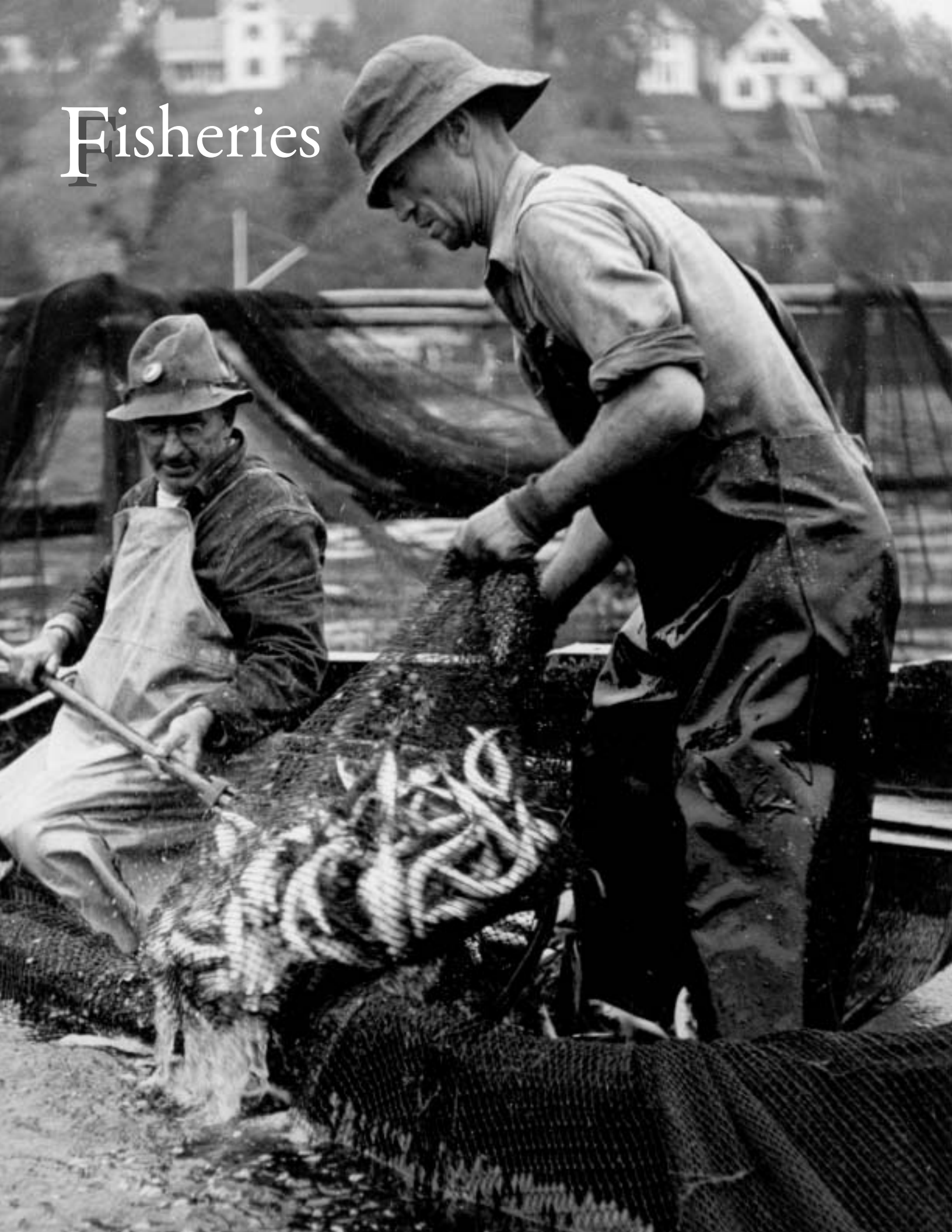


Fisheries



Introduction

Fish have always been important in Maine. Native people, European explorers, early settlers, and Mainers up to the present have depended on marine life for food and trade. Cod was long the most important food fish, as it could be preserved by salting and drying. Salt cod was safe to eat months, and even years, after it was dried, thus making it popular in warmer climates, before there was ice or refrigeration.

By the mid-nineteenth century, Maine fishermen were competing with national leader Massachusetts in quantity of fish caught. Because Maine's economy was not as diverse as other states, much of Maine's prosperity depended on a strong fishery. From the beginning of the twentieth century to the present time, the health of the fisheries has become increasingly sensitive to overfishing, pollution, climate changes, and invasive species.

This unit examines fisheries from geographical, environmental, historical, and economic perspectives. It introduces students to an ecology of fisheries, including the many species involved; the relationships between those species and their environments; and the different methods Mainers have used to catch or harvest fish. Students also learn about the markets for different kinds of fish, including how we and other cultures enjoy eating fish. The module provides exceptionally strong opportunities for addressing science learning objectives through related projects.

Lobstering is now Maine's most important fishery. Because of its tremendous economic value, there is a great deal of information available on its history and on current research. A class unit could focus effectively on just lobsters and lobstering, including how the lobster has become a cultural icon almost synonymous with the state of Maine.

As with all of our modules, there are strong overlapping relationships between *Fisheries* and other modules, especially *Our Maine Ancestors*, *Life at Sea*, and *Working the Bay*.



General learning goals are:

- To understand the great impact of fisheries in the history of Maine;
- To understand how Maine came to have such a wealth of marine resources;
- To learn about the kinds of marine life that were and are important in Maine, and about their habitat;
- To learn about the methods used to catch and preserve fish, including boats and gear;
- To learn about Maine's fishing communities;
- To understand environmental changes and human behaviors that have impacted the fisheries over the last several hundred years;
- To understand how fishing helped shape Maine's culture;
- To understand the economic changes, theories, and regulations that have impacted Maine's fisheries.



Outline

I. Factors in the Development of Maine Fisheries

- A. Banks and their Formation: Grand Banks, George's Bank, Sable Island Bank, and Others
- B. The Gulf of Maine and the Maine Coast
- C. The Gulf of St. Lawrence

II. The Cod: Why it Was So Important for So Long

- A. Preservation: Salt Cod
- B. Markets: Europe, West Indies, Urban Areas, Southern Slave Market

III. History of Fisheries in Maine

- A. Native Americans
- B. Early European Explorers, Maine's Fishing Stations, and Colonization
- C. Revolutionary War Times
- D. The Codfish Bounty
- E. Nineteenth Century: Pre- and Post-Civil War

IV. Biology Lesson

- A. Demersal, Pelagic, and Anadromous Fishes
- B. Shellfish
- C. Marine Mammals
- D. Important Fish Species: Cod, Haddock, Mackerel, Herring, and Salmon

V. Boats, Equipment, and Fishing Methods

- A. Schooners, Sloops, and Small Boats
- B. Gear
- C. Processing and Preserving
- D. Fishing Communities and Culture

VI. What about Whaling?

VII. Twentieth Century Changes in Fisheries

- A. Technological Developments in Boats, Propulsion, Fish Detection, and Capture
- B. Fresh Fish Markets, Ice, and Faster Transportation
- C. Threats to the Fisheries: Overfishing, Pollution, Ecosystem Imbalances
- D. Fisheries Management: State, Federal, International; and Protection of Marine Mammals
- E. Aquaculture

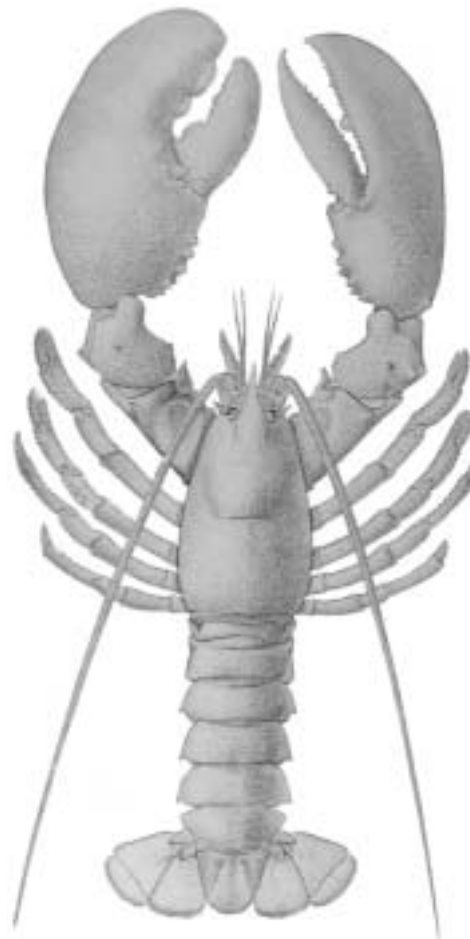
VIII. Lobster Fishing in Maine

- A. History: Pre-Colonial Times to Present
- B. Life Cycle of the Lobster and Lobster Populations
- C. Catching Lobsters
- D. Regulation, Management, and Research
- E. Maine's Lobsterboats, Communities, and Culture

IX. Other Maine Fisheries

- A. Tuna, Swordfish, Shark, Halibut, Flounder, Smelt
- B. Scallops, Clams, and Mussels
- C. Crabs and Shrimp
- D. Sea Cucumbers, Sea Urchins, Eels (Elvers), Worms
- E. Sea Moss, Kelp, and Rockweed

X. Dinner: Nutrition, Consumption, and Preparation





Learning Results, Grades K-2

Career Preparation

- A-2:** Identify strengths and interests required in a job, at home, at school, or in the community.
- A-3:** Identify local career opportunities.
- B-2:** Identify preparation necessary for a career of interest.
- C-1:** Identify examples of technology being applied at home, school, or work.
- C-2:** Demonstrate the effects of technology on where people choose to live, how they communicate, how they travel, and how they acquire goods and services.
- D-3:** Demonstrate an understanding of the importance of the conservation of resources.

English Language Arts

- H-1:** Develop a search strategy that uses appropriate and available resources.
- H-2:** Formulate questions to ask when gathering information.
- H-3:** Record and share information gathered.

Health and Physical Education

HEALTH EDUCATION

- C-3:** Choose healthful foods.
- D-1:** Describe the influences of media on health.

Mathematics

- A-2:** Understand the many uses of numbers (e.g., prices, recipes, measurement, directions in play).
- A-3:** Order, compare, read, group, and apply place value concepts to numbers up to 1,000.
- B-1:** Use and apply estimation with quantities, measurements, computations, and problem-solving.
- C-1:** Formulate and solve problems by collecting, arranging, and interpreting data.
- E-3:** Use positional words to describe the relationship of two or more objects (e.g., over, under, beside, left).
- F-1:** Estimate and measure length, time, temperature, weight, and capacity.
- F-3:** Select standard and non-standard tools for determining length, time, temperature, weight, and capacity, and use them to solve everyday problems.
- I-1:** Classify sets of objects into two or more groups using their attributes.

Science and Technology

- A-2:** Describe characteristics of different living things.
- A-3:** Explain, draw, or otherwise demonstrate the life cycle of an organism.
- B-1:** Identify ways that organisms depend upon their environment.

- B-2:** Describe how almost all animals' food can be traced back to plants.
- B-3:** Give examples of how one change in a system affects other parts of the system.
- B-4:** Describe different ecological systems on earth.
- B-5:** Describe a familiar local environment.
- C-1:** Demonstrate that living things are made up of different parts.
- C-2:** Demonstrate an understanding that plants and animals need food, water, and gases to survive.
- C-4:** Provide examples of causes of diseases.
- D-2:** Identify characteristics that help organisms live in their environment.
- J-1:** Make accurate observations using appropriate tools and units of measure.
- L-1:** Describe and compare things in terms of number, shape, texture, size, weight, color, and behavior.
- L-5:** Make and read simple graphs.
- L-6:** Use objects and pictures to represent scientific and technological ideas.
- M-1:** Describe how legends, stories, and scientific explanations are different ways in which people attempt to explain the world.
- M-2:** Describe at least two inventions, what they do, how they work, and how they have made life easier.
- M-3:** Identify commonly used resources, their sources, and where waste products go.

Social Studies

HISTORY

- B-1:** Demonstrate an understanding of the similarities between families now and in the past, including daily life today and in other times.

GEOGRAPHY

- A-1:** Use and construct maps and other visuals to describe geographic location, direction, size, and shape.

ECONOMICS

- A-1:** Identify goods and services, giving examples.
- B-1:** Explain the terms consumer and product.
- C-1:** Explain how selected cultures or countries meet basic human needs.
- D-1:** Explain where products come from and how we use them.

Visual and Performing Arts

- A-2:** Experiment with art forms.
- B-1:** Recognize samples of major styles and techniques of the arts from different cultural or ethnic groups.

Activities, Grades K-2

- **Fishing is a topic that provides many opportunities for comparing present-day practices with the past.** For example, how would a young person today become a fisherman or lobsterman? Perhaps there are local fishermen in the area who could provide information to the class. What skills, knowledge, and abilities would help someone become a good fisherman? How has technology changed the skill requirements? What do fishermen do to conserve marine resources?
- **In addition to writing opportunities of all types, learning about fisheries provides topics for easy research** for younger students. Even a trip to a market with a fresh fish counter can be a research opportunity: what kinds of fish and shellfish are available? Where did they come from? Compare to canned or frozen fish and shellfish products. Calculate price comparisons: which costs more, canned or fresh salmon? Visit a lobster pound or seafood restaurant. Make observations about the lobsters in the tanks.
- **Other math opportunities include:** ordering fish by length and weight; working with numbers of lobster traps and lobstermen; collecting data on fish found in the grocery store; measuring with gauges used by lobstermen; and classifying fish by where they live, what they eat, fresh vs. salt water, etc.



- **These concepts lead to science activities as well:** students can draw pictures of the life cycle of the lobster or other fish, describe characteristics of marine animals, and learn about the food chain. Locally, there may be opportunities to visit the shoreline and look for shells and evidence of marine animals and plants. Learn more about efforts to conserve fish and other marine resources in Maine.
- **The history of trying to keep fish fresh and lobster alive for markets** led to use of specific kinds of boats (smacks) and later to the use of ice and then refrigeration. What other methods have been used to preserve fish? What were the hazards of canning? How do people can products today in their homes? What precautions have to be observed?
- **Compare similar shellfish: clams, oysters, and mussels.** What similarities and differences are there? Are students willing to taste samples?
- **Industrial development and overfishing have affected fish and shellfish populations.** Industrial effluent from lumber mills and paper mills, along with untreated sewage, has negatively impacted fish and shellfish populations along Maine's coast. The construction of dams across rivers has kept salmon and other anadromous fish from spawning. What has been done to clean up Maine's waters and improve fish habitats?
- **Lobstermen had certain assumptions about the habits and life cycle of the lobster,** based on their observations. What do we know about lobster migration? About egg-bearing females? How does recent scientific investigation differ from traditional folk belief? Are there any traditional Native American legends or stories about fish or shellfish?
- **Students themselves may go fishing, or have friends or relatives who fish.** They might share, orally or in writing, stories about first-hand experiences. These stories may lend themselves to map-making, research into kinds of sport fish, etc.
- **Cooking activities are always fun.** Find some menus from seafood restaurants. Read recipes.



Learning Results, Grades 3-4

Career Preparation

- A-3:** Demonstrate an understanding of the connections between locally generated products and services and the efforts required to create those products and services.
- B-1:** Use a variety of resources to learn about a personally interesting career topic.
- C-1:** Illustrate how products evolve as a result of technological systems.

English Language Arts

- E-5:** Give accurate directions.
- H-2:** Use print and non-print resources (e.g., encyclopedias, dictionaries, people, indexes) to gather information on research topics.
- H-3:** Present information obtained from research in a way that combines various forms of information (e.g., maps, charts, photos).

Health and Physical Education

HEALTH EDUCATION

- A-1:** Describe the relationship between healthy practices and personal health (e.g., eating well and exercise).
- A-7:** Demonstrate essential understanding of basic health concepts.
- D-3:** Describe ways technology affects personal health.

PHYSICAL FITNESS

- A-6:** Analyze potential risks of physical activities.

Mathematics

- A-1:** Read, compare, order, classify, and explain whole numbers up to one million.
- C-1:** Make generalizations and draw conclusions using various types of graphs, charts, and tables.
- C-2:** Read and interpret displays of data.
- F-1:** Solve and justify solutions to real-life problems involving the measurement of time, length, area, perimeter, weight, temperature, mass, capacity, and volume.
- F-2:** Select measuring tools and units of measurement that are appropriate for what is being measured.
- K-1:** Use simple tables and graphs to communicate ideas and information in presentations in a concise and clear manner.

Science and Technology

- A-1:** Group the same organisms in different ways using different characteristics.
- A-2:** Design and describe a classification system for organisms.
- A-3:** Describe the different living things within a given habitat.

- A-4:** Compare and contrast the life cycles, behavior, and structure of different organisms.
- B-1:** Describe a food web and the relationships within a given ecosystem.
- B-2:** Explain the difference between producers (e.g., green plants), consumers (e.g., those that eat green plants), and decomposers (e.g., bacteria that break down the consumers when they die), and identify examples of each.
- B-3:** Compare and contrast physical and living components of different biomes—i.e., regions characterized by their climate and plant life.
- B-4:** Investigate the connection between major living and non-living components of a local ecosystem.
- J-2:** Conduct scientific investigations: make observations, collect and analyze data, and do experiments.
- K-1:** Give alternative explanations for observed phenomena.
- L-4:** Make and /or use sketches, tables, graphs, physical representations, and manipulatives to explain procedures and ideas.
- L-5:** Gather and effectively present information, using a variety of media including computers.
- M-1:** Explore how cultures have found different technological solutions to deal with similar needs or problems.
- M-3:** Explore how technology has altered human settlement.

Social Studies

CIVICS AND GOVERNMENT

- A-1:** Identify important individual rights (e.g., freedom of religion, speech, ownership of property).
- B-2:** Describe the basic structure of local and state governments.
- D-1:** Identify examples of how the United States interacts with other countries (e.g., trade, treaties).

HISTORY

- A-2:** Place in chronological order, significant events, groups, and people in the history of Maine.
- B-2:** Demonstrate an awareness of major events and people in United States and Maine history: different kinds of communities in Maine.
- C-1:** Identify changes currently occurring in their daily lives and compare these to changes in daily life during a specific historic era.

GEOGRAPHY

- A-1:** Construct and compare maps of Maine, the United States and regions of the world to interpret geographical features and draw conclusions about physical patterns.
- B-2:** Explain ways in which communities reflect the backgrounds of their inhabitants.



B-3: Use a variety of materials and geographic tools to explain how the physical environment supports and constrains human activities.

ECONOMICS

A-1: Describe barter and money and how each is used in the exchange of resources, goods, and services.

B-2: Explain how the economy of Maine affects families and communities.

C-1: Explain how selected cultures or countries meet basic human needs.

D-1: Describe, with examples, how the exchange of goods and services helps to create economic interdependence between people in different places and countries.

Visual and Performing Arts

A-4: Create original works using different media, techniques, and processes to communicate ideas, feelings, and meaning.



Activities Grades 3-4

- **In learning about the history of Maine's fisheries,** students will acquire information about specific communities in Maine which historically have been involved in this industry. In the past, young people might choose fishing as an occupation, at least for part of the year, because it was available to them. If you want to be involved in the fishing industry today, what options are there? How has technology altered not only the methods of harvesting fish but the kinds and forms of fish products (e.g., fresh, frozen, canned)?
- **Research topics associated with fisheries could include interviews** with fishermen, lobstermen, or distributors, such as people working for a supermarket. Students can make maps of fishing grounds, combining pictures of fish with the areas on the map where they are fished, or find out where different fish found in the market are caught or raised in fish farms. Read about the daily life of a fisherman or lobsterman.
- **In the area of health, the history of the fishing industries teaches us about the physical hazards and stresses of the fishing life.** What factors contributed to health problems among fishermen? In some ways, the advent of canned food allowed more variety of diet among fishermen, but canning brought its own hazards. What happens in the canning process? How can safe practice be assured in home canning?
- **In math and measurement, there are many opportunities to work with numbers:** historians have kept track of numbers of fish caught in different periods of time, numbers of fishermen, size, weight, and length of the fish, and capacity of boats. Construct, to scale, a lobster gauge to measure humans, or make a gauge that shows sizes of striped bass one can keep.
- **Graph the results of a student poll:** how many students' families eat fish? How many times a week? What kinds?
- **Another graphing idea:** have students name all the kinds of fish they can think of before studying this unit. Graph and compare with how many species they can name at the end of the unit.
- **Fish and shellfish may be classified in many different ways.** In the outline for this module, fish are identified as being demersal, pelagic, or anadromous. What other ways could students think of to classify fish and shellfish?
- **How are lobster and cod fisheries related historically?** How has the food web impacted fish catches? Make a diagram of the ocean biome.
- **Fishing banks were the result of a climate change—the retreat of the glaciers.** Study the major climate shifts the earth has undergone. Relate to the theory and documentation of global warming now underway, and how it could affect the fisheries.
- **Preservation of fish took place long before canning, refrigeration and freezing were available,** by means of smoking, salting, and drying. Did all cultures throughout the world use the same methods? Why or why not? Try drying some fruit to preserve it.
- **Regulation of the fisheries by the government** has been a topic of interest for almost as long as fishing has taken place in Maine. This module addresses some of these regulations, and provides an opportunity for discussion of the rights of individuals to fish without restrictions vs. laws aimed at preserving fish populations for the future. What do fishermen do on their own to protect fish or lobster populations? Find out how Maine's Department of Marine Resources came into being. What role do individual towns play in regulating fishing?
- **Have students pretend they lived in a fishing community in the late 1800s.** Imagine what changes their family might go through as the fisheries declined. What similar changes might be happening now?
- **The geography of fishing grounds provides opportunities for mapping.** Relate maps to towns whose economic base was fishing. Are there comparable areas in other areas of the world?
- **What items were traded for fish, besides money?**
- **Fishing and lobstering are often subjects for art in Maine.** The museum had an art show called "The Art of Lobstering" in 2004---all the entries had to do with lobsters and lobstering, and some were made of lobster parts. Do art projects about and with fish and shellfish.

Learning Results, Grades 5–8

Career Preparation

- A-3:** Demonstrate an understanding of the characteristics of a successful business.
- B-2:** Compare workplace environments and the education required for different occupations.

English Language Arts

- B-2:** Identify specific interests and questions and pursue them by identifying pertinent literature and media.
- H-8:** Make limited but effective use of primary sources when researching topics.

Health and Physical Education

HEALTH EDUCATION

- A-5:** Analyze how the environment relates to personal health.
- D-3:** Analyze the effect of technology on personal and family health.

Mathematics

- A-4:** Represent numerical relationships in graphs, tables, and charts.
- F-3:** Demonstrate an understanding of length, area, volume, and the corresponding units, square units, and cubic units of measure.
- G-1:** Describe and represent relationships with tables, graphs, and equations.
- G-2:** Analyze relationships to explain how a change in one quantity can result in a change in another.
- H-3:** Analyze tables and graphs to identify properties and relationships in a practical context.

Science and Technology

- A-1:** Compare systems of classifying organisms including systems used by scientists.
- A-2:** Decipher the system for assigning a scientific name to every living thing.
- B-2:** Analyze how the finite resources in an ecosystem limit the types and populations of organisms within it.
- B-4:** Generate examples of the variety of ways that organisms interact (e.g., competition, predator/prey, parasitism/mutualism).
- F-4:** Describe factors that can cause short-term and long-term changes to the earth.
- J-1:** Make accurate observations using appropriate tools and units of measure.
- I-4:** Make and use scale drawings, maps, and three-dimensional models to represent real objects, find locations, and describe relationships.
- M-1:** Research and evaluate the social and environmental

impacts of scientific and technological developments.

- M-2:** Describe the historical and cultural conditions at the time of an invention or discovery, and analyze the societal impacts of that invention.
- M-7:** Explain the connections between industry, natural resources, population, and economic development.

Social Studies

CIVICS AND GOVERNMENT

- B-5:** Assess competing ideas about the purposes government should serve (e.g., individual rights vs. collective rights).

HISTORY

- A-2:** Identify the sequence of major events and people in the history of Maine, the United States, and selected world civilizations.
- B-1:** Demonstrate an understanding of the causes and effects of major events in United States history and the connections to Maine history with an emphasis on events up to 1877, including but not limited to: Civil War, Industrialization.
- B-2:** Demonstrate an understanding of selected themes in Maine, United States, and world history (e.g., revolution, technological innovation, migration).

GEOGRAPHY

- A-2:** Develop maps, globes, charts, models, and databases to analyze geographical patterns on the earth.
- B-3:** Explain how cultures differ in their use of similar environments and resources.

ECONOMICS

- A-3:** Use an example to show how incentives affect economic decisions.
- B-1:** Demonstrate knowledge of economic concepts of supply, demand, price, the role of money, and profit and loss.
- B-3:** Identify how the fundamental characteristics of the United States economic system (e.g., private property, profits, competition, and price system) influence economic decision making.
- B-5:** Describe the roles and contributions of the principal contributors to the economy (e.g., laborers, investors, entrepreneurs, managers).
- C-1:** Describe the characteristics of traditional, command, market, and mixed economic systems.
- D-1:** Describe how changes in transportation and communication technologies have affected trade over time.

Visual and Performing Arts

- A-4:** Use a variety of resources, materials, and techniques to design and execute art works.

Activities, Grades 5–8



- **The business of fishing has changed dramatically since the nineteenth century.** What made a good fishery business then, as compared to the present day? Compare skills needed and the actual tasks and workplace environments.
- **There are many possible research topics within this module:** specific fish harvests, boat types, industries, regulations, markets. See our Resource List for some references, including primary sources available at the museum.
- **Health was relevant in the nineteenth century story of the fisheries,** because of the dietary habits of the public, the hazards of obtaining fish, and the need for good methods of food preservation. Today, environmental pollution of various types can result in a health hazard when eating certain fish species—learn more about this topic from contemporary sources. Make graphs or charts for environmental hazards such as mercury and red tide.
- **Scientists study fish, other marine life, and bodies of water** in order to learn more about these resources. Students could learn more about the ecosystem in Penobscot Bay or the Gulf of Maine, and interactions between various life forms.
- **Think more about the technology developments that have impacted fisheries** over the past 200 years. Pick one, such as refrigeration or engine-powered fishing vessels, and make a diagram showing all the ramifications of this development.
- **Visit a lobster pound or tank at a market.** Make observations about the lobsters. Investigate sources of seafood by interviewing the manager of a supermarket or restaurant.
- **The history of the fisheries in Maine contains many examples of regulation and attempted regulation,** changes in economic structure, and conflict between fishermen themselves and distributors, owners, managers, scientists, and politicians. These conflicts can offer material for discussion—students may take sides and debate as a fisherman vs. a regulator, etc. at certain periods in history. How do they feel about regulation by the government today? Who should have the final word about fishery regulation?
- **Investigate the fishing grounds of the world.** Learn about how another country manages its marine resources. What have been the influences of the International Law of the Sea Conference and other United Nations organizations?
- **Economics is a key issue in the operation of the fishing industry.** Students may want to choose one fishery, such as lobstering or cod fishing, and learn more about supply, demand, incentives, and how different people profit or risk differently in obtaining the catch.
- **Create artistic works about marine life and using marine life, such as shells.** The museum collection includes some works of art on the subject of fishing, fishermen, and fishing vessels.

Learning Results, Grades 9-12

Career Preparation

- A-3:** Demonstrate an understanding of the relationship between the changing nature of work and educational requirements.
- A-4:** Demonstrate an understanding of basic business concepts such as profit and loss, the availability of skilled labor, market share, and customer service.
- C-1:** Demonstrate an understanding of the integration and application of academic and occupational skills in school learning, work, and personal lives.

English Language Arts

- H-9:** Make extensive use of primary sources when researching a topic and carefully evaluate the motives and perspectives of the authors.

Health and Physical Education

HEALTH EDUCATION

- A-5:** Analyze how the environment relates to personal and community health.

Mathematics

- C-2:** Predict and draw conclusions from charts, tables, and graphs that summarize data from practical situations.
- C-4:** Demonstrate an understanding of the idea of random sampling and recognition of its role in statistical claims and designs for data collection.
- F-1:** Use measurement tools and units appropriately and recognize limitations in the precision of the measurement tools.
- G-1:** Create a graph to represent a real-life situation and draw inferences from it.
- J-1:** Analyze situations where more than one logical conclusion can be drawn from data presented.

Science and Technology

- A-2:** Describe similarities and differences among organisms within each level of the taxonomic system for classifying organisms (kingdom through species).
- A-3:** Analyze the basic characteristics of living things, including their need for food, water, and gases and the ability to reproduce.
- B-3:** Analyze the factors that affect population size (e.g., reproductive and survival rates).
- B-4:** Analyze the impact of human and other activities on the type and pace of change in ecosystems.
- F-2:** Analyze potential effects of changes in the earth's oceans and atmosphere.
- J-1:** Make accurate observations using appropriate tools and units of measure.

- J-2:** Verify, evaluate, and use results in a purposeful way. This includes analyzing and interpreting data, making predictions based on observed patterns, testing solutions against the original problem conditions, and formulating additional questions.

- J-3:** Demonstrate the ability to use scientific inquiry and technological method with short term and long term investigations, recognizing that there is more than one way to solve a problem. Demonstrate knowledge of when to try different strategies.

- J-4:** Design and construct a device to perform a specific function, then redesign for improvement (e.g., performance, cost).

- K-1:** Judge the accuracy of alternative explanations by identifying the evidence necessary to support them.

- K-2:** Explain why agreement among people does not make an argument valid. Analyze situations where more than one logical conclusion can be drawn.

- I-1:** Analyze research or other literature for accuracy in the design and findings of experiments.

- I-3:** Make and use appropriate symbols, pictures, diagrams, scale drawings, and models to represent and simplify real-life situations and to solve problems.

- M-1:** Examine the impact of political decisions on science and technology.

- M-2:** Demonstrate the importance of resource management, controlling environmental impacts, and maintaining natural ecosystems.

- M-3:** Evaluate the ethical use of introduction of new scientific or technological developments.

- M-4:** Analyze the impacts of various scientific and technological developments.

- M-5:** Examine the historical relationships between prevailing cultural beliefs and breakthroughs in science and technology.

- M-6:** Research issues that illustrate the effects of technological imbalances and suggest some solutions.

Social Studies

CIVICS AND GOVERNMENT

- A-1:** Develop and defend a position on a public policy issue within our democracy.

- B-2:** Assess the different jurisdictions and roles of local, state, and federal governments in relation to an important public policy issue.

HISTORY

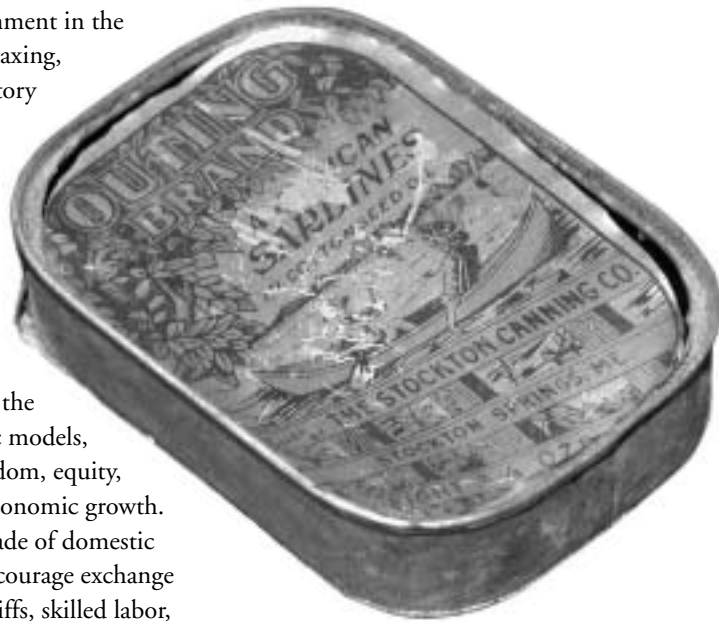
- A-1:** Identify and analyze major events and people that characterize each of the significant eras in the United States and world history. [Fisheries play a role in all eras.]

GEOGRAPHY

- A-1:** Use mapping to answer complex geographic and environmental problems.
- B-1:** Explain factors which shape places and regions over time (e.g., physical and cultural factors).
- B-2:** Analyze the cultural characteristics that make specific regions of the world distinctive.
- B-3:** Analyze how technologies contribute to cultural sharing and separation, and identify examples of the spread of cultural traits.

ECONOMICS

- B-1:** Describe the factors (i.e. physical, capital, technology, monetary resources) that impact the development and the distribution of a product.
- B-2:** Identify and analyze the role of government in the United States economic system (e.g., taxing, spending, setting interest rates, regulatory policy).
- B-3:** Explain the positive and the negative impacts of advertising techniques on human behavior.
- B-4:** Describe the full costs (including externalities) associated with the use of natural and human resources to produce economic goods and services.
- C-2:** Compare strengths and weaknesses of the market economy with other economic models, using broad societal goals such as freedom, equity, security, employment, stability, and economic growth.
- D-2:** Evaluate the effect on international trade of domestic policies which either encourage or discourage exchange of goods and services (e.g., quotas, tariffs, skilled labor, stable government).

**Visual and Performing Arts**

- B-4:** Create works that reflect concepts, theories, approaches, and styles from their own and other cultures.

Activities, Grades 9–12



- **The occupations associated with fisheries—including lobstering—are varied**, and have changed dramatically since the nineteenth and early twentieth century. Students with an interest in pursuing a job related to fishing have many ways to investigate its requirements, from interviewing local lobster fishermen, to learning about being a dealer, to working with boats and equipment. Our unit is primarily concerned with the history of fishing in Maine, which contributes to students' understanding of present day conditions. When working with primary sources, such as people actively engaged in the fishing industry today, students have an opportunity to evaluate information for motive and perspective, and to compare information from different sources.
- **Environmental issues impact fishing.** This is a very pertinent area for research related to health (mercury) concerns vs. health benefits of fish. What is being done? What kinds of public information are available to people to make them aware of both the negative and positive effects of eating fish?
- **Charts, tables, and graphs lend themselves to historical comparisons:** number and size of fish caught at various periods in history, catch effort, prices, number of boats and fishermen involved, etc. Students may want to design a research project based on historical information. Research being done today utilizes random sampling techniques—an opportunity to understand how data is collected. In the past, lobstermen drew certain conclusions from their observations about the location of lobsters. Learn how another set of conclusions can explain the same observations of behavior.
- **Science and technology offer many opportunities for further learning using fisheries as subject matter.** From classification taxonomy, to ecological study of weather and oceans, to political decisions that affect the environment, this area is rich with possibilities for further investigation. Sampling ocean water, looking at the anatomy of fish and shellfish, visiting labs, and creating inventions (maybe a better lobster trap?) are possible.
- **Public policy issues such as size limits, catch limits, regulations about offshore boundaries,** seasonal regulations, etc. are pertinent to fisheries today, as they were in the past. Students may want to take a side on a debated issue and inform themselves thoroughly about their opinion. At what level of government are fishery policies decided? Where do students think controls should originate?
- **Fish have played a role in the history of Maine, the United States, and the world.** It is interesting to look at the major events and periods of history and focus on the role of fishing in these events. (See the book *Cod: A Biography of the Fish That Changed the World*, by Mark Kurlansky, for example. See Resource List.) The geography of the fishing grounds has played a part in settlement and trade—mapping projects fit well into this topic.
- **How does culture affect fishing?** In the past, demand for fish was at least partially driven by the Roman Catholic Church's requirements for meatless days. In the Orient there were, and are, demands for certain kinds of fish and other food from the sea. (See *Maine and the Orient* unit for information relating to the demand for exotic marine foods.)
- **Economics is another content area that is very important in the fisheries unit.** Information about the history of fishing provides a starting point to learn more about economic theories, markets, and international trade policies.



Resources

CHILDREN'S BOOKS

- Allen, J.J. and William O. Thompson. *A Boy, His Grandfather, and a Lighthouse*. Kennebunk, ME: 'Scapes Me, 2003. Includes a storm, a shipwreck, and a day of lobstering.
- Bayer, Robert and Juanita. *Lobsters Inside-Out: A Guide to the Maine Lobster*. New Hampshire: Sea Grant College Program, 1987.
- Bayer, Robert and Juanita. *Lobsters Inside-Out: A Lobster Workbook*. Dubuque, IA: Kendall/Hunt, 1999.
- Brown, Joseph E. *The Sea's Harvest: The Story of Aquaculture*. New York: Dodd, Mead & Co., 1975. History of aquaculture, 2000 BC to 1970s. Black and white photographs. Upper elementary grades.
- Brown, Margaret Wise and Leonard Weisgard. *The Little Island*. New York: Random House Children's Books, 1946. Early elementary level.
- Buss, Nancy. *The Lobster and Ivy Higgins*. Honesdale, PA: Caroline House, 1992. A girl wants to save the 27 pound lobster her father has in his store. Early elementary level.
- Carrick, Carol. *The Blue Lobster: A Life Cycle*. New York: Dial Press, 1975. The life of a female lobster from the time she is hatched until her own eggs are mature. Upper elementary grades.
- Chase, Mary Ellen. *The Fishing Fleets of New England*. Boston: Houghton Mifflin, 1961. History of the Grand Banks fisheries, with some photographs. Mostly text, for middle elementary grades.
- Coggins, J. *Nets Overboard: The Story of the Fishing Fleets*. New York: Dodd, Mead, 1965. Boats, fishing gear, and all kinds of fish and shellfish. Upper elementary grades.
- Cooper, Jason. *Lobsters*. Vero Beach, FL: Rourke Publications, 1996. A simple introduction to the physical characteristics, life cycle and habitat of the lobster.
- Dethier, V.G. *Newberry: The Life and Times of a Maine Clam*. Camden, ME: Down East Books, 1981. Story of a clam's life. Lengthy; for older elementary grades.
- Floethe, L. *Fishing Around the World*. New York: Scribner, 1972. Common problems of fishermen around the world. Upper elementary grades.
- Guiberson, Brenda Z. *Lobster Boat*. New York: H. Hold & Co., 1993. Picture book about a day on a lobster boat. Good pictures. Ages 4-8.
- Harriman, Edward. *Leroy the Lobster and Crabby Crab*. Camden, ME: Down East Books, 1967.
- Hollenbeck, Kathleen. *The Lobster's Secret*. Norwalk, CT: Soundprints, 1996. A lobster hunts for food, watches for predators, and molts. Good pictures. Ages 4-8.
- Ipcar, Dahlov. *Lobsterman*. Camden, ME: Down East Books, 1962. Picture book about lobstering. Ages 4-8.
- Kessler, Deirdre. *Lobster in my Pocket*. Charlottetown, PEI: Ragweed Press, 1987. The story of a little girl in a fishing village who befriends a lobster. Ages 4-8.
- Kurlansky, Mark. *The Cod's Tale*. New York: G.P. Putnam's Sons, 2001. An excellent picture book on the history of the cod fishery. Includes good illustrations, examples of sea shanties, and fish recipes. Ages 6-12.
- Lavies, Bianca. *The Atlantic Salmon*. New York: Dutton's Children's Books, 1992. The life cycle of the salmon. Ages 8-12.
- Matteson, George. *Draggermen: A Day's Work Fishing Georges Bank*. New York: Four Winds Press, 1979. Commercial fishing aboard a trawler, with good photographs. Upper elementary, middle school.
- McCloskey, Robert. *Burt Dow, Deep-Water Man*. New York: Penguin Books, 1963. A tall tale about a Maine fisherman. Ages 4-8.
- McMillan, Bruce. *Finestkind O'Day: Lobstering in Maine*. Philadelphia: Lippincott, 1977. A young boy works as a sternman on a lobster boat. Nice photographs and story with lots of information. Ages 7-12.
- Schaefer, Lola. *Lobsters*. Chicago: Heineman Library, 2002. Basic introduction to lobsters' physical characteristics, habitat, diet, and activities. Easy text, glossary. Good introduction to chapter books for young readers.
- Verrier, Suzy. *Titus Tidewater*. Camden, ME: Down East Books, 1970. A lobster picture book. Ages 4-8.
- Weiner, Sandra. *I Want to be a Fisherman*. New York: Macmillan, 1978. A little girl wants to follow in her father's footsteps as a Long Island trap fisherman. Ages 6-10.

HIGH SCHOOL/ADULT BOOKS

LOBSTERING

- Acheson, James M. *Capturing the Commons*. Hanover, NH: University Press of New England, 2003. A look at the management of the lobster industry.
- Acheson, James M. *The Lobster Gangs of Maine*. Hanover, NH: University Press of New England, 1988. The lobster fishery in Maine.
- Conkling, Philip, and Anne Hayden. *Lobsters Great and Small*. Rockland, ME: Island Institute, 2002. The impact of lobstering on Penobscot Bay and shoreline communities.
- Corson, Trevor. *The Secret Life of Lobsters*. New York: HarperCollins, 2004. Fishermen and scientists work to unravel mysteries about the American lobster.
- Doliber, Earl. *Lobstering Inshore and Offshore*. Camden, ME: International Marine Publishing Company, 1973.



- Gilbert, Elizabeth. *Stern Men*. Boston: Houghton-Mifflin Company, 2000. A novel depicting a feud between two islands over fishing rights.
- Greenlaw, Linda. *The Lobster Chronicles: Life on a Very Small Island*. New York: Hyperion, 2002. Life as a lobster fisherman on Isle au Haut.
- Martin, Kenneth R. and Nathan R. Lipfert. *Lobstering and the Maine Coast*. Bath, ME: Maine Maritime Museum, 1985. Easy reading story of lobster fishery from colonial times through 1985. Contains photographs, drawings, and anecdotes.
- Martin, Robert Delano. *The Tale of the Lobster*. Bloomington, IN: 1st Books, 2002. Overview of the lobster and the lobster industry, including anatomy and biology, the lobster fisherman, buying and eating lobster.



FISHING GENERAL

- Bowden, Don and Minnie. *Smelt Fishing on the Lower Penobscot: The Men and Their Families, and Other Stories*. Privately published, 1998.
- Chapelle, Howard. *American Fishing Schooners, 1825-1935*. New York: Norton, 1973.
- Church, Albert Cook. *American Fishermen*. New York: W. W. Norton & Co., 1940. Lots of photographs, many from the author's marine collection.
- Commercial Fisheries News*. Stonington, ME. Monthly fisheries newspaper for the Northeast.
- Crowley, Michael and Nance Trueworthy. *Down the Shore: Faces of Maine's Coastal Fisheries*. Camden, ME: Down East Books, 2003. Photographs and text portray contemporary men and women who earn their living along Maine's coast.
- Duncan, Roger. *Coastal Maine: A Maritime History*. New York: W.W. Norton & Co., 1992. General history of Maine with information on fisheries.
- Duncan, Roger F. *Friendship Sloops*. Camden, ME: International Marine Publishing Company, 1985. See page 15 for a comparison of 1893 and 1993 costs to equip a fishing sloop.
- Finn, William. *The Dragger*. Boston: Little, Brown, 1970. Commercial fishing boats. Good photos.
- Gilman, John D. *Masts and Masters: A Brief History of Sardine Carriers and Boatmen*. Lord's Cove, Deer Island, NB: J.D. Gilman, 1993. History of the sardine fishery.
- Goode, G. Brown. *The Fisheries and Fishery Industries of the United States*. Washington: Govt. Printing Office, 1884-87. This seven-volume set was published as a baseline for fisheries studies, just after the U.S. Fish Commission was founded. An excellent, if hard-to-find resource. At Penobscot Marine Museum. See NOAA website: www.noaa.gov for some online parts of Goode's work.
- Hamlin, Cyrus, and John R. Ordway. *The Commercial Fisheries of Maine*. Maine Sea Grant Bulletin 5. United States Department of Commerce, 1974.
- Kurlansky, Mark. *Cod: A Biography of the Fish That Changed the World*. New York: Penguin Group, 1998. A view of history as it has been influenced by the demand for cod, and the ecological outcomes.
- Lunt, Dean L. *Hauling by Hand: The Life and Times of a Maine Island*. Frenchboro, ME: Islandport Press, 1999. Past and present life on Long Island, one of fourteen Maine islands still supporting a year-round community.
- Maine Department of Marine Resources. *Harvesters of the Sea: The Story of Maine's Commercial Fisheries*. Augusta, ME: Maine Department of Marine Resources, 1977. The history of fisheries in Maine.
- Maine Department of Sea and Shore Fisheries. *Report of Commissioner of Sea and Shore Fisheries*. Augusta, ME, 1897-1919. Penobscot Marine Museum has 1903-4 and 1913-14.
- Maine. *Governor's Task Force on the Maine Groundfish Industry*. Augusta, ME: Office of the Governor, 2004.
- McFarland, Raymond. *A History of the New England Fisheries, with Maps*. Mansfield, CT: Martino Publishing, 2002. Facsimile edition of 1911 edition published by University of Pennsylvania.
- National Fisherman*. Portland, ME. Monthly fisheries magazine.
- O'Leary, Wayne M. *Maine Sea Fisheries: The Rise and Fall of a Native Industry, 1830-1890*. Boston: Northeastern University Press, 1996. Very detailed account of fisheries from pre-colonial times to 1990s. Small section on lobstering.



- Sheehan, M. Elizabeth. *Maine Fisheries: A Re-Emerging Market*. Augusta, ME: Coastal Enterprises, Inc., Maine Department of Marine Resources, 2000.
- Sheehan, M. Elizabeth. *Tracking Commercial Fishing Access: A Survey of Harbormasters in 25 Maine Coastal Communities*. Portland, ME: Coastal Enterprises, Inc; Augusta, ME: Maine Coastal Program, 2004.

VIDEOS

- Captains Courageous* [videorecording], 1934. Spencer Tracy in a movie with great fishing schooner footage, based on the book by Rudyard Kipling.
- Co-Management: The New England Town Meeting Goes to Sea*. Camden, ME: Compass Light Productions, 1998. Explores whether to shift more federal fisheries management decisions to the state level and more state fisheries management decisions to the local level. Produced by Island Institute and Mainewatch. 20 minutes.
- The Gulf of Maine: A Production of Maine Public Television*. Lewiston, ME: Maine Public Television, 1995. Explores fisheries, including groundfish and lobsters, and science. 57 minutes.
- Lobster and Scallop Fishing, in Penobscot Bay, Maine*. Searsport, ME: Penobscot Marine Museum.
- Sea Change*. Lewiston, ME: Maine Public Broadcasting, 1995. Examines fisheries, sustainable fishing, and aquaculture in Maine. 58 minutes.
- A Tale of Two Fisheries*. Camden, ME: Compass Light Productions, 1997. Comparison of the lobster and cod fisheries. Part of Ocean Fisheries Case Study Series, Compass Light Documentary, Mainewatch, and Island Institute. 1996. A three part video series examining marine ecosystems, cod and lobster, and the collapsing fish stocks in Maine.

ORIGINAL SOURCE MATERIAL

- Life of the Maine Lobsterman Project*. (MF 037) Nineteen recorded interviews with lobstermen, including topics such as equipment, boats, history, clamming, trawling, and shad fishing. Descriptions available on MaineCat. Tapes available at Maine Folklife Center, University of Maine, Orono. www.umaine.edu/folklife/.
- Penobscot Bay Fisheries and Industries Project (MF 047)*. Thirteen interviews by David Taylor, conducted in 1973-74, covering fishing and related industries on Penobscot Bay and Penobscot River. Includes salmon, smelt, lobsters, captaining a lobster smack, eels, ship and boat building, and Friendship sloops. Series includes taped interviews,

brief indexes, and transcripts. Descriptions available on MaineCat. Tapes and photographs available at Maine Folklife Center, University of Maine, Orono. www.umaine.edu/folklife/.

WEB PAGES

- Brazer, Eric. *Does the Atlantic Cod, Gadus morhua, Have a Future in the Gulf of Maine?* Providence, RI: Brown University B.A. thesis, 2003. Nice summary of biology, history, and legislation. <http://envstudies.brown.edu/thesis/2003/eric%5Fbrazer/>.
- Crowley, Richard M. *The State of Fisheries in Maine 2004*. Colby College, Waterville, ME, 2005. Environmental Assessment. Overview of current conditions and historical contexts of Maine's fisheries, including lobstering. http://www.colby.edu/environ/courses/ES493/stateofmaine2004/papers/SoM04_fisheries_paper.htm.
- Downeast Institute for Applied Marine Research & Education, Great Wass Island. Current information on marine resources and abstracts of research articles. Focuses on shellfish research, hatcheries, rebuilding depleted species. www.downeastinstitute.org.
- Downeast Salmon Federation. Current news, research, hatcheries. www.mainesalmonrivers.org.
- Lobster Conservancy, an excellent educational resource on lobsters: <http://www.lobsters.org>.
- Maine Department of Marine Fisheries. Statistics and state regulations on coastal fisheries. There is an education element under "Aquarium." www.state.me.us/dmr.
- Maine Sea Grant Program. Research papers and educational programs. <http://www.seagrant.umaine.edu/index.htm>.
- New England Fishery Management Council, with current regulations, information on species, and links. www.nefmc.org.
- Portland Fish Exchange: <http://www.portlandfishexchange.com>. Good example of a fish market and auction.
- United States, National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service: www.st.nmfs.noaa.gov.