



W. K. Brooks and the Oyster Question: Science, Politics, and Resource Management in Maryland, 1880–1930

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During the 1880s, as fish populations dropped and prices rose, the promise of artificial propagation captivated the American public.¹ Because oysters provided a third of the national fish earnings,² plunging oyster harvests prompted widespread debate. Over the objections of oystermen, northern states whose natural oyster beds had been decimated allowed citizens to buy or lease areas for oyster planting, a system of artificial cultivation that had been practiced in Europe for decades. In Maryland, where oystermen enjoyed excessive political representation and where the oyster bars were still abundant, calls for private scientific management met even fiercer resistance. By 1910, as one writer put it, “An American from any other part of the country knows without being told . . . that the Maryland oyster . . . [is] deeply involved in politics.”³

Leading the Maryland oyster culture debate in the late nineteenth century was the country’s “most thorough and successful student of the oyster,” Johns Hopkins embryologist William Keith Brooks.⁴ Through his studies of oyster development and artificial fertilization, Brooks sought to advance human

¹ For primary sources, see Charles Hugh Stevenson, *A Bibliography of Publications in the English Language Relative to Oysters and the Oyster Industries* (N.p., n.d. [c. 1895]), and Victor S. Kennedy and Linda L. Breisch, *Maryland’s Oysters: An Annotated Bibliography* (College Park: University of Maryland Sea Grant Program, 1981).

² Francis Taggart Christy, Jr., “The Exploitation of a Common Property Natural Resource: The Maryland Oyster Industry” (Ph.D. diss., University of Michigan, 1964), p. 67; Ernest Ingersoll, *The History and Present Condition of the Fishery Industries: The Oyster-Industry* (Washington, D.C.: Government Printing Office, 1881), p. 251.

³ James L. Kellogg, *Shell-Fish Industries* (New York: Holt, 1910), p. 216.

⁴ Review of Brooks’s *The Oyster*, in *Pop. Sci. Monthly*, 39 (1891), 700.

welfare not just intellectually but pragmatically by increasing the supply of a nutritious food.⁵

Though his scientific discoveries had crucial economic consequences, Brooks's inability to provide accurate predictions about the annual oyster supply and his insistence on linking cultivation with privatization undermined his proposals for oyster conservation and scientific management. Despite years of advocacy, Brooks and his successors failed to persuade Maryland legislators to impose effective conservation measures on the state oyster fishery, as Gifford Pinchot and other federal resource development leaders did with western forest and range reserves.⁶ Nor were they able to persuade politicians to encourage the oyster industry to accept intensive scientific management, as land-based eastern agribusiness did in the late nineteenth century.⁷ The involvement of Brooks and other researchers in the Maryland oyster culture debate illustrates the weak role of scientific authority in influencing public policy making on a local level.

This view challenges oversimplified assumptions of a traditional "marriage of mutual convenience between science and the law" based on an understanding of scientific or technical expertise as an influential aid to factual disclosure.⁸ Although the sociological literature on regulatory policy making posits a late-twentieth-century erosion of public trust in science and technology,⁹ the decline of science as a political-judicial force began much earlier in certain contexts. The overall conclusion Sheila Jasanoff draws about

⁵ For early studies of oyster nutrition, see W. O. Atwater, "Report of Progress of an Investigation of the Chemical Composition and Economic Values of Fish and Invertebrates Used for Food," *Report U.S. Fish Commission, 1880, VIII* (1883), 231–286; W. O. Atwater, "Contributions to the Knowledge of the Chemical Composition and Nutritive Values of American Food Fishes and Invertebrates," *Report U.S. Fish Commission, 1883, XI* (1885), 433–500; W. O. Atwater, "Chemical Changes Produced in Oysters in Floating, and Their Effects upon the Nutritive Value," *Trans. Amer. Fish. Soc.*, 16 (1887), 37–52; W. O. Atwater, "Oysters as Food," *Report of the Oyster Investigation and Shell Fish Commission, for the Year Ending November 30, 1887* (1888), pp. 53–78.

⁶ Samuel P. Hays, *Conservation and the Gospel of Efficiency* (Cambridge: Harvard University Press, 1959), pp. 28–65.

⁷ Samuel P. Hays, *The Response to Industrialism 1885–1914* (Chicago: University of Chicago Press, 1995), pp. 17–18.

⁸ The quote is from Maria Eduarda Gonçalves, review of Shelia Jasanoff's *Science at the Bar*, *Sci. Tech. Human Val.*, 22 (1997), 258–264, p. 258.

⁹ See, for example, *Misunderstanding Science? The Public Reconstruction of Science and Technology*, ed. Alan Irwin and Brian Wynne (Cambridge: Cambridge University Press, 1996); Sheila Jasanoff, *Science at the Bar: Law, Science, and Technology in America* (Cambridge: Harvard University Press, 1995); Sheila Jasanoff, *The Fifth Branch: Science Advisors as Policymakers* (Cambridge: Harvard University Press, 1990); Yaron Ezrahi, *The Descent of Icarus: Science and the Transformation of Contemporary Democracy* (Cambridge: Harvard University Press, 1990); *Expert Evidence: Interpreting Science in the Law*, ed. Roger Smith

the post-1970 federal regulatory decision-making process – that political criteria often play a much greater role in legislative and judicial decisions than scientific guidelines – applies as well to the turn-of-the-century Maryland oyster culture debate.¹⁰

The historiographical perception of the symbiotic relation between science, politics, and the law owes much to Samuel Hays's classic book *Conservation and the Gospel of Efficiency* (1959). Based on his study of federal conservation programs, Hays argued that the early-twentieth-century conservation movement was not led by grassroots political reform movements. Instead, professional scientists and engineers assumed control in league with big corporations who also "placed a premium on large-scale capital organization, technology, and industry-wide cooperation and planning to abolish the uncertainties and waste of competitive resource use."¹¹ Centralized resource management as subsequently practiced was often undemocratic because grassroots user groups lacked "a deep sense of participation in the process by which technical experts made resource decisions."¹²

My analysis of the Maryland oyster culture debate leads to a different view of scientific expertise and resource management in the Progressive Era. The movement for more efficient use of Maryland's oyster lands, led by professional scientists and powerful laymen not necessarily linked with corporate interests, was thwarted by grassroots resource-use groups. Chesapeake oystermen abhorred conservationists' methods of resource-use adjustment and feared losing their independence to corporate behemoths, just like the resource users described by Hays who objected to federal restrictions on the West's forests, rivers, rangelands, and mineral mines.¹³ But unlike other grassroots groups, Maryland oystermen possessed power out of proportion to their numbers and economic importance.¹⁴ Because the tidewater counties enjoyed excessive representation in the Maryland General Assembly,

and Brian Wynne (London: Routledge, 1989); Joel Primack and Frank von Hippel, *Advice and Dissent: Scientists in the Political Arena* (New York: Basic Books, 1974), p. 285.

¹⁰ Jasanoff, *The Fifth Branch* (above, n. 9), passim.

¹¹ Hays, *Conservation and the Gospel of Efficiency* (above, n. 6), p. 266.

¹² *Ibid.*, p. 273.

¹³ *Ibid.*, pp. 272–273.

¹⁴ Maryland oyster interests enjoyed disproportionately large representation because each county possessed one senator and because tidewater counties outnumbered nontidal counties. As H. L. Mencken complained in 1928, "The vote of a malarious peasant on the lower Eastern Shore counts as much as the votes of 12 Baltimoreans." Not until 1964 did the tidewater counties' excessive representation end, when the U.S. Supreme Court mandate reapportionment. See respectively John Capper, Garrett Power, and Frank R. Shivers, Jr., *Chesapeake Waters: Pollution, Public Health, and Public Opinion, 1607–1972* (Centreville, Md.: Tidewater Publishers, 1983), p. 81; *Baltimore Evening Sun*, July 23, 1928, quoted in Christy, "Exploitation of a Common Property Natural Resource" (above, n. 2), p. 178; Victor S.

oystermen were able to safeguard the bay as a public commons through their representatives. As a result, democracy – and resource exploitation – prevailed over resource management.

William Keith Brooks

At first glance, Brooks's involvement in the oyster culture debate seems unusual, as expressed by Chesapeake scientist L. Eugene Cronin: "Even the excellent zoologist W. K. Brooks was caught up in the enthusiasm" over artificial fish propagation.¹⁵ Indeed, Brooks was the premier American morphologist of the last quarter of the nineteenth century, and a professor of biology at the nation's first private research university. As a Johns Hopkins faculty member, he conducted important morphological and embryological studies of mollusks, tunicates, brachiopods, arthropods, and coelenterates, and trained four of the twentieth century's top experimental biologists, Thomas Hunt Morgan, Ross Granville Harrison, Edmund Beecher Wilson, and Edwin Grant Conklin.¹⁶

Although Hopkins demanded no more, Brooks did not limit himself to teaching and research. He often complained that he preferred to leave the practical implications of his research to others, yet Brooks spent several summers conducting experiments in oyster propagation as the director of the Chesapeake Zoological Laboratory. Brooks established the CZL, a summer seaside expedition that allowed faculty and graduate students to collect and draw marine organisms, as part of the Hopkins graduate program in morphology in 1878. The laboratory, which later convened in North Carolina, Bermuda, and Jamaica, played an important educational role "since the sea was thought to contain the most primitive organisms and therefore hold the keys to basic relationships among animals and to early evolutionary history."¹⁷

Brooks's early work on oyster embryology and artificial fertilization led to a two-year appointment as the state's chief oyster commissioner. Alarmed

Kennedy and Linda L. Breisch, "Sixteen Decades of Political Management of the Oyster Fishery in Maryland's Chesapeake Bay," *J. Envir. Man.*, 16 (1983), 153–171.

¹⁵ L. Eugene Cronin, "Chesapeake Fisheries and Resource Stress in the 19th Century," *J. Wash. Acad. Sci.*, 76 (1986), 188–198, p. 190.

¹⁶ Keith Rodney Benson, "William Keith Brooks: A Case Study in Morphology and the Development of American Biology" (Ph.D. diss., Oregon State University, 1979), p. 118; Jane Maienschein, *Transforming Traditions in American Biology, 1880–1915* (Baltimore: Johns Hopkins University Press, 1991), p. 44.

¹⁷ Maienschein, *Transforming Traditions* (above, n. 16), pp. 49–55; W. K. Brooks, "Chesapeake Zoological Laboratory: Report of the Director for its First Six Years, 1878–83," *Johns Hopkins Univ. Circ.*, 3 (April 1884), 91–94.

at the rapid destruction of the natural beds, Brooks articulated the need for private oyster culture in Chesapeake. He warned that if the Maryland oyster industry failed to replace its wasteful, destructive methods with efficient, rational ones, an “oyster famine” would soon result. From the early 1880s until the early 1900s, Brooks conducted experiments, published books, and gave speeches in the hope of convincing Marylanders to “remove the oyster industry from a mere hunt to the level of scientific agriculture.”¹⁸ According to his student Edwin Grant Conklin, “His absorption in this work was so complete that he talked oysters in season and out of season. The story is current that at a university reception a society woman attempted to engage him in small talk; he listened mutely for a while, and then was heard to say, “Madam, the Maryland oyster is being exterminated.”¹⁹ Former student Ethan Allen Andrews stated that Brooks was so strongly committed to resolving the debate that it “played no small part” in keeping him from accepting enticing positions elsewhere.²⁰

Oyster culture advocacy was not the only popular activity in which Brooks engaged. Like other professional scientists of his time, he resolved to show the public the importance of secular science – in this case, biology.²¹ Brooks was a frequent contributor to *Popular Science Monthly*, one of the leading late-nineteenth-century institutions of scientific popularization,²² and he enthusiastically participated in both the Baltimore Natural History Club and the Baltimore and Ohio Railroad’s series of workingmen’s lectures.²³

Given his interest in popularization, it is not surprising that Brooks sought to apply his scientific expertise to a major economic problem. Far from being anomalous, Brooks’s applied work as a practical extension of his embryological research shows the centrality of embryology in late-nineteenth-century biology. His analysis of developmental processes addressed central issues related to the control of life: agriculture. Indeed, Brooks was one of several scientists who helped popularize the idea of science’s practical utility to agri-

¹⁸ E. A. Andrews, “William Keith Brooks,” *Science*, 28 (December 4, 1908), 777–786, p. 779.

¹⁹ Edwin Grant Conklin, “William Keith Brooks,” *Nat. Acad. Sci. Biog. Mem.*, 8 (1913), 25–88, p. 60.

²⁰ Andrews, “Brooks” (above, n. 18), p. 779.

²¹ John C. Burnham, *How Superstition Won and Science Lost: Popularization Science and Health in the United States* (New Brunswick: Rutgers University Press, 1987), pp. 151–152.

²² *Ibid.*, pp. 152, 160. Examples of Brooks’s popular articles include “Influences Determining Sex,” *Pop. Sci. Monthly*, January 1885, 232–330; “Can Man be Modified by Selection?” *Pop. Sci. Monthly*, May 1885, 15–25; “The Study of Inheritance,” *Pop. Sci. Monthly*, February 1896, 480–492, and May 1896, 617–626; “Thoughts about Universities,” *Pop. Sci. Monthly*, July 1899, 349–355; “The Wonderful Century,” *Pop. Sci. Monthly*, November 1899, 25–31.

²³ Keith Benson, comments, July 1997.

culture in the second half of the nineteenth century, including Justus von Liebig, Samuel W. Johnson, and Eugene Hilgard.²⁴

This is not to say that Brooks saw the objective of scientific research to be the investigation and solution of the practical problems facing the state's oyster industry. His institution, Johns Hopkins University, had been designed in 1876 to promote original research and graduate training. Brooks was first and foremost a scholar who spent much of his later career speculating on philosophical questions related to the descent of species.²⁵ Unlike an agricultural scientist employed by a publicly funded land-grant college or experiment station, Brooks was under no obligation to conduct applied research of economic importance, answer farmers' questions, or provide practical agriculture instruction.²⁶

Nevertheless, he accepted funds from the Maryland and U.S. Fish Commissions,²⁷ strove to popularize his research with respect to its economic utility, and considered his discovery of artificial oyster fertilization "one of

²⁴ Ronald L. Nyle, "Federal vs. State Agricultural Research Policy: The Case of California's Tulare Experiment Station, 1888–1909," *Agric. Hist.*, 57 (1983), 436–449.

²⁵ See, for example, W. K. Brooks, "Zoology and the Philosophy of Evolution," *Science*, 8 (December 23, 1898), 881–893.

²⁶ Charles E. Rosenberg, "Science, Technology, and Economic Growth: The Case of the Agricultural Experiment Station Scientist, 1875–1914," *No Other Gods: On Science and American Social Thought* (Baltimore: Johns Hopkins University Press, 1997), pp. 153–172. For a case study of the turn-of-the-century movement to make basic research the primary work of experiment stations, see Nye, "Federal vs. State Agricultural Research Policy" (above, n. 24).

²⁷ The U.S. Fish Commission was established in 1871 in response to declining fish yields. To promote practicable fish culture, the commission funded scientific studies of the breeding habits and "embryological history" of such species as cod, shad, alewife, salmon, smelt, Spanish mackerel, striped bass, white perch, and the oyster. In 1881, Assistant Commissioner George Brown Goode stressed that the agency's applied work provided "opportunities for investigating many new problems in physiology and embryology." He reiterated this union at the 1883 International Fisheries Exhibition in London: "Pure and applied science have laboured together always in the service of the Fish Commission, their representatives working side by side in the same laboratories; indeed, much of the best work both in the investigation of the fisheries and in the artificial culture of fishes has been performed by men eminent as zoologists." In 1887, the Fish Commission was renamed the Bureau of Fisheries and transferred to the Department of Commerce. See G. Brown Goode, *The First Decade of the United States Fish Commission: Its Plan of Work and Accomplished Results, Scientific and Economical* (Salem, Mass: Salem Press, 1881), pp. 10, 5; G. Brown Goode, "A Review of the Fishery Industries of the United States and the Work of the U.S. Fish Commission," *Papers of the Conferences Held in Connection with the Great International Fisheries Exhibition* (London: Clowes, 1883), pp. 55–56; A. Hunter Dupree, *Science in the Federal Government: A History of Policies and Activities* (Baltimore: Johns Hopkins University Press, 1986), pp. 237–238.

the most important discoveries of the last fifty years.”²⁸ Although the recent republication of Brooks’s popular 1891 book *The Oyster* testifies to his relevance in a controversy that still seethes a century later,²⁹ this paper deals with the Maryland oyster culture debate from 1880 to 1930.³⁰

Early Studies

The transportation revolution created a national market – and national demand – for oysters. The 1853 completion of the Baltimore and Ohio Railroad on the Ohio River, followed by postwar rail expansion beyond the Mississippi River, made the American West the major consumer of Chesapeake oysters. By the 1860s, dozens of packing and canning factories had been established in Baltimore and they supplied daily oyster trains of thirty to forty cars during the height of the season. The invention of refrigerated cars further increased the exploitation of both Maryland’s and Virginia’s oyster beds.³¹ As one oyster producer pointed out in 1884, “Transportation is now so rapid that oysters can be carried in the raw condition to the Rocky Mountains. Thousands of towns which, a few years ago, never received these raw oysters, are now getting them daily. Every new railroad creates a new demand for them.”³²

²⁸ W. K. Brooks, James I. Waddell, and William Henry Legg, *Report of the Oyster Commission of the State of Maryland* (Annapolis: James Young, 1884), p. 85 Brooks was the chief author of the report.

²⁹ William K. Brooks, *The Oyster: A Popular Summary of a Scientific Study* (Baltimore: Johns Hopkins University Press, 1996 [1891, 1905]). For a recent vindication of Brooks’s proposals, see Frank T. Gray, “Collective Farming on the Bay – It Doesn’t Work,” *Baltimore Sun*, January 14, 1993, p. 17A.

³⁰ For studies of the Maryland oyster culture debate from the 1940s through 1970s, see Isaiah Bowman, “Appendices III–IV,” *Report of the Commission on Conservation of Natural Resources to the Governor of Maryland* (Annapolis, 1948); Christy, “Exploitation of the Common Property Natural Resource” (above, n. 2); John J. Alford, “The Role of Management in Chesapeake Oyster Production,” *Geog. Rev.*, 63 (1973), 44–54; Victor S. Kennedy, “The Chesapeake Bay Oyster Fishery: Traditional Management Practices,” in *Marine Invertebrate Fisheries: Their Assessment and Management*, ed. J. F. Caddy (New York: Wiley, 1989), pp. 455–477.

³¹ Ingersoll, *The Oyster-Industry* (above, n. 2), p. 168; A. J. Nichol, *The Oyster-Packing Industry of Baltimore: Its History and Current Problems* (Baltimore: University of Maryland Press, 1937); Caswell Grave, *A Manual of Oyster Culture in Maryland* (Baltimore: George W. King, 1912), pp. 9–10; Kennedy and Breisch, “Sixteen Decades” (above, n. 14), pp. 160–161.

³² W. N. Armstrong, *Remarks on the Oyster Industries of Virginia, Made Before the Committee of the General Assembly on the Chesapeake Bay and Its Tributaries* (Hampton: Normal School Press, 1884), p. 8.

The Chesapeake oyster harvest dropped steadily, from 14 million bushels in 1874 to 10.6 million bushels in 1879–1880.³³ Concerned by the decrease the U.S. Coast and Geodetic Survey (formerly the U.S. Coast Survey) studied two of the bay's richest oyster areas, Pocomoke and Tangier Sounds. From 1878 to 1879, Lieutenant Francis Winslow and his group collected oyster trade and fishery statistics, interviewed oystermen and dealers, and made detailed measurements to determine the limits of the beds, the effect of dredging and environmental changes on them, and the distribution of marketable oysters upon them. Assuming that a bed containing many oysters per year was more fertile than one with few oysters, and that a bed containing more empty shells than living oysters was less robust than one with fewer dead shells, Winslow made three measurements for each bed surveyed: the number of oysters per square yard; the ratio of living oysters to empty shells; and the ratio of mature to immature oysters. The Winslow survey report concluded that the Tangier and Pocomoke beds had been fished beyond their capacity to reproduce, such that their total failure was "but a question of time."³⁴

The journal *Science* deemed many of Winslow's physical measurements, such as the temperature at the bottom and surface of shallow waters, superfluous in themselves but potentially useful in the hands of "a biological expert of high rank and long experience." While criticizing the preponderance of "details of no interest," the reviewer praised the survey for developing a method to determine the approximate number of oysters per square yard (by systematically dredging beds and counting the oysters and empty shells brought up), thereby providing the means for measuring "future decrease." The journal also praised Winslow's group for collecting data regarding the growth and mortality rates of young oysters upon tile collectors, a method of oyster culture that has been utilized in France since the 1850s.³⁵

Meanwhile, at the first session of the Chesapeake Zoological Laboratory at Fort Wool, Maryland, Brooks's initial studies of oyster development ended in failure. Following the lead of the European embryologists Karl Möbius, Félix Lacaze-Duthier, P. Coste, and M. de Bon, Brooks assumed that like the European *Ostrea edulis*, the American species was hermaphroditic and that fertilization and early development took place within the parental shell. Although Brooks and Henry J. Rice failed to find shell-bound embryos during

³³ Grave, *Manual* (above, n. 31), p. 12.

³⁴ Francis Winslow, *Report on the Oyster Beds of the James River, Virginia, and of Tangier and Pocomoke Sounds, Maryland and Virginia: U.S. Coast and Geodetic Survey Report for 1881* (Washington, D.C.: 1882), p. 344.

³⁵ "The Chesapeake Oyster-Beds" (review of Winslow's report), *Science*, 2 (September 28, 1883), 440–443, pp. 441, 442.

the summer of 1878 at Fort Wool,³⁶ Brooks's abstracts³⁷ caught the attention of Major T. B. Ferguson of the Maryland Fish Commission.³⁸

The following spring, Ferguson offered Brooks state and federal funds and barge laboratory facilities in return for tackling the question of Chesapeake oyster growth rates and food requirements. Because of the ongoing Winslow survey, Ferguson asked that Brooks work at Crisfield, Maryland, near the junction of Pocomoke and Tangier Sounds. Receiving a month's leave of absence before the end of the semester, Brooks opened the second session of the CZL. There he soon made two important discoveries about the American oyster, *Ostrea virginica*,³⁹ though not quite within twenty-four hours of his arrival, as his colleague Henry Newell Martin later asserted.⁴⁰

Assuming that the oyster embryos remained within the parental shell for so short a period that he had missed it, Brooks entered Crisfield on May 19, 1879, determined to examine adult oysters every day of the breeding season in search of young. He also intended to raise oysters by artificially fertilizing the eggs after removing them from the parental shell.⁴¹ Two days later, Brooks mixed the sex cells of four spawning oysters in a watch glass. Within two hours fertilization had indeed occurred. Until he and the rest of the group were forced to flee the Crisfield mosquitoes in July, Brooks examined more than a thousand adult oysters without ever finding a single fertilized egg or embryo anywhere the shell. This negative evidence, together with his success in artificial fertilization and hatching, strongly suggested that the eggs underwent development in the open ocean, not within the parental shell.⁴²

³⁶ H. J. Rice, "Experiments in Oyster Propagation," *Trans. Amer. Fish-Cultural Assn.*, 12 (1883), 49–56.

³⁷ W. K. Brooks, "Abstract of Observations on the Development of the American Oyster," *Zool. Anz.*, 1879; W. K. Brooks, "Abstract of Observation upon the Artificial Fertilization of Oyster Eggs, and on the Embryology of the American Oyster," *Amer. J. Sci.* (1879).

³⁸ The commission, which had been organized in 1874 to augment declining fish populations through artificial propagation, spent the next several years working with the federal commission to stock shad, rockfish, brook trout, California salmon, and German carp in Maryland waters, and later to breed smelt, herring, rockfish, shad, and trout in "fish-cultural stations" on the Susquehanna River and in Baltimore's Druid Hill Park. See W. K. Brooks, "Development of the American Oyster," *Report of the Commissioners of Fisheries of Maryland* (Annapolis: Iglehart, 1880), vi–1.

³⁹ The species is now known as *Crassostrea virginica*.

⁴⁰ Brooks, "Development of the American Oyster" (above, n. 38), p. 1; H. Newell Martin, "The Oyster Question," *Science*, 17 (March 27, 1891), 169–170. Martin taught the physiological component of Hopkins's biology program; Brooks taught the morphological section.

⁴¹ Martin, "The Oyster Question" (above, n. 40), p. 169; Brooks, "Development of the American Oyster" (above, n. 38), pp. 2–3.

⁴² Martin, "The Oyster Question" (above, n. 40), p. 169; Brooks, "Development of the American Oyster" (above, n. 38), pp. 3–4, 39.

This discovery had crucial implications for practical oyster culture.⁴³ French oyster culturalists had developed methods of rearing oysters once they had spawned and attached to a hard surface such as tiles. Brooks showed that fertilization itself could be controlled. Because each female oyster produced millions of young each year, each of which could be cultivated rather than wasted, the output of oyster farming was theoretically “almost unlimited.”⁴⁴

Brooks published his findings in 1880 in a report submitted to the Maryland Fish Commission. Although he considered the results obtained “upon certain purely scientific questions in embryology” the most important and valuable result of his summer’s work, he believed that “most of the persons who are interested in the habits of the oyster and in oyster culture would not care to read a purely technical embryological paper.”⁴⁵ Thus, he divided his account into popular and scientific sections. The former covered oyster anatomy, artificial fertilization, and egg development; the latter discussed egg segmentation, formation of the digestive tract, shell, and mantle, and contradictory views regarding the sexes of the oyster, manner of fertilization, and the gastrula theory.⁴⁶

In the section he called “somewhat popular,” Brooks implied that he was not fully convinced that the embryos of *Ostrea virginica* were never carried by the parent because he invited “amateur workers with the microscope in this country” to inform him whether they had evidence to the contrary. However, in the scientific section of the paper, he seemed much more confident of his data, using them to “show the incorrectness” of Möbius and Lacaze-Duthier’s conclusion that oysters begin life as functional males and become female as they grow older.⁴⁷

⁴³ The discovery also had important implications for experimental embryology. Artificial fertilization made it possible to study all the developmental stages of the oyster by providing a cheap, virtually limitless supply of experimental organisms. Because a steady supply of fresh sea water was needed to sustain the growth of artificially hatched oysters, in 1880 the university purchased a steam-powered engine and apparatus for breeding oysters on a small scale, thereby allowing Brooks and several graduate students to continue the oyster studies for several years. Martin, “The Oyster Question” (above, n. 40), p. 169.

⁴⁴ Ferguson and Hughlett, *Report of the Commissioners of Fisheries of Maryland* (above, n. 38), p. lxxiv. Oyster farming refers to the rearing of oysters from the egg. Three other branches of oyster culture – planting (the “growing” of mature oysters from seed oysters), reselling (the augmentation of natural oyster beds), and fattening (the conditioning of mature oysters for market) – are discussed below.

⁴⁵ Brooks, “Development of the American Oyster” (above, n. 38), p. 38.

⁴⁶ Thus, the report did not actually discuss oyster culture.

⁴⁷ Brooks, “Development of the American Oyster” (above, n. 38), pp. 4, 38–39. Brooks’s conclusion that *Ostrea virginica* never changed its sexual type during its lifetime was later discredited.

The journal *American Naturalist* pronounced Brooks's work with artificial breeding of oysters as a "triumphant demonstration of the practical value of marine biological research" that "opens up a prospect of unlimited extent to the whole gastronomical world." The journal denounced the European oyster in Darwinian terms, declaring that "its marsupial habits . . . unfit it for the struggle for existence. Its parental affection is its ruin. Its place will be taken by the less philoprogenitive but not less delicate bivalve of Baltimore. . . ."48 Brooks's belief that he had been misled by European research also stimulated criticism of dependence upon European scientists. G. Brown Goode reported that Brooks's discovery was interpreted in nationalistic terms at the 1883 International Fisheries Exhibition in London, with the assertion that "the young of the American oyster were more adventurous" than those of the European one.⁴⁹ The *New York World* was even more jingoistic about the American species: "It is more independent and refuses to be tied to its mother's apron strings, as the European oyster is tied."⁵⁰

The Maryland fish commissioners confidently wrote in their 1880 report to the governor, which was published in the same volume as Brooks's eighty-one page paper on the development of *Ostrea virginica*: "It will be seen that these investigations have placed it within our power to multiply the oyster to an indefinite amount, and although the supply has diminished to a very alarming extent, we have now sufficient knowledge to enable us, at any time, to arrest this decrease."⁵¹ Convinced that the oyster could be infinitely manipulated once the circumstances of set development and spat (floating embryo) survival were discovered, the state commission spent the first half of the 1880s funding studies in artificial oyster breeding at the U.S. Fish Commission's hatching station at Saint Jerome Creek in St. Mary's County, Maryland.

The Société d'Acclimation of Paris was so impressed with Brooks's "Development of the American Oyster" that it awarded Brooks its 1881 medal. Ernest Ingersoll included portions of the essay in his 1881 report for the U.S. Fish Commission on the nation's oyster industries. Such exposure helped establish Brooks as a world authority on oyster development.⁵² Consequently, in 1882, the Maryland General Assembly appointed Brooks to

⁴⁸ Quoted in John R. Philpots, *Oysters and All about Them, Volume II* (London: John Richardson, 1891), p. 1145.

⁴⁹ Goode, "Review of the Fishery Industries" (above, n. 27), p. 83.

⁵⁰ Charles T. White, "Mr. Oyster Comes to Town," *New York World*, September 1, 1889, p. 1. See also Martin, "The Oyster Question" (above, n. 40), p. 169.

⁵¹ Ferguson and Hughlett, *Report of the Commissioners of Fisheries of Maryland* (above, n. 38), p. lxxiii.

⁵² Conklin, "Brooks" (above, n. 19), p. 60; Ingersoll, *The Oyster-Industry* (above, n. 2), pp. 210–219; Benson, "Brooks" (above, n. 16), p. 127.

chair a commission to investigate the oyster industry in relation to Francis Winslow's allegation of overdredging. Although the legislature provided no financial support for the Oyster Commission's work, the governor tapped his emergency fund, and Johns Hopkins University gave Brooks two summers of paid leave, prompting Brooks to call the survey results "a gift from the University to the State."⁵³

The Oyster Commission

Realizing that it took Winslow nearly two years just to survey Tangier and Pocomoke Sounds and that a survey of all Maryland's oyster bars would require four or five years more, Brooks and his fellow commissioners, Oyster Navy Captain James Waddell and politician William Henry Legg, made a hurried inspection of fifty-nine of Maryland's largest oyster bars.⁵⁴ Following Winslow's methods, the number of oysters per square yard was determined by dragging a dredge with a yard-wide mouth over the bottom of each oyster bar at a constant distance and speed; its contents (oysters, empty shells, and other refuse) were then brought aboard, separated, measured, and counted. Reasoning that "any bed is on the road to destruction if the number of old oysters which are removed from it each year is as great as the number of young ones which are growing up to take their places," by estimating oyster age in terms of length and counting the oysters of various ages upon each bed, the commissioners could roughly determine whether the bed was in danger of "exhaustion."⁵⁵

The commission caught and examined 30,000 oysters from 326 dredge hauls that covered 121,000 square yards of oyster bottom. It calculated an average of one oyster to each 4.25 square yards. Because Winslow had shown an average of one oyster to each three square yards, Brooks and his fellow commissioners concluded "that within the last three years our beds have lost more than 39 percent of their value."⁵⁶

The survey results constituted only the first 20 pages of the resulting 183-page report. The rest contained long verbatim extracts from a variety of sources, including Winslow's 1879 survey, Ingersoll's 1881 summary of the oyster industry, the report of the Shell-Fish Commissioners of Connecticut, and American and European papers describing oyster culture experiments, some of which quoted Brooks's 1880 essay on oyster development. In a

⁵³ Brooks, *The Oyster* (above, n. 29), p. 181 (all quotes from the 1905 edition).

⁵⁴ Brooks, *Report of the Oyster Commission* (above, n. 28), p. 13. The Oyster Navy is described in detail below (n. 63).

⁵⁵ *Ibid.*, pp. 13, 18.

⁵⁶ *Ibid.*, pp. 5–6.

speech before the Virginia General Assembly a few months after the report's publication, oyster planter William Armstrong called it "the fullest and the completest treatise on the subject of the oyster industry ever made in any country."⁵⁷

The oyster commissioners' measurements and analysis of harvesting methods led them to conclude that "the worst forebodings" of the oyster beds' impending destruction were fully justified.⁵⁸ Rather than blaming the oystermen for overfishing, the report posited consumer demand as the key to the problem: "THE DEMAND HAS OUTGROWN THE SUPPLY."⁵⁹ The report recommended a series of *preservation* measures designed to prevent harvests from outpacing the natural beds' reproductive rates and, far more important, *conservation* measures calculated to increase the supply by introducing mass-production farming techniques to the oyster industry. The former included enforcing license laws, periodically closing breeding areas, prohibiting the sale of immature oysters, and returning shells to oyster beds to serve as substrate (cultch) rather than as raw materials for the lime, chicken grit, and road-building industries. Reshelling the natural beds was considered "a matter of the greatest importance" because the shells provided cultch for floating embryos ("spat"), which would otherwise fall to the bay bottom and sink in the mud.⁶⁰

Besides recommending protective measures for the natural beds, the report urged the intensive, scientifically managed development of the state's oyster resources. Because the oyster was as sedentary as land-based crops, the report argued that the state should lease submerged lands to private individuals and make the right to cultivate oysters "as much like a title to real estate as possible," that is, taxable and inheritable. Other conservation measures included forming a permanent oyster regulatory agency staffed by trained experts; annual surveying and marking of oyster grounds; and establishing an experimental state oyster farm to determine and demonstrate the appropriate scale and methods for the various branches of oyster culture. To avoid the possibility of corporate monopolies, large-scale oyster farming would be limited to deep waters, and individual citizens would retain the right to plant oysters on five-acre lots closer to shore.⁶¹

Inherent to the Oyster Commission's conception of an oyster farming industry was the notion of private enterprise. It greatly distressed Brooks

⁵⁷ Armstrong, *Remarks on the Oyster Industries of Virginia* (above, n. 32), p. 5.

⁵⁸ Brooks, *Report of the Oyster Commission* (above, n. 28), p. 6.

⁵⁹ *Ibid.*, p. 30.

⁶⁰ *Ibid.*, pp. 34–35.

⁶¹ *Ibid.*, pp. 165–183; Benson, "Brooks" (above, n. 16), p. 128; Kennedy and Breisch, "Sixteen Decades" (above, n. 14), p. 160.

that Maryland's oyster beds constituted a "commons" free to be exploited by anyone, without regard for maintaining the integrity of the beds or the long-term viability of the industry. An oysterman had no interest in leaving any oysters behind, for if he didn't catch and sell them someone else would. In the scramble for oysters, harvesters even remove immature "seed" oysters – two small to be edible – and sold them for fifteen cents per bushel to northern states such as Rhode Island and Connecticut, who then "planted" and tended them until they had grown enough to command more than eighty cents per bushel. From the perspective of proculturalists, the Chesapeake oyster fishery embodied an early example of "the tragedy of the commons," because such actions hastened the extinction of the natural beds and undercut the value of the crop.⁶²

In Brooks's view, if the beds were removed from the public domain and leased (he left the question of absolute sale "for future consideration") to those who had invested their own capital in "intelligent private cultivation," then the entire bay could produce untold billions of bushels, thereby enriching all Marylanders. Moreover, because "personal interest is the strongest motive which can exist to prevent the needless destruction of property," dividing up the oyster grounds into private holdings would obviate the need for protective legislation and the expensive upkeep of the Oyster Navy,⁶³ which from 1878

⁶² Garrett Hardin, "The Tragedy of the Commons," *Science*, 162 (December 13, 1968), 1243–1248. See also Garrett Power, "More about Oysters Than You Wanted to Know," *Md. Law Rev.*, 30 (1970), 199–225. Victor Kennedy states that private oyster grounds typically outproduce public ones, "probably due to the better culture and management practices of leaseholders whose capital is at risk." See Kennedy, "The Chesapeake Bay Oyster Fishery" (above, n. 30), p. 471. For alternative views, see George D. Santopietro and Leonard A. Shabman, "Can Privatization be Inefficient? The Case of the Chesapeake Bay Oyster Fishery," *J. Econ. Issues*, 26 (1992), 407–419, and David Feeny, Susan Hanna, and Arthur F. McEvoy, "Questioning the Assumption of the 'Tragedy of the Commons' Model of Fisheries," *Land Econ.*, 72 (1996), 187–205.

⁶³ After the Civil War, in recognition of various tidewater county laws, the Maryland legislature sanctioned dredging but as a conservation measure forbade dredging under power and in rivers emptying into the bay. Tension between tongers and dredgers quickly arose, because dredgers raked over river oyster beds reserved for tongers. Tongers, whose tools prevented them from encroaching on the deep-water dredging grounds, retaliated by taking the law into their own hands with loaded rifles. To quell the resulting anarchy and enforce the 1865–1866 General License Law, which levied a tax upon all oysters caught on natural beds, the Maryland General Assembly established the State Fisheries Force, popularly known as the "Oyster Navy," in 1868. See Kennedy and Breisch, "Sixteen Decades" (above, n. 14), pp. 157–158; Kellogg, *Shell-Fish Industries* (above, n. 3), p. 218; Grave, *Manual* (above, n. 31), pp. 11–12; John R. Wennersten, *The Oyster Wars of Chesapeake Bay* (Centreville, Md.: Tidewater Publishers, 1981); "Our Oyster Navy: Small in Size but Plucky," *Baltimore Sun*, November 20, 1888.

on cost more to maintain than the revenues it collected from fines and licenses to tong, scrape, and dredge.⁶⁴

Although the Oyster Commission looked to the legislature to enact its many recommendations, it emphasized the inability of government to manage private oyster cultivation. Although it was appropriate for publicly funded organizations like the Fish Commission to undertake the scientific management of sea fishes (“because it is not within the power of individuals to improve them, or increase their numbers or value”), this was not true of oysters, which because of their immobility were “as subject to improvement by cultivation as a potato.” Hence, “the common right to the beds must in time give way to private enterprise, just as surely as the common right to the natural products of the soil has given way before the progress of civilization.”⁶⁵ The most effective way to begin this process was by redefining the oyster commons as private real estate.

As the report’s chief author, Brooks employed several rhetorical strategies to counter resistance privatizing the state’s oyster grounds. First, he stressed the financial wonders that would result. Brooks encouraged citizens, legislators, businessmen, and oystermen to embrace scientific oyster culture as a panacea: “[I]t would soon double the productive area of Maryland; it would rapidly increase the wealth and prosperity of our people; it would soon remove all danger of the loss of our oysters, and it would ultimately, by taxation, relieve the people of the interior of most of the burden of the support of our State government.”⁶⁶ Every citizen would benefit, especially the recalcitrant oystermen, who could either do their own small-scale planting or work for corporate farms: “[w]hile the oyster fishermen have never earned much more than two million dollars a year, it is no exaggeration to state that our grounds are capable of yielding hundreds of millions of dollars annually.”⁶⁷

Brooks showed that such figures had a real basis by pointing to the success of other states that had been forced to adopt oyster culture after their natural beds went extinct. For example, in 1865, Rhode Island passed laws allowing the leasing of bottoms, whether or not they contained natural beds, to private citizens for planting and cultivating oysters at an annual rental of \$10 per acre. Until 1883, the grounds were used only for planting, with most of the seed oysters purchased from other states at one-third to one-fourth the cost of the mature oyster. One just 1,100 acres, production jumped from about

⁶⁴ For example, whereas the 1883 revenues were \$205,000, “the expenditure in collecting that revenue, and in feeble worthless attempts to protect the industry, amounted to about \$217,000.” Armstrong, *Remarks on the Oyster Industries of Virginia* (above, n. 32), p. 6.

⁶⁵ Brooks, *Report of the Oyster Commission* (above, n. 28), p. 11.

⁶⁶ *Ibid.*, pp. 9–10.

⁶⁷ *Ibid.*, p. 8.

72,000 bushels worth \$737 in 1865 to 660,500 bushels worth \$11,000 in 1879. Brooks contrasted the difference between the two states in disgust: “Our little revenue to the State Treasury of about fifty thousand dollars from nearly a million acres, sinks into insignificance when compared with the eleven thousand dollars which Rhode Island receives from her eleven hundred acres, and her beds are constantly improving in value, while ours are rapidly becoming worthless under our present policy.”⁶⁸

According to Brooks, modern oyster culture was most extensively developed in Connecticut’s portion of Long Island Sound. Until 1855, Connecticut’s oyster grounds belonged to the public domain. That year, the legislature passed a law allowing shore towns to distribute plots to private individuals for oyster planting or cultivation, with two restrictions: no “natural oyster-beds could be designated, and no more than two acres could be allotted to each applicant. However, because lots could be owned by “women and minors as well as by voters,” citizens could obtain several acres by taking them out in the name of family members. On these plots they planted seed oysters, most of which they bought cheaply from Chesapeake oystermen.⁶⁹

By the 1860s, with all the available inshore acreage near New Haven gone, “some adventurous spirits” encroached onto deeper water in Long Island Sound. In 1875, the Connecticut legislature exempted the area from the “no natural beds” clause, thereby giving a great boost to systematic oyster cultivation. Despite vehement opposition from oystermen, the legislature passed a law in 1880 allowing any state resident to buy an unlimited number of acres for oyster cultivation at the rate of \$1.25 per acre, provided that the land had not contained a natural bed within the past ten years. From 1880 to 1883, more than 90,000 acres were bought.⁷⁰

The 1881 Connecticut legislature appointed a board of three paid oyster commissioners to oversee the Long Island Shore area, where an annual state tax of 1 percent was imposed upon all grounds appropriated for oyster culture. Although some of the grounds were simply used to plant seed oysters, as Brooks announced, “most of them are true farms where fresh seed is raised each year.” As Brooks explained, three methods of cultivation existed: planting, which entailed clearing the bottom and covering it with seed oysters and empty shells; farming, which required covering the bottom with clean shells and spawning oysters; and reshelling, which involved covering the area near a natural bed with shells and leaving them to catch drifting spawn.⁷¹

⁶⁸ *Ibid.*, p. 73.

⁶⁹ Ingersoll, *The Oyster Industry* (above, n. 2), pp. 61–66.

⁷⁰ *Ibid.*

⁷¹ Brooks, *Report of the Oyster Commission* (above, n. 28), pp. 146–153.

None of the Connecticut oyster farmers engaged in laboratory-mediated artificial fertilization but Brooks stressed that their efforts were much more advanced than those of Maryland's oystermen. Indeed, "50,000 acres of entirely barren ground, covered 30, 40, and 50 feet by the waters of Long Island Sound, have been made into productive oyster beds, and have multiplied by a hundred fold the production of the native oysters." In ten years Connecticut had gone from importing "tens of thousands of bushels" to exporting "hundreds of thousands of bushels."⁷² The Connecticut oyster fishery gained increasing national attention through the 1880s, with G. Brown Goode announcing in 1884 that "Connecticut is putting into practice the best system of oyster-culture in the world."⁷³ As Brooks sourly observed, however, "The natural resources of this State are as nothing compared with the resource of our own waters"; Connecticut's natural beds numbered fewer than 5,000 acres and were beset by starfish, whereas Maryland had no natural predators and 130 miles of natural beds in Tangier and Pocomoke Sounds alone.⁷⁴

Finally, in the *Report of the Oyster Commission* Brooks invoked the notion of progress, employing the rhetoric of "social Darwinism" to promote his pro-oyster culture message: "It is not in the spirit of harsh criticism, but in the hope that our people may be awakened to their own interest, that we point out the similarity between the views of our people and their legislators and the opinions of savage races. We live in a highly civilized age, and if we fail to grasp its spirit we shall go to the wall before the oyster cultivars of the Northern States, just as surely as the Indians have been exterminated by the whites."⁷⁵ Unlike other Gilded Age writers, Brooks did not employ such rhetoric to defend a capitalist, racist status quo. Rather, he sought to show how northern oyster states had demonstrated their superior commercial and intellectual fitness by implementing modern agricultural techniques. If the state oyster industry did not adapt to changing conditions – increased demand and falling supply – Maryland would lose in the interstate struggle for existence as the nation's top oyster producer.

After reading the Oyster Commission report, Virginia oyster planter William Armstrong extended Brooks's evolutionary analogy by positing a three-stage development of the oyster industry analogous to land-based agri-

⁷² *Ibid.*, p. 151.

⁷³ Quoted in William M. Hudson, "The Shell Fisheries of Connecticut," *Trans. Amer. Fish-Cultural Assn.*, 13 (1884), 124–146, p. 145. See also H. C. Hovey, "Oyster-Farming in Connecticut Waters," *Science*, 2 (September 14, 1883), 376–377; "The Oyster-Fishery in Connecticut," *Science*, 5 (March 20, 1885), 234; "Shell-Fish in Connecticut," *Science*, 7 (January 15, 1886), 59–60; "Propagation of Oysters," *New York Times*, 21 January 1889, 3.

⁷⁴ Brooks, *Report of the Oyster Commission* (above, n. 28), p. 146.

⁷⁵ *Ibid.*, p. 31. In recognition of the advances made by Virginia and North Carolina, Brooks added their names to this quote in the 1905 edition of *The Oyster* (above, n. 29), p. 198.

culture. Scientific oyster culture functioned as the mechanism of progress: “In the first, the natural beds are relied on just as the forests are restored to for game. In the second stage, the young oysters of the natural beds are transplanted, separated, and cultivated, just as young wild animals are taken, tamed, and made useful to man. In the third stage, all oysters are cultivated, and the young or seed are raised by the cultivators, just as young stock is obtained from domestic animals, and not from the forests and plains.” Whereas the Chesapeake Bay oyster industry still remained in the stage of “savagery,” Connecticut’s was already advancing toward the third phase, “that of civilization.”⁷⁶

The Anticulture Backlash

Brooks’s recommendations for private oyster culture inspired reprobation, beginning with fellow commissioner William Henry Legg, an elected member of the General Assembly from the tidewater county of Queen Anne. Legg articulated the two main criticisms of the “anti-leasers” when he stated in his minority report, “The oysters of the State belong to the people of the State, and the true policy of the State is to guard and protect our oyster grounds for the benefit of the citizens.” He continued:

The citizens of the State have the right to ask and expect that legislation be in the interest of the many, not of the few; in the interest of the weak rather than the strong, and to demand that this vast public domain – the oyster grounds – shall be held now and for all time to come, as it ever has been held, as a great commons, to be used in common by the citizens of the State under such rules and regulations as the State may prescribe, and not sold to a few capitalists, thereby making the rich richer and the poor poorer.⁷⁷

Legg’s declaration that leasing violated the rights of Marylanders echoed one of the main complaints of the politically powerful oystermen. They opposed leasing because they believed that natural oyster beds belonged to the people of Maryland. They feared losing their heritage to corporate monopolies, and believed that cultivation would decrease prices by driving up production. They also asserted that oysters could not be grown on anything but a natural oyster bar.⁷⁸

⁷⁶ Armstrong, *Remarks on the Oyster Industries of Virginia* (above, n. 32), pp. 13–14.

⁷⁷ Brooks, *Report of the Oyster Commission* (above, n. 28), p. 139.

⁷⁸ Kennedy and Breisch, “Sixteen Decades” (above, n. 14), p. 161.

This last reason was not necessarily ill-founded. As Brooks's former student Caswell Grave explained in his 1912 oyster culture manual, widespread prejudice against oyster culture in Maryland stemmed from bad experiences under the Five-Acre Law. In 1830, the legislature allowed citizens to appropriate one acre of barren bottom for oyster planting. In 1867, the lawmakers increased the amount to five acres, but no substantial planting industry developed because of repeated failures and poaching by oystermen.⁷⁹ Most planters who had appropriated lots chose inshore areas in rivers where the water did not flow swiftly enough to distribute spat. Although northern oyster planters eventually learned to distinguish which types of barren bottom were most suited to the various branches of oyster culture, Maryland planters' early failures convinced oystermen that oyster culture on barren bottoms was futile.⁸⁰

Chance provided the most important circumstance sealing the doom of the Oyster Commission's bill. In 1885, the oyster industry experienced a record-high harvest of fifteen million oyster bushels, thereby undermining the assertion that the Maryland oyster faced "imminent danger of complete destruction." This, combined with the disproportionate influence of the oystermen and their representatives, encouraged state legislators to ignore the suggestions they had requested just three years earlier.⁸¹ As Caswell Grave wryly wrote, "The *patient* was thought to have completely recovered from its slight indisposition, and the *doctor* was dismissed without thanks for his diagnosis."⁸² Railroad attorney and oyster culture advocate John Cowen was more harsh in his assessment: the report was "too advanced, too bold, too thorough for our rulers, and [so] they quietly pigeon-hole it."⁸³

After the bill's defeat, Brooks continued to conduct experiments at the summer sessions of the Chesapeake Zoological Laboratory. Historians Keith Benson and Jane Maienschein have respectively addressed the role of the CZL as essential to Brooks's institutional mission to create a graduate program at Hopkins in morphology, and to shed light on the major morphological problems of the day.⁸⁴ It was also essential to his personal quest to

⁷⁹ Grave, *Manual* (above, n. 31), pp. 9, 11.

⁸⁰ *First Report of the Shell Fish Commission of Maryland* (Baltimore: Sun Job Printing Office, 1907), p. 181. Repeated in Grave, *Manual* (above, n. 31), p. 17.

⁸¹ Kennedy and Breisch, "Sixteen Decades" (above, n. 14), pp. 160–161.

⁸² Grave, *Manual* (above, n. 31), p. 13.

⁸³ John K. Cowen, letter to the editor, *Baltimore Sun*, February 4, 1889, p. 1. Reprinted in booklet form as *The Maryland Oyster and His Political Enemies* (Baltimore: Boyle, 1889).

⁸⁴ Keith R. Benson, "H. Newell Martin, W. K. Brooks, and the Reformation of American Biology," *Amer. Zool.*, 27 (1987), 759–771; Maienschein, *Transforming Traditions* (above, n. 16), pp. 49–54.

prove the feasibility of artificial oyster propagation. As Benson points out, Brooks used the CZL and several students to work on oyster problems.⁸⁵

As of 1880, Brooks had been able to rear artificially fertilized oyster eggs only through the early embryonic stages; all the embryos kept dying by the eighth day after fertilization. In the summer of 1882, Brooks found that by adding lime through the use of macerated oyster shells, a source of calcium carbonate, the embryos survived longer and grew faster.⁸⁶ As Brooks acknowledged in the 1884 commission report, the next major step was the creation of a simple, practical method of rearing artificially hatched oysters. "This step, which completes the solution of the problem, and puts it in our power to remove forever all danger of the extermination of the oyster, is the contribution of a French naturalist, M. Bouchon-Brandeleley." Encouraged by Brooks's 1880 results and experimenting with the Portuguese oyster, *Ostrea angulata* (which like the American oyster underwent fertilization in the water), Bouchon-Brandeleley succeeded in rearing seed oysters for planting in artificial ponds, or "claires." Biologist John Ryder translated the Frenchman's paper, which was published in the bulletin of the U.S. Fish Commission in April 1883.⁸⁷

In the *Report of the Oyster Commission*, Brooks also paid tribute to Ryder, who spent five years investigating the rearing of oysters from artificially impregnated eggs. In Ryder's own words, he worked from 1880 to 1885 "with the view of reaching some practical results which would be available in the hands of oyster-culturalists." From 1880 to 1882 his efforts had been "comparatively fruitless and unsatisfactory," but during the summer of 1882, in association with U.S. Fish Commission superintendent Marshall MacDonald, he resumed the experimental work at the commission's hatching station at Saint Jerome's Creek.⁸⁸

In 1883, Ryder successfully repeated Bouchon-Brandeleley's experiments in rearing oysters from artificially fertilized eggs in a claire in Stockton, Maryland, near the shore of Chincoteague Bay.⁸⁹ As he reported, "The great

⁸⁵ Benson, "Brooks" (above, n. 16), p. 99.

⁸⁶ *Ibid.*, p. 127.

⁸⁷ Originally published as G. Bouchon-Brandeleley, "Report Relative to the Generation and Artificial Fecundation of Oysters, Addressed to the Minister of the Marine and the Colonies," *J. Officiel de la Republique Francaise* (1882), 6762–6764, 6778–6782.

⁸⁸ J. A. Ryder, "Rearing Oysters from Artificially Impregnated Eggs," *Science*, 1 (February 23, 1883), 60–62.

⁸⁹ J. A. Ryder, "Rearing Oysters from Artificially Fertilized Eggs at Stockton, MD," *Science*, 2 (October 5, 1883), 463–464; John A. Ryder, "A New System of Oyster-Culture," *Science*, 6 (November 27, 1885), 465–467; John A. Ryder, "The Rate of Growth of Oysters at Saint Jerome's Creek Station," *Bull. U.S. Fish Comm.*, 5 (1885), 129–131. Despite his earlier misgivings, Ryder published his findings in a book form as *An Exposition of the Principles*

advantage of this method would be that the persons constructing the inclosures or digging out the ponds of their own territory would be absolutely protected by law from the incursions of the lawless tongers whose rights and privileges are not yet as clearly defined in some of the States as they should be." However, Ryder doubted that the rearing of oysters from artificially impregnated eggs would ever be profitable because collecting spat by simple, cheap methods, such as the use of shells, gravel, and brush, "will always yield as good results on a large scale as any artificial method could possibly give."⁹⁰

Nevertheless, in 1883, Ryder worked with Brooks on an oyster-culture apparatus that allowed them to change the water without losing embryos. The technique involved raising oysters in the laboratory and then transferring them to floating raft-like contraptions for the remainder of their development. In this way, as Brooks argued in an 1885 letter to Hopkins president Daniel Coit Gilman, oysters could be artificially cultivated everywhere in the Chesapeake: in the deep middle channel where no natural oyster beds existed, closer to the shore where natural beds had been broken up by dredgers, and even in the muddy creeks and inlets of the bay.⁹¹

In the 1884 report of the Chesapeake Zoological Laboratory, Brooks proudly summarized the corroborative studies of Bouchon-Brandelely, even though he had no affiliation with Hopkins. After describing the French naturalist's oyster-propagation experiments, Brooks asserted, "This interesting paper shows the practicability of the economic application of the more purely scientific experiments which were carried on at our laboratory in 1879." Citing Bouchon-Brandelely's acknowledgment that he was inspired by the CZL experiments, Brooks concluded, "[o]ur own share of the work is therefore exactly what we should wish: the discovery of a new scientific truth, which has, in the hands of practical economists, contributed to the welfare of mankind."⁹²

Brooks expressed his ambivalence about the propriety of practical work in private as well as in public. In a letter to Gilman, after describing his experiments with floating oyster culture mechanisms at the 1885 CZL summer

of a Rational System of Oyster Culture: Together with an Account of a New and Practical Method of Obtaining Oyster Spat on a Scale of Commercial Importance (Washington, D.C.: Government Printing Office, 1886).

⁹⁰ Quoted in Brooks, *Report of the Oyster Commission* (above, n. 28), pp. 126–127.

⁹¹ Letter from William Keith Brooks to Daniel Coit Gilman, 30 August 1885. M.S. 1, Series 1 Correspondence, Special Collections, Milton S. Eisenhower Library, Johns Hopkins University.

⁹² W. K. Brooks, "Chesapeake Zoological Laboratory" (above, n. 17), p. 93. Interestingly, an article in *Science* the previous year on "national traits in science" had asserted that "most scientific men harbor a little distrust of French work." See *Science*, 2 (October 5, 1883), 455–457.

session in Beaufort, North Carolina, Brooks expressed his distress at losing in a cyclone the apparatus and “a fine lot of oysters to take to Baltimore for exhibition.” Nevertheless, satisfied that he had demonstrated the device’s usefulness, he expressed his desire “that some one will have energy enough to put it into practical use. . . .” Stressing his proper duties as a university research scientist, he continued, “I shall write and publish my results this fall, and if no one else takes it up I shall repeat my experiments next year, and rear a few oysters for the market, keeping a strict account of the dollars and cents. I think though that the advantages of the plan will be so obvious that I shall not need to do this myself.”⁹³ In the official summary of results, Brooks concluded with much stricter language: “Engagement in business projects is no part of the office of a university, and I feel that the experiments of the past summer have brought the subject of oyster culture to a point where its further development should be left to the people who are most interested.”⁹⁴ This did not stop others from recommending that a share of the Chesapeake oyster lands be granted to Hopkins, however.⁹⁵

As Brooks had hoped, nonscientific men did come forward to take up the fight. In 1889, John Cowen, a railroad corporate attorney, drew attention to the 1884 Oyster Commission report in a long front-page letter to the editor of the *Baltimore Sun*, which was reprinted as a booklet entitled *The Maryland Oyster and His Political Enemies*. Cowen blasted the Maryland legislature for burying the report, which he claimed was “one of the most thorough and masterly that was ever received by Legislature or Parliament, and on one of the most important subjects that could come before a Maryland Legislature.”⁹⁶

Cowen attacked the state’s oyster policy as “economic barbarism” in need of a shot of scientific enlightenment. Because “every civilized State” that had eliminated public ownership of its oyster fishery had profited accordingly, once the Maryland oysterman acquiesced, “he will have passed from the

⁹³ Letter from William Keith Brooks to Daniel Coit Gilman, 30 August 1885. M.S. 1, Series 1 Correspondence, Special Collection, Milton S. Eisenhower Library, Johns Hopkins University.

⁹⁴ W. K. Brooks, “On the Artificial Propagation and Cultivation of Oysters in Floats,” *John Hopkins Univ. Circ.*, 5 (October 1885), 10. Reprinted in *Science*, 6 (November 13, 1885), 437–438.

⁹⁵ In 1890, General Bradley T. Johnson proposed that the state give 10,000 acres to Hopkins for oyster culture, with the profits earmarked for education. “The Johns Hopkins University is the great factor in the future social and political condition of this State. It alone can save our posterity from being dominated by the commercial morale, and it can hold up the high and noble ideals of honorable action and generous thoughts. It is the institution of Maryland which must in time exercise inconceivable influence on the lives, the social system and the political organization of this State.” See “The Oyster Question,” *Baltimore Sun*, November 24, 1890.

⁹⁶ Cowen, letter to the editor (above, n. 83).

precarious life of the ‘trapper’ and ‘hunter’ to that of civilized man, with his own vine and fig tree.” Cowen used similar language to criticize the abolition of dredging in certain areas of the bay: “The dredge is but an important instrument, and to abolish it would be the same kind of economic mistake as to forbid by law the use of the reaper and self-binder, and to return to the sickle and the handrake, or to substitute the old-fashioned flail for the steam thresher.” Rather than legislating technological inefficiency in the name of conservation, Cowen argued that the General Assembly should develop the oyster supply by leasing the beds to private individuals, who would then have an interest in developing and preserving them.⁹⁷

Finally, Cowen defended Brooks against the charge that he was “only a scientific student and not a ‘practical man’ – simply a ‘theorist.’” More such men were needed in the state legislature: “I would like to see a few people among our leaders who did not know anything about winning elections, and did know something about the elementary principles of political economy.”⁹⁸

Though Brooks stopped experimenting with artificial oyster fertilization by the mid-1880s, he continued advocating oyster culture.⁹⁹ In 1891, things came to a head, with prices rising to an astronomical dollar per bushel. Maryland was still the leading oyster state, but its landings had declined so much that packinghouses closed down and some oystermen traveled to North Carolina in search of better pickings.¹⁰⁰ The *Baltimore American* reported that “greedy” oyster catchers and packers “are about to kill the goose that lays the golden egg,” and *Science* published as its lead article an address given by Brooks’s colleague H. Newell Martin on “the relation of scientific investigation to the great question of the preservation of the Maryland oyster.”¹⁰¹ On March 18, Brooks gave the opening speech at a mass meeting convened by thirty-six of the city’s oyster-packing firms at the Baltimore Academy of Music (thenceforth known as the “Academy of Music” meeting).¹⁰²

⁹⁷ Ibid.

⁹⁸ Ibid.

⁹⁹ He also wrote articles promoting cultivation of movable fishes. See W. K. Brooks, “Artificial Propagation of Sea Fishes,” *Pop. Sci. Monthly* (1889), 359–367; W. K. Brooks, “Fish and Fisheries,” *Maryland: Its Resources, Industries and Institutions. Prepared for the Board of World’s Fair Managers of Maryland by Members of Johns Hopkins University and Others* (Baltimore: Sun Job Printing Office, 1893), 239–263.

¹⁰⁰ “Going to North Carolina,” *Baltimore American*, January 13, 1891; “Dredgers Feeling Blue,” *Baltimore American*, January 8, 1891.

¹⁰¹ “Facts about the Oyster,” *Baltimore American*, January 26, 1891; Martin, “The Oyster Question” (above, n. 40), pp. 169–170.

¹⁰² “Save the Oyster Beds,” *Baltimore American*, March 19, 1891. See also “Is It Reform or Ruin,” *Baltimore American*, January 9, 1891; W. K. Brooks, “Oyster Farming Needed,” *Baltimore American*, January 13, 1891; “Captain Thompson’s Views,” *Baltimore American*, January 21, 1891.

Standing in front of posters of a frontal section of an oyster and a map marking the bay's tonging and dredging grounds, Brooks spoke on oyster anatomy, embryology, and artificial propagation. John Cowen then took the stand to pay homage to Brooks as soothsayer: "That which in 1879 was prophecy, in 1891 is fulfilled history. The danger apparent to the distinguished scientist twelve years ago, is the danger realized by the practical oyster packer of today." Cowen made a plea for private oyster culture, stressed the interdependence of land- and sea-based businesses engaged in the oyster industry, and denounced the 1890 culling law as unenforceable because the fifteen-ship Oyster Navy could not possibly police 8,000 tonging boats, 800 large dredging boats, and 1,200 small ones.¹⁰³ The culling law, which prohibited the sale of immature oysters, was indeed widely ignored. As one veteran oysterman pleading for stricter enforcement wrote to the *Baltimore American*, "If anyone doubts this, let him go to the piles of shells around the steam packing-houses, and he will find millions of shells under two-and-one-half inches."¹⁰⁴

Following Cowen, U.S. Fish Commissioner Marshall MacDonald contrasted the census returns for Chesapeake oyster landing of 1880 with those of 1889.¹⁰⁵ He then traced the "marvelous increase" in oyster production in Long Island Sound that followed Connecticut's 1881 law encouraging private capital and enterprise to engage in oyster cultivation. Like Cowen, MacDonald stressed that private oyster culture would improve the fortunes not only of the 30,000 persons employed in the Chesapeake oyster fisheries but also 150,000 dependents. Finally, he called for a complete survey of all the waters of the state, both oyster- and non-oyster-producing.¹⁰⁶

The last speaker was State Senator Thomas Hodson, who in 1885 had authored an oyster planting law that passed the Senate but failed in the House of Delegates. He had also traveled with other Marylanders to Connecticut's Long Island Sound oyster grounds on a fact-finding mission, which two major Baltimore newspapers reported in separate multipart series.¹⁰⁷ Hodson gave specific examples of successful oyster culturalists in the Virginia portion of

¹⁰³ "Save the Oyster Beds," *Baltimore American*, March 19, 1891.

¹⁰⁴ T. P. E., "An Oysterman's Views," letter to the editor, *Baltimore American*, December 23, 1890.

¹⁰⁵ MacDonald succeeded G. Brown Goode as commissioner in 1888, and served until 1895.

¹⁰⁶ "Save the Oyster Beds," *Baltimore American*, March 19, 1891.

¹⁰⁷ "Profits of Oyster-Planting," *Baltimore Sun*, July 31, 1886; "Long Island Oyster Beds," *Baltimore Sun*, August 2, 1886; "Inspecting Oyster Beds," *Baltimore Sun*, August 3, 1886; "Eastern Oyster Beds," *Baltimore American*, August 3, 1886; "Long Island Oysters," *Baltimore American*, August 4, 1886; "Steam Oyster Dredgers," August 5, 1886; "Fighting Star-Fish," *Baltimore American*, August 6, 1886. See also Thomas S. Hodson, "Private Oyster Beds: Cultivation Needed in Maryland," *Baltimore American*, August 14, 1886; Thomas S. Hodson, "Connecticut's Laws," *Baltimore American*, February 2, 1891.

the day, saying that “every man who has gone into oyster planting and waited for results has reaped a hundred fold on his investment.”¹⁰⁸

After Hodson’s speech, resolutions were read urging the General Assembly of Maryland to lease or sell “at least a portion of our bay” to individual cultivators so as to demonstrate the feasibility of oyster rearing, to arrest the threatened destruction of the beds, and to place the oyster industry on a self-sustaining basis. Unlike the 1884 Oyster Commission’s conclusion that high demand was to blame, the 1891 meeting resolved that the threatened extinction of Maryland oysters was “solely due to the defective condition of our laws relating to oysters, which do nothing to encourage their artificial propagation.”¹⁰⁹ Indeed, the Maryland oyster culture debate became increasingly legalistic in the following decades.

In response to the so-called Academy of Music meeting, the Canton Oyster Exchange held a mass meeting on April 30 to discuss the “anti-leasing” side of the oyster question with respect to the “practical restoration and recuperation of our oyster industry.” As the *Sun* reported, “Nearly all the tidewater counties were represented, and loud applause greeted the arguments advanced by the speakers in favor of the State retaining ownership of the oyster beds.”¹¹⁰

All the speakers asserted that the state’s protection – not private ownership – was needed to preserve the oyster supply. “If it be barbaric to insist upon these bottoms remaining public property, it is rank favoritism to parcel them out to the exclusion of the general public,” stated Colonel Henry Page. “Nor does science demand it. Professor Brooks says the failure in supply does not result from the methods of taking, nor the seasons, but from an inexhaustible demand. A natural bed needs only protection.”¹¹¹

Privatization boded nothing but ruin for the oystermen, whose right to the beds hearkened back to the Magna Carta: “Certain it is that our English ancestors deemed the privilege of free fishery so important and essential to liberty as to insert it in the charter they wrested from King John over six hundred years ago.” As Thomas Weeks asserted, “I have heard much recently of the necessity of preserving the oyster, and I largely agree with the proposition, but there is a greater necessity for preserving American manhood.” Eliminating the commons would abolish the oysterman’s independence by making him

¹⁰⁸ “Save the Oyster Beds,” *Baltimore American*, March 19, 1891. For a specific account of a poaching raid against a Virginia oyster planter, see “Pirates on His Farms,” *Baltimore American*, January 21, 1891.

¹⁰⁹ “Save the Oyster Beds,” *Baltimore American*, March 19, 1891.

¹¹⁰ “Maryland Oysters,” *Baltimore Sun*, May 1, 1891.

¹¹¹ *Ibid.*

the “hired employee of more highly favored citizens or strangers,” in Page’s words.¹¹²

The speakers framed the debate as a conspiracy of scientists, conservationists, and corporate cartels united to swindle the people of Maryland. Attorney John Cowen’s support of private oyster culture presented an especially easy target. Albert Owens suggested that Cowen, “the ablest corporation lawyer in the State,” had ulterior motives, for “behind all he says looms the dark cloud of a corporation hand to grab not only the deep-water lots, but with them to scoop in the shallow water lots. . . .” Weeks’s barbs at Cowen and Brooks dripped with sarcasm:

The promoter sees everything distorted by his desires. He assures us that an industry which given employment to upward of 55,000 people, and indirectly contributes to the support of 220,000 more, which keeps 8,800 boats working in our oyster fisheries, and which yielded 9,650,000 bushels of edible oysters to the pack of last season, is going to suddenly dry up and die out unless the “professor” steps in and lends the helping hand of science to old “Dame-Nature.”

James Alfred Pierce delivered the coup de grâce by twisting Brooks’s utopian vision. If the commons were legislated out of existence, havoc would result: “[T]he blow will fall upon not less than thirty thousand of our people whose occupations will be cut off, their vessel property practically destroyed, their modest real estate holdings which now beautify the shores of the river and creek sacrificed, and the prosperity and happiness of their homes darkened by eclipse which this generation will not see lightened.”¹¹³

Brooks’s flawed predictions about the declining oyster supply prompted alternative interpretations. Several speakers offered anecdotal evidence from “experienced fishermen” that no natural bed had been exhausted, and that dredging had actually extended the natural beds. Brooks had confirmed this belief in 1884 commission report, explaining that dredging produced a less competitive, crowded environment by spreading the shells. But this beneficial effect was temporary; once all the living oysters had been removed the bed would go extinct.¹¹⁴ Yet the oystermen retained their faith in the natural regenerative power of the beds.

Other speakers explained declining yields as a function of natural periodic disturbances and legislative restrictions. At the end of the meeting, the president of the Canton Oyster Exchange, T. Frank Tyler, insisted that the decline since the 1889–1890 season was due both to destructive spring floods

¹¹² Ibid.

¹¹³ Ibid.

¹¹⁴ Ibid.

and the 1890 culling law, “which had been enforced fairly, if not ‘to the letter.’” At the same time, Tyler challenged the proleaders’ statistics, saying that they conflated the number of bushels packed in Baltimore from 1890 to 1891 (2,878,083) with the output of the entire Maryland industry, which was closer to 8 million. Conservationists fudged the numbers in this way to aid the “unmerciful syndicates” and “capitalists and corporations [trying] to get control of the public oyster grounds.”¹¹⁵

William Henry Legg, the politician who served on the Oyster Commission, called the fear of oyster depletion hysteria. Whereas Cowen had deemed Brooks a prophet, Legg dismissed Brooks’s projections as “the same old racket we have heard for years past,” Legg ridiculed his fellow commissioners’ prediction: “Prof. Brooks and Captain Waddell said in 1883 that the oyster property of the State was in imminent danger of complete destruction. That was nine years ago. Since then, until the last year or so, the oysters have had about as little protection as they had before, but the oysters are here yet, and they are here to stay.” He also derided the practical possibilities of oyster culture. Unlike Thomas Hodson’s Academy of Music speech stressing the success of individual oyster planters, Legg declared that none of his friends who had tried planting under the Five-Acre Law had ever made “a cent profit.”¹¹⁶

A final argument advanced by the antileasers challenged Brooks’s above-land/below-land analogy. Whereas land above water required intensive physical labor before the soil could be cultivated, the bay’s natural oyster beds required comparatively little, as Page explained: “No labor or capital is needed to sow the crop; it is furnished by nature, and nothing is required to secure its fruits but protection and the labor of taking them.” Because “private ownership in anything can be justified upon the fact that the owner’s capital or labor, or both, is invested in it,” the oyster bars could not be compared to land-based agriculture.¹¹⁷

Antileasers were not necessarily anticulture, however. Owens supported levying an annual tax on all Maryland citizens to fund oyster planting on barren bottoms and replanting on depleted beds; others stated that if oyster planting was so beneficial, its profits should go to the people, not corporations. However, though the group’s resolutions endorsed strict adherence to the culling law, they omitted support for any form of oyster culture.¹¹⁸

Oystermen and tidewater politicians were not the only ones appalled by Brooks’s leasing recommendations. The Nationalist Club of Baltimore City

115 Ibid.

116 Ibid.

117 Ibid.

118 Ibid.

held its own forum on the oyster question on April 21, 1891 under the title, “The Common Heritage of All.”¹¹⁹ Like the Canton Oyster Exchange speakers, George Wrightson, the Nationalist Club committee chairman, condemned “our scientific culturalists and our learned attorneys” for urging Marylanders to support the “monstrous proposition” of private oyster farming. He began by mocking the claims of “the scientific fraternity” regarding the huge potential output of private cultivation: “[W]e almost shudder at the thought of mother earth being at last clasped in the tender embrace of a gigantic pair of oyster shells.”¹²⁰

In order “to show the fallacy and injustice of their conclusions,” Wrightson quoted extensively from Brooks and Cowen, listing inconsistencies and challenging assumptions. He agreed with Brooks’s affirmation of the importance of returning shells to serve as cultch for exhausted oyster beds, but sarcastically asked why the oyster industry’s restoration required private and scientific management:

Is the spreading of oyster shells upon our bay and river bottoms such a stupendous undertaking that only private enterprise or privileged monopolies, can hope to attain proficiency in it? Are oyster shells or other hard bodies only to be attracted by the magnetic influence of private capital? Is it a fact that the oyster will positively refuse to propagate except upon private beds?¹²¹

Wrightson and the anti-corporate Nationalist Club presented one of the earliest American models of public oyster culture in the form of re-shelling depleted bars.

He also exposed the inherent contradiction of the Oyster Commission’s assertion that though the state should demonstrate the feasibility of oyster culture, it was incapable of managing actual cultivation. Leasing oyster grounds would require a vastly increased state bureaucracy, including an oyster agency to examine the beds and report to the General Assembly, a corps of surveyors to designate lots, a land office to verify and record leases, and extra Oyster Navy ships and officers to enforce the culling laws and erect “innumerable signals or buoys” across oyster lot boundaries. “All these, and Heaven knows how many other functions are to be performed by the State for the sole benefit of private capitalists; but the State is not qualified to have

¹¹⁹ George H. Wrightson, Chairman; George R. Gaither, Jr.; and F. H. Deane, *The Oyster Question: “The Common Heritage of All.” Address of the Nationalist Club of Baltimore City to the People of Maryland* (Baltimore: n.p., 1891). Special Collections, Milton S. Eisenhower Library, Johns Hopkins University.

¹²⁰ *Ibid.*, p. 2.

¹²¹ *Ibid.*, p. 3.

oyster shells distributed upon the bay and river bottoms. Reason revolts at an idea so idiotic!"¹²²

Finally, Wrightson disputed Brooks's interpretation of the history of private oyster culture. In contrast to Brooks's argument that private cultivation would enrich all Marylanders, just as the northern oyster states had profited, Wrightson claimed that

[T]he selling or leasing of the oyster bottoms has always resulted, as it ever must result, in the establishment of the most complete monopoly; the grounds in the Delaware Bay being controlled by capitalists in Philadelphia; while those of New Jersey, New York and Connecticut are monopolized by New York capitalists, and the people of Rhode Island have witnessed the transfer of this natural heritage of theirs to Boston owners.

Far from enriching the populace, "In all those localities the independent tong-man working for himself has ceased to exist, his place being largely supplied by the imported Italian or Hungarian, the oysterman of the future under the steam dredge system advocated by Cowen."¹²³

Wrightson angrily predicted that privatizing the Chesapeake oyster fishery would entail "the riveting of the chains of wage-slavery upon the necks of 16,000 free, honest working men of Maryland, now engaged in the tonging of oysters." He recommended that the General Assembly prohibit dredging, repeal or rewrite the 1890 Culling Law, and abolish the Oyster Navy so as to "give both rest to the oyster beds and an opportunity to the State to disband their marines." Most importantly, since reshelling the oyster bars involved "no mystery whatever," he proposed that the state employ prisoners to spread shells along bay and river bottoms "to almost indefinitely increase our oyster supply and so make more work for honest laborers to do."¹²⁴

Wrightson concluded on a prophetic note: "The great conservative people of Maryland are beginning to study this question and they are not to be deceived. The oyster grounds will *remain* as they *ever have remained, the common heritage of the whole people.*" His organization would see to it: "In this great contest, as in all contests where monopolies are striving for their own advancement, though scientists favor them and learned attorneys plead for them, and even though a powerful daily press uphold them, on the side of the great producing masses, battling for their interests, will ever be found the Nationalist Club."¹²⁵

¹²² Ibid., p. 4.

¹²³ Ibid., p. 11.

¹²⁴ Ibid., pp. 5, 11, 10, respectively.

¹²⁵ Ibid., p. 11.

Brooks took the attacks in stride. To increase awareness of overharvesting and the biological, economic, and political possibilities of private oyster culture, he recycled the commission report and the 1880 oyster development paper into a book for the intelligent lay reader. Daniel Coit Gilman praised *The Oyster* as “a memoir in natural history and a chapter of political economy.”¹²⁶ Brooks stated that he wrote the book reluctantly, for he had already done his part “by showing the capacity of the oyster for cultivation; by calling attention to the unexampled opportunities for oyster-culture afforded by our waters, and by describing the methods which should be used to improve these opportunities and to develop our resources.”¹²⁷ As if still stung by the commission’s defeat, he opened *The Oyster* by sardonically admitting that his expertise and authority were debatable:

I speak on this subject with the diffidence of one who has been frequently snubbed and repressed; for while I am myself sure of the errors of the man who tonged oysters long before I was born, it is easier to acquiesce than to struggle against such overwhelming ignorance, so I have learned to be submissive in the presence of the elderly gentleman who studied the embryology of the oyster when years ago as a boy he visited his grandfather on the Eastern Shore, and to listen with deference to the shucker as he demonstrates to me at his raw-box, by the aid of his hammer and shucking-knife, the fallacy of my notions of the structure of the animal.

Brooks’s feigned diffidence gave way to an assertion of his technical and social legitimacy. He could draw upon enough personal practical experience to preclude him from the charge of being “a mere theorist,” having dredged and tonged in five different states and hatched “more oysters than the number of people in the last census.”¹²⁸

Not surprisingly in an era marked by a growing “culture of professionalism,” Brooks invoked scientific expertise against his staunchest opponents.¹²⁹

¹²⁶ Daniel C. Gilman, introduction, *The Oyster* (above, n. 29), p. xxxvi.

¹²⁷ Brooks, *The Oyster* (above, n. 29), p. 154.

¹²⁸ *Ibid.*, p. 14.

¹²⁹ For works by American historians on professionalism and professionalization as significant social forces in the late nineteenth and early twentieth centuries, see for example, Dorothy Ross, *The Origins of American Social Science* (New York: Cambridge University Press, 1991); Barton Bledstein, *The Culture of Professionalism: The Middle Class and the Development of Higher Education in America* (New York: Norton, 1976); Thomas Haskell, *The Emergence of Professional Social Science: The American Social Science Association and the Nineteenth-Century Crisis of Authority* (Urbana: University of Illinois, 1977); Mary O. Furner, *Advocacy and Objectivity: A Crisis in the Professionalization of American Social Sciences, 1865–1905* (Lexington: University Press of Kentucky, 1975).

He criticized the oystermen for “their ignorance and indifference . . . to all but their own immediate interests.”¹³⁰ Their proposed remedies, “while they are perfectly true, are based upon such narrow experience that they are of little or no value as contributions to a broad, comprehensive view of the problem.” In deploring the long-standing feud between Chesapeake tongers and the dredgers, Brooks treated them like children fighting over toys they couldn’t share: “Occasional outbreaks show clearly the need of more efficient control of a class of men who do not hesitate to defy the law and consider themselves the judges of their own rights.”¹³¹ Furthermore, he derided their conception of the public domain: “The common right of all our people to the use of the oyster beds is a very different thing from the right of a portion of our people to exterminate the beds. . . .”¹³²

In response to proculturalists’ and conservationists’ declarations that their attitudes were not conducive to the long-term viability of the industry, oystermen invoked divine oversight of the Chesapeake Bay: “God put the oysters there for a man to take.”¹³³ Like other late-nineteenth-century professionals in the social and hard sciences who sought to use their knowledge to address modern problems, Brooks applied an urban, secular standard of value to the oystermen by entreating them to adopt highly productive, progressive, professional techniques.¹³⁴

In the absence of a system of private oyster culture, Brooks called upon the oystermen to establish an association for the “preservation, restoration and development of the public domain.”¹³⁵ Rather than paying state licensing fees for the right to harvest oysters, such a “co-operative organization” could profitably invest its money in improving the public beds, thereby gaining the incentive to conserve them. Brooks hoped “to convince the oystermen that they must depend upon their own efforts rather than upon the State government.”¹³⁶ Considering the immense sway oystermen had over their elected representatives, Brooks’s political naïveté was stunning. Like others follow-

¹³⁰ W. K. Brooks and H. McE. Knower, “The Oyster and the Oyster Industry,” *Maryland: Its Resources, Industries and Institutions. Prepared for the Board of World’s Fair Managers of Maryland by Members of Johns Hopkins University and Others* (Baltimore: Sun Job Printing Office, 1893), 264–312, p. 312.

¹³¹ *Ibid.*, p. 308.

¹³² Brooks, *Report of the Oyster Commission* (above, n. 28), pp. 10–11.

¹³³ Quoted in a Robert de Gast, *The Oystermen of the Chesapeake* (Camden, Me.: International Marine Publishing, 1970), unpaginated.

¹³⁴ For an analysis of how experiment station scientists attempted to professionalize their rural clients, see David B. Danborn, “The Agricultural Experiment Station and Professionalization: Scientists’ Goals for Agriculture,” *Agric. Hist.*, 60 (1986), 246–255.

¹³⁵ Brooks, *The Oyster* (above, n. 29), p. 173.

¹³⁶ *Ibid.*, p. 168.

ing his lead, Brooks failed to realize that demonstrating the efficacy of oyster culture was not enough, and that resource management involves much more than the application of biological expertise.¹³⁷ Indeed, his flawed predictions and perceived link with corporate interests rendered all his expertise worthless in the eyes of the traditional stewards of the bay.

As Arthur McEvoy has shown in his studies of California fisheries, scientific descriptions necessary for effective natural resource management emerge out of a complex interaction between resource ecology, economic production, and the legal system. Both science and lawmaking involve struggles for authority: between scientists and citizens over what counts as “reality,” and between people seeking to allocate access to resources for specific uses, respectively. Production depends on technology, resource availability, the sociology of resource-user groups, and the structure of legal entitlements to access. Finally, the sociology and the legal structure of the market help determine the human impacts upon the ecology of the system in question.¹³⁸

Even as the oyster-culture debate assumed an increasingly legalistic framework, Brooks and his successors neglected to integrate the forces of ecology, production, and lawmaking into their plan for restructuring and managing Maryland’s oyster commons. The oyster culturalists and conservationists failed to confront the social and ecological processes undermining their claims to scientific expertise, and the oystermen and their elected government representatives resisted efforts to manage the state’s ever-dwindling oyster supply.¹³⁹

Legal Hurdles

As the natural beds exhibited diminishing returns in the 1890s, a more politically astute man, Baltimore attorney B. Howard Haman, championed the cause of oyster culture in almost exclusively economic terms. Between 1893 and 1906, he submitted several bills linking the revenues from leasing barren bottoms for private oyster culture with the opportunity to fund state roads and

¹³⁷ Kennedy and Breisch, “Sixteen Decades” (above, n. 14), p. 154.

¹³⁸ Arthur F. McEvoy, “Science, Culture, and Politics in U.S. Natural Resources Management,” *J. Hist. Biol.*, 25 (1992), 469–486, p. 485. For his case study of the relationship between user-group sociology, resource ecology, and fisheries management, see Arthur F. McEvoy, *The Fisherman’s Problem: Ecology and the Law in the California Fisheries, 1850–1980* (Cambridge: Cambridge University Press, 1986).

¹³⁹ On the failure of contemporary scientists to address the social processes mediating lay experience of scientific knowledge claims, see *Misunderstanding Science?* ed. Irwin and Wynne (above, n. 9).

bridges.¹⁴⁰ Although the *Baltimore Sun* strongly supported Haman's efforts, tidewater politicians and citizens received them with derision.

Following the narrow defeat of Haman's 1902 bill, and pending a vote on a similar bill in 1903, the *Sun* enumerated the benefits that would accrue if the legislature voted for progress rather than being "frightened out of their senses by the bugaboo of a few tongers' votes." The math was simple: "There are within the State about 640,000 acres of oyster grounds. If 500,000 acres of this tract could be leased at the low rental of \$2 an acre it would produce an annual revenue of \$1,000,000 – as much as is received from the direct tax of 17 cents on the entire property of the State. That sum would come from what now produces nothing. . . . It would be like finding money." Besides abolishing the local road tax, thereby enabling Marylanders to "enjoy the blessings of good roads without cost," private oyster culture under the Haman bill "would increase the value of farm and other country property almost beyond estimate, bring residents to the country, make country life more pleasant, and, in short, would bring Maryland to the front rank of prosperous and progressive States." Despite the *Sun's* assertion that private oyster culture "would bring an industrious white population to Southern Maryland" and "give profitable employment to thousands and build up packing houses and busy centers of industry in Baltimore city and in the towns on the eastern and western sides of the bay," the Haman bill again lost due to pressure from oystermen fearing an influx of corporate overlords.¹⁴¹

Maryland was still the leader of the country's oyster-producing states in 1891. Ten years later it had relinquished this position to Virginia, which marketed nearly eight million bushels in 1901, three million of which came from private beds. Virginia oystermen also feared big business, overproduction, and lower market prices. However, ecological differences – the more rapid depletion of natural resources – made private culture more palatable in Virginia, as they had in the northern oyster states. The inferiority and low yield of the oyster bars in the southern half of the bay encouraged the rise of a nascent planting industry, in which oystermen sold seed oysters removed from public beds to private planters both at home and in northern states.¹⁴² In 1894, Virginia set aside 243,000 acres of its naturally productive bottoms for public use while allowing leasing of the nonproductive bottoms outside

¹⁴⁰ "An Economic Question of Importance," *Baltimore Sun*, February 18, 1893; "The Oyster and the Politician," *Baltimore Sun*, June 17, 1905; Kennedy and Breisch, "Sixteen Decades" (above, n. 14), pp. 161–162.

¹⁴¹ "Good Roads and Oyster Planting," *Baltimore Sun*, July 31, 1903.

¹⁴² John J. Alford, "The Chesapeake Oyster Fishery," *Ann. Assn. Amer. Geog.*, 65 (1975), 229–239, p. 235; J. L. McHugh and Robert S. Bailey, "History of Virginia's Commercial Fisheries," *Va. J. Sci.* (1957), 42–64.

these areas.¹⁴³ By 1910, as Brooks's former student James Kellogg wrote, "The Virginia oyster planter still has his serious troubles, but the practice of planting has become so extensive that the market does not depend entirely on the natural rocks, and hence possesses much stability."¹⁴⁴

In 1905, the Johns Hopkins University Press issued a second edition of *The Oyster*.¹⁴⁵ The *New York Times* noted that the first edition seemed to have failed in its purpose "to show Maryland oystermen their wasteful methods, and to lead to reforms." By contrast, "Virginia, North Carolina, Georgia, and Louisiana have read and appreciated the lesson, and have followed the suggestions made by the author so many years ago."¹⁴⁶ The book helped inaugurate a fresh round of debate in Maryland, leading to the most significant period for oyster legislation in Maryland, which occurred between 1906 and 1914.¹⁴⁷ B. Howard Haman continued to lead the initiative; health problems kept Brooks out of the fray.¹⁴⁸

Between May 12, 1905, and April 11, 1906, the *Baltimore Sun* published at least thirty-eight editorials on leasing barren bottom to private individuals for oyster culture, with arguments similar to those raised regarding the 1903 bill.¹⁴⁹ After fifteen years, the General Assembly finally passed a compromise version of the Haman bill "to establish and promote the industry of oyster culture in Maryland; to define, survey and mark natural oyster beds, bars and rocks, to prescribe penalties for the infringement of its provisions, and to establish a permanent shell-fish commission." The Haman Act allowed individuals to rent up to thirty acres of barren bottom in county waters and up to 100 hundred acres in the bay beyond county boundary limits. To placate the oystermen, the act prohibited corporations and excluded all natural beds. Twenty-five years after Connecticut began surveying its waters for oyster culture, the act authorized funds for a survey to define legally and technically the boundaries of "natural oyster bars," which would be maintained for the public, and "barren bottom," which would be opened for leasing.¹⁵⁰

¹⁴³ Dexter Haven, "Virginia Seed Sources," in *Oyster Culture in Maryland '79: A Conference Proceedings*, ed. Donald Webster (Annapolis: University of Maryland Cooperative Extension Service, 1979), p. 25.

¹⁴⁴ Kellogg, *Shell-Fish Industries* (above, n. 3), p. 216.

¹⁴⁵ The second edition contained an extra section addressing public health concerns about shellfish contamination and the oyster's "peculiar fitness" for concentrating cholera and typhoid microbes.

¹⁴⁶ "The Oyster," *New York Times*, December 9, 1905.

¹⁴⁷ Christy, "Exploitation of a Common Property Natural Resource" (above, n. 2), p. 88.

¹⁴⁸ Benson, "Brooks" (above, n. 16), p. 104.

¹⁴⁹ Kennedy and Breisch, "Sixteen Decades" (above, n. 14), pp. 162–163.

¹⁵⁰ *Ibid.*: Christy, "Exploitation of a Common Property Resource" (above, n. 2), p. 89; Grave, *Manual* (above, n. 31), pp. 14–18.

After Brooks died of heart failure in 1908, his eulogizers cast the Haman Act in glowing terms. Edwin Grant Conklin wrote that “the satisfaction which he [Brooks] felt in this happy culmination of his long campaign was very great.” In *Science*, Ethan Allen Andrews commended Brooks’s discipline Caswell Grave, who was appointed as the Maryland Shell Fish Commission’s scientific member, for having “utilized the new legislation for a most promising realization of Professor Brooks’s dreams of scientific knowledge and control of the vast natural resources of the state.”¹⁵¹

But two other former students doubted the new law’s efficacy. In his popular 1910 book *Shell-Fish Industries*, James Kellogg questioned the ability of the Haman Act to encourage private oyster culture because of its insistence on small leased lots and exclusion of corporations. In states such as Connecticut, the most successful private cultivators used several thousand acres, and owned enough capital to hire their own watchmen and absorb losses during bad years. Moreover, because the maximum Maryland plot size of thirty acres was not large enough to justify the expense of steam-powered boats, Kellogg predicted that most of the planted oysters would be harvested using the old-fashioned, inefficient tongs. Expecting that the boundaries would be insufficiently surveyed, he also predicted that lawsuits would proliferate should leases become numerous.¹⁵²

Caswell Grave criticized the Haman Act for imposing so many restrictions “that it can not be regarded as a satisfactory legal foundation upon which to build an industry in oyster culture.” He and his fellows on the Shell Fish Commission recommended in 1908 that the law be amended to reduce restrictions on lessees of barren bottoms. However, “an enormous catch of ‘spat’ on the oyster bars in practically all of the waters of the State” in 1906 produced more than 6 million bushels annually from 1906 to 1908, up from a historic low of 4.5 million bushels in 1904. As in 1885, the General Assembly refused to enact any of the changes proposed by the commission it had so recently convened.¹⁵³ Unpredictable ecological events assumed increasing importance in the making of oyster policy, further undercutting scientific influence and authority.

In 1910, the output from the natural beds fell to 3.5 million bushels, the lowest figure it had reached since 1865, thereby prompting the legislature to reconsider remedial measures. It again rejected the Shell Fish Commission’s recommendations, this time in favor of the act to reshell certain depleted oyster bars, to be funded by a tax of 1 percent per bushel levied on all oysters

¹⁵¹ Conklin, “Brooks” (above, n. 19), p. 60; Andrews, “Brooks” (above, n. 18), p. 779.

¹⁵² Kellogg, *Shell-Fish Industries* (above, n. 3), pp. 227–228.

¹⁵³ Grave, *Manual* (above, n. 31), pp. 5, 15.

sold in the state. However, the Reshelling Act was declared unconstitutional by a state court.¹⁵⁴

Soon after the Haman Act's passage, the U.S. Congress authorized members of the Bureau of the Coast and Geodetic Survey, the Bureau of Fisheries, and the Bureau of Chemistry to assist the Maryland Shell Fish Commission in surveying the state's oyster beds.¹⁵⁵ A special federal appropriation helped fund the six-year survey, led by engineer Charles Yates at a cost of \$216,000.¹⁵⁶ Grave had hoped to conduct site-specific oyster-culture experiments so as to utilize the knowledge of oystermen familiar with areas where young oysters developed most successfully. However, surveying the natural oyster beds consumed all the available funds, equipment, and time.¹⁵⁷

From 1906 to 1912, the Yates survey classified 216,000 acres as natural oyster bars, 44,000 for crabbing and clamming, and 760,000 as barren. Of the barren bottoms subject to lease under the Haman Act, 100,000 acres were deemed "undeveloped, but known productive oyster culture bottoms"; 200,000 acres were estimated as potentially productive; and 460,000 acres were described as barren bottoms of doubtful value. The survey produced a flood of print, including seventeen official documents and forty-three large-scale charts adding up to 2,400 printed pages and 400 square feet of paper.¹⁵⁸

After completing the Yates survey in 1912, Grave offered technical assistance to would-be oyster farmers in his *Manual of Oyster Culture in Maryland*. Grave began with a historical review on the grounds that every Maryland oyster planter should be familiar with the political and economic history of the oyster in Maryland. He then explained that the various branches of oyster culture – including the production of seed oysters (farming), the growing of oysters from seed (planting), and the conditioning of mature oysters for market (fattening) – each required different conditions for optimal

¹⁵⁴ *Ibid.*, p. 16.

¹⁵⁵ The Coast and Geodetic Survey established the surveying foundation of triangulation, hydrography, and topography. The Bureau of Fisheries (the former U.S. Fish Commission) advised on biological and economic matters. As the administrator of federal pure-food laws, the Bureau of Chemistry addressed fears of typhoid contamination by conducting a "sanitary survey." The state Shell Fish Commission coordinated the hydrographic operations, surveyed the leased oyster lots, and handled administrative matters pertaining to Maryland. Charles Yates, *Survey of Oyster Bars of Maryland, 1906–1912* (Washington, D.C.: Government Printing Office, 1913), p. 10.

¹⁵⁶ Yates, *Survey of Oyster Bars of Maryland* (above, n. 155), p. 10.

¹⁵⁷ Christy, "Exploitation of a Common Property Natural Resource" (above, n. 2), p. 89; Grave, *Manual* (above, n. 31), p. 30.

¹⁵⁸ Yates *Survey and Oyster Bars* (above, n. 155), p. 12; Christy, "Exploitation of a Common Property Natural Resource" (above, n. 2), p. 89; Grave, *Manual* (above, n. 31), p. 15.

development. As mentioned previously, Grave stressed that most of the citizens who leased bottoms under the Five-Acre Law failed to take this fact into account. Because the Shell Fish Commission had determined in the course of the Yates survey that high death rates were usually caused by overplanting, Grave, concluded, "CAREFULLY AVOID PLANTING MORE OYSTERS ON YOUR GROUND THAN CAN BE PROPERLY FED."¹⁵⁹

Grave failed to convince the oystermen. Because they believed it was possible for barren oyster bars to recuperate, they rejected the Yates survey provisions prohibiting modification of classified bottom boundaries. The oyster culture debate raged anew in 1914 as the General Assembly debated the Shepherd bill, through which oystermen and their political allies sought to change the definition of a natural bar to include leased areas that had provided oysters naturally five year before the lease.¹⁶⁰ The *Baltimore Sun* charged that the intent was to emasculate the Haman Act and the nascent private oyster fishery while masquerading as a pro-oyster culture measure. Outraged over the proposition, the *Sun* devoted an entire page of the March 10 issue to the proculture comments of bankers, businessmen, and social leaders who presumably had no financial interest in the "oyster problem." Several of the commentators invoked Brooks's prophetic assertions.¹⁶¹

However, the following day the "anti-planters" in the General Assembly won. Pursuant to the amendment, 54,000 acres were reclassified from barren bottom to natural oyster bar and thereby excluded from the leasing provisions.¹⁶² Although private oyster lessees attacked the amendment's constitutionality for potentially impairing contractual rights under existing leases, the Maryland Court of Appeals undercut this argument by pointing out that the statute guaranteed a lessee compensation if his leasehold was seized.¹⁶³ Moreover, the Shepherd Act effectively blocked the granting of further oyster leases by allowing any lease application to be challenged in court. If the judge decided that the area sought was a natural oyster bar, the application was denied, and the area was officially reclassified on the oyster charts. Accordingly, between 1914 and 1936, the acreage of "natural oyster bars" increased from 270,000 to 285,000. As Francis Christy wrote in his 1964 study of the Maryland oyster fishery, "[T]his increase does not represent a real increase

¹⁵⁹ Grave, *Manual* (above, n. 31), p. 75.

¹⁶⁰ Power, "More about Oysters" (above, n. 62), p. 214.

¹⁶¹ "Oyster Culture's Call Comes Clear and Loud," *Baltimore Sun*, March 10, 1914.

¹⁶² Christy, "Exploitation of a Common Property Natural Resource" (above, n. 2), pp. 89-90.

¹⁶³ Power, "More about Oysters" (above, n. 62), p. 214.

in productive areas but rather a by-product of unsuccessful efforts to acquire leases.”¹⁶⁴

Conclusion: Fatal Evolution

In 1916, the Shell Fish Commission, Maryland Fish Commission, state game warden agency, and Oyster Navy were consolidated to form the Maryland Conservation Commission.¹⁶⁵ In his report on the commission’s oyster activities from 1918 to 1930, biologist Reginald Truitt lamented the dearth of bay fisheries research “since the pioneering days of Dr. W. K. Brooks.” Even as Brooks’s prophesied decline worsened, the oystermen and their representatives continued to object to scientific investigation of the factors governing oyster abundance and to scientific intervention in the oyster problem. Truitt criticized the oystermen for having “put their entire hope in natural restoration with, it seems, every faith in the very methods, those of the past, that have brought the industry to the brink of ruin.” He condemned “the educational and political leadership of Tidewater Maryland” for failing to contribute “to a change in the mores in question.”¹⁶⁶

To determine whether “all of the better beds of past years could be used alike for shell planting purposes to secure a set,” from 1918 to 1927 the Conservation Commission took water samples and temperature, specific gravity, and pH readings from all of the state’s major oyster-producing areas. Despite limited funds, the department also made “practical experiments” in shell planting, which involved laying huge quantities of old oyster shells upon barren bay bottoms in the hopes of re-creating an ideal environment for the settling of spat fall. By comparing his results with those of the 1906–1912 Yates survey, Truitt concluded that the “depleted but formerly outstanding productive areas intensively studied” showed excellent prospects for oyster culture and production.¹⁶⁷ Although the state established a program of reshelling depleted beds in 1927, and allocated 1,000 acres for “an aquiculture experimental farm to be used in the study of seed bed restoration” by the newly established Chesapeake Biological Laboratory in 1930, Truitt complained that “the success achieved from the present policy has not been overly indicative, if indicative at all, that this costly procedure is to solve the

¹⁶⁴ Ibid.; Christy, “Exploitation of a Common Property Natural Resource” (above, n. 2), p. 93.

¹⁶⁵ Kennedy and Breisch, “Sixteen Decades” (above, n. 14), p. 165.

¹⁶⁶ R. V. Truitt, “Recent Oyster Researches on Chesapeake Bay in Maryland,” *Chesapeake Biological Laboratory Publication, No. 3* (1931), 1–28, p. 1.

¹⁶⁷ Ibid., p. 20.

oyster situation in Maryland.”¹⁶⁸ Indeed, the reselling program was often poorly managed in succeeding years, and the experimental farm was returned to public use, “apparently against Truitt’s advice and to the ultimate detriment of the area and the seed program.”¹⁶⁹

Maryland’s oyster yields continued their steady descent. From the 1885 high of 15 million bushels, production dropped to 2.5 million bushels in 1929, or 16.6 percent of the national output. Maryland’s privately leased beds, which covered 9,000 acres, provided 9.5 percent of the total state output (241,141) bushels. By contrast, private beds in the other four top oyster states of the Atlantic and Gulf Coasts produced up to 90 percent of the total yield.¹⁷⁰

In 1932, W. L. Fairbanks, the director of survey for the Maryland Development Bureau, couched his statistical summary in words similar to those Brooks had used a half century earlier: “Maryland is confronting a competition in oyster production that may, because of its character, jeopardize her position as one of the leading oyster-producing States of the country.” Maryland’s past superiority had rested upon the output of the public oyster beds, but Fairbanks stressed that the other leading oyster states had gained a “strong competitive position through private planting.” He concluded, “It is becoming apparent that Maryland’s present position as a leading oyster-producing State can be maintained in the future only through an expansion of the activities that have been conducted to rehabilitate the public beds of the State, through a much more extensive planting by private interests than has yet been undertaken, or by a combination of both.”¹⁷¹

However, the powerful objections of oystermen and continued overrepresentation of tidewater counties in the state legislature again deterred measures promoting private cultivation. At a time when industry throughout the country had gained a central role in defining and interpreting conservationism as “expertise and rational management of resources for business uses,”¹⁷² the

¹⁶⁸ *Ibid.*, p. 4.

¹⁶⁹ Kennedy and Breisch, “Sixteen Decades” (above, n. 14), p. 166; G. W. Wharton, *Proceedings of an Oyster Conference, 7 January 1959* (College Park: University of Maryland Press, 1959).

¹⁷⁰ Maryland was the second top-producing oyster state of the two coasts. The top producer, Louisiana, produced 2,635,028 bushels, of which 35.3 percent (928,864 bushels) was taken from private beds. In New Jersey 2,149,783 bushels, or 96.9 percent of the total catch, was taken from private beds; in New York, 1,271,527 bushels, or 96.8 percent; and in Virginia, 1,556,421 bushels, or 65 percent came from private beds. In Connecticut and Rhode Island, close to 100 percent of the total catch came from private beds, but together they produced only 774,347 bushels. W. L. Fairbanks, *The Fisheries of Maryland* (Baltimore: Maryland Development Bureau of the Baltimore Association of Commerce, 1932), pp. 106–107, 112.

¹⁷¹ *Ibid.*, p. 107.

¹⁷² Robert Gottlieb, *Forcing the Spring: The Transformation of the American Environmental Movement* (New York: Island Press, 1994), p. 26.

major conservation measures that squeezed through the Maryland General Assembly served to restrict technological innovation rather than promote sustained development. Although they acquiesced to some gear, season, and harvest-size restrictions, Maryland's oystermen effectively used legislative and judicial institutions to prevent the development of a private oyster fishery.¹⁷³ Having outlawed powered dredges, by the mid-1960s Maryland had the country's largest commercial sailing fleet and the oldest vessels.¹⁷⁴

So stunned was he by the historical disregard of Maryland legislators to the scientific suggestions of its own oyster commissions, former National Research Council chairman Isaiah Bowman used the Maryland oyster fishery in a 1940 article as one of the three examples of failed attempts to apply science to social problems.¹⁷⁵ To Bowman's amazement, rather than implementing the management recommendations made by scientists, legislature after legislature had preferred to consult "so-called 'practical' oystermen," with ruinous results. Impressed with the "astonishing accuracy" of Brooks's prediction that the Maryland oyster trade would fall if scientific remedies were not employed, Bowman concluded, "The fatal evolution of the industry in the past half century is one of the most remarkable validations of scientific method which we know."¹⁷⁶

But the evolution, or rather devolution, of Maryland's natural oyster resource was not fast or fatal enough. In 1894, scientist Charles Stevenson refined William Armstrong's three-stage evolution of the oyster industry to show how declining yields would ultimately force "hunger-gatherers" to adopt oyster culture. According to Stevenson, the world's oyster fisheries had passed or were passing through several stages of development. In the initial stage, the publicly held natural bars easily meet the demand for oysters. At the last stage the natural beds are so deteriorated that the industry relies completely upon private oyster beds. Between the first and last stage several transitional stages exist during which the natural bars function as seed beds for the increasingly important private grounds.¹⁷⁷

By the end of the nineteenth century most of Europe's oyster fisheries had reached the last stage of development. In the United States the oyster fisheries

¹⁷³ Power, "More about Oysters" (above, n. 62), p. 214.

¹⁷⁴ Christy, "Exploitation of a Common Property Natural Resource" (above, n. 2), pp. 35, 83.

¹⁷⁵ Kennedy and Breisch (above, n. 14), p. 154; Isaiah Bowman, "Science and Social Effects: Three Failures," *Sci. Monthly* (1940), 289–298. The other two examples he used were "the hitherto unresolved problems of peacemaking" and the destruction of the tropical soils.

¹⁷⁶ Bowman, "Science and Social Effects" (above, n. 175), pp. 292–293.

¹⁷⁷ Alford, "Chesapeake Oyster Fishery" (above, n. 142), p. 233; Charles H. Stevenson, "The Oyster Industry of Maryland," *Bull. U.S. Fish Comm.*, *XII* (Washington, D.C.: Government Printing Office, 1894), p. 206.

north and south of the Chesapeake Bay were also advancing toward the last stage, but Maryland's and Virginia's industries were just beginning to pass out of the first stage, a consequence of the bay's abundant natural beds.¹⁷⁸ In 1910, James Kellogg predicted that private culture would triumph as the bars evolved toward extinction: "But in the course of time – after the natural oyster beds have been destroyed – the tonger and the dredger of the natural crop will have disappeared. All opposition to oyster culture having vanished, the Chesapeake, rich with food for an unlimited oyster growth, free from the most destructive of oyster enemies, with its safe and unvarying natural conditions, will prove to be of greater value to the people on its shores than mountains full of silver and gold."¹⁷⁹

Despite a continuing downward spiral, Maryland's share of the Chesapeake's oyster beds never deteriorated enough to encourage large-scale attempts at oyster culture, even though proculturalists deployed scientific expertise in an era that glorified technical solutions, professionalism, and "the search for order."¹⁸⁰ As Caswell Grave had pointed out in 1912, time and time again, just when the oyster supply appeared on the brink of destruction, the natural beds recuperated just enough to dissolve any proculturalist, privatization, or proconservation support that had coalesced among the state's politicians.¹⁸¹ Instances of natural recovery and other unpredictable environmental changes eroded any credibility that proconservation scientists possessed vis-à-vis oystermen.

The oyster culturalists and conservationists lost the struggle over access to the Maryland oyster because they could not breach the public perception linking scientific expertise and conservation with pernicious corporate monopolies, and because the responsibility for regulating the fishery lay with the tidewater-dominated state legislature. One cannot help but wonder whether modern federal resource conservation would have begun a generation earlier had William Keith Brooks enjoyed stronger federal support and had he not equated saving the oyster with privatizing the bay. Unlike the technocrats described by Samuel Hays in his classic *Conservation and the Gospel of Efficiency*, who succeeded in pushing through their plan of progressive conservationism in the federal forest and range serves, the advocates of scientific oyster culture in the Free State failed to overcome local grassroots opponents skilled at pursuing their own version of the "gospel of expediency." Managed to satisfy political demands rather than as a renewable resource,

¹⁷⁸ Alford, "Chesapeake Oyster Fishery" (above, n. 142), p. 233.

¹⁷⁹ Kellogg, *Shell-Fish Industries* (above, n. 3), p. 228.

¹⁸⁰ The phrase is from Robert Wiebe, *The Search for Order, 1877–1920* (New York: Hill and Wang, 1976).

¹⁸¹ Grave, *Manual* (above, n. 31), p. 6.

the Maryland oyster fishery limped along, exemplifying the tragedy of the commons.¹⁸²

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¹⁸² Kennedy and Breisch, "Sixteen Decades" (above, n. 14), p. 169; Power, "More about Oysters" (above, n. 62), pp. 199–225; Hardin, "The Tragedy of the Commons" (above, n. 62).