

Chapter 5

SPORTFISHING IN MARYLAND

Activity by Maryland Households

Participation in marine recreational fishing in Maryland is determined largely by the mid-Atlantic climate, the location of fishing in the Bay and ocean, and the distribution of the population in metropolitan areas. The relatively mild climate provides pleasant fishing days from April through November. A large proportion of the population of Maryland is located in the Baltimore-Washington corridor and the Chesapeake Bay is by far the most accessible water body for residents of this corridor. Seasonal and annual participation in sportfishing can be expected to vary because of the large variation in abundance of sportfishing target species.

In Maryland, the NMFS survey is directed toward households with telephones in counties within 25 miles of the coast or major bays and estuaries. This criterion encompassed 1,314,345 occupied housing units as of the 1980 Census, which represented about 90 percent of the total occupied housing units in Maryland. Because this criterion includes households with closer access to fishing, these households are likely to account for more than 90 percent of the total fishing activity by Maryland households in Maryland. NMFS estimates that of those individual participants who both reside and fish in Maryland, 95 percent live in these coastal counties.

The NMFS telephone survey does not include information on household fishing trips out-of-state. The telephone survey does not provide information on sportfishing activity by Maryland residents in other states, nor does it include information about fishing within Maryland waters by residents from other states. By considering only in-state participants from coastal counties.

NMFS estimates that the sample is representative of about 55 to 60 percent of the participants in Maryland sportfishing activities and about 70 percent of the sportfishing trips taken in Maryland. Another 2 to 3 percent of both the participants and the trips are attributable to non-coastal county Maryland residents. These percentages have remained fairly stable throughout the 1980's.

Sportfishing Activity: Household Participation Rates and Quantity of Sportfishing Trips

The seasonal (by wave) participation data from the telephone survey provide a detailed picture of recreation fishing activity by Maryland households. Table MD.1 gives these household participation rates for each year and each wave. Household participation rates are typically about three percent in early spring, about nine percent in mid-summer and only about two percent in late fall. The sample sizes for these rates vary considerably, ranging from a minimum of 241 for March-April 1982 to a maximum of 2969 for July-August 1988. With these large sample sizes, the mean participation rates are all significantly different from zero. Additionally, the means are typically different across seasons at a high level of significance.

Two facets of Table MD.1 are interesting. First, there is considerable variability in participation rates, both across seasons in a year and across years for a given season. For example, participation rates in 1982 vary from 10.5 during July-August to 1.6 in the November-December wave; and the July-August participation rate varies from a high of 13.7 percent in 1981 to a low of 5.0 percent in 1989.

The pattern for most waves shows a decline from high participation rates in early years of the decade, with a slight resurgence in the 1986-1987 period. This is followed by further

declines towards the end of the decade. The across season variation, especially in the period from May through September, is no doubt due to variations in weather.

The linear trend analysis of the Maryland participation rates is dramatic. In all waves, the trend coefficient is negative and statistically significant. The least estimated change comes in the November/December wave (-.2 percentage points per year) and the March/April period (-.3 percentage points per year). The greatest estimated change occurs in July/August (-.7 percentage points per year) and September/October (-.4 percentage points per year). The July through October period is important because the majority of participation occurs then and because the trips/participant is largest then.

A sense of the magnitude of fishing activity can be obtained by multiplying the number of fishing households by the level of activity (typically measured by number of trips) per fishing household. If we wish to extrapolate to the population, it is sometimes more useful to think of trips per household called multiplied by number of households called. Table MD.3 gives trips per household called. The seasonal variation in fishing is apparent here. The mean trips per household called using all ten years of data, are distributed as follows:

	<u>Mean Trips</u>	<u>Percent of Annual Mean</u>
March-April	.12	8.8
May-June	.35	25.5
July-August	.51	37.2
September-October	.33	24.1
November-December	.06	4.4

Over 85 percent of the activity occurs in the six-month period May-October, and probably much of that in the months June-September.

The data on trips per household sampled by wave, presented in Table MD.3, are not consistent with any clear temporal pattern. Annual trends are being masked by variability across the seasons. When we sum trips per household sampled over the waves for each year, trends emerge which match those for participation rates. Trips per household called are highest in 1983 and 1986 and except for 1989, lowest in 1985, the first year of the striped bass moratorium.

Linear trend analysis on the trip/household called data indicated a significant negative trend in the March/April wave and the September/October wave. These are the periods of time during which the striped bass runs occur in Maryland. The moratorium could have been responsible for the trends.

Sportfishing Activity by Mode

Much of the character of fishing in a state can be determined by how and where people fish. Although shore fishing is typically the cheapest and most accessible mode, it is not always the most popular in Maryland. Table MD.4 shows the proportion of fishing to the three major modes--shore, party/charter, and private/rental. These proportions are means for the period 1981-1988 and show the distribution of fishing trips over modes for each season. Shore fishing is especially popular in early spring and late fall because boat use is low in seasons of cool and unsettled weather. Private boat use is more strongly influenced by inclement weather than other modes. Besides fishing, swimming, boating and sunbathing from a boat require good weather. There is an especially big increase from March-April to May-June.

The proportions show when households tend to use each mode, but they do not give any indication of the magnitude of fishing activity. To illustrate the magnitude, we need to estimate the aggregate quantity of trips for the season. From Table MD.3, we obtain estimates of the quantity of trips per household called. For example, the mean number of trips per household called for March/April is .12. The number of eligible households in the coastal counties in 1980 was 1,314,345. Together these imply 157,721 trips in March-April by coastal county residents. Table MD.4 shows the distribution, implying that 38.6 percent or 60,880 private/rental boat trips were taken by coastal county households. In July-August, estimated trips per household rose to .52 so that aggregate trips were estimated to be 683,459. Of these 56.3 percent of 384,788 ($= .563 * 683,459$) were private/rental boat trips. Thus there is great seasonal variability in boat activity; it expands from about 60,000 trips in March-April to over 380,000 trips in July-August. These trips include only those taken by residents of the coastal counties, but as noted in the introduction to the Maryland section, coastal county participants account for over 90 percent of all participants in Maryland.

Sportfishing Activity by Waterbody

The NMFS phone survey classifies waterbodies into four types. Table MD.5 gives the mean proportion of fishing trips to each of these waterbodies. These means are calculated over the period 1981-1988. The categories of waterbodies used for the telephone survey are broadly enough defined so as to be applicable for fishing up and down the East and West Coasts of the U.S. Consequently, they do not conform especially well to the particular circumstances in any one region.

NMFS area classifications include a) ocean, gulf and open bay, b) sound, c) river, d) enclosed bay and e) other. In Maryland, the principal fishing areas are rivers, the Chesapeake Bay and its inlets, the coastal bays and the Atlantic Ocean. There is potential for different interpretations of the NMFS areas by people who fish in Maryland. The Chesapeake Bay may be considered an open bay by some and a closed bay by others. Consequently, it is difficult to distinguish the Chesapeake Bay and Atlantic Ocean fishing activity.

Recognizing these potential ambiguities, the patterns of fishing as reported are presented in Table MD.5. Table MD.5 shows, for example, that river fishing is important in early spring when rivers offer more protected fishing than other areas. Additionally it is during the spring when anadromous fish such as shad are regularly sought in the rivers. Not surprisingly, the open areas and enclosed bays (Atlantic Ocean and Chesapeake Bay) attract more fishing (over 60 percent) in the heart of the fishing season.

To understand the magnitude of fishing in different waterbodies by coastal county residents, we use the aggregate level of fishing trips per wave. For example, fishing in rivers in March-April is estimated at 54.7 percent of the 157,721 trips, or 86,273 trips. In July-August it is 21.9 percent of 683,459 trips, a total of 149,677. Thus the proportion declines, but the absolute level increases substantially.

Catch Rates in Maryland Waters

Maryland has two major bodies of water in which saltwater angling occurs. The Chesapeake Bay and the Atlantic Ocean are considered separately because the nature of the fishing and the species caught can vary dramatically. In the Chesapeake, the principal species are bluefish, striped bass, and perch whereas bluefish, mackerels, and weakfish are more

predominant in the Atlantic Ocean. Fish are most often pursued from privately owned boats in the Chesapeake. Party and charter boats are available but not used as frequently as at the Atlantic Ocean sites.

The trend of less targeting as one moves south from New York continues when Maryland is considered. The early period (1980-1984) saw almost half (46%) of the intercepted Maryland anglers not targeting a species. This percentage fell to 36 percent in the years after 1984. Those targeting a species, most often chose as their target smallgame, representing 35% of all Maryland anglers in early period and 54% in the latter years. Flatfish consistently drew ~ 8 percent of the sample. The only other species group with significant targeting was bottomfish, which attracted 11% of the pre-1985 anglers and < 1 percent in subsequent years.

Smallgame Catch Rates

Over the last ten years, the principal smallgame species sought and harvested in Maryland has been bluefish, accounting for nearly 70 percent of all persons targeting smallgame. Striped bass (rockfish), the second most frequently sought smallgame species, has accounted for about 15 percent of the total. Weakfish has been the next most important species (12 percent), and except for spotted seatrout (2 percent), no other smallgame species contributed more than one percent.

Since 1985, the contribution of bluefish has risen to nearly 85% and the contribution of striped bass has declined to less than 1%. The reason for the shift is the imposition in 1985 of a moratorium on the commercial and recreation harvest of striped bass. Possession of an illegal fish is punishable by fines.

Figure MD1 illustrates for the period 1980-1988 the average catch of smallgame by fishing mode for individuals who were fishing in Maryland and targeting smallgame. Although smallgame catch per day by party/charter fishermen was about three times that of private/rental boat fishermen, the time trends in catch rates for both modes were remarkably similar, with poor years in 1984 and 1986 and the highest during 1985. Both displayed an increasing trend for the 1986-1988 period. Shorefishing for smallgame is not nearly as productive, with the average number of smallgame caught per day averaging between one-half and one-third of the value of the private/rental mode and between one-sixth and one-ninth of the party/charter mode. Trends in the smallgame catch by shore fishermen are not consistent with the other modes, but are not as reliable because substantially fewer fishermen targeting smallgame choose the shore mode.

Figure MD2 displays smallgame catches per day by wave and mode. The dominant feature of this figure is the extremely high catch of party/charter anglers in the March/April period. Although this is a reasonably good period for private/rental boat anglers, their catch rare is one-fourth the party/charter fishermen. The other good fishing occurs in the July through October wave, a feature common to all modes. The poorest catch rates are in May/June and November/December.

Bottomfish Catch Rates

The bottomfish most frequently sought in Maryland is white perch, sought by over 40 percent of the individuals seeking bottomfish. The next most important species is spot, making up over 20 percent of the total. Catfish, yellow perch and croaker are other important Bay bottomfish while the sea bass family and black drum are the important Ocean bottomfish. Most individuals seeking bottomfish, however, are fishing in the Chesapeake Bay.

Catch rates for bottomfish in the Bay have remained stable, if not increasing during the 1980's (Figure MD4). For the private/rental mode, the peak catch of over twenty fish per day was recorded in 1988. However, the peak for the shore mode (about 5 fish per day) was recorded in 1980. Since then, shore fishermen have settled for less but the trend suggests that shore catch rates are once again nearing their 1980 levels (about 4 fish per day in 1988).

Bottomfish catch rates vary substantially over the year (Figure MD4). Again, the best fishing occurs in the July through October period, with catch rates nearly double the rest of the year. The absolutely poorest period for bottomfish catch rate is in the March/April wave.

Flatfish Catch Rates

Nearly all fishermen targeting flatfish in Maryland are seeking summer flounder. Moreover, most flatfish fishing trips originate in Worcester County, on the oceanside of Maryland. Although some of the fishing takes place in the Atlantic Ocean, a large percentage takes place in Assawoman Bay, located west of Ocean City, Maryland.

Anglers seeking flatfish most often choose either the private/rental mode or the shore mode. Figure MD5 shows the catch rates for these modes over the selected period. Shore fishermen catch rates are similar to those for private boat fishermen, especially in the 1980-1983 period. In subsequent years, however, private boat catch rates exceeded shore catch rates, but the former exhibited greater variation across years than the latter. Finally, the low point in catch rate, the years 1985 and 1986, correspond to the same years Delaware exhibited poor catch. This suggests that the same summer flounder population was being exploited in both states.

There is a seasonal variation in flatfish catch rates also (Figure MD6). The season begins with poor availability in the March/April period, followed by the peak catch rates in May and June. The catch rates gradually decline for the rest of the year.

Characteristics of Fishing Trips in Maryland

The previous descriptions pertain to the distribution and biological aspects of fishing activities in Maryland for the years 1981-1988. There are other aspects of fishing which help in understanding the sportfishery. The UMCP survey contains considerable information on the economic characteristics of individual fishing trips for the year 1988. The following section describes these data by mode for the state of Maryland.

Table MD.6 describes one-day trips taken to Maryland for salt water sportfishing by mode of fishing. The UMCP survey includes six modes: two from shore (pier and beach) and four boat modes (party, charter, rental¹ and private.) The figures in Table MD.6 when compared across modes seem reasonable. Travel costs are higher for the party mode than for others, reflecting further distance and more travel time. The fishing costs--those items related directly to the activity and not travel--are also consistent with reasonable explanations. Both bait costs and cleaning costs are higher for charter activities, reflecting greater use of live bait and higher catch rates. Tackle costs are roughly equal across modes. The average pier fee is low because the "pier" category includes many structures (such as bridges and jetties) which do not require fees. There are few commercial fishing piers in Maryland.

Table MD.7 gives information on trips taken in Maryland by people who are on overnight visits. This includes people on vacation as well as on business trips. There are only 163 of

¹For the rental mode, the number of observations is too small to warrant any confidence in the results.

these trips, too few to disaggregate by mode. The mean travel cost is lower than for one-day trips because this measures the cost from the temporary abode. The costs of fishing services are similar to costs for day trips. The costs for fishing activity related items are in line with those for day trips.

Table MD.8 gives the distribution of species sought by mode. This table shows the importance of smallgame--primarily bluefish. Over 60 percent of each mode's trips are directed toward smallgame. Flatfish are also important, though only fishermen who fish from piers (any artificial structure) or private boats devote much effort to flatfish.

Table MD.1
Two-Month Participation Rates*
by Wave and Year

Year	Wave				
	March- April	May- June	July- August	September- October	November- December
1980	5.9%	6.6%	10.5%	9.0%	3.4%
1981	4.7	10.6	13.7	7.8	2.8
1982	3.9	7.3	10.5	5.6	1.6
1983	3.9	7.5	8.8	4.8	1.2
1984	2.3	5.5	8.1	6.0	1.6
1985	2.6	6.0	7.0	6.3	.6
1986	2.5	8.4	6.5	6.5	2.6
1987	2.3	5.5	7.9	4.0	1.3
1988	1.8	4.8	7.8	5.1	1.3
1989	3.9	5.4	5.0	3.7	0.7
Mean	3.38%	6.76%	8.58%	5.89%	1.71%

* Percent of Maryland coastal county households called who fished in Maryland marine waters in the designated two months.

Table MD.2

Linear Trend Analysis¹ of Maryland Participation Rate

By Wave, 1980-1989.

Wave	Constant	Linear Trend Coefficient	\bar{R}^2
March/April	.047 (8.36)	-.0030 (-2.86)	.44
May/June	.083 (9.48)	-.0035 (-2.11)	.28
July/August	.116 (13.69)	-.0068 (-4.26)	.66
September/October	.078 (12.07)	-.0042 (-3.48)	.55
November/December	.026 (6.00)	-.0020 (-2.46)	.36

¹Estimated model was Part. rate = $\alpha_0 + \alpha_1$ time, with time deferred as $t = 0$ for 1980, $t = 1$ for 1981 ... and $t = 9$ for 1989.

²T-ratio in parentheses.

Table MD.3
Trips Per Household Called
By Year and Season*

Year	Total	Wave				
		March- April	May- June	July- August	September- October	November- December
1980	1.54	.12	.33	.68	.43	.08
1981	1.34	.17	.44	.37	.32	.04
1982	1.49	.17	.31	.58	.40	.03
1983	1.66	.14	.40	.70	.38	.03
1984	1.26	.10	.28	.45	.38	.04
1985	1.14	.16	.24	.37	.35	.02
1986	1.62	.11	.55	.58	.28	.10
1987	1.32	.10	.33	.56	.23	.10
1988	1.23	.04	.34	.45	.35	.05
1989	1.11	.10	.33	.33	.22	.12
Mean	1.37	.12	.35	.51	.33	.06

* Trips taken within state of residence.

Table MD.4

Percent of Fishing Trips in Various Modes by Wave
 Mean 1981-1988

Mode	Wave				
	March- April	May- June	July- August	September- October	November- December
Shore	55.5%	28.2%	31.4%	31.3%	30.8%
Party/Charter	5.9	6.8	12.3	11.9	12.9
Private/Rental	38.6	64.9	56.3	56.8	56.2

Table MD.5

Percent Fishing Trips in Various Areas, by Wave
 Mean 1981-1988

Area	Wave				
	March- April	May- June	July- August	September- October	November- December
Ocean, Gulf, Open Bay	26.5%	28.1%	24.8%	31.0%	34.8%
Sound	1.0	2.4	1.5	1.7	3.5
River	54.7	15.1	21.9	18.7	19.6
Enclosed Bay	14.8	51.3	50.2	46.1	41.3

Table MD.6
 Characteristics of Day Trips in Maryland, by Mode
 (per trip averages)

Characteristic	Mode					
	Pier	Beach	Party	Charter	Rental	Private
Travel Cost	\$13.27	\$15.30	\$24.92	\$11.60	\$17.67	\$12.28
Costs for						
Bait	\$5.37	\$5.66	\$3.06	\$15.89	\$6.50	\$8.85
Equip. Rental	0	0	.63	.50	0	.28
Tackle	1.80	1.30	1.30	1.95	2.00	2.50
Cleaning	.96	1.05	2.20	4.28	.16	2.48
Fuel	--	--	--	--	0	14.39
Pier Fees	.31	--	--	--	--	--
Launch Fees	--	--	--	--	--	.41
Boat Fees ^a	--	--	25.16	146.86	25.92	
Travel Time (in minutes)	63.8	83.2	109.6	71.2	178.18	55.97
Distance (in miles)	47.8	66.1	88.1	51.0	144.8	38.98
Boat Time to first site (in minutes)	--	--	66.6	86.7	23.3	30.51
Number of Observations	68	53	33	39	4	258

^aBoat fees are charter and party fees or rental fees.

Table MD.7

Characteristics of Trips for Overnight Visits in Maryland

Characteristic	Mean	Number of Applicable Observations
Travel Cost	\$4.20	149
Cost for		
Bait	6.98	152
Equipment Rental	.22	154
Tackle	4.04	153
Cleaning	1.42	155
Fuel	29.61	70
Pier Fees	1.08	47
Launch Fees	.85	67
Boat Fees	48.88	20
Boat Rental	29.42	5
Travel Time (in minutes)	12.03	146
Distance (one-way) (in miles)	5.60	155
Boat Time (in minutes)	45.02	92
Trip Length (in miles)	8.89	156

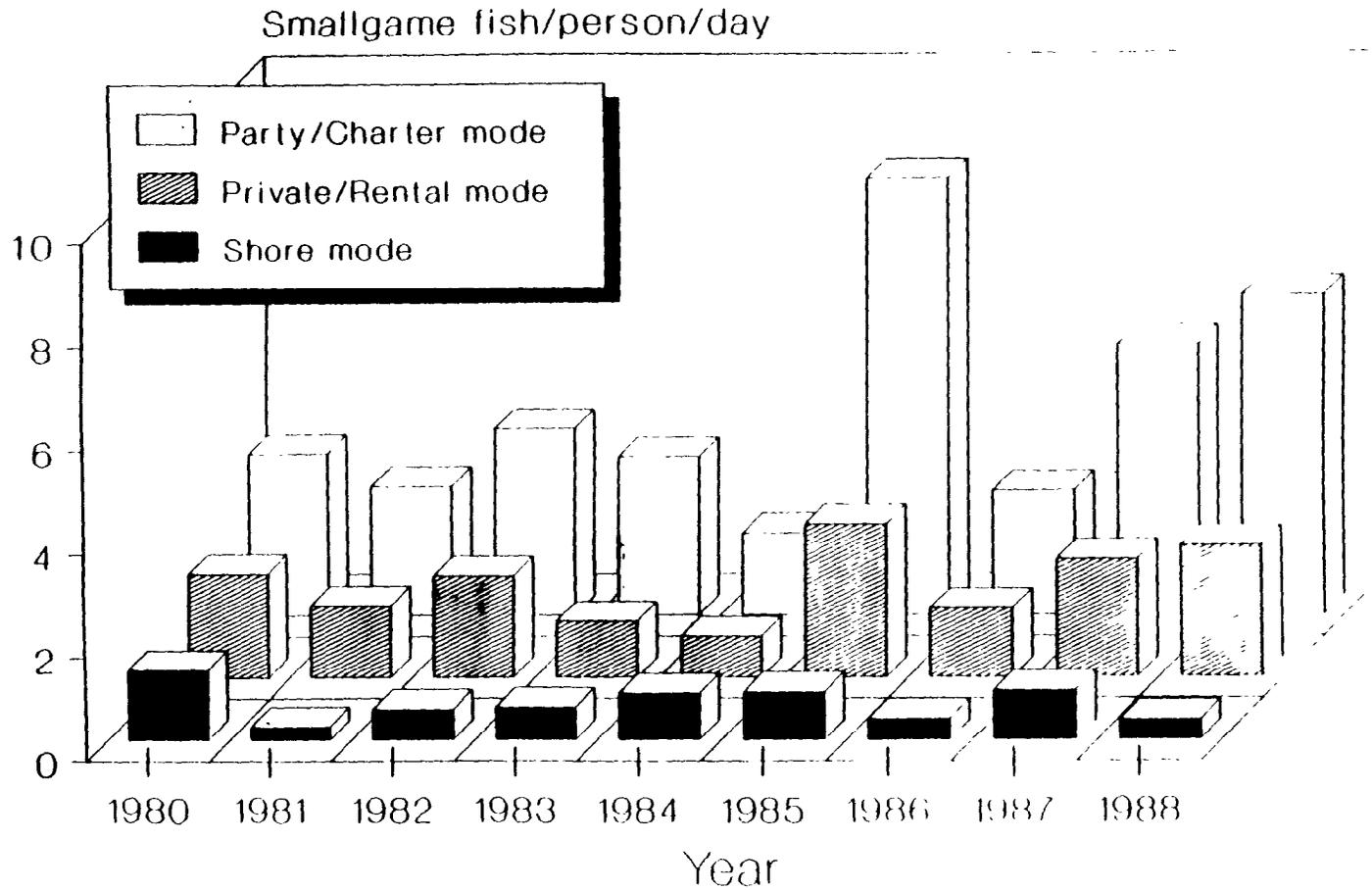
Table MD.8

Percent of Trips Seeking Different Species Groups, by Mode
for Day Trips

Species Group	Mode				
	Pier	Beach	Party	Charter	Private
Big Game	2.4%	6.2%	12.5%	31.4%	13.9%
Small Game	65.8	78.1	75.0	68.6	57.4
Flatfish	26.8	9.4	8.3	0	22.2
Bottomfish	4.9	6.3	4.2	0	5.6

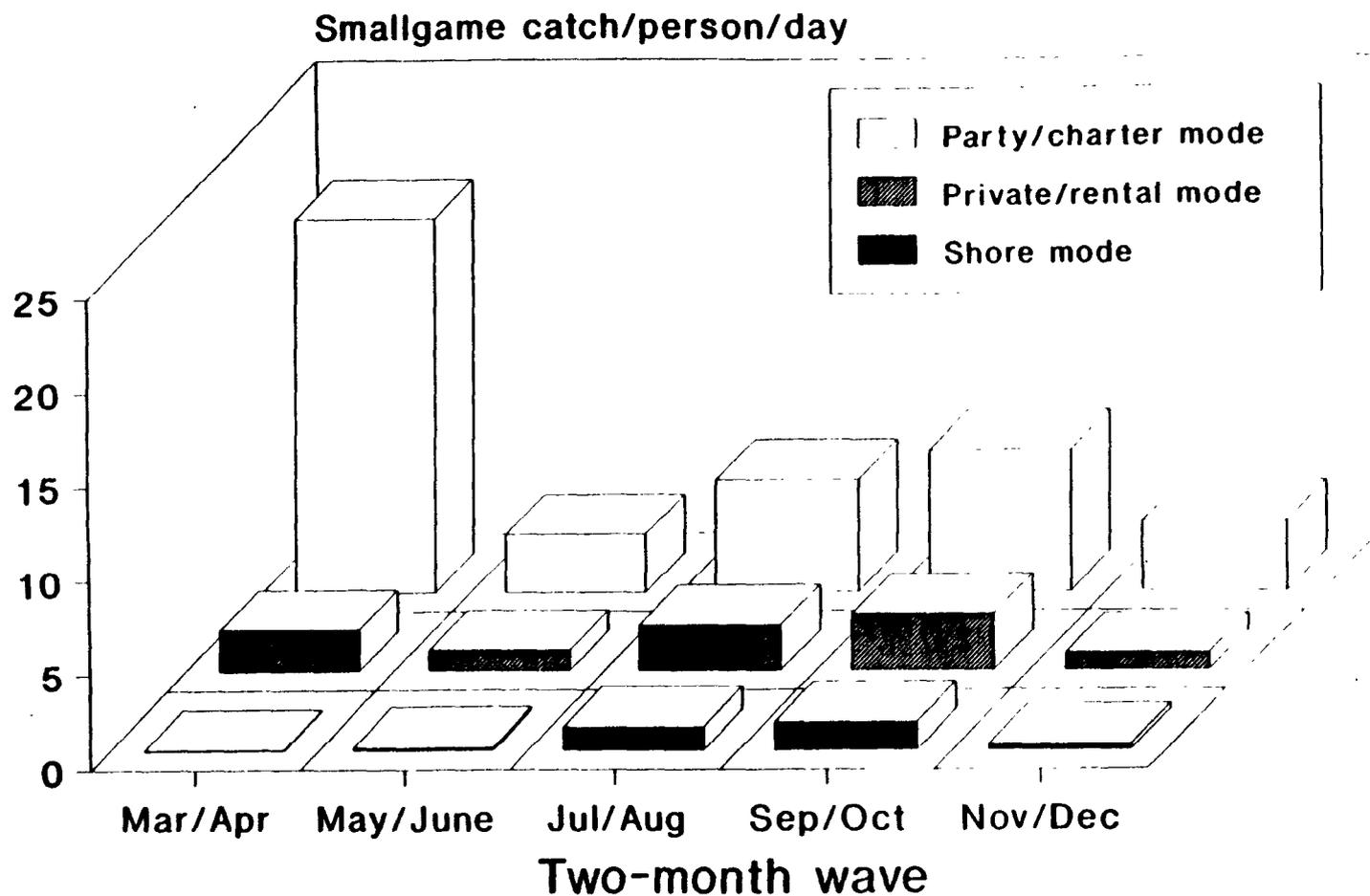
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Fig. MD1: Smallgame Catch Per Day, Maryland, Chesapeake, By Year and Mode



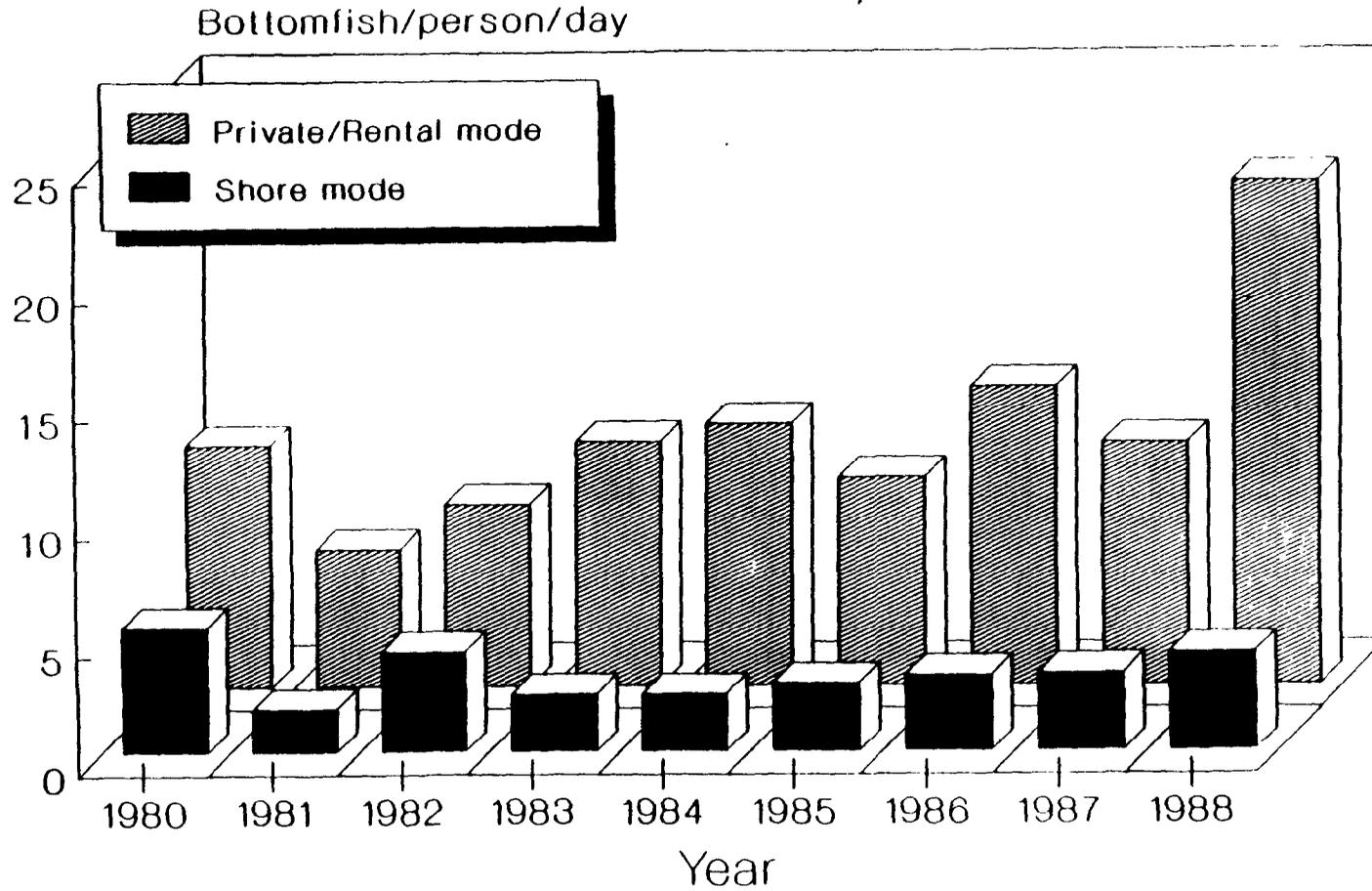
For individuals targeting smallgame
1980-1988

**Fig. MD2: Smallgame Catch per Day
Maryland, By Wave and Mode**



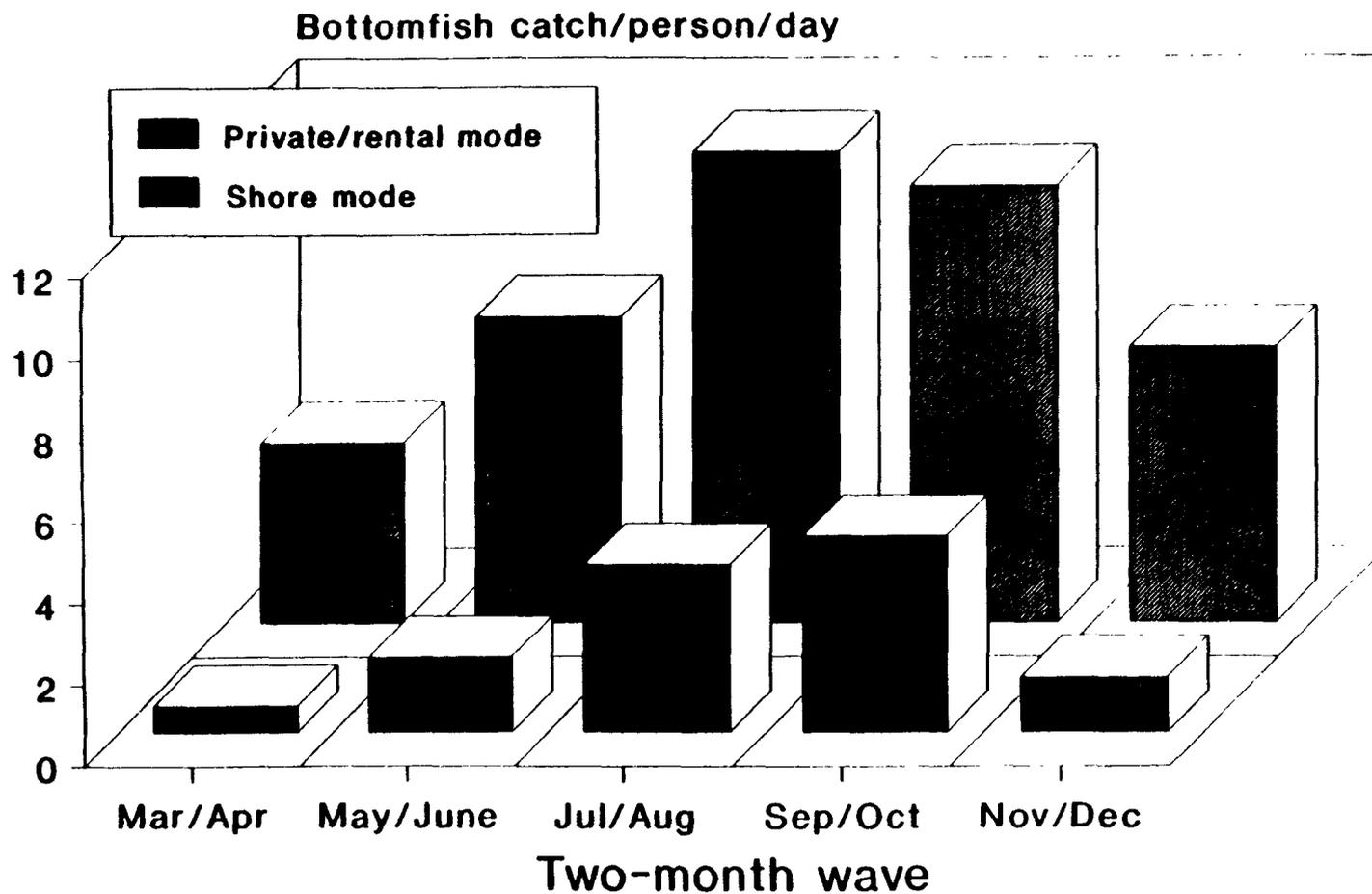
Average for anglers targeting smallgame,
1980-1988

**Fig. MD3: Bottomfish Catch Per Day,
Maryland, Chesapeake, By Year and Mode**



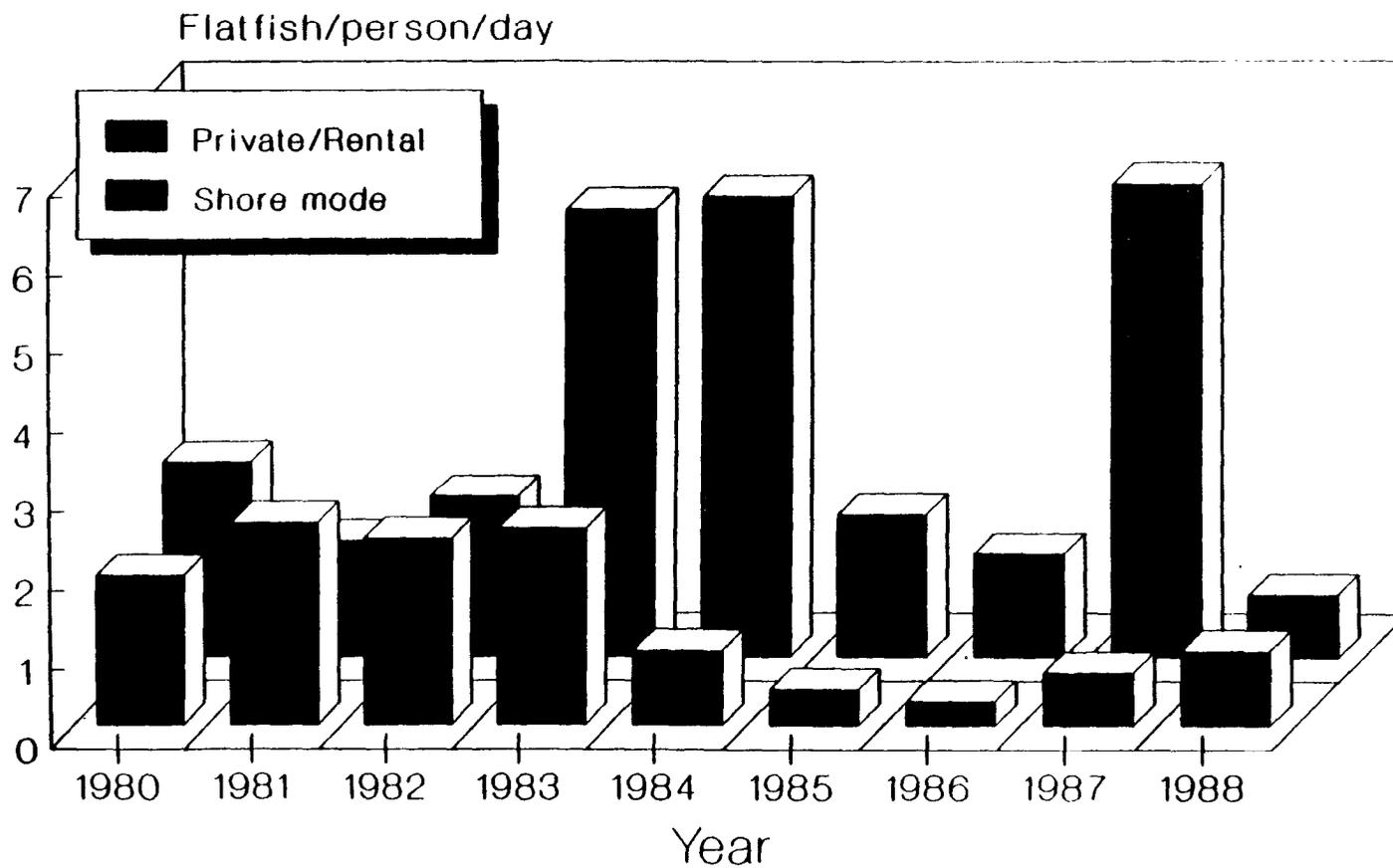
For individuals targeting bottomfish
1980-1988

**Fig. MD4: Bottomfish Catch per Day
Maryland, By Wave and Mode**



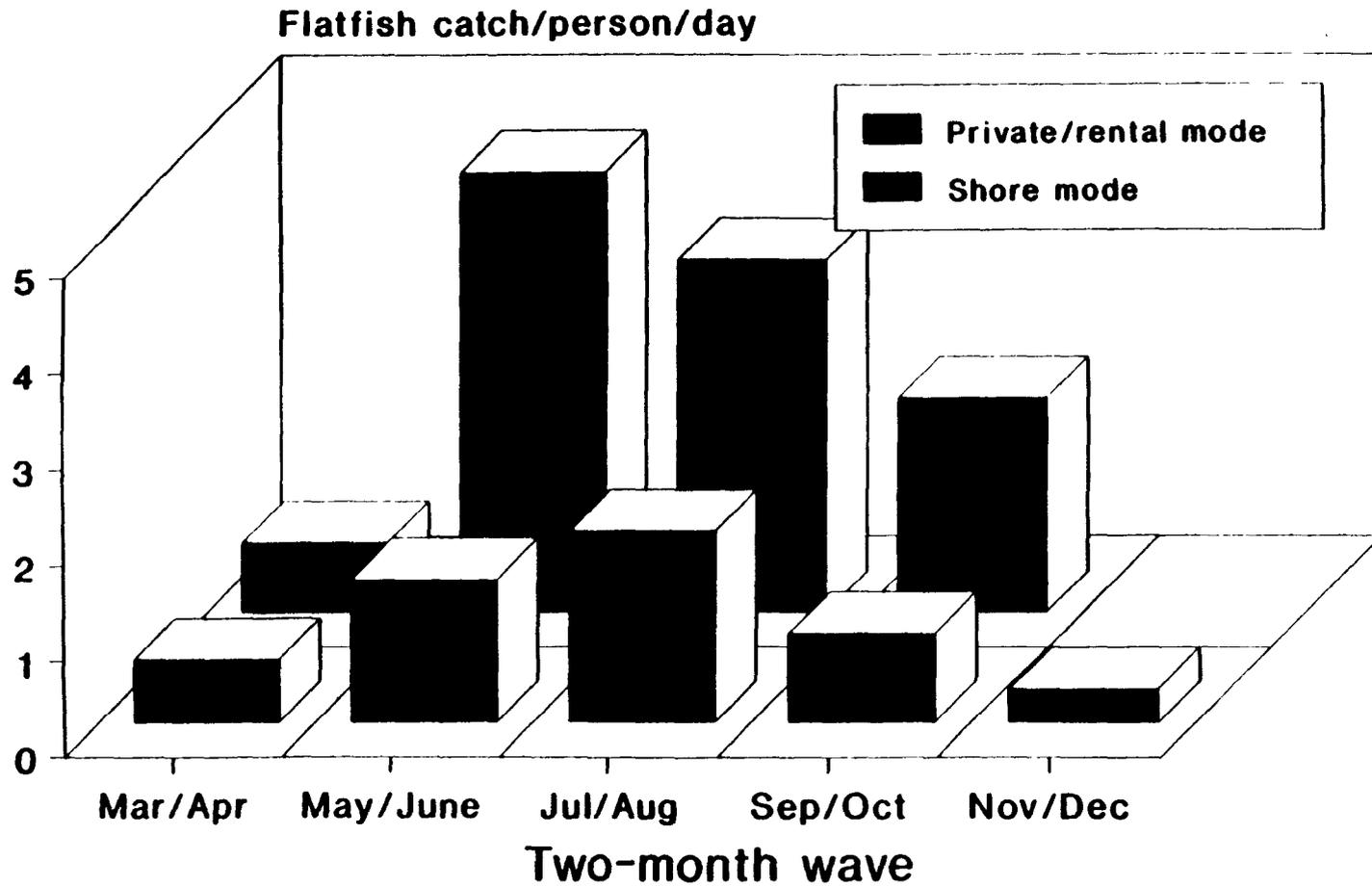
Average for anglers targeting bottomfish
1980-1988.

**Fig. MD5: Flatfish Catch Per Day,
Maryland, Oceanside, 1980-88,
By Fishing Mode**



For individuals targeting flatfish,
Worcester County

**Fig. MD6: Flatfish Catch per Day
Maryland, By Wave and Mode**



Average for anglers targeting flatfish,
1980-1988

Chapter 6

SPORTFISHING IN VIRGINIA

Activity by Virginia Households

Participation in marine recreational fishing by Virginia households is influenced by the accessibility of waterbodies, the mild climate, and the distribution of households. Along Virginia's coastline, a series of estuaries empty into the southern part of the Chesapeake Bay. Parts of Virginia border the Atlantic Ocean at the mouth of the Chesapeake Bay.

The population of Virginia is broadly dispersed across the large state. Richmond, the Norfolk/Hampton/Newport News area and the northern Virginia suburbs of Washington, DC are large population centers. Because they are located within 25 miles of the coast or major estuaries and bays, they are sampled by the NMFS telephone survey. But there is considerable population in more western locations, such as Roanoke, Lynchburg, and Charlottesville, and these populations are not represented in the sample. The Chesapeake Bay and the Potomac River are the most accessible marine waters for the northern Virginia population, but the growing population of the Norfolk/Hampton/Newport News area has direct access to the ocean, and the lower reaches of the James River and the Chesapeake Bay.

The population from which the telephone survey draws includes close to 1.2 million households as of the 1980 census. This represents about 63 percent of the population of Virginia as of that census. NMFS estimates that between 88 and 92 percent of the sportfishing participants who both reside and fish in Virginia live in these coastal counties. State residents appear to account for about 60 to 65 percent of the sportfishing participants and between 60 and

75 percent of the sportfishing trips in Virginia marine waters. The proportion of activity attributable to state residents seems to have been growing slowly but steadily over the decade.

Sportfishing Activity: Household Participation Rates and Quantity of Sportfishing Trips

The seasonal participation rates for Virginia give a detailed picture of fishing activity by households. Table VA.1 shows temporal and seasonal variation across the years and the two-month waves. The sample sizes for these participation rates vary from 260 in the November-December wave of 1980 to 4111 in the summer wave of 1988. Sampling in Virginia has expanded over the decade by a factor of six, with much of the expansion coming in recent years.

Looking at the row of mean participation rates over time for each wave gives a good sense of the variation in seasonal participation. The proportion of households fishing in July-August (10.2 percent) is about four times the proportion in March-April (2.7 percent) or November-December (2.4 percent).

Over the 1980-1989 years, within two-month periods, there is considerable variation in the participation rate. The rate for March-April goes from a low of one percent in 1983 to a high of 4.2 percent in 1985 and 1986. Some of these variations are likely due to weather, especially in early spring and late fall when weather can be quite unstable and vary considerably from year to year. The participation rates for the summer are somewhat more stable. Especially for July-August, there appears to be a decline in participation rates.

The linear trend analysis (Table VA.2) indicated statistically significant decreases in participation rates for the two waves from July through October. The estimated parameters suggest that participation rates for the July/August period fell by 5.5 percentage points over the

decade and for the September/October period by 3.3 percentage points. The May/June period also indicated a decline, although not statistically significant.

Participation rates describe the prevalence of fishing among households, but not the magnitude of fishing. Magnitude is best described by the total number of fishing trips, which depends on the number of households fishing and the number of trips per fishing household. Equivalently, the magnitude may be calculated as the product of households and trips per household. Table VA.3 gives trips per household called. It incorporates information on participation rates and trips per fishing households.

The trip figures show substantial variation across and within season. Even stable seasons like July-August show as much as two-fold variations between years (see, for example, 1984 and 1985). The temporal pattern in trips as a whole is erratic. The linear trend analysis of trips per household called indicated no significant trends.

The general pattern of seasonal variation also follows that of participation, with highest levels coming in the late spring and summer waves. This pattern can best be revealed by the proportion of mean trips occurring in each seasonal wave. As these are trips per household called, this data reflects the proportion of aggregate sportfishing activity that occurs in each period.

	<u>Mean Trips</u>	<u>Percent of Annual Mean</u>
March-April	.10	6.1
May-June	.47	28.8
July-August	.62	38.0
September-October	.30	18.4
November-December	.14	8.6

About 85 percent of mean trips, and hence 85 percent of aggregate activity, occurs in the six-month period from May to October.

Sportfishing Activity by Mode

The character of fishing in Virginia can be discerned in part by the distribution of fishing trips among the three fishing modes included in the NMFS survey. These proportions are mean participation rates for the 1981-1988 period.

The importance of the private/rental mode in Virginia is apparent from Table VA.4. In all seasons the private/rental mode accounts for at least 50% of trips and therefore a greater proportion of fishing participation than any other mode. Because of inclement weather, anglers are less likely to use private boats in early spring and late fall when boat use is lowest. Table VA.4 also illustrates the relative unpopularity of charter/party boat fishing in Virginia. Only about 10% of fishing trips are taken on this mode, with this percentage rising to almost 13% in the early spring when private boating declines.

Table VA.4 can be combined with estimates of total trips by coastal county residents per wave to show the magnitude of fishing in each mode. From the 1980 Census, there were about 1,300,00 households living in coastal counties in 1980. From Table VA.3, mean trips per

household called in March-April was .10. Hence total trips by coastal county residents would be estimated at 130,000 ($=.10 * 1,300,000$). Of these, 53.6 percent or 69,680 would be attributable to private/rental boat trips. In July-August, mean trips per household called were .62, and aggregate trips by coastal county residents were 806,000 ($=.62 * 1,300,000$). The proportion of trips predicted to be private/rental trips also rises in July-August, to 62.4 percent. Hence total private/rental boat trips are 502,944. This includes, of course, the trips by coastal county residents only.

The party/charter mode is rather small in Virginia. During July-August, there were almost 50,000 party/charter trips by coastal county residents. During March-April, there were less than 20,000. Much of the party/charter activity may come from households outside the coastal counties. But for the coastal counties, there appears to be less activity than some northern states.

Sportfishing Activity by Waterbody

The NMFS telephone survey defines fishing activity by four types of waterbodies. Table VA.5 shows the distribution of fishing trips to these waterbodies across seasons. The interpretation of these proportions is confused by the likely variation among respondents about the precise definition of these terms and by the failure of some respondents to be able to accurately classify the areas in which they fish. Like Maryland and other states on the East Coast, the NMFS categories may not conform to the actual circumstances as perceived by anglers.

While mindful of the potential for ambiguities, we can see from Table VA.5 the reported patterns for Virginia coastal county households. The largest proportion of trips is in the ocean,

gulf and open bay category. This suggests that households perceive the Chesapeake Bay as an open bay. This proportion declines in the summer as the proportion of fishing trips in enclosed bays and rivers increases, probably because of small boat activity. The magnitude of activity by waterbody for residents of coastal counties can be calculated analogously with the magnitude by mode. For example, in July-August there were 806,000 total trips. Table VA.5 shows that 38.7 percent or 311,922 were trips taken to ocean, gulf or open bay.

Catch Rates in Virginia

Like Maryland, Virginia sportfishing involves two major bodies of water, the Chesapeake Bay and the Atlantic Ocean. The species sought and caught in these water bodies are often distinct. For example, bluefin tuna may be sought in the Atlantic but obviously not in the Chesapeake. In the Chesapeake, the major species sought are spot, croaker, bluefish and summer flounder. In the Atlantic, bluefish, mackerel, weakfish are often targeted. Unlike Maryland, a large percentage of Virginia's fishing from Ocean counties is by private/rental boats rather than party/charter.

The percentage of persons targeting species in Virginia is quite similar to Maryland. Overall, about 41 percent of the intercepted anglers had no specific target. This rose from around 35% in the first half of the decade to 43% in the latter half of the decade.

Unlike Maryland, Virginians most popular target was bottomfish, capturing a consistent 26% of the anglers in both periods. Smallgame is less popular in Virginia but still is the target of around 15 percent of the sample. Flatfish were a frequent target for anglers in the first half of the decade (~ 25%) but were substantially less popular in the latter half (~ 12%). Finally, biggame is targeted by less than 1 percent of the sample.

Smallgame Catch Rates

Bluefish is the most important smallgame species in Virginia, consistently representing about fifty percent of the targeted catch of anglers who seek smallgame. The second most important species is weakfish, which represents about thirty-five percent of the targeted smallgame catch, Spotted seatrout represents about five percent of the targeted catch. Thus, three species account for ninety percent of the targeted catch of smallgame. The remaining catch is comprised of amberjack, red drum and mackerels.

Figure VA1 shows the trend in smallgame catch rates of Virginia anglers who target smallgame. Like Marylanders, Virginians who target smallgame on party/charter boats tend to enjoy larger catch rates than anglers using other modes. Over the 1980's, Virginians using the party/charter mode in Virginia's Chesapeake Bay averaged more than eight times the catch rate of those using the shore mode and nearly three times the catch rate of those using the private/rental mode. The superiority of the party/charter mode is also evident in the Atlantic Ocean although the numbers of intercepted people who were seeking smallgame in the Atlantic is substantially smaller than in the Chesapeake, and therefore not shown in Figure VA1.

The trends exhibited in the figure are not nearly as consistent as those shown for Maryland, most likely because of the smaller number of people seeking smallgame who were intercepted in Virginia. Because of sample size, the private boat mode provides the most meaningful data. Here, like Maryland, there is a slow but general upward trend in landings, after a decade low experienced in 1983. In contrast, the party/charter catch rates show a decline after 1984, but this may simply be randomness in a small sample.

Seasonally, the best Virginia catch rates of smallgame occur in the September/October period (Figure VA2). These months provide the highest catch rates for both the private/rental and party/charter mode. The catch rates for shore fishermen in the July/August period are slightly higher than the September/October period but the difference is not statistically significant. It is interesting, however, that the people who target smallgame in Virginia are predominantly intercepted in the May/June period, even though fishing for small game may be better at other times of the year.

Bottomfish Catch Rates

The most targeted and caught bottomfish in Virginia is spot, representing sixty-three percent of the pre-1985 catch of targeted bottomfish and forty-six percent of the catch since then. The next most important bottomfish is croaker, representing around twenty percent prior to 1985 and thirty percent since. Black sea bass, tautog, and black drum are the remaining targeted bottomfish. White perch, which is Maryland's predominant bottomfish, was targeted by only three intercepted anglers in the nine years of interviewing in Virginia.

The catch rate of bottomfish in Virginia appears cyclical over the 1980's (Figure VA3), both for shore fishermen and private boat fishermen. After an initial decline, catch rates peak in 1983, drop in 1984, recover in 1985 and then slowly decline for the remainder of the decade. The middle of the decade yielded reasonably good fishing, but recent catch rates have been low. Since 1983, the catch rates for the shore and private boat fishermen have moved in a consistent pattern, but one which is not consistent with that in Maryland.

Flatfish Catch Rates

As with Maryland, the overwhelming species of flatfish targeted and caught in Virginia is summer flounder. Prior to 1985, about eighty-five percent of the flatfish targeted and caught was summer flounder. Twelve percent was unidentified flounder and the other two percent was mostly southern flounder. Since 1985, ninety-three percent of the flatfish were summer flounder, five percent unidentified, and one percent winter flounder. A few left-eyed flounder and southern flounder were caught in the latter period.

Catch rates of flatfish in the Virginia's portion of the Chesapeake Bay have been lower in the latter 1980's than the earlier years (Figure VA4), both for the private boaters and shore fishermen. Catch rates in counties abutting the Atlantic have been higher on average, but with much more variation. These trends are very similar to the Delaware and Maryland experience (Figures DE4 and MD5).

Characteristics of Fishing Trips in Virginia

Previous sections pertain to participation rates, catch rates and targeted species of the Virginia sportfishery for 1981-1988. Information about fishing trips is also useful in understand the sportfishery. The UMCP survey provides considerable information on the economic aspects of fishing trips. The following section describes aspects of fishing trips by mode and state.

Table VA.6 gives cost and travel information for single-day trips by six fishing modes for day trips in Virginia. The travel costs are roughly similar for different modes, except for the rental mode, which has only 24 observations. Travel time and distance are also much higher for the rental mode. Tackle costs are higher because tackle is typically provided as part of the basic service on party and charter boats. Other costs conform with the nature of the fishery.

Cleaning costs are higher for the private and charter modes, where catch rates are higher. Bait costs are roughly similar across mode. The mean pier fee is high relative to other states, reflecting a high proportion of fees for artificial structures.

Table VA.7 gives characteristics of fishing trips taken by people who stay overnight. Such visits could be vacations, business trips, or family visits. The mean travel cost for this mode is low because visitors are travelling only from their previous night's lodging. There are 175 trips by overnight visitors, and their means are given irrespective of mode. The costs of fishing services are similar to day trip means. For example, mean bait costs are \$5.53 for the overnight visitors and range from \$4.45 to \$7.26 for day trips. From the distance and time travelled means, it is clear that the fishing trips by overnight visitors are taken quite close to the lodging.

Table VA.8 shows the distribution of effort by species sought and mode. Only charter and private boats seek big game to any extent. The presence of a small percent on pier suggests ocean piers.

Table VA.1
Two-Month Participation Rates*
by Wave and Year

Year	Wave				
	March- April	May- June	July- August	September- October	November- December
1980	2.0%	7.8%	10.4%	7.8%	4.6%
1981	2.5	11.4	13.7	9.4	2.2
1982	4.1	9.0	10.9	6.4	2.1
1983	1.0	11.6	12.3	5.9	1.3
1984	2.6	8.5	11.2	6.5	2.2
1985	4.2	7.6	8.4	5.2	1.7
1986	4.2	11.7	12.5	8.1	3.7
1987	1.4	7.1	9.0	5.6	3.1
1988	2.7	7.5	8.0	5.7	3.0
1989	2.5	6.3	6.0	4.2	0.2
Mean	2.7	8.8	10.2	6.4	2.4

* Percent of Virginia coastal county households called who indicated having fished in Virginia marine waters in the previous two months.

Table VA.2
 Linear Trend Analysis¹ of Virginia Participation Rates,
 By Wave, 1980-1989.

Wave	Constant	Linear Trend Coefficient	\bar{R}^2
March/April	.026 (3.71)	.0002 (0.16)	.00
May/June	.102 (9.22)	-.0030 (-1.48)	.12
July/August	.127 (12.14)	-.0055 (-2.82)	.44
September/October	.079 (10.67)	-.0033 (-2.38)	.34
November/December	.030 (3.97)	-.0013 (-0.89)	.00

¹ Estimated model was Part. rate = $\alpha_0 + \alpha_1$ time, with time defined as t = 0 for 1980, t = 1 for 1981 . . . and t = 9 for 1989

² T-ratio in parenthesis.

Table VA.3

Trips Per Household Called
By Year and Season*

Year	Total	Wave				
		March- April	May- June	July- August	September- October	November- December
1980	1.06	.03	.22	.47	.23	.11
1981	1.85	.08	.63	.66	.43	.05
1982	1.21	.10	.29	.52	.25	.05
1983	2.05	.01	.58	1.11	.26	.03
1984	2.01	.09	.44	.84	.30	.44
1985	1.67	.23	.70	.41	.20	.11
1986	2.03	.16	.68	.72	.33	.14
1987	1.38	.05	.36	.51	.28	.17
1988	1.67	.16	.44	.41	.40	.26
1989	1.19	.10	.32	.46	.30	.01
Mean	1.63	.10	.47	.62	.30	.14

* Trips taken within state of residence.

Table VA.4

Percent of Fishing Trips in Various Modes by Wave
 Mean 1981-1988

Mode	Wave				
	March- April	May- June	July- August	September- October	November- December
Shore	33.5%	36.8%	31.7%	25.3%	47.5%
Party/Charter	12.9	4.7	6.0	8.7	2.7
Private/Rental	53.6	58.5	62.4	66.0	49.7

Table VA.5

Percent Fishing Trips in Various Areas, by Wave
 Mean 1981-1988

Area	Wave				
	March- April	May- June	July- August	September- October	November- December
Ocean, Gulf, Open Bay	50.0%	30.6%	38.7%	44.3%	51.1%
Sound	1.3	1.0	1.1	1.0	1.7
River	16.0	31.2	25.7	23.3	11.5
Enclosed Bay	29.9	36.4	33.9	31.4	32.5

Table VA.6

Average Characteristics of Day Trips in Virginia, by Mode
(per trip averages)

Characteristic	Mode					
	Pier	Beach	Party	Charter	Rental	Private
Travel Cost	\$7.04	\$7.29	\$9.65	\$14.48	\$33.85	\$10.63
Costs for						
Bait	5.88	5.11	5.72	4.45	6.51	7.30
Tackle	3.14	2.19	1.63	.39	19.41	5.77
Cleaning	.69	.61	1.06	2.54	1.01	2.07
Fuel	-	-	-	-	.57	19.73
Pier Fees	3.39	-	-	-	-	-
Boat Fees ^a	-	-	17.94	52.14	61.12	-
Travel Time (in minutes)	29.8	40.5	66.8	81.66	180.5	37.20
Distance (in miles)	20.5	29.3	50.6	67.65	142.0	22.8
Boat Time to first site (in minutes)	-	-	33.6	41.64	27.95	34.02
Number of Observations	195	36	63	55	24	384

^a Boat fees are charter and party fees or rental fees.

Table VA.7

Characteristics of Trips for Overnight Visits in Virginia

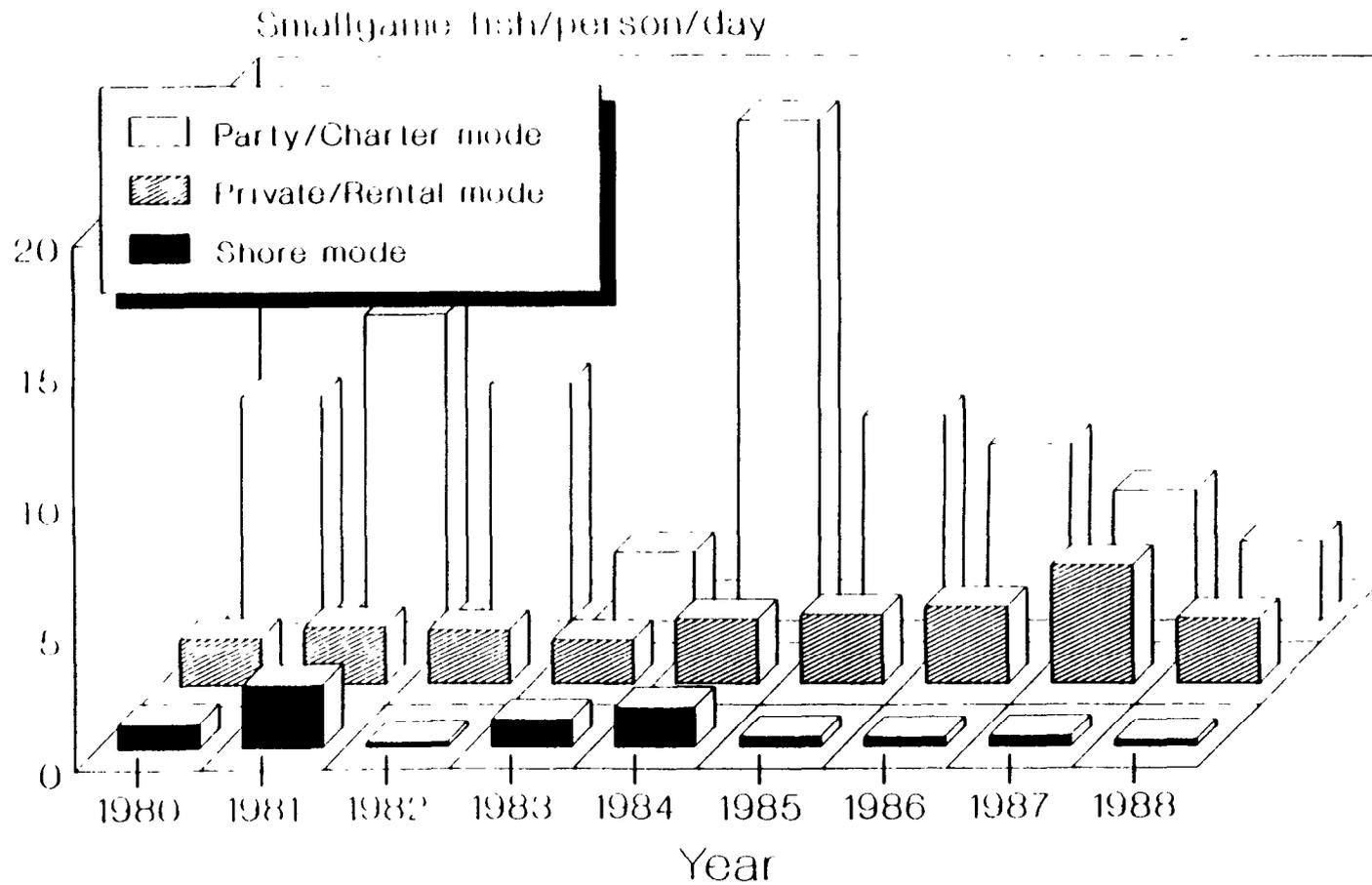
Characteristic	Mean	Number of Applicable Observations
Travel Cost	\$3.33	163
Cost for		
Bait	5.57	167
Tackle	2.50	170
Cleaning	1.22	169
Fuel	11.94	81
Pier Fees	5.19	46
Boat Fees	74.35	22
Boat Rental	41.15	12
Travel Time (in minutes)	13.62	159
Distance (one-way) (in miles)	5.18	167
Boat Time (in minutes)	26.38	103
Trip Length (in miles)	14.65	171

Table VA.8

Percent of Trips Seeking Different Species Groups, by Mode
for Day Trips

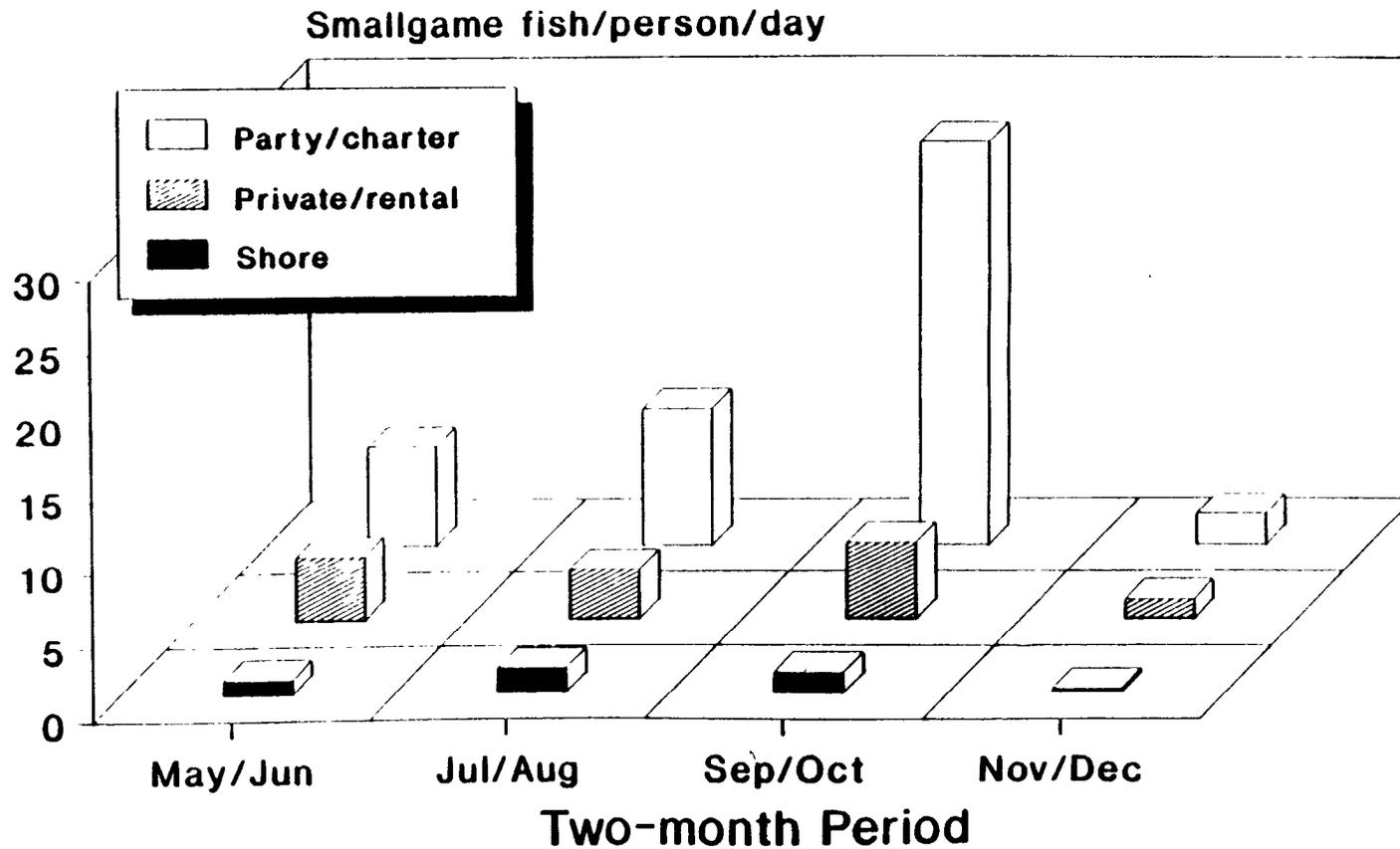
Species Group	Mode					
	Pier	Beach	Party	Charter	Rental	Private
Big Game	5.9	0.0	0.0	24.2	0.0	16.8
Small Game	23.8	60.9	42.9	45.4	17.6	33.6
Flatfish	36.6	17.4	10.7	12.1	58.8	24.2
Bottomfish	33.7	21.7	46.4	18.2	23.5	25.5

**Fig. VA1: Smallgame Catch Per Day,
Virginia, Chesapeake Bay, 1980-88,
By Fishing Mode**



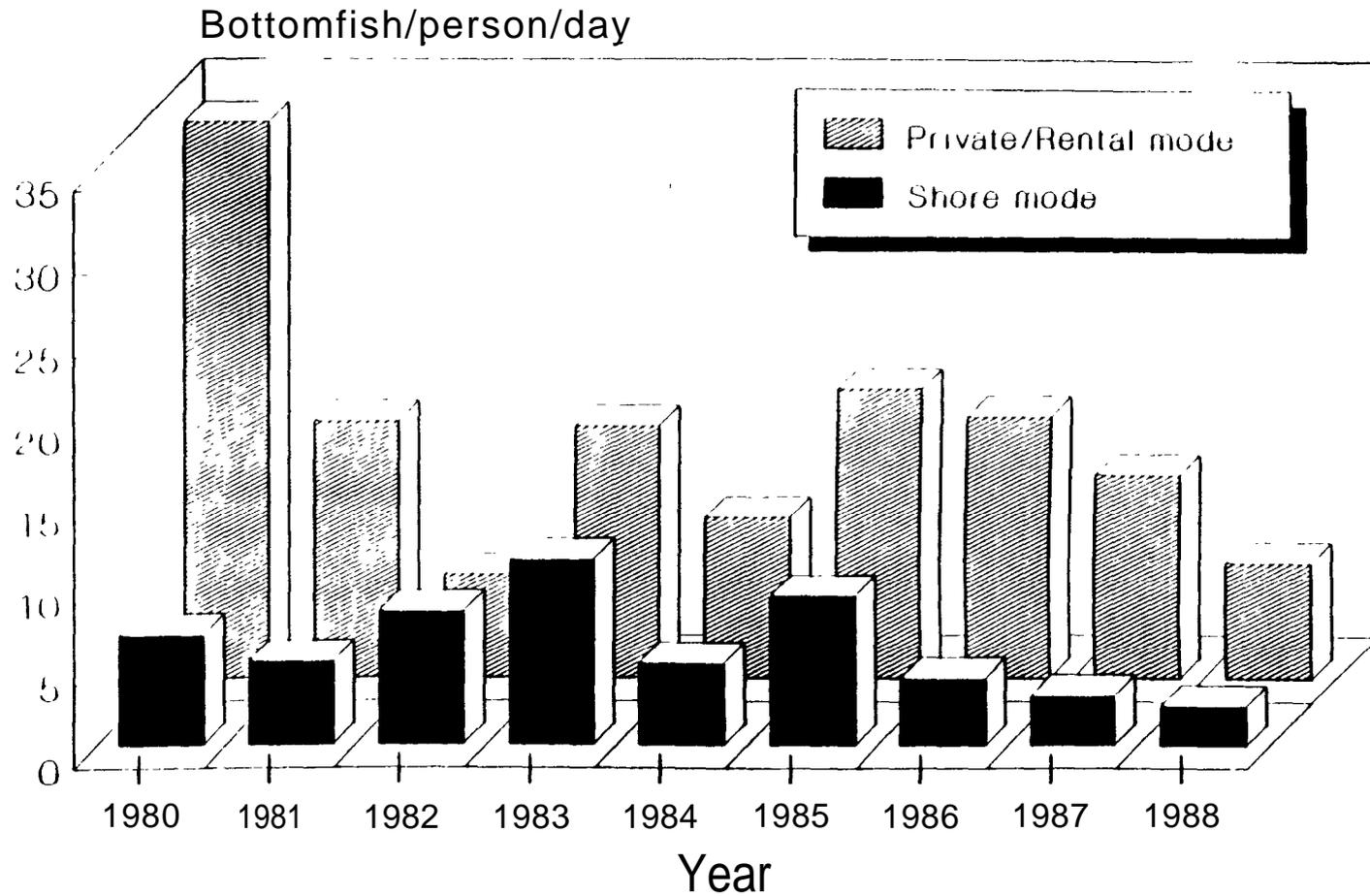
For individuals targeting smallgame

**Fig. VA2: Smallgame Catch Per Day,
Virginia, Bay and Ocean,
By Wave and Mode**



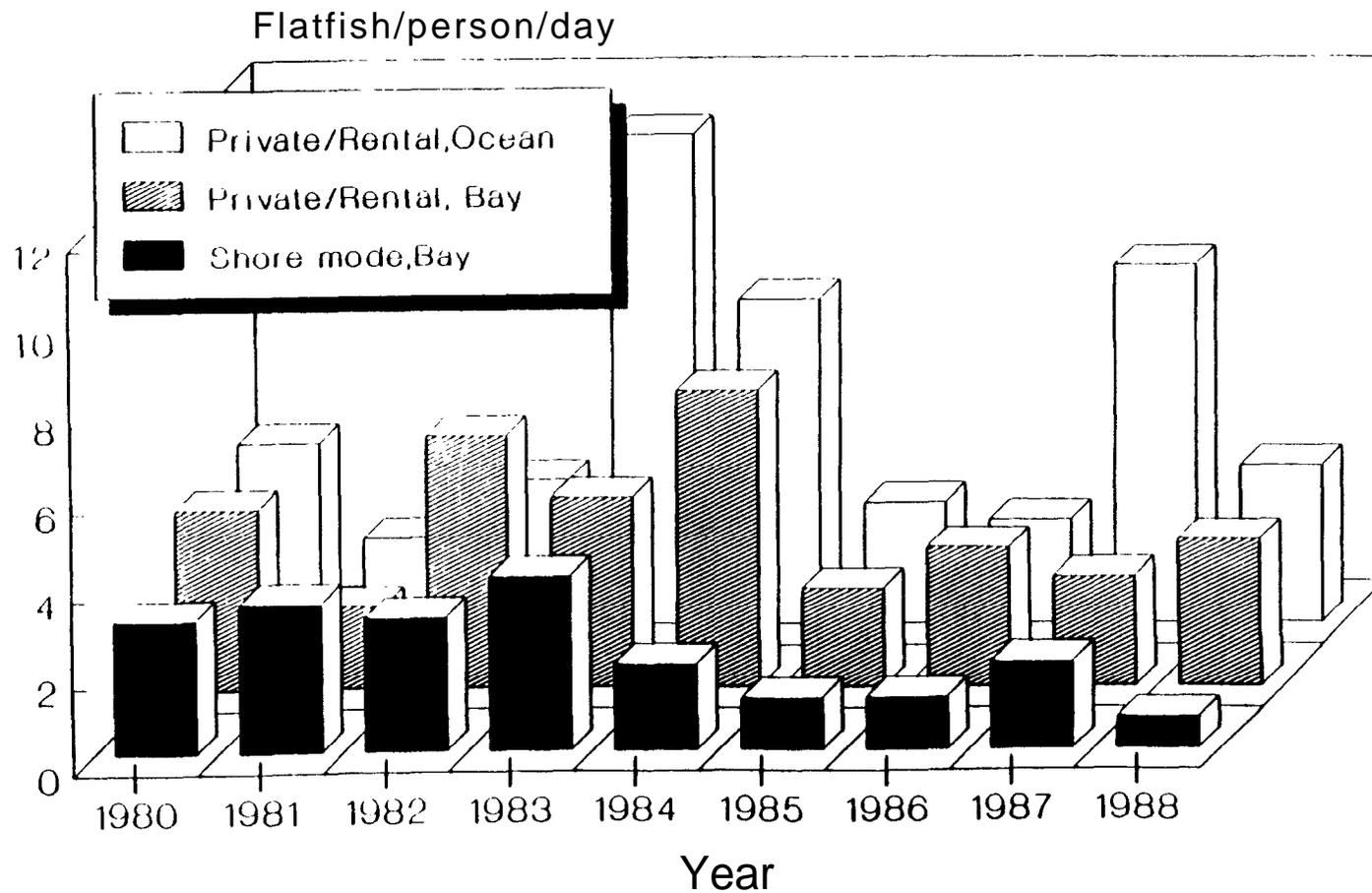
Average for individuals targeting small-
game, 1980-1988.

**Fig. VA3: Bottomfish Catch Per Day,
Virginia, Chesapeake Bay, 1980-88,
By Fishing Mode**



For individuals targeting bottomfish

**Fig. VA4: Flatfish Catch Per Day,
Virginia, Bay and Oceanside, 1980-88,
By Fishing Mode**



For individuals targeting flatfish

Chapter 7

SPORTFISHING IN NORTH CAROLINA

Activity by North Carolina Households

Anglers in North Carolina can choose among a wide variety of marine recreational fishing opportunities. Fishing takes place in the two large sounds, the Pamlico and the Albemarle, numerous brackish rivers, the bays created by the barrier islands, and the Outer Banks. The weather is fairly mild, with good fishing days available all year round. The population, however, is not distributed close to the coast as it is for many other states. North Carolina's population centers of Raleigh, Greensboro, Winston-Salem and Charlotte are located inland, more than 50 miles from the coast.

The NMFS telephone survey has two types of coverage. For wave two (March-April) and wave six (November-December) from 1980 through 1986, the telephone survey samples households who live in counties within 25 miles of the coast or estuary. This includes about 296,500 households or 15 percent of the households in the state. For waves two and six for years 1987-1989 and for waves three through five (May through October) for years 1980-1986, the survey covers households who live in counties within 50 miles of the coast. This range is sufficient to include cities such as Rocky Mount, Wilson, and Greenville and expands the sample population to about 460,700 households or 23 percent of the households in the state. Since 1987, the sampling frame for waves 3 through 5 has been expanded to 100 miles. This dual sampling frame must be borne in mind as we consider seasonal variation in participation rates and trips. While neither captures a significant portion of North Carolina's population, May through October

data reflect activities of half again as many people. Consequently, differences in the participation rates and trips per household in different waves reflect both seasonal differences in the fishery and different population sizes.

Because the sampled counties are closer to the coast, we expect residents of these counties to be more active in sportfishing. NMFS's estimates of the proportion of in-state sportfishery participants who are coastal county residents (according to the relevant definition of "coastal county" for the given year) has fluctuated radically over the decade, ranging from a low of 28 percent in 1985 to a high of 55 percent in the subsequent year. The estimates of the proportion of North Carolina sportfishing participants who are state residents has also varied, with percentages in the 50's and 60's toward the beginning of the decade but dropping to about 38 percent toward the end. This may reflect a growing tourist industry highlighting sportfishing opportunities along North Carolina's extensive coast. The proportion of trips attributable to in-state fishermen has declined also, but less dramatically as would be expected, from about 70 percent in the early eighties to between 55 and 65 percent in later years.

Participation and Quantity of Trips by Season

Table NC.1 gives the participation rates by wave and year. The first column, for March-April, and the last column, for November-December, are not comparable with the rest because the sample frame includes a different number of counties. For the May-October periods, the rate varies from a low of 7.8 percent in July-August 1988 to a high of 19.6 percent in July/August 1981. Remember, however, that the sample was expanded in 1987 to include an additional 50 miles and one would expect lower participation rates as more distant counties are added to the

sample. Because the sample sizes are large, the participation rates are significantly different from zero. The means are also typically different from one another.

Some decline in participation over time is evident here. While the decline is not uniform, the participation rate appears to have trended downward since 1983 especially in the July-October periods. The trend is not established statistically, but is quite evident in the rates for 1987, 1988 and 1989, when participation rates have been uniformly lower than the mean participation rates for the decade. The effect of changing the sampling scheme, however, cannot be separated from a potential real decline in participation rates.

The seasonal pattern of participation rates remains consistent over the years. Despite the redefinition of population, which favors the March-April and November-December waves, participation rates in these waves are substantially lower than in the waves from May through October. The similarity of rates from May to October suggests a more accessible fishery than for more northern states in the study.

Linear trend analysis of North Carolina was more complicated than for other states. For years prior to 1987, participation rates include the counties within 25 miles for March-April and November-December and the counties within 50 miles for May-October. In later years, the sample coverage changed. To account for the different sample sizes, we included in the linear trend analysis a sample size variable which reflected the change to a larger area. The results (Table NC.2) indicate no significant trend except for a marked decline of about 1 percentage point per year in the September/October wave. The sampling area change, however, always had a negative effect, as would be expected, although the short duration (3 years) was not long enough to make the parameter significant except in November/December.

The actual levels of the participation rate, in the range of 5 to 14 percent, are however high relative to more northern states. Perhaps this is due to the smaller urban population in North Carolina's telephone sample.

The participation rates tell only about the distribution of fishing among households. To learn about the magnitude of fishing in North Carolina, we need information about visits. This information is given in Table NC.3. These figures show the number of fishing trips per household called. The linear trend analysis of trip rates also was modified to adjust for the sampling area change. There were no significant trends except for a positive increase during March/April. This increase suggested that during Wave 2 trips per household called rose by .7 trips over the decade.

Figures below show that 74 percent of annual activity occurs in the months May-October. While this may understate the proportion attributable to the summer months, it is probably still less than the 85 to 90 percent that the more northerly states experience.

	<u>Mean Trips</u>	<u>Percent of Annual Mean</u>
March-April	.30	9.7
May-June	.63	20.5
July-August	.86	27.9
September-October	.81	26.3
November-December	.48	15.6

The temporal patterns that appear in the total trips data of Table NC.3 differ slightly from the participation data. Trips per household peak in 1984 and decline subsequently. This pattern is picked up more or less faithfully in each of the waves, with a few aberrations. For most of

the waves, 1987 through 1989 trips tend to be less than the wave mean over all nine years. But again this is to be expected since a more distant population was included in the sample from 1987 on. The variability within any wave is considerable even if we consider only the pre-1987 years. For example, from 1981 to 1983, trips in May-June increase by a factor of 3.4. Trips in the high year for March-April (1985) are more than three times the trips in the low year (1982).

Sport Fishing Activity by Mode

Table NC.4 provides information on the distribution of fishing trips by wave and mode. These figures are proportions of fishing trips to different modes and are means for the eight-year period.

Shore fishing, which is typically the most accessible, appears to be the most common mode in North Carolina except in the July-August period. In all waves, more than 40 percent of trips are shore trips. In four of the five waves, that figure is around 50 percent or more. The relatively mild weather probably accounts for the small change in the proportion of shore fishing trips over the seasons.

Another interesting feature of this table is the low proportion of fishing trips in the party/charter mode, in the neighborhood of one to six percent, lower than states to the north. Further, the private/rental proportion of trips is relatively constant except for the peak in July-August, and it too always exceeds 40%.

Table NC.4 is useful in conjunction with estimates of the aggregate level of trips, which is the product of mean trips per household called (from Table NC.3) and the number of eligible households. From the 1980 Census there were 296,500 households in the 25 mile zone, which was the telephone target zone in March-April and November-December for pre-1987 years.

There were 460,700 households in the 50 mile zone, the phone target in May through October for pre-1987 years. Mean trips per household called for March-April in the pre-1987 period is .34. Hence, for the phone population in March-April, we could predict about 100,810 trips ($= .34 \times 296,500$). From Table NC.4, 43,046 trips (42.7% of aggregate trips) could be attributed to private/rental boat trips. In May-June, trips per household (pre-1987) were .62, implying aggregate trips of 285,634 ($= .62 \times 460,700$). From Table NC.4, 42.4 percent or 121,109 trips could be attributed to the private/rental mode. The increase from March/April to May/June stems from the seasonally induced increase in activity from spring to early summer as well as the increase in the eligible population. Both figures omit the effect on fishing by households who live outside the relevant coastal county definition, and in North Carolina these omissions account for between 45% and 75 % of North Carolina fishing households.

Sportfishing Activity by Waterbody

Table NC.5 gives information on the distribution of fishing trips among the various waterbodies by wave. The majority of fishing trips take place in ocean, gulf and open bay. But a significant proportion of the trips, about 20 percent, occur in sounds. The Pamlico and the Albemarle provide considerable fishing opportunities. There is an increase in the proportion of trips in ocean, gulf and open bay in the fall. This is partly due to seasonal habits of species such as the drum.

With estimates of aggregate trips, we can determine the number of trips covered by the phone survey directed towards each type of waterbody. For example, there are an estimated 100,810 trips by households in the 25 mile counties in March-April. 53.7 percent of them or 54,135 are in ocean, gulfs or open bays. In September-October, households called took .92

trips, averaged over the pre-1987 years. For the 460,700 eligible households, this implies 423,844 trips. According to Table NC.5, 64.7 percent or 274,227 of these trips were taken in the ocean, gulf or open bay waterbodies. This is about a five-fold increase over March-April, but part of the increase is simply the greater coverage by the phone survey. Furthermore, the activities of non-coastal county residents are not measured. Nevertheless, there is likely a large seasonal variation in sportfishing activities on different waterbodies in North Carolina.

Catch Rates in North Carolina Marine Waters

Because of North Carolina's diverse fishing grounds, variety of species, and the relatively small sample of intercepted anglers during the decade, it is unwise to generalize greatly from the catch rate data. The ease and variety of access to North Carolina's Sounds and Ocean presents a statistical sampling nightmare. The variety of species also makes it unlikely that anglers will target species. Finally, the State of North Carolina has only funded additional samples in the basic NMFS sample population within the last few years.

About one-half of all anglers intercepted by NMFS surveyors in North Carolina were not targeting any particular species. For those targeting species, anglers seeking smallgame represented about one-half (or 25 % of all intercepted anglers), seeking bottomfish about one-sixth (8% overall), seeking flatfish about one-seventh (7% overall), and biggame about one-eighth (6% overall). These percentages were not stable over the period with the non-targeting percentage dropping from 65% prior to 1985 to 45% in the period after. The shift from non-targeting resulted in smallgame targeting increasing from 17% to over 27% and in biggame targeting rising from 1% to nearly 8%. The percentage of anglers seeking flounder and bottomfish remained reasonably constant.

Smallgame Catch Rates

The principal species of smallgame targeted in North Carolina waters in the decade are bluefish, seatrout (spotted and silver), red drum, spanish and king mackerel. With the exception of silver seatrout which was not targeted significantly after 1984, the species were targeted both prior to 1985 and subsequently. However, there was a substantial shift away from bluefish after 1984 and a concomitant shift toward king and spanish mackerel. The percent of anglers targeting bluefish fell from over 50% of the smallgame anglers to less than 30%. Simultaneously, the percentage targeting king and spanish mackerel rose from under 25% to over 50%.

As with most sportfishing activity, the reported party/charter catch per day dominated both the shore and private/rental boat mode (Figure NC1). Data on shore fishing for the entire period suggest catch rates vary between one and two smallgame per day whereas, party/charter anglers capture between five and six smallgame per day. Private/rental boat fishermen's catch rates are more similar to the shore fishermen's.

There are no apparent trends in the reported data. This could be due to switching among the variety of species in North Carolina, the relatively small sample of anglers in North Carolina, or the lack of any major trend in availability of smallgame. However, catch rates do systematically vary within the year, with July/August and November/December being the worst months for all modes and the March through June period being the best (Figure NC2). The spring and fall peaks are likely due to migratory movements of bluefish and mackerel.

Bottomfish Catch Rates

Anglers targeting bottomfish are usually seeking spot. Prior to 1985, spot was the target species of 57% of bottomfish anglers, a percentage which fell to 45% in subsequent years.

When not seeking spot, they will seek croaker (~15%), black sea bass (~6%), sheepshead (~7%) or snapper (~5%). There was a shift to the pursuit of croaker and sheepshead in the latter half of the decade.

Bottomfish are most often sought by shore anglers, although private/rental boaters often target them. During the eighties, catch rates of shore fishermen were the highest in the 1983-1985 period, averaging between 5 and 20 fish per day (Figure NC3). Private/rental boaters who targeted bottomfish were most successful in the latter half of the decade, when they averaged between 8 and 15 fish per day.

Private boaters and shore fishermen obtain their greatest catch rates in the months of September and October, averaging well in excess of ten fish per day (Figure NC4). The worst period for private boaters is March/April, which corresponds to the second-best period for the shore fishermen. Shore fishermen tend to find bottomfishing the worst in July/August.

Flatfish Catch Rates

The summer flounder is the predominant species sought by flatfish anglers, representing 85% of the reporting flatfish anglers prior to 1985 and 75% in the subsequent years. The decline appears to be related to an increase in anglers seeking southern flounder (~10%) in the later period. The only other category of note is the "unspecified flounder" that represents about 10% of the anglers.

Because the sample sizes for annual catch rates were small, it is difficult to perceive a trend during the decade (Figure NC5). The best catch rates for shore fishermen have occurred since 1984, with the highest occurring in 1985. The private/rental boat fishermen, however, do

not reflect the same movements in availability, although the last three years, 1986-1988, were all at least average years.

The period for flatfish availability from the shore is November/December, with average catch per day between three and four fish (Figure NC6). This level of catch is available to the private/rental boater for a longer period, from July through December. The peak for boaters occurs in September/October.

Characteristics of Fishing Trips in North Carolina

The survey data gathered by UMCP gives information on some of the economic details of fishing trips to North Carolina. These trips include those taken by anglers from a number of states, including North Carolina, during 1988.

Table NC.6 describes one day fishing trips by mode of fishing. There are six modes: two from shore (pier and beach) and four boat modes (party, charter, rental and private). The number of observations from the rental mode is too small to make any inferences, so the discussion will focus on the other five modes.) The variation in travel costs among modes is similar to other states, being higher for the party and charter modes. In general, the travel costs are higher for North Carolina because the main population centers are farther from the coast than in other states. The bait costs are similar for pier, beach and private boat modes. The bait costs for the party and charter are quite disparate, suggesting differences in what is covered by the fee. The distances traveled reflect the travel costs. The boat time suggests the value of trailering boats. The steaming time in the boat before fishing for the public modes is about one and a half hours, while for the private boats, most of which are trailered, it is about a half an hour. The

average pier fee is higher than in other states, because there are quite a number of piers for fishing on the coast of North Carolina.

Table NC.7 gives information on trips taken in North Carolina by people who are on overnight trips. The trips may be for a variety of purposes, including business and vacation. Travel costs, travel time and distance travelled are lower than for the single-day trips because households on vacation have already done their travelling. The costs of fishing services on the trips appear reasonably in line with the single-day trips costs.

Table NC.8 gives the distribution of species sought by mode for day trips. There is a clear divergence by mode. Small game tends to be sought by trips to the pier, beach, and private boat modes. Large game species tend to be sought by households on the party and especially charter modes. The proportions seeking flatfish are similar to other states in the mid-Atlantic.

Table NC. 1

Two-Month Participation Rates*
by Wave and Year

Year	Wave				
	March- April	May- June	July- August	September- October	November- December
1980	8.2%	13.9%	15.7%	18.2%	8.0%
1981	7.4	11.3	19.6	18.9	5.5
1982	7.4	11.0	14.4	16.5	8.0
1983	8.6	18.0	16.5	14.3	8.2
1984	5.3	13.4	15.5	16.1	6.9
1985	9.1	11.7	10.3	12.8	7.9
1986	9.4	14.8	18.1	12.6	8.6
1987	5.1	11.3	11.2	11.5	6.2
1988	8.9	11.2	7.8	9.2	5.8
1989	1.5	8.3	8.1	8.5	5.1
Mean	7.1	12.5	13.7	13.9	7.0

* Percent of North Carolina coastal county households called who indicated having fished in North Carolina marine waters in the previous two months.

Table NC.2

Linear Trend Analysis¹ of North Carolina Participation Rates,
By Wave, 1980-1989.

Wave	Constant	Linear Trend Coefficient	Sampling Area Change	\bar{R}^2
March/April	.077 (4.97)	.000 (.10)	-.030 (-1.10)	.09
May/June	.132 (8.07)	.001 (.22)	-.028 (-1.31)	.15
July/August	.171 (9.27)	-.004 (-.88)	-.045 (-1.41)	.55
September/October	.189 (28.02)	-.011 (-5.85)	-.005 (-.43)	.92
November/December	.071 (11.02)	.001 (.83)	-.026 (-2.35)	.42

¹ Estimated model was Part. rate = $\alpha_0 + \alpha_1$ time + α_2 change, with time defined as t = 0 for 1980, t + 1 for 1981 ... and t = 9 for 1989 and "change" defined as 1 in 1987, 1988 and 1989, 0 otherwise.

² T-ratio in parentheses.

Table NC.3

Trips Per Household Called
By Year and Season*

Year	Total	Wave				
		March- April	May- June	July- August	September- October	November- December
1980	3.27	.16	.42	.78	1.06	.85
1981	2.57	.18	.40	.85	.78	.35
1982	3.06	.16	.42	1.14	.94	.40
1983	4.07	.37	1.28	.92	.88	.63
1984	4.08	.21	.52	1.49	1.33	.53
1985	3.22	.57	.65	.53	.81	.66
1986	3.66	.64	.65	1.33	.64	.39
1987	2.83	.22	.82	.70	.76	.34
1988	1.99	.41	.63	.31	.35	.28
1989	2.01	.11	.50	.53	.55	.32
Mean	3.08	.30	.63	.86	.81	.48

* Trips taken within state of residence.

Table NC.4

Percent of Fishing Trips in Various Modes by Wave
 Mean 1981-1988

Mode	Wave				
	March- April	May- June	July- August	September- October	November December
Shore	51.2	53.3	42.1	49.6	51.4
Party/Charter	6.1	4.3	4.4	3.4	1.3
Private/Rental	42.7	42.4	53.6	47.0	47.3

Table NC.5

Percent Fishing Trips in Various Areas, by Wave
 Mean 1981-1988

Area	Wave				
	March- April	May- June	July- August	September- October	November- December
Ocean, Gulf, Open Bay	53.7	49.1	57.6	64.7	67.6
Sound	19.7	21.3	23.9	21.2	18.9
River	14.0	14.8	11.2	6.7	8.8
Enclosed Bay	9.7	3.2	3.8	4.9	2.9

Table NC.6

Average Characteristics of Day Trips in North Carolina, by Mode
(per trip averages)

Characteristic	Mode					
	Pier	Beach	Party	Charter	Rental	Private
Travel Cost	\$11.25	12.61	42.03	34.45	45.91	16.68
Costs for						
Bait	\$ 4.22	3.38	1.88	11.00	.60	4.92
Tackle	5.11	1.72	3.88	2.07	0.0	5.66
Cleaning	.79	.98	18.25	4.79	8.30	2.48
Fuel	-	-	-	-	2.78	23.40
Pier Fees	3.48	-	-	-	-	-
Launch Fees	-	-	-	-	-	.89
Boat Fees ^a	-	-	70.96	170.50	179.44	-
Travel Time (in minutes)	66.1	71.6	150.5	50.5	166.8	59.45
Distance (in miles)	53.55	52.9	122.4	38.0	137.1	43.07
Boat Time to first site (in minutes)	-	-	86.97	82.8	96.8	31.19
Number of Observations	137	79	15	74	9	411

^a Boat fees are charter and party fees or rental fees.

Table NC.7

Characteristics of Trips for Overnight Visits in North Carolina

Characteristic	Mean	Number of Applicable Observations
Travel Cost	\$7.32	521
Cost for		
Bait	4.99	526
Tackle	8.45	529
Cleaning	2.97	529
Fuel	24.04	188
Pier Fees	7.60	130
Launch Fees	1.01	191
Boat Fees	202.22	79
Boat Rental	^a	3
Travel Time (in minutes)	23.7	523
Distance (one-way) (in miles)	15.6	524
Boat Time (in minutes)	41.1	271
Trip Length (in days)	9.3	532

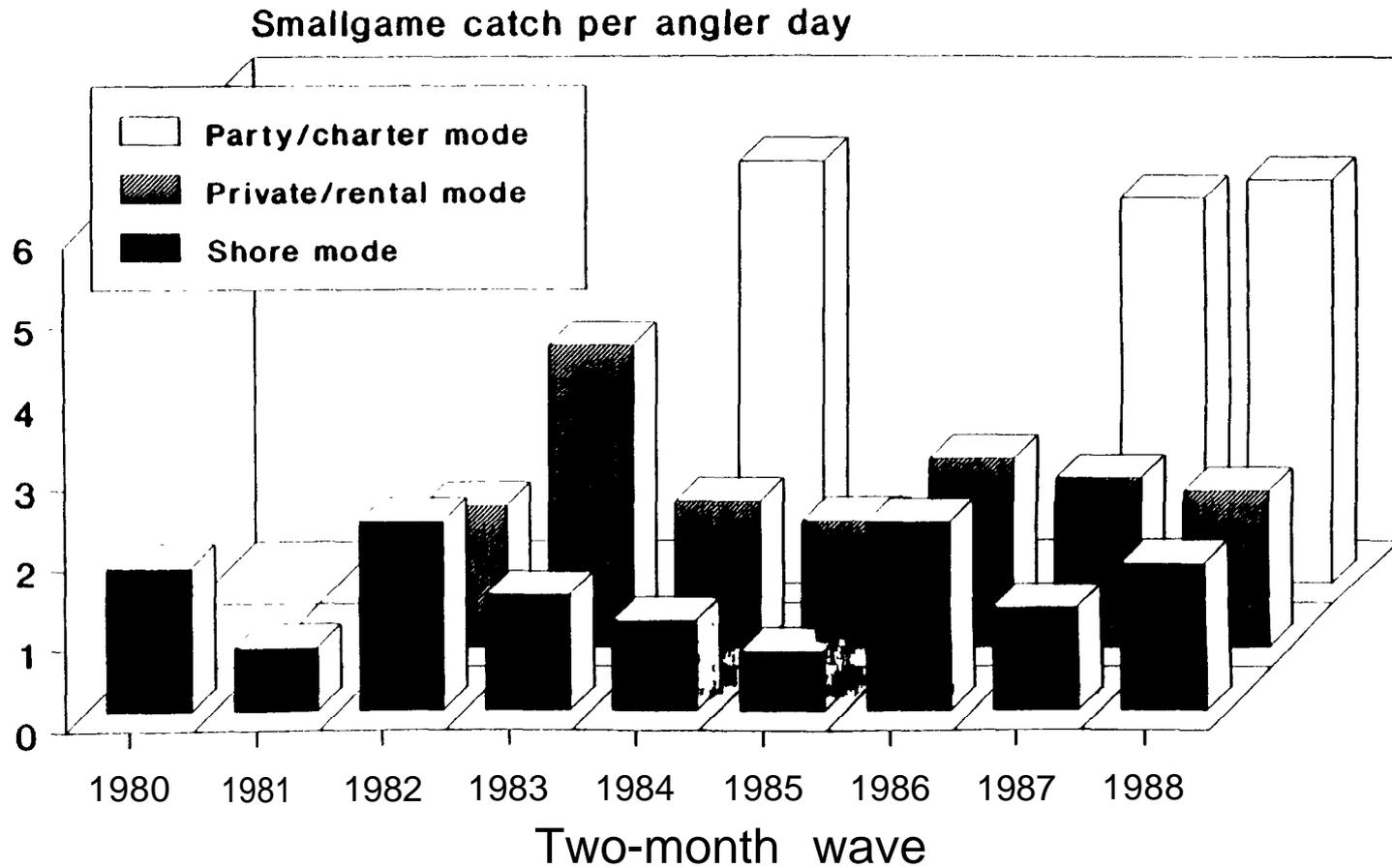
^a Not enough observations to make a reliable estimate.

Table NC.8

Percent of Trips Seeking Different Species Groups, by Mode
for Day Trips

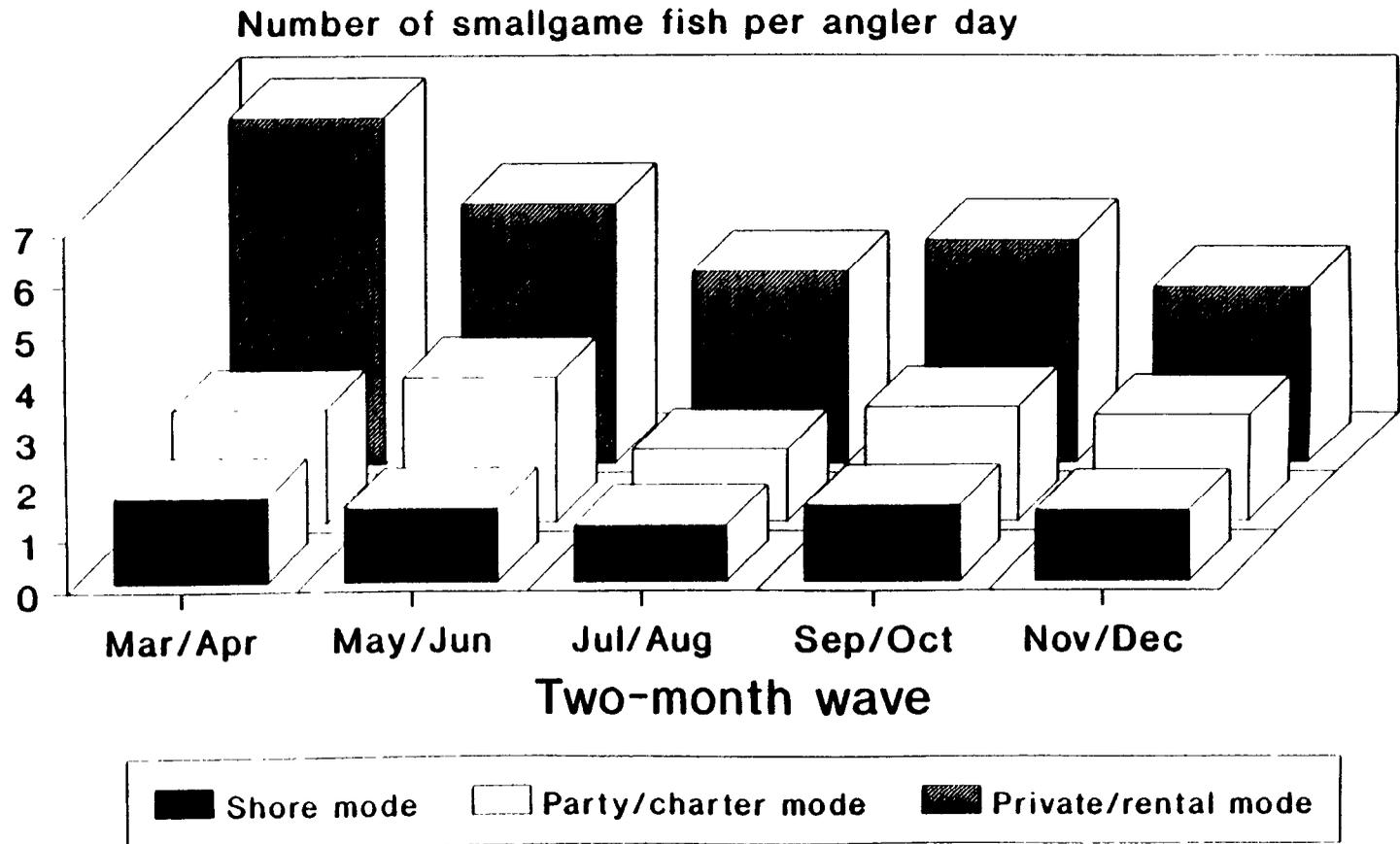
Species Group	Mode				
	Pier	Beach	Party	Charter	Private
Big Game	3.0%	5.9%	28.6%	54.7%	12.6%
Small Game	63.6	72.6	28.6	22.6	55.4
Flatfish	12.1	15.7	14.29	1.9	20.8
Bottomfish	21.2	5.9	28.6	20.8	11.2

**Fig. NC1: Smallgame Catch per Day
North Carolina, Morehead City and North
By Year, 1980-1988**



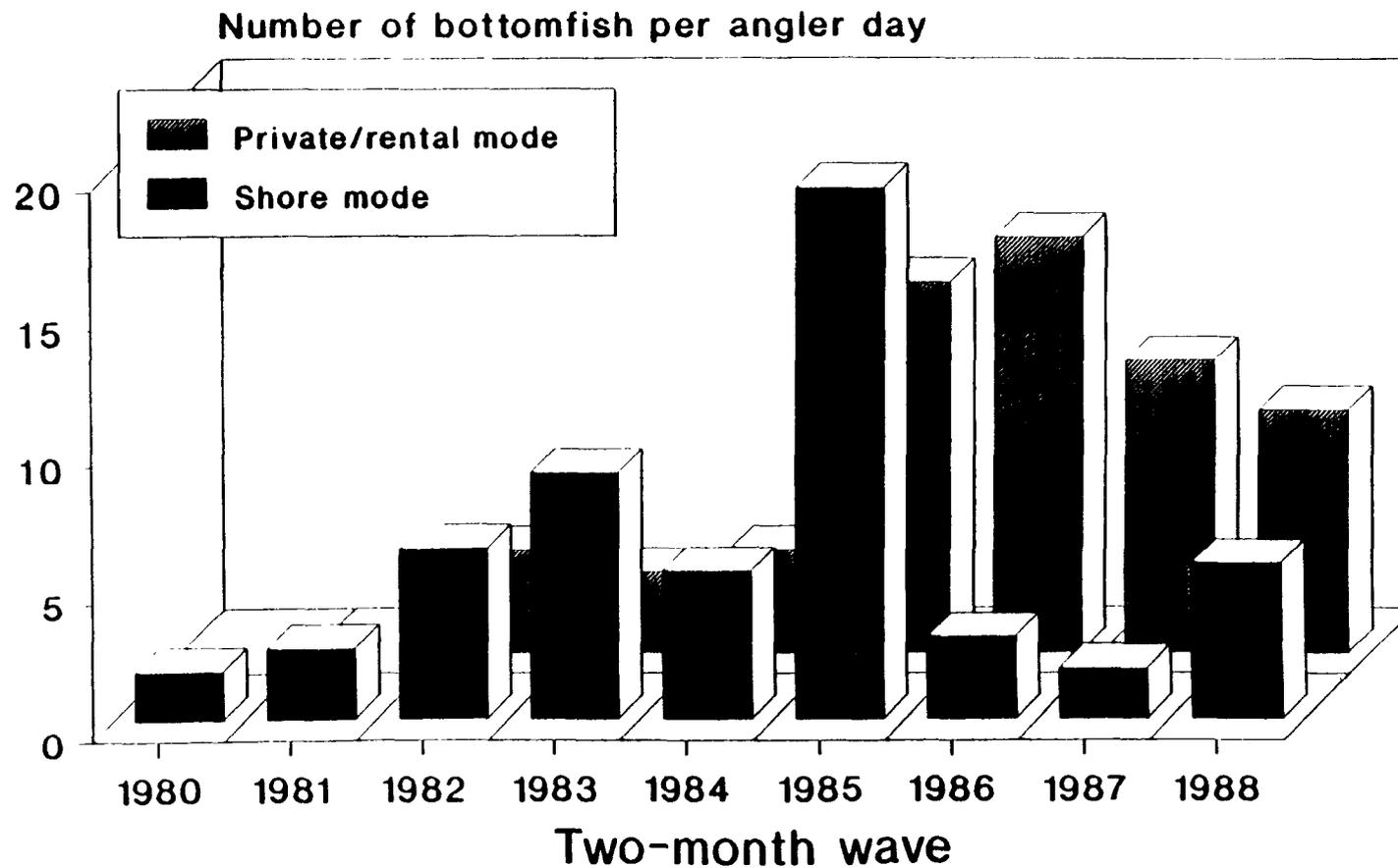
Average for anglers targeting smallgame
at sites from Morehead City northward

**Fig. NC2: Smallgame Catch Rate
North Carolina, Morehead City and North
By Wave, 1980-88**



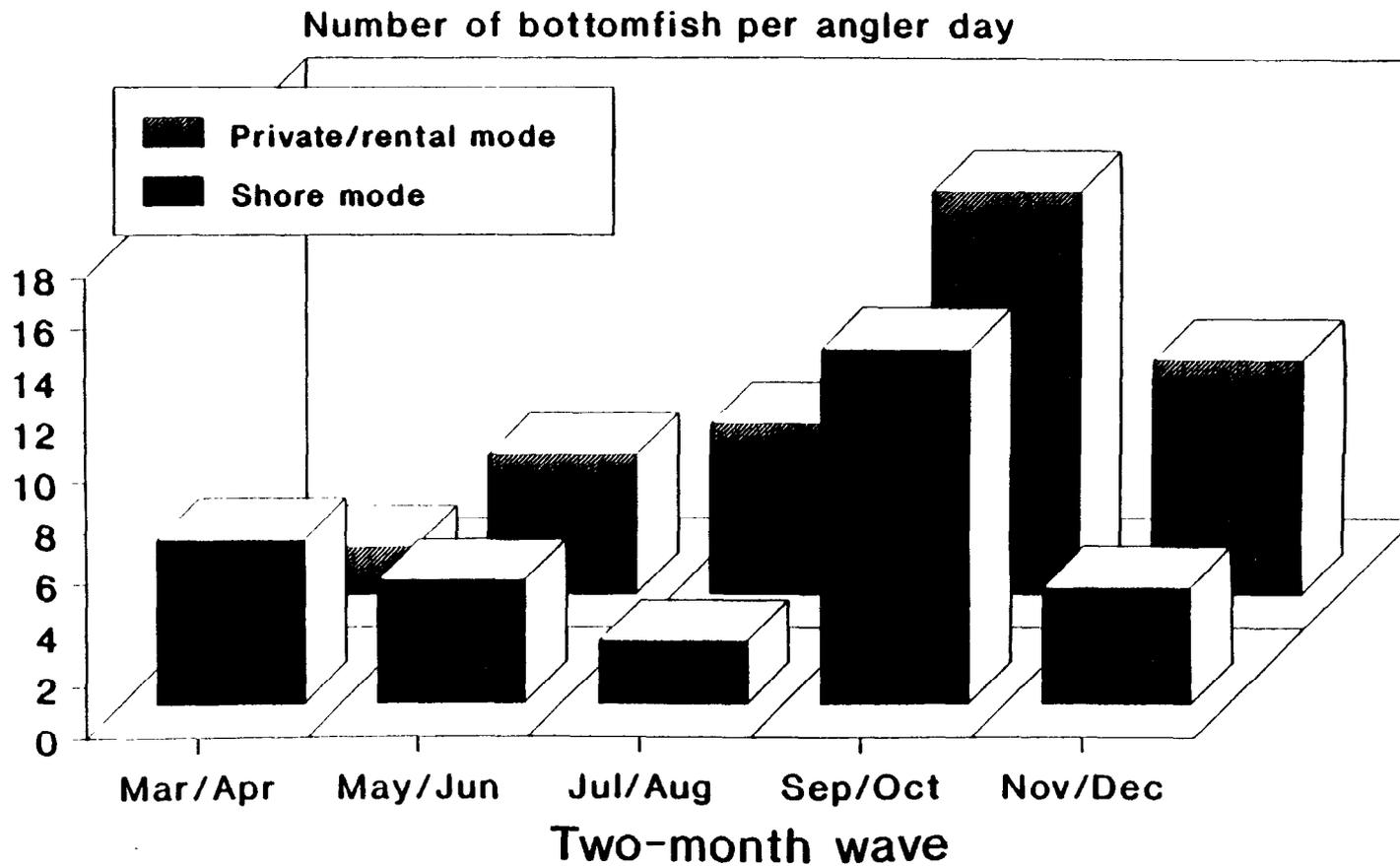
Ave. for anglers targeting smallgame
at sites from Morehead City northward.

**Fig. NC3: Bottomfish Catch per Day
North Carolina, Morehead City and North
By Year, 1980-1988**



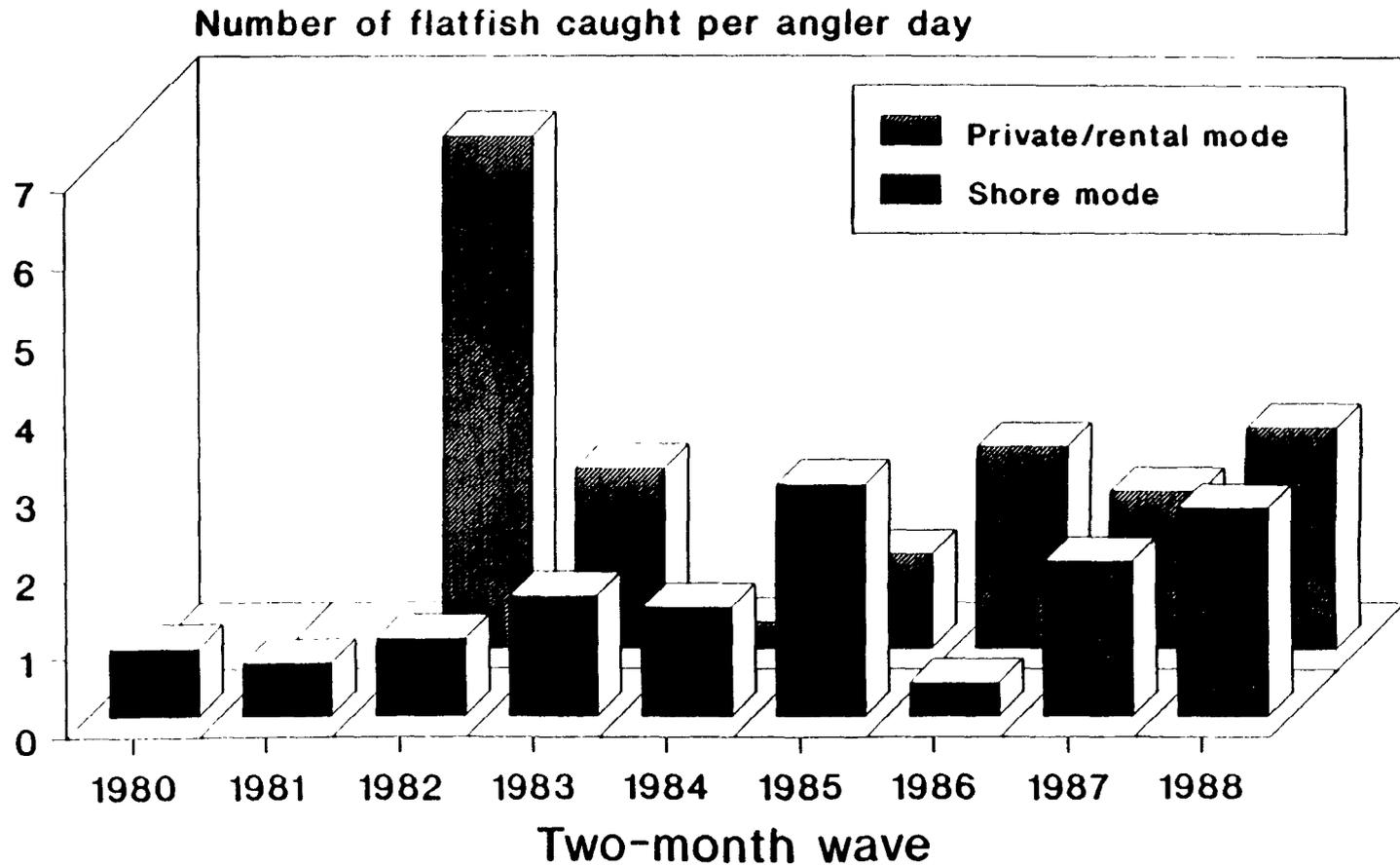
Average for anglers targeting bottomfish
at sites from Morehead City northward.

**Fig. NC4: Bottomfish Catch Rate,
North Carolina, Morehead City and North
By Wave, 1980-1988**



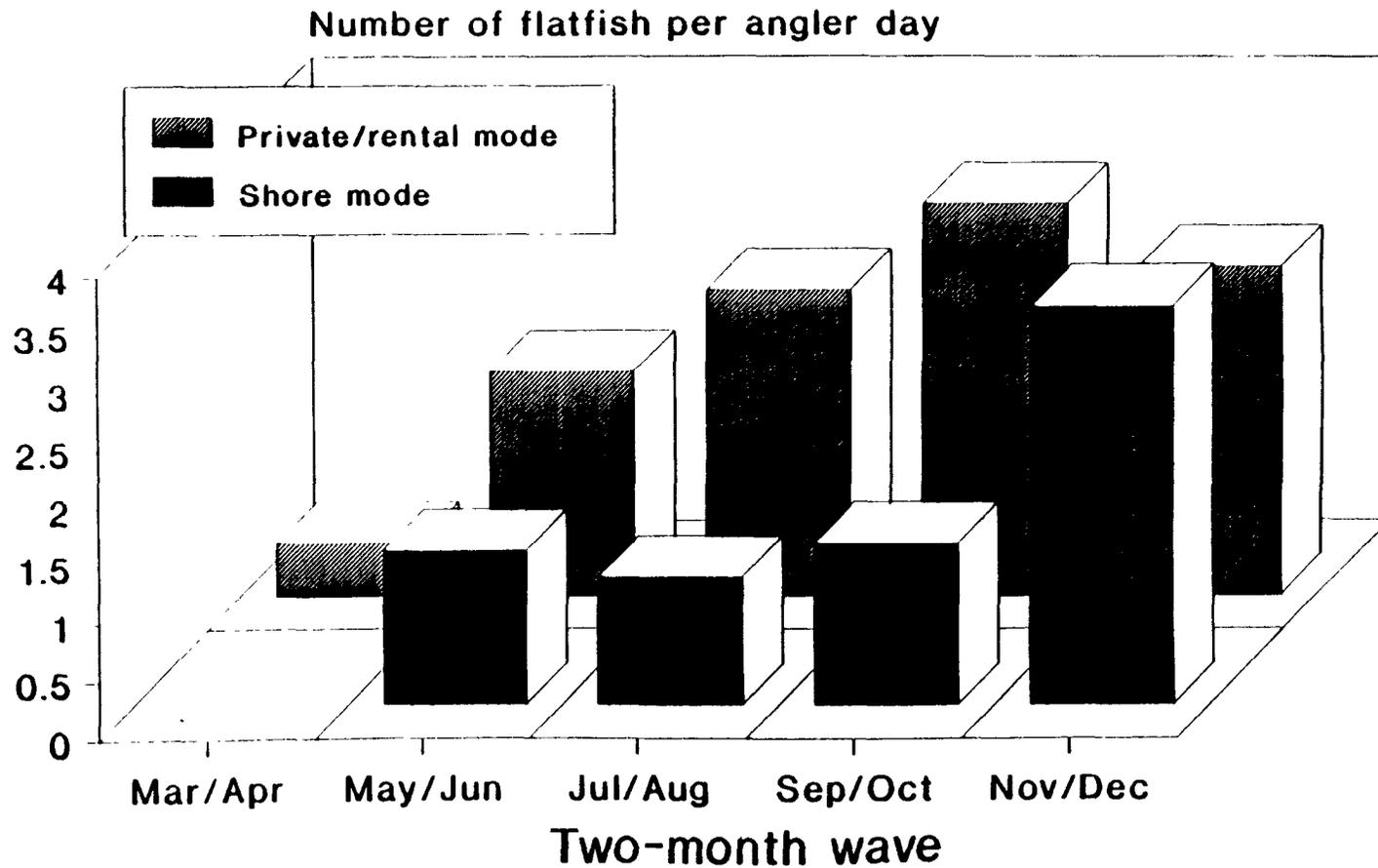
Ave. for anglers targeting bottomfish
at sites from Morehead City northward.

**Fig. NC5: Flatfish Catch per Day
North Carolina, Morehead City and North
By Year, 1980-1988**



Average for anglers targeting flatfish
at sites from Morehead City northward.

**Fig. NC6: Flatfish Catch Rate
North Carolina, Morehead City and North
By Wave, 1980-1988**



Ave. for anglers targeting flatfish
at sites from Morehead City northward.

Chapter 8

SPORTFISHING IN SOUTH CAROLINA

Activity by South Carolina Households

The extent of South Carolina's coastline is relatively short as compared with its northern neighbor. And there is a limited variety of waterbodies in which to saltwater fish. The majority of the state's population lives far from the coast, although the South Carolina coastal counties do account for a larger population share than in North Carolina, primarily because of Charleston. The largest city, Columbia, and four of the remaining six cities of any size are located more than 50 miles from the coast. Florence is located more than 25 but less than 50 miles from the coast. The climate in South Carolina permits fishing throughout the year, with heat spells during the summer months perhaps being as inclement as cold spells during the winter. Consequently, seasonal variation in fishing activity will likely be influenced by factors other than weather.

During the second and sixth waves (March-April and November-December) the sample frame encompasses only those households who live in counties within 25 miles of the coast or an estuary. According to the 1980 Census, this includes approximately 293,000 households or 28 percent of the state's population. During the remaining waves (May through October) the sample frame includes all households with telephones who live in counties within 50 miles of the coast. For 1980, the number of eligible households in this category was 346,500, only about 20 percent more than the 25-mile coastal county household count or 34 percent of the households in the state.

Over the eighties, NMFS has calculated widely varying estimates of the proportion of participants in South Carolina marine sportfishing who come from in-state coastal counties. The proportions have ranged from 20 to 40 percent, but hit a low of 9 percent in 1982. Non-coastal state residents have made up about 15 percent of participants over time.¹ The proportion of South Carolina marine sportfishing trips attributable to state residents has varied from 50 to 75 percent. These facts suggest that the nature of sportfishing participation in South Carolina has been quite variable; but it also suggests that out-of-state residents (possibly tourists) play a major role in the sportfishery.

Participation and Quantity of Trips by Season

Seasonal data on trips and participation in South Carolina give a detailed picture of the fishery. Table SC.1 reports the two-month participation by wave and year. Once again, recall that for March-April and November-December, the sample frame includes only the 25-mile counties, while for May-June through September-October, households in 50-mile counties are called.

There is a good deal of variation among years for the two-month waves, although in the summer months, the rates are fairly steady. While there is variation over the years for all waves, no trends were revealed from the linear trend analysis (Fig. SC.2).

Seasonal patterns are easier to discern in these data. The means for March-April and November-December are lower than for May-October. And this difference is somewhat understated because the March-April and November-December waves include only the 25-mile

¹The exception is 1982, when NMFS estimated that only 8.8 percent of the participants in the South Carolina marine sportfishery were residents of the coastal counties, while the estimate for percentage coming from the non-coastal counties was particularly high (at 22.6 percent).

counties. These participation rates would likely be lower in the sample frame extended to the 50-mile counties. Within the May-October waves, participation in the summer wave of July-August appears lower than in early summer or fall. The participation rates for the May-October period seem more stable than for the other two waves.

These participation rates give only a sense of the distribution of fishing among the population, not of the magnitude of fishing--that is, how much fishing effort is expended. One measure of the magnitude of fishing is given by the number of trips. This can be calculated in various ways. One way is to multiply the number of eligible households by the number of trips per household called. The product is the total number of trips in the wave. Table SC.3 gives the mean number of in-state trips per household called.

The data from Table SC.3 give some insight into the seasonal variation in activity. The mean trips per household called using all ten years of data are distributed seasonally as follows:

	Mean Trips	Percent of Annual Mean
March-April	.34	13.3
May-June	.60	23.5
July-August	.67	26.3
September-October	.55	21.6
November-December	.39	15.3

About 70 percent of the mean trips occur in the May to October waves. This is probably a slight underestimate of the proportion of activity in the summer months because of the sampling scheme. Comparing these three waves, we see that activity in May-June and July-August are

similar. The July-August summer peak, prevalent in the data for more northern states, is again found as far south as South Carolina.

There is substantial variation among years for the wave and for the annual means. The annual mean trips per household called were at a decade low of 1.17 in 1981, with mean trips for other years as much as three times higher. In individual waves there is, of course, even more variation. The high in March-April (.71 in 1985) is over six times the low (.11 in 1983). The relative variation in other waves is less, but the absolute variation is greater. For example, in May-June, trips per household called range from .33 in 1981 to .92 in 1984, an increase of .65 trips per household in 3 years.

Sportfishing Activity by Mode

Table SC.4 gives the distribution of fishing trips by coastal county residents by mode and wave. This information is useful for understanding how fishing activities change. The proportions are relatively stable over the year. The proportion of fishing trips to the shore mode lies in the 30 to 45 percent range and the proportion of trips on private boats is 50 to 65 percent. While there is some decline in the summer, it is slight. The proportion of trips accounted for by the party/charter mode falls between four and ten percent. One interesting aspect of these figures is the proportion of trips on boats. It is highest in November-December, providing additional evidence that “inclement” boating weather in South Carolina may be most prevalent in the summer.

To illustrate variations in the magnitude of fishing by wave and mode, we can expand the trips per household called to the population of coastal county residents. According to the 1980 Census, for the 50 mile counties, there were about 346,500 households, and for the 25 mile

counties, there were 293,000 households. From Table SC.3, we can get information on trips per household called. Using means from Table SC.3 implies 99,620 trips in March-April (.34 293,000) by residents of the 25 mile counties. Table SC.4 gives the distribution of these trips, implying that there were on average 38,354 shore trips and 61,622 boat trips. In May-June, the telephone survey contacted 346,500 households and they averaged .60 tips, implying 207,900 trips by households in the 50 mile counties. Of these, 37 percent or 76,923 could be attributed to shore trips by households residing in the 50 mile counties. The increase in shore trips is partly a result of more trips per household called and partly a larger population of eligible households.

Sportfishing by Waterbody

The South Carolina coast features islands, ocean beachfront, and rivers. The barrier beaches which dominate the coastline to the north are less prevalent in South Carolina. The waterbodies conform roughly to the four NMFS categories of ocean, gulf and bay; sound; river; and enclosed bay. Table SC.5 shows the distribution of fishing trips among the NMFS waterbodies.

Most fishing trips occur in rivers or the ocean, gulf and open bay category. Across the seasons, at least 80 percent of households fish in these waterbodies. Some seasonal variability is evident from Table SC.5. The proportion of trips in sounds declines in the summer months.

The aggregate quantity of trips for the sample frame in each of the waterbodies is calculated just as the trips in various modes. For example, there were an estimated 99,620 trips in March-April by residents of the 25 mile coastal counties. Of these trips, 42,235 are predicted to be in the ocean, gulf or open bay. Recall however, that this omits the trips by households

who do not live in the 25 mile coastal counties. NMFS has estimated that as few as nine percent of participants may come from the coastal counties.

Catch Rates in South Carolina's Marine Waters

South Carolina's sportfishing primarily takes place either in the Atlantic Ocean or in the river systems leading to it. In this sense, it is substantially more homogeneous than the fishing in North Carolina, Virginia or Maryland. Also, the sportfish are not as available as in North Carolina. This has led to a State program to provide artificial reefs and other attracting devices in an effort to enhance catch rates.

Because of these actions, a greater variety of species tend to be located around places anglers frequent and the ability for anglers to target species is diminished. This is manifest in a large percentage of South Carolina anglers not targeting species. In the pre-1985 period, only one in three marine anglers responded that they were targeting a species. The rate rose to one in two after 1984. The major recipient of the new targeters was smallgame, with a change from 15% of the intercepted anglers to 35 % of them. The percentage of anglers seeking biggame, flatfish and bottomfish remained reasonably constant over the two periods at ~ 2 %, ~ 4 % and ~12%, respectively.

Smallgame Catch Rates

Five species of smallgame represent over 90% of the total anglers seeking smallgame: red drum, king mackerel, spotted seatrout, bluefish and spanish mackerel. Over the decade, red drum (~26%) and spotted seatrout (~22%) captured a relatively constant share of the smallgame anglers. Bluefish on the other hand fell in importance, going from 15 percent of the smallgame anglers in the 1980-1984 period to 5 percent in the post-1984 period. The major

gainers in share were the mackerel targets, with king mackerel rising from 27 percent to 34 percent and spanish mackerel rising from 6 to 10 percent.

The reason for the increase in targeting of smallgame over the last half of the decade can be seen in Figure SC1. For both the shore mode and the private/rental mode, the catch rates in the latter half of the decade are usually better than in the first half. This and the apparent growing popularity of mackerel may have accounted for the targeting.

Among the modes of fishing, there are interesting differences in the seasonal pattern of catch rates (Figure SC2). The private/rental catch rates appear to begin the year at a low rate and then build consistently over the year, reaching nearly three fish per day in the November/December period. Catch rates of shore fishermen, on the other hand, appear to begin in a similar manner to the private boat catch but then peak in the July/August period. The party/charter mode is also the reverse of the shore fishing, with the lowest rates in the July/August period and the higher rates at the beginning and end of the year.

Bottomfish Catch Rates

There are three primary species sought by bottomfishermen in South Carolina: black sea bass, spot and sheepshead. Black sea bass were the target of 33 percent of the bottomfishermen in the pre-1985 period, a proportion which fell to 21 percent in the subsequent years. Spot, on the other hand, rose in share from 29 percent to 41 percent. Finally, the proportion of bottomfishermen targeting sheepshead doubled from 7 percent in the first half of the decade to 14 percent in the latter period.

Bottomfish, the only other target of any importance, appear to vary dramatically in availability from year to year (Figure SC3). This is likely as much the result of small samples

as natural variation. Although there is not a clear pattern to the catch rates, some of the highest catch rates for both the shore and private boat fishermen were observed during the latter half of the decade.

The seasonal patterns of catch rates are similar for the private and shore fishermen and, like the South Carolina smallgame fishermen, different for the party/charter boat anglers (Figure SC4). The private boat and shore fishermen highest catch rates are usually in the November/December and the March/June period and lowest in the summer. The party/charter fishing is the opposite, with the best fishing occurring in the summer.

Characteristics of Fishing Trips in South Carolina

Many aspects of fishing are not revealed by looking at catch and trips. The UMCP survey provides information on individual fishing trips with sites in South Carolina as destinations. This information typically has economic implications or can be used in the estimation of economic models. It is based on fishing trips taken in 1988.

Table SC.6 describes one-day trips taken to South Carolina by mode of fishing. There are six modes: pier, beach, party, charter, rental, and private boat. However, the party and rental modes have too few observations for reliable estimation of mean trip characteristics. The travel costs for the pier, beach and private boat modes are similar--about \$10. The charter boat travel cost is naturally higher because there are fewer locations where charter boat fishing is available. Bait costs are similar for pier, beach and private boat modes. Evidently, the charter fees cover the price of bait and tackle. The higher cleaning fees for charter boats probably reflects a higher catch rate. The travel time and distance show the relative dispersion of sites

among modes. On average, people travel more for piers than for beaches because they are scarcer. The same is true for charter vs. private boats.

Information on fishing trips which are part of overnight visits is given in Table SC.7. These trips are taken by people who visit South Carolina for a variety of reasons--vacation, business, family. The travel is only from the night's lodging to the fishing site, and hence it is shorter than for the single-day trips. Costs of fishing services--bait, tackle, and cleaning--are similar to the costs for day trips. The overnight trips are aggregated by mode because the small number of observations precludes estimation of mean characteristics by mode.

Table SC.8 shows the distribution of targeted trips by species groups and modes. This table is of limited value because the number of observation in the party, charter and rental modes is so small that these modes cannot be analyzed. Pier fishing is distributed roughly equally among the four groups. Beach fishing is predominantly small game and flatfish. Private boat fishing is principally small game. It is unusual that anglers target a higher proportion of their pier trips towards big game than they target for big game on private boats.

Table SC.1
Two-Month Participation Rates*
by Wave and Year

Year	Wave				
	March- April	May- June	July- August	September- October	November- December
1980	11.2%	10.1%	18.8%	12.1%	11.2%
1981	5.8	10.7	8.1	9.0	3.0
1982	7.0	11.6	7.0	12.7	7.0
1983	5.0	9.3	9.4	9.2	7.2
1984	7.6	9.7	7.9	16.1	7.6
1985	8.1	6.1	8.0	12.8	10.4
1986	7.2	11.4	11.1	10.9	9.2
1987	6.6	9.5	9.7	11.5	8.7
1988	7.4	11.0	8.0	9.2	5.5
1989	7.2	7.5	6.1	8.5	5.7
Mean	7.3	9.7	9.4	11.4	7.6

* Percent of South Carolina coastal county households called who indicated having fished in South Carolina marine waters in the previous two months.

Table SC.2

Linear Trend Analysis¹ of South Carolina Participation Rates,
By Wage, 1980-1989.

Wave	Constant	Linear Trend Coefficient	\bar{R}^2
March/April	.078 (7.89)	-.0012 (-0.64)	.00
May/June	.105 (10.29)	-.0018 (-0.94)	.00
July/August	(6.20)	-.0058 (-1.61)	.15
September/October	.122 (8.40)	-.0018 (-0.67)	.00
November/December	.082 (5.78)	-.0012 (-0.47)	.00

¹ Estimated model was Part. rate = $\alpha_0 + \alpha_1$ time, with time defined as t = 0 for 1980, t = 1 for 1981 ... and t = 9 for 1989.

² T-ratio in parentheses.

Table SC.3

Trips Per Household Called
By Year and Season*

Year	Total	Wave				
		March- April	May- June	July- August	September- October	November- December
1980	4.09	.67	.67	1.25	1.09	.41
1981	1.17	.18	.33	.28	.30	.08
1982	2.32	.22	.68	.65	.61	.16
1983	2.18	.11	.47	.63	.50	.47
1984	2.98	.59	.92	.48	.53	.36
1985	2.71	.71	.39	.54	.60	.47
1986	3.16	.19	.90	.84	.54	.69
1987	2.45	.25	.43	.74	.49	.54
1988	2.14	.18	.77	.39	.52	.28
1989	2.15	.25	.41	.86	.32	.31
Mean	2.55	.34	.60	.67	.55	.39

* Trips taken within state of residence.

Table SC.4

Percent of Fishing Trips in Various Modes by Wave
 Mean 1981-1988

Mode	Wave				
	March- April	May- June	July- August	September- October	November- December
Shore	38.5%	37.0%	37.8%	43.3%	31.2%
Party/Charter	9.2	6.5	5.3	6.3	4.3
Private/Rental	52.3	56.5	56.9	50.4	64.5

Table SC.5

Percent Fishing Trips in Various Waterbodies, by Wave
 Mean 1981-1988

Area	Wave				
	March- April	May- June	July- August	September- October	November- December
Ocean, Gulf, Open Bay	43.4	56.8	54.1	56.8	40.5
Sound	11.4	4.8	5.9	6.7	7.9
River	35.8	31.9	30.4	27.9	40.1
Enclosed Bay	3.7	4.8	7.9	7.0	7.4

Table SC.6

Characteristics of Day Trips in South Carolina, by Mode
(per trip averages)

Characteristic	Mode					
	Pier	Beach	Party	Charter	Rental	Private
Travel Cost	\$9.97	\$13.27	^b	\$28.00	^b	\$9.82
Costs for						
Bait	5.15	4.86	-	0	-	3.01
Tackle	1.28	1.85	-	0	-	3.33
Cleaning	1.07	.93	-	3.86	-	1.35
Fuel	-	-	-	-	-	10.30
Pier Fees	2.10	-	-	-	-	-
Boat Fees ^a	-	-	-	-	-	-
Travel Time (in minutes)	68.6	47.7	-	95.1	-	31.7
Distance (in miles)	59.0	39.4	-	102.6	-	21.6
Boat Time to first site (in minutes)	-	-	-	63.8	-	22.6
Number of Observations	49	26	2	15	3	289

^a Boat fees are charter and party fees or rental fees.

^b Not enough observations to estimate means reliably.

Table SC.7

Characteristics of Trips for Overnight Visits in South Carolina

Characteristic	Mean	Number of Applicable Observations
Travel Cost	\$1.99	100
Cost for		
Bait	5.32	105
Tackle	1.62	104
Cleaning	1.01	106
Fuel	11.86	48
Pier Fees	2.70	33
Boat Fees	-	17
Boat Rental	-	2
Travel Time (in minutes)	12.4	105
Distance (one-way) (in miles)	6.1	105
Boat Time (in minutes)	30.9	69
Trip Length (in days)	17.6	106

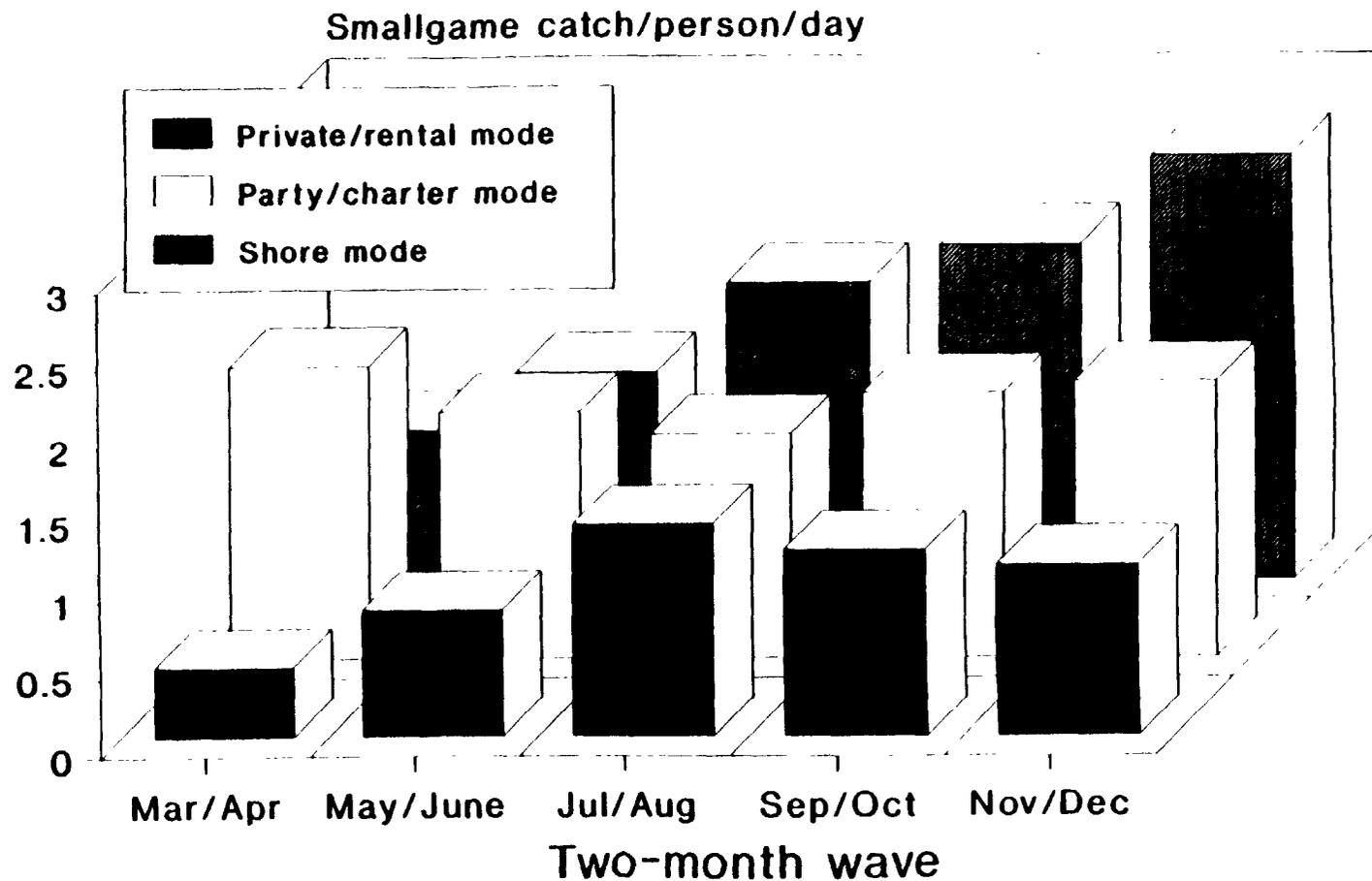
Table SC.8

Percent of Trips Seeking Different Species Groups, by Mode
for Day Trips

Species Group	Mode		
	Pier	Beach	Private
Big Game	25.0%	0%	15.6%
Small Game	18.8	53.3	59.6
Flatfish	37.5	26.7	14.8
Bottomfish	18.8	20.0	10.0

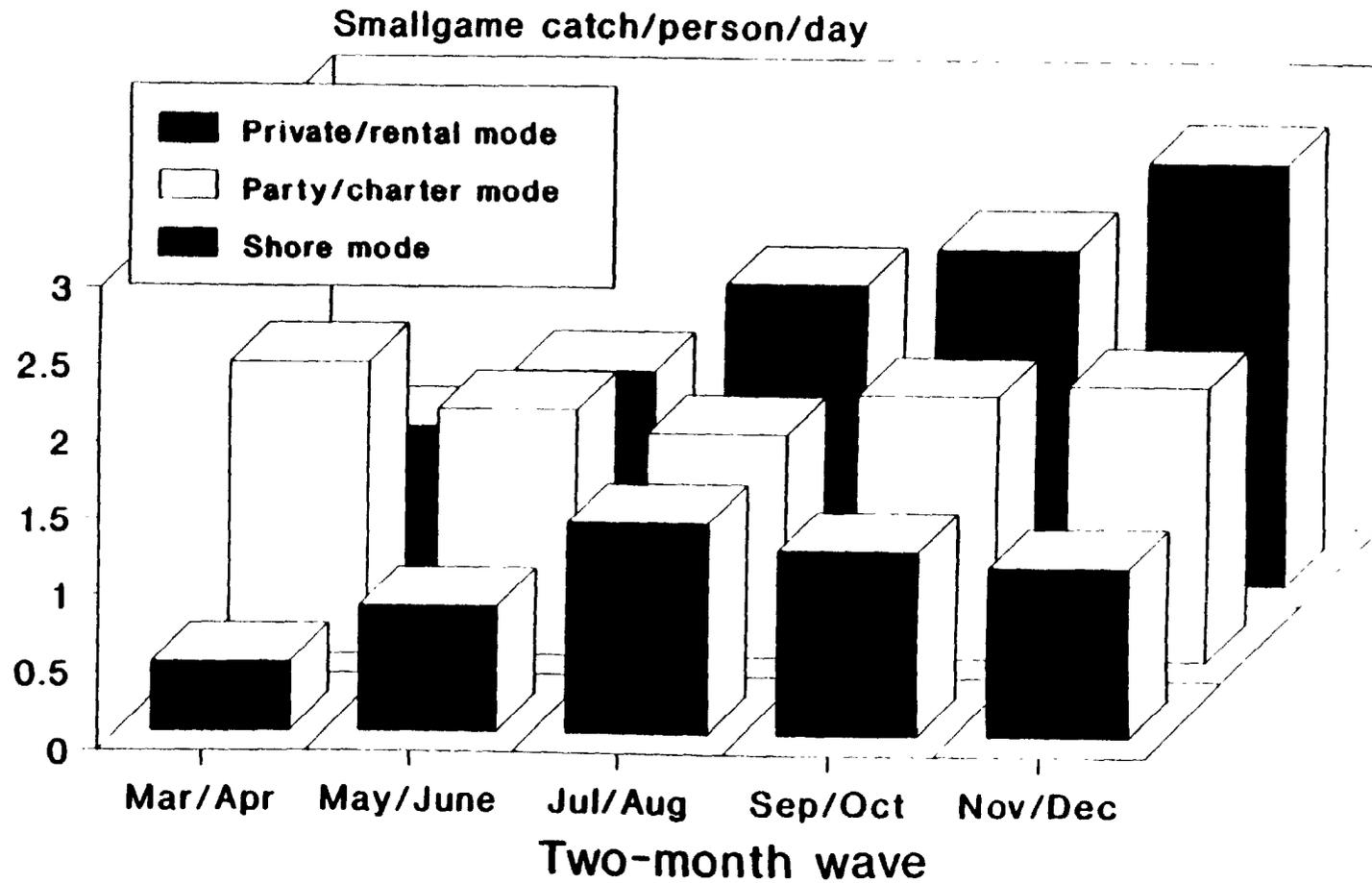
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**Fig SC1: Smallgame Catch per Day
South Carolina, By Year and Mode**



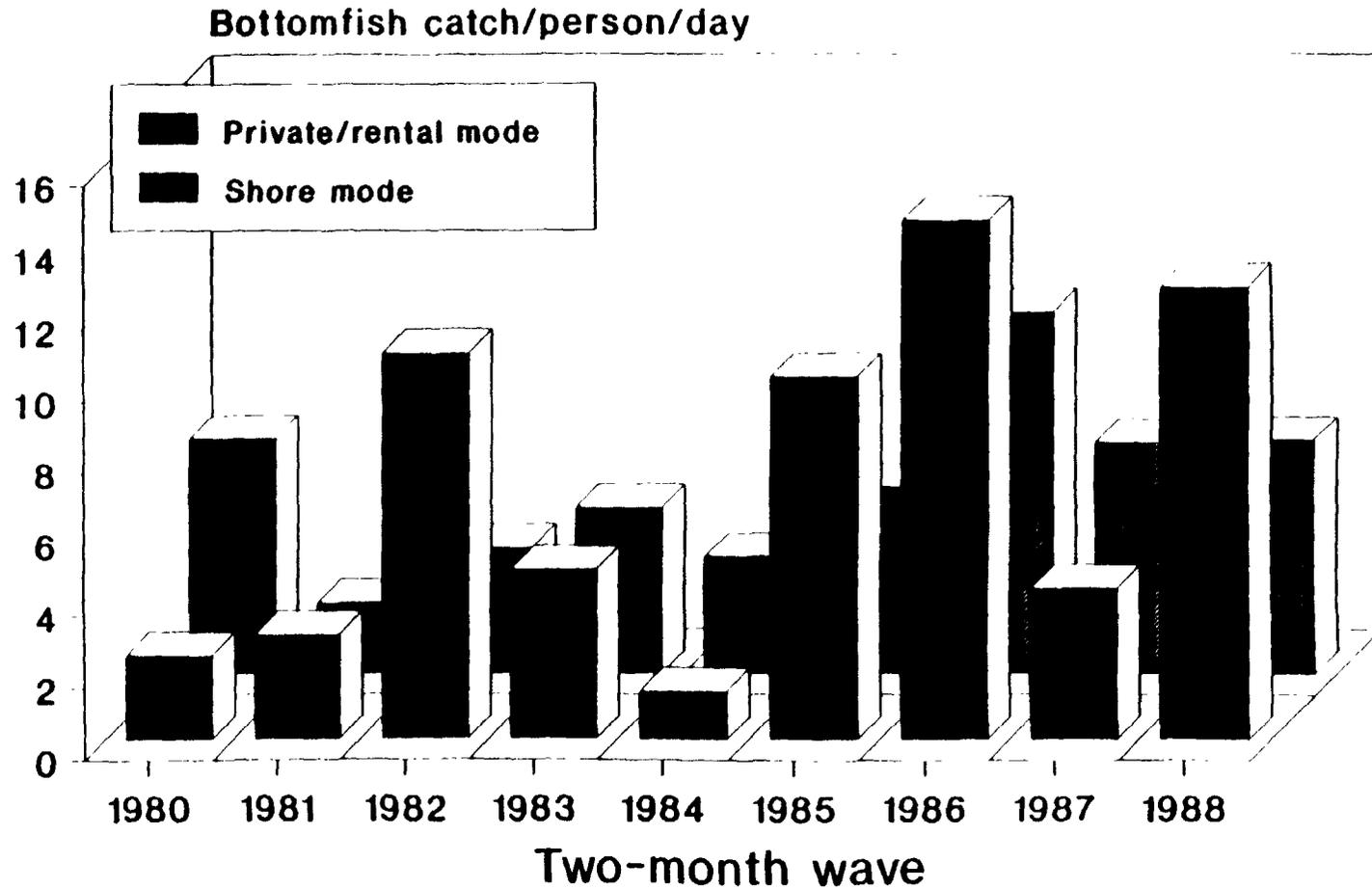
Average for anglers targeting smallgame,
1980-1988

**Fig. SC2: Smallgame Catch per Day
South Carolina, By Wave and Mode**



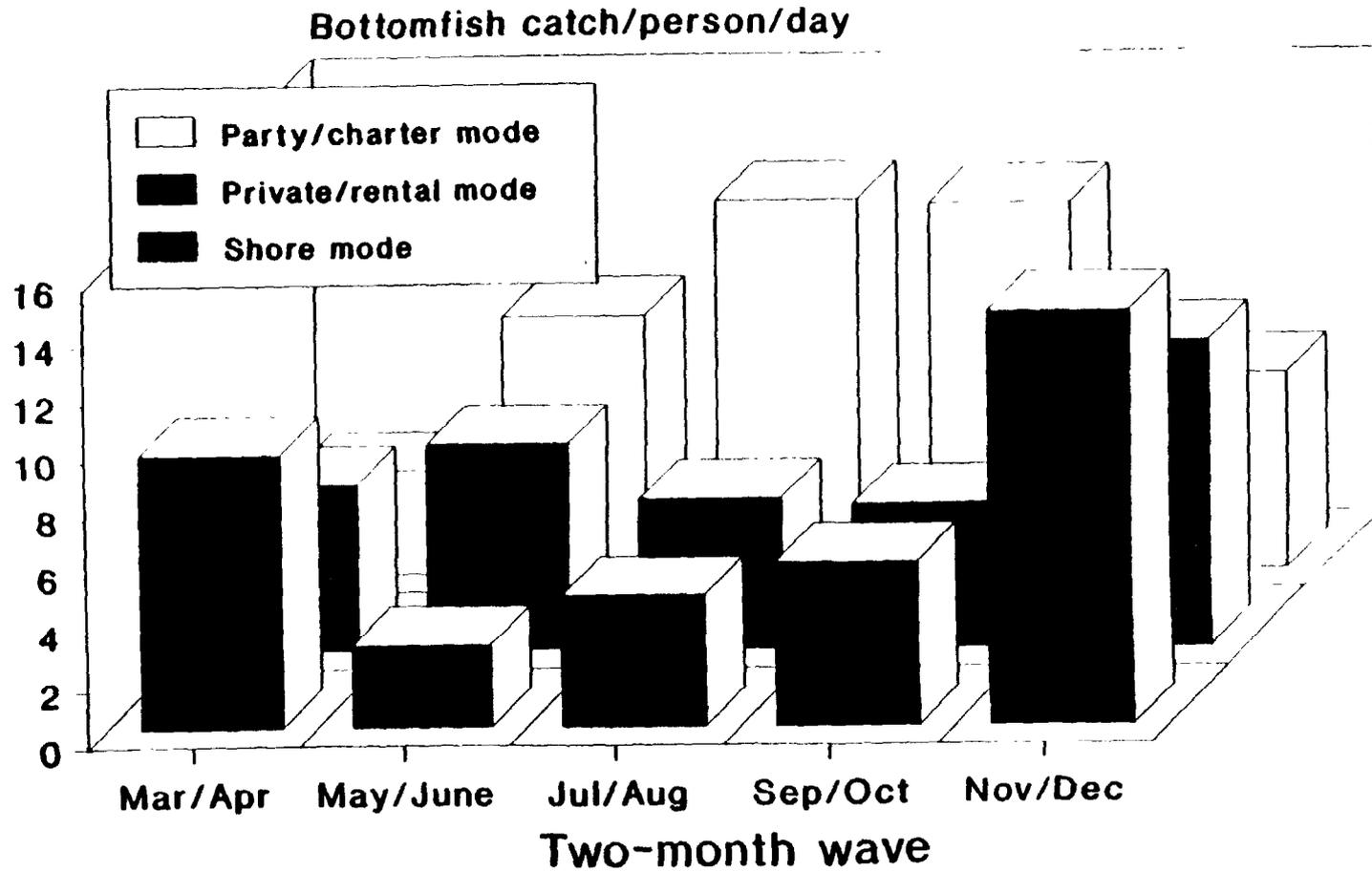
Average for anglers targeting smallgame,
1980-1988

**Fig. SC3: Bottomfish Catch per Day
South Carolina, By Wave and Mode**



Average for anglers targeting bottomfish
1980-1988

**Fig. SC4: Bottomfish Catch per Day
South Carolina, By Wave and Mode**



Average for anglers targeting bottomfish
1980-1988

Chapter 9

SPORTFISHING IN GEORGIA

Activity by Georgia Households

The pattern of marine recreational fishing in Georgia is dominated by the nature of the coastline and the distribution of population in the state. The coastline is dotted with small islands and river mouths, and lacks the long barrier islands of the states farther to the north. Except for Savannah, which has a population of about 70,000, major population centers are located well inland. The coastal population is predominantly rural. The mild climate affords fishing opportunities throughout the year.

The phone survey conducted in Georgia by the NMFS has two sample frames. For waves two and six, March-April and November-December waves, the sample frame includes counties within 25 miles of the coast or an estuary. The 1980 Census recorded about 133,300 households in this sample frame. For waves three through five, May-June, July-August, and September-October, the sample frame includes counties within 50 miles. According to the 1980 Census, there were 180,500 households in this sample frame. These represent 7 and 10 percent, respectively, of the state's population as of that census. Only about 20 to 30 percent of the sportfishing participants in Georgia marine waters have been non-coastal residents. The estimated proportion of participants who are coastal residents has varied dramatically, from a low of 33 percent in 1985 to a high of 67 percent in 1981. According to NMFS estimates, the proportion of participants coming from out-of-state has grown since the early 1980's and was especially high in 1985.

A far more stable proportion of marine sportfishing trips can be attributed to coastal county Georgia residents. Except for the low 1985 estimate of 60 percent, coastal county residents took between 70 and 80 percent of the sportfishing trips in Georgia marine waters. The proportion of trips attributable to out-of-state residents has increased over the decade from about 6 percent to 12 percent, but in 1985 this proportion jumped to 20 percent.

Sportfishing Activity: Household Participation Rates and Quantity of Fishing Trips by Season

Participation rates across seasons and years are reported in Table GA.1. The sample sizes range from a low of 98 households in wave six of 1980 to a high of 1576 households for wave four in 1988. The March-April and November-December waves are based on the sample frame that includes only households who live in the 25 mile counties. As is the case in other states, the March-April rate shows more variability than the rate for other waves. The rate varies from a low of 5.6 percent in 1985 to a high of 12.4 percent in 1981. The rates for wave six are higher on average than for wave two. The late fall weather is less unsettled and the water temperatures are higher than in the spring. Even in the fall, however, there is considerable variability as the rate goes from a low of 5.9 percent in 1983 to a high of 12.9 percent in 1986.

Table GA.1 shows both the variation across years for a given season and the variation across seasons. The means indicate the nature of the seasonal variation, but because waves two and six are based on a different population, these means can not be compared with those for waves three through five. Nonetheless, the interseasonal variation is small relative to more northern states. The mean of the lowest wave, 9.0 percent, is only about one percent smaller than the mean of the highest wave, 10.2 percent.

The linear trend analysis of participation rates (Table GA.2) is suggestive of the negative trend seen in the more northern states. All of the estimated trend coefficients are negative with only the March/April period statistically significant. For that wave, the estimated loss in participation rates over the decade is nearly 5 percentage points. In each of the other waves, the estimated loss is less.

The participation rates tell about the distribution of fishing activity among households, not about the amount of fishing activity. We typically measure the magnitude of fishing activity by the quantity of trips. One method of estimating the quantity of trips for the sample frame is to multiply the number of trips per household called by the number of households in the frame. Table GA.3 gives the mean number of trips per household called in the coastal county by wave and year. Another way of describing these means is that they embody the number of trips per household, conditional on fishing, and the fishing participation rate, as given in Table GA.1.

The seasonal variation in trips per household is slight. Consider the mean trips per wave as a proportion of the mean annual trips.

	<u>Mean Trips</u>	<u>Percent of Annual Mean</u>
March-April	.52	20.9
May-June	.56	22.5
July-August	.48	19.3
September-October	.48	19.3
November-December	.45	18.1

These figures suggest behavior remarkably lacking in seasonality. If there were no seasonality each wave would encompass 20 percent of the annual trips. The absence of seasonality also

appears when comparing the annual variation for a wave with the seasonal variation among waves. It appears that there is more variation within season over years than across seasons. These figures are a bit misleading, however, because the March-April and November-December samples include only 25 mile counties. Presumably households in those counties would take more trips on average than households in the 50 mile counties, raising the percent of the annual mean. That is, if only the 25 mile counties were considered for all waves, more seasonality would be apparent.

Table GA.3 shows no striking trends in the trips data. The pattern that does emerge on close inspection is similar to that seen in the participation rates. Annual trips per coastal county household peak in 1983. This is followed by a decline to a decade low and subsequent recovery by 1986 and a decline to a decade low in 1988. Annual variability within wave exceeds variability across waves. As an illustration, the March-April wave exhibits both the highest trips per household (1.24 in 1983) and the lowest (.16 in 1985). There is less variability over time for other waves, but it still exceeds the variability across waves in any one year.

Sportfishing Activity by Mode

The proportion of fishing trips in various modes are given in Table GA.4. These proportions are means over the nine year period of the sample. The 35.6 percent figure for March-April shore fishing means that of the fishing trips in March-April, 35.6 percent are shore fishing trips. Although shore fishing is typically the cheapest and most accessible mode, it is not the most popular. In all waves, private boat fishing is the most popular mode in Georgia marine waters. The relative lack of seasonality is apparent from the private/rental boat participation rate

which remains relatively constant across the year. The proportion of fishing households who use the party/charter mode is rather small, varying from 6.4 percent to a low of 3.7 percent in November-December.

The magnitude of fishing by wave and mode illustrates both the behavior of the anglers and the impact of their fishing. The best measure of magnitude typically available is the quantity of trips. To estimate the aggregate quantity of trips, we use the Census information on the number of households in coastal counties. In 1980, the Census total was 133,300 households in the 25 mile counties and 180,500 households in the 50 mile counties. From Table GA.3, trips per household called in March-April averaged .52, implying an estimated 69,316 trips by 25 mile coastal county residents in this wave. From Table GA.4, 60.4 percent or 41,867 are attributable to the private/rental boat mode. The estimated number of trips by 50 mile coastal county residents in July-August equals the number of eligible households (180,500) times trips per household (.48) or 86,640. From Table GA.4, 62.7 or 54,323 would be attributable to the private/rental boat mode. Almost all of the increase in coastal county boat trips from March-April to July-August can be explained simply by the a larger eligible population.

Because the sample frame varies between the middle three waves and the early spring and late fall waves, the extremes of seasonal variation cannot be examined. Comparisons are legitimate only among the middle three waves. And there is little seasonality from May through October. The aggregate estimated trips by coastal county residents vary from 101,080 in May-June to 86,640 in July-August and September-October. These estimates of aggregate trips show remarkably little seasonal variation.

Sportfishing Activity by Waterbody

On the NMFS telephone survey, there are four types of waterbodies: ocean, gulf and open bay; sound, river; and enclosed bay. Table GA.6 gives the distribution of fishing trips among these four modes. These percents are means for the nine year sample period. There is naturally some ambiguity among these waterbody types, especially in distinguishing among sounds, open bays and enclosed bays. But keeping this in mind, we can gain a limited sense of where fishing trips are directed. The proportion of fishing trips in rivers is the most remarkable figure from Table GA.6. Ranging from 60.7 percent in March-April to 33.2 percent in May-June, this proportion is quite a bit higher than for other states in the study. In fact, for most of the year, the proportion of fishing in rivers exceeds the proportion in the ocean, gulf, open bay. The two together account for almost 80 percent of the trips throughout the year.

When combined with aggregate trip information, Table GA.5 can provide estimates of the quantity of trips by wave and area. For example, from the previous section there were an estimated 71,982 trips in March-April by 25 mile coastal county residents. Table GA.5 shows that 60.7 percent of these trips or 43,693 would be river trips. Because trips per household called decline slightly from May-June to September-October, the slightly rising proportion of river trips implies roughly constant aggregate river trips by the households in the 50 mile coastal counties.

Catch Rates in Georgia Marine Waters

Georgia has a rather unique coast line, which dictates the nature of its sportfishing. A continuous stream of small coastal islands begin at its southern border with Florida and extend into the Carolinas. The extensive wetlands which result from the barrier/reef/back-bay environment greatly restricts entry for non-boating fishermen. Boat launching ramps are available and used almost exclusively by local participants. Fishermen seldom venture into the ocean but instead fish in the rivers of the back-bay.

There is not a substantial amount of data on Georgia fishing, probably due to the relatively small coastline, lack of defined entry points and lack of targeting by the Georgia fishermen, especially in the latter half of the decade. In the years from 1985-1988, two-thirds of the intercepted anglers were not targeting their fishing. This was a substantial increase from the first half of the decade, during which only 25 percent were not seeking a designated species. Concurrently there was a shift away from targeting smallgame in particular. In the pre-1985 period, over 50 percent of the anglers were targeting smallgame. This proportion fell to 25 percent for the subsequent years. The only other significant target group is bottomfish and the percentage of anglers targeting them dropped from 17 percent to 7%.

Smallgame Catch Rates

The most popular targeted smallgame species in Georgia is the spotted sea-trout or “specks” as they are called by the locals. Over 60% of the anglers targeting smallgame named spotted sea-trout as their target. The other top choices were red drum (23% of pre-1985 anglers and 29% of 1985-1988 anglers) and king mackerel (11% pre-1985 anglers and 4% of 1985-1988 anglers).

anglers), The changing preference away from mackerel may be due to declining availability of the king mackerel.

The aggregate catch rate of small game has not exhibited a clearly defined trend during the decade (Fig. GA1). As with most states, the catch rate of private boat fishermen is greater than that of shore fishermen. However, there is no apparent correlation over time between the two, suggesting much 'noise' in the data. Perhaps private and shore fishermen are targeting different species or different age-classes of the same species.

Figure GA2 lends some credence to this hypothesis. Catch per day for shore fishermen peaks in the March through August period whereas the private boat anglers experience their greatest catches during the July through December period.

Bottomfish Catch Rates

In the early eighties, the primary bottomfish species targeted by Georgia anglers were sheepshead (28%), southern kingfish (24%). Atlantic croaker (10%), spot (8%) and black sea bass (8%). Most of these species were still targeted in the period 1985-1988 although their relative importance changed. The most popular species was the southern kingfish (39%). sheepshead (16%), striped mullet (13%), black sea bass (9%), and the Atlantic croaker (7%). The percent targeting spot had fallen to 3%.

Because the data are rather sketchy, it is hard to discern any pattern in the yearly catch rates over the decade. The 1980-1981 period had so few observations that these years were not include in Figure GA3. The only consistent trend observable is an improvement in harvests from about 1984 onward. This trend is clear for the shore fishermen and, in the absence of the anomalous 1985 year, it is also true for the private boat mode.

Seasonal catch rates enjoyed by private boat and shore anglers are quite similar (Fig. GA4). The poorest harvests per day occur in the May through August period and the colder months appear to yield the best creel. For the shore fishermen, the September through December period is best. The September/October and March/April catch rates are the highest for the private boat mode.

Characteristics of Fishing Trips in Georgia

To gain insight into the nature of fishing trips, we turn to the UMCP survey. This survey obtained not only the origin and destination of fishing trips by known anglers, but important economic characteristics of the trips. Table GA.6 summarizes some of these characteristics for single day fishing trips taken in Georgia. These characteristics are by mode and pertain to fishing in 1988. The bottom row of this table shows the number of trips in each mode. The travel costs are similar across mode, with the pier travel costs being slightly higher. There are 15 fishing piers in the coastal counties of Georgia. But many of the trips reported on the UMCP survey must have been on docks or other structures, and not fee-fishing on piers because the mean pier fee is very low. The mean costs for the fishing services are roughly comparable with other states and across modes. Bait costs are high for the charter mode, suggesting that this component is not part of the contracted charter price. Most observations pertain to private boat fishing. The travel costs, distance and time for this mode are typically smaller than for other modes because many people trailer their boats, and plan to travel smaller distances. For both the charter and private boat modes, the boat time to the first fishing site is low relative to other states. Since much fishing takes place in rivers, preferred fishing sites are evidently located close to ramps.

Table GA.7 pertains to trips which are taken by households who are on overnight visits to the Georgia coastal area. These visits may be taken for many reasons--vacation, business or simply travelling through. The modes are aggregated because there are not enough observations to estimate means separately by mode. These means are consistent with the costs for single day trips and the travel costs are about the same. This is different from many states, where the travel costs for trips associated with overnight visits are less, because people stay close to where they will fish. In Georgia apparently, residents and visitors travel about the same distance. While it is speculative, both groups probably travel from Savannah to fishing areas. The costs of fishing services are also comparable to the single day trip costs. Fuel is about \$11 for both types of trips.

Table GA.8 gives the distribution of trips targeted towards the four major species groups by mode. These figures are only robust for pier and private boat modes. There are too few observations for the beach, party, and charter modes to be confident about the percents. Flatfish are important for piers and artificial structures, but not for private boats.

Table GA. 1
Two-Month Participation Rates*
by Wave and Year

Year	Wave				
	March- April	May- June	July- August	September- October	November- December
1980	12.2%	11.9%	10.1%	10.4%	13.1%
1981	12.4	12.7	14.4	12.5	8.6
1982	10.0	12.2	7.5	12.1	11.9
1983	8.1	6.1	11.7	8.9	5.9
1984	8.8	5.2	13.0	7.2	7.3
1985	5.6	8.4	6.0	9.4	10.6
1986	10.6	11.0	10.6	13.0	12.9
1987	6.9	8.9	13.4	9.3	10.6
1988	7.6	7.7	7.5	8.2	7.2
1989	8.3	9.2	7.8	8.2	9.2
Mean	9.0%	9.3%	10.2%	9.9%	9.7%

* Percent of Georgia coastal county households called who fished in Georgia marine waters in the designated two months.

Table GA.2
 Linear Trend Analysis¹ of Georgia Participation Rates,
 By Wave, 1980-1989.

Wave	Constant	Linear Trend Coefficient	\bar{R}^2
March/April	.112 (10.75)	-.0048 (-2.48)	.36
May/June	.109 (7.42)	-.0035 (-1.27)	.06
July/August	.116 (6.72)	-.0030 (-.94)	.00
September/October	.113 (10.11)	-.0030 (-1.44)	.10
November/December	.104 (6.86)	-.0016 (-0.58)	.00

¹ Estimated model was Part. rate = $\alpha_0 + \alpha_1$ time. with time defined as t = 0 1980, t = 1 for 1981... and t = 9 for 1989.

² T-ratio in parentheses.

Table GA.3
Trips Per Household Called
By Year and Season*

Year	Total	Wave				
		March- April	May- June	July- August	September- October	November- December
1980	2.00	.33	.65	.25	.46	.31
1981	2.16	.56	.40	.41	.30	.49
1982	2.79	.83	.47	.49	.48	.52
1983	2.87	1.24	.58	.40	.48	.17
1984	2.41	.49	.64	.56	.35	.37
1985	2.07	.16	.33	.40	.62	.56
1986	3.33	.50	.67	.59	.80	.77
1987	2.98	.27	.80	.80	.61	.50
1988	1.91	.77	.53	.42	.41	.28
1989	2.42	.55	.54	.47	.32	.54
Mean	2.65	.52	.56	.48	.48	.45

* Trips taken within state of residence.

Table GA.5

Percent Fishing Trips in Various Areas, by Wave
 Mean 1980-1988

Area	Wave				
	March- April	May- June	July- August	September- October	November- December
Ocean, Gulf, Open Bay	22.6%	36.7%	38.9%	26.6%	27.1%
Sound	11.9	27.7	17.4	18.1	18.1
River	60.7	33.2	38.7	48.5	50.6
Enclosed Bay	3.5	0.0	4.5	2.8	2.5

Table GA.6
 Characteristics of Day Trips in Georgia, by Mode
 (per trip averages)

Characteristic	Mode					
	Pier	Beach	Party	Charter	Rental	Private
Travel Cost	\$10.06	\$7.55	^b	\$7.59	^c	\$6.29
Costs for						
Bait	4.52	2.30	-	8.72	-	5.49
Tackle	1.51	4.43	-	0	-	2.34
Cleaning	1.67	2.04	-	0	-	1.09
Fuel	-	-	-	-	-	10.96
Pier Fees	.07	-	-	-	-	-
Boat Fees ^a	-	-	-	112.72	-	-
Travel Time (in minutes)	59.9	46.6	-	42.7	-	26.6
Distance (in miles)	46.0	36.4	-	28.6	-	16.3
Boat Time to first site (in minutes)	-	-	-	15.0	-	23.6
Number of Observations	64	12	-	8	-	220

^a Boat fees are charter and party fees or rental fees.

^b Not enough observations in this mode to estimate means reliably.

^c No observations for this mode.

Table GA.7

Characteristics of Trips for Overnight Visits in Georgia

Characteristic	Mean	Number of Applicable Observations
Travel Cost	\$7.52	51
Cost for		
Bait	4.11	51
Tackle	1.29	50
Cleaning	1.35	51
Fuel	11.02	33
Pier Fees	.17	10
Boat Fees	89.06	12
Boat Rental ^a	^a	^a
Travel Time (in minutes)	15.7	50
Distance (one-way) (in miles)	7.2	51
Boat Time (in minutes)	23.4	37
Trip Length (in days)	10.1	51

Table GA.8

Percent of Trips Seeking Different Species Groups, by Mode
for Day Trips

Species Group	Mode					
	Pier	Beach	Party	Charter	Rental	Private
Big Game	3.9%	0	0.1%	40.0%	NA	7.9
Small Game	50.0	66.7	100.0	20.0	NA	72.7
Flatfish	30.8	0.0	0.0	40.0	NA	4.2
Bottomfish	15.4	33.3	0.0	0.0	NA	14.6