

Trading on conservation: A marine protected area as an ecological fix



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A B S T R A C T

Many developing countries have encouraged the expansion of mechanised fishing in order to engage in the lucrative export of seafood. This has caused a rise in the incidental mortality of marine wildlife. In recent years, widespread concern over wildlife deaths has been used by developed consumer countries to insist on mitigation measures or to impose economic sanctions. Hence, many supplier countries have been forced to implement wildlife conservation measures to safeguard their export-driven marine fisheries. In this paper, we present an account of how the Gahirmatha Marine Sanctuary, an iconic Marine Protected Area in eastern India, was created in such a context. We suggest that it serves as an ecological fix, i.e. a token spatial solution that removes environmental barriers to the accumulation of capital, and we describe how a combination of neoliberal actors has maintained it for more than two decades so as to greenwash subsequent industrialisation along the coast. Finally, we describe its social and ecological repercussions to highlight the contrast between ground realities and the win–win discourse that accompanies such efforts to integrate conservation with capitalistic production.

1. Introduction

Over the past five decades, seafood has become one of the most important commodities in international trade and many developing countries have emerged as significant suppliers to the major markets represented by the European Union, Japan and the United States of America [1]. This is particularly true of the global shrimp trade where the supply is dominated by Asian countries such as China, India, Indonesia, Malaysia, Viet Nam and Thailand [2]. In India, the state played a pivotal role from the 1960s onwards in promoting shrimp exports to foreign markets because it could earn valuable foreign exchange. This was done under the rubric of ‘modernisation’ of fisheries and different forms of financial support were offered to promote the use of trawling vessels and facilitate their access to rich fishing grounds. For many years, this combination of state subsidies and the strong demand for seafood resulted in exponential profits [3,4]. However, this intensification has gradually led to a reduction in the resource base with the result that trawl fishers have had to periodically either intensify operations in the same location or expand to other locations in order to avoid economic losses [5,6,7,8].

A second attendant problem is that if these fishing grounds are important habitats for non-target species such as turtles and dolphins, there is a high probability that these species will accidentally be caught and killed as bycatch. For instance in many tropical countries, the best shrimping grounds are found in nearshore waters which are also important breeding habitats for wildlife such as the olive ridley turtles

(*Lepidochelys olivacea*). In these cases fishing poses a major threat to wildlife populations because with the expansion or intensification of effort, the ‘externalities’ (in the form of high incidental mortality of wildlife) keep mounting. This can give rise to intense public opposition on environmental grounds and cause a crisis of legitimacy for such extraction-based industries even within free-trade institutions such as the General Agreements on Tariff and Trade (GATT). For instance, controversy shadowed the United States’ yellowfin tuna fisheries for more than four decades because large numbers of dolphins got killed as bycatch each year. Under pressure from conservationists, the US government enforced mitigation measures on its own fleets and imposed economic embargoes on some supplier countries such as Belize, Panama and Venezuela because their fishing practices contributed to high dolphin mortality rates. This forced other supplier countries to take decisive action to reduce the proportion of wildlife caught as bycatch in order to safeguard their trading interest [9,10,11]. Therefore, seafood-exporting countries are particularly vulnerable to conservation-related economic pressure and their governments have to find ways of protecting both wildlife and export-oriented fisheries.

One common mitigation measure involves the installation of bycatch reduction devices in fishing nets so that non-target species can escape. Another is the imposition of closed seasons or temporal bans on fishing. But often, in the case of charismatic wildlife, conservationists tend to advocate the establishment of closed areas in the form of no-take Marine Protected Areas (MPAs) [12,13,14,15,16]. Such closures impose permanent spatial restrictions on direct resource

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extraction, in this case mechanised fishing, and are therefore believed to remove areas from the reach of industrial production. They seem to be 'set aside' from the larger political economy of the region although they often remain linked to it in less overt ways [17]. Building on this, the current paper suggests that while such set asides may serve as wildlife refugia they are actually more important for the role they play in enabling resource exploitation to continue in the surrounding landscape, that is their practical function is secondary to their discursive value. The concept of 'ecological fix' is used here, to explain this type of relation between a no-take MPA and the regional political economy.

2. The ecological fix

Given the vast and sometimes divergent literature on the topic of fixes, the outline presented here will be confined to a few pivotal works which have contributed to developing the concept of an ecological fix. It first originated in the idea of the *spatial fix* proposed by Harvey [5] who evoked multiple meanings of the term to analyse the many ways in which the production of space was central to the functioning of capitalism. However he primarily used the concept 'to describe capitalism's insatiable drive to resolve its inner crisis tendencies by geographical expansion and geographical restructuring.' As Jessop [18] later clarified, one way to define a spatial fix is as 'an improvised temporary solution, based on spatial reorganisation and/or spatial strategies, to specific crisis-tendencies in capitalism.' The context that they focussed on was the crisis caused by over-accumulation of capital but what is relevant to our discussion here is that as both scholars emphasised, the use of the term fix denotes the improvised, short-term nature of the response to a chronic problem caused by the capitalistic mode of production. To simplify, a spatial fix can be understood as a makeshift geographic solution to a mainstream economic crisis.

In the context of industrial fishing, as mentioned earlier, unaddressed environmental problems can lead to an economic crisis directly in the form of loss of profitability, as well as more indirectly by causing a loss of legitimacy - the degraded resource base and public reaction to the environmental costs become barriers to growth and accumulation. Therefore, to sustain growth-led development, the state has to intervene and find ways of offsetting the associated environmental costs. It has to find an *environmental fix* - that is a makeshift environmental solution to the problems caused by the capitalistic mode of production. This is especially true of states with a neoliberal orientation because of their explicit support for industrial development and free trade [19]. They have to play a contradictory role because on the one hand they are committed to promoting industrial development but on the other, they have to solve a mounting environmental problem that if left unaddressed, can lead to a major economic crisis [20]. These neoliberal attempts can take a bewildering assortment of forms that do not always involve the reorganisation of space and that sometimes involve the creation of altogether new commodities from parts of nature that previously had no market value [5,21]. Hence to retain analytical clarity here, this work borrows from Jessop and Bakker [21,22] to define the term 'ecological fix' as a spatial strategy that serves to screen or partially solve an environmental problem that can become a barrier to industrial growth. Therefore, its value lies more in its political-economic function (i.e. its discursive contribution) rather than in its ability to actually protect or conserve some aspect of nature.

This paper presents a case study of a high-profile MPA in eastern India, the Gahirmatha Marine Sanctuary, to illustrate how a no-take MPA was first created as an ecological fix for trawl fisheries in the region. Then it traces how the MPA has been used by other actors to physically and discursively constrain conservation efforts and enable industries to freely access the rest of the coast. It also presents the main ecological and social outcomes of such an MPA to depict the contrast between the 'win-win' discourse accompanying this strategy and the ground-level implications. Finally, it emphasises that such case studies

underscore the urgent need for conservationists to be attentive to the role MPAs actually play, rather than endorsing them uncritically, because these spaces tend to obscure the effects of industrialised extraction on wildlife in the larger landscape and worsen socio-economic inequalities within the fisheries sector.

3. Methods

The first author followed multi-sited ethnographic methods [23,24,25] to study the political ecology of olive ridley conservation in Odisha from 2012 to 2015 and herein, a subset of these interviews and field notes has been used. Potential respondents were identified using a combination of published literature and snowball sampling. All of them were provided with a brief overview of the study either in writing or over the phone (according to their preference) and if they agreed to participate, semi-structured interviews were conducted in person by the first author. The respondents comprised retired and serving officials of the Odisha Forest (8) and Fisheries' Departments (2), fisheries activists and leaders (4), members of trawl owners' associations (4), port authorities (3) and biologists (5). Since most were social elites, the trajectory, location and duration of the interviews was respondent-driven [26,27] and they lasted from 10 min to little over an hour. If required, select topics were revisited on a subsequent date.

Detailed running notes were taken and in addition, most interviews were recorded using a digital voice recorder (with the permission of the respondent) and transcribed completely. Inductive coding was used to identify the main themes for analysis. In addition, textual material was used from a range of sources, including technical reports, scientific papers, newsletters and newspaper articles to complete the information gleaned from interviews and observation [28].

4. Fisheries modernisation in India

The modernisation of marine fisheries began in India in the 1960s and one of its main goals was to improve the supply of seafood to a large overseas market. In particular, catching shrimp for export was so profitable that it was referred to as pink gold and from the early days, it attracted investments from firms and individual capitalists [29]. Over the next two decades, state support for shrimping led to the exponential growth of trawling fleets in several parts of the Indian peninsula including Odisha (earlier Orissa) on the east coast ([30] and references therein [31]). But this led to violent clashes with small-scale fishers in several parts of the country because they were first marginalised by the state policies and later physically displaced by the trawl fishers as shrimp was found in the nearshore waters that were the traditional fishing grounds of this sector. Finally in the 1980s, small-scale fishers collectivised to form the National Fishworkers' Forum (NFF) to campaign for their rights [4: 143–169] [32]. The NFF organised a series of agitations in the subsequent years which forced the state to pass a few laws to safeguard small-scale fishing: for example, the Orissa Marine Fishing Regulation Act (OMFRA) passed in 1982 reserves the nearshore waters (up to 5 km from the coast) for non-mechanised artisanal craft. In 1991 the first national Coastal Regulation Zone (CRZ) Notification was passed to curb the unplanned and illegal industrialisation that was displacing entire fishing villages (www.nffindia.org).

The same year, as part of the national drive to liberalize trade, the Indian state began to promote export-oriented joint fishery ventures between foreign and Indian firms within its Exclusive Economic Zone, mainly in deep waters. This met with enormous resistance from Indian fishers and their internal differences were temporarily buried to fight this 'invasion' [33,4]. Finally in 1996, following the report of a state-led enquiry commission, all joint venture licenses were cancelled. The report also recommended that one of the state agencies should take explicit charge of enforcing the zoned fishing rules for small-scale, mechanised, and deep sea vessels because tensions between these groups remained [34]. Overall, by the 1990s, the marine fisheries

sector was a politically charged one and the activism of small-scale fishers had forced the state to moderate its support for economic liberalization at both regional and national levels. It was at this juncture that the 'externalities' of marine fishing in Odisha triggered off an international dispute.

5. An MPA resolves a trade dispute

In Odisha, the expansion and intensification of trawling over two decades [35] became a significant environmental problem because this was a non-selective form of fishing that produced large volumes of bycatch, some of which had market value but a considerable proportion of which was simply dumped back into the sea [36,37]. The immediate attention of conservationists was drawn to the thousands of olive ridley turtles (*Lepidochelys olivacea*) that migrated to these waters during the peak fishing season (the winter months) to breed because they got accidentally entangled in trawl and gill nets, and drowned. Their carcasses littered the beaches in the thousands and though scientists had repeatedly emphasised the importance of regulating fishing in turtle congregation areas since the 1980s, little had been done [38]. Another long-standing concern was that the beaches of Odisha, especially Gahirmatha, were globally.

significant rookeries (i.e. nesting habitats) for olive ridleys and therefore if turtles suffered high mortality here, the population could suffer a large-scale decline [39,40]. Neither by-catch mitigation measures such as compulsory use of turtle excluder devices or TEDs in trawlers [41,42,38] nor the regulations under OMFRA, which restricted the use of gill nets as well, were enforced even though the latter would have greatly benefitted small-scale fishers—and turtles—by preventing operation of the larger mechanised vessels in nearshore waters [43,44]. Finally, in October 1996, the United States cited the large-scale fisheries-driven mortality of turtles as a major cause for concern and banned the import of shrimp from India, Pakistan, Thailand and Malaysia. The US insisted that it would not retract the ban until TEDs were made mandatory in these countries [45,46]. The four supplier countries challenged the ban in January 1997 as a contravention of the free trade agreement under the World Trade Organization (WTO) and to which they and US were signatories. The 'shrimp/turtle case' became an eminent one in international trade and law because unilateral economic restrictions had been imposed on environmental grounds. In April 1997, the WTO set up a dispute settlement panel to resolve the matter. The panel sought the opinions of third-party countries, biologists with field knowledge of the Asian supplier countries, responses of the latter to the experts' comments and an explanation of the US' position, before releasing its final report a year later [45].

One of the key questions the panel asked the experts was if the use of TEDs was indispensable or if alternative measures such as spatial or temporal closures could be adopted to conserve the olive ridleys. All the biologists reiterated that TEDs were important but only two of them responded to the idea of closures – both expressed reservations because they said enforcement would be extremely challenging. But India strongly objected to the imposition of TEDs, asserting that this would be an arduous process for a developing country to undertake. Moreover, India feared that such a device would induce high catch losses and it was also uncertain if TEDs would be effective in areas with very dense concentrations of turtles [45]. On the whole, the Indian government was extremely reluctant to intervene directly in the conditions of production of a high-value commodity. For instance, the export of shrimp from Odisha was valued at about USD 51 million¹ in 1995–96 alone [47].

Instead, India repeatedly presented to the panel that it had sufficient

¹ In India, these large crustaceans of *Penaeus* and similar genera are called prawns whereas in the US they are called shrimp. However, since most of these are caught for the export market, especially the US, in this article they will be referred to as shrimp.

conservation measures in place because the direct harvest of olive ridleys had been banned since the 1970s and it had passed rules to regulate fishing (OMFRA) and coastal development (CRZ) near the main rookeries. Moreover, since the focus of the US' case was the number of dead turtles washed ashore in the Gahirmatha area (totalling over 30,000 from 1993 to 97), India said it would prefer to impose spatial closures and altogether prevent trawling there rather than enforce use of TEDs [45]. It was during this crisis that the Gahirmatha Marine Sanctuary (GMS) was established, in September 1997, on the seaward side of the existing Bhitarkanika Wildlife Sanctuary [48]. India pointed to the two Protected Areas as further evidence of its environmental commitments and explicitly stated that with GMS, 80 per cent of all turtles found in Indian territorial waters and 50 per cent of the global population of olive ridleys were well-protected and hence the US' concerns were unfounded [45].

The panel acknowledged that large-scale turtle mortality was indeed a problem and though international NGOs campaigned to uphold the ban, it noted that the imposition of a unilateral ban by a country such as the US, which had its own shrimp trawling fleets, 'supports the conclusion that the embargo is a disguised restriction on international trade. The effect of the restriction was not so much reduced importation as the additional cost on the foreign industry, making it less competitive and the risk that the right to export might be revoked' [45]. Further it said, 'Market access for goods could become subject to an increasing number of conflicting policy requirements for the same product and this would rapidly lead to the end of the WTO multilateral trading system' (ibid, pg. 291). The panel finally ruled against the unilateral ban imposed by the US as a misapplication of the environmental provisions under WTO. Further, it insisted that the US had to first demonstrate that it had made significant efforts to arrive at a multilateral arrangement to conserve marine turtles before banning imports [45]. The US contested the ruling but its objections were dismissed by the Appellate Body. The US was instructed to initiate a transfer of technology to design and implement use of TEDs, provide support for a multi-country Indian Ocean programme for turtle conservation and institute import measures that recognised shrimp shipment certification provided by supplier countries on a case-by-case basis, rather than impose a blanket national procedure on the latter since this could be construed as interference in domestic policy and would violate the terms of free multilateral trade [45]. All the supplier countries participated in these efforts and their shrimp trade with the US resumed (except Malaysia). Negotiations to finalise the Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA-MOU) began in 1999 [49]. This account demonstrates how the US attempted to impose TEDs to curb competition from India and favour its own trawl fishers, but India countered this by strategically creating GMS to defuse the economic crisis facing its own fisheries and maintain its position in the international shrimp trade game. In summary, the well-timed creation of GMS served as an ecological fix for India's trawl fisheries.

Once the fix had been established, the state did not concern itself with the actual ecological relevance of the sanctuary. For example, in 2005 it became known that the area of Gahirmatha and Bhitarkanika sanctuaries had been reduced before final notification to enable conversion of a minor port to a major deepwater one, at Dhamra – a site less than 15 km away. Moreover environmental clearance for the project had been granted in an irregular manner [50,51]. This was despite the existence of another major port 25 km to the south, at Paradeep. The International Union for the Conservation of Nature (IUCN), an apex conservation body, also supported the Dhamra Port Company Limited (DPCL). It defended its stance against criticism from several quarters, including Indian members of the Marine Turtle Specialist Group, saying 'IUCN hopes that its work with DPCL will generate useful tools and examples around *mainstreaming biodiversity conservation in major economic development projects* [...] (emphasis

added; cf. special issue of the Indian Ocean Turtle Newsletter Vol. 8, 2008). This was well in line with its global interest in forming industrial partnerships [52]. Over the years, such neoliberal actors have contributed to maintaining GMS as a fix and setting the boundaries for conservation discourse and practice so that industrial development continues undisturbed.

6. Disciplining of conservation discourse

The GMS is used in state discourse to discipline conservation by relegating all ‘wildlife’ to this spatially demarcated ‘habitat.’ Neither the discourse about turtles nor their physical presence is tolerated in areas outside the MPA as this interferes with the practice of capital production.

Officials of State Forest Departments are key conservation actors especially in the case of olive ridleys because of their status as a highly protected species under Schedule I of the Indian Wildlife Protection Act (Amendment 1993). The law treats such animals as government property and even carcasses cannot be handled by unauthorised people. Even so, a common remark from officials was that they ‘have to be invited to comment’ about the possible impact of development projects on the olive ridleys when the projects occurred outside the protected area network. This indicates that in practice, their authority is spatially confined.

Similarly, in 2002, conservationists conducted a workshop to revive discussion about use of TEDs. But trawl fishers and fisheries officials objected strongly: ‘Use of TED does not arise unless fishing activities are allowed in the no-fishing zone [in the sanctuary...] hence amendment is warranted in the Wildlife Protection Act/OMFRA’ [53]. Conservation concerns in a production landscape were viewed as being (overtly or indirectly) obstructive and it remains difficult for conservationists to push for any regulation of trawling per se.

In another instance, during this study, a port official explained: ‘Now Gahirmatha is the northern-most nesting ground, right? [...] And we are north of Gahirmatha. So we are strictly speaking, not on the path, the regular path, of the turtles. ... (We are) outside their usual route, although turtles are not that disciplined. We can find stray turtles in Dhamra also but we are exactly not on the route so a whole lot of our efforts (at the height of the controversy) were spent in explaining our location and the turtle route and everything...’ (emphasis added). This official’s reference to the olive ridleys in the port area as ‘strays’ and his implication that they were somehow deviant in their behaviour provides a clear illustration of how the presence of turtles in the larger landscape was no longer seen as legitimate by industrial actors, given that an MPA had been set aside for them. Officials in other ports as well referred to the IUCN’s support for Dhamra port to argue that clear-cut spatial partitioning of the landscape between conservation and industrialisation is possible and desirable. Such spatial circumscription of conservation discourse is particularly significant given that the Department of Commerce and Transport intends to develop ten new ports (some surrounded by industrial enclaves), in addition to the existing three along the 480-km coastline of the state via public-private partnerships [54].

7. Constraints on conservation practice

With reference to field-level protection, the necessity of implementing OMFRA, in addition to the fishing restrictions within the sanctuary, was again emphasised by conservationists after the WTO controversy [46] but this was not followed. On the other hand, a combination of the threat posed by the shrimp export ban and the petitions filed in court by various conservationists has forced the Odisha government to periodically try to strengthen turtle conservation and several state actors have been involved in management of the sanctuary [55,44]. At present this comprises the marine police, Coast Guard and the Forest Department. But overall, two decades later, political-economic considerations still

dominate the management of the MPA.

Once an MPA is set up, the physical area and the resources it contains become the property of the state, to be managed by the Forest Department (Indian Wildlife Protection Act, Amendment 1993). Therefore, the responsibility of managing GMS fell on the Odisha Forest Department even though its model of governance is designed for terrestrial situations and has led to a serious mismatch between the governing agency and the terrain (Ramesh, unpubl.). On the other hand, while coastal waters do come under the domain of the Fisheries Department, it is not actively involved in turtle conservation because trawling continues to be profitable and the regulatory demands put forward by conservationists and small-scale fishers represent a basic conflict of interest. For instance, during interviews, some of the older members of trawler owners’ associations still referred to proponents of TEDs as ‘those American spies’ because it was seen solely as a move to reduce their share of the export trade. Revenue from the export of marine products (of which shrimp forms a major proportion) has steadily risen in value from USD 49 million in 2003–04 to USD 300 million in 2013–14 [56]. The conflict is most pronounced within the area of GMS because it is a rich fishing ground. There appears to be only a single published report on the economic value of fisheries in the sanctuary area in particular, but it indicates that the value of catch here is much greater (around USD 37 per hour) than catch around the neighbouring trawler base at Paradeep where it is merely USD 2 per hour [57]. Also, the best period for fishing commercially important species such as Indian shad, silver pomfret and shrimp coincides with the turtle breeding season [58], so the temporal overlap adds to the fishers’ resistance to conservation-driven restrictions. The Fisheries Department has further fuelled the conflict by developing trawler bases and fish landing centres at Talchua, Tantiapal, Jamboo and Kharnasi, which can be accessed only by passage through the sanctuary [59,60].

The second aspect which reduces the Forest Department’s regulatory power is that it lacks dedicated funds for on-field protection activities because neither the regional nor central governments have been willing to assign substantial monies for the protection of a migratory species. For example, in 2013–14, the department was given a meagre budget of about USD 115,700 for turtle protection in comparison with USD 1.5 million for elephant conservation [61]. It has been made to fill this shortage by relying heavily on material and financial support from industrial actors. For example, each season the Divisional Forest Officer advertises for quotations for the use of four trawlers to patrol GMS. The vessels and crew are hired from trawl owners in the vicinity while neighbouring ports provide a part of the necessary funds and berthing facilities. While such alliances are presented as a win-win solution by the parties involved (often state–NGO–industry), this study suggests that it is an extension of the ecological fix to screen more industries from environmental scrutiny. For instance, the IUCN published a report on DPCL recently titled ‘Protecting the olive ridley: the story of Dhamra port.’ Apart from providing a glowing account of the port’s environmental management plan, the report states that DPCL and the IUCN together intend to establish the Dhamra Conservation Trust to support research and conservation in the GMS and other places along the Odisha coast [62]. Earlier, the Forest Department was supposed to be an administrative partner but now it will be a beneficiary and it appears likely that corporate funds and support will continue to play a significant role in directing conservation in this area.

8. Consequences of the ecological fix

Since critical scholarship is often silent on the effects of an ecological fix other than with reference to the alleviation of an economic crisis, this section fills the gap by tracing the consequences of the neoliberal strategies that maintain GMS and indicates how it has further marginalised non-industrial actors and contributed little to turtle conservation.

8.1. Social effects

Marine fishing is banned in the core zone of GMS, across an area of 725.5 sq km adjacent to the coastline. Initially, rights of passage through the sanctuary was also severely curtailed by the Forest Department but repeated protests and petitions by the Orissa Traditional Fish Workers' Union (OTFWU) have enabled small-scale fishers to access the buffer zone where non-mechanised fishing is permitted [55,63]. However, identification of the type of vessel and gear remains difficult for a terrestrially-trained Forest Department and disputes are common. Hence the OTFWU continues to periodically submit petitions urging the government to choose one of three options: (i) reduce the area of GMS, especially the seaward distance or (ii) provide monetary compensation for not fishing during the turtle season or (iii) provide subsidies for the purchase of larger, mechanised fishing vessels so that they can go well beyond the sanctuary boundaries and fish (President and Secretary, Orissa Traditional Fishworkers' Union, pers. comm.; President, Kharnasi Boat Owners' Association, pers. comm.; [64]. More recently, in 2013, the OTFWU staged a protest in front of the office of the District Collector and re-submitted its petition against the sanctuary. In July 2016, the President of the OTFWU held a meeting in Bhubaneswar (the state capital) that was attended by the leaders of inland and brackish-water fishing communities as well. At the meeting it was resolved that small and traditional fishworkers from different parts of Odisha would form the Odisha Matsyajibi Federation to collectively protest against threats to their livelihood, especially from industrial development and wildlife conservation, and the lack of state support for their sector. During this meeting they also coined the slogan 'We do not need alms, we need our rights' (email, Odisha Matsyajibi Federation, 2016). Therefore the struggle of small-scale fishers against being physically and economically displaced from the coast by state and corporate projects continues.

The sustained protests of small-scale fishers have sensitised biologists to the social consequences of this sanctuary. As one biologist commented, '[...] one of the gestures that the turtle conservationists were supposed to make was rationalise the boundaries of the Gahirmatha Marine Sanctuary so that they (small-scale fishers) would have access to fish in certain areas where turtles not found. And that was never done. That is probably a failure of the larger groups such as ourselves to pursue more vigorously.' Further, small-scale fishers point out that the Forest Department's industrial alliance has resulted in grave injustice to their sector because fishing restrictions are mostly imposed on them while poaching trawlers get away scot-free. This can be seen in the record of arrests and fines of the Forest Department between 2002 and 2012 (obtained in response to a petition filed by fishers in 2015, under the Right to Information (RTI) Act).

As Table 1 indicates, trawlers comprise only 4 per cent of all the boats compounded by the FD between 2000 and 2012 (n = 318, after 27 incomplete entries and 68 records of net seizures were removed from analysis) whereas 39 per cent are small craft and 45 per cent mechanised boats. In contrast, Forest Department staff themselves insisted that trawlers were the worst offenders with respect to illegal fishing inside GMS. With respect to fines collected for the same time period, trawlers have contributed the minimum (11 per cent) and

Table 1
Boats Seized and Fines Collected, Bhitarkanika and Gahirmatha Sanctuaries (2000–2012).

Vessel type	Seized (%)	Fined (%)
Small craft	39	18
Gill netters	13	23
Mechanised boats	45	47
Trawlers	4	11
Total	318	14,38,555

Note: Only combined figures are available since both PAs are managed together.
INR 14,38,555 ≈ USD 30,000.

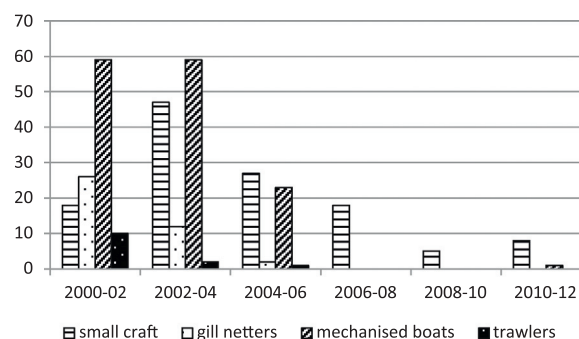


Fig. 1. Proportion of Vessels (n = 318) Seized, Bhitarkanika and Gahirmatha Sanctuaries (2000–2012) Note: Only combined figures are available since both PAs are managed together.

mechanised boats the maximum (47 per cent).

Moreover as Fig. 1 indicates, with time, the uneven application of conservation rules has become more pronounced. Since 2006, punitive measures have focussed almost solely on small-scale fishermen, who are already an impoverished group [64,65]. This focus on a particular category of fishers is a direct result of the spatial arrangement of the conservation zoning as the area that the small-scale fishers use overlaps with the core of the MPA, while the trawlers who might be causing a greater impact are outside the strict conservation zone.

8.2. Ecological effects

Scientific reservations about the role of GMS in ensuring protection of olive ridleys emerged only during interviews conducted in this study and have not been recorded in the literature before this. For instance, one biologist said that the current position of the sanctuary was 'irrational' and it needed to be realigned because it neither followed any meaningful ecological boundaries nor did it protect the breeding congregations since turtles were often found outside. Another said, '(If we demarcate an MPA)... we have to force the turtle to stay in one particular area only. That's not going to happen... you are trying to protect a species which is really dynamic, which is moving throughout its life [...] So just by merely making one small rectangle area of PA, it is not going to work.'

This is striking because although many scientific papers and technical reports describe habitat changes, turtle movement and behaviour, only one formal report addresses how some of these findings limit the ecological effectiveness of the sanctuary—and even this does not altogether reject the idea of an MPA [39]. The reasons for this reticence will be discussed at the end of this section. During interviews, the biologists were far more forthcoming and explained the implications of various studies.

The biologists' first point of contention is that the Forest Department continues to report high numbers of mass nesting turtles in Gahirmatha whereas the main nesting beach was fragmented by cyclones and shrank from about 3.5 sq. km in 1988 to two islands, less than 0.5 sq. km in extent by 1999. This area too gets periodically inundated [60,66,67,68] and it is believed that removal of sand from areas outside the boundaries has further accelerated its erosion. During our study period, biologists reported that the mass nesting beach was only 800 m in length. Therefore they questioned official estimates of about two hundred thousand turtles nesting here each year. In fact, biologists believe that the paucity of mass-nesting habitat has prevented arribadas from occurring in some years while sporadic nesting on the other hand, has increased and spread out over 35 km of the mainland beach [68]. They suggest that the turtles may eventually shift to another arribada site although sporadic nesting is likely to continue here for many more years. Moreover, they accidentally destroy each other's eggs when they nest in such high densities on a small beach. This and the periodic inundation have been reported to decrease hatching success and the

contribution of such a site to recruitment in the population as a whole is likely to be quite limited [40,69].

Second, offshore studies on olive ridleys in Odisha indicate that this species forms large breeding congregations, covering an area of about 52–58 sq. km in shallow water (20–30 m deep), during the months of December to January. These congregations occur within 5 km of the mass nesting beach. If undisturbed, such a reproductive patch will gradually move closer to the beach and finally the female turtles alone will come ashore to nest en masse. However, turtles in a reproductive patch are particularly susceptible to incidental mortality because of the high densities in which they occur and because mating pairs are oblivious to the presence of boats nearby and get entangled in the nets [70,72]; pers. obs.). The biologists interviewed repeatedly referred to the management report compiled in 2000 (Pandav and Choudhury) which had recommended that offshore protection by the Forest Department should focus on patrolling these turtle aggregations to keep gill net and trawl fishers away from them, instead of attempting to regulate fisher movement over a large predetermined section of the seascape. However, as described in the previous sections, since OMFRA has not been enforced, mechanised fishing persists even within the MPA and turtles continue to be accidentally killed [71,73].

Overall, biologists recognise that since olive ridleys are a mobile species there needs to be landscape-level regulation of developmental activities, such as that laid out by the CRZ notification and OMFRA, to address the degradation caused by diffused factors such as chemical and light pollution, disposal of plastics into the sea, beach armouring etc. and none of these can be addressed by merely demarcating a sanctuary. So why is the ecological inadequacy of GMS not discussed in the formal literature?

One researcher said that opposition to industrial projects in the landscape, irrespective of their environmental impact, indicated an ‘activist stance or was ‘misguided’ and therefore, that biologists should simply focus on maintaining MPAs (whatever their value) and not get embroiled in ‘political issues’ such as landscape-level governance. It is worth reiterating that the IUCN’s support for both MPA and industrial development played an important role in suppressing dissent over the ecological fix. Some biologists pointed to the overwhelming belief that MPAs are central to the conservation of wildlife. For instance, a biologist said, ‘As a biologist, I have to say GMS is not adequate because the turtles spend a lot of time outside the park and ... but as a conservationist I *have* to support it.’ One of them explained that the ability of biologists to influence conservation policy was very limited because some scientific ideas such as a spatio-temporally dynamic form of protection did not find any traction with the Forest Department but other more territorial forms of governance did. Two others said the decision to declare the MPA had been a purely administrative one and agreed that biologists had very little influence over the process (as befits an ecological fix). Also, questioning such decisions could affect the biologists’ access to protected sites and species because these are tightly controlled by the Forest Department. Others appeared to feel that the physical space of the MPA confers some legitimacy to conservation discourse in production landscapes because they are socially accepted as the space for wildlife and therefore policy-makers pay some attention to such issues.

On the whole, it appears likely that a combination of disciplining forces have prevented biologists from initiating an open discussion on the ecological relevance of GMS. Their heterogeneous responses also mirror a larger global debate over whether scientists can and should engage in conservation policy and advocacy [74,75,76,77]. Also, some studies have shown that conservationists (including scientists) who interrogate the dominant rationality that favours Protected Areas tend to face considerable pressure to conform or else run the risk of being penalized in multiple ways, ranging from a loss of professional authority to diminished access to funding [78,79,80,81].

9. Conclusion

As our case study illustrates, Gahirmatha Marine Sanctuary serves as an ecological fix because it was created by the state as a contingent solution to alleviate the economic crisis caused by the ban on shrimp exports. The MPA has helped to maintain the status quo with respect to how capital is accumulated in the fisheries sector because in effect, no restrictions have been imposed on trawling and hence the mode of production has remained unchanged. Further, the shared neoliberal orientation of three powerful actors—the state, the industrial sector and international conservation institutions—has helped to maintain the fix and screen the effects of further industrial growth along the Odisha coast. The fix has also been upheld by the dominant belief within the conservation community that no-take MPAs represent the best solution to many problems of marine governance [82,83,84]. However, there is intense opposition from small-scale fishers because they have borne the brunt of the restrictions and penalties imposed by the MPA, without adequate compensation from the state. Biologists too are not convinced of the sanctuary’s ecological coherence given the mobility of turtles and the diffused nature of threats posed by intensive industrialisation along the coast. Therefore, this study suggests that conservationists need to be alert to the context, discourse and practice surrounding MPAs as uncritical acceptance of such spatial solutions may enable capitalistic modes of production at a regional scale and eventually undermine the goals of wildlife conservation.

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References

- [1] W. Swartz, U. Rashid Sumaila, R. Watson, et al., Sourcing Seafood for the Three Major Markets: the EU, Japan and the USA’, *Marine Policy* 34 (6) (2010) 1366–1373.
- [2] R. Gillett, ‘Global Study of Shrimp Fisheries’, FAO Fisheries Technical Paper No. Food and Agriculture Organization, Rome, 2008, p. 475.
- [3] J. Kurien, ‘Technical Assistance Projects and Socio-Economic Change Norwegian Intervention in Kerala’s Fisheries Development’, *Economic and Political Weekly* 20 (1985) A70–A88.
- [4] A. Subramanian, *Shorelines: Space and Rights in South India*, Stanford University Press, Stanford, 2009.
- [5] D. Harvey, ‘Globalization and the Spatial Fix’, *Geographische Revue* 2 (3) (2001) 23–31.
- [6] B. Bhathal, D. Pauly, ‘Fishing down Marine Food Webs” and Spatial Expansion of Coastal Fisheries in India, 1950–2000’, *Fisheries Research* 91 (1) (2008) 26–34.
- [7] L. Campling, ‘The Tuna “Commodity Frontier”: Business Strategies and Environment in the Industrial Tuna Fisheries of the Western Indian Ocean’, *Journal of Agrarian Change* 12 (2–3) (2012) 252–278.
- [8] A. Menon, M. Bavinck, J. Stephen, R. Manimohan, ‘The Political Ecology of Palk Bay Fisheries: Geographies of Capital, Fisher Conflict, Ethnicity and Nation-State’, *Antipode* 48 (2) (2016) 393–411.
- [9] T.E. Skilton, ‘GATT and the Environment in Conflict: the Tuna–Dolphin Dispute and the Quest for an International Conservation Strategy’, *Cornell International Law Journal* 26 (2) (1993) 455–494.
- [10] C.C. Joyner, Z. Tyler, ‘Marine Conservation versus International Free Trade: Reconciling Dolphins with Tuna and Sea Turtles with Shrimp’, *Ocean Development and International Law* 31 (1–2) (2000) 127–150.
- [11] C. Hedley, ‘The 1998 Agreement on the International Dolphin Conservation Program: Recent Developments in the Tuna–Dolphin Controversy in the Eastern Pacific Ocean’, *Ocean Development and International Law* 32 (1) (2001) 71–92.
- [12] G. Notarbartolo di sciarra, T. Agardy, D. Hyrenbach, et al., ‘The Pelagos Sanctuary for Mediterranean Marine Mammals’, *Aquatic Conservation: Marine and Freshwater Ecosystems* 18 (2008) 367–391.
- [13] G. Schofield, M. Lilley, C. Bishop, et al., ‘Conservation Hotspots: Implications of Intense Spatial Area Use by Breeding Male and Female Loggerheads at the Mediterranean’s Largest Rookery’, *Endangered Species Research* 10 (2009) 191–202.
- [14] A.M. Gormley, E. Sloat, S. Dawson, et al., ‘First Evidence that Marine Protected Areas can Work for Marine Mammals’, *Journal of Applied Ecology* 49 (2) (2012) 474–480.
- [15] E. Hoyt, *Marine Protected Areas for Whales, Dolphins and Porpoises*, Earthscan, London, 2011.
- [16] S.M. Maxwell, G.A. Breed, B.A. Nickel, et al., *Using Satellite Tracking to Optimize*

- Protection of Long-Lived Marine Species: Olive Ridley Sea Turtle Conservation in Central Africa', *PLoS One* 6 (5) (2011) e19905, <http://dx.doi.org/10.1371/journal.pone.0019905>.
- [17] A.B. Kelly, 'Conservation Practice as Primitive Accumulation', *Journal of Peasant Studies* 38 (4) (2011) 683–701.
- [18] B. Jessop, 'Spatial Fixes, Temporal Fixes and Spatio-Temporal Fixes', in: N. Castree, D. Gregory (Eds.), *David Harvey: A Critical Reader*, Blackwell Publishing, Malden, 2006, pp. 142–166.
- [19] N. Castree, 'Neoliberalising Nature: the Logics of Deregulation and Reregulation', *Environment and Planning A* 40 (1) (2008) 131–153.
- [20] J. O'Connor, *Natural Causes: Essays in Ecological Marxism*, Guilford Press, New York, 1998.
- [21] K. Bakker, 'Neoliberal Nature, Ecological fixes, and the Pitfalls of Comparative Research', *Environment and Planning A* 41 (8) (2009) 1781–1787.
- [22] M. Ekers, S. Prudham, 'Towards the Socio-Ecological Fix', *Environment and Planning A* 47 (12) (2015) 2438–2445.
- [23] G.E. Marcus, 'Ethnography in/of the World System: the Emergence of Multi-Sited Ethnography', *Annual Review of Anthropology* 24 (1995) 95–117.
- [24] A. Gupta, J. Ferguson, 'Discipline and Practice: "the Field" as Site, Method and Location in Anthropology', in: A. Gupta, J. Ferguson (Eds.), *Anthropological Locations*, University of California Press, Berkeley, 1997, pp. 1–46.
- [25] U. Hannerz, 'Being There...and There...and There!: Reflections on Multi-Site Ethnography', *Ethnography* 4 (2003) 201–216.
- [26] J.A. Conti, M. O'Neil, *Studying Power: Qualitative Methods and the Global Elite*, *Qualitative Research* 7 (2007) 63–82.
- [27] W.S. Harvey, 'Strategies for Conducting Elite Interviews', *Ethnography* 11 (2011) 431–441.
- [28] R.H. Bernard, *Research Methods in Anthropology: Qualitative and Quantitative Approaches*, Altamira Press, Oxford, 2006.
- [29] J. Kurien, 'Entry of Big Business into Fishing Its Impact on Fish Economy', *Economic and Political Weekly* 13 (36) (1978) 1557–1565.
- [30] S. Reuben, S. Rao, G. Luther, et al., 'An Assessment of the Bottom-Trawl Fishery Resources of the Northeast Coast of India', *Central Marine Fisheries Research Institute Bulletin* 44 (1989) 59–77.
- [31] S. Mathew, 'Socio-Economic Aspects of Management Measures Aimed at Controlling Sea Turtle Mortality: a Case Study of Orissa, India', in: Report of the Expert Consultation on Interactions between Sea Turtles and Fisheries within an Ecosystem Context. FAO Fisheries Report No. 738. Rome: Food and Agriculture Organization, 2004.
- [32] J. Kurien, T. Achari, 'Overfishing along Kerala Coast: Causes and Consequences', *Economic and Political Weekly* 25 (35) (2011) 2011–2018.
- [33] J. Kurien, 'Impact of Joint Ventures on Fish Economy', *Economic and Political Weekly* 30 (6) (1995) 300–302.
- [34] Government of India, 'Report of the High-Level Committee to Review Deep Sea Fishing Policy: Vol. I (Murari Committee)'. New Delhi: Ministry of Food Processing Industries, 1996.
- [35] K. Scariah, C.J. Prasad, V.P. Annam, et al., 'Marine Fisheries of Orissa', in: Pillai V. N. and N. G. Menon (eds.) *Marine Fisheries Research and Management*, Cochin: Central Marine Fisheries Research Institute, 2000, pp. 222–235.
- [36] V. Salagrama, *Bycatch utilisation in Indian fisheries: an overview*. Unpublished report 1998.
- [37] A.P. Dineshbabu, E.V. Radhakrishnan, S. Thomas, et al., 'An appraisal of Trawl Fisheries of India with Special Reference on the Changing Trends in Bycatch Utilization', *Journal of the Marine Biological Association of India* 55 (2) (2013) 69–78.
- [38] E. Silas, M. Rajagopalan, A. Fernando, et al., 'Marine Turtle Conservation and Management: a Survey of the Situation in Orissa 1981 / 82 and 1982 / 83', *Marine Fisheries Information Service* 50 (1983) 13–23.
- [39] B. Pandav, B.C. Choudhury, K. Shanker, 'The Olive Ridley Sea Turtle (*Lepidochelys olivacea*) in Orissa: an Urgent Call for an Intensive and Integrated Conservation Programme', *Current Science* 75 (1998) 1323–1328.
- [40] B. Pandav, B. Choudhury, 'Conservation and Management of Olive Ridley Sea Turtle (*Lepidochelys olivacea*) in Orissa, Wildlife Institute of India, India', Dehradun, 2000.
- [41] E. Moll, S. Bhaskar, J. Vijaya, 'Update on the Olive Ridley on the East Coast of India', *Marine Turtle Newsletter* 25 (1983) 2–4.
- [42] M. Rajagopalan, E. Vivekanandan, S. Krishna Pillai, et al., 'Incidental Catch of Sea Turtles in India', *Marine Fisheries Information Service* 143 (1996) 8–16.
- [43] B. Wright, B. Mohanty, 'Operation Kachhapa: An NGO Initiative for Sea Turtle Conservation in Orissa', in: K. Shanker, B.C. Choudhury (Eds.), *Marine Turtles in the Indian Subcontinent*, Universities Press, Hyderabad, 2006, pp. 290–304.
- [44] K. Shanker, *From Soup to Superstar: The Story of Sea Turtle Conservation along the Indian Coast*, HarperCollins, Noida, 2015.
- [45] World Trade Organization. United States – Import Prohibition of Certain Shrimp and Shrimp Products. Report of the Panel WT/DS58/R., 1998 (https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds58_e.htm).
- [46] S. Bache, 'India and Marine Turtles at the WTO', *Kachhapa* 5 (2001) 6–10.
- [47] S. Pattanaik, 'Commercialization of Shrimp Trade, Environment and Rural Poverty: a Socio-Ecological Exploration in Coastal Orissa'. Working Paper Series No. E/274/2006. New Delhi: Institute of Economic Growth, 2006.
- [48] Government of Orissa. 'Gahirmatha (Marine) Wildlife Sanctuary'. Notification no. 8F (WL)4/97 18805/FandE, 1997.
- [49] World Trade Organization. United States – Import Prohibition of Certain Shrimp and Shrimp Products. Recourse to Article 21.5 by Malaysia. Report of the Panel. WT/DS58/RW., 2001 (https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds58_e.htm).
- [50] P. Sekhsaria, 'The Dhamra Port in Orissa', *Indian Ocean Turtle Newsletter* 1 (1) (2005) 14–16.
- [51] S. Rodriguez, A. Sridhar, 'Dhamra Port: How Environmental Regulatory Failure Fuels Corporate Irreverence', *Indian Ocean Turtle Newsletter* 8 (2008) 19–23.
- [52] K.I. MacDonald, 'The Devil is in the (Bio)diversity: Private Sector "Engagement" and the Restructuring of Biodiversity Conservation', *Antipode* 42 (3) (2010) 513–550.
- [53] Anonymous. 'Proceedings of the Workshop-cum-Demonstration on TED for Trawl Owners and Operators on Orissa Coast', Unpublished Report of Project Swarajya, Orissa, 2002.
- [54] Government of Orissa. (2003) 'Port Policy'. <http://documents.gov.in/OR/404.pdf>.
- [55] Government of India. 'Visit of Central Empowered Committee to Orissa, February 10–14, 2004 (Jayakrishnan Committee)'. New Delhi: Government of India.
- [56] Directorate of Fisheries. (2015) *Fisheries Statistics Report*. <http://www.odishafisheries.com/website/fisheries-statistics.htm> (accessed on Apr 10th 2015).
- [57] R. Badola, S. Hussain, 'Valuation of the Bhitarkanika Mangrove Ecosystem for Ecological Security and Sustainable Resource Use', Study Report Wildlife Institute of India, Dehradun, 2003.
- [58] S. Sivakami, S. Kuriakose, 'An Appraisal of the Marine Fisheries of Orissa, India', *Asian Fisheries Science* 22 (2009) 691–705.
- [59] P. Mohanty-Hejmadi, 'Latest Word on the Talachua Jetty, Orissa, India', *Marine Turtle Newsletter* 67 (1994) 1–2.
- [60] S. Chadha, C.S. Kar, *Bhitarkanika: Myth and Reality*, Natraj Publishers, Dehradun, 1999.
- [61] Government of Odisha. (2014) 'Outcome Budget 2014–15'. http://www.odisha.gov.in/finance/Budgets/Outcome_budget_2014-15/Forest_14-15.pdf.
- [62] IUCN. *Protecting the Olive Ridley Turtle, The Story of the Dhamra Port*. Gland: International Union for the Conservation of Nature, 2014.
- [63] A. Sridhar, *Sea Turtle Conservation and Fisheries in Orissa, India, Samudra Monograph*, International Collective in Support of Fishworkers, Chennai, 2005.
- [64] ICSF. 'Social Dimensions of Marine Protected Area Implementation in India: Do Fishing Communities Benefit?'. The India MPA Workshop Proceedings, March 2009. Chennai: International Collective in Support of Fishworkers.
- [65] D. Staples, V. Salagrama, N. Ruello, et al., *India: marine fisheries sector study*. Background paper for World Bank Marine Fisheries Study. Unpublished report, (2007).
- [66] C. Kar, M. Dash, 'Conservation and Status of Sea Turtles in Orissa', *Proceedings of the Workshop on Sea Turtle Conservation*. CMFRI Special Publication No 18 (1984) 93–107.
- [67] G. Prusty, S. Dash, M.P. Singh, 'Spatio-Temporal Analysis of Multi-Date IRS Imageries for Turtle Habitat Dynamics Characterization at Gahirmatha Coast, India', *International Journal of Remote Sensing* 28 (5) (2007) 871–883.
- [68] S. Behera, B. Tripathy, K. Sivakumar, et al., 'Nesting Habitat Suitability for Olive Ridley Turtles (*Lepidochelys olivacea*) at the Gahirmatha Rookery, Odisha Coast of India', *International Journal of Conservation Science* 4 (4) (2013) 477–484.
- [69] S. Behera, B. Tripathy, K. Sivakumar, et al., 'A Case Study on Olive Ridley (*Lepidochelys olivacea*), Solitary Nests in Gahirmatha Rookery, Odisha, India', *Testudo* 7 (5) (2013) 49–60.
- [70] K. Ram, 'Offshore Studies on Olive Ridley Sea Turtles in Gahirmatha, Orissa', *Kachhapa* 3 (2000) 13–15.
- [71] S. Behera, B. Tripathy, K. Sivakumar, et al., 'Fisheries impact on breeding of olive ridley turtles (*Lepidochelys olivacea*) along the Gahirmatha coast, Bay of Bengal, Odisha, India', *Herpetological Journal* 26 (2016) 93–98.
- [72] S.R. Kumar, 'Offshore Ecology and Behaviour of the Olive Ridley Sea Turtle *Lepidochelys olivacea* along the Rushikulya Rookery, Orissa Coast, India'. Unpublished Ph D dissertation, Saurashtra University (2015).
- [73] G.V. Gopi, B. Pandav, B.C. Choudhury, 'Incidental Capture and Mortality of Olive Ridley Turtles (*Lepidochelys olivacea*) in Commercial Trawl Fisheries in Coastal Waters of Orissa, India', *Chelonian Conservation and Biology* 5 (2) (2006) 276–280.
- [74] C. Meine, M. Soule, R.F. Noss, 'A Mission-Driven Discipline': the Growth of Conservation Biology', *Conservation Biology* 20 (3) (2006) 631–651.
- [75] N.J. Gray, L.M. Campbell, 'Science, Policy Advocacy, and Marine Protected Areas', *Conservation Biology* 23 (2) (2009) 460–468.
- [76] R. Arlettaz, M. Schaub, J. Fournier, et al., 'From Publications to Public Actions: When Conservation Biologists Bridge the Gap Between Research and Implementation', *BioScience* 60 (10) (2010) 835–842.
- [77] L.D. Jenkins, S.M. Maxwell, E. Fisher, 'Increasing Conservation Impact and Policy Relevance of Research through Embedded Experiences', *Conservation Biology* 26 (4) (2012) 740–742.
- [78] K.H. Redford, A. Taber, 'Writing the Wrongs: Developing a Safe-Fail Culture in Conservation', *Conservation Biology* 14 (6) (2000) 1567–1568.
- [79] A.J. Kinchy, D.L. Kleinman, 'Organizing Credibility: Discursive and Organizational Orthodoxy on the Borders of Ecology and Politics', *Social Studies of Science* 33 (6) (2003) 869–896.
- [80] B. Buscher, S. Sullivan, K. Neves, et al., 'Towards a Synthesized Critique of Neoliberal Biodiversity Conservation', *Capitalism Nature Socialism* 23 (2) (2012) 4–30.
- [81] C. Corson, K.I. Macdonald, 'Enclosing the Global Commons: the Convention on Biological Diversity and Green Grabbing', *Journal of Peasant Studies* 39 (2012) 263–283.
- [82] N. Gray, 'Sea Change: Exploring the International Effort to Promote Marine Protected Areas', *Conservation and Society* 8 (4) (2010) 331–338.
- [83] A.J. Caveen, T.S. Gray, S.M. Stead, N.V.C. Polunin, 'MPA Policy: What Lies Behind the Science?', *Marine Policy* 37 (2013) 3–10.
- [84] N.J. Gray, R. Gruby, L. Campbell, 'Boundary Objects and Global Consensus: Scalar Narratives of Marine Conservation in the Convention on Biological Diversity', *Global Environmental Politics* 14 (3) (2014) 64–83.