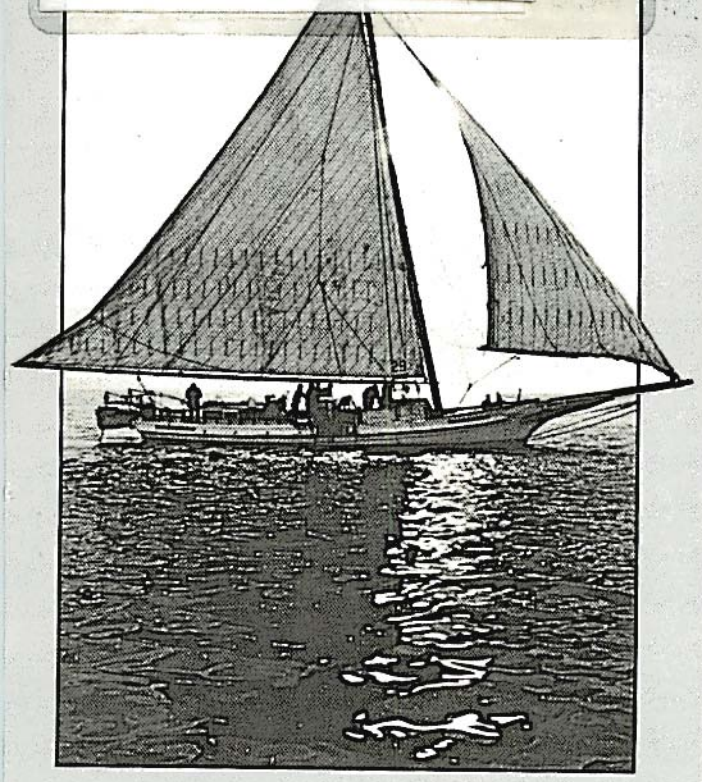
BAYSIDE GUIDE

To Weather on the Chesapeake



BAYSIDE GUIDE
To Weather on the Chesapeake

by Mark E. Jacoby

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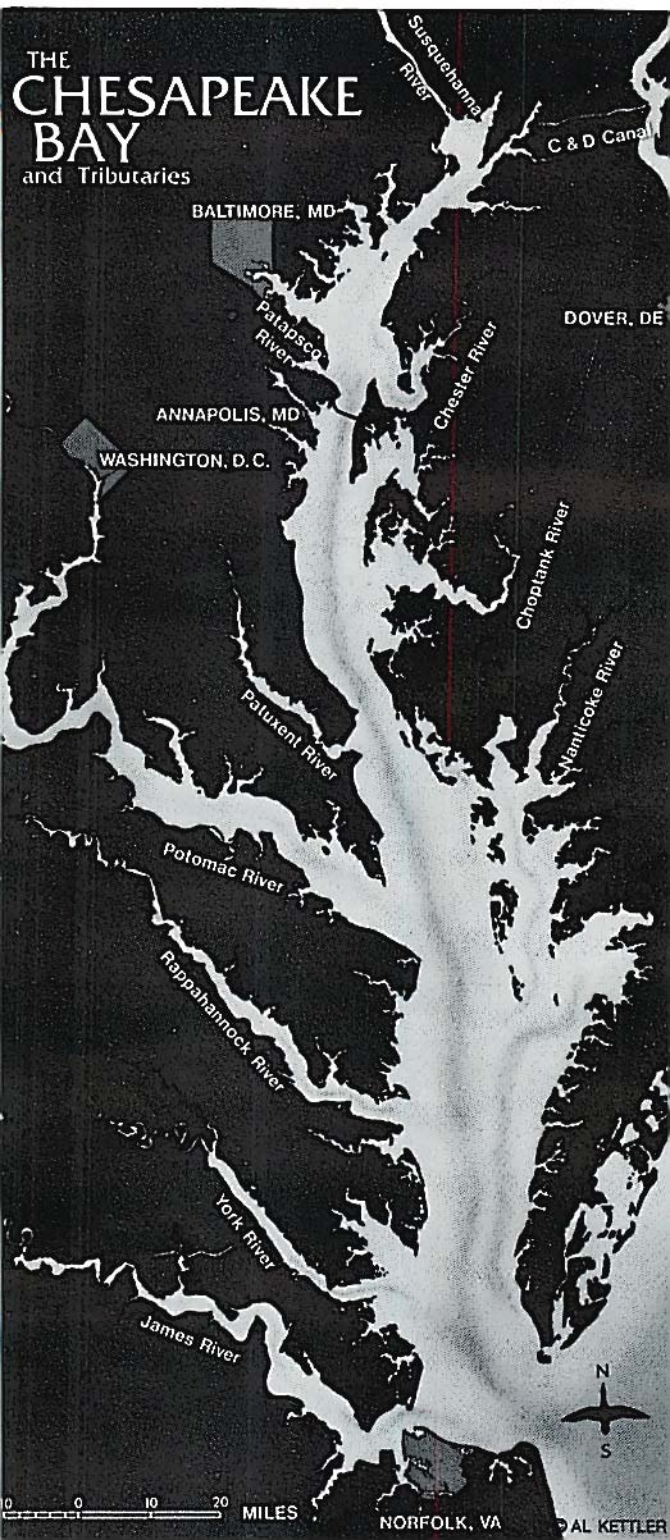

THE
CHESAPEAKE
BAY
and Tributaries
Susquehanna River
C & D Canal
BALTIMORE, MD
Patapsco River
DOVER, DE
Chester River
ANNAPOLIS, MD
WASHINGTON, D.C.
Choptank River
Nanticoke River
Patuxent River
Potomac River
Rappahannock River
York River
James River
N
S
0 0 10 20
MILES
NORFOLK, VA
AL KETTLER

When John Smith first sailed the Chesapeake at the dawn of the seventeenth century he claimed one might walk upon its surface, buoyed by the teeming mass of fish below. Though nearly four hundred years of catch-as-catch-can have taxed nature's bounty, the Bay still evokes images of plenty. And the daily rhythm of life around the Chesapeake Bay still centers on the life within its waters—a rhythm determined by seasonal movements of crabs and fish and by the seasonal market for oysters.

But the Bay is more than a livelihood for the watermen who fish its waters—it is a highway for commerce, for coal from Baltimore and Norfolk, for foodstuffs from Cambridge and for cars and televisions and tape recorders from as far away as the Orient. And the Bay is an ideal recreation area, for the yachtsmen who transit the Intracoastal Waterway, for the thousands of boaters for whom the Chesapeake is home port, for all the people who fish or ski or sail—people who may find solace in an awareness of nature alive around them.

Many different people with many different purposes swarm onto the Bay's surface on any given day, all dependent on a hospitable reception. Some come and go oblivious to the rhythm of weather's changing patterns in the sky. But for others ignorance is not blissful.

The tempo of Bay weather can change quickly. A raging Nor'easter or a galloping squall line can churn the Chesapeake's waters into a chaos of spray, blurring the distinction between air and water. Such weather can wreak havoc on the inattentive. Such weather can claim lives.

Think of those changing patterns in the sky as musical scores to nature's medley—the weather. Read those scores and you'll better understand the delicate harmony of weather and life around the Bay. Read those scores and you'll seldom be caught off cue.

This guide will introduce you to the art of reading the Chesapeake's weather and to the activities that best harmonize with that weather. Learning to anticipate the weather with the aid of this guide and, most importantly, keeping a weather eye peeled are your tickets to front row seats in nature's longest running production—and your best hedges against unwelcome surprise.

THE BIG PICTURE IN FOCUS

Your interest in weather may extend no further than answers to such questions as: Will there be rain this afternoon? or Will the clouds break? Answering these and similar questions is the business not only of weathermen but of anyone who spends time outdoors—and you can develop a weather eye if you're willing to work at it. All you need is a sensitivity to the events in the air around you and an understanding of a few simple concepts, which we'll discuss in the next section, **Clouds.**

Larger questions—Why are storm systems more common in winter? or Why are Chesapeake summers so humid?—need not bear directly on the short-term forecast. But if you want to understand the cause of weather, the whys and wherefroms of those storm systems scurrying across the continent, you will need to learn about climate—the big picture.

The Sun as director

The essence of weather is motion. And the essence of motion is energy. That energy comes from the hydrogen generator we call the sun—its uneven heating of the earth's surface drives the atmospheric motion that causes our weather.

Because the sun's vertical rays hit what we think of as the side of the earth, the equator is more intensely heated than the poles. The heated equatorial air expands and rises, bumping against the upper atmosphere and spreading out toward the cooler poles.

The journey is longer than you might expect. Because the earth is spinning counterclockwise (to us in the Northern Hemisphere), winds rushing toward the poles are deflected toward the East. In the Bay region these deflected winds cause the familiar Northern Hemisphere westerly winds (winds are named for the direction from which they come).

When equatorial air does reach the polar areas, it literally piles up, causing pressurized bulges above the poles. These areas of high pressure—called Polar

Highs—would like to flatten out by leaking air along the earth's surface. And, in fact, they do. During the winter the Northern Hemisphere Polar High may occasionally extend well past the Bay almost to the equator. Typically, however, the polar air simply slides down only to lose its identity in temperate zone skirmishes with other air masses.

The leading characters. . .

Air masses do not easily mix. Unlike in their temperatures and humidities, they jockey about in continual competition to gain more ground, their fluid boundaries diving beneath or overriding the boundaries of their neighbors. As these areas of subsiding or ascending boundaries—what weathermen call fronts—sweep across the landscape, they bring rain and snow and winds and clouds along with them.

Atlantic coastal weather, the weather that affects the Chesapeake, is dominated by two air masses—the Polar and Bermuda Highs. The Bermuda High drifts north during our summers because the North Pole tilts toward the sun. In winter, the Bermuda High recedes; the Polar High then extends further south and brings with it freezing winds from Canada and the Arctic.

. . . battling for the limelight

The temperature difference between the Polar High and more southerly air masses is large. The westerly winds rushing over this temperature boundary are funneled by this difference into a narrow, shifting corridor, especially during the winter. This creates the "jet stream," which drives across the Northern Hemisphere at speeds up to 200 miles per hour, forming eddies along its border that often enclose areas of lower pressure from the South. These pockets of low pressure, or Lows, are pushed along by westerly winds toward the Northeast where they often become the storm systems that bring heavy snow or rain to the Chesapeake.

The same effect that brings us the westerlies, the deflection of movement to the right in the Northern Hemisphere, makes the circulation around Lows and Highs opposite in direction. Winds rushing toward the

Low are deflected to the right, making them counterclockwise; winds spinning away from a High are clockwise.

Because we lie on the western side of the Bermuda High during the summer, our winds are generally southerlies; they bring us warm humid air from the South. The Polar High that influences our winter weather lies to our northeast and brings us northerly winter winds. Of course these are very general patterns, and storm systems or Bay breezes may overcome them.

An important minor character

A more localized weather event along the Chesapeake is the much-appreciated Bay breeze. The cause of Bay breezes is similar to that of large scale atmospheric winds—differences in temperature causing differences in pressure. Bodies of water such as the Bay act as heat buffers; overnight changes in atmospheric heating have little effect because water can absorb a lot of heat with little change in temperature. On land the story is different: small variations in atmospheric heating have large effects on surface temperature, as is well known to anyone who has walked barefoot on a sandy beach under the midday sun.

In the early morning, the land along the Bay may be cooler than the water, causing the Bay breeze to blow toward the water. In the afternoon, the land is hotter, and the Bay breeze blows onshore. Bay breezes can spring up when land and water temperatures differ by as little as five degrees.

With this general climate picture in mind, we are ready to get down to the practical business of forecasting the weather. And for that we must focus on the smaller picture directly above our heads.

The earth is at rest, and the moisture about it is evaporated by the sun's rays and the other heat from above and rises upwards; but when the heat which causes it to rise leaves it, . . . the vapor cools and condenses again as a result of the loss of heat and height and turns from air into water. The exhalation from water is vapor. The formation of water from air produces clouds.

—Aristotle, *Meteorologica*

PATTERNS IN THE SKY

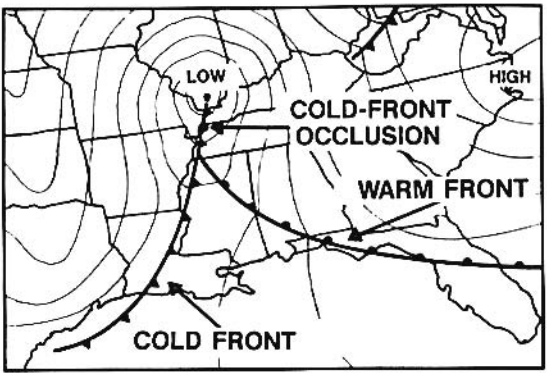
Aristotle's account of the formation of clouds could have been written in the twentieth century. Today's amateur meteorologist—the person hoping to avoid being caught unprepared for nasty weather—can still do well by joining Aristotle in observing the sky and in thinking about clouds. Changes in cloud type and intensity remain the best harbingers of changes in the weather because frontal movements that bring new weather are always preceded by characteristic clouds. If we can read these clouds, we can read the weather they bring.

Clouds, as Aristotle knew, are formed when warm moist surface air is forced aloft into cooler temperatures. Once cooled, air cannot hold as much water vapor. The vapor is "lost" to the air when it condenses into the tiny droplets that appear to us as clouds.

Differing air masses often meet but cannot easily mix. When the warm moist marine tropical air mass brought to us by the Bermuda High meets up with the cooler and heavier continental polar air mass brought by the Polar High, for example, the warm air slides above the cold air. The zone of subsiding and ascending air masses is called a front.

As the Polar High pushes south, it shoves southerly air masses aside. Where the southerly march of the Polar High is blocked, as by a mountain ridge, for example, a pocket of low pressure forms. The cold polar air sweeping down from the North—the cold front—squeezes the southerly air, actually forcing it back toward the North as a warm front on the east side of the pocket of low pressure.

Occasionally one of these fronts will overrun the other. Such occluded fronts are usually cold front occlusions—the faster cold front has overrun the warm front.

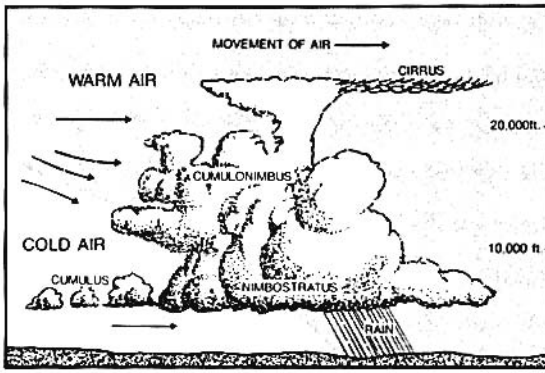


Cold fronts usually travel toward the Southeast, along a northeast-southwest line, at speeds of 10 to 20 miles per hour in summer and 20 to 30 miles per hour in winter. Because cold fronts move faster than warm fronts, the weather they bring passes more quickly—a particularly nice feature since cold fronts tend to bring nasty weather.

Warm fronts generally move from south to north at speeds about half that of cold fronts, bringing with them milder transitions in the weather.

Such is the horizontal picture of fronts you might see represented on a weather map. To understand how to predict which front is heading your way, and how soon it will arrive, we must look at vertical slices through fronts.

Cold Fronts



Your first indication of an approaching cold front is usually a thin cover of cirrus clouds about five miles up that is coming from the West. As the front draws nearer, the clouds lower and thicken into the deep nimbostratus type that are responsible for thunderstorms. Expect those thunderstorms just before the front passes. When you see low cumulus clouds, you can breathe more easily—the front has passed.

Not every cold front brings thunderstorms—that depends on the moisture content of the air masses. If both the warm and cold masses are dry, then expect little poor weather. If, as is often the case, the warm air is moist and the cold air dry, then expect nasty weather that will clear rapidly. If both air masses are moist, expect miserable weather that will hang around a while.

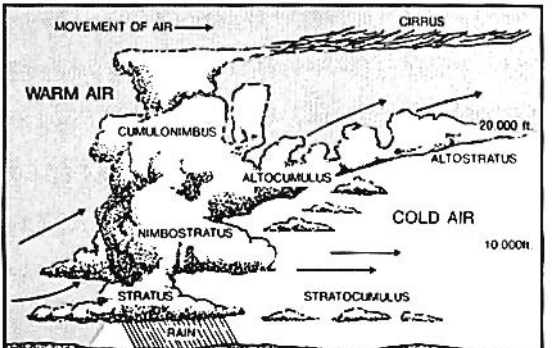
You can predict the arrival of a cold front because the slope of its cold air wedge into a warm air mass is fairly constant—typically 50 to 1. By knowing the slope of the front and estimating or measuring the wind speed, you can estimate the arrival of the front. If your first sight of an approaching front is a cirrus cloud cover at about 20,000 feet, for example, the frontal boundary is about 20,000 × 50 or one million feet, or about 200 miles away. If the cold front is approaching at a rate of twenty miles per hour (the wind speed), you should expect the front to pass in about ten hours.

Judging how far off a cold front is can help you avoid a squall line—a row of intense thunderheads and fast winds that storm ahead of a swiftly moving cold front. Squall lines may bring winds of over 50 knots. Such swift and unexpected winds have dismasted many boats and have taught even the most experienced sailors renewed respect for the patterns in the sky. Fortunately, you can foretell the advance of a squall line and avoid a similar fate—look west for columns of cumulonimbus clouds. Squall lines typically advance at a speed of 25 knots; from the first sign of darkening in the western sky to the arrival of the squall line is usually about an hour and a half.

Warm Fronts

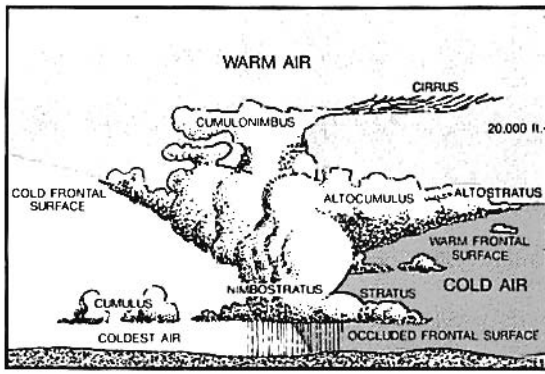
Warm fronts usually bring milder weather than cold fronts because their slope is more gradual—the warm moist air is forced aloft more slowly, giving it more time to lose its moisture.

The slope of a warm front is about 125 to 1; consequently the usual high cirrus clouds that precede them give plenty of warning. If you spot high cirrus clouds coming from the south that are about 5 miles up, you can estimate that the front is about six hundred miles away; if it's traveling at the typical ten miles per hour, you should expect it to pass in about sixty hours.



Occluded Fronts

The cold front occlusion comes on deceptively. Because the weather comes from the West you expect a cold front. But as the front draws near you notice altostratus and then altocumulus clouds that typically precede a warm front. You might be tempted to think a warm front is approaching. Don't breathe too easily—what's heading your way is a cold front occlusion, which acts like the nastier cold front but is more widespread.



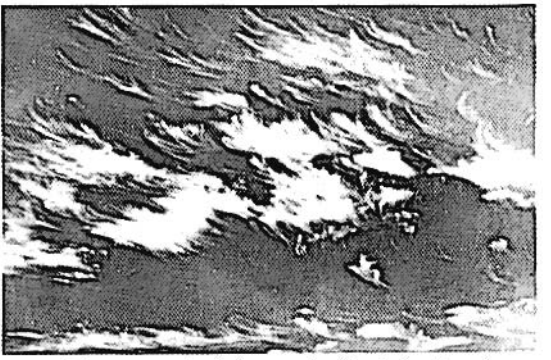
A note about winds and barometric readings

Should the sky be obscured by fog or darkness, you can still predict the passing of a front by checking the direction of the wind and the change in barometric pressure. The direction from which the wind comes will shift clockwise as a front passes. The southerly winds that precede a cold front, for example, will shift to westerlies; easterly winds preceding a warm front will shift to southerlies.

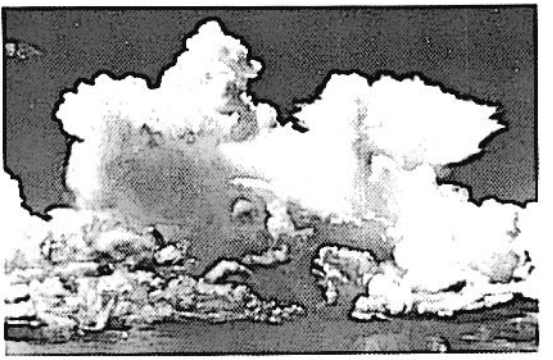
The frontal air that uplifts to form clouds leaves lowered pressure behind on the ground. As a result, the barometer will fall preceding a frontal passing, will be at its lowest as the front passes, and will then slowly rise.

Clouds—in order of appearance

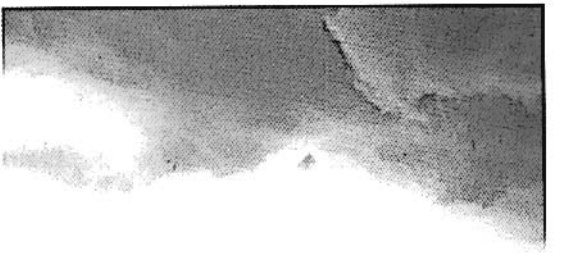
Now that we've looked at fronts from above and in cross section, the only vantage point left is the one we usually have—looking up from the ground. These photographs, courtesy of the National Oceanic and Atmospheric Administration, show the typical clouds you should expect to see as a front approaches. Check them against the clouds labeled in the cross section figures. Of course, these photographs are representative and won't exactly match what you see in the sky. But with these as a guide—and with practice—you'll soon be able to identify whatever the sky brings you.



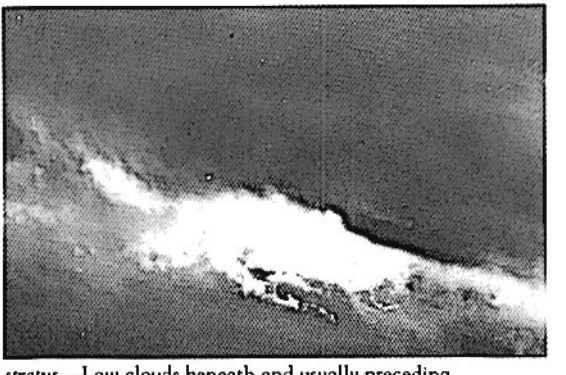
cirrus—Thin wispy clouds that are the first indication of an approaching warm or cold front.



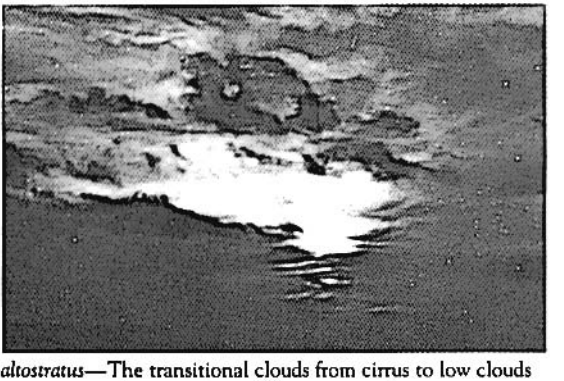
cumulonimbus—The upper portion of the thunderstorm producing cloud mass.



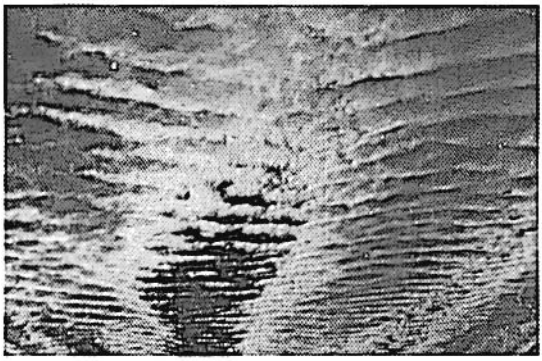
nimbostratus—The lower portion of the thunderstorm-producing cloud mass.



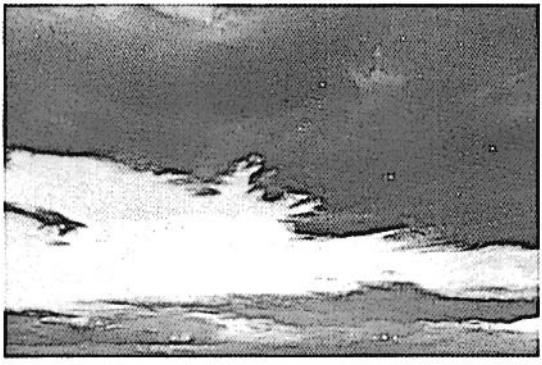
stratus—Low clouds beneath and usually preceding nimbostratus.



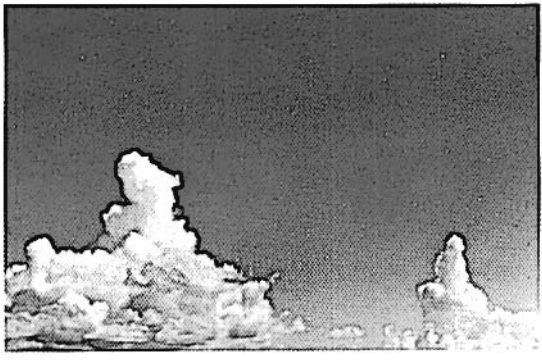
altostratus—The transitional clouds from cirrus to low clouds as a warm or slow-moving cold front approaches.



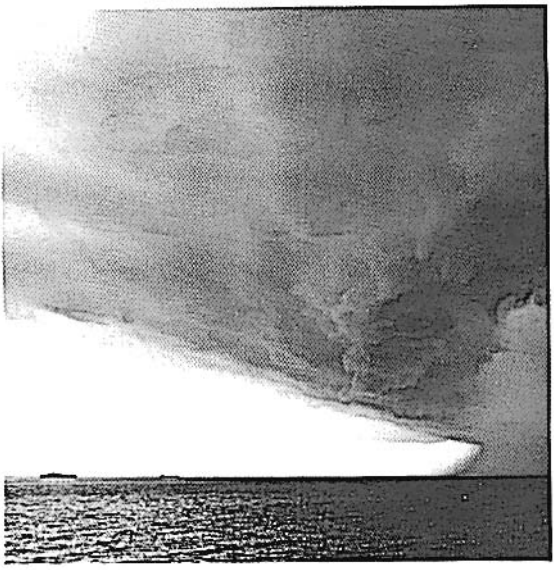
altocumulus—Lower and following altostratus, these often signal increasingly unstable conditions as a warm front approaches.



stratocumulus—Low clouds preceeding the arrival of the warm front stratus.



cumulus—Low puffy clouds that follow the passing of a front, they are an indication of fair weather.



A summertime *squall line.*

To many an unfortunate Chesapeake sailor the photograph above requires no explanation; for the rest of us, bearing down on the freighter from the West (right) is a squall line, a row of intense thunderstorms preceded by winds of up to 50 knots. Though the captain of so large a vessel need not worry for her safety, many smaller boats have been dismasted or worse by summertime squall lines. And it's not just summer that's haunted by hazard; along with fair weather, each new season brings its own foreboding of ill tidings.

SPRING

May–early June

As April gives way to May, the tongers and dredgers of the Chesapeake give up the hunt for oysters to turn their attention to crabs. The warming Bay waters have by now stirred the sleepy crustaceans from their burrows beneath the water into more hospitable and plentiful surroundings, awakening their desire for food and for mating. Above the water, too, the warming of our atmosphere brings changes as sailors and fishermen join watermen on the Bay.

By May the Polar High has retreated to the North, taking with it the intense winter cyclones that have been threatening the Bay since November. The warming of the Canadian prairies has lessened the temperature difference that speeds the jet stream, making storms slower and less violent. Only an occasional Nor'easter will bring a last reminder of winter.

May also brings back the thundershowers that often become an almost daily event in July. The northward drift of the Bermuda High carries warm moist air that, when forced aloft by cooler northerly air, will produce the unstable conditions responsible for showers. That same warm moist air often dries as it drifts over the still-cool Chesapeake waters; these cool waters lower the air temperature below the dew point, sometimes causing the water vapor to condense into a fog.

Picnicking, sightseeing, beachcombing. There are many spring days around the Bay when temperatures climb into the upper seventies (°F) under sunny skies with gentle breezes—days that are ideal for visiting the Chesapeake Bay Maritime Museum at St. Michaels, picknicking at Sandy Point, searching for shark's teeth along Calvert Cliffs, or visiting historic Yorktown.

Around the Bay it usually rains just 5 to 7 days per month during the spring. Much of this rain falls as brief showers or thunderstorms. Spring rainfall ranges from 3 to 4 inches monthly—the least falling along the Eastern Shore, south of Salisbury and over Northern Neck, near the mouth of the Potomac; the most north of the Chesapeake Bay Bridge.

Boating and fishing. Spring boating and fishing are often most comfortable in the tributaries, embayments and sounds where there are usually warmer temperatures, lighter winds, and less chop than on the open Chesapeake. Air temperatures on and near the shore are often 5 to 10 degrees warmer than over the open Bay. Annapolis, for example, averages 7 degrees warmer than Thomas Point, Mathews about 11 degrees warmer than nearby Wolf Trap Light. By the end of May these differences shrink considerably, thanks to rapidly warming Bay waters.

Bay water temperatures are frequently in the fifties in early May, but by the end of the month they have climbed to the upper sixties, particularly in shallower waters.

By May winds of gale force (34 miles per hour or more) blow less often than they did earlier in the year. In fact, winds of more than 16 knots blow less than 10 percent of the time, except over the open Bay. Strong winds are usually associated with winter-type storms or wind gusts generated by thunderstorms. They may

bring choppy seas, although waves are usually less than 2 feet. May usually has only one week of higher waves in open waters; sheltered waters are generally calm.

Thunderstorms occasionally visit the Bay in spring, but they are less severe than those that come in summer. The cool Bay waters and the often strong Bay breeze tend to act as buffers against eastward moving squall lines.

Weather you should watch

Fog—Visibilities less than ½ mile occur only 2 to 3 mornings on average during the month. They are most likely around industrial areas, such as Baltimore and Norfolk. Poor visibilities usually improve by afternoon.

Hazards you should avoid

(See the **Hazards** section for safety tips)

Hypothermia—Immersion in cold water lowers the body's core temperature, progressively causing shivering, loss of manual dexterity and finally muscle rigidity. Continued body cooling brings on mental confusion and, if the body core temperature drops below 85 degrees, heart failure. In the fifty-degree waters typical of early May, this scenario can take place in as little as an hour and a half.

Lightning—Along with thundershowers comes the possibility of lightning. If you are either the highest point on the horizon or are connected to a piece of metal—such as an aluminum Jon boat—you are inviting a lightning strike.

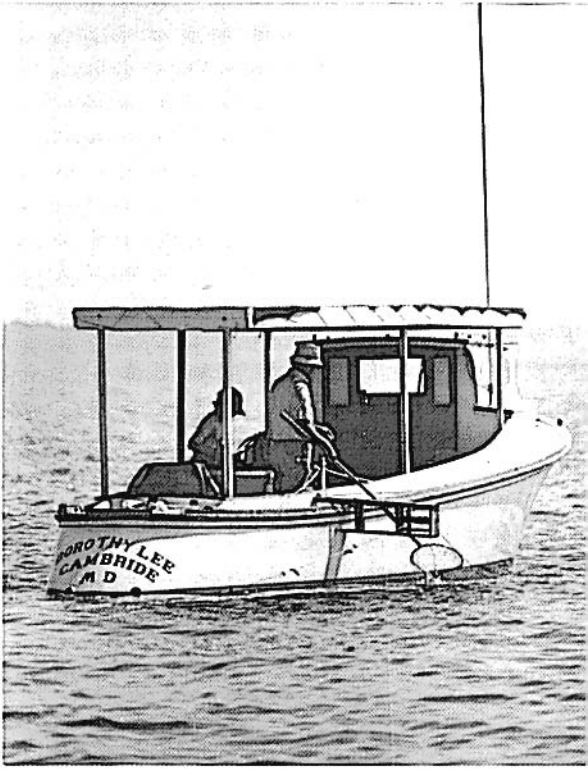
High waves and winds—The occasional winter storm in May can still produce threatening conditions on the surface of the Bay. Be sure to check the local forecast if you're heading out in a small boat. See the **Sources** section for a list of weather information sources and their numbers.

If the prior August was your last encounter with the Bay, remember to prepare yourself for spring weather. This is especially important if you venture out early in spring. A day's sailing trip in August, for example, might leave you in the dark in March, which has 2½ fewer hours of sunlight. And be sure to bring aboard plenty of warm clothing and beverages.

NORTHERN BAY	MAY	JUNE
Percent observations with		
rain	10	10
thunderstorms	1	2
90°F or more	0	0
wave heights more than 4 ft.	14	10
Average water temp °F	64	73
Morning/afternoon		
temp (°F)	64/70	69/70
winds (avg.)	S/S SW/SE	NW/S SW/SE
windspeeds 7-16 kt (%)	55/51	62/53
windspeed greater than 16 kt (%)	12/21	6/11
(%) fog (visibility less than 2 miles)	5/3	7/3

SOUTHERN BAY		
Percent observations with		
rain	5	4
thunderstorms	*	1
90°F or more	0	2
wave heights more than 4 ft.	3	2
Average water temp (°F)	63	72
Morning/afternoon		
temp (°F)	63/70	72/78
winds (avg.)	SW/SW S/E	SW/E S/NE
windspeeds 7-10 kt(%)	53/63	48/61
windspeed greater than 16 kt (%)	13/19	9/11
fog visibility mi (%)	6/4	5/3

*less than ½%



SUMMER

Mid-June–mid-September

By mid-June crabbing is in full swing. On the Cheseapeake, watermen crab either by pot or by trotline. If you spot a row of painted plastic bottles floating on the water, remember that underneath is a crab potter's livelihood—each of those buoys is attached to a square wire-mesh pot. Watermen empty and rebait these cages once a day, otherwise leaving them on the bottom to attract crabs. The trotliners' quarry is the same but their method completely different. These watermen pay out a baited line that may be thousands of feet long and then slowly work the line from one end to the other, dip-netting crabs as they go.

The slow rhythmic pace of trotlining seems well-suited to the often sweltering calm of Chesapeake summers—a calm that is, fortunately, often quickened by Bay breezes. This natural air conditioning extends

just a short distance inland, generally making the Bay a perfect place to beat the heat.

Still, thunderstorms are a regular feature around the Bay by the end of June. Typically striking in late afternoon, these thunderstorms show the direct result of convection—the daylong heating of the land which causes local uplifting of warm air. Though clouds, lightning, thunder and rain usually follow, they don't last as long as those brought by frontal systems. Unfortunately, they are not followed by cooler air—shortly after the showers are over the air may be just as hot and humid as before they arrived.

Beaching and picknicking. Beach days are plentiful during a Chesapeake summer. Water temperatures are in the mid 70s to low 80s (°F). Daytime air temperatures climb into the low 80s at the Bay shore, about 5 to 10 degrees cooler than just a few miles inland. Ninety degree-plus temperatures occur less than 20 days each season at the Bay shore, compared with 30 to 50 days inland.

Rainfall occurs once or twice a week, often as a brief afternoon shower, though July and August are wetter than June. Thunderstorms are most frequent in the southern tidewater area.

Boating and fishing. Summer is great for boating and fishing on the Bay. Air temperatures on the water climb into the upper 70s to low 80s during the afternoon and dip into the 70s at night. Rarely do they climb above 90 or drop below 60; warmer temperatures are more likely in the southern part of the Bay.

Sailing breezes over open waters and near the coast are often 7 to 16 knots, particularly during the afternoon. Occasionally an intensified Bay breeze will bring 25 knot winds. This is most likely early in the summer in open water or in an area where temperature contrasts are great, as in Baltimore, Norfolk, or Hampton.

When water and air temperatures are both in the mid 70s to low 80s in midsummer, the land-water temperature contrast disappears and along with it the Bay breeze. While this is most likely in the morning, it can happen for an entire day—but fortunately not very often.

Open water and nearshore breezes are often out of the Southwest or South in the morning. During the afternoon, southerlies prevail in the northern part of the open Bay while in the South, winds are common from the Northeast through Southwest. Close to the coast, onshore winds are the rule with numerous local variations.

Weather you should watch

Thunderstorms—Occasionally thunderstorms produce gale force winds (34 knots or more) which kick up rough seas. On 15 to 25 days per month seas never get above 2 feet, but there are times (up to 6 percent) when they build to 5 feet or more. Both thunderstorms and rain are most likely late in the day, until sunrise, directly over the water. Precipitation is more common over the northern part of the Bay; an occasional fog may sock in the southern Bay.

Squall lines—When cold fronts are particularly fast moving on a hot day, the thunderstorms they bring can be more intense than usual. A row of such thunderstorms is called a squall line. Keep an eye on the western sky—from the sign of first darkening to the arrival of the squall line is usually about an hour and a half. Return to land if you can—squall lines can produce lightning and winds over 50 knots.

Hazards you should avoid

(See the **Hazards** section for safety tips)

Lightning—What was a distant possibility in spring is now good cause for concern. Late afternoon thunderstorms and squall lines often bring intense electrical activity. Be sure you're not the highest point on the horizon and that your boat is properly grounded if you're near the water during late afternoon.

NORTHERN BAY	JUNE	JULY	AUG	SEPT
Percent observations with				
rain	10	4	11	7
thunderstorms	2	4	2	1
90°F or more	0	4	3	0
wave heights more than 4 ft.	10	4	11	13
Average water temp °F	73	79	79	74
Morning/afternoon				
temp (°F)	69/70	70/82	77/81	70/74
winds (avg.)	NW/S SW/SE	SW/S NW/SE	S/S NE/SE	NW/N N/NE
windspeeds 7-16 kt (%)	62/53	60/56	45/56	—
windspeed greater than 16 kt (%)	6/11	4/16	10/8	—
(%) fog (visibility less than 2 miles)	7/3	*/0	2/1	2/0

SOUTHERN BAY

Percent observations with				
rain	4	6	6	8
thunderstorms	1	1	1	*
90°F or more	2	5	3	1
wave heights more than 4 ft.	2	5	6	10
Average water temp (°F)	72	77	78	75
Morning/afternoon				
temp (°F)	72/78	75/82	70/80	71/77
winds (avg.)	SW/E S/NE	SW/SW S/S	SW/NE NE/E	NE/NE SW/E
windspeeds 7-10 kt(%)	48/61	48/60	51/63	49/56
windspeed greater than 16 kt (%)	9/11	6/9	9/12	17/17
fog visibility mi (%)	5/3	4/4	3/4	6/4

*less than ½%
—lack of observations

AUTUMN

Late September–October

Come September and the rhythm on the water begins to change. Watermen are turning to their winter work of tonging or diving for oysters. The skipjack fleet, a half-century old but newly refitted, begins another season of dredging by sail. Over the water other changes are in store. The season is ending for most of the weekend sailors, is waning for the transient yachtsmen returning from the South and is just beginning for the hunters. The clear autumnal sky is often filled with those other transients—the geese and ducks returning in their annual migration from Canada and the Arctic.

Autumn brings clearer, cooler weather to the Chesapeake. September is the clearest month of the year. Storm systems continue to be weak and infrequent because the jet stream is still far to the North. And convective thunderstorms are less frequent

because there are fewer clouds: the air aloft has been warmed by the heat of summer and the air near the ground is nightly cooled. Such stability inhibits cloud formation.

Sightseeing, beaching, picnicking. From the northern Bay to Norfolk the weather is ideal and the summer crowds are gone. Temperatures range from the upper 60s to mid 70s (°F) during the day and fall to the upper 40s and low 50s at night. Long stretches of rainless days are common, and good outdoor days are the rule from mid-September through mid October.

Boating and fishing. While summer warmth fades in fall, the Bay water retains enough heat to prolong temperate weather right through October. Temperatures range from 50 to 75 degrees in the northern Bay, and up to about 80 degrees in the south. Infrequent rain and strong winds—occurring only about ten percent of the time—are brought by an occasional low pressure system or a rare tropical cyclone.

Autumn is, remember, the season for the rarest—and most terrifying and destructive—of the tropical cyclones, the hurricane. Packing winds of 100 or more miles per hour, hurricanes leave wide paths of destruction whenever they come ashore. Fortunately, hurricanes are rare in the Chesapeake, striking only about once every ten years.

In open waters, autumn winds normally blow up to more than 16 knots about 10 to 30 percent of the time; strong winds are still most likely during the afternoon. These strong winds, particularly northerlies, can generate seas of greater than 5 feet.

During the night and early morning, winds often become light or calm. When this happens under clear skies, radiation fog may form along the coast and drift out over the Bay. Dense fog (visibilities less than ½ mile) occurs on an average of only 2 to 4 days per month. It is at its worst between 3 and 8 a.m., usually lifting by noon.

Water temperatures in the Bay are usually in the low 70s at the beginning of fall and drop to the low 60s as October comes to an end.

Plenty of good sailing weather remains.

Autumn winds are more variable than those of summer. Northerlies alternate with breezes from the

South in a struggle between the last of summer and the first of winter. Both strong winds and calms are more common than they were in summer. Light winds blow along the coast during morning; strong winds are more likely in open waters during the afternoon. Sailing winds are often best in open waters early and in sheltered waters after lunch. The most consistent winds in the 7 to 16 knot range are found near Baltimore, Hampton, Gloucester, and Norfolk.

Strong winds from northern or even southern quarters can build choppy seas in open waters. Near Thomas Point in October, there are about 11 days when seas are over 2 feet, compared to about 15 days at Wolf Trap Light and Smith Point.

Weather you should watch

Hurricanes—Fortunately, the National Weather Service watches these storms for us. Landfall forecasts can usually be reliably made 24 hours in advance. Always stay abreast of marine forecasts when venturing out in autumn. (See the **Weather Warnings** section for warning sources and their meanings).

Hazards you should avoid

(See the **Hazards** section for safety tips)

Hypothermia—By the end of October water temperatures have dropped into the lower 60s. It's time again to be especially cautious about hypothermia. If you're out on the water this time of year, be sure to bring extra warm clothing as a hedge against the effects of an unexpected dunking. A brisk wind on wet clothing can quickly lead to hypothermia.

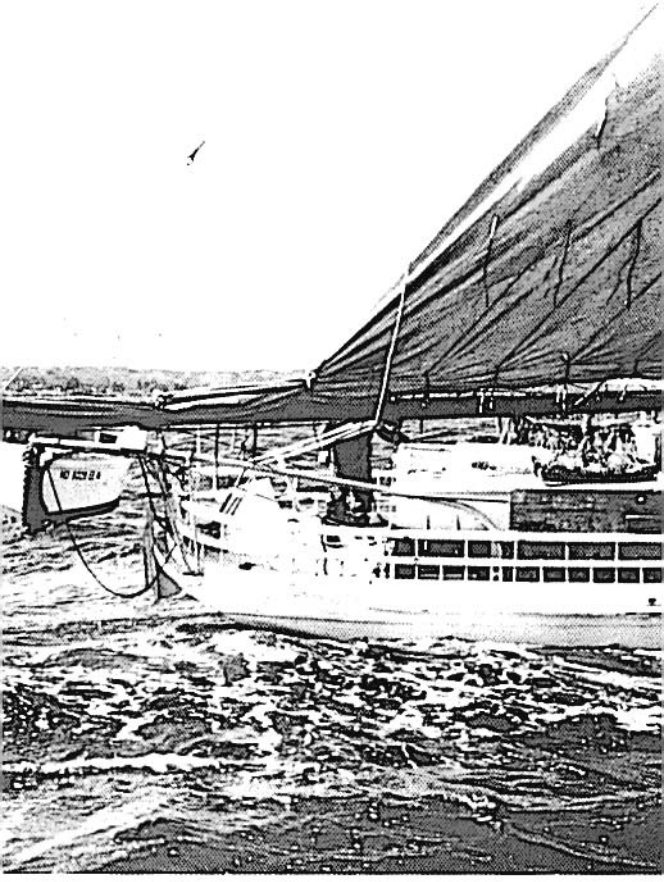
High waves and winds—Early winter storms can be treacherous if you're out unprepared in a small craft. Pay close attention to local weather forecasts and avoid open waters.

NORTHERN BAY	SEPT	OCT
Percent observations with		
rain	7	10
thunderstorms	1	*
90°F or more	0	0
wave heights more than 4 ft.	13	13
Average water temp °F	74	67
Morning/afternoon		
temp (°F)	70/74	60/65
winds (avg.)	NW/N N/NE	NE/S SW/SE
windspeeds 7-16 kt (%)	—	50/50
windspeed greater than 16 kt (%)	—	19/30
(%) fog (visibility less than 2 miles)	2/0	*/3

SOUTHERN BAY

Percent observations with		
rain	8	6
thunderstorms	*	*
90°F or more	1	0
wave heights more than 4 ft.	10	12
Average water temp (°F)	75	67
Morning/afternoon		
temp (°F)	71/77	62/67
winds (avg.)	NE/NE SW/E	NE/N E/NE
windspeeds 7-10 kt(%)	49/56	46/55
windspeed greater than 16kt (%)	17/17	20/22
fog visibility mi (%)	6/4	7/4

*less than ½%
—lack of observations



WINTER
November–April

Come November and the watermen and shippers have the Bay largely to themselves. This is a dangerous time to be out on the water—and for no one more than the watermen, some of whom are lost yearly to the cold waters and savage winter winds of the

Chesapeake. Hypothermia is a real danger this time of year. One false move in the oyster tonger's delicate dance on the narrow washboard of a Chesapeake deadrise could spell doom. One rolling wave over the stern of a heavily-laden gillnetter could be the last. If you come to the water in winter be prepared for the worst—be prepared for high winds and high waves. Be prepared for rapid-fire storm systems and wind chills below zero.

The frigid Polar High brings us this weather. The cooling of the Canadian prairies invites the jet stream farther south where it will blow two to three times as fast. One storm system after another will spin off the accelerated jet stream, each lashing the Bay region—and especially the open Bay—at up to twice the summertime speed, each bringing winds of 25 to 45 knots over open water, each whipping seas to five feet or more for days at a time.

Weather you should watch

Nor'easter—This is one storm you'll come to know if you spend winters near the water. Named for the direction from which the strongest winds come, when it comes it calls twice. Its first visit is as a typical (miserable) low pressure storm system hurrying across the Chesapeake. But after it scurries over the Delmarva Peninsula and out to the Atlantic it stalls. There, the storm builds, fueled by energy from the warm Gulf Stream waters. Its second visit is as a persistent wet howl, bringing northeasterly winds of up to 50 knots, that may last for days.

Fog—Beginning in January and extending through April, we can expect 30 to 40 fog days. Fog depends on the dew point, the temperature at which water condenses out of air (the more moisture in the air, the lower the dew point). When warm air with a low dew point crosses over cooler Bay waters, the water cools the air past the dew point and fog results. The visibility during fog normally ranges from zero, if there is no wind, to less than a mile.

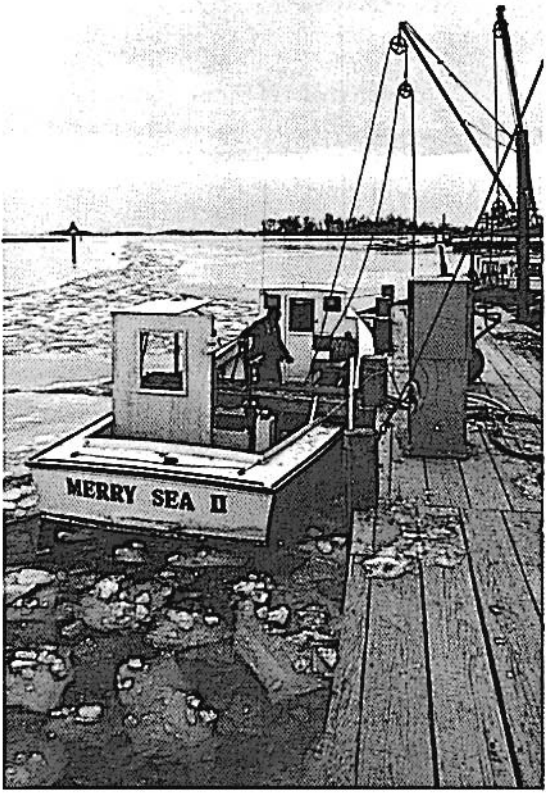
Hazards you should avoid

(See the **Hazards** section for safety tips)

Hypothermia—Winter weather can kill. See the **Spring** section for a discussion of hypothermia.

Ice—The Bay ices up heavily only about once every ten years. The other nine years are perhaps even more dangerous to boaters because once on the water, they may have difficulty returning as skim ice hardens. Skim ice, the thin ice covering common during January and February, is particularly hazardous to wooden boats—it

looks harmless enough but can slice clear through wooden planking. Don't assume that because watermen are out on the water in wooden boats it's safe for you—the bows of winter workboats are often sheathed with copper or tin to protect against skim ice damage.

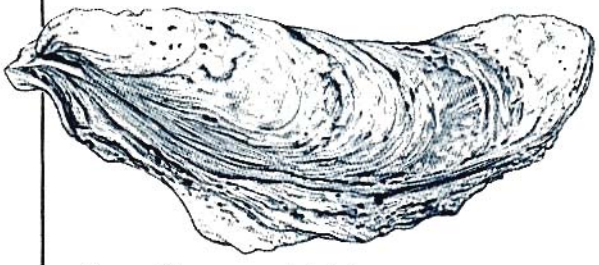


FELLOW TRAVELERS

No one travels the Bay alone. Beneath your keel or around your feet is a complex web of life whose members are your constant companions. It is a web of life we all belong to, and humans are merely the last links in the Chesapeake's food chain.

Most of the animals you're likely to seek or see on the Chesapeake form the next-to-last link in that chain. These are the creatures we eat. Though the most conspicuous, the animals you see form only the visible tip of a much more imposing food chain or pyramid. With each pound of bluefish you haul in, for example, imagine that you are harvesting some 40 tons of plankton. This is the amount of tiny plant life—eaten by the copepods (animal plankton) and anchovies—that it took to feed the bluefish before it became your meal.

And more seafood comes from the Chesapeake's food chain than from any other estuary on earth. One reason for this high productivity lies in the Bay's variety of communities. From marshlands to oyster beds to deep open waters, the Chesapeake is a study in



Oyster (*Crassostrea virginica*)

Spat—juvenile oysters that have settled on an old shell

ecological accommodation. Another reason is climate. And here, too, variety is important. With the wintry blast from the Polar High come more northerly creatures—the blue water mussels and the Jonah crabs—used to the cold hospitality of New England's waters. In summer, up from the Carolinas come the pink, white and brown shrimp and the Jacks and Pompanos, lured by the summertime northerly drift of the Bermuda High to the Chesapeake.

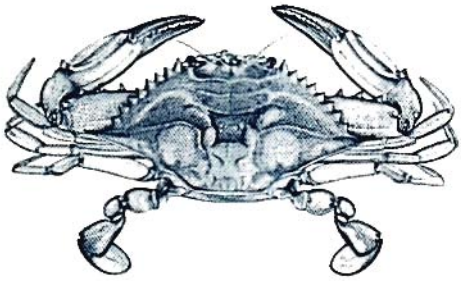
These and many other organisms follow the weather out of their usual ranges and meet in the rich organic soup that attracts fishermen and sailors and watermen by the hundreds of thousands.

Only a few of the over 2,700 species of animals and plants that live in the Chesapeake's waters show up on market shelves or dinner tables, but they all have commercial and recreational value—they all, like us, have currency in nature's carbon economy. Think of the animals presented in this guide—a small sample of those 2,700 for which the Bay is most renowned—as participants along with you in the Bay's food economy, as players in the harmony of weather and life around the Chesapeake. Think of them as fellow travelers.

Consider the oyster. People have fought and died over it, dredgeboat crews have been shanghaied to catch it and miles of road have been paved with its shell. Unchanged after 60 million years of predation and environmental hazard, it carries on with seeming indifference. This living fossil is easily the Bay's most persistently sought and easily recognized living resource.

Oysters make their home in clusters on the bottom called beds. Usually in waters from eight to 25 feet deep, the beds are found from the mouth of the Bay to as far north as Pooles Island (in the central Bay, north of Baltimore). Each bed is a world unto itself, supporting an abundant variety of life, including boring sponges, oyster crabs, worms, oyster drills and small shellfish called limpets.

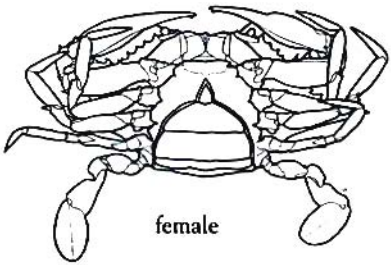
In times past, a good year would see three million bushels of oysters harvested from the Chesapeake's waters by dredge, tong, or diver's basket. The recent precipitous decline of the wild oyster fishery may cause a long-lasting revision of our measure of the Bay's wealth.



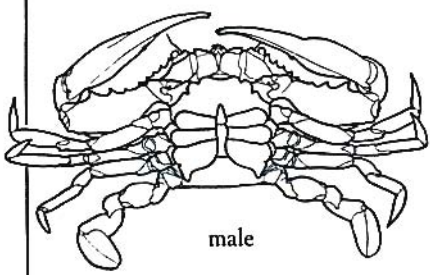
Blue crab (*Callinectes sapidus*)

Rivaling the oyster for preeminence in Bay seafood is that beautiful and savory swimmer (as the Latin name is translated), the blue crab. Found throughout the Bay at various depths and salinities, the blue crab voraciously feeds on virtually anything, from living plants to dead animals to molting members of its own species. Blue crabs burrow into the muds during the winter, the females scurrying down to the deep Virginia waters, the males settling into the nearest deep channel.

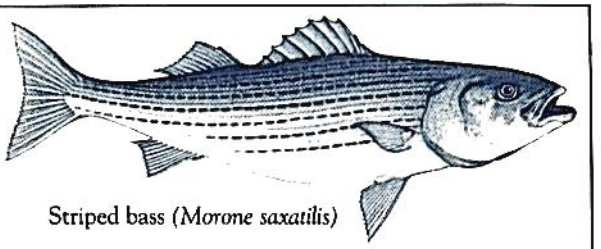
Over 55 million pounds of this crustacean are taken from the Bay by pot and trotline in a good year. And millions more are taken by the chicken-neckers, as recreational crabbers are known to watermen.



female



male



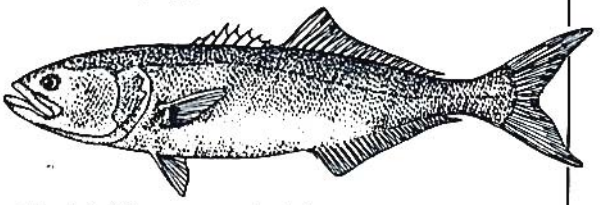
Striped bass (*Morone saxatilis*)

Once the most popular game and food fish of the Chesapeake, the striper, or rockfish as it is otherwise known, is now a species in decline. From a harvest of almost 15 million pounds in 1973, the catch had declined to less than 5 million by 1980.

The stripers' main port of call is the Chesapeake. Spawned in the Bay's fresh tributary waters, they migrate down and out of the Bay waters as they mature, only to return to home waters in the spring to spawn and complete the cycle. Some adults modify this pattern by passing through the Chesapeake and Delaware Canal, migrating out into the Atlantic where they travel up the coast to Maine or down to the Carolinas. Everywhere along the way fishermen wait for a chance at this most prized of game fish.

Reasons for the decline of the striper are unclear; explanations range from acid rain to too much chlorine and other harmful chemicals to a natural cycle—after all the striper didn't become plentiful until the 1950s, about the time when croaker populations declined.

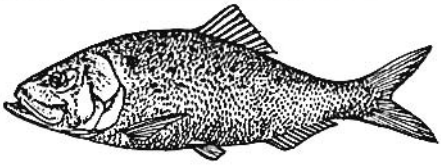
Check with local authorities before angling for rockfish—firm restrictions may apply.



Bluefish (*Pomatomus saltatrix*)

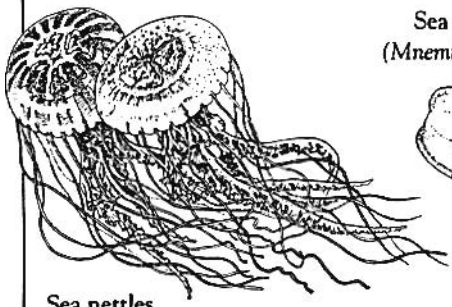
Once fairly uncommon, the bluefish came into prominence as the principal large forager following the decline of the striped bass. Adult and juvenile blues come into the Bay from the Atlantic in spring and, when populations are large, swim up into low-salinity waters.

Now a popular prey of charterboat skippers and other recreational fishermen, bluefish are sought because they're so plentiful and because they're so voracious—blues are known to continue attacking schools of menhaden even after they've had their fill. Like sharks, they seem drawn to the frenzied act of killing.



Menhaden (*Brevoortia tyrannus*)

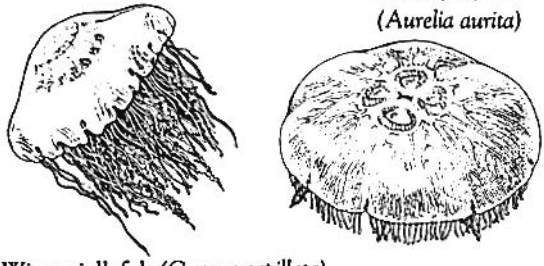
More menhaden are annually harvested from the Chesapeake than any other fish, although you won't find them in your local market—the oily and nearly inedible menhaden are used for poultry feed, crab bait, fertilizer, paints and cosmetics. They are also the favored prey of stripers, bluefish and other large foragers.



Sea walnuts
(*Mnemiopsis leidyi*)

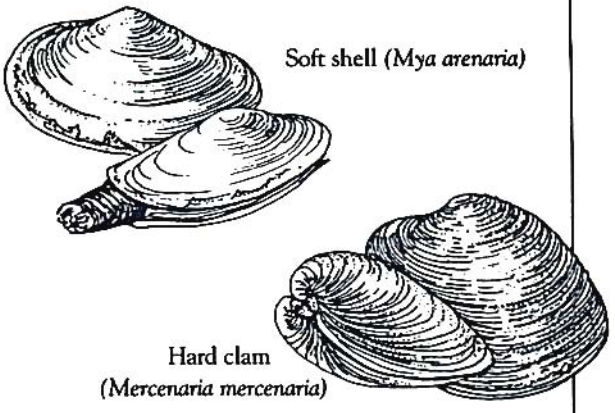
Sea nettles
(*Chrysaora quinquecirrha*)

Moon jelly fish
(*Aurelia aurita*)



Winter jellyfish (*Cyanea capillata*)

These traveling companions most people would rather leave behind. The sea nettle is the most noxious of the group, both because it often becomes plentiful during summer and because it packs a painful sting. Swimming can be a miserable experience in the Chesapeake when the nettles are out. About the only way to avoid them is to stay in low-salinity waters. According to local folk wisdom, the best relief for nettle stings is a sprinkling of monosodium glutamate (meat tenderizer) or baking soda.



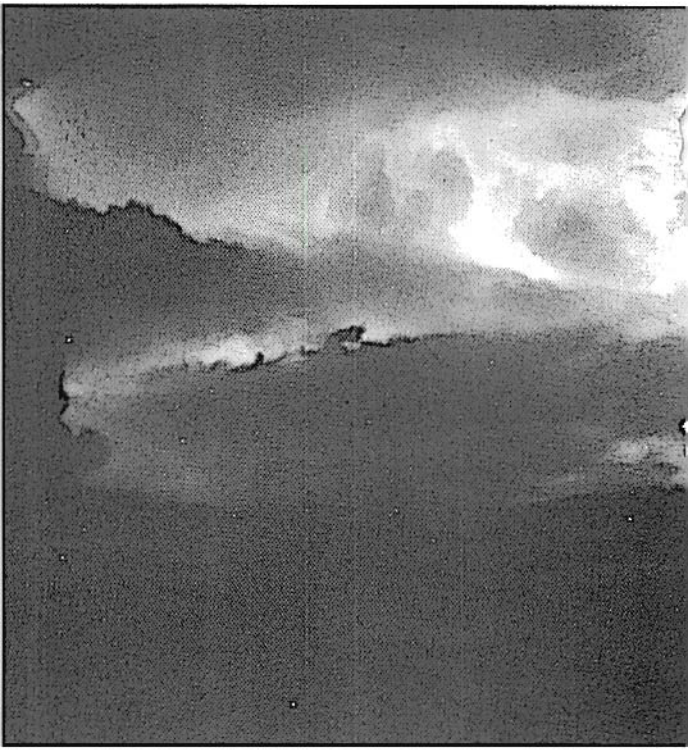
Soft shell *(Mya arenaria)*

Hard clam
(Mercenaria mercenaria)

Soft shell clams, the steamers of New England, are found throughout the Bay in lower salinity tributaries, although they are commercially harvested (look for workboats with large hydraulic escalators slung over one side) only between the Potomac and Chester rivers. Hard clams are found in higher salinity areas and are commercially more significant in the southern Bay.

Both clams burrow into soft sediments in shallow waters; the soft shell clams also live in the intertidal zone between the reaches of the high and low tides. You can dig up soft shell clams during low tide by looking for holes in the sediment (some of which may be bubbling). Hard clams are often collected by treading—walk barefoot in shallow water; when you feel a hard object grasp it with your toes and bring it up against your leg. Many people toss the clams in floating baskets pulled behind them. Be careful not to get a crab or toadfish!

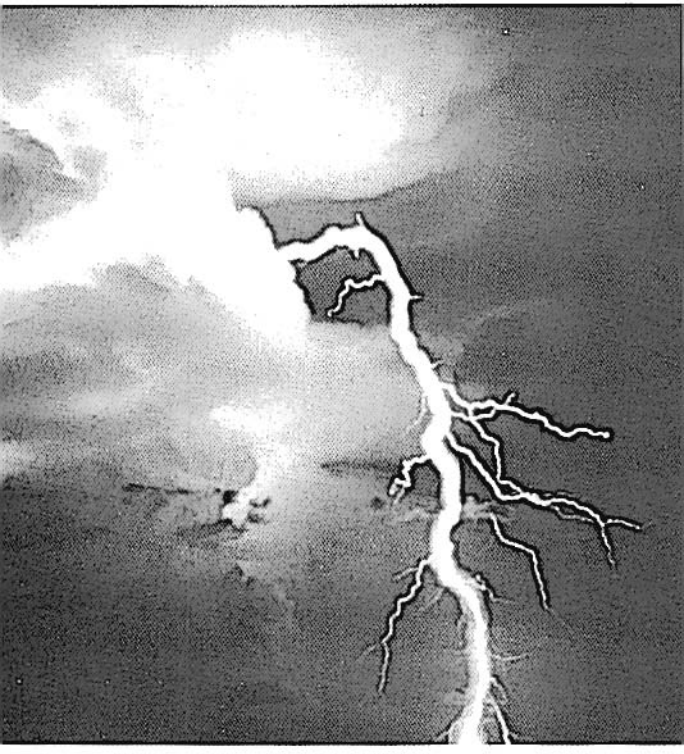
If you decide to try your hand at catching or collecting Baylife, be sure to contact the Department of Natural Resources in Maryland or the Water Resources Department in Virginia for applicable regulations. Catch limits apply for many species, licenses may be required, and for some types of fishing, oystering and crabbing, for example, waters are restricted by gear type.



HAZARDS

Racing down the Bay on a broad reach, weather guide in hand—you might feel protected against whatever nature can deliver. You might feel complacent and insulated from hazard. You might be wrong.

Understanding how to predict the weather counts for little if you're unprepared for its consequences. The Chesapeake's temperate and generally predictable climate invites an easy feeling of calm, but there are dangers lurking above and below the Bay's surface—dangers such as lightning and hypothermia, rough waters and ice and wind chill. No one who visits the Bay has a guarantee against such hazards. The best we can do is to know how to cope with them should conditions make them seem likely.



Lightning

As with winds, lightning is nature's way of keeping things even. Water droplets racing past each other in up- or downdrafts within thunderstorm clouds (nimbostratus and cumulonimbus) are the vehicles for the separation of electric charge. When the charges become strong enough, lightning strikes and neutralizes the charge. Of course lightning may stike between clouds or, and here's our worry, between a cloud and the ground. The latter happens when the bottom of a cloud becomes so highly charged that an opposite charge is induced on the ground.

Bolts of lightning follow the path of least resistance to electric neutrality—they'll strike either the closest or the strongest center of opposite charge. The trick in avoiding lightning is not to be either. Rule one is to stay away from metal objects—they will easily assume

an induced charge and become a good candidate for a strike. Rule two is not to be the highest object on the horizon.

Someone struck by lightning may be severely burned and may suffer cardiac arrest. The first aid should begin with CPR—administer it promptly and for a prolonged period. Except for the rare chance of another strike, don't worry for your own safety—the victim's body is electrically neutral.

Hypothermia

Be careful of this silent killer, especially if you're on the water between October and May—hypothermia's chilling effects may take hold in waters as warm as 70 degrees (°F). The effects range from shivering through loss of manual dexterity, muscle rigidity, mental confusion to eventual unconsciousness and heart failure. The problem is cooling of body core temperature and it happens whenever you're exposed to cold—especially if the exposure is to cold water. People washed or thrown overboard are the most likely targets—especially people who aren't wearing personal flotation devices (PFDs). And this unfortunately includes 93 percent of people who are on the water.

If you're thrown into cold waters your best strategy, if you're wearing a PFD, is to assume the Heat Escape Lessening Position (H.E.L.P.)—hold your arms tightly over your chest and raise your thighs to cover your groin. And, most importantly, keep your head out of the water. The reasoning behind this technique is simple: heat loss is greatest from the head, chest and groin.

If you're not alone when you're thrown into the water, join your unfortunate companions in the HUDDLE position: floating upright, wrap your arms around each other, keeping your chests tightly packed together, and intertwine your legs.

Assuming either of these positions may double your survival time. At a water temperature of 50 degrees, for example, the average survival time in the HELP or HUDDLE position is about four hours; if you swim or tread water this figure is cut in half. Other points that may help save your life:

- Keep your clothes and shoes on as protection from the cold,
- Avoid excessive movement to reduce exposure, and
- Stay with your boat unless you're absolutely certain that you can reach shore—since most of your energy will go toward keeping you warm you won't be able to swim very far.

Hypothermia may also affect those who are exposed to rain, spray and winds. As protection, wear a water-resistant wind-breaker over warm clothing. And keep an eye on your companions—shivering and sluggish speech are early signs of hypothermia. To really play it safe you should learn cardio-pulmonary resuscitation (CPR) and other hypothermia first aid techniques (see the Sources section for helpful publications).

Life in the shipping lane

Hundreds of awkward lumbering giants annually run up the mainstem of the Chesapeake making the channel one of the nation's busier commercial waterways—and a place for you to approach cautiously or avoid. Ships in the Bay need not threaten if you understand and allow for their limitations—they are not easily maneuvered and are slow to stop. It typically takes 4 to 6 minutes and 2,000 to 4,000 feet to stop a large ship once the engines are reversed. Your best insurance against collision (which few in small boats survive) is to know how to identify the direction of a ship's motion. At night you can tell by the pattern of lights; during the day look for the bow wake, the "bone in her teeth." If you have a VHF radio, monitor channel 13 or 16. See the Sources section for helpful publications.

A hazard yourself?

One hazard that annually takes many boaters from the Chesapeake's waters is self-induced: drunkenness. Piloting any craft in open waters requires common sense and keen perception—the two things most likely to be fogged by excessive alcohol. Because alcohol dilates the blood vessels, thus allowing the greater release of body heat, people who have consumed alcohol are also at greater risk of exposure and hypothermia.

WEATHER WARNINGS

Where to get them. . .

So you've studied the ways of the weather and you've watched the skies for signs of an approaching storm. You've learned what weather is typical for this time of year, and are familiar with the likely hazards. Maybe you've even read the paper for the day's forecast. Are you now ready to venture out safely onto the water in a small boat?

Well, not quite.

You still have to check the marine forecast, which emphasizes boating conditions and issues warnings (see below). And to really play it safe you should monitor a weather frequency while underway.

The best source of marine weather information before you leave is the National Weather Services taped telephone broadcasts:

Hampton Roads and vicinity	(804) 853-3013
Lower Chesapeake Bay	(804) 222-7411
Baltimore to Patuxent and tidal Potomac	(202) 899-3210 (301) 399-3210

The most comprehensive weather forecasts for the Chesapeake Bay are issued by the National Weather Service. Broadcast every three to five minutes over VHF-FM frequencies, these forecasts are updated every six hours (5:00 a.m., 11:00 a.m., 5:00 p.m. and 11:00 p.m.) or whenever changing conditions warrant. Inexpensive weather radios (designated with channels 1, 2, or 3, corresponding to the frequencies listed below) are available from many boating supply companies. Depending on how extensive your trip, you may need more than one channel—transmitter ranges are 30 to 70 miles. Chesapeake Bay transmitter locations and frequencies are:

Philadelphia, PA	162.475 MHz	Weather 3
Hagerstown, MD	162.475	Weather 3
Baltimore, MD	162.40	Weather 2
Salisbury,MD	162.475	Weather 3
Heathsville, VA	162.40	Weather 2

Lynchburg, VA	162.40	Weather 1
Richmond, VA	162.475	Weather 3
Norfolk, VA	162.55	Weather 1

The Coast Guard also broadcasts weather information and warnings from the National Weather Service. The transmissions are from Baltimore and Hampton Roads on **Channel 22 (157.1 MHz).** Severe emergency weather warnings are broadcast on **Channel 16 (156.8 MHz).** The Norfolk Marine Operator also broadcasts Coast Guard weather information (derived again from the National Weather Service) every six hours (6:00 a.m., etc.) on Single Side Band frequency **2538 KHz** and ten minutes later at **2540 KHz.** Weather warnings are broadcast as received, again 15 minutes later, and then every one to two hours.

. . . and what they mean

SMALL CRAFT ADVISORY—This warning is issued when winds are expected to exceed 20 knots and waves three feet during April through November, and when winds are expected to exceed 25 knots and waves four feet during December through March. Such conditions are hazardous for smaller craft, boats up to about 24 feet, but you must judge the suitability of this warning to your boat and seamanship.

SPECIAL MARINE WARNING—Winds in excess of 34 knots warrant a special marine warning. These are usually issued for approaching severe thunderstorms and waterspouts. Of course, it is not always possible to know these conditions in advance so keep your weather-eye peeled.

GALE WARNING—Issued when winds of 34 to 47 knots and waves of five feet are expected. Only larger boats should be on the water.

STORM WARNING—Issued when winds of 48 to 63 knots are expected. All boats should stay in port.

HURRICANE WARNING—Issued when winds exceeding 64 knots in hurricane conditions are expected. Even the largest of ships is in peril in such conditions.

AVERAGE ACTIVITY DAYS

	MAY		JUNE		JULY
	1-15	16-31	1-15	16-30	1-15
BEACH DAYS					
Baltimore	3	4	8	10	12
Washington	3	5	9	11	13
Norfolk	4	6	8	10	11
SAILING DAYS					
Baltimore	8	11	12	12	12
Washington	9	11	11	11	12
Norfolk	10	12	13	13	12
SIGHTSEEING DAYS					
Baltimore	9	12	12	11	11
Washington	10	13	12	11	11
Norfolk	10	12	12	10	10

*less than ½ day

Beach day

(using 9 am, 12 noon, 3 pm LST observations)
good if:

1. visibilities more than 2 1/2 miles at least once; and
2. windspeed less than 17 knots at least twice; and
3. air temperature—80°F or more at least once; and
4. cloud amount more than 9/10 or overcast with ceiling of 20 thousand feet or less twice or less; and
5. precipitation occurs twice or less

Sightseeing day

(using 9 am, 12 noon, 3 pm LST observations)
good if:

1. visibility more than 1 mile at least once; and
2. windspeeds less than 17 knots at least twice; and
3. temperatures 65°F to 90°F at least twice; and
4. relative humidity less than 46% with temperatures of 85°–90°F at least twice; and
5. precipitation twice or less

JULY	AUG		SEPT		OCT	
16-31	1-15	16-31	1-15	16-30	1-15	16-31
13	11	11	8	4	2	•
14	12	13	9	5	2	•
13	11	11	8	5	2	•
12	12	12	11	10	7	4
11	11	11	10	10	7	4
13	12	13	12	11	10	6
10	11	12	12	12	9	6
10	10	12	12	12	11	7
9	9	10	12	12	11	7

Sailing day

(using 6 am, 9 am , 12 noon, 3 pm LST observations)
good if:

1. visibility 2 miles or more at least once; and
2. windspeeds 7-16 knots at least twice; and
3. temperatures 65°F or more at least twice; and
3. temperatures 65°F or more at least twice; and
4. precipitation twice or less

NORTHERN BAY	MAY	JUNE
Percent observations with		
rain	10	10
thunderstorms	1	2
90°F or more	0	0
wave heights more than 4 ft.	14	10
Average water temp °F	64	73
Morning/afternoon		
temp (°F)	64/70	69/70
winds (avg.)	S/S SW/SE	NW/S SW/SE
windspeeds 7-16 kt (%)	55/51	62/53
windspeed greater than 16 kt (%)	12/21	6/11
(%) fog (visibility less than 2 miles)	5/3	7/3

SOUTHERN BAY		
Percent observations with		
rain	5	4
thunderstorms	*	1
90°F or more	0	2
wave heights more than 4 ft.	3	2
Average water temp (°F)	63	72
Morning/afternoon		
temp (°F)	63/70	72/78
winds (avg.)	SW/SW S/E	SW/E S/NE
windspeeds 7-10 kt(%)	53/63	48/61
windspeed greater than 16kt (%)	13/19	9/11
fog visibility mi (%)	6/4	5/3

*less than ½%
—lack of observations

JULY	AUG	SEPT	OCT
4	11	7	10
4	2	1	*
4	3	0	0
4	11	13	13
79	79	74	67
70/82	77/81	70/74	60/65
SW/S	S/S	NW/N	NE/S
NW/SE	NE/SE	N/NE	SW/SE
60/56	45/56	—	50/50
4/16	10/8	—	19/30
*/0	2/1	2/0	*/3

6	6	8	6
1	1	*	*
5	3	1	0
5	6	10	12
77	78	75	67
75/82	70/80	71/77	62/67
SW/SW	SW/NE	NE/NE	NE/N
S/S	NE/E	SW/E	E/NE
48/60	51/63	49/56	46/55
6/9	9/12	17/17	20/22
4/4	3/4	6/4	7/4

SOURCES

Printed materials

General weather

Whelpley, D. A. 1961. *Weather, Water and Boating.* Cambridge (MD): Cornell Maritime Press

Lucy, J., Ritter, T. and J. Larue. 1979. *The Chesapeake: a Boating Guide to Weather.* Order from: Sea Grant Communications Office, Virginia Institute of Marine Science, Gloucester Point, VA 23062. Price: $1.00.

Lightning

Recommended Practices and Standards Covering Lightning Protection. Order from: American Boat and Yachting Council, Box 806, Amityville, NY, 11701.

Lightning: Grounding Your Boat. Order from: Marine Advisory program, Sea Grant College, H.J. Patterson Hall, University of Maryland, College Park, Maryland 20742.

Hurricanes

Hurricane and Severe Weather Checklist for Boaters. Order from: University of Florida Marine Advisory Program, Florida Cooperative Extension Service, GO 22 McCarty Hall, Gainesville, FL 32611

Hypothermia

Hypothermia and Cold Water Survival. Order from: Office of Boating Safety, U.S. Coast Guard, Washington, D.C. 20590.

Boating guides

Chapman, Charles. *Piloting, Seamanship and Small Boat Handling.* Motor Boating and Sailing Books. P.O. Box 2316, New York, NY 10019.

Guide to Cruising the Chesapeake Bay. Chesapeake Bay Communications, Inc. 1819 Bay Ridge Avenue, Annapolis, MD 21403.

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Keep Clear: Big Ships in the Chesapeake Bay. Order from: Marine Advisory Program, Sea Grant College, University of Maryland, H.J. Patterson Hall, College Park, MD 20742.

Wildlife guides

Lippson, A. J. 1973. *The Chesapeake Bay in Maryland: an Atlas of Natural Resources.* Baltimore: Johns Hopkins University Press.

Lippson, A. J. and R. L. Lippson. 1984. *Life in the Chesapeake Bay.* Baltimore: Johns Hopkins University Press.

Courses

Cardio-pulmonary resuscitation (CPR)

American National Red Cross—contact your nearest chapter.

Boating, seamanship and water safety

American National Red Cross

United States Power Squadron
District Educational Office
USPS, District 5
PO Box 30423
Raleigh, NC 27612
(800) 243-6000

United States Coast Guard Auxiliary
District Director
5th Coast Guard District
Portsmouth, VA 23705
(804) 398-6207

Maryland Natural Resources Police
Boating Safety Education Office
Tawes State Office Building
Annapolis, MD 21401
(301) 269-2247

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