

Commonisation and Decommonisation: Understanding the Processes of Change in the Chilika Lagoon, India

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Abstract

This article examines the processes of change in a large lagoon system, and its implications for how commons can be managed as commons in the long run. We use two related concepts in our analysis of change: commonisation and decommonisation; ‘commonisation’ is understood as a process through which a resource gets converted into a jointly used resource under commons institutions that deal with excludability and subtractability, and ‘decommonisation’ refers to a process through which a jointly used resource under commons institutions loses these essential characteristics. We analyse various contributing issues and dynamics associated with the processes of commonisation and decommonisation. We consider evidence collected through household and village level surveys, combined with a host of qualitative and quantitative research methods in the Chilika Lagoon, the largest lagoon in India, and one of the largest lagoons in Asia. We suggest that in order to keep the Chilika commons as commons will require, as a starting point, a policy environment in which legal rights and customary livelihoods are respected. With international prawn markets stabilised and the ‘pink gold rush’ over, the timing may be good for a policy change in order to create a political space for negotiation and to reverse the processes causing decommonisation. Fishers need to be empowered to re-connect to their environment and re-invent traditions of stewardship, without which there will be no resources left to fight over.

Keywords: commons, commonisation, decommonisation, property, access rights, small-scale fisheries, aquaculture, prawn, global markets, Chilika Lagoon, Odisha, India

INTRODUCTION

Property rights to resources are dynamic. What appears to be a stable property rights regime at one time scale, may be undergoing change at another. These changes respond to economic, social, and political drivers, defined in the Millennium Ecosystem Assessment (2003) sense. The changes may be manifested as adaptation or fine-tuning over time, as seen in Swiss alpine commons (Netting 1976), and Japanese

village common lands (McKean 1982). In some cases, the changes may result in the replacement of one kind of property rights regime by another, as in the enclosure movement in England that resulted in the conversion of sheep grazing commons into agricultural holdings (Dahlman 1980). In other cases, the drivers may result in cycles of change, as in Sri Lanka’s Negombo Lagoon shrimp *kattudel* (a type of trap net) fisheries (Atapattu 1987), and southern Brazilian lagoon fisheries for shrimp (Seixas & Berkes 2003).

In the context of the Chilika Lagoon, the largest lagoon in India and one of the largest lagoons in Asia, we use two related concepts—commonisation and decommonisation—in our analysis of change in the governance of lagoon commons. Commons or common pool resources share two characteristics. First, the exclusion or the control of access of potential users is difficult. Second, each user is capable of subtracting from the welfare of all other users (Ostrom 1990). Thus, common pool resources are defined as those ‘in which 1) exclusion

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of beneficiaries through physical and institutional means is especially costly, and 2) exploitation by one user reduces resource availability for others' (Ostrom *et al.* 1999: 278). Here 'commonisation' is understood as a process through which a resource gets converted into a jointly used resource under commons institutions that deal with excludability and subtractability, and 'decommonisation' refers to a process through which a jointly used resource under commons institutions loses these essential characteristics. The processes of commonisation and decommonisation are continuous and potentially two-way because they are influenced by the prevalent social, economic, political and ecological drivers. Any resource can enter into a process of commonisation; already established commons or resources that are being commonised could also revert back to decommonisation.

Using the Chilika Lagoon as a case, we illustrate how resources can be commonised and decommonised, examining key challenges regarding 1) social costs, equity and marginalisation (Narayan *et al.* 2000), 2) the significance of power relations, and the importance of political ecology for commons (Johnson 2004; Robbins 2004), and 3) how commons can be managed as commons in the long run (Ostrom 1990).

The study focuses on how the Chilika Lagoon, basically a state property, was commonised through customary use by caste-based fisher communities, and later made official through a lease system by the State Government of Odisha (formerly known as Orissa). We further examine how this commons system broke down and decommonised after the rise of prawn aquaculture and aquaculture politics. (The term prawn is used to mean large shrimp, consistent with terminology in India.) We analyse various contributing issues and dynamics associated with the processes of commonisation and decommonisation. We first explore both commonisation and decommonisation through 1) key factors shaping commons use in the Chilika Lagoon, and 2) key factors in the loss of collective fisher rights, and then we discuss some of the major trends emerging from these processes. Finally, we conclude by considering lessons on 'how to keep commons as commons' in the face of growing challenges.

STUDY AREA AND METHODS

The study was conducted in the Chilika Lagoon, the largest lagoon in India, near the Bay of Bengal. The Chilika Lagoon is a Ramsar wetland of international importance, and a productive area with a fish fauna adapted to the mix of freshwater and seawater that characterises lagoon ecosystems. More than 3,00,000 fishers, belonging to specific caste groups, customarily depend upon the Chilika Lagoon for their livelihoods. The shallow and sheltered waters of the Chilika Lagoon are also suitable for aquaculture, especially for the production of the lucrative tiger prawn (*Penaeus monodon*).

The study was carried out over a period of 28 months from 2007 to 2009 using a mixed methods research approach (Creswell 2003; Johnson & Onwuegbuzie 2004). Both qualitative and quantitative methods were used under the

broad principles of participatory approaches. Three sets of data collection methods were used which included 1) a variety of surveys involving fisher households and villages, 2) consultations and interviews across multiple stakeholders, and 3) accessing secondary data sources including both village records and policy documents. We did a rapid survey of about 60 fisher and non-fisher villages around the Chilika Lagoon to get a perspective of the situation. Discussions with a number of non-governmental organisations (NGOs), research institutions, government departments, Chilika Fishers' Federation, and key individuals added to this experience. Based on some preliminary findings, a list of eight criteria¹ were drawn, based on which the two study villages (Berhampur and Badakul) were selected, and a household survey questionnaire was developed, field-tested and revised before being used. Surveys were undertaken at three different levels: 1) household (N = 160) surveys in the two selected fisher villages, 2) household-level monthly (N = 30) monitoring, and 3) general surveys in fisher villages (N = 140).

For the household survey, Berhampur and Badakul villages were selected to broadly represent Chilika villages in early and late stages of change, respectively. In Berhampur, a village with 285 fisher households, a 40% sampling (considered significant) was done, and in Badakul, a village with 60 households, 100% sampling was done. The household survey questionnaire covered areas ranging from demography and livelihoods to out-migration and village institutions. We designed the household survey questionnaire with open-ended questions, to ensure a variety of answers, which were then coded for quantification and interpretation. Following the household surveys, we also set up a household-level monthly monitoring to understand how households respond to crisis, the nature of the crisis itself, and emerging trends. The household-level monthly monitoring continued for a period of 18 months from January 2008 to June 2009. General surveys in all fisher villages in Chilika were undertaken with support from the Chilika Fishers' Federation and other local contact persons. The general survey questionnaire was designed in a format that ensured both qualitative and quantitative information was obtained, in order to help understand the overall livelihood and out-migration trends at the level of the Chilika Lagoon.

Several consultations and interviews with multiple stakeholders were conducted. Village elders, some actively involved in fish cooperatives, were important sources of information. Interviews with members of the village institution were conducted, and focus group discussions were held to elicit views of women and other vulnerable groups. Views of NGOs, relevant departments in the government, political representatives, fish traders, officials of the tourist boat associations, and representatives of the Chilika Fishers' Federation were collected to understand perceptions of a cross-section of stakeholders. Four one-day policy workshops were organised with selected representatives from various fisher villages of Chilika to discuss and come up with recommendations on specific issues linked to the Chilika

Lagoon management. Over the long term, interviews, focus groups, and other participatory exercises had a representation from over 70% households in Berhampur and 100% households in Badakul. Apart from the two study villages, a number of these exercises were also conducted in both fisher and non-fisher villages in Chilika.

A wide variety of secondary data sources were accessed. Written records of village institutions / cooperatives, account books of fish traders, records of tourist boat associations, and proceedings of the Chilika Fishers' Federation were studied. Village historical records on fishing area lease rights going back to 1957 were collected and analysed from the fisheries department. Government orders, legislative assembly proceedings, development plans and other policies concerning the Chilika Lagoon management at the district, state and national levels were analysed to understand the overall policy and administrative environment.

COMMONISING THE LAGOON: KEY FACTORS SHAPING COMMONS USE IN CHILIKA

Several factors acted together to shape the formation of commons in the Chilika Lagoon (Table 1). These factors were rooted in the social, cultural, economic, ecological and

political history and traditions of the area, and the influences of several external drivers². Ostrom (1990) identified eight 'design principles' for collective action for common pool resource management. Agrawal (2002) extended this list to a total of 24 enabling conditions for sustainability of commons use. He argued that the large number of variables potentially affecting the sustainability of common resources and their use, thus, have important theoretical implications for future research. Our study shows that a number of factors shaping commons use in Chilika conform to these design principles (Ostrom 1990) and 'sustainability variables' (Agrawal 2002). In our analysis, we argue that in addition to the mainly internal variables that Ostrom (1990) and Agrawal (2002) emphasised, external drivers can be of key importance.

Resource Conditions and Population Density

Both oral history and documented evidence³ indicate that the Chilika Lagoon enjoyed a good resource base until about the end of 1970s. The Chilika Lagoon interacted with the Bay of Bengal through a naturally existing sea mouth, and 52 rivers and rivulets supplied fresh water. The combination of variables (water depth, salinity levels, and pace of water flow) provided for a productive ecosystem and habitat for numerous

Table 1
Key factors of the commonisation process in Chilika

Key factors	Manifestations
Favourable resource conditions	Sound ecological health and a good resource base Better ecological condition of resource and regulated fishing practices favoured high production Higher incomes from fishing, and everyone got a share of benefit Economic benefits kept levels of competition and conflicts low
Relatively low population densities	Small population size meant less fishers Easier for fishers to form more cohesive and manageable groups
Rules about inclusion and exclusion (based on caste)	Only fishers by caste allowed to engage in fishing Caste-based norms specified fishing rights and entitlements
Clear rights and entitlements	Caste norms for use and management of the Chilika Lagoon resources Customary practices established specific rights of fishers with regard to access, use, management and membership Resource rights mutually sanctioned by caste users and recognised through legal arrangements Lease system protected interests of customary fishers by providing exclusive rights
Strong (nested and multi-level) fisher institutions	Fishers' institutions at various levels, i.e., from village to regional Distribution of functional responsibilities amongst institutions Community-based institutions in command
Fishing practices	Caste-based, season-based, species-based, and location specific Considered needs of each caste and allocated separate fishing techniques which helped reduce conflicts Focused on the seasonality of the Chilika Lagoon and its species; valued the importance of resource sustainability Based on collective action involving either a big group of villagers or the entire village (fishing as group activity)
Supportive government policies	Approach of minimal or no interference Favoured capture-based fishery Recognised caste-based arrangements for fisheries management
Sense of connection to the Chilika Lagoon	Social and economic benefits, ecological and political advantages, and cultural practices kept fishers connected to the Chilika Lagoon Gave meaning to fishers' life Living with the Chilika Lagoon: fishing as a 'way of life' and Chilika as a mother (concept of 'Maa Chilika')

species of flora and fauna (Asthana 1978). The ecological history of the Chilika Lagoon provides an understanding that the state of its ecosystem health and resource sustainability acted as a crucial driver of commonisation. Our analysis based on two focus group discussions on the history of the Chilika Lagoon management suggests that good resource conditions and regulated fishing practices favoured high production, and everyone got a share of the benefits. We are not claiming that resources and communities were 'stable', but there is no published literature, government or media report about resource crises and conflicts until the 1970s. Equity in sharing economic benefits seems to have kept competition and conflicts at a low level, motivating fishers to work together on the process of commonising customary fishing areas within the Chilika Lagoon.

Equitable sharing of the benefit stream provided a foundation for commonisation, and a reasonably low population density was an additional factor that helped maintain the resource base. In 1950, the total population of fishers in the Chilika Lagoon was about three-and-a-half times less than in the 2000s.⁴ Fishers were able to function cohesively enough to form village groups that could handle the rules and norms of resource use, and presumably resolve resource conflicts considering they do not feature in the written or oral histories of the region.

Caste-defined Fishing Norms and Use Rules

Based on a number of survey and settlement reports from pre-independence India⁵ and Odisha State Gazetteers, the initiation of commonisation in Chilika could be traced back to the early part of the eighteenth century. These documents suggest that fishery resources in Chilika were managed on a caste-basis. According to caste norms, the fisher castes held rights and entitlements, and were allowed to engage in fishing while the non-fisher castes were not.⁶ The non-fisher castes were considered to be higher castes, and they primarily undertook farming and other non-fishing occupations, while the fisher castes continued fishing in Chilika as their primary or only livelihood occupation. Thus, the caste system facilitated the emergence of specific caste-based occupations, that in turn allowed for defining rights and entitlements. This in itself became one of the key foundations of commonisation in the Chilika Lagoon.⁷

There are four different castes in the Chilika region which are customarily known as fishers.⁸ Once the basic distinction between the rights of fisher and non-fisher castes was in place, the fisher castes elaborated further on the rules of inclusion and exclusion, by specifying the exact nature of the fishing rights and entitlements with regard to the Chilika Lagoon fisheries resources, that each of the four fisher castes could hold (Table 2). Supported by caste norms, the rules included social and cultural sanctions; these rules were also recognised by the local kings of Parikuda and Khallikote during pre-independence, and the State Government of Odisha after independence.

Resource Rights, Nested Institutions and Multi-level Linkages

The management of the Chilika Lagoon resources was based on rules that were agreed upon. A long process of customary fishing practices that streamlined specific rights, strengthened these rules. In other words, fishing related norms, rules, and practices helped in defining important elements of excludability (or access-control) and subtractability (rules of conduct and sharing) with specific reference to access, use, management, and membership (Ostrom & Schlager 1996). Local resource rights were established and mutually sanctioned by the caste users; these eventually found recognition by the state through legal arrangements. A lease system was put in place in 1942 (before India's independence) to allow the fishers exclusive rights to specific fishing areas within the Chilika Lagoon. The lease system was based on two principles which protected the interests of the customary fishers: 1) lease was offered only to fisher villages and not to individuals, and 2) lease was meant only for fisher castes and not for non-fisher castes. Thus, clear resource rights, mutually sanctioned by caste users and recognised through legal arrangements, provided the way to commonisation in the Chilika Lagoon. Also part of the process was continued negotiation and settlement of access and benefit rights amongst potential users.

The norms and rules were made operational through elaborate institutional arrangements with multi-level linkages (Table 3). At the village level, the traditional village institutions (known as village committees) were in charge of the fishery resources, and either the village headman or a council of elders provided leadership. After 1959, village level Primary Fisherman Cooperative Society (PFCS) took over as the key community institution with regard to fisheries management in Chilika. The traditional village institutions that were responsible for the overall village management continued to provide guidance to the PFCS and monitored fishery related matters as needed. At the regional level, the Central Fisherman Cooperative Marketing Society (CFCMS), the apex organisation of all the PFCS, maintained coordination between the PFCSs and worked as an umbrella organisation to negotiate with government departments. The District Revenue Department used to lease out all demarcated fishing areas to the CFCMS, which in turn allocated them to village level PFCSs through an elaborate system of sub-leases. *Jati Panchayats* or Caste Assemblies were another prominent institutional arrangements that facilitated commons formation in Chilika. There is a saying in Chilika that 'when nothing works the *Jati Panchayat* takes over the reins and ensures that resolution of the issue is achieved'. A later addition was the Chilika Fishers' Federation that consisted of all the fisher villages as members, and it functioned as an advocacy and pressure group. These layers of commons institutions and their linkages clarify the rich institutional arrangements in the Chilika Lagoon. The nested character and the multi-level linkages of these commons institutions provided a strong institutional basis for the process of commonisation in Chilika.

Table 2
Fishing methods, techniques and practices of the various fisher castes in Chilika

Fisher castes	Fishing methods	Fishing techniques	Location of fishing	Season of fishing	Type of catch
<i>Kaibartya</i> and <i>Khatia</i>	<i>Jano</i>	Enclosure with bamboo and nets	Shallow waters in narrow channels	May – September	Bigger fish and prawn
<i>Kaibartya</i> and <i>Khatia</i>	<i>Bahani</i>	Handmade cast nets and non-motorised boats	Mostly deep waters but occasionally shallow waters	October – June	Bigger fish and prawn
Mainly by <i>Kaibartya</i> and <i>Khatia</i> ; occasionally by other fisher castes	<i>Dian</i>	Use of nets and collection by hand	Around the “Jano” fisher areas	May – September	Fish of all sizes
<i>Kandra</i>	<i>Baja, Dhaudi</i> and <i>Tataa</i> (trap fishing)	Bamboo boxes of different shapes and sizes	Shallow waters and change of place seasonally	Twelve months	Prawn and medium to small fish
<i>Tiara</i>	<i>Baja, Dhaudi, Khainchi, Mugura</i> and <i>Tataa</i>	Bamboo boxes of different shapes and sizes	Shallow waters and change of place seasonally	Twelve months	Prawn and medium to small fish
<i>Kandra</i> and <i>Tiara</i>	<i>Prawn khatti</i>	Bamboo and net enclosures for capturing prawn	Shallow waters	March – August	Prawn of all sizes
Women of <i>Bhoi</i> caste (non-fisher)	<i>Chimuta</i>	Hand pick prawns from mud under shallow water	Shallow water	March – August	Prawn of all sizes
Men of <i>Bhoi</i> caste (non-fisher)	<i>Suti</i>	Angling with hook and line only	Shallow and not so deep waters	Mainly in summer	Fish of different sizes
	<i>Poluha</i>	Manually drain water from an enclosed water area to catch fish and prawn	Shallow waters or near shore areas		Prawn
Both fisher and non-fisher castes	<i>Uthapani</i>	Fisher in extended water areas in rainy season	Near shore and in shallow areas	July – September	Prawn and fish of all sizes
Mainly by non-fisher castes; occasionally by fisher castes	<i>Khainchi, Mugura</i> and <i>Khatia</i>	Bamboo boxes of different shapes and sizes	Shallow water and change of place seasonally	Twelve months	Prawn and medium to small fish
	<i>Poluha</i>	Manually drain water from an enclosed water area to catch fish and prawn	Shallow waters	Mainly in summer	Prawn and medium to small fish

Table 3
Nested and multi-level commons institutional arrangements in Chilika and their current status

Institution	Level of organisation	Membership	Key functions	Current status
Traditional village committee	Village	All households represented by adult members	Overall village management including fishing	Exist in all villages but ineffective in dealing with current fisheries management issues
Primary Fishermen Cooperative Societies (PFCS)	Single or cluster of villages	All fishing households	All fishing related matters including fishing area leases	Exist on paper, used for annual lease but otherwise either dormant or dysfunctional
Central Fishermen Cooperative Marketing Society (CFCMS)	All fishing villages in Chilika having PFCS	All PFCS and its members	Taking area lease from revenue department and sub-lease to PFCS	Dissolved; powers were given to the Odisha State Fishermen’s Co-operative Federation (FISHFED) in 1988
<i>Jati Panchayats</i> or Caste Assemblies	Regional / national, all fishers belonging to a particular fishing caste in the Chilika region and elsewhere	Fishing villages or fishers belonging to a particular fisher caste	All matters relating to the particular fisher caste, including fishing related conflicts	Exist but with weak structure and functions
Fisher Federation	The Chilika Lagoon	All fisher villages in Chilika	Advocacy on fishers’ issues of concern, conflict resolution, and overall monitoring	Divided into five groups based on caste, location of villages and political party affiliation

FISHING PRACTICES, POLICY SUPPORT AND FISHERS' CONNECTION TO THE CHILIKA LAGOON

The traditional fishing practices were based on the seasonal cycles of fish species, and their use was specific to particular locations within the Chilika Lagoon (Table 2). Each caste of fishers used different fishing gears and methods, in different locations specified by customary norms. There was clear agreement on what to catch, where, in which season, by whom, and the particular fishing technique to be used. Thus the methods of fishing conformed to the entitlements of each particular caste, and reduced chances of conflict by allocating separate methods of fishing.⁹ By focusing on seasonally abundant species, fishing practices helped maintain a healthy lagoon system. Communal fishing methods were frequently used. A number of techniques required collective action in which a group of villagers, even the entire village, had to go together for fishing; there were rules of practice and rules for sharing the catch equitably.

The State Government of Odisha's overall policy on the Chilika Lagoon management was characterised by an approach of non-interference until about the 1970s. This unwritten policy stood in favour of a capture-based fishery, thereby keeping interference from non-fishers to a minimum. It was evident that existing social, cultural, political, and biophysical factors helped fishers to maintain strong livelihood and cultural connections with the Chilika Lagoon. The fishers considered the Chilika Lagoon as their mother ('Maa Chilika') and fishing as a 'way of life'. Sadashiva Jena, Secretary, Regional Fisher Federation, explained:

Chilika was not only a source of income and other economic benefits for us, but it also gave the real meaning to our lives as fishers. Because we are fishers by caste and custom, it is our supreme duty to engage in fishing... without fishing (and the Lagoon) we would be reduced to mere nothing. Chilika and us—we symbolise each others' identities.

DECOMMONISING THE LAGOON: KEY FACTORS IN THE LOSS OF COLLECTIVE FISHER RIGHTS

'Pink Gold Rush' in Chilika and Explosive Aquaculture

Since the 1970s, a steady increase in the global demand for fish, and a consistent decline in the total yield from capture fishery sources have brought aquaculture development to the forefront (Marshall 2001; Delgado *et al.* 2003; Pradhan & Flaherty 2008). Growing consumer demand for prawn in North America, Europe, and Japan gave rise to high international prices (Neiland *et al.* 2001; Béné 2005) thereby luring many countries into export-oriented prawn aquaculture. The international market for shrimp and prawn developed in the 1970s; prawn that previously had little value in India, now became 'pink gold' (Kurien 1992). Intensive prawn aquaculture started in the late 1970s in India and gained

momentum in the mid-1980s, putting India among the leading prawn exporting countries. The total value of export earnings from prawn in the year 2004 was USD 715 million (Food and Agriculture Organisation 2006), which has since then gone up. The Chilika Lagoon, which was a natural area for tiger prawn (*Penaeus monodon*), caught on to the trend in the early 1980s, as investors and policy makers found it highly suitable for intensive prawn aquaculture. As the international price of tiger prawns spiralled upwards, the stakes for the non-fishers became formidable (Pattnaik 2007).

Following global market trends on international prawn prices, a major blow to commonisation came with the explosive growth of prawn aquaculture in the Chilika Lagoon in the 1980s. Mainly non-fishers, with direct or indirect involvement of powerful people, started to invest in aquaculture. Driven by profit motives, they started taking over more and more of the customary fishing areas of the caste-based fishers, and converted them into prawn ponds. A culture of encroachment became prominent. Towards the end of 1980s, the Chilika Lagoon was taken over by the non-fishers and what the fisher castes call the 'Chingudi'¹⁰ mafia'. These developments gave rise to severe conflicts between caste-based fishers and non-fishers, which became a regular phenomenon in the Chilika Lagoon. Although the process of decommonisation started with the change in global markets for prawn, several other key factors, as detailed in the following sections (Table 4), also contributed to the process of decommonisation.

Fishing Area Allocation and Changes in Lease Policy

Even though aquaculture was a predominant factor in the loss of collective fisher rights, the actual loss of customary fishing areas had in fact started in the early 1970s with the creation of protected areas within the Chilika Lagoon. It is important to note that the State Government of Odisha changed its approach to the management of the Chilika Lagoon in the 1970s, by declaring Nalabana Island (1,553 ha) as a wildlife sanctuary in 1974 (the Nalabana Bird Sanctuary). In the British survey records of 1897 and the lease records of CFCMS / FISHFED this particular area was mentioned as the exclusive customary fishing ground of four *Tiara* caste fisher villages in Banapur region. In one major stroke, their rights and entitlements were withdrawn, and the area where they had livelihood rights for generations was declared 'restricted' without even an attempt to consult these villages.¹¹ This marked the beginning of a process of decommonisation of specific areas within the Chilika Lagoon.

Later, during the 1980s, the State Government of Odisha also started to move away from its earlier recognition of caste-based fishery management in the Chilika Lagoon, and involved non-caste fishers and other groups, including corporations, in the fishery. In line with this approach, the State Government of Odisha signed a memorandum of understanding with the Tata group—a large Indian holding company—allowing it to make investments in intensive prawn aquaculture within Chilika. 600 ha of customary fishing grounds belonging

Table 4
Key factors of the process of decommissioning in Chilika

Key factors	Manifestations
Global market trends	International prawn prices became a driver of change
Prawn aquaculture	Non-fishers and other powerful people undertook aquaculture activities Customary fishing areas became prawn ponds Conflicts between fishers and non-fishers became prominent
Creation of Protected Areas	Protected Areas superimposed on customary fishing areas, effectively excluding fishers Reallocation of customary fishing areas and their diversion for other uses
Change in government policy	Shift in focus from capture to culture fishery From caste-based fishery to involvement of non-fishers and industry Focus on eco-tourism in the Chilika Lagoon
Change in government lease policy	Legalised prawn aquaculture Non-fishers given rights for the first time to undertake culture fishery Fishing areas withdrawn from customary fishers and handed over to non-fisher villages for prawn aquaculture
Changes in lease arrangements	Unaffordable lease fees at 27% annual increase Seen as a strategy to displace customary fishers Unofficial sub-lease of customary fishing grounds Fishing area lease to individuals, non-fisher castes, and even government departments
Culture of encroachment	Non-fishers and 'prawn mafia' indulged in encroaching customary fishing areas Bulk of the motivation came from prawn aquaculture About half of the fishing area encroached
Loss of rights and entitlements	Encroachment, high lease fees, and loss of institutional base resulted in serious issues of access and entitlements
Erosion of fisher institutions	Centralised agencies like Chilika Development Authority (CDA) and FISHFED replaced fishers' institutions Locus of decision-making control moved from local fishers to a centralised administrative control Village level cooperatives became either dormant or dysfunctional
Change in fishing practices	Dominance of synthetic nets which replaced traditional nets Fishing became more or less an individual activity
Sense of disconnect from the Chilika Lagoon	Ecological, social and economic disintegration, and unsupportive political decisions initiated a process of disconnect Growing resource degradation (loss of biodiversity and fish productivity) aggravated fishers' disconnect by promoting out-migration The new sea mouth as a key driver of change

to nine fisher villages were handed over to Tata. However, even though project development activities had started, the company decided to pull out of the area owing to sweeping protests by fishers who were united under the banner of *Chilika Bachao Andolan*¹² (Save the Chilika Movement). Nonetheless, the area under the project remained under dispute and had not been returned to the right holder fisher villages as of 2010.¹³ This incident also set a trend of more non-fishers and outsiders getting interested in prawn aquaculture as the State Government of Odisha's intentions favouring aquaculture became evident.

Continuing with its support for aquaculture, the State Government of Odisha introduced a new lease policy in 1991 that legalised prawn aquaculture in Chilika, and made provisions for non-fisher caste villages to engage in aquaculture. In accordance with the lease policy, 6,000 ha of customary fishing areas, apart from the area already under encroachment, were withdrawn from the fisher castes and reallocated to non-caste fisher villages. These developments accelerated the pace of decommissioning by setting a trend of

encroachment, and of legalisation of aquaculture.

Fisher cooperatives protested and challenged the 1991 lease policy in the State High Court. After prolonged legal battles, prawn aquaculture was banned by the Odisha State High Court in 1993, the Supreme Court of India in 1996, and the Odisha State Legislative Assembly House Committee in 1997. Finally in 2001, the State Government of Odisha banned prawn aquaculture in the Chilika Lagoon, and cancelled the 1991 lease policy. However, such far-reaching decisions failed to make any significant impact, as illegal prawn aquaculture continues unabatedly as of 2010. According to conservative estimates, more than 60% of the Chilika Lagoon fishing area remains under illegal prawn aquaculture; according to *Seafood News*¹⁴ the figure is closer to 80%. Apart from the encroached areas, areas allocated for aquaculture under the 1991 lease policy continue to be under the control of the non-fishers. Fishing areas that were used by fishing villages as caste-based commons have, in effect, become 'privatised'.

Due to growing confusion and conflict over fishing areas, a related development occurred. Our field notes indicate that

caste-based fishers were afraid of their physical safety (owing to threats of violence) and had stopped going to their customary fishing areas, that were either located close to non-fisher villages or at distances requiring travel through non-fisher villages. In addition, many caste-based fishers could not travel to their customary fishing areas, as navigation became a real problem due to the intense web of prawn farms. Eventually, these abandoned areas became *de facto* open-access, open to encroachment and eventual privatisation. One of our study villages, Badakul, has abandoned more than half of its 2,000 ha of customary fishing area due to conflicts with aquaculture owners.

The apportionment of fishing area continued without any change in the lease fees until 1965 when a system of 10% annual increment in the lease fees was introduced. This provision was acceptable to the fisher villages as they had relatively high incomes at that time. Moreover, the village PFCSs were able to make profits and mostly took the responsibility of paying the lease fees. The 10% annual increase in the lease fees continued for a good 30 years, after which the State Government of Odisha modified lease arrangements in 1991 by increasing the annual lease fees by 27%¹⁵; this amounted to a doubling of the lease fees in less than three years. The enormous lease fees were unaffordable because by the mid-1990s fish production had plunged, bringing down fishers' income levels and forcing many to out-migrate. Since the village level PFCS were out of business, the entire burden of the lease fees had to be borne by the remaining fishers.

Despite a number of petitions and protests, the State Government of Odisha has not changed the policy for the increment in the lease fees. The burden of incremental lease fees, coupled with the loss of fish production and dwindling income levels of fishers, has become a crucial factor in the loss of fishers' control over commons in Chilika. Krushna Chandra Behera, the fisher leader of Berhampur village sees the State Government of Odisha's persistence with the high lease fees as a strategy to push caste-based fishers out of the lease system—"the strategy is to increase the lease fees so that the fishers lose their lease holding capacity; they either stop taking lease or take less area so that the State Government of Odisha can easily divert such areas to aquaculture".

Loss of Resource Access Rights, Fisher Institutions and Fishing Practices

The high lease fees coupled with the expanding encroachment of customary fishing areas resulted in serious issues of access and entitlements for caste-based fishers. While a lease entitles full access to the resource, in practice caste-based fishers were denied any such rights due to the invasive nature of encroachment. However, the caste-based fishers continued to pay the annual lease fees and take even the encroached areas on lease in order to retain long-term rights. Interviews with fishers in several villages revealed that even though parts of the leased fishing area were no longer under their possession, they preferred to renew the lease every year by paying the high lease fees just as a strategy to retain their ownership claims in

some form. Pramod Jena of Badakul village explained, "This is definitely an expensive way of maintaining our rights as fishers. But we fear that if the annual lease is not renewed, our customary fishing areas would be leased out to non-fisher villages." The lease records of CFCMS/FISHFED showed that in several cases parts of customary fishing areas have already been leased to outsiders, either because the fisher village could not renew the lease or the payment of the lease fees was delayed.

We tried to understand how fisher villages managed paying such large lease fees when fish production and their incomes were so low. We found that a common practice across fisher villages (92% of lease holding villages) has been to unofficially sub-lease portions of their customary fishing areas to outside moneylenders. The money obtained, in most cases, is used to pay for the lease fees and for the ongoing court cases involving conflicts over fishing areas. However, all of these sub-leased areas eventually end up being used for prawn aquaculture. Once sub-leased, these areas remain under aquaculture, and the moneylender pays additional money every year to maintain custody of the area. In a number of cases, we observed that the sub-leased areas were eventually encroached by the moneylenders, when the fisher village refused to continue the sub-lease after the loan money was paid back.

Many of these factors have contributed to the erosion of the local institutional base of commons in Chilika. With loss of fish resources, most PFCSs ran out of business and became largely non-functional. Our data show that only 5% of fisher cooperatives were functional; 95% had either become dormant or non-functional. Table 3 shows the current status of various local institutions, suggesting that they have gradually become ineffective. Two developments in the early 1990s were important in this regard. First, in 1991 FISHFED was created as an apex organisation of all the fish cooperatives in Odisha state including the Chilika region. Consequently, FISHFED replaced the CFCMS in Chilika. Being a Chilika regional level fishers' institution, the CFCMS was able to function in close collaboration with village-level PFCS. In contrast, the creation of FISHFED at the state level took away the locus of decision-making from local fishers to a centralised administrative control. Second, in 1992 a centralised autonomous agency known as the Chilika Development Authority (CDA) was created for administrative control of the Chilika Lagoon. Creation of these two macro-level organisations contributed to the breakdown of the nested and multi-level institutional arrangements in Chilika, and undermined customary village institutions.

Caste-based fishing practices changed significantly as the diversity of traditional fishing techniques were gradually replaced by a few dominant methods using synthetic gillnets and trammel nets (locally known as *khanda jala*) thereby resulting in new kinds of conflicts and competition among fishers.¹⁶ Moreover, fishing has increasingly become an individual activity as opposed to a group activity in which a large group or the entire village fished together. The new techniques enabled fishers to fish all year round, disregarding the seasonality of the Chilika Lagoon and its species. As resources started to dwindle

and fishing areas became restricted due to encroachment, the new fishing nets came in handy for overexploiting the Chilika Lagoon resources through intensive fishing in the remaining area, in turn increasing competition and conflict.

Resource Degradation and Fishers' Disconnection from the Chilika Lagoon

Ecological degradation and deterioration in the condition of the Chilika Lagoon resources also contributed to decommissioning. In addition to the encroachment of customary fishing grounds by large-scale prawn aquaculture, there were changes in the Chilika ecosystem itself. First, the natural opening of the Chilika Lagoon to the sea was blocked, mainly by natural processes such as coastal sand movements. This created problems because the flow of sediments from rivers caused increased siltation inside the Lagoon, changing the depth and the bottom environment. Second, the engineering solution to this problem, the artificial opening of a new 'sea mouth'¹⁷ by the State Government of Odisha in 2001 resulted in dramatic changes in the Chilika Lagoon ecosystem. As a result, the Chilika Lagoon began to lose its biodiversity and resources started to dwindle (Nayak & Berkes 2010). Productivity levels declined, eventually bringing down the income levels of fisher households to an all time low. Harihar Jena, aged 94, of Badakul village exclaims:

When I was young I was able to catch fish just by using my *gamucha* [a short piece of cloth; equivalent of a towel] in the Lagoon. I could bring that fish home even quicker than my wife was able to cook rice... that's what we ate most of the days. Now I see my sons return from Chilika empty-handed day after day. Their 50 yard-long fishing net must be thirsty for a fish. I hope mother Chilika is not dead already.

Our surveys in two fisher villages supported Harihar's concerns: between 2002 and 2008, the average annual income of caste-based fisher households dropped by 70–80%. In 2002, fishing was the primary or only occupation, but by 2008, 92% of the caste-based fisher households had taken up other occupations as primary sources of income. Forty percent of the households either abandoned fishing or engaged in seasonal fishing only; more than 90% of the households took loans averaging around USD 1500. What followed thereafter was large-scale out-migration by fishers, as wage labourers. Our surveys showed that 53% of households in Berhampur and 31% of households in Badakul had male members still away due to out-migration; the Chilika average for out-migration numbers stood at 33%.

Out-migration has created a large number of 'absent fishers', a situation averse to the notion that a process of collective action requires physical presence of the users and their day-to-day involvement in fishing. Thus, economic and ecological displacement has contributed to decommissioning of the Chilika Lagoon resources. Social, economic, and

ecological disintegration, and unfavorable political decisions have disrupted caste-based fishers' customary way of life. Disengagement of caste-based fishers from fishing initiated a process of disconnection between the caste-based fishers and the Chilika Lagoon, which soon became an additional factor in decommissioning.

DISCUSSION

Commons Continuum and Drivers at Multiple Levels

Management of fishery commons in the Chilika Lagoon have been subject to several influences that cut across political, economic, and ecological boundaries at multiple scales. The Chilika commons have been dynamic over time, consistent with the literature that suggests that commons institutions may go through processes of development and decline (Atapattu 1987; Seixas & Berkes 2003). The dynamic nature and fluctuations associated with commons development make it imperative to understand commons as a process, rather than a regime fixed in space and time. The Chilika case suggests that a set of demographic, social-cultural, political, and biophysical factors are the key determinants of the processes of commonisation and decommissioning (Figure 1). The same set of factors supported commonisation or decommissioning depending on the 'sign' (positive or negative; higher or lower) of the variable. Figure 1 also posits that drivers at multiple levels had influence over both commonisation and decommissioning of fishery resources in Chilika.

For property rights to exist, three elements are needed: the resource over which claims are being made for a benefit stream (in this case the Chilika Lagoon common resources), the claimants (in this case the fisher castes), and the others (in this case the rest of society around the Chilika Lagoon and the State Government of Odisha). Property rights are primarily about relationships among people and secondarily about control over the resource (Ostrom 2009). Figure 1 shows continuum and reversibility because variations in the same set of drivers and factors can potentially influence either commonisation or decommissioning. It was evident that existing commons faced a constant challenge of being decommissioned, although there was considerable effort by the caste-based fishers to keep the process of commonisation active. For example, when encroachment of customary fishing areas drove the process of decommissioning, payment of the high lease fees by the fishers, in spite of no access to the encroached fishing areas, kept prospects for commonisation alive. Thus, the processes of commonisation and decommissioning may be seen to be continuous, concurrent, and potentially two-way.

Changes in government policies had ripple effects on the management and use of the Chilika Lagoon commons. Previous policy of minimal or no interference from the government was replaced with tighter state controls. Many notable changes were listed: establishment of Nalabana Bird Sanctuary by abolishing customary rights, promotion of aquaculture by transfer of customary fishing grounds to non-

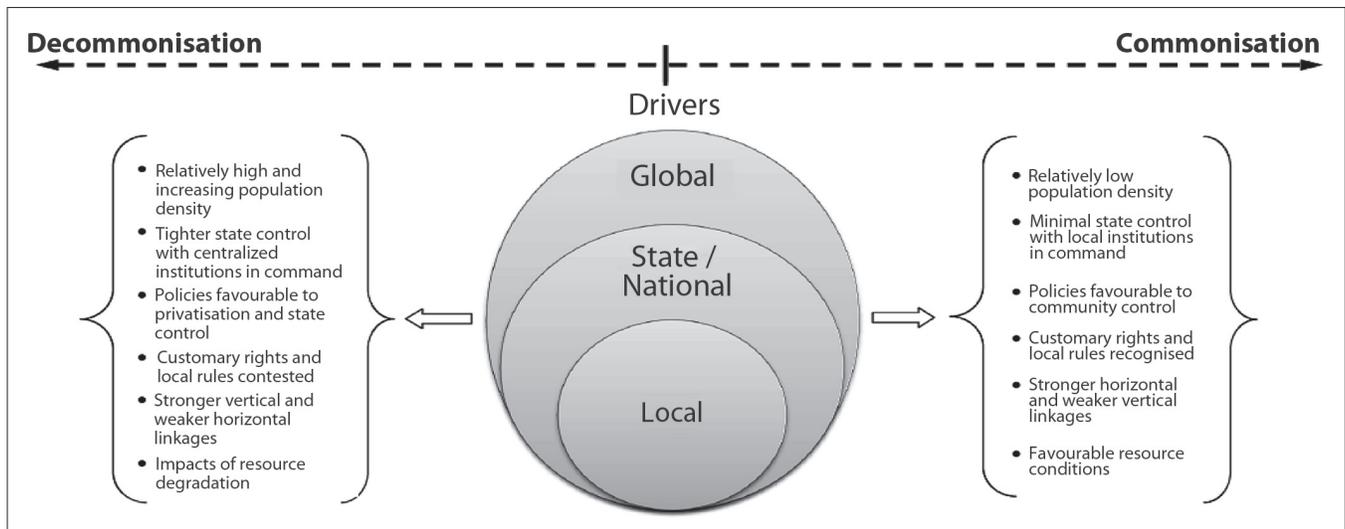


Figure 1
Drivers at multiple levels and factors that influence commonisation and decommonisation in Chilika

caste fishers and companies, legalisation of prawn aquaculture by undermining customary fishing practices based on capture fishery, and making it expensive and cumbersome for poor fishers to retain rights by changes in lease policies.

Thus, a series of changes in the State Government of Odisha's policies permitted decommonisation, changed the composition of the dominant user-groups, and caused partial elimination of capture fishery. Even though most of these changes occurred at the local, regional, and the state levels, they were largely influenced by higher level drivers. The basic drivers in the decommonisation of Chilika were the global seafood markets and the high price for tiger prawn which swayed State Government of Odisha policies in favour of decommonisation. State and regional (Chilika) level politics also contributed to the process of decommonisation. Participants at a state level policy meeting in 2008 noted that:

It is hard to imagine a situation where more than half of the 1,200 sq. km Lagoon area would move into the hands of illegal aquaculturists without the knowledge of the State Government and its local bureaucracy. It is beyond doubt that prawn aquaculture in Chilika was primarily undertaken by non-fishers and it hinged on the unofficial support from the State bureaucracy, political representatives and 'people in power' (Declaration of Chilika Research Workshop, Bhubaneswar. September 2008).

The interests of higher caste non-fishers in aquaculture clashed with the primary stake of caste-based fishers, resulting in caste conflict. Later, the caste-based fishers got divided into smaller groups based on their specific caste and their geographic location. This gave rise to intense caste politics and conflicts involving both the higher caste non-fishers and caste-based fishers, and amongst caste-based fishers themselves. For the powerful 'prawn mafia' and everyone with an interest in aquaculture, this offered ideal conditions for a strategy of

'divide and conquer'.

At the institutional level, creation of CDA and FISHFED as two apex level bureaucratic organisations toppled the diversity of institutional structures and their horizontal linkages. As village fish cooperatives became defunct and traditional village committees took a back seat, day to day initiatives around local-level institutional innovations stopped. Higher level institutions like CDA and FISHFED became inaccessible to fishers and the locus of decision-making soon moved out of village and regional boundaries. Thus, changes in local institutional arrangements and the establishment of higher level organisations were effective in either suppressing or replacing traditional fisheries institutions and dismantling the commons in Chilika.

From the point of customary fishers, with one-third of the adult population having already out-migrated, they are perhaps fighting a losing battle in Chilika. Aquaculture proponents are finding new ways to continue despite court orders and legislative proclamations. In fact, there is growing political party affiliations among aquaculture owners and a lot of prawn money continues to flow to political party leaders and their campaigns. The nexus between aquaculture owners and the 'people in power' has proved highly supportive to the process of decommonisation, and detrimental to commonisation.

Chilika is a clear case in which government policies have encouraged *de facto* privatisation, consistent with findings elsewhere that aquaculture facilitates elite takeover of previous commons (Beck & Nesmith 2001). In this case, the mechanism or the pathway is: commons → decommonisation → open-access → privatisation. Open-access fits in as a transitional phase in which commons rules no longer apply and a set of consistent new rules is not yet there. It is a 'free for all' situation where the powerful players are always at an advantage. In both the transfer of customary fishing areas to Tata (1,100 ha) and to non-fishers (6,000 ha), the fishing areas were never returned to the original users even though both the allotments

were officially cancelled. In the case of the Tata project, fishing areas remained open-access for several months before being encroached upon and privatised for aquaculture by the powerful higher caste villages. The 6,000 ha transferred under the 1991 policy was promptly encroached upon and privatised, and it continues to be under the possession of non-fisher villages even though the policy was revoked in 2001. Thus, decommissioning has pushed fishery commons in Chilika into a state of 'elite capture' (Béné 2003).

Turbulence in the Commons: Where are the Commons Going?

In Chilika, the lease system strengthened caste-based fishers' rights and entitlements and recognised their fishing rules and customary use. Caste-based fishers were able to create permanent stakes in specific fishing locations and also strengthen their claims over those areas through continuous lease. To put things in perspective, caste-based fishers' rights to access and withdraw resources were defined through the lease system, with *de facto* rights to manage, exclude and alienate, providing a 'bundle of rights' (Ostrom & Schlager 1996) under the process of commonisation. However, with the start of decommissioning, there was disintegration in the bundle of commons rights, leading to a peculiar property rights situation. While the fishers continued to pay the lease price to remain entitled to the bundle of rights, none of the rights in the bundle were actually available to them. Therefore, the postulation by Ostrom & Schlager (1996) that 'collectives may, and frequently do, hold well-defined property rights that do not include the full set of rights listed in the bundle; but to hold some of these rights implies the possession of others,' does not necessarily clarify the emerging property rights situation in Chilika.

Two major trends emerge from this analysis: 1) as of 2010, caste-based fishers of Chilika do not hold a single right from the 'bundle', an indication that they have moved from being legal rights holders to a state of dispossession, 2) non-fishers have moved from a state of no or 'thin' access to being claimants of full rights in effect. The second trend supports the theory of access (Ribot & Peluso 2003), which maintains that access has the potential to eventually lead to the establishment of property rights. However, our analysis goes further to indicate that while access can lead to property rights as observed in the case of non-fishers, legally confirmed property rights and entitlements can also regress, an outcome actually suffered by caste-based fishers in the Chilika Lagoon. Together, these trends suggest that commons are not a fixed property type; rather, commonisation/decommissioning can be better understood as processes with multiple possibilities. In case of the Chilika Lagoon, continuous changes in fishers' access and entitlements were the crux of these two processes. Chilika is not the only example in which changing access and entitlements drive commons dynamics. Many other resource-dependent communities, such as those in Tam Giang Lagoon, Vietnam (Huong & Berkes 2011) are faced with similar challenges arising from globalisation, and their dynamics may be analysed

using the notion of commonisation/decommissioning.

The question of how the regime of customary rights of caste-based fishers gradually changed into a state of *de facto* control of non-fishers in the Chilika Lagoon offers complex challenges. We consider that a bundle of commons rights, even when they appear to be *de jure* rights, is perhaps not enough without a 'bundle of powers' (Ribot & Peluso 2003). Effective commonisation would imply locating these 'powers' within the social, political, economic, and ecological contexts that shape people's ability to benefit from resources. Moreover, understanding the processes of commonisation and decommissioning requires among others, attention to co-optation (Nayak & Berkes 2008), mechanisms by which the state may seek to expand its power 'in new ways' (Lele 2000). This was evident in Chilika, as the State Government of Odisha gradually moved from its role of allocating fishing rights and entitlements, to regaining control of the Chilika Lagoon through attempts such as introducing 1991 aquaculture policies. In contrast, an active process of devolution should facilitate commonisation. But the state is by nature interested in maintaining control and accumulating power (Lele 2000; Winslow 2002), and therefore co-optation possibilities always remains high (Nayak & Berkes 2008).

The complex nature of resource management in Chilika is a result of diversification of *de facto* commons into various property rights. The factors, processes and the social-ecological and political circumstances which influenced this diversification are crucial. We observed that specific areas within the Chilika Lagoon remained simultaneously under two or more property rights regimes. Many areas that were managed as commons by caste-based fishers were in effect privatised through encroachment by non-fishers. While caste-based fishers continued to lease these encroached grounds, they had lost access to the Chilika Lagoon resources. Consequently, these areas remained under an unstable mix of commons and private property. At the same time, the State Government of Odisha retained its ownership over all these areas which made them state property.

It is evident that diversification of property types in Chilika has resulted in the establishment of multiple or mixed property rights regimes (Table 5). These various regimes are often in conflict with each other, with one type hindering the functioning of the other. The changing nature of property rights and the emergence of mixed property regimes offer interesting theoretical and practical challenges for understanding commons dynamics, and perhaps more importantly 'how to keep commons as commons in the long run'.

CONCLUSIONS: KEEPING COMMONS AS COMMONS!

Success of commonisation as a process depends on the close links between people and resources, not so much for economic dependence but for a more inherent and holistic relationship, which find expression in phrases such as 'Maa Chilika' and fishing as 'a way of life'. The fact that several fishers thought

Table 5
Mix of property rights regime in Chilika

Property rights category	Type of resources included
State property	Protected Areas: Nalabana Bird Sanctuary Regulated area for dolphins Seasonally protected areas for fish breeding Areas for tourism Ramsar site
De facto private property	Encroached fishing areas under prawn aquaculture Encroached areas already converted to other land use or construction
Village fishing commons	Caste-based management of some traditional fishing areas
Open access	Abandoned traditional fishing grounds The Chilika Lagoon areas under conflict Some deeper parts of the Chilika Lagoon

that their relationship with the Chilika Lagoon had deteriorated over the years and they were slowly getting disconnected from it, was an indication of decommonisation. Commons are not about resources and income alone, but also about relationships. An intertwining of humans and resources that makes the commons an integrated social-ecological system (Berkes & Folke 1998). Hence, in the context of commons such as the Chilika Lagoon, there is a need to deal with people and resources together, rather than each in isolation. This is a key determinant of successful commonisation; disconnection of people from their resources is thus a major driver of decommonisation.

Commonisation depends on the condition of the resource, as without a resource base it is useless to talk about a use rights regime. In resource-dependent societies, institutions and social regulations evolve in tandem with ecological changes (Nayak 2003). Commonisation, therefore, underscores the importance of resource sustainability on which access and entitlement questions rest. Our analysis supports the idea that social-ecological systems have powerful reciprocal feedbacks (Gunderson & Hollings 2002; Berkes *et al.* 2003), require institutional diversity (Ostrom 2005), and multiple institutional linkages (Nayak & Berkes 2008). Institutional diversity is core to the management of complex commons where new institutions can be ‘crafted’ from elements of existing institutions; new institutions may also arise spontaneously (Ostrom 2005). All of these contribute to a process of commonisation.

In the context of heterogeneous societies and marginalised populations, the question of how commons outcomes influence social and political structures—issues of representation, accountability, and transparency—are important considerations. In commonisation, collective action and devolution of authority may not automatically result in social, economic, and environmental justice and democratic decision-making (Béné *et al.* 2009). In dynamic situations like the one in the Chilika Lagoon, it is possible that devolution can actually create forms of ‘decentralised despotism’ (Ribot 2000). Until questions like ‘whose rights and entitlements’, ‘who has power and control’,

‘who takes the decisions’ are dealt with, the prospect of justice in the commons will remain a moot question (Zerner 2000).

Commonisation involves the transformation of resources from one property type to another, a process that is strongly influenced by prevailing policy and governance structures. In Chilika, the State Government of Odisha initiated changes such as the lease policy with a revenue orientation, primacy to aquaculture, and a redefinition of access rights that ignored the long-established rights of the caste-based fishers. Appropriate governance structures and adequate policy support can create conditions for ordered rule and collective action (Stoker 1998), and promote institutions of social coordination (Lee 2003). The process of commonisation can benefit from devolution of management rights, and power sharing (Folke *et al.* 2005), creating space for participation, representation, accountability, empowerment, and social justice (Lebel *et al.* 2006), formulation and application of principles to guide interactions (Kooiman & Bavinck 2005), and respect for diversity, complexity, power dynamics, and cross-level linkages (Nayak & Berkes 2008). If facilitated by appropriate governance and policy regimes, these factors can become key attributes of a commonisation process to keep the Chilika commons as commons.

Commons are multi-level, and drivers at various levels of organisation impact decision-making (Berkes 2007). Different actors can constrain, create, and shift scales to serve their own interests (Cash *et al.* 2006). Commonisation and decommonisation in Chilika had far reaching influences by drivers at multiple levels, such as global prawn markets, state and national policies, and local and regional caste and class politics. Various actors at different spatial scales were able to alter fisher access to commons. Thus, the long-term management of the Chilika commons will need to involve institutions at multiple levels (Young 2002, Adger 2003), and to craft new institutional arrangements (Ostrom 2005). A confusing mix of property rights regimes do exist in the area. However, to keep the Chilika commons as commons will require, as a starting point, a policy environment in which legal rights and customary livelihoods are respected. The timing may be good for a policy change: international prawn markets have stabilised and the ‘pink gold rush’ is over. Under new policies, political space for negotiation needs to be created, and processes causing marginalisation reversed. Fishers need to be empowered to re-connect to their environment and re-invent traditions of stewardship, without which there will be no resources left to fight over. Networks and partnerships are central to this process of capacity-building and social-ecological revitalisation.

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Notes

1. Village selection criteria included caste, occupation, impact of aquaculture and new sea mouth, problems related to fishing area lease and encroachment, loss of fishery-based livelihoods, rate of out-migration, and status of village cooperative and traditional institutions.
2. We use drivers as defined by the Millennium Ecosystem Assessment (2003). Drivers generally refer to any natural or human-induced factor that directly or indirectly causes a change.
3. Speeches and writings of Dr Debendranath Mansingh, and Chilika poems by village elders of Badakul offer understanding on the ecological history of the Chilika Lagoon.
4. Based on the overall population growth rate in Odisha as recorded by the National Census 2001 (www.censusindia.gov.in), and United Nations Department of Economic and Social Affairs 2008 (www.unpopulation.org). The current estimated fisher population in Chilika is about 3,00,000, spread across 150 villages and around 40,000 fisher households.
5. The first settlement under British rule was concluded in 1804–1805, followed by a Triennial settlement from 1805 to 1808, and another one year settlement from 1808 to 1809. The Governor General started a detailed settlement from 1837 to 1845. Maddox (1920) has described the procedures and rules for settlement in his book *Final Report on the Survey and Settlement of the Province of Orissa*. The subsequent settlement was taken up from 1890 to 1900, commonly known as Maddox Settlement. [Online] URL: <http://khordha.nic.in/departments/revenue.htm>
6. Fishing by non-fisher higher castes was looked down upon by society, as fishing was generally viewed as the occupation of the lower castes.
7. This is not an attempt to idealise caste system. The system of castes and sub-castes in Chilika continue to be rife with many problems, specifically issues of equity including power, control, and justice.
8. There are four fisher castes and sub-castes belonging to *Kaibartya* caste in Chilika. See Table 2 for details. There is also a fifth group called *Nolia*, originally from Andhra Pradesh, which is not a local fisher caste group but have been in the Chilika Lagoon for ages. It is important to note that fisher castes were generally placed at the lower rungs of the caste system.
9. A critical look at this arrangement indicates serious equity problems in the distribution of fishing areas and techniques of fishing. The powerless and the weaker groups within the fisher castes got poor fishing areas and were allowed techniques that were only suitable for smaller fish.
10. 'Chingudi' is Oriya for prawn and shrimp.
11. The four villages tried to challenge the government's decision by sending petitions to the Prime Minister of India; in response they received a reply which justified the State Government of Orissa's action.
12. A civil rights movement in 1990s, mostly by Chilika fishers, against the Integrated Prawn Farm Project (ISFP), a joint venture of the Tata Iron and Steel Company and the State Government of Orissa. The fishers were supported by students, intellectuals, environmentalist and human rights activists.
13. The area under the project remained 'free for all' (or open-access) for a period of time before being encroached by the Panasapada village, a powerful non-fisher village, and put under prawn aquaculture. The Siara Gola village, the original right holder village of the encroached area, continues to send petitions for the return of the fishing area both at the district and state levels but without success.
14. Seafood News (<http://www.seafood-norway.com/?lang=en>) reported in 2005 that despite court orders restricting fish aquaculture in Chilika,

about 80% of the Chilika Lagoon was taken up for prawn aquaculture, and the fishers alleged that the court orders were being flouted.

15. 10% lease fees to the revenue department, 10% administrative charges to the FISHFED, and 7% stamp duty for lease agreement. The 17% towards administrative charges and stamp duty was introduced after lease matters were transferred from CFCMS to FISHFED.
16. Experienced fishers recollect that changes in fishing practices were mainly influenced by prawn aquaculture, especially the use of synthetic (nylon) nets introduced by aquaculturalists.
17. Even though there were several other drivers of ecological degradation in Chilika, local fishers view the new sea mouth as the most important driver of social-ecological changes in the recent years (Nayak & Berkes 2010).

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