NOAA Technical Memorandum NMFS-SEFSC-389

Estimating Recreational Effort Using The Marine Recreational Fisheries Statistics Survey Data

by:

Stephen Glenn Holiman, Ph.D.
National Marine Fisheries Service
Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, FL 33702

July 1996

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

NOAA Technical Memorandum NMFS-SEFC-389

Estimating Recreational Effort Using The Marine Recreational Fisheries Statistics Survey Data

by:

Stephen Glenn Holiman, Ph.D.

U.S. Department of Commerce
Michael Kantor, Secretary

National Oceanic and Atmospheric Administration
Dr. D. James Baker, Under Secretary for Oceans and Atmosphere

National Marine Fisheries Service
Rolland A. Schmitten, Assistant Administrator
for Fisheries

July 1996

Notice

The National Marine Fisheries Service (NMFS) does not approve, recommend or endorse any proprietary product or proprietary material mentioned in this publication. No reference shall be made to NMFS, nor to this publication furnished by NMFS, in any advertising or sales promotion which would indicate or imply that NMFS approves, recommends or endorses any proprietary product or proprietary material mentioned herein, or which has as its purpose an intent to cause directly or indirectly the advertised product to be used or purchased because of this NMFS publication.

This report should be cited as follows:

Stephen G. Holiman, 1996. Estimating Effort Using the Marine Recreational Fisheries Statistics Survey Data. NOAA Technical Memorandum NMFS-SEFSC-389, 53 p.

Copies may be obtained by writing:

National Technical Information Service
5258 Port Royal Road
Springfield, VA 22161

ACKNOWLEDGMENTS

I would like to thank Ronald J. Saltz for the sample directed effort program he sent me which provided the seed that grew into the products presented here, David A. Van Voorhees for providing other programs from which these liberally borrowed form and content, and both of these individuals again along with Gerry Gray for putting up with my numerous harassments as I "learned" the MRFSS data set and developed these other programs. I would also like to thank John Vondruska for suggesting that I write and share them, and Deborah Protomaster for editing the manuscript and producing the final desktop publishing version.

EXECUTIVE SUMMARY

This document provides programs for estimating three measures of recreational effort using the Marine Recreational Fisheries Statistics Survey (MRFSS) data set. The programs produce estimates of target effort, catch effort and directed effort associated with a specific fish species or species complex. A target trip is defined as a single angler trip on which the angler indicated the species was either the primary or secondary target species. A catch trip is defined as a single angler trip on which the species was caught regardless of target intention or disposition of catch (whether the fish was kept or released). A directed effort trip is defined as a single angler trip on which the species was either targeted or caught.

The programs produce results consistent with expectations: catch effort exceeds target effort and directed effort exceeds catch and target effort taken separately. This information can be used to evaluate trends in fishing effort and aid in estimating the potential impacts of regulation. Users of these programs are advised, however, to use caution with regard to species selection, degree of stratification and application of results. Although the MRFSS performs well at measuring activity for commonly caught species, it is designed to measure gross finfish activity and not activity in a specific fishery.

TABLE OF CONTENTS

List of Tables

INTRODUCTION

This document presents three SAS© programs for estimating recreational effort using the Marine Recreational Fisheries Statistics Survey (MRFSS) data set. Although some discussion of the contents of the MRFSS data set will be given in the following sections, fully understanding the procedures described here requires prior familiarity with the data set. For a more thorough description of the MRFSS data set, see Atlantic States Marine Fisheries Commission (1994).

The three different programs estimate the number of angler trips that either target , catch , or target or catch a particular species or species complex. Results from all three programs generate the total number of individual angler trips and these totals are labeled as target effort, catct effort or directed effort respectively.

Each program uses a different set of records as determined by the type of analysis. The target effort program uses Type 1 (angler/trip data) and Type 4 (group catch data) records, the catch effort program uses Type 2 (unavailable or Type B catch), Type 3 (available or Type A catch) and Type 4 (group catch) records. The directed effort program uses all four record types because it combines target and catch data. Also, each program uses the trip files for expansion to final estimates. The trip files contain estimates of total angler trips by subregion, state, wave, mode and area.

The programs operate on specific definitions of what constitutes a positive trip. While there is likely to be more agreement on the definition of catch effort since the single requirement is simply catching the species, target and directed effort are open to fairly subjective definitions incorporating considerations of season, location, similar species, etc. It is left to the user of these programs to determine the appropriateness of the definitions used here to his/her situation or definition.

The following sections provide a brief description of each program and highlight key aspects of each analysis. These are followed by sample tables. Each program is provided in two forms, an expanded form containing extensive comments and explanation, and a concise form with the comments deleted. Copies of the expanded versions are provided in the appendices and both versions of each program are included on diskette.

The programs have not been edited to achieve maximum efficiency with minimum programming. Because the programs are set up to evaluate 1982 to current data, specific actions that are necessary to address circumstances in one or multiple years may not be necessary for all years. Examples of this are the entry of "monthly" waves (1.1, 1.2 for January, February, etc.), a separate state code for Monroe County, FL (Key West area), and certain variables that are not consistently entered as either a character or numeric variable. Although each of these problems occurs in a localized manner, i.e. in a specific year(s), wave(s), subregion, etc., efforts have not been made to pinpoint the location and address their resolution at the lower data levels. Instead, macros are used to retrieve data and universal corrections are applied.

For users intending to do an extensive time series, these programs have been timed for a single species (red snapper) in a single subregion (Gulf of Mexico) on a 486, 66 MHZ personal computer. This example takes approximately 2 ½ hours to run either the target or catch effort programs, and approximately 4 hours to run the directed effort program for the entire 1982-94 period.

Single-year analysis takes approximately 15 minutes to run the target and catch effort programs and 20 minutes to run the directed effort program. A major factor contributing to the complexity and time requirements of the programs is the inclusion of multiple contributor trips; for single contributor trips, leader-follower relationships do not exist and fish-to-contributor ratios do not have to be evaluated. If it is assumed that single contributor trips are representative of multiple contributor trips and the loss of multiple contributor observations does not compromise the precision of the estimates, then considerable programming time can be saved by evaluating just single contributor observations and making the appropriate program modifications.

The programs are not designed to analyze more than one species at one time with outputs shown by species. If separate analyses by species are conducted within a given computing run, it will be necessary to attach multiple copies of a program together. Additionally, since each program utilizes the proc append procedure, it is necessary to delete the appropriate base data sets using the proc datasets procedure.

Multiple table options are provided in each program, varying by level of stratification and content. The user of these programs is encouraged to select the versions that best reflect his or her needs or design new tables as necessary. Additionally, the tables require editing in a word processor to create proper titles, formatting, etc. A 5pt or lower font size is necessary for the more detailed summaries. The samples provided in the following sections are printed in 7pt, 7pt, 6pt and 10pt fonts, respectively, in Courier New® font.

Finally, although the MRFSS performs well at measuring activity for commonly caught species, it is designed to measure gross finfish activity and not activity in a specific fishery. Thus, the estimates produced here are more appropriate for use in trend analyses rather than in analyses that require describing precisely how many trips targeted or caught a species. Users of these programs are therefore advised to use caution with regard to species selection, degree of stratification and application of results.

TARGET EFFORT

The target effort program estimates the number of angler trips that target a particular species or species complex. Target activity is recorded in the MRFSS data set through the variables PRIM1 and PRIM2, which indicate the primary and secondary target species, respectively. The program does not distinguish between a positive response to either target variable, but is easily adapted to discriminate. Debate exists over the ability of this survey to accurately estimate target activity due to the potential influence of prestige bias; since the survey is conducted after the trip is completed (except for some shore-based trips) target responses may be more reflective of actual success rather than intention (Atlantic States Marine Fisheries Commission, 1994). The likelihood of occurrence and potential impact of this phenomenon, however, is beyond the scope of this paper. It is left to the user of this program to determine if this is likely to be a problem.

As noted in the introduction, in addition to the trip files, this program utilizes Type 1 and Type 4 files. A Type 1 record exists for each intercept interview and contains the target variables from which record selection is made. The Type 4 files identify the leader for each follower. Leader/ follower records are generated when Type A catch (available catch) cannot be searated by individual angler. Instead, all Type A catch is "attributed" to a leader and the linkage of followers to leaders is accomplished through the Type 4 records. The importance of identifying this linkage will be explained below.

The program identifies all Type 1 records that indicate targeting activity through the variables PRIM1 and PRIM2 and sums over the number of contributors, as recorded by the variable CNTRBTRS, associated with those records. Type 1 records assign a 0 or positive value to CNTRBTRS depending on whether the intercept indicates a follower (CNTRBTRS=0), a single angler (CNTRBTRS=1) or a leader (CNTRBTRS>1). By eliminating the records of followers who target when their leader also targets, double counting is avoided. Followers who target when their leader did not are also included. This is accomplished by linking the Type 1 records, which indicate target activity, with the Type 4 records which contain both individual (intercept) codes and leader codes.

This program operates on the assumption that if a leader targeted the species, then all anglers on the trip also targeted the species. As previously stated, also included are followers who target when their leader did not. It is also possible, however, that followers do not target when their leader does. Although these anglers can be identified through the Type 4 records, the program does not correct for this factor. Further, the program does not assume that if one follower targets when the leader does not, then all participants on the trip also targeted. Failing to exclude followers who do not target when their leader does will increase estimates. Not assuming that if one follower targets

then all anglers in the party target will decrease estimates. The net impact of the omission of both eventualities is unknown. The incidence of differential targeting activity is probably infrequent compared to the incidence of homogeneous trips where all anglers target the same species. Further, unless the magnitude of these factors change relative to each other, their impact is inconsequential for trend analysis.

Tables 1-4 show sample program output tables for Gulf of Mexico red snapper target effort trips by state, mode, wave and subregion.

Table 1. Sample Program Output, Target Effort, by State.

SUB REGION OF TRIP=GULF OF MEXICO

RED SNAPPER TARGET TRIPS BY STATE

	STATE											
	ALABAMA		FLORIDA		LOUISIANA		MISSISSIPPI		TEXAS		TOTAL	
	TARGET TRIPS	TOTAL TRIPS	TARGET TRIPS	TOTAL TRIPS	TARGET TRIPS	TOTAL TRIPS	TARGET TRIPS	TOTAL TRIPS	TARGET TRIPS	TOTAL TRIPS	TARGET TRIPS	TOTAL TRIPS
	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
YEAR												
1982	11,999	1,378,915	49,022	8,807,769	85,062	2,572,505	1,907	717,317	0	2,942,981	147,990	16,419,487
1983	90,273	1,740,710	44,040	14,521,381	268,837	2,685,030	0	1,039,431	0	4,085,713	403,150	24,072,264
1984	26,598	612,828	52,974	16,521,499	66,330	1,711,053	0	797,341	1,707	2,066,161	147,609	21,708,882
1985	33,351	710,846	79,914	11,583,246	31,398	2,553,624	368	572,086	257	3,910,657	145,287	19,330,459
1986	26,152	866,722	32,456	14,367,176	42,323	3,029,420	4,624	776,626	.	.	105,555	19,039,944
1987	23,039	622,080	133,202	12,321,111	17,669	2,370,674	1,763	775,582	.	.	175,673	16,089,446
1988	18,207	1,182,515	53,093	14,730,478	32,765	2,922,611	10,910	907,695	.	.	114,975	19,743,299
1989	46,406	622,719	35,542	12,031,576	47,588	2,263,719	8,367	704,496	.	.	137,903	15,622,510
1990	48,963	722,805	16,257	9,922,602	32,229	1,978,380	11,693	686,439	.	.	109,142	13,310,226
1991	45,425	648,774	72,281	14,261,115	29,632	2,419,805	22,718	843,905	.	.	170,056	18,173,598
1992	90,101	763,018	17,137	13,763,989	33,522	2,550,806	45,549	1,001,436	.	.	186,310	18,079,250
1993	115,657	933,061	43,877	12,928,092	58,107	2,703,754	59,517	866,103	.	.	277,158	17,431,009
1994	94,067	886,949	20,890	13,166,982	56,099	2,485,308	42,448	964,498	.	.	213,504	17,503,737

Table 2. Sample Program Output, Target Effort, by Mode.

SUB REGION OF TRIP=GULF OF MEXICO

RED SNAPPER TARGET TRIPS BY MODE

	MODE							
	SHORE		PARTY/CHARTER		PRIVATE/RENTAL		TOTAL	
	TARGET TRIPS	TOTAL TRIPS	TARGET TRIPS	TOTAL TRIPS	TARGET TRIPS	TOTAL TRIPS	TARGET TRIPS	TOTAL TRIPS
	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
YEAR								
1982	2,002	10,051,388	43,495	929,135	102,492	5,438,965	147,990	16,419,487
1983	35,483	16,623,065	70,822	607,559	296,844	6,841,641	403,150	24,072,264
1984	7,207	13,709,706	44,105	492,380	96,297	7,506,796	147,609	21,708,882
1985	15,221	10,268,895	55,608	746,675	74,459	8,314,889	145,287	19,330,459
1986	8,382	10,405,962	31,480	497,740	65,694	8,136,242	105,555	19,039,944
1987	28,963	6,923,388	44,227	648,271	102,483	8,517,788	175,673	16,089,446
1988	5,942	8,524,356	23,964	520,412	85,069	10,698,532	114,975	19,743,299
1989	11,926	6,419,667	25,638	490,536	100,339	8,712,307	137,903	15,622,510
1990	17,620	5,706,778	26,438	386,941	65,083	7,216,506	109,142	13,310,226
1991	50,686	8,642,251	31,667	444,609	87,702	9,086,738	170,056	18,173,598
1992	3,558	8,265,502	34,553	440,494	148,199	9,373,254	186,310	18,079,250
1993	2,648	7,642,451	81,431	747,252	193,080	9,041,306	277,158	17,431,009
1994	2,918	7,293,305	53,048	825,632	157,538	9,384,801	213,504	17,503,737

Table 3. Sample Output, Target Effort, by Wave.

SUB REGION OF TRIP=GULF OF MEXICO

RED SNAPPER TARGET TRIPS BY WAVE

	WAVE															
	1		2		3		4		5		6		TOTAL			
	TARGET TRIPS	TOTAL TRIPS	TARGET TRIPS	TOTAL TRIPS	TARGET TRIPS	TOTAL TRIPS	TARGET TRIPS	TOTAL TRIPS	TARGET TRIPS	TOTAL TRIPS	TARGET TRIPS	TOTAL TRIPS	TARGET TRIPS	TOTAL TRIPS		
	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL		
YEAR																
1982	2,428	1,245,756	32,471	2,540,191	33,860	3,608,846	40,898	3,702,564	32,820	3,247,784	5,512	2,074,346	147,990	16,419,487		
1983	90,681	4,020,124	33,323	3,010,898	47,465	4,063,714	152,295	5,608,223	56,527	5,461,165	22,859	1,908,140	403,150	24,072,264		
1984	21,926	1,741,944	18,664	3,921,251	21,757	3,941,018	26,898	4,964,790	32,295	4,856,083	26,069	2,283,796	147,609	21,708,882		
1985	18,029	2,777,964	14,549	4,307,334	26,706	3,487,607	64,856	3,522,545	15,582	3,048,326	5,565	2,186,683	145,287	19,330,459		
1986	5,557	1,620,773	20,116	2,829,692	24,048	3,559,452	25,732	2,837,382	26,577	5,069,845	3,524	3,122,800	105,555	19,039,944		
1987	28,878	3,550,826	40,726	2,109,947	29,881	2,567,991	50,811	2,836,924	17,804	2,999,005	7,573	2,024,753	175,673	16,089,446		
1988	6,834	2,126,306	19,205	2,451,599	15,234	3,500,670	56,320	4,788,257	9,983	3,742,401	7,398	3,134,067	114,975	19,743,299		
1989	5,542	3,297,541	35,483	2,948,334	23,050	2,783,023	18,987	2,289,342	46,961	2,493,520	7,880	1,810,750	137,903	15,622,510		
1990	2,941	1,961,223	23,871	2,121,274	29,959	2,678,432	17,024	2,897,255	16,940	1,615,949	18,406	2,036,093	109,142	13,310,226		
1991	18,898	2,191,203	20,103	2,575,654	36,943	3,373,494	31,708	4,676,472	41,362	3,219,015	21,041	2,137,761	170,056	18,173,598		
1992	19,322	2,267,563	28,449	2,705,954	42,688	3,367,020	39,742	4,062,677	43,136	2,935,480	12,974	2,740,557	186,310	18,079,250		
1993	24,922	2,296,437	56,621	2,574,229	40,790	3,176,285	59,736	3,666,123	63,499	3,465,600	31,590	2,252,336	277,158	17,431,009		
1994	18,607	1,801,590	27,990	2,896,589	44,338	3,380,365	56,185	3,481,661	42,366	3,560,280	24,017	2,383,252	213,504	17,503,737		

Table 4. Sample Program Output, Target Effort, by Subregion.

SUB REGION OF TRIP=GULF OF MEXICO

RED SNAPPER TARGET TRIPS

	TOTAL	
	TARGET TRIPS	TOTAL TRIPS
	TOTAL	TOTAL
YEAR		
1982	147,990	16,419,487
1983	403,150	24,072,264
1984	147,609	21,708,882
1985	145,287	19,330,459
1986	105,555	19,039,944
1987	175,673	16,089,446
1988	114,975	19,743,299
1989	137,903	15,622,510
1990	109,142	13,310,226
1991	170,056	18,173,598
1992	186,310	18,079,250
1993	277,158	17,431,009
1994	213,504	17,503,737

CATCH EFFORT

The catch effort program estimates the number of angler trips that catch a particular species or species complex. Catch is recorded in the MRFSS data set through the variables NUM_FISH (number of unavailable fish) in the Type 2 records and FSHINSP (number of fish inspected) in the Type 3 records. This program also uses the trip files and Type 4 records. Since the program does not discriminate by disposition or availability of the catch; a positive hit is recorded regardless of whether fish are landed or not. Disaggregation by disposition code is easily accomplished. However, it is not advisable to disaggregate by more than catch versus landed due to the paucity of observations at the species level.

For single angler observations, estimating the number of catch trips is a simple process; although multiple records may exist in both Type 2 (by angler, species and disposition code) and Type 3 (by angler, species and individual fish examined) records, only one record of either type is required per angler. Once identified, these records are simply summed.

Utilizing multiple contributor intercepts, however, is more complicated. The complication arises through the inseparability of the Type 3 records. Where catch is not separable, i.e. where it cannot be determined which angler caught which fish, a leader-follower recording situation occurs (generating a Type 4 record) and all inspected fish (FSHINSP) are recorded on the leader's record. Hence, entries no longer represent individual activity but instead contain observations of (possibly) multiple fish with multiple contributors. Thus, where X fish are recorded and Y anglers are involved, it must be determined how many catch trips Y anglers actually represent. This program solves this problem by comparing the number of fish caught with the number of anglers involved. Trips are estimated based on the ratio of fish to anglers such that, if the ratio is less than 1, then the number of trips is set equal to the number of fish, and if the ratio is greater than 1, then the number of trips is set equal to the number of anglers. For example, if there are 2 fish and 3 anglers, producing a ratio of less than 1, there can be at most 2 catch trips because, although one angler could have caught both fish, 2 fish cannot be caught by 3 anglers. Hence, the number of trips is set at 2, the number of fish. If there are 4 fish and 3 anglers, the number of trips is set at 3, the number of anglers, as it is possible for each angler to have caught at least 1 fish.

Before evaluating this ratio, however, the Type 2 records must be included. This complicates the analysis since the Type 2 records record individual catch and not group catch. Since the analysis considers only whether the species is caught and not whether it is examined, and due to the methodology for accounting for group catch, it is necessary to add the unavailable catch to the available catch. This requires accommodating the least detailed data, the Type 3 records, by aggregating all Type 2 records by leader. As with the target effort analysis, leaders are identified for each follower using the Type 4 records. Once all Type 2 catch is summed by leader, the totals are then added to the Type 3 records and the ratio analysis conducted.

Because of the way group catch is evaluated, this program will calculate the maximum number of trips possible, and thus produce estimates that may be biased high. However, it should be noted that not all Type 2 catch is recorded; a valid interview does not require interviewing all participants and, since Type 2 records are individual, all Type 2 catch need not be recorded. Thus, in some instances where Type 3 averaging is less than 1, incomplete Type 2 sampling may bias estimates low. In situations where it is important to know precisely the number of trips involved, under- or overestimating effort may create problems. The inability to separate the Type A catch, however, insures a certain imprecision regardless of the assumptions and methodology chosen.

Tables 5-8 show sample program output tables for Gulf of Mexico red snapper catch effort trips by state, mode, wave and subregion.

Table 5. Sample Program Output, Catch Effort, by State.

SUB REGION OF TRIP=GULF OF MEXICO

RED SNAPPER CATCH TRIPS BY STATE

	STATE											
	ALABAMA		FLORIDA		LOUISIANA		MISSISSIPPI		TEXAS		TOTAL	
	CATCH TRIPS	TOTAL TRIPS	CATCH TRIPS	TOTAL TRIPS	CATCH TRIPS	TOTAL TRIPS	CATCH TRIPS	TOTAL TRIPS	CATCH TRIPS	TOTAL TRIPS	CATCH TRIPS	TOTAL TRIPS
	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
YEAR												
1982	49,424	1,378,915	121,929	8,807,769	127,781	2,572,505	10,018	717,317	0	2,942,981	309,152	16,419,487
1983	82,647	1,740,710	67,890	14,521,381	296,704	2,685,030	6,432	1,039,431	4,804	4,085,713	458,478	24,072,264
1984	20,150	612,828	43,191	16,521,499	97,799	1,711,053	479	797,341	2,042	2,066,161	163,662	21,708,882
1985	37,574	710,846	166,344	11,583,246	47,275	2,553,624	2,162	572,086	65,509	3,910,657	318,864	19,330,459
1986	21,904	866,722	120,801	14,367,176	52,331	3,029,420	1,473	776,626	.	.	196,510	19,039,944
1987	23,107	622,080	197,304	12,321,111	25,883	2,370,674	4,544	775,582	.	.	250,838	16,089,446
1988	30,350	1,182,515	123,755	14,730,478	35,675	2,922,611	6,697	907,695	.	.	196,477	19,743,299
1989	50,641	622,719	100,904	12,031,576	44,447	2,263,719	7,196	704,496	.	.	203,187	15,622,510
1990	84,995	722,805	62,576	9,922,602	41,714	1,978,380	10,788	686,439	.	.	200,073	13,310,226
1991	74,625	648,774	146,767	14,261,115	35,960	2,419,805	15,058	843,905	.	.	272,410	18,173,598
1992	90,856	763,018	91,751	13,763,989	42,743	2,550,806	40,635	1,001,436	.	.	265,986	18,079,250
1993	138,736	933,061	157,082	12,928,092	77,957	2,703,754	43,940	866,103	.	.	417,715	17,431,009
1994	118,657	886,949	143,963	13,166,982	66,831	2,485,308	36,014	964,498	.	.	365,466	17,503,737

Table 6. Sample Program Output, Catch Effort, by Mode.

SUB REGION OF TRIP=GULF OF MEXICO

RED SNAPPER CATCH TRIPS BY MODE

	MODE							
	SHORE		PARTY/CHARTER		PRIVATE/RENTAL		TOTAL	
	CATCH TRIPS	TOTAL TRIPS	CATCH TRIPS	TOTAL TRIPS	CATCH TRIPS	TOTAL TRIPS	CATCH TRIPS	TOTAL TRIPS
	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
YEAR								
1982	0	10,051,388	153,991	929,135	155,161	5,438,965	309,152	16,419,487
1983	14,027	16,623,065	144,174	607,559	300,276	6,841,641	458,478	24,072,264
1984	2,042	13,709,706	70,675	492,380	90,944	7,506,796	163,662	21,708,882
1985	2,167	10,268,895	78,729	746,675	237,968	8,314,889	318,864	19,330,459
1986	2,935	10,405,962	120,053	497,740	73,522	8,136,242	196,510	19,039,944
1987	8,739	6,923,388	148,303	648,271	93,797	8,517,788	250,838	16,089,446
1988	6,639	8,524,356	98,304	520,412	91,534	10,698,532	196,477	19,743,299
1989	14,311	6,419,667	95,954	490,536	92,922	8,712,307	203,187	15,622,510
1990	37,432	5,706,778	55,254	386,941	107,388	7,216,506	200,073	13,310,226
1991	31,917	8,642,251	105,504	444,609	134,989	9,086,738	272,410	18,173,598
1992	4,453	8,265,502	90,255	440,494	171,279	9,373,254	265,986	18,079,250
1993	6,824	7,642,451	202,206	747,252	208,685	9,041,306	417,715	17,431,009
1994	2,918	7,293,305	192,014	825,632	170,534	9,384,801	365,466	17,503,737

Table 7. Sample Program Output, Catch Effort, by Wave.

SUB REGION OF TRIP=GULF OF MEXICO

RED SNAPPER CATCH TRIPS BY WAVE

	WAVE															
	1		2		3		4		5		6		TOTAL			
	CATCH TRIPS	TOTAL TRIPS	CATCH TRIPS	TOTAL TRIPS	CATCH TRIPS	TOTAL TRIPS	CATCH TRIPS	TOTAL TRIPS	CATCH TRIPS	TOTAL TRIPS	CATCH TRIPS	TOTAL TRIPS	CATCH TRIPS	TOTAL TRIPS		
	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL		
YEAR																
1982	2,428	1,245,756	44,302	2,540,191	114,387	3,608,846	76,219	3,702,564	62,972	3,247,784	8,843	2,074,346	309,152	16,419,487		
1983	63,815	4,020,124	68,977	3,010,898	66,592	4,063,714	153,604	5,608,223	65,086	5,461,165	40,404	1,908,140	458,478	24,072,264		
1984	7,019	1,741,944	16,255	3,921,251	44,277	3,941,018	38,067	4,964,790	20,392	4,856,083	37,652	2,283,796	163,662	21,708,882		
1985	1,549	2,777,964	36,327	4,307,334	26,079	3,487,607	143,985	3,522,545	39,481	3,048,326	71,444	2,186,683	318,864	19,330,459		
1986	5,825	1,620,773	28,814	2,829,692	41,341	3,559,452	38,175	2,837,382	64,743	5,069,845	17,611	3,122,800	196,510	19,039,944		
1987	12,524	3,550,826	19,334	2,109,947	37,325	2,567,991	66,332	2,836,924	106,408	2,999,005	8,916	2,024,753	250,838	16,089,446		
1988	5,045	2,126,306	17,385	2,451,599	53,256	3,500,670	60,362	4,788,257	50,006	3,742,401	10,423	3,134,067	196,477	19,743,299		
1989	3,695	3,297,541	45,513	2,948,334	22,604	2,783,023	22,635	2,289,342	94,112	2,493,520	14,629	1,810,750	203,187	15,622,510		
1990	0	1,961,223	31,806	2,121,274	38,208	2,678,432	34,169	2,897,255	62,874	1,615,949	33,017	2,036,093	200,073	13,310,226		
1991	18,413	2,191,203	18,395	2,575,654	49,673	3,373,494	70,819	4,676,472	69,453	3,219,015	45,958	2,137,761	272,410	18,173,598		
1992	24,405	2,267,563	39,427	2,705,954	53,128	3,367,020	57,963	4,062,677	72,655	2,935,480	18,407	2,740,557	265,986	18,079,250		
1993	25,903	2,296,437	52,333	2,574,229	95,389	3,176,285	97,784	3,666,123	98,974	3,465,600	47,332	2,252,336	417,715	17,431,009		
1994	25,230	1,801,590	59,750	2,896,589	83,164	3,380,365	89,747	3,481,661	61,036	3,560,280	46,538	2,383,252	365,466	17,503,737		

Table 8. Sample Program Output, Catch Effort, by Subregion.

SUB REGION OF TRIP=GULF OF MEXICO

RED SNAPPER CATCH TRIPS

	TOTAL	
	CATCH TRIPS	TOTAL TRIPS
	TOTAL	TOTAL
YEAR		
1982	309,152	16,419,487
1983	458,478	24,072,264
1984	163,662	21,708,882
1985	318,864	19,330,459
1986	196,510	19,039,944
1987	250,838	16,089,446
1988	196,477	19,743,299
1989	203,187	15,622,510
1990	200,073	13,310,226
1991	272,410	18,173,598
1992	265,986	18,079,250
1993	417,715	17,431,009
1994	365,466	17,503,737

DIRECTED EFFORT

The directed effort program combines elements of both the target effort and catch effort programs and estimates the number of angler trips that target or catch a particular species or species complex. This program utilizes each record type used by both the target and catch effort programs. The program first estimates the number of target trips and then adds the number of catch trips that did not also target. This latter group might be labeled incidental harvest trips. Another definition of incidental catch requires that fishing occur in a manner, season or area atypical to the species, such as trolling and catching a bottom species, catching a species outside its normal geographic range or habitat, etc. Given the latter definition, fishing in a manner or location consistent with catching the species would constitute targeted effort regardless of actual response for the PRIM1 or PRIM2 variables.

The problems associated with the estimation of both target and catch effort complicate this analysis and are handled in the same manner. Specifically, anglers who targeted when their leaders did not must be identified for estimating target effort, and estimating catch effort requires comparing the number of fish with the number of participants. An additional complication arises from the need to eliminate the catch records (Type 2 and Type 3 records) of anglers who also targeted so that double counting does not occur.

Tables 9-12 show sample program output tables for Gulf of Mexico red snapper directed effort trips by state, mode, wave and subregion.

A comparison of all tables shows results consistent with expectations: catch effort exceeds target effort and directed effort exceeds catch and target effort taken separately. Two additional measures of effort can be calculated using the target, catch and directed effort measures. Unsuccessful effort, or the number of target trips that fail to catch the species, is calculated by subtracting catch effort (consisting of target catch and "no- target" catch) from directed effort (consisting of target catch, target "no-catch" and "no-target" catch). Next, successful effort can be calculated by subtracting unsuccessful effort from total effort.

It is also possible to identify the relative importance of non-targeted/incidental catch trips to total catch trips under the operational assumption that an incidental catch trip is one where the species has not been identified as the PRIM1 or PRIM2 species.

Since all target trips are included in the directed effort totals, subtracting target effort from directed effort produces the number of incidental catch trips. This can then be compared to total catch trips. Caution should be used in making comparisons and calculating these additional measures since the data, methodologies and assumptions are not uniform in each program.

Table 9. Sample Program Output, Directed Effort, by State.

SUB REGION OF TRIP=GULF OF MEXICO

RED SNAPPER DIRECTED TRIPS BY STATE

	STATE											
	ALABAMA		FLORIDA		LOUISIANA		MISSISSIPPI		TEXAS		TOTAL	
	DIRECTED EFFORT TRIPS	TOTAL TRIPS	DIRECTED EFFORT TRIPS	TOTAL TRIPS	DIRECTED EFFORT TRIPS	TOTAL TRIPS	DIRECTED EFFORT TRIPS	TOTAL TRIPS	DIRECTED EFFORT TRIPS	TOTAL TRIPS	DIRECTED EFFORT TRIPS	TOTAL TRIPS
	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
YEAR												
1982	52,782	1,378,915	150,090	8,807,769	148,061	2,572,505	11,432	717,317	0	2,942,981	362,365	16,419,487
1983	95,417	1,740,710	100,878	14,521,381	362,258	2,685,030	6,432	1,039,431	4,804	4,085,713	569,788	24,072,264
1984	31,565	612,828	92,092	16,521,499	107,772	1,711,053	479	797,341	3,749	2,066,161	235,657	21,708,882
1985	43,744	710,846	216,297	11,583,246	63,610	2,553,624	2,531	572,086	65,766	3,910,657	391,947	19,330,459
1986	33,057	866,722	143,167	14,367,176	67,410	3,029,420	6,072	776,626	.	.	249,706	19,039,944
1987	26,735	622,080	288,854	12,321,111	28,888	2,370,674	5,907	775,582	.	.	350,384	16,089,446
1988	42,200	1,182,515	162,756	14,730,478	37,056	2,922,611	12,816	907,695	.	.	254,828	19,743,299
1989	70,224	622,719	124,213	12,031,576	59,949	2,263,719	9,511	704,496	.	.	263,898	15,622,510
1990	92,165	722,805	67,825	9,922,602	45,517	1,978,380	14,677	686,439	.	.	220,183	13,310,226
1991	81,212	648,774	205,433	14,261,115	47,689	2,419,805	19,618	843,905	.	.	353,952	18,173,598
1992	104,512	763,018	92,664	13,763,989	50,129	2,550,806	46,124	1,001,436	.	.	293,429	18,079,250
1993	157,887	933,061	153,781	12,928,092	63,196	2,703,754	53,253	866,103	.	.	428,118	17,431,009
1994	125,882	886,949	148,563	13,166,982	69,527	2,485,308	43,203	964,498	.	.	387,176	17,503,737

Table 10. Sample Program Output, Directed Effort, by Mode.

SUB REGION OF TRIP=GULF OF MEXICO

RED SNAPPER DIRECTED TRIPS BY MODE

	MODE							
	SHORE		PARTY/CHARTER		PRIVATE/RENTAL		TOTAL	
	DIRECTED EFFORT TRIPS	TOTAL TRIPS	DIRECTED EFFORT TRIPS	TOTAL TRIPS	DIRECTED EFFORT TRIPS	TOTAL TRIPS	DIRECTED EFFORT TRIPS	TOTAL TRIPS
	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
YEAR								
1982	2,002	10,051,388	173,467	929,135	186,896	5,438,965	362,365	16,419,487
1983	45,155	16,623,065	158,473	607,559	366,160	6,841,641	569,788	24,072,264
1984	9,249	13,709,706	93,518	492,380	132,889	7,506,796	235,657	21,708,882
1985	15,221	10,268,895	98,049	746,675	278,677	8,314,889	391,947	19,330,459
1986	11,105	10,405,962	124,679	497,740	113,922	8,136,242	249,706	19,039,944
1987	37,702	6,923,388	166,182	648,271	146,500	8,517,788	350,384	16,089,446
1988	12,581	8,524,356	104,368	520,412	137,879	10,698,532	254,828	19,743,299
1989	24,448	6,419,667	96,270	490,536	143,179	8,712,307	263,898	15,622,510
1990	37,432	5,706,778	61,949	386,941	120,802	7,216,506	220,183	13,310,226
1991	73,732	8,642,251	107,323	444,609	172,896	9,086,738	353,952	18,173,598
1992	8,011	8,265,502	85,523	440,494	199,896	9,373,254	293,429	18,079,250
1993	9,119	7,642,451	177,807	747,252	241,191	9,041,306	428,118	17,431,009
1994	4,376	7,293,305	180,816	825,632	201,984	9,384,801	387,176	17,503,737

Table 11. Sample Program Output, Directed Effort, by Wave.

SUB REGION OF TRIP=GULF OF MEXICO

RED SNAPPER DIRECTED TRIPS BY WAVE

	WAVE													
	1		2		3		4		5		6		TOTAL	
	DIRECTED EFFORT TRIPS	TOTAL TRIPS	DIRECTED EFFORT TRIPS	TOTAL TRIPS	DIRECTED EFFORT TRIPS	TOTAL TRIPS	DIRECTED EFFORT TRIPS	TOTAL TRIPS	DIRECTED EFFORT TRIPS	TOTAL TRIPS	DIRECTED EFFORT TRIPS	TOTAL TRIPS	DIRECTED EFFORT TRIPS	TOTAL TRIPS
	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
YEAR														
1982	2,428	1,245,756	59,046	2,540,191	127,516	3,608,846	92,614	3,702,564	70,930	3,247,784	9,829	2,074,346	362,365	16,419,487
1983	90,681	4,020,124	76,516	3,010,898	78,335	4,063,714	207,728	5,608,223	69,949	5,461,165	46,579	1,908,140	569,788	24,072,264
1984	27,302	1,741,944	23,406	3,921,251	53,998	3,941,018	49,574	4,964,790	43,283	4,856,083	38,093	2,283,796	235,657	21,708,882
1985	19,243	2,777,964	46,871	4,307,334	42,308	3,487,607	160,232	3,522,545	50,735	3,048,326	72,559	2,186,683	391,947	19,330,459
1986	10,236	1,620,773	42,952	2,829,692	46,502	3,559,452	54,464	2,837,382	76,546	5,069,845	19,006	3,122,800	249,706	19,039,944
1987	34,950	3,850,826	42,747	2,109,947	56,616	2,567,991	83,645	2,836,924	121,152	2,999,005	11,274	2,024,753	350,384	16,089,446
1988	9,840	2,126,306	28,044	2,451,599	65,451	3,500,670	87,519	4,788,257	51,384	3,742,401	12,590	3,134,067	254,828	19,743,299
1989	9,236	3,297,541	59,584	2,948,334	28,825	2,783,023	30,514	2,289,342	113,404	2,493,520	22,334	1,810,750	263,898	15,622,510
1990	2,941	1,961,223	44,774	2,121,274	50,040	2,678,432	36,475	2,897,255	55,485	1,615,949	30,469	2,036,093	220,183	13,310,226
1991	28,654	2,191,203	32,428	2,575,654	68,040	3,373,494	85,073	4,676,472	90,005	3,219,015	49,752	2,137,761	353,952	18,173,598
1992	27,007	2,267,563	48,898	2,705,954	58,285	3,367,020	63,987	4,062,677	76,964	2,935,480	18,288	2,740,557	293,429	18,079,250
1993	22,535	2,296,437	72,996	2,574,229	88,576	3,176,285	91,526	3,666,123	109,929	3,465,600	42,556	2,252,336	428,118	17,431,009
1994	22,587	1,801,590	58,642	2,896,589	94,558	3,380,365	95,008	3,401,661	67,716	3,560,280	48,465	2,383,252	387,176	17,503,737

Table 12. Sample Program Output, Directed Effort, by Subregion.

SUB REGION OF TRIP=GULF OF MEXICO

RED SNAPPER DIRECTED TRIPS

	TOTAL	
	DIRECTED EFFORT TRIPS	TOTAL TRIPS
	TOTAL	TOTAL
YEAR		
1982	362,365	16,419,487
1983	569,788	24,072,264
1984	235,657	21,708,882
1985	391,947	19,330,459
1986	249,706	19,039,944
1987	350,384	16,089,446
1988	254,828	19,743,299
1989	263,898	15,622,510
1990	220,183	13,310,226
1991	353,952	18,173,598
1992	293,429	18,079,250
1993	428,118	17,431,009
1994	387,176	17,503,737

REFERENCES

Atlantic States Marine Fisheries Commission. 1994. MRFSS User's Manual. A Guide to Use of the National Marine Fisheries Service Marine Recreational Fisheries Statistics Survey Database. Special Report No. 37. 140 pp.

APPENDIX A
TARGET EFFORT PROGRAM

```
*********************************TARGET EFFORT PROGRAM*************************
* TARGETF.SAS
* THIS PROGRAM CALCULATES THE NUMBER OF ANGLER TRIPS THAT TARGET THE SPECIE
*
* OF INTEREST.  THE RESULTS ARE PRODUCED IN SAMPLE TABLES AND SUMMARIZED BY
*    1.  YEAR, SUBREGION, STATE, WAVE AND MODE
*    2.  YEAR, SUBREGION, STATE AND MODE
*    3.  YEAR, SUBREGION, STATE AND WAVE
*    4.  YEAR, SUBREGION, WAVE AND MODE
*    5.  YEAR, SUBREGION AND STATE
*    6.  YEAR, SUBREGION AND WAVE
*    7.  YEAR, SUBREGION AND MODE
*    8.  YEAR AND SUBREGION.
*THE PROGRAM IS DESIGNED TO EVALUATE MULTIPLE YEARS AND HAS BEEN TESTED FOR
*THE SOUTH ATLANTIC AND GULF OF MEXICO SUBREGIONS ONLY.  CERTAIN OPERATIONS
*ARE INCLUDED TO ADDRESS SPECIFIC DATA NUANCES OR PROBLEMS IN THESE SUB-
*REGIONS IN SPECIFIC YEARS AND THUS MAY BE SUPERFLUOUS FOR OTHER SUBREGIONS
*OR INDIVIDUAL YEARS.
*MANY OF THE PROC SORTS ARE LIKELY SUPERFLUOUS AND THE FREQUENT PROC PRINTS
*WERE ORIGINALLY INSERTED AS SAFETY CHECKS TO SEE WHETHER THE PROGRAM WAS
*PERFORMING THE DESIRED OPERATIONS.
*VARIABLES HAVE BEEN DROPPED IN THE FIRST MACRO BECAUSE OF PROBLEMS WITH
*THEIR BEING ENTERED AS CHARACTER VARIABLES IN SOME YEARS AND AS NUMERIC
*VARIABLES IN OTHER YEARS.  THIS ACTION GENERATES NON-FATAL ERROR MESSAGES
*WHERE THE VARIABLES ARE NOT ENCOUNTERED (SUCH AS DISP3 IN TYPE2 RECORDS
*AND DISPO IN TYPE3 RECORDS).
*THE SAMPLE TABLES ARE INCLUDED FOR COMPLETENESS ONLY AND THE USER IS AD-
*VISED TO SELECT AND EDIT THE EXAMPLES AS APPROPRIATE TO THEIR NEEDS, SINCE
*THE LARGER TABLES BECOME PARTICULARLY CUMBERSOME.
*TO RUN: MAKE THE APPROPRIATE CHANGES IN THE FOLLOWING SECTION.  ALTHOUGH
*THE SPECIFICATION SECTION CONTAINS AREA_X FOR COMPLETENESS ONLY, AS THE
*PROGRAM AS CURRENTLY SPECIFIED DOES NOT DISAGGREGATE OVER THIS VARIABLE.
*****************************************************************************
*****************************************************************************

***CHANGE THE FOLLOWING***;

***LIBNAMES***;
libname strips 'c:\data\mrfss'; *LOCATION OF TRIP DATA FILES;
libname sint 'c:\data\mrfss'; *LOCATION OF INTERCEPT DATA FILES;
libname rec 'c:\data\mrfss'; *LOCATION OF OUTPUT FILES;

***TARGET SPECIES CODE***;
%let prime1 = (prim1='8835360107');
%let prime2 = (prim2='8835360107');

***SPECIES NAME***;
%let specname = RED SNAPPER;

***SUBREGION***;
%let subreg = (sub_reg=7);
```

```
***STATES***;
%let states = (st=1 or st=12 or st=13 or st=22 or st=28
or st=37 or st=45 or st=48 or st=90);

***COLLAPSED MODES***;
%let modes = (mode_fx='3' or mode_fx='5' or mode_fx='7');

***COLLAPSED AREAS***;
%let areas =(area_x='1' or area_x='2' or area_x='3' or area_x='4' or
area_x='5');

***YEARS***;
%let yrs = 94; *STARTING YEAR;
%let yre = 94; *ENDING YEAR;

***WAVES***;
%let wavest = 1; *STARTING WAVE;
%let wavend = 6; *ENDING WAVE;
*******************************************************************************
*******************************************************************************

***THIS MACRO GETS THE APPROPRIATE INTERCEPT RECORDS OF INTEREST***;
%macro stb(yrst,yrend,wvst,wvend,typst,typend);
%do I=&yrst %to &yrend;
%do j=&wvst %to &wvend;
%do k=&typst %to &typend;
data temp (drop=intsite intnum intvuer surtyp); set sint.i&k._&I.&j.;
     if &prime1 or &prime2;
     if &subreg;
     if &states;
***THIS PORTION HANDLES THOSE YEARS (I BELIEVE ONLY 1988 AND 1992)
WHERE SOME WAVES WERE CODED BY MONTH***;
     if wave=1.1 then wave=1;
     if wave=1.2 then wave=1;
     if wave=2.1 then wave=2;
     if wave=2.2 then wave=2;
     if wave=3.1 then wave=3;
     if wave=3.2 then wave=3;
     if wave=4.1 then wave=4;
     if wave=4.2 then wave=4;
     if wave=5.1 then wave=5;
     if wave=5.2 then wave=5;
     if wave=6.1 then wave=6;
     if wave=6.2 then wave=6;

***REDUCE MODES TO 3 MODES***;
     if mode_fx='1' then mode_fx='3';
     if mode_fx='2' then mode_fx='3';
     if mode_fx='4' then mode_fx='5';
     if mode_fx='6' then mode_fx='5';

***CONVERT MONROE COUNTY (KEY WEST) TO FLORIDA.  MONROE COUNTY WAS GIVEN A
```

```
UNIQUE STATE CODE IN 1987***;
     if st=90 then st=12;

%if &I=&yrst and &j=&wvst %then %do;
data t&k.temp; set temp;
%end;

%if (&I=&yrst and &j>&wvst) or &I>&yrst %then %do;
data t&k.temp; set t&k.temp temp;
%end;

%end;
%end;
%end;
%mend;
%stb (&yrs,&yre,&wavest,&wavend,1,1);
     keep year id_code prim1 prim2 sub_reg st mode_fx wave cntrbtrs;
run;

data t1temp; set t1temp;
     if cntrbtrs=. then cntrbtrs=1;
     if cntrbtrs=0 then delete; *THIS REMOVES ALL FOLLOWER RECORDS. DO NOT
PANIC, WE WILL ADD SOME BACK IN;
proc sort tagsort;
     by id_code;
run;

***THIS SECTION DEALS WITH GETTING THE RECORDS OF FOLLOWERS WHO
TARGETED THE SPECIES IN QUESTION WHEN THEIR LEADER DID NOT***;

%macro follow(yrst,yrend,wvst,wvend);
%do I=&yrst %to &yrend;
%do j=&wvst %to &wvend;

***GET ALL FOLLOWER TYPE1 RECORDS FOR ANGLERS WHO TARGETED***;
data t1data; set rec.i1_&I.&j.;
     if &subreg;
     if &states;
     if cntrbtrs=0;
     if &prime1 or &prime2;
     if wave=1.1 then wave=1;
     if wave=1.2 then wave=1;
     if wave=2.1 then wave=2;
     if wave=2.2 then wave=2;
     if wave=3.1 then wave=3;
     if wave=3.2 then wave=3;
     if wave=4.1 then wave=4;
     if wave=4.2 then wave=4;
     if wave=5.1 then wave=5;
     if wave=5.2 then wave=5;
     if wave=6.1 then wave=6;
     if wave=6.2 then wave=6;
```

```
     if mode_fx='1' then mode_fx='3';
     if mode_fx='2' then mode_fx='3';
     if mode_fx='4' then mode_fx='5';
     if mode_fx='6' then mode_fx='5';
     if st=90 then st=12;
     keep id_code prim1 prim2 year sub_reg wave st mode_fx cntrbtrs;
proc sort tagsort;
     by id_code;
run;

data t1data1; set t1data;
     mark=1;
run;

***GET ALL TYPE4 RECORDS (ALL FOLLOWERS)***;
data t4data; set rec.gp4_&I.&j.;
     if &subreg;
     if &states;
     if wave=1.1 then wave=1;
     if wave=1.2 then wave=1;
     if wave=2.1 then wave=2;
     if wave=2.2 then wave=2;
     if wave=3.1 then wave=3;
     if wave=3.2 then wave=3;
     if wave=4.1 then wave=4;
     if wave=4.2 then wave=4;
     if wave=5.1 then wave=5;
     if wave=5.2 then wave=5;
     if wave=6.1 then wave=6;
     if wave=6.2 then wave=6;
     if mode_fx='1' then mode_fx='3';
     if mode_fx='2' then mode_fx='3';
     if mode_fx='4' then mode_fx='5';
     if mode_fx='6' then mode_fx='5';
     if st=90 then st=12;
     x2=leader;
     keep year id_code leader cntrbtrs sub_reg st mode_fx wave x2;
proc sort tagsort;
     by id_code;
run;

***MERGE THE TYPE1 TARGET FOLLOWER RECORDS (DATA SET 'T1DATA1') WITH ALL THE
TYPE4 RECORDS (DATA SET 'T4DATA').  THIS PRODUCES A SET OF RECORDS CONTAININ
FOLLOWER TYPE1 TARGET RECORDS AND ALL FOLLOWER TYPE4 RECORDS AND THUS PROVII
LEADER ID_CODES FOR TARGETING FOLLOWERS***;
data tempo; merge t1data1 t4data;
     by id_code;
proc sort tagsort;
     by id_code;
run;

***WE KEEP ONLY THE MERGED TYPE1/TYPE4 RECORDS FOR ANGLERS WHO TARGETED
```

```
THE SPECIES (MARK=1. MARK=. FOR TYPE4 FOLLOWER RECORDS WITH NO TARGET TYPE1
COUNTERPART).  IT IS POSSIBLE TO HAVE MULTIPLE RECORDS WITH THE SAME
LEADER ID_CODE***;
data tempo; set tempo;
    if mark=1;
    x4=leader;
proc sort tagsort;
    by x4;
run;

***WE ARE LEFT WITH A T1T4 SET OF RECORDS THAT HAS THOSE FOLLOWER RECORDS TH
TARGET THE DESIRED SPECIES AND ALSO INCLUDES THE LEADER ID_CODE.  OF THESE,
WE ONLY NEED THE FIRST RECORD BY (LEADER) ID_CODE BECAUSE THE GOAL IS TO
IDENTIFY THE LEADER AND THIS ONLY NEEDS TO BE DONE ONCE***;
data tempoA; set tempo;
    by x4;
    if first.x4;
    tmark=2;
proc sort tagsort;
    by x4;
run;

***GET THE LEADER RECORDS (A LEADER WILL BE INDICATED BY MULTIPLE CNTRBTRS)
THAT DID NOT TARGET THE DESIRED SPECIES FROM THE TYPE1 RECORDS***;
data notarget; set rec.i1_&I.&j.;
    if &subreg;
    if &states;
    if cntrbtrs > 1;
    if &prime1 or &prime2 then delete;
    if wave=1.1 then wave=1;
    if wave=1.2 then wave=1;
    if wave=2.1 then wave=2;
    if wave=2.2 then wave=2;
    if wave=3.1 then wave=3;
    if wave=3.2 then wave=3;
    if wave=4.1 then wave=4;
    if wave=4.2 then wave=4;
    if wave=5.1 then wave=5;
    if wave=5.2 then wave=5;
    if wave=6.1 then wave=6;
    if wave=6.2 then wave=6;
    if mode_fx='1' then mode_fx='3';
    if mode_fx='2' then mode_fx='3';
    if mode_fx='4' then mode_fx='5';
    if mode_fx='6' then mode_fx='5';
    if st=90 then st=12;
    x4=id_code;
    mark=2;
proc sort tagsort;
    by x4;
run;
```

```
***MERGE THE FOLLOWERS WHO TARGETED (DATA SET 'TEMPOA') WITH THE SET OF
LEADERS
WHO DID NOT TARGET (DATA SET 'NOTARGET'). MERGING IS DONE BY THE VARIABLE
'X4'
WHICH EQUALS EITHER THE LEADER ID_CODE FOR FOLLOWERS OR THE TYPE1 RECORD
ID_CODE FOR LEADERS THAT DID NOT TARGET. WHERE THE RECORDS DO NOT MATCH, WE
WILL GET A '.' FOR EITHER VARIABLE 'TMARK' (INDICATING NO FOLLOWER TARGETS
THE SPECIES WHEN THE LEADER DID NOT) OR VARIABLE 'MARK' (INDICATING NO LEADER
RECORD OF INTEREST, WHICH MEANS THE LEADER ALSO TARGETED THE SPECIES AND WE
ALREADY PULLED HIS RECORD IN THE FIRST SELECTION). WE WANT THE RECORDS WHERE
THEY MATCH. WE END UP WITH THE LEADER RECORDS OF TRIPS WHERE THE LEADER DID
NOT TARGET THE SPECIES BUT WHERE AT LEAST 1 FOLLOWER DID***;

data one; merge tempoa notarget;
    by x4;
    if tmark^=2 or mark^=2 then delete;
*proc print; *var id_code leader x4 cntrbtrs tmark mark prim1 prim2;
run;

data two; set one;
    x4=leader;
    tmark=3;
keep leader x4 tmark;
proc sort tagsort;
    by x4;
run;

***WE HAVE IDENTIFIED THE LEADERS WHO DID NOT TARGET WHEN AT LEAST 1 FOLLOWER
DID. THE NEXT STEP IS TO ELIMINATE THE RECORDS OF FOLLOWERS WHO TARGETED
WHOSE LEADERS ALSO TARGETED SO THAT WE AVOID DOUBLE COUNTING OF THESE ANGLERS
DATA SET 'TWO' PROVIDES THE APPROPRIATE LEADERS AND DATA SET 'TEMPO' IS THE
ENTIRE TARGETING FOLLOWER DATA SET WHICH LACKS THE VARIABLE 'TMARK'. WHERE
'TWO' AND 'TEMPO' SHARE COMMON VALUES FOR THE VARIABLE 'X4', THE MERGED DATA
WILL ACQUIRE A VALUE OF '3' FOR TMARK FROM DATA SET 'TWO'. ELSEWHERE,
TMARK='.'. THESE RECORDS WILL BE DISCARDED***;
data three;
merge tempo two;
    by x4;
    if tmark=. then delete;
proc sort tagsort;
    by id_code;
*proc print; *var id_code leader x4 cntrbtrs mark tmark prim1 prim2;
run;

***MERGE THE RECORDS OF FOLLOWERS WHO TARGETED WHEN THEIR LEADERS DID NOT
(DATA SET 'THREE') WITH THE ORIGINAL SET OF ALL TARGETING FOLLOWERS (DATA SET
'T1DATA'). DATA SET 'THREE' CONTAINS THE VARIABLE 'MARK' (=1) AND DATA SET
'T1DATA' DOES NOT. THEREFORE, WHERE A MERGE MATCH OCCURS, 'MARK'=1 AND EQUALS
'.' ELSEWHERE (INDICATING THAT THE LEADERS OF THESE FOLLOWERS ALSO TARGETED
THE SPECIES). THE NON-MATCHES WILL BE DISCARDED***;
data four;
merge three t1data;
```

```
    by id_code;
    if mark=.  then delete;
*proc print; *var id_code wave cntrbtrs priml prim2 mark;
run;

%if &I=&yrst and &j=&wvst %then %do;
data fourall; set four;
%end;

%if (&I=&yrst and &j>&wvst) or &I>&yrst %then %do;
data fourall; set fourall four;
%end;

%end;
%end;
%mend;
%follow(&yrs,&yre,&wavest,&wavend);
run;

***THIS ENDS THE IDENTIFICATION OF THE RECORDS OF THOSE FOLLOWERS WHO TARGE
THE SPECIES WHEN THEIR LEADER DID NOT.  NEXT WE MUST ADD THESE RECORDS
(DATA SET 'FOUR') BACK INTO THE PRIMARY DATA SET (DATA SET 'T1TEMP')***;

data t1temp; set t1temp fourall;
    if cntrbtrs=0 then cntrbtrs=1 ;*ALL THE FOLLOWER RECORDS HAVE
CNTRBTRS=0;
proc sort tagsort;
    by id_code;
*proc print; *var id_code cntrbtrs;
run;

data t1temp; set t1temp;
proc summary;
    class sub_reg year st wave mode_fx;
    var cntrbtrs;
    output out=t1temp sum=cntrbtrs;
run;

data tallsum; set t1temp;
    if _type_ =31;
    targints=cntrbtrs;
*proc print; *var year st mode_fx wave targints;
run;

***THIS NEXT SET OF ACTIONS DEALS WITH EXPANSION TO FINAL ESTIMATES***;
%macro stba(yrst,yrend,wvst,wvend);
%do I=&yrst %to &yrend;
%do j=&wvst %to &wvend;

data temp; set sint.i1_&I.&j.;
     if &subreg;
     if &states;
```

```
      if wave=1.1 then wave=1;
      if wave=1.2 then wave=1;
      if wave=2.1 then wave=2;
      if wave=2.2 then wave=2;
      if wave=3.1 then wave=3;
      if wave=3.2 then wave=3;
      if wave=4.1 then wave=4;
      if wave=4.2 then wave=4;
      if wave=5.1 then wave=5;
      if wave=5.2 then wave=5;
      if wave=6.1 then wave=6;
      if wave=6.2 then wave=6;
      if mode_fx='1' then mode_fx='3';
      if mode_fx='2' then mode_fx='3';
      if mode_fx='4' then mode_fx='5';
      if mode_fx='6' then mode_fx='5';
      if st=90 then st=12;
      keep year id_code sub_reg st mode_fx wave cntrbtrs;
proc append data=temp base=alltemp;
run;
%end;
%end;
%mend;
%stba(&yrs,&yre,&wavest,&wavend);
run;

proc sort data=alltemp tagsort;
    by sub_reg year st wave mode_fx;
proc summary;
    var cntrbtrs;
    class sub_reg year st wave mode_fx;
    output out=allsum sum=cntrbtrs;
run;

%macro stbb(yrst,yrend);
%do I=&yrst %to &yrend;
data trip; set strips.ag&I.;
      if &subreg;
      if &states;
      if wave=1.1 then wave=1;
      if wave=1.2 then wave=1;
      if wave=2.1 then wave=2;
      if wave=2.2 then wave=2;
      if wave=3.1 then wave=3;
      if wave=3.2 then wave=3;
      if wave=4.1 then wave=4;
      if wave=4.2 then wave=4;
      if wave=5.1 then wave=5;
      if wave=5.2 then wave=5;
      if wave=6.1 then wave=6;
      if wave=6.2 then wave=6;
      if mode_fx='1' then mode_fx='3';
```

```
     if mode_fx='2' then mode_fx='3';
     if mode_fx='4' then mode_fx='5';
     if mode_fx='6' then mode_fx='5';
     if st=90 then st=12;
     keep year sub_reg st mode_fx wave numrtrip;
proc append data=trip base=trips;
run;
%end;
%mend;
%stbb(&yrs,&yre);
run;

data allsum; set allsum;
    if _type_=31;
    allints=cntrbtrs;
run;

proc sort data=trips tagsort;
    by sub_reg year st wave mode_fx;
run;

data trips; set trips;
proc summary;
    var numrtrip;
    by sub_reg year st wave mode_fx;
    output out=trips sum=numrtrip;
*proc print; *var sub_reg year st mode_fx wave numrtrip;
run;

data allsum; set allsum;
proc sort tagsort;
    by sub_reg year st wave mode_fx;
*proc print; *var sub_reg year st wave mode_fx allints;
run;

data tallsum; set tallsum;
proc sort tagsort;
    by sub_reg year st wave mode_fx;
*proc print; *var sub_reg year st wave mode_fx targints;
run;

data pcttarg;
merge trips allsum tallsum;
    by sub_reg year st wave mode_fx;
    if targints=. then targints=0;
*proc print; *var sub_reg year st mode_fx wave targints allints numrtrip;
run;

data pcttarg; set pcttarg;
    pcttarg=(targints/allints)*100;
    tartrips=(numrtrip*pcttarg)/100;
    if tartrips=. then tartrips=0 ;
```

```
*proc print; *var sub_reg year st mode_fx wave targints allints pcttarg
numrtrip tartrips;
run;

data pcttarg; set pcttarg;
proc sort tagsort;
    by sub_reg year st wave mode_fx;
run;

proc format;
    value years 81='1981'
                82='1982'
                83='1983'
                84='1984'
                85='1985'
                86='1986'
                87='1987'
                88='1988'
                89='1989'
                90='1990'
                91='1991'
                92='1992'
                93='1993'
                94='1994'
                95='1995';

    value staten   1='ALABAMA'
                   12='FLORIDA'
                   13='GEORGIA'
                   22='LOUISIANA'
                   28='MISSISSIPPI'
                   37='NORTH CAROLINA'
                   45='SOUTH CAROLINA'
                   48='TEXAS';

    value $moden   '3'='SHORE'
                   '5'='PARTY/CHARTER'
                   '7'='PRIVATE/RENTAL';

    value region    6='SOUTH ATLANTIC'
                    7='GULF OF MEXICO';
run;

data alltable; set pcttarg;
options ls=250 ps=100 nocenter nonumber;
format sub_reg region. year years. st staten. mode_fx moden.;
proc tabulate formchar='|----|+|----|';
     class year st wave mode_fx;
     var tartrips numrtrip;
     by sub_reg;
table all="&specname TARGET EFFORT TRIPS BY"*all='STATE, WAVE & MODE',
     year, (st='STATE'*wave='WAVE'*mode_fx='MODE'
```

```
     all='TOTAL')*(tartrips='TARGET EFFORT TRIPS' numrtrip='TOTAL TRIPS')
     *sum='TOTAL'*f=comma10./rts=15;
table all="&specname TARGET EFFORT TRIPS BY"*all='STATE & MODE',
     year, (st='STATE'*mode_fx='MODE'
     all='TOTAL')*(tartrips='TARGET EFFORT TRIPS' numrtrip='TOTAL TRIPS')
     *sum='TOTAL'*f=comma10./rts=15;
table all="&specname TARGET EFFORT TRIPS BY"*all='STATE & WAVE',
     year, (st='STATE'*wave='WAVE' all='TOTAL')
     *(tartrips='TARGET EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
     *f=comma10./rts=15;
table all="&specname TARGET EFFORT TRIPS BY STATE",
     year, (st='STATE' all='TOTAL')
     *(tartrips='TARGET EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
     *f=comma10./rts=15;
table all="&specname TARGET EFFORT TRIPS BY STATE",
     year, (st='STATE' all='TOTAL')
     *(tartrips='TARGET EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
pctsum<numrtrip>='%'*f=6.2)
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)/rts=15;
table all="&specname TARGET EFFORT TRIPS BY STATE",
     year, (st='STATE'
     *(tartrips='TARGET EFFORT TRIPS'*sum='TOTAL'*f=comma10.
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)
     all='TOTAL'
     *(tartrips='TARGET EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
     pctsum<numrtrip>='%'*f=6.2)
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.))/rts=15;
table all="&specname TARGET EFFORT TRIPS BY"*all='WAVE & MODE',
     year, (wave='WAVE'*mode_fx='MODE' all='TOTAL')
     *(tartrips='TARGET EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
     *f=comma10./rts=15;
table all="&specname TARGET EFFORT TRIPS BY WAVE",
     year, (wave='WAVE' all='TOTAL')
     *(tartrips='TARGET EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
     *f=comma10./rts=15;
table all="&specname TARGET EFFORT TRIPS BY WAVE",
     year, (wave='WAVE' all='TOTAL')
     *(tartrips='TARGET EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
     pctsum<numrtrip>='%'*f=6.2)
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)/rts=15;
table all="&specname TARGET EFFORT TRIPS BY WAVE",
     year, (wave='WAVE'
     *(tartrips='TARGET EFFORT TRIPS'*sum='TOTAL'*f=comma10.
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)
     all='TOTAL'
     *(tartrips='TARGET EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
     pctsum<numrtrip>='%'*f=6.2)
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.))/rts=15;
table all="&specname TARGET EFFORT TRIPS BY MODE",
     year, (mode_fx='MODE' all='TOTAL')
     *(tartrips='TARGET EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
     *f=comma10./rts=15;
```

```
table all="&specname TARGET EFFORT TRIPS BY MODE",
     year, (mode_fx='MODE' all='TOTAL')
     *(tartrips='TARGET EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
     pctsum<numrtrip>='%'*f=6.2)
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)/rts=15;
table all="&specname TARGET EFFORT TRIPS BY MODE",
     year, (mode_fx='MODE'
     *(tartrips='TARGET EFFORT TRIPS'*sum='TOTAL'*f=comma10.
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)
     all='TOTAL'
     *(tartrips='TARGET EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
     pctsum<numrtrip>='%'*f=6.2)
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.))/rts=15;
table all="&specname TARGET EFFORT TRIPS",
     year, all='TOTAL'
     *(tartrips='TARGET EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
     *f=comma10./rts=15;
table all="&specname TARGET EFFORT TRIPS",
     year, all='TOTAL'
     *(tartrips='TARGET EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
     pctsum<numrtrip>='%'*f=6.2)  numrtrip='TOTAL TRIPS'*sum='TOTAL'
     *f=comma10.)/rts=15;
run;
```

APPENDIX B
CATCH EFFORT PROGRAM

```
*****************************CATCH EFFORT PROGRAM*********************************
* CATCHF.SAS;                                                                    *
* THIS PROGRAM CALCULATES THE NUMBER OF ANGLER TRIPS THAT CATCH THE SPECIES       *
*                                                                                *
* INTEREST.  THE RESULTS ARE PRODUCED IN SAMPLE TABLES AND SUMMARIZED BY         *
*    1.  YEAR, SUBREGION, STATE, WAVE AND MODE                                   *
*    2.  YEAR, SUBREGION, STATE AND MODE                                         *
*    3.  YEAR, SUBREGION, STATE AND WAVE                                         *
*    4.  YEAR, SUBREGION, WAVE AND MODE                                          *
*    5.  YEAR, SUBREGION AND STATE                                               *
*    6.  YEAR, SUBREGION AND WAVE                                                *
*    7.  YEAR, SUBREGION AND MODE                                                *
*    8.  YEAR AND SUBREGION.                                                     *
*THE PROGRAM IS DESIGNED TO EVALUATE MULTIPLE YEARS AND HAS BEEN TESTED FOR      *
*THE SOUTH ATLANTIC AND GULF OF MEXICO SUBREGIONS ONLY.  CERTAIN OPERATIONS      *
*ARE INCLUDED TO ADDRESS SPECIFIC DATA NUANCES OR PROBLEMS IN THESE SUB-         *
*REGIONS IN SPECIFIC YEARS AND THUS MAY BE SUPERFLUOUS FOR OTHER SUBREGIONS      *
*OR INDIVIDUAL YEARS.                                                           *
*MANY OF THE PROC SORTS ARE LIKELY SUPERFLUOUS AND THE FREQUENT PROC PRINTS      *
*WERE ORIGINALLY INSERTED AS SAFETY CHECKS TO SEE WHETHER THE PROGRAM WAS        *
*PERFORMING THE DESIRED OPERATIONS.                                             *
*VARIABLES HAVE BEEN DROPPED IN THE FIRST MACRO BECAUSE OF PROBLEMS WITH         *
*THEIR BEING ENTERED AS CHARACTER VARIABLES IN SOME YEARS AND AS NUMERIC         *
*VARIABLES IN OTHER YEARS.  THIS ACTION GENERATES NON-FATAL ERROR MESSAGES       *
*WHERE THE VARIABLES ARE NOT ENCOUNTERED (SUCH AS DISP3 IN TYPE 2 RECORDS       *
*AND DISPO IN TYPE 3 RECORDS).                                                  *
*THE SAMPLE TABLES ARE INCLUDED FOR COMPLETENESS ONLY AND THE USER IS ADVISED*
*TO SELECT AND EDIT THE EXAMPLES AS APPROPRIATE TO THEIR NEEDS, SINCE THE       *
*LARGER TABLES BECOME PARTICULARLY CUMBERSOME.                                  *
*TO RUN: MAKE THE APPROPRIATE CHANGES IN THE FOLLOWING SECTION.  THE            *
*SPECIFICATION SECTION CONTAINS AREA_X FOR COMPLETENESS ONLY, AS THE             *
*PROGRAM AS CURRENTLY SPECIFIED DOES NOT DISAGGREGATE OVER THIS VARIABLE.       *
********************************************************************************
********************************************************************************;

***CHANGE THE FOLLOWING***;

***LIBNAMES***;
libname strips 'c:\data\mrfss'; *LOCATION OF TRIP DATA FILES;
libname sint 'c:\data\mrfss'; *LOCATION OF INTERCEPT DATA FILES;
libname rec 'c:\data\mrfss'; *LOCATION OF OUTPUT FILES;

***SPECIES CODE***;
%let species = (sp_code='8835360107');

***SPECIES NAME***;
%let specname = RED SNAPPER;

***SUBREGION***;
%let subreg = (sub_reg=7);

***STATES***;
```

```
%let states = (st=1 or st=12 or st=13 or st=22 or st=28
or st=37 or st=45 or st=48 or st=90);

***COLLAPSED MODES***;
%let modes = (mode_fx='3' or mode_fx='5' or mode_fx='7');

***COLLAPSED AREAS***;
%let areas = (area_x='1' or area_x='2' or area_x='3' or area_x='4' or
area_x='5');

***YEARS***;
%let yrs = 82; *STARTING YEAR;
%let yre = 94; *ENDING YEAR;

***WAVES***;
%let wavest = 1; *STARTING WAVE;
%let wavend = 6; *ENDING WAVE;
*************************************************************************;
*************************************************************************;

***THIS MACRO GETS THE APPROPRIATE INTERCEPT RECORDS OF INTEREST***;
%macro stb (yrst,yrend,wvst,wvend,typst,typend);
%do I=&yrst %to &yrend;
%do j=&wvst %to &wvend;
%do k=&typst %to &typend;
data temp (drop=intsite disp3 dispo); set sint.i&k._&I.&j.;
     if &species;
     if &subreg;
     if &states;
***THIS NEXT PORTION HANDLES THOSE YEARS (I BELIEVE ONLY 1988 AND 1992)
WHERE SOME WAVES WERE CODED BY MONTH***;
     if wave=1.1 then wave=1;
     if wave=1.2 then wave=1;
     if wave=2.1 then wave=2;
     if wave=2.2 then wave=2;
     if wave=3.1 then wave=3;
     if wave=3.2 then wave=3;
     if wave=4.1 then wave=4;
     if wave=4.2 then wave=4;
     if wave=5.1 then wave=5;
     if wave=5.2 then wave=5;
     if wave=6.1 then wave=6;
     if wave=6.2 then wave=6;

***REDUCE MODES TO 3 MODES***;
     if mode_fx='1' then mode_fx='3';
     if mode_fx='2' then mode_fx='3';
     if mode_fx='4' then mode_fx='5';
     if mode_fx='6' then mode_fx='5';

***CONVERT MONROE COUNTY (KEY WEST) TO FLORIDA.  MONROE COUNTY WAS GIVEN A
UNIQUE STATE CODE IN 1987***;
```

```
     if st=90 then st=12;

%if &I=&yrst and &j=&wvst %then %do;
data t&k.temp; set temp;
%end;

%if (&I=&yrst and &j>&wvst) or &I>&yrst %then %do;
data t&k.temp; set t&k.temp temp;
%end;
%end;
%end;
%end;
%mend;
%stb(&yrs,&yre,&wavest,&wavend,2,3);
run;

data t2temp; set t2temp;
     keep year id_code sp_code sub_reg st mode_fx wave cntrbtrs num_fish;
run;

data t3temp; set t3temp;
     keep year id_code sp_code sub_reg st mode_fx wave cntrbtrs fshinsp;
run;

***THIS DATA STEP TAGS TYPE 2 RECORDS (THROUGH LEAD=1) FOR A LATER
PROCEDURE***;
data t2temp; set t2temp;
     lead=1;
proc sort;
     by id_code;
*proc print; *var id_code num_fish sp_code cntrbtrs;
run;

***NATURE OF THE PROBLEM: FOR THE METHOD OF ANALYSIS CONDUCTED HERE, WE NEED
TOTAL FISH CAUGHT, BOTH TYPE A AND TYPE B, AND THE NUMBER OF CNTRBTRS. TYPE3
RECORDS LISTING TYPE A (FSHINSP) ARE AN ACCEPTABLE FORM BECAUSE ALL FISH ARE
RECORDED ON THE LEADER'S RECORD AND THE VALUE OF CNTRBTRS REFLECTS TOTAL
EFFORT OR PARTICIPATION.  TYPE2 RECORDS (RECORDING TYPE B CATCH THROUGH
THE VARIABLE 'NUM_FISH') ARE INDIVIDUAL BY CATCH BUT MIXED FOR CNTRBTRS (=0
FOR FOLLOWERS AND >=1 FOR LEADERS OR SINGLE CNTRBTRS).  FROM THE TYPE2 RECORDS
WE NEED ALL THE FISH BUT ONLY THE LEADER'S ENTRY FOR CNTPBTRS. WE MUST
IDENTIFY
LEADER ID_CODES FOR EACH FOLLOWER AND ADD THE FISH FROM EACH FOLLOWER TO THEIR
LEADER, THEN DISCARD THE FOLLOWER RECORDS***;

%macro fix (yrst, yrend, wvst, wvend);
%do I=&yrst %to &yrend;
%do j=&wvst %to &wvend;

data data4; set sint.gp4_&I.&j.;
     if &subreg;
     if &states;
```

```
     if wave=1.1 then wave=1;
     if wave=1.2 then wave=1;
     if wave=2.1 then wave=2;
     if wave=2.2 then wave=2;
     if wave=3.1 then wave=3;
     if wave=3.2 then wave=3;
     if wave=4.1 then wave=4;
     if wave=4.2 then wave=4;
     if wave=5.1 then wave=5;
     if wave=5.2 then wave=5;
     if wave=6.1 then wave=6;
     if wave=6.2 then wave=6;
     if mode_fx='1' then mode_fx='3';
     if mode_fx='2' then mode_fx='3';
     if mode_fx='4' then mode_fx='5';
     if mode_fx='6' then mode_fx='5';
     if st=90 then st=12;
     keep year id_code leader cntrbtrs sub_reg st mode_fx wave;
proc sort tagsort;
     by id_code;
run;

%if&I=&yrst and &j=&wvst %then %do;
data data4all; set data4;
%end;

%if(&I=&yrst and &j>&wvst) or &I>&yrst %then %do;
data data4all; set data4all data4;
%end;

%end;
%end;
%mend;
%fix(&yrs,&yre,&wavest,&wavend);
run;

data data4all; set data4all;
proc sort;
     by id_code;
run;

***MERGE THE FOLLOWER RECORDS WITH THE TYPE 2 RECORDS***;
data t2temp4;
merge t2temp data4all;
     by id_code;
*proc print; *var id_code num_fish lead leader cntrbtrs;
run;

***DISCARD THE GP4 RECORDS FOR THOSE FOLLOWERS WHO ARE NOT IN OUR
SPECIES-OF-INTEREST GROUP AND CHANGES THE FOLLOWER ID_CODE TO THE LEADER
ID_CODE***;
data t2tempx; set t2temp4;
```

```
     if lead=1;
     if cntrbtrs=0 then id_code=leader;
proc sort;
     by id_code;
*proc print; *var id_code leader num_fish cntrbtrs;
run;

***AT THIS POINT WE WILL ONLY HAVE LEADER ID_CODES WITH MIXED CNTRBTRS
ENTRIES.  AT THE END OF THE SUMMING, THE ORIGINAL LEADER CNTRBTRS WILL
SUPPLANT MOST OF THE '0' CNTRBTRS ENTRIES FROM THE FOLLOWERS RECORDS. SOME
WILL BE LEFT, HOWEVER, WHERE THE LEADER DID NOT ALSO CATCH THE SPECIES. LATER
WE WILL CHANGE THESE REMAINING CNTRBTRS=0 TO 1;

data t2sum; set t2tempx;
proc summary;
     var num_fish;
     by id_code;
     id sub_reg year st wave mode_fx cntrbtrs;
     output out=t2sum sum=num_fish;
*proc print data=t2sum; *var id_code num_fish cntrbtrs;
run;

***THIS ENDS THE EFFORT TO ADD FOLLOWER NUM_FISH TO LEADER NUM_FISH. WE
ARE LEFT ONLY WITH LEADER RECORDS (A LEADER CAN BE ONLY A SINGLE INDIVIDUAL IF
IT IS A SINGLE CNTRBTR TRIP) WHICH WILL MERGE DIRECTLY WITH TYPE3 RECORDS. WE
WILL HAVE THEREFORE RETAINED ALL LEADER AND FOLLOWER NUM_FISH AND (FROM BELOW)
ALL LEADER FSHINSP AND ALL TALLIES OF CNTRBTRS***;

data t2sum; set t2sum;
proc sort;
     by id_code;
run;

data t3temp; set t3temp;
proc sort;
     by id_code sp_code;
*proc print; *var id_code sp_code fshinsp cntrbtrs;
run;

***THIS DATASTEP ALLOWS COMBINING MULTIPLE SPECIES WITHIN THE BAG.  WE
OBTAIN THE FIRST RECORD FOR EACH SPECIES BY ID_CODE AND SUM ALL THE FISH***;
data t3temp; set t3temp;
     by id_code sp_code;
     if first.sp_code;
proc summary;
     var fshinsp;
     by id_code;
     id sub_reg year st wave mode_fx cntrbtrs;
     output out=t3temp sum=fshinsp;
*proc print; *var id_code fshinsp cntrbtrs;
run;
```

```
***THIS NEXT SERIES OF STEPS CALCULATES THE NUMBER OF TRIPS (HITS) BASED ON
THE RATIO OF FISH TO CONTRIBUTORS.  THE APPROACH FOLLOWED IS TO USE THE
MAXIMUM NUMBER OF OBSERVATIONS POSSIBLE, I.E. BOTH SINGLE AND MULTIPLE
CONTRIBUTOR RECORDS.  SINCE IT IS IMPOSSIBLE TO DISCERN FROM TYPE A CATCH
WHICH ANGLER ACTUALLY LANDED WHICH FISH, THE APPROACH TAKEN IS TO DIVIDE TOTAL
FISH BY TOTAL CONTRIBUTORS.  IF THIS RATIO IS LESS THAN 1, THE PROGRAM ASSUMES
EACH FISH WAS CAUGHT BY A DIFFERENT INDIVIDUAL AND THE NUMBER OF CATCH TRIPS
IS THEREFORE THE NUMBER OF FISH.  IF THE RATIO IS GREATER THAN 1, THEN THE
PROGRAM ASSUMES THAT EVERY CONTRIBUTOR CAUGHT AT LEAST 1 FISH AND THE NUMBER
OF CATCH TRIPS IS THEREFORE THE NUMBER OF CONTRIBUTORS.  THIS APPROACH WILL
CALCULATE THE MAXIMUM NUMBER OF CATCH TRIPS POSSIBLE***;

data tall;
merge t2sum t3temp;
by id_code;
     if fshinsp=.  then fshinsp=0; *WHERE WE DON'T HAVE T2-T3 MATCHES WE WILL
GET FSHINSP=.;
     if num_fish=. then num_fish=0.;
run;
proc sort;
     by id_code;
*proc print; * var id_code fshinsp num_fish cntrbtrs;
run;

data tall; set tall;
     by id_code;
     hit=0;
     if cntrbtrs=0 then cntrbtrs=1;
     fish=(fshinsp + num_fish);
     ave=(fish/cntrbtrs);
     if cntrbtrs=1 then hit=1;
     if ave le 1 then hit=fish;
     if ave > 1 then hit=cntrbtrs;
*proc print; *var id_code fshinsp num_fish ave cntrbtrs hit;
run;
proc sort data=tall;
     by sub_reg year st wave mode_fx;
proc summary;
     var hit;
     class sub_reg year st wave mode_fx;
     output out=tallsum sum=hits;
run;

data tallsum; set tallsum;
     if _type_ =31;
     rsints=hits;
*proc print; *var sub_reg year st mode_fx newwwave rsints;
run;

***THE NEXT SET OF ACTIONS DEALS WITH EXPANSION TO FINAL ESTIMATES***;
%macro stba(yrst,yrend,wvst,wvend);
%do I=&yrst %to &yrend;
```

```
%do j=&wvst %to &wvend;

data temp; set sint.il_&I.&j.;
     if &subreg;
     if &states;
     if wave=1.1 then wave=1;
     if wave=1.2 then wave=1;
     if wave=2.1 then wave=2;
     if wave=2.2 then wave=2;
     if wave=3.1 then wave=3;
     if wave=3.2 then wave=3;
     if wave=4.1 then wave=4;
     if wave=4.2 then wave=4;
     if wave=5.1 then wave=5;
     if wave=5.2 then wave=5;
     if wave=6.1 then wave=6;
     if wave=6.2 then wave=6;
     if mode_fx='1' then mode_fx='3';
     if mode_fx='2' then mode_fx='3';
     if mode_fx='4' then mode_fx='5';
     if mode_fx='6' then mode_fx='5';
     if st=90 then st=12;
     keep year id_code sub_reg st mode_fx wave cntrbtrs;
proc append data=temp base=alltemp;
run;
%end;
%end;
%mend;
%stba(&yrs,&yre,&wavest,&wavend);
run;

proc sort data=alltemp;
     by sub_reg year st wave mode_fx;
proc summary;
     var cntrbtrs;
     class sub_reg year st wave mode_fx;
     output out=allsum sum=cntrbtrs;
run;

%macro stbb(yrst, yrend);
%do I=&yrst %to &yrend;

data trip; set strips.ag&I.;
     if &subreg;
     if &states;
     if wave=1.1 then wave=1;
     if wave=1.2 then wave=1;
     if wave=2.1 then wave=2;
     if wave=2.2 then wave=2;
     if wave=3.1 then wave=3;
     if wave=3.2 then wave=3;
     if wave=4.1 then wave=4;
```

```
     if wave=4.2 then wave=4;
     if wave=5.1 then wave=5;
     if wave=5.2 then wave=5;
     if wave=6.1 then wave=6;
     if wave=6.2 then wave=6;
     if mode_fx='1' then mode_fx='3';
     if mode_fx='2' then mode_fx='3';
     if mode_fx='4' then mode_fx='5';
     if mode_fx='6' then mode_fx='5';
     if st=90 then st=12;
     keep year sub_reg st mode_fx wave numrtrip;
proc append data=trip base=trips;
run;
%end;
%mend;
%stbb(&yrs,&yre);
run;

data allsum; set allsum;
     if _type_=31;
     allints=cntrbtrs;
run;
proc sort data=trips;
     by sub_reg year st wave mode_fx;
run;

data trips; set trips;
proc summary;
     var numrtrip;
     by sub_reg year st wave mode_fx;
     output out=trips sum=numrtrip;
*proc print; *var sub_reg year st mode_fx wave numrtrip;
run;

data allsum; set allsum;
proc sort;
     by sub_reg year st wave mode_fx;
*proc print; *var sub_reg year st wave mode_fx allints;
run;

data tallsum; set tallsum;
proc sort;
     by sub_reg year st wave mode_fx;
*proc print; *var sub_reg year st wave mode_fx rsints;
run;

data pctcat;
merge trips allsum tallsum;
     by sub_reg year st wave mode_fx;
     if rsints=. then rsints=0;
*proc print; *var sub_reg year st mode_fx wave rsints allints numrtrip;
run;
```

```
data pctcat; set pctcat;
     pctcat=(rsints/allints)*100 ;
     cattrips=(numrtrip*pctcat)/100;
     if cattrips=. then cattrips=0;
*proc print; *var sub_reg year st mode_fx wave rsints allints pctcat numrtrip
     cattrips;
run;

data pctcat; set pctcat;
proc sort;
     by sub_reg year st wave mode_fx;
run;

proc format;
     value years 81='1981'
                 82='1982'
                 83='1983'
                 84='1984'
                 85='1985'
                 86='1986'
                 87='1987'
                 88='1988'
                 89='1989'
                 90='1990'
                 91='1991'
                 92='1992'
                 93='1993'
                 94='1994'
                 95='1995';

     value staten   1='ALABAMA'
                   12='FLORIDA'
                   13='GEORGIA'
                   22='LOUISIANA'
                   28='MISSISSIPPI'
                   37='NORTH CAROLINA'
                   45='SOUTH CAROLINA'
                   48='TEXAS';

     value $moden   '3'='SHORE'
                    '5'='PARTY/CHARTER'
                    '7'='PRIVATE/RENTAL';

     value region    6='SOUTH ATLANTIC'
                     7='GULF OF MEXICO';
run;

data alltable; set pctcat;
options ls=250 ps=100 nocenter nonumber;
format sub_reg region. year years. st staten. mode_fx moden.;
proc tabulate formchar='|----|+|----|';
     class year st wave mode_fx;
```

```
     var cattrips numrtrip;
     by sub_reg;
table all="&specname CATCH EFFORT TRIPS BY"*all='STATE, WAVE & MODE',
     year, (st='STATE'*wave='WAVE'*mode_fx='MODE'
     all='TOTAL')*(cattrips='CATCH EFFORT TRIPS' numrtrip='TOTAL TRIPS')
     *sum='TOTAL'*f=comma10./rts=15;
table all="&specname CATCH EFFORT TRIPS BY"*all='STATE & MODE',
     year, (st='STATE'*mode_fx='MODE'
     all='TOTAL')*(cattrips='CATCH EFFORT TRIPS' numrtrip='TOTAL TRIPS')
     *sum='TOTAL'*f=comma10./rts=15;
table all="&specname CATCH EFFORT TRIPS BY"*all='STATE & WAVE',
     year, (st='STATE'*wave='WAVE' all='TOTAL')
     *(cattrips='CATCH EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
     *f=comma10./rts=15;
table all="&specname CATCH EFFORT TRIPS BY STATE",
     year, (st='STATE' all='TOTAL')
     *(cattrips='CATCH EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
     *f=comma10./rts=15;
table all="&specname CATCH EFFORT TRIPS BY STATE",
     year, (st='STATE' all='TOTAL')
     *(cattrips='CATCH EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
     pctsum<numrtrip>='%'*f=6.2)
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)/rts=15;
table all="&specname CATCH EFFORT TRIPS BY STATE",
     year, (st='STATE'
     *(cattrips='CATCH EFFORT TRIPS'*sum='TOTAL'*f=comma10.
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)
     all='TOTAL'
     *(cattrips='CATCH EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
     pctsum<numrtrip>='%'*f=6.2)
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.))/rts=15;
table all="&specname CATCH EFFORT TRIPS BY"*all='WAVE & MODE',
     year, (wave='WAVE'*mode_fx='MODE' all='TOTAL')
     *(cattrips='CATCH EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
     *f=comma10./rts=15;
table all="&specname CATCH EFFORT TRIPS BY WAVE",
     year, (wave='WAVE' all='TOTAL')
     *(cattrips='CATCH EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
     *f=comma10./rts=15;
table all="&specname CATCH EFFORT TRIPS BY WAVE",
     year, (wave='WAVE' all='TOTAL')
     *(cattrips='CATCH EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
     pctsum<numrtrip>='%'*f=6.2)
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)/rts=15;
table all="&specname CATCH EFFORT TRIPS BY WAVE",
     year, (wave='WAVE'
     *(cattrips='CATCH EFFORT TRIPS'*sum='TOTAL'*f=comma10.
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)
     all='TOTAL'
     *(cattrips='CATCH EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
     pctsum<numrtrip>='%'*f=6.2)
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.))/rts=15;
```

```
table all="&specname CATCH EFFORT TRIPS BY MODE",
     year, (mode_fx='MODE' all='TOTAL')
     *(cattrips='CATCH EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
     *f=comma10./rts=15;
table all="&specname CATCH EFFORT TRIPS BY MODE",
     year, (mode_fx='MODE' all='TOTAL')
     *(cattrips='CATCH EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
          pctsum<numrtrip>='%'*f=6.2)
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)/rts=15;
table all="&specname CATCH EFFORT TRIPS BY MODE",
     year, (mode_fx='MODE'
     *(cattrips='CATCH EFFORT TRIPS'*sum='TOTAL'*f=comma10.
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)
     all='TOTAL'
     *(cattrips='CATCH EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
     pctsum<numrtrip>='%'*f=6.2)
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.))/rts=15;
table all="&specname CATCH EFFORT TRIPS",
     year, all='TOTAL'
     *(cattrips='CATCH EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
     *f=comma10./rts=15;
table all="&specname CATCH EFFORT TRIPS",
     year, all='TOTAL'
     *(cattrips='CATCH EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
     pctsum<numrtrip>='%'*f=6.2)  numrtrip='TOTAL TRIPS'*sum='TOTAL'
     *f=comma10.)/rts=15;
run;
```

APPENDIX C
DIRECTED EFFORT PROGRAM

```
*****************************DIRECTED EFFORT PROGRAM*****************************
* DIRECTF.SAS                                                                   *
* THIS PROGRAM CALCULATES THE NUMBER OF ANGLER TRIPS THAT EITHER TARGET OR      *
* CATCH THE SPECIES OF INTEREST.  THE RESULTS ARE PRODUCED IN SAMPLE TABLES     *
* AND SUMMARIZED BY                                                             *
*    1.  YEAR, SUBREGION, STATE, WAVE AND MODE                                  *
*    2.  YEAR, SUBREGION, STATE AND MODE                                        *
*    3.  YEAR, SUBREGION, STATE AND WAVE                                        *
*    4.  YEAR, SUBREGION, WAVE AND MODE                                         *
*    5.  YEAR, SUBREGION AND STATE                                              *
*    6.  YEAR, SUBREGION AND WAVE                                               *
*    7.  YEAR, SUBREGION AND MODE                                               *
*    8.  YEAR AND SUBREGION.                                                    *
* EFFORT TOTALS ACCOUNT FOR ALL TRIPS THAT TARGET THE SPECIES AND ALL NON-      *
* TARGET TRIPS THAT CATCH THE SPECIES.  AS SUCH, TRIPS THAT BOTH TARGET AND     *
* CATCH THE SPECIES ARE ACCOUNTED FOR THROUGH TARGETING TABULATION AND          *
* DOUBLE COUNTING OF CATCH EFFORT DOES NOT OCCUR.                               *
* THE PROGRAM IS DESIGNED TO EVALUATE MULTIPLE YEARS AND HAS BEEN TESTED FOR    *
* THE SOUTH ATLANTIC AND GULF OF MEXICO SUBREGIONS ONLY.  CERTAIN OPERATIONS    *
* ARE INCLUDED TO ADDRESS SPECIFIC DATA NUANCES OR PROBLEMS IN THESE SUB-       *
* REGIONS IN SPECIFIC YEARS AND THUS MAY BE SUPERFLUOUS FOR OTHER SUBREGIONS    *
* OR INDIVIDUAL YEARS.                                                          *
* MANY OF THE PROC SORTS ARE LIKELY SUPERFLUOUS AND THE FREQUENT PROC PRINTS    *
* WERE ORIGINALLY INSERTED AS SAFETY CHECKS TO SEE WHETHER THE PROGRAM WAS      *
* PERFORMING THE DESIRED OPERATIONS.                                            *
* VARIABLES HAVE BEEN DROPPED IN THE FIRST MACRO BECAUSE OF PROBLEMS WITH       *
* THEIR BEING ENTERED AS CHARACTER VARIABLES IN SOME YEARS AND AS NUMERIC       *
* VARIABLES IN OTHER YEARS.  THIS ACTION GENERATES NON-FATAL ERROR MESSAGES     *
* WHERE THE VARIABLES ARE NOT ENCOUNTERED (SUCH AS DISP3 IN TYPE 2 RECORDS      *
* AND DISPO IN TYPE 3 RECORDS).                                                 *
* THE SAMPLE TABLES ARE INCLUDED FOR COMPLETENESS ONLY AND THE USER IS          *
* ADVISED TO SELECT AND EDIT THE EXAMPLES AS APPROPRIATE TO THEIR NEEDS,        *
* SINCE THE LARGER TABLES BECOME PARTICULARLY CUMBERSOME.                       *
* TO RUN: MAKE THE APPROPRIATE CHANGES IN THE FOLLOWING SECTION.  THE           *
* SPECIFICATION SECTION CONTAINS AREA_X FOR COMPLETENESS ONLY, AS THE            *
* PROGRAM AS CURRENTLY SPECIFIED DOES NOT DISAGGREGATE OVER THIS VARIABLE.      *
*******************************************************************************
*******************************************************************************;

***CHANGE THE FOLLOWING***;

***LIBNAMES***;
libname strips 'c:\data\mrfss'; *LOCATION OF TRIP DATA FILES;
libname sint 'c:\data\mrfss'; *LOCATION OF INTERCEPT DATA FILES;
libname rec 'c:\data\mrfss'; *LOCATION OF OUTPUT FILES;

***SPECIES CODE***;
%let species =(sp_code='8835360107');
%let prime1 =(prim1='8835360107');
%let prime2 =(prim2='8835360107');

***SPECIES NAME***;
```

```
%let specname = RED SNAPPER;

***SUBREGION***;
%let subreg =(sub_reg=6 or sub_reg=7);

***STATES***;
%let states =(st=1 or st=12 or st=13 or st=22 or st=28
or st=37 or st=45 or st=48 or st=90);

***COLLAPSED MODES***;
%let modes =(mode_fx='3' or mode_fx='5' or mode_fx='7');

***COLLAPSED AREAS***;
%let areas = (area_x='1' or area_x='2' or area_x='3' or area_x='4' or
area_x='5');

***YEARS***;
%let yrs = 82; *STARTING YEAR;
%let yre = 94; *ENDING YEAR;

***WAVES***;
%let wavest = 1; *STARTING WAVE;
%let wavend = 6; *ENDING WAVE;
*******************************************************************************
*******************************************************************************;

***THIS MACRO GETS THE APPROPRIATE INTERCEPT RECORDS OF INTEREST***;
%macro stb(yrst,yrend,wvst,wvend,typst,typend);
%do I=&yrst %to &yrend;
%do j=&wvst %to &wvend;
%do k=&typst %to &typend;
data temp (drop=disp3 dispo intsite intnum intvuer surtyp);
set sint.i&k._&I.&j.;
     if &k.=1 then sp_code='0';
     if &k.>1 then prim1='0';
     if &k.>1 then prim2='0';
     if &species or &prime1 or &prime2;
     if &subreg;
     if &states;
***THIS PORTION HANDLES THOSE YEARS (I BELIEVE ONLY 1988 AND 1992)
WHERE SOME WAVES WERE CODED BY MONTH***;
     if wave=1.1 then wave=1;
     if wave=1.2 then wave=1;
     if wave=2.1 then wave=2;
     if wave=2.2 then wave=2;
     if wave=3.1 then wave=3;
     if wave=3.2 then wave=3;
     if wave=4.1 then wave=4;
     if wave=4.2 then wave=4;
     if wave=5.1 then wave=5;
     if wave=5.2 then wave=5;
     if wave=6.1 then wave=6;
```

```
     if wave=6.2 then wave=6;

***REDUCE MODES TO 3 MODES***;
     if mode_fx='1' then mode_fx='3';
     if mode_fx='2' then mode_fx='3';
     if mode_fx='4' then mode_fx='5';
     if mode_fx='6' then mode_fx='5';

***CONVERT MONROE COUNTY (KEY WEST) TO FLORIDA.  MONROE COUNTY WAS GIVEN A
UNIQUE STATE CODE IN 1987***;
     if st=90 then st=12;

%if &I=&yrst and &j=&wvst %then %do;
data t&k.temp; set temp;
%end;

%if (&I=&yrst and &j>&wvst) or &I>&yrst %then %do;
data t&k.temp; set t&k.temp temp;
%end;

%end;
%end;
%end;
%mend;
%stb(&yrs,&yre,&wavest,&wavend,1,3);
run;

data t1temp; set t1temp;
     keep year id_code prim1 prim2 sub_reg st mode_fx wave cntrbtrs;
proc sort tagsort;
     by id_code;
run;

data t2temp; set t2temp;
     keep year id_code sp_code sub_reg st mode_fx wave num_fish cntrbtrs;
proc sort tagsort;
     by id_code;
run;

data t3temp; set t3temp;
     keep year id_code sp_code sub_reg st mode_fx wave cntrbtrs fshinsp;
proc sort tagsort;
     by id_code;
run;

data t1temp; set t1temp;
     if cntrbtrs=. then cntrbtrs=1;
     if cntrbtrs=0 then delete; *THIS REMOVES ALL FOLLOWER RECORDS.  DO NOT
PANIC, WE WILL ADD SOME BACK IN;
     mark=1;
     hit=cntrbtrs;
proc sort tagsort;
```

```
     by id_code;
*proc print; *var id_code mark cntrbtrs hit;
run;

***THIS SECTION DEALS WITH GETTING THE RECORDS OF FOLLOWERS WHO TARGETED
THE SPECIES IN QUESTION WHEN THEIR LEADER DID NOT***;

%macro follow(yrst,yrend,wvst,wvend);
%do I=&yrst %to &yrend;
%do j=&wvst %to &wvend;

***GET ALL TYPE1 RECORDS FOR ANGLERS WHO TARGETED***;
data t1data; set rec.i1_&I.&j.;
     if &subreg;
     if &states;
     if cntrbtrs=0;
     if &prime1 or &prime2;
     if wave=1.1 then wave=1;
     if wave=1.2 then wave=1;
     if wave=2.1 then wave=2;
     if wave=2.2 then wave=2;
     if wave=3.1 then wave=3;
     if wave=3.2 then wave=3;
     if wave=4.1 then wave=4;
     if wave=4.2 then wave=4;
     if wave=5.1 then wave=5;
     if wave=5.2 then wave=5;
     if wave=6.1 then wave=6;
     if wave=6.2 then wave=6;
     if mode_fx='1' then mode_fx='3';
     if mode_fx='2' then mode_fx='3';
     if mode_fx='4' then mode_fx='5';
     if mode_fx='6' then mode_fx='5';
     if st=90 then st=12;
     keep id_code prim1 prim2 year sub_reg wave st mode_fx cntrbtrs;
proc sort tagsort;
     by id_code;
run;

data t1data1; set t1data;
     mark=1;
run;

***GET ALL THE TYPE4 RECORDS (ALL FOLLOWERS)***;
data t4data; set rec.gp4_&I.&j.;
     if &subreg;
     if &states;
     if wave=1.1 then wave=1;
     if wave=1.2 then wave=1;
     if wave=2.1 then wave=2;
     if wave=2.2 then wave=2;
     if wave=3.1 then wave=3;
```

```
     if wave=3.2 then wave=3;
     if wave=4.1 then wave=4;
     if wave=4.2 then wave=4;
     if wave=5.1 then wave=5;
     if wave=5.2 then wave=5;
     if wave=6.1 then wave=6;
     if wave=6.2 then wave=6;
     if mode_fx='1' then mode_fx='3';
     if mode_fx='2' then mode_fx='3';
     if mode_fx='4' then mode_fx='5';
     if mode_fx='6' then mode_fx='5';
     if st=90 then st=12;
     x2=leader;
     keep year id_code leader cntrbtrs sub_reg st mode_fx wave x2;
proc sort tagsort;
     by id_code;
run;

***MERGE THE TYPE1 FOLLOWER RECORDS (DATA SET 'T1DATA1') WITH ALL THE TYPE4
RECORDS (DATA SET 'T4DATA'). THIS PRODUCES A SET OF RECORDS CONTAINING
FOLLOWER TYPE1 TARGET RECORDS AND ALL FOLLOWER TYPE4 RECORDS AND THUS PROVIDES
LEADED ID_CODES FOR TARGETING FOLLOWERS***;
data tempo; merge t1data1 t4data;
     by id_code;
proc sort tagsort;
     by id_code;
run;

***WE KEEP ONLY THE MERGED TYPE1/TYPE4 RECORDS FOR ANGLERS WHO TARGETED THE
SPECIES (MARK=1. MARK=. FOR TYPE4 FOLLOWER RECORDS WITH NO TARGET TYPE1
COUNTERPART). IT IS POSSIBLE TO HAVE MULTIPLE RECORDS WITH THE SAME
LEADER ID_CODE***;
data tempo; set tempo;
     if mark=1;
     x4=leader;
proc sort tagsort;
     by x4;
run;

***WE ARE LEFT WITH A T1T4 SET OF RECORDS THAT HAS THOSE FOLLOWER RECORDS THAT
TARGET THE DESIRED SPECIES AND ALSO INCLUDES THE LEADER ID_CODE. OF THESE, WE
ONLY NEED THE FIRST RECORD BY (LEADER) ID_CODE BECAUSE THE GOAL IS TO IDENTIFY
THE LEADER AND THIS ONLY NEEDS TO BE DONE ONCE***;
data tempoA; set tempo;
     by x4;
     if first.x4;
     tmark=2;
proc sort tagsort;
     by x4;
run;

***GET THE LEADER (A LEADER WILL BE INDICATED BY MULTIPLE CNTRBTRS) THAT DID
```

```
NOT TARGET THE DESIRED SPECIES FROM THE TYPE1 RECORDS***;
data notarget; set rec.i1_&I.&j.;
     if &subreg;
     if &states;
     if cntrbtrs > 1;
     if wave=1.1 then wave=1;
     if wave=1.2 then wave=1;
     if wave=2.1 then wave=2;
     if wave=2.2 then wave=2;
     if wave=3.1 then wave=3;
     if wave=3.2 then wave=3;
     if wave=4.1 then wave=4;
     if wave=4.2 then wave=4;
     if wave=5.1 then wave=5;
     if wave=5.2 then wave=5;
     if wave=6.1 then wave=6;
     if wave=6.2 then wave=6;
     if mode_fx='1' then mode_fx='3';
     if mode_fx='2' then mode_fx='3';
     if mode_fx='4' then mode_fx='5';
     if mode_fx='6' then mode_fx='5';
     if st=90 then st=12;
     if &prime1 or &prime2 then delete;
     x4=id_code;
     mark=2;
proc sort tagsort;
     by x4;
run;

***MERGE THE FOLLOWERS WHO TARGETED (DATA SET 'TEMPOA') WITH THE SET OF
LEADERS
WHO DID NOT TARGET (DATA SET 'NOTARGET').  MERGING IS DONE BY THE VARIABLE
'X4'
WHICH EQUALS EITHER THE LEADER ID_CODE FOR FOLLOWERS OR THE TYPE1 RECORD
ID_CODE FOR LEADERS THAT DID NOT TARGET.  WHERE THE RECORDS DO NOT MATCH, WE
WILL GET A '.' FOR EITHER VARIABLE 'TMARK' (INDICATING NO LEADER RECORD OF
INTEREST, WHICH MEANS THE LEADER ALSO TARGETED THE SPECIES AND WE ALREADY
PULLED HIS RECORD IN THE FIRST SELECTION).  WE WANT THE RECORDS WHERE THEY
MATCH.  WE END UP WITH THE LEADER RECORDS OF TRIPS WHERE THE LEADER DID NOT
TARGET THE SPECIES BUT WHERE AT LEAST 1 FOLLOWER DID***;

data one; merge tempoa notarget;
     by x4;
     if tmark^=2 or mark^=2 then delete;
*proc print; *var id_code leader x4 cntrbtrs tmark mark prim1 prim2;
run;

data two; set one;
     x4=leader;
     tmark=3;
     keep leader x4 tmark;
proc sort tagsort;
```

```
     by x4;
run;

***WE HAVE IDENTIFIED THE LEADERS WHO DID NOT TARGET WHEN AT LEAST 1 FOLLOWER
DID.  THE NEXT STEP IS TO ELIMINATE THE RECORDS OF FOLLOWERS WHO TARGETED AND
WHOSE LEADERS ALSO TARGETED SO THAT WE CAN AVOID DOUBLE COUNTING OF THESE
ANGLERS.  DATA SET 'TWO' PROVIDES THE APPROPRIATE LEADERS AND DATA SET 'TEMPO'
IS THE ENTIRE TARGETING FOLLOWER DATA SET WHICH LACKS THE VARIABLE 'TMARK'.
WHERE 'TWO' AND 'TEMPO' SHARE COMMON VALUES FOR THE VARIABLE 'X4', THE MERGED
DATA WILL ACQUIRE A VALUE OF '3' FOR TMARK FROM DATA SET 'TWO'.  ELSEWHERE,
TMARK='.'.  THESE RECORDS WILL BE DISCARDED***;
data three; merge tempo two;
     by x4;
     if tmark=.  then delete;
proc sort tagsort;
     by id_code;
*proc print; *var id_code leader x4 cntrbtrs mark tmark prim1 prim2;
run;

***MERGE THE RECORDS OF FOLLOWERS WHO TARGETED WHEN THEIR LEADERS DID NOT
(DATA SET 'THREE') WITH THE ORIGINAL SET OF ALL TARGETING FOLLOWERS (DATA SET
'T1DATA').  DATA SET 'THREE' CONTAINS THE VARIABLE 'MARK' (=1) AND DATA SET
'T1DATA' DOES NOT.  THEREFORE, WHERE A MERGE MATCH OCCURS, MARK=1 AND EQUALS
'.' ELSEWHERE (INDICATING THAT THE LEADERS OF THESE FOLLOWERS ALSO TARGETED
THE SPECIES).  THE NON-MATCHES WILL BE DISCARDED***;
data four;
merge three t1data;
     by id_code;
     if mark=. then delete;
*proc print; *var id_code wave cntrbtrs prim1 prim2 mark;
run;

%if &I=&yrst and &j=&wvst %then %do;
data fourall; set four;
%end;

%if (&I=&yrst and &j>&wvst) or &I>&yrst %then %do;
data fourall; set fourall four;
%end;

%end;
%end;
%mend;
%follow(&yrs,&yre,&wavest,&wavend);
run;

***THIS ENDS THE IDENTIFICATION OF THE RECORDS OF THOSE FOLLOWERS WHO TARGETED
THE SPECIES WHEN THEIR LEADER DID NOT.  NEXT WE MUST ADD THESE RECORDS
(DATA SET 'FOUR') BACK INTO THE PRIMARY DATA SET (DATA SET 'T1TEMP')***;

data fourall; set fourall;
     if cntrbtrs=0 then cntrbtrs=1;
```

```
     mark=1;
     hit=cntrbtrs;
proc sort tagsort;
     by id_code;
run;

data t1temp; set t1temp-fourall;
proc sort tagsort;
     by id_code;
run;

***THE FOLLOWING PORTIONS OF THE PROGRAM DEAL WITH OBTAINING THE APPROPRIATE
TYPE2 AND TYPE3 RECORDS SO THAT WE CAN IDENTIFY TRIPS THAT CAUGHT THE SPECIES
BUT DID NOT TARGET THE SPECIES***;

***MARK THE T1TEMP (TARGETING) RECORDS FOR LATER MERGING WITH TYPE2 AND TYPE3
RECORDS FOR THE ELIMINATION OF CATCH TRIPS THAT ALSO TARGETED***;
data t1tempa; set t1temp;
     keep id_code mark hit;
proc sort tagsort;
     by id_code;
run;

data t2temp;
merge t1tempa t2temp;
     by id_code;
if mark=. then mark=0; *EVERYWHERE MARK=. IS A CATCH RECORD WITH NO TARGET
COUNTERPART.  THESE ARE THE ONES WE WANT;
proc sort tagsort;
     by id_code;
*proc print; *var id_code mark hit num_fish;
run;

***NATURE OF THE PROBLEM: FOR THE METHOD OF ANALYSIS CONDUCTED HERE, WE NEED
TOTAL FISH CAUGHT, BOTH TYPE A AND TYPE B, AND THE NUMBER OF CNTRBTRS.  TYPE3
RECORDS LISTING TYPE A ('FSHINSP') ARE IN AN ACCEPTABLE FORM BECAUSE ALL FISH
ARE RECORDED ON THE LEADER'S RECORD AND THE VALUE OF CNTRBTRS REFLECTS TOTAL
GROUP EFFORT OR PARTICIPATION.  TYPE2 RECORDS (RECORDING TYPE B CATCH THROUGH
THE VARIABLE 'NUM_FISH') ARE INDIVIDUAL BY CATCH BUT MIXED FOR CNTRBTRS (=0
FOR FOLLOWERS AND >=1 FOR LEADERS OR SINGLE CNTRBTRS).  FROM THE TYPE2 RECORDS
WE NEED ALL THE FISH BUT ONLY THE LEADER'S ENTRY FOR CNTRBTRS.  WE MUST
IDENTIFY LEADER ID_CODES FOR EACH FOLLOWER AND ADD THE FISH FROM EACH FOLLOWER
TO THEIR LEADER, THEN DISCARD THE FOLLOWER RECORDS***;


***SELECT ONLY THE TYPE2 RECORDS WITH NO TARGET (TYPE1) COUNTERPART***;
data t2temp; set t2temp;
     if mark=0;
     lead=1;
proc sort;
     by id_code;
*proc print; *var id_code num_fish sp_code cntrbtrs;
```

```
run;

%macro fix (yrst,yrend,wvst,wvend);
%do I=&yrst %to &yrend;
%do j=&wvst %to &wvend;

data data4; set rec.gp4_&I.&j.;
     if &subreg;
     if &states;
     if wave=1.1 then wave=1;
     if wave=1.2 then wave=1;
     if wave=2.1 then wave=2;
     if wave=2.2 then wave=2;
     if wave=3.1 then wave=3;
     if wave=3.2 then wave=3;
     if wave=4.1 then wave=4;
     if wave=4.2 then wave=4;
     if wave=5.1 then wave=5;
     if wave=5.2 then wave=5;
     if wave=6.1 then wave=6;
     if wave=6.2 then wave=6;
     if mode_fx='1' then mode_fx='3';
     if mode_fx='2' then mode_fx='3';
     if mode_fx='4' then mode_fx='5';
     if mode_fx='6' then mode_fx='5';
     if st=90 then st=12;
     keep year id_code leader cntrbtrs sub_reg st mode_fx wave;
proc sort tagsort;
     by id_code;
run;

%if &I=&yrst and &j=&wvst %then %do;
data data4all; set data4;
%end;

%if (&I=&yrst and &j>&wvst) or &I>&yrst %then %do;
data data4all; set data4all data4;
%end;

%end;
%end;
%mend;
%fix(&yrs,&yre,&wavest,&wavend);
run;

data data4all; set data4all;
proc sort;
     by id_code;
run;

***MERGE THE FOLLOWER RECORDS WITH THE TYPE2 RECORDS***;
data t2temp4;
```

```
merge t2temp data4all;
     by id_code;
*proc print; *var id_code num_fish lead leader cntrbtrs;
run;

***DISCARD THE GP4 RECORDS FOR THOSE FOLLOWERS WHO ARE NOT IN OUR
SPECIES-OF-INTEREST GROUP AND CHANGE THE FOLLOWER ID_CODE TO THE LEADER
ID_CODE***;
data t2tempx; set t2temp4;
     if lead=1;
     if cntrbtrs=0 then id_code=leader;
proc sort;
     by id_code;
*proc print; *var id_code leader num_fish cntrbtrs;
run;

***AT THIS POINT WE WILL ONLY HAVE LEADER ID CODES WITH MIXED CNTRBTRS
ENTRIES.  AT THE END OF THE SUMMING, THE ORIGINAL LEADER CNTRBTRS WILL
SUPPLANT MOST OF THE '0' CNTRBTRS ENTRIES FROM THE FOLLOWERS RECORDS.  SOME
WILL BE LEFT, HOWEVER, WHERE THE LEADER DID NOT ALSO CATCH THE SPECIES.  LATER
WE WILL CHANGE THESE REMAINING CNTRBTRS=0 TO CNTRBTRS=1***;

data t2sum; set t2tempx;
proc summary;
     var num_fish;
     by id_code;
     id sub_reg year st wave mode_fx cntrbtrs;
     output out=t2sum sum=num_fish;
*proc print data=t2sum; *var id_code num_fish cntrbtrs;
run;

***THIS ENDS THE EFFORT TO ADD FOLLOWER NUM_FISH TO LEADER NUM_FISH.  WE ARE
LEFT ONLY WITH LEADER RECORDS (A LEADER CAN BE ONLY A SINGLE INDIVIDUAL IF IT
IS A SINGLE CNTRBTR TRIP) WHICH WILL MERGE DIRECTLY WITH TYPE3 RECORDS.  WE
WILL HAVE THEREFORE RETAINED ALL LEADER AND FOLLOWER NUM_FISH AND (FROM BELOW)
ALL LEADER FSHINSP AND ALL TALLIES OF CNTRBTRS***;

data t2sum; set t2sum;
proc sort;
     by id_code;
run;

data t3temp;
merge t1tempa t3temp;
     by id_code;
     if mark=. then mark=0;
proc sort tagsort;
     by id_code;
*proc print; *var id_code mark hit fshinsp sp_code;
run;

***SELECT ONLY THE TYPE3 RECORDS WITH NO TARGET (TYPE1) COUNTERPART.  KEEP THE
```

```
FIRST RECORD BY ID_CODE FOR EACH SPECIES OF INTEREST***;
data t3temp; set t3temp;
     by id_code sp_code;
     if mark=0;
     if first.sp_code;
proc summary;
     var fshinsp;
     by id_code;
     id sub_reg year st wave mode_fx cntrbtrs;
     output out=t3temp sum=fshinsp;
*proc print; *var id_code fshinsp cntrbtrs;
run;

***THIS NEXT SERIES OF STEPS CALCULATES THE NUMBER OF TRIPS (HITS) BASED ON
THE RATIO OF FISH TO CONTRIBUTORS.  THE APPROACH FOLLOWED IS TO USE THE
MAXIMUM NUMBER OF OBSERVATIONS POSSIBLE, I.E. BOTH SINGLE AND MULTIPLE
CONTRIBUTOR RECORDS.  SINCE IT IS IMPOSSIBLE TO DISCERN FROM TYPE A CATCH
WHICH ANGLER ACTUALLY LANDED WHICH FISH, THE APPROACH TAKEN IS TO DIVIDE TOTAL
FISH BY TOTAL CONTRIBUTORS.  IF THIS RATIO IS LESS THAN 1, THE PROGRAM ASSUMES
THAT EACH FISH WAS CAUGHT BY A DIFFERENT INDIVIDUAL AND THE NUMBER OF CATCH
TRIPS IS THEREFORE THE NUMBER OF FISH.  IF THE RATIO IS GREATER THAN 1, THEN
THE PROGRAM ASSUMES THAT EVERY CONTRIBUTOR CAUGHT AT LEAST 1 FISH AND THE
NUMBER OF CATCH TRIPS IS THEREFORE THE NUMBER OF CONTRIBUTORS.  THIS APPROACH
WILL CALCULATE THE MAXIMUM NUMBER OF CATCH TRIPS POSSIBLE***;

data tall;
merge t2sum t3temp;
     by id_code;
     if fshinsp=.  then fshinsp=0; *WHERE WE DON'T HAVE T2-T3 MATCHES WE WILL
GET FSHINSP=.;
     if num_fish=. then num_fish=0;
run;
proc sort;
     by id_code;
*proc print; *var id_code fshinsp num_fish cntrbtrs;
run;

data tall; set tall;
     by id_code;
     hit=0;
     if cntrbtrs=0 then cntrbtrs=1;
     fish=(fshinsp + num_fish);
     ave=(fish/cntrbtrs) ;
     if cntrbtrs=1 then hit=1;
     if ave le 1 then hit=fish;
     if ave > 1 then hit=cntrbtrs;
proc sort tagsort;
     by id_code;
*proc print; *var id_code cntrbtrs fish hit;
run;

***MERGE THE TARGET RECORDS (T1TEMP) WITH THE CATCH RECORDS (TALL) AND
```

```
CALCULATE TOTAL TRIPS***;
data tallsum;
merge t1temp tall;
     by id_code;
proc sort tagsort;
     by sub_reg year st wave mode_fx;
proc summary;
     var hit;
     class sub_reg year st wave mode_fx;
     output out=tallsum sum=hits;
*proc print; *var sub_reg year st mode_fx wave hits;
run;

data tallsum; set tallsum;
     if _type_ =31;
     rsints=hits;
*proc print; *var sub_reg year st mode_fx wave rsints;
run;

***THE NEXT SET OF ACTIONS DEALS WITH EXPANSION TO FINAL ESTIMATES***;
%macro stba(yrst,yrend,wvst,wvend);
%do I=&yrst %to &yrend;
%do j=&wvst %to &wvend;

data temp; set sint.i1_&I.&j.;
     if &subreg;
     if &states;
     if wave=1.1 then wave=1;
     if wave=1.2 then wave=1;
     if wave=2.1 then wave=2;
     if wave=2.2 then wave=2;
     if wave=3.1 then wave=3;
     if wave=3.2 then wave=3;
     if wave=4.1 then wave=4;
     if wave=4.2 then wave=4;
     if wave=5.1 then wave=5;
     if wave=5.2 then wave=5;
     if wave=6.1 then wave=6;
     if wave=6.2 then wave=6;
     if mode_fx='1' then mode_fx='3';
     if mode_fx='2' then mode_fx='3';
     if mode_fx='4' then mode_fx='5';
     if mode_fx='6' then mode_fx='5';
     if st=90 then st=12;
     keep year id_code sub_reg st mode_fx wave cntrbtrs;
proc append data=temp base=alltemp;
run;
%end;
%end;
%mend;
%stba(&yrs,&yre,&wavest,&wavend);
run;
```

```
proc sort data=alltemp;
     by sub_reg year st wave mode_fx;
proc summary;
     var cntrbtrs;
     class sub_reg year st wave mode_fx;
     output out=allsum sum=cntrbtrs;
run;

%macro stbb(yrst,yrend);
%do I=&yrst %to &yrend;

data trip; set strips.ag&I.;
     if &subreg;
     if &states;
     if wave=1.1 then wave=1;
     if wave=1.2 then wave=1;
     if wave=2.1 then wave=2;
     if wave=2.2 then wave=2;
     if wave=3.1 then wave=3;
     if wave=3.2 then wave=3;
     if wave=4.1 then wave=4;
     if wave=4.2 then wave=4;
     if wave=5.1 then wave=5;
     if wave=5.2 then wave=5;
     if wave=6.1 then wave=6;
     if wave=6.2 then wave=6;
     if mode_fx='1' then mode_fx='3';
     if mode_fx='2' then mode_fx='3';
     if mode_fx='4' then mode_fx='5';
     if mode_fx='6' then mode_fx='5';
     if st=90 then st=12;
     keep year sub_reg st mode_fx wave numrtrip;
proc append data=trip base=trips;
run;
%end;
%mend;
%stbb(&yrs,&yre);
run;

data allsum; set allsum;
     if _type_ =31;
     allints=cntrbtrs;
run;

proc sort data=trips;
     by sub_reg year st wave mode_fx;
run;

data trips; set trips;
proc summary;
     var numrtrip;
     by sub_reg year st wave mode_fx;
```

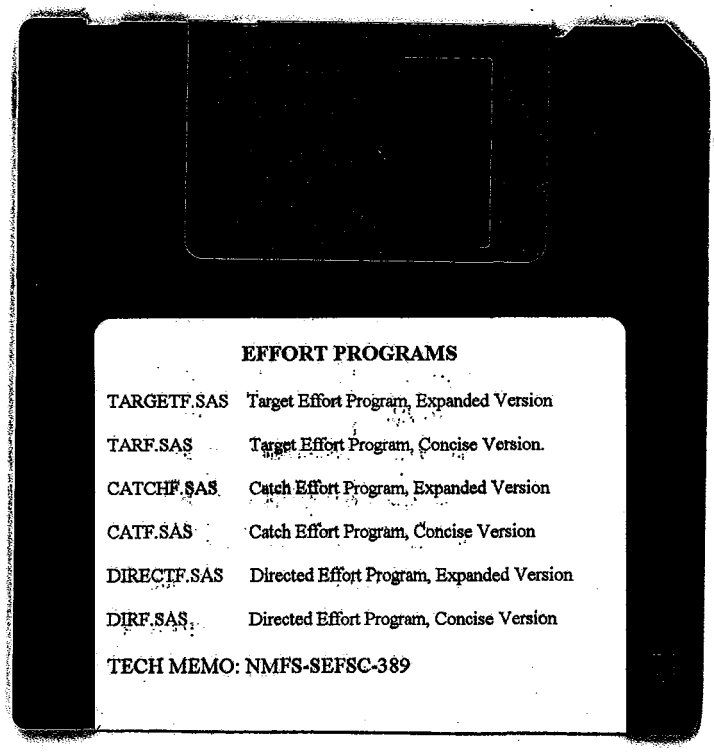
```
     output out=trips sum=numrtrip;
*proc print; *var sub_reg year st mode_fx wave numrtrip;
run;

data allsum; set allsum;
proc sort tagsort;
     by sub_reg year st wave mode_fx;
*proc print; *var sub_reg year st wave mode_fx allints;
run;

data tallsum; set tallsum;
proc sort tagsort;
     by sub_reg year st wave mode_fx;
*proc print; *var sub_reg year st wave mode_fx rsints;
run;


data pctde;
merge trips allsum tallsum;
     by sub_reg year st wave mode_fx;
     if rsints=. then rsints=0;
*proc print; *var sub_reg year st mode_fx wave rsints allints numrtrip;
run;

data pctde; set pctde;
     pctde=(rsints/allints)*100;
     detrips=(numrtrip*pctde)/100;
     if detrips=. then detrips=0;
*proc print; *var sub_reg year st mode_fx wave rsints allints pctde numrtrip
     detrips;
run;

data pctde; set pctde;
proc sort;
     by sub_reg year st wave mode_fx;
run;

proc format;
     value years 81='1981'
                 82='1982'
                 83='1983'
                 84='1984'
                 85='1985'
                 86='1986'
                 87='1987'
                 88='1988'
                 89='1989'
                 90='1990'
                 91='1991'
                 92='1992'
                 93='1993'
                 94='1994'
```

```
                95='1995';

     value staten   1='ALABAMA'
                    12='FLORIDA'
                    13='GEORGIA'
                    22='LOUISIANA'
                    28='MISSISSIPPI'
                    37='NORTH CAROLINA'
                    45='SOUTH CAROLINA'
                    48='TEXAS';

     value $moden   '3'='SHORE'
                    '5'='PARTY/CHARTER'
                    '7'='PRIVATE/RENTAL';

     value region    6='SOUTH ATLANTIC'
                     7='GULF OF MEXICO';
run;

data alltable; set pctde;
options ls=250 ps=100 nocenter nonumber;
format sub_reg region. year years. st staten. mode_fx moden.;
proc tabulate formchar='|----|+|----|';
     class year st wave mode_fx;
     var detrips numrtrip;
     by sub_reg;
table all="&specname DIRECTED EFFORT TRIPS BY"*all='STATE, WAVE & MODE',
     year, (st='STATE'*wave='WAVE'*mode_fx='MODE'
     all='TOTAL')*(detrips='DIRECTED EFFORT TRIPS' numrtrip='TOTAL TRIPS')
     *sum='TOTAL'*f=comma10./rts=15;
table all="&specname DIRECTED EFFORT TRIPS BY"*all='STATE & MODE',
     year, (st='STATE'*mode_fx='MODE'
     all='TOTAL')*(detrips='DIRECTED EFFORT TRIPS' numrtrip='TOTAL TRIPS')
     *sum='TOTAL'*f=comma10./rts=15;
table all="&specname DIRECTED EFFORT TRIPS BY"*all='STATE & WAVE',
     year, (st='STATE'*wave='WAVE' all='TOTAL')
     *(detrips='DIRECTED EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
     *f=comma10./rts=15;
table all="&specname DIRECTED EFFORT TRIPS BY STATE",
     year, (st='STATE' all='TOTAL')
     *(detrips='DIRECTED EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
     *f=comma10./rts=15;
table all="&specname DIRECTED EFFORT TRIPS BY STATE",
     year, (st='STATE' all='TOTAL')
     *(detrips='DIRECTED EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
     pctsum<numrtrip>='%'*f=6.2)
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)/rts=15;
table all="&specname DIRECTED EFFORT TRIPS BY STATE",
     year, (st='STATE'
     *(detrips='DIRECTED EFFORT TRIPS'*sum='TOTAL'*f=comma10.
     numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)
     all='TOTAL'
```

```
      *(detrips='DIRECTED EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
      pctsum<numrtrip>='%'*f=6.2)
      numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.))/rts=15;
table all="&specname DIRECTED EFFORT TRIPS BY"*all='WAVE & MODE',
      year, (wave='WAVE'*mode_fx='MODE' all='TOTAL')
      *(detrips='DIRECTED EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
      *f=comma10./rts=15;
table all="&specname DIRECTED EFFORT TRIPS BY WAVE",
      year, (wave='WAVE' all='TOTAL')
      *(detrips='DIRECTED EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
      *f=comma10./rts=15;
table all="&specname DIRECTED EFFORT TRIPS BY WAVE",
      year, (wave='WAVE' all='TOTAL')
      *(detrips='DIRECTED EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
      pctsum<numrtrip>='%'*f=6.2)
      numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)/rts=15;
table all="&specname DIRECTED EFFORT TRIPS BY WAVE",
      year, (wave='WAVE'
      *(detrips='DIRECTED EFFORT TRIPS'*sum='TOTAL'*f=comma10.
      numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)
      all='TOTAL'
      *(detrips='DIRECTED EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
      pctsum<numrtrip>='%'*f=6.2)
      numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.))/rts=15;
table all="&specname DIRECTED EFFORT TRIPS BY MODE",
      year, (mode_fx='MODE' all='TOTAL')
      *(detrips='DIRECTED EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
      *f=comma10./rts=15;
table all="&specname DIRECTED EFFORT TRIPS BY MODE",
      year, (mode_fx='MODE' all='TOTAL')
      *(detrips='DIRECTED EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
      pctsum<numrtrip>='%'*f=6.2)
      numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)/rts=15;
table all="&specname DIRECTED EFFORT TRIPS BY MODE",
      year, (mode_fx='MODE'
      *(detrips='DIRECTED EFFORT TRIPS'*sum='TOTAL'*f=comma10.
      numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.)
      all='TOTAL'
      *(detrips='DIRECTED EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
      pctsum<numrtrip>='%'*f=6.2)
      numrtrip='TOTAL TRIPS'*sum='TOTAL'*f=comma10.))/rts=15;
table all="&specname DIRECTED EFFORT TRIPS",
      year, all='TOTAL'
      *(detrips='DIRECTED EFFORT TRIPS' numrtrip='TOTAL TRIPS')*sum='TOTAL'
      *f=comma10./rts=15;
table all="&specname DIRECTED EFFORT TRIPS",
      year, all='TOTAL'
      *(detrips='DIRECTED EFFORT TRIPS'*(sum='TOTAL'*f=comma10.
      pctsum<numrtrip>='%'*f=6.2)  numrtrip='TOTAL TRIPS'*sum='TOTAL'
      *f=comma10.)/rts=15;
run;
```

APPENDIX D
COMPUTER DISKETTE FILE DIRECTORY

Program	Contents
TARGETF.SAS	Target Effort Program, expanded version (with comments/notes)
TARF.SAS	Target Effort Program, concise version (no comments/notes).
CATCHF.SAS	Catch Effort Program, expanded version.
CATF.SAS	Catch Effort Program, concise version
DIRECTF.SAS	Directed Effort Program, expanded version.
DIRF.SAS	Directed Effort Program, concise version.


EFFORT PROGRAMS
TARGETF.SAS Target Effort Program, Expanded Version
TARF.SAS Target Effort Program, Concise Version.
CATCHF.SAS Catch Effort Program, Expanded Version
CATF.SAS Catch Effort Program, Concise Version
DIRECTF.SAS Directed Effort Program, Expanded Version
DIRF.SAS Directed Effort Program, Concise Version
TECH MEMO: NMFS-SEFSC-389