

# MAINE STATE LEGISLATURE

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(In three volumes)

VOLUME II.

State of Maine  
15TH BIENNIAL REPORT  
Department of  
Sea and Shore Fisheries



For Period  
July 1, 1946 to June 30, 1948  
Plus Additional Information to Dec. 30, 1948  
Vickery Hill Building  
Augusta, Me.





**State of Maine**

**15TH BIENNIAL REPORT**

**Department of  
Sea and Shore Fisheries**

**For Period**

**July 1, 1946 to June 30, 1948**

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Vickery Hill Building

Augusta, Me.

(Cover picture was made on the Rockland waterfront by Sidney Cullen of the staff of the Courier-Gazette. Other photos by the department staff.)

STATE OF MAINE

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BIENNIAL REPORT OF  
DEPARTMENT OF SEA AND SHORE FISHERIES

Augusta, Me.

To the Honorable Governor and Executive Council:

Sirs:

I herewith transmit, in compliance with the law, the report of the Department of Sea and Shore Fisheries, for the two years ending June 30, 1948, together with statistics and other pertinent data.

RICHARD E. REED,

*Commissioner*

## COMMISSIONER'S REPORT

This report covers activities of the department for the biennium commencing July 1, 1946 and ending June 30, 1948, as well as certain phases of our work during the six month period from July 1, to December 31, 1948.

We have included pertinent information on expenditures and income, licenses, violations, statistics, the several departmental divisions and other matters in an effort to give a general over-all picture of the operations of the department. Detailed reports on surveys, economic and industry data and research projects are not included because of lack of space but this information can be obtained by contacting our headquarters.

Due to much progressive legislation promulgated at the 1947 sessions and becoming effective August 13th of that year we have been able to reorganize the department and put it on a basis to render a more comprehensive service to the industry and the general public. Such a reorganization has appeared to be desirable for many years.

We feel that our progress has been steady but that we still have a long way to go. Mistakes have been made and rectified when possible. There has been a certain amount of public criticism of some of the changes and a lot of it is justifiable but it appears that the department is on the right track and will strike a steady, even pace after the growing pains are overcome.

Major legislation affecting the affairs of the department included a revision of the laws, new licensing provisions and larger appropriations. Other acts established a Civil Service code for the warden force, a five man advisory council to the Commissioner, clarification of administrative methods and special shellfish and research programs. The latter two activities are financed by special licenses and gasoline tax refunds, respectively.

A statement of income on another page shows that the industry is now contributing approximately \$80,000 a year to the General Fund of the state and to the Shellfish Fund through license fees. It was because of this added industry participation that we were able to obtain adequate appropriations to launch a progressive program and to obtain suitable working equipment. Previously the income from fees had varied from \$6500 to \$10,000 a year.

We wish to congratulate the industry for its willingness to absorb the higher and additional fees without opposition. The faith that has been shown in the department is deeply appre-

ciated and respected and has been and will continue to be treated accordingly, to the best of our ability. Although the additional revenue has made the difference between progress and the lack of it, I wish to point out that the total far from defrays the cost of operating expenses. In fact it does not even foot the bill for the salaries and expenses of our comparatively small 28 man warden force. The remainder, or about 55% of our total expenditure, comes from the general taxpayer.

The law revision was introduced to the Legislature only after months of study and research. It was not designed to make drastic changes affecting large segments of the industry but for the purpose of streamlining and bringing up to date the legal aspects of conservation management of our fishery resources. The intent and effects of the revision have been greatly misunderstood and misrepresented but a careful analysis will show that only a few basic changes were made.

The law book is still far from perfect. Many of the Rules and Regulations are a complete muddle. They are either contradictory to the general law, antiquated or without force of law because of previous legislative action. It is fortunate that provisions were made at the 1947 sessions for a biennial revision of the fisheries laws. This will eliminate the confusion that has cropped up from year to year.

New licenses are always sure to create situations and difficulties. When the present schedule was devised every effort was made to guard against injustices, conflicts and red tape but all of these things have cropped up. We hope to be able to have the matters clarified at the 1949 sessions.

It appears that the policies, responsibilities and purposes for which this department was created, and is maintained, are the most misunderstood of any of our state government functions. This situation has grown through years of neglect of the most elementary fundamentals of fair and impartial administration of a government agency. We have endeavored to adopt and stick to a middle course, which is the only ultimately fair course, and to adhere to the mandates of the people as expressed through their legislators. Such a policy has been difficult to maintain because of past abuses but it has been proven many times to be the only solid and honest policy in the long run.

The table of violations and arrests shows a large increase over several of the previous years. This situation has been brought about by many conditions beyond our control. Our wardens have been instructed to be fair and impartial at all times and to exercise good judgment in enforcing the conservation laws. We believe that our men have sincerely tried to operate on that policy.

The job of a Sea and Shore Fisheries warden is not an easy one. We feel that mutual cooperation between the officers and the industry will eventually result in a minimum of arrests and are continuously working towards that end.

In early 1946 the department offices were moved from Boothbay Harbor to Augusta and the 1947 Legislature established the Capital City as our permanent headquarters. The past two years have strengthened our belief that it is more advantageous to the industry to have its department at the seat of government instead of in comparative obscurity at a coastal location.

During the past two years the Maine fishing industry has been enjoying more than normal prosperity and it appears that when official figures for 1948 are compiled the landings of fish and shellfish and the income of fishermen will reach an all-time high. Preliminary estimates indicate that the total catch will exceed 330,000,000 pounds for which the fishermen have received more than \$15,000,000. It is further estimated that when these products reach the ultimate consumer, after handling, processing and marketing, they will have brought at least \$60,000,000 in new money into this state. Although these figures are impressive it should be realized that rising costs have severely diminished individual profits.

The outlook for the next two years is reasonably good. Our producers and processors have the finest equipment available and have rapidly adopted the most modern methods and devices.

Unrestricted foreign competition on both fish and shellfish is rapidly getting to be a greater threat to our domestic industry. Relief from the effect of these imports can be given only by the Federal government and the department will urge such action through other agencies and the Maine Congressional delegation.

Our fisheries resources are one of our greatest economic assets and they should be fully and wisely exploited, but never destroyed. We believe that this department has a solemn responsibility to maintain the conservation and propagation practices that are best for the resource and to do everything possible to help develop and promote the industry.

The job ahead is a big one. The surface is barely scratched. We must know more about the resource and maintain a continuous inventory of our possibilities. Research and surveys are often slow work but they are the keys to progress and it is only through proven knowledge that workable and justifiable fisheries laws and developments can be devised.

We have endeavored to participate, and to lead when the occasion was proper, in regional and national meetings of officials and organizations seeking to protect the fishermen's interests,

believing that the best interests of fishermen, in the long run, mean the best interests of all our citizens. We have consistently sought the best information and advice available, and have tried to use them where and how the most good could be done. The department is much more than a law enforcement organization.

In closing I wish to thank officials of the U. S. Fish and Wildlife Service, the Atlantic States Marine Fisheries Commission, the Canadian Fisheries Departments and others for their cooperation and assistance. It is also an honor to pay tribute to our great Governor Horace Hildreth, who with his executive council has been most helpful and considerate of our problems.

RICHARD E. REED,

*Commissioner*

### ADMINISTRATION

Department offices are maintained in the state owned Vickery-Hill Building on Chapel Street, Augusta. Although the rooms are crowded, they are adequate until the new state office building is ready for occupancy.

The staff consists of an office manager who also serves as secretary to the commissioner, a license clerk, a combination accountant and bookkeeper, a law enforcement clerk, a typist and a stenographer. The chief warden and several division heads also maintain desks at headquarters.

In addition to his regular duties the commissioner serves as a member of the Maine Development Commission, chairman of the Atlantic Sea Run Salmon Commission and on the executive board of the Atlantic States Marine Fisheries Commission.

During the biennium a modern system of office procedures was adopted. Much antiquated filing and working equipment was also replaced.

All licenses are issued directly from the Augusta office and about 95% of this business is done by mail. Lobster measures and clam rings are also furnished and sold by the department without profit.

A file of educational, scientific and industry motion picture films has been set up and these are being continuously loaned and shown to schools, service clubs, groups and organizations all over the state and out of state.

The department has prepared numerous bulletins, pamphlets and circulars on every phase of the industry for free distribution and these are in great demand. We also distribute advertising

material such as recipe books, lobster pins, window displays and menu stickers to almost every state in the union.

We are fortunate to have several men in the organization who are able public speakers and barely a week goes by that they do not tell the story of our fishing industry before several groups or clubs.

Through the cooperation of Attorney General Ralph Farris we have been able to secure the services of an assistant attorney general to help us on legal matters for the first time in the history of the department.

### STATISTICS

The department employs a full time statistician who maintains working quarters in the U. S. Post Office at Rockland. He works in cooperation with another full time statistical expert who is employed by the U. S. Fish & Wildlife Service. These men cover the entire coast each month, gathering pertinent data on the industry which is published monthly and annually and which provides continuous information that is invaluable for all types of fisheries management activities.

### ADVISORY COUNCIL

The 1947 Legislature created a five man Advisory Council to the commissioner for the purpose of giving advice and assistance in shaping and administering departmental policy. Members appointed by Governor Hildreth were Clifford Look of Addison, Augustus Heanssler of Stonington, Eugene C. C. Rich of Camden, Elroy Johnson of Bailey Island and Robert Kinney of Bar Harbor.

Meetings are held twice a year and more often if necessary. Members of the Council serve for three years and without pay. Their only reimbursement is for actual expenses while attending meetings.

This new plan is working out very well and the department has found the Council to be very helpful in solving knotty problems. Mr. Johnson is chairman and members serve as a Civil Service Commission for the warden force. During the past year a meeting was held at Boothbay Harbor and another at the University of Maine.

### RECOMMENDATIONS

I wish to submit the following recommendations, covering various phases of the fisheries and department operations, to the industry, the Legislature, Maine's Congressional delegation and other interested parties:

Simplification of the present system for obtaining shellfish shucking and transportation certificates through the Department of Agriculture;

Amending the present herring torching law to permit the taking of limited amounts of this species by fishermen for bait purposes;

Repeal of the present law which denies fishermen the right to have more than 10 bushels of herring in possession at one time for bait purposes;

Curtailement of lobster rearing activities, to a purely experimental basis, until such time as the program can be scientifically justified;

Either make the four county clam transportation law enforceable or repeal it;

Review the present system of town control of clam flats to guard against instances of lack of utilization of a valuable resource;

Repeal of all antiquated laws that are neither applicable or justifiable for modern conditions;

Revision of all rules and regulations to bring them up to date and to clarify and simplify their provisions;

Firm demands that the Federal Government take adequate steps to protect the industry against growing and ruinous foreign competition;

Greater representation and consideration for the fisheries in Federal Government;

Federal legislation to outlaw the advertising and selling of African and southern crawfish meat as lobster meat;

Urge the U. S. Public Health Service to review and revamp its present standards for determining the sanitary aspects of shellfish that may be accepted in interstate commerce;

Seek closer cooperation between the department of Sea and Shore Fisheries and the U. S. Fish and Wildlife Service on research and technological projects to assist the fisheries;

Closer cooperation between all phases of the industry so that the fisheries can present a united front on legislative and administrative matters that concern their welfare;

Review of the present law requiring shucking licenses for clams sold within the state;

A more equitable and workable definition of a herring weir;

Certain revisions of the department's licensing structure.

RICHARD E. REED,

*Commissioner*



## FINANCIAL STATEMENT

### Expenditures

	July 1, 1947 to June 30, 1948	July 1, 1946 to June 30, 1947
Administration . . . . .	\$26,098.70	\$21,139.07
Statistical . . . . .	4,467.03	3,613.65
Warden Service . . . . .	87,978.25	79,163.50
Patrol Boats . . . . .	#12,725.77	8,704.64
*Propagation of Shellfish . . . . .	11,672.27	5,781.71
Operation of Lobster Rearing Station . . . . .	**19,170.35	18,575.38
U. of M. Research Project . . . . .	3,500.00	3,693.77
U. of M. Scientific Study of Lobster Shrinkage . . . . .	1,150.36	4,500.00
†Research . . . . .	12,091.24	—
‡Laboratory and Workshop . . . . .	5,233.55	—
	\$184,087.52	\$145,171.72

\*Includes purchase of seed lobsters.

\*\*Includes cost of installation of modern equipment obtained from Federal Government

†Funds provided by percentage of gasoline tax refund

‡Includes construction of shows, exhibits, and work equipment; also repairs to boats and equipment

#Includes purchase of two new boats

##Special Fund for Restoration and Development of Shellfish Resources . . . . . \$9,549.61      \$ —

###Includes salaries, propagation, surveys, and research on clams, mussels, and quahogs

	July 1, 1947 to June 30, 1948	July 1, 1946 to June 30, 1947
<b>PROSECUTIONS OF VIOLATIONS OF SEA AND SHORE FISHERIES LAWS</b>		
Illegal Fishing . . . . .	19	9
Digging Clam Without License . . . . .	3	—
Digging Marine Worms Without License . . . . .	14	17
Digging Clam in Closed Areas . . . . .	89	76
Illegal Possession of Lobsters . . . . .	75	123
Illegal Possession of Clams . . . . .	120	55
Illegal Possession of Smelts . . . . .	3	—
Illegal Sale of Lobsters . . . . .	—	2
Illegal Sale of Lobster Meat . . . . .	—	1
Illegal Sale of Clams . . . . .	5	—
Illegal Transportation of Lobsters . . . . .	—	2
Illegal Transportation of Clams . . . . .	7	11
Failure to Stop . . . . .	3	—
Dumping . . . . .	1	—
Larceny of Lobsters . . . . .	—	2
Larceny of Lobster Traps . . . . .	—	1
Larceny of Nets . . . . .	—	1
Molesting Gear . . . . .	8	6
	347	306

**FINANCIAL STATEMENT**  
**Revenues**

	AMOUNT		LICENSES ISSUED	
	January 1, 1948 to December 31, 1948	July 1, 1946 to June 30, 1947	January 1, 1948 to December 31, 1948	July 1, 1946 to June 30, 1947
	<b>General Fund Revenues:</b>			
Lobster and Crab Fishing.....	\$24,693.25	\$6,574.00	5,338	6,574
Res. Commercial Fishing.....	2,325.00	—	790	—
Non-Res. Commercial Fishing.....	70.00	—	7	—
Scallop Fishing.....	1,430.00	—	272	—
Lobster Meat Permit.....	450.00	540.00	68	54
Interstate Lobster Trans. —Original	\$2,605.00	—	79	—
—Add. Vehicle	215.00	—	48	—
	<hr/>			
Wholesale Lobster Dealer —Original	8,505.00	—	168	—
—Supp.	500.00	—	105	—
	<hr/>			
Wholesale Seafood Dealer —Original	2,800.00	—	114	—
—Supp.	150.00	—	27	—
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Retail Seafood Dealer.....	5,514.00	476.00	1,136	476
Shellfish Server.....	2,658.50	937.00	1,398	937
Sea Food Processor.....	1,025.00	—	41	—
Marine Worm Digger.....	1,184.00	964.00	447	158
Resident Sea Moss.....	232.00	{ 117.00	116	234
Non-Resident Sea Moss.....	15.00		1	—
Weir Fishing, Fish Trap, and Seine Boat.....	3,330.00	—	333	—
Quahog and Mussel Cult. and Propagation.....	12.00	—	2	—
Duplicate Licenses.....	12.00	—	—	—
Smackmen or Truckmen.....	—	325.00	—	325
Shippers.....	—	222.00	—	222
Smack Captain.....	—	60.00	—	12
Smack Owner.....	—	30.00	—	6
Truck Driver.....	—	435.00	—	87
Truck Owner.....	—	310.00	—	62
Miscellaneous Receipts.....	195.40	44.80	—	—
Foreign Clam Transp.....	—	295.00	—	59
Fines and Costs.....	8,920.86	7,220.73	—	—
Permit for Lobster Traps on Trawl.....	—	—	36	85
	<hr/>			
	\$66,842.01	\$18,550.53	10,526	9,291

**Restoration and Development of**

**Shellfish Resources:**

Commercial Shellfish.....	\$9,981.00	—	3,327	—
Shellfish Shucking.....	1,278.00	—	426	—
Res. Shellfish Transp. —Original	\$925.00	—	40	—
—Add. Vehicles	180.00	—	12	—
Non-Res. Shell. Transp. —Original	1,600.00	—	16	—
—Add. Vehicles	150.00	—	6	—
Shellfish Processor —Original	600.00	—	12	—
—Supp.	125.00	—	5	—
Duplicate Licenses.....	6.25	—	—	—
	<u>\$14,845.25</u>	—	<u>3,844</u>	—
<b>Department:</b>				
Witness Fees.....	\$9.72	—	—	—
Sale of Supplies.....	917.82	—	—	—
Sale of Equipment.....	5,401.10	—	—	—
	<u>\$6,328.64</u>	—	—	—
<b>GRAND TOTAL.....</b>	<u><u>\$88,015.90</u></u>	<u><u>\$18,550.53</u></u>	<u><u>14,370</u></u>	<u><u>9,291</u></u>

**Revenues—July 1, 1947—December 31, 1947—All Accruing to General Fund**

Moneys from Licenses Issued.....	\$9,201.00	
Fines and Costs.....	5,190.37	Total Licenses Issued—9,462
Miscellaneous Receipts.....	94.09	
	<u>\$14,485.46</u>	

**AMOUNT**

July 1, 1948	July 1, 1947
to	to
December 31, 1948	June 30, 1948

<b>*GASOLINE TAX REFUND.....</b>	<u><u>\$11,062.56</u></u>	<u><u>\$18,713.29</u></u>
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NOTE: \*This money, which formerly went into the Highway Fund, represents a portion of the gasoline tax not refunded to boat operators and was made available to the Department by the 1947 legislature to finance research, propagation, and development projects. Further details of this activity are given in another part of this report.

On January 1, 1948, issuance of all licenses was changed from a fiscal year to a calendar year basis. For this reason we have included figures for the six-months' period extending the biennium in order to give a clearer picture of present operations of the Department. All revenues from license fees represent issuances for that licensing period. The table for the six-months' period from July 1, 1947 to December 31, 1947 is set up separately because of the change-over in licensing periods and to simplify presentation of our activities.

LANDINGS AT MAINE PORTS, 1946

By Counties

Species	Washington	Hancock	Knox	Lincoln
<i>Fish</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Cod.....	444,163	857,742	1,687,193	97,556
Haddock.....	203,554	527,446	1,145,290	17,845
Hake.....	401,920	2,288,308	1,379,144	156,407
Pollock.....	328,954	498,840	2,832,757	12,251
Cusk.....	2,244	76,292	200,129	29,563
Halibut.....	3,041	6,071	8,379	—
Mackerel.....	5,695	343,005	121,433	112,263
Flounders:				
Gray sole.....	10,310	137,146	352,827	24,966
Lemon sole.....	—	—	115	—
Yellowtail.....	—	2,951	8,904	—
Blackback.....	95,666	759,251	190,743	5,974
Dab.....	1,072	48,441	214,253	10,726
Rosefish.....	—	1,187,660	15,944,007	3,016,000
Whiting.....	—	—	10,250	839,100
Wolfish (catfish).....	9,293	78,888	63,747	312
Shark.....	210	1,602	4,712	—
Shad.....	5	1,082,996	—	—
Tuna.....	—	—	—	13,790
Alewives.....	156,000	659,480	110,680	297,180
Herring.....	24,086,750	28,833,810	4,810,120	17,857,818
Smelt.....	82,397	84,985	51,047	45,956
Skate (wings).....	—	—	—	—
Sturgeon.....	—	—	—	—
Salmon.....	1,100	—	—	—
Butterfish.....	—	—	—	—
Swordfish.....	—	360	—	—
Eels.....	6,275	8,500	—	—
Miscellaneous.....	2,280	—	14,309	5,381
<b>Total.....</b>	<b>25,840,929</b>	<b>37,483,774</b>	<b>29,150,039</b>	<b>22,543,088</b>
<i>Shellfish, etc.</i>				
Crabs.....	80,000	33,288	75,393	58,841
Clams:				
Soft.....	1,830,347	1,685,449	624,555	2,319,774
Hard (quahogs).....	—	—	—	—
Lobsters, Maine.....	1,939,224	4,495,485	5,605,281	1,924,874
Shrimp.....	—	—	—	105,865
Scallops, sea.....	7,112	33,374	78,847	—
Mussels, sea.....	203,820	2,068,300	42,030	—
Periwinkles.....	10,365	—	—	9,473
Squid.....	—	—	—	—
Sea urchin (sea eggs).....	—	—	—	20,351
Bloodworms.....	—	14,701	—	30,150
Sandworms.....	—	8,120	—	29,151
Sea moss.....	—	—	29,862	32,200
Livers.....	90,583	103,886	152,019	7,194
Spawn.....	—	114	1,507	—
<b>Total.....</b>	<b>4,161,451</b>	<b>8,442,717</b>	<b>6,609,494</b>	<b>4,537,873</b>
<b>Grand total.....</b>	<b>30,002,380</b>	<b>45,926,491</b>	<b>35,759,533</b>	<b>27,080,961</b>

LANDINGS AT MAINE PORTS, 1946—Continued

By Counties

Species	Sagadahoc	Cumberland	York	Total 7 Counties	
<i>Fish</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Value</i>
Cod.....	213,275	3,164,956	190,350	6,655,235	\$417,006
Haddock.....	14,589	701,881	40,728	2,651,333	217,171
Hake.....	171,312	2,331,263	39,137	6,767,491	297,616
Pollock.....	4,237	2,895,737	2,017	6,574,793	250,728
Cusk.....	76,876	343,610	6,178	734,892	35,988
Halibut.....	44	1,773	768	20,076	4,421
Mackerel.....	190,639	960,635	681,684	2,415,354	117,254
Flounders:					
Gray sole.....	8,855	455,715	996	990,815	66,898
Lemon sole.....	5,318	70	—	5,503	276
Yellowtail.....	—	40,068	—	51,923	1,936
Blackback.....	100	25,433	617	1,077,784	51,637
Dab.....	2,635	248,444	1,794	527,365	18,842
Rosefish.....	—	20,929,185	—	41,076,852	1,647,396
Whiting.....	5,045	3,553,814	—	4,408,209	76,489
Wolfish (catfish) ..	350	18,237	58	170,885	5,823
Shark.....	2,264	34,568	15	43,371	4,261
Shad.....	—	8,542	—	1,091,543	38,566
Tuna.....	233,807	46,514	15,829	309,940	25,781
Alewives.....	1,170	—	—	1,224,510	13,359
Herring.....	—	4,518,270	—	80,106,768	1,046,649
Smelt.....	68,107	231,686	8,397	572,575	126,269
Skate (wings).....	—	65	—	65	1
Sturgeon.....	—	324	—	324	54
Salmon.....	—	—	—	1,100	770
Butterfish.....	—	38	—	38	2
Swordfish.....	—	—	—	360	162
Eels.....	—	900	—	15,675	5,991
Miscellaneous.....	1,344	18,891	—	42,205	1,717
<b>Total.....</b>	<b>999,967</b>	<b>40,530,619</b>	<b>988,568</b>	<b>157,536,984</b>	<b>4,473,063</b>
<i>Shellfish, etc.</i>					
Crabs.....	8,471	222,665	—	478,658	27,158
Clams:					
Soft.....	973,584	2,257,400	118,308	9,809,417	1,814,655
Hard (quahogs).....	74,800	93,392	—	168,192	39,590
Lobsters, Maine.....	486,646	3,102,567	1,221,721	18,775,798	7,186,325
Shrimp.....	—	55,038	612	161,515	8,076
Scallops, sea.....	4,810	12,388	—	136,531	71,922
Mussels, sea.....	—	—	60	2,314,210	61,254
Periwinkles.....	—	—	—	19,838	5,856
Squid.....	—	610	—	610	14
Sea urchin (sea eggs).....	2,800	—	—	23,151	537
Bloodworms.....	399	14,019	—	59,269	57,125
Sandworms.....	—	21,108	—	58,379	47,188
Sea moss.....	512,133	105,907	292,873	972,975	17,460
Livers.....	32,998	493,611	—	880,291	50,527
Spawn.....	38	36,879	98	38,636	2,518
<b>Total.....</b>	<b>2,096,679</b>	<b>6,415,584</b>	<b>1,633,672</b>	<b>33,897,470</b>	<b>9,390,205</b>
<b>Grand total.</b>	<b>3,096,646</b>	<b>46,946,203</b>	<b>2,622,240</b>	<b>191,434,454</b>	<b>13,863,268</b>

LANDINGS AT MAINE PORTS

By Counties—1947

Species	Cumberland	Hancock	Knox	Lincoln
<i>Fish</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Cod.....	2,294,333	289,561	1,085,434	85,396
Haddock.....	1,080,611	423,773	1,609,152	29,467
Hake:				
Red.....	46,383	—	253	—
White.....	2,398,335	244,494	539,588	64,964
Pollock.....	3,292,196	98,325	638,896	21,286
Cusk.....	261,606	28,758	196,303	5,320
Halibut.....	6,675	5,606	23,781	49
Mackerel.....	715,114	230,820	64,256	340,770
Flounders:				
Gray sole.....	237,599	78,637	285,327	9,095
Lemon sole.....	10,451	—	2,815	—
Yellowtail.....	25,806	6,579	43,185	—
Blackback.....	14,580	466,335	91,609	—
Dab.....	151,537	34,171	186,553	6,161
Other.....	60	—	—	—
Rosefish.....	13,244,364	1,066,494	24,044,904	1,632,169
Whiting.....	4,486,019	—	28,855	1,345,718
Wolfish (catfish).....	22,760	38,331	54,970	—
Shark.....	71,732	2,188	4,861	—
Shad.....	6,255	298,140	—	—
Tuna.....	59,315	—	330	887
Alewives.....	—	455,000	174,300	567,600
Herring.....	21,583,500	33,010,028	22,981,220	17,623,542
Smelt.....	84,253	195,200	79,531	60,112
Skate wings.....	—	—	225	—
Sturgeon.....	243	—	70	—
Butterfish.....	62	—	—	—
Eels.....	—	6,000	—	—
Menhaden.....	—	—	—	14,000
Miscellaneous.....	56,827	—	1,635	430
<b>Total.....</b>	<b>50,150,616</b>	<b>36,978,440</b>	<b>52,138,053</b>	<b>21,806,966</b>
<i>Shellfish, etc.</i>				
Crabs.....	235,953	22,882	36,844	16,748
Clams:				
Soft.....	970,275	1,316,030	977,345	3,190,034
Hard (quahogs).....	55,995	—	—	—
Lobsters, Maine.....	2,800,529	4,793,379	4,903,559	1,983,018
Shrimp.....	45,668	—	10,454	137,577
Scallops, sea.....	21,283	149,101	324,911	—
Mussels, sea.....	—	8,190	—	—
Periwinkles.....	—	—	—	25,900
Squid.....	—	525	—	—
Sea urchin (sea eggs).....	—	—	—	17,177
Bloodworms.....	89,073	32,037	—	42,523
Sandworms.....	1,875	12,638	—	36,644
Sea moss.....	236,119	—	160,106	16,138
Livers.....	830,295	30,128	424,182	8,456
Spawn.....	56,385	19	315	—
<b>Total.....</b>	<b>5,343,450</b>	<b>6,364,929</b>	<b>6,837,716</b>	<b>5,474,215</b>
<b>Grand total.....</b>	<b>55,494,066</b>	<b>43,343,369</b>	<b>58,975,769</b>	<b>27,281,181</b>

**LANDINGS AT MAINE PORTS — Continued**  
**By Counties — 1947**

	Sagadahoc	Washington	York	Total 7 Counties	
<i>Fish—Cont.</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Value</i>
Cod.....	230,343	186,649	33,393	4,205,109	\$234,190
Haddock.....	19,419	210,789	15,649	3,388,860	231,641
Hake:					
Red.....	—	—	—	46,636	1,176
White.....	195,538	30,710	20,802	3,494,431	160,117
Pollock.....	555	257,676	1,173	4,310,107	137,551
Cusk.....	66,020	1,432	7,693	567,132	26,984
Halibut.....	2,872	705	583	40,271	11,381
Mackerel.....	40,525	34,984	263,255	1,689,724	55,608
Flounders:					
Gray sole.....	6,179	—	—	616,837	29,647
Lemon sole.....	—	—	—	13,266	419
Yellowtail.....	15,546	—	—	91,116	2,890
Blackback.....	14,734	18,850	—	606,108	25,266
Dab.....	—	2,280	44	380,746	11,167
Other.....	—	—	—	60	2
Rosefish.....	130	—	69	39,988,130	1,224,090
Whiting.....	154,707	—	—	6,015,299	73,658
Wolfish (catfish) ..	—	2,307	28	118,396	3,148
Shark.....	400	—	175	79,356	3,939
Shad.....	—	—	—	304,395	6,223
Tuna.....	100,736	—	25,362	186,630	13,013
Alewives.....	63,000	204,000	35,000	1,498,900	11,674
Herring.....	1,396,350	24,723,000	—	121,317,640	1,515,504
Smelt.....	59,983	120,547	—	599,626	139,608
Skate wings.....	—	—	—	225	5
Sturgeon.....	—	—	—	313	50
Salmon.....	—	3,600	—	3,600	2,160
Butterfish.....	—	—	—	62	6
Swordfish.....	245	—	—	245	110
Eels.....	—	13,200	—	19,200	3,240
Menhaden.....	—	—	—	14,000	140
Miscellaneous.....	4,541	—	—	63,433	2,161
<b>Total.....</b>	<b>2,371,823</b>	<b>25,810,729</b>	<b>403,226</b>	<b>189,659,853</b>	<b>3,926,768</b>
<i>Shellfish, etc.</i>					
Crabs.....	7,742	—	—	320,169	16,136
Clams:					
Soft.....	445,111	952,045	47,452	7,898,292	1,496,642
Hard (quahogs) ..	40,307	—	—	96,302	27,662
Lobsters, Maine...	576,586	1,803,866	1,416,156	18,277,093	6,816,196
Shrimp.....	—	—	—	193,699	10,571
Scallops, sea.....	1,869	9,868	—	507,032	257,476
Mussels, sea.....	—	32,070	—	40,260	859
Periwinkles.....	144	12,769	—	38,813	4,566
Squid.....	—	—	—	525	9
Sea urchin (sea eggs)	40,600	—	—	57,777	2,499
Bloodworms.....	—	—	—	163,633	144,530
Sandworms.....	—	—	—	51,157	37,086
Sea moss.....	746,244	—	485,000	1,643,607	40,070
Livers.....	23,943	22,964	132	1,340,100	85,624
Spawn.....	—	—	113	56,832	3,395
<b>Total.....</b>	<b>1,882,546</b>	<b>2,833,582</b>	<b>1,948,853</b>	<b>30,685,291</b>	<b>8,943,321</b>
<b>Grand total.</b>	<b>4,254,369</b>	<b>28,644,311</b>	<b>2,352,079</b>	<b>220,345,144</b>	<b>12,870,089</b>

## DIVISION OF LAW ENFORCEMENT

D. T. MALLOY, *Chief Warden*

As of November 30, 1948, the staff of this division consisted of 20 district wardens, five supervisors, an administrative clerk and a chief warden who is on loan to the department from Inland Fisheries and Game. Two years ago the force numbered 35 men but since that time all wardens over seventy years of age have been retired, others resigned and Oscar Ford of Brooklin died after 10 years of service.

In line with our present policy we made but few replacements and these were all young men between the ages of 21 and 35. It is our belief that a smaller force of better paid, vigorous men with larger districts and responsibilities operates most efficiently and are more interested in their jobs.

A breakdown of the expenses of operating the warden service for the fiscal year 1947-48 is given as follows:

Reimbursed expenses, auto travel, etc.	\$24,006.61
Salaries .....	63,116.66
Clothing .....	1,992.05
Miscellaneous equipment and supplies	1,348.74
Disability compensation .....	33.00
	<hr/>
	\$90,497.06

All new wardens are now selected through competitive examinations and promotions to supervise are made in the same manner. We find that the maintenance of district supervisors is an excellent system that simplifies the field work and administration of a complicated legal fisheries setup.

The entire coast is divided into five districts with a supervisor in charge of each. So far as possible we have reassigned district wardens to more strategic locations with the resultant saving of mileage and expenses and duplication of work. Further reassignment is necessary in order to get maximum results with a minimum of men.

During the past two years the Governor and Council have approved pay raises so that our men are now on an equal footing with the warden force of Inland Fisheries and Game. The salary scale for district wardens is \$42.20 to \$48.20 a week while supervisors receive \$59.20 weekly. The chief warden is paid \$70 a week. Each man receives mileage on his car and expenses while on duty in the field.



The men have been issued new uniforms which include pants, coat, shirt, hats and ties.

During the biennium we have obtained small boats with out-board motors for the wardens who need them and have also issued field glasses, whistles, trailers and other minor items of equipment.

Full wardens meetings are held at least twice a year for the purpose of discussing department policy and mutual problems and the supervisors meet with the Commissioner and chief warden at least once a month. After the latter meetings the supervisors call their district men together to discuss new developments and further orders.

All men are required to file comprehensive weekly reports of their activities and observations and a digest of these reports is prepared at least twice a month for distribution to the entire force.

Although law enforcement is the basic duty of all wardens they are also required to gather statistics and information, to consult with the industry on departmental matters, to help the fishermen and dealers whenever possible, to work on propagation and conservation projects and serve as all around representatives of the department in the field.

During the forest fire disasters in 1947 the entire force was placed at the disposal of the State Forestry Department and performed excellent public service. The men are also made available to the State Police and department of Inland Fisheries and Game for help and cooperation whenever needed.

Previous to 1946 wardens were stationed full time on several of the offshore islands but this practice has been discontinued and regular coverage of these areas is now made by boat from shore districts more economically and just as efficiently.

## VIOLETIONS

Although violations have increased during the past two years the bulk of arrests were made on illegal clams, digging clams in polluted areas and illegal lobsters.

Wardens find themselves faced with several major laws that are practically impossible to enforce because of a poorly written statute and other laws that are extremely unpopular with a majority of the industry.

Closed clam areas were particularly troublesome because of a stiffening of the attitude of the U. S. Public Health Service which controls the sanitary requirements of shellfish that go into interstate commerce.

High prices and expanding markets were considered to be the main cause of increased bootlegging and handling of illegal sized clams and lobsters.

The force seized many thousands of short lobsters from Canadian shipments and these were released in our waters to help build up the supply. The men also released thousands of pounds of seed lobsters which were purchased from the pounds by the department.

### CIVIL SERVICE COMMISSION

The 1947 Legislature set up a Civil Service plan for our wardens based on similar plans in operation by Inland Fisheries and Game and the State Police.

Under provision of the code all men are selected through competitive examinations and are promoted in the same manner. They cannot be discharged without a formal hearing before the Civil Service Commission which is made up of members of the Advisory Council. Provisions were also made for rules and regulations governing the behavior and discipline of the men while on duty.

This plan is working out effectively and has increased the morale, unity and efficiency of the force.

### WARDEN SCHOOL

For the past two years members of the force have been brought to Augusta for a week of instruction and discussion of the laws and their jobs in general. They were quartered at Camp Keyes, State National Guard headquarters and put in many hours of intense training.

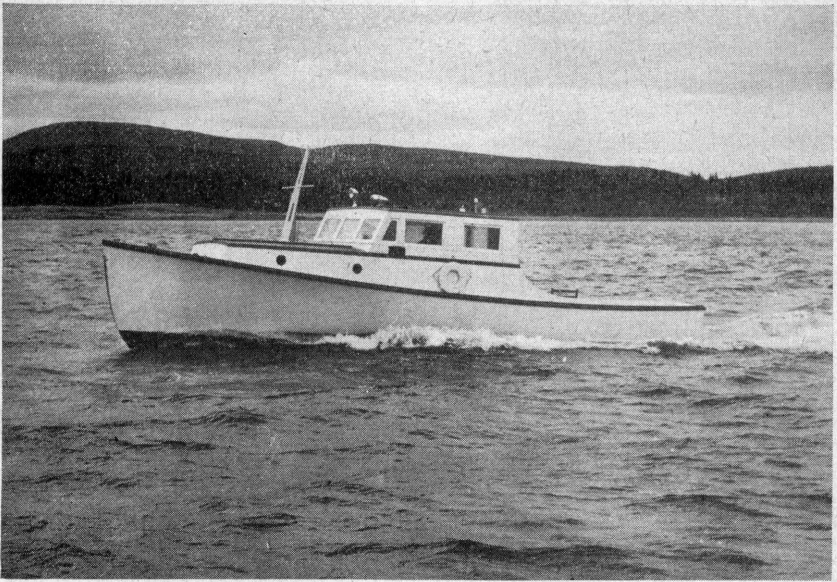
The schools have proven to be very successful. One of the greatest needs of the force, in the past, has been for uniform understanding of the laws and departmental policy with application consistent in all districts.

### PATROL BOATS

The department now has three patrol boats which are based at Rockland, Southwest Harbor and Boothbay Harbor. A fourth craft, owned by Warden Elmore Wallace of Portland is available to us for duty in that district on a rental basis.

The 34 foot Lively Lady which was built by department employees in 1937 is at Southwest Harbor and is used mainly to cover the island fishing areas around Bluehill and Frenchman Bays.

The 34 foot Guardian which was constructed for the department in 1947 is based at Rockland and covers the Penobscot Bay islands from Matinicus to Isle au Haut, including Vinalhaven,



THE PATROL BOAT "GUARDIAN"

North Haven, Islesboro, Mussel Ridges and others. She was built and equipped at a total cost of approximately \$4000 and is manned by Warden Clayton Simmons.

In 1947 we purchased a 26 foot boat from the department of Inland Fisheries and Game for \$1800 and based her at Boothbay Harbor where she is used jointly by the warden force and our laboratory research staff.

Warden Wallace's boat is used about 75 days a year to cover the islands of Casco Bay.

Our boats are repaired and maintained by our permanent personnel whenever possible.

The 55 foot patrol boat Maine was sold in early 1948 for \$5000. She was inadequate for our work and required extensive repairs. The money received from the craft is being used to help pay for a 42 foot combination research and patrol boat which is under construction at Stonington and due to be launched in April 1949. The bid price for construction and equipment was \$8,750.

At the present time our boat situation appears to be adequate but we will eventually need to base a state owned small craft in the Portland area.

Five of our wardens have been equipped with skiffs and out-board motors and several others will be issued in 1949.

## DIVISION OF MARKETING AND DEVELOPMENT

ROBERT L. PERRY, *Chief*

This division was set up to do a general promotional job for the industry and is largely financed by Maine Development Commission funds which are earmarked for such activity. Its principal jobs are to encourage more people to buy and eat Maine seafoods and to promote industrial development such as new plants, by-products, processing techniques and utilization of waste.

These activities are vital to the welfare of our fisheries and our state. Expansion of our markets means a bigger demand at better prices while new industries offer more jobs and a better utilization of our vast ocean resources.

It is the duty of the division to keep abreast of all new fisheries developments and to see that the pertinent ones are applied to our own industry when possible.

Efforts to make the nation, Maine seafood conscious are progressing and have been especially successful so far as lobsters are concerned. This work is being carried on through advertising, publicity, shows and exhibits. We have enlisted the assistance of national organizations and groups and have received wonderful cooperation.

It is generally known that the sea is the last frontier on earth for the creation of new wealth and resources and Maine is amply blessed along those lines.

We feel that the department has a responsibility to encourage growth of all phases of activity in the fisheries field. Although handicapped by lack of funds and personnel we have at least made a start and we believe that this division should eventually become greatly expanded.

We attempt to be alert for all warning signals of impending dangers to our fisheries economy and try to head off this trouble before it gets really serious. Such situations include foreign competition, lowering of tariff rates, increased transportation rates, adverse publicity, loss of markets to other products and many other problems.

In accordance with the law, one-eighth of the appropriations for the Maine Development Commission is earmarked for development and promotion of products of the sea. A similar set-up exists for industry and agriculture. For the biennium our share has amounted to approximately \$27,000 a year. The money

is expended under direction of the Commission of which the commissioner of Sea and Shore Fisheries is a member. It is only because of this plan that we are able to maintain the division.

Several months ago we engaged Robert Perry of Camden to take over the development work. Previously he had been employed by the Development Commission as an industrial engineer and promoter. Although on the Commission payroll, Perry maintains an office at our headquarters on a full-time basis.

Many of our promotional activities are handled through the New York advertising firm of Brook, Smith, French and Dorrance, which acts as advertising and merchandising counsellors for the State of Maine.

### NEW INDUSTRIES

Our cooperation with the Coast Fishing Company of Wilmington, California, which has established a modern cat food processing plant at Lubec is an example of what can be done to encourage industrial development.

In 1947 we received a request from a Los Angeles technologist who wanted much information about our herring fishery and a 100 pound shipment of these fish by Air Express. We cooperated and later learned that several executives of a big packing company were coming east to consult with us. Mr. Perry was assigned to the group and took them for a thorough tour of the coast, investigating possible plant sites. They finally chose Lubec and a new industry was born.

There are several other instances of where our marketing division was instrumental in assisting new firms to locate here or existing ones to expand their operations. Other propositions are in the air and we hope that they will materialize.

In the fall of 1947 we conducted experiments in the canning of our giant bluefin tuna. This work created an interest in such a venture and two plants are now operating on a commercial basis while others are carefully watching results.

We have conducted considerable research and promotion on our sea moss resource that has resulted in a considerable expansion of that industry.

These are only a few of many projects that the division has worked on to help increase our coastal activities.

### ADVERTISING AND PUBLICITY

We have been especially active in these fields and with good results. Numerous publicity stunts such as the selection of Jab-bawocky (a lobster to appear as a movie star), clambakes in the Middle West, seafood dinners for important groups in Washington and New York, participation in parades and national ath-

letic events, tuna tournaments, lobster festivals, queen contests, fairs and fetes have all served to focus attention on Maine fish products.

Other advertising efforts have included displays at national conventions of dieticians, food editors and women's clubs, Boston, New York and Washington Sportsmen's Shows, Eastern States Exposition, annual meeting of the National Fisheries Institute, hotel and restaurant shows, food fairs and others.

During the biennium we have published an additional 125,000 copies of our famous seafood recipe book which is considered to be an outstanding job and which is in great demand all over the country. Menu stickers, lobster pins, display materials, booklets, pamphlets and other items have all helped to sell Maine and its fishing industry.

Motion pictures are one of the most effective means of reaching the public and this medium has been well used. We worked closely with 20th Century-Fox in the making of a feature movie "Deep Water" at Vinalhaven and with the same company on a two reeler "Lobstertown" at Corea which has worldwide distribution. We have also cooperated with the Maine Sardine Packers Association on the production of a beautiful colored film "It's the Maine Sardine" which tells the story of that industry.

The department has also made a number of movies on various phases of the fisheries for distribution to clubs, schools and civic groups.



ONE OF MANY SEAFOOD EXHIBITS PUT ON BY THE DEPARTMENT

All of these efforts are supplemented by close cooperation with authors, magazine writers and newspaper people who write stories built around our fisheries. We also prepare and distribute many stories to the press and radio.

### OTHER ACTIVITIES

We have cooperated with the National Fisheries Institute on a number of projects such as a fight against increased express rates on seafood products and the development of greater representation for the fisheries in federal government.

The Commissioner has made many trips to Washington to stir up congressional assistance against foreign competition and to appear at hearings before the tariff commission. We have worked closely with the other seaboard states on fishery projects and sat in on conferences to shape the pending North Atlantic Fisheries treaty. Generally the department has taken a broad attitude on the value of letting the world know about Maine and its fishing industry.

### COMPETITION

When the world food situation becomes more stable, fish products will face greater competition from other foods. Because of this the industry must remain alert, improve its products and merchandising methods. We hope to be able to be of assistance in this effort.

### INFORMATIONAL SERVICE

As soon as facilities are available we hope to set up an informational service with regular bulletins to the industry on latest developments in marketing, processing and production techniques.

## DIVISION OF CONSERVATION AND PROPAGATION

ROBERT L. DOW, *Chief*

The work of this division is extremely important as it is designed to learn more about our fisheries resources and to formulate a policy of management whereby we can obtain a maximum yield of all species and still permanently safeguard the supply. It is indeed surprising and regrettable to learn how little is known about the nation's vast ocean resources and this is particularly applicable to Maine. For too many years we have based our conservation and propagation efforts on guess work but the trend of fisheries thinking is now towards scientific fact and we are endeavoring to shape our program along those lines.

Our first approach is an inventory of just what we have available and of the conditions that have caused a decline in the production of several of our most valuable species. This is a very big job and, with our limited facilities, can only be accomplished in a matter of years. Meanwhile we are attempting to evaluate our present conservation and propagation practices with a view towards continuous improvement.

It is certain that our fisheries resources are not inexhaustible and can be destroyed unless intelligent management is coupled with the ever increasingly efficient production methods. Such management can be successful only when patterned around proven knowledge of the fishery.

Records show that prior to 1947 the department had never employed scientific brains for any extended period. This was more a case of lack of funds rather than lack of administrative initiative and foresight.

Two actions by the 1947 legislature paved the way for our present program. One was the allocation of four-fifths of every cent of gasoline tax, not refunded to fishermen, to the department for research and propagation. This revenue which amounted to approximately \$18,000 the first year formerly went into the highway fund. The other act set up a program of restoration and development of the shellfish resources which was financed by special processing, clam digging, shucking and transportation licenses. Revenues amounted to about \$14,000 the first year and permitted us to launch our extensive soft shell clam, quahog and mussel work. Increased general appropriations also made it possible for us to budget approximately \$13,000 a year for the purchase of seed lobsters.



It is gratifying that all of the other coastal states have complimented the Maine industry for its progressive attitude and are endeavoring to establish similar programs.

### RESEARCH PROGRAM

One of our first moves, when funds became available in 1947, was to equip a laboratory in the building which houses our lobster rearing station at Boothbay Harbor. We then employed biologist Clyde Taylor on a permanent basis and later hired Frederick Baird, a graduate biology major from the University of Maine Wildlife Course. Taylor came to us from the staff of the U. S. Fish and Wildlife Service and had a general knowledge of the Maine fishing industry and especially the lobster resource. If possible we hope to obtain the services of a technologist to give better balance to our research program.

Because of our research activity we were able to obtain better cooperation from the Federal Government, Canada and other states on mutual conservation studies and problems. This has also led up to greater interest in the fisheries on the part of our colleges which are working closely with us.

Reports by Messrs. Taylor and Baird on following pages give more detail on our research work.

### RESEARCH BOAT

After selling the MAINE we obtained designs for a new 42-foot craft which will be used extensively to further our research and propagation activity. Now under construction at Stonington the boat will be launched in the Spring and we have a full schedule planned for her. She will be equipped with radio telephone, fathometer, power hoist and various types of fishing gear and research equipment. It is our plan to work the boat the year round on a variety of problems. Although comparatively small she will have a lot of cockpit room and should be adequate for our needs at the present time. Power will be provided by a 165 HP GM diesel engine which we obtained without cost from the U. S. Fish and Wildlife Service.

### SEED LOBSTERS

The department firmly believes in the protection and utilization of all seed lobsters and therefore is budgeting about \$13,000 a year for this purpose. It is our policy to buy every seeder that we can from the pounds and to distribute them equitably all along the coast. The fact that most of these lobsters are from Canada gives valuable assistance to our domestic seed stock.

Due to market conditions and heavy shrinkage in the pounds we were able to buy only about 20,000 pounds in 1948 despite the fact that we paid dealers forty-five cents a pound. We hope to be able to get a larger supply in 1949 and succeeding years. Very bad shrinkage in 1947 and lack of funds limited our purchases to about 12,000 pounds.

If the supply of seeders does not increase we expect to study the advisability of purchasing imported female lobsters which would be marked as state property and released in our waters.

It is apparent that our catch is again on the decline and that every effort must be made to halt this trend. It is also evident that some research should be launched to determine the drift of lobster eggs so that plantings of seeders can be most efficiently carried on.

## LOBSTER REARING

This is one of the most controversial activities that we have and our investigations to date indicate that the feasibility of continuing a major rearing program is decidedly questionable. In 1947 we placed the station on a 100 per cent experimental basis in an effort to learn more about the survival of fourth stagers when placed in the ocean and to get a better figure on unit production costs.

Since rearing was started in 1939 the station has operated at about 25 per cent capacity due to an inadequate heating plant. In the winter of 1948 we obtained many thousands of dollars worth of boiler room equipment from the Federal Government and installed it in an effort to step up production. Our goal was reached, but in a limited way and it now appears that the necessity of heating the water for rearing makes the operation entirely too expensive to be practical.

Our experiments prove without doubt that the fourth stagers will survive when initially released but whether or not a sizable percentage of them ever reaches maturity has not been determined. Regardless of the rate of survival, the cost per unit of production under the present method appears to be altogether too high.

The rearing program is a joint project of the state and the Federal Government and costs a total of approximately \$30,000 a year to operate. The whole setup is now the subject of serious discussion by the department and the U. S. Fish and Wildlife Service and it appears that any rearing in the future will be done



STATE AND FEDERAL FACILITIES AT BOOTHBAY HARBOR

on a limited basis to find possible new methods and to learn more about the species.

It has been definitely proven that rearing played a very small part in the great increase of production from 1939 to 1946.

The question is whether or not the money now expended for rearing could not be better utilized to study and assist the lobster industry in other ways and present facts indicate that it could, unless we can devise more efficient rearing methods. If some way could be found to get around the necessity of heating water for the rearing and hatching tanks, the over-all picture would look much brighter.

Regardless of the final decision on rearing we recommend that the station be maintained as a research and experimental center and workshop for the department.

### CLAM FLAT POLLUTION

At the present time approximately fifty areas along the coast are closed to the digging of clams because condition of the flats do not conform to standards of purity set up by the U. S. Public Health Service. This is an extremely serious problem which causes hardship to many persons who obtain the bulk of their livelihood from our clam resources.

The situation is beyond the control of state authorities as the Public Health Service has the final say on all shellfish that go into interstate trade and that represents about 90 per cent of our production. Under the present system the state Department of Agriculture is charged with the responsibility of determining which flats are contaminated and this department, in turn, is obligated to handle the enforcement problem. It appears that the situation would be less confusing and possibly somewhat improved if one department had complete control of both phases of the problem.

As it stands now Maine has to conform to the Federal standards or else be barred from shipping clams beyond its boundaries.

In 1947 we instigated a complete re-survey of all of the closed areas which was conducted by the State Sanitary Water Board in cooperation with Agriculture. The situation was somewhat relieved in a few areas but basically the problem remained as big as ever. Numerous smaller surveys have since been made and it now appears that unless the Public Health Service modifies its standards and methods of determining polluted areas the pollution in our harbors, bays and rivers will have to be cleaned up.

We are attacking the problem from several angles and hope eventually to gain results. It can be definitely stated that the department wants to see every closed area opened and is continuously working toward that end.

### CLAM CLEANSING PLANT

The 1947 Legislature made available to the department the sum of \$25,000 from the Post-War Reserve to be used for construction of a clam cleansing plant, if and when such an activity seemed advisable. It was further provided that the plant must be set up on a basis where it would earn operating costs, from cleansing fees paid by the diggers, and refund the \$25,000 to the state over a 10-year period.

We immediately made an exhaustive survey of our polluted areas and reached the conclusion that there was no location at which such a plant could be built and still fulfill the requirements set up by the Legislative act. Such reasoning was partially based on the fact that only clams from moderately polluted areas are acceptable by government standards, after the cleansing process. Continuous research to find better and less expensive cleansing methods are underway and if results are successful we shall seek adoption of such a program by the state of Maine.

In view of the above we shall suggest to the 1949 Legislature that the \$25,000 allocated for clam cleansing be made available for other government activities.

### EASTERN MAINE REARING STATION

In 1941 the Legislature appropriated the sum of \$40,000 to be used for construction of a lobster rearing station in Eastern Maine. After considerable study the department selected Lamoine as the site for this project and had construction plans drawn. Due to the war and scarcity of materials work on the station was never started but a boiler and a number of hatching and rearing tanks were obtained.

Because of the present questionable status of lobster rearing we do not recommend further work on this project at the present time.

### GROUND FISH

During the past fifteen years our inshore groundfish resources have been seriously depleted and we hope to be able to determine the causes and take proper corrective measures to help restore the fishery. The necessary facts can only be obtained by research and study over a long period of time.

As a start we have made a survey of the spawning beds of the various species and are studying the findings of the U. S. Fish and Wildlife groundfish investigations in an effort to apply some of them to our situation. When our research boat is put into operation we hope to be able to advance this program on a much more extensive and efficient scale. We are also endeavoring to obtain the services of the Federal research vessel ALBATROSS III to assist us .

### SCHOODIC LOBSTER POUND

In 1947 we leased a lobster pound from the National Park Service, for the sum of \$25 a year, to be used for experimental projects. One of the main purposes of this activity was to attempt to determine the rate of survival of fourth stage lobsters produced at the Boothbay Harbor rearing station as well as to study the growth rates and habits of this species.

The pound has been screened for the past two years and well stocked with the fourth stagers. Small fish, crabs and other species were purposely left in the enclosure to simulate as natural conditions as possible. Although the results have not been fully determined there is good evidence that a comparatively high per-

centage of the reared lobsters do survive. Fourth stagers placed in the pound in June have reached a length of one and one-half to two inches in late Fall. Biologist Taylor has prepared a report on these experiments which is available for distribution from department headquarters.

We consider it fortunate that we were able to secure the use of this pound which was scheduled to be demolished and thank the Park Service for its cooperation. Such a structure is invaluable for research work and we hope to be able to retain it for several more years.

### HERRING STUDIES

We have cooperated with the Maine Sardine Packers Association and the U. S. Fish and Wildlife Service on a study of the herring resources during the past two years. It is evident that a continuous study of this extremely valuable resource should be maintained over the years in order to give a better understanding of the trend of production, migrations, habits and other phases of the fishery.

### TUNA FISHING

Increasing demand for our bluefin tuna on the fresh fish market and developments in canning techniques have considerably improved the commercial prospects for this species. Previously the giant fish were of interest only to sportsmen who pursued them by rod and reel and harpoon.

We now have a law on our books which prohibits the taking of tuna except by hook and line or harpoon. Sooner or later the state of Maine may have to decide whether this species is most valuable as a sportsfishing attraction or as a commercial product. It is certain that the hundreds of anglers who come to our coast every season to battle the bluefins make the resource profitable for our citizens. How much more or less profitable it would be if the emphasis was put on the commercial side is a matter that will have to be decided by time and developments. It is generally believed that the supply is ample for both activities.

During the summer of 1948 we conducted experiments for the taking of tuna on line trawls but achieved poor results. We intend to continue this work on a more extensive basis in 1949.

### SEA MOSS

For the past two years we have made several surveys to determine the extent of our sea moss beds from Kittery to Calais and have supplied this information to a number of interested

parties. It appears that we have ample quantities of the growth for expansion of the industry but at the present time the trend of development seems to be downward rather than ahead. Cheaper foreign moss and the discovery of synthetics have contributed to the situation. Nevertheless production is sizable and brings a considerable sum of money to our coastal towns annually.

In 1947 we engaged a diver to examine certain sea moss areas and learned that the growth prevails in much deeper water than had formerly been believed.

### CORMORANT AND GULL CONTROL

For the past two years we have cooperated with the U. S. Fish and Wildlife Service on a program to control the herring gull and cormorant populations along our coast. We have supplied the boats and numerous wardens to assist the Federal men who furnished the egg spraying apparatus and the fluid to go with it. The projects were carried on during May and June to coincide with the egg hatching season.

The program called for visits to many of the most prolific rookeries where thousands of eggs were sprayed with a solution designed to prevent them from hatching. This method is superior to previous practices of destroying the eggs which only resulted in the female laying another set. Under the spraying technique the mother futilely tries to hatch her eggs until the breeding season has passed.

Dozens of islands and ledges were visited from York county to the Canadian line and there is evidence in some sections that the program is beginning to produce good results.

The 1948 activity report showed 5,316 cormorant eggs and 11,532 herring gull eggs treated in the southern Maine areas; 10,074 cormorant and 1,182 gull eggs in Central Coastal areas; 1,754 cormorant and 8,518 gull eggs in Eastern Maine for a total of 17,144 cormorant and 30,289 gull eggs. In 1947 the total was 15,196 cormorant and 45,768 gull eggs treated.

We also treated several hundred eggs of the black backed Gull which is a deadly enemy of the eider duck.

A much more extensive program was planned for 1948 but was hampered by bad weather. We believe this work to be very worth-while and hope to maintain it on a more far-reaching basis in the future, until the bird populations can be maintained at a normal level.



WARDENS SPRAYING CORMORANT EGGS

### SHAD RESTORATION

Years ago Maine had great runs of shad in its tidal rivers and streams that were the basis for an extensive and profitable fishery. With the advent of dams and pollution these fish became practically extinct but recent changes of conditions in some waters has indicated that new runs might be developed.

In the spring of 1948 we obtained several hundred thousand shad eggs from the State of Maryland and attempted to hatch them at Damariscotta for the purpose of experimental stocking. Due to a power failure we lost most of the eggs but in 1949 we hope to be able to obtain another supply from Maryland and resume the work.

Several streams would be stocked with fingerlings with the hope that they would survive and be the basis for a renewal of the shad fishery. This is purely an experimental proposition but, due to the comparatively small sum of money involved, seems to be a worthwhile gamble.

Each summer large schools of shad have visited the Maine coast in the vicinity of Mt. Desert Rock and for the past two years we have cooperated with the U. S. Fish and and Wildlife



Service to tag several hundred of them in an effort to find out more about the resource.

## OYSTERS

Although it appears that conditions along our coast are not entirely suitable for oyster propagation and cultivation we have conducted a few experiments to see if beds cannot be started. One of the best locations for a possible fishery seems to be a body of water known as Salt Pond in the vicinity of Sedgwick. We have conducted considerable research in that area and are awaiting results.

## UNIVERSITY OF MAINE

In the summer of 1946 the Governor and Council transferred the sum of \$10,000 from the Contingent Fund to this department to enable us to take better advantages of the economic and scientific research facilities offered by the University of Maine.

After several sessions with University officials it was decided to use the money for an economic survey of the industry and for several minor research projects to be undertaken by graduate students. The ultimate goal was, and still is, to establish a permanent fisheries program at Orono through which the University could fulfill its responsibilities to the fishing industry, on the same lines that it is working with Agriculture, Forestry and other agencies dealing with natural resources.

Dr. Thomas Pedlow of the College of Agriculture was assigned, by the University, to head the program and he has been most helpful and cooperative. Through the economic survey the University has amassed a great deal of information about the industry which will be most helpful if a program of marine fisheries training and research is eventually launched.

Research projects on seals, scallops and the geology of clam flats have also been organized and are producing worth-while data and results. In addition Dr. Pedlow has made an exhaustive study of fisheries educational and research programs now being carried on in all parts of this country, Canada, and Europe in an effort to arrive at some tangible approach to the establishment of a permanent setup at the University.

After the initial \$10,000 was expended we allocated about \$5,000 a year from our regular appropriations for continuance of the program but have not expended that amount.

A review of the situation indicates that a permanent program would have to be authorized by Legislature and funds provided for its operation.

We are still endeavoring to determine the best approach to a final decision on what phase of fisheries activity should be emphasized by the University. President Hauck and his staff are most cooperative and sympathetic but they have plainly indicated that the University has no funds which could be allocated for fisheries work and that new money will have to be provided for any activity that they could undertake.

We hope to continue cooperation with the University until a decision can be reached as we believe that it is for the best interests of the fishing industry to be closely allied with the activities of this educational institution.

### SPECIAL U. OF M. RESEARCH

In 1946 fishermen and dealers suffered large losses due to an abnormal shrinkage of lobsters in captivity. It was evident that the species was effected by unknown conditions and the Governor and Council appropriated \$6,000 from the Contingent Fund in an effort to ascertain the cause of the trouble and a possible cure.

Through the cooperation of the College of Agriculture we obtained the services of bacteriologist John Getchell who launched a thorough investigation and discovered the cause of the trouble and made certain recommendations as to how the crustaceans might be more safely held during the summer months.

Due to the importance of Getchell's work it was continued during 1948 and financed by the Maine Development Commission Funds. We hope to be able to retain his services for at least another year to complete experiments on the holding of lobsters in inland areas and the utilization of artificial salt water. He is also making progress on development of a device to attach to lobster holding tanks to prevent heavy shrinkage at certain times of the year. (Mr. Getchell's complete report will be available to the industry by the Spring of 1949.)

### ATLANTIC SALMON

We have cooperated with the Atlantic Sea Run Salmon Commission and the U. S. Fish and Wildlife Service on efforts to restore large salmon runs in our Maine rivers. This activity has

included the use of our tank truck for distribution of hatchery fish and assistance in netting spawn salmon and removing eggs from fish for propagation purposes.

## STATE OF WASHINGTON

In the spring of 1947 the State of Washington offered to exchange a supply of Dungeness crabs for egg bearing lobsters to experiment on possible propagation of these species. It was also proposed to use the shipments to try to improve techniques of shipping live shellfish by air.

We cooperated on a very limited basis. The Washington fisheries department sent us two small shipments of crabs and we in turn provided them with two dozen egg lobsters. The crabs were placed in a lobster pound and are being carefully watched. The lobsters arrived on the West Coast in poor condition and most of them had died several weeks after being put into a holding pound.

Washington also sent us 200,000 silver salmon eggs to be used in experimental stocking of our tidal waters and streams.

## SEALS

During the 1947 sessions of Legislature there was considerable discussion over the trouble and damage to the fishing industry caused by seals and efforts were made to establish a bounty for their control.

The lawmakers turned down this proposal and suggested that the department make further studies to determine the extent of the seal problem.

Through our program at the University of Maine we secured the service of graduate student John Hunt who spent the greater part of a year on this work. Meanwhile we made a thorough survey of the possible commercial value of the mammals and developed a market that would bring from \$5 to \$9 for the pelt, oil and blubber of each carcass. A fairly good business developed in some areas but gradually petered out. The uncertainty of supply prevented anyone from becoming interested in a large operation and individuals found that the work and time involved in skinning and processing eliminated the chance for reasonable profits.

Hunt's full report, which will soon be published, established that seals are harmful to the fisheries, mainly because they eat

fish and break up schools of herring while damaging nets and twine. He spent the entire summer of 1947 observing the activities of herds from Casco Bay to Bluehill Bay.

He could not find evidence that the mammals ate lobsters to any extent but believes that they did feed extensively on flounders and other groundfish. As a part of his work he examined the contents of stomachs of numerous seals taken from Maine and Canadian waters.

He does not advocate a bounty but recommends that control measures be taken in certain areas. The best method of control, he believes, is by capturing the pups when they are a day or so old and easily accessible. Shooting and capturing the young by gill nets are other suggested measures.

Hunt estimates the Maine coast seal population to be from 3,000 to 4,000. Efforts to catch the mammals by use of a trawl were not successful.

In the summer of 1948 the department in cooperation with a group of Penobscot Bay fishermen tried a seal control experiment which gave excellent results. We supplied five volunteer fishermen with rifles and ammunition and set them ashore on large ledges upon which many of the mammals came to sun themselves at low water.

During the tide the men killed 23 seals and had several probables. Expeditions of this kind look to be a very effective way of keeping the population under control.

## FISH AND WILDLIFE SERVICE

We have enjoyed very friendly cooperation with the U. S. Fish and Wildlife Service on lobster rearing, shad propagation, bird control, clam pollution surveys, Atlantic salmon restoration, shellfish research and development, statistics and other activities. This agency has always demonstrated a desire to do everything possible to be helpful and we are now negotiating with its officials for further assistance on biological and technological problems.

# PROGRESS IN FISHERIES RESEARCH

C. C. TAYLOR, *Chief Biologist*

F. T. BAIRD, JR., *Biologist*

## INTRODUCTION

In accordance with an act of Legislature which allocated a portion of the marine gasoline tax funds for support, a continuous program of conservation and research was started in July, 1947. The importance of the coastal fisheries in the economy of the State, amounting to some 14 million dollars annual income to the fishermen alone, fully justifies the need for such a program.

Within the limits of the funds and personnel available, a program of investigation has been set up designed to cover the more important species without duplication of investigations already in progress by other agencies. The ground fish and herring, for example, are subjects of investigation by the U. S. Fish and Wildlife Service. The clam fishery was already being investigated by the Department.

It has been possible to supplement the work of the present staff to great advantage by arrangements with the University of Maine permitting graduate students to undertake certain phases of various investigations as partial fulfillment of the requirements for masters' degrees. This arrangement is not only of benefit to the Department but provides practical experience and training for the students. Through the active interest and cooperation of the staff of the biology department of Bates College, several projects have been assigned to undergraduate students majoring in biology.

## EQUIPMENT

The laboratory at Boothbay Harbor is now equipped to handle the ordinary chemical, bacteriological, pathological and physiological problems which may be anticipated in fisheries work. The present laboratory space, however, is inadequate to meet the requirements of visiting biologists working in collaboration with our program and it is recommended that at least one additional room be partitioned off adjoining the present laboratory to provide additional working and desk space. This would not involve the purchase of additional laboratory equipment.

The 34-foot motor vessel *Lively Lady* was assigned to the research program during the past summer and fall for use in the experimental lobster fishing work. Forty traps were constructed, supplemented by 20 traps loaned by the Fish and Wildlife Service.

## PROGRESS REPORT ON INVESTIGATIONS

### I. The Lobster Fishery.

Measurements totaling 3,218, of the commercial catch were made at the principal ports in 1947. Analysis of these measurements shows that about 80 per cent of the 1947 catch consisted of lobsters less than  $1\frac{1}{4}$  pounds in weight, that about five per cent of the catch consisted of mature lobsters capable of reproducing and that less than 1 per cent of the total legal population would survive the fishery to escape beyond the five-inch maximum size. This situation has prevailed in the fishery since about 1939. It is a consequence of the high level of fishing intensity which does not permit lobsters to attain any size after entering the fishery. There is some evidence that the high level of catch prevailing in 1944, '45 and '46 was a consequence of imposing a 5-inch maximum size in 1935. These large lobsters form a protected spawning stock unaffected by changing fishing intensities. Unless a sufficient number of lobsters escape the fishery, however, this stock will gradually become depleted.

The experimental fishing program, carried on in conjunction with experimental plantings of fourth-stage lobsters in certain areas, has already furnished additional evidence of the high fishing mortality occurring in the legal sizes. In Linekin Bay in 1947, the catch data indicated that the supply of newly-shed lobsters comprising recruitment to the legal population was re-



LOBSTERS FROM THE EXPERIMENTAL POUND AT WINTER HARBOR

duced by 75 per cent in a period of three months. Results of plantings of fourth-stage lobsters in this area are not expected to appear in the catch of the experimental traps until 1949 and results of plantings at Round Pond in 1948 are not expected to appear in the catch of the experimental traps until 1950.

Since information concerning the growth rate of different sizes of lobsters is inadequate and since this knowledge is essential to intelligent interpretation of other data, two efforts have been made in this direction. The first was the publication of Fishery Circular No. 3 in February, 1948, presenting an analysis of catch measurements indicating that the growth of lobsters in the lower half of the legal-size range is about  $\frac{1}{2}$  inch increase in carapace length. The second step was the planting of fourth-stage lobsters in a screened lobster pound at Winter Harbor to observe subsequent growth. These lobsters have been followed through two years of growth and it is expected to be able to observe growth up to the minimum legal size.

Several miscellaneous studies concerning the biology of the lobster have been undertaken. A study of shell disease of the lobster indicated the possibility that this disease might cause mortality by attacking the gills. Preliminary histological studies of gills of diseased lobsters undertaken by students under the direction of the Bates College biology department faculty indicate some evidence of attack of the chitin in the gills. A study has been made of the effect of fresh water on the lobster and a practical means of handling fresh water problems under certain circumstances developed. An investigation of the effect of notching the tail of seed lobsters showed that no harm is likely to follow this practice even when the tail is deeply notched. An investigation of the possibility of recirculating heated water used in rearing lobster fry resulted in poor survival of lobster fry kept in the recirculated water. An investigation of the rate at which lobsters consume oxygen from sea water is being made as other duties permit.

## II. The Smelt Fishery. F. T. Baird, Jr., In Charge.

On November 1, 1947, the Fisheries Laboratory at Boothbay Harbor inaugurated a biological survey of the Atlantic Smelt. This fishery provides seasonal employment for many coastal people and is fast becoming a sport fishery. During the past few years an average of 600,000 pounds has been sold commercially in addition to a large home consumption.

From November to July all phases of the fishery were followed. Seines and weirs were checked in the fall, ice fishing during the

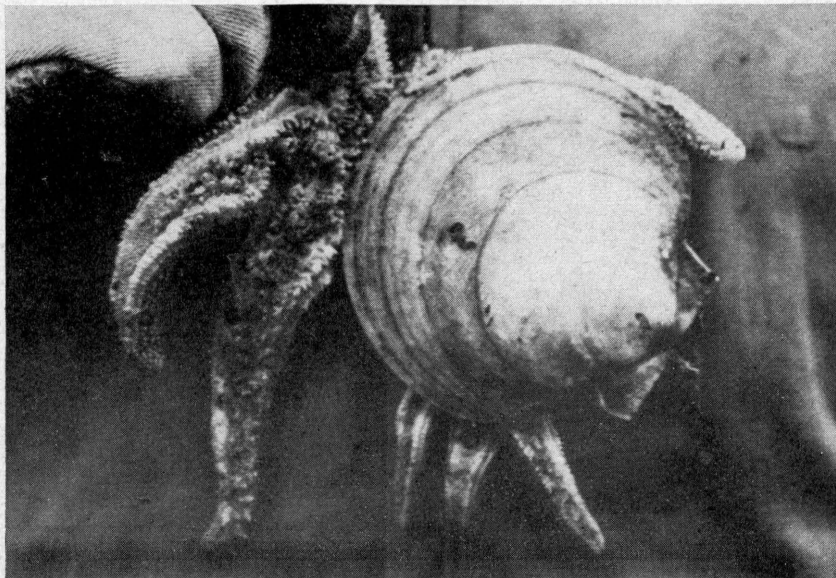


winter, and with the advent of the spawning runs several nights each week were spent on the streams. Seasonal samples of the catch were taken from areas in each county along the coast from Cumberland to Washington and from these samples age and growth, size composition, sex ratios and feeding habits were determined. As a result of the data obtained, it is now possible to narrow the field of investigation into more specific channels such as studies of spawning stocks and areas, studies of fishing methods and their effect on the population and surveys of selected streams.

The work of the smelt investigation has been materially assisted through the availability of knowledge already obtained by Canadian studies and the advice and suggestions of Canadian biologists.

### III. The Scallop Fishery

Although a program of investigation of the scallop has been drawn up, it has been found impossible for the present staff to handle this investigation adequately and work on this program has been limited to the measurement and collection of four hundred scallops in Penobscot Bay and a study of the catch statistics of scallops for the period 1939 to 1946. Although the latter study resulted in considerable information on catch per boat per day, it was found impossible to obtain the needed data for a particular area over a sufficient period of time for reliable conclusions to be drawn as to the effect of the fishery on abundance.



STARFISH CONSUMING SEA SCALLOP



The Department has been fortunate in securing the services of Walter Welch, a graduate student in Wildlife Conservation, University of Maine, to make a study of size composition of the catch, growth rate and gonad development. The results of this study are being prepared for publication.

#### IV. Atlantic Salmon Restoration

The staff is cooperating with the U. S. Fish and Wildlife Service in efforts to restore the Atlantic Salmon in the rivers of the state. At present an experiment is in progress at the Pemaquid lobster pound to determine if spawned salmon from the U. S. Fisheries Station at East Orland can be held in salt water during the winter and if, under these conditions, they will develop fertile eggs. If this experiment proves successful, it will save a considerable sum of money since much time and labor are necessary each year to obtain an adequate supply of spawn fish for hatchery operation.

#### V. Technological Studies

Experiments on methods of holding lobsters in recirculated sea water are being conducted at the University of Maine by John Getchell of the Agricultural Experiment Station staff.

Experiments on the effects of altitude on lobsters are being made at Boothbay Harbor to determine if altitude may be the factor causing poor survival in air shipments of lobsters. These experiments indicate that altitude is detrimental to the lobster but further experimentation in this field is necessary to determine the tolerance limits of lobsters to altitude.

Experimental plugging of lobsters with chemically-treated plugs have been conducted to test the possibilities of developing a plug which will prevent infection and discoloration of the claw meat. These experiments have failed to demonstrate any advantages of the treated plugs. These experiments are being continued.

A test was made of a commercial artificial lobster bait during the past fall in conjunction with the experimental fishing program. Under the conditions of the experiment, the bait caught about a third as many lobsters as redfish bait, but this situation does not necessarily apply all along the coast.

## SHELLFISH PROGRAM

By DANA WALLACE, *Specialist*

The history of the industry reveals that concern for the future of Maine's shellfish resources is not of recent origin. As early as 1890, only forty years after the initial commercialization of the bivalves, this concern was translated into the first conservation restrictions designed to increase the availability of the supply. During later years further efforts to improve the situation have been made.

Clam conservation, not only in Maine but elsewhere, has been seriously handicapped by the lack of basic information obtainable only from continuing research and experimentation upon which intelligent control and harvesting practices could be built. As early records show, efforts were initiated at various times, but never upon a continuous or long-term basis.

These early sporadic attempts, each throwing some light on the major complexities involved, have culminated in the first continuous shellfish program, instituted by the present commissioner and confirmed by the 1947 Legislature.

Since much of the work on shellfish conservation in the past has had insufficient planning and organization, and has lacked specific direction, basic information has not been obtained, and many unsolved problems directly or indirectly affecting the shellfish resource have not even been realized.

Problems that were recognized as having a direct bearing upon the condition of the fishery were not solved, nor, because of the lack of an established program of research and experimentation, were there ever continuous attempts made to solve them.

It was not until 1946 that any comprehensive shellfish program was organized by the department. Limited phases of the program were begun and the 1947 Legislature, realizing the need of implementing continuous shellfish research, study and experimentation made possible the means by which this work could be carried on more intensively.

Increased license fees and a broadened base of licenses for commercial fishing was authorized by the Legislature in 1947. Certain of these fees—namely, those from commercial shellfish, shellfish shuckers, shellfish processors, and interstate shellfish transportation—were set up as a continuous fund to be used solely for the restoration and development of the shellfish fishery. Funds obtained from these license fees do not lapse at the end of the fiscal year. A more judicious and effective expenditure of these funds is possible under this provision. A summary of income and expenditures under this fund is shown elsewhere.

The current shellfish program, as a part of the all-inclusive conservation responsibility of the Department has been directed toward the end of best utilizing our clam, quahog, and mussel resources without impairing the maximum commercial yield of the several species.

In order to insure the effectiveness of this program on a broad scale, it has been necessary to carry out diversified experiments. Some of these experiments are designed to furnish relatively immediate information but the bulk of the research work has to be, of necessity, carried out on a continuous long-term basis. This work has been further implemented by the Atlantic States Marine Fisheries Clam Technicians Committee of which Commissioner Reed is chairman and Dana Wallace a member. At periodic meetings, representatives of the various member agencies have met to discuss those experiments which each has been carrying out in attacking the most pertinent problems in the several clam producing states.

The Department has been greatly indebted to the personnel of the Research Board of Canada for basic information and counsel. The Federal research stations in the Maritimes have been engaged in a continuous shellfish program for the past ten years.

In order to obtain information on varying conditions in the different clam producing areas in Maine, cooperative projects have been carried on with representative towns and interested individuals in all of the coastal counties.

The Department has worked to the advantage of the shellfish industry by cooperating with other state and federal departments. In some areas the major problem has been that of pollution, and by working closely with the Department of Agriculture, the Public Health Service, Bureau of Health and Welfare, and the Fish and Wildlife Service, the Department has succeeded in having many specific flats reopened where conditions correct themselves seasonally.

Through Commissioner Reed's active interest in, and concern with, coastal pollution problems, he has aroused responsible federal services and agencies to the extent that research facilities to attack these problems have now been established.

One of the requirements basic to making shellfish conservation effective and efficient is to determine accurately and thoroughly the extent of the resource. In short, the practical application of conservation measures cannot be made without reasonably exact information as to the present and potential species population.



Recognized techniques borrowed from other fields of research have proved adaptable in surveying clam flat populations. To date it has been comparatively impossible to carry out this actual survey to the extent that is desirable, because of the need of dealing with other more pressing shellfish problems. Perhaps one of the most urgent of these problems has been depleted or barren flats.

Transplanting of seed stocks is being used as an intermediate propagation expedient until such time as more effective aids to natural propagation can be developed.

In the meantime, one phase of clam conservation is the taking of stunted or rapidly growing clams found in heavy concentrations and transplanting them to depleted areas to restock the flats and give the relayed clams an opportunity to reach commercial maturity. The depletion or barrenness of flats may result from overdigging, from unknown reasons, or from lack of sufficient seed.

It has been the experience of the Department, other states and Canada that clams transplanted, experimentally or commercially, have done extremely well in certain areas. In order to assure a greater degree of success in transplanting, additional information is needed about the burrowing of clams under varying conditions. Basic information on clam growths and mortalities based on different sizes, ages, points of origin, soil characteristics, seed conditions and seasonal variations is also required.



A COOPERATIVE CLAM-SEEDING PROJECT

In other flats, highly productive in previous years, similar plantings have failed completely.

It has been found that areas where clams become established, survive and grow, have good water circulation, firm flats free of shifting sands, silt, algae and other marine growths, and do not contain a population of crabs, drills, and other predators and competitors.

The Department records of the past thirty-five years indicate that extensive clam producing areas have undergone marked physical changes. Efforts to measure and analyze the extent and nature of these changes have not hitherto been made. In view of the connection between geological and hydrographical modifications of the flats and their productivity, the Department began geological studies of a selected area in cooperation with the Maine Geological Survey in 1948 and is currently being continued at the University of Maine. It is hoped that this work can be continued to a logical conclusion.

Current findings of the Department indicate that predators are very destructive to our clam population, particularly to the seed stocks. There are further indications that their activities vary seasonally in intensity.

The principal predators are the horseshoe crab which grinds the clam to ingestible size with special organs situated at the bases of the legs surrounding the mouth; the green crab that consumes seed stocks and nips off exposed portions of larger clams; the boring cockles, *Polynices*, and other drills that suck out the clam meat after having bored a round, counter-sunk hole in the shell by means of their rasp-like tongues. Several species of sea birds likewise have been observed attacking and consuming clams.

Research work is being carried on in other states and Canada to determine practical control measures to protect clams from these enemies. When workable methods of control are devised they will be included in the Department's conservation program.

In addition to the damage caused by natural enemies many clam producing areas have been and are being threatened by the encroachment of unmarketable mussels as competitors. These mussels, of no present commercial value, are competing with the native clam population for food and space, as well as reducing the water circulation and creating unfavorable flat conditions. Up to this time various control experiments made by the Department have proved to be partially successfully but inadequate for

the extensive areas affected. It is possible that the rapid encroachment of mussels on certain areas is symptomatic of a deterioration of flat conditions favorable to high clam production.

As the work of the Department's shellfish program has taken shape and direction, it became increasingly obvious that the facilities and personnel at the disposal of this Department and similar agencies in other states, individually and collectively, were insufficient to cope with the scope and diversity of shellfish research problems.

The Department took the initiative in preparing and supporting the provisions of Congressional legislation that directed the Fish and Wildlife Service to set up and carry out a research program on clams. This program is directed toward the end of finding the best clam flat management practices to produce maximum yields.

As has been the intent during the two years of the Department's shellfish program, duplication of work being done elsewhere is carefully avoided. For this reason, clam projects carried on by the Fish and Wildlife Service will be coordinated with those being performed by the Department and other comparable state and private research organizations.

It would appear from the record that the Department has been almost solely concerned with the soft clam fisheries to the exclusion of the comparatively minor, yet, valuable quahog and mussel fisheries.

In actual practice the seeding of depleted hard shelled clam areas has been carried on cooperatively by the Department and several coastal towns. In addition, quahog seed stocks have been planted in experimental plots as far east as Washington county. The principal purpose of this work has been to determine growth and survival rates and observe whether or not the species could reproduce itself under conditions different from the normal environment.

Some work on restocking edible mussel beds has been done by attempting to improve natural spawning conditions in selected areas. Results have been reasonably successful, but no extensive program for work of this type has been set up since the need for control of unmarketable mussels encroaching upon productive clam flats has appeared to be of greater importance.

As the shellfish program has developed, and the Department has become more acutely aware of the complex factors that affect the fishery, it has been necessary to alter the basic conduct of



the work as it has hitherto been carried out. A realization of the possible need for modifying hydrographic and geological conditions of the flats in order to induce a better collection, survival and growth of the clam population has required a reappraisal of research plans. Work done during the summer of 1948 by the Department and the Maine Geological Survey has been preliminary and supplementary to research work in this field of shellfish conservation.

At present, experiments to measure the effect of increasing or decreasing clam population upon the productivity of the flats are being carried out. In areas where the clam population is sparse additional seed stocks are being planted; while in other areas, where a great deal of crowding has occurred, with consequent stunting of the clams, removal of surplus stock in varying amounts has been done.

For the most part, these experiments have been carried on where intensive clamming is no longer being done because the size and number of the clams has not made it worthwhile for the fishermen to dig. This information will be used in the ultimate classification of flats according to current and potential levels of productivity. Coupled with this is the possibility that a like classification of clam stock can be made.

For the time being and the immediate future it appears to be advisable to concentrate efforts on those flats that in the past have maintained a high production level. As information becomes available about the hydrography and geology of flat conditions, it may be possible to shift emphasis to non-producing flats which, on the basis of future knowledge, may be brought into production.

In order to arouse interest in the opportunities for fisheries research the Department is cooperating with universities, colleges, and individual students in planning work on specific problems in various phases of the shellfish industry. The response to the many unexplored possibilities for research in this field has been encouraging and indicates that undoubtedly college students will devote more effort to fisheries research in the future.

Information about shellfish conservation is being brought to the attention of the industry through the media of publications, bulletins, movies, pictures, lectures, and personal contact. It is realized that, in order to make the best possible use of the state's shellfish resources, all who are interested in the industry must work together.

Our shellfish resources are annually growing in importance and value and must be intelligently managed if they are going to survive.

NOTE: FURTHER DETAILS ON ANY OF THE MATTERS DISCUSSED ON THE PRECEDING PAGES WILL BE SUPPLIED BY THE DEPARTMENT UPON REQUEST.



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Boothbay Harbor . . . . . 115-WK  
Robert L. Perry, Marketing & Development, 35 Pearl St.,  
Camden. . . . . 3006  
Germaine M. Fortier, Secretary, Augusta House, Augusta. . . 1000

COASTAL WARDENS

First District

Dwight W. Underwood, Supervisor: 70 Middle St., Saco 869, Biddeford  
Harold L. Ricker, 34 Fessenden St., Portland. . . . .  
Elmore L. Wallace, Box 263, Pearl St. Sta., Portland. . . . . 4-5887  
John F. Anderson, P. O. Box 313, Kennebunk. . . . . 488  
Clinton A. Bishop, Long Sands Road, York Village. . . . . 217-W

Second District

Warren A. Hume, Supervisor: 17 Union St., Boothbay Hbr. 440  
James W. Thurston, Orr's Island. . . . . 58, Harpswell  
Daniel H. Davis, Boothbay Harbor. . . . . 742-M  
John L. Stevens, Friendship. . . . . 161-2 Waldoboro  
Swansea G. Burns, 22 Potter St., Brunswick. . . . . 244-M

Third District

Frank G. Hallowell, Supervisor: 124 Main St., Thomaston. 143  
Fred A. McGlauffin, Friendship (Call C. L. Fales Store) . . . . Thomaston  
Merle F. Dobbins, 44 Waldo Avenue, Rockland. . . . . 1273-R  
Donald R. Hickey, 177 Main St., Thomaston. . . . . 366  
Clayton Simmons, 14 Laurel St., Rockland. . . . . 522-MK

Fourth District

Owen Richardson, Supervisor: Surry Road, RFD 3,  
Ellsworth. . . . . 276-M  
Ralph M. Pinkham, 67 High St., Ellsworth. . . . . 206-M  
Lester A. Stubbs, Hampden Highlands. . . . . 13-3  
Roy D. Stewart, Birch Harbor. . . . . 88-22, Winter Harbor  
Chester E. Brown, Box 596, Southwest Harbor. . . . . 201-3

Fifth District

Ernest V. Woodward, Supervisor: Jonesport. . . . . 63  
Robin T. Henderson, Cutler (can be reached at Charles  
Smith's) . . . . . 189-5 Machias  
Daniel J. Johnson, Lubec. . . . . 105-2  
Bertram E. Davis, South Addison. . . . . 4-3, Columbia  
Herbert L. Morang, Sr., Jonesport. . . . .