UNIVERSITY OF NORTH CAROLINA
SEA GRANT PROGRAM

DEVELOPMENT, FUNCTION AND OPERATION OF THE COASTAL SEAFOOD LABORATORY

F. B. THOMAS, T. M. MILLER & N. B. WEBB

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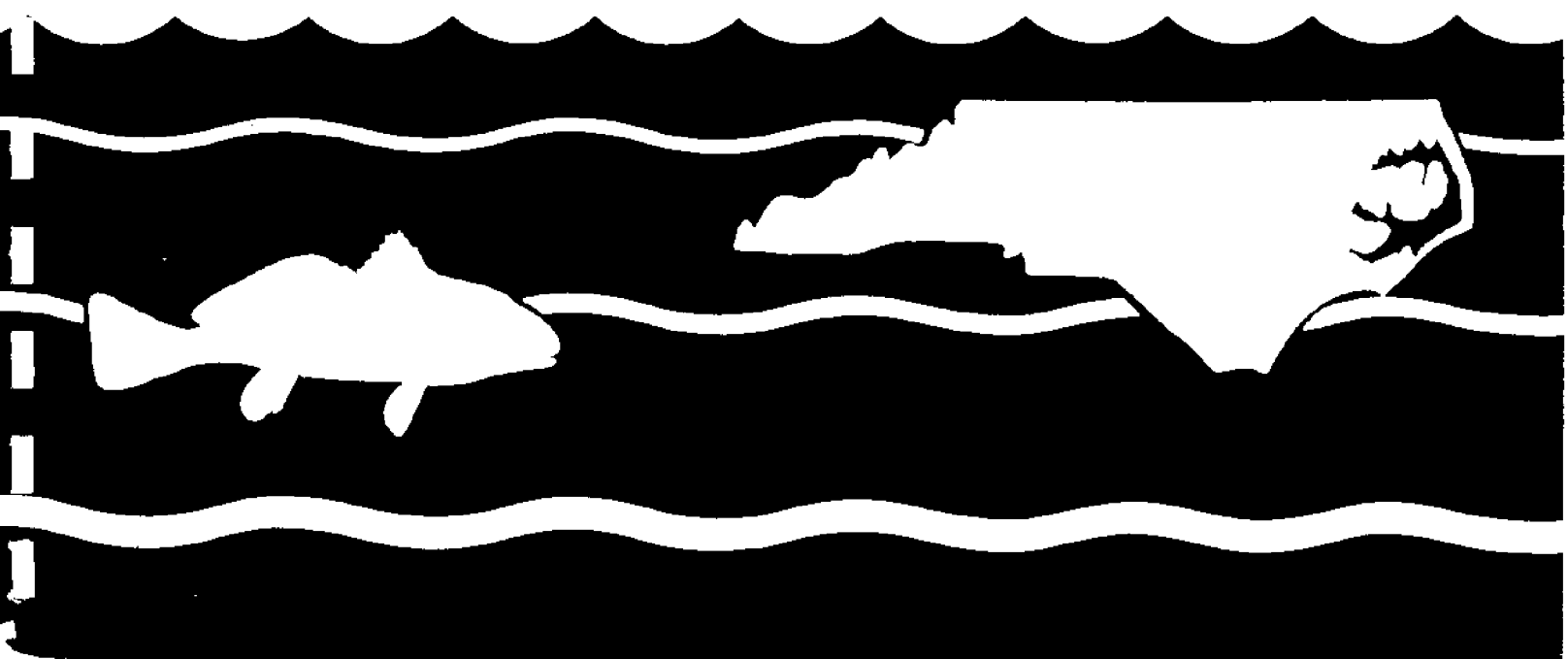

DEVELOPMENT, FUNCTION AND OPERATION OF THE COASTAL SEAFOOD LABORATORY

DEPARTMENT OF FOOD SCIENCE

N. C. S. U.

F. B. Thomas, T. M. Miller[a] and N. B. Webb

Department of Food Science
North Carolina State University
Raleigh, N. C.

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[a]Present address: Seafood Laboratory, P. O. Box 51, Morehead City, N. C.

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SEAFOOD LABORATORIES, DEPARTMENT OF FOOD SCIENCE, N. C. S. U.

Introduction:

The Coastal SEAFOOD LABORATORY, located in the new N. C. Commercial and Sports Fisheries Building at Morehead City, is an intrinsic part of the seafood group of the Department of Food Science, N. C. State University, in Raleigh. Its purpose is to conduct and use applied research and to provide advisory services required by people involved with North Carolina fisheries. The coastal laboratory was developed to compliment the seafood research work of the Raleigh laboratories.

Audience:

Varied requests are received from people concerned with coastal fisheries. The range of problems begins with the catching of seafoods, and extends to the ultimate consumer. The "audience" includes the fisherman in handling and preserving the catch, the dealer in sorting, icing, shipping and seafood processing operations and their diversified problems, and such consumers as the school lunch program, restaurants, institutions, and the housewife.

As if this extensive audience were not enough, there is awareness that coastal development and tourism exerts a considerable impact on fisheries. Seafood harvesting by sports fishermen is variously estimated at 25 to 50% of the commercial catch as reported by National Marine Fisheries Service. Preservation and corrent utilization then becomes an important factor in the supply of seafoods generated by 'sport' fishing', thus explaining SEAFOOD LABORATORY activities in this connection.

Raleigh staff:

The new quarters occupied by the SEAFOOD LABORATORY at Morehead City lead some to think this is a new program. On the contrary, research and extension work on seafoods in Department of Food Science has been under way for a number of years.

Professional staff based in Raleigh are as follows:

Dr. N. B. Webb - Research
Dr. G. Giddings - Research
Dr. F. B. Thomas - Extension

The entire Seafood Program has available to it the faculty's staff, and equipment of the Department of Food Science and the University. Several research technicians and graduate students are active participants in meeting industries' needs.

Supporting Funds:

The idea of a coastal seafood technology laboratory was conceived and planned in 1970 in connection with a group of Sea Grant projects titled, "Development of Marine Industries Harvesting and Processing Systems", which included R/SST-1, Seafood Science and Technology Applied Research, headed by Dr. Webb, and A/EA-2, Seafood Science and Technology, Advisory Services, headed by Dr. Thomas. Classified under the same title is A/EA-1, Engineering Advisory Services, headed by Mr. Norman Angel, with offices in New Bern. The concept of a coastal technology laboratory also resulted from projects conducted on behalf of N. C. Division of Commercial and Sports Fisheries, as follows:

2-8-R "A Study of the Quality of North Carolina Scallops", 9/1/65 to 8/31/68
2-76-R "Studies on the Effect of Processing on the Quality of Seafood Products", 9/1/68 to 8/31/69
2-100-R "The Investigation of Methods for Improving and Evaluating the Quality of Seafood Products", 9/1/69 to 8/31/72
2-197-R "Effects of Post-Harvest Handling, Processing and Storage on Quality and Properties of Seafoods", 9/1/72 to 8/31/75

The Food Science group has been involved in the handling and processing aspects of the Lobster Project, under a contract agreement with Coastal Plains Regional Commission. There is presently some developing cooperation with R&D Section, through Mr. Ed McCoy, ultimately having to do with fisheries management. Such matters include methods of processing and utilizing small shrimp (above 100 count), and some of the water quality problems attending shrimping operations in Pamlico Sound.

Background:
The above projects help explain the close liaison involved in planning the SEAFOOD LABORATORY facilities within the N. C. Commercial and Sports Fisheries Building. These quarters were occupied in March, 1973, but the SEAFOOD LABORATORY was started two years before at a temporary location on Bogue Sound.

Mr. T. M. Miller was placed in charge of the SEAFOOD LABORATORY in September, 1972. At that time he resigned as Research Director of Wallace Menhaden Products, Inc. and as Director of Marine Chemurgics, Inc.

An important asset made available by Wallace Menhaden Products, Inc. is a collection of technological data accumulated for 23 years. Another was the expertise resulting from the Carteret County Seafood Processing Project, a 5 year study supported by Economic Development Administration, and by Carteret County, under contract with Marine Chemurgics, Inc.

Organizational Details:
The SEAFOOD LABORATORY, by nature of its support, devotes equal time to applied research, and to advisory services. Its activities are closely interlocked with those of the group in Raleigh while directed at meeting the needs of the large coastal clientele.

The SEAFOOD LABORATORY consists of five parts: (1) Advisory Services Offices, (2) Information Center, (3) R&D Analytical Laboratory, (4) Bacteriology Laboratory, and (5) Pilot Plant, Cooler and Freezer Rooms. Mr. Miller spends about two days a week in the field working with clientele while Mr. David Hill is concerned with field problems about one day per week. Mr. Hill has been with the program for 2½ years. His past experience is that of a Sanitarian, and includes lifelong contact with the fishing industry. Mr. Billy Ricks, Coast Guard, Ret., handles project work aboard the Research Vessel DAN MOORE. The Raleigh staff, including graduate students, increasingly uses the facilities.

The Advisory Services Offices are involved in consultations and meetings which have included such subjects as good manufacturing practices in crab meat plants, plant sanitation, selection of refrigeration equipment, and new product development. Field trips are carefully planned in terms of overall importance and interest to as many people as possible. On the other hand, ways are usually found to deal with individual requests either by visits, or by letter, or by telephone, often employing background information or experience in arriving at answers.

An example of a wide-interest problem, which is the subject of many requests, has to do with renovation of existing processing facilities, or the building of new ones. New kinds of building materials and methods of construction are being considered in terms of anticipated stringent regulations of the future. In another category, an urgent individual problem had to do with severe product deficiencies resulting from poor sanitation. A list of corrective measures was provided the management of this plant and vigorous clean up measures instituted.

Advisory Services, as a matter of policy, is limited to broad appraisals and recommendations. It is made clear that the staff cannot replace individual initiative of the clientele, nor can it provide services falling in the province of independent consultants, or commercial laboratories.

The Information Center is a room containing an extensive collection of technological data bearing upon requirements of the N. C. commercial fisheries, and of those involved in other aspects of the fisheries as well. In addition to hundreds of classified reprints, there is a collection of about 8000 NMFS and FAO abstracts. Recent information, requested from manufacturers, deals with planning of buildings, construction materials, equipment, chemicals, food adjuncts, and subjects relating to such matters as freezing and packaging. The "center can be used by individuals planning new enterprises, and by students with well defined objectives.

The R&D and Analytical Laboratory is a large, well equipped laboratory providing adequate space for simultaneously conducting several projects. One area is assigned for development work on such problems as preserving quality, working out new products, upgrading seafoods, or utilizing raw materials for more profitable applications. The "Carteret County Extension Homemakers Nutrition Leaders Advisory Committee to the Seafood Laboratory", a group of twelve knowledgeable women, work in the laboratory one day each month, rendering practical assistance in exploring various new ideas and concepts. Recent work has included the small shrimp mentioned above, and in addition there has been a lot of work aimed at improving freezing and packing methods, as practiced in North Carolina.

The activities of this laboratory as a result of clienteleneeds and demands, have become quite varied. The research reported through the Carteret County Seafood Processing Project is being continued and extended because of developing need. This has to do with handling various species intended for further processing, including the rapid freezing of whole fish in blocks for compact storage and subsequent conversion into frozen fillets, steaks, and dressed forms. As result of R/V DAN MOORE offshore exploratory trips there is interest in potential

commercial species which can be harvested at 100 fathoms and beyond. N. C. Commercial and Sports Fisheries Division has supplied grouper, bonito, amberjack, squid, Jonah and red crabs, and other commercially interesting species, and these have been subjected to processing steps and packaging methods to determine best methods of handling, storing and marketing. Such efforts involve systems of treating the meats with dips and solutions intended to reduce water release, protect against oxidation, and afford optimum flavor and texture after freezing.

The analytical capability of the laboratory is aimed at measuring composition in general terms, at dealing with assessment of water quality, and at carrying out specialized tests on seafoods. An important quality criteria test presently being explored in connection with crab and scallop meats, involves use of the Resazurin Reduction Technique described by Webb, Thomas, Busta and Kerr, J. Milk and Food Tech., Nov. '72, Vol. 35, No. 11 (P665-668), but employing spectrophotometric methods for quicker determination of trends and data. Hopefully, a quicker test will also lead to one more suitable for field use. The SEAFOOD LABORATORY has also been engaged in collecting samples in the scallop plants. These will be used to estimate possible values recoverable from effluents of these operations.

The Bacteriology Laboratory is gradually being activated this summer. It will be involved in sanitation studies, and in applied research projects still to be announced. Bacteriological profiles in connection with raw materials, processing conditions, and as basis for judging sanitation practices will come within the domain of this unit.

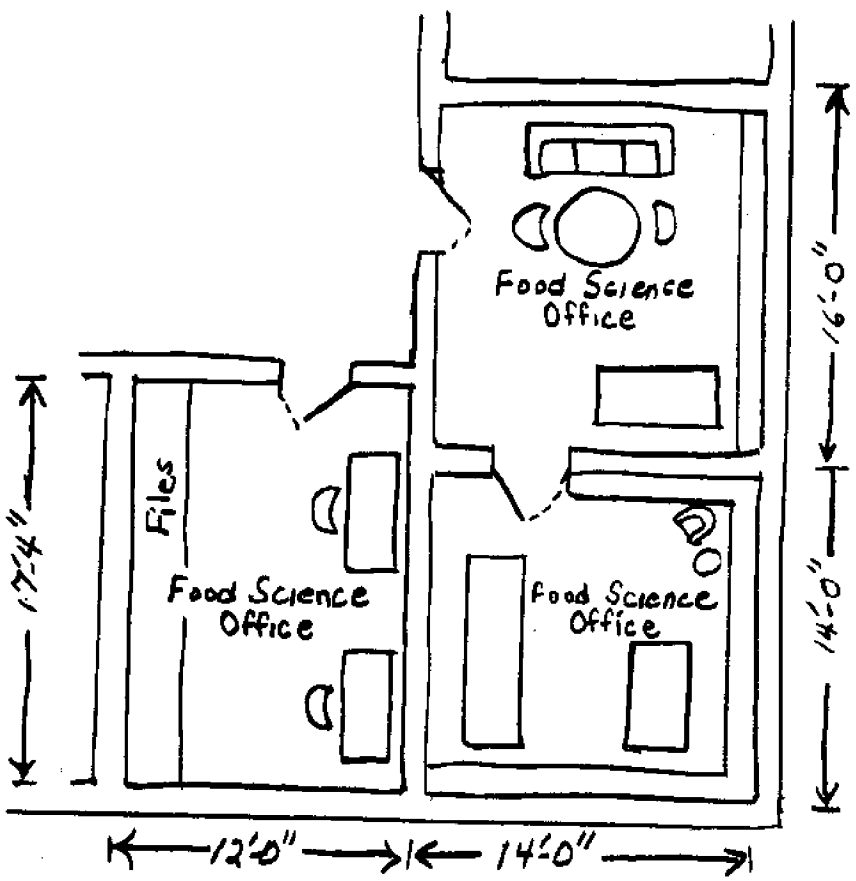
The Pilot Plant, Cooler and Freezer Rooms provide space for conducting applied research projects aimed at making the transition from laboratory to plant. The deboning machine, presently located in the pilot plant, has to do with making new products from under-utilized species. A number of products capable of providing high quality, low priced protein, are being considered. One of the activities of the R&D unit has to do with replacing some of the crab meat in deviled crab with a texturized soy protein. Although the organoleptic results are most encouraging, it would seem even better if comminuted fish flesh could serve as the crab meat extender. This is just one of the approaches being explored.

The cooler and freezing rooms are being used to store a number of new, and potentially new products in connection with shelf life. Test series having to do with use of protective dips and protective films are now being held in the frozen storage room.

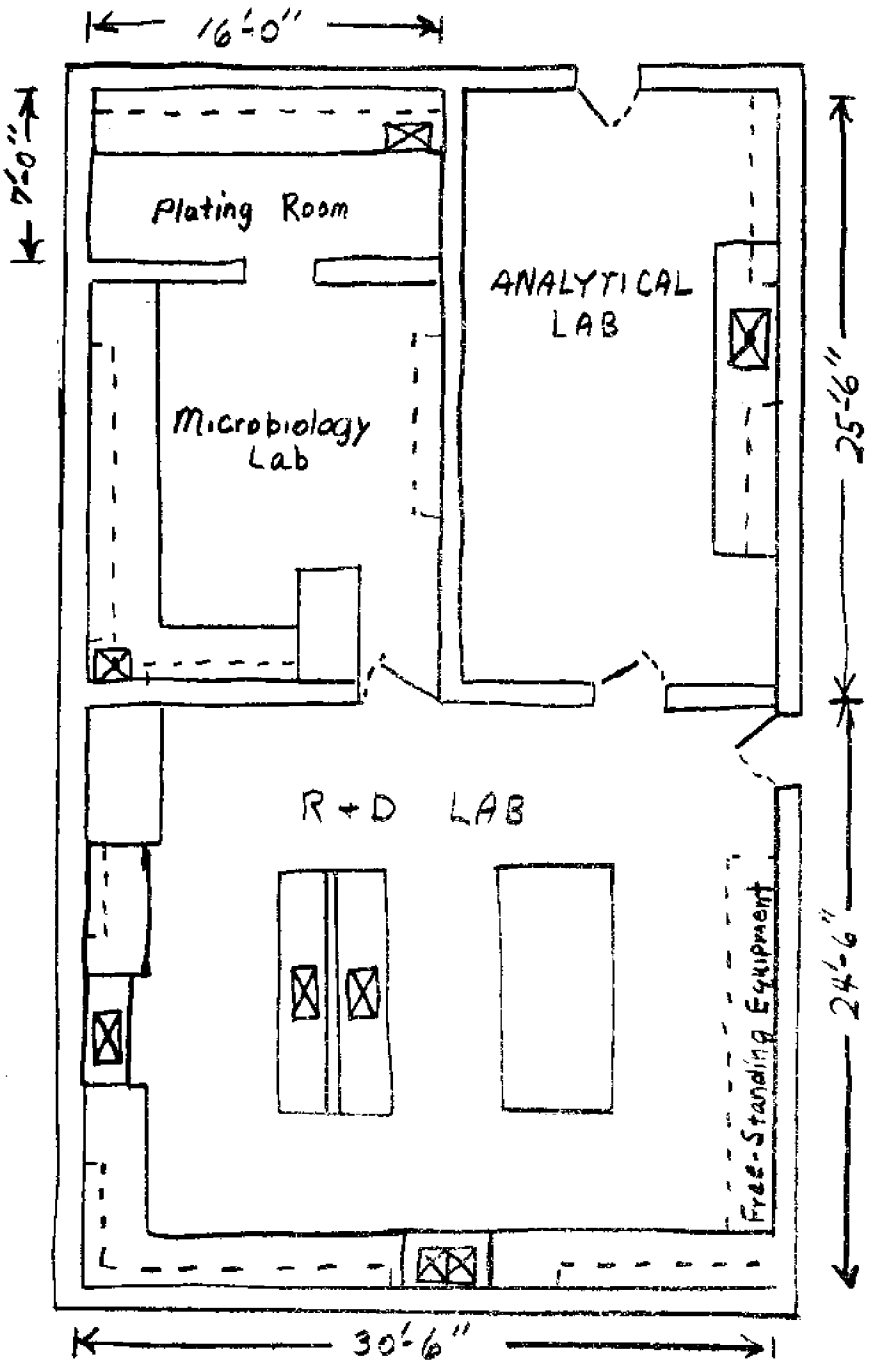
The above explanation is intended to show that the SEAFOOD LABORATORY is in fact a part of the Food Science Department in Raleigh, serving as an invaluable extension in keeping in close touch with the coastal audience. The varied nature of the demands made by clientele can be judged by examining the following list of Subjects handled by advisory services through 1973, and anticipated in 1974. This list also gives some indication of Information Sources, and kinds of Audience:

Interior lab view of space for working out short range problems for Advisory Services staff.

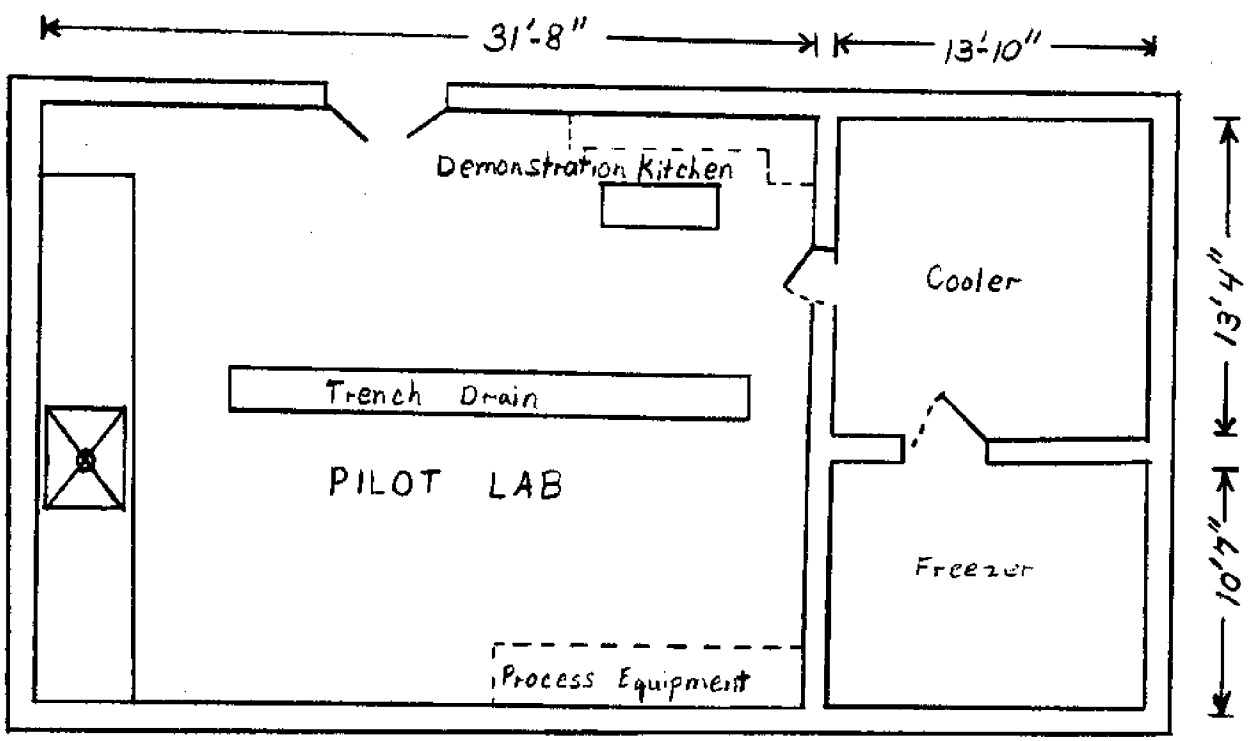
The Seafood Lab with Advisory Services offices are now housed in the new Commercial and Sports Fisheries Building, Morehead City, N. C.



Applied Research and Advisory Services Offices,
2nd Floor, N. W. Corner of New Fisheries Building



Laboratory Complex, 2nd Floor, for Applied Research
Quality Control, Sanitation and Environmental Studies



Pilot Laboratory, Cold Storage and
Freezer Layout, 1st Floor

SUMMARY OF ADVISORY SERVICES
Through '73 & Anticipated for '74

Abbreviations

Infomation Sources:

A. Applied Research R/SST-1
B. Eng. Advisory Services A/EA-1
C. Seafood Laboratory
D. Field Work
E. Information Center
F. Staff Expertise
G. Advisory Groups
H. Regulatory Agencies
I. Tri-State Seafood Committee
J. N. C. Div. Com. & Sports Fisheries, incl. R/V Dan Moore

1. Fishermen
2. Seafood Dealers
3. Basic Processors
4. Further Processors
5. Middlemen
6. Public Feeding Establishments
7. Fish Farmers
8. Tourisms & Ult. Consumers

SUBJECT	YEAR	INFO SOURCE	AUDIENCE
Finfish			
Commercial Species, Unused Varieties	'73&'74	E,J	1.2,3
Deboning & Comminuted Products	'73&'74	A,C	3,4,6
Dips, Protective incl. antioxidants	'73&'74	A,C,F	3,4
Drip Loss, Methods of Reducing	'73	A,C,F	3,4,6,8
Fish Meats, Functional Properties	'74	A,E	4
Freezing, Methods and Materials	'73&'74	B,C,D,E	3,4,6,8
Packaging, Methods and Materials	'73&'74	B,C,D,E	3,4,8
Packaged Products, Shelf Life	'73&'74	C	4,5,8
Preservation and Sanitation	'73&'74	A,B,C,D,H,J	3,4,6,8
Shelf Life, Handling for Optimum	'73&'74	C,D,J	1,2,3,8
Crabs			
Bacteriological Studies in Crab Plants	'73&'74	A,C,D,H	3
Enzymic Activity in Meats	'73&'74	A	3
Freezing Meats	'73&'74	A,C,E	3,4,6,8
Further Processing, Sanitation	'73&'74	A,C,H	3,4
Further Processing, New Products	'73&'74	A,C	3,6,8
Guidelines for Operating Crab Plants	'73&'74	A,H,I,J	3
Pasteurizing Meats	'73&'74	A,D	3,5
Potentially Commercial Off-Shore Species	'73	C,J	1,3
Processing Losses	'73&'74	A,C,D	3
Sanitation in Crab Plants	'73&'74	A,C,D,H,I,J	3
Scallops			
Chilling Meat	'73&'74	A,C,D,J	3
Effect of Processing on Quality	'73&'74	A,C,D,J	3
Handling between Catching and Processing	'73	C,D,J	3
Resazurin Reduction Test for Freshness	'73&'74	A,C,D	3
Shelf Life and Meat Quality	'73&'74	A,C,D,J	3,4,5,6,8
Swelling of Meats under Various Conditions	'73&'74	A,C,D,H,J	3,4,5,6,8
Time-Temp. Factors during Processing	'73&'74	A,C,D,J	3
Lobsters			
Processing Methods, at Sea and Ashore	'73	A,C,J	3,4
Shipboard and Shore Holding Tanks	'73	A,C,F,J	1,4,5,6,8
Shrimp			
Extraction Nutrients & Flavors from Waste	'73	C,E,F	4,6,8
Processing, Utilization Small Sizes	'73	C,E,F,J	4,6,8
Clams			
New Products from Quohogs	'73&'74	C,E,F	4,6,8
Utilizing Rangi Clams	'73&'74	A,C,E,F,J	4,6,8

SUBJECT	YEAR	INFO SOURCE	AUDIENCE
Processing Facilities			
Applying Applied Research	'73&'74	A,B,C,D,F	1,2,3,4,5,6,7
Freezing, and Frozen Storage Facilities	'73&'74	B,C,E	3,4,6
Generalized Plant Layouts	'73&'74	B,C,E,J	3,4
New Methods Sanitary Construction	'73&'74	E	3,4,5,6
Prototype Crab Meat Plant	'73&'74	E,F,G,H,I,J	3,4
Sanitation Guidelines	'73&'74	F,G,H,I,J	1,2,3,4,5,6
Publications			
Crabs, Quality Control Manual	'73	A,C,D,H,I,J	3,4
Extension Nutrition Leaders Notebook	'73	C,G	3,4,6,8
Fresh Fish Handling	'73	E,F	1,2,3,6,8
Preserving Sports Fishing Catch	'73	C,F,J	8
Prototype Crab Meat Plant	'73	D,E,F,G,H,I,J	3,4
Scallop Notes	'73	A,C,D,H	3,4
SEAFOOD PROCESSING SERIES	'74	A,C,D,E,F,H,J	1,2,3,4,5,6,7,8
Smoking N. C. Seafoods	'73	A,C,E,F	1,2,3,4,6,7,8
Mass Media			
Newspapers, Frequent Activity Reports	'73&'74	A,C,D,E,J	1,2,3,4,5,6,7,8
"Quarterly Review", Circulation=1700	'73&'74	A,B,C,D,E,F,J	1,2,3,4,5,6,7,8
Radio, Activity Reports	'73&'74	A,B,C,D,E,F,J	1,2,3,4,5,6,7,8
"Timely Tips" - Specialized Subjects	'73&'74	A,C,D,F	1,2,3,4,6
TV, Activity Reports	'73&'74	A,B,C,D,E,F,J	1,2,3,4,5,6,7,8
Waste Disposal			
Evaluation of Plant Effluents	'73&'74	A,C,D,J	3,4
Environmental Factors	'73&'74	C,D,E,F,J	1,2,3,4,5,6,7,8
Dehydration for Feedstuffs	'73&'74	C,D,F	3,4
Food Uses, Nutrients, Flavors	'73&'74	A,C,F	3,4,6,8
Mariculture Rations, Baits	'73&'74	A,C,F,J	4,7,8
Poultry and Animal Rations	'73&'74	A,C,F	4

For additional information please contact the following Food Science Extension Specialists in Seafoods.

Frank B. Thomas
Department of Food Science
129 Schaub Hall
N. C. State University
Raleigh, N. C. 27609

phone (919) 737-2956

Theodore M. Miller
Seafood Lab
P. O. Box 51
Morehead City, N. C. 28557

phone (919) 726-7341

July 31, 1973

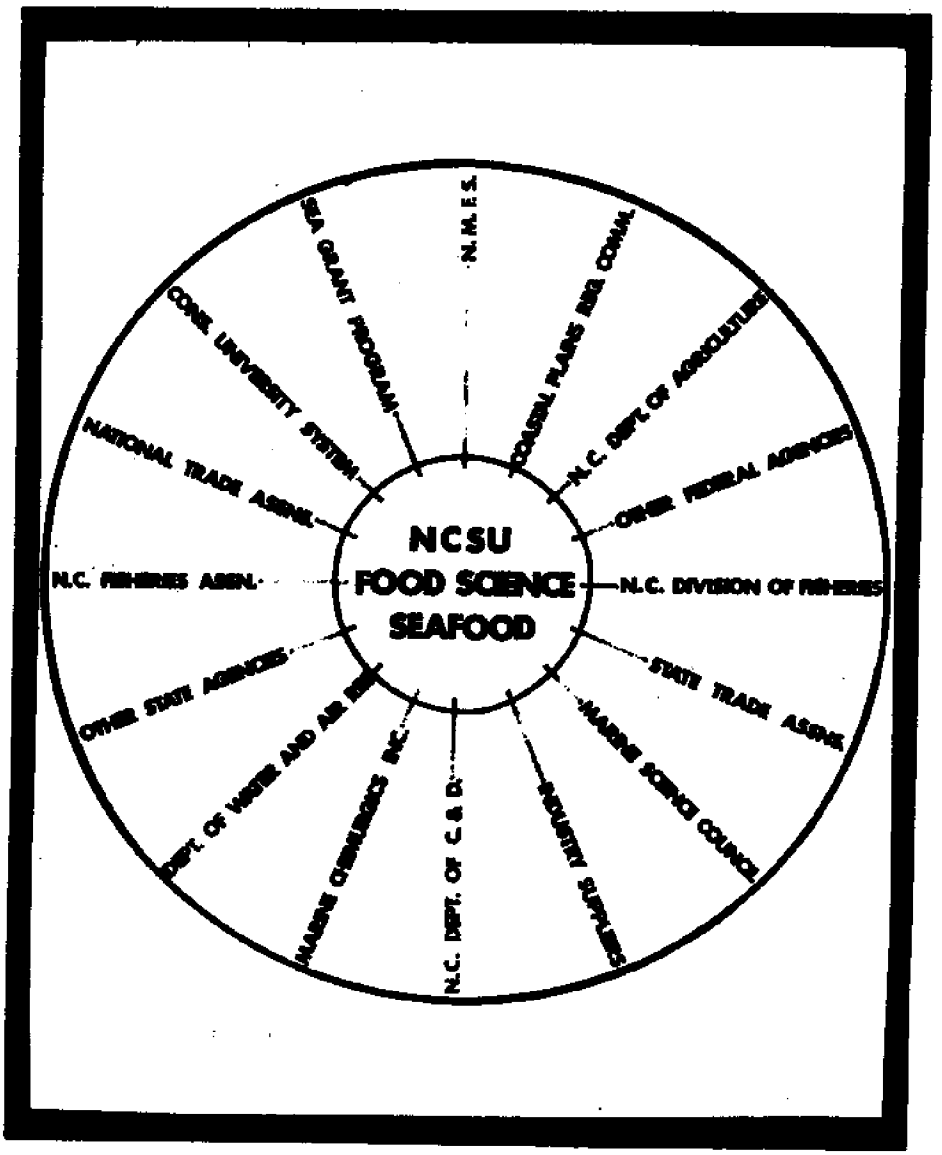
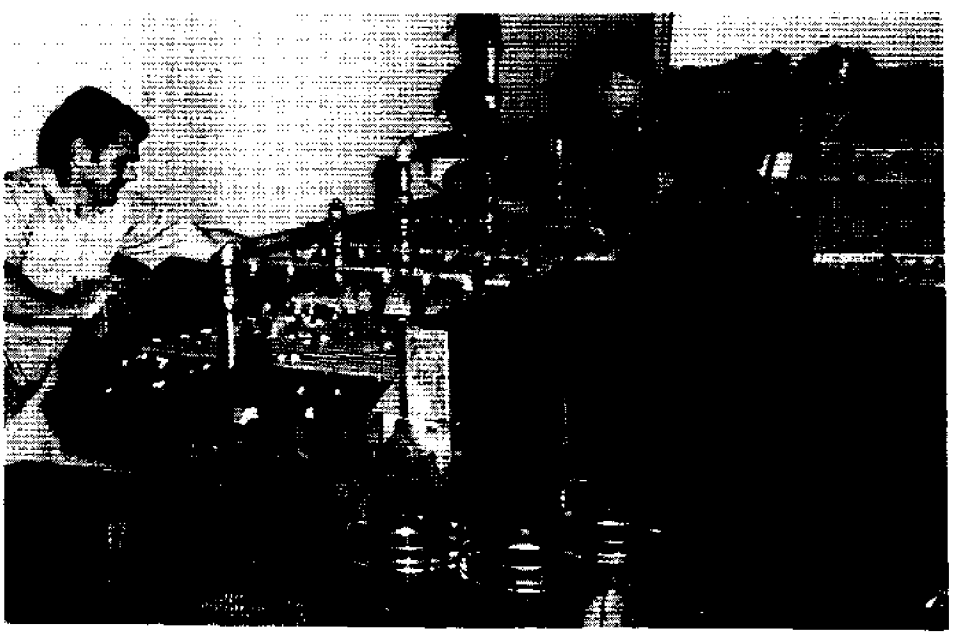


Illustration of the cooperative aspects of Sea Grant Advisory Services Program in North Carolina.

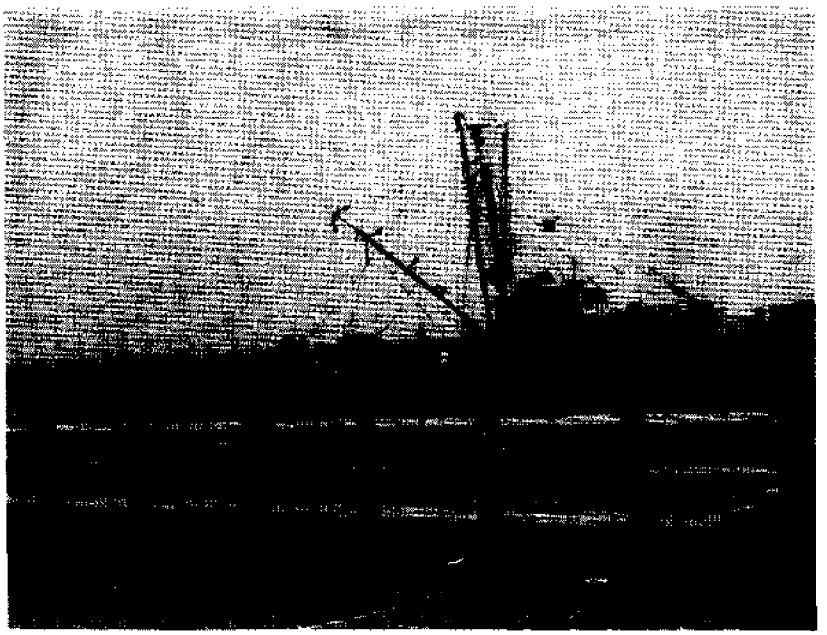
Hand picking of Blue Crab meat is an involved and often unsanitary procedure. Plant sanitation surveys, technical improvement suggestions and management meetings have helped develop an industry with a product value of $7.8 million in 1972.

Instruction and monitoring by our Advisory Services staff demonstrate proper handling, processing, packaging and freezing of ocean fresh seafoods.

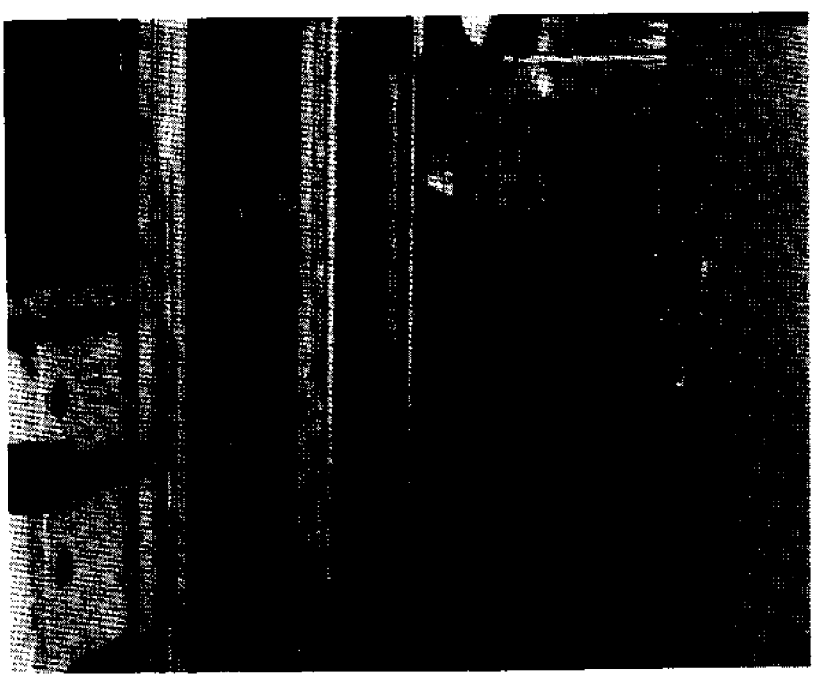
Design, layout, and equipment selection are offered clients planning to modernize, expand or build new facilities. This building houses a new 30 x 30 freezer and process facilities valued at $31,500.



The development of mechanical shucking of scallops was greatly aided by Advisory Services and applied research staff. Nine such plants now operate in Carteret County with an investment value in excess of $1.5 million.



R/V Dan Moore, sea-going laboratory available through cooperation with the N. C. Division of Commercial and Sports Fisheries.



Live holding tanks built below deck for holding crustacea in refrigerated sea water were designed and built by the Food Science Seafood program.

Planning conferences within Advisory Services and with our clientele are essential ingredients of a successful program.

Demonstrations of new equipment by and for the seafood industries helps insure proper application of mechanization. This machine scales fish at a high rate of speed compared to hand operations.

SUMMARY OF APPLIED RESEARCH

The research activities of the two laboratories are closely coordinated. The research project work primarily involves specific problem areas covering functional properties, preservation, sanitation and handling and waste utilization. These areas are investigated by short term and long term projects, depending upon the needs of the industry. The long term project areas deal with those problems which require the development of fundamental information not currently available in the literature. The short term projects involve the evaluation or application of known principles to specific problems currently facing the industry. Both of these approaches are closely coordinated and require the services of the two laboratories. Listings of the current projects are presented in this bulletin.

LONG TERM APPLIED RESEARCH PROJECTS

1. Comminuted Products

   To study the functional properties of various protein sources as related to their textural performance in comminuted seafood products.

2. Crab Meat Quality

   To study enzymatic and related proteolytic changes in crab meat to determine the basis for improving quality during preservation by:

   a. Frozen Storage

   b. Pasteurization

3. Shrimp Texture

   To determine the effect of various processing methods on the quality of pre-cooked frozen shrimp.

4. Lobsters

   To develop improved handling and processing systems for N. C. lobsters.

5. Crab Meat Moisture Measurement

   To develop a technique for measuring the expressable moisture of crab meat.

6. Crab Plant Sanitation

   To investigate levels and types of bacterial contamination and develop methods of improved sanitation for crab processing plants.

7. Protein Losses from Crab Processing

   To study the level and types of proteins lost during the processing of blue crabs.

8. Utilization of Crab Flavor Components

   To utilize crab meat scrap and crab shells for the development of flavoring bases.

9. Nature and Properties of the Myofibrillar Protein Function of Finfish and Shellfish Muscle Tissue

   To determine the influence of this function on the quality of fish and shellfish.

APPLIED RESEARCH, 1973 - SEAFOODS

Project and Significant Finding

1. Freon Freezing Blue Crab Meat:

   Freon frozen crab meat superior to conventionally frozen.

2. Time/Temperature Treatments in Pasteurizing Blue Crab Meat:

   Maximum temperature reached more significant than time at specific temperature.

3. Enzymatic Activity of Crab Meat at Various Times and Temperatures:

   Preliminary findings indicate considerable enzymatic activity in conventionally processed crab meat.

APPLIED RESEARCH, 1973 - SEAFOODS

Project and Significant Finding

4. Protein Losses from Prototype Processing of Blue Crabs:

   Indicates less cook loss at 100°C than at 121°C.

5. Chilling Scallop Meats:

   Combinations of flake ice and salt brine applied to mechanically removed meats for rapid temperature reduction.

6. Utilization of Scallop Viscera:

   Liquid and solid fractions of viscera concentrated to produce promising semi-moist pet food product.

APPLIED RESEARCH, 1973 - SEAFOODS

Project and Significant Finding

7. Mechanical Deboning of Finfish and Blue Crabs:

   Functional properties evaluated by electrophoresis, emulsifying properties, protein solubility, texture.

8. Comminuted Seafood Products:

   Under-utilized finfish comminuted and combined with other seafoods and additives to produce patties.

9. Crab Plant Sanitation:

   Application of stringent sanitation measures in crab plants indicated results not successful because of cross contamination.

APPLIED RESEARCH, 1973 - SEAFOODS

Project and Significant Finding

10. Resazurin Reduction Technique:

Resazurin technique indicated to be rapid technique for predicting shelf life of scallop meats compared with total bacterial counts and sensory ratings.

11. Rangia Clam Processing:

Studies concerned with reducing off-flavor in finished product.

Short Term Project

SEAFOOD LABORATORY — August 1, 1973

Morehead City
Project - I. A. : FINFISH - COMMERCIAL SPECIES, UNUSED VARIETIES

Initiated : Dec., 1973

Audience : Fishermen; Seafood Dealers, Basic Processors

Info Source : Exploratory Fishing

Objectives : Increase Commercial Landings, Augment Supply of Fillets, Raw Material for Further Processing.

Status : R/V DAN MOORE caught and delivered grouper, amberjack, bonito and other off-shore species. Packaged and froze as steaks and fillets, "Nutrition Leaders" conducted cooking and organoleptic tests.

Tilefish and other species tried as extenders for more expensive seafoods, ie, crab meat.

Duration : Continuing part of lab. program

Coop. Agencies : National Marine Fisheries Service-Atlantic Estaurine Fisheries Center; N. C. Dept. Com. and Sport Fisheries.

Short Term Project

SEAFOOD LABORATORY — September 4, 1973

Morehead City
Project - I. A. : FINFISH & CEPHALOPODS - SQUID

Initiated : May, 1973

Audience : Fishermen, Seafood Dealers, Basic Processors, Public Feeding Establishments, Ult. Consumers

Info Source : Seafood Laboratory, Information Center

Objectives : Estimate Size of Resource; Collect Data on Composition of Squid; Investigate Possible Domestic Uses

Status : Large quantities squid observed offshore. Literature indicates good amino acid profile, especially high in methionine. Use as extender in clam dishes, and cooking characteristics providing guidance in fitting into other American dishes, being explored in laboratory.

Duration : Continuing effort to upgrade and use fishery products.

Cooperation : N. C. Div. Commercial and Sports Fisheries, R/V/ DAN MOORE.

Encl. Method of Preparing Extender

Short Term Project

SEAFOOD LABORATORY — September 4, 1973

Morehead City Project - I. C.	:	FINFISH & CEPHALOPODS - DIPS, PROTECTIVE, INCL. ANTIOXIDANTS
Initiated	:	1960
Audience	:	Basic Processors, Further Processors
Info Source	:	Seafood Laboratory, Information Center
Objectives	:	Continue Testing and Improving Dips and Glazes for finfish in the round, dressed and filletted.
Status	:	Gelatine-Lemon Juice-Ascorbic Acid dip demonstrated on many occasions. The protective action of this dip as compared with ice glaze during tunnel freezing will be investigated in a plant trial. Also, the use of Vitamin E as an antioxidant as well as oxidase enzymes for oxygen removal, will be tried. The use of coating materials, such as dextrose, in freezing dips (I.F.) is being arranged.
Duration	:	Continuing part of program
Cooperation	:	Commercial interests

Short Term Project

SEAFOOD LABORATORY — September 4, 1973

Morehead City Project - I.D.	:	FINFISH & CEPHALOPODS - DRIP LOSS, METHODS OF REDUCING
Initiated	:	August, 1973
Audience	:	Further Processors, Public Feeding Establishments, Consumers
Info Source	:	Seafood Laboratory, Information Center
Objectives	:	Investigate Certain Phosphates and other Treatments for Reducing Drip Loss of Fillets prepared from Local Species, Following Freezing and Thawing.
Status	:	Investigating methodology employed in Canada and in New England, preparing trials in conjunction with local restaurant, the samples to be tried under practical restaurant conditions. Also, checking various frozen fillets to determine special cooking methods required to minimize adverse effects of drip loss.
Duration	:	Three months
Cooperation	:	Commercial Interests

Short Term Project

SEAFOOD LABORATORY		September 4, 1973
Morehead City Project - I. B.	:	FINFISH & CEPHALOPODS - DEBONING AND COMMINUTED PRODUCTS
Initiated	:	1970
Audience	:	Basic Processors, Further Processors
Info Source	:	Applied Research R/SST-1, Seafood Laboratory, Information Center
Objectives	:	Determine Yields of Fish Flakes, or Comminuted Meats Derived from Various Finfish Species. Try various methods and packaging and storing these meats. Prepare and demonstrate uses of these meats in commercially interesting products
Status	:	Bluefish, trout, croaker and mullet used as sources of comminuted meats. Tried adding commercial seafood flavors to fish cakes made from comminuted meats, but results not satisfactory. Flakes mixed with comminuted meats expected to solve textural and flavor problems. Aqueous extracts of shrimp, crab, clam and fish being tried to improve flavor.
Duration	:	Continuing part of laboratory program.
Cooperation	:	Commercial Interests

Short Term Project

SEAFOOD LABORATORY — September 4, 1973

Morehead City Project - I. E.	:	FINFISH & CEPHALOPODS - FISH MEATS, FUNCTIONAL PROPERTIES
Initiated	:	1972
Audience	:	Basic Processors, Further Processors
Info Source	:	Applied Research R/SST-1, Seafood Laboratory, Information Center, National Marine Fisheries Service - College Park Laboratory
Objectives	:	Assemble Known Approaches Involved in Making Use of the Functional Properties of Fish Meats in Producing Processed Products, also Consider Techniques for Producing Functional Properties which have been Destroyed in Processing.
Status	:	Surveyed problem of low functionality in fish protein concentrate, and examined steps involved in imparting functionality to denatured proteins. Employed functional properties of raw fish protein to produce binders for clam fritters. Examined moisturized food techniques for preserving functionality.
Duration	:	Continuing part of program
Cooperation	:	Commercial interests

Short Term Project

SEAFOOD LABORATORY
Morehead City
Project - I.F. G. :

August 1, 1973

FINFISH - FREEZING & PACKAGING, METHODS AND MATERIALS

Initiated	:	Sept., 1972
Audience	:	Basic Processors; Further Processors; Public Feeding Establishments; Ult. Consumers
Info Sources	:	Applied Research; Eng. Advisory Services; Information Center; Staff Expertise.
Objectives	:	More Complete Utilization of Catch while Improving Quality
Status	:	Comparing blast, plate, brine, carbon dioxide, nitrogen methods of freezing, incl. relative costs. Developing methods of bulk storing frozen finfish in round for further processing. Checking freezing and storing methods employed by clientele. Comparing moisture and oxygen barrier properties of plastic films.
Duration	:	Continuing part of lab. program
Cooperation	:	Plant and restaurant facilities of clientele

Short Term Project

SEAFOOD LABORATORY
Morehead City

September 4, 1973

Project - I. G.	:	FINFISH & CEPHALOPODS - PACKAGING METHODS AND MATERIALS
Initiated	:	1965
Audience	:	Basic Processors, Further Processors, Restaurants, Consumers
Info Source	:	Seafood Laboratory, Information Center, Staff Expertise
Objectives	:	Consider Kinds and Thicknesses of Plastic Films for Protective Value in Wrapping Seafoods. Examine requirements for Packaging in Boxes, Pouches, and in Master Cartons. Consider Methodology from Standpoint of Commercial and Consumer Suitability in Handling Raw and Processed Forms.
Status	:	Laboratory has evolved, or has used known methods, for producing fish blocks, fish frozen in containers, fillets and other dressed forms of seafoods packaged in a variety of ways. Also, cooked seafood products have been packaged, stored and tried in boil-in-bags. Industry practices are being observed to determine if bad practices (or using unsuitable packaging materials) are involved, and as basis for making recommendations as to possible improvements.
Duration	:	Continuing part of program
Cooperation	:	Plants involved in freezing are visited and methods evaluated. Restaurant operator considering small freeze plant for producing prepared dishes for own use. "Nutrition Leaders" Committee working on home methods.

Short Term Project

SEAFOOD LABORATORY
Morehead City

September 4, 1973

Project I. H.	:	FINFISH & CEPHALOPODS - PACKAGED PRODUCTS, SHELF LIFE
Initiated	:	1965
Audience	:	Basic Processors, Further Processors, Restaurants, Consumers
Info Source	:	Seafood Laboratory, Information Center, Staff Expertise
Objectives	:	Collect as Much Information as Possible Regarding Storage Characteristics of N. C. Seafoods, Effect of Various Packaging and Preservation Methods Upon Shelf Life.
Status	:	Studies have involved many commercially important species landed in North Carolina, from standpoint of shelf life when stored in ice, or after freezing and holding at below 0°F. These same studies have involved use of dips and selected plastic films known to be relatively impermeable to oxygen and moisture.
Duration	:	Continuing part of program
Cooperation	:	Working with processing plants, restaurants, and consumer groups.

SEAFOOD LABORATORY
Morehead City

September 4, 1973

Project - I. I.	:	FINFISH & CEPHALOPODS - PRESERVATION AND SANITATION
Initiated	:	1965
Audience	:	Fishermen, Seafood Dealers, Basic Processors
Info Source	:	Seafood Laboratory, Information Center, Staff Expertise
Objectives	:	Study and Disseminate All Possible Information Dealing with Boat and Shore Handling of Seafoods to Achieve Optimum Quality and Maximum Shelf Life in Unfrozen Condition.
Status	:	Examining boat and plant arrangements, containerization, cleaning procedures, methods of rapid cooling, and other aspects of problem of keeping seafoods CLEAN and COLD on way to consumers, or when intended for further processing, including freezing.
Duration	:	Continuing part of program
Cooperation	:	Working with fishermen, dealers, other handlers of seafoods.

Short Term Project

SEAFOOD LABORATORY
Morehead City

September 4, 1973

Project - I. J.	:	FINFISH & CEPHALOPODS - SHELF LIFE, HANDLING FOR OPTIMUM
Initiated	:	1965
Audience	:	Fishermen, Dealers, Basic Processors, Sport Fishermen
Info Source	:	Seafood Laboratory, Information Center, Staff Expertise
Objectives	:	Superchilling (28°F) as Method of Extending Shelf Life of Unfrozen Seafoods, and Ways of Employing the Technique in Commercial Practice.
Status	:	Superchilled fish produced by adding 5% level of salt to ice at time live fish brought aboard. Also produced by means of plate freezer, based on short exposure time. Superchilled fish packed tightly in insulated boxes successfully shipped across state, without additional refrigeration. Publication for use of sport fishermen will describe superchilling technique.
Duration	:	Continuing part of laboratory program.
Cooperation	:	Working with commercial interests and consumer groups.

Short Term Project

SEAFOOD LABORATORY
Morehead City

August 1, 1973

Project - I.K.	:	FINFISH - MENHADEN
Initiated	:	July, 1973
Audience	:	Basic Processors, Further Processors
Info Source	:	Information Center; NMFS Menhaden Investigations
Objectives	:	Conduct Pilot Study Showing Some Relationships of Composition to Year Class and Geographic Area. Examine Potential for Human Consumption.
Status	:	Menhaden Investigations at Pivers Island supplied 4 groups of fresh menhaden representing 2 fork lengths and 2 year classes. Analysis showed differences in fat yields, also indicating that low fat varieties might be employed in human food applications, ie, pickled products. Initiated salting and pickling trial.
Duration	:	Part of continuing effort to upgrade fishery products.
Coop. Agency	:	National Marine Fisheries Service, Menhaden Investigations

SEAFOOD LABORATORY

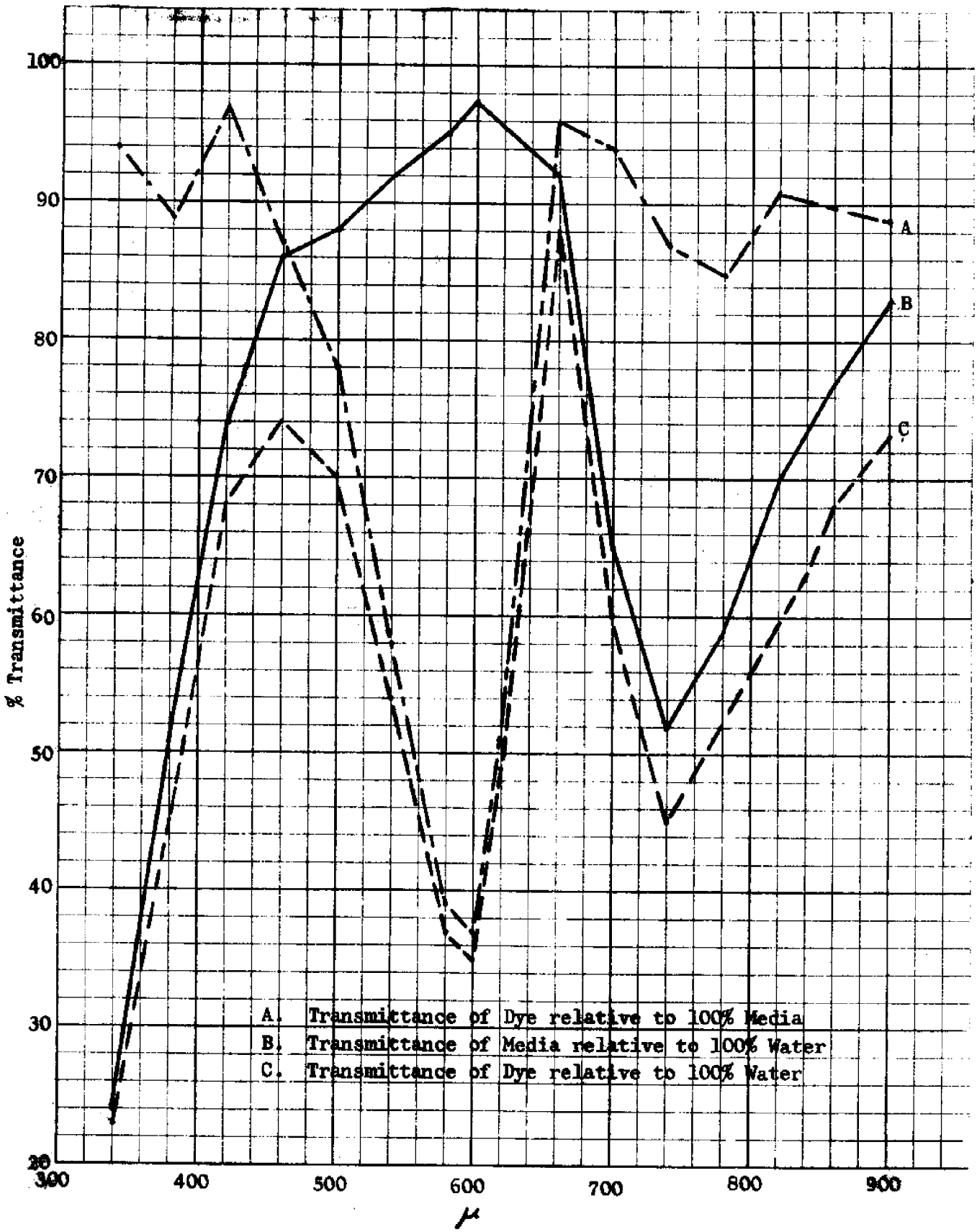
August 1, 1973

Morehead City Project - II.A	:	BACTERIOLOGICAL STUDIES IN CRAB PLANTS - RESAZURIN TEST
Initiated	:	June, 1973
Audience	:	Basic Processors
Info Source	:	"Eval. of Scallop Meat Quality by the Resazurin Reduction Technique," Webb, Thomas, Busta, Kerr; J. Milk and Food Tech., Nov. '72, Vol 35, No. 11
Objectives	:	Apply Method to Crab Meat, but Modify Technique for Increased Speed in Detecting Contaminated Crab Meat for Use as Field Test.
Status	:	Employed spectrophotometer for early detection of color changes. Used crab meat samples checked by Shellfish Laboratory as means of comparing Resazurin Reduction times with bacteriological parameters.
Duration	:	4 Months
Coop. Agencies	:	Shellfish Investigations, Board of Health; Crab Meat Plant Clientele.
*Attachment	:	Initial Tests and Possible Significance.

Seafood Laboratory, Morehead City - July, 1973

RESAZURIN REDUCTION TEST

Spectrophotometer Readings at Various Wavelengths



Short Term Project
Morehead City

ATTACHMENT - Project II.A. - BACTERIOLOGICAL STUDIES IN CRAB PLANTS
RESAZURIN TEST

INITIAL TESTS AND POSSIBLE SIGNIFICANCE

Sample (Collected 7/9/73) Between Tests, Held in Ice	Standard Plate Count* 7/9/73	7/17/73	Resazurin Reduct.** Time, Minutes 7/11	7/17	7/19
Crab meat, Special,NC5	5000	4900	360	360	350
Crab meat, Claw, NC 5	27000	2970000	30	7	___
Crab meat, Claw, NC 18	60000	47000	330	115	4
Crab meat, Special,NC 76	7000	66000	360+	345	174
Crab meat, Special,NC 18	48000	500000	270	250	22

* Determined by Shellfish Laboratory
**Determined by Seafood Laboratory

COMMENT: In this series it appears that poor shelf life of "Claw,NC5" was indicated by the Resazurin Test before it became apparent on the basis of plate counts.

The Resazurin Test also reflected the effects of storage, but not in direct relation to plate counts.

Continuation of this work in cooperation with Shellfish Laboratory appears fully justified.

Short Term Project

SEAFOOD LABORATORY
Morehead City

September 4, 1973

Project - II. B.	:	CRABS - ENZYMIC ACTIVITY IN MEATS
Initiated	:	June, 1973
Audience	:	Seafood Dealers, Basic Processors
Info Source	:	Applied Research, R/SST-1, Staff Expertise
Objectives	:	Determine Postmortem Changes occuring in Raw Crabs Stored in 34°F.
Status	:	Plant observations involving crabs delivered from distant points indicate that if there is appreciable mortality in shipment there is reduction in yield and poor meat texture, even though the plate count after processing may be acceptable. Similarly, offshore species, such as Jonah crab, produced poor meat yields and mushy meats when held in ice after death. Possible ways to handle crabs for extended periods include improved ways of keeping them alive out of water, "blanching" in steam followed by icing, complete cooking and storing in ice. Processors have inquired about best method to employ in long distance shipments.
Duration	:	Six months
Cooperation	:	Processing plants

SEAFOOD LABORATORY — September 4, 1973

Morehead City Project - II. C	:	CRABS - FREEZING MEATS
Initiated	:	July, 1973
Audience	:	Basic and Further Processors
Info Source	:	Applied Research, R/SST-1, Seafood Laboratory, Staff Expertise
Objectives	:	Improve upon Techniques for Freezing Crab Meat.
Status	:	Work with freshly dressed live crabs indicates that in spite of precautions in coating or keeping the meats surrounded by liquids there is texture impairment as result of freezing. Work will now be aimed at trying rapid freezing techniques, especially those capable of leaving a protective coating on the meats, as in brine freezing employing added dextrose.
Duration	:	1 year
Cooperation	:	N. C. Division of Commercial and Sports Fisheries, incl. R/V DAN MOORE

Short Term Project

SEAFOOD LABORATORY
Morehead City
Project - II. D

September 4, 1973

	:	CRABS - FURTHER PROCESSING, SANITATION
Initiated	:	1970
Audience	:	Basic and Further Processors
Info Source	:	Applied Research R/SST-1, Seafood Laboratory, Staff Expertise
Objectives	:	Provide Guidelines and Background Information Needed for Improved Sanitation in Crab Meat Plants
Status	:	Supporting studies dealing with various aspects of crab plant sanitation. Crab manual now in preparation. Review of regulatory actions dealing with violations of sanitary requirements. Examination of various innovations which may achieve improved quality of extracted meats, longer shelf life. Such innovations deal with methods of cooling steamed crabs before meat extraction, and possibility of inspecting and steaming extracted meats before placing in the cans.
Duration	:	Continuing program
Cooperation	:	Crab Meat Plants; Shellfish Investigations, Dept. of Health.

SEAFOOD LABORATORY
Morehead City

August 1, 1973

Project - II.G.I.	:	CRABS - PASTEURIZING MEATS; PROCESSING LOSSES.
Initiated	:	July 26, 1973
Audience	:	Basic Processors; Further Processors
Info Source	:	Applied Research R/SST-1; Tri-State Seafood Committee
Objectives	:	Explore Possibility of In-Plant STEAMING and Machine Packing of Cans; Recover Leg Meat.
Status	:	35% Crab Paste Yield from Crab Legs. Resazurin Time on Crab Paste was 120 Minutes. Pasteurizing Doubled Resazurin Reduction Time. Planning further pasteurization tests applied to meat before canning.
Duration	:	3 months
Cooperation	:	Board of Health, Shellfish Investigations

Short Term Project

SEAFOOD LABORATORY
Morehead City

August 1, 1973

Project - III. A.	:	SCALLOPS - CHILLING MEATS
Initiated	:	March, 1973
Audience	:	Basic Processors; Regulatory Agencies
Info Sources	:	"Carteret County Seafood Processing Report," April, 1969; "Effects of Processing on Quality of Scallops, Oysters, Blue Crabs," Thomas and Webb, Special Scientific Report No. 19, Sept., 1969.
Objectives	:	Urgent Need for Continuous Chilling of Meats from Mechanical Shucking Process to be Met by Demonstrating Simple Approaches Based on Use of Flake Ice-Salt Water Combinations Applied During Final Handling of Inspected Meats. Show that Rapid Chilling Improves Quality.
Status	:	During Recent Catching of Calico Scallops observed Processing in Terms of above Objectives. Employed modified Resazurin Test in making Initial Assessment of Effects of Slow Cooling in Storage.
Duration	:	1 Year
Cooperation	:	8 Processors; Board of Health, Shellfish Investigations.

Short Term Project

SEAFOOD LABORATORY
Morehead City
Project IV.A.

August 1, 1973

	:	LOBSTERS - PROCESSING METHODS AT SEA AND ASHORE
Initiated	:	September 1, 1972
Audience	:	Fishermen; Basic Processors
Info Source	:	Information Center; Staff Expertise
Objectives	:	Utilize Damaged or Outsize Lobsters not Suitable for Live Storage; Arrive at Acceptable Replacement for Live Shipping Methods.
Status	:	Rapid Blanch with Steam Enables Improved Storage in Ice until Further Processing can be Accomplished. Attractive Packaging Method After Blanching, then Followed by Freezing, being Explored. Extracted Meats following Blanching are being Subjected to various Dips, then Frozen and later Evaluated.
Duration	:	Through Sept., 1973, unless Extended.
Coop. Agencies	:	N. C. Div. Commercial and Sports Fisheries, aboard R/V Dan Moore.

SEAFOOD LABORATORY
Morehead City
Project V.B. : SHRIMP - UTILIZATION OF SMALL SIZES

August 1, 1973

Initiated	:	May, 1973
Audience	:	Fishermen; Basic Processors
Info Source	:	N. C. Commercial and Sport Fisheries Div. for Dynamics of the Fishery; Information Center for Background
Objectives	:	Work out Methods of Preserving and Processing Small (Exceeding 100 Count) Shrimp
Status	:	Examining Methods Employed in Louisiana; Evaluating Small Shrimp Caught and Processed in the Gulf area. Located Equipment Capable of Processing Small Shrimp. Conducted Cooking Tests and Organoleptic Appraisals.
Duration	:	1 Year
Coop. Agencies	:	N. C. Div. Com. and Sport Fisheries; Louisiana Processors and Equipment Manufacturers.

Short Term Project

SEAFOOD LABORATORY Morehead City Project VIII.B	:	August 1, 1973 PUBLICATIONS - EXTENSION NUTRITION LEADERS NOTEBOOK
Initiated	:	July, 1973
Audience	:	Fishermen; Restaurants; Tourists; Ultimate Consumers
Info Sources	:	Exploratory and Sport Fishing; Unpublished and Published Methods of Handling Various Species.
Objectives	:	Carteret County Home Extension Nutrition Leaders Advisory Committee to the Seafood Laboratory to Assist in Bringing together Practical Methods of Preserving, Dressing, Packaging, Cooking various Species Mostly Caught by Sport Fishermen.
Status	:	Collecting Background Information on the Kinds and Quantities of the Potentially Interesting Species. The Committee is in Process of Collecting Relevant Information Based on Personal Experience and that of People in their Respective Areas. Preparing an Outline of the Project and of the Proposed Publication.
Duration	:	1st Draft in 4 Months
Coop. Agencies	:	N. C. Div. Com. and Sport Fisheries; National Marine Fisheries Service (Pivers Island); Coastal Plains Center for Marine Development Services.

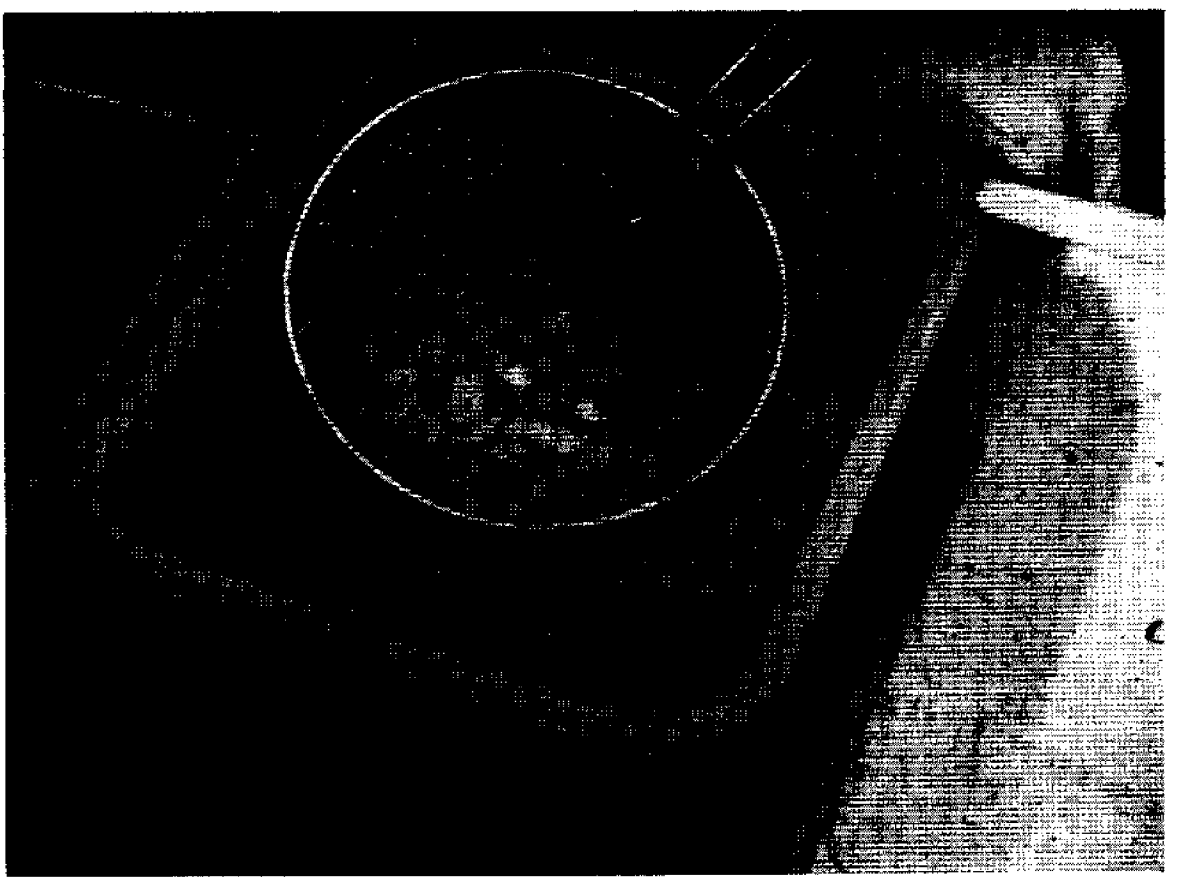
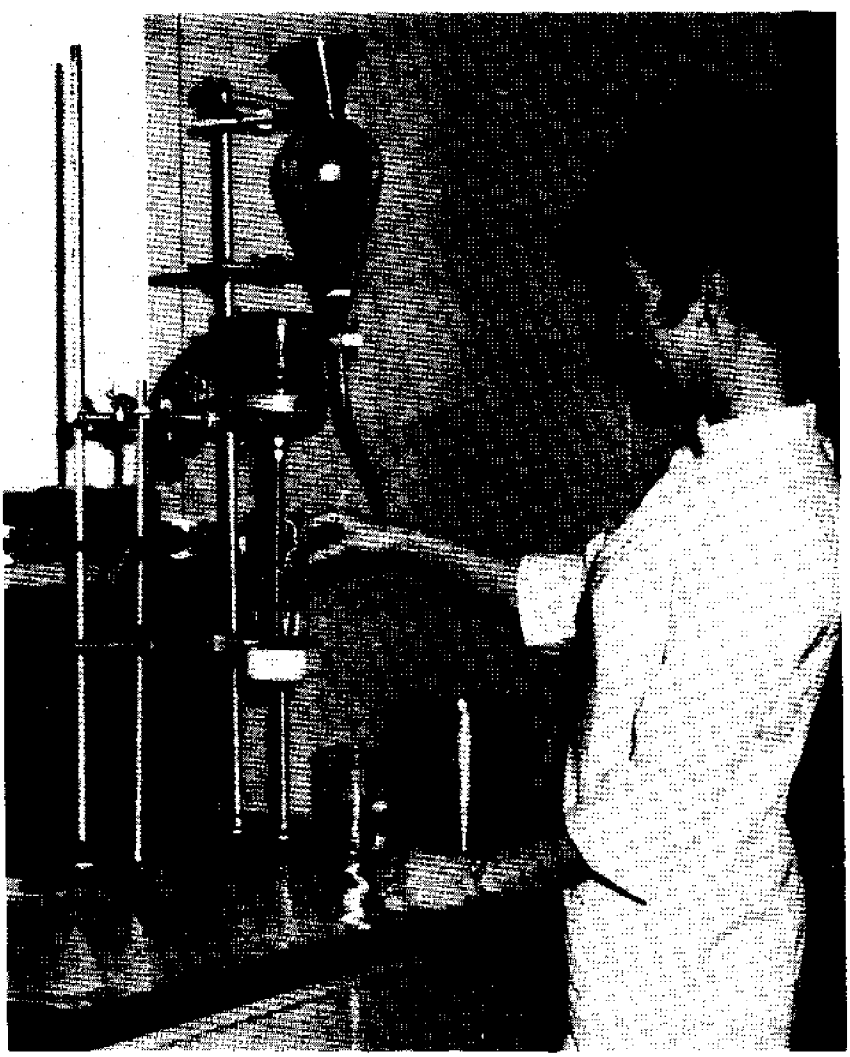
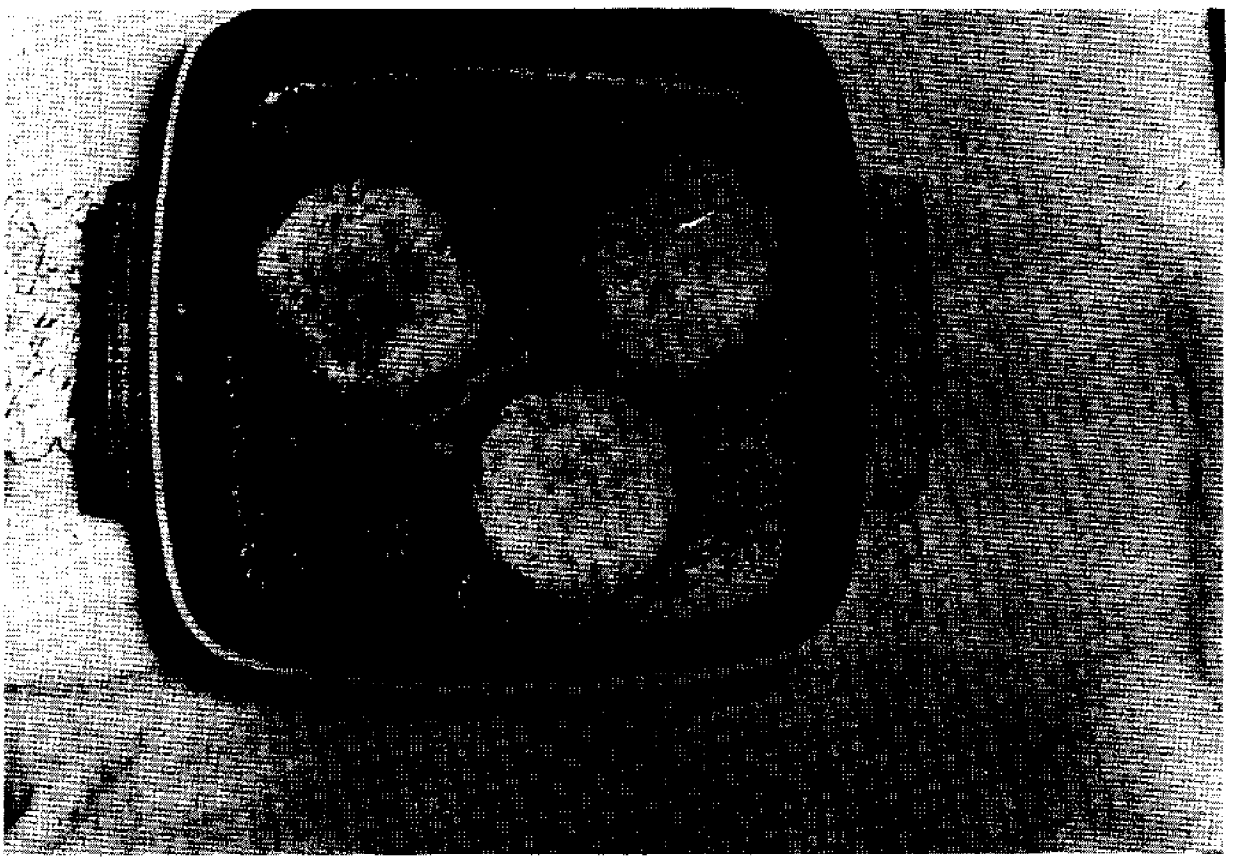


Illustration of the laboratory pilot chilling of scallop meats in an ice:salt brine mixture.

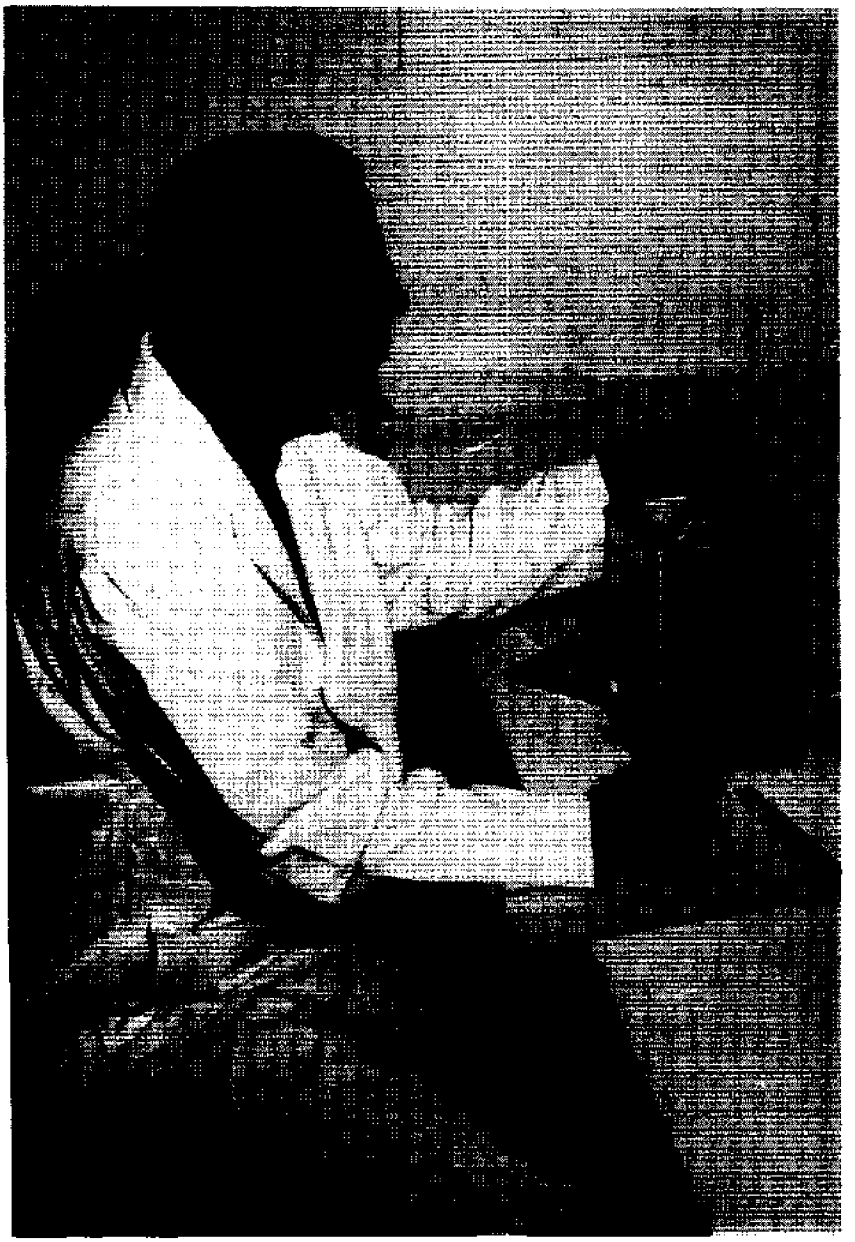
Mechanical deboning of fish muscle tissue for the utilization of low value species.



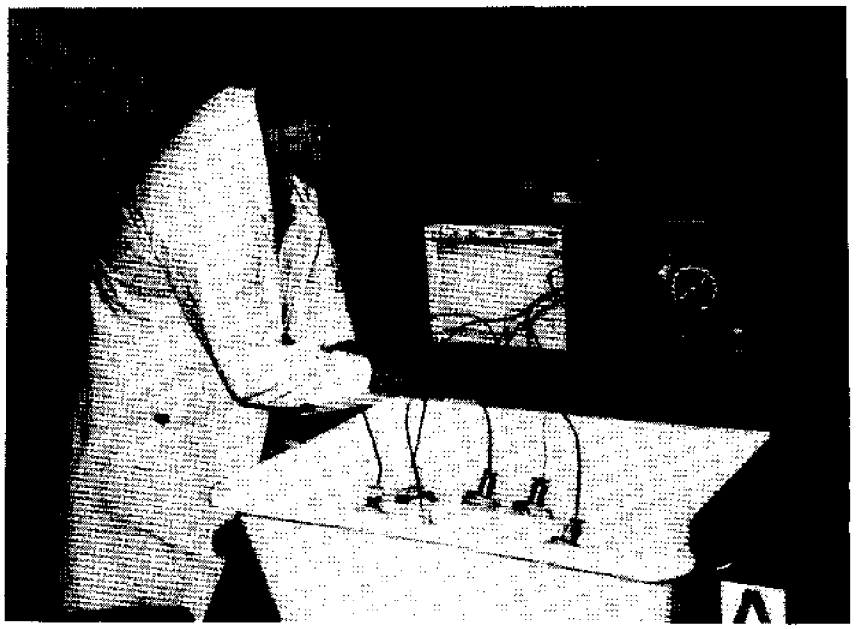
Evaluation of the emulsifying capacity of mechanically deboned fish muscle tissue.



Cooking of fish:crab meat patties prepared from mechanically deboned muscle tissue.



Technician reading the results of the resazurin color test on the microbiological level in scallop meats.



Temperature recording equipment used for controlled studies on the microbiological thermal death rate in pasteurized crab meat.

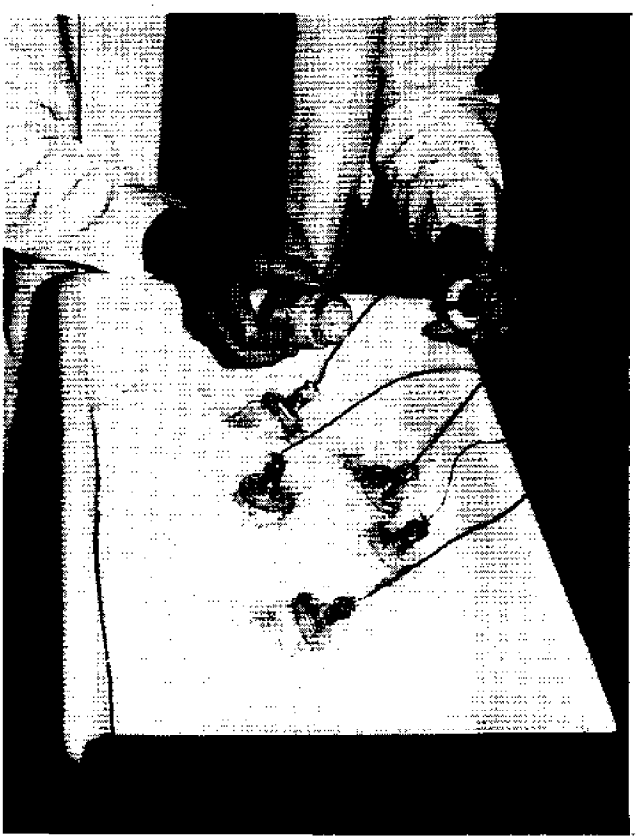


Illustration of thermocouple placement in crab meat sample jars for recording temperatures during pasteurization and subsequent chilling.