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The Assessment of Commercial Fishing Effort in Virginia 1987

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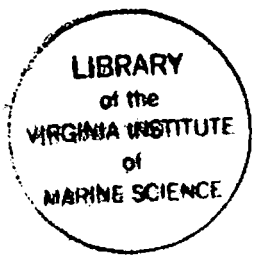

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INTRODUCTION

This report summarizes the assessment of commercial fishing effort in Chesapeake Bay and its Virginia tributaries during the period January 1, 1987 through December 31, 1987. Objectives of this study were: 1) to assess pound net fishing effort in Chesapeake Bay, and in the James, York and Rappahannock rivers; and 2) to assess anchor, drift, and stake gill net fishing effort in the James, York and Rappahannock rivers.

The study period covered the calendar year which represents a natural break in fishing effort in Virginia. Data for fyke net and haul seine fisheries, when available, have also been included.

Also included as appendices to this report are a map of Virginia waters showing pound net sites that were occupied during 1987, a Virginia Marine Resources Commission (VMRC) map of Virginia water designations and corresponding water codes which were modified slightly.

Potomac River fisheries are under the jurisdiction of the Potomac River Fisheries Commission (PRFC). The Commission issues gear licenses, and describes and documents the location of each gear site when the license is issued. Because the location of each unit of gear is well documented in the Potomac River we have not included those data in this report.

METHODS

Pound Nets

A pound net is deemed to be actively fishing when the hedging (lead), heart, and head are in place. Active pound nets were counted by an observer during aerial surveys at low altitudes once a month during January and February 1987. Semimonthly counts were made June through November 1987 and one count was made in December 1987. During March, April and May 1987, semimonthly aerial surveys were conducted using a separate source of funding. These data are also incorporated in this report. The aerial surveys do not include the northern shore of the Potomac River because of air space restrictions. Pound nets in the Potomac and its Virginia tributaries were counted by aerial survey in the lower portion of the river along the southern shore, and other areas were canvassed by telephone interviews with cooperating fishermen who hold pound net licenses issued by the Potomac River Fisheries Commission and VMRC, and by letters when telephone calls were unsuccessful.

We have identified areas where pound nets are located in Chesapeake Bay and its tributaries, using VMRC-designated codes and names of Virginia water areas (Appendix I). Two of the VMRC water areas were further divided along the western side of Chesapeake Bay using VIMS aerial pound net survey designations, which are more definitive (see Appendix I). Data will be presented in tabular form showing the number of pound nets fishing in each sampling period, the mean number of net days per day, and the number of net days per month.

Stake Gill Nets

Stake gill net effort in the James and York rivers was assessed by observers in small boats during the first and second half of May, the end of the American shad (Alosa sapidissima) gill net fishing season. The observers counted each active stand and the sections of nets in each stand. Data for total length of netting fished will be addressed in the 1987 report on Alosa entitled "Study of Alosa Stock Composition and Year-class Strength in Virginia." Personal interviews with cooperating fishermen were conducted to ascertain gill nets employed during the spring fishery in the Rappahannock River; and were continued at regular intervals throughout the year to determine maximum effort by half-month in the James, York and Rappahannock rivers.

Anchor Gill Nets

Personal interviews with cooperating fishermen were utilized as a method of determining maximum anchor gill net effort per half month. Data are reported as the total number and estimated linear feet of commercial nets fished in each river section during each half-month.

A pilot program to determine the feasibility of counting anchor gill nets in the lower section of York River using a small out-board motor boat, an operator, and one observer in late afternoon to early evening hours was conducted in three successive half-months in late summer of 1986 to ascertain the effectiveness of this method of counting gill nets. This method was deemed ineffective after three surveys were conducted in the lower York River during 1986 due to the nature of the fishery and the size of the area to be surveyed.

Drift Gill Nets

Drift gill nets are fished in the James, Pamunkey and Mattaponi rivers. Data for drift gill net effort were obtained by personal and telephone interviews with cooperating fishermen.

Fyke Nets

A fyke net is considered active, or fishing, when the hedging (lead), heart, and head (a long bag-shaped net, held open by a series of hoops) are in place and in good repair, and exhibiting a valid license for the current year. During a striped bass tagging study in April 1987, VIMS utilized commercial fyke nets in the upper James River as a source of specimens for tagging. Observers in a small boat also made a count of active fyke nets in conjunction with the stake gill net surveys in late May in the James River. An aerial survey of fyke net effort in the James River was made in early June and again in early October. Personal interviews with fishermen were another source of information on this type of gear.

Haul Seines

Haul seine fisheries were active in the James, York and Rappahannock rivers and certain areas of Mobjack Bay and the Chesapeake Bay during 1987. Data on haul seine effort were collected through personal interviews with fishermen in these areas.

RESULTS

Pound Nets

Chesapeake Bay Areas

Chesapeake Bay pound net data are shown in Tables 1 through 15, using VMRC-designated subarea codes, except where such subareas were further divided to more closely match the VIMS aerial pound net survey designations (see Appendix I). Dates of flights, mean net days per day, and net days per month are shown in these tables.

The maximum number of nets in subarea 011 (Chesapeake Bay, Western Management Area) was eight observed in the first half of May (Table 1). Peak nets occurred in this area in June and July in 1986 when there were 11 nets observed.

Subarea 027 (Fleets' Bay) had a maximum of three pound nets in 1987, the same number observed in 1986 (Table 2).

Subarea 511 (Windmill Point - New Point) had a maximum of 14 nets in the first half of June in 1987, which was three less than the maximum of 17 observed in 1986 (Table 3).

York Spit (subarea 611) had a peak of six nets in 1987, compared to a peak of nine nets in 1986 (Table 4).

Subarea 711 (Tue Marsh to Willoughby Spit) had a maximum of three nets (observed in the first half of April) in 1987. Data are shown in Table 5.

Subarea 811 (Willoughby Spit - Cape Henry) had a maximum of five nets, first observed in the last half of May. These nets were located just east

of Lynnhaven Inlet. The same number were observed in 1986, in approximately the same locations (Table 6).

Chesapeake Bay, Lower Eastern Section (subarea 411), had a maximum of 27 nets in 1987, but the peak was not observed until the first half of November. Eight nets were seen as early as the first half of April. The maximum count in this area in 1986 was 25 (Table 7).

Chesapeake Bay, Upper Eastern Section (subarea 211) had a maximum of four nets in 1987, one more than had been observed in 1986 (Table 8).

Subarea 084 (Tangier Sound) had a maximum of three nets in 1987, one more than was observed in 1986 (Table 9).

No pound nets were observed in subarea 088 (West Tangier Management Area), in subarea 111 (Chesapeake Bay, Upper Western Section) or in subarea 072 (Pocomoke Sound) in 1987.

James River

The lower section of the James River has not had a pound net fishery since 1984, when one net stand was located just west of the Hampton Roads Bridge-Tunnel on the north side of Hampton Roads. Pound nets have not been observed in the central section of James River since the late 1970's. The James River (VMRC subareas 137, 237, and 337) was not surveyed during the aerial pound net counts over the Chesapeake Bay and Virginia tributaries, with the exception of the area just west of the Hampton roads Bridge-Tunnel. Personal communication with local commercial watermen indicated they had observed no pound net fishing effort along the river in 1987. Therefore, due to time and monetary constraints, we relied on

personal communication and telephone interviews with watermen to determine the status of the pound net fishery on the James.

One fisherman had a maximum of four pound nets, located in an upriver tributary of the James (subarea 337) during 1987. This location is near a power plant warm-water discharge. These nets were in place in December 1986, and 1987, during the months of January through May, and November through December. No other pound nets were reported in the James River during the contract period (Table 10).

York River

The York River (VMRC subareas 195, 295, 395) had an active pound net fishery only in its lower section (subarea 195) in 1987. Aerial pound net surveys covered this area of the river and a maximum of 12 nets was observed in the first half of May. Data are shown in Table 11. A maximum of 12 nets was also observed in 1986.

Personal communication with local watermen along the central (subarea 295) and upper sections (subarea 395) of the river indicated no pound net activity in these sections; therefore, our aerial surveys did not extend into these areas. Again, time and monetary constraints were contributing factors in our decision not to extend the aerial survey along this river.

Pound nets were first observed in the lower section of the river in the first half of March, and all had been removed by the second half of October.

Rappahannock River

Pound nets were observed in the Rappahannock River in late March in subarea 177 (Lower Section) and a peak of seven nets had been set by the last half of May in 1987 (Table 12). Maximum nets counted in 1986 was also seven.

In subarea 277 (Central Section) two nets were observed in early March and the peak of four nets was observed in early June (Table 12).

The upper section of the Rappahannock River (subarea 377) had a maximum of 12 pound nets by the first half of May (Table 12). Although it has traditionally had the largest pound net fishery of the entire river, it did not approach the maximum of 21 nets observed in this section in 1986.

Two pound nets were observed in the Great Wicomico River (subarea 029) (Table 13). One pound net was observed in the Piankatank River mouth (subarea 069) (Table 14).

One pound net was observed in Mobjack Bay (subarea 055) in 1987 (Table 15). This net was first observed in early April and remained fishing until the second half of November. In 1986 there had been five nets in Mobjack Bay.

Stake Gill Nets

James River

The James River stake gill net fishery extended to all three subareas of the river in March and April, 1987. The largest number of nets were reported in subarea 137 (Lower Section) with 18 nets. Six nets were

reported in subarea 237 (Central Section), and one was reported in subarea 337 (Upper Section) (Table 16).

York River

York River had no stake gill nets in its lower section (subarea 195) in 1987. The Central Section (subarea 295) had stake gill nets in March and April, and the Upper Section (subarea 395) had the most extensive fishery, beginning in January and lasting through April, and again in November and December (Table 17).

Rappahannock River

The Rappahannock River, like the York, had no stake gill net fishery in its lower section (subarea 177) in 1987. Its central section (subarea 277) had nets set during the first half of January, on through the second half of May. In the second half of October nets were again set, and were in the river through the second half of December. In subarea 377 (Upper Section), there was one net set during the month of March (Table 18).

Anchor Gill Nets

The anchor gill net fishery in Virginia is extensive, and includes full-time commercial fishermen who sell all of their catch, part-time fishermen who sell their catch (probably while holding full-time jobs and fishing on their days off), and recreational or non-commercial fishermen who

set occasional nets to supply their families and/or friends with seasonal species for personal use.

Our data relate to three major Virginia tributaries to the Chesapeake Bay, and primarily nets set by full-time commercial fishermen. Anchor gill nets are relatively inexpensive, compared to pound nets. They are easily set and can be moved and set again in a different place at the whim of the individual fisherman. For this reason, it is more difficult to obtain detailed data for anchor gill nets. Data are reported in Tables 19 through 21 for the James, York and Rappahannock rivers.

James River

James River fishermen set anchor gill nets in March in subarea 137 (Lower Section) and the maximum number of nets reported in this area occurred during the first half of May. Table 19 shows nets by half-month and total estimated linear feet of net by half-month for all subareas of the James.

Seven anchor gill nets were reported being set in the last half of March in subarea 237 (Central Section). This was the maximum number reported in this section.

The uppermost section of the James River (subarea 337) was the least utilized by anchor gill net fishermen, with a maximum of three nets reported in the first half of June. Earliest nets reported were set in the first half of March.

York River

Anchor gill nets were first reported in the York River (subarea 195) in the second half of February 1987. A maximum of 59 nets were reported in the second half of September. Nets were reported fishing in every month of the year except January in this subarea (Table 20).

Twenty-eight nets were reported in the Central Section (subarea 295) in September 1987, which was the maximum for this area. Earliest reported nets were set in the first half of March.

Two nets were reported in the Upper Section (subarea 395) in early January. The maximum for the year occurred in the last half of March, and anchor gill nets were fished in every month in this section of the river.

Rappahannock River

Anchor gill nets were fished from the second half of March through the first half of December 1987 in subarea 177, the lower section of the Rappahannock. A maximum of 13 nets were set in early July (Table 21).

The Central Section (subarea 277) was the most heavily exploited by anchor gill nets in this river in 1987 with 34 nets reported in the second half of March. Nets were reported in every month of the year.

In subarea 377 (Upper Section) nets were reported in all months except August and September and the maximum of 23 nets was reported in the first half of November.

Drift Gill Nets

James River

The James River Upper Section (subarea 337) supported a drift gill net fishery in 1987, during the first half of April. Thirty nets were reported, exceeding by five the number reported from this area in 1986.

Pamunkey and Mattaponi rivers

Drift gill nets are fished in the Pamunkey and Mattaponi rivers; however, the nets are fished by part-time fishermen from small boats launched at private docks. Thus, we could not assess these fisheries.

Rappahannock River

A very limited drift gill net fishery has existed on the Rappahannock River in recent years, but has been on a recreational or part-time basis (personal communication). This trend has continued in 1987. The notable increase of regulated anadromous species in the river and the decline of the American shad fishery have both contributed to the decline of this type of fishery.

Fyke Nets

James River

Fyke nets were fished in the Upper Section (subarea 337) of the James River throughout 1987. The maximum number, 23 nets, was reported during the second half of June. This equalled the maximum number of fyke nets in 1986 (Figure 1).

York River

The Lower Section (subarea 195) of the York River had one fyke net in 1987. It was first observed in the second half of July, again in the first half of September, October, and early November.

The Upper Section (subarea 395) had one net which was set to fish in January through the first half of February, and the month of March. No other fyke net activity was reported on this river.

Haul Seines

James River

The Central Section (subarea 237) was the scene of the early haul seine activity in the James River and was limited to one unit of gear in 1987. Catfish were the target species of this fishery.

York River

The 1987 haul seine fishery began in subarea 195 (Lower Section) in early May and continued through the last half of September.

The Central Section (subarea 295) had two haul seines reported. One was fished during late May and the first half of June, and both were fished during late June and early July.

Rappahannock River

Like the James River, the Rappahannock River had one haul seine unit in operation in 1987. It was fished in late July and early August in the Lower Section (subarea 177).

Mobjack Bay

Mobjack Bay waters (subarea 55) were utilized by haul seine fishermen who also fished their gear in the Lower Section of York River (subarea 195). Therefore, it was difficult to make an assessment of this gear in this area. However, four units were reported working in Mobjack Bay in July.

DISCUSSION

The actual number of units of the various types of fishing gear in the Chesapeake Bay and its tributaries changes greatly during the course of a year, and usually reflects the commercial watermen's knowledge and

experience concerning the particular fisheries they have targeted. Fluctuations in effort are influenced by, or can be the results of:

1. restrictive fishery regulations.
2. seasonal availability of marketable species, i.e., migratory patterns and cyclic appearances of desirable species.
3. hydrological conditions, such as winter storms, hurricanes, droughts or flooding.
4. market demands (domestic and foreign).

Pound Nets

Chesapeake Bay

Pound nets in Chesapeake Bay tend to be clustered in certain areas. The choice of locations is influenced by: 1) accessibility to home ports; 2) location of docking facilities and/or seafood handling facilities; 3) good launching sites; 4) areas of sufficient size for net maintenance, pole preparation and storage; and 5) fish migratory patterns. Pound net sites occupied in 1987 are indicated in Appendix II.

Pound nets located in the Chesapeake Bay (Western Management Area) and the area from Windmill Point on the Rappahannock River to New Point capture edible species that are sold to local markets and are trucked to city markets. Fishes that have little or no demand in the marketplace are referred to as "scrap." These catches are sold locally as crab bait or trucked to processing plants in Reedville, Virginia.

The York Spit area is a productive fishing area and pound nets located there are set primarily for the summer and fall fisheries. Croaker

(Micropogonias undulatus), spot (Leiostomus xanthurus), bluefish (Pomatomus saltatrix), grey trout (Cynoscion regalis), summer flounder (Paralichthys dentatus) and Atlantic menhaden (Brevoortia tyrannus) are some of the species caught. Historically, pound nets in the Tue Marsh-Old Point areas are fished primarily for river herring (Alosa aestivalis and A. pseudoharengus), American shad (Alosa sapidissima) and spot and other summer species.

Five pound net sites in the Cape Henry area are located along the shore to the east of Lynnhaven Inlet. These nets are usually set to catch the early arriving anadromous species, river herring and shad, and subsequent summer species.

The numerous pound net sites in Chesapeake Bay (Lower Eastern Section), for the most part, lie very close inshore, and the majority of them are found from Cape Charles south. They usually remain set through the Fall season when marketable summer species migrate out of the Bay.

James River

The James River pound net fishery has been affected by bans on fishing since 1975 because of Kepone contamination. That and the high cost of setting pound nets virtually eliminated this fishery from the James until late 1986 when a gizzard shad fishery developed in the upper section of the James. One fisherman set four pound nets in 1987 in order to fulfill market demands for this species.

York River

In the lower section of the York River, pound nets are all located within three to four miles of the river mouth. Fish from these nets are landed nearby and are sold to wholesale buyers, shipped to retail markets or used locally as crab bait.

Rappahannock River

Pound nets in the Rappahannock River, lower section, were localized in two areas, one was the north shore near the river mouth and the other was just upriver of the Rappahannock River Bridge. In the central section they were located near Morattico, and in the upper section they were found from mile 35 to mile 60, but most were localized around Cat Point Creek mouth to upper Payne's Island. Catfish (Ictalurus sp.), white perch (Morone americana) and the anadromous fishes in season are target species. Retail and wholesale markets are the destinations of the edible catch and bait is sold to crab and eel pot fishermen (Davis et al. 1986).

Stake Gill Nets

Generally, the stake gill net fisheries in the James, York, and Rappahannock rivers begin in the spring when ice in the rivers is no longer a threat to poles and nets. The York River system has the most extensive stake gill net fishery in Virginia. In the James and York rivers the stake gill net season begins with the arrival of the American shad. White perch are the target species in the Rappahannock River in February and March before the arrival of American shad.

Stake gill nets are subject to fouling by marine organisms, grass, and other detritus. These conditions affect catch and occasionally the nets must be raised and cleaned. The nets are removed when shad are scarce or dockside prices are low. Other fisheries (haul seine, anchor gill net, crab pot, etc.) replace the stake gill net fishery. White perch and catfish are the target species through the late fall and winter months.

Anchor Gill Nets

The temporal and spatial aspects of the anchor gill net fisheries in Virginia were discussed in detail by Davis et al. (1986).

In general, effort in the James and York rivers in 1987 equalled that reported in 1986, whereas 70 nets were reported in the Rappahannock River, an increase of 13 nets over the total reported for the river in 1986.

Mobjack Bay and Chesapeake Bay both had anchor gill net fisheries. An estimation of 150 nets in the Chesapeake and 18 nets in the Mobjack has been offered by commercial watermen who were familiar with the fisheries in particular areas.

Drift Gill Nets

Drift gill nets are a selective gear usually employed in the upper portions of rivers. They can readily be fished from small boats, and target species have traditionally been anadromous species on their spawning runs in the James and York rivers.

Fyke Nets

The fishing style of this type of non-selective gear, utilized mainly by commercial fishermen in the upper James River, was discussed in Davis et

al. (1986). Effort in 1987 equalled that in 1986 with 23 nets reported for each year. There was one fyke net on the York River, fished by a part-time fisherman, in 1987.

Haul Seines

General areas utilized and seasonal activity of this non-selective gear was discussed in Davis et al. (1986). The lower York River was again the area of heaviest exploitation with eight haul seine units in operation. Mobjack Bay had a fishery of four units in 1987. One haul seiner operated in the James River in 1987, one less than in 1986. On the Rappahannock River there was one haul seine unit in operation, fishing for summer migrant species. This equalled the effort there in 1986.

Data Comparison Between Years

Tables 22 and 23 compare the number of licenses issued by VMRC in 1986 and 1987 to the number of gear reported fishing. Both tables show that more licenses are issued than gears fished. Therefore, in using gear licenses as a measurement of effort in Virginia waters, effort will be over-estimated.

RECOMMENDATIONS

Fishing effort data play an important part in the formulation of management plans of the fisheries of Virginia, and are usually cited when attempts are made to explain changes in a fishery's catch or calculate catch-per-unit-effort (CPUE) statistics.

Our methods of data acquisition, personal interviews and telephone conversations with commercial watermen and seafood dealers, yielded

pertinent data concerning Virginia fisheries. In future assessment studies we recommend devoting additional technical time toward personal contacts and telephone interviews with cooperating fishermen and seafood dealers to further enhance our data base.

In the past each aerial pound net survey was accomplished in one day unless bad weather or other circumstances beyond our control forced a change of plans. An additional pound net fishery developed in late 1986 in the upper James River above Hopewell. This is the first pound net activity reported in this section since the river was closed to fishing in 1975 due to kepone contamination. This upriver area, as well as the upper York and upper Potomac, would be more adequately assessed if the aerial survey were divided in two segments in each half-month.

The locations of stationary fishing devices such as pound nets and fyke nets are generally licensed for the same positions year after year, and could be identified and documented by the use of LORAN, a navigational aid. Such documentation would enable VMRC district inspectors to more accurately locate pound nets for future licensing. It may also prove useful as an aid in arbitration concerning disputes over net locations. Our last recommendation concerns VMRC gill net licensing policy.

At present, VMRC makes no distinction between a drift gill net and an anchored gill net as they are sold under the same heading "Drift net License." The drift net and anchored net differ, in that they are: generally targeting different species, are fished in different salinity regimes, and in different depths in relation to the water column; therefore, data collected from the two different types of gear are not compatible. We therefore recommend that anchored gill nets and drift gill nets be licensed separately. Additionally, we suggest a further subdivision of anchored gill

nets. In recent years there has been an increase in noncommercial use of anchored gill nets, and such landings may be considerable but have never been introduced into commercial landings statistics. Such landings, however, should be included in the total harvest from Virginia waters.

LITERATURE CITED

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Table 1. Pound net effort in Chesapeake Bay, subarea 011, Western Management Area, 1987. Data reported by half-month, mean net days per day and net days per month. Effort derived from aerial pound net counts.

	15 Jan	12 Feb	4 Mar	19 Mar	10 Apr	27 Apr	5 May	27 May	8 Jun	23 Jun	6 Jul	22 Jul	4 Aug	17 Aug	9 Sep	22 Sep	5 Oct	20 Oct	3 Nov	16 Nov	7 Dec
Western Management Area																					
Subarea 011																					
Aerial Pound Net Count	0	0	0	0	6	6	8	6	6	7	6	6	5	5	4	5	5	5	5	4	1
Mean net days/day					6		7		6.5		6		5		4.5		5		4.5		1
Net days/ month					180		217		195		186		155		135		155		135		31

Total Net Days = 1,389

Mean Net Days (Apr-Dec) = 154.3 *(excluding Dec = 169.8) (for year = 115.8)

Table 2. Pound net effort in Chesapeake Bay, subarea 027, Fleets Bay, 1987. Data reported by half-month, mean net days per day and net days per month. Effort derived from aerial pound net counts

	15 Jan	1‡ Feb	4 Mar	19 Mar	10 Apr	27 Apr	5 May	27 May	8 Jun	23 Jun	6 Jul	22 Jul	4 Aug	17 Aug	9 Sep	22 Sep	5 Oct	20 Oct	3 Nov	16 Nov	7 Dec
Fleets Bay																					
Subarea 027																					
Aerial Pound Net Count	0	1	1	1	2	1	1	1	2	3	3	3	0	3	1	1	1	3	1	1	1
Mean net days/day		1		1		1.5		1		2.5		3		1.5		1		2		1	1
Net days/ month		28		31		45		31		75		93		46.5		30		62		30	31

Total Net Days = 502.5

Mean Net Days (Feb-Dec) = 45.7 (for year = 41.9)

Table 3. Pound net effort in Chesapeake Bay, subarea 511, Windmill Point - New Point, 1987. Data reported by half-month, mean net days per day and net days per month. Effort derived from aerial pound net counts.

	15 Jan	12 Feb	4 Mar	19 Mar	10 Apr	27 Apr	5 May	27 May	8 Jun	23 Jun	6 Jul	22 Jul	4 Aug	17 Aug	9 Sep	22 Sep	5 Oct	20 Oct	3 Nov	16 Nov	7 Dec
Windmill Point - New Point																					
Subarea 511																					
Aerial Pound Net Count	0	0	1	6	9	9	10	13	14	10	10	11	11	10	11	9	8	9	8	4	1
Mean net days/day			3.5		9		11.5		12		10.5		10.5		10		8.5		2		1*
Net days/ month			108.5		270		356.5		360		325.5		325.5		300		263.5		180		31

Total Net Days = 2,520.5

Mean Net Days (Mar-Dec) = 252.1 *(excluding Dec = 276.6) (for year = 210)

Table 4. Pound net effort in Chesapeake Bay, subarea 611, York Spit, 1987. Data reported by half-month, mean net days per day and net days per month. Effort derived from aerial pound net counts.

	15 Jan	12 Feb	4 Mar	19 Mar	10 Apr	27 Apr	5 May	27 May	8 Jun	23 Jun	6 Jul	22 Jul	4 Aug	17 Aug	9 Sep	22 Sep	5 Oct	20 Oct	3 Nov	16 Nov	7 Dec
York Spit																					
Subarea 611																					
Aerial Pound Net Count	0	0	0	0	2	4	4	4	5	6	6	6	6	6	6	6	6	2	2	1	1
Mean net days/day					3		4		5.5		6		6		6		4		1.5		1
Net days/ month					90		124		165		186		186		180		124		45		31

Total Net Days = 1,131

Mean Net Days (Apr-Dec) = 125.7 (for year = 94.3)

Table 5. Pound net effort in Chesapeake Bay, subarea 711, Tue Marsh - Old Point, 1987. Data reported by half-month, mean net days per day and net days per month. Effort derived from aerial pound net counts.

	15 Jan	12 Feb	4 Mar	19 Mar	10 Apr	27 Apr	5 May	27 May	8 Jun	23 Jun	6 Jul	22 Jul	4 Aug	17 Aug	9 Sep	22 Sep	5 Oct	20 Oct	3 Nov	16 Nov	7 Dec
Tue Marsh - Old Point																					
Subarea 711																					
Aerial Pound Net Count	0	0	1	1	3	3	2	2	2	1	1	1	1	1	1	0	2	2	1	0	0
Mean net days/day			1		3		2		1.5		1		1		0.5		2		0.5		
Net days/ month			31		90		62		45		31		31		15		62		15		

Total Net Days = 382

Mean Net Days (Mar-Nov) = 42.4 (for year = 31.8)

Table 6. Pound net effort in Chesapeake Bay, subarea 811, Willoughby Spit - Cape Henry, 1987. Data reported by half-month, mean net days per day and net days per month. Effort derived from aerial pound net counts.

	15 Jan	12 Feb	4 Mar	19 Mar	10 Apr	27 Apr	5 May	27 May	8 Jun	23 Jun	6 Jul	22 Jul	4 Aug	17 Aug	9 Sep	22 Sep	5 Oct	20 Oct	3 Nov	16 Nov	7 Dec
Willoughby Spit - Cape Henry																					
Subarea 811																					
Aerial Pound Net Count	0	0	0	0	3	4	4	5	5	4	5	5	4	4	4	5	5	1	2	0	0
Mean net days/day					3.5		4.5		4.5		5		4		4.5		3.0		1		
Net days/ month					105		139.5		135		155		124		135		93		30		

Total Net Days = 916.5

Mean Net Days (Apr-Nov) = 114.6 (for year = 76.4)

Table 7. Pound net effort in Chesapeake Bay, subarea 411, Lower Eastern Section, 1987. Data reported by half-month, mean net days per day and net days per month. Effort derived from aerial pound net counts

	15 Jan	12 Feb	4 Mar	19 Mar	10 Apr	27 Apr	5 May	27 May	8 Jun	23 Jun	6 Jul	22 Jul	4 Aug	17 Aug	9 Sep	22 Sep	5 Oct	20 Oct	3 Nov	16 Nov	7 Dec
Lower Eastern Section																					
Subarea 411																					
Aerial Pound Net Count	0	0	0	0	8	13	15	18	20	19	15	14	17	19	15	23	19	24	27	16	3
Mean net days/day					10.5		16.5		19.5		14.5		18		19		21.5		21.5		3
Net days/ month					315		511.5		585		449.5		558		570		666.5		645		90

Total Net Days = 4,390.5

Mean Net Days (Apr-Dec) = 487.8 (for year = 365.9)

Table 8. Pound net effort in Chesapeake Bay, subarea 211, Upper Eastern Section, 1987. Data reported by half-month, mean net days per day and net days per month. Effort derived from aerial pound net counts.

	15 Jan	12 Feb	4 Mar	19 Mar	10 Apr	27 Apr	5 May	27 May	8 Jun	23 Jun	6 Jul	22 Jul	4 Aug	17 Aug	9 Sep	22 Sep	5 Oct	20 Oct	3 Nov	16 Nov	7 Dec
Upper Eastern Section																					
Subarea 211																					
Aerial Pound Net Count	0	0	0	0	1	2	2	2	2	3	3	4	4	3	2	0	2	3	3	0	0
Mean net days/day					1.5		2		2.5		3.5		3.5		1		2.5		1.5		
Net days/ month					45		62		75		108.5		108.5		30		77.5		45		

Total Net Days = 551.5

Mean Net Days (Apr-Nov) = 68.9 (for year = 45.9)

Table 9. Pound net effort in Chesapeake Bay, subarea 084, Tangier Sound, 1987. Data reported by half-month, mean net days per day and net days per month. Effort derived from aerial pound net counts.

	15 Jan	12 Feb	4 Mar	19 Mar	10 Apr	27 Apr	5 May	27 May	8 Jun	23 Jun	6 Jul	22 Jul	4 Aug	17 Aug	9 Sep	22 Sep	5 Oct	20 Oct	3 Nov	16 Nov	7 Dec
Tangier Sound																					
Subarea 084																					
Aerial Pound Net Count	0	0	0	0	2	2	2	2	2	3	3	3	3	3	2	3	3	3	2	2	0
Mean net days/day					2		2		2.5		3		3		2.5		3		2		
Net days/ month					60		62		75		93		93		75		93		60		

Total Net Days = 611

Mean Net Days (Apr-Nov) = 76.4 (for year = 50.9)

Table 10. Pound net effort in the James River Upper Section, subarea 337, 1987. Data reported by half-month, mean net days per day and net days per month. Effort derived by personal communication.

	Jan 1-15	Jan 16-31	Feb 1-15	Feb 16-28	Mar 1-15	Mar 16-31	Apr 1-15	Apr 16-30	May 1-15	May 16-31	Jun 1-15	Jun 16-30	Jul 1-15	Jul 16-31	Aug 1-15	Aug 16-31	Sep 1-15	Sep 16-30	Oct 1-15	Oct 16-31	Nov 1-15	Nov 16-30	Dec 1-15	Dec 16-31
James River																								
Upper Subarea																								
Personal Communication	4	4	4	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	2	3	4	4
Mean net days/day	4		4		4		4		4												2.5		4	
Net days/ month	124		112		124		120		124												75		124	

Total Net Days = 803

Mean Net Days (Jan-May, Nov-Dec) = 114.7 (for year = 66.9)

Table 11. Pound net effort in the York River Lower Section, subarea 195, 1987. Data reported by half-month, mean net days per day and net days per month. Effort derived from aerial pound net counts.

	15 Jan	12 Feb	4 Mar	19 Mar	10 Apr	27 Apr	5 May	27 May	8 Jun	23 Jun	6 Jul	22 Jul	4 Aug	17 Aug	9 Sep	22 Sep	5 Oct	20 Oct	3 Nov	16 Nov	7 Dec
York River																					
Lower Subarea																					
Aerial Pound Net Count	0	0	0	3	11	11	12	12	11	12	12	11	11	11	10	2	2	0	0	0	0
Mean net days/day			3.8		11		12		11.5		11.5		11		6		.7				
Net days/ month			118		330		372		345		356.5		341		180		21.7				

Total Net Days (Mar-Oct)= 2,064.2

Mean Net Days (Mar-Oct) = 258 (excluding Oct = 249.9) (for year = 172)

Table 12. Pound net effort in the Rappahannock River, by subarea, 1987. Data reported by half-month, mean net days per day and net days per month. Effort derived from aerial pound net counts.

	15 Jan	12 Feb	4 Mar	19 Mar	10 Apr	27 Apr	5 May	27 May	8 Jun	23 Jun	6 Jul	22 Jul	4 Aug	17 Aug	9 Sep	22 Sep	5 Oct	20 Oct	3 Nov	16 Nov	7 Dec
Rappahannock River (Lower Section) Subarea 177																					
Aerial Pound Net Count	0	0	0	1	5	6	6	7	7	6	1	1	1	2	2	1	1	1	1	0	0
Mean net days/day			1.5		5.5		6.5		6.5		1		1.5		1.5		1		0.5		
Net days/ month			46.5		165		201.5		195		31		46.5		45		31		15		

Total Net Days = 776.5

Mean Net Days (Mar-Nov) = 86.3 (for year = 64.7)

(Central Section) Subarea 277																					
Aerial Pound Net Count	0	0	2	2	2	3	3	3	4	4	4	4	0	0	2	3	3	3	3	3	1
Mean net days/day			2		2.5		3		4		4		0		2.5		3		3		1
Net days/ month			62		75		93		120		124		0		75		93		90		31

Total Net Days = 763.0

Mean Net Days (Mar-Dec) = 76.3 (for year = 63.6)

Table 12. (continued)

(Upper Section) Subarea 377																						
Aerial Pound Net Count	0	0	0	4	8	9	12	10	8	8	3	1	1	0	4	9	10	10	10	9	1	
Mean net days/day			3.0		8.5		11.0		8		2		0.5		6.5		10		9.5		1.8	
Net days/ month			93		255		341		240		62		15.5		195		310		285		55.8	

Total Net Days = 1,852.3

Mean Net Days (Mar-Nov) = 185.2 (for year = 154.4)

Table 13. Pound net effort in the Great Wicomico River, subarea 029, 1987. Data reported by half-month, mean net days per day and net days per month. Effort derived from aerial pound net counts.

	15 Jan	12 Feb	4 Mar	19 Mar	10 Apr	27 Apr	5 May	27 May	8 Jun	23 Jun	6 Jul	22 Jul	4 Aug	17 Aug	9 Sep	22 Sep	5 Oct	20 Oct	3 Nov	16 Nov	7 Dec
Great Wicomico																					
Subarea 029																					
Aerial Pound Net Count	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0
Mean net days/day									1		1										
Net days/ month									30		31										

Total Net Days = 61

Mean Net Days (Jun-Jul) = 30.5 (for year = 5.08)

Table 14. Pound net effort in the Piankatank River, subarea 069, 1987. Data reported by half-month, mean net days per day and net days per month. Effort derived from aerial pound net counts.

	15 Jan	12 Feb	4 Mar	19 Mar	10 Apr	27 Apr	5 May	27 May	8 Jun	23 Jun	6 Jul	22 Jul	4 Aug	17 Aug	9 Sep	22 Sep	5 Oct	20 Oct	3 Nov	16 Nov	7 Dec
Piankatank																					
Subarea 069																					
Aerial Pound Net Count	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0
Mean net days/day			1		1		1		1		1		1		1		0.5		0.5		
Net days/ month			31		30		31		30		31		31		30		15.5		15		

Total Net Days = 244.5

Mean Net Days (Mar-Nov) = 27.2 (for year = 20.4)

Table 15. Pound net effort in Mobjack Bay, subarea 055, 1987. Data reported by half-month, mean net days per day and net days per month. Effort derived from aerial pound net counts.

	15 Jan	12 Feb	4 Mar	19 Mar	10 Apr	27 Apr	5 May	27 May	8 Jun	23 Jun	6 Jul	22 Jul	4 Aug	17 Aug	9 Sep	22 Sep	5 Oct	20 Oct	3 Nov	16 Nov	7 Dec
Mobjack Bay																					
Subarea 055																					
Aerial Pound Net Count	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Mean net days/day					1		1		1		1		1		1		1		1		
Net days/ month					30		31		30		31		31		30		31		30		

Total Net Days = 244

Mean Net Days (Apr-Nov) = 30.5 (for year = 20.3)

Table 16. Total number of active stake gill net stands and estimated linear feet of net in the James River, reported by VMRC Subarea, by half-month, 1987. Data by telephone interviews and personal communication.

River	Half-Month	Subarea 137 Stake gill net stands	Subarea 137 Estimated Linear Feet	Subarea 237 Stake gill net stands	Subarea 237 Estimated Linear Feet	Subarea 337 Stake gill net stands	Subarea 337 Estimated Linear Feet
James River							
	Mar 1	18	15,984	6	5,328	1	888
	2	18	15,984	6	5,328	1	888
	Apr 1	18	15,984	6	5,328	1	888
	2			6	5,328	1	888

Table 17. Total number of active stake gill net stands and estimated linear feet of net in the York River, reported by VMRC subarea, by half-month, 1987. Data by telephone interviews and personal communications.

River	Half-Month	Subarea 195 Stake gill net stands	Subarea 195 Estimated Linear Feet	Subarea 295 Stake gill net stands	Subarea 295 Estimated Linear Feet	Subarea 395 Stake gill net stands	Subarea 395 Estimated Linear Feet
York River							
	Jan 1	0				6	4,644
	2	0				6	4,644
	Feb 1	0				11	8,514
	2	0				9	6,966
	Mar 1	0		24	18,577	73	56,505
	2	0		24	18,577	73	56,505
	Apr 1	0		24	18,577	73	56,505
	2	0		10	7,740	42	32,510
	Nov 1	0				2	1,548
	2	0				4	3,096
	Dec 1	0				4	3,096
	2	0				4	3,096

Table 18. Total number of active stake gill net stands and estimated linear feet of net in the Rappahannock River, reported by VMRC subarea, by half-month, 1987. Data by telephone interviews and personal communication.

River	Half-Month	Subarea 177 Stake gill net stands	Subarea 177 Estimated Linear Feet	Subarea 277 Stake gill net stands	Subarea 277 Estimated Linear Feet	Subarea 377 Stake gill net stands	Subarea 377 Estimated Linear Feet
Rappahannock River							
	Jan 1	0		3	2,592		
	2	0		3	2,592		
	Feb 1	0					
	2	0		4	3,456		
	Mar 1	0		5	4,320	1	864
	2	0		10	8,640	1	864
	Apr 1	0		10	8,640		
	2	0		10	8,640	42	32,510
	May 1	0		6	5,184		
	2	0		6	5,184		
	Oct 1	0					
	2	0		2	1,728		
	Nov 1	0		4	3,456		
	2	0		4	3,456		
	Dec 1	0		6	5,184		
	2	0		6	5,184		

Table 19. Estimated of total number and linear feet of anchor gill nets fished by commercial watermen in the James River, by VMRC subarea, by half-month, 1987. Data by telephone interviews and personal communication.

River	Half-month	Subarea 137		Subarea 237		Subarea 337	
		AGN	linear feet	AGN	linear feet	AGN	linear feet
James							
	Mar 1	2	685				
	2	3	1,028	7	2,399		
	Apr 1	3	1,028	5	1,714	2	685
	2	5	1,714	5	1,714	2	685
	May 1	5	1,714	3	1,028	2	685
	2	3	1,028	4	1,371	2	685
	Jun 1	3	1,028	4	1,371	3	1,028
	2	2	685	2	685	1	343
	Jul 1	3	1,028	4	1,371	1	343
	2	1	343	1	343		
	Aug 1	1	343	1	343		
	2	1	343				
	Sep 1	1	343	1	343		
	2	2	685	3	1,028	2	685
	Oct 1					2	685
	2			1	343		

Table 20. Estimate of total number of linear feet of anchor gill nets fished by commercial watermen in the York River by VMRC subarea, by half-month, 1987. Data by telephone interviews and personal communication.

River	Half-month	Subarea 195 AGN	Subarea 195 linear feet	Subarea 295 AGN	Subarea 295 linear feet	Subarea 395 AGN	Subarea 395 linear feet
York							
	Jan 1					2	685
	2					2	685
	Feb 1					7	2,399
	2	4	1,371			9	3,084
	Mar 1	11	3,770	4	1,371	21	7,197
	2	14	4,798	7	2,399	23	7,882
	Apr 1	13	4,455	11	3,770	15	5,141
	2	21	7,197	11	3,770	10	3,427
	May 1	25	8,568	14	4,798	8	2,742
	2	18	6,169	10	3,427	9	3,084
	Jun 1	33	11,309	17	5,826	14	4,798
	2	21	7,197	18	6,169	10	3,427
	Jul 1	28	9,596	18	6,169	11	3,770
	2	41	14,051	18	6,169	9	3,084
	Aug 1	42	14,393	13	4,455	8	2,742
	2	37	12,680	20	6,854	9	3,084
	Sep 1	44	15,079	21	7,197	10	3,427
	2	59	20,219	28	9,596	10	3,427

Table 20. (continued)

River	Half-month	Subarea 195 AGN	Subarea 195 linear feet	Subarea 295 AGN	Subarea 295 linear feet	Subarea 395 AGN	Subarea 395 linear feet
	Oct 1	10	3,427	12	4,112	6	2,056
	2	13	4,455	10	3,427	3	1,028
	Nov 1	17	5,826	7	2,399	2	685
	2	12	4,112	3	1,028	2	685
	Dec 1	1	343	2	685	2	685
	2						

Table 21. Estimate of total number and linear feet of anchor gill nets fished by commercial watermen in the Rappahannock River, by VMRC subarea, by half-month, 1987. Data by telephone interviews and personal communication.

River	Half-month	Subarea 177 AGN	Subarea 177 linear feet	Subarea 277 AGN	Subarea 277 linear feet	Subarea 377 AGN	Subarea 377 linear feet
Rappahannock							
	Jan 1			18	6,169	13	4,455
	2			18	6,169	13	4,455
	Feb 1			26	8,910	14	4,798
	2			25	8,568	20	6,854
	Mar 1			33	11,309	15	5,141
	2	2	625	34	11,652	18	6,169
	Apr 1	4	1,371	29	9,938	0	0
	2	5	1,714	10	3,427	16	5,483
	May 1	7	2,399	5	1,714	2	685
	2	8	2,742	7	2,399	0	0
	Jun 1	6	2,056	6	2,056	2	685
	2	4	1,371	6	2,056	1	343
	Jul 1	13	4,455	8	2,742	1	343
	2	3	1,028	4	1,371	1	343
	Aug 1	3	1,028	4	1,371		
	2	3	1,028	4	1,371		
	Sep 1	4	1,371	7	2,399		
	2	10	3,427	9	3,084		

Table 21. (continued)

River	Half-month	Subarea 177 AGN	Subarea 177 linear feet	Subarea 277 AGN	Subarea 277 linear feet	Subarea 377 AGN	Subarea 377 linear feet
	Oct 1	4	1,371	7	2,399	5	1,714
	2	8	2,742	11	3,770	13	4,455
	Nov 1	8	2,742	11	3,770	23	7,882
	2	10	3,724	8	2,742	19	6,511
	Dec 1	2	685	6	2,056	4	1,371
	2			6	2,056	4	1,371

Table 22. Commercial fishing effort survey. Peak net counts as compared to VMRC licenses issued, 1986.

	James River	York River	Rappahannock River	Chesapeake Bay	Other Tributaries	Total	VMRC Licenses Issued
Pound Net	3	12	33	80	8	136	214
Stake Gill net	42	127	8	NS	NS	177	397
Anchor Gill net	16	111	57	NS	NS	184	4520*
Drift Gill net	25	0	0	NS	NS	25	4520*
Haul Seine	2	7	1	NS	NS	10	36
Fyke Net	23	1	0	NS	NS	24	185

NS - Not surveyed

* - Total number of gill net licenses sold; anchor and drift gill nets are not differentiated.

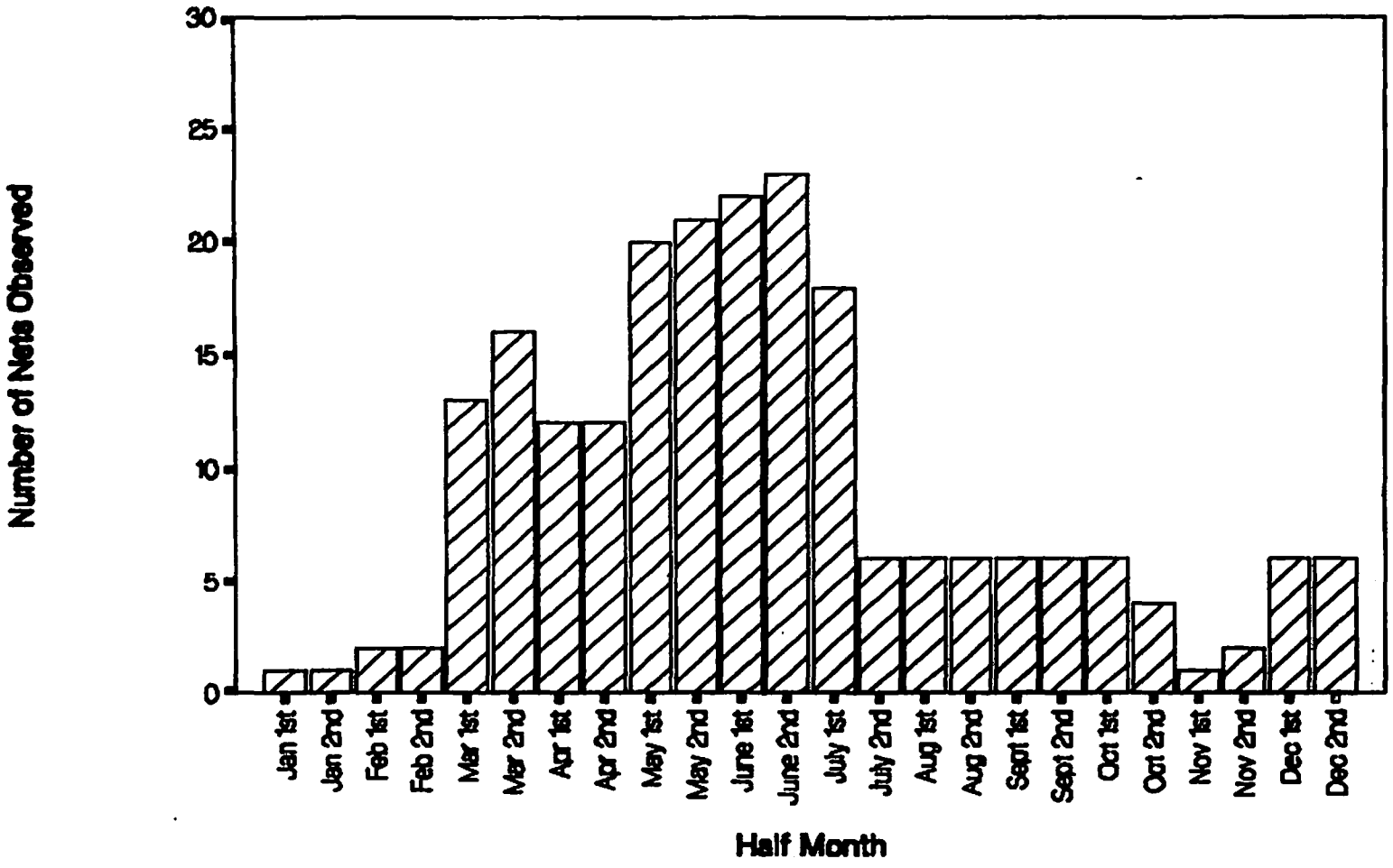
Table 23. Commercial fishing effort survey. Peak net counts as compared to VMRC licenses issued, 1987.

	James River	York River	Rappahannock River	Chesapeake Bay	Other Tributaries	Total	VMRC Licenses Issued
Pound Net	4	13	23	73	4	177	193
Stake Gill net	25	97	12	NS	NS	134	334
Anchor Gill net	15	110	70	150	18	184	4567*
Drift Gill net	30	0	0	NS	NS	30	4520*
Haul Seine	1	8	1	NS	See Notes	14	32
Fyke Net	23	2	0	NS	NS	25	168

NS - Not surveyed

* - Total number of gill net licenses sold; anchor and drift gill nets are not differentiated.

Figure 1. Fyke Nets in the Upper Section of the James River, 1987



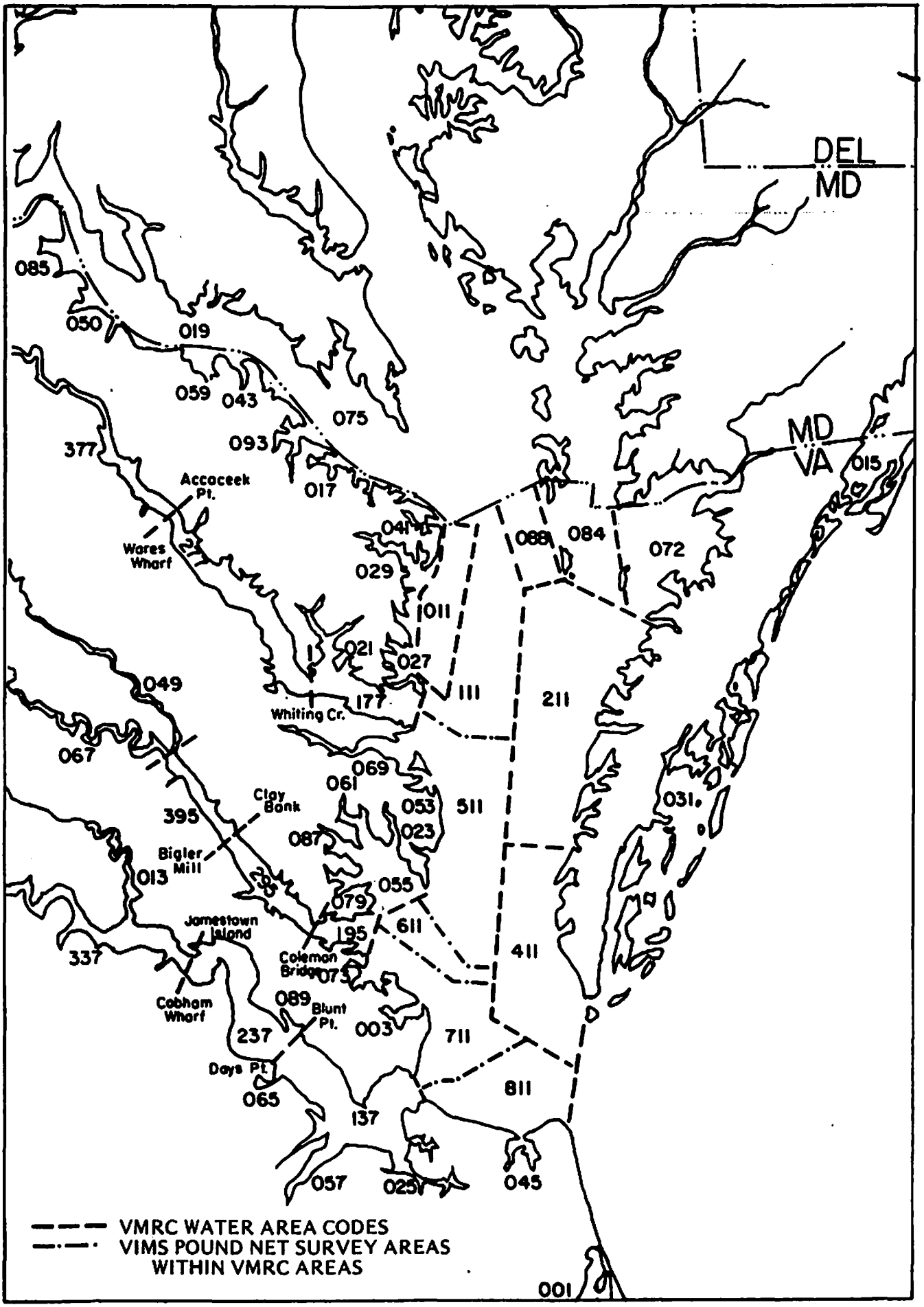
Appendix I. Virginia Marine Resources Commission water areas and modifications.

CODE	BODY OF WATER
001	Back Bay
003	Back River
005	Bogue Bay
007	Bradford Bay
009	Burton's Bay
011	Chesapeake Bay (Western Mgt Area)
*111	Chesapeake Bay (Upper Western Section)
211	Chesapeake Bay (Upper Eastern Section)
*311	Chesapeake Bay (Lower Western Section)
411	Chesapeake Bay (Lower Eastern Section)
013	Chickahominy River
015	Chincoteague Bay
017	Coan River
018	Cobb Bay (Seaside Eastern Shore)
019	Currioman Bay
021	Corrotoman River
023	East River
025	Elizabeth River
027	Fleets Bay
028	Gargathy Bay (Seaside Eastern Shore)
029	Great Wicomico River
031	Hog Island Bay
033	Horn Harbor
137	James River (Lower Section)
237	James River (Central Section)
337	James River (Upper Section)
038	Kegotank Bay (Seaside Eastern Shore)
039	Lafayette River
041	Little Wicomico River
043	Lower Machodoc Creek
045	Lynnhaven Bay
047	Magothy Bay
049	Mattaponi River
050	Mattox Creek (Potomac Rv. Trib.)
051	Metomkin Bay
053	Milford Haven
055	Mobjack Bay
057	Nansemond River
059	Nomini Bay
061	North River
063	Outlet Bay
064	Oyster Bay (Seaside Eastern Shore)
065	Pagan River
067	Pamunkey River
069	Piankatank River
070	Pocomoke River
072	Pocomoke Sound
073	Poquoson River
074	Potomac Creek (Potomac Rv. Trib.)
075	Potomac River, unclassified
175	Potomac River (Lower Section)
275	Potomac River (Lower Central Section)
375	Potomac River (Upper Central Section)
475	Potomac River (Upper Section)
076	Potomac River Trib. (Unclassified)
177	Rappahannock River (Lower Section)
277	Rappahannock River (Central Section)
377	Rappahannock River (Upper Section)
078	Rosier Creek (Potomac Rv. Trib.)
079	Severn River
081	South Bay
083	Swash Bay
084	Tangier Sound
088	West Tangier Management Area
085	Upper Machodoc Creek
086	Upshur Bay (Seaside Eastern Shore)
087	Ware River
089	Warwick River
090	Watts Bay (Seaside Eastern Shore)
091	Willoughby Bay
092	Winter Harbor (Chesapeake Bay Tributary)
093	Yeocomico River
195	York River (Lower Section)
295	York River (Central Section)
395	York River (Upper Section)
097	Unclassified Seaside Bays and Rivers
099	Unclassified Tributaries of Chesapeake Bay

*These areas have been sub-divided to correspond to VIMS aerial pound net count designations, as follows:

511	Windmill Point - New Point
611	York Spit
711	Tue Marsh - Old Point
811	Willoughby Spit - Cape Henry

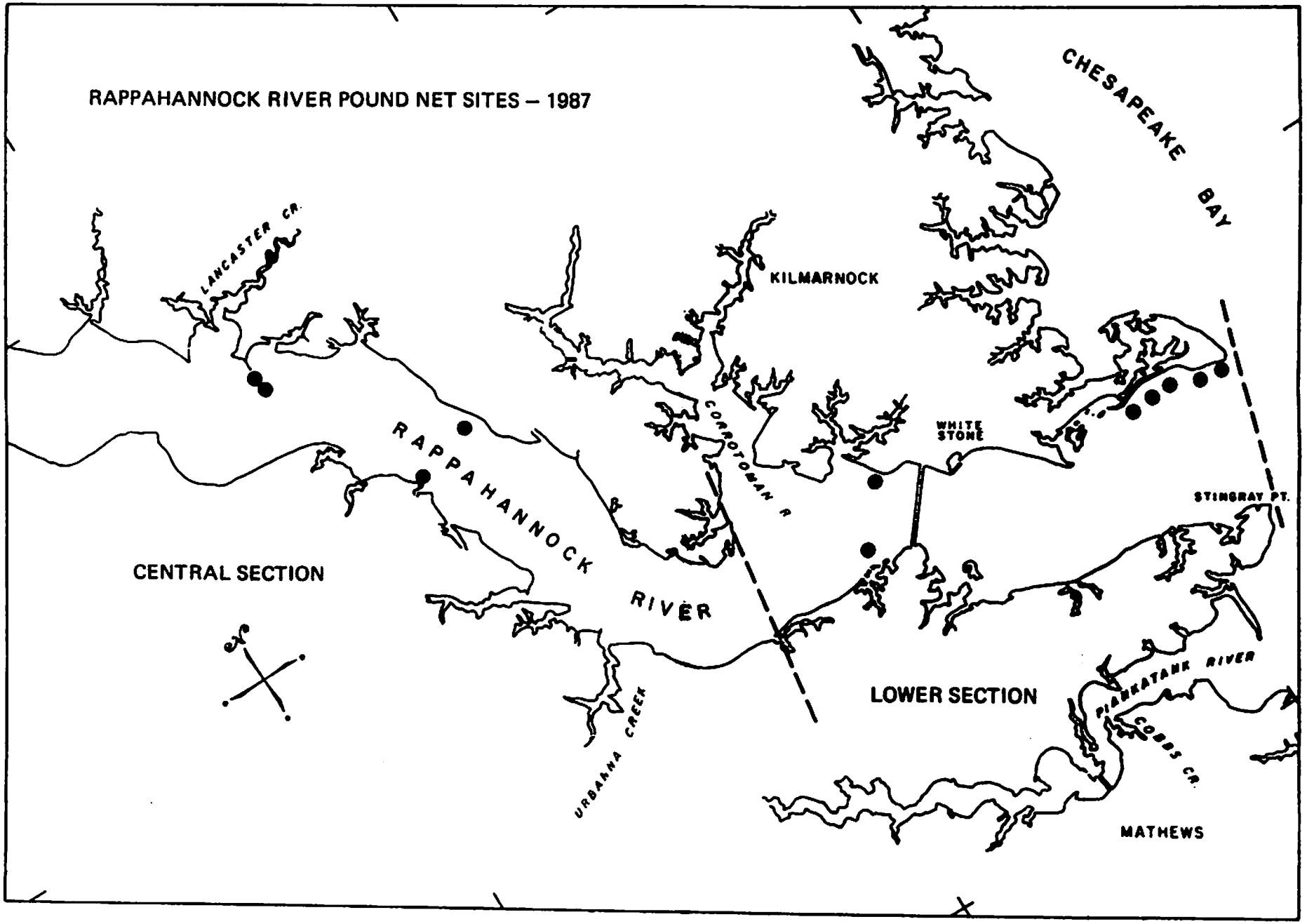
Appendix I

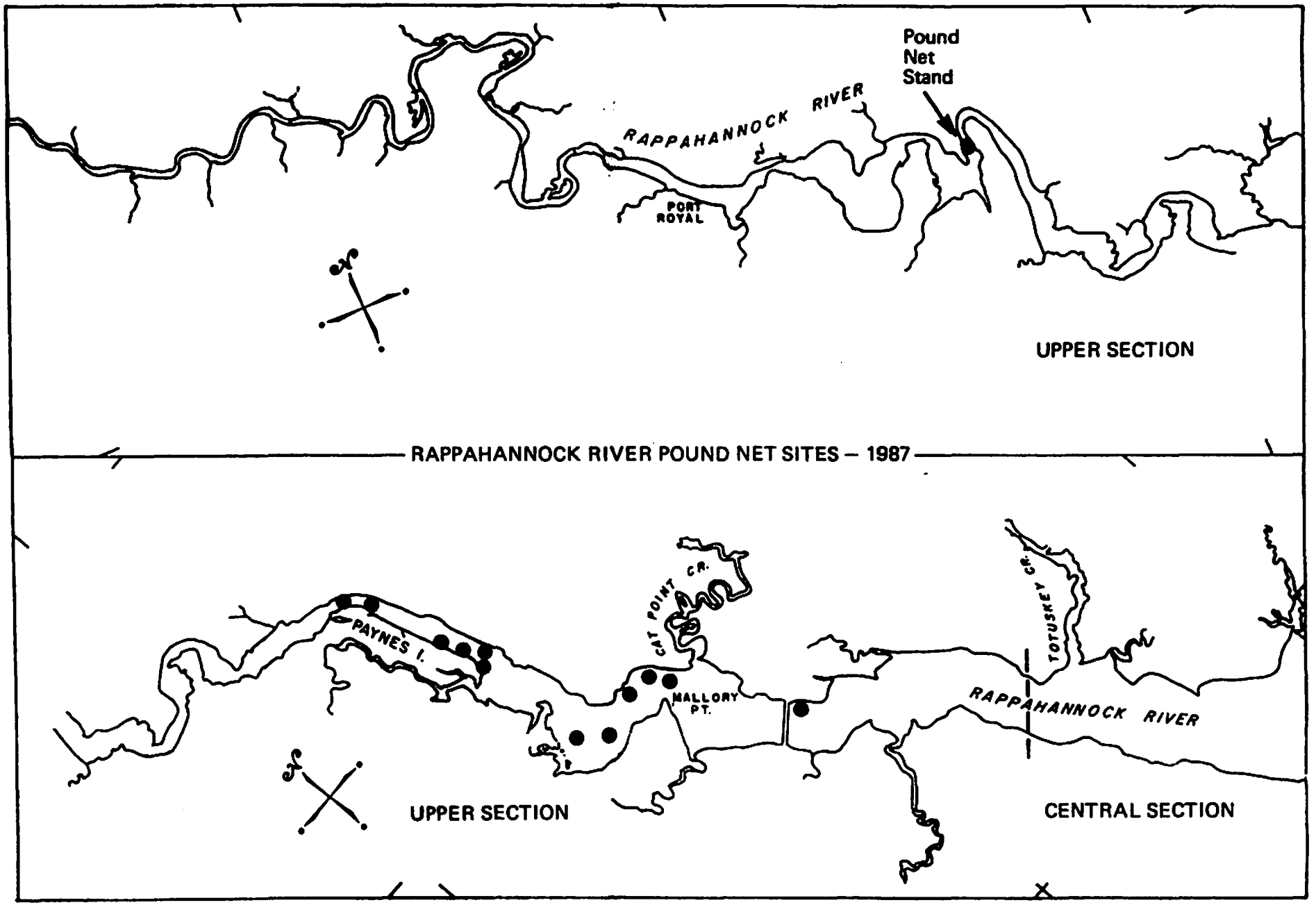

DEL
MD
MD
VA
085
050
019
059
043
075
093
377
017
Accoceek Pt.
Wares Wharf
277
041
088
084
072
029
011
021
027
049
177
111
211
Whiting Cr.
067
069
061
053
511
031
Clay Bank
395
023
087
Bigler Mill
013
055
079
295
Jamestown Island
611
195
411
337
Coleman Bridge
075
Cobham Wharf
089
Blunt Pt.
003
237
711
Days Pt.
065
811
137
057
025
045
001
VMRC WATER AREA CODES
VIMS POUND NET SURVEY AREAS WITHIN VMRC AREAS

Appendix II. Active pound net sites in Virginia waters in 1987.


Potomac River Pound Net Sites not Shown
GREAT WICOMICO RIVER
RAPPAHANNOCK
Rappahannock River Pound Nets Are Shown On Separate Chart
EAST RIVER
MOBJACK BAY
JAMES RIVER
TANGIER SOUND
Kiptopeke Dock

Appendix II (continued)


RAPPAHANNOCK RIVER POUND NET SITES – 1987
CHESAPEAKE BAY
LANCASTER CR.
KILMARNOCK
CORROTOMAN R.
WHITE STONE
STINGRAY PT.
RAPPAHANNOCK RIVER
CENTRAL SECTION
LOWER SECTION
PIANKATANK RIVER
COBBS CR.
URBANNA CREEK
MATHEWS


Pound
Net
Stand
RAPPAHANNOCK RIVER
PORT
ROYAL
UPPER SECTION
RAPPAHANNOCK RIVER POUND NET SITES – 1987
PAYNES I.
CAT POINT CR.
MALLORY
PT.
TOTUSKEY CR.
RAPPAHANNOCK RIVER
UPPER SECTION
CENTRAL SECTION