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Using social–ecological syndromes to understand impacts of international seafood trade on small-scale fisheries

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ABSTRACT

Globalization has increased the speed and flow of people, information, and commodities across space, integrating markets and increasing interdependence of geographically dispersed places worldwide. Places historically driven by largely local forces and market demands are now increasingly affected by drivers at multiple scales. Trade is particularly important in driving these changes and more fish is now exported to international markets than ever before. When small-scale fisheries are integrated into global markets, local social–ecological systems change with potentially both positive and negative impacts on livelihoods, economics and ecology, but few studies systematically investigate how and why the outcomes of market integration vary from case to case.

This paper systematically assesses multiple (social, ecological, economic and institutional) local effects of market integration in cases around the world by drawing on the global environmental change syndromes approach. Furthermore, we examine the factors contributing to the syndromes observed. Our analysis identifies three distinct social–ecological syndromes associated with international seafood trade. Results suggest that the presence of strong and well-enforced institutions is the principal factor behind the syndrome characterized by sustained fish stocks, while a combination of weak institutions, patron–client relationships, high demand from China and highly vulnerable target species explain the other two syndromes distinguished by declining stocks, conflict and debt among fishers.

A key finding is that the factors emerging as important for explaining the different syndromes derive from different scales (e.g. local market structures vs distant market characteristics), indicating a need for multi-level governance approaches to deal with the effects of market integration. Furthermore, the meta-analysis shows that each syndrome encompasses fisheries from multiple continents. This suggests that the increasingly global nature of the seafood trade appears to be driving local dynamics by creating similar conditions for vulnerabilities in localities around the world, lending support to the notion of teleconnectivity across geographic space.

1. Introduction

The world is witnessing unprecedented levels of interconnection between different regions (Crutzen and Stoermer, 2000; Steffen et al., 2011) and international markets now play an increasingly important role for social, environmental and economic outcomes at multiple levels. Globalization increases the speed and flow of people, information, and commodities across geographic space, making markets economically integrated and often reducing the number and diversity of market actors (Adger et al., 2009; Österblom et al., 2015; Young et al., 2006). These forces of globalization increase interdependence of geographically dispersed places across the globe potentially leading to 'teleconnected vulnerabilities' (Adger et al., 2009). Places that were historically driven largely by local forces and market demands are now increasingly affected by drivers at multiple scales. Thus they are nested in the broader structures of global markets and international institutions creating interdependencies that increase exposure and affect economies, livelihoods, culture and environment at the local level (Adger et al., 2009; Liu et al., 2013). These connections can also lead to simultaneous interactions and feedbacks between multiple locations as pointed out by the 'telecoupling' framework of Liu et al. (2013). Fisheries are no exception. More fish is now traded on the international market than ever before (from 25% (8 million tonnes) in 1976 to 37%

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(58 million tonnes) in 2012), with developing countries representing a growing portion of that trade (FAO, 2014). This has led to growing risks to sustainability as geographically dispersed fish stocks are now 'tele-connected' via distant markets and depletion is increasing around the world (Berkes et al., 2006; OECD, 2010; Purcell et al., 2013). Yet the decline is largely masked from consumers through substitution of species or sources (Crona et al., 2015).

While fish is an important global commodity it is also vital for food security and employment at local levels (Smith et al., 2010). One billion people are estimated to rely on fish as primary source of protein (FAO, 2000) and globally 54.8 million people are directly engaged in capture fisheries and aquaculture (Bjorndal et al., 2014). Around three times as many people are also involved in upstream (e.g. boat building) and downstream (e.g. fish processing, marketing) activities (Bjorndal et al., 2014) and FAO estimates that the small-scale fisheries sector employs ca 90% of the world fishers, producing almost half of world fish production and supplying most of the fish consumed in the developing world (UN General Assembly, 2012). When small-scale fisheries are integrated into international markets, the local fisheries systems are changed with potentially positive and negative impacts on livelihoods, economics and ecology. Studies have drawn attention to both the possibility of overexploitation and commercial stocks extinction as well as increased economic development following such market integration, but no studies systematically investigate how and why the outcomes of market integration vary from case to case.

Understanding how increasing globalization of seafood trade affects the small-scale fisheries sector is therefore vital for ensuring sustainable and equitable development. This paper systematically examines cases from around the world, assessing the social, ecological, economic and institutional implications for local fisheries systems that result from market integration, as well as the factors contributing to the observed social–ecological outcomes. Our aim is to paint a fuller picture of how local dynamics of small-scale fisheries (SSF) interact with trade-related drivers at multiple scales to affect a multiplicity of local social–ecological outcomes.

2. Trade and social–ecological outcomes

2.1. The need for a multi-scale, multi-sectoral approach to understand trade impacts on small-scale fisheries

The impact of trade on social, economic and environmental outcomes in fisheries has been debated for some time. While one side ('pro-trade') argues that increased international fish trade would benefit development and thus alleviate poverty (e.g. FAO, 2007; Schmidt, 2003) 'anti-trade' arguments are often based on the premise that export of fish has potentially negative effects on food security and local livelihood options, particularly for poor people (Abgrall, 2003; Abila and Jansen, 1997; Kent, 1997; Ruddle, 2008). The pro-trade stance argues that the cash generated by fish exports in the exporting country can contribute to economic growth (Bostock et al., 2004; Thorpe, 2004; Virdin et al., 2004). Opponents of this view instead maintain that revenue from fish trade often does not materialize (Petersen, 2003), that export-oriented industry development results in local job loss (Abgrall, 2003; Abila and Jansen, 1997; Kaczynski and Fluharty, 2002), or that the economic gains are captured by elites and do not benefit the national fisheries sector, or people connected with it (Wilson and Boncoeur, 2008). In a review of the literature Béné et al. (2010) outline compelling evidence both for and against these two opposing narratives. The reason is that most 'pro-trade' analyses are conducted using national level data, focusing on state revenues and foreign exchange—not actual economic growth, food security or poverty alleviation *per se* (ibid:4). This assumes that mechanisms are in place to allow export revenues to be redistributed for the benefit of local communities and the fisheries sectors. However, lack of such redistribution mechanisms is an essential reason why anti-trade proponents argue trade is likely to cause increasing vulnerabilities, supported largely by case-based studies.

The lack of consensus and the sometimes polarized debate around the effects of international seafood trade thus largely stem from a discrepancy in analytical approaches. As noted by Kurien (2005) aggregate analyses are bound to hide important dynamics at the micro scale, while case-based studies often fail to account for drivers or effects at larger scales. What is needed to shed light on the nuances between these two extremes is thus an approach that considers multiple drivers, occurring across diverse scales and sectors, and which takes account of multiple and diverse outcomes.

2.2. Assessing impacts of seafood trade through syndromes of social–ecological change

While valuable for evaluating causal linkages, analyses of single facets of change, like declining stocks or social inequities among fisheries actors, cannot in themselves provide an accurate understanding of the multifaceted nature of real world social–ecological change. System change is more often the result of a complex set of factors, at multiple levels and in multiple sectors, which interact to produce particular outcomes. Schellnhuber et al. (1997) and Lüdeke et al. (2004) developed 'global environmental change syndromes' to overcome this tendency for sectoral, single-faceted approaches. They argue that bundles of interacting processes can be grouped into 'syndromes of change'. The notion of a syndrome stems from Greek, meaning "flowing together of many factors".

In a similar vein we use syndromes to identify local recurring patterns of social and ecological outcomes in relation to the development of international trade in marine commodities (c.f. Srinivasan et al., 2012). These social–ecological syndromes are value neutral—a syndrome is neither 'good' nor 'bad', but can be both depending on the case and the context. For example, fish stocks may be maintained through strong regulatory institutions but this may exclude certain people from the resource, which negatively impacts their income.

2.3. Systematic comparative analysis of complex, interacting drivers of social–ecological systems change

The literature on global environmental change and social–ecological system dynamics abounds with case studies of the effects of global drivers on local dynamics. Such place-based research is critical for in-depth understanding of complex systems and has the benefit of providing rich detail on specific cases. However, this richness simultaneously reduces generalizability. At the other extreme is the growing number of large N, aggregate analyses (referred to above for fisheries), which analyze broad trends in aggregate data. Such global studies have difficulty detecting trends at intermediate (regional) levels and are challenged by conjoint causation (when two or more variables interact) as the new interaction terms for such multi-factor causations quickly increase the number of variables in relation to case numbers, thus reducing the power of the analysis. Meta-analytical approaches that synthesize findings across multiple site-specific studies can provide a way to address these challenges. However, meta-analysis is also fraught with difficulties, particularly for synthesis of complex models where pooling and standardizing variables is impossible because of the varied