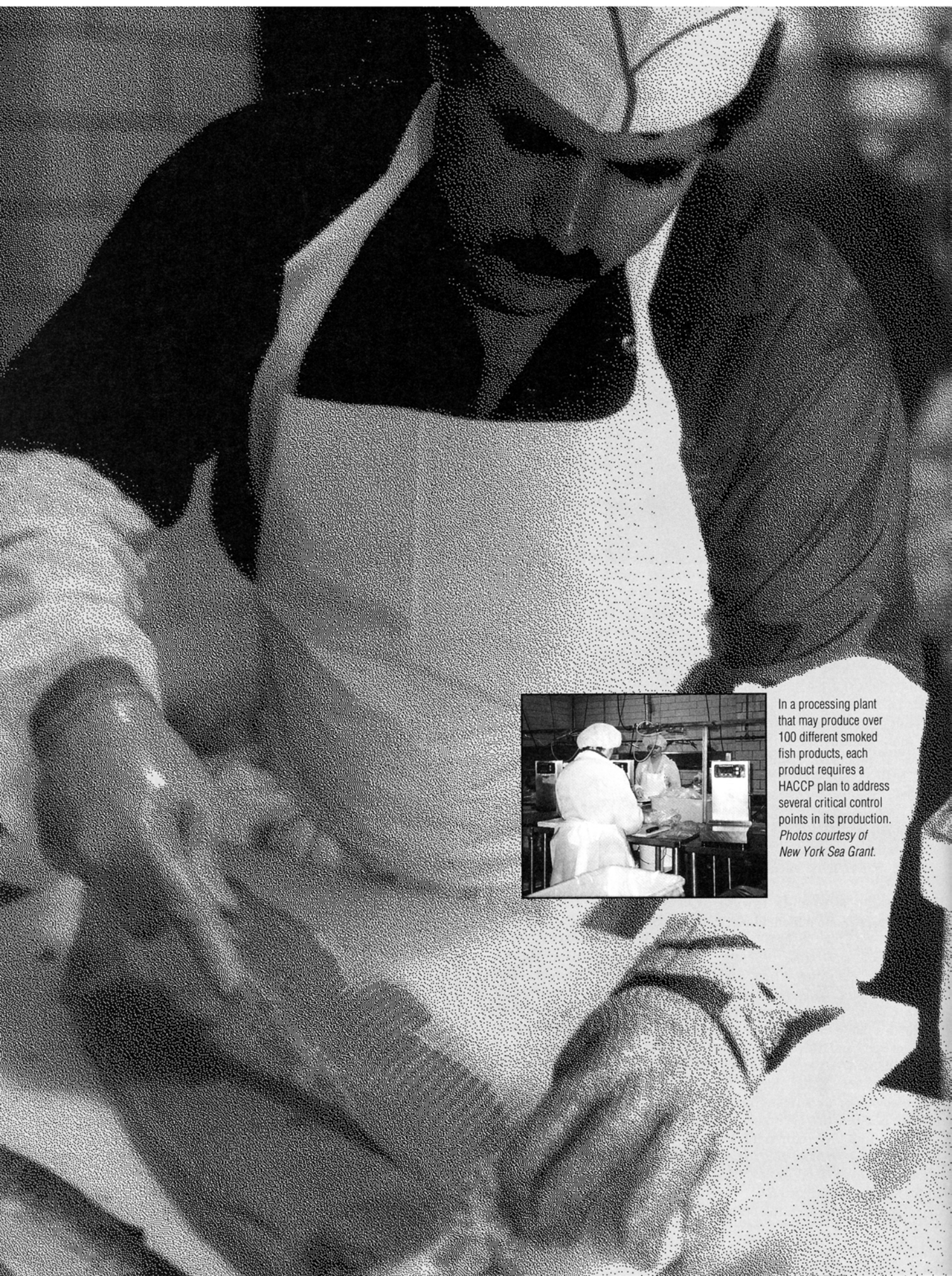


In a processing plant that may produce over 100 different smoked fish products, each product requires a HACCP plan to address several critical control points in its production. *Photos courtesy of New York Sea Grant.*

SEAFOOD INDUSTRY FIRST IN SAFETY

The seafood industry is the first to adapt a new concept in food safety, and Sea Grant specialists are doing their part to see that the fish that winds up on your dinner table is both healthy and healthful for you.

Darkness has already descended by the time workers begin unloading clams from boats tied up at the dock. And the first order of business is to check the tags that will assure workers at this seafood processing company that the shellfish have come from "certified" waters and are thus deemed by local health officials to be safe for human consumption. Controlling the source of seafood is the first step in a series of controls to ensure the safety of this company's products. As workers place clams into the refrigerator, the time and temperature will be carefully monitored and recorded. And in the morning, when the clams begin being processed into numerous products, each critical point will be carefully controlled and monitored. It is all part of a rigorous, state-of-the-art, science-based plan of seafood safety.

The new seafood safety program is perhaps the single most important change in the national seafood industry in decades. A new Food and Drug Administration (FDA) regulation requires seafood processors, wholesalers, shippers, importers, and other seafood businesses to conduct an analysis of the food safety hazards associated with their businesses and then develop a Hazard Analysis Critical Control Point (HACCP) plan that anticipates potential food safety hazards and controls them before they occur. HACCP, (pronounced has-sip), is an innovative system currently being applied to the production of seafood and other food products. Through HACCP programs, seafood safety problems are prevented or controlled from the dock through the whole processing and distribution chain. According to Ken Gall, New York Sea Grant seafood specialist, these controls fall into several categories, including source controls, to ensure that all products are harvested from safe areas, and process controls, such as specific time and temperature limits designed to prevent the growth of harmful bacteria.

National Training

The seafood industry is the first industry to implement this latest scientific approach to safety. Spearheading a national training effort for both the seafood industry and the regulators who inspect seafood businesses, the national Sea Grant network formed an alliance with the FDA, the National Marine Fisheries Service, the U.S. Department of Agriculture, university seafood specialists, the Association of Food and Drug Officials, and national industry trade organizations such as the National Fisheries Institute and the National Food Processors Association. These groups developed a training program to teach industry members and regulators about the new HACCP system and the new FDA regulation that the industry had been given two years to implement. According to the Association of Food and Drug Officials, which coordinated this training program, 321 three-day Seafood HACCP Alliance training courses have been held nationwide, and more than 9,600 individuals have completed the course. In the Northeast, 29 courses were taught in Maine, 22 in New York, nine in Rhode Island, eight in Massachusetts, and two in New Hampshire. Sea Grant specialists coordinated and taught the HACCP training course in New York, Connecticut, and Rhode Island with assistance from local FDA officials and others.

In New York, it was estimated that more than 600 seafood businesses, which contribute over $1 billion to the state's economy, would have to comply with the new FDA regulation, which went into effect in December 1997. By that target date, New York's training team had already delivered 15 courses and trained some 600 individuals from the seafood industry, the FDA, and state agencies. New York's training team included Ken Gall, who coordinated and served as supervisory instructor for the courses; Roger Tollefson, New York Seafood Council president; and John Schrade, regional food service specialist from the FDA's Northeast Regional Office in Brooklyn. Also on the team were representatives from the N.Y. State Department of Agriculture and Markets: Mike Halbert, senior inspector; Joe Corby, assistant director of food safety; and Al Bugenhagen, director of field operations. Seafood business owners or employees represented the bulk of the trainees, with federal and state food inspectors making up most of the rest. As of May, 685 people had been trained

By BARBARA BRANCA and KEN GALL, New York Sea Grant

in New York: 42 percent from New York City, 47 percent from other parts of the state, and the rest from across the country and around the globe due to the international nature of the New York seafood market.

Gall developed a special teaching module for seafood wholesalers to make the training course relevant and useful to the seafood industry throughout the entire Northeast. He also taught specialized courses for seafood importers and smoked fish employees and managers. As part of this effort, Gall worked with the Fulton Fish Market, the nation's largest wholesale fish market, to identify what was needed to comply with the FDA regulation. His report outlining potential problems and alternative solutions was used by more than 50 companies at Fulton as well as by New York City officials.

Concerns and Controls in the Northeast

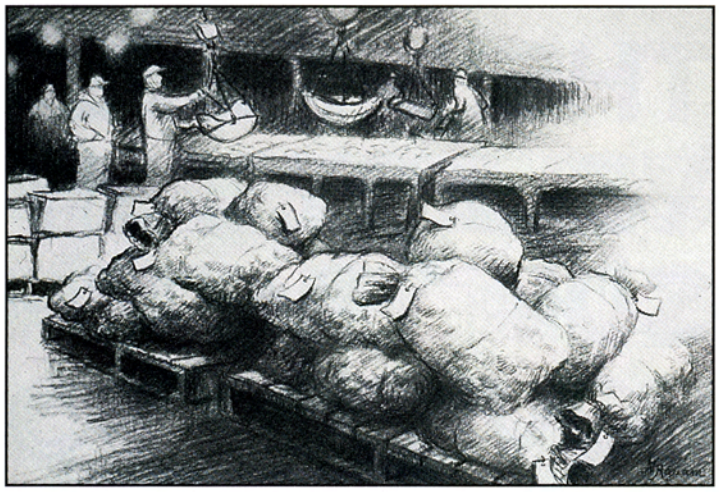
Lori Pivarnik, University of Rhode Island (URI) Sea Grant and Cooperative Extension research associate, has taught numerous HACCP classes for Rhode Island and Massachusetts seafood processors. One safety concern typically expressed is the time/temperature control needed to prevent a hazard called histamine in North Atlantic species such as tuna, bluefish, mackerel, and mahi-mahi. When these fish are left uncooked for too long, or not refrigerated at low enough temperatures, spoilage bacteria can grow and convert an amino acid called histidine into another compound, histamine. That compound can cause illness in those who eat the fish. This risk can be completely prevented by reducing the time that these fish are exposed to temperatures above 40° F.

Such temperature controls must begin when the fish is harvested and continue throughout the processing and distribution chain. According to Pivarnik, "Starting at the harvest level, there has to be concern about the rate of cooling and bringing the fish down to an acceptable temperature." Then, the primary processor and everyone thereafter who handles the fish will have time/temperature controls in their HACCP plan to safeguard these species.

Seafood processors must also deal with potential risks related to the source of the seafood, or where the product is harvested. Many of the Connecticut seafood processors trained by Nancy Balcom, Connecticut Sea Grant Extension associate educator for fisheries and aquaculture, are shellfish shippers. Shellfish shippers in Connecticut (and all other shellfish-producing states in the United States) were already keeping written records of their inventory. Now, according to Balcom, "They are adapting current forms, such as their bills of lading, to include the information that is required in their HACCP plan."

In New York, many seafood processors produce value-added seafood products, such as smoked and pickled fish and a variety of other traditional products for New York's diverse ethnic communities. Such products often require a more complicated HACCP plan that might include several critical control points in the production of a single product. For example, hot smoked fish must be smoked to an internal temperature of 145°F for 30 minutes, and raw materials and finished products must be kept below 38°F. In New York, processors must have a process schedule that shows how they will meet these requirements before they are issued a permit to produce smoked fish. In the transition to a HACCP-based system, these process controls became the basis for the critical limits that firms established in their HACCP plans.

In Maine, the lucrative lobster industry had a market value of $140 million in 1998, according to Bob Bayer, University of Maine, Orono, biosystems science and engineering professor and Lobster Institute executive director. That industry has a different type of hazard to consider in its HACCP plan. After lobsters are harvested and banded, they are often held in lobster pounds—cool tidal pools with a barrier preventing the lobsters' escape. With concentrated populations of lobsters in small areas, bacterial diseases such as Gaffkemia (which affects lobsters but not humans) often need to be treated with antibiotics to prevent the lobsters from dying. Bob Brown, Maine Import/Export Dealers Association president, says, "Maintaining the health of impounded lobsters is the biggest challenge" in lobster production. Since storing lobsters under these conditions meets the broad definition of "processing," pound owners are required to have HACCP plans in place. Under the HACCP system, the most likely hazard is the use of aquaculture drugs.



Opposite page: It's before dawn in lower Manhattan's Fulton Fish Market, and already the marketplace has been bustling with activity for hours. Fulton is the nation's largest wholesale seafood distribution point, with sales of eight trillion tons of 600 species of fish each year. *Watercolor by Naima Rauam, courtesy of the artist and South Street Seaport Museum.*

Above: Through HACCP programs, seafood safety problems are prevented or controlled from the dock through the whole processing and distribution chain. Tags on these sacks of clams are examples of source controls ensuring that all products are harvested from safe areas. *Watercolor by Naima Rauam, courtesy of the artist and South Street Seaport Museum.*

Pound owners control this hazard by using only approved drugs and making sure that the lobsters are held long enough that the antibiotics are eliminated before the lobsters are sold.

To help in this effort, Bayer, Brown, and Alfred Bushway, University of Maine food science and human nutrition professor, have prepared a model HAACP plan. "Our generic plan for live lobster can help most people develop a HACCP plan for their own businesses," says Bayer. Becky Maxim, a consumer safety investigator at the FDA office in Augusta, Maine, offers that the FDA's HACCP Plan and Logbook for Lobster Storage helps pound owners get into the habit of recording when medicated feed is applied and withdrawn, the latter being the most critical control point in lobster production.

Evaluating Impacts

Over the last two years, Sea Grant specialists have contributed much effort to HACCP training. Recently, New York Sea Grant's Gall designed a survey of trainees to find out how both the regulation and training have affected the industry. The FDA Office of Seafood and other groups are expected to use this survey as a model for collecting similar impact data on a national basis. Gall also asked the Sea Grant trainers in four states to distribute his survey to the companies attending their three-day programs. Of approximately 500 sent out, 144 surveys were returned from seafood businesses in the Northeast (New York, Connecticut, Rhode Island, Massachusetts) as well as New Jersey, Pennsylvania, Maryland, and Ohio. Sixty percent of the firms that returned the survey were wholesalers and distributors.

An overwhelming 83 percent of the survey respondents reported that "they would not have been able to develop a HACCP plan and comply with the FDA regulation without the Alliance HACCP training course." Respondents included firms of all sizes, with about half from firms of less than 10 employees and average annual sales of less than $3 million. In most cases, the employees themselves wrote their HACCP plan. Developing the plan and monitoring records took an average of about 50 hours. Respondents estimated that the HACCP plan development process, including the time devoted to developing the plan and attending training, cost an average of about $2,300 per firm.

The survey also attempted to evaluate what investments seafood firms had made to implement HACCP. Investments varied widely—from only $10 for one small firm to $750,000 for a very large one—but the mean of reported investments was nearly $25,000. The relative cost as a percentage of total annual sales was as much as 10 times greater for the smallest firms as compared to the largest. Capital investments included the purchase or upgrade of cooling equipment, including new in-plant refrigeration units, delivery truck refrigeration units and shipping containers, temperature monitoring devices, and sanitation equipment and procedures. Changes made in company operating practices included using thermometers and other monitoring devices more frequently and changing the way in which products are received, stored, displayed, and shipped.

Survey respondents reported spending an average of nine hours a week on routine HACCP monitoring and record-keeping requirements. According to the surveys, the average annual cost for these routine requirements ranges from $4,700 to $7,000 per year. However, despite the additional costs related to implementing HACCP, 75 percent of the respondents reported that, because of the price of seafood and competition within the industry, the price of their products had not increased to offset their increased overhead.

The expense of maintaining HACCP records, added to the costs of developing and implementing a HACCP system, was seen as a disadvantage. However, Gall reports, seafood business owners responded that they had a better understanding of both the food safety hazards that could affect their products and the means to control them. Many commented that they have more confidence in the safety of the seafood products they sell.

The goal of the initial three-day courses was to teach the basic principles of HACCP and to help the seafood industry and regulators understand the requirements of the FDA regulation. It was not possible to cover all the potential food safety hazards in detail or to enumerate new research developments. Also, the course was not designed to deliver detailed information on the sanitation monitoring requirements of the regulation.

One of the goals of the survey was find to out what additional training the seafood industry felt was needed. Sanitation was one of these areas. Gall is currently working with a HACCP Alliance training committee that includes Sea Grant seafood specialists from around the country, the FDA, and industry trade organizations to develop a training manual and a one-day Sanitation Standard Operating Procedures course to be offered nationwide. Other recent initiatives include the new one-day Encore refresher course, and alternative mechanisms, such as the Internet, to keep the industry up to date on the latest advances in seafood safety and technology. In the words of one seafood industry participant in the HACCP training, "There is a new sense of responsibility to the public in ensuring that consumption of any seafood is safe."

■ *Barbara Branca is the Communicator for New York Sea Grant. Ken Gall is the Seafood Specialist with New York Sea Grant.*