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How access to Maine's fisheries has changed over a quarter century: The cumulative effects of licensing on resilience

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ABSTRACT

We describe how the evolution of the licensing system for commercial fisheries in Maine has progressively limited the ability of both fishers and the State to respond to changing environmental circumstances. Over the twenty-five year period from 1990 to 2014 new licenses were created at the rate of about 0.6 per year. The changes that have occurred have not been the result of a strategic policy agenda that was set to decrease fishers' access, but rather the consequence of multiple decades of policy interventions that have sought to improve the socioeconomic and ecological productivity of individual fisheries. However, the cumulative effect has limited the flexibility of individual fishers and created strong economic interests that are incompatible with shifts towards ecosystem-based management. We use this finding to contribute to the literature on resilience, with a specific focus on the relationship between adaptive management and sustainability.

1. Introduction

1.1. Fisheries as dynamic social–ecological systems

There is increasing recognition that fisheries are complex and adaptive social–ecological systems (Berkes et al., 2003; Chapin et al., 2009b; Folke et al., 2005; Wilson, 2006) that evolve in non-linear ways across time and space (Folke et al., 2004; Gunderson and Holling, 2002). These systems are shaped by interconnected social and ecological processes that exist at multiple and overlapping scales from the ultra-local to the global (Craig and Holling, 2010). This dynamic underscores the need for holistic approaches to marine and ocean governance that account for the linkages between and within the human and natural components of these systems (Chapin et al., 2009a).

Examples of the real-world consequences that arise from being insensitive to the complex and dynamic nature of these systems are widespread (Folke et al., 2004). For instance, the failure to fully understand and account for the fine-scale heterogeneity of the marine environment has repeatedly led to the mismatch between regulatory boundaries and the ecological contours of ecosystems, creating situations in which management strategies have facilitated ecological degradation (Young, 2002). This is evident in the Gulf of Maine, for example, where geographically broad management boundaries for fishing have failed to prevent the serial depletion of spatially explicit subpopulations of Atlantic cod (Ames, 2004) and the local overexploitation of sea urchins from the region's rocky ledges (Johnson et al., 2012). In both cases, the effects of these miscalculations reverberate through the social and economic components of these systems.

Part of the underlying challenge of managing these systems is that acquiring and maintaining 'accurate' information about them is a Sisyphean chore (Wilson, 2002; Wilson et al., 2013). Indeed, the usefulness of information about the form and function of a system at one place, in one moment, often erodes quickly in both social and ecological settings, becoming highly irrelevant and inapplicable at other times or in other places if it is not continually renewed (Levin, 1999). Thus, with the exception of a small number of data-rich situations (e.g., Carpenter et al., 2011), it is difficult to confidently forecast how these systems will respond to socioeconomic or ecological changes (Schindler and Hilborn, 2015; Wilson et al., 1994). This uncertainty is commonly viewed as an impediment to management approaches that are reliant on accurate information to set catch limits and define discrete management boundaries (Standish et al., 2014).

Acknowledging this persistent problem, many scholars have called for a paradigm shift away from management approaches that require definitive information about the social and ecological characteristics of fisheries systems (Briske et al., 2008; Folke et al., 2005; Hughes et al., 2005; Wilson, 2002). Alternative approaches

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include parametric strategies that aim to preserve the life histories of marine species (Acheson and Wilson, 1996); geographic protections that maintain habitat and provide sanctuary to marine species (McClanahan et al., 2006); and community-based institutions that facilitate local responsiveness to threats (Stoll et al., 2015a). While these strategies vary in terms of how they are executed in practice, they are all part of an emerging class of management approaches that aim to build social and ecological resilience (Folke et al., 2005).

In this context, resilience is defined as the capacity of a system to withstand disturbances without fundamentally changing form or function (Adger, 2000; Walker et al., 2004). Examples of disturbances might include extreme weather events (environmental) or shifts in market demand (socioeconomic). Management approaches that foster resilience in fisheries represent a departure from conventional management in that these efforts do not aim to establish particular social or ecological limits, but rather seek to maintain the underlying processes and patterns that drive social–ecological systems so that they can withstand stressors (Chapin et al., 2009b; Wilson, 2006). In doing so, the approach sidesteps the perennial information problem by creating a framework for governance in which imperfect knowledge and scientific uncertainty is inevitable.

The primary goal of this paper is to contribute to the growing body of empirical research on resilience within the context of marine and ocean governance. Our focus in this paper is on the erosion of social resilience, although we recognize that social and ecological resilience are closely coupled in social–ecological systems (Adger, 2000). Here, we describe the evolution of the licensing system for commercial fisheries in Maine since 1977, using it as the basis for a longitudinal analysis of how fishers' access to marine resources has changed over a twenty-five year period from 1990 to 2014. The data reveal changes that reflect, in part, the cumulative effects of fisheries management decisions on fishers' access to marine resources—which, like many (perhaps most) systems of natural resource management, is the outcome of a complex and piecemeal process of negotiating 'solutions' to fisheries-specific problems that arise over time. We argue that the continual decline in access is not the result of a strategic policy agenda that was set to decrease fishers' access, but rather the unintended consequence of multiple decades of policy interventions that have sought to improve the socioeconomic and ecological productivity of individual fisheries. In providing this analysis, we show how the layering of well-intended but myopic species-specific management decisions over time – through a highly adaptive process – have contributed to the decline in resilience of the fishing fleet in Maine over a quarter century. To be clear, our goal in presenting this case is not to implicate policymakers or the legislative process entirely. Any claim of this sort would ignore (at least in part) individual agency (Cote and Nightingale, 2012; Coulthard, 2012; DiMaggio, 1998), discounting the multiple ways that decision-making by fishers may have also contributed to the over-specialization that has occurred (see Steneck et al. (2011)). Although this is a relatively local story, we contend that the process described in Maine has broad relevance to ocean and coastal governance.

Our findings enable us to more fully unpack the relationship between resilience and adaptive management, highlighting the complexity of this connection. In doing so, our aim is to contribute to the growing body of literature investigating the multiple and often hard-to-see consequences of adaptive strategies (Coulthard and Britton, 2015). Here, we specifically focus on the interplay between resilience and adaptive management that has occurred at the legislative level where institutional changes to the licensing system in Maine are negotiated and enacted. We focus at this level of the system because the legislature holds the authority to change the licensing system, but we acknowledge that there are likely underlying power relationships that influence this process. Our intent in using the term "adaptive management" is not to imply that fisheries management or the licensing system itself conforms to a particular process that involves discrete phases of goal setting, management strategy development, implementation, monitoring, and evaluation (Linkov et al., 2006), such as the Adaptive Environmental Assessment and Management framework described by Walters (1986). Instead, we use it in a broader sense to describe the ongoing management interventions that have shaped and reshaped the licensing system, defining the term as the "process by which institutional arrangements and ecological knowledge are tested and revised in a dynamic, ongoing, self-organized process of trial and error" (Folke et al., 2002:20 in Folke et al., 2005). This treatment of the term is consistent with much of the literature on social–ecological systems, which emphasizes adaptability rather than an explicit adaptive process in the formal sense, using it as the starting point to study human responses at different scales ranging from the individual level (Cinner et al., 2008; Coulthard, 2008) to broader institutional scales (Loring, 2011; Moran and Elvin, 2009; Nelson et al., 2007). We also make a distinction between successful adaptation and adaptive management as a form of responsiveness: the former being a process in which feedback informs actors about the success or failure or their actions; the latter being a process in which the absence of feedback can lead to unintended outcomes and slow learning.

1.2. Adaptability as a cornerstone of resilience

Resilience has its roots in the field of ecology (Holling, 1973). However, the concept was integrated into the social sciences shortly thereafter (Vayda and McCay, 1975), and it is now a cornerstone in the theoretical foundation of research on coupled social–ecological systems (Folke et al., 2005, 2010). In the process of becoming a thoroughly transdisciplinary idea, resilience thinking has evolved, shifting away from the perspective that it is simply a measure of the rate at which a system rebounds from a disturbance (Pimm, 1984) to the idea that it is the ability of a system to withstand disturbances without fundamentally changing (Walker et al., 2004). This reorientation has brought increased focus to the social and ecological processes that help systems weather turbulence (Allen et al., 2005; Briske et al., 2008).

The starting point for much of this research is the basic assumption that resilience is a desirable attribute and the goals of management should be to cultivate (or maintain) the resilience of a system so that the social and ecological services of a particular place or process are maintained. Yet resilience is not inherently desirable (Standish et al., 2014). Indeed, there are many cases in which systems that function poorly or are unproductive are highly resistant to change (Filbee-Dexter and Scheibling, 2014). There are also instances in which one part of a system is durable (at the expense of the rest of the system) or the system is resilient to a particular threat, but not well positioned to withstand multiple or unanticipated disturbances (Steneck et al., 2013). Folke et al. (2010) highlight this problem, differentiating between "specific" and "general" resilience. Within this ontology, specific resilience refers to the capacity of a particular part of a system to withstand one type of disturbance, whereas general resilience refers to the capacity of the system to more broadly withstand a range of perturbations. In a similar vein, Standish et al. (2014) bring focus to this issue by drawing a distinction between "helpful" and "unhelpful" resilience. Merging these ideas, we might assert that general resilience is helpful, whereas specific resilience that only buffers against a single threat or protects a particular part of a system is relatively unhelpful in the long-term. The point here is not that there is necessarily a known, desirable state of a system;