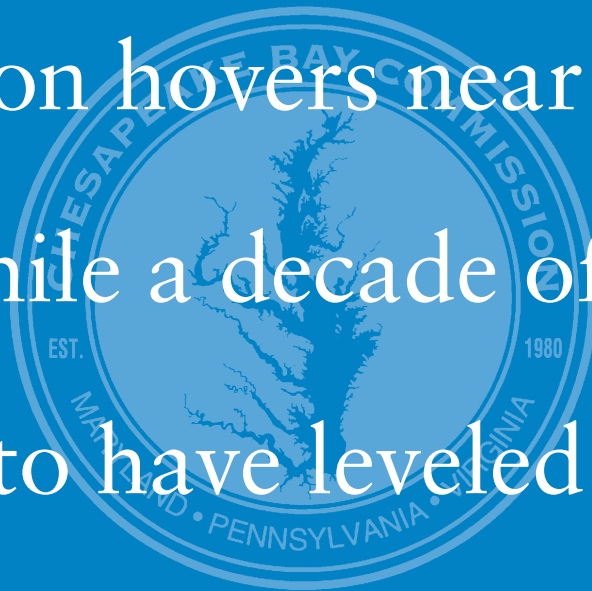


CHESAPEAKE BAY COMMISSION  BLUE CRAB TECHNICAL WORK GROUP

STATUS OF CHESAPEAKE BLUE CRAB 2005

Status of the Chesapeake Population and its Fisheries

As Baywide harvests continue below the long-term average, the Chesapeake's blue crab population hovers near historic lows. While a decade of decline appears to have leveled off, we must remain focused on our Baywide goal of doubling the spawning stock.



THE BLUE CRAB 2003

*Status of the
Chesapeake
Population
and its Fisheries*

Introduction: Blue Crabs at a Crossroads

PAGE 3

How Is the Stock Doing?

PAGE 4

How Is the Fishery Doing?

PAGE 5

Progress on the BBCAC Blue Crab Action Plan

PAGE 8

Management Actions Through 2003

PAGE 11

What Remains to be Done?

PAGE 13

Conclusion

PAGE 15

NOVEMBER 2003



Blue Crabs at a Crossroads

ATENTION REMAINS FIXED ON THE BLUE CRAB, *Callinectes sapidus*, the Chesapeake's most valuable seafood harvest and icon for the region. Those who care about the Bay, from tourists to scientists to recreational and commercial crabbers, want answers to some very pressing questions. Is the Bay's blue crab population still declining? Have management actions of the recent past triggered a turnaround? Can we — and our children's children — count on an abundance of Chesapeake blue crabs well into the future?

This report sets about to answer some of these questions.

First, there is some encouraging news: the four independent surveys of 2002-2003 suggest a stabilization of variables used by scientists to track the Bay's crab population, particularly blue crab size and abundance. While these signs are positive, the technical experts responsible for this report caution that this stabilization takes place at a historic low point in the population, and they emphasize that we must stay true to the consensus statements reached by the Bi-State Blue Crab Advisory Committee, as stated in the bi-state action plan, *Taking Action for the Blue Crab: Managing and Protecting the Stock and its Fisheries* (January 2001).

Unfortunately, efforts to ensure inter-state coordination suffered a setback when the Bi-State Blue Crab Advisory Committee (BBCAC) disbanded in July 2003 due to insufficient funding. At the BBCAC's last meeting, the Chesapeake Bay Commission committed to continuing the work of the Technical Work Group (TWG), a Baywide team of scientists and technical experts that helped to define thresholds and targets for the Chesapeake Bay blue crab fishery. Each year, in the fall, the TWG will issue a status report on the blue crab fishery, taking account of preliminary harvest trends for that year, as well as the Advisory issued each spring by the Chesapeake Bay Stock Assessment Committee (CBSAC).

Most importantly, the Technical Work Group reiterates the goal established by the BBCAC — with the input of a wide range of stakeholders, including the three principal jurisdictions (Maryland, Virginia and the Potomac River Fisheries Commission) — of doubling the Bay's blue crab spawning stock. The TWG and BBCAC reached this consensus after considering harvest trends Baywide and, significantly, four fisheries-independent surveys, which indicated a serious decline in the crab population.

This report addresses several important questions, including:

- What is the status of our follow-through on the Action Plan?
- How is the blue crab stock doing now?
- How is the blue crab fishery doing?
- What management actions were taken through 2003?
- What remains to be done?

This publication represents the first status report prepared by the Chesapeake Bay Commission's Blue Crab Technical Work Group since Maryland, Virginia and the Potomac River Fisheries Commission responded to the 2001 Blue Crab Action Plan by enacting a three-year plan to implement new management actions. This report has been prepared for, among others, the members of the Virginia and Maryland General Assemblies, who, year after year, are confronted with legislative decisions regarding the management of the blue crab. The Chesapeake Bay Commission, through its Technical Work Group, offers this account of the blue crab in the fall of 2003 as a resource for the general public, recreational and commercial crabbers, industry stakeholders, state resource managers, and all those who care about the long-term health and abundance of the Chesapeake Bay blue crab.

How Is the Stock Doing?

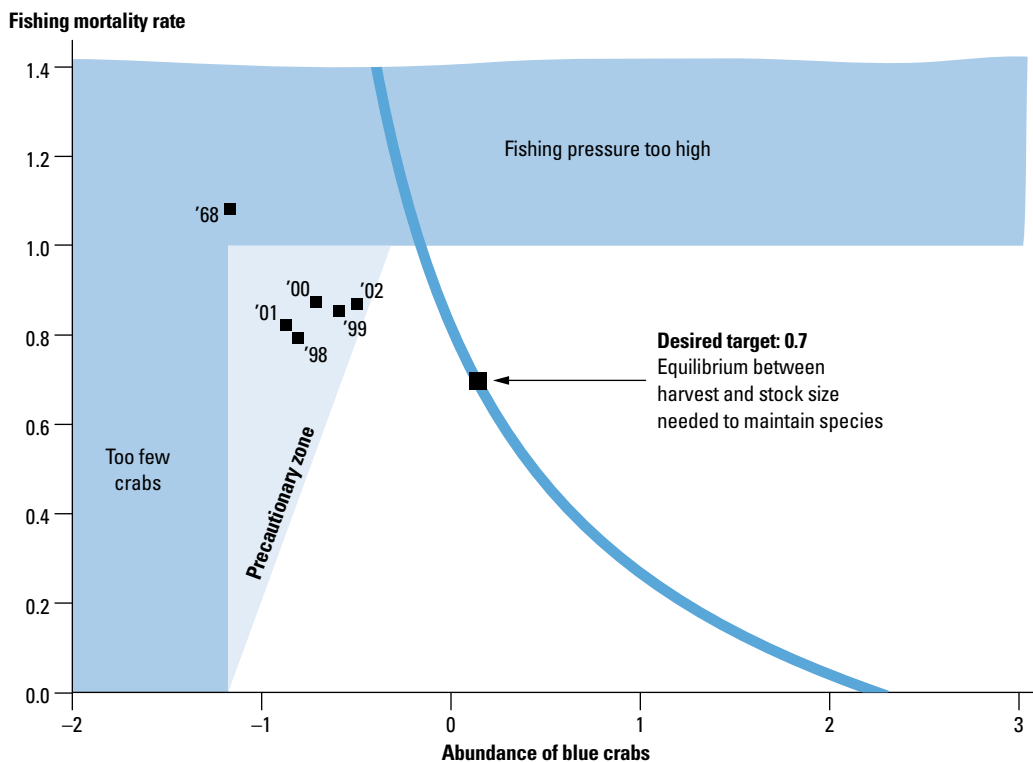
PRESSURE ON THE BAY'S BLUE CRAB STOCK remains high. With the demise of the oyster industry, the blue crab now represents the Chesapeake Bay's most valuable fishery, an essential cornerstone for communities that depend on working the water for their livelihood. The blue crab also fuels a key recreational fishery for those who live near the Bay, and for thousands who visit each year.

As noted in the *Blue Crab Advisory 2003*, published by the Chesapeake Bay Stock Assessment Committee (CBSAC),¹ scientific surveys indicate that the blue crab population “has stabilized near historically low levels.” According to the Advisory, the 2003

crab stock did not cross the abundance threshold recommended by BBCAC and endorsed by the management agencies in January 2001. Nevertheless, the level of the stock remains just inside the precautionary zone and the fishing mortality rate is still higher than the target set in 2001 (see Figure 1). Concern over the health of the stock therefore continues. Some members of the Technical Work Group point out that the word “stabilized” may connote an unwarranted optimism, and that it may be more accurate to say simply that the rapid decline observed for more than a decade has apparently slowed.

Again, while some uncertainty exists about the precise level of fishing mortality, the consensus

FIGURE 1
Fishing Pressure on the Blue Crab



To help resource managers better protect Chesapeake blue crab stocks from overharvesting, researchers have calculated a two-part threshold regime, based on fisheries-independent monitoring (particularly the winter dredge survey) and levels of fishing effort. As this graph indicates, there would be a desired target to aim for each year — which would likely fall along the curved line that shows where researchers expect to find the equilibrium between fishing pressure and the stock size needed to sustain the population. Depending on the results of monitoring data, managers could adjust levels of fishing effort (e.g., numbers of pots) to approach that target. If the data indicates low stocks, fishing effort would be reduced to stay out of the “precautionary zone,” an area that signals that the fishery could be in trouble. The low-stock threshold is marked by the 1968 level, the lowest observed by independent surveys. Levels in 1999 through 2002 all fall within the precautionary zone.

remains that it continues to be higher than the target recommended by BBCAC.²

The 2003 *Advisory* concluded that:

- The Bay’s blue crab stock (spawning stock abundance) has generally declined since the early 1990s. The stock estimate for 2002 is, however, slightly above historically low levels reported for 2000 and 2001.
- Stock abundance for exploitable crabs (called age 1+) has remained relatively stable over the past four years, though at low levels last seen in the mid-1970s.
- The addition of new crabs to the stock (called recruitment) has remained fairly stable at relatively low levels in recent years, when data are combined from Maryland, Virginia and the Baywide winter dredge survey.

According to the *Advisory*, “There is a consensus among committee members that the level of risk to the stock and to the fishery associated with low recruitment, low female spawning stock size and low exploitable stock size remains high.”

In other words, a number of indicators point to the need for continued caution in managing and protecting the Bay’s blue crab stock.

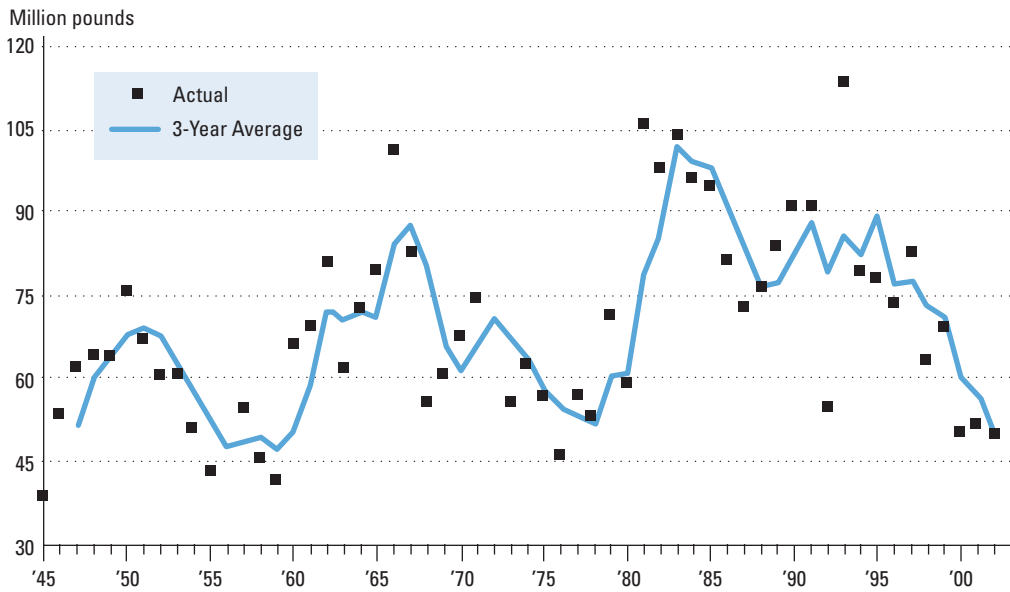
How Is the Fishery Doing?

SINCE THE CHESAPEAKE BAY BLUE CRAB FISHERY covers a wide geographic area and employs a range of harvest methods — from trotlining for hard crabs to peeler potting and scraping for soft crabs — any given season will look different depending on location, gear and perspective. Some crabbers have reported a good catch this year; others have had less success. Taking a Baywide view, one can only conclude that the Bay’s blue crab stock remains at critically low levels and consequently, warrants continued concern and close scrutiny. Recent data reveal, for instance, that 2002 saw a well below-average harvest, and preliminary numbers for 2003 suggest the same (see Figure 2).

In Virginia, the total crab harvest (including hard, soft and peeler) for 2002 was 28.2 million pounds, up from 26.7 million pounds in 2001. According to the Virginia Marine Resources Commission, the harvest in 2002 was 5 percent greater than that of 2001, but 15 percent lower than the 8-year average of 33 million pounds from 1994–2001.

In Maryland, 2002 was also slightly better than 2001 (23.8 million pounds, as opposed to 22.6 million in 2001), but so far 2003 looks to be a very slow year.

FIGURE 2
Combined Chesapeake Bay Commercial Blue Crab Harvest



Note: Reporting system changes occurred in 1981, 1993 and 1995 that could account for some variability.

By the end of August, for example, Maryland crabbers have typically landed 13 to 15 million pounds, though some years have seen hauls as high as 22 million pounds by August (which, one might argue, may not be sustainable). Preliminary figures for August 2003 post a harvest of less than 11 million pounds, several million pounds less than the harvests of recent years, and well below the long-term average. Though catches may increase later in the season, preliminary harvests through July in Virginia and through September in the Potomac look to be even more depressed.

According to researchers, and stated in the CBSAC Advisory, current low harvest levels result primarily from the diminished abundance of blue crabs in the Bay, but also probably from conservative crabbing restrictions instituted by the three jurisdictions since 2001.

As seen in data from some areas, however — such as the Potomac River — it remains clear that in some locations fishing effort has increased, even as harvest has declined. In these cases, crabbers are working harder to catch fewer crabs (see Figure 3).

Commercial Harvest. As the 2003 commercial crabbing season neared its end, preliminary figures indicated, overall, a below-average year. (Note that data for Baywide harvests of blue crabs will soon be accessible on the NOAA Chesapeake Bay Office website at noaa.chesapeakebay.net.)

Blue Crab Commercial Harvest: 2001, 2002 and Preliminary 2003 (Hard and soft/peeler, in millions of pounds)

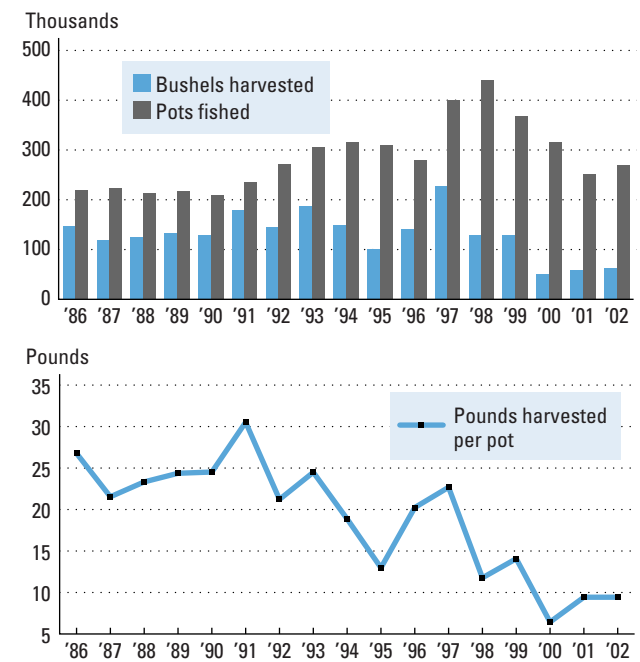
	2001	2002	Recent avg.	2003 prelim.
Maryland	22.6	23.8	28.2	13.9 (thru Sept.)*
Virginia	26.7	28.2	33.0	9.2 (thru July)*
Potomac River	2.1	2.6	4.7	1.2 (thru Sept.)*

*Note that these totals are very preliminary.

Naturally, conditions are different in different areas of the Bay. The resource management agencies of Maryland and Virginia have calculated harvests in different regions and tributaries of the Bay, and an example of that data is represented here (see Figure 4). Note that in Maryland some three-quarters of the peeler and soft crab production comes from the lower Eastern Shore/Tangier Sound area. Clearly this area represents a rich habitat for blue crabs, where grasses provide excellent refuge for molting.

Trends in the Peeler Fishery. According to a 2001 report prepared by the Bay Commission's Technical

FIGURE 3
Potomac River Catch Per Unit Effort (CPUE)



Work Group, the proportion of the total harvest represented by the peeler fishery has varied over the last 20 years.³

In Maryland, evidence points to an initial decline from 1983-1988 in soft and peeler harvests relative to total harvests, followed by an increasing trend thereafter. In the last year examined (2000), soft and peeler harvests in Maryland represented fully 10.9 percent by weight of the total commercial harvests in the state. (Since soft crabs and peelers weigh less than hard crabs, their percentage by number is even greater.)

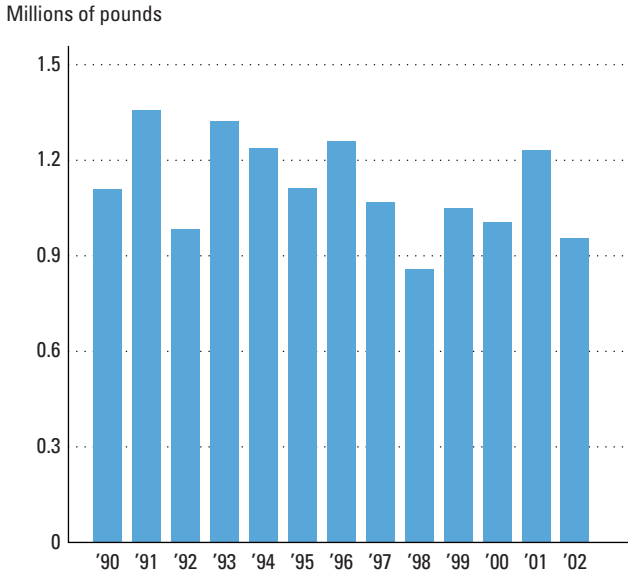
In Virginia, data suggest a consistent increasing trend over a 20-year period, from an initial level for soft and peeler harvests of 2 percent of total harvest, to 11.5 percent by 2000. According to a recent analysis, increased effort in the Virginia peeler fishery has not improved catch — so the catch per unit effort has dropped.

Data for the Potomac River indicate that the overall contribution of soft and peelers to the river's commercial crab harvest is lower than in the other two jurisdictions, but recent trends show that this sector of the fishery is increasing, accounting for about 6 percent of the total harvest in 2000.

FIGURE 4
Regional Variations in Crab Harvest

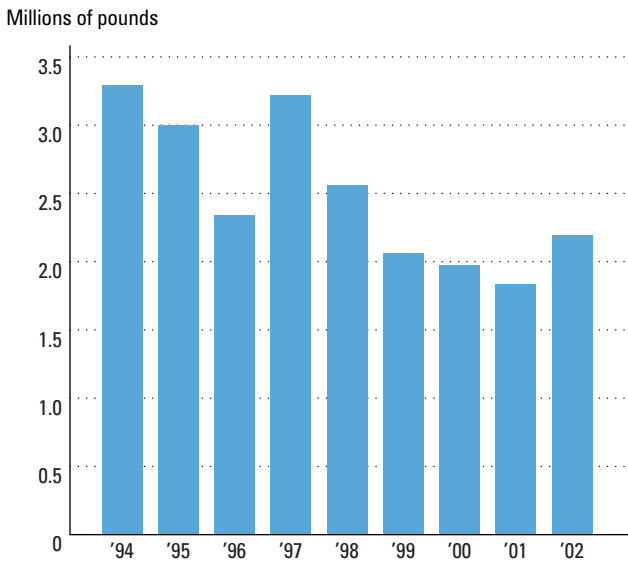
EXAMPLE 1

State: Maryland
Region: Chesapeake Bay Lower East and Tributaries
Fishery: Peeler and Soft Crabs



EXAMPLE 2

State: Virginia
Region: Chesapeake Bay Upper West and Tributaries
Fishery: Hard Crabs



Regardless of these variations, over time the effort in the soft and peeler fishery has increased Baywide, and the proportion of soft and peeler crabs relative to total crab harvests has increased. What is not known is how this fishery, which often targets mature females, affects the population in the long term. More research and analysis is required to determine the precise effect of this shift in crabbing effort on the blue crab fishery as a whole.

Recreational Crabbing. In addition to the commercial harvest, recreational crabbers are believed by many to take a significant number of crabs from the estuary. A recent study of recreational crabbing in the Bay⁴ estimated the following (in millions of crabs).

	Md. Rec. Harvest	% of Comm. Harvest	Va. Rec. Harvest	% of Comm. Harvest
2001	5.0 million	8.5%	2.1 million	4.5%
2002	3.2 million	5.3%	0.7 million	1.4%

Using these figures, it appears that while recreational crabbers may have taken as much as 4 to 7 million crabs in 2001 and 2002, this represents a relatively small percentage of the commercial harvest. This seems to counter the popular belief that recreational crabbing accounts for a considerable withdrawal of crabs from the Bay. Some question whether the recreational crab fishery is cyclical, rising when abundance provides for an easy catch and falling when chances look lean. In 2001 and 2002, it may be that low catch rates discouraged some recreational crabbing.

Fairness in Enforcement and Reporting. In repeated conversations with commercial crabbers, the point has been made that enforcement and reporting must be fair and equitable across the board. Numbers of crabbers have argued that it is the honest watermen who are penalized, since they are the ones who will follow the rules and adhere to the restrictions. Given financial and other constraints, enforcement of rules over large areas of the Bay remains an extremely daunting task — nevertheless, this issue of equitable enforcement is critical. Perhaps new methods of self-policing within the industry could help address the problem.


This issue extends to recreational crabbing as well. In the recently completed survey on recreational crabbing, for example, it should be noted that those conducting this research excluded a few very active





Taking Action for the Blue Crab

Progress on the BBCAC Action Plan

IN JANUARY 2001 THE CHESAPEAKE BAY COMMISSION'S Bi-State Blue Crab Advisory Committee released its report, *Taking Action for the Blue Crab: Managing and Protecting the Stock and its Fisheries*. Based on an extensive scientific review and five years of deliberation, the committee called for a series of actions aimed at more effective management of the fishery. After nearly three years, here is a report on how we have done.

 **1. Adopt a threshold.** Through a consensus process, the jurisdictions and their resource agencies moved deliberately to adopt a threshold, based on the fishing mortality rate, that called for preserving 10 percent of the blue crab's spawning potential. This threshold is not a goal, but rather a line that, if crossed, could jeopardize the reproductive capacity of the stock.

 **2. Adopt a target.** By consensus, the jurisdictions and their resource agencies adopted a target (a goal, based on the fishing mortality rate) that would preserve 20 percent of the blue crab's spawning stock. This would keep exploitation relative to stock abundance (as measured by the fishing mortality rate) out of a "precautionary zone" and away from threshold levels. Both the threshold and the target have been formally incorporated into the *1997 Chesapeake Bay Blue Crab Fisheries Management Plan as Amendment 1*.


 **3. Reduce fishing effort through a phased approach.** In order to protect 20 percent of the mature spawning stock, BBCAC determined that each jurisdiction needed to reduce fishing effort by 15 percent relative to levels of the late 1990s in an attempt to reduce exploitation and augment the spawning stock. Each jurisdiction agreed to attempt to do so in a phased approach, spanning the years 2001-2003, by reducing Baywide harvest by 15 percent. Working in concert with stakeholders, all three jurisdictions implemented regulations to achieve the 15 percent

Legend

The number of blue crab symbols indicates the degree to which each goal has been accomplished.


 **Accomplished**


 **Significant progress made**

 **Work begun, some progress**

 **Little or no progress made**

reduction prior to 2003, to avoid continual changes in regulations. However, without appropriate measures, we cannot fully determine whether or not the reductions in harvest caused a concurrent reduction in effort.

 **4. Address latent effort.** While current restrictions, along with relatively poor catches in many parts of the Bay, have led to reduced effort in some parts of the fishery, the problem of latent effort remains a difficult challenge. For example, there remains a very significant amount of licensed but unfished gear (referred to as "latent effort") that could be put into use should the fishery begin to rebound. While the jurisdictions have in the past implemented license limitations and mandatory apprentice programs, addressing reductions in potential entrants into the fishery remains in the study phase, since we do not yet know how successful such programs are in terms of reducing latent effort.

 **5. Ensure fairness among user groups.** The notion of fairness is often subjective, but one can argue that all three jurisdictions have made a good faith effort not to single out specific gear types or stakeholders in their move to reduce fishing pressure. Both commercial and recreational crabbers have faced new regulations, as have seafood processors. Still, very serious considerations remain concerning regulatory

differences among jurisdictions, the relative impact of various fisheries on the crab population, and the relative impact of specific regulations on various sectors of the fishery, including the processing industry.



6. Increase understanding of effort and harvest activities.

The natural resource agencies have continued to explore and initiate programs aimed at monitoring and measuring true fisheries effort and harvest — but this goal remains elusive. A charrette staged by the BBCAC Technical Work Group resulted in a report (January 2002) that focused on lack of information in the blue crab soft and peeler fishery and called for improved harvest and effort data, including biological characteristics of the harvest (size, male versus female, etc.).⁵ Large gaps in our knowledge remain, however, hindering our ability to scientifically manage the fishery.



7. In the short term, establish a process through BBCAC for continuing coordination of each jurisdiction's efforts.

In 2003, only the Maryland General Assembly appropriated funding necessary for the Chesapeake Bay Commission to continue its coordination of the BBCAC and its Technical Work Group. Since Maryland's funding was contingent upon an equal appropriation from Virginia, the BBCAC was forced to disband. At the final meeting of the committee, the jurisdictions expressed willingness and a commitment to continue to coordinate their efforts on their own. There are, however, inherent difficulties in encouraging Baywide management across geographic and jurisdictional lines. With the assistance of the Maryland and Virginia Sea Grant programs, the Commission has committed to continue its coordination of the Technical Work Group to ensure a fluid dialogue between the technical experts and the legislature.



8. In the long term, pursue alternative management regimes, through a stakeholder-driven process.

Because this is a long-term goal, progress in this area may be years in the making — nevertheless, the juris-

dictions have taken steps in this direction. The Potomac River Commission, having a much smaller geographic range, has already put in place mechanisms for stakeholder input, as have the larger jurisdictions in Maryland and Virginia, through a new Blue Crab Task Force (as well as the already existing Tidal Fish Advisory Committee) in Maryland and the Blue Crab Advisory Committee in Virginia. Whether or not these efforts will lead to substantially new approaches, such as some form of “co-management,” remains to be seen.



9. The BBCAC should initiate a long-term plan to help the jurisdictions coordinate activities related to ecosystem, habitat and multi-species-based interactions.

While explorations into the areas of ecosystem, habitat and multi-species interactions have taken place, either within the jurisdictions, or through segments of the broader Chesapeake Bay Program (such as the NOAA Chesapeake Bay Fisheries Research Program), it would be fair to say that there is as yet no targeted coordination among the jurisdictions in these areas. A lack of funding for the BBCAC removes one source of support for such multi-jurisdictional efforts.



10. Help procure adequate funding. Despite the recognized value — both economic and social — of the Bay's blue crab fishery, adequate funding for research, monitoring, analysis, management and enforcement has not been forthcoming. Considerable resource management efforts are, of course, underway in the separate jurisdictions, but states are now facing funding short falls, and even long-established monitoring efforts risk a lack of support. When the 10-point action plan was crafted, the members of BBCAC naturally assumed that the BBCAC would continue to be funded through 2003. It had become a national model for interstate cooperative fisheries management. Unfortunately, these shrinking financial resources are emblematic of the absence of funding for BBCAC itself.

“recreational” crabbers whose catch was considerably higher than the norm. This resulted from some confusion over whether data was simply misreported or whether these crabbers are actually engaged in commercial crabbing. This survey aside, commercial crabbers complain that some may be illegally selling crabs harvested under a recreational license. Again, proper enforcement of regulations is key to addressing the issue of fairly managing effort in both the commercial and recreational fisheries.

Profitability of the Fishery. In addition to the numbers of crabs harvested, the value of those crabs plays a central role in the economic status of the fishery. In Maryland, for example, the dockside value of crabs has fluctuated from an estimated \$36 million in 1997, to 24 million in 2000. In Virginia, dockside values have fluctuated much less over the same period. As indicated in Figures 5 and 6, it would generally be safe to say that while the long-term trend for harvests is down, this has not necessarily had a proportionate impact on profits, due to a long-term trend in increased prices for crab products.

In contrast to the fluctuating value of blue crabs, the number of licensed crab processing plants has not gone up and down, however — only down. In Maryland, for example, from an estimated 49 plants in 1997, the number dropped to 35 in 2001 and then down to 30 by 2002. This precipitous drop represents a genuine shift in the industry, with a greater emphasis moving to the basket and restaurant trade and away from picked-meat. At the same time, the picked-meat industry is facing serious competition from imported crabmeat. Figure 7 shows how, since the late 1990s, imports passing through the port of Baltimore have increased, rising to a dollar value of some \$120 million by 2002. Whether or not this trend will continue remains uncertain.

In addition to market influences on crab prices — which have made soft crabs a particularly valuable commodity — there are also trends in costs that directly affect those in the fishery. The cost of fuel, ice, gear, insurance and labor — which often tend to rise over time — will obviously affect the profitability of the commercial crabber.

The Bottom Line. In summary, the Bay’s blue crab fishery is currently in flux, with the harvest of soft and peeler crabs generally rising as a percentage of the total harvest, and with the processing industry facing

FIGURE 5
Maryland Blue Crab Harvest and Dockside Value, 1994–2002

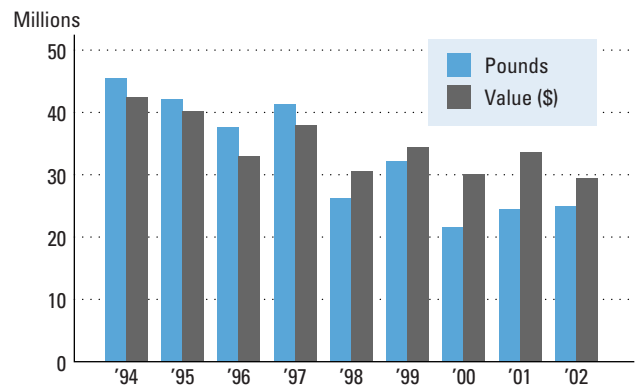


FIGURE 6
Virginia Blue Crab Harvest and Dockside Value, 1994–2002

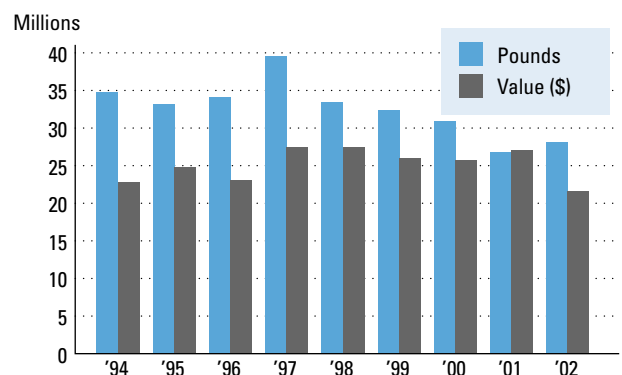


FIGURE 7
Crabmeat in Air-tight Containers Through Baltimore Customs District, 1995–2003

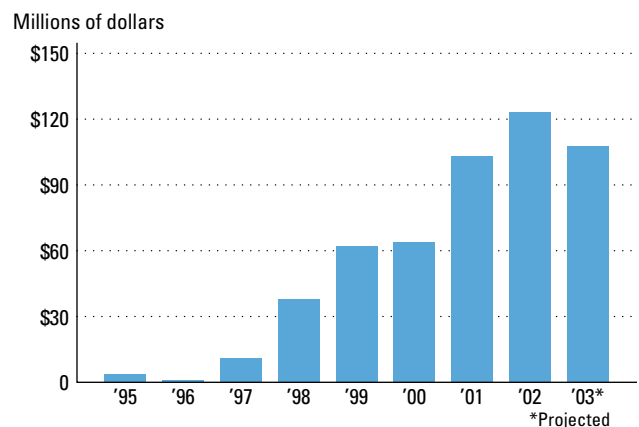


TABLE 1

Comparison of Commercial Blue Crab Regulations (2003)

	Virginia	Maryland	Potomac River Fisheries Comm.
Hard crab size limit	5 in.	5 in. (April 1 to July 14) 5½ in. (July 15 to Dec. 15)	5 in. (April 1 to July 14) 5½ in. (July 15 to Dec. 15)
Soft crab size limit	3½ in.	3½ in.	none
Peeler size limit	3 in.	3¼ in. (April 1 to July 14) 3½ in. (July 15 to Dec. 15)	3¼ in.
Sponge crabs	Permitted	Prohibited, import April 25–July 5	Prohibited
8-hour workday	yes	yes	1 hr. before sunrise to sunset
Season length	April 1–Nov. 30	April 1–Dec. 15	April 1–Nov. 30
Winter dredge	Dec. 1–March 31	none	none
Spawning sanctuary	June 1–Sept. 15	none	none

serious challenges from a shifting market and an increase in imported crabmeat. As noted, there is a consensus among crab experts that a primary contributor to low harvest rates in the Chesapeake Bay remains the relatively low population — with population levels still inside the “precautionary zone” spelled out by BBCAC. The solution, while culturally complex, appears scientifically well defined — double the number of mature male and female crabs (the “spawning stock”) that remain in the water to breed.

Finally, it is important to remember that while commercial and recreational harvests garner much of our attention, high harvests do not necessarily equate to increases in crab populations. What concerns many resource managers, researchers and other stakeholders is that heavy fishing pressure could keep harvests up, while driving down the Bay’s crab population.

Management Actions Through 2003

IN RECENT YEARS, AND ESPECIALLY SINCE REACHING an agreement in 2001 to reduce fishing pressure on crabs by some 15 percent, the jurisdictions of Maryland, Virginia and the Potomac River Fisheries Commission have instituted a range of management actions, including size limits, restrictions on the length of workdays and fishing seasons, and the establishment of seasonal sanctuaries off limits to commercial crabbing. In general, Maryland and the Potomac River Fisheries Commission have favored

moving to larger size limits, while Virginia has favored the creation and then expansion of a summer spawning sanctuary.

During 2003, management restrictions continued for the third straight year largely unchanged, though in Maryland the imposition of an increased size limit for both hard crabs (from 5 to 5¼ inches) and for peelers (from 3¼ to 3½ inches) was postponed until July 15. Otherwise, management actions have remained essentially the same in 2003 as in 2002 (see Table 1, Comparison of Commercial Blue Crab Regulations).

All three jurisdictions have joined in an effort to reduce the fishing pressure on blue crabs, with the aim of moving the fishing effort away from the threshold and toward the target. Independent surveys are now attempting to determine whether fishing effort has indeed decreased, and if so, to what degree. Clearly, it will be a few years before a genuine accounting emerges, though as noted earlier the population decline appears to have slowed, though the stock remains at a depressed level.

As noted in the 2001 status report,⁶ the popular press has widely reported new restrictions as an attempt to reduce “harvests” by 15 percent, and the public has probably not understood that the goal is to reduce fishing pressure, not harvests. While harvests may go up and down, depending on the size of the crab population, the objective here is to reduce the fishing mortality rate (factoring in both harvested and naturally dying crabs) relative to total population levels of the 1997–99 period. Since this fishing rate is determined by calculating crabbing effort (the

exploitation rate) relative to crab abundance, the rate can actually go down even with larger harvests — as long as the crab population rises faster than fishing pressure.

The key in the restoration effort is to allow the spawning stock to increase, with a primary goal of doubling the spawning stock. This will ultimately mean more crabs to catch.

In order to reduce fishing pressure, the three jurisdictions, after public hearings and discussions with industry leaders, chose a series of regulations, listed in very abbreviated form in Table 1 (page 11). Complete regulations are available from the natural resource agencies of Maryland, Virginia and the Potomac River Fisheries Commission, and on their web sites, listed below.)

Maryland

- Size limits were tightened and a sponge crab importation ban was established for a portion of the crabbing season.
- Required commercial crabbers to limit their workday to 8 hours and to take off one day a week, as well as the second and third Thursday in November.
- While Maryland's commercial crabbing season was closed a month early (October 31) in 2001, it has since been lengthened to December 15.
- In 2003, the minimum size limit for male hard crabs was 5 inches through July 14, and 5¼ inches from July 15 to the end of the season.
- In 2003, the minimum size limit for peelers was 3¼ inches through July 14, and 3½ inches from July 15 to the end of the season.
- For more detail, visit the Web site at: www.dnr.state.md.us/fisheries/commercial/index.html

Virginia

- Instituted several management efforts in recent years, including a license moratorium, sponge conservation measures, pot limits, and cull ring requirements. In 2000, Virginia established a 660-square mile sanctuary protecting waters generally over 35 feet deep from harvest during the summer (June 1–September 15). In 2002, the sanctuary was expanded to 927-square miles, with protection covering depths generally greater than 30 feet, though portions are much shallower.
- In 2002, an 8-hour workday for commercial crabbers was enacted, replacing a 2001 regulation that

had prohibited any activities associated with commercial crab potting or peeler potting on 12 Wednesdays of the summer.

- In 2001, the winter-dredge landing limit was lowered from 20 to 17 barrels.
- For more detail, visit the Web site at: www.state.va.us/mrc/page4a.htm

Potomac River

- In 2001, the hard crab season was shortened by one month, to April 1–October 31; in 2002, that season was again lengthened to November 30. Similarly, in 2001 the peeler season was May 20–October 31; in 2002, it was April 1–November 30.
- In 2002, pot limits were reduced by 10 percent for all categories.
- Hard crab size limits were increased from 5 to 5¼ inches as of August 1, 2002.
- For more detail, visit the Web site at: www.prfc.state.va.us

In each jurisdiction, these actions resulted in an estimated reduction in fishing pressure of approximately 15 percent, counting both hard and peeler commercial crab fisheries. Determining the precise impact of these regulations will require ongoing analysis over time. With such strong scientific and management consensus supporting a biologically based threshold and target, this analysis should remain a top funding priority.

All three jurisdictions have also implemented restrictions on recreational crabbers, to reduce the amount of gear and the harvests of those crabs caught recreationally. For example:

Maryland

- A recreational crabbing license, established in 2001, is required for anyone using more than 10 traps or rings and for anyone taking more than 2 dozen hard crabs or 1 dozen soft crabs or peelers. For additional requirements and exemptions, visit the Web site at: www.dnr.state.md.us/fisheries/regulations/regindex.html

Virginia

- Recreational crabbers cannot take or possess more than one bushel of hard crabs and/or two dozen peeler crabs in any one-day for personal use. For additional requirements and exemptions, visit the Web site at: www.state.va.us/mrc/page1f3.htm

Potomac

■ A recreational license has been in effect since 1999, and is required for anyone using more than five pots, or twenty traps, or 1,200 feet of trotline. In 2001, limits were tightened for license holders to one bushel of hard crabs per person (two bushels per boat), or two-dozen soft crabs per person (four dozen per boat). In 2002, the recreational season was lengthened from October 31 to November 30. For more information, visit the Web site at www.prfc.state.va.us

Again, the effect of these management efforts, whether commercial or recreational, will not likely show up immediately, and it will be necessary to track current efforts to reduce fishing pressure (i.e., by some 15 percent) in order to determine trends, and to assess the effectiveness of these measures. Since not all recreational crabbers are required to obtain a license, additional research must be funded in order to accurately quantify recreational effort.

What Remains to Be Done

AFTER A DECADE OF DECLINE, THE CHESAPEAKE'S blue crab stock is showing signs of stabilizing — but our work to restore the blue crab is far from finished. First and foremost, the rate of fishing pressure must move out of the precautionary zone established by BBCAC in 2001 (see Figure 1). As seen in a number of reports on exploitation rates, in those regions where effort to catch blue crabs has increased, harvests have not. This means more boats, more hours, more fuel — in short, more time and money — spent in trying to harvest a limited number of crabs. Not only is this inefficient, but such constant pressure risks driving the stock down further, to dangerously low levels. Of special concern has been the low level of abundance for both female crabs and large males, key for rebuilding the Bay's crab population.

In order for management measures to maintain a stable stock size for blue crabs, the following applied research must continue:

Understanding Effort. Despite the importance of the blue crab fishery in the Chesapeake Bay, tracking and documenting effort remains highly imprecise. While jurisdictions have records of licenses, exactly how

many pots, scrapes, trotlines and other gear are actually deployed at any given time is essentially unknown. The jurisdictions are experimenting with methods, such as aerial surveys, to quantify actual gear in the water — these efforts should be continued, expanded and refined. (Of note, unless “trotlining” of pots is prohibited, aerial surveys will not yield accurate estimates of effort.) The point here is that until we can better quantify actual effort in the crab fishery, we will be forced to function with our best estimates, without the benefit of solid ground-truthing.

Dealing With Latent Effort. Part of dealing with the potential for too much effort in the crab fishery is designing new ways to deal with latent effort — licensed crabbers who will enter the fishery when the conditions appear good. One question has to do with scale, i.e., the number of license holders able to move in and out of the fishery. While many watermen argue that having the flexibility to move in and out of different fisheries constitutes a cornerstone of their ability to make a living from the water, some estimates show that while fishing effort on the crab has perhaps been curtailed (by regulation and, at times, by low catch rates for hard crabbers), those reductions in effort could be completely overwhelmed if a large percentage of license holders decided to re-enter the fishery. Determining what level of latent effort is acceptable — and devising fair ways to deal with the issue — remains a difficult task.

Soft, Peeler and Hard Crabs. As noted in this report, when considered Baywide, the soft and peeler segment of the blue crab fishery has grown during the past decade. Precisely how this shift toward peelers affects blue crab population dynamics remains unclear. Research and analysis must continue into this relationship among the varying sectors of the crab fishery if we are to better understand what constitutes an optimal balance — or a potential threat to a sustainable blue crab population.

Zones and Regions. Considerable conversation has surrounded the notion of adapting management measures according to the varying zones or regions in the Bay's blue crab fishery. In one sense, three primary zones now exist in terms of resource management: the jurisdictions of Maryland, Virginia and the Potomac River Fisheries Commission. These zones do account for some fundamental variation in the estuary, such as

the greater abundance of female crabs in the more saline Virginia portion of the Bay, and the greater abundance of males in Maryland. Other potentially significant subregions are not accounted for, however, such as the Tangier Sound area — which has, for example, been responsible for some two-thirds of the soft crabs harvested in Maryland. Should areas with differing biological parameters and fishing traditions have distinct regulations? More analyses and perhaps pilot projects to test the concept would help answer such questions.

Corridors and Sanctuaries. As is well known, the Commonwealth of Virginia has established a 927-square-mile spawning sanctuary in waters generally deeper than 30 feet in effect during the summer months. Since most spawning females are in fact in Virginia waters, this seems the right place for such a sanctuary. While studies of the effectiveness of this effort have been undertaken and are ongoing, it remains crucial to document the conservation benefits of this seasonal sanctuary in order to address any lingering doubts about this approach. Of special concern are dissolved oxygen levels at the depths covered by the sanctuary. At the same time, the potential for other corridors, such as shallow-water corridors, whether in Maryland or Virginia, should be explored for their conservation potential and as possible substitutes for unpopular restrictions on commercial harvesting methods (such as limited work-days). Finally, benefits of additional seasonal expansions must be reviewed, i.e. many scientists believe that the fall migration of crabs contributes an important component to the population that spawns the following spring. At present, the sanctuaries are only in effect in the summer months.

Habitat Protection and Restoration. Submerged aquatic vegetation (SAV) and other shallow water habitats — marsh creeks, mud and sand flats — are utilized by the early life history stages of the blue crab. SAV, in particular, is an important settlement habitat for post-larvae as they enter the Bay. These habitats are most influenced by direct and indirect human impacts, especially water quality, which leads to degradation and loss of these vital habitats. Protection and restoration of SAV and the water quality to support healthy SAV should be a high priority of management agencies.

Stock Enhancement. The effort to help rebuild the blue crab stock by actively enhancing the dwindling

breeding population through hatcheries and release programs has been greeted with both enthusiasm and skepticism. Rigorous research into this effort should continue in order to build a body of knowledge demonstrating its effectiveness, cost and future potential. As with research on sanctuaries and other issues, as results accrue, they should be shared with others in the scientific community, to ensure the best vetting of advancements among a group of peers.

Multi-species and Ecosystem-based Management. In part due to the debate that erupted over whether or not predation by striped bass, croaker and other finfish was causing the decline of blue crabs in the Chesapeake Bay, it has become clear that characterizing food web interactions may prove key to understanding the population dynamics of important commercial species like the blue crab. In addition to multi-species analysis — such as interactions between striped bass and crabs — it is also essential to improve our understanding of the role of habitat and other ecological factors in this shifting dynamic. Such ecosystem studies have begun as various pockets of inquiry, and the Chesapeake Bay Program's Scientific and Technical Advisory Committee (STAC) is now investigating the needs and directions for important ecosystem fisheries research. Also, the NOAA Chesapeake Bay Office has initiated development of a Fisheries Ecosystem Planning document that describes the structure and function of the Bay ecosystem and recommends actions for implementing ecosystem-based approaches to fisheries management. A coordinated effort focused on ecosystem management should receive solid support, and implications for the economically critical blue crab stock emerging from this line of study should be followed closely.

Fishing Mortality Rates. To determine how the Bay's crab stock is doing, researchers compare their estimate of how many crabs are dying — either naturally or by being caught — with how many crabs they estimate in the Bay at different stages. By using a length-based method, scientists and resource managers have estimated this balance between crabs living in the estuary and crabs dying (the fishing mortality rate), assuming a fairly stable rate of recruitment (new crabs coming into the stock). The TWG has made clear that evaluation of this method and exploration of better methodologies should continue, even as we proceed along the course for Baywide management set in 2001.

According to the 2003 Blue Crab Advisory from the Chesapeake Bay Stock Assessment Committee (CBSAC), the winter dredge survey offers a more direct means of estimating stocks through direct Baywide sampling. This estimate of abundance can be compared with estimates for commercial and recreational fishing, along with natural mortality, to produce a more accurate annual estimate of the fishing mortality rate. The Technical Work Group encourages the further exploration of this method, and agrees with the Chesapeake Bay Stock Assessment Committee that for the immediate future both the length-based method (used to set current thresholds and targets) and the method based on the winter dredge survey should be used side-by-side to determine trends and to compare what the data is telling us. Refinement of these methods remains a central challenge for the scientific community, and an essential ingredient for effective management of the Bay's crab stock.

Critical Support for Data and Research. As is clear from the comment on Fishing Mortality Rates, effective estimates of the blue crab population and the level of harvesting effort underway in any given month or year cannot be achieved without adequate data. The Technical Work Group urges support for improved data collection, as called for in the CBSAC 2003 Advisory: better harvest and effort data for the commercial and recreational fisheries (as noted above); improved information on crab growth and natural mortality rates; and better tracking of both the stock and the harvest in terms of age, size, sex and maturity of crabs.

In addition, the Technical Work Group urges support for scientific research in a number of key areas, including the effects of recent weather extremes on crabs (from draught to major rainfall and storm events), the impact of cannibalism versus predation as controls on the population, the selective impact of varying management tools (sanctuaries versus gear changes), and the role of disease, reproductive output and longevity on the crab stock.

Understanding Cultural Difference. While we may normally associate different cultural views with different countries, anthropologists have demonstrated that even within our society very different sets of views and beliefs can divide us. Work recently undertaken to more accurately describe these differ-

ences in the crab fishery have added to our understanding of potential miscommunications among key groups — most notably the watermen who catch crabs for a living and the scientists and other technical experts who study the blue crab, *Callinectes sapidus*. Clearly, both groups have valuable knowledge of the blue crab, which should be shared and discussed, and in many cases these groups can work together to conduct research on remaining issues. The dialogues and other efforts so far undertaken in this area should continue, with an inclusion of varying communities within the three separate jurisdictions and regions (the upper and lower Bay, for example).

Toward Co-Management. In addition to an improved understanding of the differences that divide crabbers and those who manage them, the fishery ultimately needs new and innovative structures that will not only improve relations among stakeholders but also improve efficiencies in resource management. This will require both flexibility and creativity on the part of managers and a certain responsibility on behalf of the crabbers — better ways, for example, to encourage self-enforcement. With some movement toward co-management, crabbers will ultimately feel more invested in the regulations they must follow, and enforcement will become less of an issue. Already within the three jurisdictions there are blue crab advisory committees and task groups that have laid the groundwork for improved cooperation. These efforts should be continued and expanded, with information shared among all groups about what appears to work. A special challenge will be the importance of place-based input, given wide differences among communities around the Bay. Perhaps some new way of handling zones and regions could assist in shaping this regional input.

Conclusion

WITH WIDESPREAD LOW DISSOLVED OXYGEN levels, the harsh winter of 2002 and the powerful hurricane Isabel in 2003, predicting the health of the Bay's blue crab stock for the coming year will test the skills of scientists and watermen alike. Not until next spring's findings from the Baywide winter dredge survey will we have a clearer picture of what the immediate future holds for the Bay's blue crab stock.

In the meantime, one factor remains constant. There is only one crab population in the Chesapeake Bay. That population spawns in the lower Bay and then migrates through the mid and upper Bay. Preserving the Chesapeake's crab stock, therefore, requires careful management of both male and female crabs, of crabs in the southern Bay and in the northern Bay, on the eastern shore and on the western shore. Put simply, without enough mature crabs of both sexes to mate and reproduce, the crab population in the Chesapeake cannot sustain itself at levels adequate to support the kind of fishery, both commercial and recreational, we have come to expect and rely on.

The main thrust of this report, then, is to remain on course in our efforts to double the Bay's spawning stock. This is the only way that we can feel certain that the crab population is not hovering uncomfortably near minimal levels, vulnerable to unforeseen environmental changes or threats from disease or over-fishing.

As noted briefly above, there persists a number of very pressing questions about the effects of climate, predation and other factors on the Bay's blue crab stock. Despite current funding challenges, it is imperative that important scientific efforts continue to focus on improving our understanding of the crab's biology, including its life cycle and reproductive behavior. The Chesapeake Bay Commission's Technical Work Group will continue to encourage and pursue this ongoing effort to improve our knowledge of the blue crab and the fisheries it supports.

November 2003

CREDITS

This report would not have been possible without the unanimous input of the Chesapeake Bay Commission's Blue Crab Technical Work Group members and the writing and facilitation talents of Jack Greer of the Maryland Sea Grant College. Also, we wish to thank Dave Harp for contributing his photograph. For additional information about this bi-state effort, contact the Chesapeake Bay Commission, 60 West Street, Suite 200 Annapolis, Maryland 21401, or visit the Web site at: www.chesbay.state.va.us.

Notes

1. Chesapeake Bay Stock Assessment Committee. 2003. *Blue Crab Advisory 2003*, available from the Chesapeake Bay Office of the National Oceanic and Atmospheric Administration (<http://noaa.chesapeakebay.net>).
2. According to the 2003 CBSAC Advisory, the fishing mortality rate (F) appeared to hold fairly steady over the past five years, when using a length-based analysis, but that rate appears to be rising according to data from the winter dredge survey. Scientists are working to refine these estimates amid uncertainties of data collection and statistical analysis.
3. Miller, T. *et al.* *Op cit.*
4. Ashford, J. R. and C. M. Jones. 2002. *Survey of the Recreational Blue Crab Fishery in Maryland*. Center for Quantitative Fisheries Ecology, Old Dominion University. Final Report to the Maryland Department of Natural Resources.
5. Miller, T. *et al.* 2002. *Review of the Soft and Peeler Fishery for Blue Crab in the Chesapeake Bay: Report of the BBCAC Technical Work Group Charrette in Solomons, MD, August 29-30, 2001*. Available from the Chesapeake Bay Commission.
6. Bi-State Blue Crab Advisory Committee. 2001. *Blue Crabs in the Chesapeake: Status of the Baywide Fishery 2001*. Available from the Chesapeake Bay Commission.

CHESAPEAKE BAY COMMISSION

Blue Crab Technical Work Group

CHAIR

ANN PESIRI SWANSON
Executive Director, Chesapeake Bay Commission

GEORGE ABBE
Senior Crab Scientist, Benedict Estuarine Research Center, Academy of Natural Sciences

LOWELL BAHNER
Director, Chesapeake Bay Office, NOAA

CHAD BOYCE
Fisheries Management Specialist, Virginia Marine Resources Commission

JACK GREER, PH.D.
Environmental Writer and Facilitator, Maryland Sea Grant College Program, University of Maryland

ANSON HINES, PH.D.
Estuarine Zoologist, Assistant Director, Smithsonian Environmental Research Center

JOHN M. HOENIG, PH.D.
Fisheries Stock Assessment Statistician, Department of Fisheries Science, Virginia Institute of Marine Science

EDWARD HOUDE, PH.D.
Fisheries Scientist, Chesapeake Biological Laboratory, University of Maryland

ROY INSLEY
Senior Fisheries Planner, Virginia Marine Resources Commission

PHIL W. JONES
Resource Manager, Maryland Department of Natural Resources

JAMES E. KIRKLEY, PH.D.
Agricultural and Resource Economist, Department of Coastal and Ocean Policy, Virginia Institute of Marine Science

ROMUALD N. LIPCIUS, PH.D.
Marine Crustacean Ecologist, Department of Fisheries Science, Virginia Institute of Marine Science

DOUGLAS LIPTON, PH.D.
Marine Resource Economist, Department of Agriculture and Resource Economics, University of Maryland

JOHN R. MCCONAUGHA, PH.D.
Invertebrate Physiologist/Larval Ecologist, Department of Ocean, Earth and Atmospheric Sciences, Old Dominion University

THOMAS J. MILLER, PH.D.
Fisheries Ecologist, Chesapeake Biological Laboratory, University of Maryland

DEREK M. ORNER
Fisheries Scientist, Chesapeake Bay Office, NOAA

MICHAEL PAOLISSO, PH.D.
Environmental Anthropologist, Department of Anthropology, University of Maryland

ROB O'REILLY
Resource Manager, Virginia Marine Resources Commission

ROBERT J. ORTH, PH.D.
Seagrass Ecologist, Department of Biological Science, Virginia Institute of Marine Science

HARLEY J. SPEIR
Fisheries Scientist, Maryland Department of Natural Resources

WILLARD VAN ENGEL
Blue Crab Biologist and Historian, Department of Fisheries Science (retired), Virginia Institute of Marine Science

JACQUES VAN MONTFRANS
Marine Crustacean Ecologist, Department of Fisheries Science, Virginia Institute of Marine Science

YONATHAN ZOHAR, PH.D.
Fish Endocrinologist, Director, Center of Marine Biotechnology

STAFF

MELANIE DAVENPORT
Chesapeake Bay Commission

PAT STUNTZ
Chesapeake Bay Commission

Chesapeake Bay Commission

The Commission maintains offices in Maryland, Virginia and Pennsylvania. Commission staff are available to assist any member of the General Assembly of any signatory state on matters pertaining to the Chesapeake Bay and the Chesapeake Bay Program. Through its Bi-state Blue Crab Advisory Committee, the Commission has led the effort to coordinate the management of the Chesapeake Blue Crab among the three management jurisdictions — Maryland, The Potomac River Fisheries Commission and Virginia.

Headquarters and Maryland Office

60 West Street, Suite 200
Annapolis, MD 21401
Phone: 410-263-3420 · Fax: 410-263-9338
www.chesbay.state.va.us

Virginia Office

502B General Assembly Building
P.O. Box 406
Richmond, VA 23218
Phone: 804-786-4849 · Fax: 804-371-0659



CHESAPEAKE BAY COMMISSION
Policy for the Bay