Stakeholder-led knowledge production: Development of a long-term management plan for North Sea Nephrops fisheries

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This paper investigates how different kinds of knowledge are mobilised in interactions between the stakeholders, scientists and bureaucrats who are involved in EU fisheries management. It reports on an initiative led by the North Sea Regional Advisory Council aimed at making a long-term management plan for Nephrops fisheries in the North Sea. The sharing of knowledge between the actors is explored using insights from organisation management, focusing on the kinds of resources and efforts that are needed at different boundaries to allow knowledge sharing and knowledge production to occur. The findings point to the challenge of reaching a common understanding between actors when both novelty and high stakes are involved. Experiences gained during this pioneering initiative raise questions about how far it is possible to take a ‘bottom up’ collaborative process aimed at developing management instruments within a setting where there are conflicts of interests between the stakeholders involved.

Keywords: knowledge production; fisheries management; stakeholder participation; Common Fisheries Policy; knowledge exchange.

1. Introduction

The production and use of knowledge are important elements of sustainable environmental management (Cash et al. 2003; Cornell et al. 2013). Over the last few decades, the dominant role of scientific knowledge in management and policy processes has been challenged. Decision-making may take place within networks of interdependent actors who all have a share of knowledge and who do not take scientific authority for granted (Metze 2010). At the same time, researchers point to a gap between the knowledge produced by science and the use of knowledge in policies and politics (Etzkowitz and Leydesdorff 2000; Gibbons 2000; McNie 2007; Nowotny et al. 2001; Seijger et al. 2013; Van de Ven and Johnson 2006). Several participative or interactive ways of producing knowledge have been suggested to bridge this gap. These include Mode 2 (Gibbons et al. 1994), post-normal science (Funtowicz and Ravetz 1993), and engaged scholarship (Van de Ven and Johnson 2006). In these forms of knowledge production, emphasis is given to producing salient, credible and legitimate knowledge (Cash et al. 2003) in deliberation (Metze 2010) and the involvement of non-science actors in the process (Hegger et al. 2012; Hessels and van Lente 2008). Collaborations between actors from different knowledge domains are faced with numerous challenges related to how various forms of knowledge interact (Garrett et al. 2012; Verweij et al. 2010; Mackinson and Wilson 2014). Mixed-actor knowledge production has a different dynamic from that of scientific knowledge production. However, our understanding of the detailed dynamics of knowledge exchange processes is limited (Fazey et al. 2013).

In this paper, we analyse a collaborative knowledge exchange process in which a mixed group of actors with different types of knowledge is engaged and comes together to produce a specific tool for European fisheries management. The focus is on how different forms of
knowledge are mobilised in the interaction between stakeholders, scientists and bureaucrats in a process led by the North Sea Regional Advisory Council (RAC)\(^1\) to make a long-term management plan for North Sea Nephrops fisheries.\(^2\) The North Sea RAC is one of seven advisory councils established as stakeholder forums as a result of the 2002 reform of the European Common Fisheries Policy (CFP).\(^3\) RACs were formed to provide recommendations on the management of fisheries to the European Commission’s Directorate-General for Maritime Affairs and Fisheries (DGMARE) in Brussels, and to EU Member States. From the outset, their membership consisted of two-thirds representation from the fisheries sector and one-third from other interest groups, including non-governmental organisations (NGOs) (Council of the European Union 2004).

The kind of management tool that the North Sea RAC aims to produce in the process analysed in this paper serves as guidance for the European fisheries ministers when setting quotas (total allowable catches (TACs)) during their annual Council meetings. In the context of EU fisheries management, long-term management plans usually specify the measures to be used to reach the overall management objectives for each fish stock. The initiative to make such plans would normally come from DGMARE. Limited stakeholder involvement in these processes has generated a sense within the fishing industry that management plans represent ‘top-down’ management instruments imposed on them ‘from Brussels’, resulting in limited support from the fishers (Kraak et al. 2013; Wilson 2009a). The North Sea RAC initiative to develop a management plan for Nephrops fisheries, which is analysed here, exemplifies a different and non-standard approach: a ‘bottom up’ process in which the stakeholders are in the driving seat while other actors (scientists and bureaucrats) are invited into their process to contribute with relevant knowledge. This sets the case apart from the more frequently encountered settings in which stakeholders are mobilised to contribute to research projects run by scientists (O’Brien et al. 2013; Röckmann et al. 2012; Talwar et al. 2011).

The central question addressed in this paper is how knowledge is used and produced in interactions between actors who have different forms of knowledge and who are engaged in developing a long-term management plan for the North Sea Nephrops fisheries. Our aim is to contribute to the understanding of knowledge production in multi-actor settings. Inspired by Edelenbos et al. (2011), we here refer to collaborative knowledge production as the interactive process between stakeholders, scientists and bureaucrats aimed at exchanging, combining and harmonizing facts, interpretations, assumptions and causal relations from different knowledge domains when developing a tool for fisheries management. To analyse the way in which knowledge is produced in collaboration between different actors, we apply the framework proposed by Carlile (2004). This framework focuses on how knowledge is exchanged between actors, and how actors are challenged to overcome their differences in perspectives and interests when aiming to produce new knowledge together. The approach allows for in-depth exploration of processes at boundaries. This is an area where the research interests of science and technology studies scholars and organisation and management studies scholars overlap (Zeiss and Groenewegen 2009). Managing processes at boundaries is also recognized as an important element of effective knowledge systems in support of sustainable development and environmental management (Cash et al. 2003). In the present study, boundaries refer to the interfaces between actors who engage in knowledge sharing to achieve a common goal.

The remainder of this paper is as follows: In Section 2, we discuss knowledge production in the collaborative setting of making a management plan and introduce Carlile’s (2004) framework. The actors, and the roles and forms of knowledge they represent in the context of developing a tool for European fisheries management, are introduced. We then describe the methods used to collect and analyse data for the case study. Section 4 starts with a brief introduction to the Nephrops fisheries in the North Sea. This is followed by descriptions of how the knowledge and interests of stakeholders, scientists and bureaucrats interacted in the process of producing a management plan. In the Section 5 we reflect on the dynamics of knowledge sharing in the light of the various challenges encountered and the resources mobilised to overcome them. Finally, conclusions are drawn in Section 6.

### 2. Knowledge production in collaboration

Groups of actors contribute with different forms of knowledge. The terminology used to describe types of knowledge in the environmental management literature include ‘indigenous’, ‘traditional’, ‘personal’, ‘lay’, ‘local’, ‘tacit’, ‘explicit’, ‘formal’ and ‘informal’ (Raymond et al. 2010: 1768). It illustrates the diversity in types of knowledge that may be brought into a collaboration in a mixed-actor setting. The allocation of types of knowledge into categories such as ‘scientific’, ‘local’ or ‘hybrid’ should be done with caution, given that knowledge is ‘inherently personal’ (Raymond et al. 2010: 1769). In this paper, the actors who are engaged in the development of the long-term management plan for Nephrops fisheries are divided into categories (stakeholders, scientists and bureaucrats), signalling an underlying assumption that the type of knowledge that individuals bring to a collaborative process is somehow associated with their role. As a further general simplification: stakeholder knowledge can be characterized by its social validity, scientific knowledge by its scientific validity, and bureaucratic knowledge by its usefulness for the policy process (Edelenbos et al. 2011). While scientific
knowledge production follows established practices that include the application of academic discipline-specific methods and quality assurance of the output through peer review of publications, the mechanisms of mixed-actor knowledge production are not equally well established, nor are the tangible outcomes from such collaborations always easy to pinpoint.

The generation of knowledge is a multi-faceted and complex process resulting from interactions in which tacit and explicit knowledge is produced (Nonaka 1994). Tacit knowledge is based on the individual’s action, commitment and involvement and is difficult to express in words, while explicit knowledge is articulated in language and can be captured and transmitted, for example through written records. Nonaka distinguishes four modes of interplay between tacit and explicit knowledge: socialization (tacit–tacit), externalization (tacit–explicit), combination (explicit–explicit) and internalization (explicit–tacit). Interactions that can make tacit knowledge explicit are important to understand the dynamics of knowledge production in mixed-actor settings. Actors must be able to share their experiences and perspectives. The ability to communicate thus becomes a key issue in such interactions. Collins and Evans (2008) suggest that interactional expertise plays an important role in enabling communication across knowledge domains. They define interactional expertise as:

...the ability to master the language of a specialist domain in the absence of practical competence. (Collins and Evans 2008:14)

Collaborative knowledge production is challenged when the actors engaged start out with different kinds of knowledge, with little overlap between their domain-specific knowledge (Carlile 2002, 2004; Tsoukas 2009). A framework proposed by Carlile (2004) was developed to investigate the dynamics of knowledge sharing in collaborative processes aimed at innovation. Fig. 1 illustrates a modified version used here to analyse the knowledge-sharing processes between the actors who were engaged in developing a management plan for North Sea *Nephrops* fisheries. The framework draws attention to the multiple boundaries between actors and to the different characteristics these boundaries might have. Actors need to access each others’ knowledge for common understanding to develop and new knowledge to emerge. A common understanding enables the process to move forward towards a collectively produced outcome.

The boundaries between the actors have different characteristics, ranging from low to high complexity, depending on the setting. Elements that contribute to increased complexity include high degrees of novelty related to the issue and high stakes among the actors. These elements might be present separately or simultaneously.

The framework distinguishes three levels of complexity. The purpose of making such a distinction is to clarify what kinds of resources and efforts are needed to succeed with knowledge sharing, given different circumstances. The high or low complexity setting indicates which boundary process is at play and points to the kinds of resources and efforts that must be mobilised. For example, different kinds of communicative processes are needed at the three levels. They are illustrated in Fig. 1 as: exchange, deliberation and negotiation. At low levels of complexity, having a shared vocabulary might suffice to allow the exchange of knowledge between actors through the boundary processes referred to as transfer. As novelty, stakes and complexity increase, deliberation, including multiple iterations, will be needed to allow sharing of knowledge through translation processes. Boundary objects with appropriate characteristics for the task at hand (Carlile 2002), and boundary spanners (Williams 2002) who can mobilise resources and efforts and facilitate deliberations between actors with diverging knowledge and interests, are examples of resources that will be useful in such settings. At the highest level of complexity, the high degree of novelty of the issue and the actors’ high stakes challenge the sharing of knowledge between them. In such settings, the knowledge needs to be transformed for it to be shared and developed. For transformation of knowledge to take place, the actors must be willing—and able—to move outside their own familiar territory. Trade-offs might be needed, which implies that the transformation of knowledge is a political process and that knowledge production in this setting comes at a cost. At this high-complexity boundary, the sharing of knowledge takes the form of negotiations and the communicative process between actors is likely to benefit from support from a neutral facilitator. Given the complexity at this level, the distinction between knowledge production and decision-making might become blurred.

A key message embedded in this framework is that knowledge production in settings where the goal is to move beyond existing, collective knowledge and to produce something new is a challenging endeavour. Resources and efforts that enable the actors to share
their knowledge at various levels of complexity must be available for the collaboration to be fruitful. If the actors involved start out with little common knowledge, the process must allow common knowledge to evolve before complex issues can be addressed. If the actors involved have high stakes in the issues, this further adds to the challenge of producing new knowledge together. The transformation of knowledge at a high-complexity boundary requires different kinds of resources and efforts than exchange of knowledge at a low complexity boundary. We use this framework to illuminate the kinds of resources and efforts that are in place to facilitate knowledge production within the setting of the Nephrops management plan collaboration. Conversely, elements that are lacking, or that hinder progress in this mixed-actor setting, can be identified.

The actors involved in this study are categorized as stakeholders, scientists and bureaucrats, reflecting the roles they represent in the collaboration analysed. The stakeholders are members of the North Sea RAC. Their collective knowledge encompasses both fishing industry interests and nature conservation issues. This stakeholder knowledge base is thus wider than what is captured by the term ‘fishers’ knowledge’, which refers to insights about the dynamics of knowledge production in a mixed-actor setting. Tangible outcomes of the collaborative process that could represent individual tacit knowledge becoming explicit—and thus being made available for the collaboration to be fruitful—are of particular interest. The

3. Methods

A case study approach (Yin 2009) was used to investigate the dynamics of knowledge production in a mixed-actor collaboration where stakeholder knowledge, scientific knowledge and bureaucratic knowledge come together. Empirical data were collected through document review, observations in meetings, and semi-structured interviews. Combining the three methods gave opportunities for triangulation through assembling multiple records of key issues and events via several sources. The document review focused on establishing the time line for the making of the Nephrops management plan, identifying the key actors involved and key issues discussed. The process is well documented. Detailed minutes from meetings organised by the North Sea RAC are publically available via the North Sea RAC server (www.nsrac.org). Additional material was kindly supplied by the North Sea RAC rapporteur. In addition to minutes of meetings and draft versions of the management plan, documents of interest included scientific advice for North Sea Nephrops provided by ICES and correspondence between the North Sea RAC and the European Commission.

The principal investigator participated as an observer in six meetings of the North Sea RAC Demersal Working Group in 2012 and 2013, and in two meetings of the North Sea RAC Nephrops Focus Group in 2013. These events provided opportunities for observing the interaction between the key actors and gaining an understanding of the issues being discussed. In addition, the investigator spent April 2013 visiting a large fisheries stakeholder organisation in the UK to gain insights into how individuals, who represent the interests of fisheries stakeholder constituencies in RACs, operate. The on-site visit provided opportunities for learning about the diversity of views and interests within fisheries stakeholder organisations and the issues and challenges encountered by their representatives.

Ten semi-structured interviews were conducted with stakeholder representatives and five with scientists. Interview guides (Kvale and Brinkmann 2009) with open questions were tailored to each interviewee to address issues where their area of competence was of particular relevance to this study. Some of the interviews were of a scoping character, aimed at gathering background information on the role of stakeholder knowledge in the context of EU fisheries management. Five interviews focused specifically on the Nephrops management plan process. These interviews involved fishers’ representatives and environmental NGO representatives in the North Sea RAC, and scientists who had participated in meetings of the Nephrops Focus Group. The interviews lasted between 40 minutes and two hours and were conducted face-to-face (n = 10), via Skype (n = 3), and via telephone (n = 2). Eleven of the interviews were recorded and partly transcribed. For the others, detailed notes were taken.

Minutes of meetings, observer notes and interview transcripts were analysed using the ATLAS.ti (www.atlasti.com) qualitative data analysis software. The analysis aimed to pinpoint how knowledge was shared and accessed, both within and across groups of actors (i.e. stakeholders, scientists and bureaucrats). A coding scheme (Miles and Huberman 1994) was created to identify the kinds of knowledge the actors brought into the process (i.e. scientific, stakeholder and bureaucratic knowledge) and the process of sharing knowledge among and between the actor groups. Tangible outcomes of the collaborative process that could represent individual tacit knowledge becoming explicit—and thus being made available to a wider audience—were of particular interest. The
4. Results

4.1 Nephrops fisheries in the North Sea

*Nephrops norvegicus* (referred to as *Nephrops* in this paper) are known under a number of names including Norwegian or Norway lobster, prawn, scampi and langoustine. They are pale orange crustaceans that live in burrows in soft sediments down to 800 meters deep (Johnson et al. 2013). In the North Sea, *Nephrops* are primarily caught by bottom trawlers in targeted *Nephrops* or mixed *Nephrops–whitefish* fisheries. The UK has 87% of the North Sea quota while Denmark, the Netherlands, Belgium and Germany each have small shares. Nine areas, called functional units, are important for the *Nephrops* fisheries in the North Sea (see Fig. 2). *Nephrops* do not move great distances and the functional units are considered to have separate stocks (International Council for the Exploration of the Sea 2013). The functional units differ in many respects, including data availability, distance from the shore, and importance for different segments of the fishing fleet. Offshore areas, such as the Fladen, are mainly visited by large vessels based in the Scottish harbours of Fraserburgh and Peterhead. Areas close to the coast, particularly the Farne Deeps, are important to smaller vessels that operate locally out of ports on the North East coast of England (Bailey et al. 2012).

The current management regime for *Nephrops* in the North Sea does not include a management plan. The quota is set annually by a Council decision based on a proposal put forward by the European Commission, which again is based on scientific advice from ICES. One quota (TAC) is set for the North Sea as a whole. This quota is divided between the Member States according to an allocation principle referred to as relative stability. The current system allows fishers who hold a share of the North Sea quota the freedom to ‘roam’, that is, to move between the functional units.

4.2 Stakeholders take the lead: The Nephrops Focus Group

The idea to make a long-term management plan for North Sea *Nephrops* fisheries evolved within the North Sea RAC soon after its establishment in 2004. A proper management plan, as envisaged by the North Sea RAC, would be different from the ‘standard’ ones with regards to both process and content. It would be developed with involvement from fishermen and it would encompass the biological, economic and social aspects of sustainability. Such a holistic plan had never been made before within the context of EU fisheries management and the North Sea RAC was entering unfamiliar territory. North Sea *Nephrops* was given priority because this fishery was thought to be relatively uncomplicated with only a limited number of countries and fleets involved. Lessons learned from the *Nephrops* experience could then be applied later when making management plans for more complex fisheries.

A Nephrops Focus Group was established as a subset of the North Sea RAC Demersal Working Group to do the hands-on work of producing the plan. This group first assembled in May 2007, re-started in April 2009, and has continued to meet irregularly since then. The meetings of the Nephrops Focus Group usually attract around ten participants, some of whom are North Sea RAC members and others who are invited to attend as experts to share their knowledge on specific issues. A rapporteur writes detailed minutes and transforms oral and written contributions from the meetings into updated versions of the management plan. Meeting documents are made publicly available via the North Sea RAC website. A core group consisting of fishing industry representatives from the UK attend most meetings and drive the work forward. There is a strong presence of North Sea RAC members who are employed to represent the Scottish catching sector and producer organisations, reflecting the importance of the *Nephrops* fishery to Scotland. A fisher who represents small vessels that operate out of English ports attends occasionally, and brings the concerns of this segment of the fleet into the...
In spite of this disappointing situation, the information Framework Directive. The idea to include conservation of the plan. The NGO representatives kept reminding the taken into account during the deliberations and drafting conservation perspectives on sustainable fisheries were during the first few years. Their involvement ensured that applications for EU fisheries management. Environmental could potentially set a precedent that will have wider im-

Danish fishing industries are also involved. Although their North Sea RAC members who represent the Dutch and Danish fishing industries are also involved. Although their quotas for Nephrops in the North Sea are small, a management plan for Nephrops will affect their fisheries and could potentially set a precedent that will have wider implications for EU fisheries management. Environmental NGO members of the North Sea RAC attended regularly during the first few years. Their involvement ensured that conservation perspectives on sustainable fisheries were taken into account during the deliberations and drafting of the plan. The NGO representatives kept reminding the fishing industry interests in the group that EU Member States would need to reduce the impacts of fisheries on the ecosystem to comply with the Marine Strategy Framework Directive. The idea to include conservation measures in the Nephrops management plan was not, at least not initially, embraced with enthusiasm by all. However, ecological objectives and measures were repeatedly discussed and sections on how to reduce discards, protect endangered species, and minimise damage to the seabed were incorporated into draft plans.

4.3 Bringing in scientific knowledge

When the Nephrops Focus Group first assembled in May 2007, its priority was to gain an overview of scientific knowledge about Nephrops. At that time, Scottish stakeholders were exploring possibilities for having their Nephrops fisheries certified. This acted as an incentive for them to search for management arrangements that would meet accreditation requirements. Scientists from Marine Scotland Science (then the Fisheries Research Services) were invited to bring the group up-to-date on the biology and stock status of Nephrops in the North Sea. After listening to the scientists’ presentations, and brainstorming around how these scientific contributions could possibly be translated into management options, the group concluded that:

We are not equipped with responsiveness to changes in stocks. There is no answer to what is best. There are simply too many uncertainties. (Nephrops Focus Group, minutes, May 2007)  

In spite of this disappointing situation, the information provided by the scientists regarding the way Nephrops are distributed in separate stock components clarified that some choices needed to be made with regards to the overall management strategy: 

The current exploitation regime treats the North Sea Nephrops as one stock, but in fact this stock consists of seven components. Question is, ‘could we manage risk better regionally’? From a biological point of view a regional approach might be better although this would be very difficult in view of the current management framework and relative stability issues. Two management extremes are plausible, broad brush or deep detail (in respect of the areas concerned). (Nephrops Focus Group, minutes, May 2007)  

The comment pinpoints an issue which became a key challenge for the Nephrops Focus Group. The fact that Nephrops in the North Sea are found in separate geographical stock components, referred to as functional units, motivated the implementation of management measures for each stock, at least from a scientific point of view. However, a politically rooted complication was immediately spotted by participants who had knowledge about how the principle of relative stability works in practice. The producer organisation representatives had in-depth knowledge about the complexity associated with handling quota allocations and this made these stakeholders sceptical of the prospect of introducing ‘deep detail’ management solutions.

The first meeting made it obvious that there were many knowledge gaps in the scientific understanding of Nephrops stock dynamics and that it would be problematic to proceed with making a management plan in light of all these uncertainties. Further work with the management plan was therefore put on hold while the scientists engaged in scientific projects and networks to improve the situation. A question was raised: Could the fishers assist with collection of survey data? The costs associated with the necessary underwater TV camera equipment were considered prohibitively high for this to be a viable option. Fishers’ perceptions of change in the abundance of Nephrops in the area are routinely collected through the North Sea Stock Survey (Napier 2012). However, the format of the data produced makes it of limited use in stock assessment work:

If the scientists were saying the stocks are going up and the fishers say the stocks were going down, then how would you use the qualitative information from the fishers? How would you put a quantitative number on that? It is very difficult to see how you could do that in any scientifically justifiable and supportable manner. […] It is difficult to plug that into an analytical assessment. (Interview, Scientist)

When the Nephrops Focus Group re-assembled in April 2009, the methods to assess stocks had been developed further. UK scientists were again invited to share their latest knowledge with the Nephrops Focus Group. Extracts from the scientists’ presentations were included as background information in a first draft of the management plan (Nephrops Focus Group, minutes, April 2009). The same scientists were also involved in various ICES expert groups, the groups that produce the science which underpins ICES advice to the European Commission on Nephrops stocks in the North Sea. In 2009, ICES provided the European Commission with advice that management
should no longer be at the overall North Sea level, but at the functional unit level (International Council for the Exploration of the Sea 2009). According to the latest scientific knowledge, functional unit management was needed to align catch opportunities with the status of the different stocks in the North Sea. However, the Nephrops Focus Group did not let go of the idea that a ‘broad brush’ solution, which would imply continuing with one quota (TAC) for the whole of the North Sea, was a viable option:

It would seem that the TAC system applied to the Nephrops fishery is effective and appropriate for controlling the impact of the fishery upon Nephrops stocks, although there is a clear problem in deciding whether the TACs should relate to each functional unit or to the North Sea as a whole. The Development Group is proposing that the main control should be through the setting of North Sea TACs, with the functional units being dealt with through ‘no more than’ clauses. Some functional units may require additional measures to protect them if stocks fall outside given parameters (Nephrops Focus Group, minutes, April 2009).7

Thus, the next challenge for the Nephrops Focus Group was to identify appropriate instruments to put into the management plan that would meet the requirement of aligning catch opportunities with stock status while avoiding the implementation of functional unit quota management. A ‘no more than’ clause was one of several instruments identified as promising. They then turned to the active fishers for wider stakeholder consultations about potential management tools and strategies.

4.4 Port visits and stakeholder consultations

The North Sea RAC wanted the development of their management plan to be a truly ‘bottom up’ process. However, lack of funding had made wider engagement difficult. In 2010, a collaboration between the North Sea RAC and a research project made it possible to arrange a series of meetings with fishers in English and Scottish ports. The port visits were announced in the local press and were arranged at weekends to make it easier for active fishers to attend. At the meetings, Nephrops Focus Group members explained the rationale behind the management plan and summarised progress to date regarding formulating biological and economic objectives. An extensive list of possible management measures was presented. The research project component of the meetings involved a participatory modelling exercise driven by scientists (Röckmann et al. 2012). An interviewee explained the role of the scientist:

I was there in a scientific capacity. We broke up into small discussion groups and people moved around between tables. I was there to try and answer things and post questions and receive information that could be beneficial in terms of putting together a scientific evaluation model for the types of management and the types of issues that the fishermen wanted to see. (Interview, Scientist)

A wide range of concerns were brought forward by the fishers, mirroring and re-emphasizing the divergent interests that had already been encountered within the Nephrops Focus Group:

Any sort of measures on the Farne Deeps would affect us disproportionately because we don’t fish anywhere else. The Scottish and Irish vessels tend to cherry pick fisheries. If there were specific measures in the Farne Deeps they could just go and fish somewhere else. It wouldn’t hurt them as much as it would hurt the local boats. (Interview, Fishers’ representative)

The comment alludes to conflict of interests between large and small, inshore and offshore operators. Fishers who use small boats wished to protect their local grounds from exploitation by larger vessels that move opportunistically between different areas. Potential problems with damage to the grounds caused by heavy multi-rig gear were also pointed out. On the other hand, fishers operating larger boats defended the use of multi-rig gear and highlighted the need for efficiency to ensure profitability. It was also clear that the enthusiasm among the stakeholders in the Nephrops Focus Group—who saw the making of a management plan as an opportunity to get their ideas through to the European Commission—was not shared by all. The rapporteur summarised some of the issues encountered:

There had been strong differences of opinion from fishers from different ports. In fact some fishers did not accept that any change was needed and did not support any move to change the current system of management in any way. As long as that position was maintained there would be difficulties in completing a management plan for Nephrops in the North Sea. (Nephrops Focus Group, minutes, July 2012).7

The magnitude of the challenge of engaging in a constructive dialogue with the fishers took the Nephrops Focus Group by surprise. Differences in the level of interactional expertise between the fishers’ representatives in the Nephrops Focus Group and the active fishers were noted as a concern by one of the scientists:

I think a lot of individual fishers can’t reconcile the differences between what is going on in the sea in the areas where they fish and the broad scale impressions that we get coming out of fisheries data and surveys. Because we are not seen out at sea very often it is quite often stated that we don’t know what is going on. At the individual fisher’s level there is still quite a lot of that sensed. The further up the fisheries organisations one goes, the organisations’ representatives have a better understanding of where we are coming from, and of our processes. Obviously, that possibly means that they are being as institutionalized as the rest of us – which is also one of the comments from the grass root fishermen. (Interview, Scientist)

Experiences from the port visits highlighted the importance of good communication between the stakeholder representatives and their constituencies. However, as the work with the plan evolved, more and more complex scientific
jargon was used in the discussions in the Nephrops Focus Group. It became increasingly challenging to communicate about their progress in a meaningful way:

Participation by the three scientists made the discussions at times very detailed and scientific today. At the end of a lengthy exchange about Btriggers, Bmsy, Blim, Bbuffs – and fishing mortalities in all shapes and forms, too – X [A fishers’ representative] reminded us: We need to think about language. At some point we will need to explain this. We need to have an outward surface. (Observer notes, Nephrops Focus Group, July 2013)

The lack of common ground between the fisheries stakeholders that became evident during the port visits was problematic for the Nephrops Focus Group. An idea was brought forward to gain new momentum with the management plan work by making a separate fishing plan for the Farne Deeps, the functional unit where the conflicting interests were most pronounced and where the status of the stock was becoming a concern. Scientists were commissioned to consult further with fishers and to explore which objectives and management options might be suitable, given the local characteristics of the Farne Deeps. Mobilising more knowledge through more interaction in the Farne Deeps study could possibly clarify how to move forward with the management plan. The study re-confirmed the diverging views and interests that had been encountered during the port visits: small versus large operators, and local versus roaming fleets (Bailey et al. 2012). It enabled the Nephrops Focus Group to narrow in on the ‘of which no more than’ clause as the most promising instrument for management of this particular functional unit, but tension between the various interests within the group remained:

In reality, what we are proposing is functional unit management under another name. It’s very much the same thing, slightly different measures. It is probably more acceptable to the Scottish interests than it is to us. They are very well represented. They have larger vessels to protect. As small individual boats, we are not as strong as the larger sections of the industry. (Interview, Fishers’ representative)

It would be a lot to ask from stakeholder representatives to endorse a proposed management measure that would benefit competing interests or hurt the interests of their own constituency without knowing if anything can be offered in return. In spite of this tension the collaborative spirit remained high:

I would say there is willingness on all sides [...] It is an extremely difficult process. Sometimes we don’t get agreement on everything. [...] We have to balance everybody’s views to get this plan together. There will be bits of the plan that I don’t like and there will be bits of the plan they don’t like. It is the art of compromising. (Interview, Fishers’ representative)

Another pilot study was later commissioned for the Fladen functional unit to incorporate knowledge from fishers who have in-depth experience with that particular fishing ground. The Nephrops Focus Group saw the Fladen study as an opportunity to try out if, and how, the various potential management measures could be applicable in an offshore functional unit with different characteristics to those of the Farne Deeps. How to integrate individual functional unit fishing plans into an overall management plan for North Sea Nephrops fisheries, was, at the time of this writing, yet to be decided.

4.5 Taking bureaucratic knowledge seriously

Several of the Nephrops Focus Group members interact frequently with managers and policy-makers as part of their daily jobs. Insights into bureaucratic processes at international and national levels enable them to align their work with the bureaucrats’ needs and thus enhance the saliency of the outputs produced. Direct involvement by bureaucrats in the Nephrops Focus Group has been limited. Scottish government representatives attended occasionally and provided links between the Nephrops Focus Group and bureaucrats at national and EU levels by, for example, sharing insights on what was high on the bureaucrats’ list of priorities. The primary addressee for the Nephrops management plan, once finalised, would be the European Commission’s DGMARE. DGMARE representatives were kept informed about the Nephrops plan through North Sea RAC Executive Committee and Demersal Working Group meetings, in which the status of the plan would regularly be on the agenda. Feed-back from bureaucrats has generally been very positive and this has served as welcome encouragement for the Nephrops Focus Group to continue to work on the plan, in spite of the challenges encountered. A draft was brought to the attention of the DGMARE Commissioner, who responded with complements to the North Sea RAC for their work:

We are very much aware of the excellent work that is being done by the NSRAC on the development of a management plan for Nephrops in the North Sea. Indeed, my services consider that it constitutes some of the best work done by any of the RACs.8

At the same time, the Commissioner indicated what the current priorities were for the bureaucrats, adding yet more complexity to the task at hand:

I would also urge you bear in mind that we aim to develop a mixed fisheries plan for the North Sea. I would be interested in hearing your ideas on how we should go about this, and on how your work on Nephrops can be integrated into a mixed fisheries plan.8

Finding solutions to the mixed fishery management dilemma for DGMARE was no small favour to ask from a RAC. The Nephrops plan evolved during a period characterized by hectic activities in preparation for reform of the CFP in December 2013. This meant that
the emerging plan could potentially serve as a test bed for new, innovative management measures to address high-priority issues such as mixed fisheries or discards. It also meant that the key actors involved—both the bureaucrats and the stakeholders—had many other, and more urgent, issues than Nephrops management on their agendas. Progress with the plan was slow, and there was a growing concern within the North Sea RAC that the Commission would move towards setting functional unit-specific quotas before they could present their final product. The problems foreseen with such a management regime were communicated to the DGMARE Commissioner, who in response assured the North Sea RAC of the Commission’s intention to carefully evaluate all alternative management options. While this gave the Nephrops Focus Group some breathing space, the threat of functional unit-specific quota implementation continued to act as a driver for the North Sea RAC to produce a plan that better reflects the stakeholders’ ideas of good management options.

5. Discussion

The fact that the process described in the previous sections is still ongoing after more than six years indicates that the making of an holistic management instrument through an inclusive ‘bottom up’ process, encompassing different forms of knowledge, proved to be much more challenging than was originally envisaged by the North Sea RAC. The overarching goal for the collaboration (i.e. to produce a management plan that will make North Sea Nephrops fisheries sustainable), was rather abstract. It was not clear to the Nephrops Focus Group what their final product could, or should, look like. The process is characterized by high complexity. The actors involved have high stakes and their own agendas, and the issues they need to tackle are novel. The actors collectively referred to as stakeholders, are a mixed group of individuals who represent producer organisations, NGOs and the fisheries catching sector from several countries. Their wide range of—sometimes conflicting—interests makes it clear that there is no such thing as one collective view or opinion that can be ‘extracted’ out of the heads around the table and brought forward to managers and policy-makers as ‘stakeholder knowledge’. Here, we discuss how the Nephrops Focus Group encountered and handled these challenges by drawing attention to the three knowledge-generating processes illustrated in Fig. 1: transfer through exchange, translation through deliberation, and transformation through negotiation, respectively.

A foundation for deliberations and negotiations was built during an initial phase in which facts and views that were considered relevant for the management plan by the Nephrops Focus Group were exchanged. Multiple meetings in a small-scale setting allowed for exchanges where the actors’ individual tacit knowledge could be made explicit through dialogue and a common vocabulary could emerge. The collective stakeholder knowledge base of the Nephrops Focus Group was complemented through consultations with scientists and bureaucrats. Through these interactions, the stakeholders in the Nephrops Focus Group acquired interactional expertise (Collins and Evans 2008) about issues that are typically situated within the scientific and bureaucratic knowledge domains. From the scientists, the stakeholders learned about Nephrops distribution and developments related to stock assessment methodology (i.e. scientific knowledge) that was highly relevant to the task of producing a management plan. From the bureaucrats, they learned about shifting management priorities related to the CFP reform process. They also became aware of the need to have a strategy to deal with uncertainties. Equipped with a common vocabulary on a wide range of issues, the Nephrops Focus Group engaged in deliberations and negotiations in search of a common understanding around issues where their interests diverged.

Diverging views within the Nephrops Focus Group were not problematic as long as everybody’s interests could be represented in the draft plans and no firm decisions had to be made. The early drafts of the management plan became a place to put ‘everything’: they became repositories for information gathered and insights gained. They also served as a means of keeping the wider North Sea RAC and DGMARE updated about progress. By adopting this strategy of filling drafts with content as they went along, and sharing them widely, the draft plans became boundary objects with exchange and transfer characteristics (Carlile 2002): they helped to establish a shared language and allowed the members of the Nephrops Focus Group to articulate, specify and learn about their differences with regards to interests and stakes. Importantly, they represented tangible products of their collective knowledge production efforts, thus making their collective knowledge explicit.

Functional unit management illustrates an issue where it became difficult for the Nephrops Focus Group to move on from talk to action. Putting together a list of management measures that could potentially be applicable for North Sea Nephrops fisheries was not in itself controversial. However, narrowing the list down to a set of measures that could be presented as the management tool of choice was much more difficult. This experience points to the challenge of transforming knowledge in a situation where there are conflicting interests involved, for example between the fishing fleets operating in the Farne Deeps. Conflicting interests, in combination with high stakes, the novelty of the issues, and different management options (including some that were entangled in the principle of relative stability) made functional unit management a conundrum. A central aspect of producing a management plan was to find solutions to this issue. Thus, putting functional unit management to the side when challenges were encountered was not an option.
The Nephrops Focus Group experimented with negotiation to try to establish a common stakeholder view. However, there was no neutral facilitator present, nor was the informal Nephrops Focus Group setting necessarily the preferred place for individual actors to make trade-offs. The way forward became to try to address the management problem at a local scale. The making of fishing plans brought new actors and new knowledge into the process. It allowed the Nephrops Focus Group to further explore which management instruments could be considered most applicable, given the specifics of each functional unit. This implied a shift—at least temporarily—to a lower level of complexity: away from negotiation back to exchange and deliberations.

When addressing ecological objectives and measures, all members of the Nephrops Focus Group saw the potential benefits of aligning the Nephrops management plan with the implementation of the Marine Strategy Framework Directive. With this factor acting as an external driver, it became less of a problem to formulate text in the draft plan on ecological objectives and measures that everybody could agree on. Further measures would eventually be specified in other directives and policies anyway, separate from the Nephrops management plan. How to align the content of the plan with a reformed CFP was, however, more problematic. In this case, the problem was not primarily associated with conflicting interests but with lack of direction. During the CFP reform process, creating a salient management instrument became like ‘shooting at a moving target’. The bureaucrats could not give clear answers as to what their priorities would be once the new CFP was implemented. These experiences highlight the challenge of making a management plan that is adaptable, not only to the changes in status of the resource in question (i.e. the status of Nephrops stocks in the various functional units) but to shifting management priorities.

Establishing common interests around issues that have high levels of complexity calls for a transformation of knowledge (Carlile 2004). In order for such transformation to happen, the actors involved must be willing—and able—to move out of their ‘comfort zone’ and change the way they approach and understand the issue at hand. Kotter (1995) identified a sense of urgency as an important element when implementing change. The Nephrops Focus Group did not need to meet any externally imposed deadlines, nor did they have the limits (or benefits) of an operating budget. This sets the context analysed here apart from most collaborative projects where the need to deliver a specified output by a specified deadline, within a specified budget, is usually part of the deal, and which introduces an element of urgency. Although the prospect of ‘top-down’ imposed functional unit quota management was seen as a threat by some of the Nephrops Focus Group members, it did not trigger a sense of urgency within the wider group of fisheries stakeholders. The reactions from the fishers during the port visits indicate that they were unconvinced that the introduction of a long-term management plan would make things better than ‘business as usual’.

It is a paradox that the increased knowledge in the form of interactive learning processes in mixed-actor collaboration are likely to be challenged by tight deadlines. While participatory initiatives, such as the voluntary Scottish conservation credits scheme (Holmes et al. 2011), connect fishers more directly with management measures that have an influence on their own operations. Such exposure may contribute to an increased interest among active fishers to engage in mixed-actor deliberations around management options.

Communication-related barriers are common in fisheries management settings. Garrett et al. (2012) draw attention to differences in landscapes of interactive learning between working fishermen and those who are hired to represent their interests. They stress the need to allow adequate time for interactive learning processes in mixed-actor collaborations. As time is a limited resource, participatory initiatives are likely to be challenged by tight deadlines. While lack of urgency possibly slowed down the overall process of bringing the plan towards the finish line, time constraints were indeed recognized in the research project that took place during the port visits. This participatory modelling exercise added a more traditional science-driven participatory element to the process. Ambitious goals were set by the scientists, and when the desired participatory modelling outcomes could not be reached during the short interaction with the stakeholders, the scientists were left with a sense of failure. On the other hand, the stakeholders were more positive in their evaluation of the participatory experience, as the interaction with the scientists had given them the feeling that they were being heard (Röckmann et al. 2012).

6. Conclusions

In this paper, we have analysed a collaborative knowledge exchange process led by the North Sea RAC in which a
mixed group of fisheries stakeholders interacted with scientists and bureaucrats to produce a long-term management plan for North Sea Nephrops fisheries. The collaboration included elements of novelty with regards to both content and process. This inspired us to apply an analytical framework developed specifically to help understand knowledge production in innovative settings where the actors involved have different forms of knowledge and interests. The approach was useful, as it highlights the importance of matching challenges with appropriate resources and efforts that will allow actors to connect and knowledge sharing to take place at various levels of complexity. We found that the transfer and translation of knowledge across low and medium complexity boundaries between actors could take place in this collaborative setting. However, the more complex process of knowledge transformation could not be accommodated.

Face-to-face interaction in meetings of the Nephrops Focus Group and the wider North Sea RAC over several years allowed the stakeholders to develop interactional expertise that extended beyond their own stakeholder knowledge domains into scientific and bureaucratic knowledge domains. The ability to communicate by using a common vocabulary, both within and between actor groups and roles, was essential for building common understanding at the lower end of the complexity scale. Draft management plans served as boundary objects, and the Nephrops Focus Group succeeded in producing tangible outcomes from their collaboration in the form of large sections of text that everybody could agree on. However, when hard decisions needed to be made on issues where high stakes were involved, the challenge at hand was not matched by the resources available. Examples of elements that can be helpful in such contexts include: generating a sense of urgency, having a clear common goal, and engaging a neutral facilitator to bridge the actors’ knowledge and interests through negotiations. Without the mobilisation of such elements, collaborative knowledge production in complex settings will remain challenging.

A move towards more participatory research and governance practices in EU fisheries is envisaged to result in greater stakeholder buy-in and compliance (Mackinson et al. 2011; Kraak et al. 2013). The difficulties encountered by the North Sea RAC in extending their sense of ownership of the emerging Nephrops management plan to the wider stakeholder community of active fishers is a concern that will need to be addressed when developing such participatory practices.

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Notes

1. The Regional Advisory Councils (RACs) were renamed Advisory Councils in December 2013. The name North Sea RAC is used throughout this paper, reflecting the identity of this group during the time period studied.
2. The process is still ongoing at the time of this writing. This paper addresses how it evolved up until July 2013.
4. The total North Sea quota was 17,350 tonnes in 2013 (Council Regulation (EU) No 39/2013).
5. The principle of relative stability refers to an element of the CFP that specifies how quotas for each fish stock are shared between the Member States of the EU according to a fixed allocation key based on historic catches.

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