

Why should scientists lead? To underpin policy on marine and polar ecosystems

Ole Arve Misund *

Norwegian Polar Institute, Fram Centre, 9296 Tromsø, Norway

*Corresponding author. Norwegian Polar Institute, Fram Centre, 9296 Tromsø, Norway. E-mail: ole.arve.misund@npolar.no

Food for Thought articles are essays in which the author provides their perspective on a research area, topic, or issue. They are intended to provide contributors with a forum through which to air their own views and experiences, with few of the constraints that govern standard research articles. This Food for Thought article is one in a series solicited from leading figures in the fisheries and aquatic sciences community. The objective is to offer lessons and insights from their careers in an accessible and pedagogical form from which the community, and particularly early career scientists, will benefit. The International Council for the Exploration of the Sea (ICES) and Oxford University Press are pleased to be able to waive the article processing charge for these Food for Thought articles.

Abstract

I recount my personal history, beginning as a young fisherman, becoming an academic fisheries biologist, and ultimately a leader of institutions dedicated to marine and polar research, higher education, and advising policymakers. After my dissertation in the early 1990s, I embarked on an active research career at the Institute of Marine Research (IMR) in Bergen, Norway, developing a sonar method to estimate the abundance of schooling, pelagic fish. My career then transitioned to middle leadership—15 years as Section Leader and Research Director at IMR—followed by >10 years as a top leader for The University Centre in Svalbard, the National Institute of Nutrition and Seafood Research, and finally the Norwegian Polar Institute. I describe the major challenges, opportunities, and processes these leadership roles have entailed. I hope to send a positive message about the influential role of science, and the necessity of clear communication of results and advice at a time when there is a sense of urgency.

Keywords: fisheries acoustics; fish behaviour; purse seine; ecosystem approach; High Arctic university centre; polar research; management advice; leadership roles

Introduction

Is there a rationale for a fisheries biologist to transition to leading polar research? Looking back on my career, I say there is. My scientific interest and the opportunities I have taken advantage of led me from studies on abundance estimation of pelagic fish schools and sustainable pelagic fisheries to leadership positions at marine and polar research institutes and a university centre in the High Arctic. This allowed me to influence and develop the organizations I led. At the same time, I have been able to pursue my scientific interest in fisheries biology both in waters with rich pelagic fish stocks and in icy polar waters where fish are scarce. I have seen sea ice breaking up and exposing open water at the North Pole (Fig. 1) as well as running streams of meltwater high up on the ice cap of Dronning Maud Land in Antarctica—both indications of melting in the world's refrigerators. The climate is changing and mitigating actions are urgently needed. Therefore, though still a fisheries biologist at heart, I wish to continue communicating the findings of marine and polar science.

The invitation to write this essay challenged me to look back at my career, to reflect on what came out of it, and the journey itself. My first reaction was to question whether this tale would interest others, or merely strengthen my ego. Having read Knausgård's famous struggle for self-realization (Knausgård 2009), I found this a somewhat frightening task but also a stimulating challenge. Have I done anything in science or through my leadership roles that is worth taking a retrospective look at, or have I simply toed the line and done my job as others have told me to do it?

The invitation to write this retrospective came at a very timely moment; I had just stepped down from leading the Norwegian Polar Institute (NPI) and was transitioning into an emeritus position as a special adviser in an active research group, which allowed me to write about science. Having such a position is a privilege, and I argued for it, to be able to follow my interest in science. Throughout my career, I have written scholarly papers, but with leadership roles and increasing responsibility and challenges, time for science writing became scarce. During my 25 years in leadership, it was rewarding to see the organizations I led running smoothly and delivering on the operational, scientific, advisory, and communication tasks they were set. Nonetheless, it was a sacrifice not having time to do any real science of my own.

As a top leader, you must deal with uncertainties all the time, but one thing is certain: your tenure will come to an end. Then, what will you do with your time? Will you strive to go on as a spokesperson, a prominent, influential personality, or go back to doing what you were educated to do? Perhaps this essay will reveal what my own choice has been.

Exploring fish schooling in the sea

Having grown up in the vibrant fisheries community Midsund in western Norway, and spent ~3 years as a young fisher on the purse seiner *Nybo*, the long liner *Norliner*, the shrimp trawler *Oterøyng*, and the large factory trawler *Sjøvik*, working with the great fluctuations in Norwegian fisheries felt

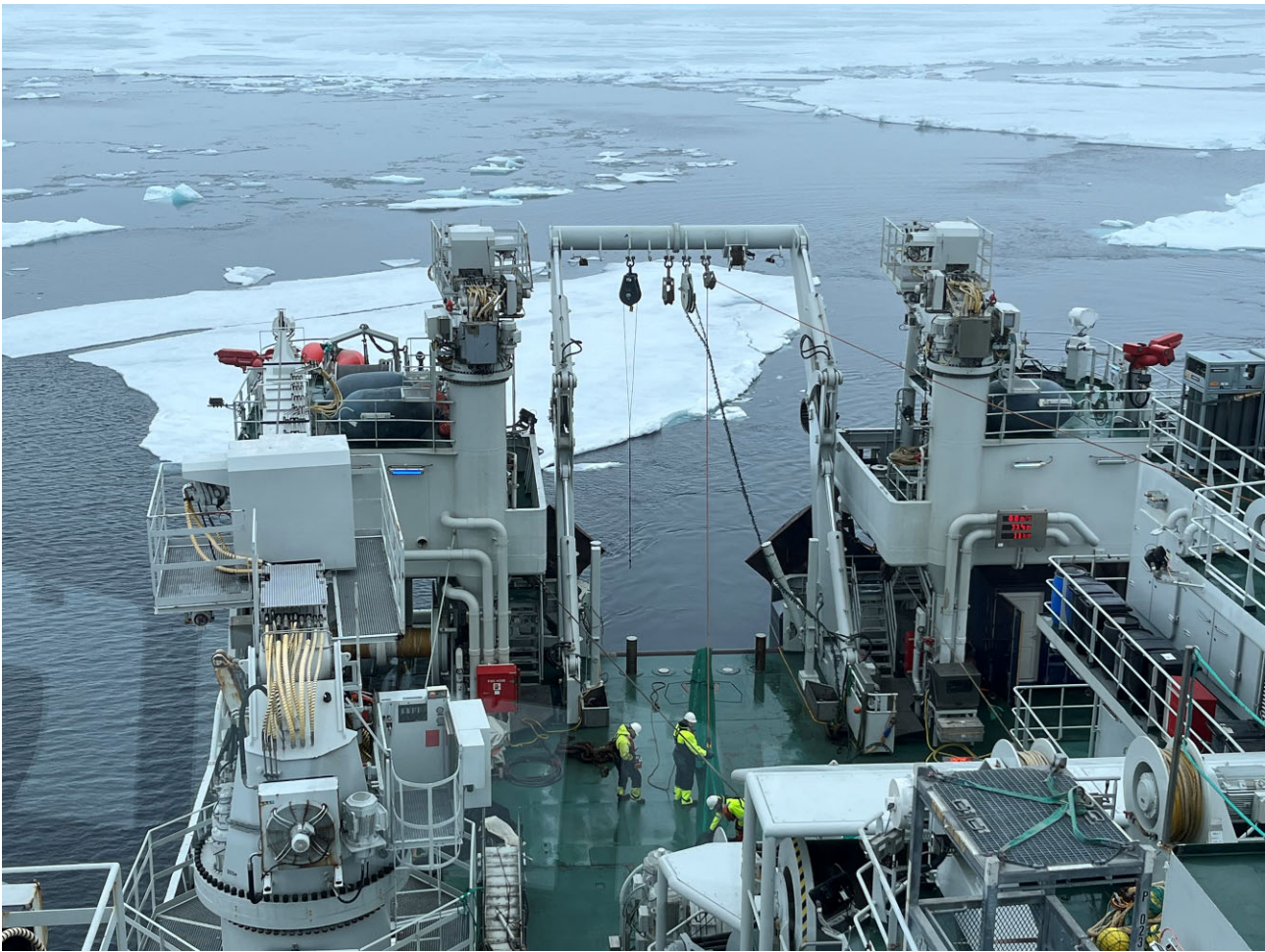


Figure 1. Deploying a pelagic trawl from 'Kronprins Haakon' at the North Pole, 31 July 2022.

relevant to me as a student at the University of Bergen (UiB) in the early 1980s. The fishery biology lectures given by adjunct professors from the Institute of Marine Research (IMR) stimulated my interest in fisheries research even further.

Odd Nakken, director of IMR, and Steinar Olsen, head of the Fish Capture Section of the Institute of Fisheries Technology (FTFI), both associate professors at UiB, encouraged me to pursue my interest in characterizing the schooling behaviour of pelagic fish species as a topic for a master's thesis. I did this on-board the purse seiners *Klaring* and *Libas* while they were fishing for herring and mackerel along the Norwegian Coast and in the North Sea in 1985. Both vessels were equipped with the first version of a digitized fisheries sonar (Simrad SM600). I filmed the sonar display at a close range using the large, heavy Video Home System camera typical at that time. This forced the skippers and fishing masters to operate the sonars from the side, and everything they said was recorded on my tapes—including a few salty oaths about me being in the way.

From the sonar recordings, I could quantify the dynamic swimming behaviour of the fish schools and establish simple relationships between the horizontal area of the fish schools and the exact catch pumped on-board (Misund 1990). With a stipend from the Norwegian Fisheries Research Council and temporary contracts at the FTFI, I continued these studies for a Doctor of Philosophy degree at UiB (Misund 1991, 1993).

Fisheries scientist at IMR, 1990–2000

The FTFI Fish Capture Section was merged with IMR in 1991, and I was very happy to be employed there. I continued studying fish schooling behaviour and participated in developing pelagic fishing gear, focusing mainly on purse seining, pelagic trawl sampling, improving abundance estimation of pelagic fish species, and marine ecosystem studies. I enjoyed cooperating with the late Arvid Beltestad, an enthusiastic and inspiring scientist who led several large research projects. 'There's money in purse seining' was his standard response when I worried about covering the cost of studying fish behaviour and sonars. My academic mentor, Prof. Anders Fernö (UiB), who had been affiliated with the Fish Capture Section, encouraged and stimulated scientific publication of the many results we produced. (For details, see [online supplementary material](#).) Fernö and I assisted and advised many students who took part in our projects while working towards their master's or PhD degrees.

A milestone was reached when a digitized, high-resolution, multibeam sonar (Simrad SA950) was installed on-board RV *G.O. Sars* in 1992. The skilled computer engineer Bjørn Totland developed software to record relevant fish school data directly from the SA950 sonar on files for subsequent processing and analysis. He also developed a very useful echogram print-out function. From then on, we could do detailed studies on

fish school behaviour, biomass, distribution, and morphology (Misund et al. 1995).

During the first cruise to test the new sonar, while we were manoeuvring *G.O. Sars* to follow schools of herring in the North Sea, the legendary captain Hallvard Østervold loudly declared, ‘Finally we are doing what this vessel was built for more than 20 years ago!’ It was less gratifying to hear mischievous comments from chief instrument engineer Kåre Hansen, who said, ‘In your PhD thesis, you assume that all fish schools are elliptical, but among the hundreds of fish schools we now have seen, hardly any have been elliptical. Maybe your thesis isn’t valid?’ After some discussion, we agreed that science is full of assumptions, and that testing those assumptions is what moves science forward.

In 1993, a new research vessel *Dr Fridtjof Nansen* for operating in African waters was launched, equipped with the high-resolution sonar system. This made it possible to study fish schools in both northern and southern waters. Conveniently for me, in 1994 the visionary Hein Rune Skjoldal invited me to participate in a programme to explore the Norwegian Sea (Skjoldal et al. 2004). During these years, I was privileged to be in a group and participate in programmes and projects alongside competent and enthusiastic people; I had access to modern, well-equipped research vessels, and time to analyse data and write papers.

In hindsight, I see that I had ~15 years of continuity and predictability during my studies of fish schooling behaviour and pelagic gear projects. For early career scientists to succeed, I recommend choosing exciting topics and ambitious research groups that provide stable conditions.

Handling interests and decisions—middle leader at IMR, 1997–2012

In the summer of 1996, I was awarded a permanent position in IMR’s Pelagic Section to work with the large pelagic fish stocks that are so important for Norwegian fisheries and coastal communities. (There is an old IMR saying: ‘Find your species and you have a lifetime commitment.’). However, that autumn a new leader for the Fish Capture Section was to be recruited. I heard my name mentioned and interpreted it as personal recognition. Seeing this as a chance to contribute to projects beyond those in which I was directly involved, I applied for the position, and got it. Thus began my 15 years as a middle manager at IMR, taking responsibility, influencing decisions, balancing the ambitions and interests of the staff, and implementing decisions from top leadership. However, leading larger groups precludes being an active scientist. This is a sacrifice, but research organizations are dependent on scientists taking terms as middle managers to ensure that knowledge within their fields advances.

Leading peers at the Fish Capture Section

Professionally, I was ready to lead and support my peers, but maybe not mentally. Having responsibility for a staff of >40 people implied dealing with difficult and time-consuming matters that I was not prepared for. I began to realize that a leadership role in a large scientific organization involves much more than facilitating science, operations, and funding. As a section leader, you are still part of the team, scientifically active at least half of the time, but you also have leadership responsibilities. To cope with the challenges I was facing, I was allowed to

join a course for young leaders at the renowned Administrative Research Foundation (AFF, <https://aff.no/aff-in-english/>). This made me much better prepared for what a leadership role entails and was especially valuable for the even more challenging leadership roles I took later. Taking care of people means helping with both problems and needs, but also communicating expectations and setting limits. Quite possibly, the most enlightening moment came when research director Åsmund Bjordal (see Bjordal 2021) gave feedback on my performance. Although he gave me good marks in general, he also wrote, ‘This guy is positive and smiling, but he does not listen anyway.’ It was rather mortifying when this remark was discussed during the young leadership course, but hopefully it helped me become more aware of the feelings and views of those around me. I have maintained contact with AFF ever since and given many staff leaders in organizations I have led opportunities to take such courses.

Research director at IMR, 2000–12

Participation in the Norwegian Sea exploration programme in the mid-1990s stimulated my interest in the dynamics of the entire ecosystem, not just the herring schools. This led me to apply for and take on the position of Research Director for the Marine Environment Centre at IMR from autumn 2000. At that time, the various centres at IMR were run as more or less separate administrative, economic, and scientific entities, which led to substantial internal tensions. Therefore, my shift from the Marine Resource Centre to the Marine Environment Centre was rather challenging, like moving to another society. However, I received very good help from the section leaders and the staff at the Marine Environment Centre and mentoring from the Managing Director Roald Vaage. After asking, ‘Are they killing you down there?’ he listened to what I had to say and came up with good advice on how to handle challenges. However, he was very clear in his expectations of what I was to do. This illustrates that as research director I had to implement decisions taken by the director, by the board governing IMR, or by the Ministry of Fisheries. At the same time, it was encouraging to have a certain influence on decision-making: as a member of IMR’s leader group, I was asked to present selected issues to the governing board, and to take part in the formal dialogue with the Ministry of Fisheries.

When I came to the Marine Environment Centre, there was growing recognition of climate change and its possible effects on marine ecosystems. Early in 2000, we established a Climate and Fish Programme at IMR. The institute was one of the four partners that established the Bjerknes Centre, which has climate change studies as its main objective, and which was awarded status as a national Centre of Excellence in 2003. Oceanographers at that time realized that in addition to the substantial annual, decadal and multidecadal temperature variations, there was an underlying gradual heating of the ocean (Sundby and Nakken 2008).

At the turn of the millennium, there were discussions about adopting a more holistic ecosystem-based approach as the foundation for IMR’s research, and for fish stock assessments within the scope of ICES activity. The IMR governing board decided to start a process to restructure the institute, dissolving the existing centres and science departments. IMR had been growing for >100 years (Schwach 2000); now, it was time to shape the institute to meet the challenges of the future. For me personally, this change evoked a moment of

sadness since the Marine Environment Centre was at that time doing well both scientifically and financially. However, the prospect of creating a new organizational structure with a distinct ecosystem perspective was stimulating and interesting. As a young leader, I gradually realized that this was an opportunity to step forward and take an active part in developing a model for the institute according to the signals from the board and the internal discourse.

After a comprehensive process, it was decided to structure the institute's research and advisory activities through ecosystem-based programmes and develop new sections, each with a specific scientific focus (Misund et al. 2007a). The staff could submit three prioritized choices of which section they wished to belong to. Most staff members got their first choice; a few were asked to accept their second choice, mainly to ensure that all groups had enough people and were functional. My strategy during this demanding process of organizational change was to take responsibility and argue for solutions that I thought would benefit IMR in the long run. Generally, middle managers play important roles in developing organizations, and their contributions are vital in times of organizational change (Hope 2010).

The new organizational structure was put in place in 2004 under Tore Nepstad as the new managing director. The first years were chaotic, with budget and administrative challenges. IMR's leader group strived to find balance among the programmes, and the science section leaders struggled to figure out who was responsible for what. Minor adjustments were made in 2007 in leadership roles and in response to dissatisfaction among the technicians, most of whom had been moved into a separate department in 2004 (i.e. they were not directly connected to the scientific activity). They were transferred back to relevant science groups.

Throughout the transition, the institute functioned, probably because the staff knew what the job was about and how to do it, irrespective of the initial management challenges. An external evaluation recognized IMR as a solid, well-functioning research and advisory organization with good national and international standing (Anon. 2012). IMR was seen to have a strong position within fisheries management, whereas some doubts were expressed concerning deliverables related to aquaculture and petroleum exploration and exploitation. The evaluation revealed several structural deficiencies and communication-related issues that weakened the institute's position. Clearly, reorganizing can be wickedly difficult, and this was no exception (Wenzel 2016a). However, several other European fishery and marine science institutes realigned their organizations with a geographic, ecosystem-based approach similar to the one implemented at IMR (Wenzel 2016b, 2017). IMR continues with much the same organization as we developed 20 years ago and delivers well. Quite possibly, it is now time to consolidate the organization after years of continuous growth and little change in middle leadership.

Director of the University Centre in Svalbard, 2012–16

After >20 years at IMR, half of the time in leadership roles, I felt it was time to do something different for a while. Leader positions should not be permanent, and my two terms as a research director at IMR were coming to an end. Having acquired an interest in polar research, I applied for and

was offered the possibility to lead the University Centre in Svalbard (UNIS), in Longyearbyen, for a 4-year period starting in March 2012. UNIS is the northernmost higher education centre in the world. It offers courses at the bachelor and master's levels in Arctic geology, Arctic geophysics, Arctic biology, and Arctic technology (Misund et al. 2017). PhD students are also supervised, and dissertation work is conducted in Svalbard. UNIS collaborates with the Norwegian universities, and ~800 students take courses there every year.

At UNIS, I soon realized that the leadership roles for the scientific departments were poorly defined and lacked a specific mandate. This made the leader group rather dysfunctional. Decisions taken at one leader group meeting were often revisited in subsequent meetings. Therefore, with the support of the UNIS Board of Directors, we advertised the department leader positions internally, with a clearly defined mandate regarding scientific, personnel, and economic responsibilities, for 4-year terms with possibility for extension once. By spring 2013, the positions were filled. Gradually, the leader group became more effective. The clear message from Berit Kjelstad, chair of the UNIS Board of Directors, helped; she said, 'the management here must have the same progress and quality as at the universities in mainland Norway'.

UNIS was in a progressive period. It was awarded memberships in the Birkeland Centre for Space Science in 2013 for its studies of northern lights and the bioCEED Centre of Excellence in Biology Education in 2014. In close cooperation with the board, we developed ambitious plans to enlarge the campus, and extend the study portfolio to include Arctic safety, and subjects within the humanities and social sciences (Misund 2017). My term as UNIS director ended in January 2016, and the ambitious plans never materialized. However, an Arctic safety centre was established by 2017 through a grant from the Ministry of Foreign Affairs.

Living in Longyearbyen was a special experience. On the one hand, it is a tightly knit, vibrant, highly international small town and, on the other hand, High Arctic wilderness lies just across the street. The seasonal variations are extreme, from the cold and dark polar night to the bright midnight sun in summer. However, Svalbard is also influenced by the global large-scale processes affecting climate (Fig. 2). The avalanche catastrophe that claimed two lives in December 2015, and that happened just 250 m from our house, contributed to a national recognition that extreme and life-threatening weather events are among the consequences of climate change.

NIFES director and merging with IMR and NIFES, 2016–7

In autumn 2015, I was among the applicants for the job of director at IMR, but the Ministry of Trade, Industry and Fisheries instead offered me the corresponding post at the National Institute of Seafood and Nutrition (NIFES), located among the historic wooden stockfish warehouses at the entrance of the Bergen harbour. As I see it, this illustrates that top leader jobs often arrive not as part of your specific plan, but rather as unexpected opportunities you must grasp when you can. What you must be ready for is top level leadership in general, not necessarily one specific position.

The objective of NIFES was to monitor and to do state-of-the-art research on nutrients and environmental toxins in seafood from Norway. The highly professional staff, among them leading researchers in their field, delivered test



Figure 2. With colleague and good friend Dr Kim Holmén when presenting our book 'The Ice is Melting. Ethics in the Arctic' at UNIS 2015 (Helgesen et al. 2015). Drawing by Aurel, *le Monde*.

results and scientific publications documenting that Norwegian seafood from traditional fisheries and a growing aquaculture industry is clean and healthy to eat. The biochemistry underlying this research is peripheral to my own field of science. However, I was recruited mainly to see to it that NIFES became integrated into a major project that was underway at the time. Under the Government's Marine Strategy (Anon. 2015), IMR, NIFES, and the Directorate of Fisheries should be co-located in the vicinity of the University of Bergen's marine institutes. We delivered a Concept Evaluation Report proposing several options for how this could be done in December 2016 (Anon. 2016b). Seven years later, the plans for a new campus for the institutions involved at Dokken in Bergen remain stalled at the political level. This is because transforming Dokken from an active harbour area to a district with other functions takes time in a >950-year-old city with a geographically narrow historical centre. This is frustrating for colleagues in the institutions involved, but I am quite confident the project will eventually be realized.

Before leaving NIFES, I was asked to consider the merging of IMR and NIFES. According to the Ministry of Trade, Industry and Fisheries, this would facilitate the process of co-locating the institutions. IMR and NIFES were both organized under programmes. In fact, the model used to restructure IMR 13 years earlier was built on the model NIFES had developed

at that time. In addition, the institutes were complementary. IMR was basically field-oriented with ecosystem-based programmes covering the marine environment, the commercially interesting fish stocks, and a growing aquaculture industry. NIFES was mainly lab-oriented with programmes on fish nutrition and healthy seafood. I therefore argued that merging IMR and NIFES would yield an organization that could deliver research and management advice on everything from marine ecosystems, fisheries, and aquaculture to seafood quality and the nutritional value of seafood for humans. For a nation where fisheries and aquaculture are fundamental for settlements and activity along the coast, such an institute would be of great value. About a month after I handed my recommendation personally to the director general at the Ministry of Trade, Industry and Fisheries, the Government decided to merge IMR and NIFES. The merger went rather smoothly and was completed by the end of 2017. It was decided that the merged organization should continue under the name IMR. There were very few difficulties and none of the turmoil often associated with such mergers. I now hear that the merger was considered logical, and IMR has been functioning as intended ever since. Former NIFES staff members figure prominently in the administrative and scientific leadership of IMR, and many former NIFES scientists are among the institute's most productive and well-known employees. My brief tenure at NIFES illustrates that unexpected, yet substantial developments can

come about when you are in the right place at the right time!

Leading the polar flagship, 2016–23

While focused on managing NIFES as professionally as I could, in my mind, I was still struggling with what I had experienced in Svalbard. So, when I was asked in late autumn 2016 about leading the NPI in Tromsø, it was an opportunity that I could not let pass. And when our daughters argued that such an offer, and some years in Tromsø, should be regarded as a privilege for a couple pushing 60, I agreed to take on the job. The NPI is a directorate under the Ministry of Climate and Environment, with research and advisory functions in both the Arctic and the Antarctic, as well as executing Norwegian authority in Antarctica. In Svalbard, the institute is present both in Ny-Ålesund and in Longyearbyen, and in Antarctica, it operates a troll station at the foot of the Gjelsvik mountains in Dronning Maud Land.

As NPI director, I reported directly to the Ministry of Climate and Environment and received an annual update of the leader contract with a set of priorities for the development of the institute. Initially, there were clear expectations that I should focus on developing and professionalizing the organization. From the ministry's Letter of Intent, it was apparent that the directives were related to national environmental targets, and they gave a clear mandate for an ecosystem approach. Therefore, we started an internal process to outline the possibility of running the scientific and advisory activities of the institute through ecosystem-oriented programmes, much as we had done at IMR 15 years earlier. By early autumn 2018, we had agreed on four new programmes. The positions as programme leaders were advertised publicly and were filled during the autumn. The programme leaders budgeted the scientific and advisory activities of the institute from 2019, within the expenditure framework set by the institute's leadership group. There was no applause for this organizational development at NPI when it was introduced, nor was there a period of chaos, most probably because the programme leaders cooperated very well, and distributed the resources to best support the tasks the institute was expected to deliver on. It is my sincere opinion that the reorganization functioned quite well.

Two weeks after I arrived at NPI, an international panel presented its report about the state of Norwegian polar research (Anon. 2017). The panel gave high scores to Norwegian polar research in general but recommended that a larger proportion of the ~2 billion Norwegian kroner spent on funding it should be distributed competitively. They also implied that this could be done by redistributing the research funding that was given directly to IMR and NPI. I was allowed to participate in a committee that was following up on the recommendations. Along with my colleagues at IMR, I dedicated much effort to explaining and defending the specific roles played by management-related institutes with mandates given directly by specific ministries (Anon. 2020a). This is an example of the influence of other, more autonomous research organizations such as universities and private sector institutes that want to compete for limited research funding.

The Fram Centre in Tromsø (www.framsenteret.no) is a cluster of >20 institutions with NPI as the dominant one. An international panel evaluated the outcome of the research cooperation among the institutions in the Fram Centre in 2019

(Anon. 2019). The panel gave good marks regarding the scientific production, but recommended a stronger, more strategic leadership. In cooperation with the Ministry of Climate and Environment, I was much involved in outlining how to implement this by establishing a relatively small steering committee with an external chairperson. By 2022, the collaborative programmes at the Fram Centre were renewed under four large programmes.

In 2022, we had a further organization-building process to prepare NPI for the future, efficiently led by Assistant Director Ellen Øseth. This resulted in the existing, >20-year-old sections in the science department being restructured. Six new sections were agreed upon, covering the scientific mandate of NPI, from the physical natural sciences (geology, glaciology, sea ice, oceanography) and the biological natural sciences (marine and terrestrial biology and ecology) to anthropogenic impacts (pollution). The staff could choose which section to belong to by submitting a first and a second priority. This process went rather smoothly. Candidates were appointed as new section leaders through an open, external recruitment process. The new sections have been operational since 1 January 2023, and seem to function well. I see reorganizations as important steps in developing organizations, and they can be successful if carried out through agreed-upon, inclusive, and transparent processes.

The new Polar Class 3 research vessel *Kronprins Haakon* (KPH), which I helped plan during my time at IMR, was about to arrive when I came to NPI in autumn 2017. KPH is owned by the NPI, operated by IMR, and used by these two institutions plus UiT The Arctic University of Norway. I had the pleasure of chairing the steering group for this three-party relationship, mostly in consensus. When no agreement can be reached, it falls to the NPI director to decide how the ship will be used. I did this once in autumn 2021, sending the ship to Antarctica to establish a new site at the ice edge for off-loading supplies to the Troll Station. The off-loading site that had been used for the preceding 20 years had suddenly calved off, and Director John Guldahl and his team at the Operations and Logistics Department strongly recommended using an icebreaker with a helicopter to establish a new one. It was a necessary, but controversial and unpopular decision.

I have visited the Troll Station in Antarctica three times. My first visit in January 2018 was just to get acquainted; in January 2020 and 2023, I accompanied delegations of politicians and civil servants to discuss the need for an upgrade of the station. During the 10-day stay in January 2020, we went hiking in the mountains near the station. To our surprise, there were rivers of meltwater at ~1350 m altitude, 300 km from the edge of the ice shelf at Dronning Maud Land (Fig. 3). The importance of being present to observe and study how climate change impacts Antarctica and its huge ice masses was among the central arguments the Norwegian Government cited for their April 2023 decision to upgrade the Troll Station so that it can house ~65 people in new buildings of about 6500 m² at an estimated cost of 2.4 billion Norwegian kroner. This will be among Norway's largest polar infrastructure investments in the coming decade. Hopefully, the new Troll Station will be ready just in time for the fifth international polar year in 2032–3.

Leading an organization with such a wide thematic and geographic mandate as NPI during the recent COVID pandemic was a very special experience. When Norway closed down on 12 March 2020, we followed advice from national health



Figure 3. Meltwater river near the Troll Station, Antarctica, 11 January 2020.

authorities and ran the institute according to our emergency preparedness plan. The NPI offices in Tromsø were closed and the staff told to work from home. Only a core team of IT technicians and staff in special circumstances were allowed to work in their offices. From home, I took strategic decisions and communicated with the leader group and staff through phone or emails. Within a few days, we had our first general meeting digitally on Zoom. All staff could be reached simultaneously, regardless of location: the Ny-Ålesund Research Station, our branch in Longyearbyen, in their homes in Tromsø, and at the Troll Station in Antarctica. By following the recommendations from our national health authorities and through procedures of quarantine and testing before field work and cruises, we were able to keep up our activities in the Arctic and Antarctica and deliver as intended during the pandemic.

Working with strong unions

So far, I may have given the impression that Norwegian research institutes function and are developed through decisions by the leadership, the boards, and the ministries. This is not the whole story. We have a tradition of strong labour unions that have a say in how the workplace should function. I have therefore prioritized regular meetings to inform and discuss with union representatives when at IMR, UNIS, NIFES, and NPI. In fact, according to the main agreement for state employees,

the development steps I have described at these organizations would not have been possible without formal approval from the unions.

Possibly, it was an advantage that I had been elected vice-chair in the scientist union ‘Havforskerlaget’ at IMR in the late 1990s. We even participated in a large strike involving many academic sectors from 28 May until 15 June 1998. It was very provocative that IMR stayed open while most of its scientists were on strike. In the end, the government intervened and ended the strike because of its substantial consequences for the country. I view the vice-chair role and my engagement in the strike as part of stepping forward and taking leadership roles. Generally, I therefore recommend that scientists with leader ambitions take a term in a relevant local union.

Scientific advice to underpin policy

Leading the Marine Environment Centre at IMR implied responsibility for advisory processes regarding the marine environment. Much focus was on the expanding and economically important offshore oil and gas industry. We advised against opening for offshore oil and gas in a block (Nordland VI) just south of Lofoten in 2001 and received much criticism. We argued that this area was close to the spawning ground for the Northeast Arctic stock of the Atlantic cod. Accidental oil spills following a blow-out could have a catastrophic

impact on new-year classes. Likewise, the regular discharges of produced water during production could cause significant endocrine disruption in fish (Meier et al. 2008). This was a concern for the North Sea fish stocks as well because of the increasing discharge of produced water during the years of peak oil production in the area.

The environmental focus and ecosystem orientation at IMR were timely when we were asked to give input to the white paper *Protecting the Riches of the Seas* (Anon. 2002), which became a central document for Norwegian marine policy in the years to come. Likewise, much effort was put into the preparatory documents for the new Ocean Resource Act that came in 2008. A precautionary, ecosystem-based approach was central in that new law.

One of IMR's major annual deliverables was fishery advice developed through the ICES advisory system and conveyed to the Ministry of Fisheries and Coastal Affairs as the basis for national positions in bilateral and regional fisheries commissions (Gullestad et al. 2014). I took part in the Joint Norwegian–Russian Fisheries Commission between 2005 and 2011 as the scientific leader of the Norwegian delegation. The Northeast Arctic cod stock grew from a rather low population level during these years and Total Allowable Catch (TAC) recommendations increased accordingly from ~400 000 to 700 000 tonnes (Jakobsen and Ozhigin 2011). Nevertheless, a very challenging issue was to address unreported landings by Russian vessels. In 2005, unreported landings corresponded to ~35% of the agreed TAC, but by 2009 this problem was eliminated. This was done by bringing the issue to the table in the Joint Commission, underpinned by documentation from a special unit in the Norwegian Directorate of Fisheries that assembled information from many inspections done by the Norwegian Coast Guard and other sources (Torsvik 2023).

Starting in the late 60s, marine aquaculture expanded tremendously in Norway. IMR, with its two research stations near Bergen, has contributed substantially to research-based development of this industry. Growing environmental problems caused the Ministry of Fisheries and Coastal Affairs to request that IMR consider possible risks posed by marine aquaculture. This was not straightforward since the focus had been on developing the industry, but in 2010 the first risk evaluation of Norwegian aquaculture was delivered. Similar evaluations have been delivered annually since then; they form the basis for the traffic light system implemented from 2018 to regulate Norwegian aquaculture (Taranger et al. 2015).

Nationally, there has been much focus on developing ocean management plans. In 2002, IMR and NPI cooperated on doing an ecosystem overview of the Barents Sea as a starting point for such a plan. The Barents Sea–Lofoten Management Plan was presented to the Norwegian Parliament in 2006 (Winsnes and Skjoldal 2008, Cochrane et al. 2014). Similar plans for the Norwegian Sea and the North Sea were presented to Parliament in 2009 and 2013, respectively. The main objective of the management plans was to establish a framework for developing fisheries, offshore oil and gas, and shipping within sustainable limits in the Norwegian Exclusive Economic Zone. Through these plans and the processes that followed, the main spawning grounds of the Northeast Arctic cod stock in the Lofoten–Vesterålen area were not opened for offshore oil and gas activity. Likewise, the central Møre spawning grounds for Norwegian spring spawning herring were not opened for offshore oil and gas extraction. The substantial influence of the Norwegian offshore oil and gas indus-

try made these advisory processes rather challenging (Misund and Olsen 2013). My experience from these processes is that it is vital for scientists and science leaders to always keep the scientifically based advice visible, despite criticism from powerful industries and even from members of Parliament.

When the Barents Sea Management Plan was revised in 2020, the northward expansion of the offshore oil and gas industry was restricted to an ice frequency of <15% (satellite recording of sea ice on 15% of the days in April in the years 1988–2017; Anon. 2020b). NPI and IMR argued for setting the limit at 0.5% ice frequency, generally some hundred nautical miles further south. Although this argument was not heeded, Parliament's decision to adopt a northern limit of 15% ice frequency will nevertheless protect vast areas in the northern Barents Sea, around Svalbard, and in the Arctic Ocean from offshore oil and gas exploration in the years to come. This shows that even though the advice from the science community was not followed to the letter, it was taken into account in the political decision. As I see it, scientifically based advice has become fundamental in politically based decisions. However, we still have a way to go to secure a sustainable future!

International relations

Being active in the ICES community from the late 1980s, sailing in South African waters in the 1990s, and working closely with colleagues from Russia during the 1990s have allowed me to develop a substantial international network. I was elected to be leader of the ICES Fish Capture Committee 1998–2000. On my list of publications, there are co-authors from >15 countries in Oceania, Europe, North America, and Southern Africa. Collaborating with Dr Pierre Fréon and Dr Francois Gerlotto in Montpellier in 1992, when working for ORSTOM (now Institut de recherche pour le développement) was rewarding (Fréon et al. 1993, Fréon and Misund 1999). During the years in the Joint Russian–Norwegian Fisheries Commission, many issues were developed in close cooperation with my counterpart Yuri Lepezevich from Ukraine (Misund et al. 2011). We maintain contact even during the current difficult times. From 2006 to 2021, I chaired the board of the Marine Infrastructure Unit at the University of Gothenburg, Sweden. As NPI director, I was the Norwegian delegate to the Scientific Committee for Antarctic Research (SCAR). This gave access to an extended international network and the opportunity to contribute to the new strategy for SCAR with the striking title *Urgent messages from the South*. Both in relation to the development of the Ny-Ålesund Research Station and in SCAR, it has been a pleasure to work closely with Prof. Takuji Nakamura, who led Japan's National Institute of Polar Research (NIPR) during the same years as I had the analogous responsibility for NPI. Finally, it has been a great pleasure to renew German–Norwegian polar relations with the Alfred Wegener Institute—Helmholtz Centre for Polar and Marine Research (AWI). A memorandum of understanding between AWI and NPI was signed by the respective directors, Prof. Antje Boetius and myself, in Berlin in May 2023.

Concluding remarks

Since 2000, I have participated in >40 agency governing meetings under three different ministries. Being the director of NPI implies membership in the Polar Committee of the Norwegian

Government, the body that deliberates on issues regarding the management and development of Norway's territories and claims in the Arctic and Antarctica (Dronning Maud Land). Altogether, this has given me the opportunity to directly influence processes related to national fisheries, marine, and polar policy. Arguing from the perspective of environmental conservation and climate concern, I have felt heard and been allowed to present science-based findings and advice and help find solutions for our difficulties.

In hindsight, it is nevertheless questionable whether my colleagues and I have been outspoken enough and clear enough in our communications. The discharges of greenhouse gases continue essentially unabated; Norway's offshore oil and gas production is as high as ever, and an opening for mineral prospecting on the seabed in the Norwegian Exclusive Economic Zone was recently granted despite our warnings about a lack of knowledge of ecosystem effects. From the outside, this is regarded as hypocrisy and a threat to the world's oceans (Anon. 2023). Therefore, we need to underpin our arguments for the necessity of a carbon-neutral future even more strongly, with the best possible science, and keep a focus on the polar areas where the changes will be most pronounced and have huge implications for our planet.

Climate change, its substantial impact on human societies, and how we must adapt will be overarching issues in the years to come. However, our current model for providing knowledge and advice about environmental issues is designed to handle previous challenges, not the ones that are coming. We have separate institutes for nature, water, air, weather, and polar regions. A much more holistic and coordinated approach is needed to handle the great challenges ahead of us. As I see it, the many separate institutions must be brought under the same climate and environment umbrella!

I encourage scientists to take on leadership roles during their scientific careers. If they find that working in such positions functions for themselves and those around them, they should consider taking on even more challenging leadership roles and sacrificing the scientist role for a while. Science organizations are very dependent on having scientists in leadership.

When executing leadership roles, remember that they are not popularity contests; rather, it is about advancing science, contributing to clear advice based on the best available knowledge, developing organizations, and seeing to it that the working environment is good and safe. In the research sector, a top leader's responsibilities include making the organization visible to the public, maintaining and advancing its position, and engaging with politicians and society to present its findings and recommendations.

With my long and active career soon behind me, I hope these reminiscences will inspire young researchers to take up the mantle of leadership not just for the good of science, but also for their own sake.

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Supplementary data

Supplementary data is available at *ICES Journal of Marine Science* online.

Conflict of interest: I have the responsibility for the content of this article and have no competing interests. I have prepared and written the manuscript.

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