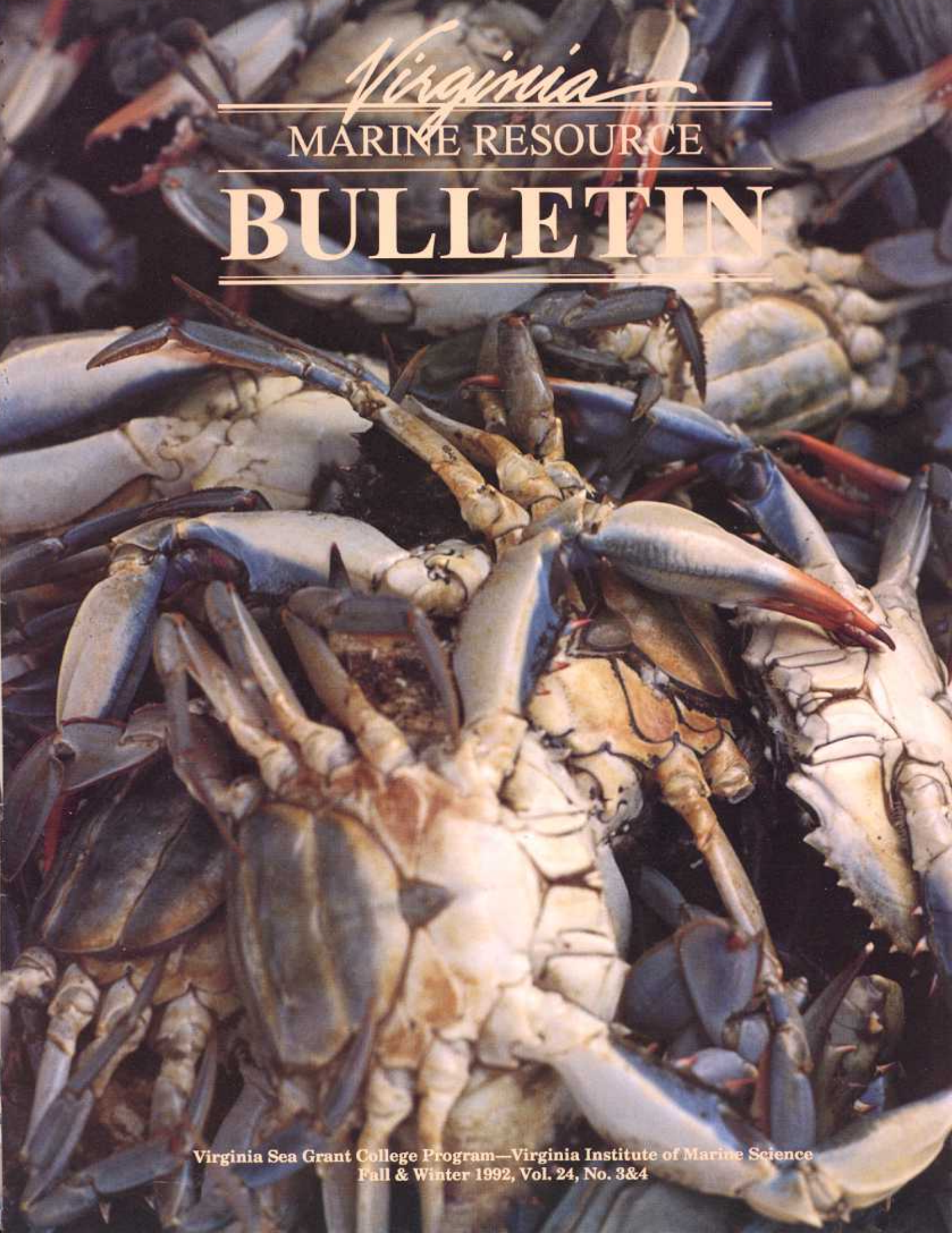

Virginia MARINE RESOURCE BULLETIN

Virginia Sea Grant College Program—Virginia Institute of Marine Science
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MARINE RESOURCE
BULLETIN

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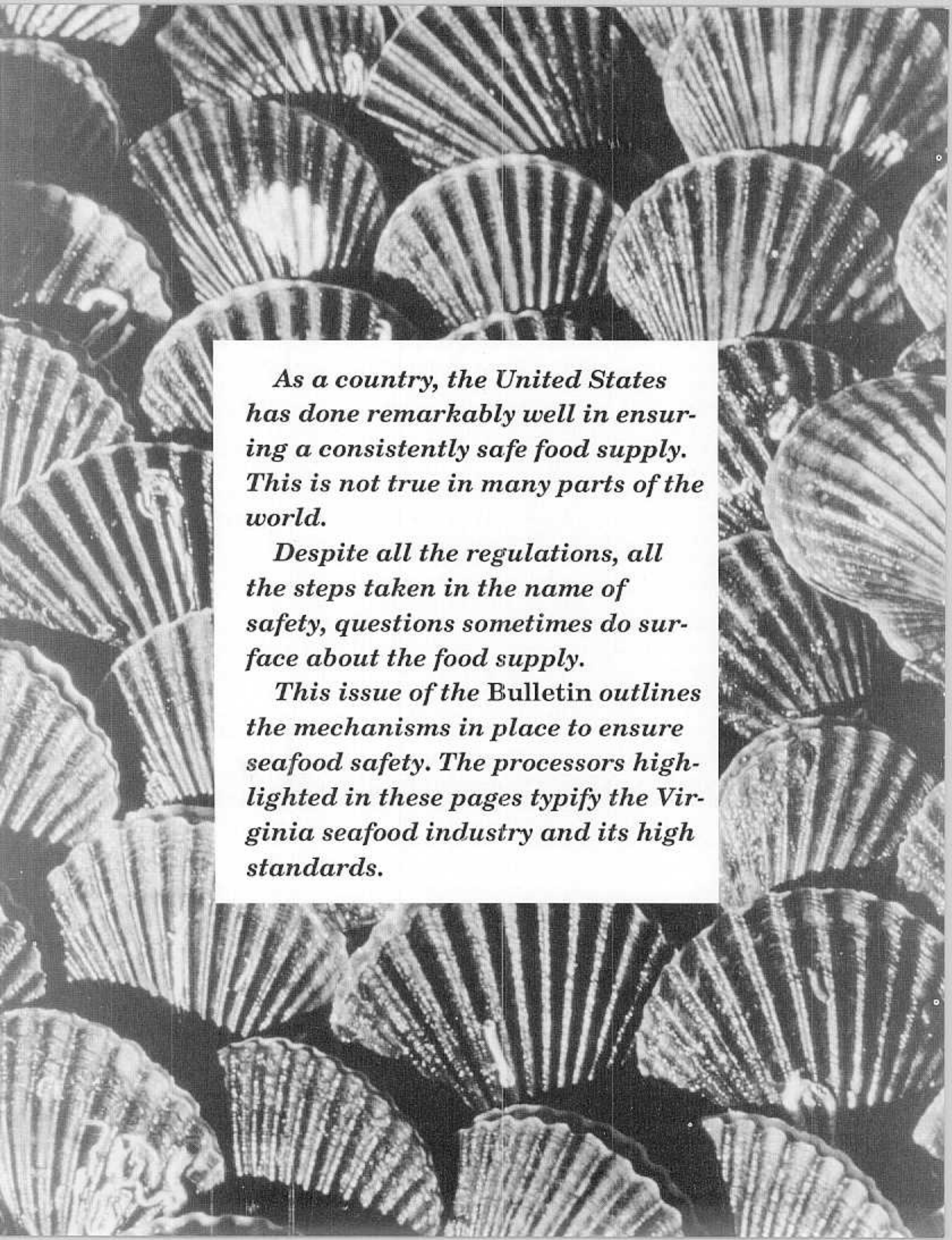
Sea Grant is a partnership of university, government and industry focusing on marine research, education and advisory service. Nationally, Sea Grant began in 1966 with passage of the Sea Grant Program and College Act.



As a country, the United States has done remarkably well in ensuring a consistently safe food supply. This is not true in many parts of the world.

Despite all the regulations, all the steps taken in the name of safety, questions sometimes do surface about the food supply.

This issue of the Bulletin *outlines the mechanisms in place to ensure seafood safety. The processors highlighted in these pages typify the Virginia seafood industry and its high standards.*

How Is Seafood Inspected?

By authority of the federal Food, Drug, and Cosmetic Safety Act, the Food and Drug Administration (FDA) of the U.S. Department of Health and Human Services is primarily responsible for the regulation of fish and seafood. To this end, the FDA conducts sanitary inspections of seafood processing operations and evaluates fish handling procedures within each facility. The FDA has the authority to seize and destroy any unacceptable products, and to impose criminal penalties for improper care, handling or sanitation. The FDA is responsible for enforcing truthful labeling requirements.

The FDA is not the only governmental body involved in making sure seafood is safe. The National Marine Fisheries Services (NMFS) of the U.S. Department of Commerce (USDC), the Environmental Protection Agency (EPA), and the coastal states all participate in seafood regulation programs which collectively and comprehensively monitor for seafood safety. Briefly, the responsibilities of each break down as follows:

❒ **Shellfish harvest waters** are monitored according to the standards set by the National Shellfish Sanitation Program, an organization of shellfish-producing state, federal and municipal officials and representatives of the shellfish industry. Testing is done by the coastal states, in cooperation with the FDA.

❒ **Facility inspections** are carried out by state health agencies, and by the FDA.

❒ **Pesticide residue tolerance levels** are set by the EPA which also monitors water conditions.

❒ **Voluntary inspection and grading services** are provided by NMFS, at costs of up to $150,000 annually per company. Included are the "PUFI" program (Packed Under Federal Inspection), the "Grade A" program, lot inspection and sanitation inspections of processing facilities.

While the programs of the FDA, the USDC and the states provide extensive regulation of the nation's seafood supply, the regulatory system and accompanying inspection activities are different than those provided by the U.S. Department of Agriculture for meat and poultry products. This latter system, designed primarily to prevent diseased animals from entering the food supply, is based on visual inspection of every carcass with federal inspectors present in processing plants on an essentially full-time basis.

Although there have been many studies of the seafood regulatory inspection program, none in recent years calls for a program identical to that used for meat and poultry. It is recognized that the potential health hazards from these proteins are quite different, as are the methods of bringing these foods to market. The regulatory systems for meat, poultry, and seafood must be designed to address the specific problems and practices indigenous to each food.

During the past several years, there have been calls for federal legislation to establish a more extensive regulatory inspection program for seafood. The seafood industry supports such actions. Greatly increased consumption of seafood, environmental changes, new understanding of risk and other factors require that the already extensive and effective seafood programs be continually improved to provide total assurance to the consumer that the seafood supply is safe and wholesome. ✣ ✣ ✣

HACCP, the Seafood Safety Net

HACCP is the acronym for Hazard Analysis and Critical Control Point. Use of HACCP procedures is rapidly gaining acceptance as the "state-of-the-art" in food safety methodology. A HACCP program identifies "critical control points" during a processing operation for a food where a "hazard" might be introduced. A monitoring procedure is instituted which detects any safety lapses in the process and thus any attendant risk. Monitoring records are kept by the processor to demonstrate that the program is being properly implemented. These records are also used by federal and state officials to monitor compliance. Critical control points could include point of receipt, the thermal processing stage of the canning process, cook and post-cook stages of preparation processes, final packaging or storage conditions.

Recent scientific evaluation of food safety procedures indicate that HACCP programs are the preferred methods for assuring fish and seafood product safety. In fact, HACCP-based programs are now being considered for other foods—including meat and poultry.

Virginia's Shellfish Inspection Program

by

Robert Croonenberghs, Director
Division of Shellfish Sanitation
Virginia Department of Health
and
Carl Armstrong, Director
Division of Health Hazards Control
Virginia Department of Health

Virginia has one of the most rigorous shellfish inspection programs in the nation. In fact, federal agencies often use the Commonwealth's program as a model for other states. Federal standards for sanitation are exceeded in most if not all areas. Plus, the Division of Shellfish Sanitation can and will—in an aggressive fashion—legally prosecute bootleggers, those who have tried to sidestep the processes which ensure the safe harvest and sale of shellfish. The article below gives an overview of Virginia's program.

During the last year the media highlighted instances of potential and actual food-borne illness traced to molluscan shellfish harvested from contaminated waters, and to mishandling. The Virginia Department of Health maintains that certified bivalve molluscan shellfish (e.g. oysters, hard clams, soft clams, etc.) harvested from Virginia waters have not been confirmed to have caused a disease outbreak in over 30 years.

This continuous record has been maintained as a result of the tremendous effort and cooperation achieved in Virginia's shellfish program. In the early 1970s the Virginia General Assembly expanded the Shellfish Sanitation program in the Virginia Department of Health (VDH) and increased the patrol of condemned waters by the Virginia Marine Resources Commission (VMRC). As a result, Virginia has one of the most comprehensive state shellfish programs in the country.

Since the Virginia shellfish industry has accepted and incorporated both the requirements of the national program, the National Shellfish Sanitation Program (NSSP), and the additional state requirements of the VDH, Virginia has historically been a national leader in the molluscan shellfish program. The VDH consistently and substantially exceed NSSP requirements for obtaining information necessary to assure both the proper classification of shellfish growing waters and the sanitary operation of shellfish processing plants.

To assure the public health safety of Virginia shellfish, the Virginia Department of Health Division of Shellfish Sanitation (DSS) carries out the following program elements:

❒ **Shoreline Survey**—The VDH inspects on a property-by-property basis in nonsewered areas. This survey is of virtually all of the watershed draining to shellfish growing areas. In 1991, 7,220 properties were inspected. While the NSSP requires a new shoreline survey for an area once

every 12 years, DSS conducts them on an average of once every six years. Potential pollution problems found by these surveys are sent to the appropriate regulatory agency for their evaluation and correction.

❒ **Seawater Sampling**— Seawater samples are collected in the shellfish growing areas to assure that unsafe levels of bacteria do not occur in the approved harvest areas. Seawater samples are collected once a month (as opposed to six times per year as required by the NSSP). The total number of samples in 1991: 24,301.

❒ **Computer Modeling**—Recently, an advanced computer modeling program has been developed and implemented to determine the proper size of closed harvest areas needed around sewage treatment plants, marinas and other point source discharges of similar concern.

❒ **Growing Area Classification**—Using the data generated by the shoreline survey, the seawater sampling, and computer modeling programs, shellfish growing areas are completely evaluated yearly (the NSSP requires this performed every three years). In addition, due to recent automation capabilities, growing area water sample results are being evaluated monthly—immediately after the most recent set of seawater sampling results are received.

❒ **Toxic Substances Analysis**—Whole live shellfish are collected twice a year from representative shellfish growing areas throughout Virginia, and are analyzed for pesticides, toxic chlorinated hydrocarbons like PCBs, and heavy metals. Sixty such samples were collected in 1991—none of which are required by NSSP.

❒ **Shellfish Plant Inspection**—All shellfish plants in Virginia must by certified by VDH and must meet sanitary and construction requirements of the National Shellfish Sanitation Program (NSSP). Shellfish plants are required by the NSSP to be inspected either semi-annually or quarterly per year. VDH inspects all plants at least once a month, if not more. In 1991 this amounted to 2,258 shellfish plant inspections.

❒ **Miscellaneous In-Plant Samples**—Potable water used in processing shellfish is tested monthly at all plants. During 1991 a total of 3,269 water analyses were performed, and 1,462 shellfish meat samples were collected and analyzed microbiologically to assure safety and quality.

As a result of the in-depth monitoring conducted by the VDH to classify shellfish growing waters, and the strict adherence to the classification standards of NSSP, the waters approved for direct harvest in Virginia are exceptionally clean. The VMRC maintains night and day patrols to prevent the illegal harvesting of shellfish from condemned areas, thus ensuring that shellfish harvested in Virginia come from approved areas. Once harvested, the shellfish for public consumption must be taken immediately to a dealer inspected and certified by the VDH, ensuring strict sanitary handling of the shellfish. After the product is shipped to Virginia markets, it is inspected by either the Virginia Department of Agriculture at the retail level, or by the local VDH sanitarians as part of their restaurant inspections.

Virginia's rigorous shellfish sanitation program has long been in place, and it is the agency's aim to continue this tradition of high standards and superior product quality.

✣ ✣ ✣

Oyster Packing

Lake Cowart would like nothing better than for every seafood processor to abide by the very highest of standards. Quite simply, it makes business sense: a consistently safe and high-quality product sells.

Cowart has invested heavily in seafood quality and safety, and in the process not a detail was overlooked at the family operation, Cowart Seafood, an oyster packing house on the Northern Neck of Virginia.

Undesirable microorganisms exist in any environment from which food is harvested—land or sea. Food processing, greatly simplified, is an exercise in outmaneuvering sometimes wily, and always opportunistic microbial opponents. Undesirable microorganisms are eliminated or not permitted an opportunity to appear, and then the product is stabilized and kept under conditions which inhibit new growth. This applies to any food product—beets or corn—poultry or seafood. The manner in which a food is stabilized is quite varied and ranges, for instance, from a cooking process for tomatoes, to cold temperatures, pasteurization or freezing for seafoods.

What the general population may not realize is that packers like Cowart willingly—no, aggressively—seek ways to ensure a safe product. By doing so, Cowart can attract major seafood buyers such as supermarket chains and major restaurants, buyers that demand a high-quality and safe product.

In terms of both safety and efficiency, product flow

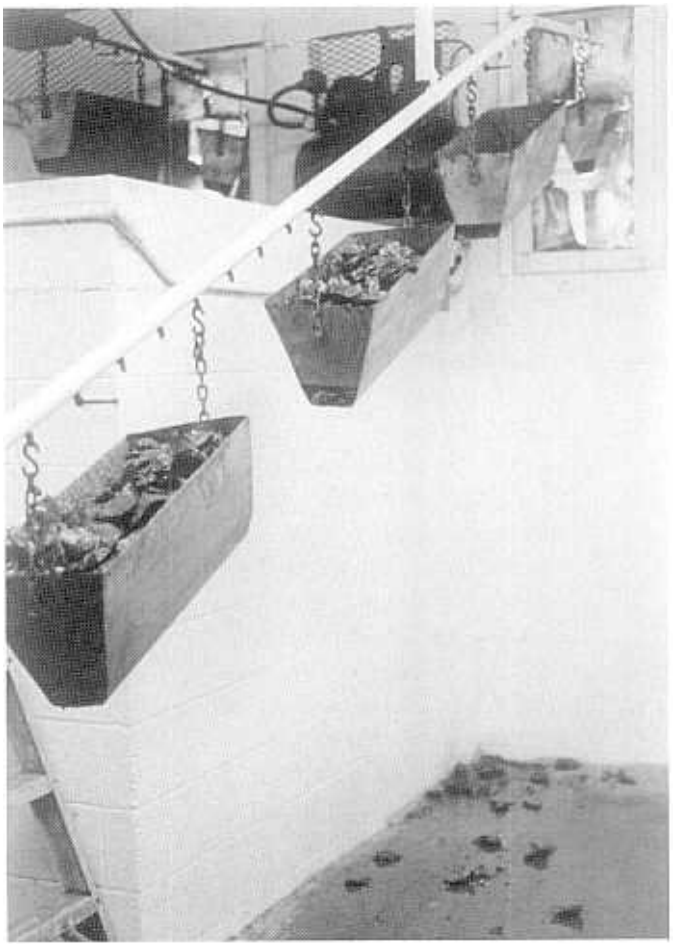
End of the shift at an oyster packing house.

through a plant is a significant issue. The object of processing is a safe food, and a product should not be made impure by substances or microorganisms from other areas, a phenomenon industry calls "cross contamination."

The first step in preventing cross contamination becomes immediately obvious when one enters a plant like Cowart Seafood; crucial stages of the operation are divided by physical barriers. Consequently, the holding area for oysters is separate from the shucking room. Oysters are conveyed to the shucking room via a window in the cement wall. The areas where oysters are cleaned, rapidly cooled and finally stored are again, all in separate rooms. The same concept is applied to tools, utensils and, of course, workers. A shovel used in the shellstock area is not used where oysters are cleaned; a shucking knife stays in the shucking room. Employees who shuck oysters are prohibited from passing through other processing parts of the plant on the way to and from the shucking room, preventing microorganisms from hitchhiking a ride.

Food contact surfaces come under quite a bit of scrutiny, too. Wooden surfaces have long been used in food processing, but these same areas can harbor microorganisms even after they have been sanitized. In Cowart's operation, not a bit of wood is to be seen. Plastic, aluminum and stainless steel are the better, cleaner surfaces. Even the platforms on which workers stand are aluminum, and stainless steel is used in the ice bins.

Just how extensive are Virginia's rules governing harvest, processing and distribution? The Commonwealth's Shellfish and Crustacea Sanitation Regulations, detailed in a 165-page document, is a study in the minutiae of harvesting and processing. The state elected on its own to exceed most, if not all of the federal regulations. In Virginia's regulations, obvious preventative measures are outlined, as well as what would seem fairly obscure to the layman. Thus, the acceptable types of sanitation are outlined, as are the foot candles of illumination for every area, the wall color, the floor slope, and the number of times shucking knives must be cleaned in the course of a day. The amount of ice that must be produced each day is defined as is the type of water that can be used to produce ice. Even the dimensions of the shucking table are in black and white. Division of Shellfish Sanitation Director, Robert Croonenberghs, points out that rules exist for whether or not a hairline crack in the floor is acceptable.



Oysters being conveyed to the shucking room.

As Cowart gives a tour of the family plant, he is also taking care of business—checking on progress, lifting this, double-checking that, taking care of this detail, that detail—a man focused on the exacting business of oyster packing. It is not surprising that in a place like the Northern Neck of Virginia, where the Chesapeake Bay and its tributaries are as earnestly harvested as the

surrounding fields, where a town is actually named Mollusk, and where energetic businessmen like Cowart have long been in the trade, that the future of the oyster resource is of utmost concern.

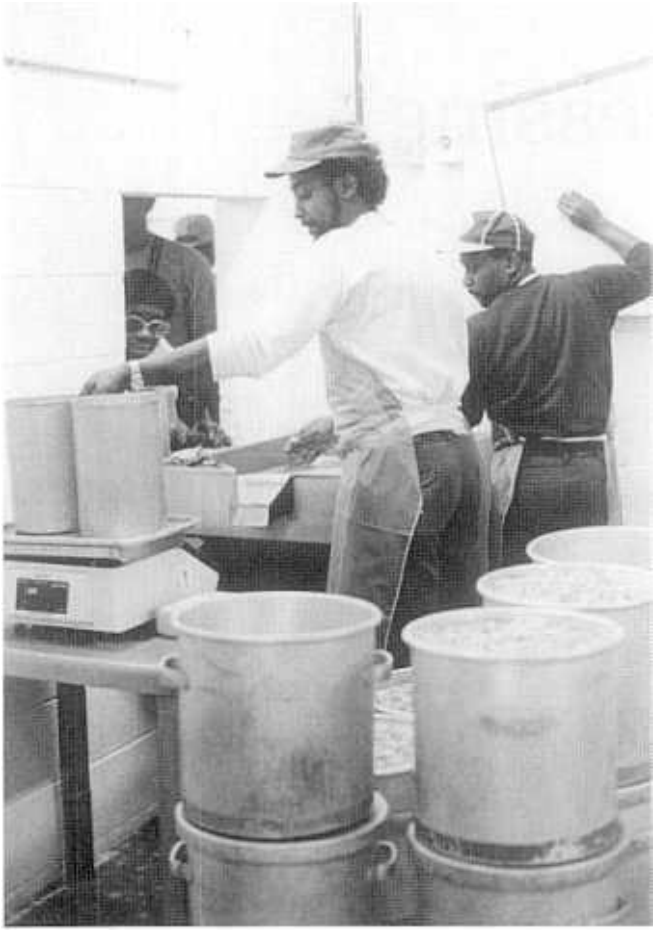
The harvest of oysters in the Chesapeake Bay has declined disastrously in recent years, and the oyster wars of the 19th and early 20th century seem to have found a continuum in this century. The Winchester rifles and howitzers of the oyster wars are not being used, but the dispute between states, agencies and individuals is still heated. No wonder: the oyster's value is two-fold and significant. Not only is the oyster a sought-after food product, it is also the best filtering animal that the Chesapeake Bay could possess. At one point in the not too remote past, oysters could filter the water volume in the estuary in a week or less. Now it takes almost a year.

Although the oyster harvest is a mere shadow of previous years, industry people like Cowart think about the amount of oyster ground available for planting, the number of oysters which could be harvested, and about the research and measures which could make it possible. Stringent processing regulations do not overly concern businessmen like Cowart, whose family has been in the business for 84 years. . .the future of the Virginia oyster does. ✣ ✣

Oyster Season on the Northern Neck

The "clink," "clink," "clink" of oysters being opened in the shucking room is the most pervasive sound as one approaches the cluster of white buildings which make up this packing operation on the Coan River, a tributary of the Potomac River.

The quietness of the surrounding fields and the river belie the reality inside a packing operation. When it is oyster season, long days are in or-



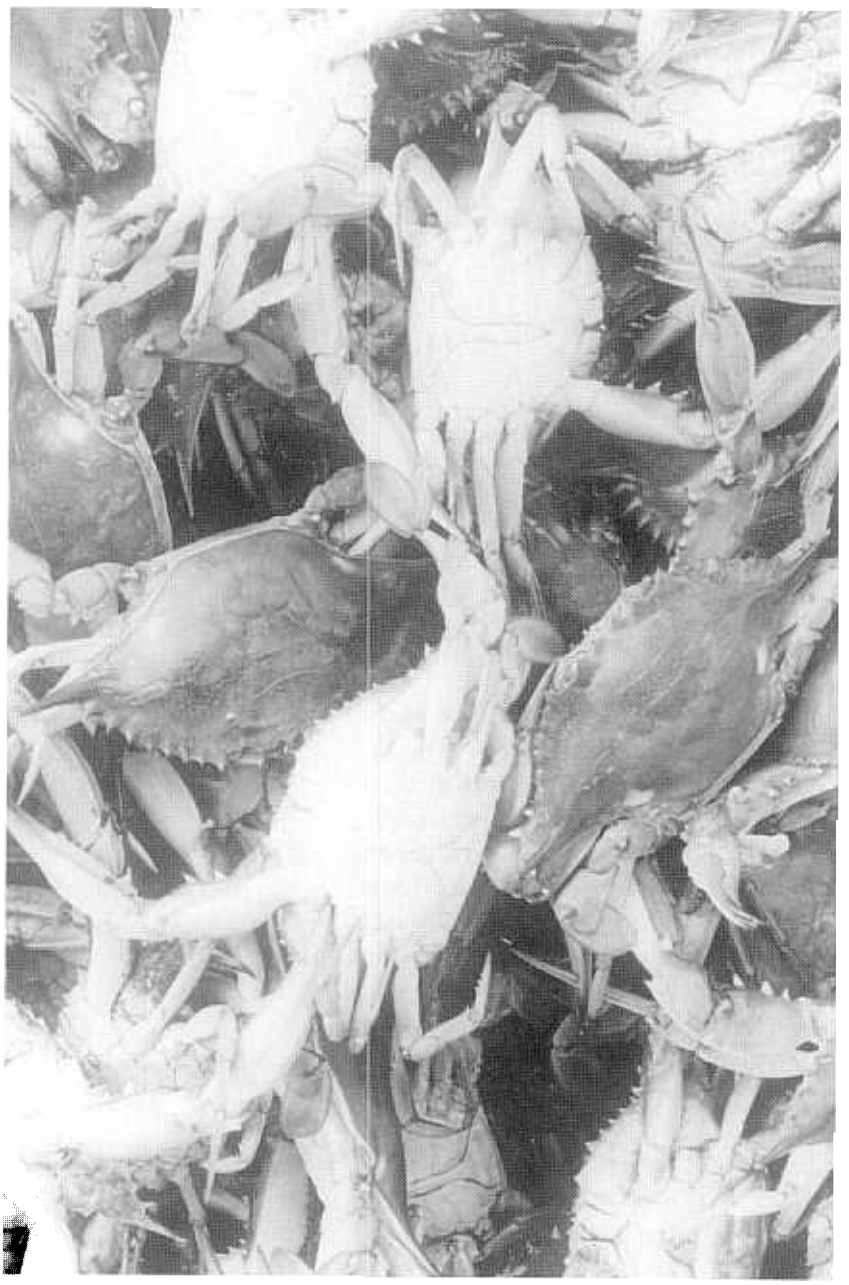
der. The work is labor-intensive and requires exacting skills.

Oyster shuckers do not live the 8-to-5 existence of most of the world. Shucking starts at about 3 a.m. and continues until about 9 a.m. Packing and processing continues until approximately 5 p.m.

After oysters arrive they are stored in stall-like enclosures. From there they are loaded onto a conveyer which passes through a window to the shucking room. An average shucker can process eight pounds an hour. Oysters are shucked into stainless steel containers and then taken to a window and weighed (shuckers are paid by production). The next step is the "blowing tank." Here oyster meats are freed of grit and cleaned as they are agitated in a large tank for several minutes. Ice is constantly placed in the tank to bring the temperature to below 45° F.

Oysters are drained and placed in containers, and the product temperature brought down even further in the cooler. After this, the product's fate is determined by the buyer or the market. Some oysters may be destined to be sold as a fresh product; others, like Oysters Rockefeller, further processed and then frozen.

Crab Processing



Companies like RCV Seafood Corporation and Graham and Rollins have blue crab processing down to a science and the firms' managers, Weston Conley and Jim Casey, are the first to admit that they relied heavily on science toward that end.

Long before the federal program for seafood standards was in place, the two companies sought to make a superior product even better. Although the two companies have different owners and operate in contrasting settings—RCV in the country and Graham and Rollins in downtown Hampton—the firms have this in common: their customers include some of the choosiest and most demanding companies in the nation and in the world. The high-quality supermarket chains and companies that RCV and Graham and Rollins supply, routinely set their standards at levels which significantly exceed the U.S. government's.

When the federal standards were set for seafood safety, continuous inspection was not mandated. However, both RCV and Graham and Rollins elected to add quality control technicians to their staff. The inspectors monitor crucial steps in the process; maintain and check records to determine whether processing procedures have been followed;

and check packaging integrity.

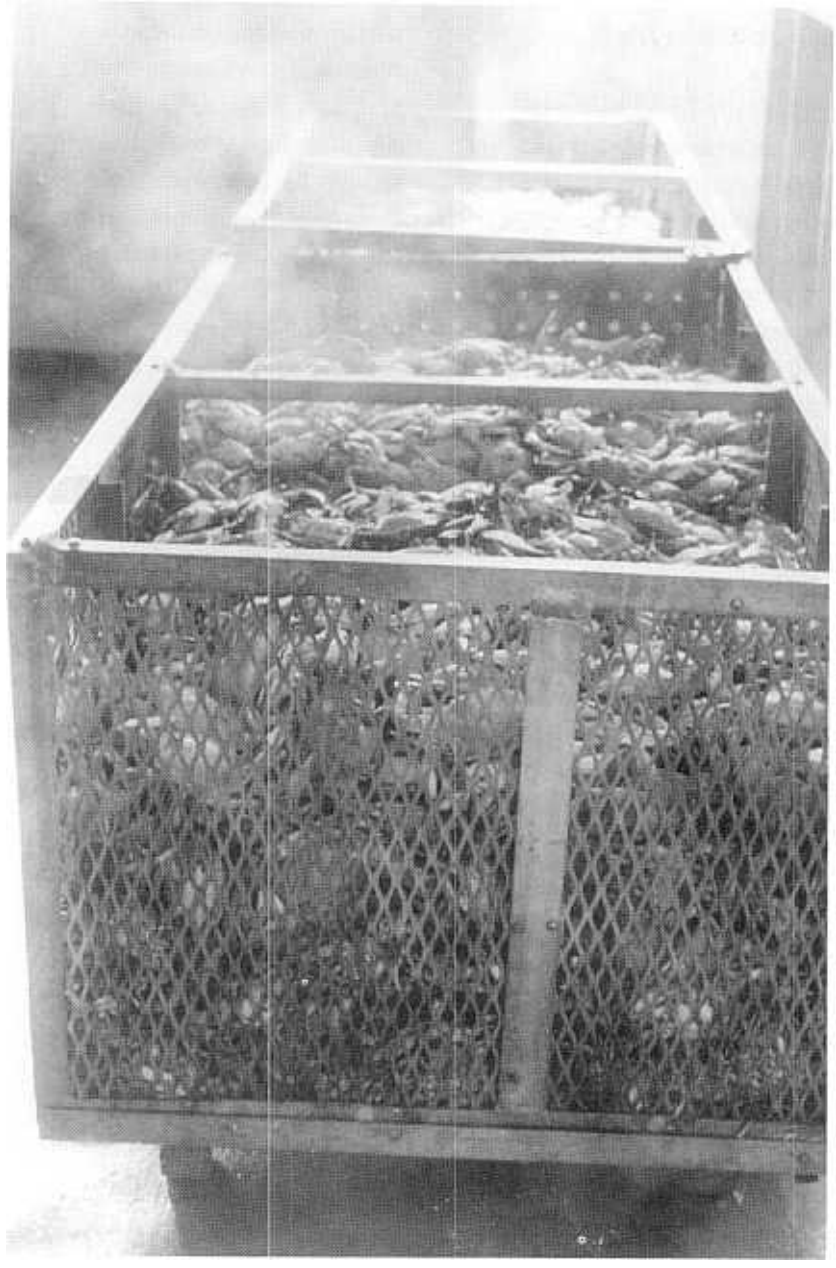
The following areas are of special concern when it comes to crab processing: the sanitary conditions in the picking house; the cooking and the pasteurization process; packaging integrity; and temperature/time control.

In a Virginia crab plant it would be an anomaly to visit an operation and not see something being sanitized. It starts at the beginning of the process when blue crabs arrive. At Graham and Rollins, *Callinectes sapidus* literally run what can only be the equivalent of a crustacean's gauntlet, a long turning cylinder which the crabs must traverse. Water is sprayed through holes in the cylinder and as the crabs try to escape, they are cleaned.

Cooking the product at RCV and Graham and Rollins is an automated process, eliminating the possibility of operator error. Temperatures are automatically recorded and those records checked daily to ensure that the proper temperatures were used during cooking. Crabs are loaded into bins and basically pressure cooked. A massive amount of crab can be cooked at once: 3,600 pounds at RCV and 1,000 in the cookers at Graham and Rollins.

The next step beyond cooling is the most labor intensive, extracting the meat from the crab with as little shell as possible. Crab picking is a more difficult occupation than it might first seem. It takes between one and two years for a picker to become proficient. Even though a premier crab picker at Hampton Bay Days one year picked four pounds in 15 minutes, the average picker manages six pounds in sixty minutes.

From a sanitation point of view, the picking room probably receives the most attention. Most people probably think of food processing mostly as cooking a product. In truth, making sure conditions are sanitary is a strong underpinning of any food processing operation. In addition to separating the picking operation from all the



Baskets of crabs after cooking

rest—to avoid cross contamination—and all the other routine sanitation measures, the picking house daily undergoes the sort of cleansing that one might envision seeing in an operating room at a hospital. Not a surface escapes scrutiny. At RCV, two solutions are used, the first one for cleaning, the second for sanitizing. The sanitation program for this room was developed with scientists at the Virginia Polytechnic Institute in Blacksburg, Virginia.

Equally important are the temperatures used during pasteurization, a process which represents a quantum leap for crabmeat harvesters and processors. Pasteurization enables the product to have a shelf life of up to two years, a fact which stabilizes the market and makes it possible to ship the product all over the country, year-round.

Pasteurization is a straightforward process, yet it still has a number of variables which have to be taken into account. In crabmeat pasteurization the product is heated to a certain point and then rapidly cooled. The aim is to bring the product temperature down quickly to prevent any organisms from forming. Product temperature is brought down via an ice waterbath, a process in which the heated cans are cooled. An example of the type of variable which would crop up in this area, would be the circulation within the waterbath—since the object is to bring the cans and meat down to a uniform temperature.

In the world of processing, where variables are many and much more complicated than the one listed above, technological assistance from food scientists can be an asset to processors. Both Conley and Casey underscored the importance of assistance they received from George Flick and Tom Rippen, Virginia Sea Grant scientists who are nationally recognized for their expertise in blue crab processing and pasteurization. Virginia Sea Grant scientists have assisted industry in areas ranging from plant design and sanitation, to pasteurization and packaging. One example of this assistance is a definitive manual on pasteurization, developed by Virginia Sea Grant at Virginia Polytechnic Institute with the Bureau of Shellfish Sanitation, Virginia Department of Health, and the U.S. Food and Drug Administration.

Container seam integrity is one of the last major safety issues in a crab processing plant. At both RCV and Graham and Rollins the continuous inspectors evaluate seams to ensure there is no leakage. The can seam is evaluated by a seam scope, a device that magnifies a cross section of the seam which is then measured.

If a question did arise about a batch or even an individual can of crabmeat, RCV and Graham and Rollins would not have any difficulty reconstructing all the processes of every hour of the day. The list of procedures would impress the proverbial, paper-bound and red-tape loving bureaucrat. Crabs are checked and evaluated when they arrive; automatic controls on cookers provide a written record of the process; and cold room and freezer temperatures recorded. During pasteurization all the temperatures are controlled and documented. A picker training program outlines sanitation measures which must be taken. There are forms for equipment sanitation and for the condition of the physical plant. As Casey said, he has a form for everything.

As a truck at RCV was being washed before being sent out for the next batch of *Callinectes sapidus,* Conley summed up what might be a common thought among processors. He has confidence in his product and if Virginia does have one of the most stringent programs in the country, that is fine with him. It is worth it.

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It takes between one and two years for a picker to become proficient.

Sea Scallop Processing

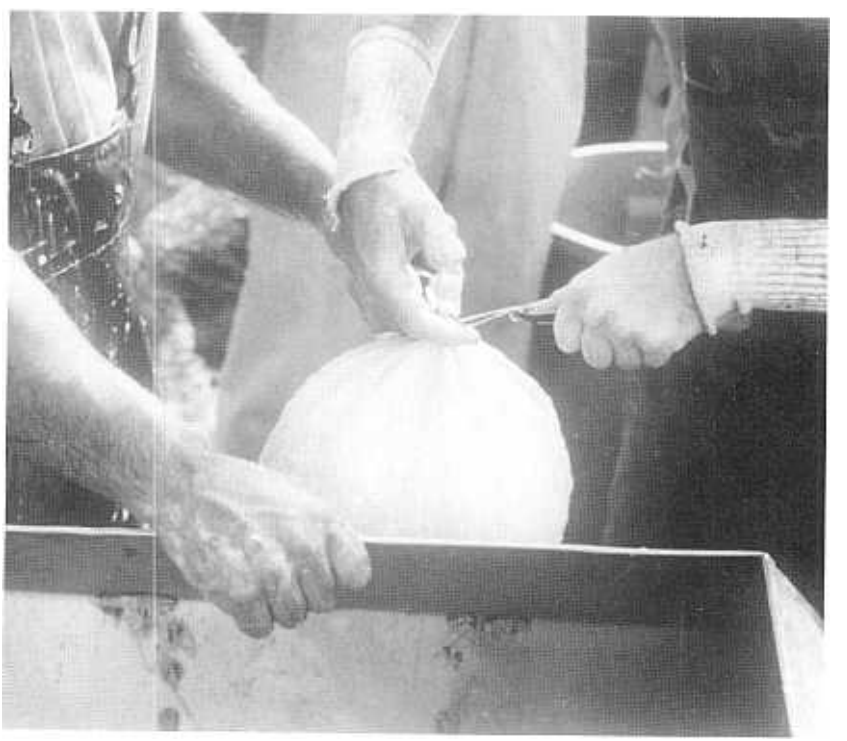
Offshore—in sometimes rough seas and during the long shifts when the one-and-3/4-ton dredges empty haul after haul of sea scallops—is when product quality is determined.

The average person ordering sea scallops at a restaurant could not fathom the steps taken to ensure quality. Harvesting sea scallops appears labor-intensive, but relatively uncomplicated: the shellfish are landed on deck, shucked, washed and then stored in ice in the hold. However, during those hours on deck, strict control of product temperatures is one of the most significant ways in which quality is maintained.

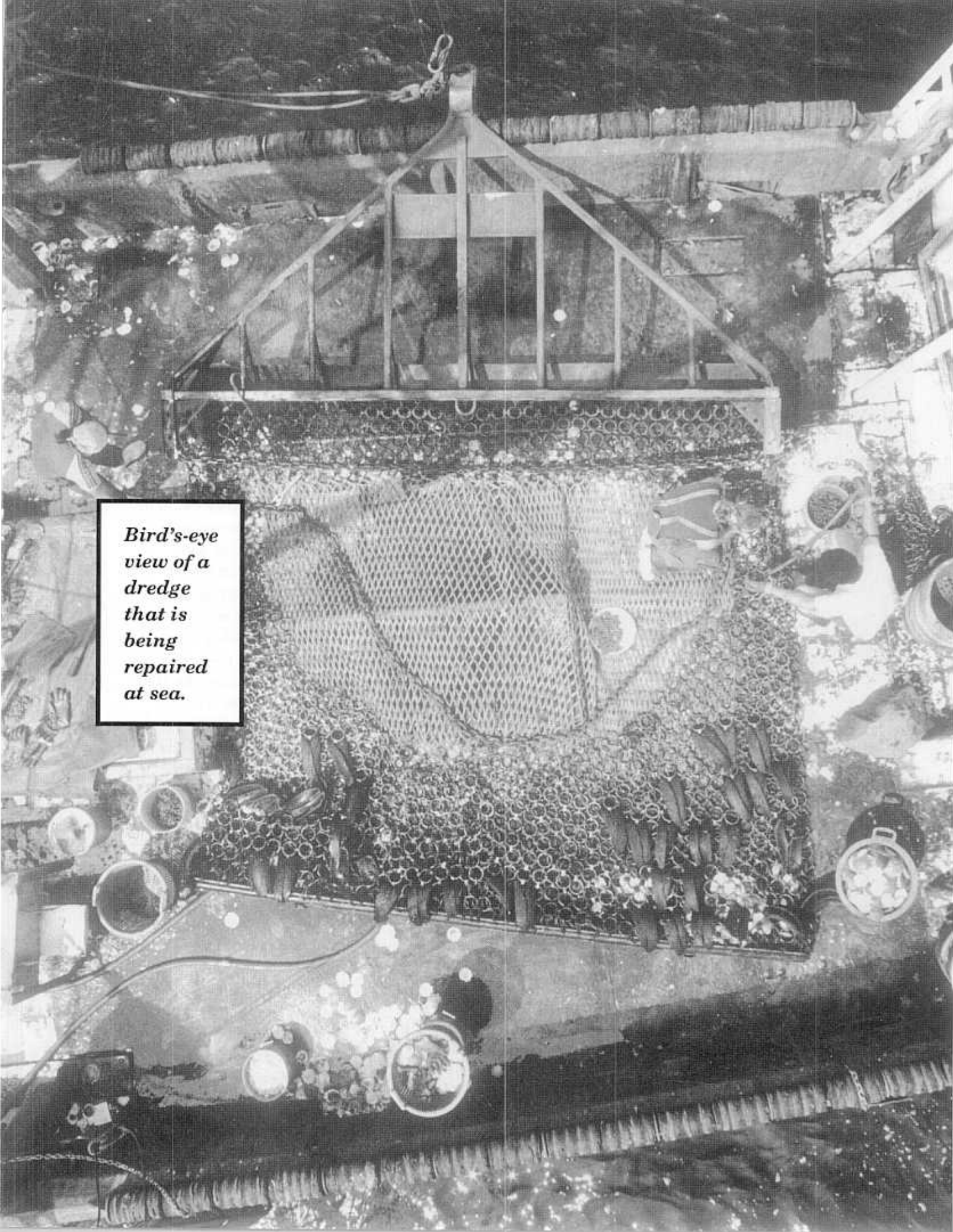
Over the past decade the seafood industry has reached a new level of professionalism in which standards far exceed those of the past, according to Bill Wells, co-owner of Seaford Scallop. "In many ways we have stepped into the 21st century," Wells said, adding that he has watched the process within his industry, from the first changes onboard to the very last. "It's been a real success story," he said. Wells attributes the greatly improved handling procedures to a concerted effort by industry members and scientists.

At Seaford Scallop all trips are graded, and bonuses can be expected if the grade is high. What, most people might wonder, could they be graded for? The answer is deceptively simple: the number of scallop meats per pound; the amount of shell mixed in with the product; the overall appearance; the odor; and the moisture content of the product. The criteria used to judge these qualities is the result of many years of work by Virginia Sea Grant and a number of scallopers in the mid-Atlantic.

Maintaining product quality is not a one-time event; it is an ongoing assessment of procedures used during harvesting, said Wells. Toward that end, Seaford Scallop crews are educated and then procedures are reviewed, and reviewed again. Several informational tools are used at Seaford Scallop, but one extensively, a video entitled *At-Sea Handling of Sea Scallops / Mid-Atlantic Region.* The information contained in the video—and which is shown to crews as they make their way to offshore waters—is a compendium of numerous research projects by Virginia Sea Grant scientists William DuPaul,



Bagging scallops.



Bird's-eye view of a dredge that is being repaired at sea.

Insulated totes are now used to chill and store sea scallops before they are bagged and placed in the hold.

Robert Fisher and James Kirkley.

During a scallop trip a crew might land 10,000 pounds. The tows are about 50 minutes long and during that same trip, the crew can expect to shuck approximately 333,000 scallops. In summer, surface water temperature can reach 80° F and temperatures aboard deck, needless to say, are also high. This is when "thermal abuse" can occur, a phenomenon which can cause scallops to yellow or to wafer (to flatten). Although yellowing or wafering does not pose a health problem, it does result in an unattractive product. Exposure to warm temperatures can also shorten shelf life.

In the past, harvested scallops might accumulate on deck where they would be exposed to warm temperatures and a drying wind. This normally happened when the harvesting capacity of the vessel exceeded the shucking capability of the crew. Workers now run clean seawater over the scallops, keeping the scallops alive until they are shucked. Then the crew shucks the final product, the adductor muscles, into chilled seawater.

The most efficient way of preventing thermal abuse came in the form of an insulated tote with an ice/seawater mixture. Totes are now used to store scallops before they are bagged and placed in the hold. If necessary, scallops can be chilled in totes for six to eight hours.

From fishing vessel to packaging plant is only a few feet, and the processing

Workers sort scallops at the processing plant.

segment of a sea scallop operation is clear-cut: the product is washed and packaged. However, processing aids are utilized and that was an area that needed definition.

Tom Catlett, General Manager of Wells Ice and Cold Storage, speaks highly of the Virginia Sea Grant initiative which resulted in specific guidelines for utilizing processing aids.

Almost five years ago research began in this area. The challenge? At that time Sea Grant researcher Robert Fisher noticed product quality differences among mid-Atlantic processors. Plants were using a wide range of applications with mixed results. Also, to many a processor's dismay, the same application would have different results at various times in the year.

Processing aids are used to prevent moisture and soluable proteins/vitamins from being lost. The loss could happen during refrigeration, frozen storage, thawing or cooking. The ideal is for the sea scallop to retain the appearance, color, odor and texture of a freshly shucked product. After many, many experiments researchers determined that a low concentration of sodium tripolyphosphate and salt produced the best results.

Catlett, who provides sea scallops to top-of-the-line customers, believes one other area could be enhanced: consumer education. If the general public knew what is acceptable and what is not, both industry and the consumer would benefit. In the short term, Catlett offers these tips to consumers: scallops should be firm not mushy; they should have a mild odor opposed to a strong or offensive one. The color of a scallop should be appealing. Above all, be wary of bargin-basement prices since "the cheapest product is not always the best."

Fish Processing

When seafood processor Charlie Amory was told that this issue of the *Bulletin* would be about seafood safety, he said, "It's about time someone wrote about this." Amory, of Amory Seafood in Hampton, feels like many in the seafood business—not given enough credit for product safety. After negative reports about seafood aired last year, reaching millions of people, many in the industry felt like they had been put in an untenable position. No matter how they responded they would appear very much on the defensive.

Shortly into the interview, Amory raises a point which had been very much on the minds of industry members, but little publicized. Amory and many others have doubts about the credibility of some of the "experts" who appeared before Congress and gave testimony, saying that several of the experts represented special interest groups at odds with the seafood industry. Figures and statistics were presented, many claim, in a

way which puts seafood in the very worst light.

Amory has a point about the potential influence of some special interest groups. Washington, D.C. is not just the home of Congress, the House of Representatives and federal government. It also contains a city of lobbyists, who have their associations located close to government, the better to reach legislators. And special interest groups come in all forms, the good and the sometimes questionable.

The measures taken by food processors like Amory, all part of ensuring a safe product, are not remotely understood by the general population. Amory pulls a long list out of a file, an accounting of the 32 city, state and federal agencies which at some point in the year visit a seafood processor like Amory. Some of the agencies inspect the plant once a year, others, frequently. A few of the agencies perform redundant functions. Dealing with 32 agencies is time-consuming, but Amory concludes it is part of the cost of doing business in the 1990s.

The U.S. food supply is considered to be among the safest—if not the safest—in the world. The U.S. has this reputation because of the effectiveness of industry and the federal and state regulatory agencies, the latter

charged by law with protecting the public health. Fish and seafood that are bought and sold in this country must meet tough food safety standards.

When seafood safety standards were being formulated by the federal government, planners had a formidable task. The number of fish species caught in the United States is sizeable, and setting safety regulations for each species, difficult, to put it mildly. Every species deteriorates differently, seasonal differences are found in some fish, and the spoilage process can even vary from fish to fish within the same species. Part of the national plan for standards would pinpoint critical areas in the processing line. That sounds easy enough until this consideration: a critical point for one species may not be one for another.

This is where industry is also not given enough credit. In a business like Amory's, which has processing for 75

Photo above: Off-loading squid from the hold. To the left: Squid are washed before they are sorted.

years, people are attuned to quality. At a glance, a processor knows what shape the catch is in. This type of knowledge is not easily or quickly decanted. The seasoned processor inspects texture, temperature, firmness and odor when fish arrive at the plant, and knows when the fish were caught and how well they were stored.

If seafood inspection is to be upgraded even further, then industry and government will have to cooperate, said Amory. "We can't be adversaries," he said, adding that it will take time to put in black and white what that seasoned inspector is able to assess in a few seconds.

Amory Seafood processes between three and five million pounds of fish annually. In all the years, the company has never had a product liability claim or an order returned because of quality.

. . .the U.S. food supply is considered among the safest—if not the safest—in the world. The U.S. has this reputation because of the effectiveness of industry and the federal and state regulatory agencies, the latter charged by law with protecting public health.

Sorting the catch at a seafood packing house.

Quality Control Starts in the Home

It is an old story, the one in which two forces engage in a life and death struggle. It is a theme of the natural world right down to the realm which can only be seen through a microscope, the minute sphere of microorganisms. Theirs is truly a Darwinian world in which the survivors are adept at evolving, sometimes rapidly, to a changing environment.

Therein lies a challenge for food scientists. Pathogens can change. To make matters a bit more confusing, avirulent biotypes exist for many pathogens—meaning, a non-infective organism can have the same genetic constitution of a pathogen. The difficulty is in distinguishing the two.

Pathogen and bacteria are words which incite alarm in many people. This is unreasonable since microorganisms are an ubiquitous feature of the natural environment. Only in food science *theory* exists an area free of bacteria: the interior parts of sound vegetables and fruits, and the muscle tissue of healthy animals. That theoretical, bacteria-free area is evaded by the real world as the sterile knife touches the exterior fruit skin and introduces contamination from the skin as it cuts through the fruit.

So, then, what is the bacteria-phobic, or just plain cautious consumer to think? This nation's current standards obviously exceed those of the past, and are superior to most countries today. Food scientists have made great strides in developing methods for safe food processing, and national and state programs are in place to help protect public health. Even so, illness does occur and the source can often be found right in the home, in the manner in which people prepare food. Many food safety experts believe the majority of complaints about illness can be traced back to practices in the kitchen.

All food products require care in handling. The plate that raw meat is on should not be the same one used to serve the cooked product; the microorganisms that were on the meat did not disappear and are still on the plate. Customarily, pork and chicken are cooked thoroughly for safety, a fact the general public understands and nonchalantly accepts. When it comes to seafood, people are many times not as understanding, sometimes eyeing seafood with suspicion. This really does not have to be the case. If a consumer follows the following guidelines, he or she can benefit enormously from the high-quality and healthy protein which is found in seafood.

- Buy from a reputable seller.
- Keep fresh and smoked seafood refrigerated at 32-40 F. Do not store seafood for prolonged periods. Try to use seafood within two days. If that is not possible, freeze it.
- Keep a recreational catch cold. Food products deteriorate quicker at higher temperatures, so cool the catch rapidly whether it is caught on shore, pier, or vessel.
- Observe proper sanitation. Human skin is covered with bacteria that contaminate any food. Washing one's hands cuts down on contamination.
- Handle raw and cooked seafood separately. Cleanse the work area and utensils between preparation and serving of seafood. Raw and cooked seafood should not come into contact with each other.
- Cook fish until it begins to flake; scallops are ready when they are no longer translucent. The standard rule of thumb when using hot cooking methods (high temperature baking, grilling, broiling) is ten minutes per inch of flesh. ✣ ✣

For commercial and recreational fishermen

Rare Appearances

That the Chesapeake Bay is temporary or permanent home to 287 marine, brackish and freshwater fish species is known. What is still poorly understood is why some fish appear in the Bay system at all. High salinity and elevated temperatures are often suspected as probable reasons for the rare appearance of various fishes. However, in this year of fairly normal salinity but somewhat cooler than normal temperatures, smooth puffer (*Lagocephalus laevigatus*), barrelfish (*Hyperoglyphe perciformis*), and gray snapper (*Lutjanus griseus*) were found.

The oddest-appearing catch was a smooth puffer, a species also called rabbit fish because of its large hare-like eyes and teeth. The specimen found at the Cell, just above Cherrystone on the Eastern Shore, was 27 inches and about 9.4 pounds. The normal range of the smooth puffer is from Massachusetts to Brazil, but it is uncommon north of Cape Hatteras, North Carolina. The smooth puffer differs from the commonly found northern puffer (*Sphoeroides maculatus*) in its much larger size—up to about two feet, compared to less than 10 inches for a northern puffer. Plus, the smooth puffer only has stiff prickles on its underside as opposed to its entire body. Like the northern puffer, the smooth puffer lives up to its name, swelling its body when threatened. Early in the 18th century a colonist was surely describing a puffer when he recorded a curious fish, one which would swell until it is "like to burst."

The barrelfish (*Hyperoglyphe perciformis*) is generally a deep-water, pelagic fish. The sample landed this year off the mouth of the Chesapeake Bay was approximately 3.5 pounds and 10 inches long. The range of the barrelfish is from Nova Scotia to south Florida and into the Gulf of Mexico. *Perciformis* is rarely recorded as present in the Bay system. The small size of the specimen caught this year indicates it was a juvenile. Small barrelfish are occasionally at the surface offshore, usually in association with floating debris (i.e. grass lines). Adults taken in 400-800 feet of water off Key Largo, Florida, weighed up to 27 pounds and were about three feet in length.

Gray snapper (*Lutjanus griseus*), or mangrove snapper, is a tropical marine reef fish. The grey snapper found here was caught in Long Creek in Lynnhaven Inlet and was 3.5 pounds and about 15-16 inches long. *Lutjanus griseus* can grow to about 35 inches in length and 25 pounds in weight. The normal range is from Florida to Brazil. This species is a popular recreational fish because it is a fighter and is good to eat. ✣

Zebra Mussel Conference

Until six years ago, few people in the United States had heard of zebra mussels (*Dreissena polymorpha*). By the fall of 1989 the small molluscs had colonized the surface of nearly every firm object in Lake Erie. The molluscs have since spread throughout the Great Lakes, to the Hudson and Mississippi rivers and are expected eventually to reach most of North America's waterways.

The Mid-Atlantic Sea Grant network will conduct a conference in March to bring together managers, educators and technical experts to assess the zebra mussel threat to the mid-Atlantic region and to decide how to best mount a broad plan for public awareness and action.

The conference will be in Baltimore, Maryland, on March 10-12. The Wednesday training session costs $20; the Thursday and Friday conference sessions, $65 through February 26 ($85 after that date). For further information on the conference, call Dan Terlizzi at the Maryland Sea Grant Extension Program (410) 638-3255. Or call the Sea Grant office in Delaware, (302) 831-8185; New Jersey, (908) 932-9636; North Carolina, (919) 515-5287; or Virginia, (804) 642-7164.

Trade show exhibitors should call Barbara Doll, North Carolina Sea Grant, for details at (919) 515-5287.

The conference will be held at Stouffers, 202 East Pratt Street, Baltimore, Maryland 21202. If you need hotel reservations at Stouffers, call 1-800-535-1201.

The sponsors for this conference are: the Sea Grant Programs of the Mid-Atlantic (Delaware, New Jersey, Maryland, North Carolina and Virginia); the Maryland Department of Natural Resources; Maryland Power Plant Research Program; and the National Oceanic and Atmospheric Administration; and the National Sea Grant College Program.

✣ ✣ ✣

New Edition

People who own a copy of *Fishes of the Chesapeake Bay* are usually protective of the book, wary of borrowers who might not return it. That is because it has long been considered the definitive book about Bay fishes. The book is now being revised by Ed Murdie and Ray Birdsong, scientists at Old Dominion University. The introduction to this new edition will be by John Musick, scientist at the Virginia Institute of Marine Science.

This edition is slightly different than the last. Instead of describing the status of various fisheries, the new edition will expand sections on species, making it a useful guide to anyone interested in Chesapeake Bay fishes. The publication will also include as many color photos as possible, again to aid readers in identification. *Fishes of the Chesapeake Bay* is scheduled for a September 1993 publication by Smithsonian Press. ✣

The following is adapted from a brochure published by the Virginia Marine Products Board, an organization devoted to promoting Virginia seafood products both on a national and international level.

Seafood Soups

The most basic of all seafood soups is fish stock, made by cooking fish trimmings with selected vegetables, spices and usually wine or vinegar. After being strained, this clear, thin liquid is used as a base for many seafood soups and elegant sauces. Chowders are usually a mixture of finfish or shellfish, vegetables, and spices with either a tomato or cream base. Chowder recipes oftentimes call for fish stock as a basic ingredient. A bisque is a rich cream-based soup made with shellfish and spices. Creole bouillabaisse and gumbo are hearty seafood stews made of a combination of seafoods and vegetables and are usually begun by making a roux of oil and flour. The roux for gumbo is generally a dark chocolate brown whereas the roux for a bouillabaisse is light brown.

Unlike meat stews which require long cooking times to tenderize the muscle tissue, seafood soups and stews require relatively little time in preparation. The broth and vegetables may be cooked for 30 minutes to an hour to blend flavors, but the seafood is added at the end of the cooking period because its muscle tissue is so naturally delicate and tender. Both finfish and shellfish make delicious soups. Be careful, however, when selecting finfish for a soup. Take into account the following guidelines when purchasing fish and in the preparation of a seafood soup:

- Use a firm-textured fish that will hold its shape.
- Unless the recipe specifically calls for them, avoid high fat fish because they tend to have a stronger flavor and do fall apart easily.
- Removing the skin and dark muscle underneath the fish will result in a milder flavor.
- Remove all bones before adding the fish to the soup (a pair of tweezers works well).
- Add the seafood, both finfish and shellfish, toward the end of the cooking period.

Quick Scallop Vichyssoise

1 lb. scallops
1 quart boiling water
2 T. salt
2 cans (10 1/2 oz. each) condensed cream of potato soup
1 pint milk
1pint half and half
2 T. chopped chives

Place scallops in boiling water. Cover and return to the boiling point. Simmer 3-4 minutes, depending on size of the scallops. Drain. Grind scallops or chop into very small pieces. Combine soup, milk, and cream; heat. Mash or put through sieve. Add scallops; heat. Sprinkle chives over top. Makes 6 servings.

Old-Fashioned Oyster Chowder

1 pint oysters, fresh or frozen, undrained
8 strips bacon, diced
2 T. butter or margarine
2 cups cooked potatoes, coarsely chopped
1/2 cup sliced green onion or 1 medium onion, chopped
1/2 cup diced celery
1 medium carrot, coarsely shredded
1/2 cup water
2 cups milk
2 cups half and half
1 can (12 ox.) whole kernel corn, drained
1 1/2 t. salt
1/8 t. white pepper
2 dashes liquid hot pepper sauce
chopped parsley

Thaw oysters if frozen. Fry bacon over moderate heat in large Dutch oven until crisp. Remove bacon, reserve. Remove all but 2 tablespoons of bacon drippings from pan; add margarine or butter. Saute potatoes in drippings until lightly browned. Add onions, celery, carrots, and water; cover and simmer about 5 minutes or until vegetables are tender. Add milk, half and half, corn, salt, pepper and liquid hot pepper sauce. Simmer. Add oysters, oyster liquor, and bacon. Heat just until edge of oysters curl. Add liquid hot pepper sauce. Ladle into soup bowls; sprinkle with parsley. Makes about 10 cups, 6 to 8 servings.

On the cover: blue crabs
en masse to the cooker.
Photo by Susan C. Waters.

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