Chapter 12

Experts on Unknown Waters: Environmental Risk, Fisheries Science, and Local Knowledge in the Russian North

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In the fall of 1894, a catastrophe took place in the north of the Russian Empire: twenty-five fishing boats were wrecked during a severe storm on their return to Archangel’sk from seasonal fisheries along the Murman coast of the Barents Sea.[[1]](#endnote-2) The summer cod and halibut fisheries were traditionally a male occupation among the local people, known as Pomors, who ventured out on a seasonal basis from their homes along the coast of the White Sea.[[2]](#endnote-3) Because in some villages almost all of the male population participated in the fisheries, this catastrophic shipwreck left children orphaned and deprived families of their main sources of income. Those fishermen who survived the wreck lost their boats and gear.

High mortality at sea was a normal feature of Pomor life. We might consider it a “routine risk,” but in 1894 the scale of the catastrophe was too large for the authorities and society not to notice, so it became an “extreme event.”[[3]](#endnote-4) The event I discuss follows the pattern described by Kenneth Hewitt, that “rather being private and scattered, the tragedies are public and concentrated.”[[4]](#endnote-5) Thus, the catastrophe was discussed at the Royal Society for the Assistance to Russian Trade Navigation, which had existed since 1873. This society united ship owners, mariners, industrialists, merchants, and state officials interested in the development of water routes and marine trade. To manage the generous donations collected for victims of the catastrophe, the St. Petersburg Branch of the Society formed the Committee for Aid to the Pomors of the Russian North. The collection of donations was blessed by Tsar Nicholas II, who participated privately and also gave an order to the state treasury to contribute substantially. Grand Prince Alexei Mikhailovich became honorary head of the committee, while Mikhail Fedorovich Mets, chair of the St. Petersburg Branch of the Royal Society for the Assistance to the Russian Trade Navigation, was chosen as acting chair.[[5]](#endnote-6)

The founding of this committee was one manifestation of the consolidation of Russian civil society in the 1890s, which was profoundly influenced by the Great Famine of 1891 and a major typhus epidemic the following year—and this civil society was located socially as other historians have argued, “between Tsar and people.”[[6]](#endnote-7) At first, the new committee dealt with the payment of pensions and other social assistance to families of the fishermen. It also worked towards organizing a system of insurance for small fishing vessels, and partly succeeded in that, although it is evident that most of the Pomors lived according to a traditional, religious understanding of the world in which the notion of risk made little sense.[[7]](#endnote-8) Thus, the committee worked as a risk-management organization, a type of body that was becoming more common in Europe and the United States at that time and rapidly emerging in Russia.[[8]](#endnote-9)

However, to fulfill these everyday practical tasks of dealing with risk was not enough for the committee. It wanted to use the money to substantially improve local communities, not just for ordinary social work. Because fish were at the core of the economic and social life of the Pomor, the leaders of the committee decided to invite natural scientists to discuss how to improve the lives of the Pomor by bringing them knowledge about fish resources. Such a proposal was very much in line with the activities of other organizations that promoted scientific research, such as the *zemstva* (local government organizations), which supported studies of local resources and the gathering of statistics.[[9]](#endnote-10) Because there were no *zemstva* in the Russian North, the philanthropic committee served as a substitute organization with at least some of their functions, one of which was the promotion of applied science. And according to their professional interests and belief in natural science as a tool for solving all kinds of problems involving natural resources and environment, natural scientists proposed that a long-term research expedition was necessary to improve the northern fisheries and minimize their risks.

Using the work of the committee as an example, I will discuss attempts to connect the issue of disaster and risk with the development of scientific knowledge about the environment. I propose that risk and knowledge were closely connected in this case. I follow Ulrich Beck’s notion that “the existence of and distribution of risks and hazards are *mediated in principle through argument*” and “qualified expert judgment is still required to determine it [risk] ‘objectively.’”[[10]](#endnote-11) In this case, however, the experts did not focus on risk itself. Disaster was used as a trigger to develop scientific understandings of the environment and envision social transformation.

The increasing involvement of natural scientists in the search for solid foundations of resource use and risk management occurred in an environment that they poorly understood. Nevertheless, scientists declared that they could discover the general laws of the region’s environment and resources and thereby articulate a reorganization of socioeconomic life based on rational scientific knowledge. Such a declaration and its acceptance by civil society and authorities is characteristic of the onset of what would come to be called the “knowledge society,” a society that generates and shares knowledge that can be used to improve the human condition.[[11]](#endnote-12) It is exactly that period of time when “science became a productive force in the 19th century” and thus “ceased to belong exclusively to the superstructure of society.”[[12]](#endnote-13)

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<H1> ***Risk, Civil Society, and Nature’s Experts in Russia at the End of the Nineteenth Century: The Case of the Murman Scientific-Fisheries Expedition***

In the second half of the nineteenth century, attitudes towards risk held by the government and especially civil society changed. Mortality at sea always was considered an inevitable part of the professional life of fishermen and, though it caused both concern and admiration in outsiders, there were no attempts to mitigate the risk. The idea that traditional Pomor vessels were unsafe had been widely discussed since the time of Peter the Great, well known for his strict policy of forbidding traditional northern ship-building while introducing of foreign types of vessels, among other modernizing efforts. But in spite of new regulations, the Pomor themselves continued to build traditional vessels and found them suitable for the style of inshore fishing they conducted.[[13]](#endnote-14)

Thus, it was first of all not the local citizens but the emerging civil society in the political centers whose attitude toward risk changed in the late nineteenth century. They no longer were willing to tolerate the level of risk that several decades previously had been considered quite normal. For example, the Pomors’ hunting expeditions to Spitsbergen (Svalbard) in the eighteenth century had been quite risky. The risk of death was between 1 and 10 percent, but the Pomors considered this risk relatively reasonable compared with their other activities.[[14]](#endnote-15) However, in the middle of the nineteenth century, after several tragedies, hunting expeditions to Spitsbergen ended at least in part because they came to be considered too risky.[[15]](#endnote-16)

At the end of the nineteenth century, scientists and others in elite society ranked the improvement of vessels as the most important step to minimize the risks of the northern fisheries. Instead of the Netherlands, to whose technology Peter the Great looked as a model, Norway was then very rapidly developing near the northern coasts of Russia. Its fisheries flourished and Norwegian fishermen, encouraged by large state subsidies, traded their traditional boats for modern decked vessels that could travel further from the shore. Authorities took their example as a model for Russian northern fishermen as well.[[16]](#endnote-17) However, on the eve of the twentieth century it was no longer possible just to borrow technologies; rather, they had to be understood, rationalized, and approved by science.[[17]](#endnote-18)

In that period, “science” was a magic word in Russia. According to Elizabeth Hachten, it was a period of “emergence of a newly vibrant public culture of science.” Natural science (not social) was believed capable of solving most social and economic problems. As Hachten writes: “The natural sciences, theoretical and applied, contributed both ideologically and practically to the educated public’s desire for purposive action to achieve the goals of renewal and reform of society.”[[18]](#endnote-19)

The Pomor case at first developed similarly to others wherein authorities and civil society advocated to scientists and vice versa—scientists convinced civil society of their power—in connection with challenges posed by environmental catastrophes or epidemics. Scientists were quite happy to propose a plan of research to provide clear reasons for these events and actions to prevent them. Well-known examples of the involvement of scientists in the public campaigns of that time range from confronting drought and famine with scientific studies of soil and vegetation to health campaigns in which bacteriologists and other medical scientists were highly involved.Changes in attitude toward risk appear in examples from bacteriology of the same time. For instance, while rabies in Russia was infrequently contracted, and the risk of getting it was many times less than most other infectious diseases, the fatal character of rabies and the fear it aroused put anti-rabies vaccination at the forefront of public health concern in southern Russia. Struggle against this rare but terrible disease united the efforts of scientists and civil society for the benefit of both.[[19]](#endnote-20) Like deaths from disease, deaths at sea might be considered barbaric and uncivilized, caused by the most terrifying forces of nature: wild animals and the depths of the ocean. In putting an end to these deaths, modern science could secure for humans freedom from malevolent aspects of the natural world.

Some general assumptions about science circulated in Russian society at that time: the usefulness of applied science to improve human interactions with nature—in agriculture, forestry, fisheries, and mining—and an understanding of the importance of science for better risk management in all sides of human life. These two approaches coexisted with the notion of science for its own sake and for the improvement of society in general. All these assumptions led to broad support of scientific education for improvement of economic life and better social order.

Improvement of maritime education in the Russian Empire, including that of local coastal dwellers, was a goal of the Royal Society for the Assistance to Russian Trade Navigation. Accordingly, the meeting of the society in November 1896 was devoted to the lecture “On Fishermen’s Schools for our North” presented by the professional ichthyologist and fisheries inspector Nikolai Arkadievich Varpakhovskii. The lecture provoked a vibrant discussion, largely induced by previous attention to the fate of the northern fishermen in connection with the 1894 catastrophe and activities of the Committee for Aid to the Pomors. Discussion led to the organization of one more institution, the Northern Commission, intended to help the committee define the problems and develop a plan for their solution.[[20]](#endnote-21) The main items on the commission’s agenda included organizing scientific-fisheries research of the northern seas, fishermen’s schools, and fisheries inspection in Arkhangel’sk region.[[21]](#endnote-22) Mikhail Mets led the 25-member commission. Members included three marine officers including one hydrographer, five engineers, two diplomats working in Norway, and 13 scientists (eight zoologists, one botanist, one geologist, and three meteorologists). The composition of the commission clearly shows that the Royal Society for the Assistance to Russian Trade Navigation considered the problem of improving the education and economic life of the northern fishermen to be primarily a zoological one.[[22]](#endnote-23)

Zoologist Nikolai Knipovich,[[23]](#endnote-24) who already had some experience in surveying northern fisheries, was the most active proponent of the idea of a scientific expedition funded by the committee. Knipovich relied heavily on the emerging ideas and methods of international, and above all Scandinavian, fishery science and oceanography. He was appointed a head of large, permanent Murman Scientific-Fisheries Expedition, well-funded by the Committee for the Aid to Pomors. [[24]](#endnote-25) The expedition, in turn, became the major Russian institution to participate in international oceanographic research under the umbrella of the International Council for the Exploration of the Sea (ICES), founded in 1902. Thus, Knipovich tried to steer the program of the expedition towards two rather contradictory objectives: the practical tasks of improving local fisheries that were demanded by the philanthropic committee and modern oceanographic research.[[25]](#endnote-26) He was in favor of modernizing fisheries and wanted science to go beyond purely practical applications, which he largely left to other institutions and people.

Members of the commission justified undertaking comprehensive research of the northern seas on the basis of two interrelated points: the voices of local fishermen complaining about the lack of knowledge of fish behavior, and references to successful foreign examples where scientific research helped improve fisheries. The meetings of all these societies, committees, and commissions took place in St. Petersburg. The Pomors lived and fished in the north, 1,000 to 1,500 kilometers from the capital. Most had never traveled to St. Petersburg at all. However, several people who are named in the protocols as “representatives of Pomors” attended some meetings while several others sent letters that were published in the protocols. In contrast to the opinions of scientists and committee members, which were published in the first person, the voices of representatives of local fishermen are articulated by others—the same scientists and committee members. For instance, Mets opened his speech at the meeting on February 7, 1897, later published under the title “The Necessity for Scientific–Fisheries Marine Research near the Murman Coast,” with a reference to the pro-research opinion of a Pomor representative, S. V. Postnikov. Mets told the audience that Postnikov, while participating in many voyages on the northern seas over almost half a century, had seen many expeditions to study coastal areas, but never the sea itself. Postnikov had observed no practical results from these expeditions and doubted that a single need of the fisheries had been satisfied by them. Postnikov stressed the usefulness of scientific research for the local fishermen and called on scientists to study the sea and marine fish and emphasized that they should hurry to assist the Pomors, who urgently needed enlightenment.[[26]](#endnote-27)

It is not clear from the text whether Mets continued to paraphrase Postnikov’s opinion or added his own thoughts when he pointed to the example of Norway,

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where in order to assist the “dark” working people, enlightened people equipped with knowledge and science appeared…they learned… where, how and when the fish came… and after that the “dark” fishermen needed only to follow their exact instructions, without wasting their time and labor on ineffective efforts. It is completely different here. Nobody knows so far from where and how cod was coming to the Murman coast, and whether it is right that there are no fish nearby when fishermen wait for a long time for fish. It is also not known whether there are any fish near the coasts in winter time.[[27]](#endnote-28)

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Details in Mets’s speech indicate that Postnikov was not an ordinary fishermen (which is clear also from his ability to attend the meeting), but a rich industrialist who had a larger vessel designed for the high seas that allowed him to search for fish offshore where ordinary fishermen on their small, unsafe boats could not go at all. The results of his successful fishing offshore were used to legitimize a scientific program of studies of fish distribution and ocean currents on a large scale. From this example it can clearly be seen that Postnikov, Mets, and other members of the commission claimed to represent local voices in justifying the development of scientific research. Because the Committee for the Aid to Pomors was not a governmental but a philanthropic organization, funded by both charity and state money, it probably required this kind of justification.

Pomor Barents Sea fisheries were seasonal inshore fisheries, dependent on unpredictable patterns of fish migration. The most valuable fish species in the Barents Sea, like cod and herring, spawned in the west near Norwegian shores and migrated to the Barents Sea for feeding only.[[28]](#endnote-29) Too often fisheries were interrupted not only by bad weather but by inexplicable absences of fish near the shore. Sometimes fish appeared around western Murman but did not go further along the coast to eastern Murman, where most of the seasonal fishing stations were located. Sometimes the pattern was the opposite—the number of fish seemed to drop rapidly in the waters near western Murman, but appeared for a longer time and in larger quantities near eastern Murman. Scientists believed that, due to unknown reasons, even when fish were not coming close enough to the shore to be caught from small artisanal boats they nevertheless occurred in large quantities offshore. At the meeting of the society, Mets reported some cases such as these, among them the successful attempts made by Postnikov. The same evidence, also with reference to Postnikov, was provided by Knipovich. At a meeting in February 1897, he introduced into the record an 1895 letter from Postnikov he had found in his papers. It described successful offshore fishing in early spring when fish did not yet come close to the shore. Postnikov wrote that some Pomor followed him and also got good catches. Thereafter, one of the main tasks of the scientific expedition was “to point out to fishermen where they could find fish.” Almost everyone agreed the information would be useful to the Pomor. The head of the committee even alleged that local fishermen were so “at one” with the sea that there was no reason to doubt their ability to use the new knowledge that they would be given. But several members of the committee more familiar with local conditions, for instance the Russian Consul in Finnmark, V. A. Bereznikov, doubted the ability of fishermen in an economically underdeveloped area to reap immediate benefits from the scientific knowledge. Bereznikov asked how the Pomor would find these places in the absence of good charts of the offshore areas and navigation instruments. [[29]](#endnote-30)

These discussions also show the juxtaposition of egalitarian, objective knowledge to exclusive, traditional knowledge. N.I. Gunin, another “representative of the Pomor” who attended the meetings, emphasized that the Pomor needed scientific research to provide them with equal knowledge about where the fish occur. “Nowadays,” he continued, “there are some Pomor who know more than others and use this knowledge for their own profit only.”[[30]](#endnote-31)

Committee members assumed that once the Pomor understood how to find fish in the open sea and developed offshore fisheries, they would see the necessity of exchanging their poor vessels for better Norwegian ones. The committee even began to set up a program for assisting them to do that. Again, only Bereznikov was skeptical about the need to advise Russian fishermen to use Norwegian fishing vessels and advocated for the ancient Russian *shniaka,* a boat commonly used by the Pomors*.* The local boat was better adapted to the coasts of the eastern Murman, where there were not enough sheltered places to put boats at anchor, because *shniaka* could easily be pulled out of rough waters onto shore. Thus the problems and controversies that might be caused by the proposed rapid changes of long-term traditional practices and technologies were significant. After long discussions during the winter and spring of 1897, the society decided to apply to the Minister of Agriculture and State Domains, the Minister of Finance, and the Navy to convince them of the need for scientific fisheries studies near the Murman coast. Minister of Finance Sergei Witte, “having a steadfast sympathy with the activities of the committee,” was willing to finance scientific studies.[[31]](#endnote-32) To be able to fulfill a very ambitious program and to build a specially designed research vessel (the very first not only in Russia, but in Europe), the committee again announced a collection of charity money. Later it also received generous state funding.

Thus, we see that the initial goal of the discussions, to minimize the risks of marine fisheries in the wake of the 1894 catastrophe, was soon almost forgotten. It was replaced by a general idea of economic and technological progress based on comprehensive scientific studies. The practical work of establishing regulations and safety measures for these fisheries was mostly postponed to a later time, when due to the work of natural scientists, knowledge of the marine environment and fish resources would increase.

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<H1> ***Resource Construction in the Absence of Stakeholders***

What was the knowledge the committee and its scientists wanted to obtain? The Barents Sea remained almost unstudied until the end of the nineteenth century. Maps of the coast itself were suitable but maps of the sea bed were absent and there was little understanding of the system of currents. Currents were important because fisheries were based on stocks of migratory fish: cod, halibut, haddock, and pollock appeared near Russian shores following food—smaller fish such as herring and capelin—and then disappeared. High fluctuations in the time of migrations and quantity of fish led to high fluctuations in catches, making fisheries an inconsistent economic activity, too dependent on unpredictable natural forces. The need to predict and rationalize catch fluctuations everywhere at that time was a driving force behind the development of fisheries science.[[32]](#endnote-33) As in agriculture, this work was presumed essential to rendering fisheries a reliable economic enterprise, in an inevitable shift from intuitive artisanal activity to part of the modern economy based on rational knowledge.

As emphasized above, Russian civil institutions that supported scientific research and the scientists themselves looked to western countries as research models. Thus, it is important to discuss briefly the kinds of science these countries could offer for studying fish resources. Concerns about the fate of fishermen in rapidly changing societies across Europe led to the organization of research on a wide scale. The first method approved in many countries was the questionnaire. For instance, the usual approach in the United Kingdom was to create temporary Royal Commissions to analyze fishermen’s more strident complaints.[[33]](#endnote-34) In Germany, the biologist Victor Hensen, hired by the Kiel Commission in the 1870s, also started his studies of fisheries with questionnaires, though he regarded them as complementary to the results from observation stations, since the total catch from an area was a necessary factor in any attempt to evaluate what he called the general metabolism of the sea.[[34]](#endnote-35)

Dissatisfied with information gathered from fisher-folk, many researchers shifted their focus from fishermen and fisheries to the fish themselves. This was a time when the leading U.S. expert on fisheries, Spencer Baird, had “realized that the usual method of interviewing fishermen and other interested and knowledgeable parties would not be sufficient, and had initiated a program of scientific study to answer the many questions that had to be addressed.”[[35]](#endnote-36) In Norway, also from the middle of the nineteenth century, the state became highly involved in research into the biological resources of the fishing industry, where previously it had been content with only “regulating the trade and the way in which fishing gear was used.”[[36]](#endnote-37) This shift is connected with the name of Georg Ossian Sars and his studies of cod. Some methods developed for studies of humans were extended to fish: Friedrich Heincke in Germany adopted the concept of the average man for studies of fish populations, while Johan Hjort in Norway later transferred the approach of determining generations from the censuses of human populations to those of fish.[[37]](#endnote-38)

The Scandinavian countries led the field in the twentieth century modernization of the use of marine resources. The development of fisheries oceanography and biology was one of the expressions of the modernist thrust of Scandinavian countries which soon spread rapidly to other areas. Scientists from these countries authored a new scientific program that linked fish to their ocean environment and was disseminated on an international scale, leading to the foundation of ICES.[[38]](#endnote-39) ICES’s goal to link fish distribution to the properties of the waters they inhabit at least partly redirected the attention of fishery scientists from studies of fishing as a socio-economic activity towards what would later be known as biological oceanography.

Knipovich hoped he would be able to discover the general laws of fish distribution according to environmental factors. This aim was in line with contemporary thinking in other studies of nature in Russia at that time,[[39]](#endnote-40) especially geographical botany, in which practitioners tried to find a general law of the distribution of plants in connection with soil and climatic conditions. Having graduated from St. Petersburg University, with its strong tradition of environmental thinking, represented by soil scientist Vasilii Dokuchaev,[[40]](#endnote-41) botanist Andrei Beketov,[[41]](#endnote-42) and others, Knipovich was engrossed by searching for clear links between the distribution of marine fauna, including fish, and environmental factors.

Knipovich well knew the socio-economic problems of the region: an outmoded system of forming fishing teams wherein fishermen, lacking credit to invest in their own endeavors, relied on the owners of boats and gear, primitive travel and communication between their residences on the White Sea coast and Murman coast, poor infrastructure and trade, and so on. The lack of fishermen was also acknowledged by the Committee, one of the tasks of which was also to facilitate the colonization of the coast, a program started in the 1860s and heavily supported by state.[[42]](#endnote-43) In 1893 and 1895, Knipovich led two surveys of the northern fisheries organized by the Ministry of Agriculture and State Domains. In his reports, he supported the development of infrastructure in the region: first of all the construction of the railroad to Murman, the plan approved in 1894 by Witte but not fulfilled until World War I.

But Knipovich was a zoologist, not a state bureaucrat or rich industrialist, thus he could not help much with solving the large infrastructural and social problems of the region. What could he promise when he was lucky enough to be appointed as head of a long-term, well–funded expedition—the first one of that scale in Russia? Very logically, he promised the committee that funded his expedition that he would find plenty of fish offshore, which should drive more fishermen to the Murman coast. Enchanted, the committee did not seriously entertain doubts about the practical implementations of the proposed scientific studies, nor did it support Bereznikov’s proposal to separate long-term biological studies from more urgent and more practically oriented tasks, deciding instead to support the proposal for a large-scale expedition based on the program presented by Knipovich.

Thus, it is possible to argue that Knipovich and other experts who worked in the expedition used scientific knowledge, methodology, and instruments (research vessels, hydrographical instruments, fishing gear, etc.) in order to construct a new resource—fish that would be suitable for development of off-shore fisheries. Theoretically, fish in the ocean are not considered a resource when they are not caught and their distribution is not more or less understood and predicted. To become a resource, the natural objects must be “enrolled in networks that code those objects with the status of resources, and embed them within different visions of future prosperity.”[[43]](#endnote-44)

It is evident that fish in unknown waters with unknown migration patterns could not be a manageable resource.[[44]](#endnote-45) Knipovich hoped, however, that this resource would be larger and more stable, and although not easily accessible in his times, would draw attention and stimulate the technological development of Russian fisheries. Thus he clearly worked for the future. In his program, he argued that the studies he proposed needed a long period of time. A member of the Northern Commission, the well-known polar geologist Feodosii Chernyshev, compared Knipovich’s scientific program with the program of surveying for mineral resources when the state was investing money in the hope that mining would someday generate a much larger profit.[[45]](#endnote-46) So the scientists did not see much difference between fisheries and mines, concentrating on the resources themselves, not on the local resource users, the Pomor, whom they were called on to assist.

The word “stakeholder” did not exist at that time, and scientists did not think too much about who would use the knowledge they created, and how. The problem of how to proceed “from knowledge to action,” much discussed during the past several decades in application to environmental knowledge and actions to protect natural resources and local people, was not even understood a century ago. Knowledge was considered to be a power in itself. Additionally, the attitude towards the future was very different. Whereas we now see that knowledge and action are both necessary for change, on the eve of the twentieth century, scientists believed that their main task was to gain new knowledge on behalf of later generations who would be better prepared to use it. When the future was seen in the light of progress, and even more when it was seen in the projections of future social revolution which would completely change the existing social order, the problem of the practical application of knowledge moved into second place.

Knipovich’s political views were radical: as a student at St. Petersburg University, he was a member of one of the first illegal social-democrat groups in Russia, founded by the Bulgarian Marxist Dimitar Blagoev. Knipovich was arrested twice: in 1887 and then in 1896, just before he began to work for the committee. He was not allowed to teach at the university and in 1887-1893 was also not allowed to have any job at governmental or civil institutions. However, he did not become a professional revolutionary like his sister, Lidiya Knipovich, and in 1892 he defended his master’s dissertation. In 1893, when the restrictions on work in state institutions ended, he was hired by the Ministry of Agriculture and State Domains to conduct a survey of northern fisheries.[[46]](#endnote-47) His assistant Leonid Breitfuss was a “politically unreliable person” as well. This did not prevent the committee from giving them responsibility for the generously funded expedition. It seems that it was not possible to find established and politically moderate people to go and work on the remote and severe Murman coast.[[47]](#endnote-48) Liberal members of the committee, the official head of which had been the Prince Alexander Mikhailovich, and the radical Knipovich were all very critical of the contemporary economic and cultural lives of the northern fishermen and saw their traditional pattern of resource use as terribly backward. Thus they were not interested in improving the fishermen’s lives but wanted to change them completely. They wanted to provide the foundations for a better organized and more reasonable life based on scientific knowledge instead of traditional practices.

Thus, a rather peculiar situation occurred whereby civil society (in this case the Committee for Aid to the Pomors) supported activities to advance “pure” science, not to help local communities. This direction was taken very much on the basis of the successes of scientists involved in solving fisheries problems in foreign countries such as Norway and Denmark. Scientists emphasized that Russia was behind other countries in the level of marine scientific knowledge, and they paid considerable attention to the necessity of reducing this difference. As was so common in Russia during this period, the practical applications of research were not clearly formulated and the results were considered as self-evidently useful.[[48]](#endnote-49)

Local authorities could not mediate between scientists and fishing communities: over such vast territory they were simply not enough officials. Private capital was not interested in investing in fisheries in this remote northern region because there were already enough profitable fisheries in the south, where the whole infrastructure was far better developed. It is interesting that the committee and scientists at that time did not expect private capital to try to use the fish resources in the North. They did not see the future of the region in the development of capitalism, as some scientists started to think later. They either supported a communal way of life by the Pomor that, from their point of view, could be improved by science and technology, or dreamed of future revolution that would radically transform the region.

However, the process of colonization of the Russian North offers us the best window on the construction in uncharted waters of new fishing “resources” led by scientists. As everywhere at the periphery of the Russian Empire, colonization went both directions—external and internal. Russia was at the same time a colonial empire and a colonized territory.[[49]](#endnote-50) On the one hand, the Russian North was a part of an old heartland realm that began to be colonized under Novgorodian rule, with Russian fishermen establishing their seasonal fisheries on the Murman coast by the mid-sixteenth century. On the other hand, it remained a newly colonized territory, both the sparsely inhabited coastline but especially the sea itself. Many debated the need to establish a border of territorial waters and organize effective defense against foreign vessels, since the area had proved to be highly vulnerable during the Crimean War. An attempt to “colonize the open sea” by the expedition for the sake of local fishing communities was closely connected to activities that were paving the way for the intensification of internal colonization of the area. Authorities hoped that obtaining a new resource would bring new settlers to the coast and thus facilitate the governmental colonization program. The same colonization policy idea was implemented slightly later in the Russian Far East, as Mark Sokolsky describes in the next chapter.

Tsarist leaders expected new open-sea fishermen would either come from other parts of Russia or the Pomor themselves would miraculously and rapidly transform their mode of life and technology. However, when the results of experimental fishing conducted by the expedition were obtained and then published, none of their predictions came true. The expedition’s exploratory offshore fishing did not bring any immediate profit for Russian fishermen, who had no suitable vessels. Instead, they in fact led to considerable earnings for foreign trawlers. The Murman expedition was then accused of facilitating the arrival of British trawlers at the shores of the Barents Sea. Thus, an anonymous author wrote in 1907 about the enormous catches of foreign trawlers that exploited fishing grounds founded by the expedition, and “thus about one million rubles that were spent on the Committee brought benefit not to Russian Pomor but to German and British businessmen.”[[50]](#endnote-51) As early as 1900, the expedition was accused of “forgetting the needs of local fishermen in favor of foreign science.”[[51]](#endnote-52) During the following five years, after Knipovich lost his position as head of the expedition because of conflicts with committee members who wanted to shift the expedition’s activities to more practical tasks, Breitfuss managed to maintain a high level of scientific research amazingly well despite being forced to fulfill numerous practical tasks, such as building baths for seasonal fishermen and maintaining a school for their orphans.[[52]](#endnote-53)

In 1907-08, in the new circumstances that followed the 1905 Revolution, several attempts were made to revive the activity of the expedition. There were efforts to remove the expedition from the jurisdiction of the committee—which in the words of Breitfuss “was a closed institution that did not experience any control, either from the Society for Navigation, or the Ministry which subsidized it, and functioned as a dilettante without a clear plan”[[53]](#endnote-54)—and hand over supervision to local authorities and local civil society, then developing rapidly. For instance, when in 1908 the local Archangelsk Society for the Study of the Russian North was founded, it immediately provoked a discussion of the fate of the expedition. However, the local authorities were not able to allocate the large amount of money needed for continuation of the research. Thus an application to the central authorities was inevitable. The proposal for a new stage of research was submitted to the State Duma but failed because the authorities did not see any reliable institution which could lead this work.

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<H1> ***Conclusions***

After several years it became obvious that in spite of the expedition’s success in obtaining high-quality scientific knowledge on oceanographic patterns in the Barents Sea, as well as fish distribution discoveries and finding new grounds for off-shore fisheries, local fishing communities were proving unable to put this new knowledge into practice. The expedition attempted to institute new types of fishing vessels, mostly borrowed from the Norwegians, but they were too expensive for local Russian fishermen. Knipovich complained that the expedition was blamed by the committee for fishing too few fish.[[54]](#endnote-55) But for him, the primary goal of the expedition was not actual fishing, or testing and improving fishing technology, but rather developing marine science. Thus, to free the expedition from these tasks, he proposed giving the small fishing vessels bought for the expedition to fishermen. By 1900, the expedition had already sold most of its small vessels, which much reduced its capacity to develop other practical fisheries research. He wanted to encourage the fishermen themselves to experiment with these boats and fishing gear. “Otherwise it would be too hard to struggle with the laziness of fishermen, although these features of their character harm them so much,” he explained.[[55]](#endnote-56)

Basic knowledge about fishing grounds gathered by the Murman Expedition needed to be transformed into practical recommendations. This task was taken up by several private industrialists who bought English trawlers and, in addition to their commercial fishing, systematically surveyed the waters. As in Norway, most local citizens in the Russian North opposed the idea of the development of trawling fisheries. They declared the trawl a “rapacious foreign device” that threatened traditional artisanal fisheries. During my many years of research on the history of Pomor fisheries, I have not seen in the documents any clear sign of environmental consciousness among the Pomors in our modern understanding of the term that would explain their opposition to industrial fishing. As a result, I have seen no evidence to support the arguments in the previous chapter that Orthodox religious beliefs of the Pomor led to any conscious protection of resources. Rather than the religion itself, it was the scant population density, traditional social life, and poor technology that were responsible for relatively small human pressure on marine environment.[[56]](#endnote-57)

The invasion of English trawlers, along with Norwegian fishing vessels and marine hunting expeditions, in a region where no formal borders of territorial waters had been established, redirected the attention of central and local authorities from the modernization of fisheries to guarding the region from foreigners—a concern about foreign resource exploitation that Mark Sokolsky and Ryan Jones underscore in the following chapters on the Pacific Ocean. It also became evident that knowledge itself could not help without significant changes in technology. In 1908, Breitfuss correctly diagnosed the problem of Russian northern fisheries (which might be generalized to Russian fisheries at that time as a whole): “by contrast with western European countries, which are strong in technology and economic power and which rush for fish to our North, to the shores of Iceland and even to the coasts of northern and western Africa, because their fishermen do not know ‘where’ to get fish, we, living so close to the best fishing place, do not know ‘how’ to get fish.”[[57]](#endnote-58) Two decades later, however, when industrialization became a definite goal of the Soviet government, the scientific legacy of Knipovich’s program led to the foundation of Soviet industrial fishing, which over the subsequent 20 years almost eliminated local users of marine resources in the Russian North. This process proves Stephen Bocking’s contention that “Conventional resource science can also exclude other forms of knowledge, including that of resource users.” [[58]](#endnote-59) Thus, the resources the expedition “constructed” in the absence of stakeholders became useful in a future when the Soviet state became the ultimate stakeholder and user of these resources.

The scientific enterprise brought into being by concerns of civil society about risks for the local users of fish resources provided knowledge that was used for the development of industrial fisheries, which eliminated traditional technologies and local users of marine resources with their risky marine ways of life. This chain of causation illustrates the often-realized politics of risk reduction or even elimination through a full transformation of traditional lifeways. The notion of risk is often used and even abused by experts, industrialists, and authorities to justify the radical shift from traditional to modern economies. Risk mitigation serves as a trigger for large transformations that, with the success of modernization, could then be more or less forgotten.

1. \* The chapter is part of a project titled “Natural Resources in History of Russia: Economic institutes, Communities of Experts and Infrastructures” funded by Russian Science Foundation (N 16-18-10255).

   For a general description of the area at the end of the nineteenth century, see Alexander Engelhardt, *A Russian Province of the North*, trans. Henry Cooke (Archibald Constable and Company, 1899), originally published in Russian as *Russkii Sever* (Izdanie A. S. Surovina, 1897). [↑](#endnote-ref-2)
2. The name *Pomor* descends from the Russian word *more* (“the sea”). The Pomors are the people who live near, travel to, and regularly work on the sea, and generally refers specifically to those residing near the White and Barents seas. According to T. A. Bernshtam, in the sixteenth century the name *Pomorye* referred to the uninhabited areas of the western Barents Sea coast, where Russian fishermen came to fish. Gradually, the name *Pomorye* was extended to the inhabitants of the area, covering all people who took part in the Barents Sea cod fishery. Later, all populations of the White Sea coast were referred to as Pomors, although their local identity differs from place to place and is still under discussion. See T. A. Bernshtam, *Pomory. Formirovanie gruppy i sistema khoziaistva* (Nauka, 1978), 69-80, [↑](#endnote-ref-3)
3. See Kenneth Hewitt, *Regions of Risk: A Geographical Introduction to Disasters* (Pearson Education, 1997). [↑](#endnote-ref-4)
4. Hewitt, *Regions*, 8. [↑](#endnote-ref-5)
5. *Trudy Severnoi komissii 1897-1898 gg*. (Тip. Isidora Gol’dberga, 1898). [↑](#endnote-ref-6)
6. See David Moon, “The Environmental History of the Russian Steppes: Vasilii Dokuchaev and the Harvest Failure of 1891,” *Transactions of the Royal Historical Society* 15 (2005): 149-174; Bianka Pietrov-Ennker and Galina N. Ulianova, eds. *Grazhdanskaia identichnost i sfera grazhdanskoi deiatelnosti v Rossiskoi Imperii, vtoraia polovina XIX-nachalo XX veka* (ROSSPEN, 2007); Adele Lindenmeyer, *Poverty is Not a Vice: Charity, Society and the State in Imperial Russia* (Princeton University Press, 1996); E. W. Clowes, S. D. Kassow, and J. L. West, eds., *Between Tsar and People: Educated Society and the Quest for Public Identity in Late Imperial Russia* (Princeton University Press, 1991); Joseph Bradley, *Voluntary Associations in Tsarist Russia: Science, Patriotism and Civil Society* (Harvard University Press, 2009); idem., “Subjects into Citizens: Societies, Civil Society and the State in Tsarist Russia,” *The American Historical Review* 107, no. 4 (October 2002): 1094-1123. [↑](#endnote-ref-7)
7. Carlo C. Jaeger et al. (2001) give the following definition of risk: “A situation or event in which something of human value (including humans themselves) has been put at stake and where the outcome is uncertain.” See Carlo C. Jaeger et al., eds., *Risk, Uncertainty, and Rational Action* (Earthscan Publications, 2001), 17. On the religious world of the Pomor, see Stephen Brain’s article in this volume. [↑](#endnote-ref-8)
8. For the history of major changes in understanding environmental risks in Europe see Uwe Lübken and Christof Mauch, “Uncertain Environments: Natural Hazards, Risk and Insurance in Historical Perspective,” *Environment and History* 17, no. 1 (2011): 1-12 and Frank Oberholzner, “From an Act of God to an Insurable Risk: The Change in the Perception of Hailstorms and Thunderstorms since the Early Modern Period,” *Environment and History* 17, no. 1 (2011): 133-152. For the United States, see Arwen P. Mohun, *Risk: Negotiating Safety in American Society* (John Hopkins University Press, 2013), esp. Chapter 6. Paul J. Best, “Insurance in Imperial Russia,” *The Journal of European Economic History* 18, no.1 (1989): 139- 169. [↑](#endnote-ref-9)
9. See Theodore Porter and William Gleason, “The Zemstvo and Public Initiative in Late Imperial Russia,” *Russian History* 21 (1994): 419-37; and Thomas E. Porter, *The Zemstvo and the Emergence of Civil Society in Late Imperial Russia, 1864-1917* (Carnegie Mellon University Press, 1991). [↑](#endnote-ref-10)
10. Ulrich Beck, *Risk Society: Towards a New Modernity* (SAGE, 2010), 27. Emphasis in the original. [↑](#endnote-ref-11)
11. On the concept of a “knowledge society” in general see Nico Stehr, *Knowledge Societies* (Sage, 1994); on the importance of studying the developments of knowledge societies and “knowledge regimes” for environmental history, see Sverker Sorlin and Paul Warde, “The Problem of the Problem of Environmental History: A Re-reading of the Field,” *Environmental History* 12 (January 2007): 124-125 and Frank Uekoetter, “The Knowledge Society,” in *The Turning Points of Environmental History,* ed.Frank Uekoetter (University of Pittsburg Press, 2010), 132-145. [↑](#endnote-ref-12)
12. *The Knowledge Society: The Growing Impact of Scientific Knowledge on Social Relations*, ed. Gernot Böhme and Nico Stehr (Kluwer Academic Publishers, 1986), 18. [↑](#endnote-ref-13)
13. See Bogoslovsky, P. *O kupecheskom sudostroenii v Rossii, rechnom i pribrezhnom,* (Tip. Morskogo ministerstva, 1859). [↑](#endnote-ref-14)
14. See [Margarita](https://mail2.hse.ru/owa/redir.aspx?C=EQWS8cJgDgTginHaVL4ji1via4CYVEJ3Igp-oGL4N7iv3vfnRe3UCA..&URL=%2f%2fwww.hse.ru%2fen%2forg%2fpersons%2f148097038" \t "_blank) Dadykina, Alexei Kraikovski, and [Julia](https://mail2.hse.ru/owa/redir.aspx?C=N2Lyb0jjwSrQGxKi5VVR3MT5KGVVSVp8URYBEgMd6nav3vfnRe3UCA..&URL=%2f%2fwww.hse.ru%2fen%2forg%2fpersons%2f4414313" \t "_blank) Lajus, “[Mastering the Arctic Marine Environment: Organizational Practices of Pomor Hunting Expeditions to Svalbard (Spitsbergen) in the Eighteenth Century](https://mail2.hse.ru/owa/UrlBlockedError.aspx" \t "_blank),” *Acta Borealia* 34, no. 1 (2017): 61. [↑](#endnote-ref-15)
15. The real reasons for the cessation of hunting expeditions to Spitsbergen should be studied in more detail. There may have been a combination of too much risk, backward technology, and changes on the market that made such expeditions unprofitable. See T.S. Minaeva and V. Gorter, “Pomorskoe i norvezhskoe osvoenie Spitsbergena v pervoi polovine XIX veka,” *Vestnik Severnogo (Arkticheskogo) Federalnogo Universiteta. Seria: Gumanitarnye i sotsialnye nauki,* no. 4 (2013): 5-12. [↑](#endnote-ref-16)
16. For details on the use of Norway as a model for the economic development of the Russian North, see Julia Lajus, “In Search for Instructive Models: The Russian State at a Crossroads to Conquering the North,” in *Northscapes: History, Technology, and the Making of Northern Environments,* ed. Dolly Jorgensen and Sverker Sorlin (University of British Columbia Press, 2013), 110-136. [↑](#endnote-ref-17)
17. See Charles C. Gillispie, “The Natural History of Industry,” *Isis* 48, no. 4 (1957): 398-407. [↑](#endnote-ref-18)
18. Elisabeth A. Hachten, “In Service to Science and Society: Scientists and the Public in Late-Nineteenth-Century Russia,” *Osiris* 17 (2002): 172. [↑](#endnote-ref-19)
19. Hachten, “Service,” 201-207; Moon, “Vasilii Dokuchaev.” [↑](#endnote-ref-20)
20. See *Trudy Severnoi komissii*. [↑](#endnote-ref-21)
21. The term *scientific-fisheries research* (*nauchno-promyslovye issledovaniia* in Russian) is a translation of the German term *Fisherei Wissenshaft.* [↑](#endnote-ref-22)
22. This observation is very much in line with the statement made by Hachten that in Russia in the late nineteenth century, natural science suddenly took on an aura of cultural authority, privileging it above many other forms of culture. See Hachten, “Service,” 184. [↑](#endnote-ref-23)
23. He also used the German spelling of his name, Knipowitsch, in his non-Russian publications. [↑](#endnote-ref-24)
24. For more details on the Murman expedition see Julia A. Lajus, “Early Years of Biological Oceanography in the Russian North: Murman Scientific-Fishery Expedition, 1898-1908,” in: *Ocean Sciences Bridging the Millennia: A Spectrum of Historical Accounts. Proceedings of the VI International Congress on the History of Oceanography* (Intergovernmental Oceanographic Commission of UNESCO and China Ocean Press, 2004), 127-131 and Julia A. Lajus, “‘Foreign Science’ in Russian Context: Murman Scientific-Fishery Expedition and Russian Participation in Early ICES Activity,” *International Council for Exploration of the Sea* [*ICES*] *Marine Science Symposia* 215 (2002): 64-72. [↑](#endnote-ref-25)
25. Nikolai M. Knipovich, “Proekt nauchno-promyslovykh issedovanii u Murmanskogo berega,” in *Trudy Severnoi komissia,* Supplement 1, 5-25. [↑](#endnote-ref-26)
26. For the discussion of the rhetoric of backwardness during the late tsarist era, see Yanni Kotsonis, *Making Peasants Backward: Agricultural Cooperatives and the Agrarian Question in Russia, 1861-1914* (St. Martin's Press, 1999). [↑](#endnote-ref-27)
27. For the full citation see “Neobkhodimost’ nauchnopromyslovykh morskikh issledovanii u beregov Murmana,” in *Trudy Severnoi komissia,* Supplement 1, 1-3 [↑](#endnote-ref-28)
28. For general description of Russian northern fisheries see Julia Lajus, Alexei Kraikovski and Alexei Yurchenko, “The Fisheries of the Russian North, c. 1300-1850,” in *A History of the North Atlantic Fisheries, Vol. 1: From Early Times to the Mid-Nineteenth Century,* ed. David J. Starkey, Jon Th. Thor, and Ingo Heidbrink (Verlag H.M. Hauschild, 2009), 41-64; see also Alexei Kraikovski “‘The Sea on One Side, Trouble on the Other’: Russian Marine Resource Use Before Peter the Great,” *Slavonic and East European Review* 93, no. 1 (2015): 39-65; and for the period after 1850 see Bjorn-Peter Finstad and Julia Lajus, “The Fisheries in Norwegian and Russian Waters, 1850-2010,” in *A History of the North Atlantic Fisheries, Volume 2: From the 1850s to the Early Twentieth-First Century,* ed. David J. Starkey and Ingo Heidbrink (Verlag H.M. Hauschild, 2012), 226-237. [↑](#endnote-ref-29)
29. *Trudy Severnoi komissii,* 58, 51. [↑](#endnote-ref-30)
30. *Trudy Severnoi komissii,* 55. [↑](#endnote-ref-31)
31. *Trudy Severnoi komissia,* Supplement 1, 44. [↑](#endnote-ref-32)
32. See Tim D. Smith, *Scaling Fisheries: The Science of Measuring the Effects of Fishing, 1855-1955* (Cambridge University Press, 1994). [↑](#endnote-ref-33)
33. Smith, *Scaling*, 51. [↑](#endnote-ref-34)
34. Eric L. Mills, *Biological Oceanography: An Early History, 1870 -1960* (Cornell University Press, 1989), 15-16. [↑](#endnote-ref-35)
35. Smith, *Scaling*, 51. [↑](#endnote-ref-36)
36. T. Solhaug and G. Saetersdal, “The Development of Fishery Research in Norway in the Nineteenth and Twentieth Centuries in the Light of the History of the Fisheries,” *Proceedings of the Royal Society of Edinburgh (B)* 73 (1971/72): 401. [↑](#endnote-ref-37)
37. Michael M. Sinclair and Tim D. Smith, “The notion that fish species form stocks,” *ICES Marine Science Symposia* 215 (2002): 297-304; Sarah Jansen, ‘Den Heringen einen Paß ausstellen: Formalisierung und Genauigkeit in den Anfängen der Populationsökologie um 1900’, *Berichte zur Wissenschaftsgeschichte* 25, no. 3 (2002): 153-169. [↑](#endnote-ref-38)
38. Helen Rozwadowsky, *The Sea Knows No Boundaries: A Century of Marine Science under ICES* (ICES and University of Washington Press, 2002). [↑](#endnote-ref-39)
39. Jonathan D. Oldfield and Denis J. B. Shaw, *The Development of Russian Environmental Thought: Scientific and Geographical Perspectives on the Natural Environment* (Routledge, 2016). [↑](#endnote-ref-40)
40. See Moon, “Dokuchaev.” The development of soil sciences led by Dokuchaev was a reaction to the same complex of issues: risks for agriculture (droughts), attempts to understand the connections of plant distribution to the environmental factors, and a strong belief in science. See also David Moon, *The Plough that Broke the Steppes: Agriculture and Environment on Russia’s Grasslands, 1700-1914* (Oxford University Press, 2013). See also Mieka Erley’s chapter earlier in this book. [↑](#endnote-ref-41)
41. About Andrei N. Beketov's views on nature see Daniel P. Todes, *Darwin without Malthus: The Struggle for Existence in Russian Evolutionary Thought* (Oxford University Press, 1989). [↑](#endnote-ref-42)
42. See Jens-Petter Nielsen, “The Murman Coast and Russian Northern Policies ca. 1855-1917”, in *In the North my Nest is Made: Studies in the History of the Murman Colonization, 1860-1940,* ed. Alexei Yurchenko and Jens Petter Nielsen (European University at St. Petersburg and University of Tromso Press, 2005); Julia Lajus, “Colonization of the Russian North: a Frozen Frontier,” in *Cultivating the Colony: Colonial States and their Environmental Legacies,* ed. Christina Folke Ax, et al. (Ohio University Press, 2011), 164-190. [↑](#endnote-ref-43)
43. Dag Avango, Annika E. Nilsson and Peder Roberts, “Assessing Arctic Futures: Voices, Resources and Governance,” *The Polar Journal* 3, no. 2 (Dec. 2013): 431-446. [↑](#endnote-ref-44)
44. For the need of resource units to be predictable for successful governance see Elinor Ostrom, “A General Framework for Analyzing Sustainability of Social-Ecological Systems,” *Science* 325 (2009): 419-422. Ostrom writes (p. 419) that “System dynamics need to be sufficiently predictable that users can estimate what would happen if they were to establish particular harvesting rules…. Some fishery systems approach mathematical chaos and are particularly challenging for users or government officials.” [↑](#endnote-ref-45)
45. *Trudy Severnoi komissii*. [↑](#endnote-ref-46)
46. Nikolai M. Knipovich, *Polozhenie morskikh rybnykh i zverinykh promyslov Arkhangel’skoi gubernii (iz otchetvo Ministerstvu zemledeliia po komandirovkam 1893 i 1894 gg.)* (Tip. V. Kirshbauma, 1895). [↑](#endnote-ref-47)
47. This practice of hiring unreliable and even exiled people to do research in the North or in Siberia had a long tradition in nineteenth-century Russia, and even grew after the Revolution of 1905. [↑](#endnote-ref-48)
48. See Karimov, *Dokuda topor i sokha khodili: Ocherki istorii zemelnogo i lesnogo kadastra v Rossii XVI-nachala XX veka* (Nauka, 2007), 182-184. [↑](#endnote-ref-49)
49. About importance of internal colonization for understanding Russian history see Alexander Etkind, *Internal Colonization: Russia’s Imperial Experience* (Polity Press, 2011). [↑](#endnote-ref-50)
50. “Ulovy (nemtsev i anglichan) v Belom more,” *Vestnik rybopromyshlennosti* (1907), 12: 570-571. [↑](#endnote-ref-51)
51. [“Complaints of Pomors”], *Novoe vremia* 29 (July 1900): 4. [↑](#endnote-ref-52)
52. Leonid L. Breitfuss, ‘Kurzer Ueberblick ueber die Tatigkeit der wissenschaftlichen Murmanexpedition, 1898-1904’, *Mitteilungen des Deutschen Seefisherei-Vereins* 7/8 (1905). [↑](#endnote-ref-53)
53. Leonid L. Breitfuss, *O Komitete dlia pomoschi pomoram Russkogo Severa* (Tipo-litografiia Pechatoe iskusstvo, 1910), 9-10. [↑](#endnote-ref-54)
54. Nikolai M. Knipovich, “Raboty ekspeditsii dlia nauchno-promyslovykh issledovanii Murmana s maia po noiabr 1900 g.,” *Russkoe sudokhodstvo,* no. 226/229 (1901): 52. [↑](#endnote-ref-55)
55. Knipovich, “Raboty,” 54. [↑](#endnote-ref-56)
56. The discussion of beluga whales in the previous chapter is inaccurate. The Pomor did hunt these whales in quite large numbers and statistics of catches as well as images of the hunting are well-known, see for instance Ia. I. Alekseeva, “Istoriia promysla morskikh mlekopitaiuschikh v Belom i Barentsevom moriakh (XV v.-1915 g.),” in *Morskie mlekopitaiuschie Golarktiki: materialy Piatoi mezhdunarodnoi konf*. *Odessa, Ukraina, 14-18 oktiabria 2008 g.: sbornik nauchnykh trudov,* ed. A. Boltunov (Sovet po morskim mlekopitaiuschim, 2008), 35-37. [↑](#endnote-ref-57)
57. Leonid L. Breitfuss, *Ekspeditisiia dlia nauchno-promyslovykh issledovanii u beregov Murmana. Otchet o ee rabotakh v 1904 g.* (Komitet dlia pomoshchi pomoram russkogo severa), xxxiv. [↑](#endnote-ref-58)
58. Stephen Bocking, *Nature’s Experts. Science, Politics, and the Environment* (Rutgers University Press, 2006), 88. [↑](#endnote-ref-59)