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what appeared limitless plenty: the RISE AND FALL

OF THE NINETEENTH-CENTURY ATLANTIC HALIBUT FISHERY

ABSTRACT

The destruction of the nineteenth-century Atlantic halibut fishery occurred in the space of a few decades and without industrial fishing methods. Between the 1840s and the 1880s, halibut moved from by-catch to marketable product. This change from negative commodification to positive commodification resulted from increased immigration, technological advances, changing consumer tastes, and halibut's natural history. Once almost infinitely abundant, commercial value and growing markets led to enthusiastic fishing efforts mid-nineteenth century. Market demand influenced both human behaviors and ecosystems. A series of localized depletions became the commercial extinction of halibut in the northwest Atlantic. The nineteenth-century Atlantic halibut fishery demonstrates how species once considered by-catch can be pushed to commercial extinction.

THE RISE AND FALL of the Atlantic halibut fishery occurred in the span of a few decades. Lorenzo Sabine's 1853 *Report on the Principal Fisheries of the American Seas* called New England's halibut industry a "new enterprise" and devoted a single page of the 317-page work to it. By the 1880s, George Brown Goode's definitive, multi-volume *The Fisheries and Fishery Industries of the United States* could speak only retrospectively of the fishery. For most of American history, consumers and fishermen considered halibut a worthless by-catch: undesirable if not outright unpalatable. Yet somehow, this enormous flatfish about which no one cared was driven to near-extinction by two generations of hook-and-line fishermen.[1]

The meteoric rise and precipitous fall of the Atlantic halibut fishery illustrates the environmental consequences of commodifying nature. A story at the intersection of labor, markets, and ecology, the tale of the Atlantic halibut fishery's collapse is a haunting precursor to the twentieth-century cod fishery's crash and offers an illuminating contrast to the relatively successful management of Pacific

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halibut. Whether highlighting successes or failures, marine environmental historians are realizing the potential of such stories for helping to understand humans' role in refashioning the ocean environment.[2]

At first glance, the nineteenth-century Atlantic halibut fishery fit the typical pattern of fisheries collapse. It followed predictable boom-and-bust cycles of commercial potential, enthusiastic fishing, resource strain, declining productivity, efforts to sustain catches and profits, and ultimately, collapse. Yet, unlike many other species, halibut was disdained by fishermen and consumers. For centuries, halibut lacked commercial value despite its abundance almost everywhere in the northwest Atlantic Ocean. An early lack of value, however, did not prevent fishermen from removing halibut from the water. Three pernicious practices that foreshadowed routine twentieth-century fishing habits were associated with halibut very early: discarding, by-catch, and high-grading. At different periods throughout the seventeenth, eighteenth, and nineteenth centuries, fishermen discarded halibut as worthless or rejected it as by-catch. Then, between 1840 and 1880, predictable factors and unexpected events converged to elevate halibut to a desirable commodity. Fish dealers imposed a selection process, however, high-grading some halibut while marginalizing most of the catch although it had already been landed. These deleterious practices came to define the fishery—and to push halibut stocks to the brink of commercial extinction.

Robust immigration, improved transportation, consumer tastes, corporate decision-making, market capitalism, advances in refrigeration, and the physical nature of the fish itself—in terms of reproduction and product preservation—all contributed to its trajectory from worthlessness to commercial commodity, and then on to commercial extinction. Ascribing value, or lack thereof, to nature has important consequences. Highly valuing a product like teak results in resource degradation from enthusiastic harvesting. Conversely, declarations of worthlessness lead to other forms of degradation like draining swampland to improve it or sacrificing some tracts as landfills. Halibut's path from insignificance to product reveals the incremental process of commodifying the environment, and its tale has implications for other species of by-catch that have attained commercial potential. Halibut's story is especially compelling because the usual bogeyman of overfishing, mechanization, played no role. It reinforces a point made by Paul Holm, Richard Hoffmann, and others: that overfishing was much more common in pre-industrial fisheries than most twentieth-century fisheries scientists have imagined.[3]

Good marine environmental histories remain scarce. Arthur F. McEvoy and Joseph E. Taylor III lead the field, examining patterns of fisheries collapse and competition among groups for common resources. Their scholarship refutes previous oversimplifications of west coast fisheries' problems. McEvoy explores the interrelations between ecology, economics, and human culture in California's fisheries. Taylor leaves little beyond scrutiny when examining "nature's impact on history" alongside "human impacts upon salmon." Both apply the lessons of fisheries to other cases of resource management. Both begin their works

chronologically at the point of crisis. Against this backdrop, it is easy to view the case of Atlantic halibut as just another timeworn story of overfishing and near-extinction.[4]

However, the story of the Atlantic halibut fishery differs from that of west coast fisheries. McEvoy and Taylor start with an a priori assumption, backed by evidence, that the fish populations in question already possessed market desirability. The narrative of the Atlantic halibut, on the other hand, begins with it considered as a nuisance. Further, the Atlantic halibut fishery involved fewer social groups, and occurred on a smaller geographic scale. The halibut fishery existed—geographically, temporally and ecologically—within the larger cod fishery, which remained viable before, during, and well after the halibut fishery declined. While significant, halibut never had the long-term economic importance of cod, salmon, or sardines. Also, the destruction of the Atlantic halibut fishery before mechanization stands in stark contrast to west coast fisheries. Finally, unlike the cases studied by McEvoy and Taylor, no regulatory structures—legal, folk, or aquacultural—affected the nineteenth-century Atlantic halibut fishery. The story of Atlantic halibut invites a different kind of explanation for the decline of a fishery.[5]

Halibut's early status as by-catch led to practices that affected its once-abundant distribution throughout the northwest Atlantic. When it did attain commercial value, though, new sets of problems emerged. Localized depletions rapidly produced a regional depletion. As marine scientists have made clear, the overfishing of megafauna and apex predators has broad, deleterious results for ecosystems. Killing and discarding halibut as worthless by-catch, and then suddenly targeting halibut as a valuable commodity, helped to make the Atlantic halibut as rare as the American bison in about the same amount of time.[6]

TALES OF NATURAL ABUNDANCE

BY ALL ACCOUNTS, the seas teemed with Atlantic halibut well into the nineteenth century. European explorers noted great numbers of halibut even though they considered it barely fit for consumption. "There is a large sized fish called a Hallibut, or Turbut," Captain John Smith wrote in 1624, "so bigg that two men have much a doe to hall them into the boate; but there is such plenty, that the fisher men onely eate the heads & finnes, and throw away the bodies." Other commentators echo halibut's abundance and low status. A decade later, William Wood's *New Englands Prospect* instructed English readers that "halibut is not so much unlike a plaice or turbot, some being two yards long, and one wide, and a foot thick. The plenty of better fish makes these of little esteem, except the head and fins which stewwed or baked is very good." Over two centuries later, Captain Chester Marr could still paint pictures of plenty in the "early days" (before 1848) of the fishery. Speaking retrospectively in 1885, Marr told of a "solid school of them as thick as a school of porpoises" and another instance where "the whole surface of the water as far as you could see was alive with halibut." Halibut stocks seemed infinite early in the fishery, and Marr reminisced about fishing all night

without catching a single cod: "we caught 250 [halibut] in three hours; the crews of some vessels would go and cut the fins off the fish and let their bodies go." The abundance Marr described made his 1885 lament even more poignant: "No wonder they were broken up. We thought they were always going to be so. Never made no calculations that we were going to break them up." Despite what appeared limitless plenty, in Marr's lifetime, New England hand- and trawl-liners transformed unfathomable abundance into a collapsing resource.[7]

A cold-water fish, Atlantic halibut (*Hippoglossus hippoglossus*) ranged from about forty degrees north latitude to waters above the Arctic Circle. This largest species of flatfish occupied coastal waters as well as offshore banks including Georges Bank, Jeffrey's Bank, and the Grand Banks. Before the inception of the organized fishery in 1836, George Brown Goode reported that "those who wished to catch halibut had no difficulty in finding an abundant supply within a few miles of shore" in Massachusetts. Halibut were "very abundant in Massachusetts Bay and off Cape Cod, so much so as to be sometimes regarded as a decided nuisance by cod fishermen." They were "considered by the fishermen to be troublesome pests, as are dogfish at the present time," noted Goode in 1887; "it was often impossible to catch many codfish ... on account of the great voracity of the halibut." Inshore or offshore, this nuisance swam almost everywhere in the northwest Atlantic. Almost everywhere ashore, it was a useless article.[8]

The absence of commercial value made halibut easy to ignore, and poor record-keeping was a hallmark of the nineteenth-century halibut fishery. To encourage American fisheries, the federal government offered a bounty on cod. Logbook keepers duly noted precise numbers of codfish. Evidence indicates that some vessels caught cod and halibut on the same trips, but the logbooks only mention halibut in passing. Tonnages, individual numbers, and biomass data referencing halibut mortality, either as by-catch or as target species, are simply not available. Vessels were not licensed for the halibut fishery. Only three types of licenses existed—for cod fishing, for mackerel fishing, and for the coasting trade. Further, not all vessels that fished were registered fishing boats. Some vessels holding coasting licenses went fishing, and some vessels with codfishing licenses fished for halibut. In short, the paper trail is full of holes.[9]

Inadequate data is problematic for establishing baseline halibut populations, but sufficient material remains for historians to chart the growth and decline of the fishery itself. Anecdotal evidence points to abundance in the by-catch period, before about 1836, and then later in the target species era. Logbooks of codfishing vessels present fishermen's attitudes in detail and offer glimpses of halibut's abundance. To the crew of the schooner *Beverly*, on a voyage to the Western Bank and Georges Bank, the term "fish" meant marketable codfish. The logkeeper mentioned all other species by name.

The *Beverly's* fishermen found good fishing in the summer of 1836. On June 21, 1836: "the fish Came on quite Stiring [strong] at times[.] dressed down 475 quite Large fish the best that we have Cought as yet ... plenty of dogfish [sand sharks]." The following day they were equally successful and "dressed 546 good fish[,]" but noted the "water appears full of dogfish." Their luck ran thin the

following week: "fish scarce [but] Numbers of Hallibut." A few days later, on July 2, 1836, the crew caught "all Night about 100 fish" and noted "Numbers of Hallibut & dog fish & 1 ground Shark." Halibut and dogfish were noteworthy only as impediments to codfishing.[10]

The *Beverly's* autumn voyage confirmed halibut's abundance and undesirable qualities. On September 7, 1836, terrible fishing conditions drove the logkeeper to complain "hardly anything but Hallibut and Sand Fleas." Sand fleas are parasitic amphipods that attack the halibut, rendering it useless to fishermen and eventually killing the fish itself. The following day, the crew "dressed down 369 good fish all from 2 am to 8 am." This ended quickly, though; the rest of the day was good for "only two fish & plenty of Hallibut and Sand Fleas." Like sand fleas on halibut, halibut were themselves a parasite on the cod fishery. The crew "hauld in the Lines...hove up Early and Stood of[f] to the North" rather than catch halibut. Sand fleas were not the problem. Two days later, the fishermen worked "all Night" to catch "127 fish." They again hove up anchor and "tried adrift & Cought Nothing but Hallibut & Lay adrift 3 hours & Cought Nothing." Sand fleas notwithstanding, every time there were only halibut, rather than cod, the onerous task of hauling up six hundred pounds of anchor and cable and striking out for a new location was preferable to taking halibut. Halibut were so numerous, problematic, and unmarketable that cod fishermen were often told "to cut adrift all halibut which were drawn up," and, as Goode explained, "every year many thousands [were] thus turned back to the deep with a fatal wound" from the swallowed hook.[11]

Few ecologists, and fewer historians, have examined the discarding of unmarketable fish. "Recently," writes Mike Hagler, "it has come to be recognized that throwing fish overboard occurs on a far larger scale than many scientists had imagined and that it has far-reaching effects for the entire marine ecosystem." The halibut fishery rose and fell over a century before this problem drew marine scientists' attention. While ramifications for the northwest Atlantic ecosystem can only be presumed, some things are certain. Before halibut stocks were subjected to sustained fishing pressure driven by market forces, the cod fishery was rife with halibut discards. Jill M. Casey and Ransom A. Myers considered the implications of discard in a study of the barndoor skate, a species caught as by-catch by modern bottom fishermen. They propose that in the late twentieth century, large, slow-to-reproduce marine vertebrates with little or no commercial value are nonetheless susceptible to near-extinction simply because they inhabit the same waters as commercially-valuable fish like cod and redfish. Like the barndoor skate, every halibut removed was one less fish available to reproduce. There is no way of knowing how many halibut cod fishermen removed from the water before 1836 during the by-catch era. However, the near-extinction of the barndoor skate suggests that significant damage can be done to a fish population even if it is not targeted by an organized fishery. Casey and Myers illustrate how lack of commercial value offers no insurance against ecological ruin.[12]

Discarding halibut may have had a salutary effect on other fish in the ecosystem, even as it diminished halibut's presence and function. Juvenile halibut

consumed crustaceans and mollusks, but mature halibut ate fish. Removing halibut influenced finfish species in threefold fashion. Thousands, perhaps tens of thousands of discarded halibut provided repast for other species. Simultaneously, removing halibut lowered the rate of predation on halibut's prey species. Most importantly, it enlarged the ecological niches in which competing species lived. These populations expanded, making halibut's niche even smaller.[13]

Human environmental impact and natural ecosystem fluctuation often coexist. Natural forces influence human activity, but for halibut, humans affected nature in ways far more consequential. Halibut's natural history left it vulnerable to sustained fishing pressure. Halibut took years to reach reproductive maturity and tended to breed in easily-fished areas. These characteristics, combined with natural variations of fish populations, led to an ebbing of halibut stocks and subsequent catches. Marine scientist Tim Smith argues "fluctuations [are] the very essence of ecosystems" but then proceeds to describe how human activities either on or off the water had far greater importance than natural variations. Similarly, Jeremy Jackson argues for the primacy of overfishing as the cause of change in coastal ecosystems. "Ecological extinction caused by overfishing," he asserts, "precedes all other pervasive human disturbance to coastal ecosystems, including pollution, degradation of water quality, and anthropogenic climate change." Both scientists recognize the role of natural fluctuations in marine ecosystems, but however powerful a variable nature was in the northwest Atlantic, Smith and Jackson identify organized human fishing as the signal factor vis-à-vis sustainability, depletion, or extinction of fish stocks. This was certainly the case for halibut.[14]

CREATING A NASCENT MARKET AND A FISHERY

FROM THE AGE OF EXPLORATION to the 1830s, people disdained Atlantic halibut. Newburyport halibut dealer John G. Plummer depicted the New England fishing industry in the early 1830s, when halibut was occasionally taken as by-catch on codfishing vessels. "There was a Large Fleet of Vessels that went From Beverly to the Grand Banks for Codfish," reported Plummer. "They used to Bring Home Some Halibut Salted in With the Codfish." Writing retrospectively in 1894, Plummer described the birth of a market for halibut on Massachusetts' North Shore. "The First Fresh Halibut that Was Ever Cut and Smoked in this Country, Was Cut & Cured by Harry Merchant and Moses Lufkin & Smoked in Lufkins Dog House in Lufkins yard at Gloucester. They had hard Work to Sell it at any Price." The halibut businesses of Merchant and Lufkin, and of Plummer. make clear three things. First, despite preferences for codfish, some vessels brought home halibut in the 1830s. Second, some halibut was salted at sea, while some was landed fresh and then smoked. Finally, halibut was difficult to sell "at any Price" in the 1830s.[15]

Low market value and no market value, though, are very different notions. The motivation to catch, salt, and land halibut along with cod was the incipient halibut market developing in the late 1830s. "David Crowell used to buy it at about two dollars a quintle" [quintal=112 pounds], reminisced Plummer, "and keep it

until Cold Weather & then Dry it on his Flakes & Ship it West and Sell it as Dry Halibut." Merchant and Lufkin smoked their halibut and Crowell dried his: the point is that they were pioneers trying to market a fish long overlooked. Fishermen's actual willingness to land the fish marked the change. Halibut had begun its move from by-catch to commodity.[16]

Initiated by frustrated cod fishermen who decided not to discard their halibut by-catch, commercial halibut fishing began on Georges Bank in 1836. "The fishery for halibut and cod on Georges Bank is an enterprise of recent times," reported John Babson in 1860. "About 1830, it is said, a Gloucester schooner first resorted to that shoal for fishing. It was not, however, till several years after this time, that any considerable number of vessels engaged in the business." One such vessel was the luckless schooner *Beverly*. During their autumn 1836 voyage, the *Beverly's* crew could not find codfish despite valiant efforts. Early in the trip, chances of catching cod remained high and the crew avoided halibut as they had avoided dogfish. Late in the voyage, however, changes in fishing strategy driven by desperation reflected the advent of a halibut market. On October 6, 1836, the disheartened crew of the *Beverly* began preparations and "Com's [commenced] Salting Hallibut" in an attempt to put some fish—any fish—into the hold. Halibut was a catch of last resort.[17]

For millennia, salt was a dependable method of food preservation and salted fish was commonplace throughout the Atlantic basin. However, halibut's large size and thickness of flesh made it difficult to salt thoroughly. As a result, it was usually harder to preserve. The dining habits of the schooner *Mirror's* crew reflected this problem of preservation. On April 9, 1840, the crew "had muddled cod heads for breakfast, boiled halibut for dinner and the same minced for supper." The "muddled" codfish heads illustrate the longstanding practice of consuming at sea unmarketable parts of fish in order to avoid, literally, eating the profits. Halibut's situation was a bit different. Since halibut was more difficult than cod to preserve with salt, the crew ate halibut caught at the beginning of the trip. *Mirror* crewmember Alfred Beckett's meticulous log keeping reveals subtle changes as the voyage progressed.[18]

Beckett's logbook reflected a newfound market value for halibut that directed changes in fishing practices and dining habits. First, Beckett paid close attention to fish that he caught himself, and even distinguished them by species. On a single list from April 10 to May 11, Beckett kept track of his cod, halibut, and haddock. He caught more cod than anything, totaling eighty-two for the month. He also caught twenty-three haddock and fourteen halibut. The same month, in the log's day-by-day section, he noted: "I caught a nice large halibut and dressed him this morning," and another day "caught a few codfish and halibut." The fact that Beckett was beginning to dress his halibut indicated it was headed for market rather than galley table. As the voyage lengthened, the *Mirror's* other fishermen began preserving the more recently caught, fresher halibut for sale. In its place on the bill of fare, the crew began eating the unmarketable parts. Gone was "boiled" and "minced" halibut. Now, the crew dined on throw-aways like "halibut backbone fried." Additionally, when not fishing, Beckett occupied himself "drying

halibut to smoke." The preparation of the fish for smoking and the eating of fried backbone instead of filets or steaks shows halibut's rising commercial importance. Halibut was not the most important fish being caught by the *Mirror* in 1840, but neither was it the nuisance the *Beverly* considered it in 1836. Demand kept increasing throughout the 1840s, and by the end of the decade, sentiments towards the halibut were changing. Catching halibut, once an incidental fishery, had evolved into a major enterprise.[19]

THE RISE OF A NEW MARKET

FROM HUMBLE BEGINNINGS in 1836, steadily increasing demand, especially for fresh fish, drove the halibut fishery's rapid expansion in the 1840s and 1850s. Shorter voyages by boats specifically targeting halibut, and conversion from salt to ice helped to solve preservation problems. Improved preservation created new opportunities to market halibut. Technology, in the form of ice and railroads, increased pressure on natural resources. Improved fishing gear assured supply would meet increased demand, and the natural bounty of marine ecosystems seemed to ensure that the halibut fishery could grow exponentially. Transportation via regional railroads, and the 1869 completion of the transcontinental railroad, helped increase demand and expand markets for fisheries products. Fishers and consumers no longer considered halibut unmarketable by-catch, and as a result, vessels from Boothbay Harbor, Maine, to New London, Connecticut, pursued halibut. Small towns consumed catches locally, but some halibut boats off-loaded at central markets in Boston or New York. Towns within the orbits of these principal markets had the most successful fleets. Gloucester, Massachusetts, handily beat any competing ports. Gloucester vessels regularly landed more fish of all species than all other ports combined. Unquestioned abundance suggested halibut's vast commercial potential. Atlantic halibut were finally worth catching.[20]

Immigration created demands for fish that helped expand the halibut fishery. Waves of Irish, German, and Italian immigrants swelled New England's population from the mid-nineteenth century onward. The increasing population had to be fed, and fish was "cheap staple food." Irish, Italian, and French-Canadian Catholics observed meatless days, and Lent, which coincided closely with the traditional start of the halibut season, created greater demand for fish. More significant than immigration, transportation, and religious fasting, however, were changes in the collective American palate.[21]

In 2002, environmental historian John Soluri examined relationships among popular tastes, mass-market consumption, corporate decision-making, and their resulting agroecological effects. Using bananas as his vehicle, he demonstrated elegantly how consumer tastes helped precipitate natural resource degradation. The Gros Michel banana came to dominate the United States market because it was "large, aesthetically pleasing, and shipped well." When Panama disease, a fungal pathogen, decimated Latin American Gros Michel farms, U.S. markets continued to demand the strain because they were the "variety around which most early twentieth-century U.S. shippers, distributors, retailers, and consumers

formed their notion of what constituted 'a banana.'" Consequently, growers delayed switching to disease-resistant varieties. Instead, they deforested large tracts of tropical forest to cultivate new, disease-free fields of what consumers had decided defined "banana-ness." According to Soluri, "market definitions of 'fruit quality' exerted a strong effect on production techniques and shaped the magnitude of the Panama disease problem." Consumer tastes were critical to encouraging markets for specific types of bananas—and specific types of fish—and Soluri highlighted the relationship between consumption and production. Consumer demand altered the banana industry's business and production techniques, and ecological problems resulted. Because American consumers increased their demands for fresh foods of all kinds, their collective ideas of taste and desirability influenced both the mass market and the marine environment.[22]

During the nineteenth century, fresh fish gained in popularity and salted fish developed a negative image. Once a middle-class American staple, pickled and salted fish began to be associated with immigrants, the urban working classes, and the southern black population. "In an upwardly-striving, increasingly middle-class nation," writes historian Wayne M. O'Leary, "which tended to emulate its monied aristocracy in matters of taste and life style, the identification of fish consumption with poverty was sufficient incentive for many to abandon the practice." Ice and refrigeration helped convert America's collective palate to fresh foods, and the halibut fishery grew to meet demands of the developing fresh fish market. The conversion of Gloucester halibut vessels to ice by 1845 changed the fishery dramatically. The preservation problems of salting halibut, and the undesirability of salted fish in general, were eliminated simultaneously. Moreover, fish preservation was no longer limited by seasonal temperature variation. Introducing ice to preserve fresh fish effectively made pursuing Atlantic halibut a year-round endeavor.[23]

Ironically, when fishermen began using ice in lieu of salt, halibut's physical characteristics made it much more desirable to consumers. Halibut, noted Edward Ackerman in 1941, were the exception to many conventions of historic fisheries. Unlike cod, haddock, pollock, or cusk, halibut had dense flesh that held up better to icing. Usually, markets for fresh fish were limited to coastal areas because most fish deteriorated rapidly on ice. By the 1850s, "fresh fish" meant either species caught on nearby fishing grounds and consumed locally, or halibut, which could be transported great distances on ice. The preservation of high-quality halibut in fish holds was of fundamental importance to both the creation of a market and the decline of halibut in the northwest Atlantic. With rising demand created by immigrants, by new markets accessible via railroad, and by changing American foodways, what had formerly been unmarketable by-catch was fully transformed into a profitable product.[24]

EFFECTS OF THE MARKET ON FISHERMAN AND FISH

LARGER MARKETS RESULTING from immigrants, changing tastes, and ice preservation led to newfound profitability, which in turn spurred exponential increases in fishing effort. Technological advances in fishing equipment

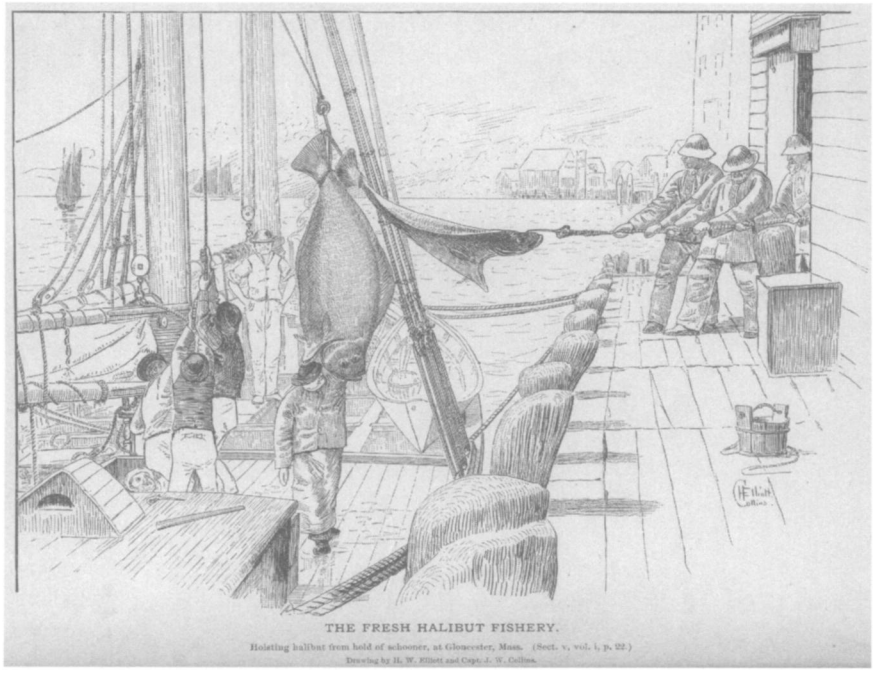
Figure 1. Icing Halibut at Sea.

George Browne Goode, *The Fisheries and Fishery Industries of the United States* (Washington, DC: U.S. Government Printing Office, 1887), Section 5, "History and Methods of the Fisheries," Plate 16, from a photograph by T .W. Smillie, 1882.

Unlike other New England groundfish, halibut's flesh was better suited to preservation by icing. The conversion of fishing vessels from salt to ice spurred a major expansion of the halibut fishery after the 1850s.

accompanied this transformation. In the 1830s, crews fished from the decks of schooners with hand lines. As the industry expanded in the mid-nineteenth century and fishers felt the pressure of the market, most halibut vessels converted

Figure 2. Offloading Halibut at Gloucester, Massachusetts.



George Browne Goode, *The Fisheries and Fishery Industries of the United States* (Washington, DC: U.S. Government Printing Office, 1887), Section 5, "History and Methods of the Fisheries," Plate 19.

Gloucester, Massachusetts, was the premiere fishing port for most New England fisheries, including halibut.

to trawl-lines. Fishermen attempted trawl-line fishing for halibut as early as 1843, but the first serious trawl-lining did not begin until the late 1840s. A trawl-line consisted of a ground line anchored and running horizontally along the bottom for approximately eighteen hundred feet. A ganging (gan-jing) every fifteen to twenty-five feet held one baited hook. A tub of trawl held coiled lines, each with 150 hooks. Fishermen buoyed the entire apparatus for ease of retrieval, and used dories—fifteen- to twenty-foot boats stored on deck—to set and retrieve the line. Halibut schooners carried six dories.[25]

Trawls revolutionized human impact on the fishing banks. Catch per unit of effort (CPUE) increased several hundredfold, as a fisherman who had tended four hooks could now set hundreds. Each dory set one to four trawl tubs, and up to six hundred hooks per dory were possible. Ashore, the rationale behind this heretofore-unseen economy of scale was the new demand. At sea, trawl-lines ushered in a major expansion of the halibut fishery—and the beginning of halibut's decline in the northwest Atlantic.

Trawl-lining's impact appeared almost immediately and created another dilemma: high-grading. In 1847, rail service from Boston began and the new Gloucester Fishing Company tried to take advantage of the train by making retailers trek to Gloucester for halibut. However, Boston was already the established market, and luring buyers to Gloucester proved difficult. In 1848,

the company took a huge gamble and agreed to purchase the fleet's entire yearly catch. Unbeknownst to the company, the northwest Atlantic ecosystem and human endeavor were about to collide. To the chagrin of company officials, in 1848, "George's Bank yielded as it never had before," largely due to trawl-lining. However, the fledgling company remained contractually obligated to purchase greater-than-expected quantities of fish. Desperate to avoid financial ruin, the Gloucester Fishing Company created a system of high grading to avoid "the carrying out to the letter of their contracts with the fishermen."[26]

Corporate decision-making prevailed and the company imposed the grading system upon halibut boats. Fish were divided into three grades: white, grey, and sour. The highest, white, indicated halibut's completely white underbelly. Grey halibut's underside was drab. Sour halibut were fish "slightly tainted in the vicinity of the abdominal cavity." The price-per-grade was roughly half the next higher grade, so when white was 5 cents per pound, grey was 3 cents per pound and sour around 1.5 cents per pound. There was validity to the lesser price of sour halibut, but differences between white and grey were negligible. Retail sellers rarely marked a difference in price between white versus grey halibut, and there was no marked difference in flavor or firmness.[27]

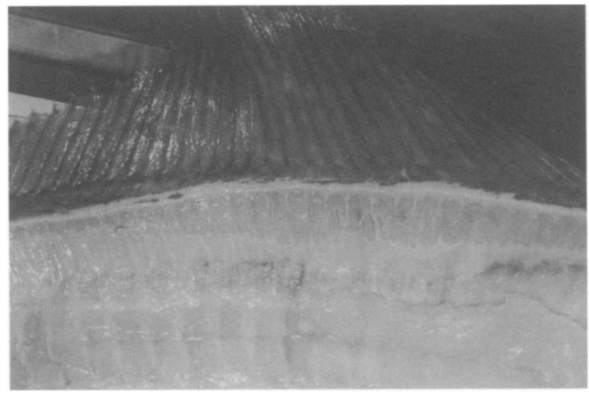
The Gloucester Fishing Company declared bankruptcy in its first year. However, the high grading system remained, "and since that time it has uniformly been made use of, to the disadvantage of the fishermen." The practice was also disadvantageous to halibut stocks. Unlike the cod fishery, where large catches drove down prices, the halibut grading system encouraged fishermen to discard all but the highest, most expensive grade. The plenitude of fish coupled with graduated pricing invited abuse. "This fish has been so abundant," Babson reported, "and such enormous quantities of them have sometimes been brought in, that the poorer qualities have been thrown overboard in our harbor." Practices resulting from the grading system, itself the result of a single decision by a flagging company, resulted in considerable resource mismanagement. Throwing fish overboard in port instead of selling them led to more trips, more fishing pressure, and ultimately, more halibut taken out of the ecosystem to meet demands not just for fresh fish, but for high-graded fish only.[28]

On the Great Plains, bison were shot for their tongues and hides. Since the early seventeenth century, the marine environmental equivalent was harvesting halibut fins. As colonial commentators John Smith and William Wood reported, halibut heads and fins were highly prized delicacies. Foodways historian Sandra Oliver notes that the heads of large fish like halibut or cod contained a great deal of flesh. Historically, people enjoyed food that was "slightly glutinous stuff" in ways the modern palate does not. Simply put, "we do not like gloopy-ness." Halibut fins were a gloopy delicacy. The halibut's lateral fins have dozens of spines. At the fin's base, in between each spine, are two muscles—one on top, one on the bottom. The flesh where fin connects to body has a higher fat content than the rest of the flesh. Additionally, between each individual muscle is a layer of fat. When cut off laterally, the cross-section is honeycombed between flesh and fat layers. It is tender, fatty, "gloopy," and absolutely delicious when fried.[29]

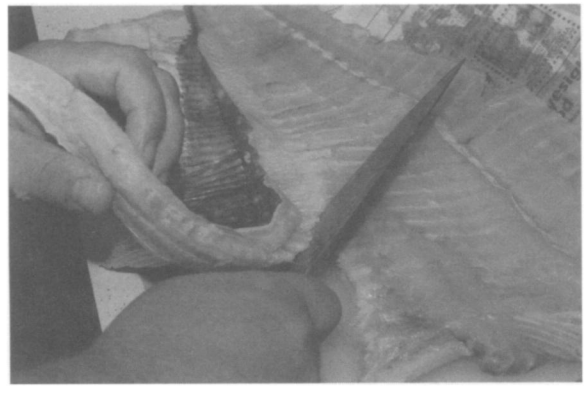
Isinglass was a gelatinous substance used in brewing, purifying liquors, and making jellies. Manufactured by the Gloucester Isinglass and Glue Company among others, it was produced from byproducts of Gloucester fisheries, namely, codfish heads and sounds. Oliver believes that nineteenth-century isinglass was also produced from halibut heads along with codfish heads and sounds. Isinglass production, and the fact that the fins were considered a delicacy, may explain some of the most perplexing information recovered from Gloucester Custom House impost records.[30]

The penchant for halibut fins did not end with Smith and Wood in the colonial period. On numerous occasions in the 1850s and 1860s, fishing schooners returned with barrels of codfish "tongues and sounds." Many vessels also brought home barrels of "halibut fins," possibly for the gourmet's table or, along with cod tongues and sounds, for isinglass production. Taking halibut fins was the

Figures 3, 4, and 5. Halibut Fins.



Small muscles interlayered with fatty deposits are located at the base of halibut's fins.



By slicing lengthwise, the author removes the fins, which possess a sizable piece of flesh and fat. Note that the modern fishmongers have already processed the fish, yet the flesh at the base of the fins remains even after removing the filets.

Pan-fried in light cornmeal, the halibut fin at left retains a large piece of flesh. At right, the soft flesh and fat can be seen interspersed among the spines of the fin.

forerunner to future fisheries practices like harvesting only a shark's fins for soup. Landings from the schooners *John* and *Flying Cloud* offer some insight into the degree of resource degradation resulting from the practice.[31]

Custom House records reveal boats that packed halibut bodies and halibut fins separately but landed them together. The ratio of barrels of fins to pounds of halibut can be roughly estimated by examining the records of the *John* and the *Flying Cloud* between 1857 and 1860. On the low end, the *John* landed 13 barrels of halibut fins and 10,000 pounds of halibut in bulk; 769 pounds of dressed halibut yielded a barrel of fins. On the high end, the *Flying Cloud* landed 15 barrels of halibut fins and 35,000 pounds of halibut in bulk; 2,333 pounds of dressed halibut yielded a barrel of fins. Most common, though, was a ratio of about 1,000 pounds of halibut yielding one barrel of fins.

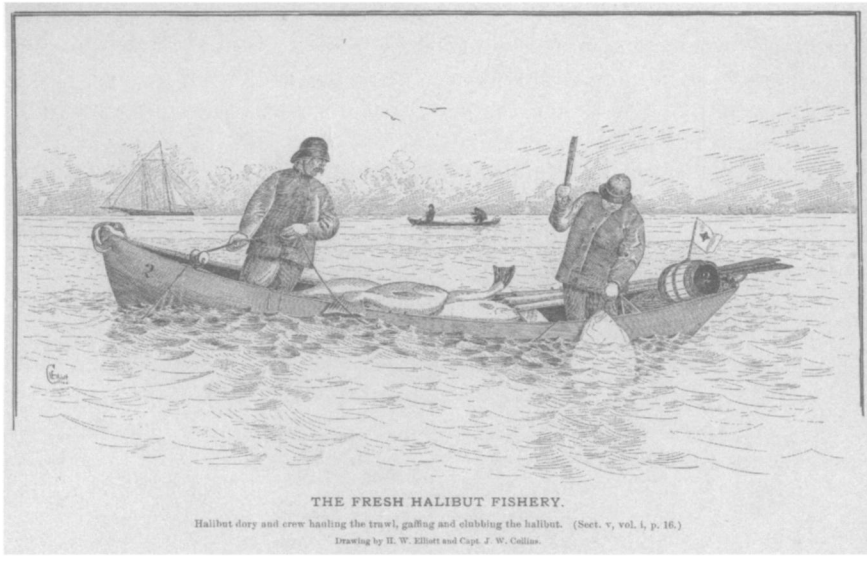
However, on two separate occasions the *Flying Cloud* landed 3 barrels and 10 barrels, respectively, of halibut fins, but no halibut. Taking the median ratio suggests that the equivalent of 13,000 dressed pounds of halibut (more prior to dressing) were discarded to glean 13 barrels of fins. Unfortunately, it is impossible to know how many individual fish these figures represent. Valuing fins over fish was like killing bison for only its tongue and hide. Such high levels of discard (except for fins) indicate that the practice killed substantial numbers of fish to land comparatively small amounts of product.[32]

Against a backdrop of soaring production and changing fishing practices, halibut's natural history contributed to the stock's decline. Regardless of species, fishing pressure reduces individual fish size. For halibut, diminishing size affected reproduction. Halibut had a 35- to 50-year life cycle when left alone, and took a long time to reach reproductive maturity. Females took longer than males, and maturation depended on environment and location. Females could be as young as seven years or as old as twelve years before reaching sexual maturity. These individuals were three to four feet long. Smaller individuals and greater numbers of halibut removed from the water resulted in fewer specimens reaching reproductive maturity. Informed by his own experience, fisherman James Connolly was aware of the conventional wisdom surrounding halibut's reproduction. He straightforwardly reported: "Halibut are big fish, and big fish breed slowly."[33]

Halibut were the largest flatfish, both historically and in modern times. In the 1880s, Goode sized average males around 50 pounds, and average females about 150 pounds, "though they are sometimes much heavier." Larger specimens easily topped two, three, and four hundred pounds. In June 1917, the schooner *Eva Avina* took the largest halibut ever recorded. Nine feet and two inches long, it topped the scales at 625 pounds dressed.[34]

Such large fish were challenging to land from rowboats. Trying to escape from its captors off Miquelon, Newfoundland, an especially large specimen careened a fishing dory about wildly until the two dory mates deftly brought the fish to the surface. Before stunning it, one doryman drove an iron gaff into the fish's head. The fish lurched aggressively, pulled the gaff from the fisherman's hand, and headed for the bottom. Fifteen minutes later, it was again muscled to the surface. The doryman took no chances—he drove the fluke of a sixteen-pound trawl anchor

Figure 6. Knocking Halibut Unconscious.



George Browne Goode, *The Fisheries and Fishery Industries of the United States* (Washington, DC: U.S. Government Printing Office, 1887), Section 5, ""History and Method of Fisheries," Plate 9.

A large halibut could wreak havoc on a fishing dory and its occupants if not first subdued with a "gob stick."

into the halibut's head. Undeterred, it escaped again, nearly pulled the fisherman from the capsizing boat, took the anchor with it, and snapped the hook off the line. As fishing pressure reduced individual size, fights to land fish like these declined—along with reproductive rates.[35]

Declining overall size was only one way fishing pressure affected reproductive rates. When large halibut became increasingly rare in coastal waters, fishermen began targeting "chicken halibut"—juveniles. In 1887, Captain J. W. Collins described his experience fifteen years previously: "Fishermen often find young halibut in considerable abundance on Cache's, New Ledge, and Tippinies, the last fishing ground being most noted for their occurrence. When haddock fishing about 15 years ago, we often caught chicken halibut in about 40 to 45 fathoms of water ESE from Chatham. On one occasion we took about 60 small halibut on a single set of our haddock trawls." Spencer Baird, United States Commissioner of Fish and Fisheries, described a thousand-pound load of chicken halibut delivered to New York City "that averaged three pounds each." These fish were even smaller than the modern, limited, chicken halibut fishery of Maine, which, according to the National Marine Fisheries Service, caught eight- to fifteen-pound fish. In scale and scope, the Maine fishery is a fraction of the historic halibut fishery, but it contributes to modern problems, as Atlantic halibut are "currently in an overfished condition." Modern chicken halibut fishing and its predicament suggests that the historic chicken halibut fishery, which harvested even smaller fish, was similarly detrimental to populations.[36]

Captain Collins described catching chicken halibut in the early 1870s in

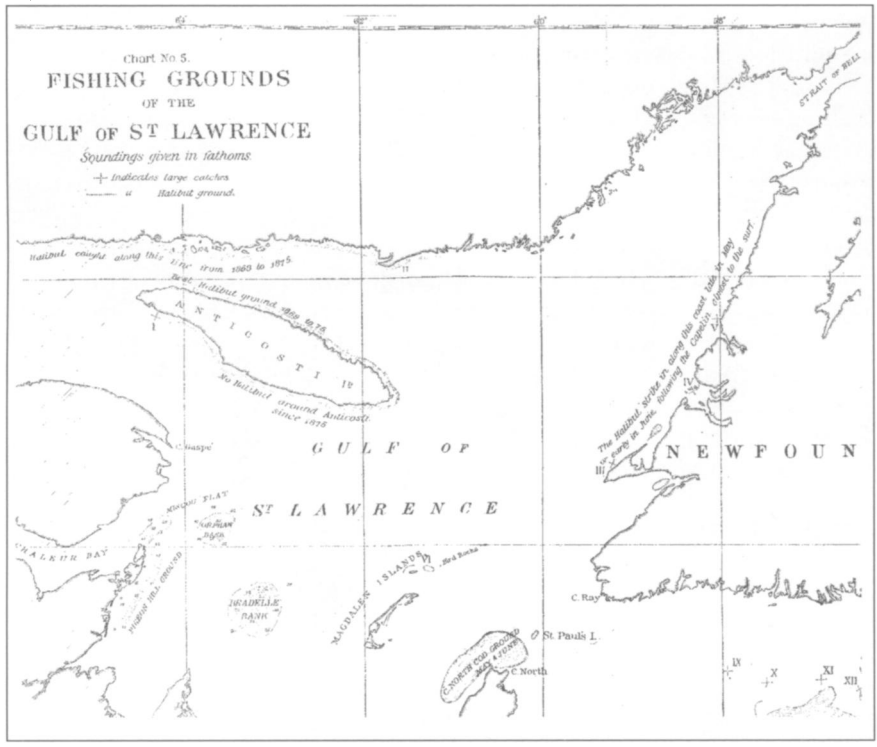
relatively shallow water "on clean sand or rocky bottom." In 1999, the National Marine Fisheries Service described the habitat as well: "Juvenile Atlantic halibut are quite localized, being found in apparently well-defined nursery grounds and in coastal areas 20-60 m deep with sandy bottoms." Marine scientist David Cushing's work on Pacific halibut indicate that halibut breed inshore and migrate to deeper waters as they mature. What Collins identified as chicken halibut grounds were in fact the breeding grounds and nursery areas from which juvenile halibut later migrated. "Strangely, however," reported Collins," "a full grown halibut is seldom caught in any of these localities." By fishing in breeding areas, nineteenth-century fishermen effectively ensured that their resource would not replace itself. Ultimately, Atlantic halibut suffered a double blow. As increased fishing pressure reduced size, fewer fish reached reproductive maturity. Then, those individuals that managed to reproduce found their spawn the object of an intensive chicken halibut fishery. Coastal halibut fishing combined with halibut's lengthy maturation period and slow reproductive rates practically guaranteed Atlantic halibut's decline.[37]

FROM DEPLETIONS TO EXTINCTION

LIKE CONCENTRIC RIPPLES moving away from Massachusetts's North Shore, successive localized depletions progressed into the regional depletion of Atlantic halibut. Fishermen in Massachusetts Bay, the area that had sustained fishing pressure longest, first observed the decline. From the earliest colonial records, halibut were plentiful close to the shore, and two centuries later, Goode still claimed halibut were "very abundant" in Massachusetts Bay, especially "before 1830, [when] those who wished to catch halibut had no difficulty in finding an abundant supply within a few miles of shore." However, the fish, Goode reported, "were gradually exterminated in the bay." When inshore halibut became scarce, the industry concentrated its efforts on the substantial halibut stocks on the offshore banks, especially Georges Bank, during the 1840s, 1850s, and 1860s. This camouflaged the degree of resource degradation: it was easy to ignore halibut's decline in coastal waters because the bulk of the industry now focused on the plentiful stocks offshore. In less than a generation, intense commercial demand and unrelenting fishing pressure destroyed the Massachusetts Bay inshore fishery by the 1850s.[38]

Fishermen sought halibut close to shore whenever possible and coastal areas continued to suffer fishing pressure. Temporally, some inshore and offshore fisheries overlapped. Goode charted halibut catches in Canada's Gulf of St. Lawrence from the 1860s and 1870s, and they were all near-shore. The crumbling Massachusetts Bay fishery and the viable Gulf of St. Lawrence fishery illustrate how, depending on geography, dearth and plenty could exist simultaneously. However, inshore fishing still targeted both breeders and brood, and the lessons of the Massachusetts Bay fishery were not learned by those fishing in the Gulf of St. Lawrence. Nonetheless, in Canadian coastal waters, an extensive fishery persisted into the 1870s. Halibut fishermen could still catch fish close to shore—if they wanted to sail hundreds of miles to the northeast.[39]

Figure 7. Near-shore Halibut Grounds, 1870s.



George Browne Goode, *The Fisheries and Fishery Industries of the United States* (Washington, DC: U.S. Government Printing Office, 1887), Section 3, "The Fishing Grounds of North America," Chart 5.

As New England's coastal waters were depleted, near-shore halibut were increasingly difficult to find. Here, notes along the coastline of the Gulf of St. Lawrence, Canada, indicate some of the last remaining inshore halibut fisheries.

Although the industry's solution to inshore decline was to head offshore, the plentiful halibut found on Georges Bank throughout the 1850s were disappearing by the late 1860s. The Civil War created greater demand and pushed up prices, which in turn led to increased pursuit of halibut. "It must be conceded that the unusual demand and high prices of the war period … gave a material impetus to the industry," Collins told *Harper's Magazine*. "This was a temporary boom that probably would not have occurred under peaceful and normal conditions." Once the premier halibut fishing ground, Georges Bank was fished out by 1870. Trawl-lining, wartime demand, and consumer taste resulted in halibut's depletion in a locale once crowded with fish.[40]

Nature, rather than overfishing, was blamed for halibut's disappearance. Contemporary commentators for popular audiences saw migration: "The seaward movement of the Halibut has been noted by American fishermen" *National Geographic* magazine retrospectively reported in 1923. "When the taking of halibut first began, it was most abundant on George's Bank. Later, it gradually disappeared from the banks and went farther out to sea." Instead of migration, specific, localized fishing grounds were being depleted. Fishermen responded by

working deeper waters further from New England's coast. By 1874, most fishing effort concentrated on the canyons and gullies between the banks in one hundred to three hundred and fifty fathoms of water. Within a decade, deep-water fishing characterized the industry. In 1884, the *Boston Daily Advertiser* noted, "very few [halibut] can now be found on our banks, where twenty years ago they were numerous. Our vessels have to hunt for new grounds, and fish in deep water to get any." Moving to deeper waters, reported W.A. Wilcox, was "especially noticeable in the halibut fishery, [with] vessels now fishing in from 200 to 400 fathoms, or 1,200 to 2,400 feet of water." Moving to deeper waters would prolong the industry, but not the prospects of the species itself. Unsustainable fisheries management practices had purged halibut from easily fished waters, and deep water locales began suffering increased fishing pressure. By any measure, the industry described by Goode in 1884 and Wilcox in 1887 was far different from the easy capture of chicken halibut in forty fathoms of water in 1872 described by Captain Collins. A single generation of fishermen had eliminated near-shore and shallow-water halibut stocks. Repeated patterns of localized depletion evolved into the regional depletion of Atlantic halibut. Finally, the only way to secure halibut fares was to leave the region entirely.[41]

The halibut fishery's movement further afield began in 1866. In search of halibut, Captain Averill York took the schooner *John Atwood* to the Davis Strait on the west coast of Greenland. The voyage was long—two thousand miles—and perilous, as there were no accurate charts of the region, but possibilities of significant returns made the risk worthwhile. Greenland halibut (*Reinhardtius hippoglossoides*) swam in shallower waters (nineteen to ninety fathoms), making them easier to catch, and there was less chance of fog than on Georges or the Grand Bank. Other advantages included continuous sunlight in which to fish, and a summer season, although "summer" was relative on the cold coast of Greenland. There, the fishery grew throughout the 1870s. Demand created by mid-century fresh halibut markets necessitated this geographic expansion, which, ironically, required a return to salt for preservation because the voyage was so long. The product returned from Greenland was salted "flitches," layers of boneless flesh that were smoked once back in Gloucester. A cursory survey of fish company advertisements in 1876 reveals that the bulk of Gloucester's halibut was sold smoked. In 1890, the captain of the Gloucester fishing schooner *Concord* ignored Georges and the Grand Banks entirely. In late March, the *Concord* sailed short-handed, planning to ship "the rest of the crew in Iceland, for that is where we are bound, on a fletching halibut trip." It was the *Concord's* fourth season in Iceland, where "natives tell us there is halibut in amongst the islands the whole year around." This was a serious commitment: each trip was six months long. The halibut fishery's principal location was now Greenland and Iceland, and salted and smoked halibut returned to the same fish markets that had once so eagerly demanded fresh halibut.[42]

Between the Civil War and the mid-1880s, every halibut ground once fished was exhausted until localized overfishing created a regional dilemma in the northwest Atlantic. These areas progressed further offshore until the only way

to land halibut fares in profitable quantities was to sail halfway across the Atlantic. What had been plentiful and unavoidable by-catch in the 1830s was, by the 1880s, elusive and almost impossible to catch by fleets of vessels specifically targeting halibut. In the space of forty years, halibut was driven to commercial extinction in the northwest Atlantic. It was not without irony that at the end of the nineteenth century, *Harper's Magazine* reported "car-loads of fresh halibut are sent from Seattle to New York, and even to Gloucester, the headquarters of the New England deep-sea fishery."[43]

CHANGED VALUES, CHANGED SEAS

HALIBUT REMAIN IN THE NORTHWEST Atlantic today, both near-shore and further out to sea. However, it is clear that by the early twenty-first century, stocks are mere shadows of their historic populations, even though no precise numerical baseline exists for early halibut stocks. The virtual eradication of Atlantic halibut came in part because nineteenth-century fishermen failed to develop a cogent institutional memory. Halibut fishermen in the 1920s and 1930s looked at smaller fish, taken in lesser quantities, yet still believed they were landing good fares. Captain Sanford Doughty considered ten thousand pounds of halibut, taken over five trips to the Grand Banks in the 1930s, as doing "awful well." On one trip in 1860, the crew of the *Flying Cloud* threw that amount overboard when harvesting only fins. Without institutional memory, similar boom-and-bust cycles were repeated on different fishing banks between 1840 and the 1880s.[44]

Doughty may have thought he was doing "awful well," but halibut in the northwest Atlantic ecosystem were not. Nature negatively commodified led to by-catch and discard. Nature positively commodified led to overfishing. Both resulted in resource degradation. The damage done to marine ecosystems absent mechanized technology was an early warning sign of the frailty of some species despite robust appearances. The warning went unheeded. As the East Coast fishery declined, Pacific halibut replaced Atlantic in the 1890s marketplace. Almost on cue, Pacific halibut stocks suffered significant decline in the twenty-five year period between 1899 and 1924, for largely the same reasons as Atlantic halibut. The timing of commodification was a key difference between the Atlantic and Pacific halibut's narrative: before fishers began exploiting Pacific stocks, they already knew about the lucrative eastern market. Consumer tastes had already changed and nature had already been commodified positively, which in turn led to the enthusiastic fishing of Pacific halibut. Another difference was the west coast response. When faced with a combined environmental and diplomatic problem, Progressive-era American and Canadian politicians and scientists addressed, albeit imperfectly, Pacific halibut's severe overfishing in a 1923 treaty. Such oversight was never present in the Atlantic halibut fishery. The capitalism of Pacific fishers may have helped restructure nature, but by the twentieth century, conservationists, managers, scientists, and politicians, each with their own agendas, kept watch over the industry before it was too late.[45]

Failing to portray accurately the composition of oceans past obscures the degree of human modification taking place. Marine scientist James T. Carlton

notes that "humans [have] been altering the oceans for millennia" and finds it remarkable "that it has taken until the end of the twentieth century to gain the first serious glimpses ... of the extent to which human activities have modified the seas." The twentieth-century decimation of the barndoor skate shows how a by-catch species, swimming in waters being fished for a target species, can be driven to near-extinction. But the demise of Atlantic halibut was more complicated than a case of being in the wrong place at the wrong time. Halibut's natural history and habitat were important contributing factors to its demise, but it was shifting human values and the process of commodification that ultimately pushed a fish once considered worthless to the brink of commercial extinction. The rise and fall of the Atlantic halibut fishery warns that other species initially treated as by-catch can easily suffer the same fate.[46]

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NOTES

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1. Lorenzo Sabine, *Report on the Principal Fisheries of the American Seas: Prepared for the Treasury Department of the United States* (Washington, DC: Robert Armstrong, 1853), 197; George Brown Goode, *The Fisheries and Fishery Industries of the United States*, section 5, vol. 1 (Washington, DC: U.S. Government Printing Office, 1887). For a discussion of the terms "fisherman" and "fisher," see the "Introduction and Glossary" by the editors of *The Ecologist* 25 (March/April, May/June, 1995): 42-45; and Linda Greenlaw, *The Hungry Ocean: A Swordboat Captain's Journey* (New York: Hyperion, 1999), 11. The term "fisherman" refers to men who fished; "fishers" refers to men, women, and children engaged in fishing industries.
2. W. Jeffrey Bolster, "Opportunities in Marine Environmental History," *Environmental History* 11 (July 2006): 567-97.
3. For more on the role of technology and its effects on the fisheries, see Simon Fairlie et al., "The Politics of Overfishing," *The Ecologist* 25 (March April, May/June, 1995): 46-73. For more on the issues of by-catch and discard, see Dayton L. Alverson, *A Global Assessment of Fisheries Bycatch and Discard* (Rome: Food and Agriculture Organization of the United Nations, 1994); and Larry B. Crowder and Steven A. Murawski, "Fisheries Bycatch: Implications for Management," *Fisheries* 23 (June 1998): 8-17. See, also, Poul Holm, Tim D. Smith, and David J. Starkey, eds., *The Exploited Seas: New Directions for Marine Environmental History* (St. John's, Newfoundland: International Maritime Economic History Association/Census of Marine Life, 2001); Poul Holm and David J. Starkey, eds., *Studia Atlantica 3: Fish Catching and Fish Processing: Essays on the Development of Technology* (Esbjerg, Denmark: North

Atlantic Fisheries History Association, 1999); Poul Holm & David J. Starkey, eds., *Studia Atlantica 2: Markets and Modernisation* (Esbjerg, Denmark: North Atlantic Fisheries History Association, 1998); Poul Holm, "Catches and Manpower in the Danish Fisheries, c1200-1995," in *Studia Atlantica 1: North Atlantic Fisheries, 1100-1976: National Perspectives on a Common Resource*, ed. Poul Holm, David J. Starkey and Jón Th. Thór, (Esbjerg, Denmark: North Atlantic Fisheries History Association, 1996), 177-206; Poul Holm "The Bohuslen Herring. Interlude to Dutch Supremacy in the European Fish Market, 1556-1589," in *In het kielzog. Maritiem-historische studies aangeboden aan Jaap R. Bruijn, bij zijn vertrek als hoogleraar zeegeschiedenis aan de Universiteit Leiden*, ed. L. M. Akveld et al., (Amsterdam: De Bataafsche Leeuw, 2003), 282-88; Poul Holm and Brian R. MacKenzie, "Environmental History and Historical Fish Populations in the Baltic," in *Learning from Environmental History in the Baltic Countries*, ed. Per Eliasson, (Malmö: Liber, 2004), 39-44; Richard C. Hoffmann, "Economic Development and Aquatic Ecosystems in Medieval Europe," *American Historical Review* 101 (1996): 631-69; Richard C. Hoffmann, *Fishers' Craft and Lettered Art* (Toronto: University of Toronto Press, 1997); Richard C. Hoffmann, "Medieval Fishing," in *Working With Water in Medieval Europe: Technology and Resource Use*, ed. Paolo Squatriti (Leiden: Brill, 2000), 331-93; and Richard C. Hoffmann, "Carp, Cods, Connections: New Fisheries in the Medieval European Economy and Environment," in *Animals in Human Histories: The Mirror of Culture and Nature*, ed. Mary J. Henninger-Voss (Rochester, NY: University of Rochester, 2002), 3-55.

4. Arthur F. McEvoy, *The Fisherman's Problem: Ecology and the Law in the California Fisheries, 1850-1980* (Cambridge: Cambridge University Press, 1986), 6, 73; Joseph E. Taylor III, *Making Salmon: An Environmental History of the Northwest Fisheries Crisis* (Seattle: University of Washington Press, 1999), 6. See, also, Joseph E. Taylor III, "Burning the Candle at Both Ends: Historicizing Overfishing in Oregon's Nineteenth-Century Salmon Fisheries," *Environmental History* 4 (January 1999): 54-79. Neither McEvoy nor Taylor fully accept Garrett Hardin's "tragedy of the commons" argument. Human adaptability, cognition, and culture, as well as "spatial and racial" barriers to the so-called "commons" complicate the story of who fishes, for what species they fish, and the rules—written or unwritten—that determine how they fish. For recent works on historical marine ecology, see note 6.
5. McEvoy, *Fisherman's Problem*, 6. For the commercial value of fish, see Mark Kurlansky, *Cod: A Biography of the Fish That Changed the World* (New York: Walker, 1997); and Harold A. Innis, *The Cod Fisheries: The History of an International Economy*, rev. ed. (1940; reprint, Toronto: University of Toronto Press, 1978). For a discussion of by-catch and discards, see note 12, and Mike Hagler, "Deforestation of the Deep: Fishing and the State of the Oceans," *The Ecologist* 25 (March/April, May/June, 1995): 76. See, also, Taylor, *Making Salmon*, and Christopher L. Dyer and James R. McGoodwin, eds., *Folk Management in the World's Fisheries: Lessons for Modern Fisheries Management* (Niwot, CO: University Press of Colorado, 1994).
6. Jeremy B. C. Jackson et al., "Historical Overfishing and the Recent Collapse of Coastal Ecosystems," *Science* 293 (July 2001): 629-37; Jeremy B. C. Jackson, "What Was Natural in the Coastal Oceans?" *Proceedings of the National Academy of Sciences* 98 (May 8, 2001): 5411-18; Michael Berrill, *The Plundered Seas: Can the World's Fish Be Saved?* (Vancouver: Greystone, 1997); Andrew Rosenberg et al., "The History of Ocean Resources: Modeling Cod Biomass Using Historical Records," *Frontiers in Ecology and the Environment* (March 2005): 84-90; Robert S. Steneck and James T. Carlton, "Human Alterations of Marine Communities: Students Beware!" in *Marine Community Ecology*, ed. Mark D. Bertness et al. (Sunderland, MA: Sinauer Publishers, 2001), 445-68. While no evidence to date suggests that halibut were a "keystone species," that is, one whose removal spurred a radical reorganization of the ecosystem, Atlantic halibut

were nonetheless apex predators at or near the top of the food web of the northwest Atlantic.

7. John Smith, *History of Virginia* (London, 1624), in Goode, *Fisheries,* section 1, 193; William Wood, *New Englands Prospect* (London, 1634), in *The Fish and Fisheries of Colonial North America: A Documentary History of the Fish Resources of the United States and Canada.* part 2. *The New England States*, ed. John C. Pearson, National Oceanic and Atmospheric Administration Report # NOAA-72040302, (Woods Hole, MA: National Oceanic and Atmospheric Administration, 1972), 196, emphasis added; George Brown Goode, "A Brief Biography of the Halibut," *American Naturalist* 19 (October 1885): 958.
8. Goode, *Fisheries,* section 5, vol. 1, 5, 29-30. *Hippoglossus vulgaris* was the nineteenth-century taxonomy. Fishers and consumers made no distinction between Atlantic, Greenland, and Pacific halibut. Modern taxonomy recognizes three distinct groups: *Hippoglossus hippoglossus* for northwest Atlantic halibut, *Reinhardtius hippoglossoides* for Greenland halibut, and *Hippoglossus stenolepis* for Pacific halibut.
9. For more information on the cod bounty, see Sabine, *Report on the Principal Fisheries of the American Seas*, 159-69, and the frontispiece of any "Journal of a Voyage." These blank logbooks, printed by S. G. Simpkins and Co., Boston, MA, were designed to record codfish catches by individual fishing vessels. The frontispiece is the actual wording of the regulation. Phillips Library, Peabody Essex Museum, Salem, MA (hereafter PL-PEM). Also, for a discussion of international treaties and conflicts as well as bounties, see Innis, *The Cod Fisheries.* For recent treatment of estimating past populations based on data from the cod logs, see Rosenberg et al., "Modeling Cod Biomass Using Historical Records," 84-90.
10. Log of the schooner *Beverly*, April 1833-September 1841, entries from June-July 1836, Manuscript # Log 1816S (microfilm: series 91, roll 11), PL-PEM.
11. Steve Kaimmer, "The Problem With Fleas," http://www.iphc.washington.edu/halcom.biology.fleas.htm (accessed February 23, 2001); Wesley George Pierce, *Goin' Fishin': The Story of the Deep-Sea Fishermen of New England* (Salem, MA: Marine Research Society, 1934), 128; Log of the schooner *Beverly*, entries from September-October 1836; Goode, *Fisheries,* section 5, vol. 137. Sand fleas are parasitic amphipods that burrow into the flesh of the fish and eat it from the inside out. The only thing remaining is skin, bones, and spines. Modern Pacific Halibut fishermen note that the fleas are highly localized, often finding fish free of the fleas on the same line as fish infested with them. Pierce reports: "These vessels were often anchored in deep water when fishing on the Bank, so they carried plenty of cable, eight and one-half or nine-inch circumference rope, and in length from three hundred and fifty, to four hundred fathoms, the greater part of it coiled on the port side, for they used the port anchor. About one-forth of it was coiled on the starboard side, made fast to the spare anchor, and they all carried a third anchor which was lashed securely under the windlass. These three anchors weighed from five hundred to six hundred and eighty pounds each." I have taken six hundred pounds as a median weight. Additionally, the point here is that heaving up the anchor, a lengthy, difficult, and heavy job regardless of its actual weight, was preferable to catching "only halibut."
12. Mike Hagler, "Deforestation of the Deep," 76; Jill M. Casey and Ransom A. Myers, "Near Extinction of a Large, Widely Distributed Fish," *Science* (July 31, 1998): 690-92. Taxonomy: Barndoor skate (*Raja laevis*), cod (*Gadus morhua*), and redfish (*Sebastes* sp.). Hagler discussed the difference between by-catch and discards: "By-catch is captured fish that are not the target species of the fishery. Discards are fish that are thrown back because, for various reasons, they are considered undesirable: they are of the wrong species, the wrong size (usually too small but sometimes too big), inferior

quality or surplus to quotas. Until recently, the complex issue of by-catch and discards was largely ignored by fishermen, scientists, and managers who typically felt that they were unavoidable by-products of fishing about which little could be done. Recently, however, it has come to be recognized that throwing fish overboard occurs on a far larger scale than many scientists had imagined and that it has far-reaching effects for the entire marine ecosystem."

13. U.S. Department of Commerce, National Marine Fisheries Service, "Essential Fish Habitat Source Document: Atlantic Halibut, *Hippoglossus hippoglossus*, Life History and Habitat Characteristics," NOAA Technical Memorandum NMFS-NE-125 (Woods Hole, MA: National Oceanic and Atmospheric Administration, 1999), 2. Adult halibuts' diet includes alewife, capelin, cod, cusk, flounder, haddock, herring, mackerel, northern sand lance, ocean perch, ocean pout, sculpins, silver hake, skates, and squid.
14. Tim D. Smith, *Scaling Fisheries: The Science of Measuring the Effects of Fishing, 1855-1955* (Cambridge: Cambridge University Press, 1994) 8, 33; Jackson, *Historical Overfishing*, 629. See, also, Kurlansky, *Cod.*
15. John G. Plummer Memoir, 1894, unpaginated, MSS # 0.274, PL-PEM. From the handwriting and layout, it appears that Plummer wrote the entire memoir at once (in 1894, as dated). Some pages are dated, but the dates used do not necessarily correspond to the dates of the events described. When available, dates provided as page headings are used in the endnotes as reference points, and the dates in his text are used as historical dates. Here, by comparing this entry to the dated entries of the entire memoir, he is retrospectively describing the 1830s industry.
16. Plummer Memoir, n.p., n.d. In this entry, Plummer is writing a retrospective account of his early life and business. Again, a comparison of this entry to the available dates reveals that he was referring to the late 1830s or early 1840s.
17. John J. Babson, *History of the Town of Gloucester, Cape Ann Including the Town of Rockport* (1860; reprint, Gloucester, MA: Peter Smith, 1972), 573. See, also, David W. Low, *The Pioneer Industries of Essex County: Planting and Fishing, Their Past and Present Success* (Salem, MA: Observer Steam Printing Rooms, 1880). Also, Low, in *Pioneer Industries of Essex County*, 13, proclaimed the halibut fishery one of Gloucester's major industries: "In 1836 the fresh halibut fishery commenced, and is now one of Gloucester's specialties." Log of the schooner *Beverly*, September-October 1836.
18. Log of the schooner *Mirror*, March-August 1840, entry from April 9, 1840. MSS# Log 1840M (B12) (microfilm: series 91, roll 35), PL-PEM. "Muddled" heads were either broken up, possibly prepared in wine, or both.
19. Log of the schooner *Mirror*, April 10-May 11, 1840.
20. Andrew W. German, "History of the Early Fisheries, 1720-1930," in *Georges Bank*, ed. Richard W. Backus (Cambridge: MIT Press, 1987), 411; Goode, *Fisheries*, section 5, vol. 1, 37, 3.
21. Percy Wells Bidwell, "Population Growth in Southern New England," *Publications of the American Statistical Association* 15 (December 1917): 2-3; Helen Corliss Babson, *History of the Fishing Industry in Gloucester, Massachusetts (to 1918)* (typescript, 1918), 21 (Sawyer Free Public Library Gloucester, MA, call #639.2). Bidwell's article offers a wealth of near-contemporary information on economic growth as related to immigration, and specifically in maritime industries. For additional information on immigration, see David Ward, *Cities and Immigrants: A Geography of Change in Nineteenth-century America* (New York: Oxford University Press, 1971); William E. Van Vugt, *Britain to America: Mid Nineteenth-century Immigrants to the United States* (Urbana: University of Illinois Press, 1999); Ruth Ann M. Harris, *The Nearest Place that Wasn't Ireland: Early Nineteenth-century Irish Labor Migration* (Ames: Iowa State University Press, 1994); Arthur Gribben, ed., *The Great Famine and the Irish Diaspora*

in America (Amherst: University of Massachusetts Press, 1999); David A. J. Richards, *Italian American: The Racializing of an Ethnic Identity* (New York: New York University Press, 1999); and Donna R. Gabaccia, *Italy's Many Diasporas* (Seattle: University of Washington Press, 2000). For a discussion of nineteenth-century population and economic growth, see Peter Temin, *Causal Factors in American Economic Growth in the Nineteenth Century* (London: Macmillan and Company, 1975); and Morton Owen Schapiro, *Filling Up America: An Economic-Demographic Model of Population Growth and Distribution in the Nineteenth-Century United States* (Greenwich, CT: JAI Press, 1986). On fish as a cheap staple food, see Babson, *History of the Fishing Industry*, and Wayne M. O'Leary, *Maine Sea Fisheries: The Rise and Fall of a Native Industry, 1830-1890* (Boston: Northeastern University Press, 1996).

22. John Soluri, "Accounting for Taste: Export Bananas, Mass Markets, and Panama Disease," *Environmental History* 7 (July 2002): 386, 390, 387, 403, 388, 402. Taxonomy: The Gros Michel banana is *Musa acuminata*. Panama disease is *Fusarium oxysporum* f. *cubense*.
23. Wayne M. O'Leary, *Maine Sea Fisheries: The Rise and Fall of a Native Industry, 1830-1890* (Boston: Northeastern University Press, 1996), 265-66, 270, parenthesis in original. For additional discussion of the changing foodways of Americans, see Richard J. Hooker, *Food and Drink in America: A History* (New York: Bobbs-Merrill Company, 1981), Sandra Oliver, *Saltwater Foodways: New Englanders and their Food, at Sea and Ashore, in the Nineteenth Century* (Mystic, CT: Mystic Seaport Museum, 1995); and Louis Untermeyer, *Food and Drink* (New York: Harcourt, Brace, and Company, 1932).
24. Edward A. Ackerman, *New England's Fishing Industry* (Chicago: University of Chicago Press, 1941), 78, 214. Ackerman reported that halibut "keeps extraordinarily well" and that "halibut has better keeping qualities than other ground fish" when iced.
25. German, "History of the Early Fisheries," 409; Goode, *Fisheries*, section 5, vol. 1, 10-12, 39. See also Massachusetts Historical Society, *The Fisheries of Gloucester From the First Catch by the English in 1623 to the Centennial Year 1876* (Gloucester, MA: Procter Brothers, 1876). In 1843, fishermen believed that anchoring on the offshore banks to set trawl lines was too dangerous. By the late 1840s, however, profitability had trumped safety and trawl-lining was standard practice offshore.
26. Babson, *History of the Town of Gloucester*, 553; Goode, *Fisheries*, section 5, vol. 1, 32, 23; Massachusetts Historical Society, *Fisheries of Gloucester*, 40.
27. Goode, *Fisheries,* section 5, vol. 1, 22-23; Massachusetts Historical Society, *Fisheries of Gloucester*, 40.
28. Babson, *History of the Town of Gloucester*, 573-74; Goode, *Fisheries,* section 5, vol. 1, 23.
29. Smith, *History of Virginia*, in Goode, *Fisheries,* section 1, 193; Wood, *New Englands Prospect*, Pearson, *The Fish and Fisheries of Colonial North America,* 196; Sandra Oliver, telephone communication with the author, April 12, 2001, Dover, New Hampshire (handwritten notes in possession of the author); Author's personal experience, August 24, 2002. The author would like to thank Dan Bugge and Sam Samson, employees of Pike Place Fish, 86 Pike Place, Pike Place Market, Seattle, Washington, for their help in procuring (without too many strange looks) a number of fresh Pacific halibut fins upon which to perform these culinary experiments. For a complete treatment of bison products, see Andrew Isenberg, *The Destruction of the Bison* (Cambridge: Cambridge University Press, 2000).
30. *Report of the Massachusetts Board of World's Fair Managers* (Boston: Wright & Potter State Printers, 1894), 235; Sandra Oliver, telephone communication, April 12, 2001. The sound is the portion of the codfish's backbone removed in the splitting and salting process. Isinglass also was produced from sturgeon. For more information on isinglass and other historic foodways, see Sandra Oliver, *Saltwater Foodways*.

31. Gloucester Customs House Records, Impost Records 1854-1863, schooners *Galena*, *Flying Cloud*, *Gentile*, *Cherub*; schooners *John*, *Flying Cloud*, *Henry Fenwick*, series 2, vol. 13 (National Archives and Records Administration, Waltham, MA).
32. Gloucester Customs House Records, Impost Records, schooner *John*, May 8, 1857; schooner *Flying Cloud*, May 14, 1860; schooner *John*, May 29, 1858; schooner *Flying Cloud*, May 16, and November 29, 1859; schooner *Flying Cloud*, December 24, 1860 and September 9, 1861.
33. Department of Commerce, "Atlantic Halibut," 1-2, 7; James B. Connolly, *The Port of Gloucester* (New York: Doubleday, Doran, and Company, 1940), 185.
34. George Brown Goode, "A Brief Biography of the Halibut," *American Naturalist* 19 (October 1885): 959; Goode, *Fisheries,* section 1, 193; John Oliver La Gorce, "Fish and Fisheries of Our North Atlantic Seaboard," *National Geographic* 44 (December 1923): 606-07. "Dressed" meant without innards or head.
35. Goode, "A Brief Biography of the Halibut," 966; Department of Commerce, "Atlantic Halibut," 2.
36. U.S. Commission of Fish and Fisheries, *Bulletin of the United States Fish Commission, Volume VI for 1886* (Washington, DC: U.S. Government Printing Office, 1887), 412-13; Commission of Fish and Fisheries, *Bulletin for 1886*, 412-13; Department of Commerce, "Atlantic Halibut," 1, 4. The Maine chicken halibut fishery caught fish between 3.6 and 6.8 kilograms.
37. Commission of Fish and Fisheries, *Bulletin for 1886*, 412-13; Department of Commerce, "Atlantic Halibut," 1-3; David Cushing, *Population Production and Regulation in the Sea: A Fisheries Perspective* (Cambridge: Cambridge University Press, 1995), 103. Goode refers to Captain Ashby's observation of eggs present in halibut of twenty pounds weight. Captain Ashby believes halibut begin to reproduce at that size, which is still considerably larger than both the modern and historic chicken halibut fisheries. See Goode, "A Brief Biography of the Halibut."
38. Goode, *Fisheries,* section 1, 194; Goode, *Fisheries,* section 5, vol. 1, 5.
39. George Brown Goode, "Chart No. 5. Fishing Grounds of the Gulf of St. Lawrence," map in *Fisheries,* Section 3.
40. Joseph William Collins, "Decadence of the New England Deep-Sea Fisheries," *Harper's New Monthly Magazine* 94 (March 1897): 614.
41. La Gorce, "Fish and Fisheries of Our North Atlantic Seaboard," 606-07; Goode, *Fisheries,* section 1, 193; U.S. Commission of Fish and Fisheries, *Bulletin of the United States Fish Commission, Volume V for 1885* (Washington, DC: U.S. Government Printing Office, 1885), 90; W. A. Wilcox, *The Fishing Industry and Annual Report of the American Fish Bureau*, (Gloucester, 1887) 12. Goode reported: "Since 1850 [halibut] have partially disappeared from this region, and the fishermen have been following them to other banks, and since 1874 out into deeper and deeper water, and most of the fisheries are now carried on almost exclusively in the gullies between the off-shore banks and on the outer edges of the banks in water one hundred to three hundred and fifty fathoms in depth." Near-shore and shallow-water differ; offshore fishing banks like Georges Bank are actually quite shallow.
42. Newton Pratt Scudder, "The Halibut Fishery—Davis' Strait," in *Report of the Commissioner of Fish and Fisheries, Part VIII, Report for 1880* (Washington, DC: U.S. Government Printing Office, 1883), 190-93; Wilcox, *Fishing Industry and Annual Report*, 16; Massachusetts Historical Society, *Fisheries of Gloucester*. Advertisements were in Massachusetts Historical Society, *Fisheries of Gloucester*; Log of the schooner *Concord*, March 29, 1890-27 September 1890, entries from March 26 and July 10, 1890, not cataloged, accession # 2002.017 PL-PEM 1, 70; Goode, "A Brief Biography of the Halibut," 969. Although the Greenland halibut is technically a different species,

nineteenth-century fishers made no distinction between northwest Atlantic halibut (*Hippoglossus hippoglossus*) and Greenland halibut (*Reinhardtius hippoglossoides*).

43. Collins, "Decadence of the New England Deep-Sea Fisheries," 616. Again, nineteenth-century fishers made no distinction between Atlantic halibut (*Hippoglossus hippoglossus*) and Pacific halibut (*Hippoglossus stenolepis*).
44. Captain Sanford Doughty, transcript of oral history, November 1966, call# MSM-OH66-6D (G.W. Blunt White Library, Mystic Seaport, Mystic, Connecticut).
45. John Thistle, " 'As Free of Fish as a Billiard Ball is of Hair': Dealing with Depletion in the Pacific Halibut Fishery, 1899-1924," *BC Studies* 142/143 (Summer/Autumn 2004): 105-06, 124-25. Despite its imperfections, the 1923 halibut treaty between the United States and Canada introduced to the Pacific a degree of regulation missing from the Atlantic halibut fishery.
46. James T. Carlton, "Apostrophe to the Ocean," *Conservation Biology* 12 (December 1998): 1165.