CHARACTERIZATION OF THE CHESAPEAKE BAY POUND NET AND WHELK POT FISHERIES AND THEIR POTENTIAL INTERACTIONS WITH MARINE SEA TURTLE SPECIES

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Final Report

Submitted to:

Northeast National Marine Fisheries Service
Fisheries Science Center/Northeast Region
166 Water Street
Woods Hole, MA 02543

Contract #: 43EANFO30131

April 2001

INTRODUCTION:

The Chesapeake Bay and the coastal waters of Virginia serve as a principal developmental habitat for demersal juvenile loggerhead (*Caretta caretta*) and Kemp's ridley (*Lepidochelys kempii*) sea turtles (Musick and Limpus, 1997; Lutcavage and Musick, 1985). Green (*Chelonia mydas*) and leatherback (*Dermochelys coriacea*) sea turtles are also found within Virginia waters, though in fewer numbers. Sea turtles enter the Chesapeake Bay each spring when the sea temperatures reach approximately 18° C (Bellmund et al., 1987; Byles, 1988; Keinath, 1993; Keinath et al., 1987; Musick, 1988). Aerial surveys and telemetry studies conducted in the 1980's suggest that between 5,000 and 10,000 juvenile loggerheads forage in Chesapeake Bay each summer (Keinath et al., 1987, Byles, 1988). Sea turtles that use the Chesapeake Bay as a summer foraging area emigrate with falling water temperatures in September and October and swim south along the coast of North Carolina where they pass Cape Hatteras in November and December (Keinath, 1993; Musick and Limpus, 1997; Musick et al., 1987).

The Virginia Institute of Marine Science (VIMS) has served as the National Marine Fisheries Service Sea Turtle Salvage and Stranding Network stranding center for Virginia since 1979. As such, the VIMS program has organized a statewide stranding network consisting of about 100 cooperating individuals and agencies. Dead stranded sea turtles are identified and measured. In addition, hundreds of sea turtles have been necropsied by VIMS scientists to determine cause of death, sex, foraging habits and to study age and growth (Bellmund et al., 1987; Keinath et al., 1987; Klinger, 1988; Lutcavage, 1981; Lutcavage and Musick, 1985; Musick et al., 1985).

Each year, between 200 and 300 sea turtle stranding deaths are recorded within Virginia's waters. The vast majority of these strandings are juvenile loggerhead and Kemp's ridley sea turtles. High turtle mortalities during the spring migration in late May and early June have been documented by VIMS for 21 years (Keinath et al., 1987; Lutcavage, 1981; Lutcavage and Musick, 1985). These historical stranding data clearly show that more than half of the yearly turtle deaths occur in May and June when the turtles first enter the Bay. Within May and June, peak strandings typically occur within the last week of May through the first two weeks in June (Figure 1). Kemp's ridleys also show an additional peak in strandings in the fall (October and November). At the time that turtles first move into the Bay and when loggerhead and Kemp's ridley stranding mortalities are highest, mean water temperatures range between 16° and 18° C (Musick and Limpus, 1997) (Figures 2 and 3).

During the peak of the stranding season, several fisheries are operating within Virginia's waters. These include the poundnet fishery, channel whelk fishery and gillnet fisheries. In 1998 and 1999 there were a large number of strandings in the southern Bay, the beaches of Fisherman's Island, Kiptopeke State Park and Sunset beach areas of Northampton County. It is very likely that these strandings are due to an increase in commercial fishing, particularly the spring offshore gillnet fisheries (Terwilliger and Musick 1995). In addition to black drum and smooth hound (*Mustelus canis*), gill-netters have recently begun to target the monkfish (*Lophius americanus*) in May and June. Data generated by the VIMS sea turtle stranding database were utilized this spring by National Marine Fisheries Service (NMFS) managers to enact emergency fisheries regulations in Virginia's waters during the 2000 stranding season. For 30 days beginning May 12, 2000, the use of all large-mesh gillnets were prohibited from use in Virginia waters. This

period coincided with historic peaks in the number of strandings observed by VIMS since 1979. Comparisons between May and June strandings occurring along the Virginia coast, particularly the Virginia Beach oceanfront region, indicate that a large reduction in strandings occurred between 1999 and 2000 (Figure 4). Due to the gillnet closure, there was also a reduction in fisheries landings reported within this region. However, a significant number of strandings still occurred within Bay waters, particularly along the shores of the Western Bay.

Some of these sea turtle mortalities may be attributed to entanglement in poundnet leaders (Bellmund et al., 1987; Musick et al., 1985): nets with large (10+") mesh leaders set in the lower Chesapeake Bay where currents are strong that may entangle turtles when they first enter the Bay after the spring migration. At this time, many of these turtles are emaciated and weak (Bellmund, 1988). These mortalities drop off substantially by the end of June, and turtles tracked using radio transmitters were able to forage around the nets with little threat (Musick et al., 1985; Byles, 1988). VIMS assessed the impact of the poundnet fishery on sea turtles in the 1980's, estimating that between three and 33% of the sea turtle strandings were attributed to leader entanglement (Bellmund et al., 1987). The impact of poundnets on sea turtles in the Bay was determined by data obtained from both in-water net surveys and aerial population surveys.

The channel whelk fishery is a relatively new fishery to Virginia's waters and has not been monitored by VIMS or the National Marine Fisheries Service observer program to date. Since the 1980's VIMS has lacked the funding to perform additional aerial flights and in-water fishery surveys. As such, current turtle populations in the Bay and fisheries induced mortalities are not known. This project attempts to better define both the poundnet and channel whelk fisheries in the Bay, their current distribution, method of fishing and potential for inducing sea turtle mortalities. Project objectives include providing the Northeast Region of the National Marine Fisheries Service and Fisheries Science Center with a quantitative description and characterization of the Chesapeake Bay poundnet and whelk pot fisheries. These data will be used for developing a strategy for estimating turtle mortality within these fisheries and is the first step in determining if and how an observer program may be implemented within Bay waters.

METHODS:

Between the dates of September 13 and October 31, 2000, all poundnets within Virginia's main stem Chesapeake Bay, and approximately five miles up river of the major tributaries, were located and recorded. Poundnet stands were first located by a shoreline aerial survey. The survey area corresponded to the known distribution of sea turtles within the Chesapeake Bay (Bellmund et al., 1987; Keinath et al., 1987; Byles, 1988). Flights were conducted at a speed of 130 km/hr and altitude of 152 meters. The latitude and longitude of all poundnet stands were recorded and all stands were mapped in reference to local features.

All poundnet stands identified by aerial survey were subsequently accessed by boat. The exact location of all poundnet stands, their fishing status, depth, latitude and longitude, and leader mesh sizes were recorded. Of the poundnet stands that had active leaders, the type of leader was recorded and mesh size measurements were taken. Mesh size was recorded in centimeters as both knot-to-knot and stretch (Figure 5). In addition

to poundnets located within Virginia's waters, poundnet stands located along the Virginia shore of the Potomac River were also recorded. For each stand recorded, observations were made regarding the fishing status of both the leader and the pound as well as whether the stand was licensed to fish in the year 2000. All sea turtle mortalities were documented. Observations were also made on the interaction between local bird species and poundnets.

Landings data and licensing information were obtained from the Virginia Marine Resources Commission (VMRC). All data were analyzed from 1980 to 1999, corresponding to the time in which the Virginia Institute of Marine Science has been collecting stranding data within Virginia's waters. The study region was divided geographically into five regions: Western Bay, Eastern Shore-Bay, Eastern Shore-Ocean, Virginia Beach-Ocean and Southern Bay (Figure 6). These regions correspond to the sea turtle stranding regions utilized by the Virginia Institute of Marine Science Sea Turtle Stranding Program.

Attempts were made during the aerial flights and in-water surveys, to assess the distribution of whelk pots within the Bay. Unfortunately it was not possible to accurately distinguish between crab pots and whelk pots set within Bay waters. Both pot types are set with a similar type of marker buoy and many whelk pots may be set at once on the same line, similar to the system used by lobster pots. Consequently, characterization of the whelk fishery was limited to gathering landings and license data from the VMRC, interviewing local fishermen and National Marine Fisheries Service Observers.

RESULTS:

Poundnet Fishery:

Poundnet stands are semi-permanent structures that consist of wooden poles driven into the sediment. These poles serve as a framework for mesh nets that are attached to the poles, typically forming three distinct segments: the leader, the heart and the pound (Figure 7). In some instances, nets have a double pound. Any stand that has a net in the water, regardless of whether the net is attached to the leader, heart or pound only, must have a current license posted on the net structure.

To be licensed within any given year, the net must be fished a minimum of one day within that year in order for the licensed fisherman to maintain the rights to that particular stand. Poundnets typically do not target any particular species. Poundnets are passive fishing devices in that they are semi-permanent structures that fish will swim into and become trapped within. Species of fish that are caught within a net depend upon the season in which the net is fishing and what species of fish are in the Bay during that time (Appendix A).

A total of 82 poundnet stands were recorded and surveyed within Virginia's waters. An additional 21 poundnet stands were surveyed along the southern Virginia shore of the Potomac River, within Maryland's waters. The majority of Virginia stands (54) were located within the Western Bay region from the York River north to Smith Point at the mouth of the Potomac River. No stands were found within the Western Bay region south of the York River. Only two stands were located within the Virginia Beach-Ocean region, just west of the Chesapeake Bay Bridge Tunnel. Twenty-six stands were

located along the Eastern Shore-Bay with the concentration of stands found from Kiptopeke State Park, south to Fisherman's Island. No stands were located along the Southern Bay within the distribution range of sea turtles. An aerial flight along the ocean side of the Eastern Shore also indicated that no poundnets were set within this region. This distribution of poundnet stands would suggest that if turtles are interacting with the poundnets in some way, the greatest possible interaction would occur within the Western Bay and Eastern Shore-Bay regions where the poundnet numbers are greatest (Figure 8).

Some stands that were observed consisted only of a license posted on a pole, no nets. To be licensed within any given year, the net must be fished a minimum of one day within that year in order for the licensed fisherman to maintain the rights to that particular stand. Other stands that were observed included poundnets with only pounds, hearts or leaders, or combinations of hearts and leaders only, pounds and leaders only, etc. The highest concentration of actively fishing nets were observed between Reedville and Smith Point along the Western Bay and just north of Kiptopeke State Park south to Fisherman's Island along the southern Eastern Shore Bay region (Figure 8). Please refer to the Microsoft Excel file (Appendix B) for a detailed list of all poundnets surveyed, their locations (latitude/longitude), mesh size, license information and fishing status.

Three distinct types of leaders were observed within the Bay. These included regular mesh leaders, stringer leaders and buoy leaders (Figure 9). Mesh leaders were most common and found throughout the Bay (Figure 10). Stringer leaders were found only along the Western Bay, particularly near the northern tip of Mobjack Bay and on nets near Reedville. Buoyed leaders were only found on the Eastern Shore-Bay, along the northern half of this region (Figure 10).

Within the Western Bay, 32 of the 54 poundnet stands had leaders with nets. Of these, nine were stringer leaders, the rest mesh leaders. The majority of the leaders (24) had a knot-to-knot (k-k) measurement of less than 10 cm. Seven leaders had a k-k measurement between 10 and 15 cm, and only one leader had a k-k measurement greater than 15 cm (Figures 11 and 12). The two Virginia Beach-Ocean nets had k-k measurements of 8 and 10 cm. Along the Eastern Shore-Bay, 15 of the 26 poundnet stands had leaders with nets. Of these five were buoyed leaders. Mesh sizes were somewhat larger along the Eastern Shore with only four leaders having a mesh size less than 10 cm (k-k). Six leaders had k-k mesh sizes between 10 and 15 cm, and five leaders had mesh sizes greater than 15 cm. Three of these nets had mesh sizes greater than 20 cm (Figures 11 and 12). The larger meshed leaders along the Eastern Shore-Bay were located towards the southern tip of the Eastern Shore. Of the 21 poundnet stands surveyed along the southern shore of the Potomac River, only six stands had active leaders. Five of these nets had a k-k mesh size less than 10 cm. One net had a k-k between 15 and 20 cm (Figures 11 and 12). No mesh size surveyed exceeded 25 cm k-k.

The mesh sizes of the pounds were all approximately 1-2 inch k-k (~3-4 cm) throughout the Bay. The pounds serve as a 'live well' and are constructed of very small meshed nets. Hearts were all constructed of nets that were approximately 10 cm or less, k-k. There were no large mesh (15 cm+) hearts in the Bay. The only variations in mesh size were among the leaders. This variation is attributed by fishermen to the relative strength of tidal or current flow within the area the net is set, not to any particular targeted species.

Whelk Fishery:

Virginia's whelk pot fishery targets two species of whelk: the channeled whelk (*Busycotypus canaliculatus*) and knobbed whelk (*Busycon carica*), with the channeled whelk the preferred and targeted species (Mills, 2000). The landing requirement for the whelks is 5 ½ inches tip to tip for the shell and 2 ¾ diameter for the shell whorl.

There are three different types of whelk pots used by Virginia fishers within Virginia's waters and offshore federal waters. Two types are made out of wood and the other, less popular variety is made out of sections of a metal or plastic barrel. The first type of wooden pot is square in shape and roughly 53 x 53 cm (21 X 21 in) in width and 28 cm (11 in) in height. Wooden slats cover the sides and bottom of the pots. The slats on the sides are 0.3 cm (1 in) wide, 28 cm (11 in) high, and 0.6 cm (0.25 in) thick. They are placed at 0.3 cm (1 in) intervals all around the side of the pot. The slats across the bottom of the pot are 0.3 cm (1 in) wide, 56 cm (22 in) long and 0.6 cm (0.25 in) thick, and spaced in 2.5 cm (1 in) intervals. The inside bottom portion of the pot is braced by a piece of wood measuring 0.6 x 0.68 cm (1x 1.75 in) and extends 51 cm (20 in) across the bottom of the pot. Each pot has about 10 – 15 kg (20-30 lbs) of weight to keep it secure on the bottom when set. The top inside of the pot is bordered by string that is tied about 2.5 cm (1 in) away from the inside of the pot. This is used to prevent the whelks from escaping out of the pot. A length of rope is tied on either side of the pot to create a 30 cm (1 ft) rope bridle that extends above the pot. A length of rope is tied to the pot and a bullet buoy attached to it to mark the spot (Plates 1 and 2).

The second type of wooden pot, or Jenkins model, is built with the same dimensions, but has the top inside of the pot bordered with plastic-coated, one-inch square crab pot wire. On the top of the pot there is a 3.9 cm (10 in) piece of coated square crab pot wire extending out from one side, creating a half-cover for the pot. This is used to prevent the loss of whelks if the pot is turned over due to turbulent seas, when raised, or if invaded by sea turtles and other marine life. The coated wire is 0.3 x 0.3 cm (1 x 1 in) with a 0.7 cm (2 in) diagonal. The bridle is tied on the side of the pot opposite from the mesh cover, and at the bottom of the pot. The bridle extends 30 cm (1ft) up along the side of the pot (Plates 3 and 4).

The barrel and metal pots are created by cutting the bottom or top portion from a 55-gallon drum or plastic barrel (Plate 5). The pot measures 8.6 cm (22 in) across and 30 cm (1ft) high. The bottom is weighted by the same manner as the wooden pots and the weight is placed inside the pot. The inside is also bordered with string to prevent whelk from escaping. The bridle and buoy attachment is the same as the non-Jenkin's wooden traps. This trap type is not widely used within Virginia's waters.

For this survey, it was not possible to accurately distinguish between crab pots and whelk pots set within the Bay. In 2000, both pot types were set with a similar type of marker buoy and many whelk pots may be set at once on the same line, similar to the system used by lobster pots. Both aerial and in-water (surface observation) surveys were inconclusive. However, communication with the Virginia Marine Resources Commission and local fishermen resulted in a broad based understanding of the fishery.

The best estimate of pots fished is derived from the total number of licenses issued by the Virginia Marine Fisheries Commission (VMRC). Licenses are issued to individual fishermen and up to 200 pots may be set under each license. Licenses are

required for any pot set within Virginia's state waters, both inside and outside the Chesapeake Bay. Currently, 50 licenses have been issued by VMRC out of a maximum of 77 possible licenses that could be granted. This translates into a maximum estimate of 10,000 pots that could be set within Virginia's waters. It has been estimated by VMRC (R. O'Reilly pers. comm.) that the majority of the fishing effort is concentrated in coastal waters, with few fishermen fishing inside the Bay. The total number licenses issued for Virginia waters in 2000 were 43, however, no data is currently available on the number of active fishermen (those fishing more than ten days within the year)(R. O'Reilly, pers. comm.).

This fishery was initiated in 1991 as an experimental fishery. Anyone fishing within Virginia state waters must be registered by the state of Virginia. In 1999, 42 licenses were sold and approximately 14 fishermen were actively (more than 10 days) fishing in Virginia's waters (R. O'Reilly, pers. comm.). The year 2000 is the first year that there has been a limited entry license (200 pots/license) issued in Virginia. The majority of the fishing occurs outside state waters and these fishermen are not required to be permitted by the state or the Federal government. Since there are no regulations affecting the offshore whelk pot fishery, unlimited gear may be set.

Local fishermen and the VMRC agree that the effort of the whelk pot fishery is centered offshore, particularly outside Virginia's state waters up to 20-30 miles offshore, and at a lesser distance off of Chincoteague. VMRC has estimated that an average of 500 pots are set by individual fishermen fishing offshore (outside the 3 mile limit). Often, fishermen may set 250 pots in a day, alternating when the pots are pulled to allow for 48 hour soak times. No data are currently available on the number of fishermen setting pots. Any whelk landings in Virginia are limited to 60 bushels of whelk per trip. There are no current limitations/regulations as to where pots may be set in the Bay, and of those fishermen actively fishing in Virginia's waters, the primary harvest areas are along the Eastern Shore-Ocean, Virginia Beach-Ocean and ocean side of the Bay mouth (S. Iverson, pers. comm.). This particularly includes the area from Cape Henry south to Dam Neck and some effort off Wachapreague on the Eastern offshore (most effort off Wachapreague is offshore, outside Virginia's waters).

Ocean landings (meat weight) increased considerably in 1999. Between 1994 and 1998, total landings from whelk pots ranged between 200,000 and 400,000 pounds meat weight in Virginia. In 1999, the landings increased to approximately 1,400,000 pounds meat weight (Figure 13). Chesapeake Bay landings between 1994 and 1999 ranged between 30,000 and 60,000 pounds meat weight. Within this timeframe, landings peaked in 1995 and 1998 (approximately 60,000 pounds). In 1999, Bay landings were approximately 50,000 pounds meat weight (Figure 14). The proportion of Bay landings since 1994 represents roughly between 3.02% (1999) and 28.17% (1995) of the total channel whelk landings in Virginia (Figure 15).

Due to the timeframe allotted to this survey, it was not possible to physically monitor the number of whelk pots set in the Bay on a seasonal basis. Information obtained from local fishermen and the VMRC indicate that there are no enforced closed seasons to this fishery; however there are two peaks observed, one in the spring, one in the fall. The spring peak begins in April and continues until mid May or early June, though fishing will continue all summer. The fall peak begins approximately the third week in October and continues until approximately the third week in December.

Generally, the fall peak is more pronounced and these peaks are observed both in and outside the Bay (Figures 16 and 17).

Incidental Capture:

During the six-week survey period, only two sea turtles were observed to have interacted with the poundnets. Both animals were found on the same day in nets located along the Eastern Shore-Bay (Figure 18). One turtle had first become entangled in a gill net (approximately 4 inch mesh size) before drifting into and snagging on a poundnet leader pole. Another turtle had entangled in the large mesh leader (10 inch) of an adjacent poundnet. Constriction wounds indicated that the probable cause of death for each turtle was entanglement. Both animals were juvenile loggerhead (*Caretta caretta*) sea turtles (Plate 6).

On several occasions, various species of birds were observed to have entangled within a poundnet. These interactions occurred within all parts of the net (pound, leader and heart) regardless of mesh size. Species observed were the brown pelican (*Pelicanus occidentalis*) and cormorant (*Phalacrocorax spp.*). Cormorants were commonly observed to be swimming and fishing within the pound. When approached by boat, the birds would attempt to take flight, however, many did not have enough water for take-off and would become entangled or struggle with the mesh of the pound.

The potential for sea turtle mortality from whelk pots is due to the bridle. Bridles that extend above the trap 30 cm (1ft) or more pose a threat to turtles feeding from the pots. In this case, there is the potential for the turtle to get its head entangled in the line and have difficulty surfacing. The Jenkins model with the bridle attachment on bottom side of the trap extends only approximately 3 cm (1in) above the top of the pot, with the largest area between the bridle and pot being to the side. This may eliminate the potential for turtle entanglement.

DISCUSSION:

For economic reasons (expensive fishing gear, high labor costs), the poundnet fishery has declined substantially over the last 20 years and continues to decline as older poundnetters retire. Yet, the number of sea turtle strandings in spring has been rising in recent years (Figures 19 and 20). Apparently, mortalities induced by the poundnet fishery have been replaced and perhaps surpassed by a rapidly expanding spring gillnet fishery focused on both the seaside and lower bayside of Virginia's Eastern Shore and off Virginia Beach (Figure 21). It is probable that the large, heavy mesh monofilament gill nets used in the monkfish, black drum and smooth dogfish fisheries pose a threat to sea turtles. On the other hand, the rise in sea turtle strandings in recent years may be a reflection of a growing sea turtle population within the Bay.

One of the most important missions of the VIMS Turtle Program has been the use of aerial surveys to determine relative abundance and seasonal distribution of animals found in Chesapeake Bay and coastal waters (Byles, 1988; Keinath, et al., 1987; Keinath and Musick, 1987). These data show juvenile population trends, which can be used as general indicators of the demographic trajectory (increases or decreases) of the entire population. Since sea turtles may take up to 25 years to mature (Klinger, 1988) census of

our juvenile turtles (six to 12 years of age) may be the best indicator of the success or failure of conservation efforts (initiated only 10-20 years ago) on nesting beaches throughout the southeast. Aerial census data can also be used to evaluate the incidence of mass mortalities (Musick et al., 1985, 1987, 1990).

Aerial surveys were used by VIMS to provide summer population estimates of loggerhead sea turtles in Chesapeake Bay and coastal waters in the mid-1980's (Byles, 1988; Keinath et al., 1987). The surveys suggested that between 5,000 and 10,000 loggerheads were present in Chesapeake Bay at that time and between three and 33% of the strandings could be attributed to poundnets. Unfortunately funding has not been available since then to determine population trends over time. Given historical population estimates and increasing turtle strandings, the question of primary importance is:

> Are the increasing sea turtle mortalities recorded in Virginia in recent years simply a reflection of increasing turtle populations? Or are they a reflection of higher mortality rates inflicted by new and expanding fisheries?

In order to better understand the level of take occurring within the Bay fisheries, real-time monitoring of sea turtle mortalities and direct assessments of fishery induced mortalities, ideally through the use of side scan sonar, need to occur. All fisheries must be considered, including the Bay gillnet fishery. It is also crucial to reestablish aerial surveys to provide estimates of loggerhead standing stocks for comparison with estimates obtained during the mid-1980's. Unfortunately, this present survey was not initiated until late in the sea turtle season. Sea turtles depart the Chesapeake Bay in the fall months with the onset of cooler air and sea temperatures (Bellmund et al., 1987; Keinath et al., 1987). Future surveys should be initiated much sooner and should include the spring and summer months when the turtles first enter and reside in the Bay, as well as the fall months when turtles move out of the Bay for their southern migration.

An observer program should include: closely monitoring real-time sea turtle mortalities to determine where and when commercial fisheries and other human activities provide a significant threat to sea turtles; the use side-scan sonar to survey fishing poundnet leaders and gill nets, for sub-surface entangled sea turtles to provide estimates of by-catch mortality; reestablishing aerial surveys of sea turtle abundance in Virginia waters to compare stranding patterns with abundance patterns in time and space and fishing gear deployment; and finally, calculating estimates of current standing stocks of loggerhead sea turtles in Chesapeake Bay from aerial surveys to compare to historical estimates made in the mid-1980s in order to determine whether these stocks are increasing or declining.

With regards to the whelk fishery, it can be observed similarly to the protocols and methodology used for the offshore sink gillnet and lobster pot fisheries. These two methodologies are already in place by NMFS and can used to observe this fishery. Despite the fact that it was difficult to tell the difference between crab or sea bass pots and whelk pots in 2000, changes may be made to the method of setting offshore pots in 2001. This is primarily due to a substantial loss of pots from flounder trawlers in the 2000 fishing season. Some fishermen are adopting a methodology where only one pot is set per buoy instead of the trot line method. These pots are being set 50 to 75 yards apart and

along a loran or GPS line. It may be possible to aerially differentiate from crab and sea bass pots. Further documentation of this fishing method is needed.

Most of the effort is currently focused offshore apparently due to larger whelks caught in these areas. Since there is very little crab pot activity outside the Bay in the offshore waters, aerial surveys could be used in the offshore areas to locate conch pots offshore. While the Bay tributaries have recently opened to whelk pot fishing, it is still difficult to tell the difference between the float marking the crab pots and those for whelk pots. While effort inside the Bay bridge tunnel might be minimal at best (R. O'Reilly, pers. comm.), landings data indicate that there is substantial fishing effort in the Bay. More data are needed regarding the level of whelk pot effort within Bay waters. This may best be accomplished by a boat-based observer program.

Monthly landings data suggest that few whelks are caught during much of the time that sea turtles are resident in Virginia's waters (mid-May through October). The peak of the whelk catch (both Bay and ocean) occurs primarily in November and December, after turtles have begun their seasonal migration south. The landings that occur in May and June may coincide with when turtles are first entering the Bay, however, with the rise in sea temperatures the fishery landings by whelk pot decrease through the rest of the warmer, summer months when turtles are resident within Virginia's waters.

It is also recommended that the Jenkin's whelk pot be used with the side bridle design in place of the top bridle design of the wooden and barrel pots. By having a side bridle that has very little area between the top of the bridle and the pot, with virtually no overlap with the pot's top (the area where turtles would attempt to access the pot contents), sea turtle mortalities from entanglement may be reduced.

On a management level, it is imperative that the best possible population data be determined. The National Marine Fisheries Service has yet to establish maximum allowable sea turtle take limits for any Virginia-based fishery. Overestimating the population may result in take limits that could cripple sea turtle populations in the Bay and eastern U.S. waters. It is therefore necessary to update current sea turtle abundance estimates within the Bay, and to further identify all potential fisheries that may cause some mortality to the sea turtles seasonally inhabiting the Bay. During the peak stranding season, numerous fishing activities are occurring within the Bay, including but not limited to poundnets and whelk pots. More information is needed on the Bay gillnet fisheries in order to complete the equation of what is actually occurring to induce sea turtle mortalities. It is also important to ensure that all aspects of sea turtle behavior, particularly seasonal dive, surfacing and foraging patterns, are fully understood. The physical condition of sea turtles when they first enter the Bay in the spring should be assessed and the influences of temperature on seasonal migration should be better defined.

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Figure 1. Mean loggerhead (*Caretta caretta*) and Kemp's ridley (*Lepidochelys kempii*) strandings per week in Virginia, May and June 1979-2000

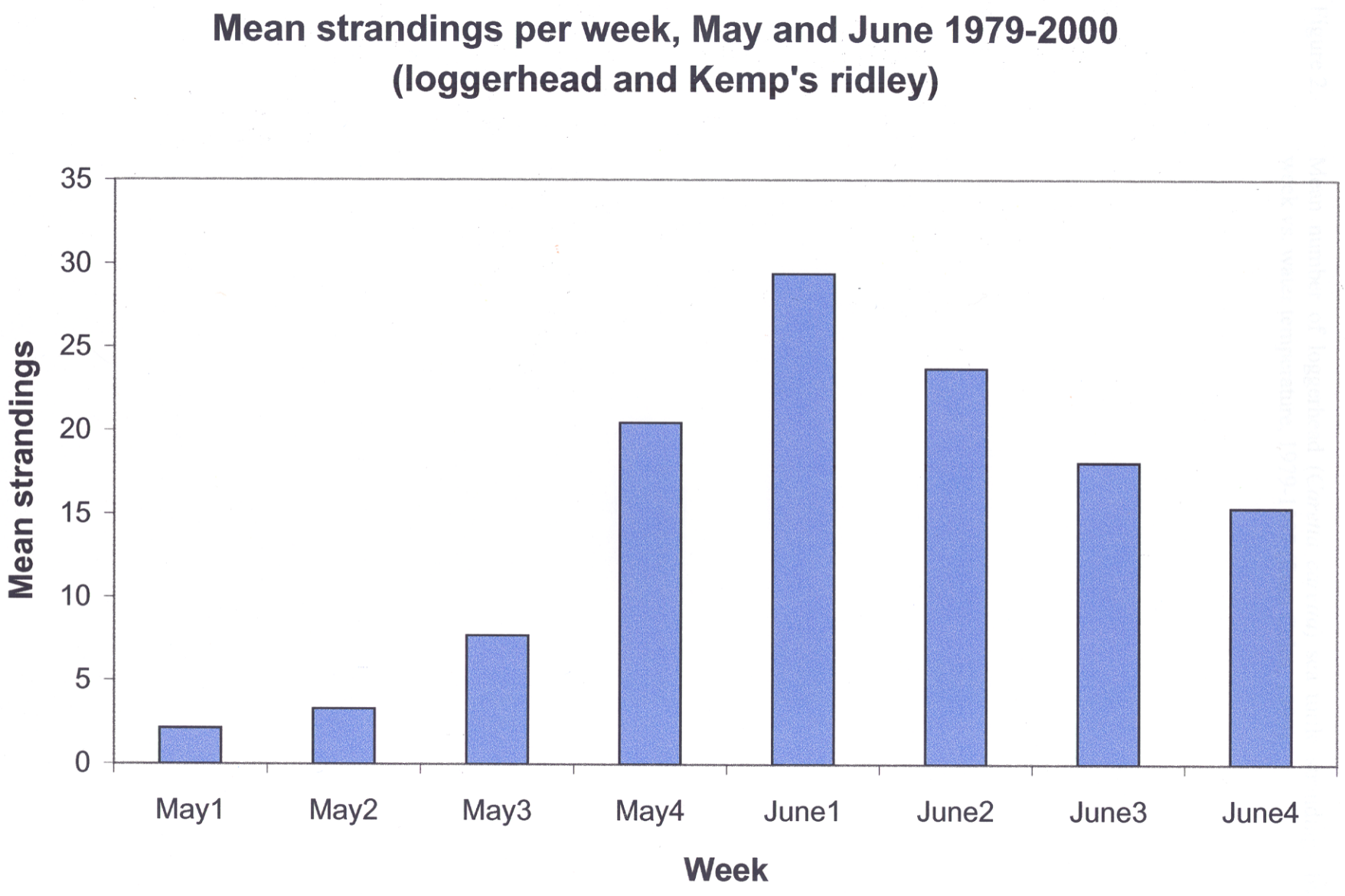
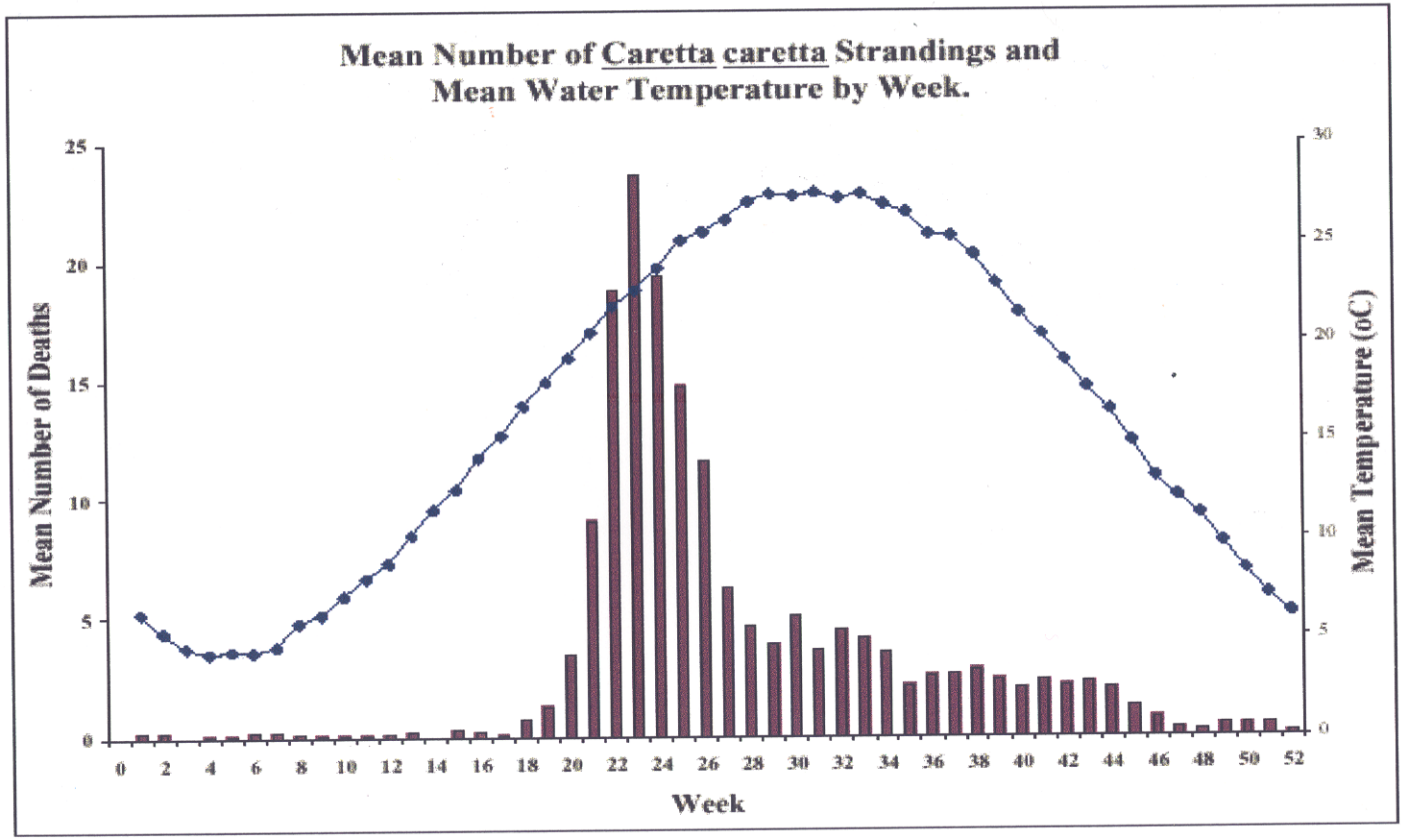
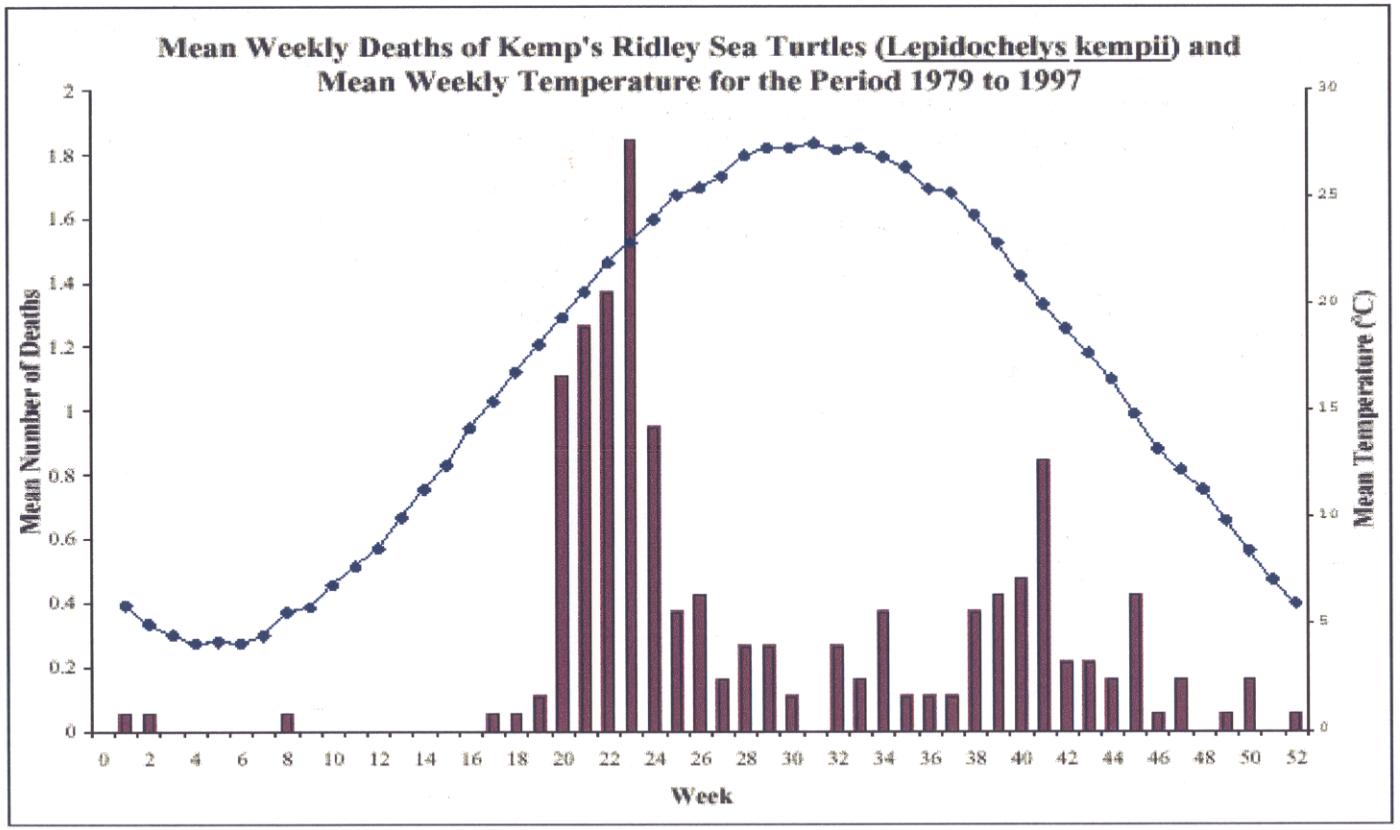

Mean strandings per week, May and June 1979-2000
(loggerhead and Kemp's ridley)
Mean strandings
35
30
25
20
15
10
5
0
May1
May2
May3
May4
June1
June2
June3
June4
Week

Figure 2. Mean number of loggerhead (*Caretta caretta*) sea turtle strandings by week vs. water temperature, 1979-1997 (from Coles, 1999)



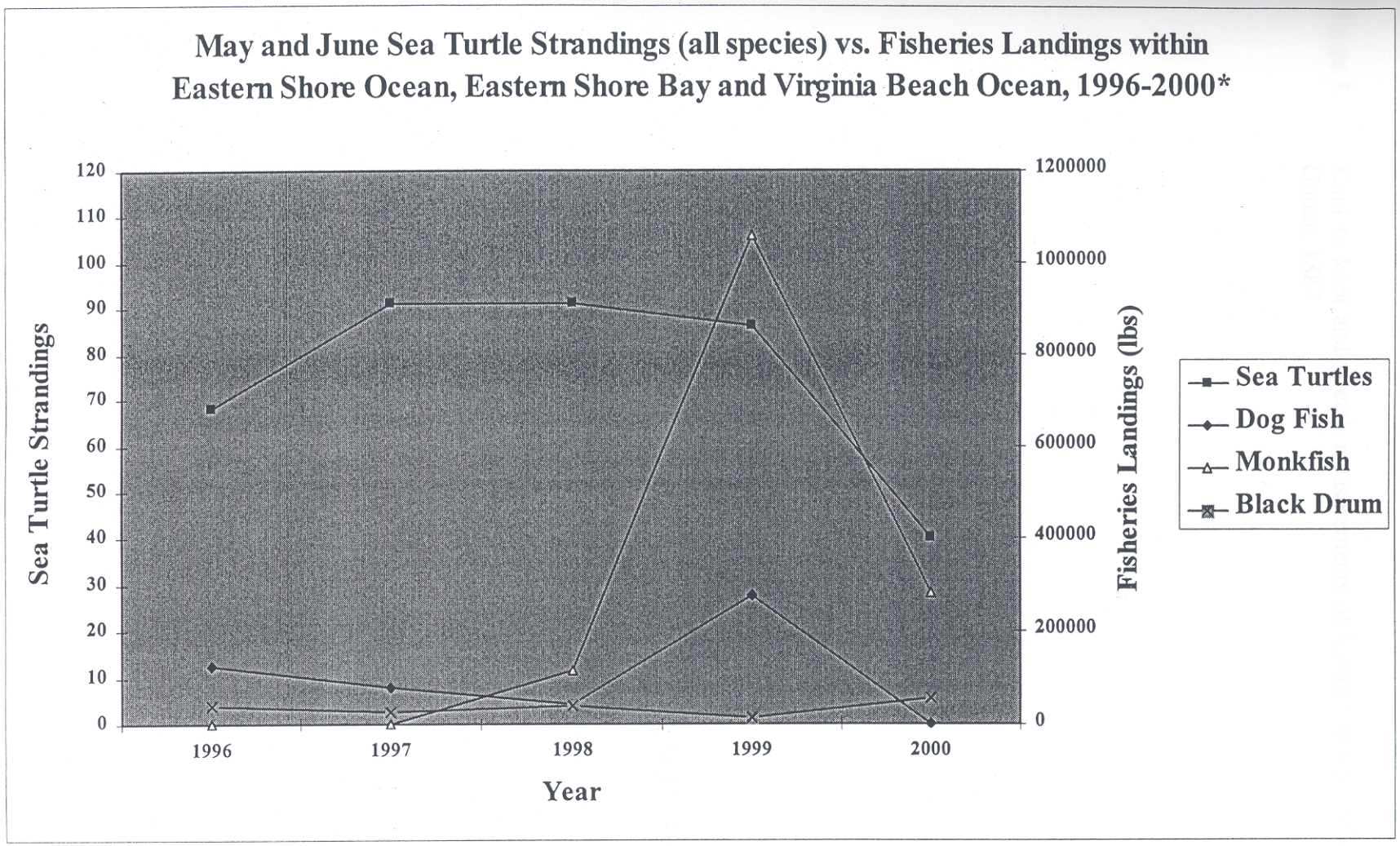
(From Coles, 1999)

Figure 3. Mean number of Kemp's ridley (*Lepidochelys kempii*) sea turtle strandings by week vs. water temperature, 1979-1997 (from Coles, 1999)



(From Coles, 1999)

Figure 4. May and June sea turtle strandings (all species) vs. fisheries landings within Eastern Shore Ocean, Eastern Shore Bay and Virginia Beach Ocean regions, 1996-2000. Landings data courtesy of VMRC



*Landings data courtesy of VMRC

Figure 5. Knot to knot and stretch measurements of leader meshes. Adapted from Goode, 1887

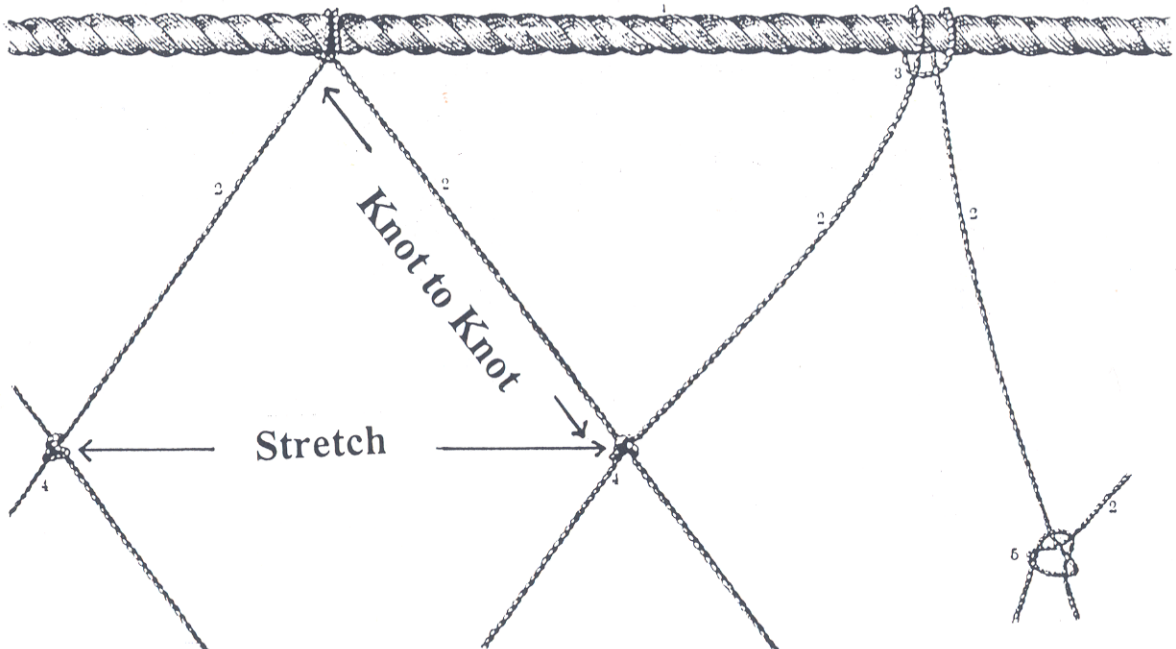

Knot to Knot
Stretch

Figure 6. Sea turtle stranding regions within Virginia

Virginia Sea Turtle Stranding Regions

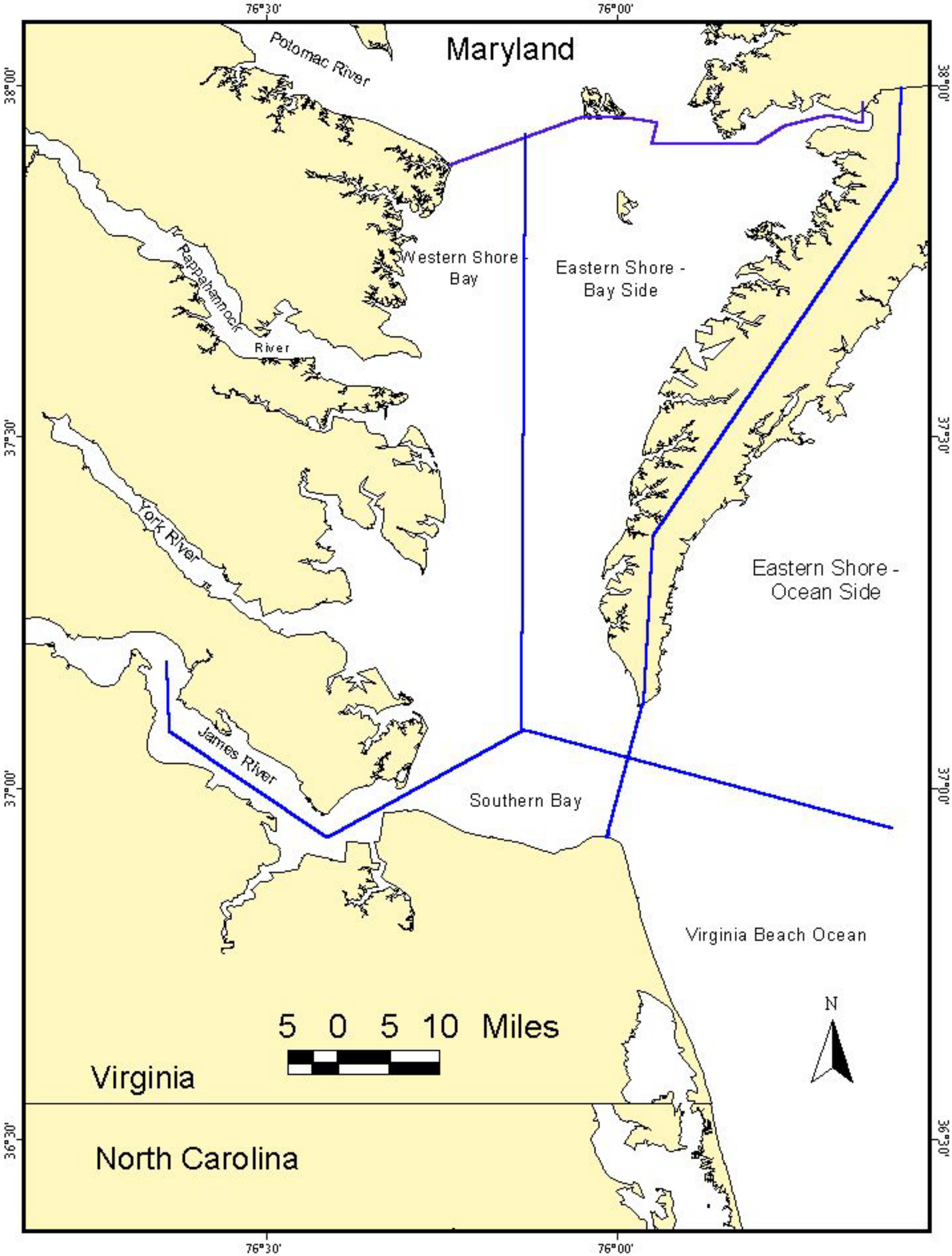


Figure 7. Poundnet parts (leader, heart and pound). Adapted from Austin et al., 1998

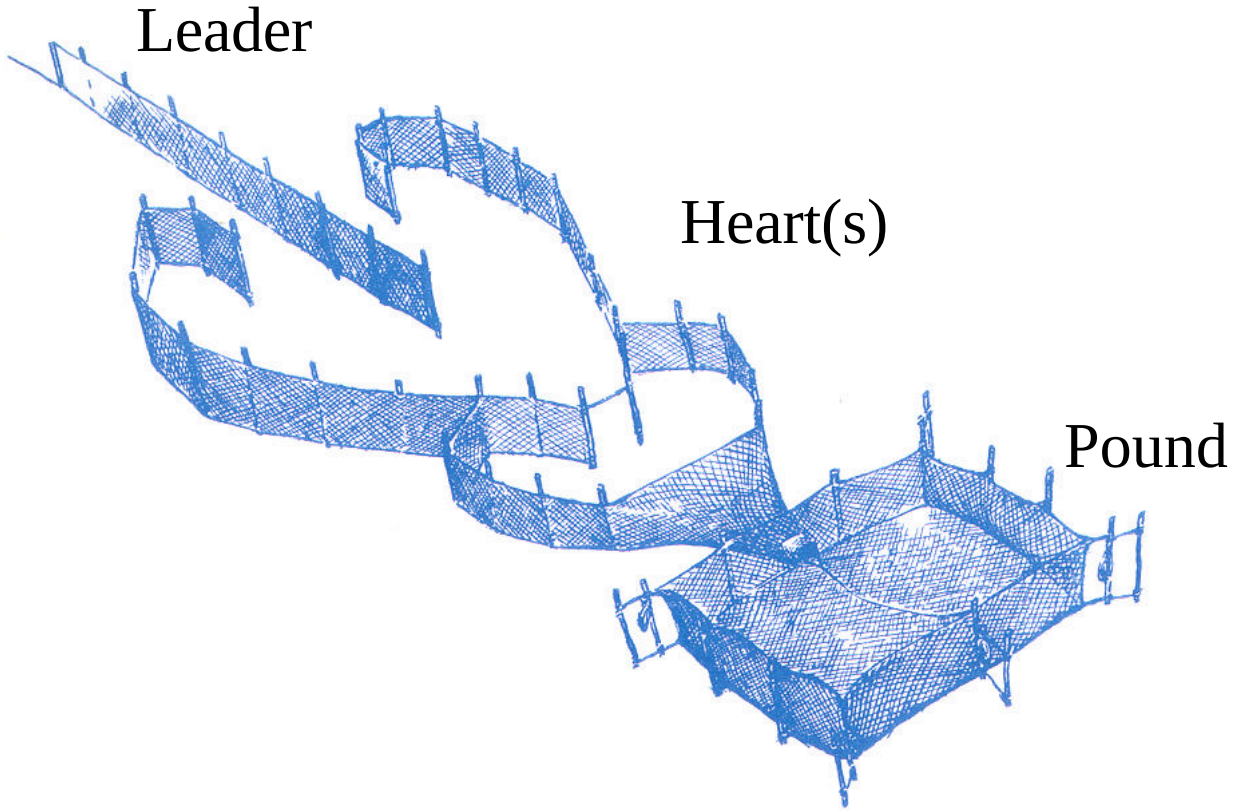

Leader
Heart(s)
Pound

Figure 8. Locations of all active, inactive and non-measured poundnet stands in the Chesapeake Bay, Virginia, fall 2000

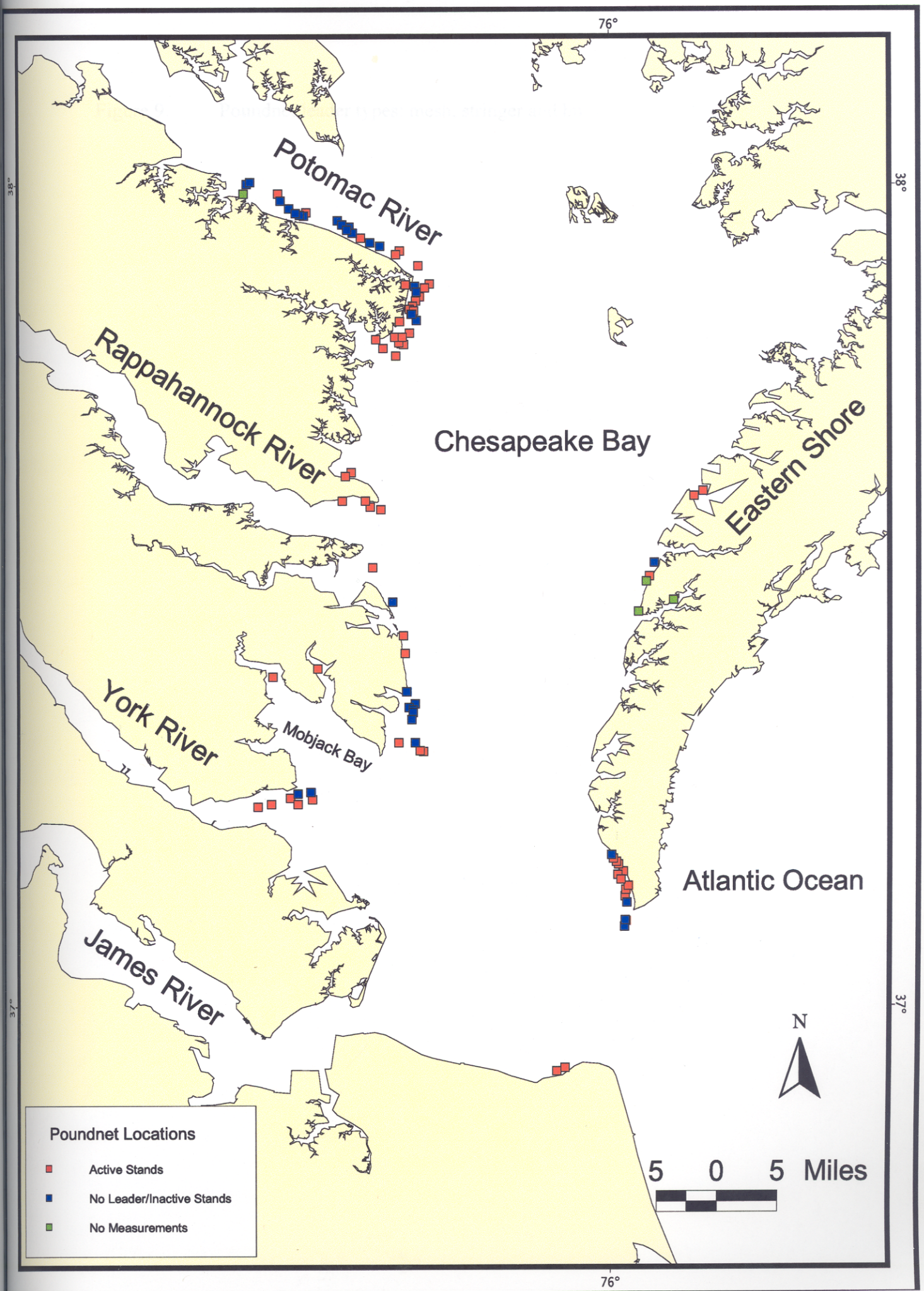
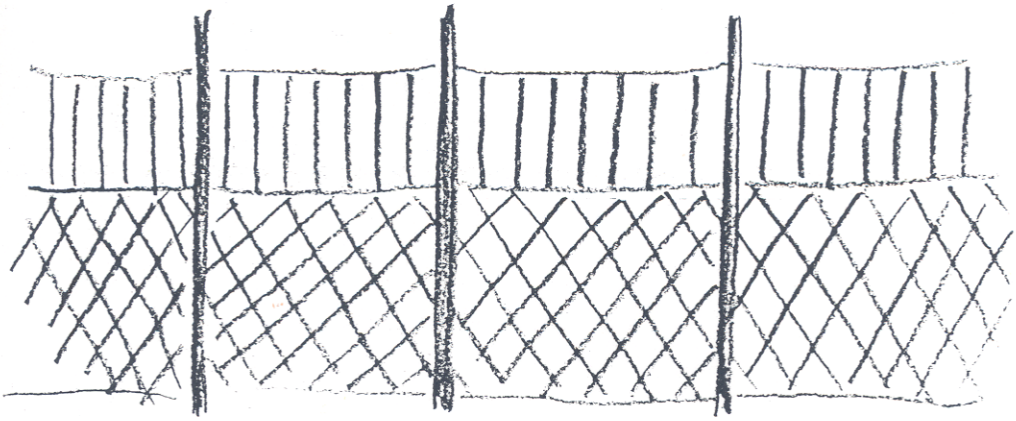

76°
38°
38°
37°
37°
76°
Potomac River
Rappahannock River
Chesapeake Bay
Eastern Shore
York River
Mobjack Bay
Atlantic Ocean
James River
N
5 0 5 Miles
Poundnet Locations
Active Stands
No Leader/Inactive Stands
No Measurements

Figure 9. Poundnet leader types: mesh, stringer and buoy

Poundnet Leader Types:

Mesh:

Stringer:



Buoy:

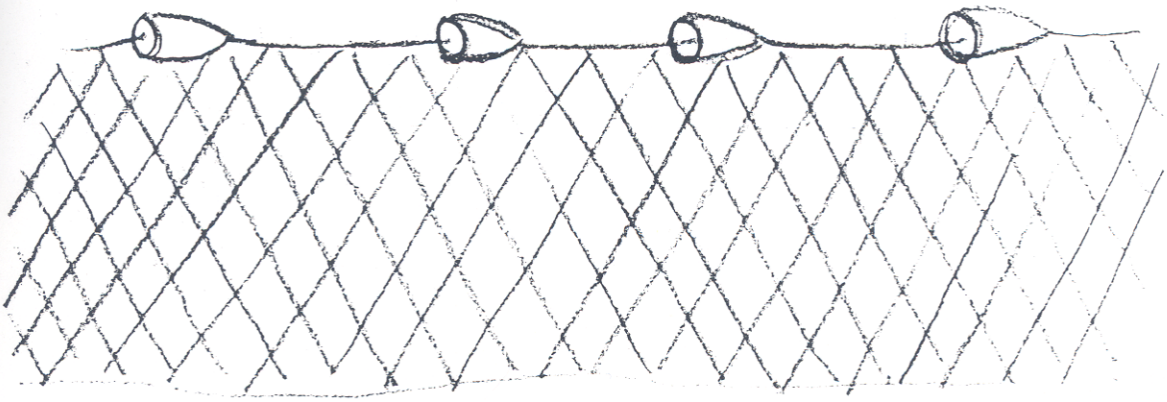


Figure 10. Locations of mesh, stringer and buoy leaders within the Chesapeake Bay, Virginia, fall 2000

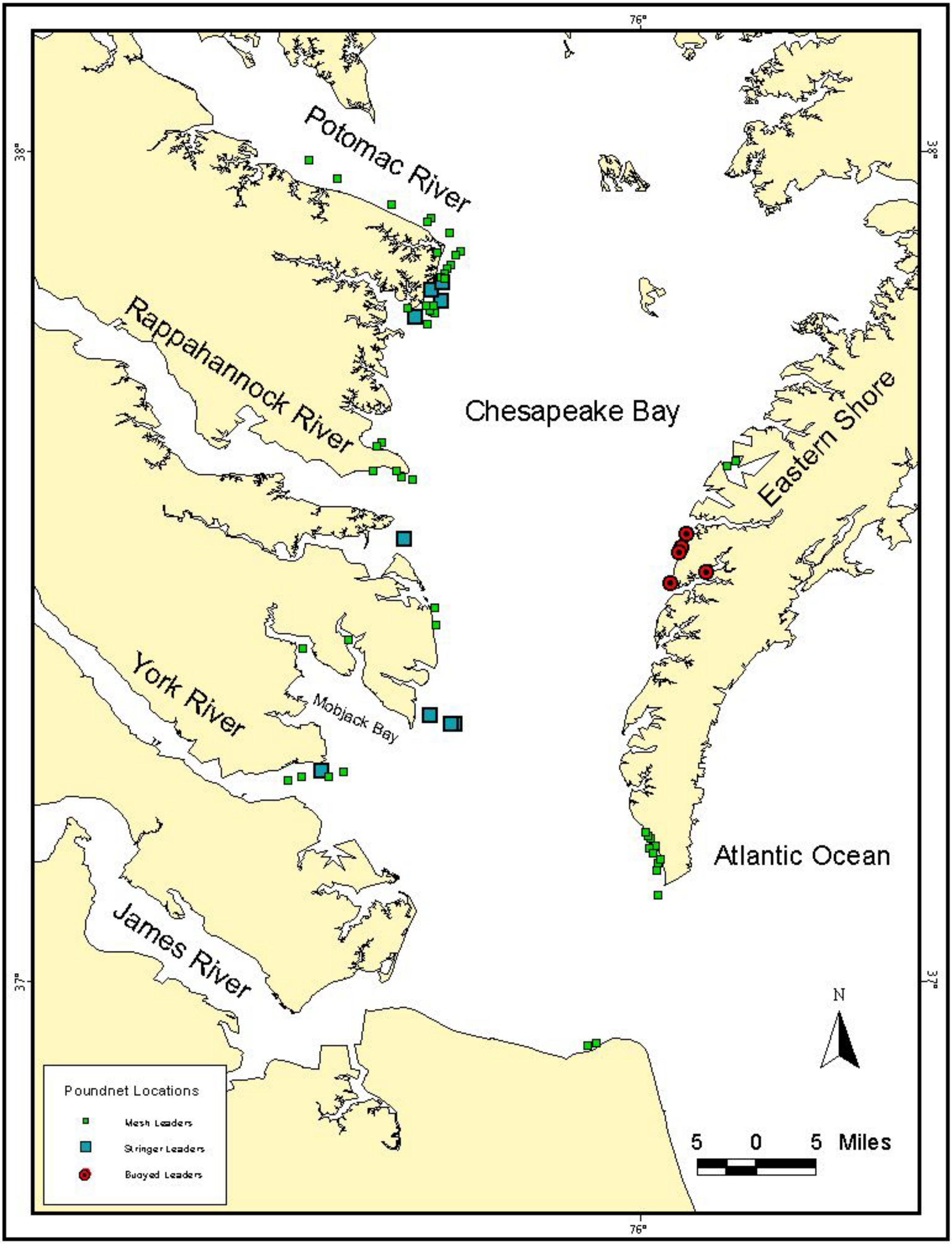

76°
38°
38°
Potomac River
Rappahannock River
Chesapeake Bay
Eastern Shore
York River
Mobjack Bay
Atlantic Ocean
James River
37°
37°
N
Poundnet Locations
Mesh Leaders
Stringer Leaders
Buoyed Leaders
5 0 5 Miles
76°

Figure 11. Locations of all small-mesh leaders (<10 cm k-k) in the Chesapeake Bay, Virginia, fall 2000

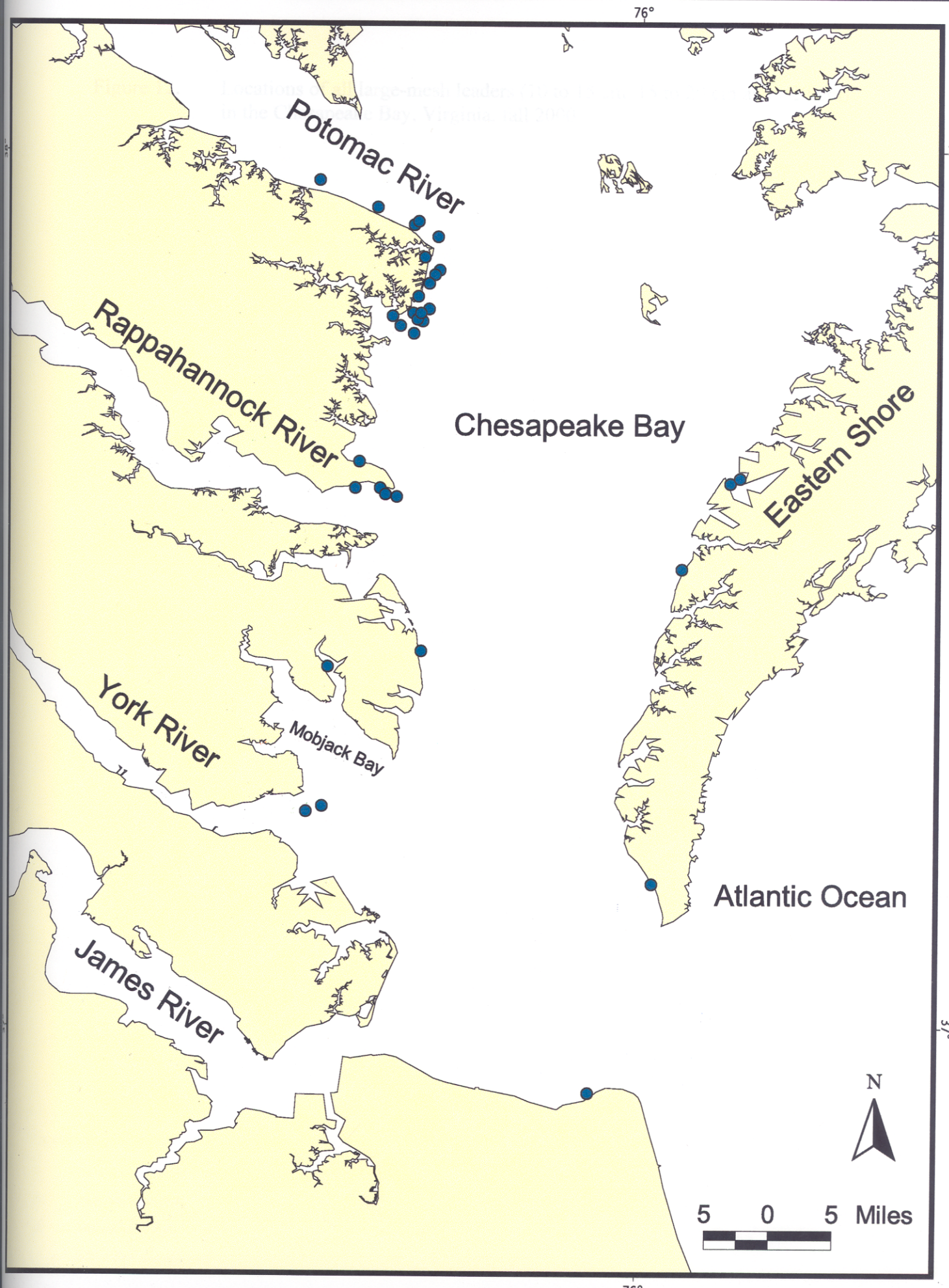

76°
Potomac River
Rappahannock River
Chesapeake Bay
Eastern Shore
York River
Mobjack Bay
Atlantic Ocean
James River
37°
N
5 0 5 Miles
76°

Figure 12. Locations of all large-mesh leaders (10 to 15 cm, 15 to 20 cm and >20 cm) in the Chesapeake Bay, Virginia, fall 2000

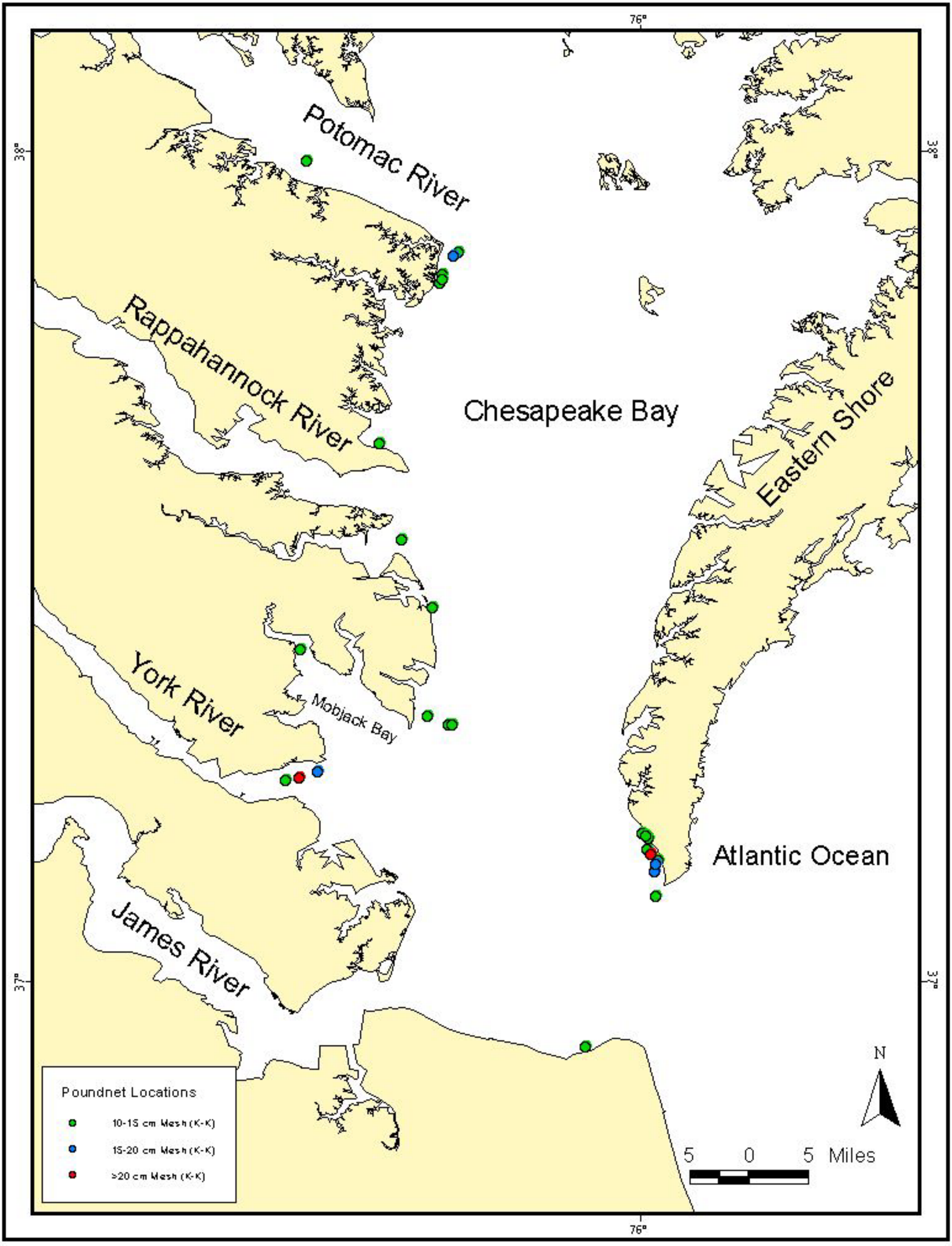

76°
38°
38°
Potomac River
Rappahannock River
Chesapeake Bay
Eastern Shore
York River
Mobjack Bay
Atlantic Ocean
James River
37°
37°
Poundnet Locations
10-15 cm Mesh (K-K)
15-20 cm Mesh (K-K)
>20 cm Mesh (K-K)
N
5 0 5 Miles
76°

Plate 1. Wooden whelk pot with top bridle

Plate 2. Side and top views of the wooden whelk pot, top bridle model

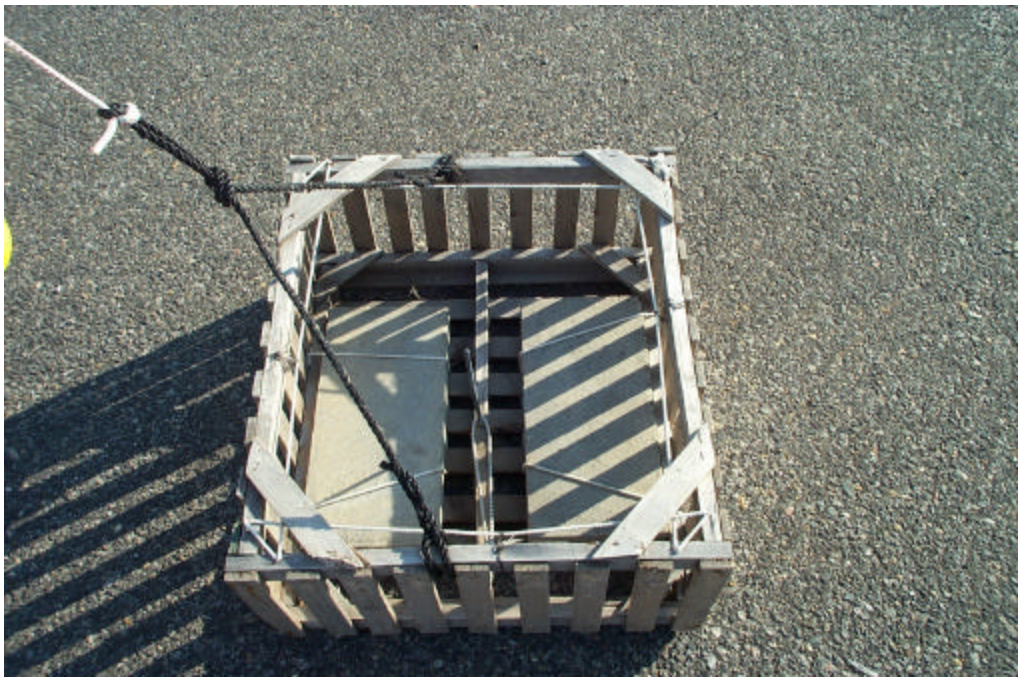


Plate 3. Side views of Jenkin's model whelk pot with side bridle

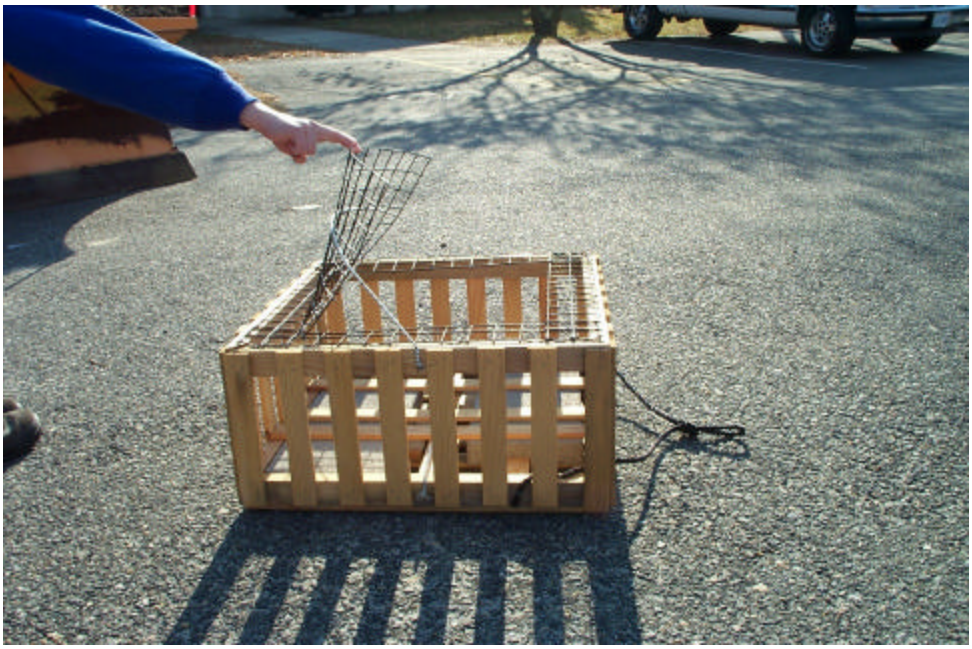


Plate 4. Top view, Jenkin's model whelk pot with side bridle

Plate 5. Typical barrel used in the construction of barrel whelk pots (top bridle). NOTE: Two whelk pots may be constructed from each barrel

Figure 13. Whelk pot ocean landings (meat weight, lbs) in Virginia 1994-1999. Landings data courtesy of VMRC

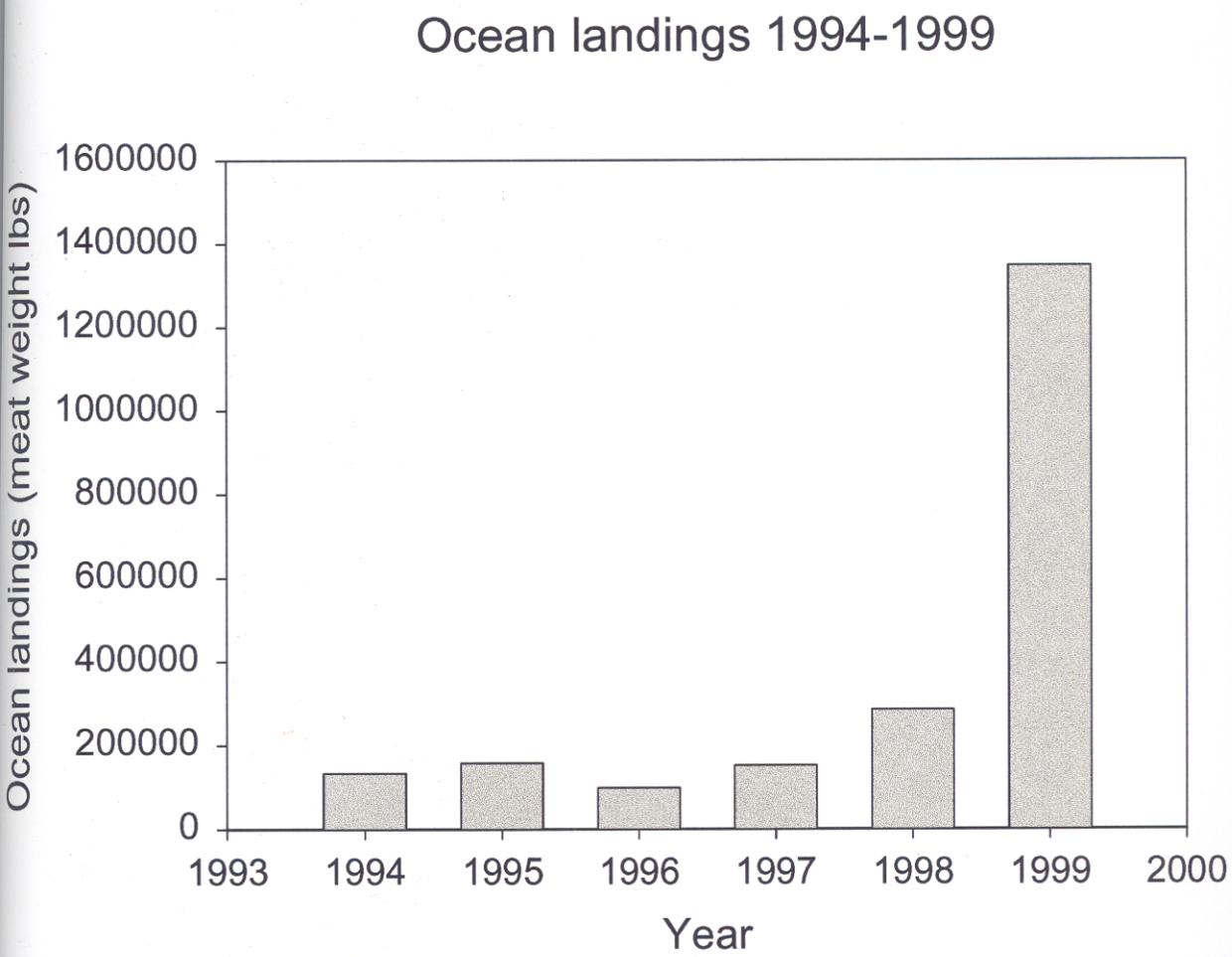

Ocean landings 1994-1999
Ocean landings (meat weight lbs)
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
1993
1994
1995
1996
1997
1998
1999
2000
Year

Figure 14. Whelk pot Chesapeake Bay landings (meat weight, lbs) in Virginia 1994-1999. Landings data courtesy of VMRC

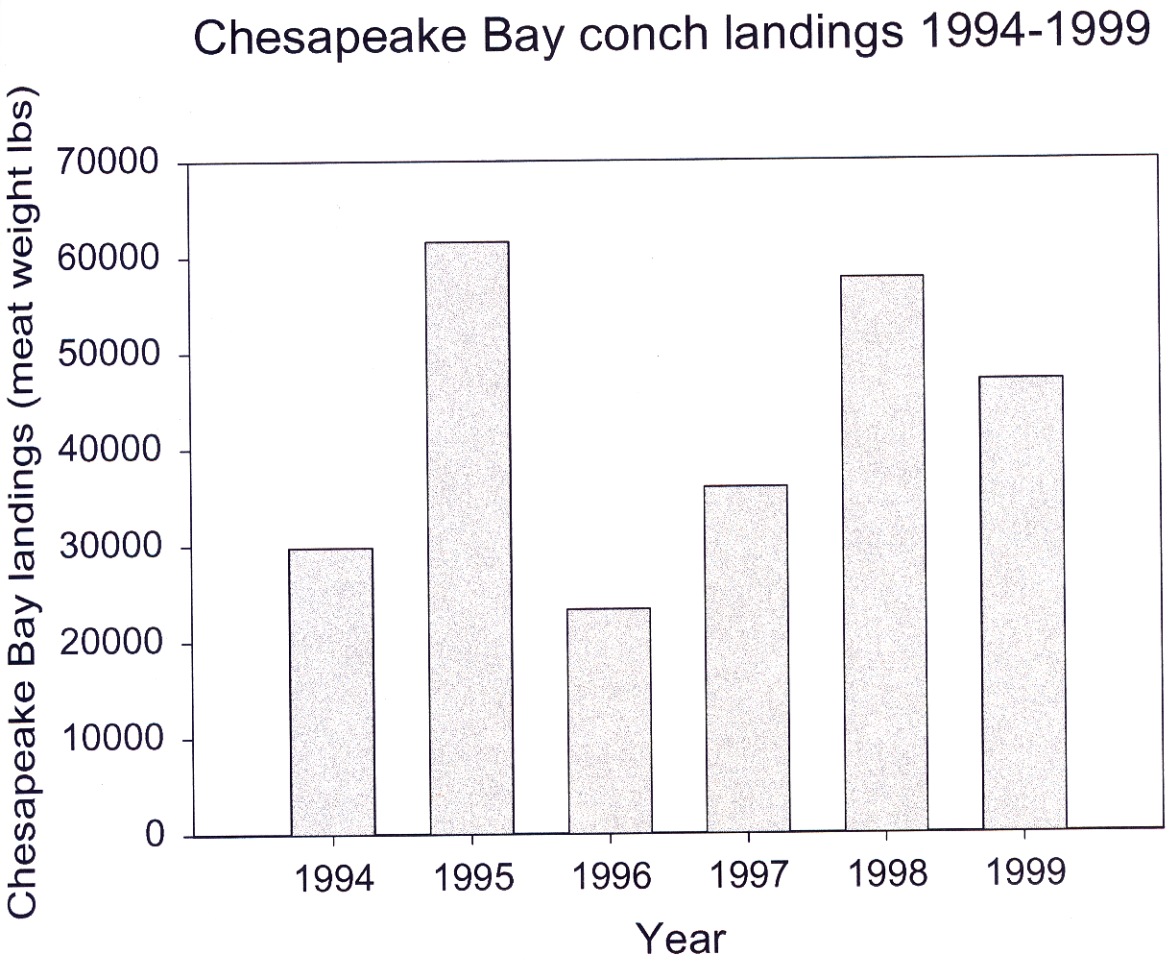

Chesapeake Bay conch landings 1994-1999
Chesapeake Bay landings (meat weight lbs)
70000
60000
50000
40000
30000
20000
10000
0
1994
1995
1996
1997
1998
1999
Year

Figure 15. Relative proportion of whelk landings from the ocean vs. Chesapeake Bay, Virginia, 1994-1999. Landings data courtesy of VMRC

Figure 16. Mean monthly whelk landings (meat weight, lbs) Virginia ocean 1999. Landings data courtesy of VMRC.

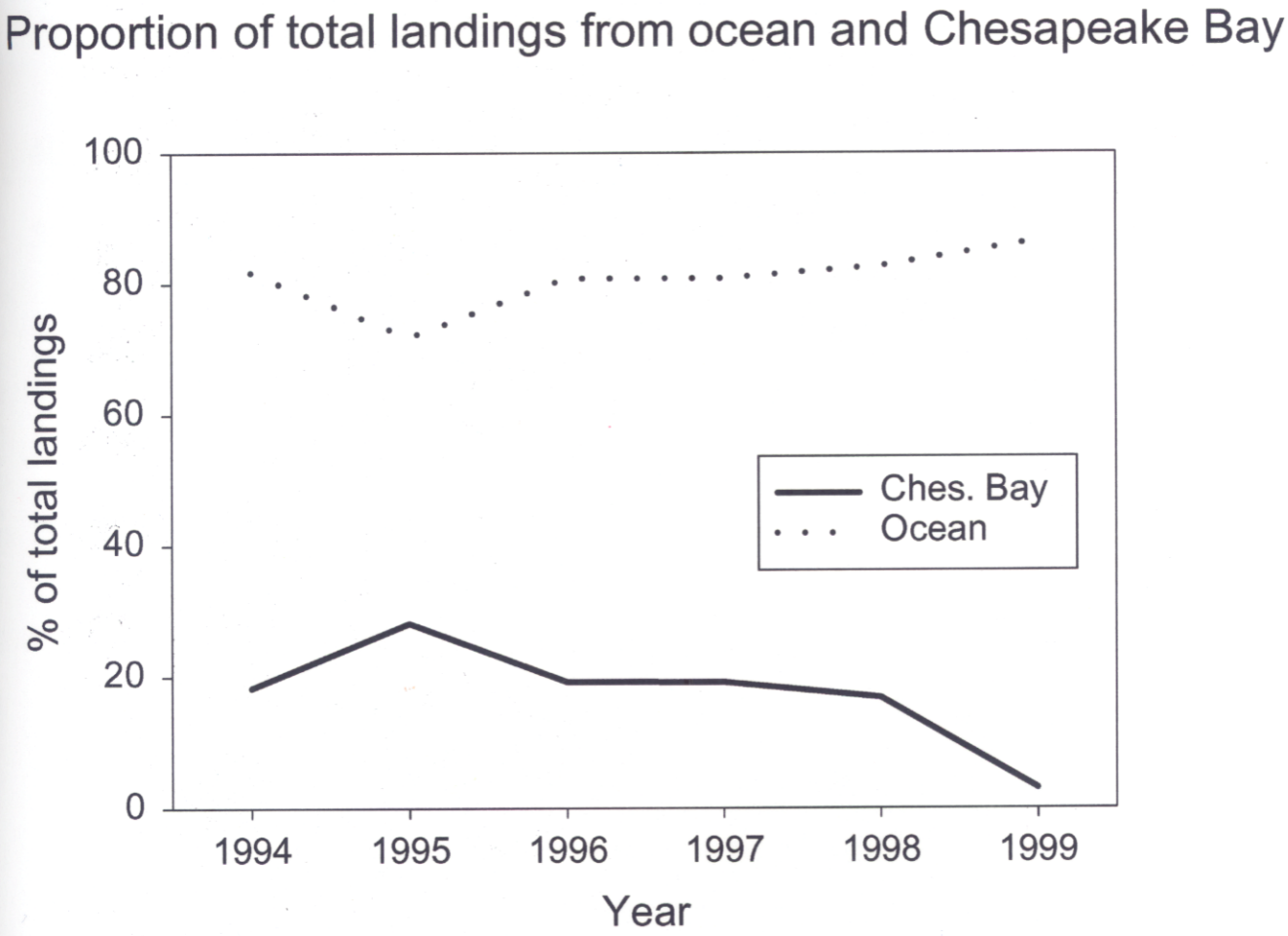


Figure 16. Mean monthly whelk landings (meat weight, lbs), Virginia Ocean, 1994-1999. Landings data courtesy of VMRC

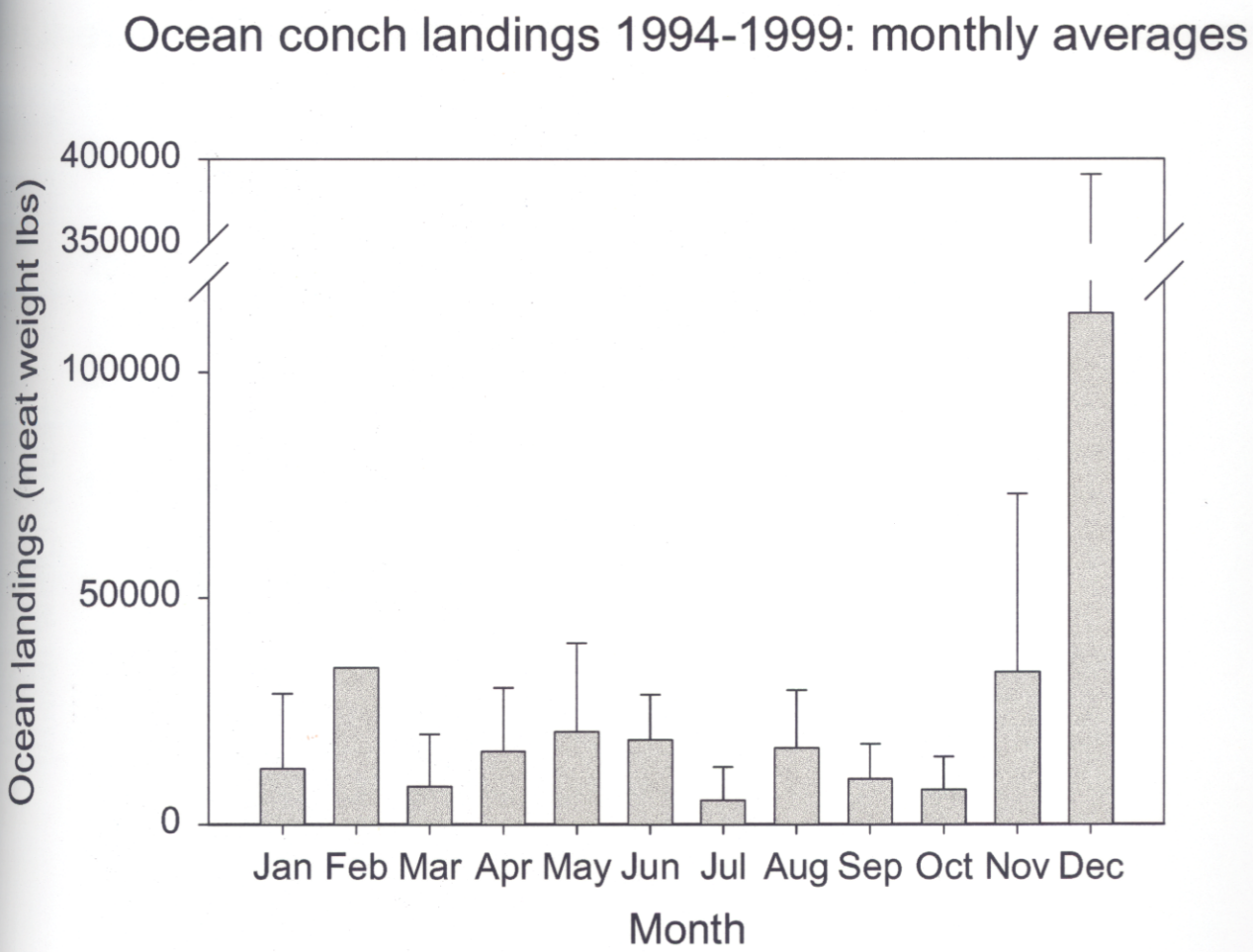

Ocean conch landings 1994-1999: monthly averages
Ocean landings (meat weight lbs)
400000
350000
100000
50000
0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Month

Figure 17. Mean monthly whelk landings (meat weight, lbs), Chesapeake Bay, Virginia, 1994-1999. Landings data courtesy of VMRC

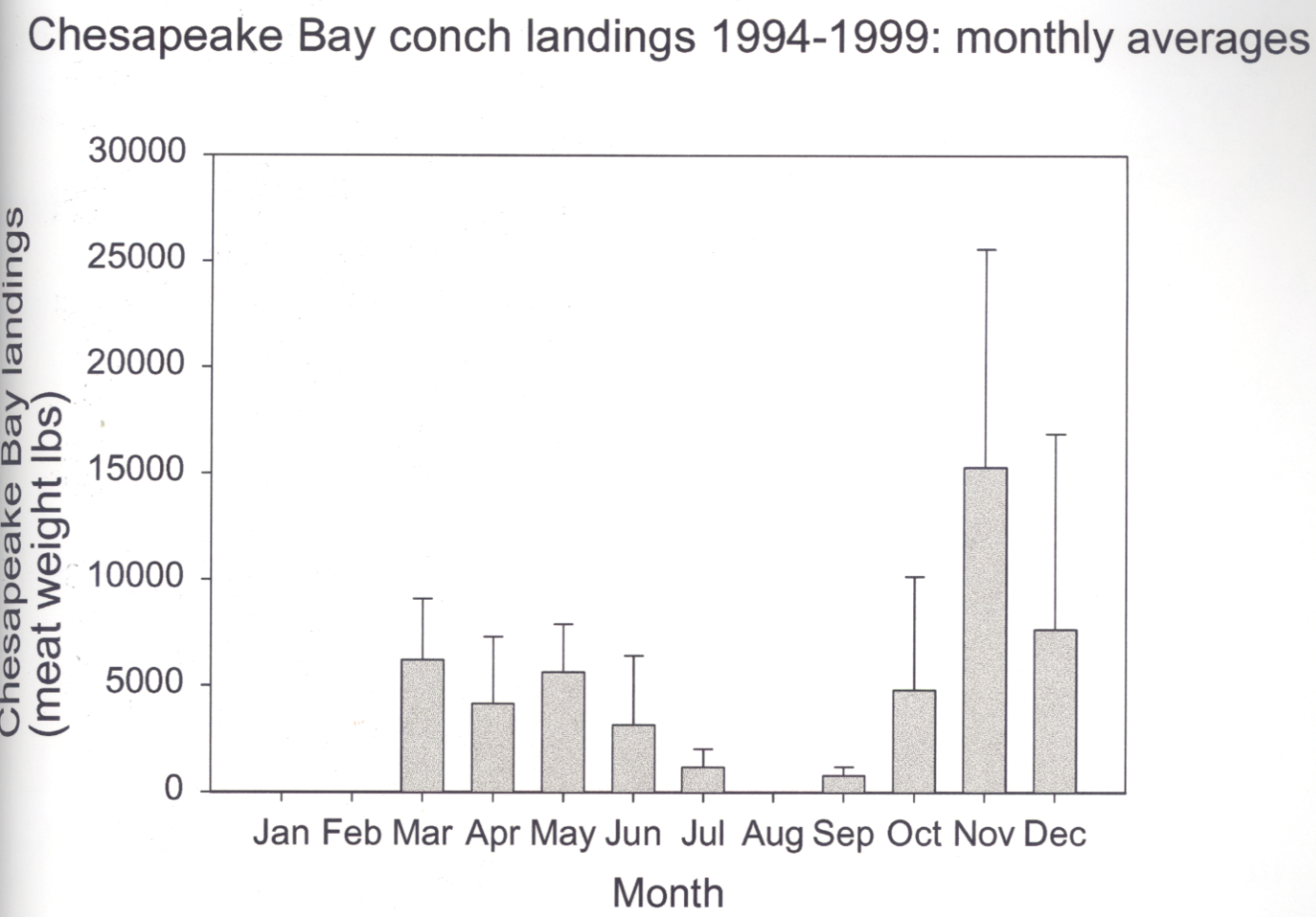

Chesapeake Bay conch landings 1994-1999: monthly averages
Chesapeake Bay landings
(meat weight lbs)
30000
25000
20000
15000
10000
5000
0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Month

Figure 18. Locations of incidental sea turtle mortalities observed on fall survey of Bay poundnets, fall 2000

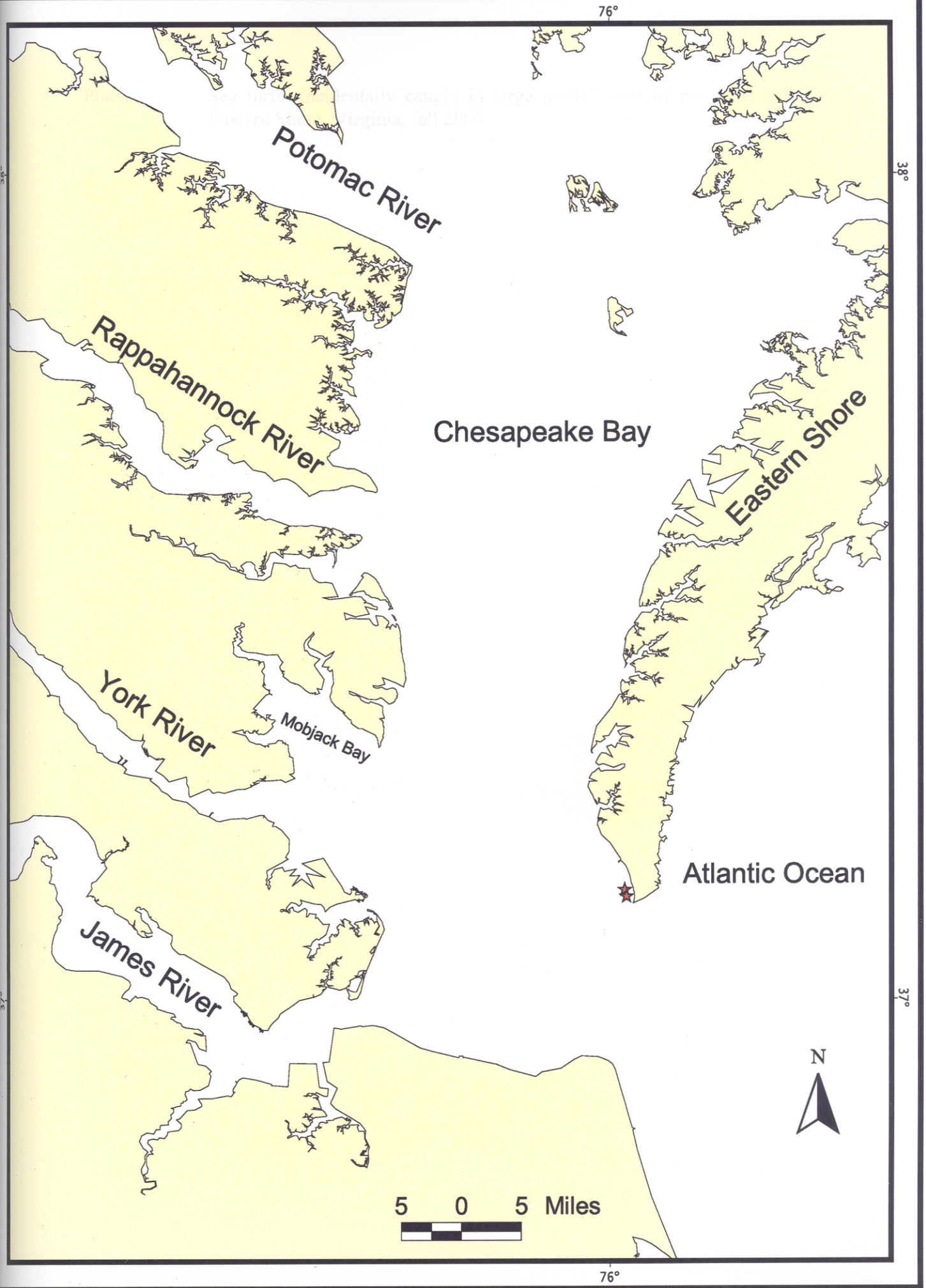

76°
38°
37°
Potomac River
Rappahannock River
Chesapeake Bay
Eastern Shore
York River
Mobjack Bay
Atlantic Ocean
James River
N
5 0 5 Miles

Plate 6. Sea turtle incidentally caught in large mesh leader of poundnet off the Eastern Shore, Virginia, fall 2000

Figure 19. Virginia poundnet landings, all species (lbs), 1980-1999. Landings data courtesy of VMRC

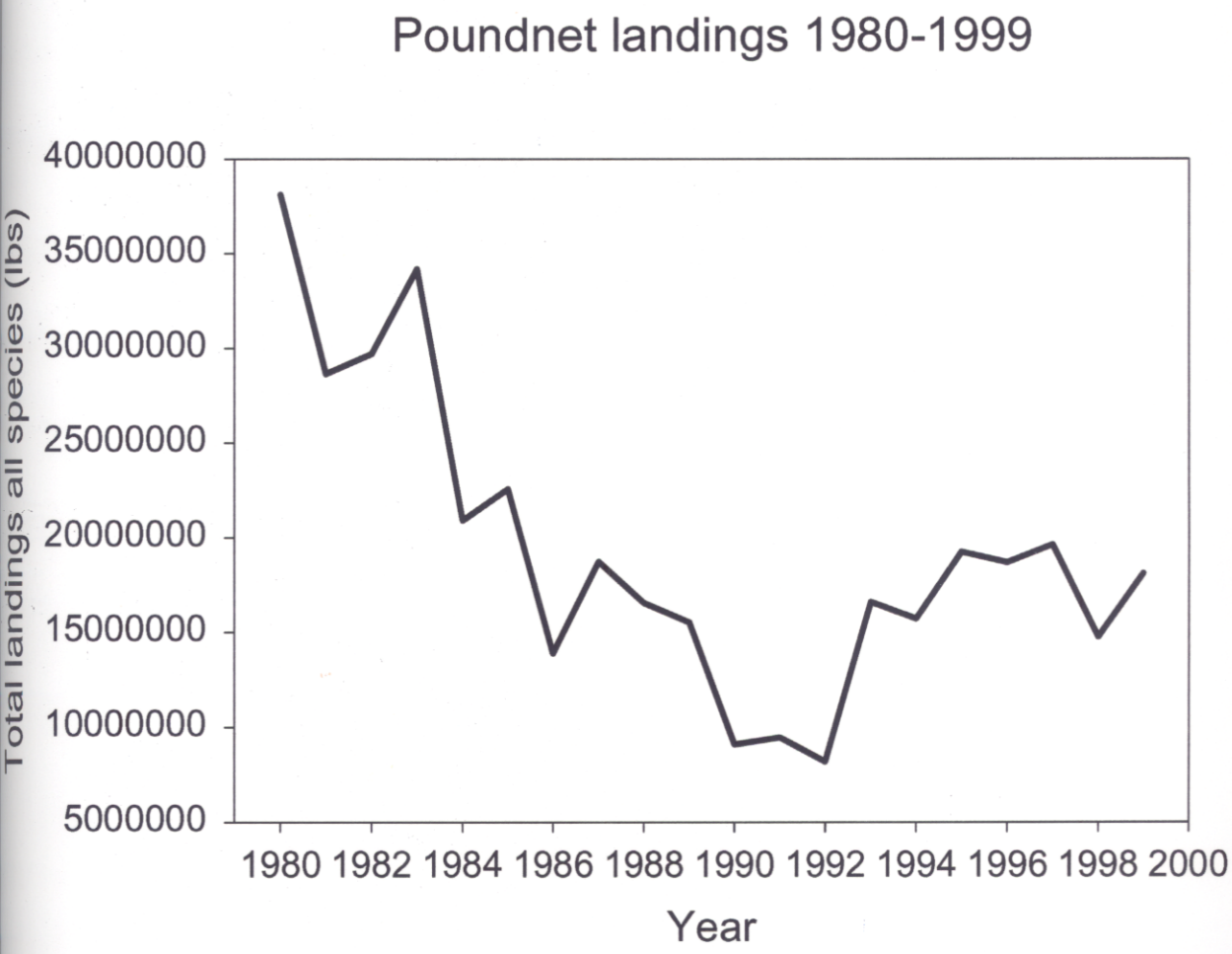

Poundnet landings 1980-1999
Total landings all species (lbs)
40000000
35000000
30000000
25000000
20000000
15000000
10000000
5000000
1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000
Year

Figure 20. Poundnet licenses issued in Virginia vs. sea turtle strandings (all species), 1980-September 2000. License data courtesy of VMRC.

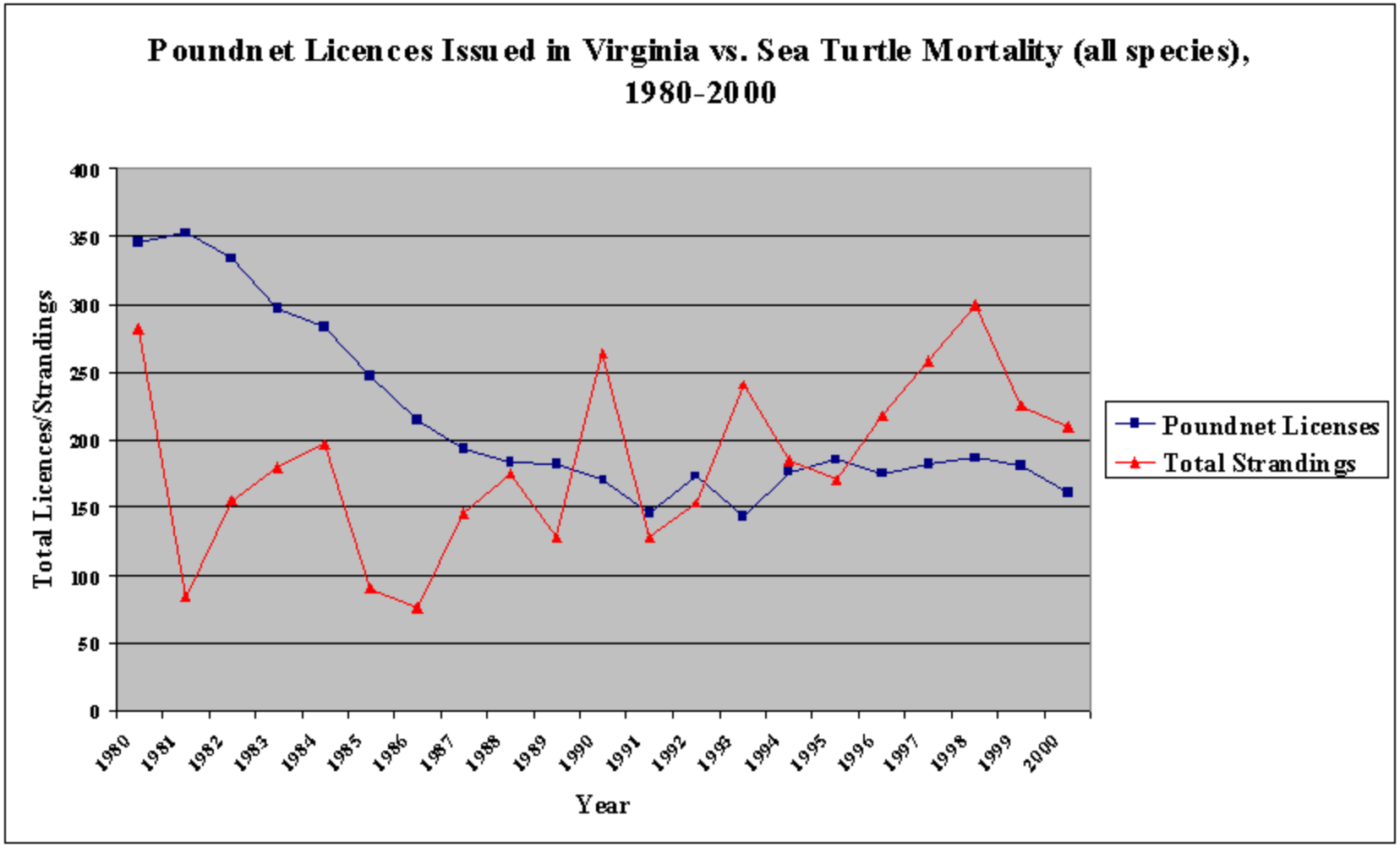
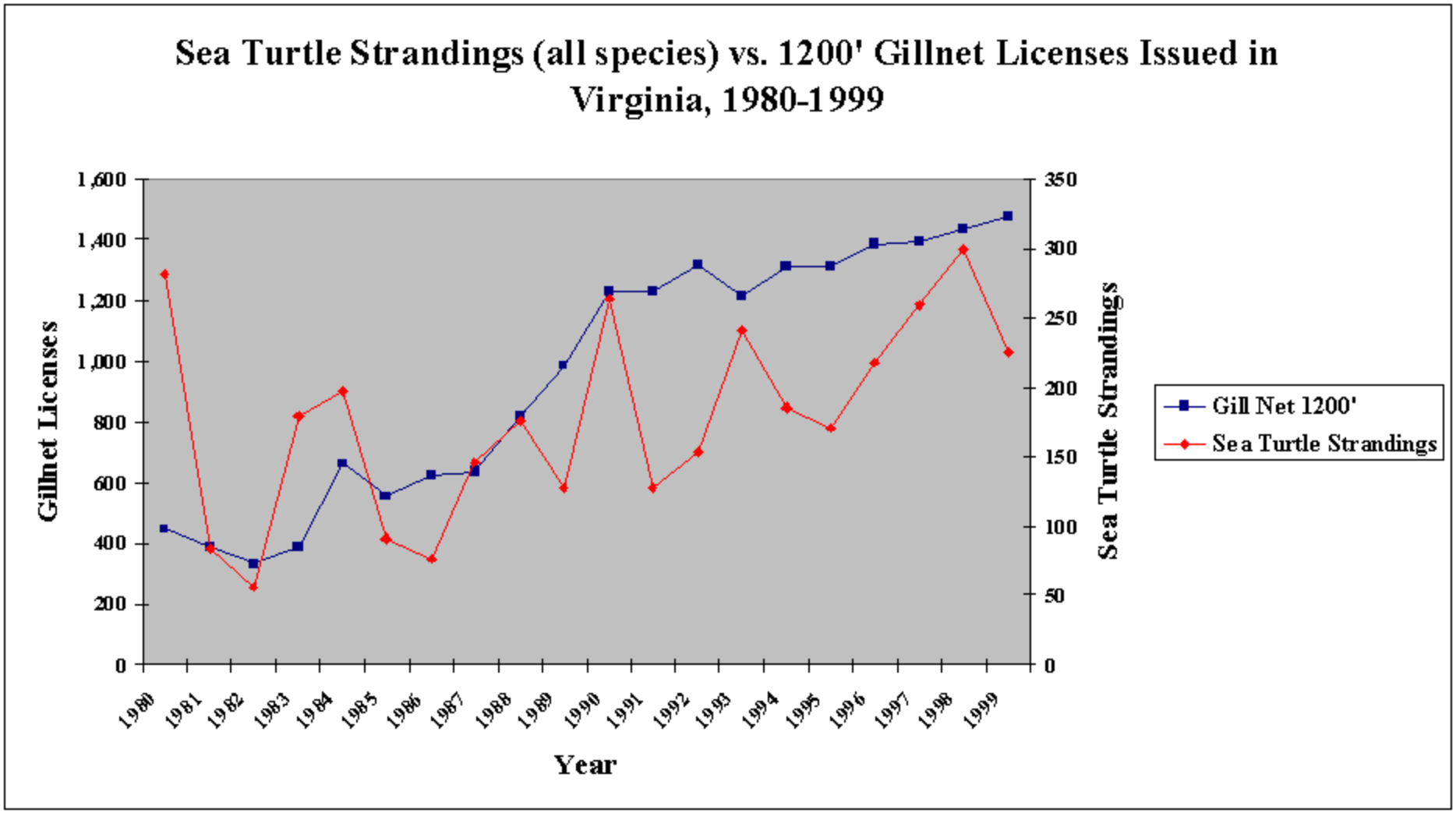

Poundnet Licences Issued in Virginia vs. Sea Turtle Mortality (all species), 1980-2000
Total Licences/Strandings
400
350
300
250
200
150
100
50
0
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Year
Poundnet Licenses
Total Strandings

Figure 21. Sea turtle strandings (all species) vs. 1200' gillnet licenses issued in Virginia, 1980-1999. License data courtesy of VMRC


Sea Turtle Strandings (all species) vs. 1200' Gillnet Licenses Issued in Virginia, 1980-1999
Gillnet Licenses
Sea Turtle Strandings
Year
0
200
400
600
800
1,000
1,200
1,400
1,600
0
50
100
150
200
250
300
350
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
Gill Net 1200'
Sea Turtle Strandings

Appendix A.

Landings data provided by the Virginia Marine Resources Commission show that the following species have been caught by poundnets:

Alewife (*Alosa pseudoharengus*)
Bluefish (*Pomatomus saltatrix*)
Bonito (*Sarda sarda*)
Butterfish (*Peprilus tricanthus*)
Cobia (*Rachycentron canadum*)
Catfish (*Arius* or *Bagre spp*.)
Cod (*Gadus morhua*)
Atlantic Croaker (*Micropogonias undulatus*)
Black Drum (*Pogonius cromis*)
Red Drum (*Sciaenops ocellatus*)
American Eel (*Anguilla rostrata*)
Winter Flounder (*Pseudopleuronectes americanus*)
Summer Flounder (*Paralichthys dentatus*)
Harvest Fish (*Peprilus alepidotus*)
Atlantic Herring (*Clupea harengus*)
Spotted Seatrout (*Cynoscion nebulosus*)
Sheepshead (*Archosargus probatocephalus*)
Spanish Mackerel (*Scomberomorus maculates*)
Gizzard Shad *(Dorosoma cepedianum*)
Northern Puffer (*Sphoeroides maculates*)
Little Tunny (*Euthynnus alletterathus*)
White Perch (*Morone Americana*)
Red Hake (*Urophycis chuss*)
Silver Hake (*Merluccius bilinearis*)
Amberjack (*Seriola spp*.)
Spadefish (*Chaetodipterus faber*)
Sturgeon (*Acipenser spp*.)
Scup (*Stenotomus chrysops*)
Tautog (*Tautoga onitis*)
Spot (*Leiostomus xanthurus*)
Dogfish (*Squalus acanthias*)
Mullet (*Mugil spp*.)
Menhaden (*Brevoortia spp*.)
Hickory Shad (*Alosa mediocris*)
Striped Bass (*Morone saxatilis*)
Skipjack Tuna (*Euthynnus pelamis*)

Appendix B. Microsoft Excel file (hard copy) of all poundnet stands surveyed within the Chesapeake Bay, Virginia, fall 2000

LeaderStatusCode	LeaderStatus
0	missing data
1	fishing, has license
2	not fishing
3	fishing, no license

LeaderTypeCode	LeaderType
0	missing data
1	mesh
2	stringer only
3	stringer with mesh
4	bouyed leader

PoundnetStatusCode	PoundnetStatus
0	missing data
1	fishing, has license
2	not fishing (no net)
3	one of two pounds fishing
4	fishing, no license

NOTE: All measurements are in centimeters

IncidentalCaptureCode	IncidentalCapture
0	missing data
1	no interaction observed
2	live turtle, leader
3	live turtle, heart
4	live turtle, pound
5	dead turtle, leader
6	dead turtle, heart
7	dead turtle, pound
8	dead bird, leader
9	dead bird, heart
10	dead bird, pound
11	live marine mammal, leader
12	live marine mammal, heart
13	live marine mammal, pound
14	dead marine mammal, leader
15	dead marine mammal, heart
16	dead marine mammal, pound

PoundNetID	Licence#	Location (general)	Region	PoundLat	PoundLong	PoundDepth	PoundnetStatus
1	2000-6	York River, north shore	WB	37.2420	-76.4260		1
3	2000-101	York River	WB	37.2530	-76.3870	31	1
4	1999-2	York River - off Guinea Marsh	WB	37.2580	-76.3780	15	2
2	Ubscured	York River, north shore	WB	37.2450	-76.4100	31	4
5	2000-100	York River - off Guinea Marsh	WB	37.2510	-76.3600	38	1
6	1998-109	York River- off Guinea Marsh	WB	37.2600	-76.3620	10	2
7	2000-91	off Guinea Marsh- Outer Range of York River Channel	WB	37.2450	-76.3780	36	1
31	2000-166	Silver Beach	ES-Bay	37.4930	-75.9230	3	1
24	2000-38	Cape Charles - Kiptopeke breakwater concrete ships	ES-Bay	37.1630	-75.9840	13	1
25	2000-141	Kiptopeke State Park - N	ES-Bay	37.1720	-75.9900	9	1
26	2000-148	Kiptopeke - N	ES-Bay	37.1750	-75.9920	9	1
23	2000-191	Cape Charles - Bayside	ES-Bay	37.1590	-75.9910	34	1
30	2000-169	Silver Beach	ES-Bay	37.4790	-75.9650	3	3
27	2000-144	Kiptopeke - N	ES-Bay	37.1790	-75.9960	10	1
33	None	Silver Beach - North Tip (North of Tower)	ES-Bay	37.5390	-75.9460	5	2

PoundNetID	LeaderType	LeaderStatus	#Poles	MeshStretch	MeshK-K	IncidentalCapture	Notes
1	1	1	41			1	Heart/leader has ~6" mesh stretch; too choppy to measure leader (also ~6" or 15 cm)
3	3	1	36			1	3-4" leader; too choppy to measure safely; status - 1 pound - 1" ; 1 heart - 6" Leader mesh/stringer stretch - 6-8" estimate
4	0	2	26			1	no nets - 1 heart
2	1	3	46			1	large mesh leader (10-12"); too choppy to measure safely
5	1	1	48	10		1	1 heart, 1 pound - pound 1" ,heart 4-5" leader status-top just exposed
6		2	7			1	1 pound 1 heart, no leader some netting stretched to heart - 4-5" mesh
7	1	1	50	8		1	no mesh k-k data; 3-4" leader too choppy to measure
31	4	0	0			1	leader to shore - no (E) data; 0 poles- 2 on shore; too shallow - no leader poles/ stakes on shore
24	1	1	34	11	8	1	leader to shore - no (E) data
25	1	1	50	15	10	1	leader to shore - no (E) data
26	1	1	46	15	10	1	leader to shore - no (E) data
23	1	1	58	23	15	1	
30	4	1	0			1	position of non-fishing pound (lat 37.479 long -75.965); no poles 1 stake near shore which net is attached to -leads to shore; too shallow to access active leader 2 heads (separate) but no leader near towers
27	1	1	42	18	14	1	leader goes to shore - no (E) data
33	4	2	0			1	no pound or heart leader locations marked by buoys, no net Gillnets in between net 31 and 32

32	2000-154	Silver Beach - Southern edge of a series of houses - North of Tower	ES-Bay	37.5220	-75.9520	6	1
34	2000-165	Silver Beach- in front of wooden seawall - North of tower	ES-Bay	37.5160	-75.9560	8	1
35	2000-151	Milbys Point - in Creek	ES-Bay	37.6200	-75.8980	6	1
36	2000-150	Milbys Point (in creek)	ES-Bay	37.6260	-75.8870	4	1
37	2000-112	off of Newpoint	WB	37.3090	-76.2260	30	1
38	2000-111	Off of Newpoint	WB	37.3100	-76.2300		1
16	2000-152	Cape Charles - bayside	ES-Bay	37.1330	-75.9820	29	1
28	2000-149	Kiptopeke - N	ES-Bay	37.1830	-75.9980	13	1
21	1999-78	Cape Charles - Bayside	ES-Bay				2
17	2000-155	Cape Charles - Bayside	ES-Bay				2
29	2000-143 / 1999-51	Kiptopeke - N	ES-Bay				2
11	None	Fisherman's Island	ES-Bay	37.0960	-75.9830	14	2
14	none	Cape Charles - Bayside	ES-Bay				4
18	None	Cape Charles - Bayside	ES-Bay	37.1410	-75.9810	25	4

32	4	1	0	7	5	1	leader to shore - no (E) data 1 pole near shore; same mesh in heart no leader poles
34	4	1	0			1	leader to shore - no (E) position 1 pole nearshore; no mesh data - too shallow
35	1	1	40	12	8	1	leader to shore - no (E) position southern edge of creek
36	1	1	30	12	8	1	leader too shallow to get (E) position 2 pounds here- one in disrepair next to this one; northern side of creek
37	2	1	50		13	8	dead bird in leader - 10/14/2000 no real mesh - string only; stretch mesh N/A 2 pounds strung end to end (with 38)
38	2	1	78		12	1	stretch mesh - N/A; being fished while there "Ginnie"
16	1	1	32	28	17	2	pound - torn net, bad shape loggerhead turtle caught in leader position (lat 37.132 long -75.980)
28		2	41			1	leader to the shore - no (E) data leader status - no nets, no heart poles- not counted doubled up replacement poles
21		2	27			1	no pound; inactive stands leader to shore - no (E) data (poles only)
17	1	1	13	15	10	1	Inactive pound (no pound) but has leader no leader (E) data - goes to shore no pound net - but leader and part of heart
29		2	77			1	no pound; leader to the shore - no (E) data watermen replacing the stakes 1/3 of leader poles missing forward of heart
11		2				1	TWO NETS in same location; no leader; inactive stand
14		3	15			1	pieces of net in complete disrepair; Net not active but has bits of net in water w/o license
18	1	3	42	24	20	1	check leaderlong (H) - looks like recorded incorrectly on datasheet

20	2000-160	Cape Charles - Bayside	ES-Bay	37.1460	-75.9780	9	1
15	2000-90	Cape Charles - Wise Point	ES-Bay				2
22	2000-158	Cape Charles - Bayside	ES-Bay	37.1530	-75.9870	29	1
9	none	Lynnhaven	VB-Ocean	36.9210	-76.0650	21	4
12	2000-74	Fisherman's Island - Bay	ES-Bay	37.1030	-75.9810	7	1
10	2000-171	Fisherman's Island -bayside	ES-Bay	37.0960	-75.9830	14	2
13	2000-172	Fisherman's Island - bayside	ES-Bay	37.1040	-75.9820	12	2
19	2000-161	Cape Charles - Bayside	ES-Bay				2
8	None	Lynhaven/ Fort Story	VB-Ocean	36.9250	-76.0550	23	4
83	2000-24PN	Potomac River	MD-Bay	37.9250	-76.2780	23	2
82	2000-PN97	Potomac River	MD-Bay	37.9350	-76.3010		1
48	2000-106	Rigby Island - N tip	WB	37.4500	-76.2500		

20	1	1	14	15	10	1	leader to shore - no (E) position 7 poles on each side double stacked leader/ pound and funnel
15		2	11			5	Inactive stand; dead turtle in net - loggerhead - entangled in gillnet that has hooked onto pound pole on 7th pole - monofilament turtle location (lat 37.125 , long -75.980)
22	1	1	32	32	23	1	no gill nets until south of Kiptopeke
9	1	3	67	15	10	1	some sections of net in disrepair at least 20% gone; Russel boat working the nets heart in disrepair
12	1	1	21	15	10	1	leader goes into shore no net for heart
10	0	2				1	TWO NETS in same location poundnet status-heart only no leader - old license 1999-72 2 apparent heart portions of the net - both not fished- these are the 2 nets closest to the bridge no seastate specified - only chop then calm time 1011
13	0	0				1	no leader - only heart has net -but mangled
19	1	1	24	36	23	1	No pound net leader in bad shape - some missing
8	1	3	58	10	8	9	leader mesh - larger mesh closer to head (15th pole) stretch 24cm k-k 15cm on leader stetch 15cm k-k 10cm on head entangled dead pelican nets in disrepair in some areas
83		2	95			1	no leader
82	1	1	103	6	4	1	
48	1	1	30			1	no pound; Spec trout possibly - shallow, near shore; leader mesh is same as pound mesh--could not measure, too shallow Leader to shore - no (E) data

49	None	S tip of Gwynn Island	WB	37.4910	-76.2630	17	2
50	2000-133	S of Rapp. Off Stingray Point	WB	37.5330	-76.2870	18	1
51	2000-121	S shore of Rapp - upriver from sturgeon creek	WB	37.4100	-76.3540	13	1
55	2000-77	Mouth of Rapp - Windmill Point - outermost of 3 on N side of Rapp	WB	37.6040	-76.2770	17	1
47	2000-108	N of Garden Creek entrance 2 large houses on shore	WB	37.4280	-76.2480	7	1
54	2000-73	Rapp river- N side of Windmill Point - Downriver of condos and harbor entrance channel - off condos closest to point	WB	37.6070	-76.2900	17	1
53	2000-75	Off Windmill Point - Most upriver	WB	37.6140	-76.2960	16	1
52	2000-85	N shore of Rapp - upriver towards bridge near Mosquito Point	WB	37.6140	-76.3240	13	1
46	None	N of Newpoint - (S of Wolftrap Light)	WB	37.3820	-76.2460		2
45	None	N of Newpoint Comfort	WB	37.3670	-76.2360		2
44	None	N of Newpoint Comfort	WB	37.3630	-76.2430		2
43	None	N of Newpoint Comfort	WB	37.3600	-76.2380		2
42	1998-132	N of Newpoint Comfort	WB	37.3570	-76.2380		2
41	1998-134	N of Newpoint light	WB	37.3480	-76.2400		2
39	None	Newpoint - inshore from 111,112 and slightly north	WB	37.3200	-76.2360	30	2
56	None	Little Bay	WB	37.6490	-76.3130	23	4
69	None		WB	37.8340	-76.2340	20	2
57	None	Little Bay	WB	37.6440	-76.3200	18	4
40	2000-114	N of Newpoint Light	WB	37.3200	-76.2560		1
79	2000-33		WB	37.8780	-76.2470		1

49		2				1	inactive stand
50	2	1	72		12	1	lisense could also be 103,108,or 138 obscured by bird droppings
51	1	1	57	8	5	10	Lisence also 1999-42 crab pots and gill nets along s shore of Rapp.; dead bird in pound
55	1	1	45	13	8	1	
47	1	1	61	13	9	1	Pound is small compared to others Leader to shore - No (E) data
54	1	1	53	11	7	8	Double Head Some leader poles missing in middle Dead bird in leader
53	1	1	61	7	5	1	Leader to shore - no (E) data Double head In front of 2 condo buildings - upriver of yacht haven entrance channel - markers and riprap jetty
52	1	1	42	11	7	1	Double head
46		2	12			1	
45		2	14			1	Inactive stand
44		2	39			1	inactive stand
43		2				1	Inactive stand
42		2	44			1	Inactive stand
41		2	32			1	Inactive stand
39	0	2	3			1	
56	1	3	35	16	10	10	dead cormorant in pound double pound last 8 poles of leader have smaller mesh (same as pound)
69						1	inactive stand, pound poles only
57	1	3	59	15	8	1	
40	2	1	60		12	1	
79	1	1	82	8	5	1	Double pound

66	2000-12		WB	37.8140	-76.2510	15	1
80	2000-42		WB	37.8790	-76.2180	13	1
58	2000-1	Fleeton Off Point	WB	37.7910	-76.2590	16	1
78	2000-19		WB	37.8760	-76.2360	3	2
77	2000-31		WB	37.8690	-76.2340	14	2
76	2000-8		WB	37.8630	-76.2300	26	1
75	2000-10		WB	37.8580	-76.2350	21	1
68	2000-16		WB	37.8190	-76.2420	16	1
74	2000-26		WB	37.8520	-76.2380	20	1
73	2000-5		WB	37.8480	-76.2420	16	1
72	2000-3		WB	37.8460	-76.2370	25	1
60	2000-39	Fleeton Point - S of Smith Point	WB	37.8060	-76.2520	18	1
81	2000-29		WB	37.8740	-76.2240	24	1
71	2000-30		WB	37.8420	-76.2390		2
59	2000-23	Fulton - off point	WB	37.8050	-76.2490	20	1
61	None	Reedville/ Fulton Point area - south of Smith Point	WB	37.8070	-76.2550	16	1
62	2000-27	Back to Fulton Point - closest to Harbor Entrance	WB	37.8000	-76.2740	16	1
63	2000-38		WB	37.8110	-76.2830	10	1
64	2000-24	Just off Fleeton - near Reedville N of point and 6 nets	WB	37.8140	-76.2600	11	1
65	2000-13	Just off Fulton near Reedville - N of point and 6 nets	WB	37.8330	-76.2540	13	1
67	2000-23		WB	37.8140	-76.2510	16	1

66	1	1	83	13	8	1	leader is manufactured stuff Double pound
80	1	1	114	14	10	1	
58	1	1	113	12	8	1	Double pound Poles about 4-5 feet apart
78		2	18			1	inactive stand
77		2	42			1	just offshore of 2 white houses - one of which is boarded up
76	1	1	95	12	8	10	double pound 2 dead cormorants in pound, 2 in leader
75	1	1	85	14	8	1	Double pound
68	3	1	136	12	8	1	Last 14 ploes just had stringer on top
74	1	1	107	15	10	1	Double pound
73	1	1	68	12	8	1	Double pound
72	1	1	77	15	10	1	Double pound
60	1	1	107	7	5	1	double pound 2 different size meshes - also have stretch 19cm and k-k 12cm (larger mesh for only a few feet, like a patch)
81	1	1	99	25	17	1	Double pound
71		2	3			1	3 stakes total; inactive stand
59	1	1	74	13	7	1	
61	1	1	123	12	8	1	Double Pound; smaller mesh in leader probably (7cm-5cm) between pole# 80 to end
62	2	1	81		7	1	Double Pound No leader on last 8 poles
63	1	1	93	7	5	1	Double Pound Last 20 poles - end w/o obvious leader
64	1	0	97	8	5	1	Double pound last 23 had no leader manufactured "webbing" blown out on top of poles on leader
65	3	1	99	13	7	1	end - 48 poles - stringer on top then all mesh heart has same design, stringer on top of mesh
67	1	1	61	13	8	1	Leader was blown out in several places

70	2000-36		WB	37.8420	-76.2400	20	1
94	2000-75PN	Potomac River	MD-Bay	37.9620	-76.3700	12	2
101	2000-18PN	Potomac River	MD-Bay	38.0010	-76.4390	17	2
87	2000-21PN	Potomac River	MD-Bay	37.9290	-76.2900	20	2
86	093668	Potomac River	MD-Bay	37.9010	-76.2320	23	1
89	2000-13PN	Potomac River	MD-Bay	37.9480	-76.3150	28	2
85	2000-95PN	Potomac River	MD-Bay	37.9190	-76.2540	25	1
84	2000-94PN	Potomac River	MD-Bay	37.9150	-76.2590	19	1
103	2000-??	North River, Mobjack	WB	37.4000	-76.4080		1
102	None	Potomac River	MD-Bay	37.9890	-76.4430		2
88	2000-14PN	Potomac River	MD-Bay	37.9410	-76.3110	20	2
100	2000-79PN	Potomac River	MD-Bay	38.0030	-76.4350	21	2
99	2000/84PN	Potomac River	MD-Bay	37.9890	-76.4010	30	1
98	2000-82PN	Potomac River	MD-Bay	37.9800	-76.3980	27	1
97	2000-76PN	Potomac River	MD-Bay	37.9710	-76.3880	22	2
95	2000-85PN	Potomac River	MD-Bay	37.9630	-76.3750		2
93	2000-37PN	Potomac River	MD-Bay	37.9660	-76.3670	17	1
92	2000-80PN	Potomac River	MD-Bay	37.9560	-76.3290	20	2
91	2000-16PN	Potomac River	MD-Bay	37.9510	-76.3240	21	2
90	2000-15PN	Potomac River	MD-Bay	37.9450	-76.3180	19	2
96	2000-77PN	Potomac River	MD-Bay	37.9650	-76.3800	17	2

70	3	1	135			1	Double pound Stringer on top of mesh 9-12 cm (k-k) stringer width 15 (s),10 (k-k) mesh below last 8 poles had no leader
94		2				1	Inactive stand
101		2				1	inactive stand
87		2				1	inactive net
86	1	1	98	18	9	1	Leader has some holes
89		2	85			1	inactive net
85	1	1	74	14	8	1	
84	1	1	96	13	6	1	
103	1	1				1	Data courtesy of Charles M/John Lucie; License # obscured by bird droppings; approx 15 cm stretch, 10 cm k-k
102		2	75			1	Too shallow to read license number by boat. Lat/long taken approx 25 meters away from stand. Inactive stand
88		2				1	inactive net
100		2				1	inactive stand
99	1	1	74	26	15	1	
98		2	75			1	No net on leader but pound in water
97		2				1	inactive stand
95		2					Only one pole with the license marking old stand location??
93	1	1	74	12	7	1	some holes in nets
92		2				1	inactive stand
91		2				1	inactive stand
90		2				1	inactive stand
96		2	74			1	inactive stand