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Stakeholders' perceptions of marine fish farming in Catalonia (Spain): A Q-methodology approach

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ABSTRACT

Marine aquaculture production is becoming increasingly important to meet global seafood demands. Conversely, there are concerns about potential environmental impacts, especially associated with marine fish farming, and the access to and use of coastal resources. While only a small number of studies on social acceptability of fish farming exist, understanding the range of perceptions among social groups is a key challenge for successful management of aquaculture, and thus for sustainable development. The case study presented here uses the Q-methodology to explore the perceptions of five aquaculture-related key stakeholder groups (NGOs, local fishermen, fish farming industry, scientists and regional administration) towards marine fish aquaculture in Catalonia (NE Spain). The 30 participants were asked to sort 39 statements about environmental, social and economic aspects of marine fish farming, on a scale from strongly agree to strongly disagree. The factor analysis identified four distinct factors, each representing a different perception. While Perception 1 regards fish farming as an activity with important socio-economic benefits and low environmental costs, Perception 2 gives highest importance to environmental concerns. Perception 3 represents a more balanced view, valuing the socio-economic benefits and expressing moderate concern about environmental impacts, whereas Perception 4 focuses mainly on economic aspects. Interestingly, the four perceptions were represented by various groups of stakeholders and not all respondents from the same sector shared the same perception. This study contributes to the scarce scientific information on social research on aquaculture, revealing limitations, challenges, and opportunities of the industry.

1. Introduction

The worldwide decline of capture fisheries (e.g. Myers and Boris, 2003; Pontecorvo and Schrank, 2012) and a simultaneous increase in seafood demand has triggered a rapid growth of marine aquaculture (FAO, 2012). Responsible for this continuous growth are the developing countries, particularly in Asia, whereas annual growth rates in the European Union (EU) have been minimal since 2000, averaging only 0.4% (FAO, 2012). The EU increasingly relies on fish originating from other regions, importing 65% of its finfish products (AIPCE-CEP, 2012). The causes for the stagnation of the European aquaculture sector are believed to be numerous, e.g. limited access to space and licensing, price instability, pressure from imports, limited access to loans and stringent EU regulations (EU Commission, 2002, 2009). Moreover, the social acceptability of the industry and its products has been identified as a key factor for the successful achievement of the sector's growth potential (Fezzardi et al., 2013; Kaiser and Stead, 2002). The recognition of the range of perceptions that exist on marine aquaculture's economic, social and environmental benefits and costs is therefore a central aspect towards a sustainable development of this industry (Burbridge et al., 2001; Kaiser and Stead, 2002; Mazur and Curtis, 2008).

Marine aquaculture production is becoming increasingly important to meet global seafood demands, and is believed to improve the economic development of rural coastal communities (Burbridge et al., 2001; Katranidis et al., 2003; Varadi et al., 2001). Conversely, there are concerns about aquaculture's negative environmental effects, especially associated with marine sea-cage fish farming, due to its high dependence on fish meal and fish oil (Naylor et al., 2000, 2009). Potential impacts of fish farm production involve various effluents (e.g. waste feed, feces, pesticides and medications) (Primavera, 2006), negative interactions with wild fish populations (Diamant et al., 2000; Heggberget et al., 1993) and reduced amenity values (Read and Fernandes, 2003). The access to and use of coastal resources of fish farms can lead to conflicts with other users of the coastal zone (Halwart et al., 2007; Hoagland et al., 2003; Nimmo et al., 2011). In addition, there are consumer concerns about the quality of farmed fish products (Verbeke et al., 2007).

Therefore, the range of perceptions of different stakeholders, as an important part of marine aquaculture management and planning, should be taken into account (Chu et al., 2010; Mazur and Curtis, 2008; Robertson et al., 2002). Insufficient participation and consultation

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of relevant stakeholder groups could lead to mismanagement of resources and social conflict and/or decreased public support and trust (Buanes et al., 2004; Kaiser and Stead, 2002; Shindler et al., 2002). Hence, there is a need to develop effective stakeholder involvement that aids communication and understanding on the many complex issues related to aquaculture (Stead et al., 2002). It is now widely accepted that a more competitive and sustainable future aquaculture industry has to be based on an integrated approach (Fezzardi et al., 2013; GESAMP, 2001), representing an interdisciplinary framework that combines knowledge from natural resource management and social sciences (Stead et al., 2002).

There is a small but increasing number of social science studies on fish farming. However, most of them focus on consumer perceptions (Altintzoglou et al., 2010; Fernández-Polanco and Luna, 2010, 2012; Verbeke et al., 2007) or the opinions of the general public (Freeman et al., 2012; Katranidis et al., 2003; Shafer et al., 2010), rather than perceptions of aquaculture-related key stakeholder groups (Chu et al., 2010; Rudell and Miller, 2012; Whitmarsh and Palmieri, 2009). Developing an overview of the different stakeholder perspectives can increase stakeholders' awareness of other perceptions (Raadgever et al., 2008) and may result in better mutual understanding and consensus between distinct groups and sectors (Pahl-Wostl and Hare, 2004). Moreover, studies of the different perceptions inform about what stakeholder groups consider the most important issues (Mazur and Curtis, 2008) and their attitudes towards measures for improvement. This can help governments and the aquaculture industry to develop a socially acceptable and sustainable aquaculture sector.

The present case study investigates the different perceptions on marine fish farming held by a diverse group of aquaculture-related key stakeholders in Catalonia (Spain). Spain is the third largest marine fish producer in the EU after the United Kingdom and Greece (APROMAR, 2013) and the third largest importer of fish products worldwide (FAO, 2012), with a per capita seafood consumption of 26.8 kg in 2011 (MAGRAMA, 2011). Yet, in 2010 the production of marine fish aquaculture in Spain has decreased 9.4%. Despite a slight increase in 2012, the production volume still remains 8.8% below the level of 2009 (APROMAR, 2013). In the autonomous region of Catalonia (NE Spain) industrialized marine fish farm production started at the beginning of the 1990s and has mainly focused on producing Gilthead seabream (*Sparus aurata*) and European seabass (*Dicentrarchus labrax*). Most of the farm installations have been initiated in cooperation with fishermen's guilds. Catalonia used to be the second most important region for marine fish farm production in Spain and has been pioneering in the development of offshore farming systems (Jordana, 1999). However, partially due to increasing national and international competition, the financial crisis and the price instability of aquaculture products (Fernández-Polanco, 2012), 60% of the Catalan fish farming installations had to close over the past decade (APROMAR, 2013). As a consequence, the total farmed fish production has decreased 22.3% from 2005 to 2012 (APROMAR, 2013). Even though recent production numbers indicate a slight increase, the development of the aquaculture sector remains complex (APROMAR, 2013).

This study aims at understanding the causes for the decrease of the present fish farming sector in Catalonia and to investigate the limitations, challenges and opportunities in an environmental, social and economic context. For this purpose, Q-methodology was applied, consisting of collecting and selecting statements directly from stakeholders, getting stakeholders to sort the statements according to their agreement or disagreement, factor analysis of the sorts, and finally analysis and interpretation of the factors identified.

The specific research questions were: (1) what are the distinct perceptions regarding the ecological, social and economic costs and benefits of fish farming in Catalonia, (2) which are the major areas of agreement and disagreement between perceptions, (3) which stakeholder groups share the same perception and (4) which are the most important issues and proposed measurements for improvement?

2. Material and methods

Previous studies of social perception towards aquaculture (e.g. Freeman et al., 2012; Mazur and Curtis, 2008; Robertson et al., 2002; Whitmarsh and Palmieri, 2011) predominantly applied survey-based research methods. An alternative to such techniques is the Q-methodology. While the typical result of a survey-based study is a statistical analysis of pre-specified categories selected by the researcher, the outcome of a Q-study is a set of factors to explain the perceptions that exist among people (Addams and Proops, 2000), allowing participants to raise their own topics rather than these being imposed by the researcher (Dryzek and Berejikian, 1993). This method, developed by the British psychologist William Stephenson in the 1930s (Stephenson, 1953), combines the benefits of both qualitative and quantitative research (McKeown and Thomas, 1988; Stephenson, 1953). Q-methodology does not require large population samples to obtain statistically valid results (Brown, 1980), as it produces an in-depth view of different perspectives that exist in a given situation, but does not intend to generalize its results to a larger population (Steelman and Maguire, 1999). Q-methodology is increasingly being used to explore perspectives of people involved in environmental issues (e.g. Bischof, 2010; Frantzi et al., 2009; Mattson et al., 2006; Raadgever et al., 2008; Swedeen, 2006), including aquaculture (Rudell and Miller, 2012).

2.1. Collection and selection of statements

The first step of a Q-study is to generate a series of statements on the topic under investigation. In this study, semi-structured face-to-face interviews with 35 well-informed stakeholders were conducted during the period from April to June 2012. Participants were recruited on the basis of their relevance to the study aim and their knowledge of the aquaculture industry. The selected stakeholders included scientists, NGOs, fish farmers, fishermen and the regional fishing and aquaculture administration. The scientific sector included experts in aquaculture economics (University of Barcelona), marine ecology (CSIC — Spanish National Research Council), aquaculture research (CSIC and IRTA — Institute of Food and Agricultural Research in Catalonia) and aquaculture–environment interactions (University of Alicante). The fish farming sector consisted of respondents from different fish farms in Catalonia, the Catalan Association of Aquaculture (ACA), the Spanish Fish Farmers Association (APROMAR) and a consultancy specialized in marine fish farming. The administration was represented by the fisheries and aquaculture administration, the environment department and the coast directorate from the regional administration in Catalonia. Environmental NGOs were represented by national and regional organizations (WWF Spain, Greenpeace Spain, Ocean2012, Oceana Spain, Fundació Mar and Nereo). Actors from the fisheries sector consisted of the presidents of the fishermen's guilds ("cofradía") at different ports (with and without fish farm installations nearby) along the Catalan coast. Participants were encouraged to speak freely about positive and negative aspects of fish farming in an environmental, social and economic context, and on measures to improve the sector's sustainability. A total of 356 statements were initially extracted from the interviews. Statements on similar aspects of aquaculture were combined, which considerably reduced the number of statements. To ensure that the whole range of perceptions is represented, the statements were sorted into the three categories of interest: environment, social and economic. In each category, statements were chosen that were representative of all the sub-themes that arose during the interviews. This process reduced the number of statements to a final list of 39 (13 statements from each category).

2.2. Sorting of statements

Out of the 35 participants that have been interviewed, 30 respondents (six from each sector) were asked to sort the 39 statements.