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The Bluefish, An Unsolved History: Spencer Fullerton Baird's Window into Southern New England's Coastal Fisheries

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The Bluefish, An Unsolved History:

*Spencer Fullerton Baird's Window into Southern New
England's Coastal Fisheries*

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Spring, 2018**

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For my grandfather, who incited my love of Cape Cod and Buzzards Bay.

Introduction

In June 1871, Spencer Fullerton Baird, former Assistant Secretary of the Smithsonian Institution, arrived in Woods Hole, Massachusetts as the first United States Commissioner of Fish and Fisheries. Baird was appointed to this position by President Ulysses Grant and was faced with the challenge of organizing a new branch of government that was to deal with the “conservation of natural aquatic resources which appeared to decline under intensive exploitation.”¹ During the United States Civil War and immediate years following, the federal government experienced a significant expansion with an increased number of federal employees and agencies that gained authority unlike before. Environmental devastation of the Civil War prompted President Abraham Lincoln to protect the Yosemite Valley in 1864, leading to the rise of national park preservation, with Yellowstone established as a national park in 1872. As the nation began to address the preservation of land on a federal level, especially in the west, it also turned attention to its waters. Just six years after the conclusion of the Civil War, the federal government recognized a need to protect and investigate the nation’s coastal waters and institute the United States Commission of Fish and Fisheries, a decision that deepened tensions between locals and outside experts and that didn’t resolve many fundamental questions about human versus natural causes of fisheries’ decline.² Baird stood out among his contemporaries as a figure that was accepting of both human and natural agency when examining fishery decline while resisting too much intervention or control of southern New England’s fisheries. The bluefish (*Pomatomus Salatrix*) were unique throughout Baird’s investigation as a species that consistently

¹ Paul S. Galtsoff, *The Story of the Bureau of Commercial Fisheries Biological Laboratory Woods Hole, Massachusetts* (Washington, D.C., 1962), 1.

² Jennifer Hubbard, "In the Wake of Politics: The Political and Economic Construction of Fisheries Biology, 1860–1970." *Isis* 105, no. 2 (2014): 364-78.

escaped human comprehension. While the bluefish puzzled scientists like Baird that attempted to understand the full breadth of their behavior, the species was crucial and productive to the investigation and overall knowledge of fisheries and fish behavior in southern New England and beyond.

Baird had spent a summer in the small town of Woods Hole years prior in 1863, but his return in 1871 seemed insignificant to the local population. Paul Galstoff wrote *The Story of the Bureau of Commercial Fisheries Biological Laboratory Woods Hole, Massachusetts* in 1962, the first comprehensive history of the United States Commission of Fish and Fisheries. Galstoff comments on Baird's arrival in the summer of 1871, "the event seemed to be trivial and the arrival of the newcomer was not reported in local newspapers."³ But Baird's arrival in Woods Hole and ultimate decision to erect the U.S. Fish Commission headquarters there would forever change the small town that has now evolved into an internationally prominent center for oceanographic research.

When Baird arrived to Woods Hole in the summer of 1870, "a dispute of considerable importance in southern New England was reaching a crisis."⁴ Dean C. Allard's dissertation on Baird's career and the U.S. Fish Commission discusses the tensions present in southern New England over the condition of fisheries in the late 1860s and early 1870s. Advanced methods of capturing large quantities of fish including weirs, pounds and traps were the focus of this conflict. Fixed nets distributed along the shoreline were monopolized by a few local men who took an abundance of coastal fish in the spring and early summer. Allard argues:

Although these highly efficient instruments of capture were found along the entire coast between the tip of Cape Cod and Long Island, they were especially concentrated in

³ Galstoff, 1.

⁴ Dean C. Allard, "Spencer Fullerton Baird and the U.S. Fish Commission: A Study in the History of American Science." PhD dissertation, George Washington University (Ann Arbor, Mich.: University Microfilms, 1969), 69.

certain areas. Two of these, Vineyard Sound and Buzzards Bay, were in the Woods Hole area.⁵

With Buzzards Bay to the west and Vineyard Sound to the east, the town of Woods Hole is situated directly in between these two bodies of water (See Map 1.1). As the waters surrounding Woods Hole provided ideal conditions for newly introduced fixed nets to capture fish in bulk, the town of Woods Hole became the center of dispute among Massachusetts fishermen. In the wake of large scale commercialization of fishing, local disputes for conservation in Woods Hole arose. Baird counted 33 weirs, traps and pounds bordering the north and south shores of Cape Cod in 1871. By 1889, 97 weirs, traps and pounds were present and by 1905, 128 lined the Cape Cod coastline.⁶

Opposed to the presence of these traps in coastal waters was a large group of fishermen that followed the age-old technique of line fishing from small boats or the shoreline and that believed there was a stark decline in coastal fish populations following the introduction of traps and pounds.⁷ Also included in this group, were those who had been forced out of maritime trades due to the decline of the merchant marine and whaling industries in the aftermath of the Civil War. Further enraged by the growing presence of traps and pounds were low paid laborers who had previously supplemented their scarce incomes with money earned from shore fishing. Sports and recreational fishermen that enjoyed the fisheries located on the south shores of New England were also in opposition to these fishing apparatuses and their owners. Allard presents this conflict as a “struggle between two types of property owners.”⁸ The men in favor of trapping usually were owners of considerable amounts of land located on the shoreline as well as

⁵ Allard, 69.

⁶ Matthew G. McKenzie, “*Baiting Our Memories: The Impact of Offshore Technology Change on Inshore Species Around Cape Cod, 1860-1895,*” in David J. Starkey, et al., *Oceans Past: Management Insights from the History of Marine Animal Populations* (Earthscan, 2008), 84.

⁷ Allard, 69.

⁸ Allard, 69.

fish dealers that bought these large quantities of fish and supplied them to the mass market. Conversely, line-fishermen generally were laborers attempting to supplement their wages or recreational fishermen whose hobby was disrupted by these advanced fishing apparatuses.

Map 1.1



Des Barres, Joseph F. W. (Joseph Frederick Wallet). "[Buzzards Bay and Vineyard Sound]." Map. 1776. *Norman B. Leventhal Map Center*, <https://collections.leventhalmap.org/search/commonwealth:7h149w46g> (accessed April 09, 2018).

The line fishermen argued that the traps crowded the shorelines taking large quantities of fish. Furthermore, these traps caught fish before they were able to spawn, decreasing the likelihood that the next generation of coastal fish would inhabit the shores of southern New England. As the national market expanded for fresh fish, local trappers defended themselves simply because line fishermen could not service the increasing consumer market. Trappers also referenced notable scientific authority to support their claims. At the time, Professor Thomas H. Huxley from England maintained that oceanic fish were inexhaustible by fishermen.⁹ Trappers believed themselves to be progressive, advancing the fisheries and surpassing outdated fishing methods that were unable to serve the mass market for fresh fish. By 1870, numerous petitions signed by nearly 11,000 people were presented to the Massachusetts state legislature in opposition of the use of fixed traps in coastal waters.¹⁰

While in Woods Hole in the summer of 1870, Baird was witness to this increasing conflict. Allard considers Baird's desire to involve himself in this conflict and ultimately investigate this matter on the basis of science and his career in Washington:

As a representative of the federal government standing above local interests, Baird might be able to bring the states of southern New England into agreement on a regulatory policy. As a scientist, he could perhaps solve the mysteries surrounding the decline of coastal fisheries by posing questions to nature itself, instead of to fishermen and other interested parties. So far as Baird personally was concerned, there were excellent reasons to look into the matter. He was keenly interested in proving the utilitarian value of science.¹¹

Baird's career at the Smithsonian, paired with his passion for science, stimulated a keen interest in this dispute and the growing field of marine biology. Baird felt that his qualifications would allow him to undertake the project of establishing the U.S. Fish and Fisheries Commission with the primary objective to investigate and address the conservation of aquatic resources. Whether

⁹ Allard, 72.

¹⁰ Allard, 73.

¹¹ Allard, 76.

Baird was actually “above local interests” when he was appointed Commissioner is uncertain, due to his experience visiting Woods Hole prior.¹² Baird had already made observations about the fishery conditions and interacted with locals of Woods Hole nearly a decade prior to his appointment. It’s also unclear whether Baird could’ve really posed “questions to nature itself.” At the time of his appointment, Baird had extensive experience as a naturalist. At Dickinson college, Baird held positions of librarian and curator of the college’s natural history collection and served as a professor of natural history. He then became Assistant Secretary of the Smithsonian where he oversaw the establishment of the United States National Museum while managing a large network of collectors in natural history. In 1870, this experience and his overall admiration for natural history qualified Baird to be appointed Commissioner of the U.S. Commission of Fish and Fisheries, but whether he was truly able to pose “questions to nature itself” is uncertain.

Prior to choosing Woods Hole as the permanent site for the U.S. Commission of Fish and Fisheries, Baird conducted extensive research of the fishing grounds of the entire New England Coast.¹³ Baird explored the diverse factors that may have been causing the decline of fish populations in New England throughout his two-year investigation in the region, which he published in his report titled “Report on the Condition of the Sea Fisheries of the South Coast of New England in 1871 and 1872.”

The first section of Baird’s report is titled, “Preliminaries of the Inquiry” where he gives an overview of the importance of United States coastal fisheries and his rationale for selecting

¹² Brian W. Ogilvie, *The Science of Describing: Natural History in Renaissance Europe* (Chicago: University of Chicago Press, 2006).

¹³ Galtsoff, 9.

Woods Hole as the headquarters for the U.S. Commission of Fish and Fisheries. He introduces this section by highlighting the significance of coastal fisheries:

Whether we consider the amount of wholesome food which they yield, the pecuniary value of their products, the number of men and boys for whom they furnish profitable occupation, the stimulus to ship and boat building which they supply, and not the least of all, their service as a school for seamen, from which the merchant-marine, as well as the Navy of the country, derive their most important recruits.¹⁴

Baird points out the importance of these fisheries on a local level within New England as these fisheries provide employment to the male population. He also identifies their significance on a national level by mentioning the importance of food fishes and the use of New England coastal waters in training the United States Navy. In addressing the many uses and resources derived from coastal fisheries, Baird is able to draw attention to his research about the apparent depletion of these fisheries and the larger impacts on New England and the United States in wake of fishery exhaustion.

Baird states that the fisheries had been handled “without reference to the possibility of future exhaustion”.¹⁵ The increase in railroad transportation in the latter half of the nineteenth-century allowed ice packed fish to be transported across the country, thus increasing their demand. The incentive for fisheries then was to obtain the largest supply of fish in the shortest amount of time for transportation in bulk. Baird regarded this sequence as leading to waste and “reckless destruction of the fish”.¹⁶ He included potential consequences of these careless practices, “the impression has become prevalent that the fish themselves are diminishing, and that in time some kinds, at least, will be almost or quite exterminated.”¹⁷ Baird expresses fear for the condition of coastal fisheries in regards to the increasing demand of food fish. Baird writes:

¹⁴ Spencer F. Baird and United States Fish Commission. “Report on the Condition of the Sea Fisheries of the South Coast of New England” [Pt.1 (1871-1872): 1873] VII.

¹⁵ Baird, VII.

¹⁶ Baird, VII.

¹⁷ Baird, VII.

The supply, which formerly greatly exceeded the demand, now, to a certain extent at least and in certain localities has failed; and the impression has become prevalent that the fish themselves are diminishing, and that in time some kinds at least, will be almost or quite exterminated.¹⁸

Baird references potential future extinction of fish populations in consequence of the progressively demanding fish market. He enforces the need to conserve these coastal fish populations by drawing attention to future extinction of certain fish species as an ultimate consequence of the current “reckless destruction.”

Throughout his investigation, Baird attempted to understand causes in the depletion of coastal fisheries in New England. Baird paid particular interest to the local bluefish population in New England, going so far as to dedicate an entire chapter of his report to the bluefish. Generations of local experience with the bluefish in the waters of Buzzards Bay and Vineyard Sound contributed to the testimony Baird received to inform this chapter (See again Map 1.1). Other scholars of environmental history that have focused regionally on Cape Cod or New England have discussed fish species like cod, mackerel, menhaden, shad, and alewives, while almost entirely excluding the bluefish from their narratives.¹⁹ Additionally, these works of coastal environmental histories largely narrate stories of decline, where resources were exploited and eventually depleted. When examining nearly four centuries of bluefish behavior, the story of the bluefish follows a different trajectory than the common coastal environmental history narratives of decline. Because the bluefish is a highly migratory and pelagic predator, scholars and scientists throughout this long period have struggled to fully understand the nature and habits

¹⁸ Baird, VII.

¹⁹ W. Jeffrey Bolster, *The Mortal Sea: Fishing the Atlantic in the Age of Sail* (Cambridge: Harvard University Press, 2012); John T. Cumbler, *Cape Cod: An Environmental History of a Fragile Ecosystem* (Amherst: University of Massachusetts Press, 2015); Mark Kurlansky, *Cod: A Biography of the Fish That Changed the World* (New York: Walker and, 1997); John McPhee, *The Founding Fish*. 1st ed. (New York: Farrar, Straus and Giroux, 2002); David J. Starkey, et al. *Oceans Past: Management Insights from the History of Marine Animal Populations* (Earthscan, 2008).

of the species. In researching the four centuries of scholarship on bluefish in Cape Cod and New England, I found that the species didn't at all fit into the narrative of pre-colonial abundance and then a steep course of decline due to the commercialization of fishing and an overall capitalist market structure. Instead, persistent puzzles about the bluefish reveal drastic fluctuations in population numbers and unexplained periods of disappearance in Southern New England. While fisheries particularly around Cape Cod witnessed periods of steep decline in the colonial era, the bluefish were abundant. Additionally, although Baird included the bluefish population in his claim about overall fishery decline in Southern New England during his investigation, later research revealed that the bluefish were at their peak abundance during that period.

Matthew McKenzie's article "Baiting Our Memories: The Impact of Offshore Technology Change on Inshore Species Around Cape Cod, 1860 – 1895" details a story of the Cape Cod alewife fishery and local intervention. McKenzie discusses common narratives that associate the arrival of European settlers to Cape Cod as a defining moment of change in terms of the conservation of coastal marine resources. McKenzie writes, "While sustenance and sustainability could coexist before the dawn of European and Anglo-American economic relationships, an ecological downturn coincided with the early modern or modern advent of Western-style market capitalism."²⁰ Prior to capitalist market structures brought by Europeans or their Anglo-American descendants, "any incentive for conservation is laid asunder by the appeal of easy profit."²¹ This idea fits into larger environmental history narratives that largely blame European colonists and the advent of capitalist market structures for the exploitation of marine resources and ultimately the beginning of the narrative of decline as marine animals became commodities. McKenzie discusses these traditional narratives but uses the case of Cape Cod's

²⁰ Starkey, 78.

²¹ Starkey, 79.

local population and their attempts to protect the local alewife fishery to challenge the notion that “there was an inevitable tie between expansion of European market systems and the decline of marine resources.”²² The population of Cape Cod held protective attitudes toward their respective fisheries and particularly the alewife fishery for most of the eighteenth century. McKenzie argues that local details and local intervention can’t be overlooked in this instance, “far from a story of inevitable decline, Cape Codders’ management and mismanagement of their local anadromous fisheries reveals the power that local people had over their fisheries resources.”²³ McKenzie emphasizes that “local details matter” when examining histories of coastal fishery management.²⁴

McKenzie writes of Cape Cod’s alewife fishery in the second half of the nineteenth-century:

Like many other marine environmental histories, this story follows a trajectory of expansion and decline: once a fishery is commercially developed, it is only a matter of time before fishers over-exploit and destroy, or all but destroy a once thriving marine ecosystem.²⁵

When examining the condition of Cape Cod’s bluefish fishery during this same period, a very different story was told. In the 1870’s when Baird was conducting his investigation, the bluefish were at their peak abundance, which could possibly account for Baird’s great interest in the species.²⁶ Baird often referenced the bluefish as being equally destructive to surrounding fisheries as the increased presence of local fish traps and pounds. In the conclusions of his report

²² Starkey, 80.

²³ Starkey, 80.

²⁴ Starkey, 79.

²⁵ Starkey, 78.

²⁶ Henry Bigelow and William C. Schroeder, *Fishes of the Gulf of Maine*, (Washington: United States Government Printing Office, 1953), 384.

Baird first confirms the claim that the coastal food fish in southern New England have decreased.²⁷ He goes on to explain this depletion,

The decrease of the fish may be considered as due to the combined action of the fish-pounds or weirs and the blue-fish, the former destroying a very large percentage of the spawning fish before they have deposited their eggs, and the latter devouring immense numbers of young fish after they have passed the ordinary perils of immaturity.²⁸ Baird condemns the increased presence of fishing apparatuses in Vineyard Sound and Buzzards Bay as well as the bluefish as the main causes of depletion among local fisheries. This narrative not only characterizes the bluefish as extremely destructive but also suggests that the bluefish was a type of pest within coastal waters, traveling in large schools and devouring other fish. Yet Baird then writes, “There are no measures at our command for destroying the blue-fish.” Baird clearly acknowledged the lack of human control or “command” over bluefish during his investigation. Furthermore, the language used to depict the predator is entirely different from the way McKenzie described the fragile alewife fishery during this period. Instead of a period of rapid decline, the bluefish witnessed a period of plenty at the expense of their prey fisheries, as Baird describes.

Baird wasn't aware that the bluefish were at their peak abundance during his investigation and although he often mentioned the destructiveness of the bluefish and their large quantities in southern New England's coastal waters, he used his own observations in the Woods Hole area to report what he believed to be a decline in the bluefish population. “I have myself been able to appreciate a very great difference in the abundance of blue-fish in the vicinity of Wood's Hole from 1863 to 1871.”²⁹ From his experience spending summers in Woods Hole, Baird observed a depletion of bluefish in the area in the span of just eight years. Estimates of

²⁷ Baird, XXXVIII.

²⁸ Baird, XXXVIII.

²⁹ Baird, 240.

bluefish populations in the mid twentieth century reveal that their population was at peak abundance when Baird reported his observation of depletion, but it's interesting that Baird offers his own impression of bluefish population numbers. Published in his report, Baird estimated that there were, "one thousand millions [or 1 billion] as occurring in the extent of our coasts referred to, even neglecting the smaller ones, which, perhaps, should also be taken into the account."³⁰ Baird points out that he believed this was a rather low approximate of the bluefish population numbers in southern New England. In 1853, when Henry Bigelow and William Schroeder published *Fishes of the Gulf of Maine*, they commented on Baird's report and wrote that the bluefish annually destroyed at least twelve hundred million millions [or 1 quintillion 200 quadrillion] of fish in the four summer months in the coastal waters of southern New England. More recently, scientists have tried to estimate and detect accurate population numbers for the bluefish as well as the species' fecundity in order to provide proper information to prevent overfishing of the species and promote proper fishery management. Largely, these studies are inconclusive as complications arise when trying to estimate bluefish numbers as the species is a migratory and pelagic species but the fact that these studies are being conducted reveal a curiosity among scientists to gain a more coherent picture of bluefish populations, possibly suggesting a decline in bluefish numbers.

Throughout the four centuries studied here, bluefish populations along the east coast of the United States have changed cyclically. In 1884, George Brown Goode, Baird's assistant, published *The Fisheries and Fishery Industries in the United States*. Goode discussed the importance and interest of the bluefish:

Great interest attaches to this fish in consequence of the changes in its abundance, and even its actual occurrence on our coast, within the historic period. The precise nature and

³⁰ Baird, 242.

extent of the variation has not been established, nor whether it extended along the entire coast or not.³¹

The bluefish constantly perplexed scientists, naturalists and scholars that wrote of the species and its behavior. When looking at the material these people produced, it seems they were unable to fully understand bluefish behavior in a singular lifetime. While local reports were able to account for supposed bluefish migratory patterns maybe one generation prior, it seems the bluefish consistently escaped complete human understanding throughout the four centuries studied here.

Below are two images of bluefish specimens. Mark Catesby (1683-1747), a renowned English naturalist created an illustration of the bluefish in Virginia using watercolor and gouache. Catesby depicts the scales of the fish using hues of blue and accentuates its sharp teeth along the lower jawline (See Figure 1.1). Unlike his other illustrations of birds, Catesby doesn't attempt to naturalize the fish in their natural habitats or with any background. Instead, Catesby creates strict profiles for the fishes that portray them as mere specimens, rather than a species that inhabited a complex aquatic ecosystem. Henry Bigelow and William Schroeder included a sketch of the bluefish in their work *Fishes of the Gulf of Maine* that was published in 1953 (See Figure 1.2). The sketch resembles Catesby's depiction of the fish and similarly doesn't include any background for the fish. Bigelow and Schroeder's work was created as a guide and all sketches incorporated in *Fishes of the Gulf of Maine* exclude a background for the illustrations. Catesby's description of the bluefish was from a naturalist perspective while the sketch that Bigelow and Schroeder include in their work seemed to be included simply to identify the fish. Both images give no indication of the habitat the bluefish existed or any of its behaviors. Instead of a natural history or environmental history of the bluefish, this thesis provides an intellectual history of the species in Southern New England.

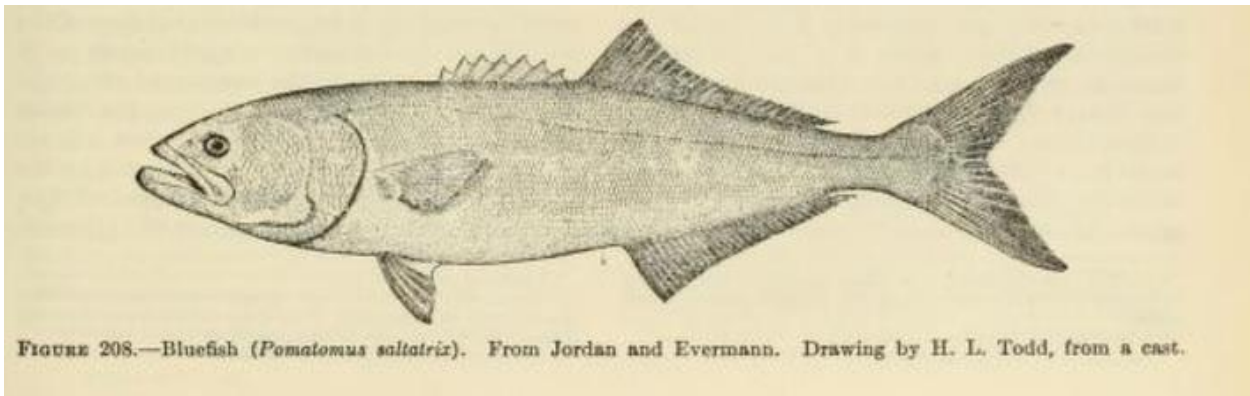
³¹ George Brown Goode, *The Fisheries and Fishery Industries of the United States, Volume 1, Issue 1* (U.S. Government Printing Office, 1884), 435.

Figure 1.1



McBurney, Henrietta., Windsor Castle. Royal Library, and Museum of Fine Arts, Houston. *Mark Catesby's Natural History of America : The Watercolors from the Royal Library, Windsor Castle* (London: Merrell Holberton, 1997), 79.

Figure 1.2



Bigelow, Henry and William C. Schroeder, U.S. Fish Wildlife Service, Woods Hole Oceanographic Institution, and United States. Bureau of Biological Survey. *Fishes of the Gulf of Maine*. 1st Revision. ed. Fishery Bulletin (U.S. Fish and Wildlife Service); 74. (Washington: U.S.G.P.O., 1953), 383.

This thesis examines people's responses to and documentation of bluefish behavior in southern New England from the middle of the eighteenth-century to the present period. I visited the Smithsonian Institution's archives and examined Spencer Baird's papers while also visiting the Woods Hole Historical Society to gather archival material for this thesis. Additionally, I closely read and interpreted key portions of Baird's published writings. The bluefish were

important characters in events that took place in Southern New England over the course of the eighteenth to twenty-first centuries. In 1764, the bluefish were supposedly connected to an epidemic that killed two hundred and twenty-two Native Wampanoags that lived on Nantucket. A century later, the bluefish were central to Baird's report and his understanding of coastal fisheries in New England. In the twentieth century, bluefish behavior continued to confuse scientists while they were consistently portrayed as a vicious predator in the sea. Recently, scientific studies have gained a better understanding of the species' migratory patterns and general habits, but there are still large gaps in scholarship and comprehension of the bluefish.

By examining bluefish behavior over four centuries in New England, a unique environmental history is uncovered that extends across larger fields of knowledge. This thesis includes elements of Indigenous, environmental and scientific histories.³² The bluefish exposed greater topics throughout my research that included dynamics between local knowledge and larger scale national conservation efforts, the development of notions of pests, the threat of predators like bluefish on coastal fisheries, the depletion of resources and questions over causation, and the widespread anxieties about industrialization. Most importantly, over the

³² For Native American History, see Lisa T. Brooks, *The Common Pot: The Recovery of Native Space in the Northeast* (University of Minnesota Press, 2008); Jean M. O'Brien, *Firsting and Lasting: Writing Indians out of Existence in New England* (University of Minnesota Press, 2010); Alix Cooper, *Inventing the Indigenous: Local Knowledge and Natural History in Early Modern Europe* (Cambridge, New York: Cambridge University Press, 2007).

For Environmental History, see Jeffrey W. Bolster, *The Mortal Sea* (Harvard University Press, 2012); John T. Cumbler, *Cape Cod* (University of Massachusetts Press, 2015); David J. Starkey, et al. *Oceans Past: Management Insights from the History of Marine Animal Populations* (Earthscan, 2008); Mark Fiege, *The Republic of Nature: an Environmental History of the United States* (University of Washington Press, 2012) Theodore Steinberg, *Down to Earth : Nature's Role in American History* (Oxford University Press, 2002).

For History of Science, see Helen M. Rozwadowski, *Fathoming the Ocean: The Discovery and Exploration of the Deep Sea* (Cambridge, Mass.: Belknap Press of Harvard University Press, 2005); Londa L. Schiebinger, *Plants and Empire: Colonial Bioprospecting in the Atlantic World* (Cambridge, Mass.: Harvard University Press, 2004); Donald Worster, *Nature's Economy: a History of Ecological Ideas*. 2nd ed., (Cambridge University Press, 1994).

course of centuries, the bluefish consistently provoked questions about agency of depletion and control in regards to southern New England's coastal fisheries. Included in discussion of the local bluefish species was always a developing conversation about agency and who was to blame for destruction or diminution of surrounding fisheries. Baird identified the combined efforts of the bluefish and fishermen with advanced fishing apparatuses as the main cause of depletion among coastal fisheries of Cape Cod but never resolved the ambiguity about which was most important.

By closely examining discussions about bluefish throughout four centuries this thesis reveals the extent and limits of human knowledge of marine environments and aquatic species. Narratives about New England's bluefish population in the century before Baird's investigation largely focus on nature's agency in the event of Nantucket's Native epidemic and period of bluefish disappearance. Baird's investigation focused on the combined efforts of human and natural agents when examining the depletion of fisheries in Southern New England. Interestingly and rather uniquely to the bluefish species, scholars and scientists since Baird, have highlighted natural agency again in discussion of the bluefish while leaving out human agency. Marine environments continue to present challenges for scientists to examine and understand entirely. Species like the bluefish prove to be particularly challenging due to their large distribution and migration habits. Because of these characteristics, scientists today still struggle to comprehend reproductive capacities and accurate global population numbers of the bluefish and similar migratory, pelagic marine species.

One

The Diseased Bluefish?

The Nantucket epidemic of 1763-1764 and the disappearance of the local bluefish

In 1764, a period of great mortality among the Indians of that Island. It has been suggested that the disease which attacked the Indians may have been in consequence of an epidemic in the fish upon which they fed, or else that it invaded both fish and Indians simultaneously, resulting in almost their entire extermination.

- Spencer Fullerton Baird

From August 16th 1763 to February 16th 1764, what was reported as an “uncommon mortal distemper” struck the native Wampanoag population of Nantucket.³³ Zaccheus Macy, a descendent of one of the first English colonists to settle on Nantucket, recounted this epidemic in 1794, producing one of the first known written record of the disease. Macy reported that two hundred and twenty-two of the existing three hundred and fifty-eight Native people died in the six months that the epidemic lasted on the island.³⁴ In the nearly four centuries since the epidemic occurred, few accounts have provided explanations for this distemper. Governor Oliver of the Massachusetts Bay Colony reported the event in a letter to London where he emphasized the unique Indian susceptibility to the disease. He noted, “what is still more remarkable than even the great mortality of the distemper is, that not one English person had it on either of the islands.”³⁵ While two hundred and twenty-two Natives died on Nantucket, thirty-nine of the fifty-two infected Natives on Martha’s Vineyard contracted the disease and also died. Governor Oliver clearly ties the disease to ideas about susceptibility and race while Macy offers a different explanation. Macy noted that the same year the sickness on the island stopped spreading was the same year the bluefish disappeared from Nantucket’s coastal waters. In 1800, Noah Webster

³³ Zaccheus Macy, Collections of the Massachusetts Historical Society. ... ser.1, v.3 (1794) 158-159.

³⁴ Zaccheus Macy, 158-159.

³⁵ Donald Pelrine, “Indian Sickness in the Town of Miacoment.”

made note of the relationship between the mortality among Wampanoags on Nantucket and the disappearance of the local bluefish population occurring simultaneously and deemed it “a remarkable fact.”³⁶ In 1873, when Spencer Baird published his “Report on the Condition of Sea Fisheries of the South Coast of New England in 1871 and 1872” he again linked the Native population of Nantucket to the local bluefish population, suggesting that the bluefish either brought the disease to the Native population or that the two populations were infected simultaneously.³⁷ In her article, “The Nantucket Indian Sickness” Elizabeth Little suggests that the distemper among the Wampanoag population was yellow fever, making no mention of the disappearance of bluefish at the time.³⁸ Though the disease hasn’t been identified, the many explanations for the distemper and the unusual connection to the bluefish population reveal people’s changing but limited understandings of the bluefish species and the Indigenous Wampanoags in Nantucket.

This event raised various questions about natural and human agency particularly pertaining to the bluefish population and the Wampanoag population of Nantucket. What was this unknown disease and why was there an exclusively Native susceptibility to it when European settlers were surely in contact with it? Why was the bluefish disappearance connected so closely with the epidemic of Wampanoags on the island and what did that association reveal about the relationship between the two populations? Did this event spark an enduring narrative of the bluefish as a problematic and controversial species? And why has this event received little attention after Baird’s mention of it in his investigation?

³⁶ Noah Webster, *A Brief History of Epidemic and Pestilential Diseases with the Principal Phenomena of the Physical World, Which Precede and Accompany Them, and Observations Deducted from the Facts Stated*, Vol 2. (London: G.G. and J. Robinson, Paternoster-Row, 1800), 159.

³⁷ Spencer F. Baird and United States Fish Commission. “Report on the Condition of the Sea Fisheries of the South Coast of New England” [Pt.1 (1871-1872): 1873]. 237.

³⁸ Elizabeth A. Little, “The Nantucket Indian Sickness”, 185.

In the late 1640s, Thomas Mayhew traveled to Nantucket, an island roughly thirty miles south of Cape Cod as a missionary from Martha's Vineyard and Massachusetts. Mayhew and his family had come to Massachusetts from England a decade prior. Upon arrival on the island of Nantucket, Mayhew encountered over three thousand Indigenous people living there. The Natives living on Nantucket were a part of the Wampanoag tribe that inhabited present day Rhode Island and southeastern Massachusetts including Cape Cod and Martha's Vineyard. The island's sandy soil wasn't ideal for the harvesting of crops, but the Wampanoags subsistence largely depended on the animals they could hunt and fish from the ponds and shorelines.

Thomas Macy was among the nine English settlers that purchased Nantucket from Mayhew. Thomas's grandson, Zaccheus Macy (1715-1797) wrote a detailed account of Nantucket and includes one of the first references to the epidemic that devastated the Wampanoag population on island from 1763 to 1764. Macy begins with a "Description of the Island" where he discusses a decrease in the in settlers' profits in the farming business. Macy focuses on the "Indian corn" as an example of crop reduction on the island, "Since my time, we called it only a milling crop, when we got from eighteen to twenty bushels of Indian corn from an acre. But now, when we get from five to fourteen bushels, we esteem it a tolerable crop."³⁹ Macy then discusses a decline in livestock on the island, primarily focusing on profits from the sheep population. Macy writes,

The rule of our old men was, when they had a hundred lambs, they would kill fifty sheep that year and leave fifty lambs to keep their stock good, and it would generally do it. But for ten or twelve years past, when we have a hundred lambs if we kill thirty sheep, and leave seventy lambs, it will not keep our stock good.⁴⁰

Macy reveals a narrative of decline among crops and livestock in his "Description of the Island."

When discussing the sheep population, Macy describes the long-time preservation system in that

³⁹ Zaccheus Macy, 158.

⁴⁰ Zaccheus Macy, 158.

was in place to maintain a steady sheep population on the island. Published in 1794, Macy points out the failure in this system for the past ten to twelve years. After introducing a framework of decline in profits and livestock and crop populations, Macy continues by referencing the 1763-1764 epidemic on Nantucket that devastated the Indian population. He includes this reference in the section of his account titled “Of the Indians” where he discusses their kind and welcoming nature. He mentions the “good food and very good strong beer” the Wampanoags often offered the settlers.⁴¹ Macy then writes:

By drinking rum their numbers were so much reduced that in the year 1763, there were but three hundred and fifty eight left on the island. In that year an uncommon mortal distemper attacked them. It began the 16th of the eighth month, 1763, and lasted till the 16th of the second month, 1764. During that period two hundred and twenty-two died. Thirty-four were sick and recovered. Thirty-six who lived among them, escaped the disorder. Eight lived at the west end of the island and did not go among them: none of them caught the disease. Eighteen were at sea. With the English lived forty, of whom none died.⁴²

Macy begins by recounting a great loss of the indigenous population that occurred between August 16th 1763 and February 16th 1764. He first mentions that the Native population had already decreased when the epidemic struck, alluding to the abuse of alcohol and great consumption of rum. Introducing the epidemic in this way, Macy insinuates that the Wampanoag population could have been particularly susceptible to disease because of alcohol abuse. By mentioning their supposed alcohol dependency, Macy also suggests that the rapid decline of the Nantucket Native population was of less importance because of their already apparent shrinking population. From mid-August 1763 to mid-February 1764, two hundred and twenty-two of the existing three hundred and fifty-eight Indians died. Macy points out that none of the English settlers caught the disease and the Wampanoags that lived with English were able to escape

⁴¹ Zaccheus Macy, 158.

⁴² Zaccheus Macy, 158-159.

mortality as well. Macy's account implies that the English, and the Natives most closely associated with them had the natural ability to avoid disease.

Donald Pelrine's article, "Indian Sickness in the Town of Miacomet" includes the first accounts from Governor Andrew Oliver of the Massachusetts Bay Colony about the epidemic. Governor Oliver reported the sickness from Boston to London in October 1764. He describes an, "uncommon sickness which prevailed last year at the islands of Nantucket and Martha's Vineyard which lie about six or seven leagues distant from the Indian plantation of Mashpee on the Continent, where it did not make its appearance at all."⁴³ Governor Oliver reports that the sickness arrived in Martha's Vineyard in December 1764, months after it arrived in Nantucket. Oliver doesn't report the total number of Natives on Martha's Vineyard but states that out of the fifty-two Indians who had contracted the sickness, thirty-nine died.

The Governor went on to describe the sickness while including ideas of race and susceptibility:

The appearance of the distemper was much the same in both islands; it carried them off in each, in five or six days. What is still more remarkable than even the great mortality of the distemper is, that not one English person had it in either of the islands, although the English greatly exceed in numbers; and that some persons in one family who were of mixt breed, half Dutch and half Indian, and one in another family, half Indian and half Negro, had the distemper, and all recovered; and that no person at all died of it, but such as were intirely of Indian blood. From hence it was called the Indian Sickness.⁴⁴ Oliver points out how "remarkable" it is that the English settlers of both islands didn't contract the sickness. This excerpt reveals interesting notions about race in the eighteenth century. Oliver states that while English colonists didn't fall sick, some people that were "of mixt breed" succumbed to the sickness but were able to recover. The epidemic was only fatal to full blooded Wampanoags, adding to greater narratives about diminishing Native populations across the

⁴³ Donald Pelrine, "Indian Sickness in the Town of Miacomet."

⁴⁴ Pelrine, "Indian Sickness in the Town of Miacomet."

region. Jean O'Brien discusses popular ideas about blood and genealogy that enforced one's status in colonial New England.⁴⁵ This ideal contributed to popular narratives about "the last full blooded Indian." O'Brien claims that the obsession and rhetoric of blood, "conveyed deep meaning about the identity of New Englanders and the claims they could make."⁴⁶

Another member of the Macy family, mentioned the epidemic in 1835. Obed Macy (1755-1844) wrote:

The whites, apprehensive that the disorder would spread among themselves, were at first cautious in approaching the sick, but they at length found that the natives only were affected by it, for how much soever they exposed themselves, not one was taken sick.⁴⁷ Like Zaccheus, Obed reinforces the claim that only Natives were targeted by this disease although white colonists had considerable contact with the disease.

Elizabeth Little's article published by the Nantucket Historical Association titled, "The Nantucket Indian Sickness" discusses the mysterious epidemic that "effectively destroyed the Nantucket Indian Community."⁴⁸ Little elaborates on the symptoms of the epidemic. Reports of victims noted their jaundice, considerable pain and high fevers.⁴⁹ Assumptions of the cause of the epidemic varied. Governor Oliver attributed the illness to a combination of the shortage of corn on the island and the unusually cold and wet summer of 1763. By 1797, the origin of the sickness was thought to have arrived by a brig from Ireland with sick or dead passengers and crew members. Little discredits hypotheses that suggest the illness was measles or smallpox because, "colonial English, and especially islanders, were susceptible to such well known diseases."⁵⁰ Little makes a case that the disease was yellow fever:

⁴⁵ O'Brien, 126.

⁴⁶ O'Brien, 126.

⁴⁷ Elizabeth A. Little, "The Nantucket Indian Sickness", 184.

⁴⁸ Little, 181.

⁴⁹ Little, 184.

⁵⁰ Little, 184.

In the 18th-century major yellow fever epidemics occurred near the wharves in port cities on the east coast as ship-born commerce with the West Indies increased. In 1762, only a year before the Nantucket epidemic, there was a yellow fever epidemic in Philadelphia, and major yellow fever epidemics occurred in 1793 at Philadelphia, and at Providence in 1797.⁵¹

To this day, the disease has yet to be identified but there is significant discussion about the epidemic that contributes to greater narratives of disease among Natives in the Northeast in the early colonial period. Little writes, “There has been much speculation about the identity of this disease and the uniquely Indian susceptibility to it.”⁵² Published in 1990, Little again references the “uniquely Indian susceptibility” to the disease like earlier accounts.

Donald Pelrine’s article, “Indian Sickness in the Town of Miacoment” additionally includes a supposed vision by a Nantucket Wampanoag elder just before the epidemic struck. Pelrine writes, “On a certain day, he appeared before the pawpaws outside of the Sachem’s wigwam. He told of a vision that appeared to him, a sorrowful foretelling of future events.”⁵³

The elder apparently warned:

A great canoe filled with white men who came from afar will appear on our shores. There is a sickness on that canoe which will spread among our people and overcome them. Many will die, the old and young alike. When this time comes to pass, the bluefish that leap in our waters will swim out to the horizon. They will not be caught again to feed the bellies of the hungry.⁵⁴

This supposed myth reveals an interesting narrative about Wampanoag attitudes to the epidemic. According to this vision, the elder predicted that the European settlers would carry a disease that would devastate the Wampanoag population on the island. Whether or not this prophecy was actually reported before the epidemic struck, the fact that it has persisted after centuries likely suggests that Wampanoags largely blamed the English settlers for bringing disease to Nantucket.

⁵¹ Little, 186.

⁵² Little, 181.

⁵³ Pelrine, “Indian Sickness in the Town of Miacoment.”

⁵⁴ Pelrine, “Indian Sickness in the Town of Miacoment.”

Furthermore, the vision predicted that the bluefish would disappear at the same time the disease hit the island.

Other accounts have supported the claim that the epidemic was associated with the temporary disappearance of bluefish in Nantucket's coastal waters. Zaccheus Macy's account goes on to connect this rare "mortal distemper" to Nantucket's coastal bluefish population:

Before this period, and from the first coming of the English to Nantucket, a large fat fish, called the blue fish, thirty of which would fill a barrel, was caught in great plenty all round the island, from the 1st of the sixth month till the middle of the ninth month. But it is remarkable, that in the year 1764, the very year in which the sickness ended, they all disappeared, and that none have ever been taken since. This has been a great loss to us.⁵⁵ Macy references the bluefish population's great abundance from English settlement on the island in 1659 to 1764 and its sudden decline when the disease was introduced to the island. As Macy tells it, bluefish ceased to exist in the waters surrounding Nantucket in 1764, the same year that the sickness that had devastated the native population concluded. Macy's account sites the disappearance of the bluefish as being "a great loss" to the English settlers on Nantucket, suggesting that they consumed the fish but avoided the sickness that the bluefish potentially brought to the Native population. Macy reveals an interesting connection among Nantucket's coastal bluefish population and the Wampanoags on the island, drawing on ideas that the Native population had a significant relationship to the island and its surrounding waters and fisheries. Macy's account prompts questions on the carrier of disease and why the two populations simultaneously disappeared from the island. He somehow suggests that the bluefish could've been the bearers of deadly disease to the Natives on the island, who had a unique susceptibility to them likely after consumption of the fish. Interestingly, the bluefish aren't referenced as dying

⁵⁵ Zaccheus Macy, 159.

because of the disease they bore, but instead they're noted as disappearing from the island somehow because of the great mortality of the Wampanoag population.

In 1800, Noah Webster published *A Brief History of Epidemic and Pestilential Diseases, with the Principle Phenomena of the Physical World Which Precede and Accompany them, and Observations Deducted from the Facts Stated*, contributing to colonial knowledge on disease. Webster expounds on the diminution of aquatic animals in the second half of the eighteenth-century in various locales in the United States. Webster details the effects of fish populations as a result of an earthquake that struck the American coast, “some whales and multitudes of cod were killed, and seen afterwards floating on the water.”⁵⁶ After illustrating this grim scene, Webster mentions the epidemic on Nantucket and the disappearance of bluefish almost a decade later. Webster writes, “The disappearance of the blue fish from Nantucket in 1764, just after the great mortality among the Indians, is a remarkable fact.”⁵⁷ A decade after the Nantucket epidemic and disappearance of the bluefish, Webster goes on to discuss the disappearance of oysters nearby in Wellfleet, MA. “Not less singular was the sickness and extinction of the Wellfleet oysters, in 1775, the year of a fatal dysentery in America.”⁵⁸ When discussing the events in Nantucket and Wellfleet, Webster reveals a connection among the distempers in fish populations and human populations. He mentions another similar instance, “Still more remarkable was the sickness or ill state of the cod fish taken on the banks of Newfoundland, in the year 1788. They were thin, unfit for use, and when preserved, turned to a blue or dark colour.”⁵⁹ Webster concludes by referencing Aristotle, “no pestilential disease appears to affect all kinds of fish; but that these animals are subject to sickness, which is known by their being thin, and not changing their

⁵⁶ Webster, 159.

⁵⁷ Webster, 159.

⁵⁸ Webster, 159.

⁵⁹ Webster, 159.

colours.”⁶⁰ Webster reinforces Aristotle’s claim that no pestilential or infectious diseases affect all fish populations but sick or infected fish could be observed by being thin or and not changing color. Interestingly, none of these observations are mentioned in the case of the bluefish of Nantucket. When discussing the epidemic of Wampanoags on Nantucket and coastal bluefish populations, the bluefish aren’t depicted as physically changing in anyway, only disappearing from the island’s coastal waters.

Spencer Baird, while conducting his two-year investigation of sea fisheries on the South Coast of New England referenced Zaccheus Macy’s original account of the epidemic. Baird’s report, published in 1873, interprets Macy’s account in a natural history of the bluefish species:

The blue-fish were very abundant about Nantucket in 1659 to 1763, and were taken in immense numbers from the 1st of June to the middle of September. They all disappeared, however, in 1764, a period of great mortality among the Indians of that Island. It has been suggested that the disease which attacked the Indians may have been in consequence of an epidemic in the fish upon which they fed, or else that it invaded both fish and Indians simultaneously, resulting in almost their entire extermination.⁶¹

Macy and Baird’s accounts, over seventy years apart, suggest an intertwined connection between the Native Americans on Nantucket and their local bluefish population. Baird suggests that the bluefish were the cause of this mortality among the native population, incriminating the bluefish as a carrier of a deadly disease. His other supposition is that the natives and bluefish contracted the same sickness that desolated the indigenous people of Nantucket while simultaneously wiping out the local bluefish population. This account seems incomplete when examining earlier mentions of bluefish throughout New England.

John Josselyn’s, *New England Rarities 1672*, discusses the “blew-fish or horse.”⁶² He writes, “I did never see any of them in England. They are big, usually, as the salmon, and better

⁶⁰ Webster, 159.

⁶¹ Baird, 237.

⁶² John Josselyn, *New-England’s Rarities Discovered*, (Duke University Libraries: 1860), 228.

meat by far. It is common in New England, and esteemed the best sort of fish next to rock-cod.”⁶³ Again, Josselyn mentioned the bluefish in 1673 when he wrote *An Account of Two Voyages to New-England*. He discusses the fishing habits of Natives in New England, “their fishing followes in the spring, summer, and fall of leaf. First for Lobsters, Clams, Flouke, Lumps, or Podles, and Alewives, afterwards for Bass, Cod, Rock, Blew-Fish, Salmon and Lampres.”⁶⁴

Josselyn’s and Macy’s early accounts of bluefish abundance in New England and Nantucket would suggest that seventeenth and eighteenth century New Englanders, including European settlers, ate bluefish. Their alleged abundance in the region and the comments made by Josselyn about their meat and taste indicate that the bluefish would’ve been a valuable source of food during this period. Macy’s account cites the disappearance of the bluefish as being “a great loss” to the Nantucket settlers, suggesting that they consumed the fish. Baird’s mention of bluefish causing an epidemic among the indigenous population of Nantucket or the two populations simultaneously being effected by the same disease entirely excludes mention of the English settlers on Nantucket that likely consumed the bluefish but were unaffected by the disease they carried.

In *A Brief History of Epidemic and Pestilential Diseases, with the Principle Phenomena of the Physical World Which Precede and Accompany them, and Observations Deducted from the Facts Stated*, Webster discusses a similar instance in New England from 1793 to 1794, thirty years after the epidemic on Nantucket. While one of Baird’s suppositions about the bluefish and the epidemic on Nantucket is that the bluefish carried the disease to Wampanoags who consumed

⁶³ Josselyn, 228.

⁶⁴ Josselyn, 305.

the fish and somehow had a unique susceptibility to the disease, Webster writes in 1800 about a diseased New England oyster population that infected humans who ate them. Webster writes,

In the years 1793-4, the oysters on the coast of Connecticut and Rhode Island were all sickly, watery, and tasteless, and wholly unfit for food; and, in some instances, brought on nausea or sickness in those who ate them.⁶⁵

Close by in Connecticut and Rhode Island, people like Webster were able to identify a connection among the oyster disease and disease among humans who ate them over seventy years before Baird published his report. Though the disease wasn't fatal to the humans in Connecticut or Rhode Island, it's significant that Macy, Webster and Baird all seem to suggest similar ideas about diseased fish populations and their connection to humans who interact with them.

Webster again provides a similar occurrence where fish populations and humans were infected at the same time in 1797. He writes,

In 1797 multitudes of small dead fish floated down James River in Virginia. It is remarkable that, in the summer following, all the country from Norfolk to Philadelphia, the very latitudes through which that river passes, was very sickly' Norfolk, Baltimore, Philadelphia were all afflicted with the bilious plague.⁶⁶

Webster continuously discusses instances where fish and human populations seem to have been affected by severe diseases, similar to the bluefish and the Wampanoags of Nantucket. In this occurrence depicted by Webster, the relation between the "small dead fish" and the inhabitants of Norfolk, Baltimore and Philadelphia are less clear as he doesn't point out that these inhabitants consumed diseased fish. Instead, Webster points out that the fish died prior to the infection of humans in these cities. Webster's instances of disease among the Wellfleet oyster population and the occurrence of dying fish in the James River and their relation to human populations differ slightly from Macy and Baird's account of the bluefish and Wampanoags on

⁶⁵ Webster, 160.

⁶⁶ Webster, 160.

Nantucket. In Webster's two detailed instances, the shellfish or fish are diseased before the humans are inflicted with illness. Macy's first account of the bluefish disappearance on Nantucket suggests that the bluefish disappeared after the death of a significant portion of the Wampanoag population, when the disease stopped spreading on the island. While Baird supposes that the bluefish could've carried disease to the Natives on Nantucket, he also surmises that a disease could've affected both populations simultaneously. Though Baird's speculation that the bluefish was the carrier of deadly disease, his other supposition about disease inflicting both populations simultaneously and Macy's original account about the bluefish disappearing after the disease spread on the island don't implicate the bluefish as the bearer of disease on the Wampanoag population on Nantucket.

Webster concludes his section on epidemics and disease in fish and human populations with a point about disease in the water and air and a supposed relation between the two environmental spheres.

The reader cannot fail to remark here the correspondence in place between the epidemic diseases in the water and the air; the fish and the human race, in contiguous regions, being diseased about the same time: a fact too remarkable to be permitted to escape particular observation.⁶⁷

Webster reveals an extremely interesting, but not entirely explained association between diseases in the water or among fish and diseases that are in the air that impact the human race.

Pelrine's article concludes by mentioning the supposed last of the Natives on Nantucket and the return of the bluefish. Pelrine argues that in the mid-nineteenth century the last Wampanoag on Nantucket died and not long after, bluefish returned to the western coast of Nantucket. He writes, "Ninety years later Abram Quarry, the last homeowner on the island to be acknowledged as a Native American, died. Shortly thereafter, three bluefish were caught off

⁶⁷ Webster, 160.

Madaket.”⁶⁸ Whether Quarry identified himself as Wampanoag is unclear, but the population of Nantucket seemed to regard him as the “last” of the island’s Natives. Jean O’Brien’s book *Firsting and Lasting* discusses the phenomenon of “lasting” that existed in the nineteenth-century narration about Indigenous peoples of the Northeast. O’Brien argues that local narratives often pointed out the idea of decreasing populations of Indigenous people by using rhetoric like “the last Indian” which influenced larger narratives of the Northeast and the United States, virtually writing Natives out of existence during this period.⁶⁹ In particular, an epidemic that killed 222 of the 358 Wampanoags on Nantucket reinforced popular European contentions that Native populations were somehow diminishing across the Northeast. While Jean O’Brien’s idea of lasting suggests a rather slow and prolonged decline of Native populations in the Northeast, narratives of the Wampanoag population on Nantucket reveal a rapid decline or “lasting” as the majority of their population died in the six months that the epidemic lasted on the island. Quarry’s death was believed to instigate the return of the bluefish to Nantucket’s waters as he was regarded as the “last” of the Wampanoags on the island.

Little includes discussion on the conditions in Nantucket during 1763 and 1764 that likely contributed to the spread of disease on the island. Little argues that she can’t dismiss ideas that the sickness was typhus, smallpox, bubonic plague or a combination of these diseases. She does include a more in depth discussion and argument for yellow fever when examining records of climate and trade in the 1760s on Nantucket. With similar climate to Philadelphia, Little suggests that the “Indian Sickness” on the island resembled the yellow fever epidemic that occurred in Philadelphia in 1763.⁷⁰ Little writes:

⁶⁸ Donald Pelrine, “Indian Sickness in the Town of Miacoment.”

⁶⁹ Jean M. O’Brien, *Firsting and Lasting Writing Indians out of Existence in New England*, Indigenous Americas (Minneapolis, Minn.; London: University of Minnesota Press, 2010), 107.

⁷⁰ Little, 186.

By using content analysis on the diary kept by John Winthrop of Cambridge between 1743 and 1779, W.L. Baron has been able to show that the summer of 1763 was cool and rainy, the fall was cool and clear, and the winter, December, January and February was exceptionally warm. Additional data would be welcome, but we have no reason to reject a yellow fever hypothesis in 1763-1764 because of the temperature.⁷¹

Little argues that these exceptionally warm temperatures in the winter of 1763-1764 could account for the lasting presence of disease carrying mosquitos on Nantucket. Little also discusses whaling ports in the West Indies in the eighteenth-century. In 1763, whaleships from Nantucket with Native crewmen began trading off the coast of West Africa where yellow fever was endemic.⁷² Little offers evidence of a yellow fever striking Nantucket in 1763 and 1764 while other historians have provided evidence for alternative illnesses.

Native survivors of the illness were listed by Macy as, “18 at sea, 34 who recovered, and 84 on the island who did not catch the sickness for a total of 136.”⁷³ Little argues that the 18 Natives at sea were likely adult whalers or fishermen. When evaluating Baird’s account, its interesting that the Native men that interacted closely with the fisheries didn’t contract the illness. Little doesn’t include discussion on the disappearance of the bluefish as correlating to the Nantucket epidemic but the inclusion of temperature changes during the period of 1763 and 1764 provides insight into the migratory patterns of the bluefish population. Her exclusion of the Wampanoag epidemic as somehow being connected to the bluefish disappearance suggests that she rules out the likelihood of there being a correlation between the two incidents because she cites Macy’s original account of the epidemic multiple times. Additionally, Little didn’t include Baird’s investigation in her references for this article.

⁷¹ Little, 186.

⁷² Little, 187.

⁷³ Little, 187.

Recent scientific studies of the bluefish have described its habits as a species as being, “a cosmopolitan, migratory, pelagic predator.”⁷⁴ This particular scientific study also notes the differing ranges in bluefish throughout history:

The contemporary distribution of bluefish is coincident with sea surface temperatures of 18-27 degrees Celsius (64-80 degrees Fahrenheit), and it has been suggested that shifts in its ranges and contacts between populations have resulted from historical changes in water temperature.⁷⁵

Published in 1953, Bigelow and Schroeder’s *Fishes of the Gulf of Maine*, an oceanographic and biological survey of the Gulf of Maine described the migratory patterns of the bluefish when examining their preferred water temperature. As a migratory species, the bluefish are described by Bigelow and Schroeder as:

Creatures of warm water, never found in any numbers in temperatures lower than about 58 to 60 degrees (at least in summer); and they appear along the United States coast as warm-season migrants only.⁷⁶

Though Little referenced an exceptionally warm climate in the winter of 1763-1764 that could’ve allowed for the prolonged presence of infected mosquitos, temperature records from John Winthrop’s diary during this time revealed colder summers than usual. While the bluefish are described as “creatures of warm water”, the drop in temperatures in the summer months could explain the disappearance of the bluefish in Nantucket’s surrounding waters coinciding with the introduction of the epidemic.

After disappearing from Nantucket’s surrounding waters in 1764, testimony that Baird received affirmed that the bluefish disappeared from Woods Hole not long after, in 1780 or 1790.⁷⁷ In the absence of the bluefish, it was noted in Baird’s report, that the scup first made

⁷⁴ Miralles, Laura (2014) Paleoclimate Shaped Bluefish Structure in the Northern Hemisphere, Fisheries, 597.

⁷⁵ Miralles, 597.

⁷⁶ William C. Schroeder, *Fishes of the Gulf of Maine*, (Washington: United States Government Printing Office, 1953), 384.

⁷⁷ Baird, 238.

their appearance in Woods Hole.⁷⁸ Mr. J.C. Parker of Falmouth attested in testimony given to Baird that, “the first blue-fish seen at Wood’s Hole in this century was taken in July, 1831.”⁷⁹ Baird reinforces this and writes in his report, “they are also noted as having shown themselves at the head of Buzzard’s Bay in 1830 and 1831, and although numerous, were of small size, measuring about a foot in length.”⁸⁰ The bluefish return to Buzzards Bay in great abundance after their disappearance forty or fifty years earlier but in smaller size.

David Storer goes into detail about the return of the bluefish within Cape Cod’s coastal waters in *A History of the Fishes of Massachusetts* published in 1855. Storer references Macy’s account of the bluefish and Native peoples on Nantucket noting that, “for a long series of years it disappeared from our waters.”⁸¹ Storer’s account coincides with testimony that Baird received about when the bluefish returned to New England’s coastal waters and Buzzards Bay in particular. He writes, “occasionally, for the last thirty years, a few straggling specimens, very small, have been taken, but they were rarely seen until within the last fifteen years.”⁸² Written in 1855, Storer’s account cites bluefish as being regularly visible to New England waters around 1830, consistent with Baird’s later testimonies. Storer goes on to say that from 1830, the bluefish:

have gradually increased in numbers, and, generally speaking, have been of much larger size than when they were first observed. Now they visit the coast south of the Cape, at Buzzard’s Bay, the Vineyard Sound and Nantucket, in large numbers; and also Massachusetts Bay as far as Boston from the wharves of which city I have observed specimens to be taken yearly since September, 1844.⁸³

⁷⁸ Baird, 238.

⁷⁹ Baird, 238.

⁸⁰ Baird, 238.

⁸¹ Storer, David Humphreys, 1804-1891. *A History of the Fishes of Massachusetts*, (Boston, 1855), 160.

⁸² Storer, 161.

⁸³ Storer, 161.

Increasing in quantity and size, local people noted that the bluefish returned to coastal New England in the years after 1830. Fisherman and local fish merchants likely realized the increased presents of bluefish in their waters as their prey species began to diminish.

Storer writes about an instance in 1846 in Falmouth where the bluefish devastated the local herring and mackerel fisheries:

Its food is herring and mackerel, and when it appears these fisheries are destroyed. Thus, in March, 1846, the herring fishery on the south side of Falmouth was spoiled by the ravages of this species. On the night of the 27th of June, 1847, Captain Atwood caught in his mackerel-nets two large blue-fish. He fished but two more nights that season; - the blue-fish had driven the mackerel entirely from the coast. From that time until now, 1853, the mackerel fishery at Provincetown has been ruined.⁸⁴

Storer alludes to the bluefish as an entirely destructive species by referencing their appearance among the herring and mackerel fisheries in Falmouth where the fisheries were completely demolished. Captain Atwood of Provincetown, who was later included in Baird's report cites the destruction of mackerel in his fishing nets due to only two bluefish. Storer argues that from that instance in 1847 until 1853 the mackerel fishery in Provincetown had been ruined. Not only is the bluefish mentioned as viciously preying on the mackerel, but Storer argues that the local mackerel population has been entirely driven off the northern coast of Cape Cod by the presence of just the few bluefish that had targeted the Provincetown mackerel fishery. Storer uses two instances that occurred on opposite ends of Cape Cod to portray the devastation that the supposed reintroduction of the bluefish into the coastal waters caused to its prey populations.

After establishing their abundance in New England centuries prior, Baird supposes that the local bluefish population reached its peak from 1850 to 1860 and then began to steadily decline.⁸⁵ Diminution of the bluefish was noted in Vineyard Sound at this time by Mr. Harmon of Pasque Island who claimed, "the blue-fish, within a very few years, had diminished to such an

⁸⁴ Storer, 161.

⁸⁵ Baird, 239.

extent that, when fishing from the stands, not more than two or three could be taken in a day”.⁸⁶ Baird points out a gradual decrease in the local bluefish population until 1871 when they began to rapidly decline.⁸⁷ In Woods Hole specifically, Captain Thomas Hinckley commented on local bluefish when Baird was in the process of creating this report in 1871-1872. Baird writes that Hinckley, “believes the decrease to be very decided, and states that it commenced four or five years ago” in the late 1860s.⁸⁸ Captain Edwards, also from Woods Hole, provides his suppositions for the depletion of the local bluefish by citing natural causes. According to Edwards, the bluefish in 1871 were not more than half or one-fourth as plenty as they were a few years ago; this either in consequence of their extending their cruising grounds farther to the east, or the diminution of their food.”⁸⁹ Baird adds his own observations on the depletion of the bluefish species in Woods Hole, “I have myself been able to appreciate a very great difference in the abundance of blue-fish in the vicinity of Wood’s Hole from 1863 to 1871.”⁹⁰ Inhabitants and visitors of Woods Hole understood a significant depletion of the bluefish in their waters but couldn’t entirely understand the causes.

⁸⁶ Baird, 239.

⁸⁷ Baird, 239.

⁸⁸ Baird, 239.

⁸⁹ Baird, 239.

⁹⁰ Baird, 240.

The Bloodthirsty Bluefish

Baird's unique outlook on the coastal fishery decline due to combined human and natural agents

The blue-fish has been well likened to an animated chopping machine, the business of which is to cut to pieces and otherwise destroy as many fish as possible in a given space of time.

- Spencer Fullerton Baird

Throughout Spencer Baird's investigation, he largely focused on the testimony he acquired from local fishermen and fish dealers in Southern New England to develop the report he published in 1873. Included in the many questions Baird posed in his investigation, questions that were central to his investigation addressed the apparent depletion in coastal fisheries, species population numbers and spawning habits of fish species from which local knowledge of fish populations and the coastal marine environments was crucial. Amidst widespread national fears of increasingly industrialization, Baird published his report on apparent fishery depletion in New England that drew upon these anxieties. In his discussion of the bluefish, Baird often employed language that related the species to manmade industrial machinery or human fishermen. In doing this, Baird argued that the convergence of the bluefish and fishermen with their highly mechanized fishing apparatuses were the destructive agents to the coastal fisheries of New England and responsible for overall fishery decline in the region. Unlike the majority of scholars and scientists before and after his time, Baird uniquely considered the combined effort of human and natural agents when analyzing coastal fisheries. In one of his early works, *The Voyage of the Beagle* Charles Darwin discussed the combined human and natural "enemies" in regard to extinction of certain species. Darwin writes,

In the cases where we can trace the extinction of a species through man, either wholly or in one limited district, we know that it becomes rarer and rarer and is then lost: it would

be difficult to point out any just distinction between a species destroyed by man or by the increase of its natural enemies.⁹¹ Baird was certainly informed by Darwin as a renowned contemporary and was likely influenced by his ideas about the combination of natural and human agents on species and larger notions about extinction. Baird's discussion about human agency as a component of fishery decline contributed to larger contemporary narratives regarding industrialization. Works by Theodore Steinberg, Upton Sinclair, and Jeffrey Bolster engage with these narratives and are utilized in this chapter to situate and emphasize Baird's unique arguments.

Within his report, Baird provided background on President Grant's decision to appoint him as the U.S. Commissioner of Fisheries and ultimately what initially caused the federal government to take concern with New England's coastal fisheries. In the winter of 1869-1870, people of Rhode Island and Massachusetts presented petitions to their state legislatures, requesting that a law be passed forbidding the use of fixed apparatuses for capturing fish.⁹² Connecticut had endured similar debates in 1868 when protests conducted by line fishermen opposing traps at the mouth of the Connecticut River led to laws regulating the nets until 1871 when they were entirely abolished. Rhode Island ultimately prohibited the use of traps or pounds except within limited districts. Massachusetts came to a different decision as Committee Chairman Captain Nathaniel Atwood, of Provincetown proclaimed that there was no reasonable ground for the complaint and action by the State wasn't necessary.⁹³ When Baird arrived in Woods Hole in the summer of 1870, disputes over fixed apparatuses for fishing were culminating across Massachusetts.⁹⁴

⁹¹ Darwin, Wilson, and Wilson, Edward O, *From so Simple a Beginning: The Four Great Books of Charles Darwin*. 1st ed., (New York: W.W. Norton &, 2006), 166.

⁹² Baird, VIII.

⁹³ Baird, VIII.

⁹⁴ Allard, 70.

In December of 1870, Baird wrote a letter to Henry Dawes, Massachusetts state Representative recounting an interview they had a few days prior. Baird describes the decline of certain types of fish in the Vineyard Sound area based off of his own observations, comparing his recent experiences in 1870 to his past impressions of the area's coastal fisheries in 1863. He wrote,

During my visit of last summer to the Vineyard Sound, I was much impressed by the apparent diminution in the number of particular kinds of fish, in that vicinity, as compared with their abundance during my first visit, in 1863; and I found the same impression to be almost universal on the part of those with whom I conversed on the subject. A similar complaint is heard from Long Island Sound to the Bay of Fundy and the indications at present are that, unless some remedy be applied – whatever that may be – the time is not far distant when we shall lose, almost entirely, the source of food supply, a calamity which would invoke a bad number of evils in its train.⁹⁵

In 1871, it became clear that the decline of fisheries in the United States was a matter that the federal government government needed to investigate. Baird includes that State committees deemed the matter to be investigated by a scientific official of the federal government, competent in the inquiry and neutral to local concerns.⁹⁶ These fisheries that exhibited “alleged diminution” existed in “tidal and navigable waters of the United States” where the federal government had jurisdiction over State governments.⁹⁷ Federal involvement became necessary⁹⁷ at this time as Baird argues, “if left to the States, it would be impossible to secure that harmony and concurrence of action necessary for a successful result”.⁹⁸ In his letter to Dawes in December 1870, remarking on their meeting, Baird commented on the duty of the federal government to address the depletion of New England's coastal fisheries,

State action has been invoked at various times for the purpose of securing a remedy for the evil in question; but owing to conflicting interests, and the influence of powerful parties who are concerned in maintaining the present mode of fishing, little has been

⁹⁵ Spencer Baird to Henry Dawes, December 1870, Box 19, Folder 8, Spencer Fullerton Baird Papers 1833-1889, Smithsonian Institution Archives, Washington D.C.

⁹⁶ Baird, X.

⁹⁷ Baird, X.

⁹⁸ Baird, X.

accomplished; especially in view of the impression that seemed to prevail that the subject, if requiring legislation at all, must be provided for by the general government, which controls the waters in which the fish are captured.⁹⁹

The condition of New England's coastal fisheries that were of large dispute, required intervention of the federal government for the investigation as state governments effectively had no official authority on the matters of these tidal and navigable waters.

Baird also suggested to Dawes that extensive research be conducted on coastal fisheries with the command of a United States fish commissioner. Baird wrote,

It is necessary that a careful research be entered upon for the purpose of determining what should really be done; for any action presupposes a knowledge of the history and habits of the fish of our coast that, I am sorry to say, we do not, at present possess.¹⁰⁰

Baird urged for careful research to be taken of New England's fisheries mainly because he felt the United States wasn't well informed on the habits of coastal fish and fisheries. He encouraged Dawes to appoint a commissioner that would undertake research to obtain the proper knowledge of the "history and habits" of coastal fish and fisheries. Baird then recommended areas of research,

We must ascertain, among other facts at what time the fish reach our coast, and during what period they remain; when they spawn, and where; what is the nature of their food, what localities they prefer; what agencies interfere with the spawn or the young fish; what length of time elapsed before the young themselves are capable of reproducing; for how many years the function of reproduction can be exercised; and many other points of equal importance.¹⁰¹

These topics of research became central to Baird's investigation as all questions he posed about each fish species of southern New England's coastal waters fell under these categories. Baird clearly brings up the question of agency in regards to disrupting spawn or young fish, which becomes a fundamental question and discussion throughout his investigation. Baird later deems

⁹⁹ Spencer Baird to Henry Dawes, December 1870, Box 19, Folder 8, Spencer Fullerton Baird Papers 1833-1889, Smithsonian Institution Archives, Washington D.C.

¹⁰⁰ Spencer Baird to Henry Dawes, December 1870, Box 19, Folder 8, Spencer Fullerton Baird Papers 1833-1889, Smithsonian Institution Archives, Washington D.C.

¹⁰¹ Spencer Baird to Henry Dawes, December 1870, Box 19, Folder 8, Spencer Fullerton Baird Papers 1833-1889, Smithsonian Institution Archives, Washington D.C.

the combined efforts of the local bluefish population and commercial fishermen as the natural and human agents that interfere with the spawn or young fish.

On February 9th, 1871 the federal government took action and Hon. H. L. Dawes bill that he presented to the House of Representatives became law. The “Joint Resolution for the Protection and Preservation of Food-Fishes of the Coast of the United States” reads:

Whereas it is asserted that the most valuable food-fishes of the coast and the lakes of the United States are rapidly diminishing in number, to the public injury, and so as materially to affect the interests of trade and commerce: Therefore, *Be it resolved by the Senate and House of Representatives of the United States of America in Congress assembled*, That the President be, and he hereby is, authorized and required to appoint, by and with the advice and consent of the Senate, from among the civil acquaintance with the fishes of the coast, to be commissioner of fish and fisheries, to serve without additional salary.¹⁰²

A year after Massachusetts denied the need to limit the uses of fixed apparatuses for fishing, the United States Congress passed a law to create an entirely new branch of government, dedicated to researching and preserving United States fisheries. Section 2 of the Joint Resolution states:

And it be further resolved, That it shall be the duty of said commissioner to prosecute investigations and inquiries on the subject, with the view of ascertaining whether any and what diminution in the number of the food-fishes of the coast and the lakes of the United States has taken place; and if so, to what causes the same is due, and also whether any and what protective, prohibitory, or precautionary measures should be adopted in the premises; and to report upon the same to Congress.¹⁰³

The Joint Resolution clearly states the purpose of Baird’s position as Commissioner. He was first ordered to identify the extent of depletion of fisheries in coastal waters in the United States. If signs of depletion were proven, Baird was instructed to devise protective or precautionary measures for the conservation of these coastal environments to present to Congress.

After being offered the position of U.S. Commissioner of Fish and Fisheries by President Grant, Baird traveled to Vineyard Sound in June, 1871. He asserted that, “it was in that region that the alleged decrease was most clearly manifested, and established my headquarters at Woods

¹⁰² Baird, XI.

¹⁰³ Baird, XI.

Hole.”¹⁰⁴ With the greatest presence of advanced fishing apparatuses, Buzzards Bay and Vineyard Sound provided the ideal location to conduct an investigation on the exploitation of coastal fisheries. Located in between the waters of Buzzards Bay and Vineyard Sound, Woods Hole provided easy access across New England coastal waters to New Bedford and Vineyard Haven.¹⁰⁵ Conklin Lillie’s book *The Marine Biological Laboratory* published in 1988 describes the aquatic environments of Buzzards Bay and Vineyard Sound as being roughly ten degrees warmer than the northern waters of Cape Cod Bay. The relatively warmer temperature in this area could’ve made bluefish activity most visible because they prefer warmer temperatures. Lillie argues, “Woods Hole is thus about midway between the northern and southern marine faunas and floras, and the biological advantages of such a situation are evident.”¹⁰⁶ Not only did the waters surrounding Woods Hole contain a the greatest concentration of weirs, traps, and pounds in southern New England, but also presented the ideal aquatic environment for marine life to thrive, and a the perfect locale for Baird to conduct his investigation of fishery conditions.

Eighty- Eight Questions of the Investigation

Central to Baird’s two-year investigation, were eighty-eight questions regarding fish and fisheries in New England (See Appendix 1.). Baird devised these questions with help from local scientists to drive his research and believed that if all were answered, “would leave little room for future inquiry”.¹⁰⁷ Baird and fellow scientists aimed to investigate all local fish populations and their association with the waters they inhabited. Baird explains, “one supposed cause of the diminution of the fishes was the alleged decrease or displacement of the objects upon which they

¹⁰⁴ Baird, XII.

¹⁰⁵ Baird, XII.

¹⁰⁶ Conklin Lillie, *The Woods Hole Marine Biological Laboratory*, (Biological Bulletin; v. 174, No. 1, Suppl. Woods Hole, Mass.: [Marine Biological Laboratory], 1988), 2.

¹⁰⁷ Baird, XIII.

subsist.”¹⁰⁸ Baird’s questions largely deal with local fish populations’ relationships to each other and to their coastal aquatic ecosystems. These questions more specifically inquired about the geographical distribution of each fish species, their reproductive habits, what season they were most abundant, if they showed signs of disease, and their capture and economic value.¹⁰⁹ The questions fall under fourteen specific categories listed as, name, distribution, abundance, size, migrations and movements, relationships, food, reproduction, artificial culture, protection, diseases, parasites, capture, economical value and application. The wide range of questions that Baird and his colleagues posed reveal their primary concerns in 1871 and 1872 in regard to southern New England’s coastal fisheries.¹¹⁰

Baird includes a section entirely on the apparent abundance of fish in the coastal waters of southern New England. As Baird acquired testimony to determine if the fisheries of New England were diminishing, he first had to first address their supposed abundance. Baird asks four questions in this section on abundance.

4. How abundant is it, compared with other fish?
5. Has the abundance of the fish diminished or increased within the last ten years, or is it about the same?
6. If diminished or increased, what is the supposed cause?
7. What is the amount or extent of the change in abundance?¹¹¹

These questions address abundance in relation to other fish. By posing the first question on the comparative abundance of fish species, Baird gained testimony from local people on the relationships between fish populations and the destruction that some fish species were causing to their prey’s population. Baird’s next three questions address the extent of diminution in fish

¹⁰⁸ Baird, XIII.

¹⁰⁹ Baird, XIII.

¹¹⁰ See Appendix A.

¹¹¹ Baird, 3, 4.

populations and supposed causes. Fishermen and fish dealers that answered Baird's questions were likely to answer these questions based on their experience in recent catches and profits.

Among these eighty-eight questions were inquiries about human impact on the coastal fisheries of Cape Cod. Twenty-five of the total eighty-eight questions in this report fall under the "Reproduction" heading. In this section, question 42 asks, "Is spawning interfered with by lines or nets, or otherwise?"¹¹² Baird and his colleagues were interested in the effect that these fishing devices had on the Cape's local species, and specifically their reproductive patterns. Baird provides extensive questions on where and when the fish spawn and their general spawning habits. Question 63 asks, "What enemies interfere with or destroy the spawn or the young fish; do the parent fish devour them?"¹¹³ Baird questions what possible enemies would interfere with the spawn, then comments on some species tendency to consume their own spawn. Baird cites the bluefish as an example of a species that regularly targets spawning fish:

The food of the blue-fish consists very largely of individuals which have already passed a large percentage of the chances against their attaining maturity, many of them, indeed, having arrived at the period of spawning.¹¹⁴

He estimates that there are one thousand million bluefish in the coastal waters of southern New England and each bluefish eats roughly ten fish per day.¹¹⁵ By these estimations, Baird arrives at a conclusive figure of "ten thousand millions [or 10 billions] of fish destroyed per day."¹¹⁶ With the amount of local bluefish and their tendency to prey on spawning fish, Baird reveals significant concern about local spawning fish and the future condition of the bluefish's prey populations. Baird questions the destruction of each local species spawn or young fish by human intervention in question 42 and natural factors in question 63. A final question in this section

¹¹² Baird, 6.

¹¹³ Baird, 5.

¹¹⁴ Baird, 241.

¹¹⁵ Baird, 242.

¹¹⁶ Baird, 242.

asks, “Are the young of this fish found in abundance, and in what localities?” Baird attempts to address where there is an abundance of young fish for each species in order to protect them.

Later in his report, Baird mentions that fish traps specifically target spawning fish, creating an imbalance within the fish population of New England’s fisheries.¹¹⁷ He goes on to suggest that imposing regulations on fish traps could restore the spawning cycles of local fish species.¹¹⁸

Baird and his colleagues were distinctly concerned with the reproduction of coastal fish species and the disturbances that humans and other predacious species could cause on these reproductive cycles.

In the “Protection” section, Baird only includes one question. Question 67 asks, “are these fish protected by law or otherwise?”¹¹⁹ Before conducting thorough research, Baird wanted to know if certain species were protected. In this case, protected species may have shown less signs of depletion in 1871 and would’ve provided a reference point when examining fish populations that were unprotected and exhibited significant signs of depletion as Baird began conducting his research.

The two final sections of Baird’s list of questions are titled “Capture” and “Economical Value and Application”. The questions listed in these categories solely address human intervention and economic benefit of New England’s coastal fisheries. Under the Capture heading, Baird questions how the fish is generally caught, whether by a hook or net. Question 74 asks, “What would be the average daily catch of one person with the hook, and what the total for the season?”¹²⁰ The following question then asks, “Answer the same question for one seine or

¹¹⁷ Baird, 127.

¹¹⁸ Baird, 127.

¹¹⁹ Baird, 6.

¹²⁰ Baird, 6.

pound of specified length.”¹²¹ By comparing which modes of capture obtain the greatest number of fish, Baird can examine how to proceed with possible protective measures and fishing restrictions for each apparatus. Baird addresses possible changes in fish populations when questioning each species’ economical value and application. Question 84 asks, “What were the highest and lowest prices of the fish, per pound, during the past season, wholesale and retail, and what the average; and how do these compare with former prices?”¹²² Investigating the varying prices of the marketed fish can suggest a reduction in the fish population or potential decrease in the weight or size of the fish.

Baird acquired testimony from local people to answer the questions he devised and further his research. Baird was able to gather volunteers from the entire southern coastline of New England from Hyannis, Massachusetts to Newport, Rhode Island, Buzzards Bay, Nantucket and Martha’s Vineyard.¹²³ Baird explains that he obtained testimony from a large number of people who were interested in his inquiry, “among whom were nearly all the leading fishermen, both line-men and trappers, as well as those who had been dealers in fish and engaged in supplying the markets of New York and Boston for many years.”¹²⁴ As fisherman and fish merchants, the volunteers who gave testimony were extremely knowledgeable about the fish species and waters of the southern New England coastline. Additionally, the sheer number of testimonies that Baird received indicates a significant interest in his research among fishermen and fish dealers in New England. Many of their testimonies reveal a concern with the recent decreases in their seasonal catches of coastal fish. Furthermore, the livelihood of these

¹²¹ Baird, 6.

¹²² Baird, 6.

¹²³ Baird, XIV.

¹²⁴ Baird, XIV.

volunteers largely depended on successful fish catches, prompting them to give sincere testimony on the condition of these coastal fisheries.

After establishing his headquarters in Woods Hole and conducting research from the town's surrounding area, he received significant testimony on the condition of fisheries that surrounded Woods Hole and in Buzzards Bay. Captain Isaiah Spindel of Woods Hole gave his testimony on September 5th, 1871. Captain Spindel was the manager of a fish-pound at the eastern point of Buzzard's Bay. Spindel details the typical species his fish-pound catches in Buzzards Bay and which months produce the highest yield of each species. He comments on the spring and summer of 1871, "We have caught less fish this year than last, and got poorer prices for them... We did three times as well last year though. I do not know why we did not do better this year."¹²⁵ He continues with possible explanations for the decline of his seasonal catch, "whether it was in consequence of the greater number of pounds in this vicinity, or because the fish were caught more at the westward".¹²⁶ Spindel points out a stark decrease in his seasonal fish catch compared to previous years and reveals a concern about the competition between fish pounds in Buzzard's Bay. As a pound manager, Spindel's concerns of diminishing coastal fish populations stem from his decreasing profits and growing competition due to the increasing presence of traps in the vicinity of Woods Hole.

Baird also received testimony from Potter Brightman of Westport who detailed his recent experience fishing in Buzzard's Bay. This testimony was given on September 25th, 1871. Brightman begins, "I can tell you it is slim fishing; the fishing is growing worse every day".¹²⁷ He attributes this scarcity to the pounds and traps located around Buzzard's Bay, and specifically

¹²⁵ Baird, 68.

¹²⁶ Baird, 68.

¹²⁷ Baird, 70.

in Woods Hole, “Soon after they began to trap at Wood’s Hole fish began to grow scarce.”¹²⁸ As a recreational sports fisherman and as shown in his testimony, Brightman clearly blamed the traps in the vicinity of Woods Hole as the cause for coastal fish exhaustion. Brightman is asked what he would do to remedy the shortage of fish in the area and he confidently responds, “I would stop the trapping; that would remedy it. I would vote to stop trapping pretty quick...Soon after they began to trap at Wood’s Hole fish began to grow scarce”.¹²⁹ Brightman clearly testifies to complain of the depletion of fish in Buzzard’s Bay which he attributes to trapping. Brightman seems convinced that outlawing trapping would improve the overall exhaustion of local fish species. Brightman and Spindel have very different reasons for their concerns regarding the depletion of fisheries in the surrounding waters of Woods Hole, but both arrive at the same conclusion. Both men explicitly state that there had recently been a decline in fish populations in the area.

The Bluefish

Central to Baird’s report was discussion on New England’s bluefish population. Baird explained the species as having “a very important bearing upon the condition of our coast-fishes generally, and one worthy, perhaps, of much more attention than it has hitherto received.”¹³⁰ Noting the little attention and research that had been paid to the bluefish, Baird went on to dedicate an entire chapter of his report to the species and the details and statistics he had learned about them. As a migratory, pelagic predator, the bluefish is consistently depicted as a vicious and destructive to other fish populations of southern New England throughout Baird’s report.

¹²⁸ Baird, 71.

¹²⁹ Baird, 71.

¹³⁰ Baird, 235.

Included in Baird's report on coastal fisheries and their inhabitants is extensive testimony and information on the local bluefish species. Captain Edwards of Woods Hole answered Baird's questions about the local bluefish. Edwards identified that the bluefish have "diminished" within the last ten years.¹³¹ When examining the extent of the depletion of bluefish Edwards clearly reports, "Diminished more than half; probably three-fourths, so that there is not more than one-fourth as many."¹³² As a local of Woods Hole and ship captain, Edwards' knowledge of the coastal waters in New England prompted him to conclude a significant decrease in the local bluefish population.

Edwards was less clear when answering questions on the cause of this depletion. He responds to his question on the abundance of bluefish compared to other species by stating, "There are more pounds of blue-fish caught now than of any other kind."¹³³ The quantity of bluefish caught by humans surpasses that of any other local species. This answer seems to suggest that the bluefish may be more abundant than other populations of local fish. When answering what the "supposed cause" of the depletion of bluefish is, Edwards answers, "I think they have extended their cruising-ground to the east, as they do not find the bait that they used to."¹³⁴ Edwards comments on the abundance of bluefish when explaining that there are more pounds of the bluefish caught than any other species, but overall says that the population has diminished by close to three-fourths. He attributes this depletion to a natural cause, when directly answering the question of why the bluefish population has decreased, without mention of human intervention. He is able to identify that the bluefish population has diminished and that they are caught more than any other fish in the coastal waters of New England but ultimately

¹³¹ Baird, 55.

¹³² Baird, 55.

¹³³ Baird, 55.

¹³⁴ Baird, 55.

concludes that this depletion is caused by natural factors, the bluefish extending their “cruising ground to the east”.¹³⁵

Baird offers other possible explanations for the supposed exhaustion of local bluefish, now including human factors:

The question now arises as to the causes of this decrease in abundance on the part of the blue-fish on the south side of New England, while they appear to be as plentiful as ever off the coast of New Jersey and Long Island...it is a curious coincidence at least, if not a relation of cause and effect, that it is precisely in this area of diminished abundance of particular kinds of fish that we find the summer-fishing, by means of traps, pounds, and gill nets, to have received its highest and most rapid development.¹³⁶

Baird proposes that the sport fishing during the summer season with traps, pounds and nets could've accelerated the decline of the bluefish on the southern coast of Cape Cod. He cites the apparent abundance of the bluefish in the more southern waters of New Jersey and Long Island.

Baird also includes the bluefish's destructive tendencies towards other local fish populations. Often, Baird antagonizes the bluefish when discussing the balances and dynamics of fish species in New England's coastal fisheries:

The blue-fish has been well likened to an animated chopping machine, the business of which is to cut to pieces and otherwise destroy as many fish as possible in a given space of time. All writers are unanimous in regard to the destructiveness of the blue-fish. Going in large schools, in pursuit of fish not much inferior to themselves in size, they move along like a pack of hungry wolves, destroying everything before them. Their trail is marked by fragments of fish and by the stain of blood in the sea, as, where the fish is too large to be swallowed entire, the hinder portion will be bitten off and the anterior part allowed to float away or sink. It is even maintained, with great eagerness, that such is the gluttony of the fish, that when the stomach becomes full, the contents are disgorged, and then again filled. It is certain that it kills many more fish than it requires for its own support.¹³⁷

After discussing the apparent depletion of the bluefish species, Baird goes on to characterize the bluefish as gluttonous and violent. The bluefish are depicted as an enemy in the sea, a pack aimlessly preying on various local fish while leaving a trail of blood in their wake. The species is

¹³⁵ Baird, 55.

¹³⁶ Baird, 240.

¹³⁷ Baird, 241.

depicted further as especially bloodthirsty and aggressive because it preys on fish similar in size. Baird attributes the bluefish to predacious mammals, like the wolf but writes earlier in his report that the species is “characterized by a voracity and bloodthirstiness which, perhaps, has no parallel in the animal kingdom.”¹³⁸ He also portrays the species as a “chopping machine”, illustrating the bluefish as a destructive apparatus, similar to the human operated fishing traps and pounds. By comparing the bluefish to chopping machinery, Baird portrays the species as extremely violent and destructive in an almost robotic manner.

Baird’s metaphor of a “chopping machine” alluded to broader anxieties about the scale and pace of U.S. industrialization in the second half of the nineteenth-century. In the 1850s Cincinnati became the first city in the United States to streamline meat production for pork packing by creating a mechanized system to slaughter animals in large numbers.¹³⁹ Pigs were hung from a rotating wheel that enabled workers to systematically slaughter the animals in mass quantities before they were sent to the butchers at the chopping table to be cut and packaged. Frederick Law Olmsted, renowned landscape architect, visited the city and witnessed the mass slaughtering of livestock. Olmsted wrote of the process, “No iron cog-wheels could work with more regular motion... Plump falls the hog upon the table, chop, chop; chop chop; chop, chop, fall the cleavers. All is over.”¹⁴⁰ In Olmsted’s description, this process closely parallels the language used to talk about the bluefish. While in the 1850s this process was primarily small scale to meet the needs of local communities, the invention of a refrigerated railroad car revolutionized the meat processing industry to become national. In the late 1960s a railroad car was developed with cold enough air circulation to carry a load of dressed beef between Chicago

¹³⁸ Baird, XXIII.

¹³⁹ Theodore Steinberg, *Down to Earth: Nature's Role in American History* (Oxford: New York: Oxford University Press, 2002) 191.

¹⁴⁰ Steinberg, 191.

and Boston.¹⁴¹ By the 1880s, the beef industry was entirely nationalized with the introduction of advanced refrigerated railroad cars, the same cars that were used to transport food fish across the United States, increasing the need for large scale fishing. As the well-known mechanized system of killing livestock known as the “disassembly line” was at the forefront of American consciousness and defined American modernization and the nationalization of the meat industry, Baird carefully likened the bluefish to an “animated chopping machine” and in relationship to other sea habitants, Baird described the bluefish as an “unmitigated butcher.”¹⁴² While Olmsted depicts the disassembly line and the mass slaughtering of livestock in Cincinnati as a mechanized and methodical system, Baird likens the bluefish to the butchers in this process but describes the species as a chaotic and absolute killer.

The public was increasingly receptive to graphic representations of factories and efficient machinery as the nation industrialized further. In 1906, Upton Sinclair published his novel, *The Jungle* which gained significant reception by the U.S. population. Sinclair conducted research in 1904 for his novel to gather information about the meat industry in Chicago. Sinclair sought to expose the harsh conditions for mainly immigrant workers in meat packing factories in Chicago and other industrialized cities. Similar to Olmsted’s commentary on the Cincinnati disassembly line, Sinclair offered a detailed account of Chicago’s meat processing factories in the beginning of the twentieth century. Sinclair astonished the public by suggesting that human workers that fell into meat processing vats were ground up and processed and packaged alongside animals to be sold for public consumption. Sinclair wrote,

As for the other men who worked in tank rooms full of steam, and in which there were open vats upon a level with the floor, their peculiar trouble was that they fell into the vats; and when they were fished out there was never enough of them left to be worth

¹⁴¹ Steinberg, 192.

¹⁴² Baird, 241 & 245.

exhibiting. Sometimes they would be overlooked for days, till all but the bones of them had gone out to the world as Anderson's Pure Leaf Lard!¹⁴³ Sinclair's graphic and horrifying description of the meat processing factories in Chicago wasn't published until a few decades after Baird wrote about the bluefish but the language and receptions were similar. While Baird likened the bluefish to contemporary industrialized meat processing factories, he evoked a sense of horror in the public. By relating bluefish to highly newly developed slaughterhouse machinery, Baird aroused fear in those who read his report, much like Sinclair's novel. As cities industrialized and factories became highly mechanized, the American public took great interest in books like *The Jungle* that exposed the conditions of these environments while Baird explicitly drew connections between these harsh factories and the bluefish population. But if the meat packing industry could be regulated in response to Sinclair's novel, what could people do about the bluefish?

Baird's Conclusions

After conducting his research in 1871 and 1872, Baird drew conclusions of his investigation before publishing his report in 1873. He lists thirteen comprehensive conclusions that he's come to after two years of extensive research on New England's coastal fisheries. His first three points address the rate of depletion of the local fish populations, which he argues have rapidly decreased in the few years before publishing the report. Baird states:

- I. The alleged decrease in the number of food-fishes in these waters within the past few years has been fully substantiated.
- II. The shore fishes have been decreasing during the past twenty-years, gradually at first, but much more abruptly from about the year 1865, the reduction by the year 1871 being so great as entirely to prevent any successful summer-fishing with the hook and line, and leaving to the traps and pounds the burden of supplying the markets. This statement applies also, but perhaps to a certain extent, to the blue-fish. The decrease in their numbers first manifested itself about ten years ago, and is going on quite rapidly until now.

¹⁴³ Upton Sinclair, *The Jungle* (Fiction Reprints: Cambridge, Mass.: R. Bentley, 1971), 91.

III. This period of decrease represents the time during which the traps and pounds have been well established, their operations increasing year by year, and their catch, especially in the early spring, being always very great.¹⁴⁴

Baird's testimonies and research suggested that there had been an apparent decrease in the overall population of food-fish in the coastal waters of New England. He argues that the depletion began twenty years prior to the publication of the report, in 1853. The exhaustion of these fish populations escalated in 1865 and by 1871 there was such a notable depletion in the coastal waters of southern New England that obstructed "any successful summer-fishing with the hook and line". In his opening conclusive points, Baird first credits this decrease to the escalating presence of traps and pounds in local New England waters.

Baird continues with his concluding arguments:

- IV. In 1871 and 1872 the decrease in the number of fish has been so great as to reduce very largely the profit formerly derived by the traps.
- V. The appearance, in 1871, of an unusually large number of young fish spawned in 1870 is a phenomenon only to be explained by the probably escape of a larger number of breeding-fish than usual during the previous season, an abrupt decrease in the ravages of the blue-fish and other species, or else by a spontaneous movement northward of newly-hatched fish that ordinarily would have remained on a more southern coast. While these fish will probably, for several years, constitute a marked feature in the fisheries, there is no evidence of the existence of a second crop of young fish corresponding to the one in question.¹⁴⁵

Baird first addresses decrease in profits for traps in the area which he credits to the decline in surrounding fish populations. After addressing plummeting profits and a clear decrease in local fish populations Baird discusses the reproductive cycles of local fish in the past few years, offering a few possible explanations. He argues that in 1870, an unusually high number of spawning fish led to the increase in young fish populations. Baird points out that this was atypical and includes mention of the bluefish involved with this phenomenon. He writes that there was a sudden decrease in the "ravages of the blue-fish and other species." While

¹⁴⁴ Baird, XXXVIII, XXXIX.

¹⁴⁵ Baird, XXXIX.

throughout the report, Baird seems to allude to the fact that the bluefish have become almost more bloodthirsty than in previous decades, he concludes by stating that the increase in young fish population numbers could be attributed to the bluefish and other predacious fish species as being less damaging or destructive as previous years. Changes in typical bluefish behavior, particularly in becoming less destructive in 1870 and 1871 are cited by Baird as a possible reason that young fish populations were able to flourish.

Baird goes into more detail about the negative effects of pounds and traps on the local fish species in his concluding arguments and continues to discuss the predaciousness of the bluefish.

VI. The decrease of the fish may be considered as due to the combined action of the fish-pounds or weirs and the blue-fish, the former destroying a very large percentage of the spawning fish before they have deposited their eggs, and the latter devouring immense numbers of young fish after they have passed the ordinary perils of immaturity.¹⁴⁶ Pounds or weirs, Baird argues, specifically target spawning fish before they've had a chance to deposit their eggs. Baird further suggests that the spawning fish that are able to lay their eggs then face issues with the predacious bluefish. While pounds and weirs target spawning fish before eggs are laid, the bluefish target any young fish that were able to survive infancy. Baird combines the human intervention of fishing apparatuses and a common natural predator, the bluefish, to explain the depletion of fish populations in New England. Baird continuously likens the bluefish to fishermen and their fishing apparatuses and deems them both guilty of destroying the coastal fisheries of southern New England. In this instance, the bluefish and humans are portrayed as complementary to each other in destroying surrounding fisheries in southern New England.

¹⁴⁶ Baird, XXXIX.

Jeffrey Bolster's book, *The Mortal Sea: Fishing the Atlantic in the Age of Sail* includes historical narratives from Cape Cod fishermen over their concern with spawning fish and the protection of Massachusetts' fisheries while incriminating the local bluefish population.

Bolster recounts a "Report on the Fisheries" by Paul Crowell before the Nova Scotia Assembly in 1852. Crowell was concerned with the damage to the mackerel fishery by the large-scale catching of spawning fish with seines or nets.¹⁴⁷ Crowell wrote of the mackerel,

As there is no doubt the mackerel are bound to Chaleur Bay for the purpose of spawning, it would lead us to believe that when one fish is taken with the net or seine [in the spawning season], thousands are destroyed which would otherwise likely come to maturity. Could the practice of taking fish with their spawn be abolished, it is likely they would be much more abundant.¹⁴⁸

Fishermen were clearly concerned with the fishing of spawning fish decades before Baird conducted his investigation. Targeting spawning fish were a main concern for fishermen who feared the many fish that wouldn't have a chance to reach maturity. While Crowell depicts large scale fishing operations and the use of fishing apparatuses like nets and seines as the main offender for the depletion of mackerel in Canada, Baird attributes the depletion of all coastal fish on the southern coast of New England to the combined efforts of the pounds and weirs and the bluefish.

Inhabitants from Yarmouth, a town located on Cape Cod within Barnstable County, also had concerns with the bluefish and the species' effect on smaller fish or prey species in the region prior to Baird's report. Yarmouth inhabitants blamed the bluefish for the depletion of coastal fisheries while defending the use of seines. They wrote to the legislature in efforts to prevent limiting seining,

¹⁴⁷ Jeffrey W. Bolster, *The Mortal Sea* (Harvard University Press, 2012) 129.

¹⁴⁸ Bolster, 129.

It would be a much better way of protecting the fisheries of the coast of Massachusetts, by paying a bounty of so much per barrel for all the bluefish taken than to stop the seining of them, as it is known by all... that they destroy almost all other smaller fish.¹⁴⁹ While the Yarmouth locals clearly noticed a need to protect fisheries, they condemned the bluefish for the damage while defending the use of seines. Bolster writes, “Defining the bluefish as wolves of the sea, and waging war on them, seemed more palatable” than limiting seining to local fishermen. Bolster defines this letter to the legislature as waging war on the bluefish population in effort to distract from human impacts.

Fishermen and scientists in the second half of the nineteenth-century consistently pointed to southern New England’s bluefish populations as the driving force of destruction for surrounding young fisheries. In multiple towns on Cape Cod around the time of Baird’s investigation, claims were made that condemned the bluefish as the main cause of depletion for young fish species that fell prey to them. Using rhetoric that played on people’s worries about industrialization, local fishermen scapegoated the bluefish while also attempting to observe marine ecological dynamics that experts only partially understood.

¹⁴⁹ Bolster, 131.

Three

Pest of the Sea?

Persistent Ambiguity about Bluefish from Baird to Carson and beyond

Going in large schools, in pursuit of fish not much inferior to themselves in size, they move along like a pack of hungry wolves, destroying everything before them.

- *Spencer Fullerton Baird*

In the years after Baird's publication of his report in 1873, persistent ambiguities about the bluefish remained that scholars, environmental historians and scientists continued to try and understand. Left uncertain were questions about the bluefish's population and migration habits, their explicit effect on local fisheries and to what extent humans could have or should have taken action with the species. Included in Baird's report and in other works by scholars such as Rachel Carson decades later are comparisons that liken the bluefish to the wolf. In the beginning of the twentieth century, Theodore Roosevelt's administration developed a plan to entirely eradicate varmints, including wolves from America. While the bluefish are likened to wolves to portray the species as a pest in the twentieth century, it's interesting that like wolves, bluefish were never hunted on a large scale as a pest nor later protected and preserved. This inconsistency could be attributed to the bluefish being an aquatic species, largely invisible to humans. Wolves wreaked havoc in the American west during this period while humans watched them viciously hunt their sheep, the bluefish remained largely inconspicuous. Additionally, bluefish continuously escaped human understanding and appreciation like the wolf. Periods of disappearance and ambiguities in population, migration and spawning habits kept those that tried to study the bluefish unable to entirely comprehend the species.

Before being appointed Commissioner of the U.S. Fish and Fisheries, Baird wrote to Massachusetts representative Henry Dawes explaining that extensive research had to be conducted on the fisheries in order to formulate remedies for the apparent depletion of coastal fish. Baird wrote in 1870, “any action presupposes a knowledge of the history and habits of the fish of our coast that, I am sorry to say, we do not, at present possess.”¹⁵⁰ Baird’s enthusiasm on the topic of United States fisheries led him to be appointed Commissioner of the U.S. Fish and Fisheries where he became the individual to compile knowledge of the “history and habits” of coastal fish which didn’t before exist.

Upon being appointed as Commissioner of U.S. Fish and Fisheries, Baird’s instructors following his investigation and research of the coastal fisheries of southern New England were clear. He was ordered to:

Prosecute investigations and inquiries on the subject, with the view of ascertaining whether any and what diminution in the number of the food-fishes of the coast and the lakes of the United States has taken place; and if so, to what causes the same is due, and also whether any and what protective, prohibitory, or precautionary measures should be adopted in the premises; and to report upon the same to Congress.¹⁵¹

Baird’s two-year investigation led him to draw conclusions about the future of the coastal fisheries in southern New England after establishing an apparent decrease in the number of food-fishes, Baird suggested “protective, prohibitory, or precautionary measures” for the future wellbeing of coastal fisheries and included them in his report.¹⁵² Baird’s conclusions largely place blame on the bluefish population and the presence of traps and pounds as the offenders that destroyed coastal fish populations. He discusses possible solutions for the overall depletion of fish populations in New England:

¹⁵⁰ Spencer Baird to Henry Dawes, December 1870, Box 19, Folder 8, Spencer Fullerton Baird Papers 1833-1889, Smithsonian Institution Archives, Washington D.C.

¹⁵¹ Baird, XI.

¹⁵² Baird, XXXVIII

VII. There are no measures at our command for destroying the blue-fish, nor would it be desirable to do this, in view of their value as an article of food. The alternative is to regulate the action of the pounds so as to prevent the destruction of fish during the spawning season.¹⁵³

Baird suggests that wiping out the bluefish population would be more useful in replenishing local fish species than regulating the numerous local pounds. He defends the need for bluefish only by referencing their economic value as a food fish. Baird concludes that the alternative to destroying the bluefish is to regulate pounds, thus protecting the spawning fish. Baird again references the combined efforts of the bluefish and local pounds as destructive agents for other spawning fish populations.

Baird's next few concluding points entirely address possible regulations of local traps and pounds:

VIII. The quickest remedy would be the absolute abolition of the traps and pounds. This, however, would be a harsh measure, and their proper regulation will probably answer the purpose of restoring the supply, although a greater number of years will be required. Such regulation may consist either in prohibiting the use of traps or pounds during the entire season of the spawning of the fish, or for a certain number of days in each week during that season."

IX. As the principle profit of the pounds is derived from the catch of fish during the spawning season, it will probably be sufficient to try the experiment of prohibition of the use of nets from Friday night until Monday morning of each week of the spawning season.

X. It is desirable that the regulation for a close time during each week be passed by the several states; and if this cannot be effected, then the General Government should enact absolute prohibition, or at least during the spawning season, as it possesses no officers who could exercise the supervision required to enforce the partial closure, or before whom complaints could be entered and the penalty exacted.

XI. Any marked increase in the number of the shore-fishes, resulting from their protection during the spawning season, will probably tend to restore the blue-fish to their original numbers.¹⁵⁴

Baird alludes to the destruction that traps and pounds have inflicted on New England's coastal fisheries by stating that their absolute abolition would be the quickest remedy in replenishing local fish populations. Baird argued that the traps and pounds specifically targeted the spawning

¹⁵³ Baird, XXXIX.

¹⁵⁴ Baird, XXXIX.

fish and led to an overall depletion of coastal fish populations. Baird goes on to conclude that states in New England should experiment with the prohibition of fish nets on weekends during the spawning seasons. He points out the need for the General Government to intervene by enacting absolute prohibition of traps and pounds if states government in New England aren't able to self-regulate. His final point about the regulations of traps and pounds mentions the bluefish. Throughout his report and even in his concluding points, Baird cites the bluefish as destructive towards other fish populations and even indicates wanting to entirely eradicate the local bluefish population. But in his conclusion, Baird takes concern with what he perceived as a diminishing bluefish population. Baird reported that regulations of traps and pounds would replenish shore fish populations and thus restore the bluefish population to their original numbers, reestablishing a balance in fish species within New England's fisheries.

XII. As there is reason to believe that scup, and to a less degree other shore-fishes, as well as blue-fish, have several times disappeared at intervals to a greater or less extent, within the historic period of New England, we cannot be certain that the use of traps and pounds within the last ten years has actually produced the scarcity complained of. The fact, however, that these engines do destroy the spawning fish in so great numbers renders it very probably that they exercise a decided influence. No vested interest or right will suffer by the experiment of regulating the period of their use, as we have attempted to show that a better price will be obtained from a smaller number of fish, by preventing the glutting of the market, and the consequent waste of so perishable an article as fresh fish.

Baird touches on the local tensions that existed across New England and particularly in the area of Woods Hole and Buzzards Bay prior to the start of his investigation. While mentioning his attempts to regulate the fish market in wake of the decline of local fish populations, Baird includes discussion on the bluefish and their unexplained migratory patterns and periods of disappearance. Here, Baird seems to point out the bluefish's disappearance from New England's waters at intervals as another source of confusion for scientists and fishermen when trying to understand the species. The bluefish again escaped complete human understanding. Baird

discusses traps and pounds in the area but is careful to not deem them responsible for the depletion among local fisheries and instead references fish like the bluefish that tend to sporadically disappear from the area for periods of time.

In 1884, an updated report was published by George Browne Goode, assistant director of the U.S. National Museum who had also been a longtime assistant of Baird's titled *The Status of the United States Fish Commission in 1884: A Review of What has been Accomplished in Fish Culture and the Investigation of American Fisheries*. Goode praised Baird for his remarkable work as Commissioner:

I think I may say without fear of challenge that very much of the improvement in the condition of our fisheries has been due to the wise and energetic management of our Commissioner. Himself an eminent man of science, for forty years in the front rank of biological investigation, the author of several hundred scientific memoirs, no one could realize more thoroughly the importance of a scientific foundation for the proposed work.¹⁵⁵

Baird's exhaustive work conducted on coastal fisheries and efforts made by the Fish Commission were recognized on a global scale in 1880 at the International Fisheries Exhibition.

Goode writes:

The principal activity of the Commissioner, however, has been directed to the wholesale replenishment of our depleted waters. The success of fish culture is well recognized in the United States, but it was especially gratifying to its advocates that in 1880 the grand prize of the International Fisheries Exhibition at Berlin was awarded to Professor Baird as "the first fish-culturist in the world."¹⁵⁶

Goode suggests that Baird and research on coastal fisheries prompted a well-recognized fish culture. This likely referred to Baird's involvement in the agricultural aspects of fisheries, promoting food-fish. Transactions of the American Fish Culturists' Association wrote of the 1881 exhibition, "The Exhibition, though general in its scope, was intrinsically a fishcultural

¹⁵⁵ George Brown Goode, *The Status of the United States Fish Commission in 1884: A Review of What has Been Accomplished in Fish Culture, and the Investigation of the American Fisheries*. (Washington: Government Printing Office, 1884), 3.

¹⁵⁶ Goode, 3.

exhibition, the chief interest being concentrated in those matters which relate to the culture and preservation of fish.”¹⁵⁷

Goode includes a section of his report titled “Results of Inquiry into Causes of Fishery Deterioration.” Goode introduces this section by offering an explanation of the “distinction between the extermination of a species in a restricted locality” and the “destruction of a fishery.”¹⁵⁸ Goode writes, “The former is somewhat unusual, and seemingly impossible in the case of oceanic species, while the latter, especially for limited regions, is almost of yearly occurrence.”¹⁵⁹ In 1884, the general understanding of the Fish Commission was that oceanic species were unable to go extinct. Goode includes an interesting analogy when discussing oysters and “close-time legislation” or regulating fishing only during spawning seasons.¹⁶⁰ He cites British Biologist Professor Huxley, “Suppose that in a country infested by wolves you have a flock of sheep; keeping the wolves off during the lambing season will not afford much protection if you withdraw shepherd and dogs during the rest of the year.”¹⁶¹ In terms of oyster beds, Huxley believed that regulations only in place during the spawning season wouldn’t succeed, as nothing would stop oyster fishermen from clearing oyster beds during other seasons. Previously in his report, Baird described the bluefish as a “pack of hungry wolves”, depicting a bloodthirsty predator.¹⁶² While Baird likens the bluefish to the wolf in his report, Huxley likens fishermen and advanced fishing apparatuses to the wolf.

¹⁵⁷ American Fisheries Society, *Transactions of the American Fish Culturists’ Association*. (Cambridge: Harvard University, 1881), 57.

¹⁵⁸ Goode, 7.

¹⁵⁹ Goode, 7.

¹⁶⁰ Goode, 8.

¹⁶¹ Goode, 8.

¹⁶² Baird, 241.

Goode continues to talk about regulations regarding shell-fish beds arguing that they “must be cultivated as carefully as garden beds, and this can only be done by leasing them to individuals.”¹⁶³ In 1884, this practice had just begun as oysters were being artificially planted in new areas and individuals were able to lease them. Natural oyster beds were harder to implement similar policies as they’d been used by fishermen for centuries. Goode continues with thoughts on the future of the oyster industry as oyster beds in New England faced destruction:

It is probable that the present unregulated methods will prevail until the dredging of the natural beds ceases to be remunerative, and that the oyster industry will then be transferred from improvident fishermen to the care-taking oyster culturists, with a corresponding increase in price and decrease in consumption.¹⁶⁴

Goode depicts fishermen as wasteful and excessive when describing their interactions with natural oyster beds while oyster culturists are “care-taking.” Goode believed the preservation of oyster beds in New England depended on oyster culturists, those who were promoting the maintenance of oysters. As Baird was described as the “first fish culturist”, it’s likely that this title referred to Baird’s continuous work on the promotion of food-fish and his dedication to preserving coastal fisheries.

After discussing the fears of the over cultivation of oyster beds by fishermen, Goode argues that:

Migratory, semi-migratory, or wandering fishes, ranging in schools or singly over broad stretches of ocean, mackerel, herring, menhaden, bluefish, bonito or squeteague, are apparently beyond the influence of human agency, especially since they spawn at a distance from the coast, or since the adults, when about to spawn, cannot be reached by any kind of fishery apparatus.¹⁶⁵

While sedentary oyster beds were of great concern to the Fish Commission, migratory fish were thought to be entirely removed from human agency. Goode goes on to note of migratory fish,

Their fecundity is beyond comprehension... The conclusions gained by Professor Baird tally exactly with those of Professor Huxley, that the number of any one kind of oceanic

¹⁶³ Goode, 8.

¹⁶⁴ Goode, 8.

¹⁶⁵ Goode, 9.

fish killed by man is perfectly insignificant when compared with the destruction effected by their natural enemies.¹⁶⁶ Language like this reinforces Baird's report that was published ten years prior, especially in reference to the bluefish. Baird often offered destroying the bluefish species entirely to help combat the diminution of their prey. Language like that included in Baird's report about the bluefish coincides with understandings that migratory fish populations could never even be slightly impacted by human influence. Goode points out that the bluefish's fertility and ability to produce an abundance of offspring is "beyond comprehension." Because Baird and his successor, Goode weren't able to understand the scope of the bluefish's spawning abilities, they assumed the bluefish's spawning activity was so great that it could never be affected by humans.

For years' after his investigation in 1871 and 1872, Baird continued correspondence with Captain N.E. Atwood. Atwood was a fisherman and fish dealer from Provincetown and gave considerable testimony for Baird's original investigation. Atwood attested that in June of 1847, he found two bluefish in his mackerel nets and shortly after, he claimed all mackerel had been driven off the coast of Cape Cod.¹⁶⁷ Atwood continued to write Baird after the investigation updating him on certain patterns he noticed within the coastal fisheries of Provincetown. In December 1879, Atwood wrote to Baird on the return of a great presence of mackerel around Provincetown. In a previous letter Baird had asked Atwood to send Cod liver oil at a wholesale price if possible. Atwood explained the lack of Cod in Provincetown waters by citing a large and unusual presence of mackerel in the area.

I am sorry to say that I am not getting any Cod livers yet our fishermen say that there is no school of Cod come in yet, owing to the large school of mackerel that have been caught here in gill nets our fishermen have not got ready to fish for Cod – during the

¹⁶⁶ Goode, 9.

¹⁶⁷ Storer, 161.

month of November a large number of mackerel was caught. They were mostly small and sold at from 2 to 3 cents apiece here...¹⁶⁸

Atwood suggests that the return of mackerel drove away the usual presence of Cod in November 1879. He goes on to note how abnormal this pattern was in Provincetown. Atwood writes of the mackerel, “Where could they have come from and where have they been all summer. I did not think there was any such mackerel Month of Cape Cod.”¹⁶⁹ Though Atwood doesn’t discuss the bluefish in this instance, because his prior testimony of relationships between the bluefish and mackerel, Atwood makes a suggestion about the relation between fish species in Provincetown. This letter marked the first significant mention or discussion of the mackerel since 1846 and 1847 when the mackerel were included in discussion of the destructiveness of the bluefish on the herring and mackerel fisheries in Falmouth and Provincetown. Writing in 1879, Atwood excludes the bluefish from his analysis, but the large and unusual presence of the mackerel could’ve been credited to the absence of bluefish during this time. It’s likely that the bluefish could’ve been present in the Provincetown waters during the summer as they prefer warmer temperatures and as they migrated away from Provincetown in the fall, schools of mackerel were able to return without the bluefish as present predators. If this had been the case, it’s likely that Atwood would’ve included this information, as he had been knowledgeable of the bluefish and mackerel relationships prior. It’s interesting that while Atwood largely victimized the mackerel when providing testimony for Baird’s investigation in 1871, when he discusses the mackerel as preying on the Cod fishery, he doesn’t employ the same language. This change in language could suggest a broader understanding that Atwood had gained in the years after he testified for Baird

¹⁶⁸ N.E. Atwood to Spencer Baird, 27 December 1879, Box 14, Folder 7, Spencer Fullerton Baird Papers 1833-1889, Smithsonian Institution Archives, Washington D.C.

¹⁶⁹ N.E. Atwood to Spencer Baird, 27 December 1879, Box 14, Folder 7, Spencer Fullerton Baird Papers 1833-1889, Smithsonian Institution Archives, Washington D.C.

or that he didn't consider the mackerel to be as destructive as the bluefish in Cape Cod's coastal waters.

In October 1893, the *Barnstable Patriot* a newspaper covering Cape Cod and the islands published an article about bluefish located off of the coast of New Jersey. The article, titled "Bluefish Baited" reveals interesting notions about human intervention on the bluefish population:

New Jersey fishermen a few years ago began throwing over from their boats large quantities, tons on tons, of ground up fish to attract the bluefish, and, once attracted, they would catch these with their hooks and lines, and the bluefish hang around for this food and let the small fish alone. One result of this baiting is to keep the bluefish from crowding northward; another is to hold them back from going southward, and the final result is to add several months to the season for fresh bluefish in the market, for all the time that they lie about to be fed they are being caught by the fishermen. This industry employs now a large fleet.¹⁷⁰

New Jersey fishermen were manipulating their local bluefish population in order to prolong their fishing season. By doing this, the article suggests a multitude of irregular outcomes. First, instead of hunting their usual prey, the bluefish were more attracted to the chopped fish that the fishermen were throwing overboard. It's unclear how long this practice was employed for, but it's likely that if it was used for multiple consecutive years, the various prey species of the bluefish would've expanded their population sizes. Additional outcomes discuss the human manipulation of the usual migratory patterns of the bluefish. By feeding the bluefish from their boats, the fishermen managed to keep the bluefish somewhat stationary around the New Jersey coastline, keeping them from moving northward in the summer months and southward in the winter months. Though not explicitly cited in the article, it's probable that this practice had a great impact on the habits of the bluefish along the East Coast of the United States. By keeping

¹⁷⁰ "Bluefish Baited." *Barnstable Patriot*, 17 October 1893.
<http://digital.olivesoftware.com/Olive/APA/Sturgis/SharedView.Article.aspx?href=BAR%2F1893%2F10%2F17&id=Ar00225&sk=F2723B4E&viewMode=image>

the bluefish relatively stationary off of New Jersey, they probably began spawning there more frequently than they usually would've. This operation likely hindered bluefish fisheries both north and south of New Jersey. Additionally, the East Coast bluefish population could've declined due to this because the fish were gathering in one place while monitored and fished by fishermen. "Bluefish Baited" reveals extremely interesting references to the ways human activity could've manipulated larger regional population patterns and behaviors of the bluefish in the late nineteenth century.

A *Barnstable Patriot* article written in July 1914, describes the scarcity of the bluefish.

The article credits this depletion to presence of sweep nets in New England:

Although some bluefish were taken last week, yet at present these fish are scarce. The use of sweep nets for several years past have driven off the fish. In the fifties and sixties these fish were caught with hook and drail, and thousands of barrels were shipped at Railroad Wharf by Timothy Crocker, the New York market glutted and the fish were sold as low as one cent per pound. Bass and scup were also very plenty and now are very scarce. At Nantucket where no seines are used the fish are caught from shore with hook and drail and fishing is good.¹⁷¹

The article discusses the scarcity of bluefish, scup and bass in New England where sweep nets are used to fish but points out that there is an abundance of fish in Nantucket where seines aren't used for fishing large quantities of fish at once. In the roughly three decades from Goode's updated report and this *Barnstable Patriot* article, the bluefish go from being unable to be impacted by human agency to scarce due to the human employed sweep nets.

Unusual water temperatures could also explain the scarcity of bluefish in coastal New England waters during this time. In Woods Hole specifically, coastal near-surface water temperatures had been taken almost daily since 1886. In 2004, scientists compiled the records of these coastal water temperatures in their titled, "A One Hundred Year Coastal Water

¹⁷¹ "Marine News: Fishermen." *Barnstable Patriot*, 27 July 1914.
<http://digital.olivesoftware.com/Olive/APA/Sturgis/SharedView.Article.aspx?href=BAR%2F1914%2F07%2F27&id=Ar00208&sk=479A2713&viewMode=image>

Temperature Record from Woods Hole.” The scientists reported years between 1886-2002 in which the mean monthly near-surface temperature was warmest or coldest during winter (December, January and February) and summer (June, July, August).¹⁷² June 1916 was the coldest summer month in the record, averaging 15 degrees Celsius or 59 degrees Fahrenheit. This doesn’t entirely explain why fish would crowd closer to Nantucket, but it could explain their scarcity around most of New England in the several years prior to 1916.

In 1953, Henry Bigelow and William Schroeder published *Fishes of the Gulf of Maine*, a report of their oceanographic and biological survey of the Gulf of Maine. They were commanded by the Bureau of Fisheries in cooperation with the Museum of Comparative Zoology of Harvard University during in the summer of 1912 to record their findings of fish, floating plants and animals and the physical and chemical state of its waters.¹⁷³ The Gulf of Maine includes the shore lines of northern Massachusetts, New Hampshire, Maine and parts of New Brunswick and Nova Scotia as it covers the waters from Nantucket Shoals and Cape Cod to Cape Sable. Bigelow and Schroeder’s handbook reveals a significant amount of early twentieth century scientific understanding of the bluefish. The habits of the bluefish are detailed, “the bluefish is oceanic in nature, found indifferently inshore, offshore, and in many parts of the ocean. It usually travels in schools, sometimes including many thousands.”¹⁷⁴ These migratory patterns of the bluefish swimming inshore and offshore can explain some of their habits that colonists and fisherman of New England revealed in the eighteenth and nineteenth centuries. In 1901, Bigelow and Schroeder note, that a school of bluefish that stretched 4 to 5 miles long was reported seen

¹⁷² Scott W. Nixon, Stephen Granger, Betty A. Buckley, Melissa Lamont, and Brenda Rowell, “A One Hundred and Seventeen Year Coastal Record from Woods Hole, Massachusetts” in *Estuaries* Vol. 27, No. 3. June 2004: (397-404).

¹⁷³ Henry Bigelow and William C. Schroeder, *Fishes of the Gulf of Maine*, (Washington: United States Government Printing Office, 1953), 1.

¹⁷⁴ Bigelow and Schroeder, 384.

inshore in Narragansett Bay.¹⁷⁵ The handbook then details the predacious qualities of the bluefish in a similar manner to Baird's report that was published seventy years earlier:

It is perhaps the most ferocious and bloodthirsty fish in the sea, leaving in its wake a trail of dead and mangled mackerel, menhaden, herring, alewives, and other species on which it preys. Goode wrote long ago, the bluefish, "not content with what they eat, which is itself of enormous quantity, rush ravenously through the closely crowded schools, cutting and tearing the living fish as they go, and leaving in their wake the mangled fragments." It is not only the schooling fish that fall prey to them, but scup, squeteague, hake, butterfish cunners, and small fish of all kinds, besides squid.¹⁷⁶

The bluefish is repeatedly depicted as a greedy predator that is unsatisfied with the large quantity of food it eats and attacks schools of fish aimlessly. By revealing habits of the bluefish in this way, scientists suggest that the bluefish is a vicious predator to other fish, killing them aimlessly without needing them to subsist. Bigelow and Schroeder employ the word "mangled" and "mangled fragments" when revealing the bluefish's predaciousness. They reveal that the bluefish eats only parts of its prey, illustrating a picture of a pack of bluefish that leave in their wake their butchered victims.

The bluefish are described in many instances as eating much more than they require to subsist, contributing to their bloodthirsty and voracious reputation. Baird wrote of the bluefish,

Sometimes among a school of herring or menhaden thousands of blue-fish will be seen, biting off the tail of one and then another, destroying ten times as many fish as they really need for food, and leaving in their track the surface of the water covered with the blood and fragments of the mangled fish.¹⁷⁷

Baird also wrote of the gluttony of the bluefish describing the species as, "the most voracious fish on record, which, from its earliest age to its maximum development is in the habit of destroying its own weight or more in fish every day."¹⁷⁸ As the species is also repeatedly likened to the wolf, the bluefish and wolves in North America sometimes share this quality that Jon

¹⁷⁵ Bigelow and Schroeder, 384.

¹⁷⁶ Bigelow and Schroeder, 384.

¹⁷⁷ Baird, XXIII.

¹⁷⁸ Baird, 241.

Coleman, author of *Vicious: Wolves and Men in America* deems “surplus killing.”¹⁷⁹ Coleman describes this phenomenon as, “a form of exuberant bloodletting deeply disturbing to wolves’ human admirers.”¹⁸⁰ Like the wolf, the bluefish’s “human admirers” or scientists like Baird, studying the species were troubled by the predacious patterns of the bluefish, as recognized in the many testimonies that mentioned the tactic of the species’ surplus killing. Coleman writes of the wolf, “wolves tend to eat the vulnerable, but their predation ensures neither a well-regulated nor a healthy prey population.” Similar to the way the bluefish are discussed in nineteenth and twentieth-century literature, the wolf fails to have a regulated prey population or consistent predacious pattern. Coleman reveals that this practice is unusual for wolves as they usually “devour everything, hide, hair, and bone, leaving only a stain in the snow.”¹⁸¹ Surplus killing only occurs when the wolves’ prey populations become vulnerable, usually in the case of a harsh winter where “scientists have come across multiple corpses at kill sites with only their choicest parts nibbled on.”¹⁸² Coleman goes on to attempt to explain this uncommon behavior,

The triggers for this behavior remain a mystery, but it appears to be brought on by a sudden shift in the prey animals’ ability to defend themselves. Surplus killing is an extreme case of the imbalance that can result even when wolves restrict their diet to the vulnerable.¹⁸³

It’s unclear whether the bluefish’s prey populations became increasingly vulnerable possibly due to the introduction of human operated fishing apparatuses in the 1870s. In that case, like the wolf, the bluefish in New England could’ve adopted this “surplus killing” practice under these circumstances, and thus became a focal point of Baird’s report. It’s also possible that with the

¹⁷⁹ Jon T. Coleman, *Vicious: Wolves and Men in America*. (Yale University Press, 2004), 80.

¹⁸⁰ Coleman, 80.

¹⁸¹ Coleman, 80.

¹⁸² Coleman, 80.

¹⁸³ Coleman, 80.

introduction of these large scale fishing apparatuses that the only fish that the bluefish had access to were the ones that were the most vulnerable.

While Bigelow and Schroeder appear to be disturbed by the “surplus killing” tactics and destructiveness of the bluefish on local fisheries on the east coast of North America, in the beginning of the twentieth-century, wolves and coyotes aroused similar concerns in the American West. Donald Worster’s *Nature’s Economy* discusses varmints or pests like the wolf and coyote in early twentieth-century America. The wolf had dominated the American West for the first three hundred years of European settlement in the region. Worster describes the mammal as a “symbol of a fierce and powerful nature that defied human rule.”¹⁸⁴

While the bluefish has gained significantly less attention than the wolf, the two species seemed to confuse and frustrate American inhabitants, scientists and governments that couldn’t explain the species behavior in the beginning of the twentieth-century. Worster references J. Frank Dobie, an American writer and advocate for wildlife conservation during this period. Dobie wrote, “sympathy for wild animals, sympathy that is intellectual as much as emotional, has not been a strong element in the traditional American way of life.”¹⁸⁵ Worster continues with an interesting argument about moralism and ethics in regards to American wildlife:

We have made distinctions in our national reaction to wildlife, chosen favorites as well as singled out enemies. Here as in other matters, the Anglo-American mind has exhibited a peculiarly intense moralism that, in this case, assigns every species to an absolute ethical category: good or bad.¹⁸⁶

Worster goes on to explain that the “varmint”, including wolves, pumas, bears and coyotes, are inherently “bad” in America’s moral consciousness. He writes, “From the time the Puritans of New England first put a bounty on their heads, the carnivores were most often viewed as

¹⁸⁴ Donald Worster, *Nature's Economy: A History of Ecological Ideas*. 2nd ed. (Cambridge: New York, NY, USA: Cambridge University Press, 1994), 258.

¹⁸⁵ Worster, 260.

¹⁸⁶ Worster, 260.

implacable, devilish foes who deserved nothing less than total extermination.”¹⁸⁷ While wolves and other “varmint” were targeted as vicious predators, destroying their prey populations in the American west, the bluefish were being depicted in the same manner in regards to coastal fisheries on the east coast of the United States. While the bluefish was being constantly likened to the wolf, it’s interesting that these species were the center of debate because of their predaciousness in the United States around the same time. Under Theodore Roosevelt’s administration from 1901-1909, an official program was constructed to entirely eradicate varmint, specifically wolves in America.¹⁸⁸ Pressures for this government program were sparked in part by livestock associations, especially “western sheepmen.”¹⁸⁹ Not long after Goode employed the analogy of wolves and sheep to explain seasonal laws regulating oyster beds in New England, western sheepmen advocated for the entire eradication of the wolf to protect their “tragically vulnerable” sheep.¹⁹⁰ The Bureau of the Biological Survey in the Department of Agriculture was tasked with this project and by 1907, poisons were employed in National Forests to kill 1,800 wolves and 23,000 coyotes.¹⁹¹ By 1915, Congress created a division within the Department of Agriculture’s Bureau of Biological Survey titled Predatory Animal and Rodent Control Service.¹⁹² In efforts to protect rancher’s cattle and sheep and sport hunter’s elk and deer, the group was ordered to exterminate creatures that preyed on these species, including the wolf. A biologist within the department noted, “Large predatory mammals destructive to livestock and game no longer have a place in our advancing civilization.”¹⁹³ The United States

¹⁸⁷ Worster, 260.

¹⁸⁸ Worster, 262.

¹⁸⁹ Worster, 264.

¹⁹⁰ Worster, 264.

¹⁹¹ Worster, 263.

¹⁹² Steinberg, 145.

¹⁹³ Steinberg, 146.

had embarked on a war against the predacious wolf in attempt to eradicate the entire species much like Baird suggested the extermination of the bluefish in efforts to replenish coastal fisheries in his report.

In the mid-twentieth century, conservationists' attitudes towards wolves shifted as scientists understood more about their behavior. In 1963, Farley Mowat's *Never Cry Wolf* was published after observing wolves in the subarctic regions of southern Keewatin Territory and northern Manitoba, Canada. From 1948-1949, Mowat was sent as a biologist by the federal government of Canada to investigate whether wolves were responsible for declining caribou populations in the region. Mowat concluded his work by stating that wolves largely subsisted off of small rodents and oftentimes chose mice to eat instead of the caribou.¹⁹⁴ Mowat reflected on the work he did in Canada thirty years after the publication of *Never Cry Wolf*,

We have doomed the wolf not for what it is but for what we deliberately and mistakenly perceive it to be: the mythologized epitome of a savage, ruthless killer—which is, in reality, not more than the reflected image of ourselves. We have made it the scapewolf for our own sins.¹⁹⁵

Mowat points out that humans unfairly misperceived wolves, labeling them as savage and ruthless killers. The narrative for wolves in America transformed from a vicious predator to a preserved species that received significant scholarship. In the last century, the bluefish hasn't gained nearly the same amount of attention that the wolf has. There were never federal projects assigned to eradicate the bluefish and then efforts to preserve the species. While scientists have recently tried to acquire accurate population numbers for the bluefish in order to prevent overfishing of the species, they've received little consideration by the general population.

Bigelow and Schroeder reference Baird's report when describing the species:

¹⁹⁴ Farley Mowat, *Never Cry Wolf*. 1st American Ed. ed. (Boston: Little, Brown and Company, 1963).

¹⁹⁵ Farley Mowat, *Never Cry Wolf: The Groundbreaking Book that Changed How the World Looks at the Wolf* (Open Road Media, 2015), Preface.

Baird writing in the 1870's when bluefish were at the height of their abundance, estimated that they annually destroyed at least twelve hundred million millions of fish during the four summer months off southern New England; and while this calculation surely was wildly exaggerated it will help give the reader a graphic realization of the havoc that they wreak during their periods of plenty.¹⁹⁶ Baird's numbers aren't included in *Fishes of the Gulf of Maine* for accuracy but rather for the awareness of the species' destructive qualities. Interestingly, Bigelow and Schroeder reveal that when Baird wrote about the bluefish seventy years prior, the population was at its peak abundance. This could explain why the species was such a large concern throughout Baird's investigation. The bluefish were clearly disrupting the coastal fisheries in the 1870s when Baird received testimony from numerous New Englanders about the damage it caused, but the true scope of this damage is hard to understand when later examining the peak in abundance of the population at the time. The fisherman and fish merchants that offered testimony about the bluefish almost suggested that the bluefish had become more bloodthirsty and fierce in the 1870s rather than noting the increase in their population. Instead, the testimony given by locals of Woods Hole in the 1870s attest that the bluefish population had largely diminished.

The handbook identifies migration and spawning habits of the bluefish. Bigelow and Shroeder argue that it isn't until the end of May that the first commercial catches of bluefish are reported off the southern coast of Massachusetts. In late June, schools of small, young bluefish or snappers come inshore in numbers and "run up into harbors and estuaries all along the coast, from Delaware Bay to Cape Cod."¹⁹⁷ It is likely that the few bluefish that Storer mentioned as wreaking havoc on Provincetown's mackerel fishery in late June were snappers. The large bluefish don't arrive until later in the summer and come close enough inshore on the western and southern coasts of Cape Cod for anglers casting in the surf to catch them.¹⁹⁸ Disappearing from

¹⁹⁶ Bigelow and Schroeder, 384.

¹⁹⁷ Bigelow and Schroeder, 384.

¹⁹⁸ Bigelow and Schroeder, 384.

the New England coastal waters by early November, the bluefish are present for at least five months in these waters.

Bigelow and Schroeder are less clear on the spawning patterns of the bluefish species:

it appears that they spawn from late spring through July and perhaps into August. But bluefish have never been reported actually spawning, though watch has been kept for them, which makes it likely either that they interrupt their inshore visit to move offshore for the purpose, perhaps sinking deep, or that most of them have spawned out before they appear along our northern coasts. In either case, the regular presence of “snappers” in numbers inshore, and the occasional captures of smaller fry in the Chesapeake Bay and in the Gulf of Maine make it likely that the spawning grounds of our northern bluefish are not far distant.¹⁹⁹

Suppositions are made about the spawning habits of the bluefish because there hadn't been reports of their spawning. Bigelow and Schroeder offer two theories, either the bluefish migrate from inshore to offshore for the purpose of spawning or that they have spawned before they reach coastal waters. Both hypotheses argue that the bluefish spawn in offshore waters. But Bigelow and Schroeder surmise that the spawning grounds of the bluefish must be located in relatively close by offshore waters as large numbers of snappers inshore is common.

In 1929, Rachel Carson spent the summer in Woods Hole at the Marine Biological Laboratory on a summer study fellowship.²⁰⁰ Carson later credited one of her most acclaimed works, *The Sea Around Us* published in 1951 to her time spent in Woods Hole. Carson wrote, “the genesis of *The Sea Around Us* belongs to that first year at Woods Hole, when I began storing away facts about the sea.”²⁰¹ Shortly after that first summer spent working in Woods Hole, Carson was hired by the U.S. Bureau of Fisheries where she began writing nature and conservation articles. In 1937, Carson wrote her essay published in *Atlantic Monthly*, “Undersea”

¹⁹⁹ Bigelow and Schroeder, 385.

²⁰⁰ Mary A. McCay, *Rachel Carson*, Twayne's United States Authors Series; TUSAS 619 (New York: Toronto:New York: Twayne Publishers; Maxwell Macmillan Canada ; Maxwell Macmillan International,1993), XV.

²⁰¹ McCay, 40.

which was later transformed into her book *Under the Sea Wind*. “Undersea” imaginatively describes underwater habitats and relationships among aquatic creatures. Carson weaves a lively and poetic narrative that ties all oceanic beings together. Carson opens her article by emphasizing the obscure nature of the ocean, “Who has known the ocean? Neither you nor I...” Carson details the ocean as a great unknown to humans with “earth-bound senses”. The article then discusses specific relationships among species, including the bluefish. Carson writes:

These ocean pastures are also the domain of vast shoals of adult fishes: herring, anchovy, menhaden, and mackerel, feeding upon the animals of the plankton and in their turn preyed upon; for here the dogfish hunt in packs, and the ravenous bluefish, like roving buccaneers, take their booty where they find it.²⁰²

While Carson describes the other fish species, herring anchovy, menhaden, and mackerel as being part of a predator and prey cycle, the bluefish is described entirely as a predator.

Describing the bluefish as ravenous, Carson anthropomorphizes the bluefish, likening the species to reckless pirates. Carson suggests an interesting quality of the bluefish in this analogy. After describing the bluefish as buccaneers she writes that the species’ takes “booty where they can find it”, pointing out a seemingly reckless and unpredictable system of killing equating the many species that fell prey to the bluefish as some sort of prize.

Carson again mentions the bluefish in *The Sea Around Us* when discussing the ocean’s surface water. In her chapter “The Pattern of the Surface”, Carson notes, “nowhere in all the sea does life exist in such bewildering abundance as in the surface waters.”²⁰³ She goes on to mention the bluefish, again referencing its predaciousness:

From the plankton the food chains lead on, to the schools of plankton-feeding fishes like the herring, menhaden, and mackerel; to the fish-eating fishes like the bluefish and tuna and sharks, to the pelagic squids that prey on fishes; to the great whales who, according

²⁰² Rachel Carson, “Undersea” *Atlantic Monthly*, September 1937.

²⁰³ Carson, Rachel, and Katherine L. Howe, *The Sea around Us* (New York: Oxford University Press, 1951), 16.

to their species but not according to their size, may live on fishes, on shrimps, or on some of the smallest of the plankton creatures.²⁰⁴

Carson depicts an intricate food chain with plankton as the foundation. The bluefish is mentioned as a fish-eating fish and compared to much larger fish than itself. Carson only mentions the bluefish in her works when discussing its raptorial qualities.

In the 1960s and 1970s a prominent theory emerged as the “science of chaos” in the United States.²⁰⁵ Donald Worster argues, “throughout the modern era the scientific community assumed that nature, despite a few appearances to the contrary, was a perfectly manageable system of simple, linear, rational order.”²⁰⁶ When Carson examined oceans and marine life, the language she uses in her works tends to suggest that she regarded marine environments and their inhabitants in an equilibrium or regarded equilibriums as the norm. What emerged as the theory of chaos in the few decades after Carson wrote her most prominent works was the idea that, all nature and human life is “fundamentally erratic, discontinuous, and unpredictable.”²⁰⁷ In 1974, Robert May, a physicist that had relocated from Australia to the biology department of Princeton published an essay on ecology that had the word “chaos” in its title.²⁰⁸ May pointed out in his essay that “wildlife populations often did not follow some simple pattern of increase, saturation, competition, struggle, and balance.”²⁰⁹ Though this conversation in the field of ecology developed long after Baird’s investigation, he likely would’ve been open to this dynamic and theory of chaos. In regards to the bluefish and their sporadic migration habits and fluctuating population numbers, Baird’s study of this species would’ve supported twentieth-century

²⁰⁴ Carson and Lowe, 19.

²⁰⁵ Worster, 405.

²⁰⁶ Worster, 406.

²⁰⁷ Worster, 405.

²⁰⁸ Worster, 408.

²⁰⁹ Worster, 408.

scientific ideas of chaos and disorder. Furthermore, while contemporaries of Baird and environmental historians today seem to diminish the bluefish as a major natural factor among fisheries in New England, Baird accepted the bluefish and their uniquely chaotic behavior as a component of fishery conditions throughout his investigation.

At the beginning of the twenty-first century, scientists began to examine bluefish behaviors and reproductive habits in comprehensive case studies. From 2001-2003, scientists conducted a study that examined the reproductive biology of the bluefish along the East Coast of the United States. The study examined 1437 female bluefish, sampled from the continental slope from Florida to New York. Scientists examined the spawning location, pattern and timing and fecundity of the female fish. The study also argues that the bluefish fishery is one of the most important recreational fisheries in the United States, accounting for roughly 30% of the total weight of all species captured by line fishermen along the East Coast. The study discusses gaps in scientific understanding of the reproductive biology in the bluefish stating it is, “complicated by the distribution of the population and most information has been gathered from spatially and temporally restricted periods.”²¹⁰ Furthermore, the scientists write,

Estimates for fecundity that are critical to management are almost entirely lacking for bluefish. The data used to define reproductive capacity of bluefish along the East Coast, are based on unpublished studies and do not indicate whether bluefish are batch or total spawners.²¹¹

Still, when this study was published in 2007, scientists weren't entirely confident in the bluefish's reproductive capacities along the East Coast. Because the bluefish has such a large distribution and migration habits the study suggests, “large amounts of sampling effort from a broad range of gears over a number of years may be necessary to completely interpret the

²¹⁰ Eric Robillard, “Reproductive biology of bluefish (*Pomatomus saltatrix*) along the East Coast of the United States” in *Fisheries Research* (Volume 90, Issues 1–3, April 2008), 198.

²¹¹ Robillard, 198.

seasonality of spawning.”²¹² Interestingly, in the centuries since Baird’s investigation, scientists are still having trouble understanding the full extent of the species’ reproductive and spawning habits. The study concluded with,

The results of this coast-wide study provide the first evidence from direct observations of ovaries that bluefish along the East Coast of the United States are asynchronous, batch spawners, with a continual and protracted spawning pattern.²¹³

The bluefish of the east coast irregularly spawn multiple times in one breeding season. Bluefish found in southern portions of the East Coast were found to spawn in March and April while bluefish found in northern areas spawned from May to August. This study coincides with Bigelow and Schroeder’s suppositions made about the bluefish spawning patterns in the Gulf of Maine. Though less specific, Bigelow and Schroeder surmised that the bluefish spawned in the late spring through July or even into August. These spawning patterns also coincide with times that Bigelow and Schroeder saw the greatest presence of bluefish along the Gulf of Maine. In their handbook, they included:

Creatures of warm water, never found in any numbers in temperatures lower than about 58 to 60 degrees (at least in summer); and they appear along the United States coast as warm-season migrants only.²¹⁴

Biologists conducted a study on the bluefish (*Pomatomus Salatrix*) in 2014 that reveals contemporary scientific knowledge on the bluefish species and its known habits. The scientists that conducted this study, “Paleoclimate Shaped Bluefish Structure in the Northern Hemisphere” examine the global population structure of the bluefish species. They describe the habits of the bluefish as, “a cosmopolitan, migratory, pelagic predator distributed over continental shelves and in estuaries of temperate waters of the Atlantic, Indian and Pacific oceans and adjacent seas,

²¹² Robillard, 208.

²¹³ Robillard, 205.

²¹⁴ Bigelow and Schroeder, 384.

including the Mediterranean, Aegean and Black seas.”²¹⁵ Because the bluefish is widely distributed across these vast areas, scientists aimed to detect accurate population units of the bluefish to provide information that would prevent overfishing of the species and promote proper bluefish fishery management. The article notes differing ranges of the bluefish throughout history, “the contemporary distribution of Bluefish is coincident with sea surface temperatures of 18-27C, and it has been suggested that shifts in its ranges and contacts between populations have resulted from historical changes in water temperature.”²¹⁶ Changes in water temperature noted here could account for the periods that bluefish had disappeared from the coastal waters of Nantucket and Woods Hole. This study reveals the persistent hardships that scientists face when understanding bluefish and their population numbers specifically. The intention for this study is significant as scientists are currently trying to grasp accurate bluefish population numbers in efforts to protect the species.

²¹⁵ Miralles, Laura, Francis Juanes, Antonio F. Pardiñas & Eva Garcia-Vazquez (2014) Paleoclimate Shaped Bluefish Structure in the Northern Hemisphere. 579.

²¹⁶ Miralles, 579.

Conclusion

In the past twenty years, historians have recently turned to the United States Civil War as a watershed moment in the environmental history of the United States.²¹⁷ This scholarship reveals that modern tendencies to emphasize human agency and environmental decline can be traced back to the period of Baird's lifetime where he surely witnessed and was involved in discussion on these topics. Throughout the U.S. Civil War, entire landscapes were demolished across the South as Union generals burned and destroyed whole crop fields, forests, mills, bridges and railways as military strategy. Ruination on such a large scale provoked northerners and southerners to interact and understand their environments differently than they had before.²¹⁸ Americans began tracing the development of war through its destructive practices, and through their sources a new national narrative emerged. Environmental historians have recently paid more attention to the American Civil War as an impetus for modern forms of environmental conservation. After witnessing the decimation of entire landscapes, Americans were forced to acknowledge and appreciate their natural surroundings in a new light.

Amidst environmental destruction, George Perkins Marsh, a renowned environmental historian published his book *Man and Nature* in 1864 as the Civil War came to an end with purpose of revealing, "the extent of the changes produced by human action in the physical conditions of the globe we inhabit."²¹⁹ Lewis Mumford, a historian and writer esteemed Marsh's

²¹⁷ Timothy B. Smith, *The Golden Age of Battlefield Preservation: The Decade of the 1890s and the Establishment of America's First Five Military Parks* (Knoxville: University of Tennessee Press, 2008), 14.

²¹⁸ Megan Kate Nelson, *Ruin Nation: Destruction and the American Civil War* (Athens: University of Georgia Press, 2012), 3.

²¹⁹ George P. Marsh, *Man and Nature*. Edited by David Lowenthal, (Seattle, University of Washington Press, 2003), iii.

work the, “fountainhead of the conservation movement.”²²⁰ In his introduction to a new edition of Marsh’s *Man and Nature* published in 2003, David Lowenthal argues, “many before Marsh had noted various specific facets of environmental change; none had ever seen or traced the effects of human impact as an interrelated whole.”²²¹ In his book, Marsh challenged existing popular ideas that human influence on nature was minimal and instead warned the American public of the severity of their effect on the natural environment. Marsh’s clear warnings to the American population were published just before the end of the Civil War, in the midst of environmental ruin. Americans realized unlike before that human agency could have a devastating impact on their environment.

Just seven years after the publication of Marsh’s book addressed devastation to American land, the federal government perceived a need to turn attention to its coastal waters and their inhabitants as the United States Commission of Fish and Fisheries was established. While many Americans witnessed destruction to southern landscapes, it was hard for many Americans to take concern or notice changes in marine environments that they couldn’t see. In Helen Rozwadowski’s book, *Fathoming the Ocean: The Discovery and Exploration of the Deep Sea* she argues that the sea and the deep sea “could only be known indirectly, through fishing, whaling, or attempts to dip sampling devices beneath the waves” in the twentieth-century.²²² Destruction of marine habitats or diminution of marine species was hard to account for and quantify when humans had only an indirect relationship with the sea.

In 1871, Baird was instructed by the federal government to discern whether the alleged depletion among Southern New England’s fisheries could be determined. While investigating

²²⁰ Lisa M. Brady, *War Upon the Land: Military Strategy and the Transformation of Southern Landscapes during the American Civil War* (Athens: University of Georgia Press, 2012), xiv.

²²¹ Marsh, xv.

²²² Rozwadowski, 4.

Southern New England's coastal fisheries as a whole, Baird revealed unique scholarship on the bluefish species as they fit into and interacted with the coastal waters of New England. Baird's understanding of the bluefish provided a window into larger ideas about coastal marine environments, as the American population witnessed a new trend towards conservation. While the language that Baird used to characterize the species was consistent with most of the scholarship on the bluefish, Baird was able to account for human and natural agents when examining overall coastal fishery decline.

Recently, the extensive scholarship on Cape Cod and the exploitation of coastal and marine environments has largely accounted for human agency when analyzing narratives of decline. Jeffrey Bolster's book *The Mortal Sea: Fishing the Atlantic in the Age of Sail* presents an extensive history of the exploitation of marine resources from the seventeenth century to the twenty first century. Bolster largely leaves out the bluefish from his narrative of coastal decline and focuses on the overfishing of species like the menhaden, mackerel and cod. Bolster emphasizes human agency in the overall destruction to New England's marine environments. Human impact on aquatic environments seems easier to document than natural agency and more specifically bluefish behavior. It's possible that historians have tended to focus on human agency when attempting to narrate a history of the sea as it is easier to chronicle. Baird's investigation and findings differ from narratives like Bolster's that focus largely on human intervention as a cause of fishery or coastal environmental destruction. Baird was able to comprehensively account for the combination of human and natural agents, like the bluefish when investigating coastal fishery diminution.

In the last four centuries, scientists, scholars, and historians have attempted to document and comprehend bluefish behavior in New England. The species consistently presented

challenges to those that made effort to understand the full extent of their migration patterns, population numbers and spawning habits. Consistent throughout scholarship on bluefish in the region were characterizations of the species as a vicious and bloodthirsty predator, an unwanted pest, or a somehow diseased fish. Though few scientists are studying the species to gain a better understanding of population numbers and distribution in the future, it's likely that the bluefish's long legacy in New England will remain for the most part, a puzzle.

Appendix 1.

Questions Relative to the Food-Fishes of the United States

A. Name.

1. What is the name by which this fish is known in your neighborhood? If possible, make an outline sketch for better identification.

B. Distribution.

2. Is it found throughout the year, or only during a certain time; and for what time?
3. If resident, is it more abundant at certain times of the year; and at what times?

C. Abundance.

4. How abundant is it, compared with other fish?
5. Has the abundance of the fish diminished or increased within the last ten years, or is it about the same?
6. If diminished or increased, what is the supposed cause?
7. What is the amount or extent of the change in abundance?

D. Size.

8. What is the greatest size to which it attains, (both length and weight,) and what the average?
9. State the rate of growth per annum, if known; and the size at one, two, three, or more years.
10. Do the sexes differ in respect to shape, size, rate of growth, &c.?

E. Migration and Movements.

11. By what route do these fish come into the shore; and what the subsequent movements?
12. By what route do they leave the coast?
13. Where do they spend the winter season?
14. When are the fish first seen or known to come near the shore, and when does the main body arrive; are the first the largest; are there more schools or runs than one coming in, and at what intervals?
15. When do the fish leave shore, and is this done by degrees or in a body?
16. Is the appearance of the fish on the coast regular and certain, or do they ever fail for one or more seasons at a time, and then return in greater or less abundance; if so, to what cause is this assigned?
17. How do the runs differ from each other in number and size?
18. Which sex comes in first; and how far advanced is the spawn in the female on first arriving?

19. Will either sex, or both, take the hook on first arriving; and if so, is there any period of the stay of the fish when they refuse it?
20. If they refuse the hook at first, how soon do they begin to take it after arriving?
21. Do the schools of fish swim high or low; and is their arrival known otherwise than by their capture; that is, do they make a ripple on the water; do they attract birds, &c.?
22. What is the relation of their movements to the ebb and flow of the tide?
23. Does spawn ever run out of these fish taken with a hook?
24. Answer same question in regard to fish taken in nets or pounds; is the spawn ever seen in any quantity floating about inside of nets?
25. Are these fish anadromous; that is, do they run up from the sea into fresh water for any, and for what, purpose?
26. If anadromous, when are they first seen off the coast; when do they enter the mouths of the rivers, and what is the rate of progression up stream?
27. If anadromous, what the length of their stay in fresh water, and when do they return to the sea, or do they become exhausted by breeding and die?
28. Do the different sexes or ages vary in this respect?
29. Do these fish come on to the breeding-grounds before they are mature; or do you find the one or two year old fish with the oldest?
30. What are the favorite localities of these fish; say whether in still water or currents, shallow or deep water, on the sand, in grass, about rocks, &c.?
31. What depth of water is preferred by these fish?
32. What the favorite temperature and general character of water?

F. Relationships.

33. Do these fish go in schools after they have done spawning, or throughout the year, or are they scattered and solitary?
34. Have they any special friends or enemies?
35. To what extent do they prey on other fish; and on what species?
36. To what extent do they suffer from the attacks of other fish, or other animals?

G. Food.

37. What is the nature of their food?
38. Are there any special peculiarities in the manner of feeding of these fish?
39. What amount of food do they consume?

H. Reproduction.

40. Is there any marked change in the shape or color of either sex during the breeding-season, or any peculiar development of, or on, any portion of the body, as the mouth, fins, scales, &c.?
41. Are there any special or unusual habits during the spawning season?
42. Is spawning interfered with by lines or nets, or otherwise?
43. At what age does the male begin to breed, and at what age the female?
44. For how many years can these fish spawn?

45. Does the act of spawning exert an injurious effect?
46. Where do these fish spawn, and when?
47. Can you give any account of the process, whether males and females go in pairs, or one female and two males; whether the sexes are mixed indiscriminately, &c.?
48. Is the water ever whitened or colored by the milt of the male?
49. What temperature of water is most favorable for hatching?
50. At what depth of water are the eggs laid, if on or near the bottom?
51. What is the size and color of the spawn?
52. What is the estimated number for each fish; and how ascertained?
53. Answer the question for one season, and for the lifetime.
54. Do the eggs, when spawned, sink to the bottom, and become attached to stones, grass, &c.; or do they float in the water until hatched?
55. Do the fish heap up or construct any kind of nest, whether of sand, gravel, grass, or otherwise; and if so, is the mouth, the snout, or the tail used for the purpose, or what; and if so, how is the material transported; or do they make any excavation in the sand or gravel?
56. Do they watch over their nest, if made either singly or in pairs?
57. When are the eggs hatched, and in what period of time after being laid?
58. What percentage of eggs laid is usually hatched?
59. What percentage of young attains to maturity?
60. What is the rate of growth?
61. Do the parents, either or both, watch over the young after they are hatched?
62. Do they carry them in the mouth or otherwise?
63. What enemies interfere with or destroy the spawn or the young fish; do the parent fish devour them?
64. Are the young of this fish found in abundance, and in what localities?
65. On what do they appear to feed?

I. Artificial Culture.

66. Have any steps been taken to increase the abundance of this fish by artificial breeding?

J. Protection.

67. Are these fish protected by law or otherwise?

K. Diseases.

68. Has any epidemic or other disease ever been noticed among them, such as to cause their sickness or death in greater or less number?
69. When have these epidemics taken place, and to what causes have they been assigned?

L. Parasites.

70. Are crabs, worms, lampreys, or other living animals found attached to the outside or on the grills of these fish?

M. Capture.

71. How is the fish caught; if with a hook, what are the different kinds of bait used, and which are preferred?
72. If in nets, in what kind?
73. At what season and for what period is it taken in nets, and when with the line?
74. What would be the average daily catch of one person with the hook, and what the total for the season?
75. Answer the same question for one seine or pound of specified length.
76. Is the time of catching with nets or pounds different from that with lines?
77. Is it caught more on one time of tide than on another?

N. Economical Value and Application.

78. What disposition is made of the fish caught, whether used on spot or sent elsewhere; and if the latter, where?
79. What is its excellence as food, fresh or salted?
80. How long does it retain its excellence as a fresh fish?
81. To what extent is it eaten?
82. Is it salted down, and to what extent?
83. Is it used, and to what extent, as manure, for oil, or for other purposes, and what?
84. What were the highest and lowest prices of the fish, per pound, during the past season, wholesale and retail, and what the average; and how do these compare with former prices?
85. Are these fish exported; and, if so, to what extent?
86. Where is the principal market for these fish?
87. NAME AND ADDRESS OF OBSERVER.
88. DATE OF STATEMENT.

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