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An evaluation of self-governance in the New Zealand Bluff oyster fishery—A modelling approach ☆, ☆☆

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ABSTRACT

Many fisheries economists consider ITQ-based self-governance to be the future of fisheries management. This management regime is argued to have a positive impact on fisheries management. Researchers often use unstructured case studies to empirically evaluate this management regime. Yet those analyses remain discipline-specific. In addition, the methods used in the case studies are often descriptive and unable to separate the contribution of self-governance from that of ITQs—another effective fisheries management tool. The lack of rigorous empirical evaluation to date calls for a more structured approach to examine self-governance regimes, and to enable better-informed judgement whether the merits of ITQ-based self-governance can be realised. This paper reports systematic evaluation of fisheries self-governance for a New Zealand fishery. A bio-economic model is used to project the fishery's stock status and the industry's profitability. By combining a Bayesian statistics approach in the biological sub-model with a system dynamics approach in the economic sub-model, this research is able to identify the contribution of self-governance above that of ITQs. The self-governed Bluff oyster fishery is studied to test the practicality of the bio-economic model and to determine the impact of self-governance on the fishery's management. The analysis yields results that shed some light on ITQ-based self-governance. First, supporting theoretical literature, the self-governance regime promotes economic efficiency in the fishery. In addition, ITQ-based self-governance adds value to fish stock management because of the positive relationship between profitability and stock abundance.

1. Introduction

This paper evaluates the contribution of self-governance to fisheries management. It compares the resource and economic performance of the New Zealand Bluff oyster fishery (OYU5[1]) under the current Individual Transferable Quota (ITQ) complemented by self-governance regime, to a counterfactual regime—ITQ without self-governance. The method developed in the paper separates the impact of self-governance from the impact of ITQ, which is itself an effective fisheries management tool (*e.g.*, [1–3]).

Fisheries management and economics has evolved since 'sole-ownership' (*e.g.*, [4,5,8]), 'government intervention' (*e.g.*, [6,9]) and ITQs (*e.g.*, [1,7]). Recently, a new component of fisheries management, self-governance (also described as self-management, co-operative management, participatory management and co-management), has been gaining support (*e.g.*, [2,6,9,10]). This paper focuses on self-governance by Individual Transferable Quota (ITQ) holders as a means of fisheries management in New Zealand. Generally speaking, self-governance means a separation of management responsibilities between the government and fishery users. In the New Zealand context, self-governance saw government responsible for the macro items of fisheries management, such as meeting international obligations and approving management plans developed by fishery users. On the other hand, fishery users are responsible for micro-items, such as developing harvest strategies and designing and purchasing catch related research [11].

ITQ-based self-governance has been increasingly discussed in fisheries management literature. Scott [9] among others, argued that fishing rights evolve from an open-access regime to limited entry, followed by rights-based systems, and finally, towards a

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[1] The Fisheries Act 1996 divides New Zealand's 200 nautical mile Exclusive Economic Zone (EEZ) into 10 FMAs according to likely stock boundaries and administrative considerations. The Bluff oyster fishery is in Fisheries Management Area (FMA) 5, and hence is named OYU5.

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self-regulated framework created by rights holders. Sometimes called 'the future direction' of fisheries management, ITQ-based self-governance is argued to bring many benefits including economic efficiency enhancement, institutional effectiveness promotion, and resource and environment stewardship [1,6,7,9,10].

New Zealand appears to be the only country that recognises and endorses self-governance by ITQ-holders [12,13]. Policy developments up until 2008 within the New Zealand Ministry of Fisheries (MFish) provided a clear signal encouraging ITQ-holders to participate in fisheries management. The policies included the launch of a collaborative governance research project from 2008/09 to 2010/11, the introduction of shared fisheries policy in 2006 and the preparation of a plan for every ITQ fishery by 2011 [14]. However, towards the end of 2010, the policy of government facilitated devolution changed direction. The original arrangement of developing a plan for every ITQ fishery changed into development of one deepwater fishery plan, one pelagic fishery plan and three plans for inshore fisheries. This change in direction was brought about by the lack of substantive outcomes from stakeholder-led planning. In fact, there have been policy inter-changes over the years both endorsing and indifferent towards self-governance [15].

Hence, it is appropriate and timely at this crossroads to consider the benefits of implementing a self-governance management regime for New Zealand fisheries. It is important to not only study ITQ-based self-governance, but to also identify the contribution from self-governance before it is widely promoted. Because institutional change can be costly, there might be significant policy development and implementation costs but disappointingly small gains as a result of the new policy.

Despite the promotion of ITQ-based self-governance by economists and the New Zealand government, investigation of the empirical contribution of this management regime is limited. Until now, there has been a lack of systematic evaluation of self-governance in ITQ fisheries. Specifically, all previous research literature has uniformly used an unstructured case study approach to empirically evaluate ITQ-based self-governance [15–18]. The unstructured case study approach often conflates the contribution of self-governance and use of ITQ as an integrated management regime, rather than treating them as separate influences.

However, evaluating self-governance together with ITQs is unsatisfactory because of the indeterminacy problem. Indeterminacy arises when observations depend on more than one cause or hypothesis [19]. Specifically for New Zealand fisheries management, the ITQ programme is an efficient management tool on its own (*e.g.*, [20–22]) and it is difficult to isolate the benefits provided by self-governance because it is intimately intertwined with ITQs. An unstructured case study may fail to identify the specific contributions of self-governance.

The indeterminacy problem can be further illuminated by the following two examples. In a case study of the New Zealand rock lobster fishery, Yandle [16] focused on the institutional development and economic performance (*i.e.*, catch and Catch Per Unit Effort (CPUE)) of the fishery. At the conclusion of the case study the author noted that "QMS and the devolved governance are so intertwined … that it is difficult to separate their relative contributions" [16, p. 303]. Another example can be found in the New Zealand Bluff oyster fishery case study by Yang et al. [15]. In this study, the authors separated the institutional contribution of self-governance from that of ITQs. Specifically, they found the levels of communication among fishery managers and fishers were improved by establishing a unique management structure within the self-governance regime. However, although the paper found an overall improvement in resource management, the contribution of self-governance was conflated with that of ITQs.

This paper succeeds the work of Yang et al. [15] and focuses on evaluation of the resource and economic performance of the Bluff oyster fishery. In order to assess the impact of self-governance separate from that of ITQs, we apply a bio-economic model that uses Bayesian inference and system dynamics to the Bluff oyster fishery and compares the fishery's stock status and profitability under 'with' and 'without' self-governance regimes.

The remainder of this paper is arranged as follows. Section 2 describes the bio-economic model developed to examine the biological and economic performance of the fishery. Section 3 describes how the model can be used to analyse the 'with' self-governance and 'without' self-governance regimes. Section 4 presents the results of the modelling. Section 5 discusses whether self-governance contributes to fish stock management and profit improvement. Finally Section 6 provides conclusions from this research.

2. Method

Bio-economic models are often used in fisheries management literature to analyse policy impacts on fish stock dynamics and profitability (*e.g.*, [23,24]). In this paper, the bio-economic model is created to simulate the Bluff oyster fishery. In order to identify and evaluate the management impact of self-governance, the bio-economic model is used to imitate fish stock dynamics and fishing industry profitability dynamics under the current 'with' self-governance management regime and a counterfactual 'without' self-governance regime. This is somewhat different from the traditional use of bio-economic models in much research (*e.g.*, [25–27]) where profit optimisation is often set as the targeted objective, which resembles the ideal situation.

Fig. 1 provides an overview of the model structure. The Bluff oyster fishery is managed under the New Zealand Quota

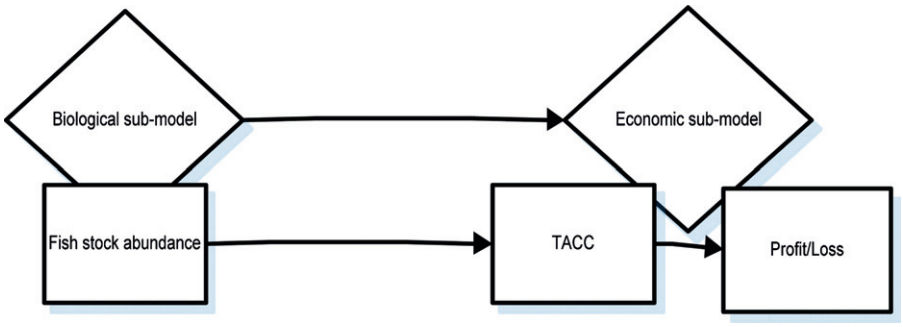

Fig. 1. Bio-economic model structure under the QMS.