



PB90246745



NOAA Technical Memorandum NMFS-F/NEC-71

**Allocation of Statewide-Reported
MRFSS Catch and Landings
Statistics between Areas:
Application to Winter Flounder**

**U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Fisheries Center
Woods Hole, Massachusetts**

September 1989

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL
INFORMATION SERVICE
SPRINGFIELD, VA 22161

Recent issues in this series

41. **Calculation of Standing Stocks and Energetic Requirements of the Cetaceans of the Northeast United States Outer Continental Shelf.** By Robert D. Kenney, Martin A. M. Hyman, and Howard E. Winn. May 1985. iv + 99 p., 1 fig., 5 tables, 1 app. NTIS Access. No. PB85-239937/AS.
42. **Status of the Fishery Resources Off the Northeastern United States for 1985.** By Conservation & Utilization Division, Northeast Fisheries Center. August 1985. iii + 137 p., 46 figs., 49 tables. NTIS Access. No. PB86-125473/AS.
43. **Status of the Fishery Resources Off the Northeastern United States for 1986.** By Conservation & Utilization Division, Northeast Fisheries Center, September 1986. iii + 130 p., 45 figs., 48 tables. NTIS Access. No. PB87-122115/AS.
44. **NOAA's Northeast Monitoring Program (NEMP): A Report on Progress of the First Five Years (1979-84) and a Plan for the Future.** By Robert N. Reid, Merton C. Ingham, and John B. Pearce, eds., and Catherine E. Warsh (water quality), Robert N. Reid (sediments & bottom organisms), Adriana Y. Cantillo (trace contaminants in tissues), and Edith Gould (biological effects), topic coords. May 1987. xi + 138 p., 13 figs., 1 table, 9 app. NTIS Access. No. PB87-210100.
45. **Food and Distribution of Juveniles of Seventeen Northwest Atlantic Fish Species, 1973-1976.** By Ray E. Bowman, Thomas R. Azarovitz, Esther S. Howard, and Brian P. Hayden. May 1987. xi + 57 p., 10 figs., 19 tables. NTIS Access. No. PB87-215851/AS.
46. **Influence of Freshwater Inflows on Estuarine Productivity.** By James G. Turek, Timothy E. Goodger, Thomas E. Bigford, and John S. Nichols. May 1987. iii + 26 p. NTIS Access. No. PB87-213666/AS.
47. **MARMAP Surveys of the Continental Shelf from Cape Hatteras, North Carolina, to Cape Sable, Nova Scotia (1977-1984). Atlas No. 2. Annual Distribution Patterns of Fish Larvae.** By Wallace W. Morse, Michael P. Fahay, and Wallace G. Smith. May 1987. viii + 215 p., 27 figs., 2 tables. NTIS Access. No. PB87-232831/AS.
48. **Indexed Bibliography of the Bay Scallop (*Argopecten irradians*).** By Barbara D. Sabo (Gibson) and Edwin W. Rhodes. May 1987. iii + 85 p. NTIS Access. No. PB87-231411/AS.
49. **Northeast Fisheries Center Framework for Inshore Research.** By Research Planning & Coordination Staff, Northeast Fisheries Center. July 1987. vi + 44 p., 2 figs., 2 tables. NTIS Access. No. PB87-232286/AS.
50. **Status of the Fishery Resources Off the Northeastern United States for 1987.** By Conservation & Utilization Division, Northeast Fisheries Center. October 1987. iii + 132 p., 48 figs., 50 tables. NTIS Access. No. PB88-148549.
51. **An Annotated List of the Fishes of Massachusetts Bay.** By Bruce B. Collette and Karsten E. Hartel. February 1988. x + 70 p., 1 fig., 1 table. NTIS Access. No. PB88-179247/AS.
52. **An Evaluation of the Bottom Trawl Survey Program of the Northeast Fisheries Center.** By Survey Working Group, Northeast Fisheries Center. March 1988. ix + 83 p., 33 figs., 13 tables. NTIS Access No. PB88-201983/AS.
53. **Contaminants in Hudson-Raritan Estuary Water and Influence of Cold Storage upon Its Chemical Composition.** By Anthony Calabrese, Lawrence J. Buckley, and J. Christopher Powell. May 1988. vii + 37 p., 10 figs., 11 tables. NTIS Access. No. PB88-225628/AS.
54. **Epizootic Ulcerative Syndromes in Coastal/Estuarine Fish.** By Carl J. Sindermann. June 1988. v + 37 p., 8 figs., 1 table. NTIS Access. No. PB89-110803/AS.
55. **A Plan for Study: Response of the Habitat and Biota of the Inner New York Bight to Abatement of Sewage Sludge Dumping.** By Environmental Processes Division, Northeast Fisheries Center. June 1988. iii + 34 p., 5 figs., 3 tables, 4 app. NTIS Access. No. PB89-100903/AS

(continued on inside back cover)



NOAA Technical Memorandum NMFS-F/NEC-71

This TM series is used for documentation and timely communication of preliminary results, interim reports, or special purpose information, and has not received complete formal review, editorial control, or detailed editing.

Allocation of Statewide-Reported MRFSS Catch and Landings Statistics Between Areas: Application to Winter Flounder

Frank P. Almeida

Woods Hole Lab., National Marine Fisheries Serv., Woods Hole, MA 02543

U. S. DEPARTMENT OF COMMERCE

Robert A. Mosbacher, Secretary

National Oceanic and Atmospheric Administration

John A. Knauss, Administrator

National Marine Fisheries Service

James W. Brennan, Assistant Administrator for Fisheries

Northeast Fisheries Center

Woods Hole, Massachusetts

September 1989

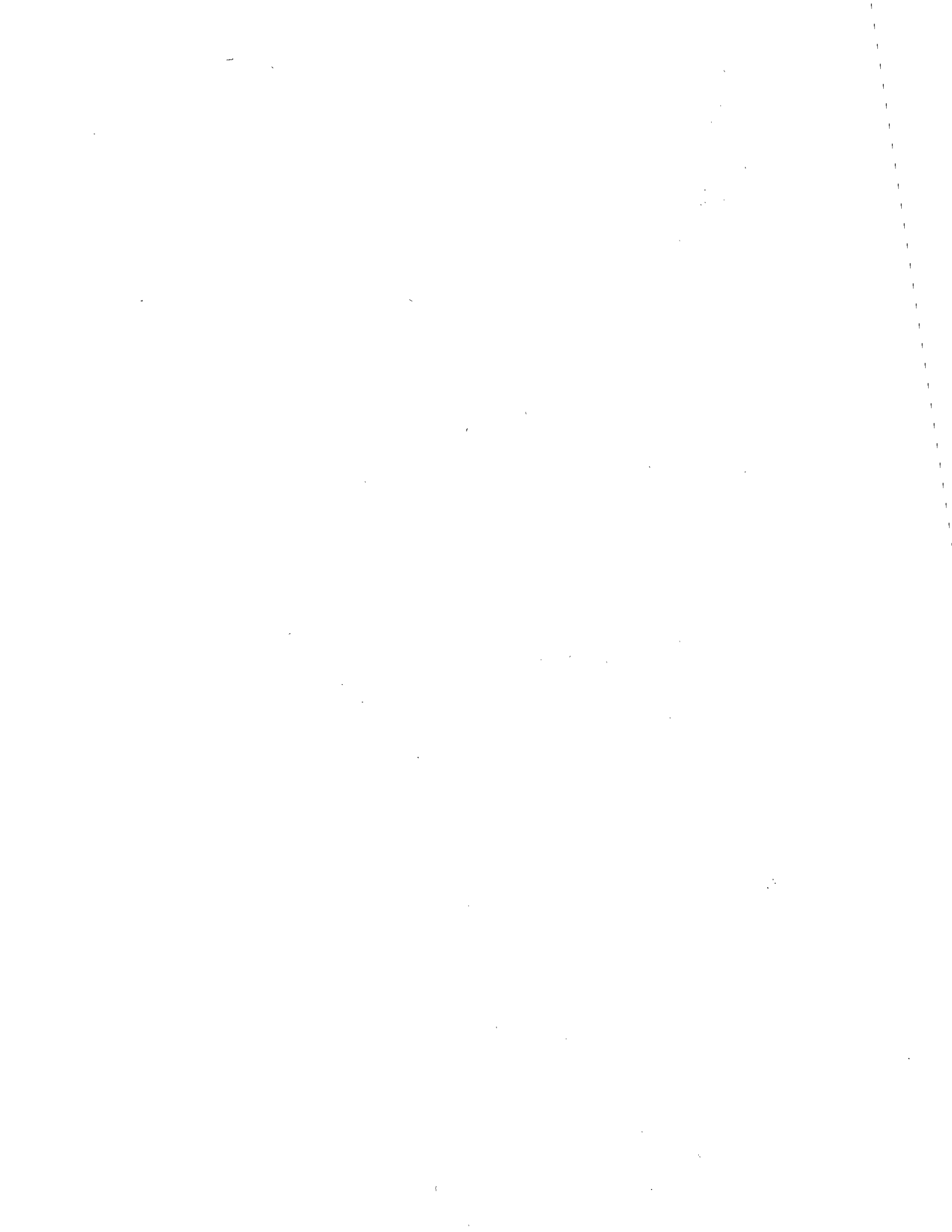


Table of Contents

Executive Summary	v
Introduction	1
Methods	1
Results	2
Discussion	4
References Cited	6

List of Tables

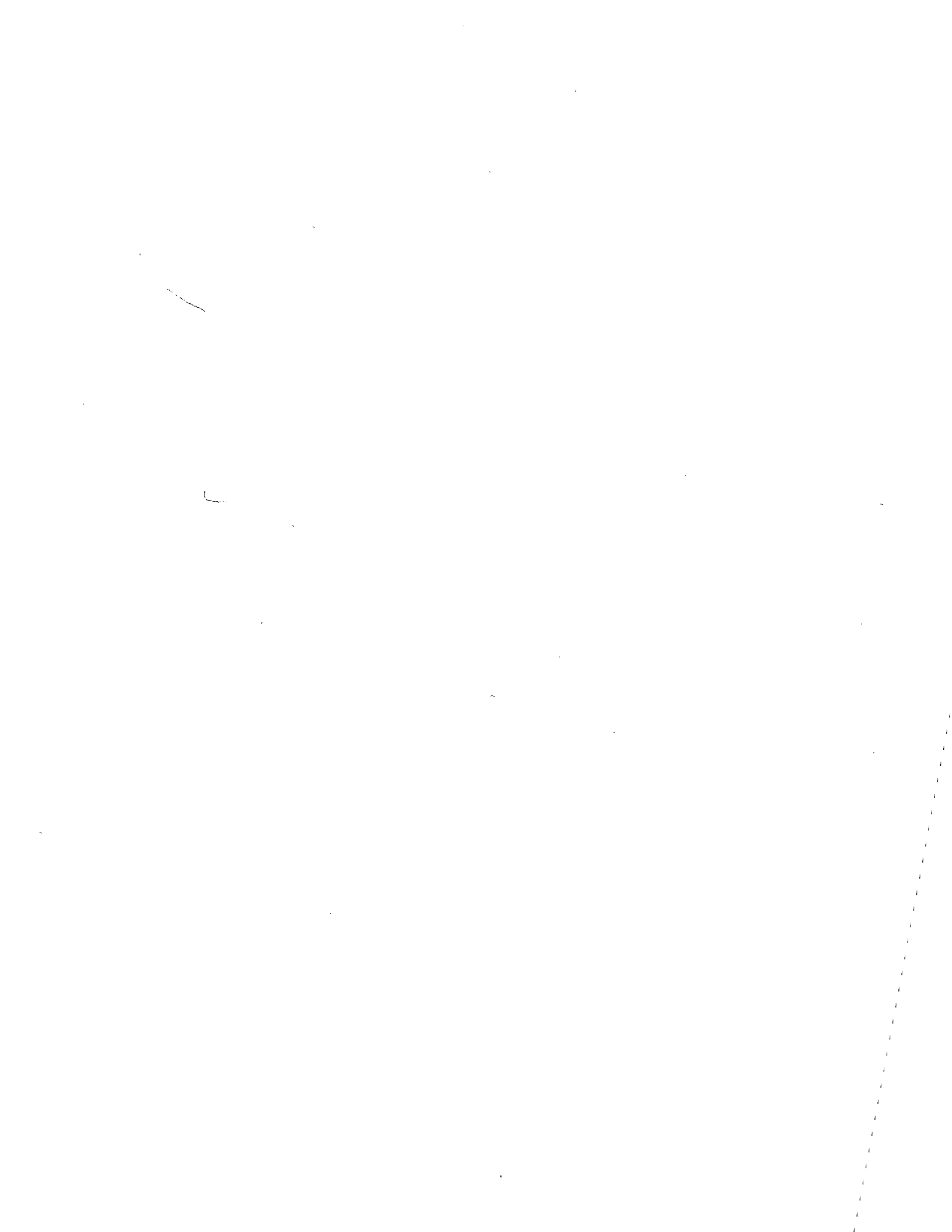
Table 1. Number of sites visited and number of intercepts by MRFSS agents for each area in Massachusetts during 1979-87	3
Table 2. Proportion of intercept catch (numbers) of winter flounder by bimonthly period (wave) from Massachusetts by area during 1979-87	4
Table 3. Recreational landings (metric tons) of winter flounder by state from the Gulf of Maine and Southern New England - Middle Atlantic areas during 1979-87	5
Table 4. Recreational catch (metric tons) of winter flounder by state from the Gulf of Maine and Southern New England - Middle Atlantic areas during 1979-87	6
Table 5. Commercial and recreational landings (metric tons) of winter flounder by state during 1979-87	7
Table 6. Commercial and recreational landings (metric tons) of winter flounder from the Gulf of Maine and Southern New England - Middle Atlantic areas during 1979-87	8

List of Figures

Figure 1. Approximate location of Massachusetts coastal counties	1
Figure 2. Recreational landings (metric tons) of winter flounder from the Gulf of Maine and Southern New England - Middle Atlantic areas during 1979-87	5
Figure 3. Percentage of recreational landings (metric tons) of winter flounder from the Gulf of Maine and Southern New England - Middle Atlantic areas during 1979-87	5
Figure 4. Commercial and recreational landings of winter flounder from the Gulf of Maine area during 1979-87	8
Figure 5. Commercial and recreational landings (metric tons) of winter flounder from the Southern New England - Middle Atlantic area during 1979-87	8

Appendix Tables

Appendix Table 1. MRFSS intercept catch (Type A, thousands of individuals) from Barnstable and Plymouth Counties during 1979-87	9
Appendix Table 2. MRFSS intercept catch (Type A, thousands of individuals) from Massachusetts counties, excluding Barnstable and Plymouth, during 1979-87	14



EXECUTIVE SUMMARY

A method is described for allocating statewide-reported catch and landings statistics [coming from the Marine Recreational Fisheries Statistics Survey (MRFSS)] between two groups when both contribute to the state's catches and landings. The method, based on an analysis of landings recorded at each intercept site used in the MRFSS, has been applied to landings of winter flounder from Massachusetts during 1979-87. Landings from Barnstable and Plymouth Counties, Massachusetts, with sites on both the northern and southern sides of Cape Cod, were assigned to either the Gulf of Maine or the Southern New England - Middle Atlantic area, based on the proportion of intercept landings recorded from each of the northern and southern sites. Landings from the northern sites of Barnstable and Plymouth Counties were then combined with the landings from the remaining northern counties of Massachusetts, and with the landings from New Hampshire and Maine, and were designated as Gulf of Maine landings. Likewise, landings from the southern sites of Barnstable and Plymouth Counties, combined with the landings from the remaining southern counties of Massachusetts, and with the landings from Rhode Island, Connecticut, New York, and New Jersey, were designated as Southern New England - Middle Atlantic landings.

Results indicate that about 88 percent of Massachusetts recreational landings (in weight) of winter flounder were taken from the Gulf of Maine area during 1979-87. Recreational landings were roughly equal between the two areas during 1979-82, but during 1983-86, about 84 percent of the landings were reported from the Southern New England - Middle Atlantic area. In 1987, the Southern New England - Middle Atlantic area contributed about 68 percent of the landings.

When recreational landings were combined with commercial landings, the data indicate that recreational landings contributed an average of 52 percent of the total landings from the Gulf of Maine area during the period, while in the Southern New England - Middle Atlantic area, recreational landings contributed 36 percent of the total.

The method described is applicable to other species and areas (with additional work determining specific site locations) in the historical MRFSS data base, but will not be necessary after 1990 when an additional area variable is added to the survey.



INTRODUCTION

Winter flounder (*Pseudopleuronectes americanus* Walbaum) is an important component of both the commercial and recreational fisheries off the northeastern coast of the United States. According to the Marine Recreational Fishery Statistics Survey (MRFSS), it clearly is one of the most desired species in the recreational fishery and ranks among the top three species in numbers caught in the coastal waters of the North Atlantic region from Maine to Connecticut. In the Mid-Atlantic region from New York to Virginia, it has ranked consistently in the top eight species in numbers caught since 1979.

Since the inception of the annual MRFSS in 1979, catches of winter flounder have been reported by region (North Atlantic, Mid-Atlantic, etc.) and state (U.S. Dept. of Commerce 1984, 1985a, 1985b, 1986, 1987; unpublished U.S. Department of Commerce data). A concern of assessment biologists with this reporting scheme is that, while Cape Cod, Massachusetts, forms a natural boundary between individuals belonging to groups north and south of the cape, recreational catch statistics are reported for the entire state, and are not easily separable into the northern and southern areas. This limitation to the catch data base has made effective assessment of the inshore stocks difficult. In the assessments conducted to date, recreational landings statistics were reported by region/state (Conserva-

tion & Utilization Division, Northeast Fisheries Center 1988; Foster 1987), and analyses of overall removals from component stocks were not possible.

In the two Massachusetts counties that have intercept sites on both the northern and southern sides of Cape Cod (Barnstable and Plymouth), sites were assigned to either the Gulf of Maine or Southern New England - Middle Atlantic area depending on the sites' specific locations. Catches from these two counties were then allocated to the appropriate area based on the proportion of intercept catches landed from each of the sites.

This report presents the results of allocation of total catch and landings from the winter flounder recreational fishery during 1979-87. It also presents catch and landings statistics by state and area, and examines the effects of the addition of the recreational catch to commercial landings by state and area. The method is applicable to other species and areas (with additional work determining site locations) in the MRFSS data base.

METHODS

The first step in the allocation process was to assign Massachusetts counties to northern or southern areas and to identify those counties which had shorelines in both areas (Figure 1). The following table provides a summary of the counties and the areas to which they were assigned:

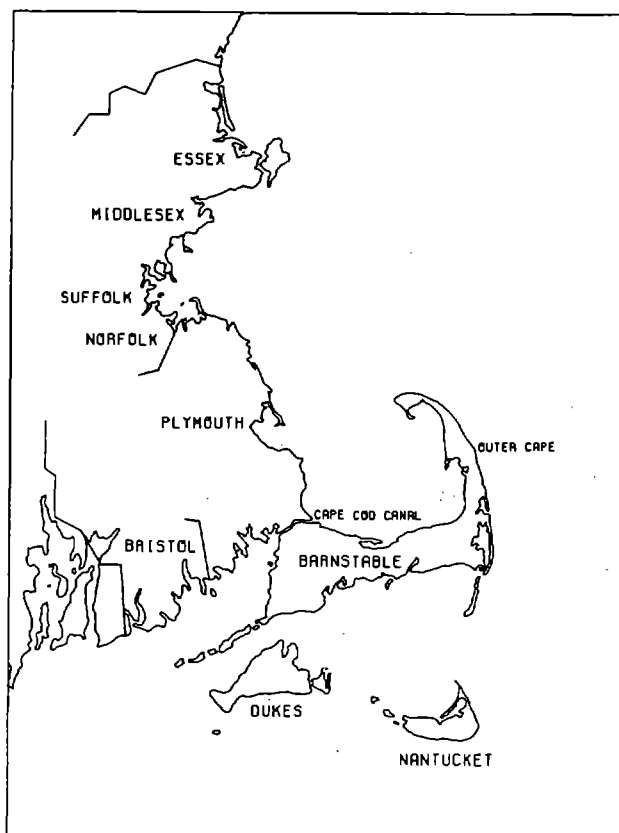


Figure 1. Approximate location of Massachusetts coastal counties.

County	MRFSS Code	Area Assigned
Essex	9	Northern
Middlesex	17	Northern
Norfolk	21	Northern
Suffolk	25	Northern
Bristol	5	Southern
Dukes	7	Southern
Nantucket	19	Southern
Barnstable	1	Northern/Southern
Plymouth	23	Northern/Southern

For Barnstable and Plymouth Counties, it was necessary to determine the actual location of sites visited by MRFSS agents and to assign each site to the northern or southern area. This areal assignment assumes that fishermen intercepted at northern sites had fished in waters north of Cape Cod, and that fishermen intercepted at southern sites had fished in waters south of Cape Cod. Sites of concern were those located in or very close to the Cape Cod Canal and on the outer cape. Canal sites were assigned to the northern area (Howe and Coates 1975; Pierce and Howe 1977; and A. Howe, pers. comm.), while outer cape sites were assigned to the southern area. For each year, intercept

catches (*i.e.*, Type A catches in the MRFSS sampling scheme -- those available for identification) in numbers were separated into bimonthly periods (*i.e.*, "waves" in the MRFSS sampling scheme) and assigned to one of the two areas based on site location.

For counties that had all of their sites in one area, Type A catches were assigned by wave to the appropriate area north or south of the cape. Total catches from each area (northern and southern) were then summed, and percentages were calculated of the total intercept catch taken from each area (*i.e.*, northern counties and northern sites from Barnstable and Plymouth Counties versus southern counties and southern sites from Barnstable and Plymouth Counties).

Expanded catch estimates in numbers (Types A+B1+B2, where B1 = catches used for bait, filleted, discarded dead, *etc.*; and B2 = catches released alive) for the entire state were then summed by wave. The area:total ratios were applied to these wave-specific estimates and then summed over waves to obtain the total Massachusetts catch by northern or southern area. Intercept catches, and therefore calculated ratios, were assumed to reflect total catch by area and wave.

Expanded catch estimates in numbers were summed over the range of the stock area. Massachusetts catches north of Cape Cod were combined with catches from Maine and New Hampshire, and designated as Gulf of Maine catches, while those catches south of Cape Cod were combined with catches from Rhode Island, Connecticut, New York, and New Jersey, and were designated as Southern New England - Middle Atlantic catches. Expanded estimates in weight were calculated after the procedure detailed in Terceiro (1987), *i.e.*:

$$\text{Total Catch (kg)} = [\text{Total Type A (kg)} / \text{Total Type A (no.)}] \cdot [\text{Type A+B1+B2 (no.)}]$$

where the mean weight of total Type A catches from the North Atlantic region were applied to Maine, New Hampshire, Massachusetts, and Rhode Island Type A+B1+B2 numbers, and the mean weight of total Type A catches from the Mid-Atlantic region were applied to Connecticut, New York, and New Jersey Type A+B1+B2 numbers.

To estimate total removals from the population, catches released alive (Type B2) were eliminated from the total expanded catches estimated above. Type B2 catch (numbers) was estimated by area, as described for Type A catch. However, since there were no estimates of Type B2 catch in weight, the mean weight of Type A individuals was applied to Type B2 numbers to estimate the weight of the Type B2 catch. This probably resulted in an overestimate of the Type B2 catch in weight since smaller individuals are typically released alive, and larger individuals are kept and made available to MRFSS interviewers for weighing. Estimates of total landings were then calculated as:

$$\text{Total Landings (kg)} = [\text{Total Catch (kg)}] - [\text{Total Type B2 Catch (kg)}].$$

RESULTS

A summary of the number of sites visited and number of intercepts in which winter flounder were caught by year and area is given in Table 1. There were a total of 511 sites identified as possible intercept locations in Massachusetts, 265 (52 percent) of which were found in the northern area and 246 (48 percent) in the southern area. In all years except 1986, the number of different sites visited in the northern area were greater than the number in the southern area for Barnstable and Plymouth Counties as well as for the other counties in the state. While only 40 percent of the total possible sites in Barnstable and Plymouth Counties are located in the northern area, an average of 56 percent of the sites visited each year were from the northern area. Of the remaining counties, 65 percent of the total possible sites are located in the northern area with an average of 80 percent of the sites visited each year coming from that area. This differential distribution of sites visited in the state may bias the catch statistics in favor of the northern area, especially during those years when very low percentages of the total sites visited were in the southern area of the state. In Barnstable and Plymouth Counties, the annual percentages of winter flounder intercepts in the northern area versus the southern area were roughly constant, averaging 60 percent, except in 1986 when the annual value was 20 percent. In the other counties, the annual percentages of intercepts, northern versus southern, averaged 87 percent except in 1986 when the annual value was 33 percent.

Based on allocation of intercept catch (Type A only) between northern and southern areas of Massachusetts, the annual percentages of Massachusetts intercept catch in numbers from the northern area averaged 85 percent, and the annual percentages of Massachusetts landings in weight from the northern area averaged 88 percent, during 1979-87 (Tables 2 and 3). Wave 4 (July-August) produced the highest percentage of intercept catch (in numbers) coming from the northern area (93 percent). There were no intercept catches of winter flounder reported from Wave 1 (January-February) since no intercept sampling takes place north of Georgia during this wave. Total intercept catches (Type A in numbers) by year and wave from northern and southern areas of Barnstable and Plymouth Counties, Massachusetts, are given in detail in Appendix Table 1. Total intercept catches by year and wave from other counties in Massachusetts, separated into northern or southern areas, are given in detail in Appendix Table 2.

Total recreational landings (Type A+B1) from Maine to New Jersey were at a high of 11,470 metric tons (mt) in 1979, but declined sharply in 1980 and averaged 6,900 mt during 1980-84 before increasing to 9,952 mt in 1985. The landings then dropped to their lowest level of 3,618 mt in 1986, followed by an increase to 5,958 mt in 1987 (Table 3, Figure 2). Trends in total catch (Table 4) were similar to those exhibited for the landings statistics.

Table 1. Number of sites visited and number of intercepts by MRFSS agents for each area in Massachusetts during 1979-87

Year	Barnstable and Plymouth Counties					Other Counties		
	North	Canal	South	Outer Cape	Total	North ¹	South ²	Total
Sites Visited								
1979	15	-	7	-	22	37	2	39
1980	12	-	3	2	17	37	2	39
1981	13	-	10	-	23	14	-	14
1982	16	-	8	2	26	17	2	19
1983	18	-	18	-	36	13	3	16
1984	15	1	14	-	30	4	2	6
1985	8	-	7	-	15	3	-	3
1986	5	-	7	-	12	1	5	6
1987	8	-	7	-	15	9	3	12
Total Possible	121	7	159	14	301	137	73	210
Intercepts								
1979	42	-	21	-	63	106	3	109
1980	55	-	18	2	75	152	2	154
1981	45	-	23	-	68	34	-	34
1982	90	-	21	2	113	101	2	103
1983	123	-	126	-	249	46	4	50
1984	65	1	67	-	133	11	6	17
1985	39	-	15	-	54	4	-	4
1986	12	-	49	-	61	12	24	36
1987	48	-	30	-	78	163	5	168

¹Includes Essex, Middlesex, Suffolk, and Norfolk Counties.

²Includes Bristol, Dukes, and Nantucket Counties.

Recreational landings from the Gulf of Maine area declined from a high of 6,145 mt in 1979 to an average of 3,805 mt during 1980-82 before dropping sharply again to average 1,516 mt during 1983-85. The reported landings in 1986 were only 281 mt, but increased to 1,928 mt in 1987 (Table 3, Figure 2). The Southern New England - Middle Atlantic area reported landings averaging 3,078 mt during 1980-82, after which landings increased to average 6,426 in 1983-85. In 1986, landings dropped by almost one half to 3,338 mt, and rose only slightly to 4,030 mt in 1987 (Table 3, Figure 2).

Percentages of recreational landings by area were roughly equal between the two areas during 1979-82, averaging 55 and 45 percent from the northern and southern areas, respectively. During 1983-86, however, landings from the Southern New England - Middle Atlantic area averaged of 84 percent of the total. In 1987, while the southern area still reported a higher percentage of the total (68 percent), the percentage was slightly closer to those during 1979-82 (Table 3, Figure 3).

When recreational landings statistics were compared to commercial landings statistics by individual state, the data demonstrated that for Connecticut, New York, and New Jersey, recreational landings made up over 50 percent

of the total landings on average during 1979-87 (Table 5). For New York and New Jersey, recreational landings exceeded commercial landings each year, while in Connecticut, recreational exceeded commercial in six of nine years. For Massachusetts, recreational landings averaged 23 percent of total landings during 1979-87, with a low of 7 percent in 1986 and a high of 43 percent in 1979. For Rhode Island, recreational landings averaged only 14 percent of total landings, whereas for Maine and New Hampshire, recreational landings averaged 8 and 40 percent, respectively. While the average percentage contributed by New Hampshire recreational landings was quite high, annual values in that state exceeded 50 percent only twice in the time series (1979 and 1980).

Total winter flounder landings (commercial and recreational) summed over area indicate that recreational landings make up a significant percentage of the total from both the Gulf of Maine area, averaging 52 percent, and the Southern New England - Middle Atlantic area, averaging 36 percent, during 1979-87 (Table 6). Landings from the Gulf of Maine decreased from a high of 8,166 mt in 1979 to average 6,350 mt during 1980-82, and again declined to an average of 3,308 mt during 1983-85, before dropping sharply to only 1,547 mt in 1986. The estimated landings

Table 2. Proportion of intercept catch¹ (numbers) of winter flounder by bimonthly period (wave) from Massachusetts by area during 1979-87

Year	Wave					
	1 (Jan-Feb)	2 (Mar-Apr)	3 (May-Jun)	4 (Jul-Aug)	5 (Sep-Oct)	6 (Nov-Dec)
Northern Counties						
1979	-	.983	.942	.937	1.000	1.000
1980	-	.973	.991	1.000	.986	1.000
1981	-	1.000	.993	.970	.975	1.000
1982	-	.995	.932	.949	1.000	1.000
1983	-	.484	.728	.990	.625	.922
1984	-	-	.602	.987	.989	.027
1985	-	.782	.994	1.000	.737	1.000
1986	-	-	.940	.500	.941	-
1987	-	.510	.993	1.000	.962	.918
Mean	-	.636	.902	.926	.913	.856
Southern Counties						
1979	-	.017	.058	.063	-	-
1980	-	.027	.009	-	.014	-
1981	-	-	.007	.030	.025	-
1982	-	.005	.068	.051	<.001	-
1983	-	.516	.272	.010	.375	.078
1984	-	1.000	.398	.013	.011	.973
1985	-	.218	.006	-	.263	-
1986	-	1.000	.060	.500	.059	-
1987	-	.490	.007	-	.038	.082
Mean	-	.364	.098	.074	.087	.144

¹Includes Type A only.

in 1987 increased to 3,135 mt, similar to the 1983-85 mean (Table 6, Figure 4). Landings from the Southern New England - Middle Atlantic area remained relatively constant during 1979-85, averaging 13,837 mt, and ranging from a low of 12,368 mt in 1979 to a high of 15,250 mt in 1984. In 1986, landings from this stock also declined sharply to 8,274 mt, and increased slightly to 9,219 mt in 1987 (Table 6, Figure 5).

DISCUSSION

The allocation of recreational landings to stock areas both north and south of Cape Cod, Massachusetts, will result in improved analysis of the condition of the winter flounder population in the inshore waters of the Northeast. While the stock structure of winter flounder in these waters is still uncertain, the method outlined in this report can be applied to any region (once specific intercept sites in that region are assigned to stock areas), including New York catches of winter flounder, with catches allocated to either Long Island Sound or the Middle Atlantic waters south of Long Island. Moreover, the addition of an "area" variable to the MRFSS intercept and expanded catch data base will

make future allocations of recreational landings far easier than the process described herein. The area variable will be added to the Barnstable and Plymouth County, Massachusetts, sites beginning in January 1990.

The actual level of total recreational removals of winter flounder from the population is still unknown, but probably lies somewhere between total recreational catch (Types A+B1+B2) and total recreational landings (Type A+B1) estimates, depending on the degree of hooking mortality operating on the B2 catch (fish released alive). Based on this analysis, Type B2 catch averaged about 14 percent of the total recreational catch from the Gulf of Maine area during 1979-87, while it averaged about 25 percent from the Southern New England - Middle Atlantic area (Table 4). The increased percentage of B2 catch from southern waters may be due to an increased proportion of small individuals in that area. There are no estimates of the hooking mortality level for winter flounder or other flatfish, with the exception of Pacific halibut where hooking mortality ranged between 8 and 24 percent (International Pacific Halibut Commission 1988). One of the few studies discussing the effects of anatomical trauma on marine fish compared the effects of catching soft-coral reef fishes caught by angling and trawling (Rogers *et al.* 1986). In that

Table 3. Recreational landings¹ (metric tons) of winter flounder by state from the Gulf of Maine and Southern New England - Middle Atlantic areas during 1979-87

State	1979	1980	1981	1982	1983	1984	1985	1986	1987
Gulf of Maine									
ME	179.2	208.5	29.8	0.0	0.0	0.0	0.0	33.5	1.9
NH	92.2	118.9	34.4	15.9	40.9	57.5	17.1	22.1	18.6
MA	5874.0	3148.6	3603.0	4254.6	1308.4	1133.3	1989.4	224.8	1907.5
Total	6145.4	3476.0	3667.2	4270.6	1349.3	1190.8	2006.5	280.5	1928.0
Southern New England - Middle Atlantic									
MA	101.1	26.4	53.2	93.9	446.3	350.8	211.8	145.8	70.7
RI	151.5	76.5	110.8	311.6	261.5	330.2	912.5	1368.0	607.2
CT	576.4	524.0	319.0	412.6	301.6	704.2	598.0	272.3	738.3
NY	3950.5	1870.5	2393.6	1106.7	3286.0	3663.2	4087.0	1326.7	2425.5
NJ	545.4	222.3	446.8	1264.8	668.3	1319.4	2136.1	225.1	188.6
Total	5324.9	2719.6	3323.4	3189.5	4963.8	6367.7	7945.4	3337.9	4030.3
Combined Areas									
Total	11470.3	6195.6	6990.5	7460.1	6313.0	7558.6	9951.9	3618.4	5958.3
Percent by Area									
% GOM	53.6	56.1	52.5	57.2	21.4	15.8	20.2	7.8	32.4
% SNE-MA	46.4	43.9	47.5	42.8	78.6	84.2	79.8	92.2	67.6

¹Includes Type A+B1 only (assumes no hooking mortality).

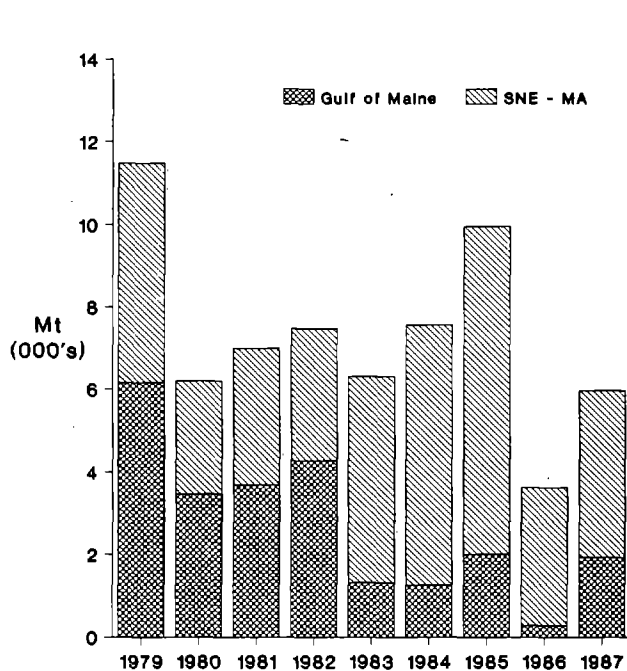


Figure 2. Recreational landings (metric tons) of winter flounder from the Gulf of Maine and Southern New England - Middle Atlantic areas during 1979-87.

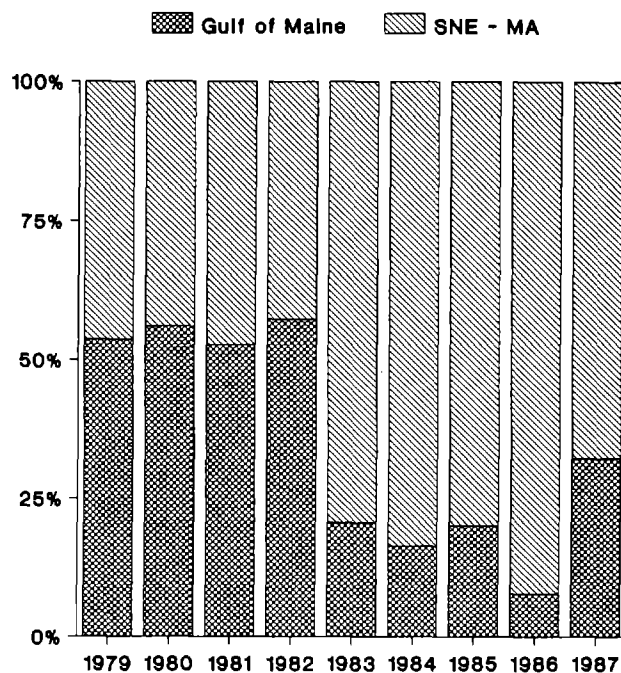


Figure 3. Percentage of recreational landings (metric tons) of winter flounder from the Gulf of Maine and Southern New England - Middle Atlantic areas during 1979-87.

Table 4. Recreational catch¹ (metric tons) of winter flounder by state from the Gulf of Maine and Southern New England - Middle Atlantic areas during 1979-87

State	1979	1980	1981	1982	1983	1984	1985	1986	1987
Gulf of Maine									
ME	183.8	211.7	30.7	-	-	-	-	34.7	1.9
NH	160.5	191.8	61.9	19.4	49.0	67.2	17.1	23.8	21.9
MA	6306.0	3496.1	4113.5	4631.5	1479.1	1249.1	2327.7	329.8	2380.1
Total	6650.3	3899.6	4206.0	4650.9	1528.1	1316.3	2344.8	388.4	2403.8
Southern New England - Middle Atlantic									
MA	121.8	29.1	62.9	96.8	510.5	398.1	265.2	192.0	92.0
RI	233.0	101.5	124.7	342.7	331.7	425.5	1020.9	1804.4	779.4
CT	752.4	663.1	368.3	478.6	371.6	797.7	733.3	299.6	854.5
NY	5457.1	2638.0	3391.4	1381.1	4182.0	5323.5	5922.1	1816.9	3169.7
NJ	853.9	318.5	513.4	1783.8	927.6	1664.1	2920.0	275.2	227.7
Total	7418.2	3750.3	4460.7	4082.9	6323.4	8608.8	10861.5	4388.1	5123.2
Combined Areas									
Total	14068.5	7649.9	8666.7	8733.8	7851.5	9925.1	13206.3	4776.4	7527.1
Percent by Area									
% GOM	47.3	51.0	48.5	53.3	19.5	13.3	17.8	8.1	31.9
% SNE-MA	52.7	49.0	51.5	46.7	80.5	86.7	82.2	91.9	68.1
Type B2 Percent of Total									
% GOM	7.6	10.9	12.8	8.2	11.7	9.5	14.6	27.8	19.8
% SNE-MA	28.2	27.5	25.5	21.9	21.5	26.0	26.8	23.9	21.3
Total	18.5	19.0	19.3	14.6	19.6	23.8	24.7	24.2	20.8

¹Includes Type A+B1+B2 (assumes 100% hooking mortality).

study, the authors reported that up to 27 percent of black sea bass caught by angling suffered trauma sufficiently severe to produce fatalities. The effect of trauma was probably related to the body morphology of individual species; however, this estimate cannot be applied to winter flounder. Studies examining the effects of hooking and releasing small winter flounder and other species are necessary to effectively determine the actual level of removals from populations of recreationally caught species.

REFERENCES CITED

- Conservation & Utilization Division, Northeast Fisheries Center. 1988. Status of the fishery resources off the northeastern United States for 1988. *NOAA Tech. Mem. NMFS-F/NEFC-63*. 135 pp.
- Foster, K.L. 1987. Status of the winter flounder *Pseudopleuronectes americanus* stocks in the Gulf of Maine, Southern New England, and Middle Atlantic areas. *Nat. Mar. Fish. Serv., Woods Hole Lab. Ref. Doc. No. 87-06*. 70 pp.
- Howe, A.B., and P.G. Coates. 1975. Winter flounder movements, growth, and mortality off Massachusetts. *Trans. Amer. Fish. Soc.* 104(1): 13-29.
- International Pacific Halibut Commission. 1988. Annual Report - 1987. *Int. Pac. Halibut Comm., Seattle, Wash.* 51 pp.
- Pierce, D.E., and A.B. Howe. 1977. A further study on winter flounder group identification off Massachusetts. *Trans. Amer. Fish. Soc.* 106(2): 131-139.
- Rogers, S.G., H.T. Langston, and T.E. Targett. 1986. Anatomical trauma to sponge-coral reef fishes captured by trawling and angling. *Fish. Bull., U.S.* 84(3): 697-704.
- Terceiro, M. 1987. Using the marine recreational fishery statistics survey (MRFSS) in stock assessments. *Nat. Mar. Fish. Serv., Woods Hole Lab. Ref. Doc. No. 87-11*. 15 pp.
- U.S. Department of Commerce. 1984. Marine recreational fishery statistics survey, Atlantic and Gulf coasts, 1979(Revised)-1980. *Nat. Mar. Fish. Serv., Curr. Fish. Stat. No. 8322*. 239 pp.

Table 5. Commercial and recreational¹ landings (metric tons) of winter flounder by state during 1979-87

	ME	NH	MA	RI	CT	NY	NJ
1979							
Recreational	179.2	92.2	5975.1	151.5	576.4	3950.5	545.4
Commercial	447.2	22.5	7715.5	2788.0	240.1	674.5	94.8
% Recreational	28.6	80.4	43.6	5.2	70.6	85.4	85.2
1980							
Recreational	208.5	118.9	3175.0	76.5	524.0	1870.5	222.3
Commercial	566.3	26.5	11752.1	3971.1	227.5	754.3	66.9
% Recreational	26.9	81.8	21.3	1.9	69.7	71.3	76.9
1981							
Recreational	29.8	34.4	3656.2	110.8	319.0	2393.6	446.8
Commercial	668.8	44.5	11668.1	4178.1	523.1	953.4	235.5
% Recreational	4.3	43.6	23.9	2.6	37.9	71.5	65.5
1982							
Recreational	-	15.9	4348.5	311.6	4126.0	1106.7	1264.8
Commercial	897.6	104.5	9599.1	3480.0	514.6	836.9	120.4
% Recreational	-	13.2	31.2	8.2	88.9	56.9	91.3
1983							
Recreational	-	40.9	1754.7	261.5	301.6	3286.0	668.3
Commercial	677.7	76.7	10138.6	3087.5	531.4	660.9	141.7
% Recreational	-	34.8	14.8	7.8	36.2	83.3	82.5
1984							
Recreational	-	57.5	1484.1	330.2	704.2	3663.2	1319.4
Commercial	424.8	94.6	9522.4	3295.2	593.7	614.4	87.5
% Recreational	-	37.8	13.5	9.1	54.3	85.6	93.8
1985							
Recreational	-	17.1	2201.2	912.5	598.0	4087.0	2136.1
Commercial	332.5	74.9	6332.5	2888.8	541.5	576.7	216.3
% Recreational	-	18.6	25.8	24.0	52.5	87.6	90.8
1986							
Recreational	33.5	22.1	370.6	1368.0	272.3	1326.7	225.1
Commercial	294.0	51.3	4755.5	1948.1	294.8	406.9	168.2
% Recreational	10.2	30.1	7.2	41.3	48.0	76.5	57.2
1987							
Recreational	1.9	18.6	1978.2	607.2	738.3	2425.5	188.6
Commercial	241.3	92.5	5374.2	1736.4	643.2	556.6	103.4
% Recreational	0.8	16.7	26.9	25.9	53.4	81.3	64.6
Average % Recreational	7.9	39.7	23.1	14.0	56.8	77.7	78.6

¹Includes Type A+B1.

U.S. Department of Commerce. 1985a. Marine recreational fishery statistics survey, Atlantic and Gulf coasts, 1981-1982. Nat. Mar. Fish. Serv., Curr. Fish. Stat. No. 8324. 215 pp.

U.S. Department of Commerce. 1985b. Marine recreational fishery statistics survey, Atlantic and Gulf coasts, 1983-1984. Nat. Mar. Fish. Serv., Curr. Fish. Stat. No. 8326. 222 pp.

U.S. Department of Commerce. 1986. Marine recreational fishery statistics survey, Atlantic and Gulf coasts, 1985. Nat. Mar. Fish. Serv., Curr. Fish. Stat. No. 8327. 130 pp.

U.S. Department of Commerce. 1987. Marine recreational

fishery statistics survey, Atlantic and Gulf coasts, 1986. Nat. Mar. Fish. Serv., Curr. Fish. Stat. No. 8392. 127 pp.

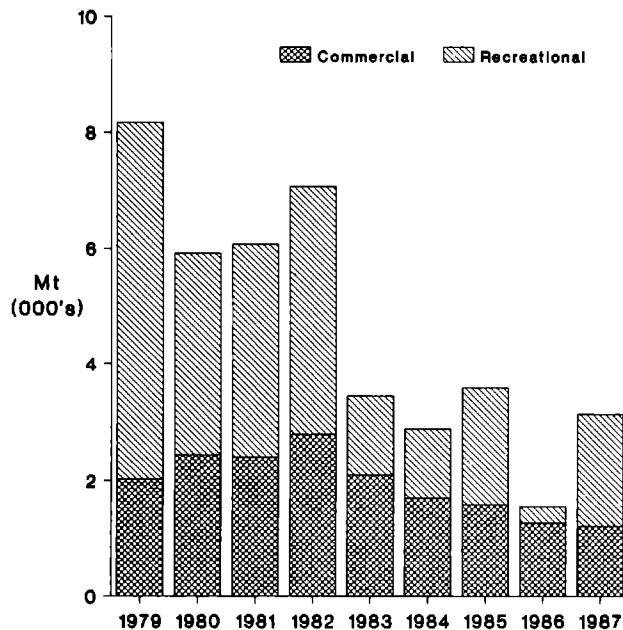


Figure 4. Commercial and recreational landings of winter flounder from the Gulf of Maine area during 1979-87.

Table 6. Commercial and recreational¹ landings (metric tons) of winter flounder from the Gulf of Maine and Southern New England - Middle Atlantic areas during 1979-87

Year	Commercial	Recreational	Total	Percent Recreational
Gulf of Maine				
1979	2,021	6,145	8,166	75.3
1980	2,437	3,476	5,913	58.8
1981	2,406	3,667	6,073	60.4
1982	2,793	4,271	7,064	60.5
1983	2,096	1,349	3,445	39.2
1984	1,698	1,191	2,889	41.2
1985	1,582	2,007	3,589	60.0
1986	1,266	281	1,547	18.2
1987	1,207	1,928	3,135	61.5
				Mean = 52.3
Southern New England - Middle Atlantic				
1979	7,043	5,325	12,368	43.1
1980	10,867	2,720	13,587	20.0
1981	11,557	3,323	14,880	22.3
1982	9,438	3,190	12,628	25.3
1983	8,659	4,964	13,623	36.4
1984	8,882	6,368	15,250	41.8
1985	6,579	7,945	14,524	54.7
1986	4,936	3,338	8,274	40.3
1987	5,189	4,030	9,219	43.7
				Mean = 36.4

¹Includes Type A+B1.

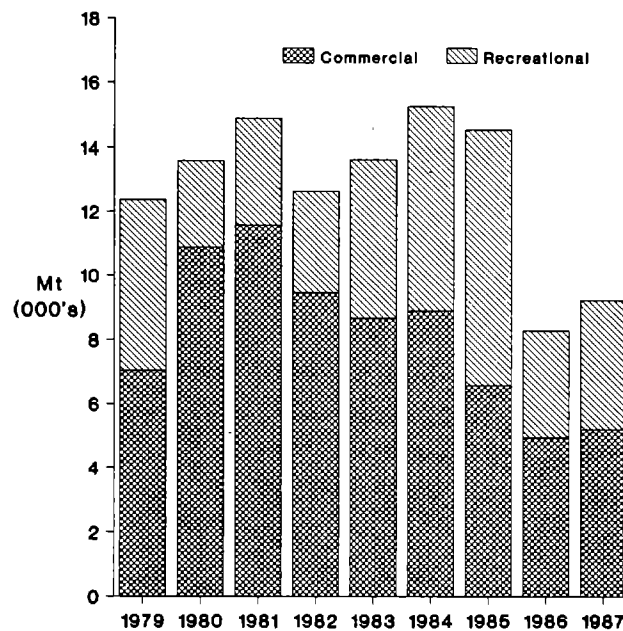


Figure 5. Commercial and recreational landings (metric tons) of winter flounder from the Southern New England - Middle Atlantic area during 1979-87.

Appendix Table 1. MRFSS intercept catch (Type A, thousands of individuals) from Barnstable and Plymouth Counties during 1979-87

County	Wave						Total
	1	2	3	4	5	6	
Year: 1979							
CATCH BY COUNTY (numbers)							
Barnstable	0	0	82	148	0	0	230
Plymouth	0	0	1040	964	1112	8	3124
TOTAL	0	0	1122	1112	1112	8	3354
CATCH BY STOCK AREA							
Northern Cape and North							
Barnstable	0	0	0	145	0	0	145
Plymouth	0	0	825	533	1112	8	2478
TOTAL	0	0	825	678	1112	8	2623
Southern Cape and South							
Barnstable	0	0	82	3	0	0	85
Plymouth	0	0	215	431	0	0	646
TOTAL	0	0	297	434	0	0	731
PROPORTIONS BY STOCK AREA							
North	0.000	0.000	0.735	0.610	1.000	1.000	0.782
South	0.000	0.000	0.265	0.390	0.000	0.000	0.218
Year: 1980							
CATCH BY COUNTY (numbers)							
Barnstable	0	20	1	25	21	0	67
Plymouth	0	521	769	202	671	5	2168
TOTAL	0	541	770	227	692	5	2235
CATCH BY STOCK AREA							
Northern Cape and North							
Barnstable	0	0	0	25	17	0	42
Plymouth	0	521	728	202	610	5	2066
TOTAL	0	521	728	227	627	5	2108
Southern Cape and South							
Barnstable	0	20	0	0	0	0	20
Plymouth	0	0	41	0	61	0	102
TOTAL	0	20	41	0	61	0	122
Outer Cape							
Barnstable	0	0	1	0	4	0	5
TOTAL	0	0	1	0	4	0	5
PROPORTIONS BY STOCK AREA							
North	0.000	0.963	0.945	1.000	0.906	1.000	0.943
South	0.000	0.037	0.053	0.000	0.088	0.000	0.055
Outer Cape	0.000	0.000	0.001	0.000	0.006	0.000	0.002

Appendix Table 1. continued.

County	Wave						Total
	1	2	3	4	5	6	
Year: 1981							
CATCH BY COUNTY (numbers)							
Barnstable	0	0	36	788	244	177	1245
Plymouth	0	143	0	1418	4640	740	6941
TOTAL	0	143	36	2206	4884	917	8186
CATCH BY STOCK AREA							
Northern Cape and North							
Barnstable	0	0	0	767	0	177	944
Plymouth	0	143	0	1349	4630	740	6862
TOTAL	0	143	0	2116	4630	917	7806
Southern Cape and South							
Barnstable	0	0	36	21	244	0	301
Plymouth	0	0	0	69	10	0	79
TOTAL	0	0	36	90	254	0	380
PROPORTIONS BY STOCK AREA							
North	0.000	1.000	0.000	0.959	0.948	1.000	0.954
South	0.000	0.000	1.000	0.041	0.052	0.000	0.046
Year: 1982							
CATCH BY COUNTY (numbers)							
Barnstable	0	4	436	847	167	922	2376
Plymouth	0	71	290	311	2369	0	3041
TOTAL	0	75	726	1158	2536	922	5417
CATCH BY STOCK AREA							
Northern Cape and North							
Barnstable	0	0	27	594	163	922	1706
Plymouth	0	67	290	311	2369	0	3037
TOTAL	0	67	317	905	2532	922	4743
Southern Cape and South							
Barnstable	0	4	409	133	4	0	550
Plymouth	0	4	0	0	0	0	4
TOTAL	0	8	409	133	4	0	554
Outer Cape							
Barnstable	0	0	0	120	0	0	120
TOTAL	0	0	0	120	0	0	120
PROPORTIONS BY STOCK AREA							
North	0.000	0.893	0.437	0.782	0.998	1.000	0.876
South	0.000	0.107	0.563	0.115	0.002	0.000	0.102
Outer Cape	0.000	0.000	0.000	0.104	0.000	0.000	0.022

Appendix Table 1. continued.

County	Wave						Total
	1	2	3	4	5	6	
Year: 1983							
CATCH BY COUNTY (numbers)							
Barnstable	0	1160	1665	136	1161	393	4515
Plymouth	0	281	2436	467	977	0	4161
TOTAL	0	1441	4101	603	2138	393	8676
CATCH BY STOCK AREA							
Northern Cape and North							
Barnstable	0	363	318	119	291	365	1456
Plymouth	0	148	1799	467	977	0	3391
TOTAL	0	511	2117	586	1268	365	4847
Southern Cape and South							
Barnstable	0	797	1347	17	870	28	3059
Plymouth	0	133	637	0	0	0	770
TOTAL	0	930	1984	17	870	28	3829
PROPORTIONS BY STOCK AREA							
North	0.000	0.355	0.516	0.972	0.593	0.929	0.559
South	0.000	0.645	0.484	0.028	0.407	0.071	0.441
Year: 1984							
CATCH BY COUNTY (numbers)							
Barnstable	0	336	1155	269	121	147	2028
Plymouth	0	0	125	1702	2914	0	4741
TOTAL	0	336	1280	1971	3035	147	6769
CATCH BY STOCK AREA							
Northern Cape and North							
Barnstable	0	0	645	261	106	0	1012
Plymouth	0	0	125	1702	2913	0	4740
TOTAL	0	0	770	1963	3019	0	5752
Southern Cape and South							
Barnstable	0	336	510	8	15	143	1012
Plymouth	0	0	0	0	1	0	1
TOTAL	0	336	510	8	16	143	1013
Cape Cod Canal							
Barnstable	0	0	0	0	0	4	4
TOTAL	0	0	0	0	0	4	4
PROPORTIONS BY STOCK AREA							
North	0.000	0.000	0.602	0.996	0.995	0.000	0.850
South	0.000	1.000	0.398	0.004	0.005	0.973	0.150
Canal Area	0.000	0.000	0.000	0.000	0.000	0.027	0.001

Appendix Table 1. continued.

County	Wave						Total
	1	2	3	4	5	6	
Year: 1985							
CATCH BY COUNTY (numbers)							
Barnstable	0	154	600	16	19	2	791
Plymouth	0	583	4081	0	0	0	4664
TOTAL	0	737	4681	16	19	2	5455
CATCH BY STOCK AREA							
Northern Cape and North							
Barnstable	0	0	600	16	14	2	632
Plymouth	0	576	4054	0	0	0	4630
TOTAL	0	576	4654	16	14	2	5262
Southern Cape and South							
Barnstable	0	154	0	0	5	0	159
Plymouth	0	7	27	0	0	0	34
TOTAL	0	161	27	0	5	0	193
PROPORTIONS BY STOCK AREA							
North	0.000	0.782	0.994	1.000	0.737	1.000	0.965
South	0.000	0.218	0.006	0.000	0.263	0.000	0.035
Year: 1986							
CATCH BY COUNTY (numbers)							
Barnstable	0	470	224	1	16	0	711
Plymouth	0	17	2389	0	1	0	2407
TOTAL	0	487	2613	1	17	0	3118
CATCH BY STOCK AREA							
Northern Cape and North							
Barnstable	0	0	101	1	16	0	118
Plymouth	0	0	2364	0	0	0	2364
TOTAL	0	0	2465	1	16	0	2482
Southern Cape and South							
Barnstable	0	470	123	0	0	0	593
Plymouth	0	17	25	0	1	0	43
TOTAL	0	487	148	0	1	0	636
PROPORTIONS BY STOCK AREA							
North	0.000	0.000	0.943	1.000	0.941	0.000	0.796
South	0.000	1.000	0.057	0.000	0.059	0.000	0.204

Appendix Table 1. continued.

County	Wave						Total
	1	2	3	4	5	6	
Year: 1987							
CATCH BY COUNTY (numbers)							
Barnstable	0	0	125	0	474	82	681
Plymouth	0	0	2709	1	10	61	2781
TOTAL	0	0	2834	1	484	143	3462
CATCH BY STOCK AREA							
Northern Cape and North							
Barnstable	0	0	100	0	373	54	527
Plymouth	0	0	2709	1	0	61	2771
TOTAL	0	0	2809	1	373	115	3298
Southern Cape and South							
Barnstable	0	0	25	0	101	28	154
Plymouth	0	0	0	0	10	0	10
TOTAL	0	0	25	0	111	28	164
PROPORTIONS BY STOCK AREA							
North	0.000	0.000	0.991	1.000	0.771	0.804	0.953
South	0.000	0.000	0.009	0.000	0.229	0.196	0.047

Appendix Table 2. MRFSS intercept catch (Type A, thousands of individuals) from Massachusetts counties, excluding Barnstable and Plymouth, during 1979-87

County	Wave						Total
	1	2	3	4	5	6	
Year: 1979							
CATCH BY COUNTY (number)							
Bristol	0	2	0	0	0	0	2
Essex	0	73	1152	258	23	5	1511
Middlesex	0	40	1	0	0	0	41
Nantucket	0	0	0	16	0	0	16
Norfolk	0	0	2602	5982	1055	0	9639
Suffolk	0	1	579	236	128	15	959
TOTAL	0	116	4334	6492	1206	20	12168
CATCH BY STOCK AREA							
Northern Counties							
Essex	0	73	1152	258	23	5	1511
Middlesex	0	40	1	0	0	0	41
Norfolk	0	0	2602	5982	1055	0	9639
Suffolk	0	1	579	236	128	15	959
TOTAL	0	114	4334	6476	1206	20	12150
Southern Counties							
Bristol	0	2	0	0	0	0	2
Nantucket	0	0	0	16	0	0	16
TOTAL	0	2	0	16	0	0	18
PROPORTIONS BY STOCK AREA							
Northern Counties	.000	.983	1.000	.998	1.000	1.000	.999
Southern Counties	.000	.017	.000	.002	.000	.000	.001
Year: 1980							
CATCH BY COUNTY (number)							
Bristol	0	1	1	0	0	0	2
Essex	0	243	41	599	391	0	1274
Middlesex	0	0	0	0	1	0	1
Norfolk	0	0	1661	225	3371	0	5257
Suffolk	0	0	2267	48	16	0	2331
TOTAL	0	244	3970	872	3779	0	8865
CATCH BY STOCK AREA							
Northern Counties							
Essex	0	243	41	599	391	0	1274
Middlesex	0	0	0	0	1	0	1
Norfolk	0	0	1661	225	3371	0	5257
Suffolk	0	0	2267	48	16	0	2331
TOTAL	0	243	3969	872	3779	0	8863
Southern Counties							
Bristol	0	1	1	0	0	0	2
TOTAL	0	1	1	0	0	0	2
PROPORTIONS BY STOCK AREA							
Northern Counties	.000	.996	1.000	1.000	1.000	.000	1.000
Southern Counties	.000	.004	<0.001	.000	.000	.000	<0.001

Appendix Table 2. continued.

County	Wave						Total
	1	2	3	4	5	6	
Year: 1981							
CATCH BY COUNTY (number)							
Essex	0	0	20	651	561	0	1232
Norfolk	0	0	4695	50	4140	0	8885
Suffolk	0	0	296	134	509	0	939
TOTAL	0	0	5011	835	5210	0	11056
CATCH BY STOCK AREA							
Northern Counties							
Essex	0	0	20	651	561	0	1232
Norfolk	0	0	4695	50	4140	0	8885
Suffolk	0	0	296	134	509	0	939
TOTAL	0	0	5011	835	5210	0	11056
PROPORTIONS BY STOCK AREA							
Northern Counties	.000	.000	1.000	1.000	1.000	.000	1.000
Southern Counties	.000	.000	.000	.000	.000	.000	.000
Year: 1982							
CATCH BY COUNTY (number)							
Bristol	0	0	81	0	1	0	82
Essex	0	1421	662	81	326	0	2490
Norfolk	0	9	5557	3190	10993	0	19749
Suffolk	0	0	201	553	2156	69	2979
TOTAL	0	1430	6501	3824	13476	69	25300
CATCH BY STOCK AREA							
Northern Counties							
Essex	0	1421	662	81	326	0	2490
Norfolk	0	9	5557	3190	10993	0	19749
Suffolk	0	0	201	553	2156	69	2979
TOTAL	0	1430	6420	3824	13475	69	25218
Southern Counties							
Bristol	0	0	81	0	1	0	82
TOTAL	0	0	81	0	1	0	82
PROPORTIONS BY STOCK AREA							
Northern Counties	.000	1.000	.988	1.000	1.000	1.000	.997
Southern Counties	.000	.000	.012	.000	<0.001	.000	.003

Appendix Table 2. continued.

County	Wave						Total
	1	2	3	4	5	6	
Year: 1983							
CATCH BY COUNTY (number)							
Bristol	0	15	0	1	1	0	17
Essex	0	162	229	243	173	0	807
Norfolk	0	0	2967	926	0	0	3893
Suffolk	0	215	0	0	9	0	224
TOTAL	0	392	3196	1170	183	0	4941
CATCH BY STOCK AREA							
Northern Counties							
Essex	0	162	229	243	173	0	807
Norfolk	0	0	2967	926	0	0	3893
Suffolk	0	215	0	0	9	0	224
TOTAL	0	377	3196	1169	182	0	4924
Southern Counties							
Bristol	0	15	0	1	1	0	17
TOTAL	0	15	0	1	1	0	17
PROPORTIONS BY STOCK AREA							
Northern Counties	.000	.962	1.000	.999	.995	.000	.997
Southern Counties	.000	.038	.000	.001	.005	.000	.003
Year: 1984							
CATCH BY COUNTY (number)							
Bristol	0	0	0	19	18	0	37
Essex	0	0	1	2	0	0	3
Norfolk	0	0	0	17	0	0	17
Suffolk	0	0	0	32	1	0	33
TOTAL	0	0	1	70	19	0	90
CATCH BY STOCK AREA							
Northern Counties							
Essex	0	0	1	2	0	0	3
Norfolk	0	0	0	17	0	0	17
Suffolk	0	0	0	32	1	0	33
TOTAL	0	0	1	51	1	0	53
Southern Counties							
Bristol	0	0	0	19	18	0	37
TOTAL	0	0	0	19	18	0	37
PROPORTIONS BY STOCK AREA							
Northern Counties	.000	.000	1.000	.729	.053	.000	.589
Southern Counties	.000	.000	.000	.271	.947	.000	.411

Appendix Table 2. continued.

County	Wave						Total
	1	2	3	4	5	6	
Year: 1985							
CATCH BY COUNTY (number)							
Essex	0	0	5	1	0	0	6
TOTAL	0	0	5	1	0	0	6
CATCH BY STOCK AREA							
Northern Counties							
Essex	0	0	5	1	0	0	6
TOTAL	0	0	5	1	0	0	6
PROPORTIONS BY STOCK AREA							
Northern Counties	.000	.000	1.000	1.000	.000	.000	1.000
Southern Counties	.000	.000	.000	.000	.000	.000	.000
Year: 1986							
CATCH BY COUNTY (number)							
Bristol	0	1351	200	1	0	0	1552
Dukes	0	0	24	0	0	0	24
Norfolk	0	0	3382	0	0	0	3382
TOTAL	0	1351	3606	1	0	0	4958
CATCH BY STOCK AREA							
Northern Counties							
Norfolk	0	0	3382	0	0	0	3382
TOTAL	0	0	3382	0	0	0	3382
Southern Counties							
Bristol	0	1351	200	1	0	0	1552
Dukes	0	0	24	0	0	0	24
TOTAL	0	1351	224	1	0	0	1576
PROPORTIONS BY STOCK AREA							
Northern Counties	.000	.000	.938	.000	.000	.000	.682
Southern Counties	.000	1.000	.062	1.000	.000	.000	.318

Appendix Table 2. continued.

County	Wave						Total
	1	2	3	4	5	6	
Year: 1987							
CATCH BY COUNTY (number)							
Bristol	0	102	0	0	0	0	102
Dukes	0	0	0	0	36	0	36
Essex	0	106	11	4	0	0	121
Norfolk	0	0	90	0	2557	200	2847
Suffolk	0	0	732	0	809	0	1541
TOTAL	0	208	833	4	3402	200	4647
CATCH BY STOCK AREA							
Northern Counties							
Essex	0	106	11	4	0	0	121
Norfolk	0	0	90	0	2557	200	2847
Suffolk	0	0	732	0	809	0	1541
TOTAL	0	106	833	4	3366	200	4509
Southern Counties							
Bristol	0	102	0	0	0	0	102
Dukes	0	0	0	0	36	0	36
TOTAL	0	102	0	0	36	0	138
PROPORTIONS BY STOCK AREA							
Northern Counties	.000	.510	1.000	1.000	.989	1.000	.970
Southern Counties	.000	.490	.000	.000	.011	.000	.030

(continued from inside front cover)

56. **Characterization of the Middle Atlantic Water Management Unit of the Northeast Regional Action Plan.** By Anthony L. Pacheco, ed. July 1988. v + 322 p., 136 figs., 21 tables. NTIS Access. No. PB89-145262/AS.
57. **An Analysis and Evaluation of Ichthyoplankton Survey Data from the Northeast Continental Shelf Ecosystem.** By Wallace G. Smith, ed. August 1988. xiii + 132 p., 53 figs., 12 tables, 1 app. NTIS Access. No. PB89-122501/AS.
58. **An Indexed Bibliography of Northeast Fisheries Center Publications and Reports for 1987.** By Jon A. Gibson. August 1988. iii + 20 p. NTIS Access. No. PB89-113013/AS.
59. **Surveys of Breeding Penguins and Other Seabirds in the South Shetland Islands, Antarctica, January-February 1987.** By W. David Shuford and Larry B. Spear. September 1988. vii + 27 p., 14 figs., 1 table. NTIS Access. No. PB89-141311/AS.
60. **Survey of Antarctic Fur Seals in the South Shetland Islands, Antarctica, during the 1986-1987 Austral Summer.** By John L. Bengtson, Lisa M. Ferm, Tero J. Harkonen, Everett G. Schaner, and Brent S. Stewart. September 1988. vii + 8 p., 1 fig., 3 tables. NTIS Access. No. PB89-141303/AS.
61. **Fish as Sentinels of Environmental Health.** By Robert A. Murchelano. September 1988. iii + 16 p., 4 figs. NTIS Access. No. PB89-139737/AS.
62. **The Effects of Density Dependent Population Mechanisms on Assessment Advice for the Northwest Atlantic Mackerel Stock.** By W. J. Overholtz, S.A. Murawski, W.L. Michaels, and L.M. Dery. October 1988. v + 49 p., 7 figs., 20 tables. NTIS Access. No. PB89-151948/AS.
63. **Status of the Fishery Resources Off the Northeastern United States for 1988.** By Conservation and Utilization Division. October 1988. iii + 135 p., 51 figs., 52 tables. NTIS Access. No. PB89-130819/AS.
64. **The Shell Disease Syndrome in Marine Crustaceans.** By Carl J. Sindermann. February 1989. v + 43 p., 5 figs., 2 tables. NTIS Access. No. PB89-162523/AS.
65. **Stock Assessment Information for Pollock, *Pollachius virens* (L.), in the Scotian Shelf, Georges Bank, and Gulf of Maine Regions.** By Ralph K. Mayo, Stephen H. Clark, and M. Christina Annand. April 1989. vi + 14 p., 6 figs., 14 tables. NTIS Access. No. PB90-120676/AS.
66. **Guidelines for Estimating Lengths at Age for 18 Northwest Atlantic Finfish and Shellfish Species.** By Judith A. Pentilla, Gary A. Nelson, and John M. Burnett, III. May 1989. iii + 39 p., 18 figs., 19 tables. NTIS Access. No. PB90-210100.
67. **Response of the Habitat and Biota of the Inner New York Bight to Abatement of Sewage Sludge Dumping. Second Annual Progress Report -- 1988.** By Environmental Processes Division, Northeast Fisheries Center. July 1989. vii + 47 p., 39 figs., 11 tables, 3 app. NTIS Access. No. PB90-160656/AS.
68. **MARMAP Surveys of the Continental Shelf from Cape Hatteras, North Carolina, to Cape Sable, Nova Scotia (1984-87). Atlas No. 3. Summary of Operations.** By John D. Sibunka and Myron J. Silverman. July 1989. iv + 197 p., 36 figs., 2 tables. NTIS Access. No. PB90-125444/AS.
69. **The 1988 Experimental Whiting Fishery: A NMFS/Industry Cooperative Program.** By Frank P. Almeida, Thurston S. Burns, and Sukwoo Chang. August 1989. v + 16 p., 9 figs., 11 tables, 1 app. NTIS Access. No. PB90-160664/AS.
70. **Summer Distribution of Regulated Species on Georges Bank with Reference to the 1988 Experimental Whiting Fishery.** By Frank P. Almeida, Sukwoo Chang, and Thurston S. Burns. September 1989. v + 25 p., 74 figs., 1 table.

Information Services Section
Northeast Fisheries Center
National Marine Fisheries Service, NOAA
Water St.
Woods Hole, MA 02543

Postage and Fees Paid
U.S. Department of Commerce
COM-210



THIRD CLASS MAIL

PUBLICATIONS AND REPORTS OF THE NORTHEAST FISHERIES CENTER

NOAA's National Marine Fisheries Service (NMFS) seeks to "achieve a continued optimum utilization of living resources for the benefit of the Nation." As the research arm of the NMFS's Northeast Region, the Northeast Fisheries Center (NEFC) supports the NMFS mission by "planning, developing, and managing multidisciplinary programs of basic and applied research to: (1) better understand the living marine resources (including marine mammals) of the Northwest Atlantic, and the environmental quality essential for their existence and continued productivity; and (2) describe and provide to management, industry, and the public, options for the utilization and conservation of living marine resources and maintenance of environmental quality which are consistent with national and regional goals and needs, and with international commitments." To provide its data, information, and advice to constituents, the NEFC issues publications and reports in three categories:

Technical Memorandums--Issued irregularly as *NOAA Technical Memorandum NMFS-F/NEC* series. Series includes data reports of long-term or large area studies; synthesis reports for major resources or habitats; annual reports of assessment or monitoring programs; documentary reports of oceanographic conditions or phenomena; manuals describing field and lab techniques; literature surveys of major resource or habitat topics; findings of task forces or working groups; and summary reports of scientific or technical workshops. Issues do not undergo exhaustive technical review and editing, but are reliable sources of information. Limited free copies are available from authors or the NEFC. Issues are also available from the National Technical Information Service, 5285 Port Royal Rd., Springfield, VA 22161.

Reference Documents--Issued irregularly as the *Northeast Fisheries Center Reference Document* series. Series includes: data reports on field and lab observations or experiments; progress reports on continuing experiments, monitoring, and assessments; and background papers for scientific or technical workshops. Issues receive minimal internal scientific review and no technical editing. No subscriptions. Free distribution of single copies.

Information Reports--Issued in several series, including: *Monthly Highlights* (monthly); *End-of-Year Report* (annual); *News Release* (irregular); *Fishermen's Report* (up to four times per year); and *The Shark Tagger* (two times per year). Content is timely, special-purpose data and/or information. Level of scientific review and technical editing varies by series. All series available through free subscription except for *The Shark Tagger* which is available only to participants in the NMFS Cooperative Shark Tagging Program.

To obtain a copy of a Technical Memorandum or a Reference Document, or to subscribe to an Information Report, write: Information Services Section, Northeast Fisheries Center, Water St., Woods Hole, MA 02543. An annual list of NEFC publications and reports is available upon request at the above address. Any use of trade names in any NEFC publication or report does not imply endorsement.