Fisheries Research xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Fisheries Research

journal homepage: www.elsevier.com/locate/fishres

# Refinements to harvest strategies to enable effective implementation of Ecosystem Based Fisheries Management for the multi-sector, multi-species fisheries of Western Australia

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ARTICLE INFO

*Article history:*
Received 13 October 2015
Received in revised form 15 April 2016
Accepted 24 April 2016
Handled by A.E. Punt
Available online xxx

*Keywords:*
Harvest strategies
Ecosystem Based Fisheries Management
Resource-based approach sectoral allocations
Social and economic objectives
Annual catch tolerance levels

ABSTRACT

To address increasing community expectations and deliver the 'social licence to operate', fisheries management in Western Australia (WA) has been systematically adopting a suite of reforms termed Ecosystem Based Fisheries Management (EBFM). EBFM extends beyond the fishery-level 'ecosystem approach' of considering ecological, social and economic objectives by taking a resource-level approach to coordinate management of all fishing sectors that capture a 'resource' (which can be defined as one or more species) to better deliver overall community outcomes. This initiative required refinements to harvest strategies to cover the broader EBFM scope and also to deal with the challenges associated with their application to the multi-sector, multi-species fisheries common in WA. The efficacy of these EBFM-based harvest strategies was assessed using four case study resources that cover the diversity of fishery management systems applied in WA. Key refinements include the use of indicator species for multi-species resources and establishing appropriate tolerance levels to determine the acceptable range of annual deviations in catch/effort that meet the levels specified by the harvest control rules or sectoral allocation decisions. While some refinements are ongoing, the case studies demonstrate that a single, comprehensive harvest strategy can collectively address all target species objectives and intra and inter-sectoral allocations at the resource-level plus any other relevant economic, social or ecological objectives (e.g. habitat and protected species interactions) at the appropriate level (resource or activity/sector). This holistic approach is already generating efficiency dividends through the adoption of tolerance levels that are minimising unnecessary management interventions. Similarly, fewer management elements now require pre-season negotiation which is also reducing administrative costs. The comprehensive but agile approach adopted by WA is likely to be especially relevant for other coastal jurisdictions with highly variable environments where fisheries often have multiple sectors, species, stakeholders and objectives that need to be considered.



## 1. Introduction

Community expectations concerning the level of transparency and rigour that should be applied to the decision-making processes used for managing natural resources, such as fisheries, have increased greatly in recent decades (e.g. FAO, 2003; Caddy and Cochrane, 2001; Cochrane and Garcia, 2008; CBD, 2010). To justify their 'social licence to operate', fisheries must now be managed by taking what is generally called an 'ecosystem approach' (EAF—FAO, 2003, 2011; Fletcher and Bianchi, 2014). This approach is designed to demonstrate that the full spectrum of impacts of fisheries on the environment has been considered (e.g. CoA, 2007a; MSC, 2014), and that the social and economic costs and benefits generated by their access to resources have been distributed appropriately (e.g. De Young et al., 2008; Haward et al., 2013). To deal with this broadening scope, Western Australia (WA) has systematically developed and adopted a suite of policy, governance and assessment reforms for its fisheries management systems consistent with EAF principles (e.g. DoF, 2000, 2002; Fletcher et al., 2005) which now also extend to explicitly deal with the cumulative impacts of fishing activities at a bioregional level (DoF, 2010a; Fletcher et al., 2010; see Table 1 for details). Collectively, these initiatives have established one of the few complete applications of what, in Australia, is termed Ecosystem Based Fisheries Management (EBFM) (Fletcher, 2006; Fletcher et al., 2012; Cochrane et al., 2014).

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http://dx.doi.org/10.1016/j.fishres.2016.04.014
0165-7836/

**Table 1**
Summary of the timelines for the policy and legislative initiatives undertaken to implement Ecosystem Based Fisheries Management (EBFM) within Western Australia.

| Time | Initiative |
|---|---|
| 2000 | Policy for integrated management of recreational and commercial sectors adopted (DoF, 2000). |
| 2002 | Policy for implementing Ecologically Sustainable Development adopted (DoF, 2002). |
| 2002 | Integrated Fisheries Management guidelines developed (Fletcher and Curnow, 2002). |
| 2005 | Concept for Ecosystem Based Fisheries Management (EBFM) defined (Fletcher, 2006). |
| 2007 | First explicit access sectoral allocation decisions made by WA government (DoF, 2007). |
| 2008 | A draft EBFM framework was developed (Fletcher et al., 2010) and trialled (Fletcher et al., 2011). |
| 2010 | Formal adoption of EBFM policies by the Department and a proposal to draft new legislation was announced (DoF, 2010a,b,c). |
| 2011 | EBFM processes start being incorporated into Department's operational and governance structures (Fletcher et al., 2012).<br>A resource assessment framework to identify indicator species for all key resources was developed (DoF, 2011)<br>Approval to draft new Aquatic Resource Management Act (ARMA) was given by Cabinet in November 2011 |
| 2013 | Approval to print ARMA bill (i.e. introduce to Parliament) was given by Cabinet in November 2013. |
| 2015 | ARMA Bill was introduced to Parliament on 24 February 2015 and given its first and second readings. |
| 2016 | Debate of the Bill in the lower and upper houses and a review committee stage is required before it can be proclaimed. |

To more efficiently implement the EBFM approach, revised legislation is currently being progressed through the WA parliament (WA Govt, 2013). The new Act is based on a fundamentally different governance approach that will provide the 'head powers' for fisheries management to be formally developed at the resource-level, rather than at the fishing activity (e.g. 'x' trawl fishery), or sectoral level (e.g. recreational fishery), as traditionally applied. A 'resource' is defined as an identifiable group of one or more species in a bioregion, area, habitat or ecosystem (WA Govt, 2013; e.g. northern demersal scalefish resource; south-west estuarine resource). This legislation will enable management of all fishing activities affecting each of WA's major aquatic resources to be fully coordinated and to deliver explicit resource-level objectives (ecological, social and economic) established by the Minister on behalf of the community. Meeting these objectives will require determining what levels of impact are acceptable for each resource plus establishing the most appropriate levels of access that should be allocated to each stakeholder sector. Such an approach is particularly important for managing coastal aquatic resources that are 'used' by a diverse set of stakeholders (including extractive sectoral uses – commercial, recreational, customary; and non-extractive sectoral uses – conservation, tourism) who often have competing values and differing expectations (Mazur et al., 2014).

To efficiently achieve the holistic outcomes anticipated under EBFM will require the establishment of a tailored set of decision or control rules which are generally termed harvest strategies (NRC, 1998; McIlgorm, 2013). Harvest strategies were originally developed to enable the efficient implementation of both adaptive and precautionary approaches for the management of individual target species within US fisheries (Hilborn and Walters, 1992; Mace, 1994; Garcia, 1996; Rosenberg and Restrepo, 1996). The concept has since been adopted across many jurisdictions (e.g. Commonwealth fisheries in Australia; CoA, 2007b; Smith et al., 2013; New Zealand, NZMF, 2008a,b) for the management of target stock sustainability, to the extent that they are now considered an essential component for third-party certification processes (e.g. MSC, 2014). Such policies have not, however, explicitly addressed all the social, economic and ecological requirements needed for undertaking EBFM (McIlgorm, 2013).

With widespread interest in the broader adoption of harvest strategies, national guidelines have been developed for Australian fisheries (Sloan et al., 2014). These guidelines identified a series of challenges that have been barriers to the development of harvest strategies for certain types of fisheries (e.g. recreational, multi-gear, multi-species). With the high proportion of multi-species resources (35 of 45 'resources' comprise more than one species) and multi-sector fisheries (21 of 45 'resources' are fished by both commercial and recreational sectors) in WA (Fletcher and Santoro, 2015) such challenges need to be addressed for harvest strategies to be of practical value. Consequently, they must specify the appropriate overall harvest levels for the resource (total catch and/or effort) and, where relevant, levels for each indicator species targeted within the resource. Harvest strategies in WA must also assist delivery of any intra and inter-sectoral allocation decisions for each targeted resource (e.g. DoF, 2010b) plus any additional ecological, economic and social objectives already established for the relevant fisheries/sectors or other affected resources (e.g. habitat and protected species interactions). But a harvest strategy is the management instrument designed to implement these previously agreed objectives, it is not the vehicle to make these decisions.

Western Australia's harvest strategy policy and associated guidelines (DoF, 2015) outline the series of refinements identified to enable the practical development of harvest strategies to effectively deal with the broad scope of EBFM. The efficacy of these refinements were examined using a number of examples that cover a wide spectrum of the situations often encountered in WA, including single and multi-species 'resources', that are accessed by single and multi-sector/gear fisheries, to achieve multiple objectives, using either input or output-based management systems often with different harvesting approaches. The assessment identifies where these strategies have already been successful or where further refinements will be required to complete implementation. The benefits and difficulties encountered using this process in WA are likely to be applicable in many coastal jurisdictions which often have multi-species and/or multi-sectoral/gear fisheries.

## 2. Materials and methods

### 2.1. Harvest strategy definition and policy

To address EBFM requirements in WA, developing a harvest strategy for a resource is undertaken "*To establish clear and specifically articulated performance levels and associated management actions designed to achieve the agreed objectives for the resource and relevant fishery sectors*" (DoF, 2015). The harvest strategy guidelines not only cover the potential to have multiple objectives and sectoral allocations associated with the target species, but also incorporate strategies to manage bycatch and interactions with habitat and protected species. They also must include elements that effectively coordinate management at both the individual fishery and sector levels to achieve any agreed resource or fishery-level social and economic outcomes.

Please cite this article in press as: Fletcher, W.J., et al., Refinements to harvest strategies to enable effective implementation of Ecosystem Based Fisheries Management for the multi-sector, multi-species fisheries of Western Australia. Fish. Res. (2016), http://dx.doi.org/10.1016/j.fishres.2016.04.014