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Conclusions: Assessing, Comparing and Explaining Institutional Resilience to Climate Change

Olav Schram Stokke

The first chapter of this book posed three questions, which have structured the ensuing chapters.

1. *How do global warming and other environmental changes generate shifts in the abundance, distribution and migratory patterns of commercially and ecologically important marine stocks?* Drawing on Chapters 6 and 11, the first section below summarizes findings regarding selected demersal, benthic and pelagic stocks in polar seas, including Northeast Arctic cod, Barents Sea snow crab, Northeast Atlantic mackerel and Antarctic krill.
2. *To what extent and how do stock-shifts pose challenges to the national, international and transnational management regimes established for the management of commercially and ecologically important fisheries?* Drawing largely on the case studies of international management presented in Chapters 7 through 13, the next section specifies the relationships between stock-shifts and challenges to each of the three management tasks presented in Chapter 1 – the cognitional, the regulatory and the compliance tasks.
3. *To what extent and how have the actors operating these regimes adapted them to the changing circumstances and succeeded in maintaining or improving levels of regime performance – i.e. achieved institutional resilience?* Drawing on all the chapters in this book, the subsequent section in this concluding chapter offers a comparative assessment of the management cases studied here as to their cognitional, regulatory and compliance resilience, and then examines how differences among them can be accounted for by the three risk factors identified in Chapter 3: problem characteristics, broader setting and institutional design. The final section reflects on the merits of disaggregating the analysis of institutional resilience, and on the broader relevance of our findings for other efforts to adapt fisheries management regimes to the impacts of climate change.

Climate change and shifting stocks in polar seas

Although it is not the only driver of change in stock distribution and migration, climate change is clearly affecting the abundance and distribution of commercially and ecologically important stocks in both regions examined in this book: the east Atlantic segment of the Northern Seas – comprising the Nordic (Norwegian, Greenland and Icelandic) Seas and the Barents Sea – and the Southern Ocean.

Northern Seas

More than a century ago, as Stiansen and his colleagues note in Chapter 6, the three Norwegian ocean-science pioneers Bjørn Helland-Hansen, Fridtjof Nansen and Johan Hjort recognized the close relationship between variations in ocean temperature and patterns of recruitment, distribution and abundance of important commercial species in the Northern Seas. Geobiological mechanisms further specified in more recent research include higher primary production due to larger ice-free areas, greater influx of organisms carried by rising inflows of Atlantic water and generally higher biological activity at high temperatures. As Stiansen and colleagues also note, the impacts of temperature on the spatial distribution of fish stocks depend crucially on three other factors as well: bottom topography, stock abundance and food availability, with the relative significance of those factors differing across species.

Topographic conditions are especially important for demersal species like cod and haddock; they serve to constrain the effects of ocean warming on the northward expansion of Northeast Arctic cod (*Gadus morhua*), the world's largest cod stock. Instead of expanding from the relatively shallow Barents Sea into the deep high-seas portion of the Central Arctic Ocean, this stock is more likely to respond to future warming by moving eastwards into the shelf areas of the Kara Sea and around Novaya Zemlya. In these waters, however, persistent winter sea-ice is expected to deter the development of new spawning areas.

Topographic conditions are equally important for benthic stocks. A pertinent example here is the spatially expanding snow crab (*Chionoecetes opilio*) stock now found in most of the Barents Sea northward of a line between Franz Josef Land and central regions of Svalbard: continued ocean warming will enable its further northward expansion on the Barents Sea shelf.

For pelagic species, in contrast, stock abundance and food availability are the key factors determining how ocean warming affects spatial distribution. Scientists agree that the growth of the Northeast Atlantic mackerel (*Scomber scombrus*) stock during the past fifteen years has given rise to a much wider distribution than previously. As Stiansen and associates report, considerably greater uncertainty exists as to whether the future migration route taken by mackerel after spawning will direct any further expansion northwards into the Norwegian Sea or westward toward Icelandic and Greenlandic waters. That uncertainty is deepened by the competition for prey between mackerel and herring.

This scientific uncertainty as to the durability of the currently high occurrence of mackerel in western parts of the Northern Seas has important political implications: it

figures centrally in the account given by Østhagen and colleagues in Chapter 7 as to why the user-states have found it so difficult to agree on a new division of quotas for this stock. Thus, performance on the *cognitional* management task of building shared knowledge on the relative importance of factors that influence stock distribution spills over into the *regulatory* management task, as elaborated below.

Southern Ocean

Scientific uncertainty also attends the question of whether and how the spatial distribution of Antarctic krill (*Euphausia superba*) is affected by the ongoing warming of the Southern Ocean. As noted by McBride in Chapter 11, some scholars report evidence of a substantial poleward contraction of this huge crustacean stock, which would concur with broader-based predictions issued by the Intergovernmental Panel on Climate Change (IPCC) and with regional modelling studies of suitable krill habitat under various warming scenarios. However, these reports are contested within the scientific community; and the working group responsible for evaluating such evidence for the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) has concluded that lack of long-term information on large-scale krill biomass prevents clear answers thus far.

Compared to the situation in the Northern Seas, the scientific basis for assessing variability and long-term trends for Antarctic krill is relatively weak. Survey activities have been rare or spatially limited, as Stokke notes in Chapter 12; and catch reports provide supplementary information only for the relatively small area where krill fisheries are concentrated, in waters surrounding the Antarctic Peninsula in the Southwest Atlantic. Nevertheless, as McBride points out (Ch. 11), according to what is now known about krill biology and the physical environment of the Southern Ocean, the impacts of a poleward shift of the stock are likely to be negative on several accounts – including significant reduction of habitats suitable for spawning, hatching, larvae survival and juvenile growth.

Similar to the general case in the Northern Seas, other ongoing environmental changes such as ocean acidification, ultraviolet radiation, greater competition from other zooplankton and the recovery of the great whales in the Southern Ocean interact with ocean warming to render the future abundance and spatial distribution of krill more variable and more uncertain.

Challenges to regional management regimes

The generic challenge to fisheries management deriving from these impacts of climate change is hardly new. Variations in ocean conditions and shifts in abundance and spatial distribution of commercial fish stocks, often affecting various harvester groups differently, have long been part and parcel of fisheries management. However, as the chapters in this book bring out, climate change acts to amplify the challenges to the three tasks – cognitional, regulatory and compliance – of resource management.

These three management tasks are explained in Chapter 1 (see also Stokke 2015). The *cognitional* task involves developing and communicating scientific advice on how various levels of harvesting pressure will affect the status of the stocks and their long-term ability to support employment, yield incomes and provide food. The *regulatory* task entails moving from such a shared understanding of means–end relationships into joint commitments among user-states to a set of common or compatible rules. Finally, the behavioural or *compliance* task is to ensure that those rules shape the performance of target groups – the fishing vessels that feed the global seafood value chain. How, then, have shifts in the abundance and spatial distribution of fish stocks examined here affected the performance of each of those management tasks?

Cognitional task challenged

Extensive research on the cognitional management task has identified three factors as particularly important to the persuasiveness of scientific advice: credibility, legitimacy and salience (Cash et al. 2003; Mitchell et al. 2006). Rapid stock-shifts may undermine the credibility and legitimacy of researcher inputs by rendering scientific assessments more uncertain or contested.

Disagreement among scientists on how to interpret observational data is not by itself detrimental to fisheries management: on the contrary, it may indicate vibrant scientific exchange at the frontier of policy-relevant knowledge building. Consider for instance the ongoing methods-oriented debate noted by McBride (Ch. 11) on whether a long-term poleward contraction and decline of the Antarctic krill stock is already underway. Such scientific dissensus can hardly be said to impinge on the cognitional task when, as in this case, the scientific advisory body itself examines and brings out the arguments of both sides and encourages more extensive monitoring and further investigation (SC-CAMLR 2019: 198).

In contrast, Østhagen and colleagues describe in Chapter 7 how scientific disagreement can become intertwined with political controversy among states in ways that undermine the perception among participants and outsiders that inputs are wholly independent of narrow political interests. For instance, a dispute over survey methodologies favoured differently by scientists from the various parties to the polarized mackerel dispute nurtured suspicions that inputs to the scientific advisory process were distorted by political considerations (see also Gänsbauer et al. 2016). Similarly, Young and Stokke note in Chapter 3 that fear of such politicization of science was among the reasons why Norway and the EU terminated the practice of allocating quotas of their shared stock of North Sea herring on the basis of regularly updated model-based estimates of zonal attachment.

In the case of mackerel, the threat to scientific credibility, and thus to the persuasiveness of scientific advice, was compounded by evidence that scientists had systematically underestimated the stock for several years, partly due to its changing distribution (Spijkers and Boonstra 2017: 1842). Earlier studies indicate that low accuracy in the predictions inherent in scientific advice regarding how the stock will respond to harvesting pressure has the effect of reducing the propensity of decision-makers to keep quotas within recommended levels (Stokke 2012).

If stock-shifts can render scientific inputs less credible even in the Northern Seas – where advisory processes centre on the International Council for the Exploration of the Sea (ICES) with its solid reputation for impartiality (Gullestad 1998) and especially advanced peer-review procedures aimed at insulating the advisory process from political pressure (Lassen, Kelly and Sissenwine 2014) – then the challenge may be assumed to be at least equally severe in other regions.

In the mackerel case, as commented by Østhagen and colleagues in Chapter 7, an additional controversy has revolved around how to define zonal attachment. Should one consider only the amount of time that proportions of the stock occur in each zone, or should the calculation also take additional factors into account? In the negotiations as well as in the scientific debate, Icelandic and Faroese participants have held that the weight-gain the mackerel stock achieves while within their exclusive economic zones (EEZs) should figure in the calculations, because that gain occurs at the expense of other ecosystem components within these zones (see also Totland 2020: 159).

Also the salience of scientific advice – its relevance to the specific regulatory issues debated by decision-makers – may suffer if a change in spatial distribution shifts the political attention from issues of conservation to allocation, because scientific advisory bodies typically have much less to say about the latter. In Chapter 8, Jørgensen notes how a working group established under the Joint Norwegian–Russian Fisheries Commission (JNRFC) was unable to agree on the implications of new information they had collected regarding the zonal attachment of Greenland halibut (*Reinhardtius hippoglossoides*). That was partly due to disagreement within the working group on the criteria for determining zonal attachment – but also because the group lacked a firm basis for stating an opinion on how zonal attachment should be weighed against other allocation criteria, notably historical fishing and contributions to research and conservation.

Those criteria and others, including the dependency of coastal fishing communities on the stock in question, are explicitly listed but neither specified nor ranked in the UN Fish Stocks Agreement – today's most authoritative statement of international fisheries law (see also Ch. 2 by Molenaar). As in the JNRFC Greenland halibut case, as Jørgensen notes, a similarly tasked working group on allocation criteria under the North-East Atlantic Fisheries Commission (NEAFC) soon declared itself unable to provide consensual advice on how to specify and weigh the various allocation criteria applied in international law.

In these and other cases, the salience or policy relevance of scientific advice suffers whenever changes in the spatial distribution of stocks serve to shift the focus of management debates from conservation – the level of harvesting pressure – to allocation. Under such circumstances, the indeterminacy of international fisheries law with respect to precise contents, operationalization and relative weight of allocation criteria equips scientists poorly for providing advice on the most pressing issues. As with credibility and legitimacy, low scores on salience mean that decision-makers must proceed with their regulatory task without being able to draw on the advantages of a cognitional task successfully performed, as would be evident in well-substantiated, consensual advice from the regime's scientific body.

Regulatory task challenged

The distinction between allocation and conservation is equally useful when we turn to the challenges deriving from climate change to the regulatory management task of achieving agreement among all or most user-states on rules that constrain the harvesting pressure to levels that are sustainable and do not jeopardize future use.

Instances of allocative challenges amplified by changes in spatial distribution abound in the contributions to his book: in all the management processes examined, stock-shifts have generated international allocation disputes or intensified existing ones. The EU has requested a share of the total allowable catch of snow crab in the Barents Sea, due to the rising occurrence of this species in waters beyond the territorial sea of Norway's Svalbard archipelago – where, according to an EU interpretation rejected by Norway, nationals of other signatories to the Svalbard Treaty are entitled to equal access to natural resources (Ch. 10). Similarly, Russia has requested larger shares of Barents Sea quotas for Greenland halibut, Northeast Arctic saithe (*Pollachius virens*) and redfish (*Sebastes mentella*), on grounds of rising abundance outside Norway's EEZ (Ch. 8). On several occasions, including the period from 2017 to 2020, Norway has set for itself quotas of Norwegian spring-spawning herring (*Clupea harengus*) in the Nordic Seas well above its share in earlier allocation agreements, citing poor alignment with the stock's zonal attachment. Further, Iceland and the Faroe Islands have cited the increased occurrence of mackerel in their own EEZs when demanding recognition as coastal states with respect to management of this stock and corresponding entitlements to shares of the total allowable catch (Chs. 5, 7 and 8). In fisheries diplomacy, the term 'coastal state' denotes also non-state entities with exclusive competence in fisheries – here, the EU and the autonomous territories of the Faroe Islands and Greenland.

For reasons related to contested sovereignty claims to Antarctica, the regime for managing krill fisheries in the Southern Ocean does not employ national quotas. Therefore, climate-related controversies concern not quota allocation but the relationships between fisheries and area-based management (Chs. 12 and 13).

Taken together, then, the chapters in this book leave little doubt that the allocative part of regulation has been rendered more difficult by the impacts of climate change.

In several of the cases examined here, disputes over allocation have involved new entrants to a fishery – typically involving the additional complication that existing members of a regime tend to be averse to recognizing the newcomers as legitimate participants in the management process and unwilling to share part of the total allowable catch. The disputes over mackerel in the Nordic Seas (Ch. 7) and cod in the Barents Sea Loophole (Ch. 9) are obvious cases in point; however, newcomer issues are evident also in the EU–Norway dispute over snow crab in the Barents Sea (Ch. 10). As Molenaar explains in Chapter 2, the rules and practices on participation of many regional fisheries management organizations and arrangements (RFMO/As) raise barriers for new entrants seeking membership, frequently to the extent of granting any existing member the right to veto; this holds true also for the 2018 Central Arctic Oceans Fisheries Agreement. Even when newcomers obtain membership or agree to adhere to an RFMO/As core rules as a 'cooperating non-contracting party', they have no guarantee of being granted a quota if the stock is fully exploited – which is often the case.

Similar reluctance to acknowledge new entrants is evident in less institutionalized arrangements such as the loosely coupled clusters of annual agreements negotiated bilaterally and multilaterally concerning pelagic species in the Nordic Seas. As Østhagen and colleagues note in Chapter 7, it took more than ten years from Iceland's first request for a status as a coastal state to the mackerel before Norway and the EU were ready to grant it – and that acknowledgement came only after Iceland had demonstrated powerful harvesting ability, also within its own EEZ. Moreover, the initial share offered by Norway in the ensuing negotiations was considerably less than 1 per cent.

Unfortunately, allocative controversies serve to compound also the conservation part of the challenge that climate change poses to regulation – a challenge that has been described in the following terms: 'as climate change potentially introduces a greater level of ecosystem uncertainty, successful ecosystem outcomes potentially mean that management practices may need to be more conservative' (Trathan and Agnew 2010: 338). Allocative controversy can compound that amplified conservation challenge in at least two ways. First, breakdown of quota negotiations often induces each party to set unilateral quotas that add up to a total harvesting pressure well above scientific recommendations. Østhagen and colleagues mention this phenomenon in Chapter 7: when the EU, Norway and the Faroe Islands finally agreed in 2014 on a long-term three-party quota arrangement, they set aside a certain portion of the agreed total quota to non-parties – in practice, to Greenland and Iceland. Given their failure to reach agreement also with Iceland, it is hardly surprising that the subsequent quota set unilaterally by Iceland was much higher than what was set aside for Iceland by the other three. In the ensuing years, the cumulative quotas were 30 to 40 per cent above what the scientists had recommended (ICES 2020a: 5–6): non-agreement on allocation can indeed undermine conservation.

A second way in which allocative controversy compounds the conservation challenge becomes evident when parties manage to obtain agreement on how to share a total quota only by increasing it beyond the bounds of precaution. For instance, Jørgensen notes in Chapter 8 that Norway in practice agreed in 2009 that changes in the zonal attachment of Greenland halibut justified a proportionally higher Russian quota. Nevertheless, total Norwegian catches remained stable, because the two coastal states agreed to increase the total quota fivefold from the previous year: for the first time in a decade, the 2010 catch limit was set above the precautionary level recommended by ICES scientists (ICES 2020b).

In short, whereas lack of agreement on allocation jeopardizes conservation by promoting unilateralism among the user-states, inclusive agreements are sometimes obtained at the expense of conservation. In all cases examined in this book, the impacts of climate change have acted to render one or both of those pathways to regulatory failure more likely.

Compliance task challenged

As to the behavioural or compliance task of fisheries management, climate change can challenge it by reducing the spatial fit between harvesting operations and the

jurisdictional basis for essential compliance activities – notably, verification, review and response to rule violations (Hovi, Stokke and Ulfstein 2005).

The verification and review parts of compliance work revolves around monitoring, control and surveillance – key functions of regional fisheries management regimes implemented by means such as observer systems, at-sea inspection, port controls, as well as catch documentation and trade-tracking schemes (see Ch. 2 by Molenaar). Several regional regimes, including CCAMLR and NEAFC, complement information derived from such activities with the operation of satellite-based vessel-monitoring systems, enabling the integration of data from real-time tracking of all vessels flagged by member-states (Stokke 2014).

As Stokke elaborates in Chapter 9, a generic condition for effective verification in fisheries is having access to more than one source of information on harvesting activities, enabling the cross-checking of the reports provided by fishers to their flag states or by states to regional management regimes. Shifts in the spatial distribution of valuable commercial stocks can undermine that condition by constraining at-sea inspection or by removing the basis for comparison of catch- and port-delivery reports. Stokke notes how, in the early 1990s, the co-occurrence of increasing landings of Russian-caught cod in foreign ports and greater availability of this species in the high-seas part of the Barents Sea and in a ‘grey zone’ – where the two coastal states refrained from inspecting each other’s vessels due to a then-unsettled maritime boundary dispute (see also Chs. 3 and 8) – led to very severe overfishing of agreed quotas that proceeded undisclosed for a long time.

The response to perceived rule violations may also be complicated by the impacts of climate change. Under the annual protocols adopted by JNRFC, Norway may license the harvesting of an agreed amount of the total allowable snow-crab catch in the Barents Sea. As Østhagen and Raspotnik discuss in Chapter 10, the westward expansion of that stock has made it available in the high-seas ‘Loophole’ as well as in Norway’s Fisheries Protection Zone (FPZ) around Svalbard. Further, they note that the EU has acknowledged that snow crab is a sedentary species and therefore subject to the continental shelf regime, which grants to the coastal-state management authority beyond 200 nautical miles, provided certain geological and bathometric conditions are met – as they are in the Barents Sea. Norway’s right to prohibit foreign crab-catch vessels in the Norwegian part of the ‘Loophole’ shelf is therefore not disputed. One Norwegian arrest of an EU-licensed vessel has occurred there as well, but the international dispute revolves around another arrest conducted within the FPZ. In that zone, the EU holds that Norway’s sovereign rights are to be exercised within the constraints of the 1920 Svalbard Treaty, including the principle that nationals of other signatories shall have equal access to natural resources.

For efforts to enhance compliance with international rules, therefore, as with those targeting the cognitional and the regulatory aspects of management, shifts in the spatial distribution of marine stocks may present additional complications. This is particularly the case when the stock in question becomes available in areas where the jurisdictional basis for verification and enforcement activities are weak or disputed.

Institutional resilience: drivers and impediments

As explained in Chapter 1, ‘institutional resilience’ denotes the ability of those who operate institutions to adapt them to changing circumstances as necessary for retaining or improving levels of regime performance. This section compares the regional management regimes examined here in terms of resilience to the additional cognitional, regulatory and compliance challenges posed by climate- or otherwise-induced stock-shifts, then seeks to explain variation in such institutional resilience.¹

Resilience compared

Among the three management tasks, the regulatory one has clearly taken the hardest blow from the stock-shifts examined in this book. All the regimes in question have managed to withstand the additional challenges posed to the cognitional task. In the Northern Seas, ICES plays a central role in this aspect of management and has continued its regular provision of consensual scientific advice on the levels of harvesting pressure deemed compatible with the precautionary approach – also for the highly contested pelagic stocks of herring and mackerel (see Ch. 7; ICES 2020a). The salience of such advice has declined for stocks subject to allocative controversy – but here we should recall that ICES has never requested or been authorized to provide advice on quota sharing. However, even in the politically contested cases of herring and mackerel in the Nordic Seas, the advisory system has produced not only annual total allowable catch advice but also inputs relevant to allocation. On request from the relevant coastal states or their regional management regimes, ICES has prepared survey- and fishery-based reports on changes in a stock’s distribution and migration (e.g. on mackerel, ICES 2013; see Ch. 7), sometimes including annual percentage calculations of zonal attachment (as on herring, ICES 2014). Similarly, for the Barents Sea, as Jørgensen details in Chapter 8, the JNRFC has established separate ad hoc expert groups to map changes in the distribution of halibut and redfish to inform the Commission’s allocative deliberations. On the whole, then, extensive stock-shifts and considerable quota controversies in the Northern Seas have not disrupted the cognitional performance of the regional fisheries regimes.

As shown by Stokke in Chapter 12, fairly high levels of cognitional resilience are evident also for the Antarctic case, because reports of a rapidly warming Southern Ocean have served to increase political pressure for improving the Scientific Committee’s risk-assessment procedure as applied to the krill fisheries. Although the current procedure is clearly inadequate, the causal effect of climate change has been to promote efforts to make multi-scale surveys and stock assessments more regular events than has been the case thus far.

High resilience scores are in order also for the behavioural or compliance task: the overall pattern emerging from the findings reported in this book is a set of compliance systems that have been coping rather well with challenges deriving from climate-change related stock-shifts. As Molenaar explains (Ch. 2), RFMO/As worldwide have developed a broad menu of cooperative measures for detecting and deterring illegal,

unreported or unregulated (IUU) fishing, including denial of entry and use of ports. In Chapter 9, Stokke notes how the JNRFC applied a broad range of such measures when combating two waves to IUU fishing in the Barents Sea in the 1990s and early 2000s. Despite the risk of being challenged on the basis of the Svalbard Treaty, as Østhagen and Raspotnik report in Chapter 10, Norway did arrest the EU vessels that fished for the sedentary snow crab on its continental shelf without having obtained a quota from the coastal state. Even in the deeply contested pelagic fisheries for herring and mackerel, compliance with the sum of coastal-state quotas has generally been high (ICES 2020a, 2020c) – partly because those quotas have been set high in order to support competing claims to enlarged shares of the stocks (see Ch. 7). And in the Southern Ocean, as Stokke notes in Chapter 12, CCAMLR has recently stepped up its observer coverage in the krill fishery to 100 per cent, and krill catches have remained far lower than the agreed limit.

Compared to these strong performances on the cognitional and compliance dimensions, regulatory resilience has been far more variable, with complications involving both conservation and allocation. In the Northern Seas, only the JNRFC has regularly managed to deliver quota agreements in line with scientific advice in cases involving shifts in spatial distribution. Thus, Jørgensen shows in Chapter 8 that despite a north- and eastward shift of Northeast Arctic cod (see also Ch. 6), Russia has refrained from requesting any renegotiation of its 50/50 sharing agreement with Norway, and the total allowable catch is typically held within the scientific advice. Moreover, for less-valuable shared stocks, the two coastal states have rather smoothly negotiated new division keys in recent years – and only in the case of Greenland halibut did such reallocation coincide with catch-limit increases somewhat beyond ICES recommendations.

The gap in regulatory performance from the Barents Sea to the Nordic Seas is striking. The states fishing for Norwegian spring-spawning herring have not achieved a comprehensive quota-division accord since 2012; in practically every year since then, the sum of coastal-state quotas has exceeded the scientific advice by more than 10 per cent (ICES 2020c). The situation is even worse for the mackerel stock, as discussed by Østhagen and associates in Chapter 7. Although two of the newcomers, the Faroe Islands and Greenland, in processes involving economic sanctions or threats of such sanctions from the EU and Norway, have decided to join a quota-sharing agreement, the failure to reach a comprehensive agreement dates back to 2009. The cumulative quotas have exceeded the scientific advice by a considerably greater margin than for herring – on average by as much as 40 per cent each year (ICES 2020a).

The longer-term trend in Antarctic krill regulation, as noted by Stokke in Chapter 12, falls somewhere between the successful Barents Sea adaptations and the many failed quota negotiations on large pelagic species in the Nordic Seas. Agreed catch limits for krill ensure a very low harvesting pressure, considering the huge size of the stock. However, the slow pace towards establishing a feedback management system means that CCAMLR remains unable to respond quickly to any rapid changes in the local abundance of krill relative to predator needs in the areas where the fishery is concentrated.

How can we account for these differences in resilience to the challenges that stock-shifts pose to fisheries management in the two regions studied here? The remainder of this section summarizes what the contributions to this book tell us about factors that impede or drive institutional resilience. The comparative part of the argument benefits from the case diversity identified in Chapter 1 – in the number of actors, the extent of the stock shift and the procedural strength of the regime – and is structured by the three types of risk factors that Young and Stokke identify in Chapter 3 as crucial for efforts to avoid failure in environmental governance: *problem characteristics*, *broader setting* and *institutional structure*.

Problem characteristics

One possible explanation for variation in governance performance is that certain characteristics of the social problem addressed by a regime make coping more difficult in some cases than in others – what Underdal (2002) calls ‘malignancy’, revolving around the severity of collective-action problems associated with free-rider incentives. A core proposition in the study of collective action is that the larger the number of actors that must agree on regulatory constraints, the greater is the risk that one or more of them will seek to avoid being bound or to avoid compliance (Olson 1971). In fisheries management, such problem malignancy can be compounded – for instance, if a stock’s rising occurrence on the high seas provides greater opportunities for free-rider behaviour (see Ch. 2 by Molenaar) or by a highly dynamic ecosystem undergoing rapid or nonlinear change (see Ch. 3 by Young and Stokke).

As argued in Chapter 1, the cases presented in this book display analytically helpful diversity with respect to both the number of actors involved and the dynamism of the ecosystem, notably the extent of the spatial shift of the marine stocks under study and their availability on the high seas or in waters involving disputed jurisdiction. Hence, Jørgensen notes in Chapter 8 an important advantage held by the JNRFC over the regimes for managing the pelagic stocks in the Nordic Seas: the most valuable stocks occur more or less exclusively within the EEZs of only two states, rendering the management problem more benign. Problem dynamism too is particularly high in the pelagic sector, as Østhagen and colleagues remind us in Chapter 7: mackerel and herring migrate over greater ocean areas than demersal species do, so the changes in spatial distribution have been more extensive. Moreover, as Stiansen and associates elaborate in Chapter 6, the distribution of pelagic species is closely related to stock size – a factor which also tends to fluctuate more widely for pelagic species than for the major stock managed under the bilateral Barents Sea fisheries regime, Northeast Arctic cod.

Rapid changes in stock distribution draw attention to another problem characteristic which may affect the ability of states to devise effective institutional adaptations: the state of knowledge regarding the expected duration of a stock shift. Even in the contested management processes over the pelagic stocks, the regimes’ scientific body has provided consensual advice on the extent of changes in distribution – but the expected duration of that change remains shrouded in scientific uncertainty (see also Ch. 6).

Judging by the cases examined here, such uncertainty has an ambiguous effect on the resilience of management. In Chapter 7, Østhagen and associates show how disagreement as to whether today's wide distribution of mackerel is cyclical or climate-driven (and thus durable), has fostered hardliner policies on both sides of the dispute. In contrast, Jørgensen in Chapter 8 lists scientific uncertainty among the drivers of resilience for the Barents Sea regime, arguing that it may have restrained Russia from requesting a new cod-division key – as that state has done for the less-valuable regional stocks of halibut, redfish and saithe. In the future, Jørgensen argues, the current 50/50 division of cod may again compare favourably (from a Russian perspective) with the stock's zonal attachment.

Jørgensen also notes an important difference between the situations in the Barents Sea and the Nordic Seas that may explain why scientific uncertainty plays out differently. In contrast to Russia with respect to cod, the Faroe Islands and especially Iceland had very little to lose from a confrontational approach towards the regional pelagic heavyweights (the EU and Norway), as their agreed shares in the stocks were initially negligible.

Compared to the Northern Seas situation, the character of the regulatory problem posed in the Southern Ocean is considerably less malign: the value of the krill fishery is far lower, and the allocative dimension is practically absent. Unlike the other regimes examined here, CCAMLR does not allocate quotas among user-states. Thus, the debate recounted by Stokke in Chapter 12 on whether and how to allocate the krill quota over smaller management units revolves around the balance between environmental protection and utilization of a stock with modest commercial significance – it is not a question of allocation among states fiercely competing for long-term shares of quotas valued highly by their respective fishing industries (see also Chs. 7 and 13).

The fact of a relatively benign problem due to the limited commercial value of the fishery may also explain why the EU for several years refrained from pursuing the snow-crab dispute with Norway, as Østhagen and Raspotnik argue in Chapter 10. Although a few small EU member-states and some EU parliamentarians have lobbied for a more assertive stance on the part of the European Commission and the European External Action Service (EEAS), counter-arguments have included the value of maintaining well-functioning cooperation with Norway on the commercially far more important stocks covered in the annual EU–Norway quota agreements. However, Østhagen and Raspotnik also note the limits of that logic, especially in periods of controversy over those more important stocks: the disagreement over snow crab was among the items that featured in the heated diplomatic exchange between the EU and Norway in 2021 over the cut in the EU quota for cod in the FPZ around Svalbard and the subsequent, unilaterally set, EU cod quota (see Stokke 2022).

At the core of a problem-characteristics account for resilience is how the actors involved perceive the costs and benefits of a cooperative arrangement relative to a situation with no external constraints on their behaviour or that of others. As the contributors to this volume bring out, factors that go into such a calculus include the number of states with access to the fishery, the extent of the spatial stock shift and expectations about future ones, the availability of the stock in question on the high seas

and whether it is robust enough to withstand the higher harvesting pressure generally associated with unilateral quotas.

Political context

As Young and Stokke elaborate in Chapter 3, a second category of factors that can explain variation in institutional resilience is the broader political or socioeconomic setting for efforts at international governance. An important dimension here is whether the issues at hand are linked to deep-seated partisan differences among the states concerned.

A broader political context marked by intensive rivalry can promote institutional resilience, argues Jørgensen in Chapter 8. She notes how the two coastal states in the Barents Sea during the Cold War – Norway and the Soviet Union – with their opposite placement in the East–West rivalry, had to find practical solutions to their fisheries issues while treading as lightly as possible on several underlying jurisdictional disputes, in order to avoid incidents that might escalate into dangerous situations (see also Ch. 3). It has been argued that this broader setting of geopolitical competition spurred an ‘urge to agree’ in the Barents Sea fisheries regime that facilitated mutual accommodation on difficult matters such as the adoption of fixed division keys for shared stocks and enforcement in disputed waters (Stokke and Hoel 1991; Hønneland 2006). According to Jørgensen, this urge to agree has gradually been internalized among participants in the JNRFC, generating a ‘culture of compromise’ that helps to explain the resilience of this institution. She finds evidence of such resilience also in the recent cooperative zonal-attachment studies and subsequent adaptations of several quota-sharing agreements.

The general mechanism that connects the broader political context with accommodation and resilience in the JNRFC case is the concern that disputes over fisheries matters may spill over into larger and potentially more sensitive controversies among the parties. In Chapter 4, Raspotnik and Østhagen refer to the same mechanism when placing the snow-crab row between the EU and Norway in the scholarly debate on EU actorness. Understanding EU external behaviour, they argue, requires keen attention to how actor interests are pursued within a multi-level governance structure distinctive to each issue-area. With respect to marine living resources, internal EU decision-making is shaped by the extensive competence that member-states have ceded to the Commission – which, in the snow-crab case, has a shared interest with the EEAS, another coordinating body involved in the making of EU external policy, in preventing a marginal dispute from impacting negatively on the EU’s broader foreign-policy relations with Norway.

Thus, the snow-crab case brings out how the relationship between political context and cooperation depends on the relative institutional clout held by sector agencies and those responsible for coordination. For a long time, as Raspotnik and Østhagen note (see also Ch. 10), the European Commission and the EEAS managed to keep the snow-crab dispute solely a fisheries issue, decoupled from the larger question of whether the equal-access provisions of the Svalbard Treaty apply beyond Svalbard’s territorial sea. The latter question would raise the stakes of the dispute considerably, most likely

affecting the EU's general foreign-policy relations with Norway as well as its aspirations to play a more prominent role in multilateral processes of Arctic governance.

The cases studied in this book, therefore, reinforce a point made by Young and Stokke in Chapter 3: a conflictual political setting will not necessarily impede cooperative environmental problem solving, provided institutional means can be found for decoupling the issues of conflict, or at least reducing their linkage with the practical tasks of management. Indeed, institutional solutions that have succeed in overcoming geopolitical rivalry or accommodating underlying disputes might even be particularly valuable to those operating the regimes, rendering the solutions more rather than less resilient to external challenges (Stokke 2022).

Socioeconomic environment

Cases displaying diversity in EU actorness, including the ability to pursue a coherent and consistent policy across policy areas, also illustrate the importance of the socioeconomic dimension of the broader setting. As Young and Stokke note in Chapter 3, the socioeconomic environment for governance efforts includes matters such as the prosperity of the countries involved, as well as the mode and extent of attention paid by industry or other non-state actors. As noted in Chapter 1, all the regimes studied in this book have memberships that largely comprise wealthy and technically advanced states – but our management cases differ in interesting ways regarding the roles played by various categories of non-state actors.

Thus, the difference that Raspotnik and Østhagen emphasize in Chapter 13 between the Barents Sea setting and that in the Southern Ocean – the highly limited EU fishing-industry engagement in Antarctic fisheries – can account for the conservation-oriented role assumed by the EU in recent controversies over Antarctic environmental governance. In contrast to the pragmatic conflict-avoidance approach that has gradually prevailed in its snow-crab policy, the EU has taken an active and assertive position in CCAMLR by sponsoring and supporting a string of proposals for marine protected areas (MPAs) throughout the Antarctic, also in harvesting areas, despite increasing resistance from some of the fishing states. With very low economic stakes in the region, the EU Commission has fewer incentives for avoiding open disagreement with harvesting interests. And, as Raspotnik and Østhagen add, the Antarctic stands out as a particularly attractive location for implementing EU commitments to the Aichi Target under the Convention on Biological Diversity as regards providing area protection status or area-based conservation measures to 10 per cent of the world's coastal and marine areas.

Among the arguments for Antarctic MPAs, which may include areas where krill harvesting is prohibited or subject to particularly stringent regulations, is that they can support scientific research on the ecosystem effects of krill harvesting by providing reference data from otherwise comparable no-fishing areas. Accordingly, adoption and implementation of MPA measures could provide evidence of institutional resilience. Within CCAMLR, however, as Stokke argues in Chapter 12, such resilience is instead evident in the pragmatic decoupling of the crucial process of improving the krill management procedure from the increasingly contested MPA initiatives. Since around

2012, the MPA issue has become entangled in a larger controversy among CCAMLR members on how to balance the utilization and protection elements of the regime's conservation objective. One indication of how this controversy has constrained decision-making capacity: since 2015, CCAMLR has been unable to agree even on a Climate Change Response Work Plan proposed by the Scientific Committee as part of its efforts to integrate the impacts of climate change into its research coordination and advisory efforts. As in the Barents Sea cases combining fisheries and jurisdictional disputes between Norway and Russia or the EU, decoupling the process of revising the management procedure for Antarctic krill from the broader controversies over MPAs is a means for enhancing CCAMLR's resilience to the impacts of a warming Southern Ocean.

A noteworthy change in the socioeconomic environment for all the management processes examined in this book is the strengthening of private sustainability certification schemes, operating alongside the intergovernmental management regimes. In Chapter 5, Hønneland describes and assesses the operation of the most significant scheme, the Marine Stewardship Council (MSC), which originated in a partnership between a major transnational food company and the global environmental organization WWF. Today, the MSC certifies more than 10 per cent of the world's capture fisheries, including several of those for Antarctic krill, Barents Sea cod, herring in the Nordic Seas and, until 2019, mackerel.

As Hønneland shows, the MSC has played a role in the mackerel dispute from the outset, because the certificates awarded to several of the regional mackerel fisheries, initially in 2009, were made conditional on reducing quota overfishing and ensuring international agreement on a new harvest-control rule. The risk of having their certificates withdrawn was among the motivations for a loosely coupled group of pelagic industry associations in the Northeast Atlantic, the Mackerel Industry Northern Sustainable Alliance (MINSA), to engage with management bodies, scientists and the media in favour of an inclusive quota-sharing agreement.

From a resilience perspective, industry incentives pressing for mutual accommodation on the part of their respective governments are particularly welcome in disputes characterized by rigid positions among the states involved, as in the mackerel case. In Chapter 7, Østhagen and associates relate that rigidity to the political clout of the pelagic fishery associations when engaging in domestic decision-making – especially in Iceland and the Faroe Islands, but also in Norway. On this matter, the limits of what private governance initiatives can achieve are made clear by Hønneland in Chapter 5: MINSA has failed to recruit the Icelandic pelagic association, and any flexibility that its lobbying activities may have incited in other delegations has thus far been insufficient to overcome the differences.

More tangible outcomes of private governance are evident in the Southern Ocean. The MSC certifies most of the Antarctic krill fisheries. As Hønneland brings out in Chapter 5, stakeholder submissions, objections and conditions set by the MSC assessment teams have revolved around inadequate knowledge regarding the population dynamics of target stocks and their interaction with other ecosystem components. Keen to retain their certificates, fishery clients have therefore introduced sampling programmes in their own fishing activities and provided various financial

and in-kind support to research. As Stokke points out in Chapter 12, MSC-certified members of the Association of Responsible Krill Harvesting Companies (ARK) take by far the greatest share of the Antarctic krill catch; and they regularly provide vessel capacity for survey purposes, free of charge, as with the ambitious 2019 synoptic krill survey which covered all areas where krill fisheries occur. Moreover, ARK has used its observer status in CCAMLR to encourage parties to move forward on improving the risk-assessment procedure and developing a krill management system sensitive to updated information about the ecosystem. As Stokke adds, this association has also assumed voluntary restrictions more stringent than CCAMLR conservation measures, including the pledge to avoid krill-fishing grounds located close to breeding grounds and foraging areas for land-based predators.

Therefore, paying attention to the socioeconomic setting for international governance efforts is important for understanding variation in institutional resilience. As with the prosperity of the states involved, the relative clout of various categories of non-state actors involved is likely to influence the configuration of interests among regime participants and the resources available for overcoming differences.

Institutional design and interplay management

The third set of generic factors important for effective governance pinpointed by Young and Stokke in Chapter 3, besides problem structure and broader setting, concerns attributes of the management institutions themselves and their interplay. We noted in Chapter 1 that the regimes studied in this book display considerable diversity with respect to *procedural strength*, i.e. the means an institution provides for enabling the adoption of binding decisions on substantively controversial matters. The cases studied in this book have brought out the relevance of such strength for institutional resilience, notably the existence of firm procedures for protecting the integrity of scientific advisory bodies and decision-making arenas allowing regular negotiations among all the states involved in the fishery. Also conducive to institutional resilience are certain substantive norms on conservation and allocation as well as dynamism within a steadily wider complex of institutions relevant to fisher compliance, including trade rules and private governance schemes.

A relevant feature of most of the management processes examined in this book is that adaptations to stock-shifts have involved interplay within the larger complexes of institutions that co-govern various activities occurring within a geographic area. Such institutional interplay, in which one institution affects the contents, operations or consequences of another institution, has been the subject of growing interest in studies of international governance in realms ranging from fisheries (Stokke 2001), to genetic resources (Raustiala and Victor 2004), and climate change (Keohane and Victor 2011). Various terms are employed for such institutional complexes, but the core conceptual components are the same: plurality of institutions that are distinctive in terms of decision-making and participation, yet deal with the same activity, or aspects of the same activity, usually in a non-hierarchical manner (Oberthür and Stokke 2011).

As shown in Chapters 7 to 9, conducive institutional interplay is central to the cognitional resilience that has marked the management regimes in the Northern

Seas, each centred on a decision-making procedure that includes written advice from ICES. The institutional features that make this organization particularly well suited for solving the cognitional problem in Northeast Atlantic fisheries management are its membership, comprising national fisheries research institutions in all coastal states, and a set of procedures that can balance the salience or policy relevance of the advice with insulation from political pressure that may be exercised by industry or governments (Stokke 2019).

On the salience side of that balance, ICES receives annual requests for advice on the total allowable catch of specified stocks from the management bodies or their members, often identifying particular issues in need of scientific elucidation (ICES 2017). In responding to such requests, ICES calls first upon a working group typically dominated by experts from the members involved in the fisheries (and therefore with incentives to finance research activities). This working group compiles available data and conducts the necessary analyses.

Insulation from political pressure is among the aims of the subsequent step in the ICES advisory procedure: a review group or process involving experts from members without any stakes in the fishery who are asked to examine the analysis against the benchmark of 'best available science' and to develop draft advice. Next, the ICES Advisory Committee reviews that draft, modifies it as appropriate and adopts the official advice. Thus, most of the underlying work is typically carried out by researchers from the main harvesting states – whereas the development, quality control and provision of the advice is placed in a multilateral setting centred on third-party peer review.

In the Southern Ocean, the Scientific Committee that advises CCAMLR on conservation measures is less shielded from political controversy than its Northern Seas counterpart, because the advice must be adopted by consensus among committee members. Nevertheless, as Stokke argues in Chapter 12, the high degree of transparency that characterizes the Scientific Committee, based on the requirement in its Rules of Procedure that it shall report 'all the views' expressed in the deliberations, implies that also in CCAMLR decision-making proceeds on the basis of broad scientific input, also in matters marked by controversy.

Institutional characteristics important for regulatory resilience include, beyond those promoting scientific integrity, two types of rules that shape the ability of states to obtain agreement on conservation and allocation on a regular basis – procedural and substantive.

In practice, the procedural rule of consensus predominates in all the management regimes examined here. For CCAMLR and the JNRFC, this rule is formalized in the constitutive documents. In the considerably shallower and more loosely coupled 'coastal states' regimes that emerged in the 1990s with the recovery of the large pelagic stocks in the Nordic Seas, each member may de facto veto an inclusive agreement by refusing to join it – which each member has indeed done at one time or another. As elaborated in Chapter 1, regulatory negotiations on the pelagic stocks proceed by two rounds of multilateral negotiations and numerous bilateral negotiations between coastal states concerning quota exchange and reciprocal access to each other's zones. Thus, although NEAFC procedures allow for qualified-majority decisions, the ramifications for those

decisions have already been set in less formalized processes, jointly providing ample opportunity for exit. And as Molenaar notes in Chapter 2, the provisions on decision-making in the Central Arctic Ocean Fisheries Agreement indicate that a consensus requirement will prevail there as well. The formal or *de facto* consensus rule applied in all the regimes examined here places obvious limits on their ability to respond rapidly and effectively to change whenever members disagree on how to respond.

Preventing or handling regulatory disagreement is precisely the role intended for the substantive decision rules on conservation and allocation which more and more fisheries management regimes have adopted, encouraged by the development and diffusion of the precautionary approach to fisheries management during the 1990s (Stokke 2001). As Jørgensen notes in Chapter 8, some time ago the JNRFC adopted long-term management plans with specific harvest-control rules for all the shared stocks (see also Hønneland 2006; Kvamsdal et al. 2016). When combined with fixed quota-allocation keys, these harvest-control rules – based on biological reference points and, in the case of the valuable Northeast Arctic cod, an inter-annual quota stability clause – have greatly facilitated reaching agreement on management responses to any changes in the stock. In the Barents Sea fisheries regime, annual decisions on conservation as well as allocation are normally obtained more by calculation than by negotiation.

CCAMLR has adopted a preliminary decision rule for Antarctic krill which facilitates the setting of catch limits – but a main limitation of that rule is its arbitrary nature and its disjunction from updated information on the state of this stock and the needs of its predators (see Ch. 12). The inclusively agreed harvesting-pressure rules in place for herring and blue whiting (but not mackerel) in the Nordic Seas (ICES 2019) are superior in that respect, but disagreements over how to allocate the corresponding total allowable catch have reduced their practical value considerably. A substantive decision rule on conservation facilitates regulatory resilience – but cannot deliver it reliably unless supported by a legitimate allocative rule or procedure.

The legitimacy of such allocative rules or procedures – argue Young and Stokke in Chapter 3, after reviewing a string of regulatory successes and failures – can be upheld in several ways. A fixed allocation key with a long duration (Franck 1990), like the more than forty-year old 50/50 sharing agreement on Northeast Arctic cod, is likely to be more robust than one adopted recently. However, an explicitly temporary division key may be perceived as more legitimate for stocks that fluctuate widely in abundance and distribution, such as Icelandic capelin in the Nordic Seas (also Kvamsdal et al. 2016). And whether fixed or temporary, allocation keys accompanied by a flexibility mechanism whereby the parties may exchange part of their respective quotas for access to other species in the region are likely to remain acceptable to all parties over time, as they allow states to buffer changes and capitalize on differences in how they value the species in question (also Chs. 7 and 8).

As with the cognitional management task, certain institutional characteristics have proved important for the high resilience displayed on the compliance side of management in the fisheries regimes examined here. As Molenaar points out in Chapter 2, the 1995 UN Fish Stocks Agreement operationalized the general duty which states have under the UN Convention on the Law of the Sea (UNCLOS) to cooperate on fisheries management by linking it to RFMO/As. In the realm of compliance, regional

organizations such as CCAMLR and NEAFC have pioneered various cooperative measures for detecting and deterring harvesting not authorized by regime members – including vessel-monitoring schemes, catch documentation requirements and IUU vessel lists. As Molenaar notes, the RFMO/As have generally designed the trade-restrictive part of their IUU measures in ways that target vessels rather than states, thus reducing the risk of challenge under the dispute settlement procedure of the World Trade Organization.

The relationship between fisheries compliance measures and international trade rules is also central in Stokke's account in Chapter 9 of how the coastal states in the Barents Sea have gradually expanded their compliance systems to ensure continued effectiveness. A first step was taken in the 1990s with the establishment of the Permanent Committee on Compliance and Control under the JNRFC, enabling deeper cooperation among the enforcement agencies of the two states (see also Ch. 8). One decade later, when Russian fishing companies began delivering their catches in various European ports beyond the reach of their home governments, cross-regime adaptations were necessary – primarily involving the mobilization of the multilateral compliance system operated by NEAFC.

In short, important institutional attributes conducive to the resilience of resource management regimes can be observed at the micro-level: procedural or substantive means for supporting the cognitional, regulatory and compliance tasks of management. As this section shows, such conduciveness may also derive from institutional characteristics observable at the macro-level, including the interplay among several institutions with different memberships and capacities. One important such macro-level characteristic is the extent to which the interplay makes good use of the institutions' respective strengths, as it does in the cases involving dynamic interplay between bilateral and multilateral levels of governance or between international resource-management and trade regimes.

Disaggregate analysis, case diversity and broader lessons

In this book we have examined the resilience of fisheries management regimes by focusing on how climate-related stock-shifts have affected the cognitional, regulatory and compliance management tasks in cases involving four major marine stocks, attentive to processes of institutional adaptation. Among the advantages of such tripartite disaggregation of resilience analysis is to facilitate comparison across cases of fisheries management. Such disaggregation ensures that the study of institutional adaptation attends, in operational detail, to the three core activities that participants and sub-bodies in most international fisheries regimes actually engage in – generating knowledge and providing advice, negotiating agreed regulations and taking steps to enhance compliance (Stokke 2012).

Another advantage of the disaggregate approach to governance analysis, besides promoting comparability, is to facilitate a more nuanced assessment of adaptation and performance one that is sensitive to successes and failures concerning each part of the larger management challenge, whatever the overall performance of the regimes

in questions. Moreover, as the preceding section shows, the specific combination of problem structure, political and socioeconomic setting and institutional characteristics that best explain variation in resilience regarding *one* governance task does not necessarily provide the most compelling account for the other two.

What lessons, then, can be derived from our case studies? And what of their applicability to broader sets of efforts to adapt fisheries management to the impacts of climate change in other parts of the world?

One finding that cuts across the cases examined here is that institutional resilience is especially important, but unfortunately also especially difficult to obtain, when problem malignancy is high. Rising malignancy may be due to an increase in the number of actors involved in the fishery, a more extensive spatial stock shift or one implying greater availability on the high seas or in areas where jurisdiction is disputed, or it may derive from a rise in economic value of the fishery. All these external perturbations tend to make the non-cooperative option relatively more attractive to the actors involved in management, thus raising the risk of management failure.

On the cognitional dimension, non-cooperation shows up as suspicion among the scientists involved that inputs from others are politically motivated and as perceptions among decision-makers that the scientific advice is unreliable. Our case studies indicate that maintaining cognitive problem solving under such circumstances is well served by a strong transnational network of experts firmly committed to shared standards of scientific inquiry and validation – which in the broader study of environmental governance is often referred to as an *epistemic community* (Haas 1992).

As all the cases examined here include such networks, although they vary in cohesiveness, our study does not put to test the proposition that the existence of an epistemic community is necessary for cognitional resilience – but the fact that the networks examined here continued to perform well also under the least-likely circumstances of highly disputed allocation, indicates that the scientific-cooperation lesson is broadly applicable (see Levy 2008). Moreover, the processes traced in our case studies indicate that such resilience is supported by peer-review procedures that can serve to counteract any political pressure on the advisory process, by the creation of special working groups tasked with establishing a shared factual basis on those parts of allocative questions that are scientific in nature, and by private governance schemes that incentivize industry contributions to research activities.

On the regulatory dimension of management, non-cooperation may involve harvesting quotas set up unilaterally by states or other entities, typically adding up to total allowable catches in considerable excess of what the scientists recommend. Our case studies indicate that in situations involving strong power-asymmetries, coercive means such as economic sanctions may prove relevant for inducing cooperation – although such means have not succeeded in generating comprehensive allocation agreements in the cases studied here. Processes traced in our cases as well as the comparative analysis indicate that a well-functioning scientific advisory body and pressure from private governance bodies are conducive, but not sufficient, for regulatory resilience.

Similar comments apply regarding substantive decision rules that facilitate annual negotiations over conservation and allocation issues, notably harvest-control rules and

fixed or adjustable quota-division keys. Such substantive decision rules appear to be conducive for regulatory resilience in the cases examined here, but only if both kinds are present. Moreover, the single case in which both kinds of rules are present involves relatively low malignancy and relatively high procedural strength. By implication, the high score on regulatory resilience in that case is probably explained in part by those favourable circumstances. Since favourable circumstances also make that case a most-likely success story from a methodological point of view (Levy 2008), any claim concerning broader applicability of such substantive decision rules as an effective means for obtaining regulatory resilience should be stated with caution.

On the compliance dimension of management, non-cooperation shows up as opportunistic reporting practices among fishers and inadequate effort or ability by states or other relevant entities to cross-check such reports with complementary sources of information, such as inspections and satellite monitoring. Our case studies indicate that providing international management regimes with strong compliance systems which commit members to procedures that enable review of their compliance performance and joint development of measures for raising the cost of rule violation among fishers can work effectively – also under malign circumstances when the availability of a stock is high relative to the total allowable catch and corrupt practices are well established in the value chain. Also the diffusion of many such means for monitoring, control and surveillance among RFMO/As during the 2010s testifies to the broad applicability of that finding, although parts of the menu of compliance measures may prove more difficult to implement if regime members are less wealthy and/or technically advanced than in the cases studied here. Further, because fishers and fishing companies that are prepared to take more fish than their entitlement will constantly search for new ways to evade control, our studies show how decision-making on such compliance systems should be flexible enough to allow adaptation, also by involving new actors and institutions that can be relevant for combating illegal, unregulated and unreported fishing.

Summing up, then: the separate analyses of challenges, adaptations and performance on the cognitional, the regulatory and the compliance sides of management offered in this volume have meant that lessons regarding the conditions for institutional resilience, including the strategies for avoiding institutional failure, have been substantively richer and also more precise than would otherwise have been the case.

Note

- 1 Parts of this section draw on material published in Stokke (2022).

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