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The Troubled Ascent of a Marine Ring Seine Fishery in Tamil Nadu

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The transition to ring seine fishing in India is examined, paying special attention to the implications of legal pluralism. Ring seine fishing developed in niches and spread swiftly throughout the subcontinent, dividing the fisher population into fervent protagonists and antagonists. It is argued that sociotechnical innovations are often contested, and that rival parties apply alternative legal regimes to advance their rights. Fieldwork in Cuddalore, Tamil Nadu suggests that regimes function as arenas for deliberating and battling alternative futures in fishing and mask deep sociolegal divides.

This paper follows from a project titled “Contesting the Coastal Commons: The Changing Sociolegal Position of Fishing Populations in Tamil Nadu and Maharashtra” (Nr. W07.04.030.247), which was funded by the Netherlands Organisation for Scientific Research (NWO) and the Indian Council for Social Science Research (ICSSR). The present paper was completed in close collaboration with D Parthasarathy (IIT-Bombay) and A Menon (Madras Institute of Development Studies), and benefited from contributions by K Subramaniam and others. The author appreciates comments on earlier versions of this paper from Francesca Pilo and Aarthi Sridhar. In addition, the author is thankful for inputs from the anonymous reviewer.

This paper makes use of sociotechnical transition studies, and particularly, a multi-level perspective (Schot and Kanger 2018), to understand contemporary developments in Indian capture fisheries. This study adds the concept of legal pluralism (Bavinck and Gupta

2014) to transition literature and examines the complications that pluralism creates for innovation dynamics. A case study on the rise of ring seine fishing in southern India, it examines the implications of legal pluralism for sociotechnical transitions.

Capture fisheries are known not only for their diverse harvesting technologies, but also for their propensity to evolve over time (Valdemarsen 2001). Major collective changes to fishing technologies are, therefore, analysed as sociotechnical transitions (Geels 2004). The empirical focus of this paper is the emergence of a new, downsized form of purse seine technology in India, known locally as ring seine fishing. This practice has spread along the entire East Coast, replacing other forms of fishing, and it is now moving up the East Coast. However, this process of spatial dissemination is far from smooth, as the technology is heavily disputed by fishers and is even prohibited by state governments—for instance, in Tamil Nadu and parts of Odisha (Bavinck et al 2017; Nair and Mohammed 2015; Sridhar et al 2005). The district of Cuddalore, located in the upper reaches of Tamil Nadu, is a contemporary hotspot for ring seine fishing. I analyse the sociotechnical transition taking place there to build a general argument about the effects of legal pluralism on the “stability” of such transitions. Rather than viewing transitions as smooth processes, I view them as undetermined, contested, and occurring at multiple, yet linked, levels.

Theoretical Perspective on Sociotechnical Transitions

World fisheries are infamous for the crisis in which they are currently enveloped, generally known as “overfishing” (FAO 2018). Overfishing—the unsustainable exploitation of fish stocks—is the result of a process of technical modernisation that commenced in the 19th century (Bavinck 2011; Garcia et al 2014; Smith 2000). The transition to ring seining that is now occurring in South India is a related development.

Sociotechnical transition studies investigate patterns and mechanisms in technological change processes (Geels 2002), highlighting transition pathways (Geels and Schot 2007) as well as, for example, issues of space and scale (Raven et al 2012). Presented as a middle-range theory (Geels 2010), scholars in this field view tensions and mismatches that occur within systems as “windows of opportunity” for innovation (Geels 2011: 29); here, “innovation” is generally perceived as a desirable phenomenon. In this paper, which centres on disputes, I take a more nuanced position, allowing for “unwanted” innovation and sociopolitical contestation.

Sociotechnical transition studies divide sociotechnical systems into three levels: niche, regime, and landscape (Geels 2004; Schot and Kanger 2018). Technical innovations, arguably, commence in “niches”—“protected space[s] where promising new technologies are developed” (Hermans et al 2013: 614). Niche activities develop in reference to “regimes,” which are defined as the “semi-coherent rule sets directing the behaviour of a set of actors in a single sociotechnical system” (Schot and Kanger 2018: 1,055). Both niches and regimes are embedded in “landscapes,” which include larger macro processes and conditions. Sociotechnical transition theory has been applied in a variety of settings, including fisheries (Haasnoot et al 2016).

For the purpose of analysis, and in line with contemporary sociolegal scholarship, we adjust the above framework and specifically allow for the pluralisation of regimes. Legal pluralism scholars point out that societies and societal sectors, rather than enjoying coherent legal systems, are frequently characterised by normative plurality (Benda-Beckmann 2002; Bavinck and Jyotishi 2014). Depending on the interactions that occur among legal systems and the pertinent power equations, a field may be characterised by fragmentation, conflict, or mutual support.

Legal pluralism prevails in many aquatic regimes (Bavinck and Gupta 2014). Fisheries in South India too have been fruitfully investigated

from a legal pluralism angle (Bavinck 2001; Jentoft et al 2009; Bavinck et al 2013; Karnad 2017). Legal pluralism creates dilemmas for governors in charge of “steering” sociotechnical developments (Jentoft and Bavinck 2014), and for citizens who engage in forum shopping (Benda-Beckmann 1981).

In the following sections, I trace the transition to ring seine fishing in Tamil Nadu, distinguishing several phases in the change process. The data are from a two-year research project (2016–18), in which I led a team investigating fisheries in Cuddalore. In total, I spent four months in the region (August–September in 2016 and 2017), walking the coastline from north to south, joining a ring seine fishing trip, and talking to a variety of stakeholders about the issues affecting ring seine fishing.

History of Ring Seining: An Overview

The rise of ring seining in India must be viewed against the backdrop of fisheries development, which the Government of India took up with urgency after independence. Scholars note that marine fishing is an age-old occupation in India, and that countless fishing castes have specialised in the trade (Subramanian 2009). At the time of independence in 1947, the country had 5,00,000 marine fishers; according to the government, their main problem was low productivity (Chopra 1951). The Blue Revolution that the Government of India subsequently initiated hinged on the introduction of a new fishing technology. Fundamental to the effort was the Indo–Norwegian Project (INP), which commenced in 1953 and continued until 1972; it introduced the modern techniques of bottom trawling and purse seining in India (Sandven 1959; Kurien 1985). Bottom trawling was the first of these techniques to catch on, especially after trawl operators discovered foreign markets for shrimp in the late 1960s and prices went up manifold (Kurien 1978). Semi-industrial trawl fishers, however, soon entered into a serious conflict with the large population of small-scale fishers, who felt that their livelihoods were under threat. This conflict prompted the rise of what became a national fisher

movement (Sinha 2012) and the first round of legislation curbing trawling operations. Meanwhile, INP was experimenting with purse seine technology, the result of which was the development of a fleet of large purse seiners along the East Coast, which pursued schools of fish that travel up and down the coast (Edwin and Dhiju Das 2015; Pravin and Meenakumari 2016). A purse seine is a large surrounding net, the bottom of which closes after encircling a shoaling school of fish. The early fleet of purse seiners too came into conflict with small-scale fishers over resources (Nair and Jayaprakash 1983; D'Cruz 1998), thus triggering some attempts at government regulation (Pravin and Meenakumari 2016).

Bottom trawling and purse seining marginalised the small-scale fishing population in India, a process which was offset, to some extent, by the motorisation of small craft. Motorisation increased the range and speed of small-scale fishers, and provided them with countervailing power against trawlers and purse seiners (Bavinck 1997). While the fishing populations along many coastlines were already acquainted with encircling techniques (such as the shore seine), the motorisation of small craft facilitated the downsizing of purse seine technology. As such, the mini purse seine, also known as the ring seine, came into use among small-scale fishers along the Southeast Coast of India in the early 1980s (Edwin and Dhiju Das 2015).

There are two accounts of the genesis and subsequent spread of the ring seine. The first connects it to an initiative of the ICAR-Central Institute of Fisheries Technology (ICAR-CIFT) in Kochi, Kerala, in 1982 (Edwin and Dhiju Das 2015; Pravin and Meenakumari 2016). The other more detailed account links the development of ring seining to ingenious small-scale fishers in various parts of Kerala. They were inspired by their new knowledge of large-scale purse seining, probably acquired from working on purse seiners, and by prevailing fishing practices in their native regions (D'Cruz 1998). Starting in Kerala, where it is now the dominant mode of fishing (Edwin and Dhiju Das 2015: 90), ring seining has veritably spread across the Northwest and East Coasts of the country (Pravin and Meenakumari 2016).

Cruz (1998) divides the rise of ring seining along the East Coast into three phases: the origin or innovation (1985–1986), growth, and development (1987–1990). A census by the South Indian Federation of Fishermen Societies (SIFFS) reveals that at the end of the latter period, there were 2,259 ring seine units in Kerala, equivalent to 4.5 ring seines per kilometre of coastline (Pravin and Meenakumari 2016: 14, 45). As ring seining spread along the coast of Kerala, so too did tensions with small-scale fishers who were not party to this shift; I shall return to this in the next section.

Sociotechnical transitions, such as ring seining, occur in response to prevailing conditions in the marine environment, on the one hand, and the market, on the other. Inshore and offshore waters were relatively rich in demersal and pelagic species, so the various modernisations that occurred increased the fish catch spectacularly, in turn boosting marine fish production almost eightfold, from approximately 47,000 MT in 1948 to 35,83,000 MT in 2015 (Government of India 2017). In later decades, however, harvesting levels have stabilised, and catches per unit of effort have decreased; there is significant evidence of “fishing down the foodweb” (Bhathal and Pauly 2008). Indeed, the National Policy on Marine Fisheries recently concluded that “fisheries resources from near-shore waters are fully utilized” (Government of India 2017: 14) and that only the deep sea offers opportunities for intensification.

The decline of inshore fisheries, as noted in this recent policy document, was already evident to fishers in the 1990s (Bavinck 2001); indeed, scientists have occasionally issued warnings on the dangers of uncontrolled innovation. The respected fisheries scientists, Silas and colleagues (1980: 3), writing about the rise of purse seine fishing on the East Coast, argued that “[s]uch wasteful and destructive fishing could irreparably damage the fish resources,” and strongly recommended better regulation. We encounter similar voices in our discussion on ring seining in Tamil Nadu.

The market too was receptive to the introduction of new fishing technologies in inshore waters. I have already mentioned the impetus of international demand, first for shrimp and later for other seafood products. The continual increase in seafood prices, both internationally (Delgado et al 2003) and locally (Government of India 2014: 152), has been a strong incentive for entrepreneurs in India to invest in fisheries.

Now, mention needs to be made of the state-based regulatory regime governing marine fisheries and its relation to technical innovation. I have already mentioned the Indian government's interest (at the central- and state-level) in modernising fisheries. The Constitution provided the foundation for this effort by assigning the regulation of fisheries in territorial waters (within 12 NM [nautical miles] from shore) to state governments; the central government is in charge of fisheries in the rest of the exclusive economic zone. Importantly, the Constitution (Article 19[g]) stipulates that every citizen of India is allowed to engage in any profession; this provision afforded non-fishers the opportunity to invest in fishing. Non-fisher investments took place frequently, especially during the early innovation phases of trawling and purse seining (Kurien 1978; Bavinck 2001).

Jurisdiction for regulating marine fisheries was established only in the 1980s, after violent conflict erupted along the entirety of the Indian coast. In response to a model bill circulated by the central government, state governments began to formulate legislations for regulating marine fisheries, with a focus on separating the two warring parties. The Tamil Nadu Fisheries Regulation Act came into force in 1983; while it has repeatedly been supplemented by government orders, it recently underwent a comprehensive revision in 2017.

For this paper, another government notification (GO No 40 of the Department of Animal Husbandry and Fisheries, Tamil Nadu) is relevant. It states:

In exercise of the powers conferred by [...] the Tamil Nadu Marine Fishing Regulation Act, 1983 [...], the Governor of Tamil Nadu hereby prohibits fishing [...] with Purse-Seine nets by any fishing vessel/craft, whether country craft or mechanised boat, irrespective of their size, and power of the engine, in the entire coastal areas of Tamil Nadu in the territorial waters, as a measure to conserve the fishery.

Not only does this notification pertain to the entire coastline of the state, it also relates to all kinds of fishing activity, by small-scale and semi-industrial (or mechanised) vessels alike. It is motivated by conservation needs, which, as we shall see, are contested (as is the ring seine fishery as a whole).

State law is not the only source of regulation for Tamil Nadu fisheries, where legal pluralism is the rule. The fisheries on the Coromandel Coast, which stretches over approximately 400 km (kilometres), are well-known for their caste-based fisher councils, or *ur panchayats*, which have traditionally played a role in ensuring the well-being of hamlet populations (Bavinck and Vivekanandan 2017). Rooted in patrilineal kinship structures, and based on principles of equality, *ur panchayats* are strong, local decision-making platforms, handling dispute resolution, representation, community welfare, and fisheries management (Bavinck 2001). The last activity hinges on the widely-shared notion that adjacent land and water “belong” to the local *ur panchayat*, which is, therefore, in charge of making decisions on the acceptability of new fishing technologies and practices. *Ur panchayats* evaluate such technologies and practices according to their potential to cause three types of harm: to the marine environment, to the majority style of fishing, and to the community as a social entity. An unfavourable judgment by an *ur panchayat* could lead to the banning (*tadai*, in Tamil) of certain gear (Bavinck and Karunaharan 2006). Each fisher settlement along the Coromandel Coast has an *ur panchayat* in addition to a system of regional cooperation through *panchayat circles* or “head villages” (*talai nagar*, in Tamil).

Zooming in on Cuddalore

Cuddalore is situated halfway along the Coromandel Coast of Tamil Nadu (Figure 1, p 39)—this is an area notorious for natural and man-made disasters. While the former include cyclonic storms and rare tsunamis, the latter are often linked to the establishment in the 1980s of a large Petroleum, Chemicals and Petrochemicals Investment Region (PCPIR) that has been involved in multiple pollution scandals.

The Cuddalore coastline is 57 km long. It is dissected by two major rivers and extensive backwaters which separate the coastal belt from the interior. According to the fisheries department, there are 47 marine fishing hamlets here, partially clustered around three urbanising harbour locations (Cuddalore Old Town, Parangipettai, and Mudasal Odai) and otherwise spread out along the coast (Department of Fisheries 2010). It estimates the marine fishing population to be approximately 45,000 individuals, the majority of whom belong to two fishing castes: Pattinavar and Parvatharajakulam. The latter are located primarily in the central part of the coast, and the former dominate settlements in the northern and southern reaches.

Several events and processes have left marks on the marine fishing population in Cuddalore: the tsunami of 2004, the rapid industrialisation of the coastal zone, and the ongoing modernisation of fisheries. The tsunami that swept the low-lying Cuddalore shore in December 2004 caused many deaths, particularly in the fishing population, and extensive material damage. Following the tsunami, the government relocated a number of fishing hamlets to the interior, while others were provided with seawalls and ecosystem-based protection measures.

While most chemical industries in the region operate near the backwaters and not along the coast, coastal populations have nonetheless experienced negative side effects. For example, numerous jetties and pipelines have been constructed in order to import raw materials and discharge of waste. These infrastructures inevitably occupy coastal land and water, interfere physically with

fishing operations, and affect the health of fish stocks and marine ecosystems. In order to compensate the fishing populations, the panchayats have negotiated deals with industrial companies, whereby the latter make annual contributions to temple festivals and reserve a limited number of low-paying jobs for people from the adjacent hamlets.

The blue revolution, launched by the Government of Tamil Nadu, affected the fishers of Cuddalore in similar ways as in other parts of the country. While large-scale purse seining activities never developed as on the East Coast, two large trawling centres emerged in the district (Cuddalore Old Town and Mudasal Odai)—here, trawling activity centred on the resource-rich inshore zone, where small-scale fishers also plied their craft (Lawrence and Bhalla 2018). A section of the small-scale fishing population subsequently transitioned to trawl fishing, either as owners or, more frequently, as crew. Sometimes, they migrated permanently to harbour towns in or around the district for this purpose. The majority, however, continue to engage in small-scale fishing, making use of a range of drift netting technologies (Bavinck 2001). These small-scale fishers target the various, marketable species available in the Bay of Bengal in different seasons; it is important to note that the species that ring seines currently target are largely the same as those that regular small-scale fishers catch.

Many fisher respondents in Cuddalore expressed pessimism about the future of marine fisheries. Along this entire coastline, there is a strong drive to educate children, in the hope that the younger generation will abandon the dead-end occupation of fishing. Meanwhile, ongoing research indicates that many older fishers are currently spending a varying number of years in Gulf countries or in Singapore, having been “pushed out” by the poor conditions of the local fisheries, and “pulled” abroad by the opportunity to earn good money. In all, these developments show that Cuddalore fishers are broadening their perspectives beyond the hamlet, the coastal strip,

and the fishing profession. Ring seine fishing has emerged in this reality.

Regulations governing ring seine fishing in Cuddalore come from two sources. The first is the district administration, headed by the collector, who depends strongly on the assistant director of fisheries and their small staff for matters concerning fisheries. Both are based in Cuddalore. Fisher law also emanates from the ur panchayats in each hamlet. Although the ur panchayats still possess considerable power, recent research demonstrates variability with regard to structure, scope, and activity (Bavinck and Vivekanandan 2017); these factors are probably related to changes in the macro-environment, as sketched above.

Fishers in the district recognise two head villages that correspond with two caste groups: Devanampattinam (for the Pattinavar) and Samiyarpettai (for the Parvatharajakulam). Both villages figure in the transition to ring seine fishing, to which I now turn.

Contestations over Ring Seine Fishing

Ring seine fishing technology swept up the coast from southern Tamil Nadu, reaching the fishing port of Pazhayar, at the border of Cuddalore, in the late 1990s. United under the Devanampattinam flag, a large fleet of irate Cuddalore fishers travelled to Pazhayar and set fire to the ring seine nets (surukkuvalai, in Tamil) being used there. This incident demonstrated the widespread resistance to ring seine technology and temporarily put its adoption on hold. Respondents point out, however, that in the years that followed, fishers in Cuddalore became increasingly aware of the financial advantages associated with ring seine fishing. Thus, as a former official of the fisheries department pointed out, “other fishing methods were not generating big catches, and ring seining provided new opportunities for small-scale fishers” (anonymous personal communication, 15 September 2016). Interestingly, the fishers of Devanampattinam converted first—and wholeheartedly—to the technology, and those from other villages

followed suit. Respondents agreed that this transition gained momentum especially after the tsunami of 2004.

Various encircling techniques for capturing passing schools of pelagic fish were, at the turn of the millennium, already in use along the Coromandel Coast. Ring seine gear, however, was an upgrade to these earlier techniques; small-scale fishers found it attractive as it was possible to share ownership. As the labour requirement for ring seining was high (normally 30–60 people), it made sense for fishers to form investment or labour groups. Thus, shareholder groups of 20–30 fishers purchased small ring seine nets (approximately 400 m long; Tamil: *adantavalai*)—either new or second-hand—and committed to collectively operating the gear. Members split the returns equally. The advantage of ring seine fishing was that it did not require the immediate purchase of a new vessel; instead, motorised crafts, which had become plentiful after the tsunami and were normally used for small-scale fishing, could be used for this purpose.

This form of collaborative fishing is still practised in several fishing villages along the Cuddalore coastline. Small ring seine nets cost between `5 lakh–`7 lakh (second-hand) and `10 lakh (new), and a share normally costs less than `25,000 per member. In addition to this democratic and rather simple form of ring seining, however, new, more capital-intensive and harbour-based fishing forms have emerged; the pertinent core technology is, once again, being imported from Kerala.

The first so-called *kanaa* boat—a high-prowed vessel, 15–20 m long—fitted with winches and specifically designed for ring seine fishing, was probably brought to Cuddalore town in 2006 (personal communication Taniyavelu, 12 September 2016). The investment required was not large (a second-hand *kanaa* boat currently costs `20 lakh); this kind of vessel made offshore fishing for larger fish species possible, and allowed for more sizeable nets (1,500 m long). For *kanaa* fishing too, shareholdership is a regular phenomenon. Interestingly, respondents agree that the number of shareholders in a *kanaa* group has declined from an average of 20 to just 5–10. This is indicative of the increasing

wealth of fishers involved in kanaa fishing. Cuddalore now counts among the major fishing ports, with a substantial number of kanaa boats in Cuddalore Old Town (an estimated 150 vessels) and Parangipettai (fewer than 20 vessels). The owners/operators of these vessels hail from fishing villages along the coast; respondents all agreed that Devanampattinam is the centre of trade. Kanaa boats operate both inshore and offshore, and, as such, come into conflict with small-scale fishers.

Recent additions to the ring seine fleet are the large steel boats that go on multi-day fishing trips to offshore waters—they can be considered regular purse seine vessels. These large boats target the most valuable pelagic species, such as tuna, and cost `12 lakh each, including gear. Operating costs are estimated at `3 lakh per voyage. Although shared ownership prevails in this case too, the original system of shareholder/crew participation has largely been abandoned. Workers now come from agricultural professions, and owners often do not personally go fishing. Moreover, wealthy shareholders seem to invest in more than one vessel.

The transition to ring seine fishing that occurred in Cuddalore has several defining features. First, there was a move from small-scale ring seine technology to larger, more capital-intensive forms; all these forms of fishing still coexist along the coast. Second, while collective shareholdership is still the norm, the size of ring seine operating groups is reducing as the wealth of individual fisher investors increases. Traders appear to have played a role in funding the initial shift to ring seining, but their role has declined over time. Although ring seine fleets largely operate in the same locations as the trawling fleets of Cuddalore, there seems to be limited interaction between these fleets; indeed, there is a certain degree of animosity between trawling and ring seine fishers. Third, ring seine fishing is now often considered to be the fishing populations' mukkiyamaana tozhil (primary work), in contrast to small-scale fishing (Tamil: sinna tozhil, or small-time work). In this, it differs from trawl fishing, which has always been regarded as a sector in which small-scale fishers cannot easily participate. Finally, I

have shown how ring seine fishing has been contested by the fishing population, even from its inception.

I will return to this point after sketching the disparate and often emotionally charged opinions that fishers, government officials, scientists, and activists have about ring seining in Cuddalore and the region at large. Opponents of ring seine fishing in the district tended to emphasise two aspects. First, ring seine fishing tends to result in the overall depletion of inshore fish stocks. Harvesting entire schools of fish (including juveniles and egg-bearing females) arguably causes overall fish stocks to decline. This might have other negative consequences; for instance, predator fish no longer come inshore. Second, ring seine fishing arguably benefits a certain segment of the fishing population to the exclusion of others. Small-scale fishers in the region, who use drift nets, have observed that their catches of sardine, mackerel, and other schooling species have reduced. Theirs is an argument of fairness and social justice. Meanwhile, proponents of ring seine fishing point to the extreme fecundity of many pelagic species and the lack of scientific evidence on overfishing. They also emphasise that there is a general crisis in the fishing sector and an unavailability of income-generating alternatives. Finally, they point out that other state governments in India, such as the one in Kerala, have even encouraged fishers to adopt ring seining.

Debates on the potential harmfulness of purse or ring seine fishing have been around for a long time; the counsels of Silas and co-authors (1980) were noted earlier. Such warnings, in addition to the vehement protests of fishers along the coast of Tamil Nadu, undoubtedly inspired the government notification banning ring seine fishing in the state. In Cuddalore, the effort to limit ring seine fishing was taken up by the chief administrator, Singh Bedi, who had gained popularity within fishing communities because of his excellent handling of the tsunami disaster. In the wake of his efforts, the Fisheries Department held a number of meetings in the district, warning fishers of the dire consequences associated with ring seine fishing (anonymous personal communication, ex-AD Fisheries, 15

September 2016). Today, fishers still talk about Bedi's spirited opposition to ring seining (personal communication Devaraj, 7 August 2016).

The fishers of Cuddalore also took remedial action. Once the Devanampattinam inhabitants and village council abruptly gave up on opposing ring seine fishing and joined the band wagon, the Samiyarpettai head village led the protest against incipient ring seine activity. This precipitated in a peace meeting (in the district collector's office on 12 March 2004), which fisher representatives from both sides and several government officials attended. The meeting ended with a resolution, signed by all those present, that ring seine nets should no longer be used.

While ring seine fishing in Cuddalore increased in the post-tsunami period, and many ur panchayats stopped opposing this technique, a group of 23 villages headed by Samiyarpettai persevered. They did not allow their members to engage in ring seining, and continued to lobby against the use of this technology with each ur panchayat sending a letter to the district collector asking for the government ban to be enforced. This led to another peace meeting on 21 June 2016; once again, fisher representatives from both sides and a number of government officials attended. The decision taken at the meeting was to limit the number of ring seine units employed in the district, and to terminate ring seining altogether within a year. The latter clause was added so as to allow those who had invested in ring seining to recover their investments. However, the decisions made during this meeting have not been honoured; indeed, at the time of my fieldwork in 2016, new ring seine units were being established. Moreover, fishers from Samiyarpettai complained that, in retribution for their opposition to ring seining, fish traders in Cuddalore had stopped purchasing their fish. A year later, a young fisher from Samiyarpettai voiced disappointment in the fact that the decisions made at the peace meeting had essentially been ignored, complaining that the government should have more actively ensured their implementation.

The government should have restricted the use of ring seine nets much sooner. Now, they cannot do anything because people have invested large sums of money. Now, the only thing to be done is to raise awareness among fishers and inculcate change—a form of slow action. The government should be doing more now, as fishing practices are so poor. (personal communication, Saktivel, 3 September 2017)

Next, I reflect on the troubled transition to ring seine fishing, as it occurred in Cuddalore.

Discussion

The sociotechnical transition to ring seine fishing in India had several features. First, the technology—a radically modernised version of existing encircling techniques—was introduced and developed in “niches” along the East Coast of India. It subsequently spread to what might be termed “subordinate niches” along the East Coast, before it entered Cuddalore, Tamil Nadu.

The landscape of this transition was multidimensional, broad-based, and anchored in a policy of “innovation for growth” (Schot and Steinmueller 2018). The technology originated in Europe and was introduced in India through multilateral development cooperation projects. Indian governments embraced the technology in order to enhance fish production, as did individual fishers who were eager to offset the decline in catches, which was caused at least partly by overfishing.

The “regime” governing the introduction and practice of ring seine fishing, however, is not so straightforward. Subsequent governments in India, which have each claimed a monopoly over regulating fisheries in the country, have taken different standpoints, sometimes allowing ring seining, and sometimes not; in any case, the government failed to provide a nationwide regulation framework. Thus, while the Tamil Nadu government has officially prohibited ring seining, Kerala permits it. Therefore, much of the equipment used in Cuddalore was

purchased legally in Kerala. Moreover, even though the Tamil Nadu government has officially banned ring seining, it makes no efforts to implement this regulation—the most glaring example is in the harbour of Cuddalore Old Town, which houses a large, active fleet of illegal ring seine vessels.

Parallel to the fractured and ineffectual nature of government regulation, there is a strong, but increasingly variable, system of customary law at the village level, which is anchored in *ur* panchayats. Panchayat members and ordinary fishers share the opinion that, based on historical precedence, they have a moral right to govern inshore fishing spaces. The main way in which *ur* panchayats do so is by banning harmful fishing practices (Bavinck and Karunaharan 2006). Thus, at the inception of ring seining in the region, *ur* panchayats on this part of the coast joined for a punitive expedition against perpetrators in Pazhaiyar, a fishing town across the border in Nagapattinam district.

In subsequent years, however, fisher opinion in the Cuddalore district became divided; one group of panchayats was in favour of an overall ban of ring seines, while another group strongly supported the use of the technology. Peace meetings organised under the auspices of the district collector brought no solace. In fact, the number of ring seine units continued to rise, much to the dismay of a section of the fishing population and many members of government, scientists, and members of civil society.

In Conclusion

Besides the “niche” and the “landscape,” sociotechnical transition studies emphasise the importance of the prevailing institutional “regime.” The assumption is that regimes are semi-coherent, thereby “accounting for the stability of [sociotechnical] configurations” (Geels 2002: 1,260; Schot and Kanger 2018). The case of ring seine fishing in India demonstrates, however, that transitions sometimes occur in contexts of legal plurality. This paper questions the effects of legal

pluralism on sociotechnical regimes and transition processes, with a focus on ring seine fishing.

Legal pluralism causes institutional fragmentation, which has an impact on ordinary citizens and authorities. Three points stand out. First, the quality of legal pluralism plays a role in the stability of sociotechnical transitions. Legal pluralism scholars distinguish between “weak” and “strong” (or “deep”) forms of legal pluralism—the former falls under the umbrella of, for example, a state legal order, and the latter denotes the coexistence of distinct legal systems (Griffiths 1986). A strong legal pluralism perspective draws attention to fundamental tensions occurring in the very field in which a sociotechnical transition is taking place. Such tensions are evident in the case of ring seining in Tamil Nadu, particularly because of the differing stances of *ur* panchayats and government authorities.

Second, power equations and politics play important roles in the stability of any sociotechnical transition (Kenis et al 2016), as they do in conditions of legal pluralism (Jentoft and Bavinck 2014). If one legal system and its members dominate the field, long-term stability is more likely than when legal systems rival each other in strength. In the latter case, such as with ring seining in India, the stability of the transition is questionable. With the existence of many different perspectives, ring seining is currently shaky at best.

Finally, when societal systems, such as fisheries, rely heavily on ecological services for their existence (Costanza et al 2017), a degradation of these services may negatively affect whatever stability is supposed to exist in a sociotechnical transition. The changes that are occurring in the marine ecosystem as a result of multiple human interventions, including ring seining, may eventually limit its practice. The future of ring seining in India is, therefore, yet to be decided.

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