast, except *Paralichthys californicus*, California halibut, and *Hippoglossus stenolepis*, Pacific halibut, which are listed separately.
19. Flounders, summer Includes primarily the species *Paralichthys dentatus*, the summer flounder, in Regions I and II; and the species *P. albigutta*, the Gulf flounder, and *P. lethostigma*, the southern flounder in Regions III, IV, and V. Other members of the family Bothidae, left-eye flounders, may be included in any region.
20. Flounders, winter Includes primarily the species *Pseudopleuronectes americanus*, the winter flounder; but may include other members of the family Pleuronectidae, the right-eye flounders.
21. Greenlings Includes members of the family Hexagrammidae, the greenlings, except *Ophiodon elongatus*, the lingcod, which is listed separately.
22. Groupers Includes those Atlantic members of the sea bass family Serranidae, which are commonly known as groupers.
23. Grunts Includes members of the family Pomadasysidae, the grunts.
24. Haddock Includes only the species *Melanogrammus aeglefinus*.
25. Hake, red Includes only the species *Urophycis chuss*.
26. Hake, silver Includes only the species *Merluccius bilinearis*.
27. Halibut, California Includes only the species *Paralichthys californicus*.
28. Halibut, Pacific Includes only the species *Hippoglossus stenolepis*.
29. Jacks Includes those Atlantic members of the family Carangidae known as the crevalles, runners, jacks, and amberjacks; particularly of the genera *Caranx* and *Seriola*. The members of the genus *Trachinotus*, known as pompanos are listed separately.
30. Jack mackerel Includes only the species *Trachurus symmetricus*.
31. Kingfishes Includes Atlantic members of the genus *Menticirrhus*.
32. Ladyfish Includes only the species *Elops saurus*.
33. Lingcod Includes only the species *Ophiodon elongatus*.

34. Mackerels, Atlantic Includes only the species *Scomber scombrus*, the Atlantic mackerel, and *Scomber japonicus*, the chub mackerel.
35. Mackerel, king Includes only the species *Scomberomorus cavalla*.
36. Mackerel, Pacific Includes only the species *Scomber japonicus*.
37. Mackerels, Spanish Includes the species *Scomberomorus maculatus*, the Spanish mackerel, and *Scomberomorus regalis*, the cero.
38. Mulletts Includes members of the genus *Mugil*, the mullets.
39. Ocean whitefish Includes only the species *Caulolatilus princeps*.
40. Opaleye Includes only the species *Girella nigricans*.
41. Perches Includes primarily the species *Morone americana*, the white perch in Regions I and II, and primarily the species *Bairdiella chrysura*, the silver perch in Regions III, IV, and V.
42. Perch, yellow Includes only the species *Perca flavescens*.
43. Pollock Includes only the species *Pollachius virens*.
44. Pompanos Includes primarily the species *Trachinotus carolinus*, the Florida pompano, but includes other members of the genus *Trachinotus*, the pompanos.
45. Porgies Includes those members of the family Sparidae that are commonly known as porgies.
46. Puffers Includes members of the families Tetraodontidae, the puffers; and Diodontidae, the porcupinefishes.
47. Rockfishes Includes Pacific members of the family Scorpaenidae, the rockfishes and scorpionfishes.
48. Sablefish Includes only the species *Anoplopoma fimbria*.
49. Salmon, chinook Includes only the species *Oncorhynchus tshawytscha*.
50. Salmon, coho Includes only the species *Oncorhynchus kisutch*.
51. Salmon, pink Includes only the species *Oncorhynchus gorbuscha*.
52. Sculpins and cabezon Includes the species *Scorpaenichthys marmoratus*, and other Pacific members of the family Cottidae.
53. Seabass, white Includes only the species *Cynoscion nobilis*.
54. Searobins Includes members of the family Triglidae.

55. Seatrout, sand Includes primarily the species *Cynoscion arenarius*, the sand seatrout, but also includes *C. nothus*, the silver seatrout.
56. Seatrout, spotted Includes only the species *Cynoscion nebulosus*.
57. Shad, American Includes only the species *Alosa sapidissima*.
58. Sharks Includes members of the order Squaliformes weighing over 5 pounds. Individuals weighing 5 pounds or less were assumed to be primarily *Mustelus canis*, the smooth dogfish, and *Squalus acanthias*, the spiny dogfish, and are listed separately.
59. Sharks, dogfish Includes primarily the species *Mustelus canis*, the smooth dogfish, and *Squalus acanthias* the spiny dogfish; although includes other small sharks weighing less than 5 pounds.
60. Skates and Rays Includes members of the order Rajiformes, the skates and rays, mostly of the families Dasyatidae and Rajidae.
61. Smelts Includes members of the family Osmeridae, the smelts, and Pacific members of the family Atherinidae, the silversides.
62. Snappers Includes members of the family Lutjanidae, the snappers; except the species *Lutjanus campechanus*, the red snapper, and *Ocyurus chrysurus*, the yellowtail snapper, which are listed separately.
63. Snapper, red Includes only the species *Lutjanus campechanus*.
64. Snapper, yellowtail Includes only the species *Ocyurus chrysurus*.
65. Snook Includes only the species *Centropomus undecimalis*.
66. Spadefish, Atlantic Includes only the species *Chaetodipterus faber*.
67. Spot Includes only the species *Leiostomus xanthurus*.
68. Steelhead Includes only the species *Salmo gairdneri*, primarily a fresh-water species and usually called rainbow trout, but called steelhead when sea run.
69. Striped bass Includes only the species *Morone saxatilis*.
70. Surfperches Includes members of the family Embiotocidae, the surfperches and seaperches.
71. Tautog Includes only the species *Tautoga onitis*.

72. Toadfish, oyster Includes only the species *Opsanus tau*.
73. Trout, cutthroat Includes only the species *Salmo clarki*.
74. Trout, Dolly Varden Includes only the species *Salvelinus malma*.
75. Tunas Includes all members of the genus *Thunnus*, the tunas, all members of the genus *Euthynnus*, and Atlantic members of the genus *Sarda*.
76. Wahoo Includes only the species *Acanthocybium solanderi*.
77. Weakfish Includes only the species *Cynoscion regalis*.
78. Yellowtail, California Includes only the species *Seriola dorsalis*.
79. Miscellaneous Includes fish of doubtful identity and those species of which too few were reported to be tabulated separately, including those listed below:
- Bonefish Includes only the species *Albula vulpes*.
- Carp Includes only the species *Cyprinus carpio*.
- Cutlassfish, Atlantic Includes only the species *Trichurus lepturus*.
- Eel, conger Includes only the species *Conger oceanicus*.
- Halfmoon Includes only the species *Medialuna californiensis*.
- Halibut, Atlantic Includes only the species *Hippoglossus hippoglossus*.
- Herring, Atlantic Includes members of the family Clupeidae, the herrings, except *Alosa sapidissima*, the American shad, which is listed separately.
- Lizardfishes. Includes members of the family Synodontidae, the lizardfishes.
- Sturgeon Includes members of the family Acipenseridae, the sturgeons.
- Tarpon Includes only the species *Megalops atlantica*.
- Triggerfishes and filefishes Includes members of the family Balistidae, the triggerfishes and filefishes.

COMMON NAME INDEX

This index is based upon common fish names used by anglers and is meant to be used in locating the species group in which the catch of any fish would appear *if reported*. Listed are only those fishes that occurred or are likely to have occurred under one of the species groups shown in Classification of Species Groups. Individual common names are included in the index only where needed to locate them in the appropriate species group. Thus, all the true rockfishes are shown to be in species group 47 (Scorpaenidae) and those whose name contains "rockfish" are not listed individually.

The number following each name indicates the species group in which it would most probably be reported in the survey. For example, we do not know whether catches of arrowtooth flounder specifically are included in the reported category of "flatfishes" in Regions VI and VII; but if taken they will occur in species group 18, which includes all Pacific Ocean flatfishes with the exception of California halibut and Pacific halibut which are listed separately. On the other hand, since bergall is a synonym only for cunner, a single-species group, one may ascertain definitely the reported catch of that species by referring to species group 13, cunner.

Sometimes confusion arises when one common name refers to two or more species groups. For example, "bluefish", which is the generally accepted common name for *Pomatomus saltatrix*, (species group 5), is sometimes used in referring to the blue rockfish and also the black sea bass. It would be listed as follows:

Bluefish, 5
for black sea bass, 2
for rockfishes, 47

Those species such as "tarpon", which have catches too low to be compiled separately, have been included under the miscellaneous category and do not appear on this list. Also there are a few of the more well-known species such as Pacific sargo that are not listed because none of the fishermen interviewed reported catching any. Therefore, if a fish is not listed below, it was either included in the miscellaneous category or not reported at all. Those species included in the miscellaneous category are listed at the end of Classification of Species Groups.

The number given in the following listing refer to the numbers of the species groups defined in Classification of Species Groups.

abrego, 75	bajonado, 45
acara aya, 63	balloonfish, 46
aguaji, 22	bananafish, 32
alabato, for California halibut, 27	barb, 31
for Pacific halibut, 28	barberpole, 47
albacore, 75	barracho, 47
for jacks, 29	barracuda, 1 (also barracouta)
alfione, 70	barrie, 1 (also barry)
alilonghi, 75	barriga blanca, 47
amberfish, 78	barringa, 47
amberjack, 29	
for California yellowtail, 78	
angelfish, 66	
Atkafish, 21	

- bass, bar, 16
 - black, *for* black croaker, 12
 - for* rockfishes, 47
- black sea, 2
 - for* groupers, 22
 - for* rockfishes, 47
- blue, *for* opaleye, 40
 - for* croaker, 12
- bull, 3
- calico, 3
- California kelp, 3
- California sand, 3
- Catalina, 47
- channel, 16
 - for* grouper, 22
- kelp, 3
- red, 16
- red spotted, 3
- reef, 16
- rock, 3
 - for* black sea bass, 2
 - for* striped bass, 69
- sand, 3
 - for* rockfishes, 47
- sea, 2
 - for* groupers, 22
 - for* red drum, 16
 - for* rockfishes, 47
- spottailed, 16
- spotted, 16
- spotted sand, 3
- stone, 22
- streaked, 69
- striped, 69
- sugar, 47
 - for* Pacific basses, 3
- white, 69
- beccafico, 47
- becuna, 1
- belina, 47
- bellows fish, 46
- bergall, 13
- berg-gylt, 13
- beshaw, 48 (also beshow)
- biajaiba, 62
- bielaya ryba, 50
- billfishes, 4
- blackback, 20
- blackfish, smooth, 71
 - for* black sea bass, 2
 - for* tautog, 71
- black-harry, 2
- black-jack, 29
- black-margate, 23
- blackmouth, 49
- black-will, 2
- blanquillo, 39
- blinkers, 34
- bloater, 6
- blower, 46
- blowfish, 46
- blue, *for* bluefish, 5
 - for* blue marlin, 4
- blueback, 20
 - for* cutthroat trout, 73
- blue-eye, 40
- bluefish, 5
 - Boston, 43
 - California, 40
 - for* black sea bass, 2
 - for* greenlings, 21
 - for* rockfishes, 47
- blue runner, 29
- bocaccio, 47
- boca-Colorado, 23
- bocalao, 33
- bolina, 47
- bonaci arara, 22
- bone-dog, 59
- bone-eater, 6
 - for* ladyfish, 32
- bonehead, 47
 - for* Pacific bonito, 6
 - for* cabezon and Pacific sculpins, 52
- bonejack, 6
- bonito, 6
 - for* cobia, 10
 - for* tuna, 75
 - for* jacks, 29
 - black, 10
 - oceanic, *for* tuna, 75
- bonyfish, 32
- borracho, 47
- bosco, 47
- boxfish, 46
- brail, 19
- branca, 47
- bream, salt-water, 45
- brill, 18
- brochet de mer, 65
- brownfish, 47
- bugara, 70
- bullhead, 9
 - for* cabezon and Pacific sculpins, 52
- bull-red, 16
- bullseye, 34
- bumper, 29
- buoykeg, 47
- burrfish, 46
- butterball, 47

- butterbass, 47
 butterfish, *for* groupers, 22
 for jacks, 29
 for pompano, 44
 for sablefish, 48
 for spot, 67
 lemon yellow, 22
 buttermouth, 70
- caballa, 34
 cabbeo, 10 (also cabio)
 cabellerote, 62
 cabezon, 52
 cabezuda, Liza, 38
 cabrilla, 3
 caesar, 23
 caji, 62
 canary, 47
 candlefish, *for* sablefish, 48
 for smelt, 61
 capelin, 61
 Cape-May-goody, 67
 capron, 61
 carbio, 10
 carbonero, 29
 Carolina robin, 54
 casabe, 29
 Catalina, 47
 catalineta, 23
 catfish, 9
 gafftopsail, 9
 oceanic, *for* cobia, 10
 cavalle, 35
 for jacks, 29
 cavally, 29
 cavco, 10
 cavilia, 29
 cefalo, 38
 cefalutano, 47
 cernie, 47
 cernier, 22
 cero, 37
 for king mackerel, 35
 king, 35
 silver, 35
 spotted, 37
 cerod, 47
 char, Oregon, 74
 red-spotted, 74
 chaugge, 13
 checouts, 77
 chefra, 47
- cherna, 22
 for rockfishes, 47
 cherne, 47
 chickwick, 77
 chilipepper, 47
 Chinafish, 47
 chiro, 32
 choggies, 13
 chogset, 13
 chop espina, 45
 chub, *for* mackerels. Atlantic, 34
 for spot, 67
 for tautog, 71
 chucklehead, 47
 chuss, 25
 chut, 12
 cibi amarilla, 29
 cibi mancho, 29
 cigarfish, 29
 coalfish, *for* cobia, 10
 for pollock, 43
 for sablefish, 48
 cobblerfish, 44
 cobia, 10 (also cobio)
 cod, *for* lingcod, 33
 for rockfish, 47
 for sablefish, 48
 Alaska, 11
 Atlantic, 11
 black, 48
 blue, *for* cabezon, 52
 for lingcod, 33
 for sablefish, 48
 buffalo, 33
 bull, 52
 channel, 47
 coal, 48
 cultus, 33
 gray, 11
 green, *for* lingcod, 33
 for pollock, 43
 greenling, 33
 kelp, 21
 leopard, 33
 Pacific, 11
 red-rock, 47
 rock, 47
 silver, 43
 tommy, *for* croaker, 12
 for greenlings, 21
 true, 11
 white, 33
 winter, 11
 codalargo, 47

- codfish, 11
- codling, 25
- cod-shark, 59
- coney, 22
- convictfish, *for* sheepshead, 45
 - for* rockfishes, 47
- corbina, California, 7
- coronado, 29
- corsair, 47
- corvina, *for* California corbina, 7
 - for* croaker, 12
- cottonwick, 23
- cowfish, 47
- crab-eater, 10
- crevalle, 29
- croaker, 12
 - for* white seabass, 53
 - king, 53
 - spotfin, 12
 - yellowfin, 12
 - black, 12
 - white, 12
- crocus, 12
- curnoli, 70
- cub, 71
- cubra, 62
- cucumberfish, 46
- cuda, 1
- cuda-bear, 1
- cultus, 33
- cunner, 13 (also conner)
- cybium, spotted 37

- dab, *for* Pacific flatfishes, 18
 - (see also sanddab)
 - rusty, 20
 - mud, 20
- dark-chili, 47
- day-fish, 61
- dogfish, 59
 - horned, *for* sharks, 58
- dog-shark, 59
- dollarfish, 29
- dolphin, 14
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