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Identities, Communities, and Practices in the Transition Towards Sustainable Mussel Fishery in the Dutch Wadden Sea

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Abstract The Dutch mussel fishery in the Wadden Sea, a World Natural Heritage Site, is currently involved in a step-by-step transition from the traditional but controversial method of dredging mussel seed from natural beds using trawl nets to alternative sustainable practices. The main objectives of the transition are to allow the natural development of mussel bed ecosystems and to simultaneously achieve a large-scale sustainable mussel fishery. The transition is a joint enterprise of state officials, environmental organizations, and the mussel fishery sector and requires striking a balance among their differing interests and identities. As such, it may be considered as an example of social learning. This article explores the multiple efforts and controversies of this transition using concepts such as identities, communities and practices. We conclude that the transition endeavor is characterized by innovative new practices that have brought together two in principle contradictory identities in order to negotiate natural and social limits that might facilitate a sustainable future for the mussel fishery in the Wadden Sea.

Keywords Nature conservation · Identity · Transition · Communities of practice · Socio-natural limits · Mussel fishery · Wadden Sea

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Introduction

One of the most serious environmental problems worldwide is the decline or collapse of fish stocks and the subsequent socioeconomic impacts on people dependent on these (Kooiman *et al.* 2005). The great challenge is how to transition towards sustainable fisheries that address both the needs of fishing communities and environmental requirements. This article explores the transition efforts of the mussel fishery in the Dutch Wadden Sea, a shallow sea at the rim of the European continent (Fig. 1) consisting of tidal flats, salt marshes, and barrier islands. The environmental and ecological value of the Wadden Sea have been recognized by UNESCO, which has designated it a World Natural Heritage Site; moreover, it is protected as a part of the European Natura 2000 network of nature reserves.¹ However, it is also recognized for its economic value. In addition to fisheries, other economic activities include gas exploitation, salt mining, port related industry, and recreation.

In the Wadden Sea, the blue mussel (*Mytilus edulis*) – henceforth referred to simply as the mussel – is one of the keystone species. Mussels live in colonies forming solid structures called mussel beds that increase the diversity of habitats and thereby the biodiversity of the Wadden Sea (Albrecht 1998; van der Heide *et al.* 2012). Mussel beds, for example, provide habitats for organisms such as the shore crab (*Carcinus maenas*), the winkle (*Littorina littorea*), and the sand worm (*Nereis virens*) (Dankers and Zuidema 1995). In addition, mussels are an important source of food for birds such as the oystercatcher (*Haematopus ostralegus*), the red knot (*Calidris canutus*), and the eider duck (*Somateria mollissima*).

¹ A large part of the Wadden Sea is regulated by Natura 2000, which is based on European Bird and Habitat directives.

Fig. 1 Map of the Dutch coastal zone

The interaction of environmental and economic interests usually generates prolonged conflicts with often disappointing results for many parties. Such conflicts in the Wadden Sea area have involved all the major economic activities: shellfish fishery (e.g., Swart and Van Andel 2008; Hanssen *et al.* 2009), gas exploitation (e.g., Turnhout *et al.* 2008), salt mining, industries, and recreation (Wortelboer and Bischof 2012). In order to articulate the controversy that has emerged around the conflicting interests of commercial mussel production and the conservation of mussel-beds-related ecosystems, the government, the mussel fishery sector, and environmental organizations are currently involved in a joint enterprise to realize a transition towards a sustainable mussel fishery. During the transition period the traditional but controversial method of dredging mussel seed - that is, the small mussels that form the basic resource for mussel farming - from natural beds using trawl nets will be replaced, step-by-step, by alternative methods. The main objectives of the transition are to allow the undisturbed development of mussel beds in the Wadden Sea and to simultaneously achieve a sustainable commercial mussel fishery.

These firm limits to human use of the Wadden Sea in terms of conservation and restoration are required by the European Natura 2000 directives and within the Dutch context this has been framed within the concept of *natural limits* (Meijer *et al.* 2004; RVDW 2007). According to Swart and Van der Windt (2012:402) this concept implies: “a framework of limit values for the most important natural parameters on which there is scientific consensus, such that if these limits are not exceeded, natural processes will continue undisturbed.” The application of this natural limits concept to the Wadden Sea has been justified (Meijer *et al.* 2004; RVDW 2007) because the area is legally considered to be one of the most important Dutch natural areas. However, Swart and Van der Windt (2012:404–405) have stressed that to understand conflicts around setting conservation goals what they call *social limits*

must also be taken into account, defined as: “a framework of limit values for the most important societal parameters on which there is social and scientific consensus, such that if these limits are not exceeded essential societal processes or conditions will go on undisturbed.” When natural and social limits do not overlap, this may provide space for resource utilization, otherwise at least one of the limits must be dropped.

The transition of the Dutch mussel fishery to sustainable harvesting methods requires the establishment of both the natural and social limits for the mussel fishery. The parties involved have therefore signed a “transition covenant.” The natural limits are delineated by, among other issues, the transition covenant’s recognition that the main objective for the Wadden Sea is ensuring its “sustainable protection and development as a natural area and the preservation of the unique open landscape” (PNERW 2010:68 – translated from the Dutch). Accordingly, the parties recognize the shared interest of lowering the dependency of the mussel sector on bottom-seed fishery and creating trajectory for natural recovery. However, the covenant also explicitly states that the economic aspect (i.e., social limits) of the mussel fishery will be maintained: fishing activities in the Wadden Sea, for instance, have to be guaranteed for the long term. Ever since the covenant was signed, the commercial mussel fishery sector, individual fishers, a number of environmental protection organizations, and the government have been involved in planning and carrying out practical experiments in order to develop sustainable practises. These efforts are focused on completely ending bottom-dredging of natural beds in 2020. The transition may be considered a social learning² endeavor, since it is

² Muro and Jeffrey (2012) define social learning as “a process of collective and communicative learning that is thought to enable stakeholders to arrive at a shared understanding of a specific environmental situation, and to develop new solutions as well as ways of acting together in pursuit of a shared ambition.”

characterized by the covenant's theme of "learning by doing." As steps are taken in the execution of the transition's plan, knowledge is produced through constant monitoring, while learning moments are generated that might lead to a sustainable transition (PNERW 2012). We may thus consider the transition enterprise of the mussel fishery as an example of social learning that seeks to establish, through the delineation of natural and social limits, sustainable practices for mussel fishery.

Theoretical Background

The transition covenant joins the growing body of literature that focuses on system transitions towards sustainable development (e.g., Grin *et al.* 2010). This is a co-evolutionary perspective that shows how the different elements of a system (e.g., visions, user practices, regulatory frameworks) interact and can be rearranged to trigger social change (Schot and Geels 2008; Seyfang and Haxeltine 2012). Three key elements that have to be considered when exploring transitions towards sustainability: (1) *Managing central expectations*: expectations are essential because they guide transitions. In this article, we explore the underlying identities that shape the expectations of the different stakeholders involved in the mussel transition. (2) *Building social networks*: this is important for facilitating interactions among actors. Here, we focus on the degree of community participation within the social network organized around the mussel transition. (3) *Learning practices*: we address the relationship between the actual practices conducted and the defined objectives towards sustainability.

The developments found in the mussel transition also fit the current trend in environmental governance aimed at boosting social learning through integrative and participatory knowledge management strategies (Armitage *et al.* 2008; Turnhout *et al.* 2008; Raymond *et al.* 2010). A related model introduced by Wenger and colleagues in order to understand the role of social learning is the theory of *communities of practice* (CoP): "groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (2002:4).

According to Wenger *et al.* (2002), there are three central elements that facilitate the understanding of learning processes – namely: the domain, the community, and the practice. These elements reflect the central aspects of the transition theory described above. The first element, the *domain* of knowledge, relates to the identity of the community, which is defined by a shared area of interest (e.g., issues, problems). In the mussel transition, we may assume that its *identity* can be expressed in terms of the *expectations* of stakeholders to define the transition's objectives towards a sustainable mussel fishery, i.e., a

fishery that takes into account both the economic perspectives of the commercial mussel fishery sector and the natural recovery of wild mussel beds. These objectives have been in principle accepted by all covenant signatories. The second element, the *community*, involves the people engaged in joint activities, discussions, and information exchange (Wenger 2006). Here we might cite representatives from the government, the mussel sector, and the environmental organizations involved. The third element, the *practice*, implies a "shared repertoire of experiences, stories, tools, and ways of assessing recurring problems" (Wenger 2006:2). Here we can cite meetings, the reports produced by the members of the community, and practical experiments to replace bottom-dredging by alternative methods, or the closure of areas to fishery.

Moreover, an important underlying concept (also for the CoP theory) is the concept of *boundary objects*, introduced by Star and Griesemer (1989:393), meaning "objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites." Wenger *et al.* (2002) apply such boundary objects as a linguistic form of collaboration for connecting and freeing-up different parties or practices. Such objects can be concepts, things, maps, and even landscapes. For example, the Wadden Sea area itself can be seen as a boundary object because it connects people, while, at the same time, the significance of the area can be interpreted quite differently by different parties. For example, it is considered by environmentalists as a natural ecosystem that should be protected and restored as much as possible, while fishers primarily view it as their traditional fishing ground. We see in the transition covenant, however, that both these parties agree that the Wadden Sea is an area that should be managed in a sustainable way.

In our approach we aim to apply these terms and concepts in order to characterize and understand the dynamics of the mussel transition as an example of social learning towards a more sustainable development. The three main questions we address are:

1. How can the domain of the mussel transition be characterized, taking into account different identities with different transition objectives?
2. How can the community of the mussel transition be characterized in terms of the degree of community participation of the different stakeholders?
3. To what extent do the practices (e.g., experiments and interactions) of the community strengthen the sustainability objectives as defined in the transition covenant?

Data for this exploration have been collected through research using scientific literature, reports, policy documents,

newspapers articles and websites, and by semi-structured interviews with key actors from government, fishery organizations, fishers, and environmental organizations.³ In the next section, we describe the current status of the transition and subsequently we analyze the transition process according to (and therefore answering) our three research questions. In the last section we derive some tentative conclusions.

The Dutch Mussel Fishery: A Practice in Transition

Mussel cultivation started in the Zeeland Delta in the south-west of the Netherlands (Fig. 1) in the nineteenth century (Ens *et al.* 2004). In the Wadden Sea, this practice was introduced in the early 1950s after a parasite decimated the Zeeland Delta mussel population (Smaal 1991; Ens *et al.* 2004). Currently, some 80 companies cultivate mussels in the western Dutch Wadden Sea on sub-tidal flats leased from the government. In 2011, a total of 7707 ha were distributed among 510 plots in this area De Mesel and Wijsman (2011). The sector estimates that about 700 persons are currently directly employed in mussel cultivation.⁴ In 2009, approximately 170 of them were working in the mussel fleet (Taal *et al.* 2010).

Mussel cultivation depends on access to “mussel seed,” that is, one-year-old mussels measuring 10–30 mm (Spencer 2002). The traditional method is to dredge mussel seed with trawl nets from natural beds and subsequently to deposit this on cultivation plots with a lower density than natural beds in order “to improve growth and fattening” (Spencer 2002:150). Most seed for Dutch mussel cultivation is harvested in the Wadden Sea because the Zeeland Delta shows far less spat fall⁵ (Bult *et al.* 2003).

During the first year mussels on cultivation plots reach up to 40–50 mm. Frequently these mussels are moved to other plots “with good growing conditions and low storm risks” (Dankers and Zuidema 1995:73). During the second year they grow to a commercial size of 55–70 mm (Spencer 2002). Mussels are then harvested and transported to auction. Empty plots are subsequently cleaned, and new half-grown mussels are deposited.

De Mesel and Wijsman (2011) found that in the fall of 2010 a total of 47.5 million kilograms of mussels were present in the western part of the Dutch Wadden Sea. Although production

fluctuates yearly, these figures make the Netherlands one of the main producers in the world (Spencer 2002).

In the early 1990s, the combined effect of storms, bad spat fall, and intensive shellfish fishery led to the disappearance of many intertidal mussel beds (Dankers and Zuidema 1995; Ens *et al.* 2004). This resulted in high mortality rates among birds, for which these bivalves are staple food (Beukema 1993; Turnhout *et al.* 2008). This event triggered a major controversy between shellfish fishers and environmental organizations about the future of the cockle and mussel fishery. Aiming to find a balance between these two groups the government implemented the Sea and Coastal Fisheries Policy in 1993. Among other measures, areas were closed for shellfish harvesting with the primary goal of restoring mussel beds. In addition, a policy for bird food preservation was implemented, enabling complete closure of areas in years with low shellfish stocks (MANFQ 1998; Hanssen *et al.* 2009). The effects of this policy were assessed in 1998 by an ecological evaluation program (EVA-I). However, the policy amendments failed to end the conflict because the measures apparently did not convince all stakeholders (Hanssen *et al.* 2009). Moreover, the controversy had already become a public debate in the media (Swart and Van Andel 2008). In this context, a follow up evaluation, EVA-II, was conducted, led by a steering committee formed by governmental officials, fishery representatives, environmental organizations, and research institutes. Despite these cooperative efforts, Hanssen *et al.* (2009) argued that “stakeholders remained entrenched in their respective positions,” the pro-nature camp arguing that fishery had been “proven to be damaging,” while the pro-fishers side claimed the opposite – defending its position in court and disregarding research results. In November 2004, however, the government approved a plan to end mechanized cockle fishing from January 2005 onwards, buying out this industry with money obtained from lifting the moratorium on gas exploitation in the Wadden Sea (Meijer *et al.* 2004). In addition, the commercial mussel fishery was required to work towards becoming sustainable by 2020. Nevertheless, fishing permits were repeatedly granted by the Dutch authorities, which allowed seed-dredging activities to continue. Some environmental organizations thought that these mussel-seed fishing permits did not acknowledge the natural limits for the use of the Wadden Sea and fought them in court. In 2008, the Dutch State Council banned a permit declaring illegal this kind of fishing in a large part of the Wadden Sea, relying on EU Habitat and Bird directives. According to the council, scientific evidence that mussel fishery did not significantly harm natural mussel beds was lacking (Hanssen *et al.* 2009; Jansen *et al.* 2012).

In reaction, mussel fishers launched the campaign “Stop the Green Lie,” strongly criticizing the environmental movement for disrupting productive processes in the (culturally and economically) relevant Dutch agrarian and fishery sectors. In

³ Data were collected between the spring of 2012 and the fall of 2013. Ten semi-structured interviews were conducted in May and June 2012. The interviews were conducted and transcribed in Dutch. The transcripts were analyzed according to our three research question. Specific quotes for this article were translated by our research team and the English proofread by the Language Center of the University of Groningen.

⁴ www.vriendenvandemossel.nl (accessed March 2014).

⁵ Spat fall is the process in which bivalves (e.g., mussels) larvae attach to a surface and begin to develop shells.

particular, they criticized the environmental organizations that fought the permits in court.⁶

The social and political pressure was such that both parties began intensive negotiations, and finally an agreement was reached in 2008 together with the government in the form of a covenant to gradually replace the unsustainable bottom-trawling with non-bottom dredging methods.

The Transition

At present, two partly overlapping phases can be distinguished in the transition after the signing of the covenant. During the first phase from 2008 to 2010, the agreement was further elaborated in the form of the execution plan published in the spring of 2010 (PNERW 2010). The second phase concerns the implementation of the transition plan, begun in 2009 when the mussel sector voluntarily decided to reduce bottom-dredging by 20 % as a first step in the transition, and without any assurance of an alternative (PNERW 2012).

The execution plan stipulates stopping bottom-trawling of mussel seed in natural mussel beds, replacing it step-by-step with alternative methods. On the basis of historical analyses, it was estimated that an average total of 40 million kilograms of seed could be caught in the Wadden Sea annually. Accordingly, it was agreed to irreversibly close down natural mussel beds trawl fishery in seven steps by 2020. Each step would have to be taken if the annual production of mussel seed by alternative methods was to be increased by about 5.5 million kilograms (PNERW 2012). The agreements and the results are regularly monitored and reported on in the form of progress evaluations.

During the first phase, the transition project consisted of two groups made up of members from all the covenant partners: a steering group making the decisions and a project group that prepared the decision-making process around the technical aspects of the transition (see below). This steering strategy has been continued in the second phase of the current transition process.

From these ongoing experiments it appears that the so-called “mussel seed or spat-collectors” are rather effective as an alternative for bottom-dredging. Usually these are net- or rope-like structures suspended in the water column, attached to a number of floats or to long-tubes (Fig. 2) that are anchored to the seafloor. Mussel larvae, which are free-moving organisms up until a size of approximately 0.3 mm, settle on the spat-collectors (Jansen *et al.* 2012). When they are grown to the appropriate size, they are harvested from the collectors and dropped on the cultivation plots.

The transition has led to mixed results so far. The years 2010 and 2011 showed very low spat fall. In 2011 the total production by spat-collectors was 7.4 million kilograms. However, part of the total production came from collectors installed before the covenant agreement and another part was collected from collectors in the Zeeland Delta. These two portions do not count in terms of the transition (PNERW 2012; Jansen *et al.* 2012), and the amount of mussel seed that counts in the transition step was lower than the required 5.5 million kilograms. Thus, after the aforementioned initial closure of 2009, the reduction of bottom-trawling stagnated. However, 2012 delivered a good spat fall, and spat-collector production has also been good (11.5 million kilograms in the Wadden Sea),⁷ meaning that the second step of the transition was already completed in 2013.

Moreover, although spat-collectors did not produce enough to trigger the follow-up transition steps in the first years, collector technology is considered rather successful because, despite low spat fall, it has resulted in higher seed harvests for those fishers using it. On the other hand, the collectors require heavy financial investments on the part of mussel fishers, jeopardizing (if they do not produce enough) the continuation of the transition.

So far, it is difficult to establish whether the other transition objective, that is, mussel-bed restoration, has been successful. Star-fish (*Asterias rubens*) predated most of the mussel population in one (approximately 150 ha) of the two already closed mussel-bed areas (Jansen *et al.* 2012).

In 2012 the transition discussion focused on another issue. According to Dutch law it is forbidden, without permission, to transport mussel seed harvested in the Zeeland Delta to the Wadden Sea (where growing conditions for mussels are better) because of the threat of introducing exotic species that can harm the protected Wadden Sea ecosystems. Nevertheless, the covenant framework has arranged some protocols for these south–north seed transports. Because of the low seed harvest of 2010 and 2011, the Ministry allowed south–north transports in April 2012. Around 40 transports were carried out from parcels in the Zeeland Delta to the Wadden Sea. To prevent the introduction of exotic species, several measures were taken: samples were collected in the Zeeland Delta to detect undesirable species, transports were carried out in the early spring, when water temperature is low, thus lowering the probability of undesirable species being present, and finally, mussel seeds were washed with fresh water and samples were taken before they were sown in the Wadden Sea plots.⁸ Environmental organizations, nevertheless, complained about

⁶ www.stopdegroeneleugen.nl/index.php?option=com_content&view=article&id=48&Itemid=53 (accessed March 2013).

⁷ www.visserijnieuws.nl/nieuws/8185-veel-meer-mosselzaad-ingevangen-in-mzisvoorlopige-oogstgegevens-2012.html (accessed July 2013).

⁸ www.rijkewaddenzee.nl/nieuws/nieuws/toestemming-vervoer-zeeuws-mosselzaad-naar-de-waddenzee (accessed July 2013).

the transports. However, the government did not find their arguments strong enough to reject the transport because fishers supplied the required scientific assessment in line with the Natura 2000 framework.

Exploring the Mussel Transition: Identities, Communities, and Practices

The Domain: A Dialogue Between Identities

Within the transition towards sustainability, one of the major challenges is to achieve a common commitment of all parties concerned to meet their different expectations, which are shaped by underlying identities. According to (Wenger *et al.* 2002:27), a domain of a community (of practice) requires “common ground and a sense of common identity.”

Identity is a widely used concept in sociological literature. For example, Castells (1997–2004:6) defined identity as “the process of construction of meaning on the basis of” cultural attributes “that are given priority over other sources of meaning.” According to him an individual or collective actor may have multiple identities, which often leads to “stress and contradiction in both self-representation and social action” (Castells 1997–2004:6). The latter may well have occurred in the transition, where we can distinguish two types of identities constructing the meaning of the Wadden Sea: one related to *fishing traditions* and one to *nature conservation*. The challenge presented was to link these two identities to the transition objectives: an undisturbed development of natural mussel beds, involving natural limits, and a profitable commercial mussel fishery sector, involving social limits. If these limits do not contradict each other, the interests and expectations of both parties can be achieved; otherwise, conflict may be expected with respect to these interests and underlying identities.

Both identities are deeply rooted in Dutch culture. Large-scale fishery, including the mussel fishing culture, has a long history and may be considered part of the Dutch identity of living with and managing the sea. The Dutch mussel sector literally claims that mussel culture constructs the Dutch identity.⁹ For example, “Mussel-Day” in Yerseke annually draws thousands. Moreover, the mussel fishery is a well-organized sector and even has an NGO-like support group (Friends of the Mussel).¹⁰

On the other hand, Dutch nature conservation goes back to the nineteenth century, and millions of people

are members of a conservation organization.¹¹ Also the environmental sector is well organized and includes a cluster of eight different organizations focusing on the Wadden Sea: the Natural Wadden Coalition.¹² In addition, in recent decades the Wadden Sea has been increasingly recognized and evaluated by biologists and environmentalists as one of the main nature conservation areas, and even qualified as the Dutch “last wilderness,” implying that there is no or only limited room for mussel cultivation there. One interviewee argued that: “the current innovation of spat-collectors is a nice step; but is this really achievable for the mussel sector? But, it goes without saying that there is no space in the Wadden Sea for the mussel fishery as it was before” (personal communication, June 2012).

These two identities are elaborated upon here as Weberian ideal types for analytical purposes, since we can find some further gradations and nuances of these identities in the Wadden Sea. In this area, for example, there is a long tradition of coexistence between natural and social limits negotiated and shaped by the different actors with different perspectives and identities. A case in point is the widely accepted existence of parcels for the production of adult mussels where bottom-trawling is tolerated. Moreover, most environmental organizations think that mussel culture belongs to the traditional use of (the identity of) the Wadden Sea. As one representative of an environmental organization said (personal communication, June 2012): “[F]ishery enables the economic sustainability of this area. I cannot imagine the coastline without fishing activities. However, you cannot maintain a system (i.e., fishery) which is unsustainable because of the methods you are using.” This view was supported by a researcher (personal communication, May 2012) involved in the transition: “More moderate environmental organizations also think that fishery is part of the Wadden Sea system, although it ought to be sustainable.” The transition demonstrates the dynamic nature of such socio-natural limits when trying to establish new fishery methods that meet the recognized natural values of the Wadden Sea.

Among fishers we also find recognition of the conservation value of the Wadden Sea. For instance, there are fishery organizations, such as the Good Fishers¹³ and the Integrated Fishery Foundation,¹⁴ that claim to practice

⁹ www.vriendenvandemossel.nl (accessed July 2013).

¹⁰ This organization claims to count around 5,500 friends (e-mail communication, September 2012).

¹¹ For instance, the Dutch branch of Bird Life International had a total of 153,022 members in 2011 (source: www.jaarverslagvogelbescherming.nl/files/Strategisch_meerjarenplan_2011.pdf, accessed December 2012); Society for Preservation of Nature Monuments in the Netherlands around 730,000 (<http://www.natuurmonumenten.nl>, accessed July 2013); At the end of 2012, the Wadden Association had approx. 43,300 members (www.waddenvereniging.nl/wv/images/PDF/vereniging/2013/ALVGoedgekeurd_jaarverslag2012.pdf, accessed July 2013).

¹² “Coalitie Wadden Natuurlijk.”

¹³ “Goede Visser” – www.Goedevissers.nl.

¹⁴ “Stichting Geïntegreerde Visserij” – www.geintegreerdevisserij.nl.

Fig. 2 Spat-collectors in the Wadden Sea (both adapted with permission; left-picture's source: www.wageningenur.nl/nl/Dossiers/dossier/mzi.htm; right-picture's source: www.mzi.nu. Accessed March 2014)

sustainable fishing methods. Moreover, some mussel fishers agree that the transition to a sustainable practice for collecting seed is desirable and probably unstoppable, since it is part of the current mussel-fishery modernization process (personal communication, May 2012). So both identities have some flexibility and different groups and individuals have expressed only slightly different interpretations of the socio-natural limits, which might have made it easier to reach some common ground for starting negotiations.

Nevertheless, within the transition endeavor we see a continuous struggle to shape and reshape such limits, as illustrated by the conflict of the south–north transport of mussel seed described above. Fishers were prepared to risk introducing exotic species to the Wadden Sea since they believe that the current protocols are appropriate for dealing with these possible risks. For example, a fishers' representative argued (personal communication, May 2012): “Statistically speaking, I know that it is not safe to drive, yet I still prefer to. This is something psychological – the important question is: what risks do you want to take with these issues (i.e., south–north transports) in nature?” A fisherman argued that: “I see this south–north transport as a future central activity for the sector, as something really good [...]; however, we have done it [referring to the protocols] now in a very strict way.” However, environmental organizations define a much stronger natural limit as argued by an environmental organization spokesperson (personal communication, June 2012) whose understanding of the Wadden Sea (identity) does not allow for any risk: “These protocols (i.e., to discover unwanted exotic species) help us (i.e., environmental organizations) although, such an assessment is never 100 % safe [...] I just do not want to have it on my conscience that the ecosystems were destroyed because we introduced something.” On the other hand, some risks have been accepted anyway, as is illustrated by the 2012 transports that were tolerated (by all parties) because the actual control system was considered, to a certain extent, to be adequate for the control of exotic species.

Although the two dominant identities did not merge, they were involved in an innovative process that enabled talks and negotiations. The process can be defined as innovative when

we consider it within the context of the longstanding controversies around shellfish fishery. As argued by an environmental organization representative (personal communication, June 2012): “Everybody discussing around one table; that was not done before... (as an environmental organization) you do not speak with fishers.” This innovative and constructive character is also acknowledged by representatives from the mussel fishery (personal communication, May 2012): “You come to the negotiation table and then you have to play a role where you don't shout at or confront the others, but work in a kind of think-tank in which constructively and together, you exchange ideas working towards a win-win situation.” Or as another fisherman (personal communication, May 2012) said: “It is also a process of getting used to one another; I have been collaborating there (i.e., the transition meetings) with people who, before, metaphorically speaking, I could have drunk their blood. [...] The atmosphere has improved. Because when you are in the trenches, everything the other party does is wrong. But when you say: we have a common problem, then you must make some concessions. We have made a lot of concessions, but the environmental organizations have too. They also have their grassroots, so they encounter the same difficulties that we do.”

To conclude, these examples illustrate that to facilitate a sustainable transition the debate has to be shaped not only by the figures related to mussel beds, spat-collector productivity, etc., but also by the extent to which different identities shape and re-shape natural and social limits in the Wadden Sea. (Wenger *et al.* 2002:153) argue that “there is increasing need to cross boundaries because today's complex problems frequently require solutions that are not confined to one practice, or even to a single organization” – or confined to a single identity, for that matter. They claim that many forms of connection can enhance boundary activities, among them “boundary objects that can accommodate similar interpretations across practices (e.g., a well-written contract or design proposal)” (Wenger *et al.* 2002:154). In this sense, one can argue that the transition covenant works as a boundary object, since it is aimed at accommodating and negotiating interests, expectations, and identities across the practice with a sustainable mussel fishery as goal.

Degrees of Community Participation

There are many parties involved in the transition. Not all parties, however, participate in the same way. Based on empirical research, Wenger *et al.* (2002) distinguished three levels of community participation. First there is the “small *core* group of people who actively participate in discussions,” debates, and forums by taking on community projects and identifying topics for the community to address; they move the community along its learning agenda (Wenger *et al.* 2002:56). Within this core group we usually find the community coordinator who organizes encounters and facilitates connectivity among community members. The next outer level is the *active* group whose members attend meetings regularly and participate occasionally in community forums, although with lower regularity or intensity than the core group. Beyond these active and core groups, they argue that the majority of community members are *peripheral*, rarely participating because they either think that they lack authoritative views or they just do not have the time to assume more authority, but rather observing the interaction between the core and active members. Moreover, they argue that these peripheral activities are important because they serve to further discuss and, therefore, shape the domain. Finally, the outer circle of the community consists of people (outsiders) who are not members of the community “but who have an interest in the community,” for example, customers, suppliers, and “intellectual neighbors” (Wenger *et al.* 2002:56).

In the mussel transition endeavor, we can also distinguish core, active, peripheral, and outsider members. The transition’s *core* and *active* community members are comprised mainly of the covenant signatories, i.e., the government represented by the ministry of economic affairs, four environmental organizations (the Netherlands Society for the Protection of Birds¹⁵ – Bird Life International partner; the Wadden Association¹⁶; the Foundation Wad¹⁷; and the Society for Preservation of Nature Monuments in the Netherlands¹⁸), and mussel fishers (represented by the Producer Organization of the Dutch Mussel Culture).

The transition also has a coordinator who manages the process, for instance, by organizing meetings. We can interpret the steering committee as the core group. This committee consists of the chairpersons and representatives of the covenant signatories and makes final decisions based on the findings of the project group, which in turn can be considered as the active group, comprised of representatives of the three signing parties. The project group raises and deliberates issues

concerning the transition, eventually assigns scientific research, and prepares policy steps.

Beyond these active groups there are the *peripheral* actors, who do not participate in the transition negotiations yet are affected by the decisions. In this group we have, for instance, the grassroots members of both the mussel producer organization and of the environmental organizations, who merely observe the interaction of their representatives. In this context, the issue of heterogeneity, representation, and legitimacy emerges concerning the extent to which these individuals, the backbones of the two identities (i.e., nature conservation and fishers tradition) described above, accept the decisions and concessions made by their representatives during the transition negotiations. This was illustrated by a representative of an environmental organization (personal communication, June 2012): “You slowly try to take with you your grassroots, especially to inform them about why we participate [in the transition], but this is very difficult. People just think that the Wadden Sea is a natural area [...], why should it be emptied by the fishery?” Similarly, as articulated by state officials: “This is the dilemma of environmental organizations. On the one hand they do want to take new steps in the transition [...], but, on the other hand, they have to allow fishery in areas in which there were no fishery activities before” (personal communication, June 2012). On their end, the representatives of mussel fishers also experience some trouble in convincing their grassroots constituents. A representative of the sector (personal communication, May 2012) argued that: “Our grassroots are different from those of the environmental organizations; ours are formed by entrepreneurs and families.” Within this group, we find entrepreneurs who have invested in spat-collectors and move the transition forward. However, others have been unable to make the required investments, but their interests are, nevertheless, also represented by the producer organization. This is a source of possible conflict within the different groups and, probably, also for the transition. One fisherman argued (personal communication, May 2012): “You can say that the covenant is nice, and that you want to stick to the agreements. But I just want a profitable company. However, now I have to pay for 400 or 500 extra hours a year with less turnover, even losses” (he refers to the time and monetary investments that the spat-collectors require).

Finally, beyond these active and peripheral groups, we find the outsiders who do not have a direct stake in the transition but who may be affected by, and may affect its evolution. Among these outsiders we find, for instance, supermarket retailers. Because of the evolution of markets in which transnational companies have been empowered in a globalized economy, this type of actor is becoming more powerful in the mussel fishery.

¹⁵ www.vogelbescherming.nl.

¹⁶ www.waddenvereniging.nl.

¹⁷ “Stichting WAD.”

¹⁸ www.natuurmonumenten.nl.

Furthermore, one might argue that some consultancy bureaus and research institutes (e.g., Imares-WUR¹⁹) could also be seen as outsiders, since they are not integrated within the transition as partners but work on a contract basis to conduct research on certain topics for the active groups. Finally, other outsider groups are, for example, shrimp fishers and recreational organizations, because transition developments may affect them. For instance, the spat-collector installations also hinder fishing and sailing activities, and closed areas are not only closed for the mussel fishery but also for other fishing and recreational activities.²⁰

The structure provided by the theory of CoPs has enabled our analysis of transition effort. In the mussel transition we have seen a similar structure characterized by different degrees of community participation as described by Wenger *et al.* (2002). Nevertheless, there are differences regarding the functions and roles of the core and active groups. The core group in the transition (i.e., the steering committee) mainly has a decision-making role, whereas the active group (i.e., the project group) deliberates, assigns research projects, and prepares policy steps. Thus, the active group in the transition performs tasks that, according to Wenger *et al.* (2002), should be implemented by the core group.

Another difference is that, in a CoP, community members participate voluntarily. But in the transition effort community members are, to a certain extent, forced to participate as the transition is characterized by two parties with different identities (see above). A key issue that may emerge when two parties have to cooperate is that of *power*. In the transition context we see that environmental organizations have been empowered by their juridical initiatives and the subsequent decision of the Dutch State Council (relying on EU Habitat and Bird directives) regarding fishing permits. On the other hand, we have seen that the mussel sector is very capable of organizing effective public campaigns or commissioning scientific research. In spite of longstanding controversies between the two parties, these empowerment processes have forced the covenant partners to collaborate, and generated a kind of balance of power between them.

Towards Sustainable Practices

The third question we aim to answer is if the community practices will strengthen the sustainability objectives as defined in the transition's covenant. Wenger *et al.* (2002) define

practice in the sense of common resources that “include a variety of knowledge types: cases and stories, theories, rules, frameworks, models, principles, tools, experts, articles, lessons learned, best practices, and heuristics” (p.38). These resources enable the community to address problems or initiate action. The practices of the mussel transition effort are also aimed at addressing, for instance, the problems generated by traditional bottom-trawling, or those emerging from the upscaling of spat-collectors in the Wadden Sea.

According to Wenger *et al.* (2002) one of the tasks of a shared practice is to establish a baseline of common knowledge that can be assumed by the community members. Similarly, transition practices also focus on certain issues and are aimed at generating a knowledge baseline that can be assumed by the different identities involved in the transition. The central transition practices are upscaling spat-collectors, downscaling seabed-fishery, restoration of mussel beds by closing areas to fishery activities, and designing a protocol to manage the south–north transport risk (PNERW 2010).

For example, a knowledge base has been generated from the various perspectives on the deployment of spat-collectors as an alternative to bottom-dredging. Spat-collectors have proven their capacity to collect mussel seed in years with low spat fall (see above) and have thus, to an extent, provided a return on the investments made by those fishers experimenting with them. A mussel fisher acknowledges (personal communication, May, 2012) that “it is true that because in the last years there has been low spat fall, those of us who began with the spat-collectors are in a better economic position than those who didn't.” Nevertheless, he also argued: “However, in years with good spat fall the traditional bottom-trawling method is more efficient. Among other things because the collectors are labor-intensive, and you also have to invest in things like winter storage space.” Another fisher also claimed that high investments are required for appropriate use of the spat-collector technology: “The expenses are huge. We still don't know how long these materials will last. Then you need winter storage [...] that was not necessary before, but that mortgage, that costs money every month. [...] It is amazing how many extra expenses this stuff requires” (personal communication, May 2012).

Beyond the cost-efficiency issues of spat-collectors other environment-related issues have been raised by the interviewees and are also defined in the reports emerging from the transition practice (PNERW 2012). For example, the effects of spat-collectors on the ecosystem capacities, as the multiplication of spat-collectors may end up having consequences, e.g., in terms of plankton levels; the possible effects (e.g., sound disturbance) of installation, maintenance, harvest, and disassembly on birds and marine mammals; the production of waste matter by the installations – micro-waste, such as plastic due to the regular collector usage, and macro-waste,

¹⁹ www.wageningenur.nl/nl/Expertises-Dienstverlening/Onderzoeksinstituten/imares.htm.

²⁰ See also the news release (in Dutch) and protest of the Association of Sailors in the Wadden Sea (2009) about the procedures for where the locations of spat-collectors in the area should be located: www.wadvaarders.nl/site/pages/verantwoord/dossiers/dossier-mzi-s/wadvaarders-fel-tegen-de-huidige-plaatsing-van-mzi92s-8-mei-2008.php (accessed July 2013).

such as debris due to storm damage, accidents, etc.; and the possible impact on the seascape if numbers increase.

Finally, looking beyond fishery practices, we have to remember that another central transition objective is the environmental restoration of naturally evolving mussel beds. With this in mind, experiments and monitoring activities have been initiated that also require the attention of the community. One of the most important measures is the closing of areas to fishing activities in an attempt to restore mussel beds, although to date these measures have been unsuccessful, since no mussel bank has yet evolved. According to a representative of the environmental organizations: “Yes, we have closed areas for fishery where there are no mussels at all; you could ask, does this make sense? On the other hand, we have a kind of mussel rights on paper. So, actually, it is something like virtual mussel banks” (personal communication, June 2012).

Discussion and Conclusion

We have explored the transition efforts of different stakeholders to trigger sustainable mussel fishery practices in the Dutch Wadden Sea with two objectives: first, to enable the continuation of a large-scale but adapted commercial mussel fishery and, second, to restore natural mussel-bed-related ecosystems. This is not an easy endeavor as different interests and identities have different definitions of what sustainability is. As such, the transition can be seen as an example of social learning practice in which, by taking some action (e.g., installation of spat-collectors, closure of areas for fishery), stakeholders aim to learn where to delineate the flexible natural and social limits in which to operate.

Our examination has been conducted by applying central elements and concepts of transition theory (e.g., Schot and Geels 2008) and the theory of communities of practice (Wenger *et al.* 2002). First, we have the domain; here we see that to address relevant issues and problems and to delineate acceptable natural and social limits of the mussel fishery in the Wadden Sea, the covenant works as a boundary object bringing together the different identities. Second, we have explored the community involved in the transition, presenting the core, the active, the peripheral, and the outsider levels of community participation. This level-approach has been helpful in exploring the role and the degree of involvement of different actors in the transition. For example, it allows us to distinguish those actors who are not directly involved in the transition (i.e., outsiders in CoP terminology) but are affected by its practices, such as the shrimp fishery and recreational sailing. Therefore, the active community might also need to learn from and negotiate with these outsiders in order to reach sustainability. Third, the practices carried out by the transition partners can be seen as activities oriented towards generating a

knowledge base, from which to engage social learning and sustainable action in the Wadden Sea.

Nevertheless, although CoP theory has been helpful in exploring the transition, we cannot define the transition's community as a community of practice as defined by Wenger *et al.* (2002) because, for example, the community of a real CoP is characterized by the voluntary participation of its members for knowledge sharing and learning purposes; whereas in the transition, and due to the longstanding controversies, the covenant partners have been, to an extent, forced to participate. This might reinforce some of the concerns expressed in the literature regarding the lack of attention to power-related issues in CoP theory (see, e.g., Fox 2000; Roberts 2006). Moreover, the analytical capacities of the CoP model are limited to exploring the transition context because of the two identities defined above. These two identities make it difficult to speak about a homogeneous community. Rather, we see two visions of the Wadden Sea and of the mussel fishery, with the relevant parties, due to persistent controversies, obliged to cooperate within the transition framework according to the covenant. This heterogeneity issue is also considered by the transition literature highlighted here. The success of the transition process might depend on the capacity of the core and active groups to maintain both identities united in making decisions that are widely supported and meet different expectations, such as upscaling spat-collectors and strengthening the protocols for south–north transport based on credible and sound knowledge.

Moreover, we see that an innovative aspect of the governance approach of the transition effort is the facilitation of a somewhat horizontal platform for decision-making, which is aimed at searching and articulating sustainable alternatives for the controversies around the mussel fishery in the Wadden Sea.²¹ It is innovative because it has facilitated the negotiation between two identities claiming different understandings of the Wadden Sea: on the one hand, as a “field” to collect mussel seed, as expressed by the identity associated with fishing traditions, and, on the other, as a place for the undisturbed development of nature (e.g., of naturally occurring mussel beds) claimed by the nature conservation identity.

Some authors in the field of coastal zone and fishery management claim that rather than searching for consensus and one-size-fits-all types of solutions, participatory processes, in which different stakes and worldviews are integrated into a process (in our case, the transition process), can (ought to) be oriented, for example, towards facilitation or conflict

²¹ To put the innovative character (beyond the controversies around the shellfish fishery in the Wadden Sea) in perspective, the transition effort has to be understood in the context of the so-called ‘Dutch polder model.’ It is a decision-making model that is characterized by forms of consultation conducted by state officials to understand the plurality of interests that exist in the Dutch society. One could argue that these cultural conditions form a fertile soil in which the mussel transition can evolve.

articulation rather than towards seeking consensus (McCreary *et al.* 2001; Van de Hove 2006; Turnhout *et al.* 2008). Notwithstanding the aforementioned grassroots-representation issue, these transition practices, due to their innovative and constructive character, ought to be further articulated. These practices have been able to bring into the decision-making process two, in principle, contradictory identities in order to negotiate natural and social limits that might facilitate a sustainable future in the Wadden Sea.

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