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Review

A revolution without people? Closing the people–policy gap in aquaculture development

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ABSTRACT

Failure of the blue revolution is a global risk. The international problem is that there is a gap in knowledge exchange between the aquaculture industry, policy makers trying to support aquaculture development and people who depend on aquaculture for a job and/or food source. Thus, governments and international organizations promoting aquaculture as the solution to improving food security, nutrition and income are failing to optimise production of natural aquatic resources. We identify a "people–policy gap", and suggest that this is an understudied constraint, which needs to be overcome before worldwide food security can be achieved from aquatic environments. We argue that this gap leads to uneven distribution of benefits, a disconnection between benefits and local needs, and detrimental effects on human health and food security, all of which can have negative repercussions on human communities and ecosystems. In order to address this need, we present an analytical framework to guide context specific, policy-relevant assessments of the social, economic and ecological dimensions of aquaculture on a case-by-case basis. The framework is designed to make best use of existing data and scientific tools for decision-making.
In conclusion, we argue for: equal consideration of ecological, social and economic issues in aquaculture policy-making; pre-emptive identification of likely social impacts; integration of people- and context-specific social framing conditions into planning and policy review; addressing the social disconnection between global consumption and production; and, encouragement of creative combinations of theories and methods to assess and interpret the social dimensions of aquaculture in multiple contexts.

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Contents

1. Introduction

A notable disconnect between science and policy in relation to aquaculture development exists (Costa-Pierce, 2010; Kaiser and Stead, 2002; Stead, 2005). Many have argued that, in order to bridge this 'science–policy gap', synthesising multidisciplinary knowledge about complex issues affecting policy decisions is a necessary part of an integrated planning process (Bradshaw and Borchers, 2000; Dürrenberger et al., 1999; Fischhoff, 2012; Jones et al., 1999; Lubchenco, 1998). However, assumptions about origins of the science–policy nexus hold direct implications for how this interface is managed (Graffy, 2008) and is heavily influenced by social, economic, political and cultural conditions (Ahmed and Lorica, 2002; Beveridge and Little, 2002; Beveridge et al., 2013; MacNeil et al., 2010; Sinh et al., 2007). In the case of aquaculture, a contextual approach particularly in terms of the social impacts of aquaculture at different scales (individual, community, national, regional and international) has been neglected. Indeed, the ongoing rapid spread and evolution of aquaculture dubbed the "blue revolution" is still in its infancy with respect to addressing the issue of how to design and implement processes to support management informed by those with relevant interests for translation into policy. This participatory process seeks to integrate lay persons' (citizens, stakeholders) views and knowledge with scientific information and procedural rationalities, to adapt to new issues and needs, and to plan and implement effective responses.

More often than not, the local socio-economic implications of aquaculture development are taking a back seat to trade, ecological and technological motivations, especially in light of current efforts towards sustainable intensification of aquaculture production (Smith et al., 2010). This is worrying, since the bulk of aquaculture production is produced in developing countries in which smallholders dominate the rural landscape, making up a large proportion of people involved in aquaculture production in many countries. They participate across the wide spectrum of aquaculture, ranging from subsistence fish farming to specialisation in more commercially oriented forms of aquaculture (WorldFish, 2011). If the potential socio-economic costs and benefits of aquaculture continue unchecked and not considered as part of aquaculture policy development, the result is the exclusion of society from a revolution initiated for its very own benefit. This could result in social and environmental repercussions counterproductive to aquaculture's potential to addressing global food security issues.

Currently, governments and international organizations (e.g. FAO, EU) worldwide are responding to the *blue revolution* by becoming increasingly interested in expanding aquaculture to foster food security, nutrition and income generation. Scientific and technological advances have underpinned the onset of this *blue revolution* and are increasingly informing aquaculture development policies (e.g. SCAR-Fish, 2013) meaning that biological, economic and technological concepts have found their way into high-level decisions. Reports such as the "Blue Frontiers" by Hall et al., 2011 that aim to inform policy makers about the impacts of aquaculture on the environment and to stimulate debate on the optional animal food production systems for tomorrow are a case in point. However, despite these commendable efforts, we argue that aquaculture has not yet reached its potential largely because, to-date, there has been little attempt to manage this sector's activity by taking into account its multiple and varied dimensions (social, ecological, economic). Instead, the focus has been production-oriented. Furthermore, most research has focused on species exported from, and areas exporting to, the developed countries rather than on the more significant production, trade and consumption that occurs in most developing countries, indicating a severe social scientific knowledge deficit in aquaculture research (Belton and Bush, 2014). In addition, 95% of the global food economy is domestic and just 5% is trade, with the result that 'what happens in urban markets and in urban–rural supply chains is by far the most important market force affecting farmers' (Reardon et al., 2012; Belton and Bush, 2014). This underlines the placed-based and highly social-contextual nature of aquaculture production and the importance of the social construction of knowledge pertaining to certain aspects of aquaculture.

In order to be effective and inclusive, decision-making and policy formulating processes should be informed by science (where relevant) and include input from stakeholders at various levels of decision-making (e.g., individual, local, national and regional). With increasing transparency being demanded about decision-making then policy makers, for example a scientific fisheries officer working in a government natural resources management department, are under pressure to show what evidence they are using to base decisions on management measures selected. Policy-making institutions can vary depending on the country and evidence for policy making coming from members in the government administration to other international and semi-private organizations such as the Food and Agriculture Organization of the United Nations (FAO), the World Wide Fund For Nature (WWF) and Aquaculture Certification Council (ACC), etc., all of which are interlinked by formal and informal institutional exchange processes. In this sense, institutions can be termed as *rules of the game* (North, 1990) which are the interface, regulating what members of the social systems (or local stakeholders) are permitted and forbidden to do in relation to the ecological systems and in relation to themselves (Ostrom, 2005; Schlüter et al., 2013). Social Network Analysis can shed light on how these different institutions interact and exchange

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