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Incorporating economics into fisheries management frameworks in Australia

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ABSTRACT

A large gap has been identified between the current and optimal economic performance of wild-capture commercial fisheries in Australia. Economic approaches have the potential to assist fisheries to bridge this gap, such as bio-economic models that combine biology with fishing costs to evaluate the economic performance of a broad range of management measures. Economic objectives are prevalent in overarching Australian fisheries legislation, however economic data is often not collected and economic analyses or instruments not broadly applied. This paper reviews selected Australian fisheries to demonstrate the accrued economic benefits from applying formal bio-economic models and conducting empirical analyses of the impact of supply on product value. Challenges to the implementation and continued use of economic analyses and instruments are discussed including: (i) short-term transition costs and associated trade-offs between ecological, economic, social and political objectives; (ii) scarce logistical and financial capacity to collect and analyse economic data; (iii) a lack of desire among industry to change and transition to economic targets such as maximum economic yield (MEY), particularly when it is associated with lower catches; and (iv) a lack of economic literacy among fisheries managers and industry. It is contended that many of these challenges initially arise from an absence of clearly identified and prioritised objectives within overarching legislation and management plans. Once objectives are prioritised, limited resources can be allocated more efficiently to improve data collection, economic analysis and increase awareness as well as education of managers and industry.

1. Introduction

Many countries manage their fisheries resources to achieve an assortment of ecological, economic, social and political objectives [1,2]. For example, Australia has adopted a national ecological sustainable development (ESD) framework in legislation for managing its fisheries, establishing a requirement to consider ecological, economic and social implications when setting catches of target species [3]. This requirement is reflected in the Commonwealth *Fisheries Management Act 1991* (FMA 1991), which stipulates that the Commonwealth management agency – the Australian Fisheries Management Authority (AFMA) must ensure "that the exploitation of fisheries resources and the carrying on of any related activities are conducted in a manner consistent with the principles of ecologically sustainable development". While most countries have similar broadly phrased goals or higher order objectives within overarching legislation, these often lack an operational definition within fisheries management plans and policies that would allow them to be measured and attained [4–6].

According to Lackey [7] management objectives must be: (i) explicit and specific, with no broad generalisations; (ii) quantifiable, if not empirically then at least subjectively; (iii) contain measure(s) to evaluate performance and; (iv) have enough flexibility to respond to changes in societal preferences and ecological constraints. Objectives that fulfil these criteria can direct the decision-making process by delivering a mandate to fisheries managers, while providing a means of identifying potential conflicting activities, evaluating performance and measuring results [8,9].

Fisheries objectives are often countervailing to some extent, such that they cannot be simultaneously optimised [10]. For example, the New South Wales *Fisheries Management Act 1994* stipulates that the objectives of the Act include, the promotion of "viable commercial fishing and aquaculture industries", while ensuring "quality recreational fishing opportunities" and providing "social and economic benefits for the wider community of New South Wales." In this example, allocation of catch or fishing areas to either the recreational or commercial fishing sector diminishes harvests by the other sector,

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particularly in the absence of an agreed resource allocation mechanism. Most of "the wider community" in this jurisdiction are neither recreational nor commercial fishers, so the only benefit they receive is through economic flows or perhaps access to seafood as consumers. Consequently, disagreement and conflict among stakeholders may arise if trade-offs are not considered and priorities selected among overarching objectives.

Stakeholder groups often differ considerably in their opinion about the relative importance of particular objectives and the values they place on the resource [6,11,12]. For example, Pascoe and Proctor [11] in a study of objective preferences among stakeholder groups within Australian Commonwealth fisheries showed how industry stakeholders prioritised economic objectives, environmental stakeholders prioritised ecological objectives relating to minimising environmental impacts, while social scientists and recreational fishing groups prioritised social objectives relating to minimising externalities, such as impacts on coastal communities. Consequently, in the absence of well-specified and prioritised objectives, decision-makers have no guidance on how to make fisheries management decisions that balance these competing objectives [5,10,11]. This can lead to reactive, short-term decision-making and the prioritisation of an issue for political reasons [5]. Principal-agent costs may then be incurred when the manager's (agent) decisions do not effectively represent the interests of the owners or society at large (principal) [13,14]. Empirical analyses indicate that these costs can be considerable [15], with various authors attributing widespread failures in fisheries management to inappropriate consideration and prioritisation of objectives [1,5].

Historically, the focus of management decision-making in fisheries has been based on achieving biological objectives relating to maximising sustainable production [11,16,17]. This was a product of the inherent values of most fisheries managers, who had a background and education in biological sciences [8,16] as well as the United Nations Law of the Sea Convention (LOSC) and other international conventions that focussed on achieving the maximum sustainable yield (MSY). More recently, economic objectives, such as maximising the economic efficiency of the fishery, are gaining increasing importance in driving the outcomes of management decision-making [11,17,18]. For example, New South Wales has a legislative economic objective that aims to: (i) promote viable commercial fishing and aquaculture industries; and (ii) to provide social and economic benefits for the wider community of New South Wales. Similarly, Victoria has a legislative economic objective to: (i) promote the commercial fishing industry and to facilitate the rationalisation and restructuring of the industry. The increased focus on these fishery economic objectives by Australian jurisdictions is in part due to the general desire to increase fishery profitability by rebuilding wild capture fish species to more precautionary (and economically efficient) targets that offset the rising costs of fuel and volatility in fish prices caused by fluctuating exchange rates and increased aquaculture production [19,20]. Additionally, as competition over marine resource space intensifies, there is pressure to increase commercial fishery profitability so that fishing remains an economical viable option when negotiating with other industry groups advocating alternative uses [17].

In response to greater consideration of fisheries objectives and aspirations, there has been increased interest in incorporating economic approaches into fisheries management frameworks [2,18]. This is most clearly reflected in the Commonwealth jurisdiction in Australia with the release of the Ministerial Direction to AFMA in 2005. This required AFMA to transition all managed fisheries to individual transferable quotas (ITQ) (unless this could be proven to not be cost effective), which theoretically would improve efficiency through rationalisation of the fishing fleet and reduced incentives to overcapitalise [21–23]. The Ministerial Direction also required that AFMA measure the impact of its decisions on the economic performance of its fisheries through the development of a harvest strategy policy applied to all targeted stocks [24]. The harvest strategy policy was implemented in 2008 and required fisheries managers to target biomass corresponding to the maximum economic yield (B_{MEY}) as the default target reference point, in order to meet the revised economic objective within the *Australian Fisheries Management Act 1991* of "maximising the net economic returns to the Australian community from the management of Australian fisheries" [25].

While the application of economic instruments, such as ITQs are expanding within Australia, the objective (or reasoning) behind their use is often unclear among stakeholders, with many considering the reasoning to be based on biological or ecological rather than economic objectives [26,27]. For example, the impetus behind the Australian Commonwealth Government's Ministerial Direction to AFMA and adoption of ITQs as the preferred management system was foremost to recover biologically overfished stocks (of which there were 24 in 2005) and to prevent future overfishing in Commonwealth-managed fisheries [28,29]. Likewise in the Tasmanian southern rock lobster fishery, ITQ management was introduced in 1998 on the basis of needing to "constrain catch to a sustainable level" following a prolonged period of stock decline [27,30]. Similarly, in the Western Australian rock lobster fishery the main impetus for reducing effort in the fishery and transitioning towards a maximum economic yield (MEY) target was to address low recruitment levels and achieve stock sustainability objectives [19,31].

The justification for the implementation of economic instruments and use of economic analyses within Australian fisheries has primarily been to meet biological or ecological targets, however the resulting economic benefits from optimal harvest levels create further justification for their continued adoption [2,26,31]. According to Pascoe [17] economics can provide an important framework for management of the marine environment through: (i) valuation of non-market environmental services; (ii) assessing the performance and outcomes of different management measures and policies; and (iii) through the use of economic instruments (such as ITQs). Bio-economic modelling, in particular has been advocated as an important tool in managing fisheries for economic and ecological sustainability [27]. Bio-economic models recognise that the optimal harvest is determined not only by the biology of the stock but also the cost structure of the fishery and the value of the harvest [32]. By combining factors that influence the biological side (e.g. stock recruitment relationship) and economic side (e.g. prices and fixed and variable costs of fishing), decision-makers can model interrelationships to provide an insight into the optimal management of the stock [32,33].

Bio-economic models that explicitly consider economic factors and harvest controls rules have been developed for various fisheries, however most are not directly used for management purposes [34]. This paper will discuss some of the few Australian fisheries where economic considerations have been incorporated into management decision-making, through either the use of formal bio-economic models or empirical analyses of the impact of supply on product value. The accrued economic benefits to these fisheries will be highlighted as justification for the widespread adoption of economic analyses within other fisheries to identify and reduce the gap between current and optimal fisheries performance [35–37]. Consideration will also be given as to why economic analyses such as bio-economics are not more broadly applied to assist management decision-making, despite implicit or explicit economic objectives being prevalent in overarching Australian jurisdictional fisheries legislation.

2. Discussion

2.1. Case studies from Australian fisheries

2.1.1. Tasmanian rock lobster fishery – insightful ways of increasing value

Bio-economic analysis has been utilised in the Tasmanian southern rock lobster (TSRL) fishery in Australia as a way of increasing the