REPORT OF THE TASK FORCE ON

THE VIRGINIA BLUE CRAB WINTER DREDGE FISHERY

TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA

SENATE DOCUMENT NO. 30

COMMONWEALTH OF VIRGINIA
RICHMOND
2000

PREFACE

This report is submitted pursuant to Senate Joint Resolution No. 397 of the 1999 Session of the Virginia General Assembly.

SENATE JOINT RESOLUTION NO. 397

Requesting the Secretary of Natural Resources, in consultation with the Virginia Institute of Marine Science and Old Dominion University, to establish a task force to study the effects of winter dredging on the long-term sustainability of the blue-crab fishery.

Agreed to by the Senate, February 25, 1999
Agreed to by the House of Delegates, February 23, 1999

WHEREAS, the Chesapeake Bay blue-crab fishery generates annual revenue of approximately $227 million; and

WHEREAS, the decline in other Bay fishery resources such as oysters and shad has increased fishing pressure on the crab population; and

WHEREAS, the fishing effort for blue crabs has increased five-fold between 1945 and 1995; and

WHEREAS, the blue-crab landings have not increased significantly despite increases in the fishing effort; and

WHEREAS, the increased effort has decreased the efficiency of the fishery, as measured by catch-per-unit-effort; and

WHEREAS, recent studies of the blue-crab fishery have shown it to operating at or beyond sustainable levels of fishing pressure, with one of the consequences being a decrease of the spawning stock; and

WHEREAS, a significant component of Virginia's blue-crab landings is derived from a wintertime dredge fishery which targets mature female blue crabs; and

WHEREAS, the preservation of blue-crab spawning stock is essential for sustaining the fishery, and blue-crab landings in three of the last four years have been below the long-term average for the crab harvest; now, therefore, be it

RESOLVED by the Senate, House of Delegates concurring, that the secretary of Natural Resources, in consultation with the Virginia Institute of Marine Science and Old Dominion University, be requested to establish a task force to study the effects of winter dredging on the long-term sustainability of the blue-crab fishery. The study shall evaluate the options for restoring the blue-crab fishery, including, but not limited to, whether a prohibition on the taking of blue-crabs should be imposed, during which the Commonwealth would compensate watermen for their lost income.

All agencies of the Commonwealth shall provide assistance to the task force for this study, upon request.

The task force shall complete its work in time to submit its findings and recommendations to the Governor and the 2000 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents.

Members of the Task Force*

Dr. Eugene Burreson, Chair, Virginia Institute of Marine Science
Dr. Mark Butler, Old Dominion University
Dr. William DuPaul, Virginia Institute of Marine Science
Dr. John Hoenig, Virginia Institute of Marine Science
Dr. Romuald Lipcius, Virginia Institute of Marine Science
Dr. John McConaugha, Old Dominion University

*Dr. Cynthia Jones, Old Dominion University, was originally appointed to the Task Force, but she was unable to serve because of other commitments out of the country.

Acknowledgements

The task force wishes to thank Jack Travelstead and Rob O'Reilly and their staffs at the Virginia Marine Resources Commission for providing license and harvest data for the various blue crab fisheries in Virginia and Maryland. This report could not have been completed without their valuable assistance. Thanks are also due Marcel Montane, Jacques Van Montfrans and Lyle Varnell of VIMS for assisting with sections of the report.

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EXECUTIVE SUMMARY

Purpose of the report: The purpose of this report is to analyze the Virginia winter crab dredge fishery, to evaluate the impact of this fishery on the long-term sustainability of blue crab populations, and to make management recommendations.

Status of the blue crab stock in Chesapeake Bay: There is some debate among scientists as to the exact status of the blue crab stock; however, there is consensus that the stock is fully exploited, that spawning stock biomass is below the long-term average, that average size of crabs is decreasing, that fishing effort is at near record levels and that there is no evident trend in recent recruitment.

Sex ratios of the Virginia and Maryland blue crab harvests: Because of the life cycle of the blue crab, male crabs tend to be most abundant in Maryland and female crabs tend to be most abundant in Virginia. Thus, the sex ratio of the harvest in Maryland is approximately 50% males and 50% females. The sex ratio of the harvest in Virginia from all gear types is approximately 30% males and 70% females.

Characteristics of the Virginia winter dredge fishery:

- The fishery runs from 1 December to 31 March each year.
- Data for this fishery are good and are better than for any other blue crab fishery in Chesapeake Bay.
- The fishery is well managed, with declining effort, a license cap, a daily limit, and mandatory reporting. However, even though the number of crab dredge licenses has been stabilized through regulatory action, the effective number of days fished remains somewhat open-ended. If resource conditions, prices, weather and other external conditions are favorable for any given year there could be a significant and undesirable concomitant increase in fishing effort.
- The harvest from the fishery is 96% female.

Characteristics of other blue crab fisheries:

- Major pot and trot line fisheries occur throughout the Bay in spring, summer and fall and remove a significant (but unquantified) portion of the annual standing stock of blue crabs prior to the start of the winter dredge fishery.
- In contrast to the winter dredge fishery, where effort is declining, between 1994 and 1998 there has been a 14% increase in the number of hard pot licenses and an 82% increase in the number of peeler pot licenses.
- The other blue crab fisheries account for 92.7% of the Bay-wide harvest over the last 13 years and 91.3% of the Bay-wide female harvest since 1993.

Impact of the winter dredge fishery:

- Over the last 13 years, the winter dredge fishery has accounted for 7.3% of Bay-wide harvest annually and since 1993 has accounted for 8.7% of the female crabs harvested annually.
- Since 1991, the winter dredge fishery has harvested on average 32% of the female crabs at least one year of age that reside in the Bay at the beginning of the winter dredge fishery

season (that is, 32% of what is left after the other fisheries have occurred), and on average 21% of the total crabs at least one year of age that reside in the Bay at the beginning of the winter dredge season.

Recommendations:

- The Task Force does not recommend that the winter dredge fishery be singled out for additional restrictions. However, the Task Force would not be opposed to future restrictions on the dredge fishery, if those restrictions were deemed necessary as part of an overall blue crab management plan that considered additional restrictions in all fisheries.
- Because the winter dredge fishery has the *potential* to significantly impact the number of over-wintering crabs, the Task Force does not recommend that any expansion of the winter dredge fishery be allowed.
- The Task Force recommends that other blue crab fisheries be assessed for their impact on blue crab stocks.
- The Task Force recommends increased funding to expand data collection to include recreational effort and harvest, sex ratio of harvest in all blue crab fisheries and effective effort of the pot fisheries.

I. Introduction

The Blue Crab Winter Dredge Fishery Task Force was established by the Secretary of Natural Resources on July 19, 1999. The Task Force met formally four times; all meetings were open to the public. In making its recommendations, the Task Force considered all license and harvest information available, and especially long-term trends in these data. The Task Force also considered recent analyses by Virginia scientists on the impact of the winter dredge fishery on blue crab stocks. Because there is only a single, Bay-wide stock of blue crabs, the Task Force felt it was important to put the dredge fishery into a Bay-wide context, not just a Virginia context. For that reason, Bay-wide harvest data were used in all analyses.

Because of the life cycle of the blue crab, most male crabs occur in Maryland and most female crabs occur in Virginia. Thus, throughout the year, the overall Virginia blue crab fishery is composed predominately of female crabs. Critical to the evaluations were data on blue crab sex ratios for the various fisheries in both Virginia and Maryland. Unfortunately, these data do not always exist or are not as precise as the Task Force would have liked, and this lack of data hampered the evaluations.

This report represents the first analysis of the winter dredge fishery in Virginia in relation to long-term sustainability of blue crab stocks.

II. Status of the blue crab stock in Chesapeake Bay

There is no consensus at the present time among Bay scientists on the exact status of the blue crab stock. The lack of consensus is primarily a result of inadequate data on total harvest (especially recreational harvest), sex ratios of harvested crabs in the various fisheries, actual fishing effort and growth and age of blue crabs. Nonetheless, most scientists agree that the stock is fully exploited, that spawning stock biomass is below the long-term average, that the average size of crabs is decreasing, and that the industry is overcapitalized (Rugulo et al., 1997; Miller and Houde, 1998; Chesapeake Bay Stock Assessment Committee, 1999; Bi-state Blue Crab Advisory Committee Technical Workgroup, 1999; Lipcius and Stockhausen, 1999).

III. Life cycle of the blue crab and ramifications for sex ratios Of the Virginia and Maryland harvests

A. Life cycle of the blue crab in Chesapeake Bay

Mating of blue crabs takes place throughout the bay from early May to October. Females about to molt or "shed" to maturity (known as pubertal females) are attracted to a scent given off by male crabs. Watermen have capitalized on this natural behavior by baiting peeler pots with mature males (a practice known as "jimmie potting") during a phase of the soft crab fishery known as the spring peeler run. In nature, when a female has found and successfully paired with a male, she will shed her hard outer shell during her molt to maturity, mate while

in the soft-shell condition and be protected by the male until her new shell hardens. Once the shell has hardened, the female is released and she will once again be able to defend herself.

During summer, mature female crabs from locations throughout the Chesapeake Bay migrate toward high salinity waters associated with the mouth of the Bay. After full development, the eggs are extruded onto the abdomen (or "apron") and the females (now considered "sponge crabs") continue to migrate towards the Bay mouth. Maximal egg extrusion in Chesapeake Bay occurs in summer, primarily from July through mid-September. It is known from studies conducted in Florida that female crabs have the potential to produce as many as 8 to 11 sponges during their lifetime from a successful mating to a large male crab. Female crabs mate only once in their lifetime and store sperm from the male for fertilizing successive egg masses. In Chesapeake Bay, female crabs are thought to produce at least 2-3 sponges if left unharvested, and can likely produce more.

Both mature crabs with developing ovaries (Maryland and Virginia) and "sponge crabs" (predominantly Virginia) are subject to fishing pressure by the hard pot fishery as they move from the tributaries and Bay mainstem to the lower Bay spawning areas. It is thought that the greatest impact on the spawning stock can be attributed to the hard crab fishery, which harvests the vast majority of crabs, though pubertal and mature females are captured by a variety of fishing gear used in all of the fisheries. During the winter months, both male and female crabs bury in the sediment and remain immobile. However, the vast majority of crabs buried in the bottom of the lower Bay consist of female crabs that are over-wintering in preparation for spawning the following spring. This is the segment of the crab population that is targeted by the winter dredge fishery. As the water temperature warms in the spring, crabs emerge from the sediment and begin foraging for food. Mature females extrude an egg mass during the late spring or summer. Larvae within each egg of the sponge develop by using up the available yolk (which gives the egg mass an orange color) and after approximately two weeks, they are fully developed (the large dark eyes cause the black coloration of the egg sponge). The eggs hatch into a free-swimming larval stage that is exported from the Chesapeake Bay and develops in the oceanic waters of the continental shelf. Larvae remain in the water column for approximately 30-45 days, and, depending on winds and currents, may be carried far away from the Bay mouth. Metamorphosis to the postlarval stage then occurs and it is this stage that reinvades the Chesapeake Bay between the months of July to November, and settles primarily in beds of submerged aquatic vegetation (SAV). Peak settlement and subsequent metamorphosis into the more typical juvenile crab stage generally occurs during September and October. As crabs grow they disperse from the grass beds (which are found primarily in Virginia waters and lower Maryland) to other habitats in the tributaries and upper bay. The majority of males migrate into low salinity waters and thus occur in the upper portions of Virginia tributaries, and throughout Maryland. Females do not migrate as extensively as males and the majority stay in, or return to, Virginia to spawn after maturity. Crabs reach maturity and legal hard crab size in 1 (early settlers) to 1.5 (late settlers) years.

B. Sex Ratios in the Maryland and Virginia Blue Crab Fishery

Because of the natural distribution of blue crabs, Virginia's blue crab fishery is highly dependent upon the female portion of the population. The crab pot fishery, which includes both hard crab pots and peeler pots, accounts for the majority (86.5%) of the blue crab landings in Virginia since 1993 and is composed of approximately 70% females. The winter dredge fishery, which has accounted for 13.5% of Virginia landings since 1993, is composed of approximately 96% females. The percentage of females harvested by crab scrapes and crab pound nets is unknown, but these fisheries account for only 1-2% of the total harvest. In summary, since 1993, the total annual Virginia blue crab harvest has been composed of 73.5% females.

In contrast, the blue crab fishery in Maryland is dependent, but to a lesser extent, upon the male portion of the population. Since 1966, blue crab landings in Maryland were composed of slightly more than 50% males. The majority of landings were attributed to the pot fishery (61-67%) and the trot line fishery (30-36%). Although the data are incomplete, the sex ratios of landings from these gear types appear to be approximately 1:1.

IV. Characteristics of the winter dredge fishery

Virginia's winter dredge fishery is conducted from December 1 to March 31 in the Virginia portion of the mainstem of the Chesapeake Bay and the offshore waters to the 3-mile limit. There is a 153-square mile crab sanctuary in the lower Bay in which crab dredging is prohibited. The number of licensed vessels, on an annual basis, ranged from 207 to 315 with an average of 263 during the period 1980 to 1993. The sale of licenses increased to 372 in 1994 in response to a new regulation that took effect on July 1, 1994. This regulation limited future seasonal (for the December 1 – March 31 fishery) license sales to those individuals who participated in the winter dredge fishery the previous season. The goal of this regulation was to reduce the number of seasonal license holds to 225 or less by attrition. License holders that dropped out of the fishery would not be replaced until the number of licensed vessels drops below 225 for a winter dredge season. Since the 1994/95 season the number of licenses has steadily decreased, from 372 licenses for the 1994/95 season to 264 licenses for the 1998/99 season (Figure 1). The number of licenses has continued to decline to 248 for the current 1999/00 season, which is 10% above the target level of 225 licenses. The number of boats that actually dredge (Figure 2) is lower than the number of license holders.

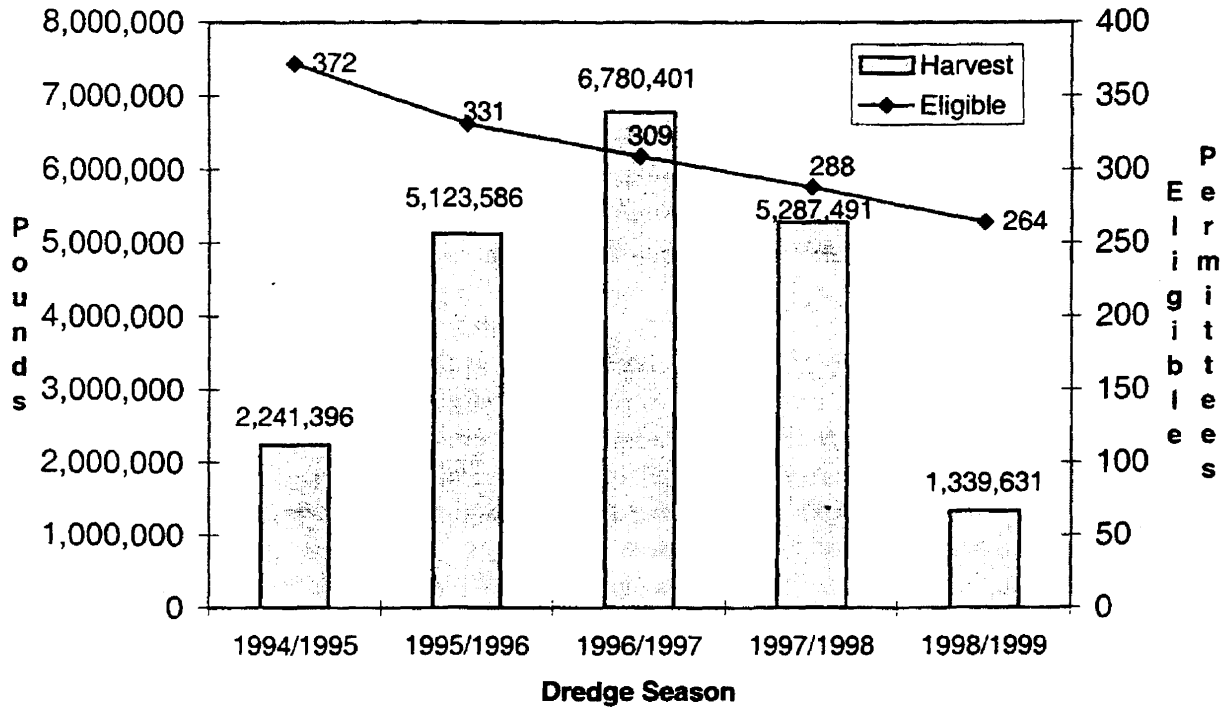

Figure 1. Winter crab dredge harvest and number of seasonal license holders (eligible permitees) from the 1994/95 season through the 1998/99 season. Source: VMRC Plans/Statistics, Mandatory reporting database.

Since there are a limited number of participants and the harvest is purchased almost exclusively by Virginia picking houses, VMRC has been able to collect good statistical data for this fishery even prior to mandatory reporting implemented in 1993. The Winter Dredge Fishery makes up a small portion of the total blue crab harvest in Chesapeake Bay. Over the last 13 years, the harvest from the winter dredge fishery averaged 16.6% of the total Virginia blue crab harvest, but only 7.3% of the Bay-wide harvest (Table 1). Since the blue crab population in Chesapeake Bay is considered to be a single stock, Bay-wide harvest is the key parameter for understanding the impact of any crab fishery in Maryland or Virginia. Harvest for the dredge fishery has varied from 1.3 to 9.9 million pounds with an average of 6.2 million pounds during the period 1986 through 1998: the lowest harvest since 1986 was in the 1998/99 season. Variation in harvest does not appear to be correlated with the number of license holders or number of actual crab dredge fishermen (Figure 1 and 2). Rather, harvest is correlated with the annual fraction of the blue crab population that is resident in the lower Bay, and therefore susceptible to the winter dredge fishery (Lipcius and Montane, 1999). The winter dredge harvest peaks in December (Table 2) and declines throughout the rest of the dredge season. Harvest in January is on average two thirds or less of the December harvest. Catch per Unit Effort (Figure 3) is also highest in December and declines sharply during the remainder of the season. These data indicate that the availability of crabs to the dredge fishery is greatly reduced after the first month. The overall decline in catch after December

helps explain why greater than 50% of the dredge fishers work less than 20 days during the dredge season (Figure 4).

There have been periodic restrictions imposed on the fishery by the Virginia Marine Resources Commission (Appendix I) and, overall, the fishery is well managed, with declining effort, a seasonal license cap, a daily limit, and mandatory reporting. However, it is recognized that fishing effort, in terms of days fished, is dependent on the abundance of crabs in the lower Bay at the start of the winter dredge season, prices, and prevailing weather conditions. Although the number of crab dredge licenses has been stabilized through regulatory action, the effective number of days fished remains somewhat open-ended. As shown in Figure 4, most dredgers work less than 20 days. If resource conditions, prices, weather and other external conditions are favorable for any given year, crab dredge fishermen could work many more days and there would be a significant and undesirable concomitant increase in fishing effort.

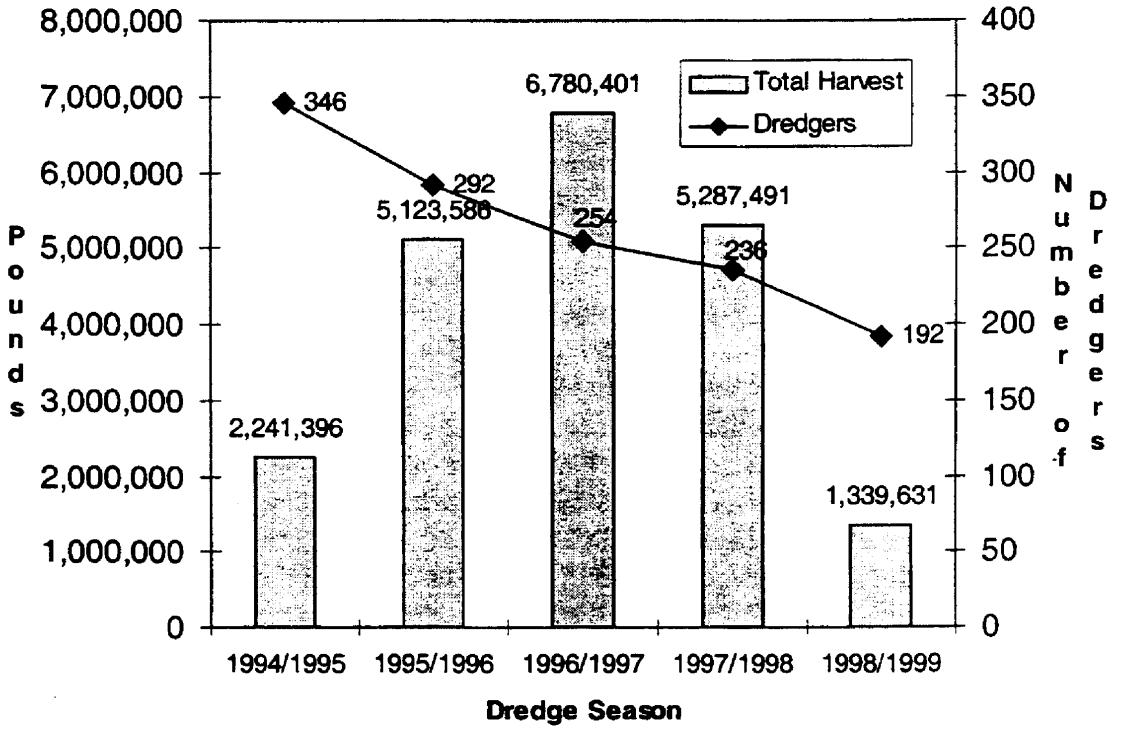

Figure 2. Winter crab dredge harvest and number of actual crab dredge fishermen (dredgers) from the 1994/95 season through the 1998/99 season.

Table 1. Annual contribution of the winter dredge fishery to the bay-wide harvest (in pounds) of blue crab, 1986-1998. Virginia, Potomac River and Maryland harvests represent total blue crab harvests from those regions. Source: VMRC Plans and Statistics.

Year	Virginia harvest	Potomac harvest	Maryland harvest	Bay-wide harvest	Winter dredge harvest	Dredge harvest as % of Bay-wide
1986	34,939,069	6,073,786	46,413,057	87,425,912	8,200,068	9.38%
1987	29,984,618	5,029,389	42,647,226	77,661,233	5,570,499	7.17%
1988	34,463,533	5,141,062	41,672,836	81,277,431	6,203,458	7.63%
1989	41,651,160	5,478,470	42,351,662	89,481,292	9,935,700	11.10%
1990	49,858,198	5,300,310	45,093,696	100,252,204	7,928,549	7.91%
1991	41,283,701	7,330.559	47,489,878	96,104,138	7,669,254	7.98%
1992	21,386,971	4,815,799	30,857,256	57,060,026	3,816,465	6.69%
1993	53,619,495	7,776,034	56,820,262	118,216,791	7,798,599	6.60%
1994	34,832,834	6,158,713	44,237,335	85,228,882	4,519,628	5.30%
1995	33,235,447	4,299,848	41,169,148	78,704,443	3,224,182	4.10%
1996	34,091,615	5,949,118	37,005,559	77,046,292	6,452,410	8.37%
1997	38,997,325	9,365,601	40,149,308	88,512,234	6,227,972	7.04%
1998	34,582,994	5,614,377	25,676,443	65,873,814	2,714,502	4.12%
Totals	482,926,960	78,333,066	541,583,666	1,102,843,692	80,261,286	7.28%

Table 2. Virginia winter crab dredge harvest (pounds) by season, 1988/89 – 1998/99. Source: VMRC Plans and Statistics.

Season	December	January	February	March	Totals
1988/89	3,915,680	2,115,783	817,571	2,522,066	9,371,100
1989/90	4,480,280	2,416,495	371,874	571,520	7,840,169
1990/91	4,568,660	2,936,588	2,208,360	675,900	10,389,508
1991/92	1,848,406	1,215,276	865,981	195,413	4,125,076
1992/93	1,539,795	1,330,273	683,765	689,401	4,243,234
1993/94*	5,089,680	1,450,611	1,229,255	188,125	7,957,671
1994/95	1,651,437	400,953	134,846	54,160	2,241,396
1995/96	2,624,143	1,618,558	678,953	201,932	5,123,586
1996/97	3,952,967	1,759,046	903,453	164,935	6,780,401
1997/98	3,400,538	1,040,253	523,100	323,600	5,287,491
1998/99	827,549	331,159	75,504	33,681	1,267,893

*Mandatory reporting implemented.

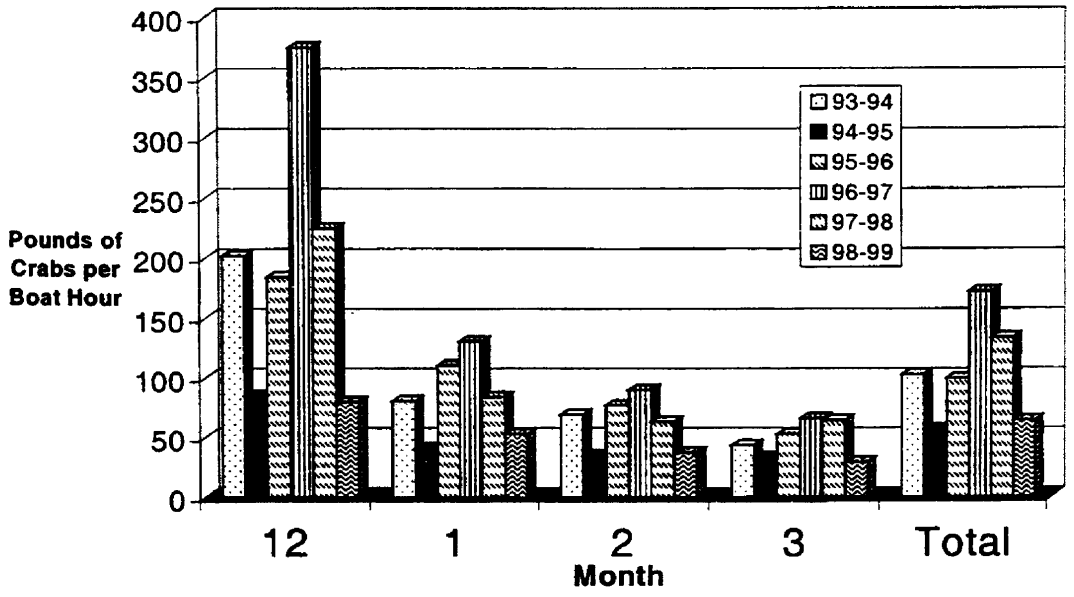

Figure 3. Virginia winter dredge fishery catch per unit effort (CPUE). CPUE is calculated by total catch of crabs for one properly reported crab dredge trip divided by hours dredged. Source: VMRC Plans and Statistics, Mandatory Reporting Program.

V. Impact of the Virginia Winter Dredge Fishery on long-term sustainability of the blue crab fishery

The Virginia hard crab harvest from both the dredge and pot fisheries is dominated by mature female crabs. The winter dredge fishery targets a segment of the population that is made up of 95-97% mature females. This segment mainly consists of female crabs that have matured, mated and migrated to the lower bay during the "fall run"(Van Engel, 1958). Approximately 10-20 % of the crabs are females that spawned the previous summer and are over-wintering in the lower Bay (McConaugha, 1992).

Information on the impact of the winter dredge fishery on blue crab stocks has been provided by an analysis of data collected from the Bay-wide winter dredge survey (Lipcius and Montane, 1999). The winter dredge survey uses a stratified random design, which divides the Chesapeake Bay into three geographic strata (Figure 5). The lower Bay stratum was sampled monthly from November, before the onset of the winter dredge fishery, through the fishery's closing in March; approximately 50 stations were sampled each month.

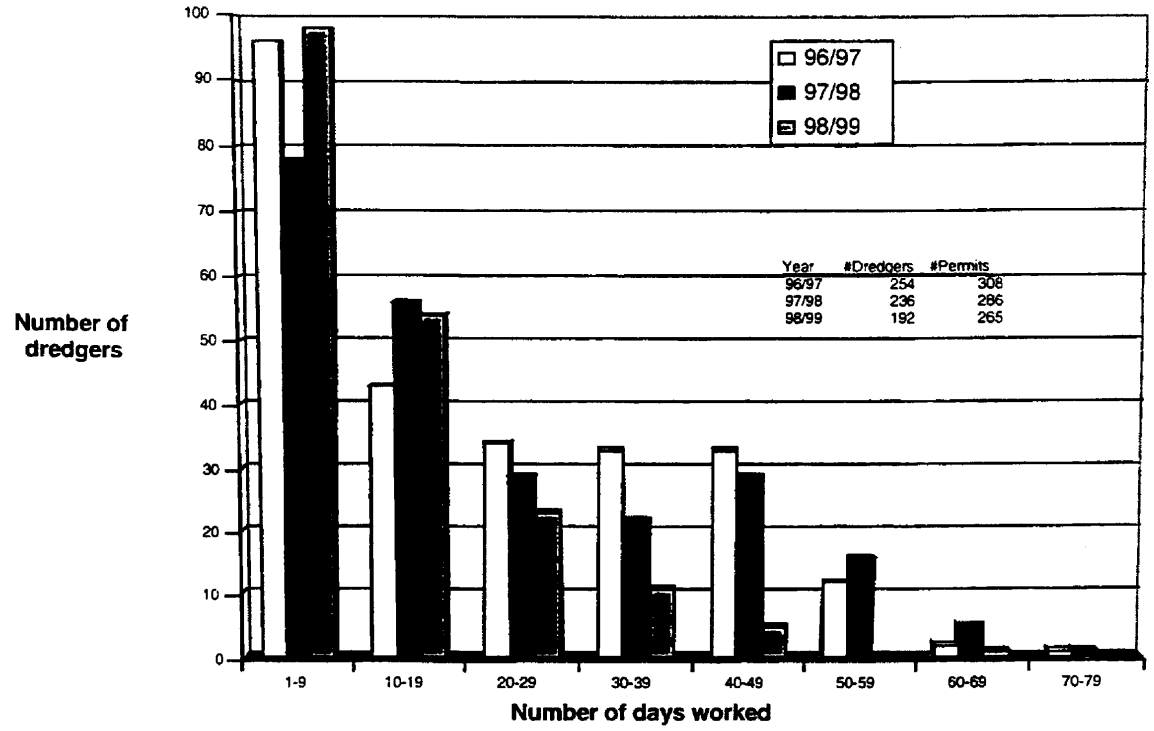

Figure 4. Number of crab dredgers plotted against the number of days worked. Source: VMRC Plans and Statistics.

Winter dredge survey results show that males and females are distributed heterogeneously throughout the bay in winter (Figure 6). Most adult females are concentrated in the Lower Bay, with additional substantial densities in the Middle Bay. Relatively few adult females inhabit the Upper Bay and tributaries in winter. In contrast, males and juvenile females are at highest abundances in the Upper Bay, Middle Bay and tributaries.

The depletion rate of Bay-wide abundance of 1+ aged female crabs by the winter dredge fishery is shown in Figure 7. The depletion rates for 1+ female crabs and similar data for all 1+ crabs were used to calculate winter dredge fishery exploitation rates of all 1+ age crabs and 1+ age female crabs (Figure 8). Exploitation rate is the percentage of Bay-wide crabs present at the beginning of the dredge fishery (November) that are removed by the winter dredge fishery from December through February. The exploitation rate for all crabs at least one year of age (1+ crabs) averaged 21% since 1991; the exploitation rate for female crabs at least one year of age (1+ females) averaged 32% since 1991. It should be emphasized that these exploitation rates refer to the fraction harvested from the population remaining after the other blue crab fisheries have occurred and before the annual influx of recruits. The depletion rates of the dredge survey and calculated exploitation rates by the dredge fishery are relative rates. They may also reflect absolute rates if the following assumptions are valid: (i)

movement of crabs into and out of the dredge fishery grounds during winter are either negligible or offset each other, and (ii) efficiency estimates for the dredge survey are consistent across all parts of the Bay and for all life-history stages.

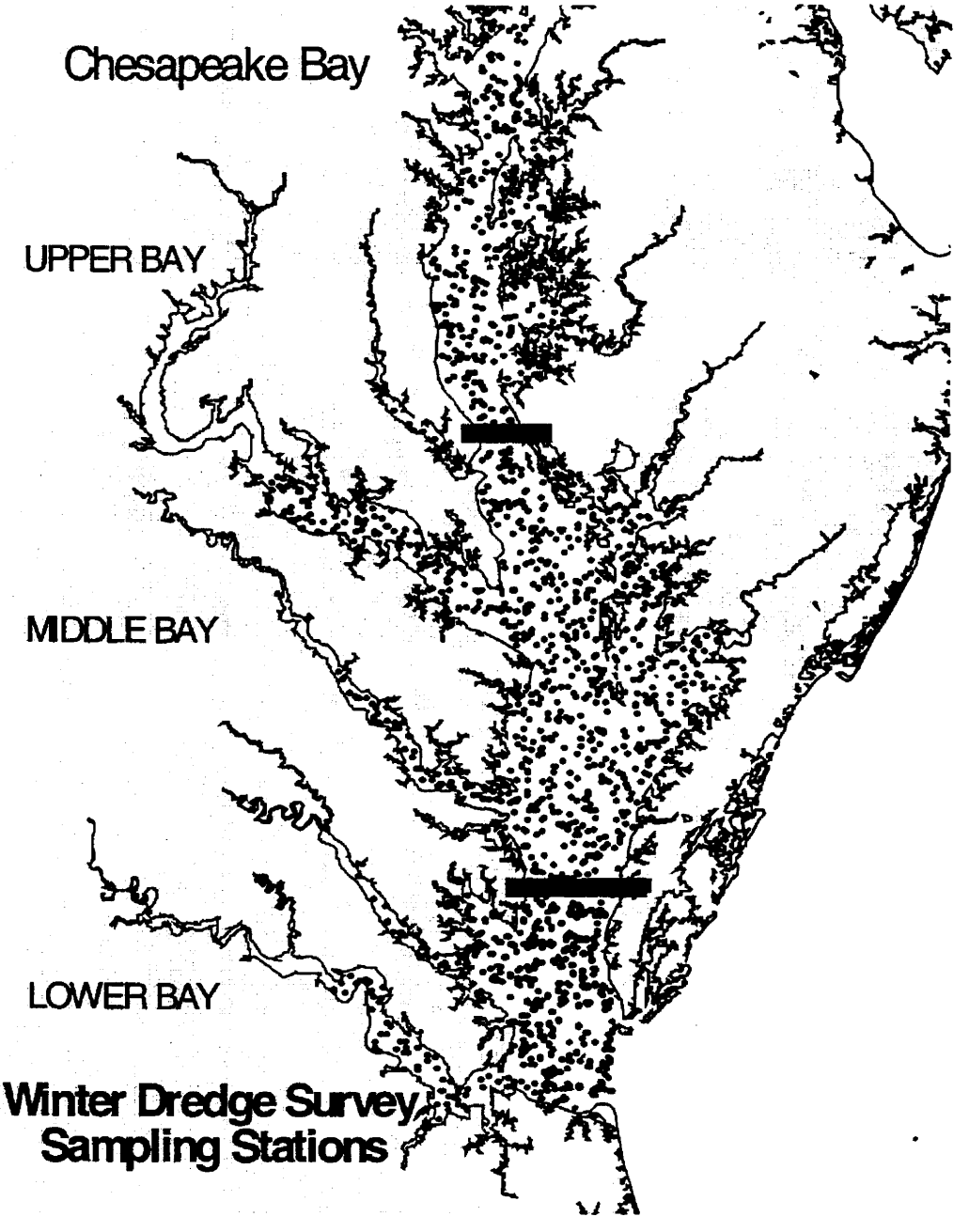

Figure 5. Representative sampling stations by the winter dredge survey for the 1990-1991 season. The sampling strata include the (i) Upper Bay mainstem and all tributaries, (ii) Middle Bay mainstem, and (iii) Lower Bay mainstem. Strata are divided by the solid horizontal lines.

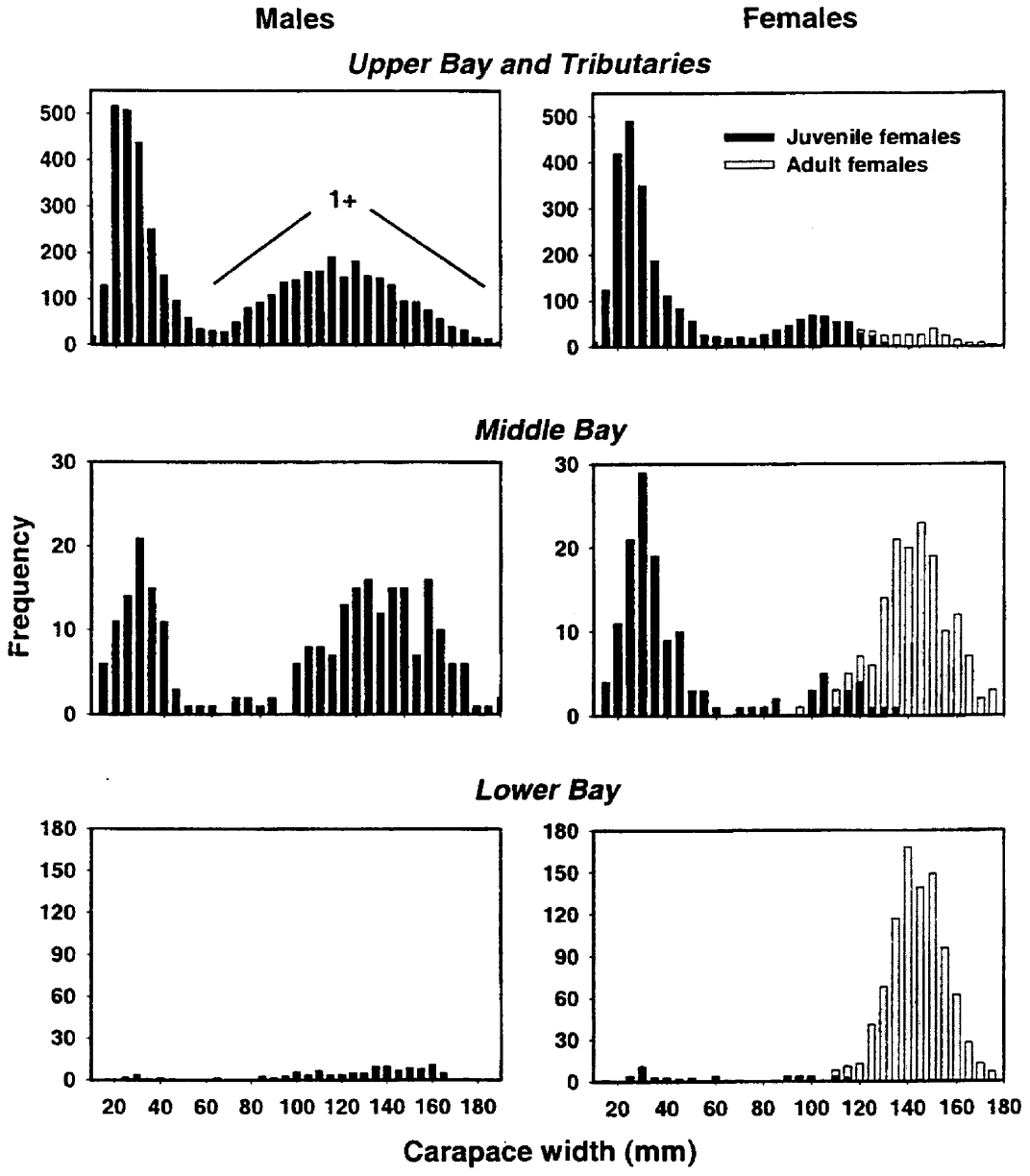

Figure 6. Representative size structure of the blue crab population in the 1990-1991 winter season. Analyses were conducted with the 1+ segment of the population, which includes crabs 1 year of age and older. Ages are artificial classifications based on size. Age 1+ crabs are 60mm carapace width and greater.

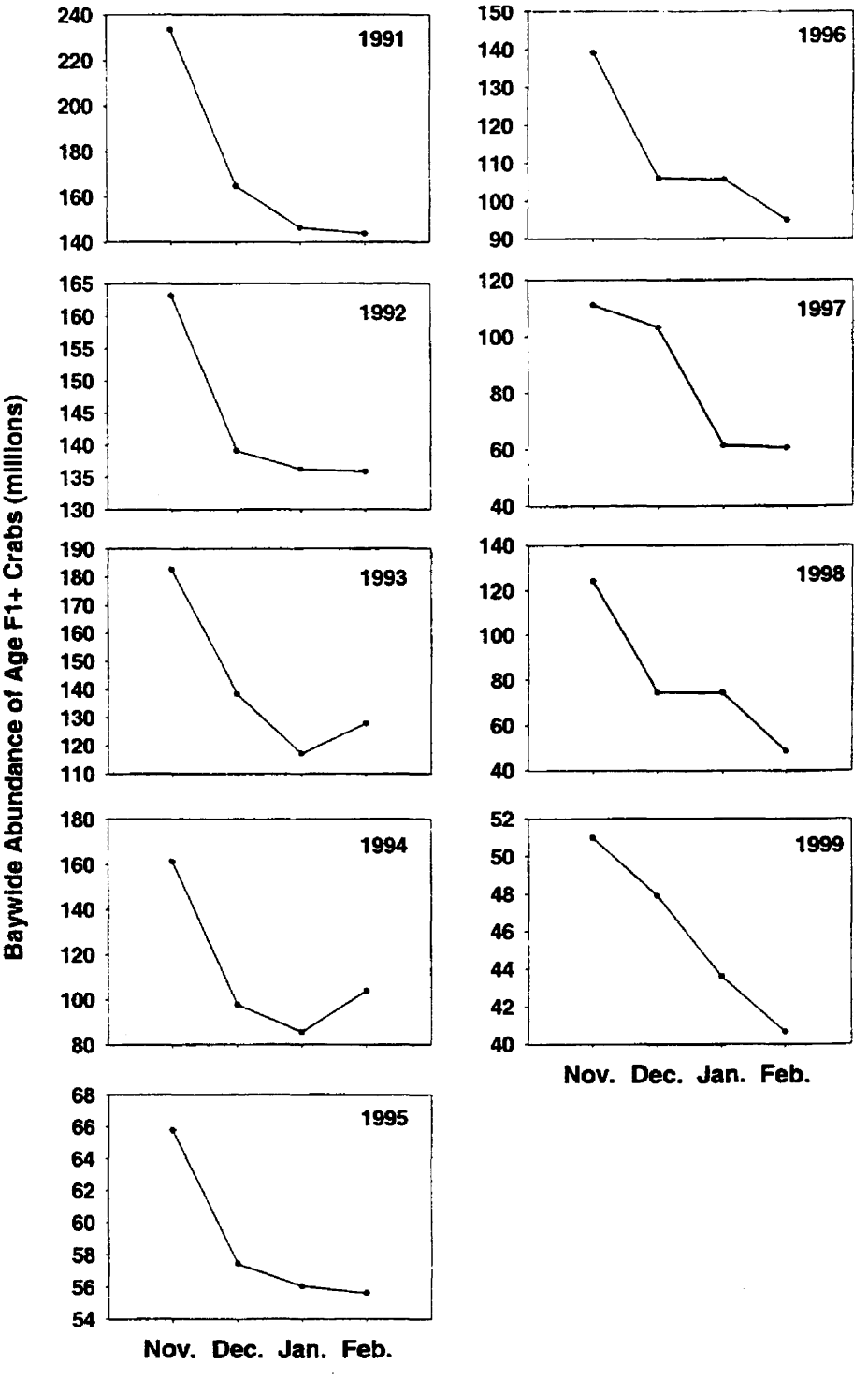

Figure 7. Depletion rates in the winter dredge fishery grounds of the lower bay, as exemplified by the estimated Bay-wide abundance of all F1+ crabs (= female crabs greater than 2.36" carapace width) from November through February in the winter dredge survey. The year in each graph pertains to the months of January and February; e.g., 1995 refers to November 1994, December 1994, January 1995 and February 1995. Note the different abundance axis in each graph.

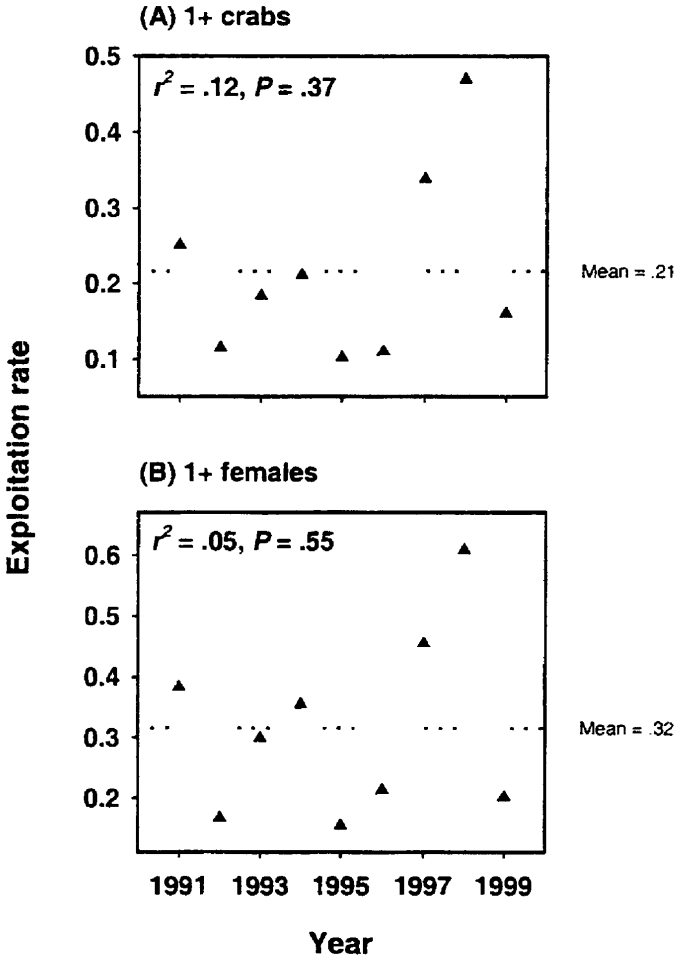

Figure 8. Exploitation rates of (A) all 1+ crabs and (B) 1+ females over time, as measured by the dredge survey from Bay-wide estimates of population abundance before and after the dredge fishery. Trends over time for both sets of exploitation rates are not statistically significant (1+ crabs: $r^2 = .12$, $P = .37$; 1+ females: $r^2 = .05$, $P = .55$).

The pounds of female crabs harvested Bay-wide can be estimated from the total catch and information on the sex ratio of each segment of the Bay-wide fishery. Precise sex ratio data are not available for all fisheries, but there are estimates of sex ratios from a variety of studies in each state. From this information, the percentage of the total harvest of females that can be attributed to the winter dredge fishery can be calculated. The dredge fishery is composed of approximately 96% female crabs, pot fisheries in Virginia are composed of approximately 70% female crabs, all fisheries in Maryland and the Potomac River are composed of approximately 50% female crabs. Total harvest data is shown in Table 1 and other data indicate that peeler harvest is approximately 10% of non-winter dredge fishery harvest in each area (VMRC data). From these data, the winter dredge fishery accounts for 8.7% of the Bay-wide harvest of female crabs (Figure 8). The peeler fisheries harvest 9.1% of the female crabs and the hard crab fisheries harvest 82.2% of the female crabs.

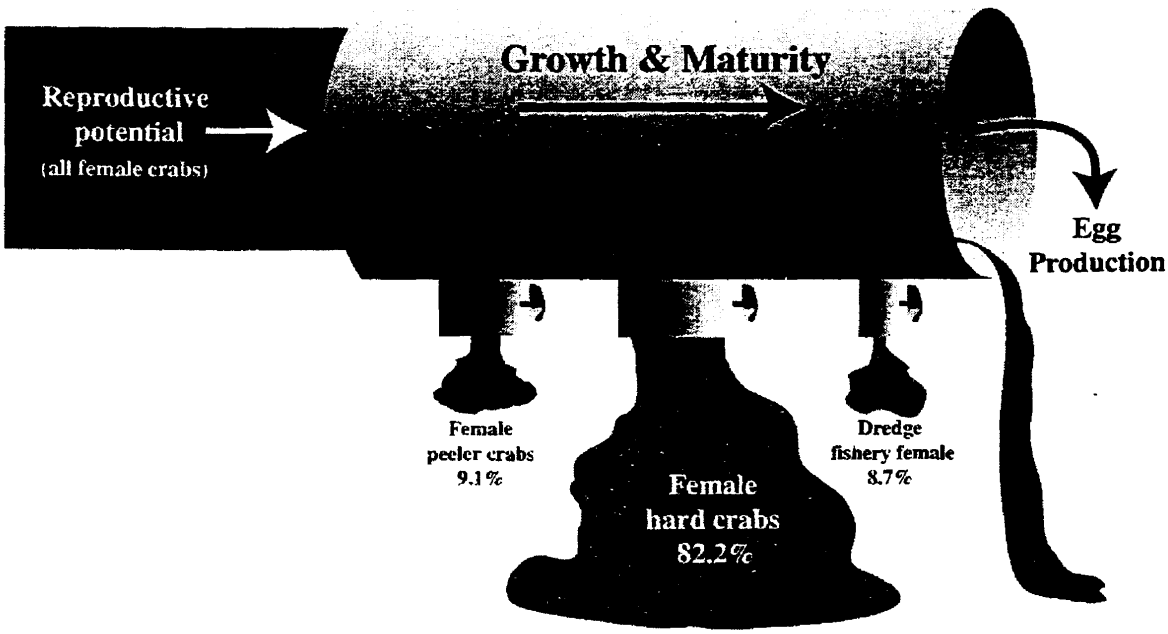

Figure 9. Conceptual model of loss of Bay-wide reproductive potential from the various fisheries. Data for peeler crabs and hard crabs includes all gear types in Virginia, Maryland and the Potomac River, except for the winter dredge fishery. Calculations are on the basis that 50% of Maryland and Potomac River harvests are female and 70% of Virginia harvest is female. The winter dredge fishery is 96% female. Percentages of female crabs in each category were derived by averaging the annual harvest from 1994 through 1998 and multiplying by the estimated percentage of females.

VI. Non-catch mortality in the winter dredge fishery

Mobile fishing gear such as trawls and dredges inflict unintended mortality on both target and non-target (by-catch) species. The dredge used in the winter blue crab dredge fishery has the capability to penetrate several inches into the bottom substrate. The dredge is equipped with 6-inch "teeth" attached to the cutting bar which, when towed along the bottom, digs the crabs out of the bottom. Some crabs may be damaged by the passing of the gear and left to die in the bottom. Others that are dislodged from the bottom substrate and not retained by the dredge, may not be able to rebury and subsequently die due to cold water exposure. The end result is that there is additional crab mortality other than what is reported in the landings. This is sometimes referred to as "incidental" or "non-catch mortality."

To the best of our knowledge, there has not been a directed study to determine the extent or magnitude of the non-catch mortality in the winter blue crab dredge fishery. The non-catch mortality may be highly variable depending upon several factors such as water temperature, crab density and fishing effort patterns. To adequately examine the impacts of the winter blue crab dredge fishery, the portion of fishing mortality contributed by non-catch mortality should be addressed.

VII. Conclusions and Recommendations

The Blue Crab Winter Dredge Fishery Task Force reached a consensus on the following points.

- The status of the Bay-wide blue crab stock is not known precisely but it is clear that the stock is highly exploited and may be overexploited. Thus, a precautionary approach is warranted and effort should be limited in the fishery overall.

- The prohibition on the taking of late-stage (dark) sponge crabs enacted by VMRC greatly reduced the coastal ocean pot fishery and may have resulted in a *de facto* expansion of the blue crab spawning sanctuary to the three mile limit (McConaugha, 1999).

- Information about the winter dredge fishery is good and it is better than for any of the other fisheries for blue crab in the Bay. Specifically, we have information on

    - Fishing effort
    - Landings
    - Harvest composition
    - Mortality on the stock attributable to the dredge fishery

    In contrast, for most of the other fisheries for blue crabs in the bay, we have at best the landings and a rough idea of the effort and composition of the catch.

- Fishing effort in the winter dredge fishery is declining. In contrast, between 1994 and 1998 there has been a 14% increase in the number of hard pot licenses and an 82% increase in the number of peeler pot licenses.

- The winter dredge fishery harvest amounts to 5.9% of the total Bay-wide harvest over the last five years and this fraction has been declining in recent years. Since 1993, the winter dredge fishery has taken 8.7% of the female crabs harvested Bay-wide.

- Major pot and trot line fisheries occur throughout the Bay in spring, summer and fall and remove a significant (but unquantified) portion of the annual standing stock prior to the start of the winter dredge fishery. We estimate that the winter dredge fishery since 1991 has harvested on average 30% of the female crabs 1 year of age or older that were in the Bay at the start of the dredge season and 21% of the total number of crabs 1 year of age or older in the Bay at the start of the dredge season (that is, 21% of what is left after the other fisheries have occurred).

- Concern has been expressed about the fact that the winter dredge fishery targets adult females. This fishery is not unique in targeting females. Because of the life cycle of the blue crab, most of the fisheries in Virginia target female crabs. It may seem at first glance that the dredge fishery is bad because it is preventing mature animals from reproducing. However, if juvenile females and other mature females are heavily exploited by other gear types, then the supply of spawning females will be squeezed off and the "pool" of spawning females will disappear. That is, a juvenile female crab has to run a gauntlet of fisheries and escape each one in order to take a place in the pool of spawning females. Our concern is that ineffective control of the other fisheries may cut off the supply of maturing females; our ability to detect that this is happening is severely limited by the quality of the data available. Thus, even if the winter dredge fishery were to be completely eliminated, the problems with the blue crab fishery would not be solved. We would still be faced with an unknown total harvest (recreational landings are just beginning to be estimated), poor information on the fishing effort in most fisheries, poor information on the size and sex composition of the catch in most fisheries, and a poorly known but evidently very high fishing mortality (harvest) rate. It is important to equally protect all female crabs to ensure a continuing supply of spawning females.

- We believe that the available data have some deficiencies that make managing the blue crab fishery problematic. For example, the recreational effort and harvest is unknown, the sex ratio data of the Bay-wide harvest is inadequate, and the effective effort of the pot fisheries is poorly known. While the proposed pot tagging system will improve the accuracy of effort estimates, we do not believe that other inadequacies can be answered with available resources. The amount of new resources made available for assessment and management of the resource ought to reflect the value of the fishery.

Recommendations.

- The Task Force does not recommend that the winter dredge fishery be singled out for additional restrictions. However, the Task Force would not be opposed to additional restrictions on the dredge fishery, if those restrictions were deemed necessary as part of an overall blue crab management plan that considered additional restrictions in all fisheries.
- Because the winter dredge fishery has the *potential* to significantly impact the number of over-wintering crabs, the Task Force does not recommend that any expansion of the winter dredge fishery be allowed.
- The Task Force recommends that other blue crab fisheries be assessed for their impact on blue crab stocks.
- The Task Force recommends increased funding to expand data collection to include recreational effort and harvest, sex ratio of harvest in all blue crab fisheries and effective effort of the pot fisheries.

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APPENDIX I. History of management actions pertaining to the Virginia crab dredge fishery

- In June 1989, the VMRC passed a regulation limiting crab dredging from sunrise to sunset.
- In 1989, VMRC Stock Assessment initiated a crab dredge survey to track CPUE trends. A program was also being developed to collect biological data from the dredge and pot fisheries to study population dynamics.
- The 1992 session of the Virginia General Assembly passed a law that required that all commercial fishermen obtain a registration license and a two-year delay process became effective for new entrants. In addition, a mandatory reporting program was established that required all commercial fishermen to report their catch. Authorization was granted to the VMRC to delay opening the winter crab dredge season until after December 1, due to weather conditions.
- In November 1993, the VMRC held public hearings and considered several proposals in response to recommendations concerning control of fishing effort contained in the Chesapeake Bay Blue Crab Fishery Management Plan. A regulation was amended that reduced the daily catch limit in the crab dredge fishery from 25 to 20 barrels per vessel (1 barrel=3 bushels). Another regulation was passed that established a limited entry system on crab dredge licenses; whereby the number of crab dredge licenses issued as of 3/31/94 would be set as the maximum number in future seasons. No crab dredge licenses would be issued to any new applicant until the number of licenses dropped below 225 (the ultimate maintenance level).
- The 1994 session of the General Assembly removed the specifications for crab dredge dimensions in the Code and authorized VMRC to promulgate regulations limiting the size of dredges.
- In 1995, the VMRC prohibited crab dredging in the Hampton Roads Management Area (22.7 square miles), and limited the crab dredge size to an 8-foot width.
- The 1996 session of the General Assembly expanded VMRC's authority relating to the opening or closure of the dredge season, whereby in addition to weather conditions, changes could be made for the purposes relating to the conservation of the blue crab. In addition, the VMRC may close any season early or close a season in its entirety.

Source: Virginia Marine Resources Commission.