Marine Resource Bulletin

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A SEA GRANT ADVISORY SERVICE OF THE COLLEGE OF WILLIAM AND MARY

by Dick Cook

Climate Scale Model Predicts Croaker Populations

Dick Cook Photo

From the sorting table (cover photo) to an ice-filled shipping carton goes a full measure of spot and croaker. Accurate predictions of populations will aid commercial operations such as this Severn, Virginia wholesaler.

WATERMEN AND MARINE scientists for years have suspected a relationship between subnormal water temperatures and mortalities of certain fish species. In the Chesapeake Bay area, for example, juvenile Atlantic croaker stocks suffer mortalities when the water temperature drops below 4° C. The extent to which such die-offs affect surviving year classes and subsequent harvest potential is a subject important to commercial fishermen and resource managers, alike.

Previously, the assessment of any given fishery has depended upon yield models that do not take environmental fluctuations into account, even though at least one such factor, temperature, can have a drastic affect on the survival, and hence the abundance, of several commercially important species.

Because of the croaker's commercial importance, and because of a unique opportunity to use long-term water temperature and trawl survey data, VIMS graduate student Brenda L. Norcross, a Ph.D. student in the School of Marine Science, has attempted to develop a climate scale model to predict croaker populations.

According to Dr. Herbert M. Austin, Norcross' major professor, similar work has been done on Atlantic menhaden by Dr. Merton C. Ingham (National Marine Fisheries Service, NOAA), another member of Norcross' dissertation committee. Dr. Sharon K. LeDuc (Environmental Data and Information Service, NOAA), who also serves on the committee, has successfully correlated weather with corn and wheat yields.

"We had a really unique opportunity to study croaker right here in the York River," Norcross said, "the channels and deeper holes in the York constitute the wintering ground for croaker. I was able to use 25 years of existing data from the VIMS juvenile trawl survey, plus concurrent water temperature data."

The York River data set was the primary base from which Norcross and Austin developed the croaker prediction model. Abundance values for croaker were corrected to "number per 10-minute tow." A croaker biological year was designated October through the following September, since October is considered the peak of croaker spawning, and as such is the reference month for aging the species.

Annual commercial croaker landings data (1962-1976) by state and water body for the East Coast was supplied by the National Marine Fisheries Service. From this, only Virginia landings were selected. To lengthen the data set, NMFS croaker landings data for Virginia (1929-1976) were included, as were Virginia Marine Resources Commission data (1977-1979).

Norcross and Austin considered it especially fortunate that the survey used for the data base encompassed the periods of disappearance, absence and resurgence of the Atlantic croaker in the Chesapeake Bay region.

As previously stated, the object of the researchers' work was to come up with a predictive model for Atlantic croaker in the York River. The published results, "Climate Scale Environmental Factors Affecting Year Class Fluctuations of Chesapeake Bay Croaker," is VIMS Special Scientific Report No. 110. The work was supported by the National Marine Fisheries Service and the Office of Sea Grant, NOAA.

In action, the model seems to be working. Quoting from a paper by Norcross, Austin, LeDuc and Ingham to be presented before the International Council for the Exploration of the Sea in early October, 1981:

> "In order to predict the number of juvenile croaker that will be in the York River during the summer of 1981, the 1981 January (1.6 C) temperature and February (4.9 C) temperatures were averaged, and this average (3.3 C) was put in to the predictive equation. According to the model, the average number of juvenile croaker that will be caught per 10-minute tow by the VIMS York River trawl survey from April to September, 1981 is predicted to be 3.69."

What does this mean in terms of relative croaker abundance? "That's a pretty low number," Norcross said, "and so far, the trawl results are well within the accuracy limits predicted by the model. The April through July average number of croaker per 10-minute tow in the York River is 1.15.

The historical data show a low of 0.09 croaker per trawl in 1968 and a high of 142.6 in 1974. No croaker were caught in the April 1981 samples. Norcross says that in the past, there were 8 years in which no croaker were caught in April, and that those years, between 1959 and 1969, coincided with the decline of the commercial croaker fishery in Virginia.

"Based on the model prediction and what we are seeing in the trawls so far, it appears the cold snap we experienced at the beginning of 1981 will result in a small croaker year class, and possibly reduced sport and commercial catches in 1982-82," Norcross said.

That isn't the best news for Bay area fishermen, but if the prediction model continues to prove accurate, it will give advance notice not only of poor years, but of bumper years for this sought-after fish as well. Any such information on important fish species will help those who utilize the fish plan ahead, and that IS important.

Handicapped Boaters Association Formed

HBA are the initials, and they stand for Handicapped Boaters Association, a non-profit organization chartered by the State of New York that believes recreational boating is for everyone, even the severely handicapped.

HBA's key purpose, according to its President, Gene Hedley, is the sharing of information, formalized bi-monthly in the organizations' journal, Boating World Unlimited.

Literature introducing HBA sets as its aims the establishment of a national communications network for disabled boaters; indentification of the recreational boating needs of the disabled; and informing the marine industry, recreation community and relevant government agencies of the needs of disabled boaters.

For more information please direct your inquiry to: Handicapped Boaters Association, P.O. Box 1134, Ansonia Station, New York, N.Y. 10023.

Scientists Seek Answers to Buffer Zone Dilemma

by Kym Young

Dick Cook Photo

With Sea Grant backing, researchers at VIMS and Old Dominion University are taking a close look at the "buffer zone" concept of quarantining shellfish beds near marinas.

TWO OF VIRGINIA'S major industries, shellfishing and recreational boating, share the same waters of Chesapeake Bay. The extent of impact that boating and marina activity have on the cleanliness of adjacent waters supporting (or capable of supporting) shellfish is an issue now being studied by scientists from the Virginia Institute of Marine Science (VIMS) and Old Dominion University (ODU). VIMS Sea Grant Marine Advisory Services encouraged the scientists to undertake the study as a result of concern expressed by the affected industries and resource management agencies. The study is now being coordinated through Virginia's Graduate Marine Science Consortium.

The primary objective of this three-phase study, funded by the National Sea Grant Program and the State of Virginia, is to provide information on the impact of selected marinas on the bacteriological quality of adjacent waters. The work of Dr. Howard Kator, VIMS Department of Microbiology-Pathology, involves bacteriological studies of fecal coliforms in the vicinity of estuarine marinas. Dr. Paul Hyer, VIMS Department of Oceanography, is working on computerized mathematical models of marina flushing, and Dr. Carvel Blair, ODU Department of Oceanography, is using the Chesapeake Bay Model in Stevensville, Maryland, to compare the flushing rates to tidal creek marinas with those predicted by Hyer's field-calibrated computer models.

For public health reasons, the Commonwealth establishes "buffer zones" around marinas. Buffer zones are primarily established because of the possibility that oysters or clams taken from waters adjacent to marinas could contain bacterial or viral pathogens derived from sewage water discharged from boats in marinas or marina sewage facilities. Shellfish within these zones are assumed to be polluted and their direct harvesting and marketing is prohibited except under special Virginia Marine Resources Commission provisions whereby they can be relayed, cleansed and re-harvested from approved depuration areas.

In response to a 1972 U.S. Food and Drug Administration Shellfish Sanitation Program review, Virginia's Health Department imposed many new buffer zones in shellfish growing waters, con-

demning a 1/8 mile radius around marinas with 1-50 boat slips, a 1/4 mile radius for marinas with 51-100 boats slips and a 1/2 mile radius for those with more than 100 boat slips. Either seasonal (effective from April 1 through October 31) or year-round in nature, these buffer zones were established with the intention of later determining for each marina whether they were adequate. For lack of funds and manpower, the Health Department has never been able to make these evaluations.

Scientists involved in the marina pollution study hope that their research results will provide the scientific basis and tools for establishing adequate limits of shellfish buffer zones specific to given marinas.

Kator feels that implementation of buffer zones based solely on the number of marina vessel slips, without regard to vessel composition, presence of sanitation devices and consideration of tidal flushing, is not the most equitable way of dealing with possible marina-related pollution. The scientist points out that the absence of scientific information pertaining to marinas is reflected in the diversity of buffer zone standards found among coastal states. Marinas with similar boat capacities in different states may have: (1) No shellfish buffer zones, (2) Zones including only the marina power or (3) Zones extending outward from the marina for distances varying from 1000 feet to 1/2 mile.

"Although we are sympathetic to state government manpower and funding limitations which have provided impetus for adoption of the buffer zone management strategy," says Kator, "it is our contention that blanket application of a buffer zone standard is inappropriate, owing to real differences in marina usage patterns, boat composition and unique hydraulic characteristics."

Kator, assisted by VIMS scientist Martha Rhodes, has selected for a comparative study two marina settings of differing complexity representative of the dominant marina type in Virginia--the tidal creek marina.

The immediate objectives of Kator and Rhodes' research are to conduct regular intensive bacteriological surveys to determine if the marinas are contributing fecal pollution, and to determine at what distances from the marina significant levels of fecal coliforms attributed to marina activities can be found. Intrinsic to the work is the separation of input of fecal coliforms from the marina and fecal coliforms from other sources besides the marina, such as faulty home septic tanks or storm runoff.

Research results to date, based on 440 water samples and 48 oyster samples collected within the 1/4 mile buffer zone around one Mobjack Bay marina, indicate that marina-related activities have not produced measurable changes in water quality with respect to fecal coliforms. No consistent relationship between distance from the marina and fecal coliform density has yet been observed. A second creek containing three marinas and representing a more complex situation is currently being studied.

"Application of a buffer zone, while understandable from an administrative point of view, must ultimately be replaced by classification of each marina in terms of its unique characteristics," says Kator. "Of course, results obtained from one marina-estuarine system cannot necessarily apply to another. Each marina will vary with respect to hydrography, boat usage patterns, shoreline inputs, boat composition and sanitary device installations, and therefore must be examined individually."

As part of the marina pollution study, Hyer and VIMS scientist Albert Y. Kuo are conducting dye studies in the creeks from which mathematical models are developed to simulate how tidal flushing within marinas distributes pollutants, an important consideration in determining buffer zones. Comparisons between the models and bacteriological field samples provide the scientists with clues as to where waste discharges, if any, are entering the creeks and what most significantly affects their distribution. Also, the models can be used to predict the results of simulated waste discharges.

Hyer feels that the subject of modeling marinas has been neglected. "In view of legislative turmoil that has developed around marinas, boats and their potential discharges, the time is right to develop mathematical models for use in studying these problems," says Hyer.

Blair and ODU scientist Dr. George M. Hecker are investigating the possibility that the Chesapeake Bay Model in Stevensville, Maryland, can be used to determine marina flushing characteristics. Blair explains that a dye tracer released in the Bay Model will spread nearly the same way in space and in time as would the same tracer, or under certain circumstances a pollutant, released at the same location in an actual marina. For an evaluation of a large number of marina sites, the Bay Model, like Hyer's mathemtical model, offers the advantage of being less expensive and less time-consuming than in-the-field studies.

"Since the model shrinks time as well as space," Blair says, "a few technicians using this procedure could, in a matter of weeks, provide concentration contours for most of the Commonwealth's marinas. Coupled with a knowledge or estimate of

Dick Cook Photo

Virginia shellfish, such as these oysters, may not be taken from marina buffer zones except by special permit, and then only to be relayed elsewhere to grow out in unrestricted waters for later harvest.

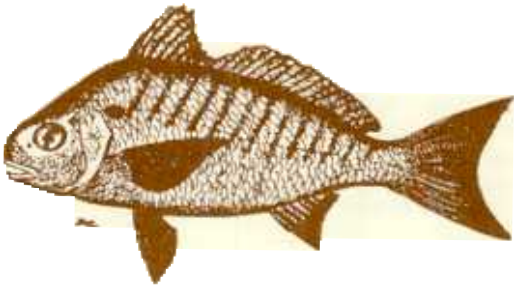
pollutant discharge and bacteriological decay rates, this would permit regulatory agencies to redraw buffer zones on a more scientific and specific basis than is now possible."

Findings from Blair and Hecker's initial dye-release studies in the Chesapeake Bay Model are now being analyzed. The results will be compared to Hyer's field-calibrated mathematical models to determine which method most accurately and economically provides realistic buffer zone contours. Kator emphasizes that research results to date are not conclusive for the entire marina pollution problem. "We cannot generalize on the results we've obtained so far from analysis of just two creeks. Further results may even indicate that Virginia needs more stringent buffer zone regulations."

Ultimately, research results could provide both regulatory and enforcement officials from all coastal states with better analytical tools to develop more scientific buffer zone standards. Both Maryland and North Carolina Health Department officials have expressed interest in the outcome of Virginia's study. Through in-the-field bacterial analysis, mathematical models and hydraulic models, scientists at VIMS and ODU hope at least to improve resource management agencies' understanding of the relationship between marinas, boating and the environment.

FISH HOUSE KITCHEN

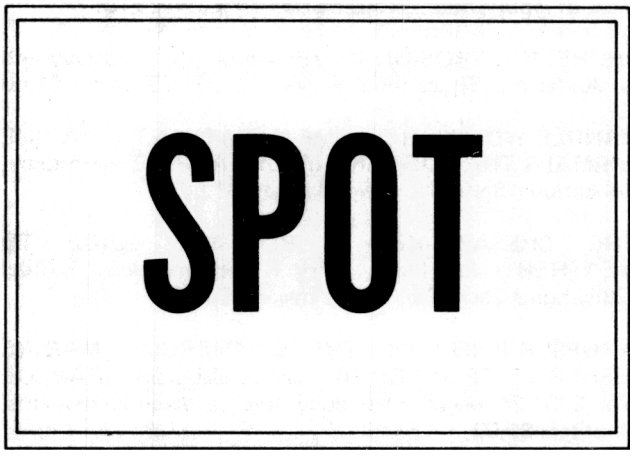
The spot, so-named because of the black smudge behind its gill flap, is the Number One marine panfish in Virginia. Spot, plentiful all summer, are most abundant right now in Chesapeake Bay and in the mouths of its tributary rivers. Whether you catch your own or patronize a neighborhood seafood market, be sure to plan a few meals around this small but delicious fish.



GRILLED SPOT

Cleaned, whole spot, "tails on"
Lemon-pepper Marinade (not lemon-pepper seasoning)
Salt
Pepper
Lemon juice
Seasoned salt

Allow two or three spot per person, depending on the size of the fish and the appetites of the diners. Fire up a charcoal grill or hibachi and let the coals burn low. Don't use too many–this process is "half smoke, half cook." While the charcoal is burning down (a process which may well take an hour) wipe the fish dry and stack them in the bottom of a mixing bowl. Sprinkle liberally with marinade and lemon juice. Add salt, pepper and seasoned salt to taste, turning the fish to ensure full exposure. Cover bowl and leave at room temperature for 30 minutes. Uncover bowl and stir fish around in seasoning. Recover bowl and check coals. When coals have burned down past maximum heat, level them out and place fish on rack. Position rack for slow cooking and cover with lid or piece of foil. After 30 minutes, carefully lift and turn each fish with aid of spatula and fork. Cook 20-25 more minutes. The skin will darken, some may stick to grill, but if cooked slowly enough, fish will remove easily, be moist and tangy inside with a hint of smoke flavor. For added flavor, add a few wet hickory chips to coals while cooking.



SPOT SALAD

1 ½ cups cooked, flaked spot
¼ cup mayonnaise
¼ cup French dressing
½ cup chopped tomato
¼ cup diced celery
1 tablespoon finely chopped onion
1 avocado, peeled and diced
¼ cup diced cucumber - pared
Salt, pepper and dash of salad seasonings to taste
2 eggs, hard-boiled
Lettuce

Combine all ingredients. Chill before serving on lettuce, then garnish with sliced, hard-boiled eggs. Serves 4.

SOUTHERN FRIED SPOT

Cleaned, whole spot, "tails on"
Shortening
White stone-ground cornmeal
Butter or substitute
Lemon juice
Seasoned salt
Salt
Pepper

Remove excess moisture from fish by patting briefly with paper towl. Place handful of cornmeal in strong paper or plastic sack. Add liberal doses of salt, pepper and seasoned salt. Shake mixture up. Add spot (8 or 10 will do for a start). Heat ½ inch of shortening or cooking oil in skillet until it starts to smoke. Cut heat back to medium and place spot in skillet after shaking off excess cornmeal. Adjust heat so that fish fry quickly but do not burn. Do not touch fish too soon or they will fall apart. Carefully shake skillet from side to side to avoid sticking. When the tails curl up and turn crisp, turn fish over. Cook 2-3 more minutes (this should brown second side) and remove to paper towels to drain. Immediately run a butter pattie or dab of margarine over each fish, sprinkle with salt, pepper and lemon juice. Serve as soon as possible.

SEA GRANT PUBLICATIONS

The publications listed in this section are results of projects sponsored by the VIMS Sea Grant Marine Advisory Service. Order publications from Sea Grant Marine Advisory Service, Publications Office, Virginia Institute of Marine Science, Gloucester Point, VA 23062. Make checks payable to: VIMS Sea Grant.

A PRELIMINARY EVALUATION OF THE POTENTIAL FOR A SHARK FISHERY IN VIRGINIA - J.A. Colvocoresses and J.A. Musick. SRAMSOE No. 234, 39 pages. First copy free to Virginia residents; all other $1.00

COMMERCIAL FISHING NEWSLETTER. Published quarterly. Free subscription obtained by written request.

TIDE GRAPHS FOR HAMPTON ROADS, VIRGINIA and TIDE GRAPHS FOR WACHAPREAGUE, VIRGINIA. Published quarterly. Free subscription obtained by written request.

THE MARINE TURTLES OF VIRGINIA J.A. Musick Educational Series No. 24, 17 pages. $1.00

VIRGINIA'S CHARTER AND HEAD BOAT FISHERY: analysis of catch and socioeconomic impacts - Anne R. Marshall and Jon A. Lucy. SRAMSOE No. 253, 90 pages. $2.00

This publication represents the first documentation of the charter and head boat industry in Virginia, a $6 million plus business. Vessels and equipment, economics structure, effort and catch and factors affecting the future are explored. Valuable to fisheries and resource managers.

FEASIBILITY OF CRAB MEAL PROCESSING IN THE CHESAPEAKE BAY REGION - Thomas J. Murray and William D. DuPaul. SRAMSOE No. 248, 63 pages.

Hard crab waste disposal generated by Chesapeake Bay blue crab picking operations became an acute industry problem in early 1980. This Sea Grant report explores the viability of continuing to process crab scrap into poultry and livestock feed in Virginia and Maryland.

RECREATIONAL BOATING IN VIRGINIA: a preliminary analysis - Tom Murray and Jon Lucy, 63 pages. All $1.00

This report provides an overview of the status and significance of recreational boating in the state. Activities associated with Virginia's nearly 140,000 registered pleasure boaters generated $120 million in direct economic impact during 1980.

VIRGINIA'S COASTAL MARINA INDUSTRY: A DESCRIPTIVE ANALYSIS - Jon A. Lucy. VIMS Contribution No. 957, 8 pages. 25 cents

MANUAL FOR GROWING THE HARD CLAM (mercenaria) - Michael Castagna, John N. Kraeuter. SRAMSOE No. 249, 110 pages. $3.00

THE PRESENT AND POTENTIAL PRODUCTIVITY OF THE BAYLOR GROUNDS IN VIRGINIA Vols. I and II) - Dexter S. Haven, James P. Whitcomb and Paul C. Kendall. SRAMSOE No. 243, Vol. I, 167 pages, Vol. II 154 pages plus 64 charts. $10.00 for both volumes

AUDIOVISUAL AIDS AND PUBLICATIONS AVAILABLE FROM THE VIMS SEA GRANT MARINE EDUCATION CENTER. 40 pages. $1.00

FISHY ACTIVITIES FOR YOUR SMALL FRY - Mary E. Sparrow and Frances L. Lawrence. Educational Series No. 28, 36 pages. $2.00

POTENTIAL EFFECTS OF THE 1980-81 DROUGHT ON OYSTER DISEASES AND PREDATORS - J.D. Andrews. Advisory No. 20. Free

SALINITY PROJECTIONS FOR THE JAMES, YORK, and RAPPAHANNOCK RIVERS - Dr. Albert Kuo and Michael J. Oesterling. Advisory No. 21. Free

Six new FISH PROMOTIONAL LEAFLETS! - Chesapeake King....THE BLUE CRAB, Bountiful Bivalve...THE HARD CLAM, Pearl of the Chesapeake...THE AMERICAN OYSTER, Succulent Seafare...THE SOFTSHELL CRAB, Poor Man's Lobster....THE MONKFISH, and Making the Most of Your Catch....THE BLUEFIN TUNA. Free

SHORELINE EROSION IN VIRGINIA - S. Hardaway and G. Anderson. Educational Series No. 31, 25 pages. $1.00

HANDLE WITH CARE: SOME MID-ATLANTIC MARINE ANIMALS THAT DEMAND YOUR RESPECT - Jon Lucy, Educational Series NO. 26, 13 pages. $1.00

THE CHESAPEAKE: A BOATING GUIDE TO WEATHER - Jon Lucy, Terry Ritter, and Jerry LaRue. Educational Series No. 25, 22 pages. $1.00

A DESCRIPTION OF THE COMMERCIAL MARINE FISHERIES OF VIRGINIA - James Zaborski. SRAMSOE No. 233, 24 pages. First copy free to Virginia residents; all others $1.00

Marine Schoolhouse Series No. 14

a Whodunnit Mystery
by Mary E. Sparrow

The CLAM CLAN CAPER

It was only a matter of minutes between the anonymous phone call and the arrival of *Sergeant Fish* and his squad of fish detectives at the scene of the crime. It wasn't a pretty sight, what with bits and pieces of the clam clan scattered about. An entire clam community had been wiped out, except for a single survivor, *Mya A. Renaria.* She was being rushed to the fish hospital by seahorse-drawn ambulance, so the sergeant had no opportunity to question her as yet.

"Ann Chovy" the sergeant called to his aide, "get over to the hospital in case that survivor is able to give us a description of the killer. The rest of you look around for clues and gather up those shell remains: Perhaps Coroner *Croaker* can shed some light on this disaster."

With final instruction to his staff to comb the area for eyewitnesses, *Sergeant Fish* sought a quiet eddy in which to reflect upon the facts, such as they were. The Chesapeake Bay eelgrass community was fairly heavily populated. Dense stands of eelgrass offered shelter and food to residents and visitors, alike. The long ribbon-like leaves poking out of the estuary's sand and mud sediments also afforded a ready hide-out to practically any assassin.

It was unlikely that one of the community's residents was responsible for the death of the clam clan. Most of them, small crustaceans and worms, assorted mollusks and snails, would be incapable of such violence. The pipefish and sticklebacks were equally harmless.

The large number of teenagers in the area, juvenile spot, croaker and bluefish, only rarely attacked small soft clams, so *Sergeant Fish* thought further on the incident. It was probable that the killer was a visitor and not a resident.

That evening at the police station, *Sergeant Fish* waited for a telephone call from *Ann Chovy* for a report on the survivor, *Mya.* In the meantime, he pulled the files on all known clam killers with the same modus operandi, that is, the same method of operation.

These included:
Pagonias cromis, the Black Drum
Scianops ocellatus, the Red Drum or Channel Bass
Lopholatilus chamaelonticeps, the Tilefish
Opsanus tau, the Toadfish
Tetraodon muculatus, the Puffer or Swellfish
Rhinoptera bonasus, the Cownose Ray

The sergeant drew a line through "tilefish." That character was strictly a deepwater operator, and the eelgrass beds were in the shallows. At this time an assistant came in with information gleaned from frightened residents that were hiding in the grass bed. The information was spotty..... even Mr. *Scallop* with his forty eyes didn't see enough to pinpoint the culprit. Still, there were bits and pieces to go on. Here is what *Sergeant Fish* heard from those who caught a glimpse of the clam clan killer:

1. Olive green in color
2. Dark bands and spots on side
3. 10-14 inches in length
4. Small mouth
5. Chubby shape
6. Yellow side
7. Oval shaped eyes
8. White belly
9. Fan-shaped pectoral (side) fins
10. Rounded caudal (tail) fin
11. Scales, if present, very small

He looked over the list. Not bad. Now if only he could match it up with one of the suspects from the files. Still, there was a problem. Not one witness actually saw the killer clearly, and there was one tidbit of information that just did not seem to fit. Shortly after the crime, a witness noticed a yellowish globe floating at the surface. She was too far away to get a good look, but she thought it was alive and that it had bumps, maybe spines all over it.

Sergeant Fish was baffled. Perhaps, it was just an innocent bystander, or an accomplice (helper) to the killer's crime or maybe, even the killer in disguise! Sergeant needed more information. He fed the suspects' names into the computer. If he could learn their usual hangouts, maybe he could place them in the area of the crime.

The phone rang. It was policewoman *Ann Chovy.* The *sturgeons* had done all they could, but *Mya* didn't make it. And *Ann Chovy* didn't get a final statement from her either.

Sergeant Fish hung up. He was sorry about *Mya,* but he would not need her statement. Finally he knew. He knew who the culprit was when he compared the witness accounts to the characterisitics of each suspect. If only the computer could give him a match to verify his conclusion, he could clinch this case. He skimmed the printout. There it was! The description matched, the time frame matched (April to November) and the last known address matched: The Chesapeake Bay and its brackish water tributaries.

Who do you think did it? Are you sure? How can you find out? How did *Sergeant Fish* (XX) find out? Talk over a plan to identify the culprit with your family, a friend or teacher. Follow your plan, and when you think you know who did it, write the answer in the blank.

(XX) Words in the story that are in italic type are either "hidden" common names *(Ann Chovy* = anchovy) or scientific names of the organisms *(Mya A. Renaria* = Mya arenaria).

NOW READ ON!

This is a very "fishy" story. But interwoven with the fiction are facts. In nature, the puffer eating the clams would not necessarily be "good" or "bad." In nature, it is simply a matter of survival. Many organisms are eaten by other organisms, which in turn are eaten by still others. This is called a food chain.

This story illustrates how to identify fish. Look at the list of witness descriptions. What kinds of information does *Sergeant Fish* use to identify the clam killer? Fish can be identified by a combination of characteristics:

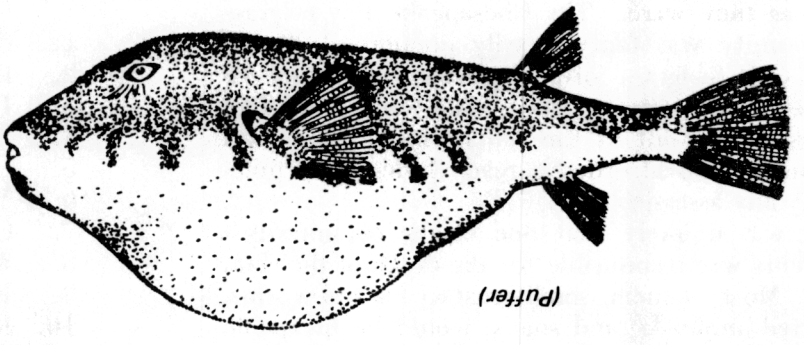
1. Body shape
2. Shape and position of their fins
3. Size and shape of the gills
4. Color
5. Eye shape
6. Mouth (and teeth) shape and size
7. Scale shape and size

Knowing what kind of environmental conditions exist in an area may help you predict what kind of fish and other organisms you'll find there. Most animals not only have a preference, but are adapted to a certain habitat.

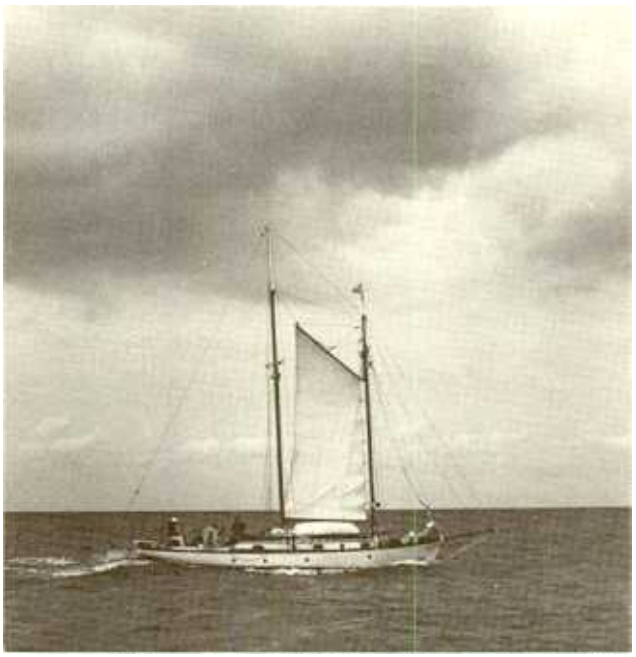
The shape of a fish's mouth, its location on the head and the shape of the teeth gives clues to what a fish eats. In the case of the clams, a fish's teeth would have to break through the shell. The plate-like teeth of the puffer are well suited for this. Pointed teeth, good for grasping or breaking off chunks of flesh, would break on the clam's shells.

There are many fascinating organisms that live in the Chesapeake Bay, and learning about them can be fun. Writing a creative story is one way to learn. You can use your imagination, but also include facts that you have learned by reading about the setting and your cast of characters -- the organisms.

WANTED!
for the
CLAM CLAN
MURDERS!!!



Virginia's New Boat Titling Law



Effective January 1 , 1981, the tax paid on boat sales through Virginia boat dealers will be changed from a 4 percent sales tax to a 2 percent titling tax, also required in casual sales between individuals.

THE GENERAL ASSEMBLY, in passing House Bill 986 during its last session, added Virginia to the ranks of eleven states requiring titles for boats. Effective January 1, 1982, the law will be administered by the Virginia Commission of Game and Inland Fisheries along with its existing boat registration program.

The tax paid on boat sales through boat dealers will be changed from a 4 percent sales tax to a 2 percent titling tax, significantly reducing the total purchase cost. However, for persons involved in casual sales between individuals, a new 2 percent titling tax must now be paid by the buyer. Like boat registration fees, titling fees will go into the Game Commission's Game Protection Fund where they will be used for the benefit of boaters.

The titling law was introduced into the General Assembly by Delegate Thomas Moss of Norfolk at the request of the Virginia Association of Marine Industries, representing more than 100 boating industry businesses throughout the state. The marine trades association felt the legislation was needed to provide boat owners and financiers with a strong legal document that would serve both as proof of boat ownership and as the appropriate vehicle to better secure financing the record liens on boats. It was also hoped that boat titling would make stolen boats easier to detect during transactions and easier to retrieve by law enforcement personnel. The legislation was supported by the Virginia Bankers Association and various law enforcement groups.

The Game Commission and Department of Taxation are currently formulating the necessary regulations to administer the boat titling law. Basic points, in general terms, include:

Boats principally kept in Virginia which are 15 feet or more in hull length and weighing 400 lbs. or more (including motor and accessories) purchased after January 1, 1982 must be titled ($7.00 fee) at the time of purchase (documented vessels exempted)

Boats upon which a lien exists must be titled no later than February 15, 1982 (documented vessels exempted).

Boats purchased prior to January 1, 1982 must be titled upon renewal of the Virginia registration (documented vessels exempted).

Any boat, including documented vessels, may be titled by the Commission upon requests of the owner; however, such titling does not change existing sales requirements on such boats when sold.

For casual sales between individuals, the seller must provide the buyer with a certified bill of sale to be used by the buyer in either applying for a new title or transfering the existing title through the Commission.

A 2 percent titling tax must be paid by the buyer of a boat requiring titling, whether it is bought new or used from a boat dealer or a private party, the tax based upon the sales price of the boat and all attached accessories without deducting trade-in value.

No titling tax will be required for any boat purchased prior to January 1, 1982, but a $7.00 fee must be paid when the boat is titled.

No titling tax is required on boats built by commercial watermen for their own use, but such boats must be titled if they are 15 feet or longer, weigh more than 400 pounds and are not documented.

Credit will be given for sales tax or other such taxes paid on a boat bought in another state.

Title fees and taxes can be paid to authorized boat dealers or the Game Commission; titling taxes can also be paid at offices of the Virginia Department of Taxation and a receipt forwarded to the Game Commission with a title application.

Boating Industry Seminar

A Marina/Boatyard/Boat Dealer Management Seminar and Workshop will be convened for Virginia's boating industry October 21 in Virginia Beach. Cosponsored by the VIMS Sea Grant Marine Advisory Services and the Virginia Association of Marine Industries (VAMI), the day-long program will be held in conjunction with VAMI's annual convention at the Virginia Beach Pavillion.

The purpose of the program is to provide both large and small boating firms with practical information on management tools that can better serve their operations. Two University of Rhode Island researchers will conduct a seminar and workshop on how to put marina/boatyard financial statements to better use in evaluating a firm's progress. In addition, a representative of Dealer Management Systems in Virginia Beach will outline estate planning and employee benefit techniques for marina owners and boat dealers. Professional selling techniques and how the basics of boat selling fit today's changing market will also be addressed. Following the seminar a panel discussion will be convened on Virginia's new boat titling requirements.

To register for the program contact Peter Easter, VAMI Executive Director, 301 East Market Street, Charlottesville, VA 22901 (804) 977-3716.

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Cover Note

A morning's catch is sorted at a Severn, Virginia fish house. Croaker, spot and weakfish are staples.

Dick Cook Photo

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Address Correction Requested