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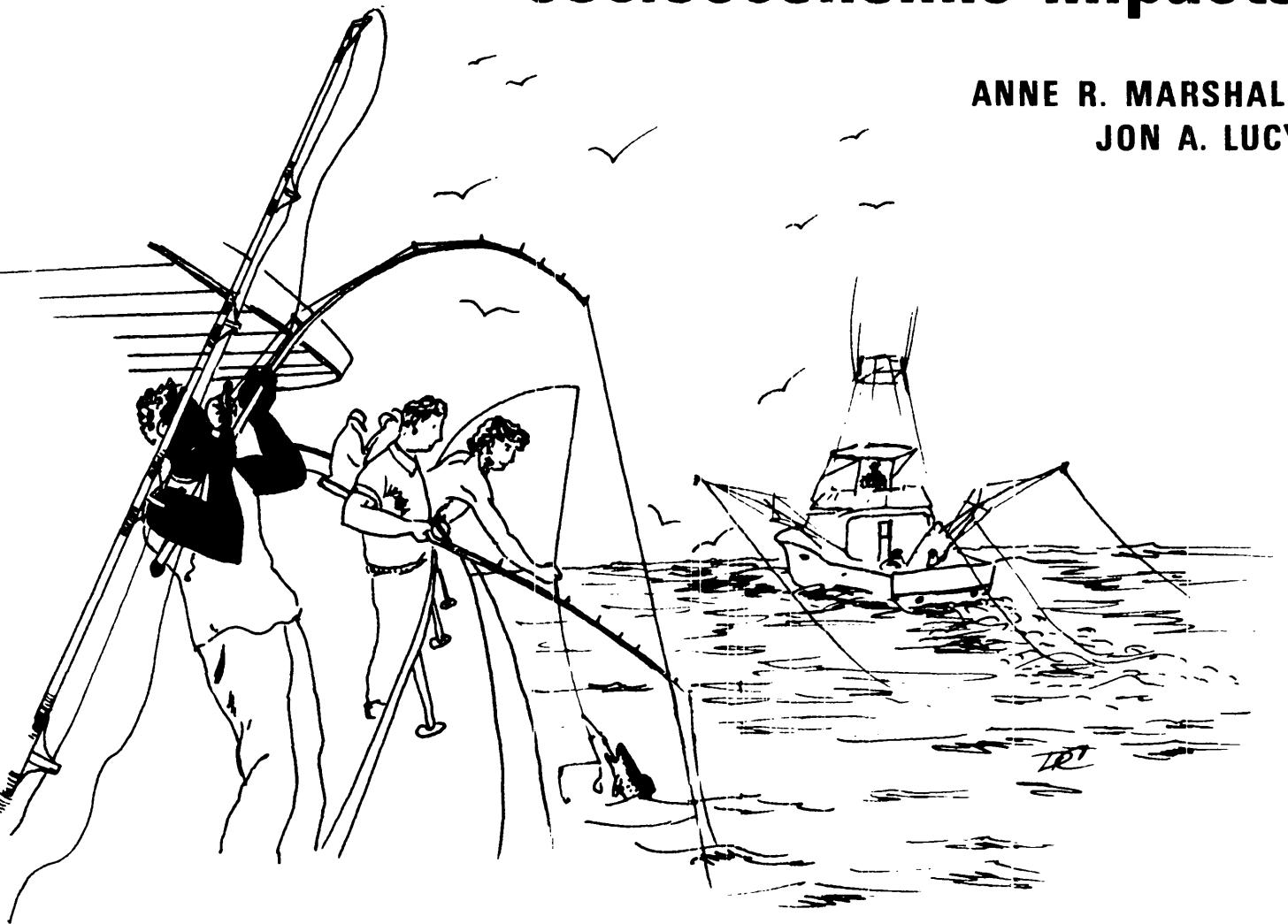
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VIRGINIA'S CHARTER AND HEAD BOAT FISHERY

analysis of catch and socioeconomic impacts

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SPECIAL REPORT IN APPLIED MARINE SCIENCE AND OCEAN ENGINEERING NO. 253
Virginia Sea Grant Program, Virginia Institute of Marine Science,
College of William and Mary, Gloucester Point, VA 23062

VIRGINIA'S CHARTER AND HEAD BOAT FISHERY:
ANALYSIS OF CATCH AND SOCIOECONOMIC IMPACTS

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ABSTRACT

A comprehensive foundation of integrated socioeconomic and catch and effort data was established on Virginia's charter and head boat fishing industry. Data was collected using a questionnaire interview technique with a stratified random sample of boat captains fishing in Chesapeake Bay and ocean waters. In addition, a catch and effort survey of the charter fishery based in the Northern Neck area was made using voluntarily recorded daily logs during the 1979 season.

During 1978 approximately 24 head boats were operating from May to October out of ports in three of the four analytical regions. The greatest concentration of head boats occurred in the Virginia Beach/Norfolk region. Three types of head boat operations were distinguished by a full- and/or half-day trip schedule. Average vessel length was 49 feet and average vessel age was 18 years. Regionally, average annual gross revenues per boat ranged from \$7,767 to \$54,446. Head boats in Virginia Beach incurred the highest costs but had the highest average net revenues and returns to management. Approximately 39,339 half-day and 25,820 full-day angler-trips were made on head boats in 1978. Bottom-fish comprised 87% of the head boat catch by weight with spot, Atlantic croaker, black sea bass, and weakfish making up the majority of the landings. Bluefish were of secondary importance. Based on landings reported by the head boats surveyed, the estimated total catch of head boat anglers equalled approximately 808,000 lbs. in 1978.

Approximately 110 charter boats were operating during 1978 from April to October in all four analytical regions. Businesses operated on either a full- or part-time basis. Average vessel length was 38 feet and average vessel age was 15 years, but a great diversity of vessels was used for charter fishing. For full-time businesses, average annual gross revenues ranged from \$6,374 to \$27,438 by region. Full-time businesses in Virginia Beach/Norfolk and on the Eastern Shore had the highest average net revenues and returns to management. Gross revenues gained by part-time businesses in all regions were generally only enough to cover fixed costs. An estimated 1,167 half-day and 39,657 full-day angler-trips were made on charter boats in 1978. Primary target species varied by region, but overall the species composition of the total catch was: bluefish-53%, bottom fish-32%, bluefin tuna-12%, white marlin and other offshore pelagic species-3%. Based on landings reported by the charter boats surveyed, the estimated total catch of charter anglers was approximately 1,661,000 lbs. in 1978.

Catch and effort data were returned from 626 charter trips during the Northern Neck survey. Bluefish and bottom-fish were the target species on 87% and 13% of the trips, respectively. Catch rates were higher on bluefish trips than on bottom-fish trips. The highest average monthly catch rate occurred in July with 86.5 fish per bluefish trip, or 2.6 fish per person per hour. The estimated total catch of the fishery from May to October 1979 was 102,540 fish, of which bluefish comprised 89%, weakfish-7%, spot-2%, and Atlantic croaker-1%.

Head boat and charter boat businesses generated an estimated \$2.3 million and \$4.7 million, respectively, in direct and indirect expenditures during 1978. Economic factors may regulate future growth of the fishery more than fishing success. This service industry is dependent on interactions of fish availability and customer demand; management strategies should be designed with this perspective.

INTRODUCTION

Recent growth in the Nation's sport fisheries has prompted much concern and interest in the biological and economic impacts of recreational angling activities. The Fishery Conservation and Management Act of 1976 requires that recreational fisheries be integrated into national policies of fisheries management. Determination of the sport fishing harvest and evaluation of the associated economic impacts are essential for sound and equitable management of fish stocks utilized both commercially and recreationally.

Charter and head boats¹ occupy a special position in recreational fisheries. Although availability of particular fish stocks creates the business potential, a market of fishermen willing to pay for the experience is necessary for success. Due to the commercial basis of this fishery and the large number of participants, its contributions to coastal economies and use of marine resources needed to be substantiated.

This study was designed to characterize the owners or captains, business and economic structure, vessels and equipment, fishing effort and catch, and factors affecting the future of the charter and head

¹ charter boat - fishing vessel for hire at a set rate per trip,
usually carries 6 fishermen or less
head boat - fishing vessel that charges trip fees on a per person
("head") basis, carries more than 6 fishermen

boat industry. An additional catch and effort survey was made of one group of charter boats operating out of ports in the lower Potomac River. The analysis of this data provides a comprehensive interpretation of the industry that is valuable to fisheries managers and other coastal resource managers. The study also furnishes the industry with a documentation of its nature and significance.

METHODS

Data on the charter and head boat industry was collected by personally interviewing randomly selected boat captains with a structured questionnaire. The first task in creating a sampling regime was to identify the captains or boats in operation and their location. This information was obtained from a brochure on sport fishing in Virginia published by the Virginia State Travel Service (1978), membership lists from three industry associations (Northern Neck Charter Boat Association, Tidewater Charter Boat Association, and Kings Creek Charter Boat Association) and from contacts at marinas where groups of charter and head boats docked. Boats that operated temporarily in Virginia waters and had home ports in other states were not included in the sampling population.

Due to the well-known diversity of fishing environments in Virginia and to the differences in regional locations of charter and head boats (i.e. rural vs. metropolitan) the total boat population was stratified into regional groups. The five sampling regions were: 1) Rudee Inlet (Virginia Beach, oceanside) 2) Virginia Beach and Norfolk Chesapeake Bay ports (Lynnhaven, Little Creek, and Oceanview) 3) Lower

Peninsula (Hampton) and York River ports 4) Rappahannock and Potomac River ports and 5) Eastern Shore ports. From each of these groups a random sample was drawn of 75% of the operating captains.

Interviewing began in January 1979 and was terminated in September of the same year.

For analysis, the five sampling regions were modified into four analytical groups. Businesses in sampling region 1 (Rudee Inlet) were combined with those in region 2 (Virginia Beach/Norfolk Chesapeake Bay ports) to insure the confidentiality of head boat businesses. Results are thus reported by analytical regions, which are: Region I - Virginia Beach/Norfolk, Region II - Hampton/York River, Region III - Rappahannock/Potomac, Region IV - Eastern Shore. Head boats were analyzed separately from charter boats.

For the second phase of the study, the Northern Neck Charter Boat Association¹ agreed to cooperate in a survey of their activities during the 1979 fishing season. All captains in the Association were provided with log sheets and were asked to record each trip's catch (number and weight) and effort (number of fishermen and number of hours fished). The information reported was compiled by month, type of trip, and by species. Data was expanded to estimate the total catch of the fishery.

¹ The Northern Neck is the area of land between the Potomac and Rappahannock rivers; the organization is currently known as the Smith Point Charter Boat Association.

During the 1979 season, three trips were made on three Northern Neck charter boats, courtesy of the captains, to directly sample a trip's catch. All fish caught were weighed and measured (fork-length). This trip data provided a comparison for the data reported in captains' logs.

RESULTS

HEAD BOAT OPERATIONS

Population and Location

Sixteen head boat businesses were surveyed in all regions except the Eastern Shore (Region IV). There are currently (1980) reports of two head boats operating at Eastern Shore locations. Home ports of the head boats sampled are shown in Figure 1. Approximately 24 head boats were operating in Virginia during 1978.

Captains

The average age of head boat captains surveyed was 48 years, with ages ranging from 22 to 66 years. Operators had been in the business for an average of 23 years and had been licensed captains for approximately 19 years. Many had previous experience operating other sport fishing vessels.

Since head boat fishing in Virginia is seasonal, most captains required an alternate source of income; 69% had other jobs and 25% were supplemented by retirement income. Of those with other occupations, 53% were employed in marine trades, such as commercial

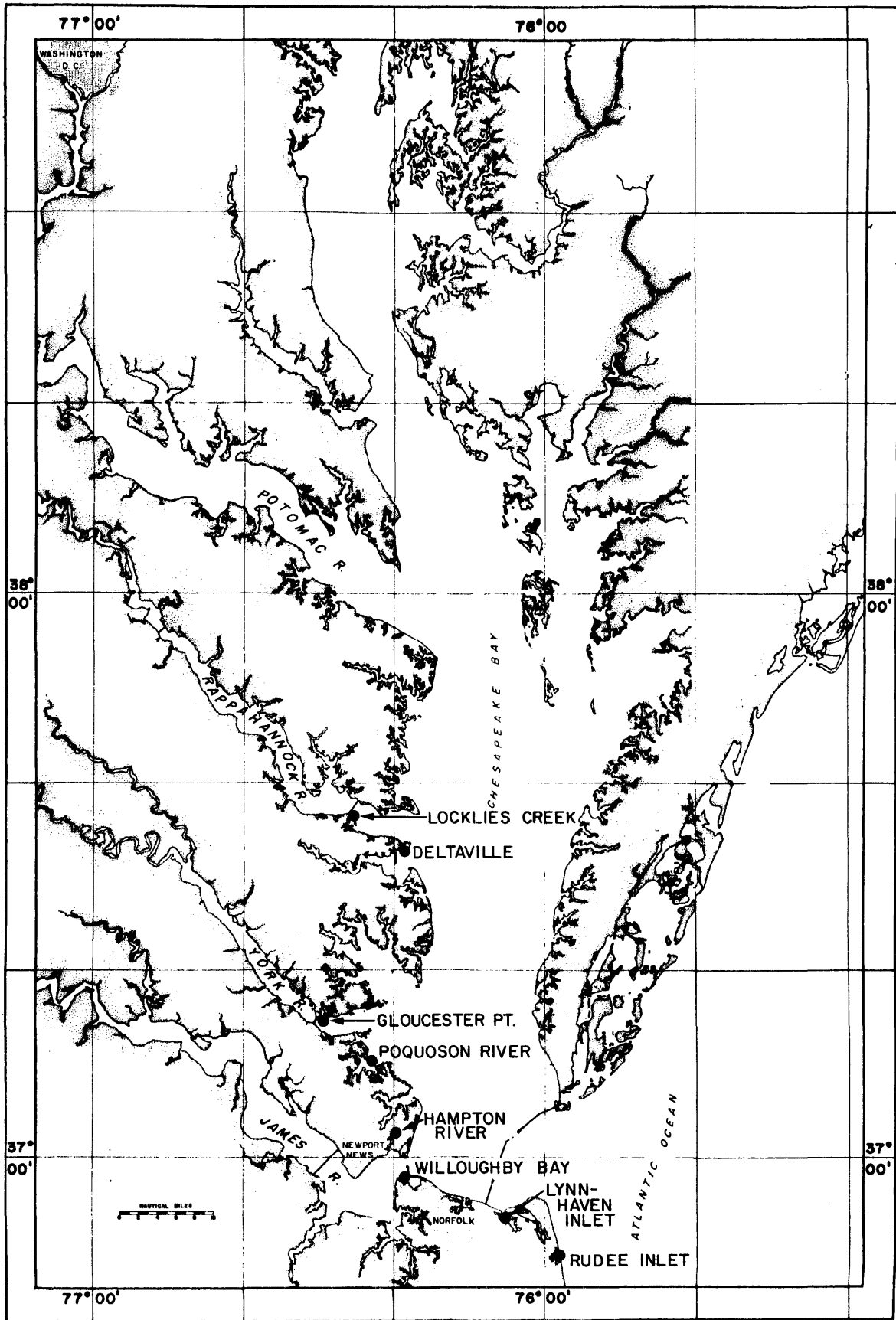


Figure 1. Locations of head boats in sample population - 1978

fishing, marinas, boat-building and shipping. The most frequently stated reason, or motivation, for getting into the head boat business was for the enjoyment of fishing. However, regional differences in motivation were apparent. A majority of Virginia Beach/Norfolk (Region I) captains had other reasons for running a head boat such as, "growing up in it," or as a compatible alternative to commercial fishing. Many captains in the Chesapeake Bay were in business for a source of income.

Business Structure

The majority (53%) of head boat businesses were individual proprietorships, 20% were partnerships and 27% were corporations; 75% of the head boat corporations were located in Virginia Beach and Norfolk (Region I). Owner-operations were predominate (75%), and Region I was the only area where boats run by hired captains (40%) were sampled. The operating season for head boats in Virginia is generally from April or May until September or October, and may be extended on either end depending on the weather. Customer demand however is greatest from late May through September.

Effort data revealed three types of head boat operations: 1) those specializing in half-day (3-4 hour) trips (31%), 2) those taking mainly full-day trips (50%), and 3) those running both full- and half-day trips (19%). Region III (Rappahannock/Potomac) head boats reported only a full-day trip structure, but Regions I (Virginia Beach/Norfolk) and II (Hampton/York R.) had a mix of all three types of operations.

Half-day rates in 1978 ranged from \$6.00 to \$10.50 per person in Region I, and from \$7.00 to \$10.00 in Region II. Full-day rates ranged from \$12.00 to \$18.50 per person in Region I, from \$12.00 to \$20.00 in Region II, and from \$10.00 to \$12.00 in Region III. Some head boats in Region I also offered a charter rate for full-day fishing trips to anglers' clubs or other organizations wanting to reserve the boat. Most head boat operators felt that "word-of-mouth" advertising by satisfied fishermen had been the most effective method of attracting customers.

All boats surveyed in Regions I and II had 1-3 mates (depending on the number of passengers) or bait-persons on board. Sixty percent of these employees received a wage per trip plus tips, while others worked only for tips. Head boats surveyed in Region III did not employ mates.

Vessels and Equipment

Vessel characteristics of head boats often had a wide range of values (Table 1). Newer and larger vessels with a greater cruising range typify the head boats in Region I. For Chesapeake Bay fishing, Region III vessels were smaller, had the lowest fuel capacity, and were powered by gasoline engines. All head boats sampled were wooden hulled vessels.

Electronic equipment used most frequently on head boats were VHF radios, C.B. radios, and depth-finders or fish-finders. The only boats with Loran sets were located in Region I. Region III vessels

TABLE 1

Head boat vessel characteristics by region
[mean (range) or percentage]

| Vessel Characteristics | Region | | | |
|----------------------------|--------------------------|-------------------|--------------------|-----------------------|
| | I (n=10) | II (n=3) | III (n=3) | ALL (n=16) |
| Length (ft.) | 50 (40 - 65) | 53.3 (40 - 64) | 41.3 (40 - 43) | 49.0 (40 - 65) |
| Draft (ft.) | 3.6 (3 - 4) | 4.0 (2.5 - 5) | 3.0 (2.5 - 3.5) | 3.6 (2.5 - 5) |
| Displacement (net tons) | 16.5 (11 - 28) | * | 8.3 (7 - 10) | 14.3 (7 - 28) |
| Fuel capacity (gal.) | 350 (100 - 1000) | 183 (70 - 240) | 50 (45 - 52) | 262 (45 - 1000) |
| Cruising range (miles) | 219 (100 - 500) | * | 54 (33 - 75) | 177 (33 - 500) |
| Vessel age (yrs.) | 15.4 (6 - 44) | 25.0 (5 - 50) | 17.0 (3 - 28) | 17.5 (3 - 50) |
| Engine type | 100% diesel ¹ | 100% diesel | 100% gas | 81% diesel 19% gas |
| Engine age (yrs.) | 11.1 (3 - 25) | 13.3 (3 - 32) | 6.3 (5 - 7) | 10.6 (3 - 32) |

¹single or twin diesel engines

* missing values

carried the least electronic equipment. Depth finders, or fish finders, ranked first in importance of equipment used to locate an area to fish. However, many captains relied heavily on their own experience for locating fish rather than electronics. Use of radios for sharing information on fishing sites was also indicated as important.

Economic Analysis

The economic analyses presented in Table 2 should be interpreted as relative representations of the financial nature of head boat operations within a region. These breakdowns of average annual costs and returns do not represent an actual vessel's financial profile, since all costs are not incurred by all businesses. Within Region I, significant economic differences were found between two groups of head boats; those operating out of Virginia Beach ports (Rudee Inlet and Lynnhaven Inlet), and those from the Norfolk port (Oceanview). Thus, values of the economic variables are presented separately for the two groups in Table 2.

The greatest average total operating costs (\$24,718) were computed for Virginia Beach head boats; both total fixed costs (\$7,278) and total variable costs (\$17,440) were highest for these boats. Annual fuel and oil expenses formed the greatest proportion of variable costs for head boats in Regions II and III, followed by yearly repair and maintenance costs. The largest annual fixed costs were insurance payments and hull depreciation.

TABLE 2

Economic analysis of head boat businesses -
annual costs and returns (1978)

| | Average values per boat per year | |
|---|----------------------------------|---------------|
| | Region I | |
| | Virginia Beach (n=7) | Norfolk (n=3) |
| Gross Revenue | \$54,446 | 13,152 |
| Expenses: | | |
| <u>Variable Costs</u> | | |
| crew wages | 3,311 | 0 |
| fuel and oil | 4,241 | 813 |
| bait | 3,414 | 0 |
| ice | 614 | 0 |
| repair & maintenance | 2,258 | 933 |
| lures, line, hooks, etc. | 676 | 125 |
| advertising/booking | 2,926 | 2,560 |
| Total variable costs | 17,440 | 4,431 |
| <u>Fixed costs</u> | | |
| slip rent | -1 | -1 |
| depreciation - | | |
| hull | 2,161 | 1,860 |
| engine | 1,173 | 372 |
| electronics | 1,008 | 113 |
| rods & reels | 253 | 192 |
| insurance | 2,683 | 1,017 |
| Total fixed costs | 7,278 | 3,554 |
| <u>Total Costs</u> | 24,718 | 7,985 |
| <u>Net Revenue</u> | 29,728 | 5,167 |
| Return to Capt's. Labor | 7,718 | 3,467 |
| Return to Management (before taxes, interest on investment) | 22,010 | 1,700 |

¹Slip rent is included with advertising/booking costs because most boats in Region I pay a standard commission to the marina where they dock which covers these expenses.

Table 2 (concluded)

| | Region II (n=3) Hampton/York River | Region III (n=3) Rappahannock/Potomac |
|---|---------------------------------------|--|
| Gross Revenue | \$15,553 | 7,767 |
| Expenses: | | |
| <u>Variable Costs</u> | | |
| crew wages | 0 | 0 |
| fuel and oil | 983 | 1,400 |
| bait | 147 | 0 |
| ice | 298 | 0 |
| repair & maintenance | 709 | 1,217 |
| lures, line, hooks, etc. | 20 | 53 |
| advertising/booking | 380 | 5 |
| Total variable costs | 2,537 | 2,675 |
| <u>Fixed costs</u> | | |
| slip rent | 0 | 120 |
| depreciation - | | |
| hull | 930 | 465 |
| engine | 187 | 793 |
| electronics | 268 | 160 |
| rod & reels | 157 | 44 |
| insurance | 900 | 725 |
| Total fixed costs | 2,442 | 2,307 |
| <u>Total costs</u> | 4,979 | 4,982 |
| <u>Net Revenue</u> | 10,574 | 2,785 |
| Return to Capt's. Labor | 4,183 | 3,667 |
| Return to Management (before taxes, interest on investment) | 6,391 | -882 |

Average gross and net revenues, captains' salaries, and return to management¹ were highest for Virginia Beach head boats followed by Hampton/York River boats. Region III (Rappahannock/Potomac) businesses showed an average loss in return to management. Some businesses in all groups of head boats incurred losses at the management level, but only 6% had a loss in net revenues.

Fishing Effort - Number of Trips and Number of Fishermen

Effort characteristics distinguished three types of businesses among regions: 1) half-day trip operations, 2) full-day trip operations, and 3) half- and full-day trip operations (Table 3). Half- and full-day operations in Region I reported the greatest amount of effort (no. of trips). The majority of half-day trips made by these businesses occurred from June to September. Monthly head boat effort is depicted in Figure 2.

The average number of head boat fishermen carried per half- or full-day trip is presented in Table 4. Boats carrying the most fishermen per trip were located in Region I, but the range of reported values was wide. The average number of hours fished per trip was 3.2 and 6.0 for half- and full-day trips, respectively.

Catch - Target Species, Locations, Method, Landings

Region I - Virginia Beach/Norfolk

Ten percent of the head boats surveyed in this region fished exclusively in ocean waters. These boats were located at the

¹ Return to management was profit (or loss) after a captain's salary had been deducted from net revenues.

TABLE 3

Head boat annual (1978) fishing effort
by type of operation [average number of trips/boat/year]

| Region | Type of operation | | | | | |
|--------------------------------------|-----------------------|-----------------|-----------------------|-----|----------------------------------|----|
| | <u>Half-Day (n=5)</u> | | <u>Full-Day (n=8)</u> | | <u>Half & Full Day (n=3)</u> | |
| | HD ¹ | FD ² | HD | FD | HD | FD |
| Region I (Va. Beach/Norfolk) | 127 | 5 | 4 | 93 | 190 | 65 |
| Region II (Hampton/York River) | 53 | 1 | 0 | 150 | 85 | 31 |
| Region III (Rappahannock/Potomac) | - | - | 0 | 73 | - | - |
| ALL | 112 | 4 | 2 | 93 | 155 | 54 |

¹HD = half-day trips

²FD = full-day trips

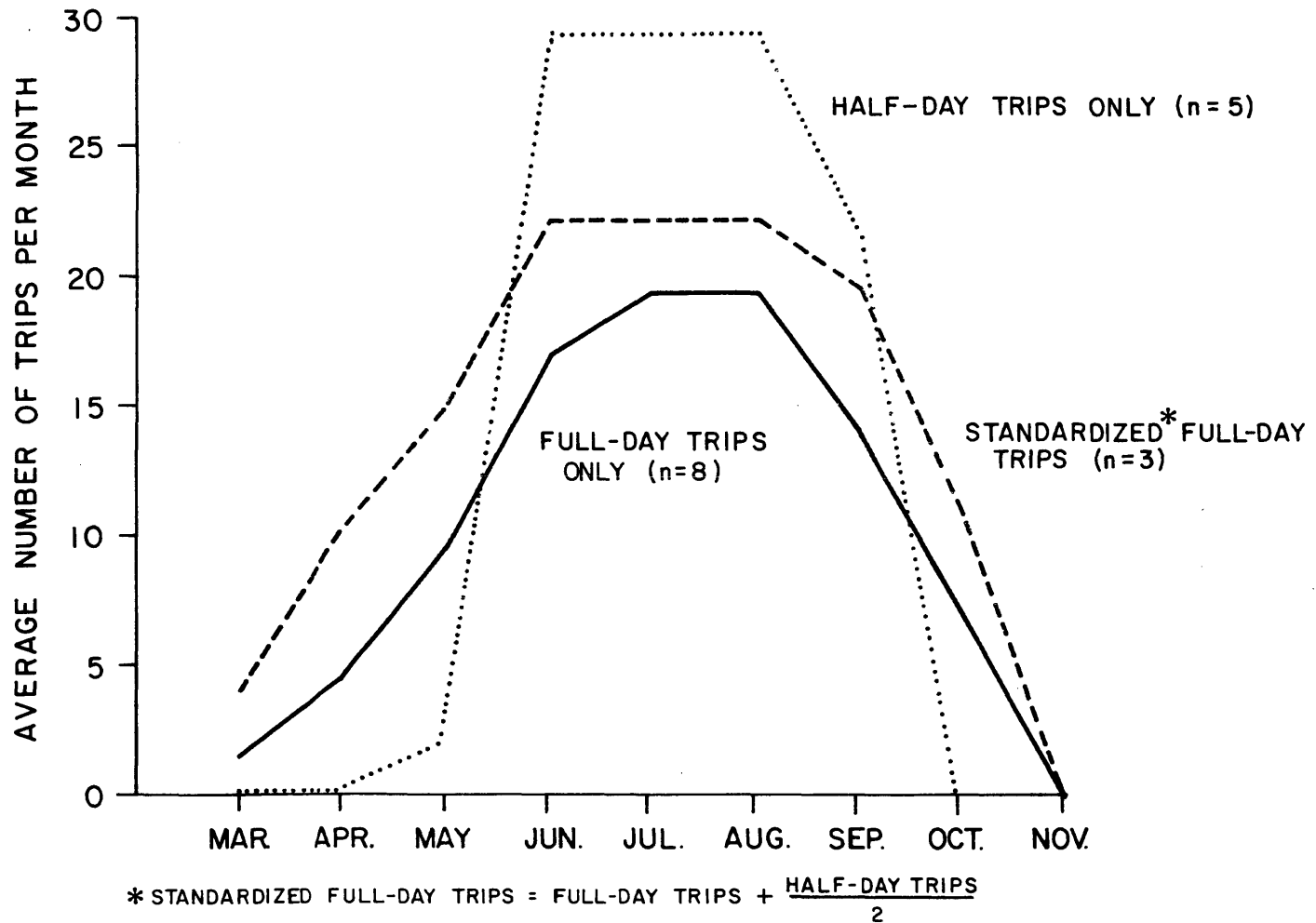


Figure 2. Head boat monthly effort (trips) by type of operation - 1978

TABLE 4

Head boat angler effort [average number of fishermen per trip (range)]

| | Half-day trips | Full-day trips |
|------------|-----------------|-----------------|
| Region I | 22 (12 - 42) | 26 (13 - 40) |
| Region II | 18 (11 - 25) | 15 (5 - 25) |
| Region III | - | 10 (10) |

ocean-side port (Rudee Inlet) in Virginia beach. All other boats spent the majority of their time fishing in the Chesapeake Bay either in the vicinity of the Chesapeake Bay Bridge Tunnel or off Hampton and the Oceanview area of Norfolk, with occasional ocean trips. Primary target species for offshore fishing trips were Atlantic (Boston) mackerel (Scomber scombrus) from March to early April, black sea bass (Centropristis striata) from spring to fall, and tautog (Tautoga onitis) in the spring and fall months. Fishing for Atlantic mackerel involves locating a school and jigging with either artificial bait or worms with the boat adrift. An investigation of the 1978 recreational fishery for Atlantic mackerel in Virginia was made by Smith (1979). The Atlantic mackerel season is short and is often limited by weather conditions. Head boats bottom-fish for tautog and black sea bass on wrecks, artificial reefs, and rock piles, using natural bait (squid, crab) either drifting or at anchor.

Of the head boats in this region that fish primarily in the Chesapeake Bay, 56% reported beginning the season (usually in April) by taking smaller than average parties trolling for bluefish (Pomatomus saltatrix). Some effort for bluefish may occur in the fall and they are also caught incidentally throughout the summer on bottom-fishing trips. Bottom-fishing trips begin in May or June for weakfish (grey sea trout) (Cynoscion regalis), Atlantic croaker (Micropogonias undulatus) and spot (Leiostomus xanthurus). Summer flounder (Paralichthys dentatus) are caught while bottom-fishing but are not as important a target species as the three sciaenids (weakfish, spot, and croaker). Head boats generally drift over an

appropriate substrate, such as sandy-bottom, oyster or mussel beds while anglers bottom-fish with natural baits, especially squid, bloodworms and cut-bait.

A computation of catch per season was only possible for head boats operating from the Virginia Beach ports. Norfolk head boat captains surveyed reported that catch per trip or per month was so variable that they could not reliably estimate an average. They did report however that spot were the most abundant fish in their catch throughout the season, Atlantic croaker were second in abundance (especially in June and July), and weakfish were abundant in spring and fall catches.

Total reported catch of all species for the Virginia Beach head boats surveyed was 424,700 lbs. in 1978 (Table 5). Black sea bass dominated the catch of head boats fishing offshore, followed by bluefish and tautog. Spot dominated inshore catches, followed by Atlantic croaker and weakfish.

Region II - Hampton/York River

Head boats in this area fish in the lower Chesapeake Bay in the vicinity of Hampton and Poquoson and in the York River. Trolling trips for bluefish are made in April, May and October, while bottom-fishing trips occurred from June to September. Target species on bottom-fishing trips were Atlantic croaker, spot, weakfish and summer flounder. Fishing is done while drifting with natural bait. Total reported catch of all species was 85,075 lbs., with bluefish

TABLE 5

Region I (Virginia Beach only)
head boats (n=10) total reported catch (lbs.),
1978

| | Half-day trips | Full-day trips | TOTAL |
|--------------------------|----------------|----------------|---------|
| Bluefish | 4,550 | 49,500 | 54,050 |
| Bottom-fish ¹ | 203,150 | 167,500 | 370,650 |
| TOTAL | 207,700 | 217,000 | 424,700 |

¹Bottom-fish catch includes primarily: Atlantic croaker, black sea bass, spot, weakfish.

TABLE 6

Region II (Hampton/York River) head boats
(n=3) total reported catch (lbs.), 1978

| | Half-day trips | Full-day trips | TOTAL |
|--------------------------|----------------|----------------|--------|
| Bluefish | 500 | 14,150 | 14,650 |
| Bottom-fish ¹ | 25,225 | 45,200 | 70,425 |
| TOTAL | 25,725 | 59,350 | 85,075 |

¹Bottom-fish catch includes primarily: Atlantic croaker, spot, summer flounder, weakfish.

equal to approximately 17% of the catch (Table 6). In the bottom-fish catch, spot were the most numerous, followed by Atlantic croaker and weakfish.

Region III - Rappahannock/Potomac

Head boats fished in the Rappahannock River and in the Chesapeake Bay in the vicinity of the river. Bottom-fishing for spot, Atlantic croaker and weakfish occurred from June to September or October. Boats drift or anchor, especially over oyster beds, and fishermen generally use 'peeler' crabs (the blue crab, Callinectes sapidus, in the stage prior to molting) and bloodworms for bait. Occasionally, trolling trips for bluefish were made in April or May and October.

Total reported catch of bottom-fish by the head boats surveyed was 42,000 lbs; spot were the most abundant fish in the catch, followed by weakfish and Atlantic croaker. Total bluefish catch was reported to be 6,000 lbs.

Additional Information

Residency of customers and their habits of overnight accommodation differed by area of operation (Table 7). Norfolk-based head boats served the highest percentage of local (within 25 miles) customers and Region III (Rappahannock/Potomac) boats drew the greatest proportion of out-of-state fishermen (typically Washington, D.C., and other urban areas). Boats in Virginia Beach, a resort area, reported the highest percent (47%) of customers who spent the night in a local motel or campground before going fishing.

TABLE 7

Residency and accommodations of head boat
fishermen by region [percent]

| | Customer residency: | | | Overnight accommodation ¹ |
|----------------|---------------------|----------|--------------|---|
| | Local | In-state | Out-of-state | |
| Region I | | | | |
| Virginia Beach | 18 | 53 | 29 | 47 |
| Norfolk | 67 | 30 | 3 | 16 |
| Region II | 26 | 64 | 10 | 17 |
| Region III | 0 | 63 | 37 | 15 |

¹Spending at least one night in a local motel or campground.

Reported conflicts with gill netters and menhaden (Brevoortia tyrannus) purse-seiners were by direct interference. Trawler operations or gill net sets in preferred sport fishing areas were believed to either cause fish to move out of the area or to interrupt fishing activities. Possible over-fishing of black sea bass stocks was another concern. Conflicts with sport divers occasionally occurred on wreck sites.

Fish population fluctuations affect the composition of the head boat catch. Striped bass (Morone saxatilis) were an important component of head boat catches until 1973 and 1974. Presently it is a rare catch and their absence has shortened the late fall fishing season. Atlantic croaker stocks which had been low for several years in Virginia, (Joseph, 1972) returned to higher levels of abundance in 1975 and 1976 and became a major target species. Current bluefish abundance has added to the total catch, especially in spring months. Captains reported that catches of spot have always been fairly stable and are the foundation of the inshore bottom-fishery. ✓

Water pollution that affects the availability of fish stocks was most often cited by captains as a major factor influencing the future success of the head boat fishery. Kepone¹ pollution in the James River caused the closure in 1975 of the river's estuarine waters to the harvesting of most finfish, and thus reduced the customary fishing

¹ Kepone, a pesticide manufactured in Hopewell, Virginia, was found as a pollutant in the James River and as a residue in many finfish and shellfish of the James River and the lower Chesapeake Bay.

grounds of head boats in the area. No precise economic impact of the closure on the head boat fishery is available (Kumpf, 1977), but some operators, especially in Norfolk and Hampton, claimed to have lost half of their business in the first season (1976) of the fishing ban. Another factor some operators believed important to future success was active promotion of recreational fisheries by state and local chambers of commerce or tourist and travel agencies. ✓

CHARTER BOAT OPERATIONS

Population and Location

A total of 69 charter boat captains were surveyed in all regions. The home ports of the charter boats sampled are shown in Figure 3. The number of active charter fishing businesses forming the 1978 study population was 110.

Captains

The charter boat captains surveyed averaged 49.8 years of age, with ages ranging from 22 to 81 years. Captains had been in the business for an average of 18 years and had been licensed for approximately 16 years. Most had previous experience in operating other sport fishing boats.

Because of the seasonality of sport fishing in Virginia, no captain reported his charter business as his sole source of income; 76.5% of the charter captains had another job and 23.5% were retired

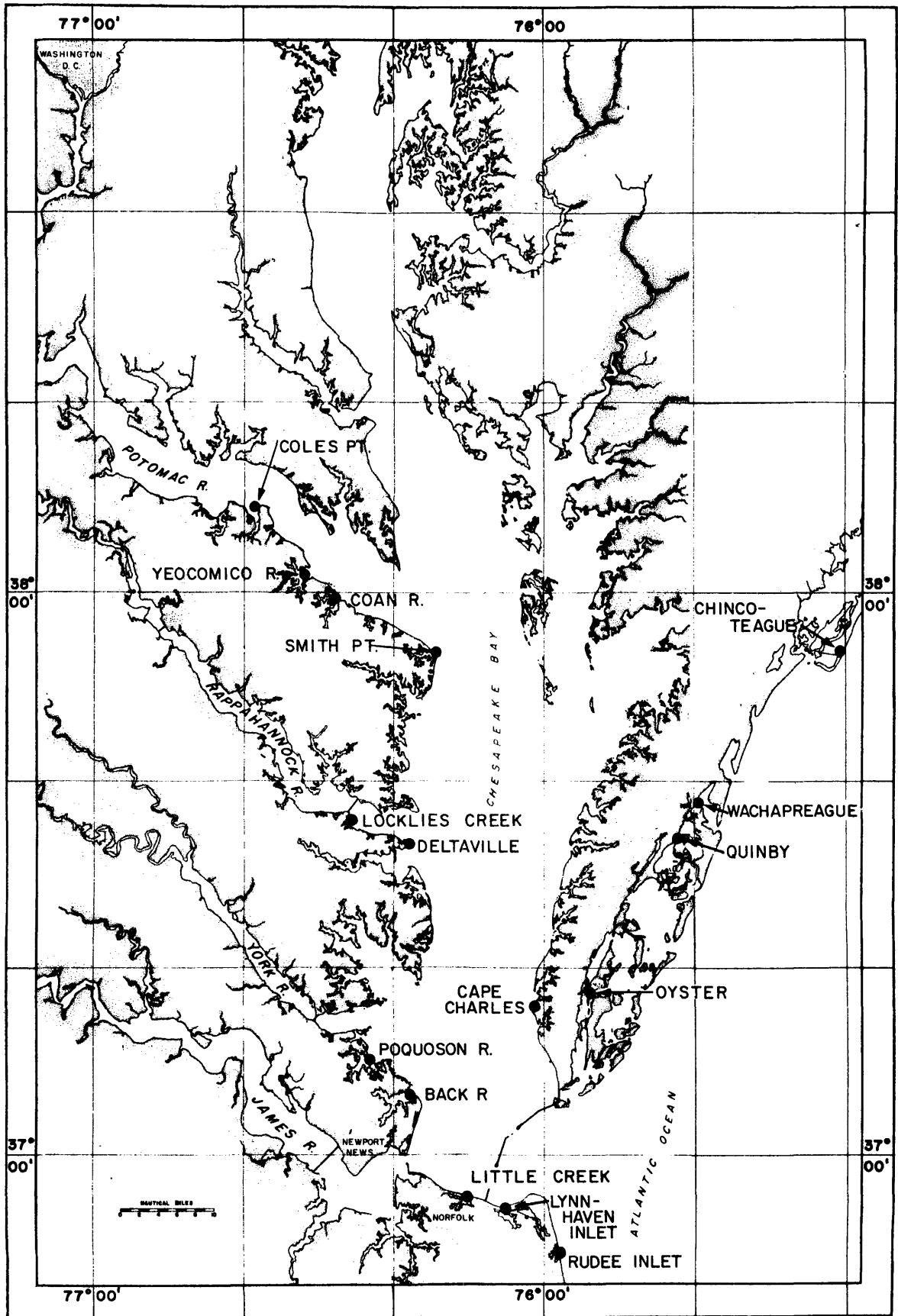


Figure 3. Locations of charter boats in sample population - 1978

with compensation or other income. Captains employed in various marine trades formed 35.3% of the survey population, and 36.8% had professional, managerial or self-employed occupations either in other businesses, industry, or education. Captains in Regions I and II most often held professional, managerial, or self-employed positions in fields other than marine trades. Region III and IV captains more often had alternative employment in marine trades.

The motivation for operating a charter fishing business most frequently reported (58%) by captains was the enjoyment of and participation in fishing. Chartering as a source of income was also an important motivating factor (41%). A comparatively large percentage (57%) of captains in Region IV (Eastern Shore) stated other reasons for being in business such as, "to be on the water", "grew up in it", "a seasonal alternative to commercial fishing", and "to be one's own boss".

Business Structure

Two types of operations were found among charter fishing businesses; 1) full-time operations, those businesses offering fishing trips continuously during the season, and 2) part-time operations, those available for charter during a smaller proportion of the season and taking less than 50 trips a year. Of the businesses surveyed, 68% operated full-time and 32% were part-time. Part-time operations were most frequent in Regions II (Hampton/York River) and III (Rappahannock/Potomac).

Most charter businesses (84%) were individual proprietorships. The greatest percentage of corporations was found in Region I (Virginia Beach/Norfolk). Charter boats run by hired skippers were most frequent in Region I, but overall, owner-operations predominated (90%). The business season for Virginia's charter boats begins in April or May and lasts through October. Captains fishing offshore may start as early as March and finish in December for certain species. Many boats fished into November and December for striped bass (Morone saxatilis) until population levels dropped in the late 1970's. ✓

Although most charter businesses offer half-day (3-4 hour) trips, full-day trips were the predominant mode of operation. Full- and half-day charter rates varied depending on the type of fishing trip, (Table 8). Seventy-four percent of all charter businesses surveyed had a mate on board and 51% of these received a wage per trip besides tips.

"Word-of-mouth" advertising was considered the most effective method of attracting customers by 70% of the captains surveyed. Only 20% found conventional advertising useful for promoting business. The booking of trips was most often handled by the captains themselves (96%), however, a majority of captains in Regions I and IV also had bookings made by the marina where they docked.

Vessels and Equipment

Vessel characteristics of charter boats are reported by region in Table 9. Boats in Region I (Virginia Beach/Norfolk) were the largest,

TABLE 8

Minimum and maximum charter fishing
rates (1978) by region and type of trip

| | Rates | |
|-------------------|----------------|----------------|
| | Full-day trips | Half-day trips |
| <u>Region I</u> | | |
| Bottom-fishing | \$150 - 168 | \$90 - 159 |
| Trolling | 180 - 230 | - |
| Tuna | 225 - 260 | - |
| Marlin | 325 - 350 | - |
| <u>Region II</u> | | |
| "Bay" | \$ 95 - 140 | \$72 - 90 |
| Tuna | 150 - 210 | - |
| Marlin | (200) | - |
| <u>Region III</u> | | |
| Bottom-fishing | \$ 80 - 125 | \$25 - 55 |
| Bluefish | 135 - 200 | - |
| <u>Region IV</u> | | |
| Bottom-fishing | \$130 - 160 | \$60 |
| Trolling | 150 - 185 | - |
| Tuna | 205 - 225 | - |
| Marlin | 240 - 300 | - |

TABLE 9

Charter boat vessel characteristics by
region [mean (range) or percentage]

| Vessel characteristic | Region | | | | |
|----------------------------|---------------------------|-------------------|-------------------|--------------------|-------------------|
| | I (n=16) | II (n=4) | III (n=26) | IV (n=23) | ALL (n=69) |
| Length (ft.) | 41.5 (33 - 47) | 32 (24 - 40) | 38.9 (23 - 50) | 36.1 (19 - 43) | 38.1 (19 - 50) |
| Draft (ft.) | 3.4 (2.5 - 4) | 3.3 (2.5 - 4) | 2.9 (1 - 4.5) | 3.2 (2.2 - 4.5) | 3.1 (1 - 4.5) |
| Displacement (net tons) | 13.5 (7.5 - 19) | 7.7 (6 - 9) | 13.0 (6 - 31) | 10.0 (6 - 15) | 11.6 (6 - 31) |
| Fuel Capacity (gal.) | 274 (125 - 500) | 113 (50 - 180) | 145 (30 - 490) | 136 (24 - 250) | 168 (24 - 500) |
| Cruising Range (miles) | 242 (150 - 475) | 175 (30 - 300) | 173 (28 - 330) | 208 (90 - 325) | 203 (28 - 475) |
| Vessel Age (yrs.) | 11.3 (.2 - 23) | 6.3 (3 - 11) | 13.8 (3 - 22) | 19.5 (3 - 41) | 14.7 (.2 - 41) |
| Hull Types | 93% Wood 7% Fiberglass | 75 W 25 F | 85 W 15 F | 87 W 13 F | 87 W 13 F |
| Engine Types | 80% Diesel* 20% Gas* | 50 D 50 G | 38 D 62 G | 57 D 43 G | 54 D 43 G |
| Engine Age (yrs.) | 6.1 (.2 - 30) | 6.3 (3 - 11) | 6.1 (1 - 18) | 10.8 (1 - 45) | 7.6 (.2 - 45) |

*single or twin engines

had the greatest cruising range and were most often powered by diesel engines. The greatest diversity was found among vessels in Regions III and IV. In Region III (Rappahannock/Potomac) differences existed between boats that specialized in either fishing for bluefish or bottom-fish, and in Region IV (Eastern Shore), a large number of older boats co-existed with a few more modern vessels.

Electronic equipment used most frequently on charter boats were depth finders or fish finders, VHF radios, and C.B. radios. In Region I almost all the boats sampled had Loran sets and 25% had radar. Depth finders were most often reported as the primary piece of electronic equipment used in locating an area to fish. However, boats fishing in offshore areas relied more heavily on Loran. Communication between captains by radio was also important in locating fish.

Economic Analysis

Full- and part-time charter businesses were separated in the economic analysis due to differences in number of trips per year, and the values of revenues and expenses. The average values of the economic variables (Tables 10 and 11) are relative representations of the type of charter businesses in a region. The range of the values of gross revenues, variable and fixed costs, was quite wide in all regions.

Full-time Charter Fishing Operations

The greatest average total costs (\$17,160) were incurred by Region I (Virginia Beach/Norfolk) full-time charter businesses.

TABLE 10

Economic analysis of full-time charter
fishing businesses - annual costs and returns (1978)

| | Average values per boat per year | |
|---|------------------------------------|-----------------------------|
| | Region | |
| | I (n=13) Virginia Beach/Norfolk | II (n=2) Hampton/York R. |
| Gross Revenue | \$27,438 | \$6,374 |
| Expenses: | | |
| <u>Variable Costs</u> | | |
| crew wages | 1,082 | 0 |
| fuel and oil | 4,863 | 798 |
| bait | 1,391 | 90 |
| ice | 386 | 101 |
| repair & maintenance | 2,691 | 510 |
| lures, line, hooks, etc. | 760 | 113 |
| advertising/booking | 474 | 121 |
| Total variables costs | 11,647 | 1,733 |
| <u>Fixed costs</u> | | |
| slip rent | 709 | 180 |
| depreciation - | | |
| hull | 1,362 | 1,181 |
| engine | 666 | 150 |
| electronics | 1,069 | 312 |
| rods & reels | 585 | 249 |
| insurance | 1,122 | 0 |
| Total fixed costs | 5,513 | 2,072 |
| <u>Total Costs</u> | 17,160 | 3,805 |
| <u>Net Revenue</u> | 10,278 | 2,569 |
| Return to Capt's. Labor | 5,340 | 2,525 |
| Return to Management (before taxes, interest on investment) | 4,938 | 44 |

TABLE 10 (concluded)

| | III (n=14) Rappahannock/Potomac | IV (n=18) Eastern Shore |
|--------------------------|------------------------------------|----------------------------|
| Gross Revenue | \$12,720 | \$14,837 |
| Expenses: | | |
| <u>Variable Costs</u> | | |
| crew wages | 311 | 874 |
| fuel and oil | 1,680 | 1,411 |
| bait | 670 | 702 |
| ice | 278 | 180 |
| repair & maintenance | 1,180 | 1,356 |
| lures, line, hooks, etc. | 186 | 263 |
| advertising/booking | 108 | 20 |
| Total variable costs | 4,413 | 4,806 |
| <u>Fixed costs</u> | | |
| slip rent | 259 | 386 |
| depreciation - | | |
| hull | 1,388 | 582 |
| engine | 510 | 409 |
| electronics | 230 | 348 |
| rods & reels | 241 | 183 |
| insurance | 611 | 336 |
| Total fixed costs | 3,239 | 2,244 |
| <u>Total costs</u> | 7,652 | 7,050 |
| <u>Net Revenue</u> | 5,068 | 7,787 |
| Return to Capt's. Labor | 4,175 | 4,767 |
| Return to Management | 893 | 3,020 |

TABLE 11

Economic analysis of part-time charter fishing
businesses - annual costs and returns (1978)

| | Average values per boat per year | |
|--------------------------|-----------------------------------|-----------------------------|
| | Region | |
| | I (n=3) Virginia Beach/Norfolk | II (n=2) Hampton/York R. |
| Gross Revenue | \$5,833 | \$ 865 |
| Expenses: | | |
| <u>Variable Costs</u> | | |
| crew wages | 367 | 87 |
| fuel & oil | 1,167 | 78 |
| bait | 207 | 40 |
| ice | 110 | 19 |
| repair & maintenance | 383 | 350 |
| lures, line, hooks, etc. | 183 | 136 |
| advertising/booking | 87 | 15 |
| Total variable costs | 2,504 | 725 |
| <u>Fixed costs</u> | | |
| slip rent | 567 | 270 |
| depreciation - | | |
| hull | 1,449 | 914 |
| engine | 794 | 550 |
| electronics | 275 | 130 |
| rods & reels | 331 | 55 |
| insurance | 340 | 400 |
| Total Fixed Costs | 3,756 | 2,319 |
| <u>Total Costs</u> | 6,260 | 3,044 |
| <u>Net Revenue</u> | -427 | -2,179 |
| Return to Capt's. Labor | 1,500 | 325 |
| Return to Management | -1,927 | -2,504 |

TABLE 11 (concluded)

| | III (n=12) Rappahannock/Potomac | IV (n=3) Eastern Shore |
|--------------------------|------------------------------------|---------------------------|
| Gross Revenue | \$2,880 | \$2,470 |
| Expenses: | | |
| <u>Variable Costs</u> | | |
| crew wages | 83 | 140 |
| fuel and oil | 450 | 288 |
| bait | 63 | 231 |
| ice | 40 | 56 |
| repair & maintenance | 588 | 367 |
| lures, line, hooks, etc. | 56 | 93 |
| advertising/booking | 17 | - |
| Total variable costs | 1,297 | 1,175 |
| <u>Fixed costs</u> | | |
| slip rent | 168 | 250 |
| depreciation - | | |
| hull | 743 | 555 |
| engine | 435 | 374 |
| electronics | 120 | 159 |
| rods & reels | 115 | 70 |
| insurance | 231 | - |
| Total fixed costs | 1,812 | 1,408 |
| <u>Total Costs</u> | 3,109 | 2,583 |
| <u>Net Revenue</u> | -229 | -113 |
| Return to Capt's. Labor | 1,208 | 967 |
| Return to Management | -1,437 | -1,080 |

Region II charter boats had the lowest cost structure and also the lowest annual effort. Annual fuel and oil expenses formed the largest component of total variable costs, followed closely by repair and maintenance costs. Hull depreciation was the greatest fixed cost in all regions (Table 10).

Average gross (\$27,438) and net (\$10,278) revenues for Region I charter boats were the highest in the survey. Net revenues were not significantly different between Region I and Region IV businesses. Some businesses in all regions showed a loss in return to management.

Part-time Charter Fishing Operations

The greatest average total operating costs (\$6,260) were incurred by Region I part-time businesses (Table 11). Average yearly repair and maintenance expenses often exceeded fuel and oil costs for part-time operations. Unlike full-time businesses, total fixed costs were higher than total variable costs.

Average gross revenues were highest for Region I charter boats and lowest in Region II. An average loss in net revenues was computed for part-time businesses in all regions. Only Regions I and III had any part-time businesses that reported a net gain in revenues.

Fishing Effort - General

Annual fishing effort, measured in number of trips, of full- and part-time charter businesses is presented in Table 12. The average number of trips made per year was not significantly different among

TABLE 12

Charter boat annual (1978) fishing effort by type of operation
[average number of trips/boat/year]

| | Region | | | | | | | |
|----------------------|-------------------------|-----------------|------------|----|---------------|----|-------------|----|
| | I (n=13,3) ¹ | | II (n=2,2) | | III (n=14,12) | | IV (n=18,4) | |
| | FD ² | HD ³ | FD | HD | FD | HD | FD | HD |
| Full-time operations | 104 | 5 | 49 | 3 | 84 | 0 | 94 | 0 |
| Part-time operations | 30 | 0 | 7 | 0 | 21 | 6 | 22 | 0 |

¹for n=x,y: x = number of full-time businesses in sample
y = number of part-time businesses in sample

²FD = full-day trips

³HD = half-day trips

Regions I, III, and IV. Region II (Hampton/York River) full- and part-time boats took significantly fewer trips per year. The average size of a charter party was 5.3 fishermen per trip.

The number of hours spent fishing per trip depended on the type of fish being sought. On bluefish or bottom-fish trips anglers may spend from 5 to 8 hours fishing. On offshore trips for species such as white marlin or tuna, fishing time lasts only 4 to 6 hours since one-way travelling time to the fishing grounds may be 2 to 3 hours.

Catch and Effort - By Region

Region I

A seasonal succession of target species exists for charter boats operating out of ports in Region I (Virginia Beach/Norfolk). The bluefish is usually the first species sought on trips beginning in April and lasting through June. Boats troll for bluefish in nearshore ocean waters, especially around the Chesapeake Light Tower, or in the Chesapeake Bay in the vicinity of the Chesapeake Bay Bridge Tunnel. Trolling trips for bluefish also occur in October when the fish are making their southward and offshore migration. Bluefish were caught by charter boats all summer, either as an incidental catch or as an alternative if the catch of another target species was low. Total reported catch of bluefish (excluding incidental catch) for the boats surveyed was 187,060 pounds (Table 13).

The bluefin tuna (Thunnus thynnus) is the species sought by 94% of the region's captains in June and July. Boats fish for bluefin by

TABLE 13

Region I - Virginia Beach/Norfolk charter boats (n=16)
 reported effort and catch by target species, 1978

| Target Species | Number of trips | Reported catch (lbs.) |
|------------------------------------|-----------------|--|
| Bluefish | 560 | 187,060 |
| Bluefin Tuna | 382 | 118,599 |
| White Marlin/ offshore pelagics | 323 | 5,640 - white marlin 13,110 - others ¹ |
| Bottom-fish ² | 118 | 17,280 |
| King Mackerel | 65 | 9,419 |
| Half-day ³ | 61 | 9,525 |
| | | <u>360,633</u> |

¹Includes: wahoo, dolphin, bonito, tunas, blue marlin

²Includes: black sea bass, weakfish, summer flounder, Atlantic croaker, spot

³Half-day trip catch consists of bluefish and/or bottom-fish

trolling ocean waters 10 to 30 miles offshore. Total reported catch of bluefin tuna for the boats surveyed was 118,599 lbs. and most of the fish weighed less than 50 lbs. (Table 13).

When bluefin tuna have left the area, 81% of the Region I captains fish in deep offshore waters from late July through September primarily for white marlin (Tetrapturus albidus) and also other 'game' fishes such as wahoo (Acanthocybium solandri), little tunny ("false albacore") (Euthynnus alletteratus), skipjack tuna (Katsuwonus pelamis), dolphin (Coryphaena hippurus), Atlantic bonito (Sarda sarda), blue marlin (Makaira nigricans), and yellowfin tuna (Thunnus albacares). The fishing areas are generally 30-50 miles offshore and boats rarely go beyond the 100-fathom isobath. Baits used include artificial lures and natural baits such as ballyhoo, mullet, squid or other fish. Captains reported that the catch of white marlin ranged from 0 to 4 per trip and the average weight per marlin was approximately 40 lbs. The captains reported that generally 75% of all marlin caught were released. Total reported number of white marlin caught was 559, and total number landed was 141 (5,640 lbs.). Catch of other offshore pelagic species was reported to be 13,110 lbs. (Table 13).

During the summer, from late May to early September, 37.5% of the captains surveyed reported taking bottom-fishing trips, either for black sea bass in ocean waters on wrecks or artificial reefs, or for weakfish, summer flounder, Atlantic croaker and spot in the Chesapeake Bay. Total reported catch of all bottom-fish was 17,280 lbs. (Table 13).

From late August to October, 50% of the captains reported fishing for king mackerel (Scomberomorus cavalla), usually less than 30 miles offshore, by trolling artificial or natural baits. The total reported catch was 9,419 lbs. (Table 13). Bluefish and dolphin are also landed on these trips.

Half-day trips for bluefish or bottom-fish were made by 41% of the captains surveyed. Total reported half-day catch (species not distinguished) was 9,525 lbs.

Region II

Charter captains in Region II (Hampton, Poquoson ports) began the season trolling for bluefish from April to early June usually in the Chesapeake Bay. Total reported catch equalled 10,700 lbs. (Table 14).

Bottom-fishing trips began in June and continued through September for weakfish, summer flounder, Atlantic croaker, and spot. Boats fished Bay waters from the vicinity of the Chesapeake Bay Bridge Tunnel to the York River. Captains reported a total bottom-fish catch of 4,584 lbs. (Table 14).

Only 25% of the captains in this area fished for bluefin tuna during June through July. A total catch of 1,500 lbs. was reported (Table 14).

Region III

Two sub-groups of charter boats in this region were distinguished by target species sought and by the location of their home ports.

TABLE 14

Region II - Hampton/York River charter boats (n=4)
 reported effort and catch by target species, 1978

| Target Species | Number of trips | Reported catch (lbs.) |
|--------------------------|-------------------------------|-----------------------|
| Bluefish | 44 | 10,700 |
| Bottom-fish ¹ | 57 (full-day) 6 (half-day) | 4,584 |
| Bluefin Tuna | 10 | 1,500 |
| | | <u>16,784</u> |

¹Includes: weakfish, Atlantic croaker, spot, summer flounder

Charter boats from ports in the Rappahannock River fished principally for bottom-fish such as spot, weakfish and Atlantic croaker, while boats out of Potomac River ports fished primarily for bluefish.

Rappahannock Ports

Boats from the Rappahannock (n=8) that began fishing in May often fished for bluefish by trolling with artificial lures in the Chesapeake Bay. Trips reported in May were few and total reported catch was 3,843 lbs. Bottom-fishing trips began in June and continued through September and occasionally to November. The total catch of bottom-fish from the 316 full-day and 59 half-day trips reported was 69,970 lbs. Spot were the most abundant fish in summer bottom-fishing catches, followed by weakfish and Atlantic croaker. Weakfish were particularly abundant in catches from late summer to October, while croaker were most numerous in June and July catches. Boats bottom-fish in the Rappahannock and Piankatank Rivers and in the Chesapeake Bay near these rivers by drifting or anchoring, using natural bait such as bloodworms and peeler blue crabs.

Potomac River Ports

Boats from the Potomac (n=18) began fishing for bluefish in late April or early May and continued through October. Captains reported taking occasional bottom-fishing trips for weakfish, croaker, spot, and sometimes white perch (Morone americana) from June to October. Weakfish are often a by-catch on bluefishing trips. All fishing is done either in the Potomac River or in the Chesapeake Bay near the

river's mouth and across to the Eastern Shore. Bluefish are caught either by trolling with lures or, primarily, by chumming. Menhaden are ground up for the chum, which is tossed into the water periodically, and strips of menhaden bait the hooks that are drifted out into the chum line.

When describing their catch or effort per month, captains did not distinguish between bluefish and bottom-fish trips, therefore catch data for this fishery is presented as total pounds of all fish per month (Table 15). The total catch was approximately 90% bluefish (see 1979 Northern Neck Charter Boat Catch and Effort Survey results). The total number of full-day trips reported by full- and part-time captains were 925 and 162, respectively.

Region IV

Fishing activities are diverse and vary by port in Region IV (Eastern Shore) (Table 16). Effort is primarily directed towards seasonally abundant target species. One of the first species to be sought is the black drum (Pogonias cromis); 26% of the captains surveyed (n=23) fished for black drum from late April through May. Boats from Cape Charles, Oyster and Chincoteague fished the Chesapeake Bay near Cape Charles by drifting or anchoring with clams as bait. May provided the most successful sport catches of black drum in this area. Charter boats from Maryland ports also fish for black drum off Cape Charles. Average catch per trip ranged from 6 to 9 black drum. The average reported weight per fish ranged from 40 to 50 lbs. Total reported catch was 46,775 lbs. (Table 16).

TABLE 15

Region III subgroup¹ - charter boats from Potomac River ports (n=18) reported total catch (lbs.) per month, 1978

| Total catch (all species) ² in pounds | | | |
|--|-----------------------------|----------------------------|----------|
| Month | Full-time operations (n=11) | Part-time operations (n=7) | Combined |
| April | 1,400 | 700 | 2,100 |
| May | 38,800 | 3,300 | 42,100 |
| June | 79,450 | 8,030 | 87,480 |
| July | 87,300 | 9,190 | 96,490 |
| August | 79,950 | 8,230 | 88,180 |
| September | 50,610 | 4,880 | 55,490 |
| October | 25,550 | 3,550 | 29,100 |
| November | 700 | 450 | 1,150 |
| ALL | 363,760 | 38,330 | 402,090 |

¹Catch of Region III subgroup - Rappahannock River charter boats is reported in text.

²Catch is approximately 90% bluefish, but includes weakfish, croaker and spot.

TABLE 16

Region IV - Eastern Shore charter boats (n=23) effort and catch by target species, 1978

| Target species or Species group | Percent of boats reporting trips | Home-ports | Number of trips reported | Total reported catch (lbs.) | Season |
|---------------------------------------|--|--|--------------------------------|--------------------------------|-----------------|
| Black Drum | 26% | Cape Charles Oyster Chincoteague | 135 | 46,775 | late Apr.-May |
| Summer Flounder | 61 | Quinby Wachapreague | 681 | 60,388 | Apr.-Sept. |
| Bluefish | 52 | Cape Charles Oyster Wachapreague Chincoteague | 193 | 48,725 | June-Aug. |
| Bottom-fish ¹ | 26 | Cape Charles Oyster | 146 | 20,925 | June-Sept. |
| Black Sea Bass ² | 9 | Chincoteague | 51 | 9,250 | late May-July |
| Bluefin Tuna | 39 | Cape Charles Quinby Wachapreague | 103 | 17,366 | June-July |
| White Marlin, etc. ³ | 17 | Cape Charles Wachapreague | 44 | - | late July-Sept. |
| Weakfish and Atlantic Croaker | 70 | Quinby Wachapreague Chincoteague | 417 | 98,820 | late Aug.-Oct. |

¹Includes: weakfish, croaker, spot, flounder, red drum, black sea bass.²Black sea bass are also landed on other offshore trips from other ports.³Other offshore pelagics sought include: tunas, wahoo, dolphin, bonito, king mackerel.

Summer flounder fishing by Eastern Shore charter boats began in April and lasted through September. Captains (61%) from Quinby and Wachapreague fished the waters behind the barrier islands in the inlets and channels among the salt marshes using natural bait such as minnows (Fundulus sp., Menidia sp.), or squid. The total catch of summer flounder from these boats equalled 60,388 lbs. (Table 16). Weakfish and croaker were caught incidentally on these trips.

Bluefish were a target species from June to August for 52% of the captains surveyed. Boats taking trips for bluefish from Cape Charles, Oyster, Wachapreague, and Chincoteague fished either the Chesapeake Bay mouth or nearshore ocean waters by trolling with artificial lures. Total reported catch was 48,725 lbs. (Table 16). Bluefish were also landed on other offshore trolling trips, and other pelagic species were caught while bluefishing.

Captains surveyed in Cape Charles and Oyster (26%) took bottom-fishing trips for weakfish, Atlantic croaker, spot, summer flounder, red drum ("channel bass") (Sciaenops ocellata) and black sea bass from June to September. Boats fished around the Chesapeake Bay Bridge Tunnel and in waters behind the barrier islands and reported a total catch of bottom-fish of 20,925 lbs. (Table 16).

A minority of captains (9%) specifically sought black sea bass from late May through July in ocean waters often around artificial reefs and wrecks. Reported landings from these trips equalled 9,250 lbs. Black sea bass were also landed on other offshore trips and on bottom-fishing trips.

Bluefin tuna were sought by 39% of the Eastern Shore captains from late June through July. Boats fished for bluefin tuna from 20-35 miles offshore. Captains reported total landings of 17,366 lbs. (Table 16).

A few captains (17%) from Cape Charles and Wachapreague took offshore trips for white marlin and other pelagic species (wahoo, dolphin, Atlantic bonito, tunas, king mackerel) from late July through September. Although 44 trips were reported, most captains were unable to estimate an average catch per trip.

From late August through October, most of the captains surveyed (70%) concluded their fishing season with trips for weakfish and Atlantic croaker in the inlets and ocean waters up to 4 miles offshore. Trips originated from Quinby, Wachapreague and Chincoteague, and total reported catch equalled 98,820 lbs. (Table 16). Weakfish and croaker were also landed on other Eastern Shore trips as described previously.

Additional Information

Residency of customers and their habits of overnight accommodation differed by area of operation (Table 17). Few local residents fished on charter boats and the highest percentage (7%) was reported in Region I. In-state customers made up the greatest proportion of fishermen in all areas except the Eastern Shore (Region IV), where many charter fishermen come from more northern states and

TABLE 17

Residency and accommodations of charter boat
fishermen by region [percent]

| | Customer residency: | | | Overnight accommodation ¹ |
|--------------|---------------------|----------|--------------|---|
| | Local | In-state | Out-of-state | |
| Region I | 7 | 50 | 43 | 63 |
| Region II | 1 | 65 | 34 | 21 |
| Region III | | | | |
| Rappahannock | 0 | 76 | 24 | 7 |
| Potomac | 4 | 82 | 15 | 23 |
| Region IV | 0 | 32 | 68 | 55 |

¹Spending at least one night in a local motel or campground.

Washington, D.C. Regions I and IV had the highest percentages of at least one night's usage of motels or campgrounds by fishermen.

Overall, 29% of the charter captains surveyed reported direct or indirect conflict with various commercial fisheries. Direct interference at fishing grounds were with menhaden trawlers, gill netters, and tuna seiners. Much concern was expressed on the Eastern Shore about the effects of a large number of finfish trawlers fishing close to shore on fish stocks also utilized by recreational fishermen. Confrontations with sport divers occurred only in Region I, specifically at the Chesapeake Light Tower where many boats regularly trolled for bluefish and which is a popular diving site.

Most captains felt that the future of the charter fishing industry depended on the abundance of sport fish stocks, on water pollution problems, specifically their effects on availability of sport fish, and on the economic effects of inflation, recession and increasing fuel costs. Captains saw very little chance of increasing financial gains. According to some captains, demand for charter fishing has declined due to the great increase in private boat ownership, but most felt that as long as sport fish are available, charter fisheries would persist. Increases in trip fees, due to rising costs, have not yet become prohibitive to customers.

NORTHERN NECK CHARTER BOAT CATCH AND EFFORT SURVEY - 1979

The proportion of captains returning log sheets varied monthly between 19.4% and 38.7% (Table 18). Captains reported complete catch

TABLE 18

Catch and effort data from 1979 Northern Neck charter boat
daily log sheets - by month

| MAY - 35.5% response | | |
|--------------------------------|----------------|---------------|
| | Bottom-fishing | Bluefishing |
| Total no. of trips | 0 ¹ | 79 |
| <u>Average values per trip</u> | | |
| no. of fishermen | | 5.9 |
| no. of hours fished | | 5.7 |
| no. of bluefish | | 60.6 |
| no. of weakfish | | 1.6 |
| no. of croaker ² | | .1 |
| no. of spot | | 0 |
| no. of all species | | 62.4 |
| no. of fish/person | | 11.1 |
| no. of fish/person/hour | | 2.0 |
| <u>Reported totals</u> | | |
| Bluefish - no. | | 4,788 |
| weight | | 21,574 lbs. |
| Weakfish - no. | | 128 |
| weight | | 1069.5 lbs. |
| Croaker - no. | | 10 |
| weight | | 32 lbs. |
| Spot - no. | | - |
| weight | | - |
| Others - no. | black drum - 4 | |
| weight | | 232 lbs. |
| All species - no. | | 4,930 |
| weight | | 22,907.5 lbs. |
| Fishermen | | 465 |
| Man-hours | | 2,665.5 |

¹One bluefish trip included some effort for bottom-fish, but was not separated for analysis.

²Atlantic croaker

TABLE 18 (continued)

| JUNE - 38.7% response | | |
|--------------------------------|------------------------|--------------------------|
| | Bottom-fishing | Bluefishing |
| Total no. of trips | 19 | 137 |
| <u>Average values per trip</u> | | |
| no. of fishermen | 5.6 | 5.7 |
| no. of hours fished | 6.0 | 5.9 |
| no. of bluefish | 12.7 | 72.3 |
| no. of weakfish | 24.7 | 2.9 |
| no. of croaker | 6.7 | .1 |
| no. of spot | 9.5 | - |
| no. of all species | 53.8 | 75.3 |
| no. of fish/person | 11.1 | 13.6 |
| no. of fish/person/hour | 1.9 | 2.3 |
| <u>Reported totals</u> | | |
| Bluefish - no. | 241 | 9,900 |
| weight (lbs.) | 1,115 lbs. | 42,676 lbs. |
| Weakfish - no. | 469 | 403 |
| weight | 2,809 lbs. | 3,356 lbs. |
| Croaker - no. | 130 | 9 |
| weight | 375 lbs. | 27 lbs. |
| Spot - no. | 180 | - |
| weight | 72 lbs. | - |
| Others - no./ | flounder - 1/2 lbs. | striped bass - 1/10 lbs. |
| weight | black drum - 1/19 lbs. | |
| All species - no. | 1,023 | 10,313 |
| weight | 4,392 lbs. | 46,069 lbs. |
| Fishermen | 107 | 784 |
| Man-hours | 646.0 | 4,549.0 |

TABLE 18 (continued)

| JULY - 38.7% response | | |
|--------------------------------|------------------------|------------------------|
| | Bottom-fishing | Bluefishing |
| Total no. of trips | 22 | 140 |
| <u>Average values per trip</u> | | |
| no. of fishermen | 6.3 | 6.1 |
| no. of hours fished | 5.6 | 5.4 |
| no. of bluefish | 22.9 | 85.1 |
| no. of weakfish | 23.9 | 1.2 |
| no. of croaker | 15.2 | .2 |
| no. of spot | 9.1 | - |
| no. of all species | 71.3 | 86.5 |
| no. of fish/person | 12.9 | 14.2 |
| no. of fish/person/hour | 2.2 | 2.6 |
| <u>Reported totals</u> | | |
| Bluefish - no. | 505 | 11,910 |
| weight | 2,258 lbs. | 54,000 lbs. |
| Weakfish - no. | 526 | 164 |
| weight | 3,103 lbs. | 1,104 lbs. |
| Croaker - no. | 335 | 26 |
| weight | 886 lbs. | 58 lbs. |
| Spot - no. | 200 | - |
| weight | 80 lbs. | - |
| Others - no./ | black drum - 2/68 lbs. | flounder - 1/5 lbs. |
| weight | red drum - 1/46 lbs. | red drum - 3/91.5 lbs. |
| All species - no. | 1,569 | 12,105 |
| weight | 6,441 lbs. | 55,258 lbs. |
| Fishermen | 138 | 850 |
| Man-hours | 760.0 | 4,641.0 |

TABLE 18 (continued)

| AUGUST - 35.5% response | | |
|--------------------------------|----------------------------|----------------------|
| | Bottom-fishing | Bluefishing |
| Total no. of trips | 15 | 105 |
| <u>Average values per trip</u> | | |
| no. of fishermen | 6.7 | 5.9 |
| no. of hours fished | 5.8 | 5.4 |
| no. of bluefish | 6.8 | 59.8 |
| no. of weakfish | 28.8 | .2 |
| no. of croaker | 2.7 | - |
| no. of spot | 10.3 | .05 |
| no. of all species | 50.3 | 60.1 |
| no. of fish/person | 9.0 | 10.5 |
| no. of fish/person/hour | 1.4 | 2.0 |
| <u>Reported totals</u> | | |
| Bluefish - no. | 102 | 6,277 |
| weight | 440 lbs. | 24,996 lbs. |
| Weakfish - no. | 432 | 25 |
| weight | 1,048.5 lbs. | 79.5 lbs. |
| Croaker - no. | 40 | - |
| weight | 104 lbs. | - |
| Spot - no. | 154 | 5 |
| weight | 48.5 lbs. | 2.5 lbs. |
| Others - no./ | flounder - 1/.8 lbs. | red drum - 3/90 lbs. |
| weight | black drum - 1/45 lbs. | |
| | black sea bass - 2/.5 lbs. | |
| | 'shark' - 22/46 lbs. | |
| All species - no. | 754 | 6,310 |
| weight | 1,733 lbs. | 25,168 lbs. |
| Fishermen | 100 | 624 |
| Man-hours | 569.0 | 3,396.5 |

TABLE 18 (continued)

| SEPTEMBER - 22.6% response | | |
|--------------------------------|---------------------------|----------------------------|
| | Bottom-fishing | Bluefishing |
| Total no. of trips | 10 | 67 |
| <u>Average values per trip</u> | | |
| no. of fishermen | 6.3 | 6.1 |
| no. of hours fished | 6.4 | 5.7 |
| no. of bluefish | 10.4 | 69.2 |
| no. of weakfish | 18.5 | .2 |
| no. of croaker | 2.7 | .06 |
| no. of spot | 16.2 | - |
| no. of all species | 48.6 | 69.8 |
| no. of fish/person | 8.3 | 11.4 |
| no. of fish/person/hour | 1.4 | 2.0 |
| <u>Reported totals</u> | | |
| Bluefish - no. | 104 | 4,638 |
| weight | 675 lbs. | 18,273 lbs. |
| Weakfish - no. | 185 | 14 |
| weight | 635.5 lbs. | 87.0 lbs. |
| Croaker - no. | 27 | 4 |
| weight | 33 lbs. | 8 lbs. |
| Spot - no. | 162 | - |
| weight | 101 lbs. | - |
| Others - no./ | flounder - 2/5 lbs. | flounder - 3/1.5 lbs. |
| weight | black sea bass - 6/2 lbs. | black sea bass - 15/7 lbs. |
| All species - no. | 486 | 4,674 |
| weight | 1450.5 lbs. | 18,376.5 lbs. |
| Fishermen | 63 | 410 |
| Man-hours | 417.0 | 2,344.0 |

TABLE 18 (concluded)

| OCTOBER - 19.4% response | | |
|--------------------------------|--------------------------|-----------------------|
| | Bottom-fishing | Bluefishing |
| Total no. of trips | 18 | 14 |
| <u>Average values per trip</u> | | |
| no. of fishermen | 5.7 | 7.2 |
| no. of hours fished | 5.8 | 5.5 |
| no. of bluefish | 1.7 | 32.6 |
| no. of weakfish | 22.1 | .4 |
| no. of croaker | - | - |
| no. of spot | 1.2 | - |
| no. of all species | 31.4 | 33.7 |
| no. of fish/person | 6.4 | 5.0 |
| no. of fish/person/hour | 1.1 | .9 |
| <u>Reported totals</u> | | |
| Bluefish - no. | 31 | 457 |
| weight | 101 lbs. | 1,949 lbs. |
| Weakfish - no. | 397 | 5 |
| weight | 2,192.5 lbs. | 30.0 lbs. |
| Croaker - no. | - | - |
| weight | - | - |
| Spot - no. | 21 | - |
| weight | 4 lbs. | - |
| Others - no. | flounder - 9/5.5 lbs. | flounder - 4/1.5 lbs. |
| weight | sea bass - 107/24.5 lbs. | sea bass - 6/2.3 lbs. |
| | tautog - 1/7 lbs. | |
| All species - no. | 566 | 472 |
| weight | 2,334 | 1,982.8 lbs. |
| Fishermen | 103 | 101 |
| Man-hours | 591.5 | 546.5 |

and effort data for 626 trips between May 2 and October 28, 1979. Of the trips reported, 86.6% were for bluefish and 13.4% were bottom-fishing trips. The composition of the total reported catch from bluefish trips was 97.9% - bluefish, 1.9% - weakfish, and .2% - Atlantic croaker, spot, and others. Of the total reported bottom-fishing catch, 45.7% consisted of weakfish, 22.4% - bluefish, 16.3% - spot, 12.1% - Atlantic croaker, and 3.5% - other (Table 19).

The analysis of the reported catch and effort data by month and type of trip is presented in Table 18. Effort in terms of the number of fishermen per trip and the number of hours fished per trip did not vary widely. Bluefish trips usually produced a higher average catch. Weakfish were caught incidentally on bluefish trips more often than other species. On bottom-fishing trips, weakfish always comprised the greatest proportion of the average catch per trip but were followed closely in some months by bluefish or spot.

Landings per trip of all species varied widely within months and also among trips reported on the same day. Thus, the range of values used to compute average catches was large. The average catch of bluefish per trip was highest in July (85.1 fish). The average number of weakfish caught per bottom-fishing trip was higher in August, but heavier catches were made in June and July. The highest average catch per bottom-fishing trip of Atlantic croaker occurred in July (15.2 fish) and of spot, in September (16.2 fish).

The number of fish landed per person per trip, and number of fish landed per person per hour were computed by month and type of trip

TABLE 19

Catch and effort data from 1979 Northern Neck
charter boat daily log sheets - summary

| | MAY THROUGH OCTOBER 1979 | | |
|----------------------------|--------------------------|--------------|--------------|
| | Bottom-fishing | Bluefishing | Combined |
| <u>Reported Totals:</u> | | | |
| no. of trips | 84 | 542 | 626 |
| no. of fishermen | 511 | 3,234 | 3,745 |
| no. of man-hours | 2,983.5 | 18,187.5 | 21,171.0 |
| Bluefish - no. | 983 | 37,970 | 38,953 |
| weight | 4,589 lbs. | 163,468 lbs. | 168,057 lbs. |
| Weakfish - no. | 2,009 | 739 | 2,748 |
| weight | 9,789 lbs. | 5,726 lbs. | 15,515 lbs. |
| Croaker ¹ - no. | 532 | 49 | 581 |
| weight | 1,398 lbs. | 125 lbs. | 1,523 lbs. |
| Spot - no. | 717 | 5 | 722 |
| weight | 305 lbs. | 3 lbs. | 308 lbs. |
| Others ² - no. | 155 | 40 | 195 |
| weight | 271 lbs. | 441 lbs. | 712 lbs. |
| All species - no. | 4,396 | 38,803 | 43,199 |
| weight | 16,352 lbs. | 169,763 lbs. | 186,115 lbs. |

¹Atlantic croaker

²'Others' includes black drum, red drum, summer flounder, striped bass, black sea bass, 'shark', and tautog.

(Table 18). Bluefish trips produced greater average catches per person than bottom-fishing trips in all months except October. The monthly average catch per person per trip for both types of fishing is presented in Figure 4. Figures 5 and 6 present the average monthly catch per person per hour for bottom-fish and bluefish trips, respectively, and include the 95% confidence limits. The highest catch rates occurred in July for both types of fish trips.

An average monthly weight per fish was calculated by dividing the total reported catch in pounds by the total reported catch in numbers for bluefish, weakfish, Atlantic croaker and spot (Table 20). Weakfish average weights varied the most throughout the season, with the greatest weights per fish occurring in May and June. The heaviest croakers were caught in May and the heaviest spot were landed in September. Bluefish weights varied little during the season.

Catch and effort data were collected from three bluefish trips by sampling on-board three charter boats (Table 21). Average length and weight of bluefish varied little among trips. The highest catch per trip (103 bluefish), per person (14.7), and per man-hour (2.5), occurred on the June 18 trip.

To estimate the total catch of the Northern Neck charter boat fishery in 1979 from the data reported, two additional statistics were computed. The average number of all trips made per boat per month was calculated for full- and part-time businesses combined (Table 22). Combining businesses was acceptable because the ratio of full- to part-time operations reporting data was the same as that existing in

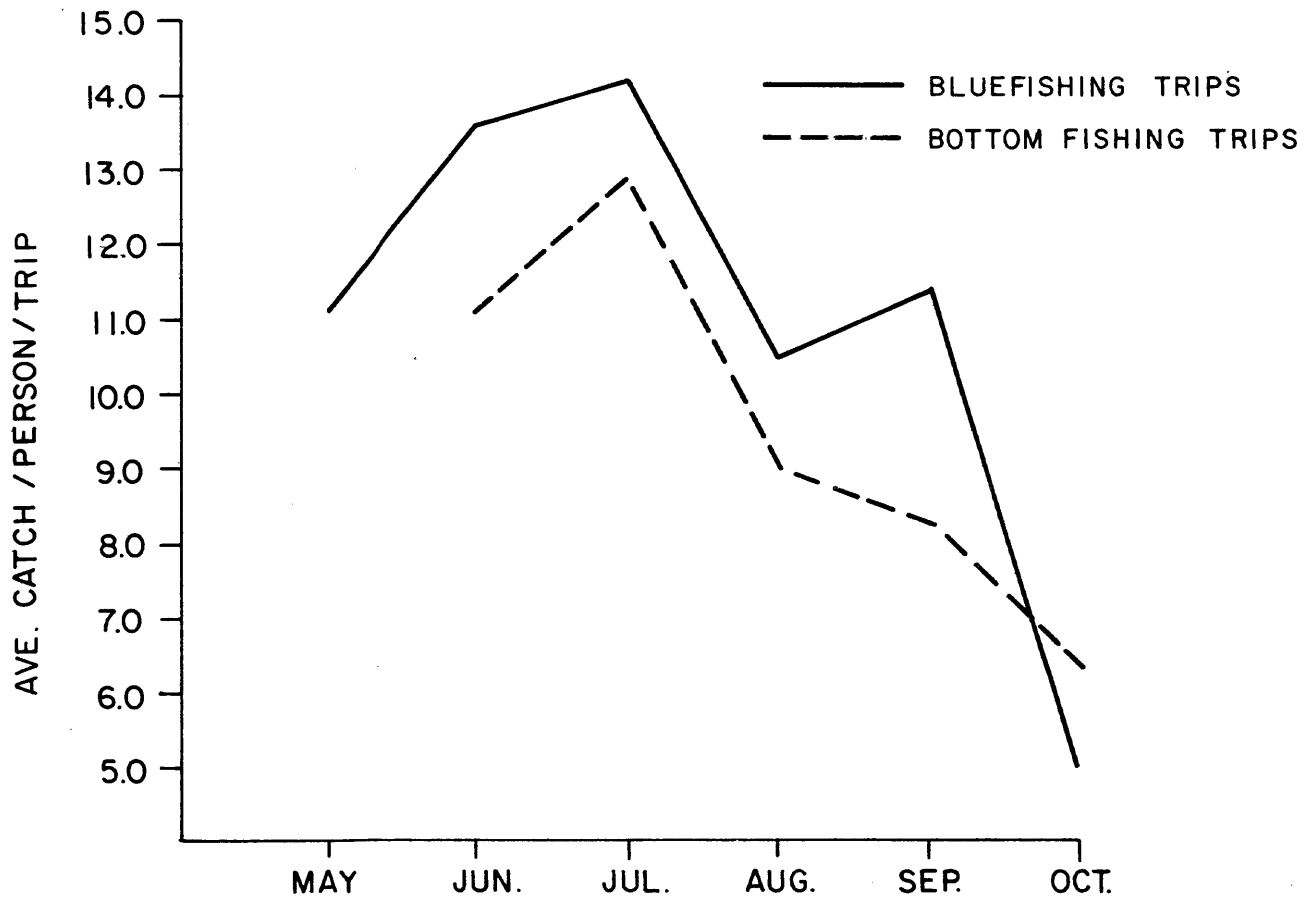


Figure 4. Monthly average catch (no. of fish) per person per trip - 1979 Northern Neck charter boat survey

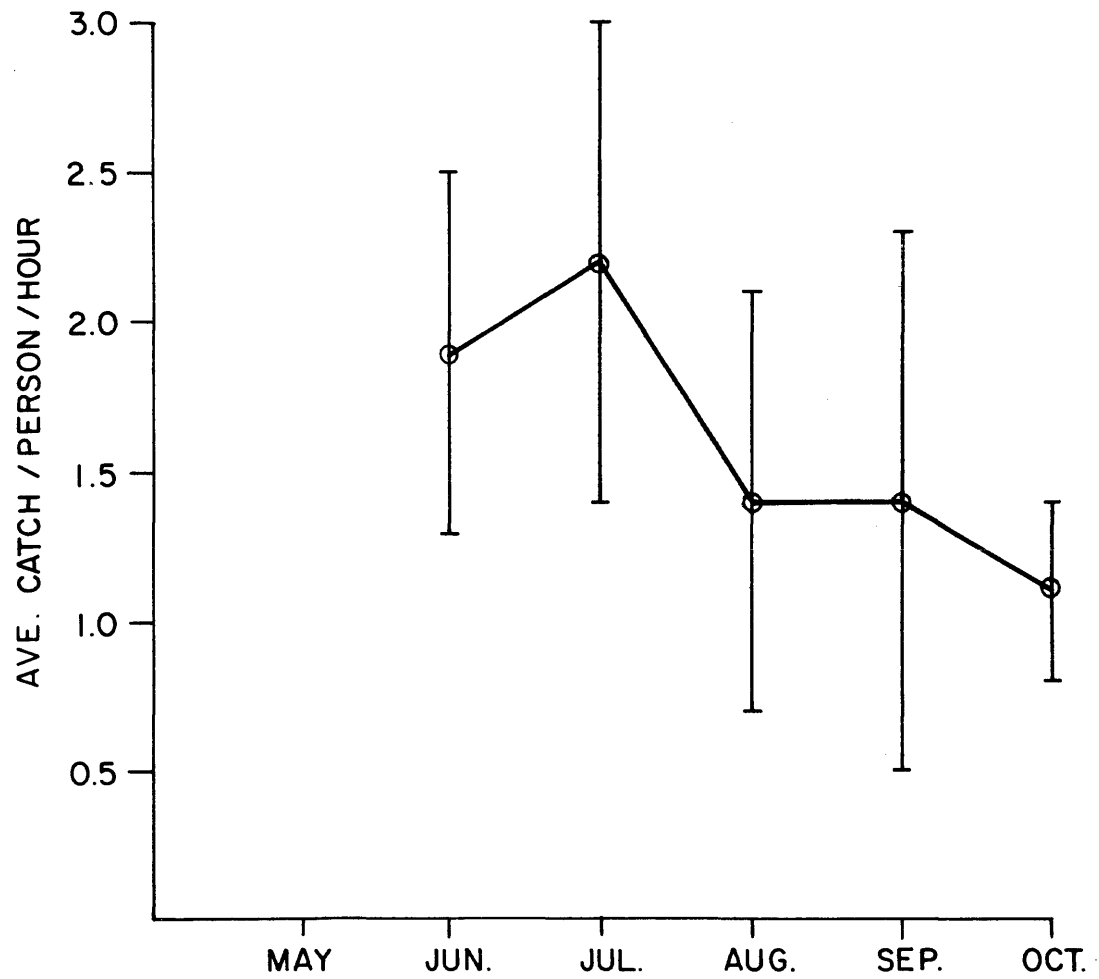


Figure 5. Monthly average catch (no. of fish) /person/hour and 95% confidence limits for bottom-fishing trips - 1979 Northern Neck charter boat survey

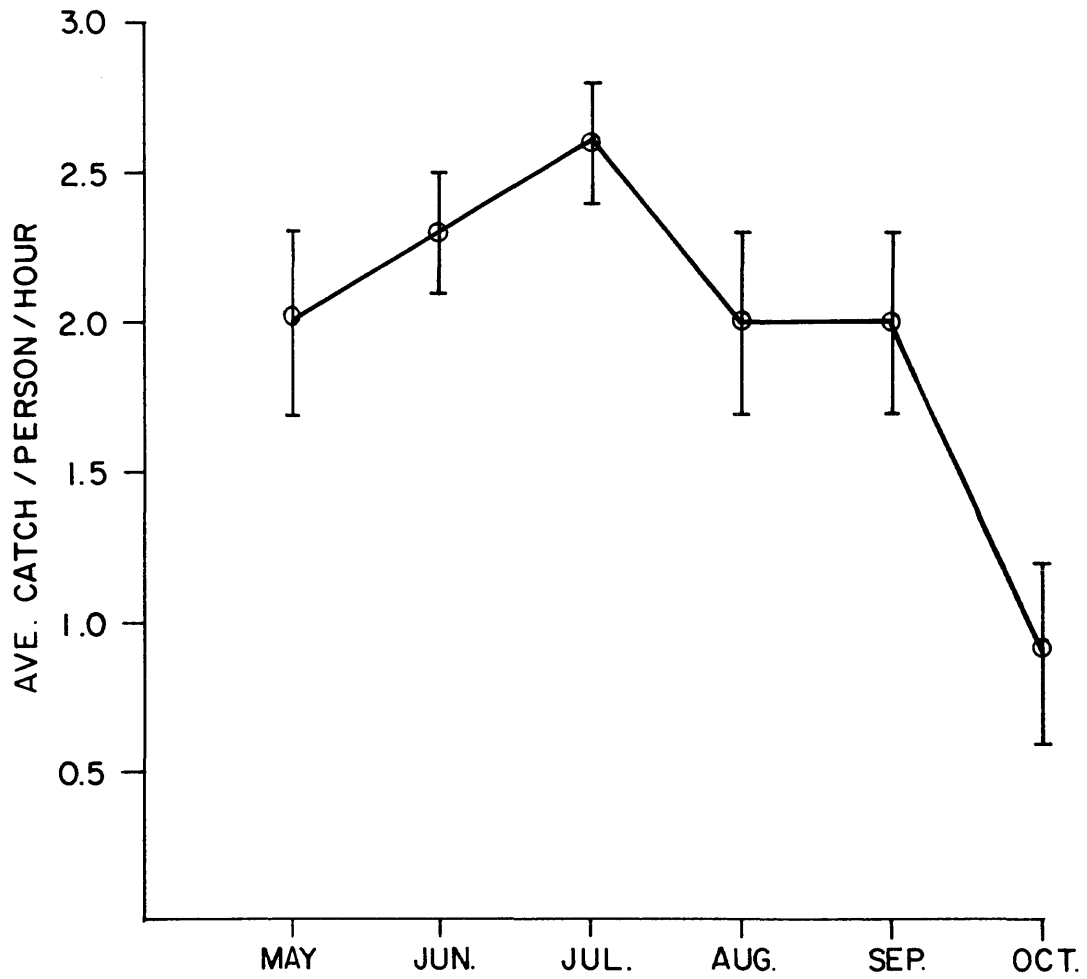


Figure 6. Monthly average catch (no. of fish) /person/hour and 95% confidence limits for bluefishing trips - 1979 Northern Neck charter boat survey

TABLE 20

Monthly average weights of fish from 1979
Northern Neck charter boat log sheet data

| | Average weight (lbs.) per fish ¹ | | | |
|----------|---|----------|----------------------|------|
| | Bluefish | Weakfish | Croaker ² | Spot |
| May | 4.5 | 8.4 | 3.2 | - |
| June | 4.3 | 7.1 | 2.9 | .4 |
| July | 4.5 | 6.1 | 2.6 | .4 |
| Aug. | 4.0 | 2.5 | 2.6 | .3 |
| Sept. | 4.0 | 3.6 | 1.3 | .6 |
| Oct. | 4.0 | 5.5 | - | .2 |
| Combined | 4.3 | 5.6 | 2.6 | .4 |

¹ $\frac{\text{reported total catch (lbs.)}}{\text{reported total catch (no's.)}}$

²Atlantic croaker

TABLE 21

Catch, effort, and bluefish length and weight
data from three sampling trips on Northern Neck charter boats, 1979

| | TRIP DATE | | |
|--------------------------------------|---------------------------|---------------------------|---------------------------|
| | June 18 | July 2 | July 18 |
| no. of fishermen | 7 | 3 | 6 |
| hours fished | 6 | 4.5 | 6.5 |
| no. of bluefish | 103 | 17 | 60 |
| catch (no.)/person | 14.7 | 5.7 | 10.0 |
| catch (no.)/person/hr. | 2.5 | 1.3 | 1.5 |
| Bluefish: | | | |
| Total weight | 334.3 lbs. | 48.5 lbs. | 186.9 lbs. |
| Average weight (min. - max.) | 3.3 lbs. (1.5 - 7.0) | 2.9 lbs. (1.7 - 3.7) | 3.2 lbs. (2.2 - 5.1) |
| Average fork-length (min. - max.) | 20.0 in. (15.9 - 26.7) | 18.6 in. (15.2 - 21.8) | 19.1 in. (16.8 - 23.5) |

TABLE 22

Reported monthly effort per boat from 1979
Northern Neck charter boat survey¹

| Number of trips/boat - average; (minimum - maximum) | |
|---|---------------|
| May | 7.2 (2 - 14) |
| June | 13.0 (4 - 30) |
| July | 13.5 (4 - 32) |
| Aug. | 10.9 (2 - 24) |
| Sept. | 11.0 (2 - 21) |
| Oct. | 6.3 (1- 16) |

¹Full- and part-time operations combined.

the total population. Bottom-fish and bluefish trip data were pooled because of the low frequency of bottom-fishing trips and the average catch of all fish (in numbers) per trip per month was computed.

The formula for estimating total monthly catches was: average catch/trip (all fish) X average number of trips/boat X total number of boats (31). Because most of the reported counts of catch per trip were concentrated in the lower range, the geometric average of catch per trip, a more appropriate statistic than the arithmetic average, was used in the calculations. Monthly species composition of the total reported catch was known (Table 23) and these percentages were applied to the total catch estimates to compute the catch of each species.

Total catch of all species from May to October was estimated to be 102,540 fish, of which bluefish = 91,345, weakfish = 7,301, Atlantic croaker = 1,225, spot = 1,882, and others = 848 (Table 24). Catch estimates for September and October are least reliable because of the lower response rates in those months. Rough estimates of the weight of a total species catch can be made by multiplying the monthly computed average weight per fish (Table 20) by the estimated number of fish caught per month in Table 24. Using this method it was estimated that approximately 391,000 lbs. of bluefish, 40,800 lbs. of weakfish, 3,200 lbs. of Atlantic croaker, and 800 lbs. of spot were landed from May to October 1979 by the Northern Neck charter fleet.

TABLE 23

Monthly species composition (percentages)
of total reported catch (no. of fish) - 1979
Northern Neck charter boat survey

| | May | June | July | Aug. | Sept. | Oct. |
|--------------------|------|------|------|------|-------|------|
| Bluefish | 97.1 | 89.5 | 90.8 | 90.3 | 91.9 | 47.0 |
| Weakfish | 2.6 | 7.7 | 5.0 | 6.5 | 3.9 | 38.7 |
| Atlantic croaker | .2 | 1.2 | 2.6 | .5 | .6 | - |
| Spot | - | 1.6 | 1.5 | 2.3 | 3.1 | 2.0 |
| Other ¹ | .1 | * | .1 | .4 | .5 | 12.2 |

¹See Table 18

*less than .1

TABLE 24

Monthly estimates of total catch (number) and 95% confidence limits of the Northern Neck charter boat fishery - 1979

| | Catch estimate (no.) (95% confidence limits) | | |
|--------------------|---|-----------------------------|-----------------------------|
| | MAY | JUNE | JULY |
| <u>All species</u> | 12,187 (10,602 - 13,995) | 24,220 (21,480 - 27,283) | 27,914 (24,482 - 31,806) |
| Bluefish | 11,834 (10,295 - 13,589) | 21,677 (19,225 - 24,418) | 25,346 (22,230 - 28,880) |
| Weakfish | 317 (276 - 364) | 1865 (1654 - 2101) | 1396 (1224 - 1590) |
| Atlantic croaker | 24 (21 - 28) | 291 (258 - 327) | 726 (637 - 827) |
| Spot | - | 388 (344 - 437) | 419 (367 - 477) |
| Other | 12 (11 - 14) | - | 28 (24 - 32) |

TABLE 24 (concluded)

| | AUG. | SEPT. | OCT. | TOTAL |
|--------------------|-----------------------------|-----------------------------|-----------------------|-------------------------------|
| <u>All species</u> | 13,922 (11,421 - 16,929) | 18,926 (16,334 - 21,926) | 5371 (4238 - 6836) | 102,540 (88,557 - 118,775) |
| Bluefish | 12,571 (10,313 - 15,287) | 17,393 (15,011 - 20,150) | 2524 (1992 - 3213) | 91,345 (79,069 - 105,537) |
| Weakfish | 905 (742 - 1100) | 738 (637 - 855) | 2080 (1640 - 2646) | 7,301 (6173 - 8656) |
| Atlantic croaker | 70 (57 - 85) | 114 (98 - 132) | - | 1,225 (1071 - 1399) |
| Spot | 320 (263 - 389) | 587 (506 - 680) | 108 (85 - 137) | 1,822 (1565 - 2120) |
| Other | 56 (46 - 68) | 95 (82 - 110) | 657 (519 - 837) | 848 (682 - 1061) |

DISCUSSION

General Overview

Virginia's commercial sport fishing industry encompasses a diversity of enterprises. The variety of fishing services offered is indicative of the types of recreational fishing opportunities available and of the nature of customer demand within a region. The survey's samples gave accurate representations of the true populations and correctly identified the relative proportions of charter and head boats.

The ratio of charter boats to head boats was found to be approximately 4.5 to 1. However, total fishing effort (angler-trips) by head boats was greater than by charter boats because of greater angler capacity and a higher annual number of fishing trips. Head boat operations tended to yield higher average gross revenues, but were not always more profitable than charter businesses because of greater operating expenses.

Another distinction between Virginia's charter and head boat industries is the type of fish sought, fishing methods and fishing locations. Charter fishing is predominated by the pursuit of pelagic game fish, from inshore bluefish to offshore tunas and billfish. Head boats, because of the number of anglers carried, are generally limited to bottom-feeding fish, or fish that can be caught without trolling. It is not uncommon however for charter boats to bottom-fish during certain parts of the season. Most Eastern Shore charter boats

actually fished primarily for bottom-fish (summer flounder, Atlantic croaker, weakfish) due to a high local availability of these fish and a long tradition of this type of operation.

Species composition of the reported charter boat catch ranked by weight was bluefish - 53%, bottom-fish (weakfish, Atlantic croaker, summer flounder, spot, black drum, black sea bass) - 32%, bluefin tuna - 12% and other offshore pelagic fish (white marlin, king mackerel, other tunas, dolphin, wahoo, etc.) - 3%. Bottom-fish comprised 87% of the reported head boat catch.

For comparison with past activities, Richard's (1965) documentation of approximately 10% of the Eastern Shore charter boat landings from 1955 to 1962 indicated that bottom-fish (summer flounder, weakfish, Atlantic croaker, black sea bass, black drum, red drum) comprised 83.6%, and pelagic fish, 16.4% of the total catch. Of the pelagic fish landed, 54% were bluefish, 1% were bluefin tuna, and 45% were other offshore species (Atlantic bonito, dolphin, cobia, little tunny, white marlin). Thus, on the Eastern Shore (Region IV) catch composition has changed little, but overall, pelagic fish have increased in importance due to greater availability and demand. Spot and Atlantic croaker dominated Virginia's inshore head boat catches followed by weakfish and summer flounder from 1955 to 1960 (Richards, 1962), a ranking that still prevails. How current black sea bass head boat landings compare with the past is unknown.

The Head Boat Industry

Head boat fishing lacks the versatility of charter activities, but this service appeals to many people because of the low price, the opportunity to catch popular food fish, and the ease of access. Some captains claimed that more customers are becoming "meat-fishermen."

The Virginia Beach head boat fleet has increased in recent years due to greater demand from the growing number of residents and the large resort tourist trade. Since this survey was completed, three new head boats have entered the fishery in Virginia Beach. Initial investments required to start a head boat business are currently so high that most of the new Virginia Beach vessels have been additions to established operations and were formed as corporations. The new head boats are large and have an angler capacity of up to 60 to 70 passengers.

High demand in Virginia Beach, especially during the summer tourist season, enables head boats to schedule two half-day trips daily. Although the average total costs for operating a head boat in Virginia Beach were as much as four times greater than any other area, average net revenues were the highest computed. The most successful businesses were those that, depending on seasonal preferences and fish availability, operated both a full- and half-day trip schedule. Many captains fishing the Virginia Beach area claimed that the use of electronic navigation, communication, and depth-finding equipment has improved head boat operations and has increased catch. Man-made

structures such as the Chesapeake Bay Bridge Tunnel and offshore artificial reefs have also enhanced the fishery.

Older head boat businesses and captains characterized the operations fishing the Chesapeake Bay out of Norfolk, Hampton, Poquoson, and the York and Rappahannock rivers. Norfolk head boats were the only businesses heavily patronized by local customers. This situation presented a distinctive set of factors affecting operation. Local residents fished frequently and desired a high catch rate. News of poor head boat fishing for a few days would spread rapidly and business would decline temporarily. Norfolk head boats once drew mostly non-local or vacationing fishermen who, according to the operators, are now attracted to the greater resort area of Virginia Beach. Average net revenues were low compared to vessels that were docked only 10-20 miles away in Virginia Beach.

Head boat businesses operating in the Hampton/York River area were well-established and had a stable customer market. A high number of angler trips and low operating costs yielded, on the average, a relatively high net return. In the past, a large group of head boats operated in the adjacent Newport News-James River area (Richards, 1962) but none were identified in this study.

Rappahannock River head boats represented the oldest elements of Virginia's fleet and operations have remained relatively unchanged. Vessels were small, gasoline powered, and had a low angler capacity. Total expenses were low but so were gross revenues. Bottom-fishing

success in the area had reportedly declined in recent years and captains felt that the market would not bear an increase in trip fees. As in the Hampton/York River area, few head boats have recently entered the fishery because of high initial investments, rapidly rising variable costs and an uncertain future of customer demand and abundance of fish stocks. Captains that have retired from business in these areas have not been replaced. Apparently, the size of the head boat fleet fishing in the vicinity of the Rappahannock River was larger from 1955 to 1960 (Richards, 1962) but the exact number of boats operating at that time is unknown.

An estimate of total angling effort was made from the reported data. Approximately 39,339 half-day and 25,820 full-day trips made by head boat anglers in Virginia during 1978 (Table 25). Since this study was completed, a total of five or six new head boats have been added to Virginia's fleet. Current (1981) annual head boat angler effort in Virginia is thus assumed to be higher than that of 1978.

Based on the average landings reported by the captains surveyed, an estimate was made of the total catch of all head boats fishing during 1978. Approximately 94,000 lbs. of bluefish and 714,000 lbs. of bottom-fish (spot, Atlantic croaker, black sea bass, weakfish, tautog, summer flounder) were caught by head boat anglers in 1978. These estimates should be used with caution since they were not made from actual measurements of anglers' catches during the season. However, they represent the relative contribution that bluefish and

TABLE 25

Estimated total number of head boat
angler-trips made in 1978

| | Half-day angler-trips | Full-day angler-trips |
|------------|--------------------------|--------------------------|
| Region I | 37,079 | 19,950 |
| Region II | 2,260 | 2,305 |
| Region III | - | 3,665 |
| Total | 39,339 | 25,820 |

✓) 39,339
 19669
25820
15489 FULL
 DAY
 ANGLERS

bottom-fish make in the head boat fishery and give an indication of the magnitude of the actual total catch.

The total gross revenues from head boat fishing fees were estimated to be \$667,600 (Table 26). Although other fisherman expenditures directly related to head boat fishing trips, such as for food, lodging, or transportation, were not obtained in this survey, a rough estimate of them was made from values in other reports. In compiling available data for a management plan, the Gulf of Mexico and South Atlantic Fishery Management Councils (1980) estimated that for every dollar spent on charter and head boats fees, anglers spent an additional \$.75 with businesses providing food, lodging or transportation. Assuming this ratio, Virginia's head boat fishermen spent an estimated \$500,700 in 1978 for goods and services associated with their angling trips (Table 26).

The direct revenues from fishermen's expenditures have an additional indirect impact on the economy through what is known as the multiplier effect. A portion of the money spent on head boat fees and on associated services is re-spent within a region and contributes to the income (wages and profits) of other area residents and businesses. A nation-wide study calculated that the multiplier for charter and head boat gross revenues equalled 1.14 and that for associated gross revenues was .81 (Centaur Management Consultants, 1977). Applying these multipliers to Virginia's head boat industry, an estimated total \$1,166,631 was generated in 1978 in indirect revenues (Table 26).

TABLE 26

Estimated total direct and indirect economic
impacts of the head boat fishery - 1978

| | Va. Beach | I Norfolk | Region II | III | ALL n=24 |
|---|------------------|---------------|---------------|---------------|----------------|
| <u>Direct impacts:</u> | | | | | |
| Estimated total gross revenues- fishing fees | \$490,041 | 92,064 | 46,660 | 38,835 | 667,600 |
| Estimated total gross revenues- associated busi- nesses ¹ | <u>\$367,531</u> | <u>69,048</u> | <u>34,995</u> | <u>29,126</u> | <u>500,700</u> |
| | \$857,572 | 161,112 | 81,655 | 67,961 | 1,168,300 |
| <u>Indirect impacts:</u> | | | | | |
| Multiplier effects on fishing fee revenues ² | \$558,647 | 104,953 | 53,192 | 44,272 | 761,064 |
| Multiplier effects on associated revenues ² | <u>\$297,700</u> | <u>55,929</u> | <u>28,346</u> | <u>23,592</u> | <u>405,567</u> |
| | \$856,347 | 160,882 | 81,538 | 67,864 | 1,166,631 |
| Direct & Indirect | \$1,713,919 | 321,994 | 163,193 | 135,825 | 2,334,931 |

¹Includes food, lodging, transportation; see text for method of estimation.

²Multiplier values from: Centaur Management Consultants, 1977.

The sum of direct and indirect impacts yields the total expenditure generated by the fishery. The estimated economic impact of Virginia's head boat industry was \$2,334,931 in 1978. This is only the monetary value and does not include any estimate of the intangible values, such as recreational benefits or aesthetic satisfaction.

The Charter Boat Industry

In recent years the regional groups of charter boats in Virginia have experienced either growth or decline as a result of changes in customer demand, fishing opportunities, and/or financial success. In Region I (Virginia/Norfolk) the number of charter boats has increased over the past 20 years due to growth in tourism, an expanding local population, and the establishment of an ocean inlet in Virginia Beach. Within the region there has been a net movement of charter businesses from Norfolk to Virginia Beach. According to captains surveyed, the decline of charter fishing that has occurred in Region II (Hampton/York River) was caused by reduced fishing success and customers being attracted elsewhere. In the upper Chesapeake Bay area of Region III (Rappahannock/Potomac) fleet size has grown in the last ten years. Increasing customer demand and improved fishing success due to the greater availability of bluefish and weakfish have produced this expansion. On the Eastern Shore (Region IV) fleets have declined in Oyster, Quinby and Chincoteague, but have grown in Cape Charles and Wachapreague.

The two fish species that have had the most impact on Virginia's charter fishery in the last 15 years are the bluefish and the striped bass. From the early 1960's to 1972 striped bass were reportedly abundant in catches of boats fishing the Chesapeake Bay from its mouth to the Potomac River. Large stripers were available in spring and late fall, and "school stripers" (1-2 lbs.) were present during summer months. Striped bass stocks in Virginia waters have declined sharply and captains reported that their last successful trips for stripers were made in 1975. Speir et al. (1977) documented a similar reduction in Maryland's recreational striped bass landings. The absence of striped bass shortens the season of Virginia's charter boats that fish the Bay during fall and early winter months and thus decreases potential revenues.

Offsetting this decline was an increase in the abundance of bluefish stocks during the late 1960's that has been sustained through the present. Commercial and recreational landing statistics reflect this upward trend in abundance, but exact biological data on population size is lacking (Gulf of Mexico and South Atlantic Fishery Management Councils, 1980). Bluefish are currently one of the most important sport fish for anglers fishing the North and Middle Atlantic regions of the U.S. East Coast (Wilk, 1977; Nicholson and Ruais, 1979). Bluefish changed the nature of part of the charter fishery in Region III (Rappahannock/Potomac) by shifting Bay fishing away from bottom-fish (especially the sciaenids) and striped bass. In comparison with a previous survey, the total sport catch of bluefish

in Maryland's Chesapeake Bay waters was up by 225% since 1962 (Speir et al., 1977). Bluefish were the second most abundant fish in the total catch of North Carolina's charter boats during 1977 (Manooch and Laws, 1979).

Sciaenid fishes, especially weakfish, spot, and Atlantic croaker, dominated Virginia charter boat bottom-fishing catches in the past (Richards, 1962, 1965) and continue to do so in some areas, particularly the Eastern Shore region. Captains reported that weakfish availability had been ample in the past few years, and that the years between 1974 and 1978 yielded successful catches of Atlantic croaker. The availability of spot did not seem to fluctuate widely from year to year. Captains noted that two sciaenids, the northern and southern kingfish (Menticirrhus saxatilis and M. americanus) have disappeared from bottom catches, as well as two other fish, the northern puffer (Sphaeroides maculatus) and the pigfish (Orthopristis chrysoptera).

The importance of deep-sea fishing to Virginia's charter industry is relatively new. Only in the last 10 or 15 years have white marlin and bluefin tuna become major target species for boats with ocean access. On the Eastern Shore, captains reported that offshore big game fishing began in the late 1940's, but only recently gained in importance. Vessel improvements and the use of electronic navigational and fish-finding equipment made more successful offshore fishing possible. Due to apparent declines in abundance of billfish and several other pelagic species (king mackerel, spanish mackerel,

cobia) and because of their importance to sport fishermen, management plans have been constructed to regulate these fisheries (South Atlantic Fishery Management Council, 1980; Gulf of Mexico and South Atlantic Fishery Management Councils, 1980). Bluefin tuna, the most actively sought tuna by Virginia's charter boats, have also declined in availability and current National Marine Fisheries Service regulations limit the sport catch to four bluefin tuna, depending on size, per angler per day.

An estimate of total angling effort was made from the reported data. Approximately 1,167 half-day and 39,657 full-day angler-trips were produced by all charter businesses operating in 1978 (Table 27). Regionally, the greatest angler effort was estimated for Eastern Shore operations.

Using the reported average landings, an estimate was made of the total catch of the charter boats fishing during 1978. Approximately 904,000 lbs. of bluefish, 542,000 lbs of bottom-fish (weakfish, Atlantic croaker, summer flounder, black drum, spot, black sea bass, red drum), 185,000 lbs. of bluefin tuna, and 30,000 lbs. of offshore pelagic species (white marlin, etc.) were caught by charter boat anglers in 1978. The same limitations on these estimates exist as described in the discussion of head boat estimated landings.

Unlike head boat businesses, charter boat revenues are dependent only on the number of trips made per year and not on the number of fishermen carried. Part-time charter businesses took so few trips

TABLE 27

Estimated total number of charter boat angler-trips made in 1978 (full- and part-time businesses combined)

| | Half-day angler-trips | Full-day angler-trips |
|------------|-----------------------|-----------------------|
| Region I | 451 | 10,006 |
| Region II | 36 | 650 |
| Region III | 680 | 13,721 |
| Region IV | <u>-1</u> | <u>15,280</u> |
| Total | 2) 1,167 583 | 39,657 583 |

¹No half-day trips were reported in survey.

110,240
2,500
112,740

that making a profit or even meeting expenses was usually impossible. Revenues gained were generally enough to cover the fixed costs of owning the boat and fishing equipment, which was often a major objective of the part-time captain. The highest average annual gross revenues were computed for full-time businesses in Region I (Virginia Beach/Norfolk), but the average full-time charter business in Region IV (Eastern Shore) was as financially successful, in terms of net revenues, as Region I operations. Location in a rural area and fewer high cost offshore trolling trips kept total expenses low for Eastern Shore boats.

The direct economic impact from all charter boat gross revenues was estimated to be \$1,346,741 in 1978 (Table 28). Using the method described in the discussion of head boat impacts, charter boat anglers generated an additional estimated \$1,010,057 in gross revenues with other businesses associated with their angling trips (Table 28). Applying the previously described income multipliers to charter fishing direct revenues, an estimated \$2,353,429 of total indirect revenues were generated in 1978 (Table 28). The estimated economic value of Virginia's charter fishing industry was \$4,710,227 in 1978.

The values of direct and indirect expenditures (excepting fishing fee revenues) calculated for both charter and head boat fleets should be used with caution, as they are based on broad assumptions and were computed using possibly incompatible data from the literature. Direct measurement of resident and nonresident angler expenditures and computation of regional income multipliers are necessary for a more accurate evaluation of economic impact.

TABLE 28

Estimated total direct and indirect economic
impacts of the charter boat fishery
(full- and part-time businesses combined) - 1978

| | I | II | Region III | IV | ALL |
|---|------------------|---------------|----------------|----------------|------------------|
| <u>Direct Impacts:</u> | | | | | |
| Estimated total gross revenues- fishing fees | \$489,778 | 13,613 | 378,480 | 464,870 | 1,346,741 |
| Estimated total gross revenues- associated businesses ¹ | <u>\$367,334</u> | <u>10,210</u> | <u>283,860</u> | <u>348,653</u> | <u>1,010,057</u> |
| | \$857,112 | 23,823 | 662,340 | 813,523 | 2,356,798 |
| <u>Indirect Impacts:</u> | | | | | |
| Multiplier effects on fishing fee revenues ² | \$558,346 | 15,519 | 431,467 | 529,951 | 1,535,283 |
| Multiplier effects on associated revenues ² | <u>\$297,540</u> | <u>8,270</u> | <u>229,927</u> | <u>282,409</u> | <u>818,146</u> |
| | \$855,886 | 23,789 | 661,394 | 812,360 | 2,353,429 |
| Direct & Indirect | \$1,712,998 | 47,612 | 1,323,734 | 1,625,883 | 4,710,227 |

¹Includes food, lodging, transportation; see text for method of estimation.

²Multiplier values from: Centaur Management Consultants, 1977.

Northern Neck Charter Boat Fishery

The 1979 log book survey achieved for the first time a continuous, season-long documentation of the catch and effort of a group of Virginia's charter boats. Success was due to particularly high levels of support and enthusiasm from the captains involved. Response rates were quite adequate, and because of the homogeneity of the fishery, the estimates of total catch from monthly samples are useful representations of the actual catch.

Log data has inherent errors and biases that can only be corrected by sampling a boat's catch at dockside. By sampling Carolina head boat catches with both log books and a creel census, it was found that log data generally gave significantly higher estimates of a trip's catch than creel counts, especially if a catch was large (Huntsman et al., 1978). However, because of the size of the fishery and the expenses involved in port sampling, Huntsman et al. (1978) concluded that the extensive, low cost coverage offered by log books, although biased, met their needs in monitoring head boat catches. Similarly, due to the nature of the Northern Neck charter fishery and this study, the use of logs maintained by boat captains was the most cost effective method of data collection.

The possibility that captains may have overestimated the weight of their catches, especially total catch of bluefish, was indicated by the measurements made on the sampling trips. Bluefish landed on sampling trips averaged about three pounds, while reported average weights were four pounds or more. The catch of North Carolina charter

boats was surveyed by log books and by creel clerks who sampled landings periodically in order to calculate average weights of each species (Manoch and Laws, 1979). This may be the best method to use for obtaining weights of catches, rather than expecting captains to provide a precise measurement.

The log book survey showed that bluefish dominate this Chesapeake Bay fishery almost exclusively. This estuarine fishery for blues is quite different from the offshore fishery described for North Carolina's charter boats (Manooch and Laws, 1979). Highest catches per trip of bluefish in North Carolina were made during fall months, whereas in the Northern Neck, highest bluefish catches per trip occurred in June and July. Monthly average bluefish catch per trip was always higher for the Virginia charter boats. Much smaller fish (.5-1.5 lbs.) were landed during the summer months in North Carolina and very large blues were present in spring and fall (Manooch and Ross, 1979). Northern Neck reported average weights of bluefish (4.0-4.5 lbs.) varied little throughout the season. Manooch and Ross (1979) felt that their data showed the possibility of the existence of at least two populations of bluefish in North Carolina waters. Kendall and Walford (1979) presented evidence that the two major spawning seasons and areas of bluefish may represent two separate populations. What position the bluefish frequenting Virginia's Chesapeake Bay occupy in the Atlantic population structure is unknown.

Bluefish catch per person per hour (2.1) by Northern Neck charter anglers for the whole season was more than twice that of Maryland

charter fishermen (.89 bluefish/person/hour) in 1976. Catch rates for bluefish trips in the Northern Neck fishery were generally higher than those reported for the Texas charter fishery (McEachron, 1980), the Dade County, Florida charter fishery (Gentle, 1977) and the South Carolina charter fishery (Liao and Cupka, 1979).

CONCLUSION

The charter and head boat industry is a form of public access to common property marine fishery resources. It is a service industry that is dependent on interactions of fish availability and customer demand. Designers of management policies affecting the accessibility to these resources must evaluate potential impacts from this perspective. Planners should also focus on the economic and social benefits that accrue to coastal communities when making decisions influencing commercial sport fishing.

How the activities of Virginia's charter and head boat fleet compare with all other marine recreational fishing in the state is unknown. The total number of angler-trips provided by all charter and head boats was estimated to be 105,983. Speir et al. (1977) calculated that 1,694,200 finfishing trips were made in the Maryland portion of the Chesapeake Bay and that 14.3% of these were charter boat angler trips. The survey also revealed that despite the greater amount of effort expended by private boat anglers, charter boat fishermen landed 42% of the total catch by weight (Speir et al., 1977). It is possible that a charter or head boat angler in Virginia has a greater harvest capacity than a private fisherman, as several

other studies have reported higher catch rates on charter and head boats (Briggs, 1962; Frisbie and Ritchie, 1963; Caillouet and Higman, 1973). Preliminary survey data on Virginia's bluefin tuna sport fishery indicated that the catch per unit effort of charter anglers was twice as great as that of private anglers (James Cowan, pers. comm.).

In 1978 commercial fishermen landed at Virginia ports 2,740,355 lbs. of bluefish, 22,937,146 lbs. of bottom-fish (Atlantic croaker, black drum, black sea bass, red drum, spot, summer flounder, tautog, weakfish) and 233,413 lbs. of offshore pelagic fish (bonito, cobia, dolphin, king mackerel, marlin, tuna) (U.S. Department of Commerce, 1980). In comparison, total charter and head boat landings for 1978 were estimated in this study to equal approximately 998,000 lbs. of bluefish, 1,256,000 lbs. of bottom-fish, and 215,000 lbs. of offshore pelagic species. While significant, these landings represent only one component of the total recreational landings. It is likely that at least the total sport fishing catch of bluefish and offshore pelagic species exceeded the commercial catch during 1978 in Virginia.

The magnitude of the marine sport fishing harvest in Virginia needs to be determined if management of recreationally and commercially exploited fish stocks is required. The Commonwealth should implement a research program to document recreational landings. A quantitative dockside census of the landings of charter and head boat anglers needs to be made coincident with the survey of catch and effort of other modes of angling. The survey of marine anglers should

also determine the economic impacts of their activities in order to facilitate meaningful comparisons with commercial fisheries.

Each management tactic used to control total harvest has a particular effect on different fisheries. Managers regulating the charter and head boat industry must carefully consider possible reactions to proposed strategies. Seasonal catch quotas or allocations, often used for regulating commercial fisheries, are not generally applicable to sport fisheries because of the difficulty of acquiring timely and complete landing data and of enforcement. Instead, daily catch quotas or size limitations are more often set for recreationally sought fish since these are easier to monitor and accept. A daily catch limit on billfish may impose little hardship on a Virginia charter business since customers have not generally demanded a high catch rate. However, a catch limit on a bottom-fish that head boat anglers have traditionally sought in quantity may cause these businesses to lose customers. In this case a minimum size restriction, if compatible with conservation requirements, may be more beneficial to the head boat industry. Prohibiting the catch of a species important to charter or head boats during their fishing season could be detrimental if other species available did not meet customer demands.

To resolve conflicts arising between commercial and sport fishermen over common resources, the optimum yield strategy requires an emphasis on the economic impacts relative to differential allocation. The majority of the estimated \$7,045,158 of direct and

indirect revenues from Virginia's charter and head boat industry resulted from anglers pursuing bluefish and sciaenid fishes. Summer flounder, bluefin tuna, and black sea bass were also of economic importance. Bluefish, sciaenids, and summer flounder are of equal recreational and economic importance to other sectors of the sport fishery such as private boat angling, pier fishing, and surf casting. The expenditures and impacts relative to these species is conceivably in the tens of millions. Currently, bluefish are not important target species for commercial fishermen in Virginia, but sciaenids (spot, Atlantic croaker, weakfish) and summer flounder form a major part of the commercial food fish landings. If sciaenid or flounder stocks should decline and managers decide to regulate the fisheries, sport fishermen must be able to document the economic value of their activities to insure political recognition and equitable allocation.

It is difficult to predict the future of Virginia's charter and head boat fishing industry. Growth or stability will likely be influenced more by economic factors than fishing success. Operating expenses are rising rapidly, most especially fuel costs, and some captains may be forced out of business. Although net returns are generally low, many operators depend on this source of income during the fishing season. Owners may also have difficulty financing replacements for old vessels and equipment. Head boat businesses may be able to withstand economic pressures better than charter operations because of their capacity to generate higher net revenues. To promote a prosperous future, beyond combating financial problems, charter and

head boat operators need to involve themselves in the process of the conservation and management of the fishery resources that are the foundation of their industry.

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