



Department of
**Primary Industries and
Regional Development**

*We're working for
Western Australia.*

AQUATIC RESOURCES MANAGEMENT PAPER: 4

ARMA-Based Harvest Strategy Policy

DISCUSSION DRAFT

July 2022

Important disclaimer

The Chief Executive Officer of the Department of Primary Industries and Regional Development and the State of Western Australia accept no liability whatsoever by reason of negligence or otherwise arising from the use or release of this information or any part of it.

Department of Primary Industries and Regional Development
1 Nash Street
PERTH WA 6000
Telephone: (08) 6551 4444
Website: dpird.wa.gov.au
ABN: 18 951 343 745

Contents

| | |
|---|----|
| Purpose | 2 |
| Legislative and Policy Context..... | 2 |
| Harvest Strategies | 3 |
| Overview | 3 |
| History of Harvest Strategies in WA..... | 5 |
| Key changes for revised ARMA-based HSP | 6 |
| Critical Policy Differences for Future Harvest Strategies | 10 |
| Key Outcomes from the Updated Policy..... | 12 |
| Other HSP Considerations..... | 12 |
| Scope of Issues Covered | 12 |
| Target Species | 12 |
| Bycatch, Habitat and Ecosystems | 13 |
| Priority of resource objectives for use in AHL calculation | 13 |
| Multispecies fisheries and Species Suites | 13 |
| Straddling and Migratory Stocks..... | 14 |
| Determining Risk Levels | 14 |
| Precision, Precaution, Uncertainty and Risk | 16 |
| Cost effectiveness and Practicality | 16 |
| Application of the Policy | 16 |
| ARMA based policies and MAR framework | 16 |
| Specific Elements Required for the Harvest Strategy component of an ARMS or MPS | 18 |
| 1. Measuring Performance | 18 |
| 2. Determination of the Allowable Harvest Level..... | 18 |
| 3. Calculate ‘TAC’ and sectoral ‘TACC and TARCs’ (and any zonal separations)..... | 19 |
| Harvest Strategy Processes and Guidelines..... | 19 |
| Glossary of Terms..... | 20 |
| References | 23 |
| Appendix 1 – Current ARMA Process outlines..... | 27 |
| Streamlined Objective Setting and Allocation Process..... | 27 |
| Comprehensive Objective setting and Allocation Process | 29 |

Purpose

The *Harvest strategy policy and operational guidelines for the aquatic resources of Western Australia* (DoF, 2015) needed to be updated to ensure the development of future harvest strategies in Western Australia (WA) align with the legislative principles, management processes and policy procedures specified within the *Aquatic Resources Management Act* (2016; ARMA).

This *ARMA-based Harvest Strategy Policy* (HSP) outlines each of the updated policy elements that will be applied for future harvest strategy development in WA. A companion set of updated operational guidelines and processes for the implementation of the HSP will also be established.

Legislative and Policy Context

Over the past two decades, a series of legal and policy instruments developed within WA has provided the basis to be one of the first jurisdictions to have fisheries managed effectively using the principles of Ecologically Sustainable Development (ESD), Integrated Fisheries Management (IFM) and Ecosystem Based Fisheries Management (EBFM). This includes enabling explicit consideration of relevant ecological, social and economic risks for the ESD-based management of each fishery (DoF, 2002; Fletcher et al., 2002; Fletcher 2005), generating formal IFM-based sectoral allocations of access (DoF, 2000; Fletcher & Curnow, 2002) plus having planning processes that extend beyond individual fisheries by use of a resource-level, risk-based EBFM governance framework (Fletcher, et al., 2010, 2012; Cochrane et al, 2014; Fletcher 2015).

Improving the consistent and coordinated implementation of these concepts was a key driver for the replacement of the *Fish Resources Management Act* (FRMA, 1994) with the *Aquatic Resource Management Act 2016* (ARMA). A critical benefit being that the FRMA was largely focused on the management of individual commercial fishing activities whereas the broader scope of ARMA requires a more holistic, resource-based management approach. The objects of ARMA is therefore to “*ensure the ecological sustainability of the State’s aquatic resources and aquatic ecosystems for the benefit of present and future generations; and ensure that the State’s aquatic resources are managed, developed and used having regard to the economic, social and other benefits that the aquatic resources may provide*”.

The management principles contained within ARMA explicitly recognise that the aquatic resources of WA are ‘used’ by a diverse set of stakeholders which can include a wide range

of direct¹ and indirect² extractive-based stakeholders plus multiple non-extractive stakeholders³ who may have different values and often competing expectations. Importantly, the ARMA principles specify that “*interests of different sectors of the community that use aquatic resources or aquatic ecosystems be identified and considered*” with appropriate levels of access for each stakeholder sector needing to be established. ARMA provides, therefore, the legislative mechanism for the management of all fishing activities to be fully coordinated to deliver the resource-level objectives (ecological, social, economic and governance) established by the Minister on behalf of the community for each WA aquatic resource in a manner that is to be “*as practical, efficient and cost effective as possible*”.

The objects and principles within ARMA are consistent with contemporary ‘sustainability concepts’ including those of the UN-FAO- Ecosystem Approach to Fisheries (FAO; 2012; Fletcher and Bianchi, 2016); the Quadruple Bottom Line (ecological, social, economic and governance- see also Caputi et al., 2018) and, importantly, ESG (Environmental, Social and Governance; see Gov. WA., 2021). Given the growing national and international community expectations for the social acceptability of activities and products, being able to demonstrate these concepts are being effectively applied is increasingly important for all industries and sectors. One of the critical elements each fishery needs to have to demonstrate it is meeting these requirements is a formal harvest strategy.

Harvest Strategies

Overview

Harvest strategies provide the clear set of documented rules for determining when and how the management arrangements should be adjusted to achieve acceptable performance in relation to the set of objectives established for a resource. The basic elements of all harvest strategies include:

- determination of the harvesting approach (constant harvest/exploitation rate, constant escapement/stock size and constant catch);
- establishment of suitable reference points that best reflect the set of sustainability and other objectives (Fig. 1); and
- development of the harvest decision and control rules that describes how fishing exploitation/activities should be adjusted as a function of changes in stock size or other attributes in relation to sustainability and other reference points (Fig. 2).

¹ Direct extractive stakeholders include commercial, recreational, customary and charter sectors.

² Indirect extractive stakeholders include retail fish consumers plus the hospitality and tourism sectors.

³ Non-extractive stakeholders include conservation and eco-tourism sectors and the general public.

The key purpose of a harvest strategy is to maintain an acceptable level of risk (i.e. medium or lower) for each of the objectives by keeping the resource above the threshold level and preferably close to the target level with suitable certainty. Where the risk is currently high or severe (approaching or below threshold or limit), they should also specify the actions needed to return this to an acceptable level in a suitable timeframe (Fig. 1).

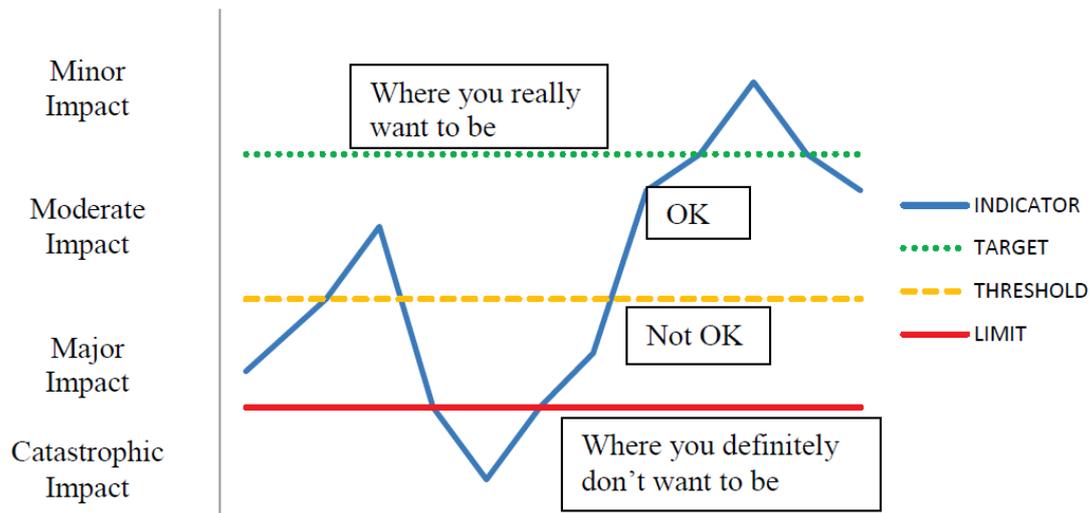


Figure 1. The general relationship between indicators, target, threshold and limit reference values and impact (consequence) levels for a resource (from DoF, 2015).

Harvest strategies help achieve acceptable risk levels through the development of a set of Harvest Control Rules (HCRs) which predefine what changes to management settings will occur in order to meet the agreed objectives for the resource based on the current or likely future status of indicators relative to the limit, threshold or target reference levels (Fig. 1).

A key element for determining HCRs for a resource is to establish the highest acceptable level of ongoing fishing mortality (which translates into specific catch and/or effort levels) that can be applied when the stock indicator is (or would be) at the target level. Where the resource declines below the target level, the allowable Fishing Mortality (F) must also decrease which is translated by the HCRs into a suitably reduced allowable catch and/or effort level.

As the resource gets closer to the limit level, the proportional reductions in the allowable F and therefore the reductions in allowable catch/effort generated by the HCRs also get bigger. Where the resource is below the limit, fishing levels need to be greatly reduced and, in some situations, may even need to cease until a suitable level of recovery has occurred (Fig. 2).

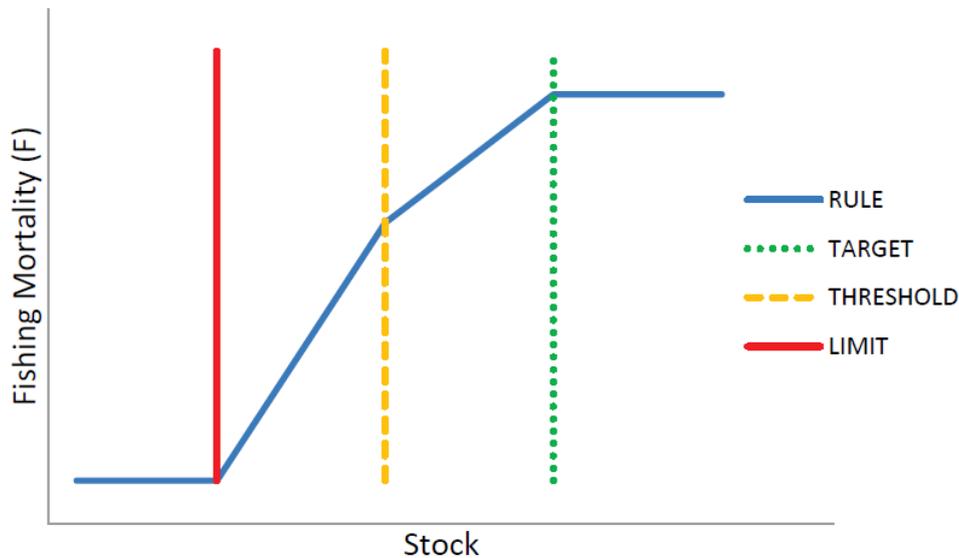


Figure 2. The general relationship between the expected changes to fishing mortality used for harvest control rules based on current resource/stock level in relation to target, threshold and limit reference values (from DOF, 2015).

The widespread adoption of formal harvest strategies and HCRs over the past 20 years has been one of the critical elements associated with the improvement in the sustainability outcomes for many fisheries worldwide (Hilborn et al., 2020). Consequently, harvest strategies are now a key component of contemporary fishery management systems and an essential requirement for third party certification including through the Marine Stewardship Council (MSC).

Given the strong interest generated for adopting harvest strategies in Australia over the past decade, national guidelines were developed (Sloane et al., 2014) from which specific harvest strategy policies and guidelines have subsequently been developed in most Australian jurisdictions including WA.

History of Harvest Strategies in WA

Given the above, there have been a number of motivations over the past 20 years in WA to develop formal harvest strategies. This includes assisting with export-based WA fisheries obtaining Commonwealth EPBC export 'certification' (CoA, 2007) and enabling WA fisheries seek MSC certification (Bellchambers et al., 2016). To ensure these harvest strategies were being developed in a consistent and robust manner, a WA based set of harvest strategy policy and operational guidelines (WA 2015 Policy) was developed (DoF, 2015) with the key elements externally reviewed (Fletcher et al., 2016).

The formal definition in the 2015 Policy was that '*a harvest strategy establishes clear and specifically articulated performance levels and associated management actions designed to*

achieve the agreed objectives for the resource and relevant fishery sectors'. This differed from the National Harvest Strategy Guidelines (Sloane et al, 2014) to reflect the potential for WA to develop strategies that took a resource level (multi-sector) approach to management.

The 2015 Policy included the potential for a harvest strategy to deliver multiple objectives, sectoral allocations and accommodate multiple target species (including the use of indicator species; see Newman et al., 2018). It also incorporated the rules to manage the risks generated from bycatch, habitat and protected species interactions. This EBFM approach not only eliminated the need to have multiple policies but also the need to have multiple overlapping strategy documents for the same resource/fishery (Fletcher et al., 2016).

Since the 2015 policy was developed, most key WA fisheries have had a formal harvest strategy developed with many now pending a review. Increasingly, these strategies are being developed in a coordinating manner that covers all the fisheries/sectors that are accessing the same resource (e.g. West Coast Demersal Scalefish Harvest Strategy – DPIRD, 2021).

Key changes for revised ARMA-based HSP

While the 2015 Policy incorporated many of the EBFM based principles that were contained within what was then the draft *ARM* Bill (2015), some specific elements had to reflect the *FRMA*. With the passing of *ARMA*, it is necessary to have an updated HSP to ensure future strategies are consistent with all principles and processes required under *ARMA*. In addition, given the clear requirement to be consistent with the WA Climate Change Policy⁴, the revised HSP needs to include explicit consideration of the potential for climate change impacts and emission reduction requirements. The key differences between the *FRMA* and *ARMA* relevant to harvest strategy development are outlined below:

FRMA – The *FRMA* was focused on establishing restricted access and developing management plans for each of the different commercial fishing activities that operated around the state. This resulted in a large number (45) of separately identified commercial fisheries, of which most (35) were multi-species or multi-gear fisheries, and many (21) were multi-sector (fished by both commercial and recreational sectors).

The fishery management plans developed under the *FRMA* were essentially a documentation of the sets of rules for each of the different commercial fishing activities. Importantly, they did not include an explicit outcome objective to be achieved for the use of the resource apart from ensuring ecological sustainability. There was also no legislative

⁴ <https://www.wa.gov.au/service/environment/environment-information-services/western-australian-climate-change-policy>.

'head of power' within the *FRMA* to generate explicit recreational fishery management plans with this sector's management based on the intersection of various state-wide and regional level regulations. The implications for harvest strategies under the *FRMA* were:

- No formal requirement to link the management of each commercial and recreational fishery accessing the same resource.
- No requirement for outcome-based economic &/or social objectives from which to establish clear target levels.
- Limited ability to develop clear and coordinated management/decision control rules for the recreational sector.

The harvest strategies developed during this period were successful in managing stock sustainability, evidenced by the high level of WA fish stocks not at risk from fishing (average of 95% for the past decade- see DPIRD 2021). The annual management setting processes were, however, often not efficient. With no outcome-based objective for the use of the resource, this limited the setting of clear target performance levels and therefore annual negotiations to determine seasonal management arrangements when above the threshold (including TACs/TAEs/Opening dates, etc.) frequently generated repeated intra and intersectoral disagreements.

ARMA – The management principles contained within *ARMA* that will affect future harvest strategy developments include:

- The primary management units are to be aquatic resources, not fishing activities.
- Each managed aquatic resource requires an Aquatic Resource Management Strategy (ARMS)⁵, which has three main components (Fig. 3):
 - A description of the resource.
 - Setting of a main 'objective', sector allocations and engagement methods.
 - Development of a Harvest strategy to achieve the main objective for the resource.

Significantly, under *ARMA*, harvest strategies for managed resources will no longer be stand-alone, independent documents. Instead, they will now be one component of an overarching management strategy for the delivery of the clear set of outcomes determined by the Minister for the coordinated use of each managed resource (Fig. 3).

⁵ A Ministerial Policy Statement made also be made by the Minister for a non-MAR resource that is consistent with the component elements of an ARMS but without the formal statutory elements. These may be used as an interim step in the development of an ARMS and especially while a fishery/resource continues to operate using a management plan developed under the *FRMA*.

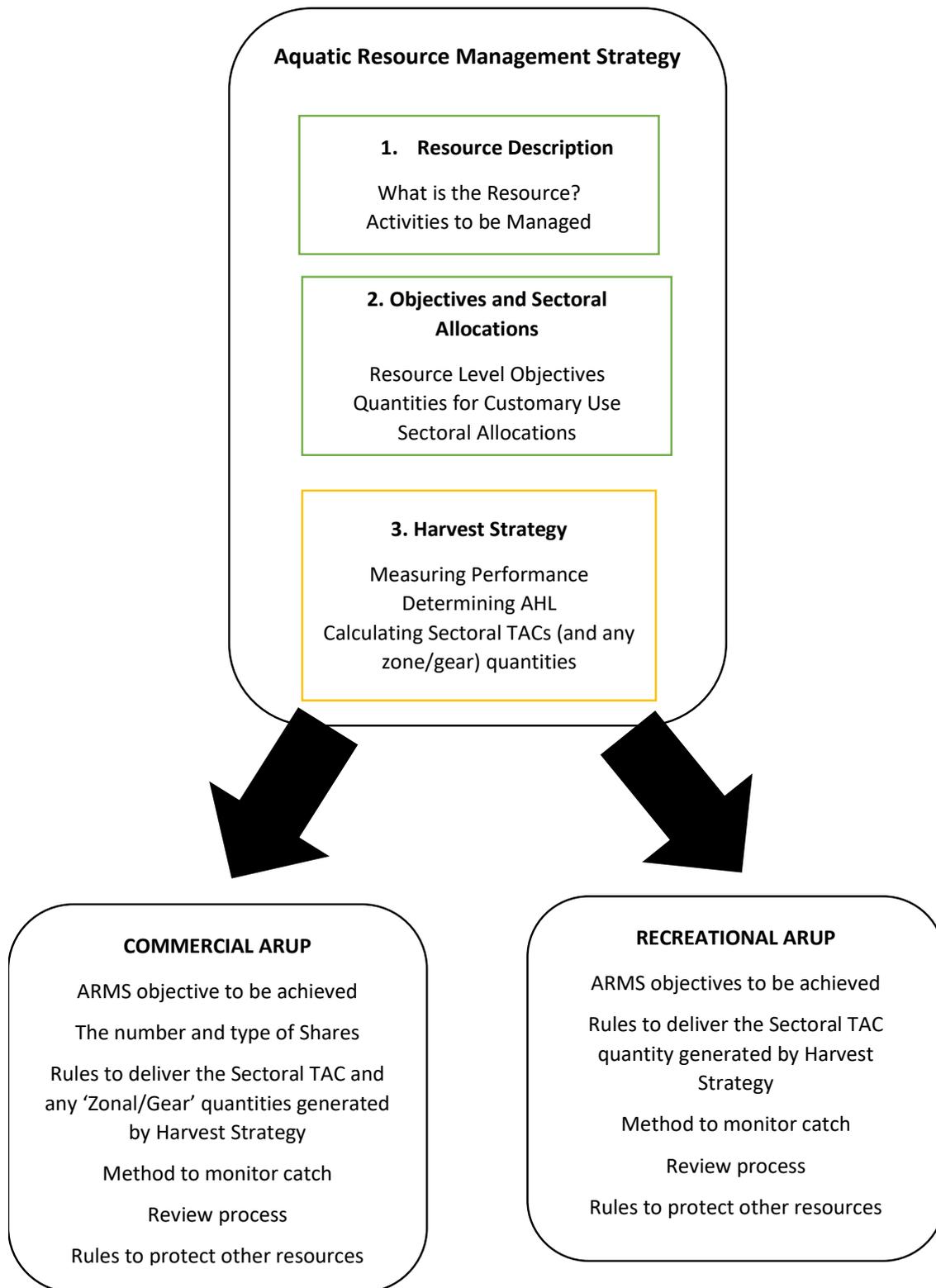


Figure 3. Outline of the three key components required to develop an overarching (resource level) Aquatic Resource Management Strategy (ARMS) and their relationship with the sectoral level, Aquatic Resource Use Plans (ARUPs) designed to deliver the ARMS (or an MPS).

Under ARMA, the harvest strategy specifies the methodology to determine the Allowable Harvest Level (AHL)⁶ for the managed resource for each fishing season that will deliver acceptable risk levels for achieving the main objective.

From this AHL, a Total Allowable Catch (TAC)⁷ is calculated as the (variable) quantity of the resource available each fishing season after the fixed priority quantities allocated for customary fishing and public benefit uses have been accounted for (Fig. 4).

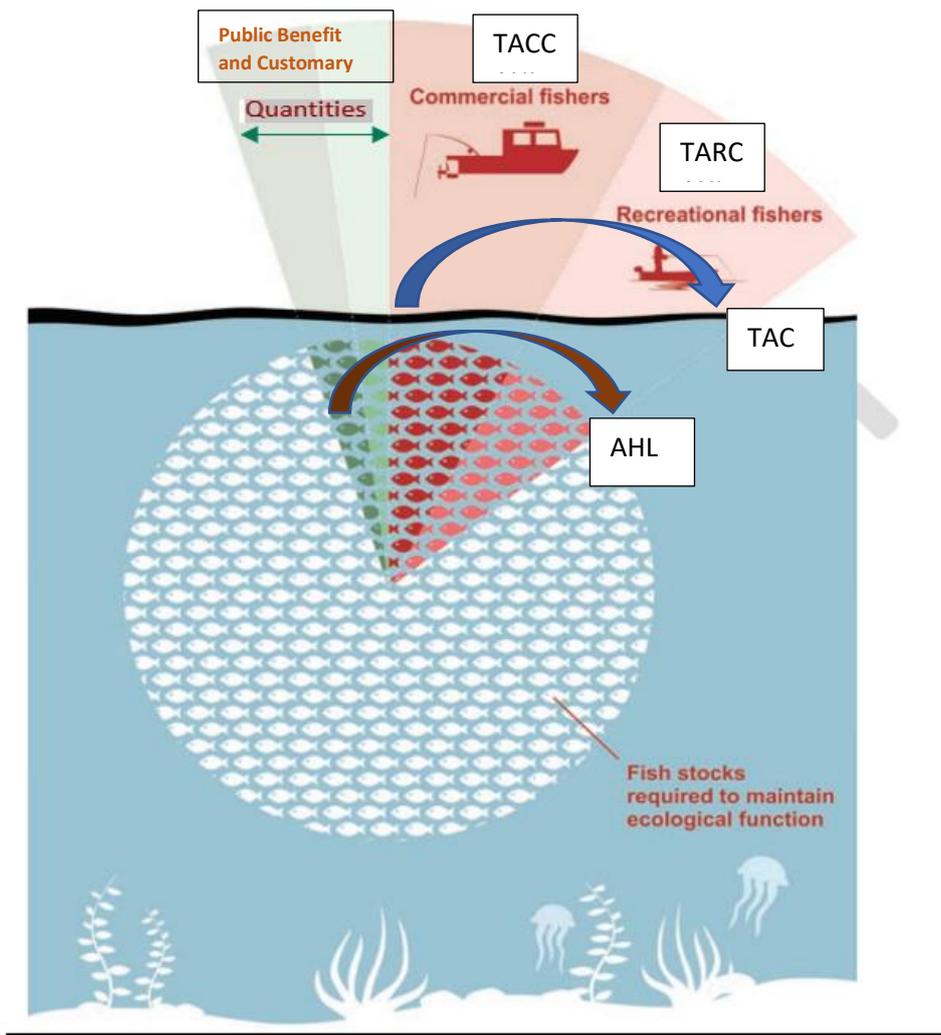


Figure 4. Summary of the relationship hierarchy for the AHL, priority allocation quantities, TAC, TACC (commercial share; including broodstock collection) and TARC (recreational share; including charter catch).

⁶ AHL replaces the term “Sustainable Harvest Level” (SHL) from the previous 2015 HS policy.

More than one AHL may be required for some multi-species and multi-stock resources.

⁷ The TAC is a ‘quantity’ that can be a weight, volume, time spent fishing, type or quantity of gear.

From the TAC, the sectoral catch entitlements for the commercial sector and recreational fishing sector for each fishing period [the Total Allowable Commercial Catch (TACC) and the Total Allowable Recreational Catch (TARC)] are calculated as direct proportions of the TAC using the specified sectoral allocations as defined in second section of the ARMS/MPS (Fig. 4). The TACC can also be divided into different types of resource shares based on management zones or fishing gear, etc.

The set of management arrangements that are developed for each sector to maintain their catch levels to these TACC and TARC levels each fishing season will be contained within the relevant Aquatic Resource Use Plans (ARUPs); or 'fishery management plans'⁸ for those resources operating under an MPS.

Critical Policy Differences for Future Harvest Strategies

Based on ARMA requirements, ARMA-based harvest strategies:

- Are one component of an overarching, comprehensive resource level management strategy that addresses all relevant fishing activities to determine the overall allowable catch levels and sectoral entitlements for each fishing season that will best deliver the 'main objective' (as set by the Minister).
- Are designed to deliver on the overarching strategy that must now include the clear definition of the social and economic outcomes to be generated (as per the main objective) from the sustainable use of the resource plus specify the sectoral allocation proportions that are "fixed for the duration of each strategy⁹."
- Set suitable threshold and limit performance levels to meet ecological sustainability and establish suitable target and other performance levels to achieve the economic and social outcomes outlined by the main objective with default 'minimum' target values that approximate Maximum Economic/Experience Yield (MEY) levels¹⁰.
- In determining sustainability performance levels, have regard for the potential for climate change impacts in line with the Western Australian Climate Policy.

⁸ The use of this term includes both formal commercial fishery management plans as per the FRMA or a set of regulations used to manage the commercial or recreational sector for that resource.

⁹ Second reading speech – 24 February 2015.

[https://www.parliament.wa.gov.au/Hansard/hansard.nsf/0/683d382d1f940a4448257e45003678de/\\$FILE/A39+S1+20150224+p556c-558a.pdf](https://www.parliament.wa.gov.au/Hansard/hansard.nsf/0/683d382d1f940a4448257e45003678de/$FILE/A39+S1+20150224+p556c-558a.pdf)

¹⁰ MEY stock levels are approximately 20% more conservative than those for Maximum Sustainable Yield (MSY) which optimises catch rates, this is also a requirement for MSC certification.

- Outline the monitoring and reporting needed to adequately assess performance for stock sustainability and other ‘main objective’ outcomes.
- Describe the assessment principles and methodology¹¹ plus the associated control rules that will be used to calculate the AHL for each fishing period that best delivers on the main objective.
- Calculate the TAC from the AHL for the current fishing period by removing the ongoing priority quantities (e.g. number, kg, tonnes) specified for customary fishing and public benefit uses.
- Generate the TACC and TARC for each fishing period by applying the proportional sectoral allocations to the TAC.
- Where relevant, divides the TACC among different types of resource shares (e.g. management zones, fishing methods).
- A summary of the processes to generate the catch entitlements for each fishing season is presented in Fig. 5.

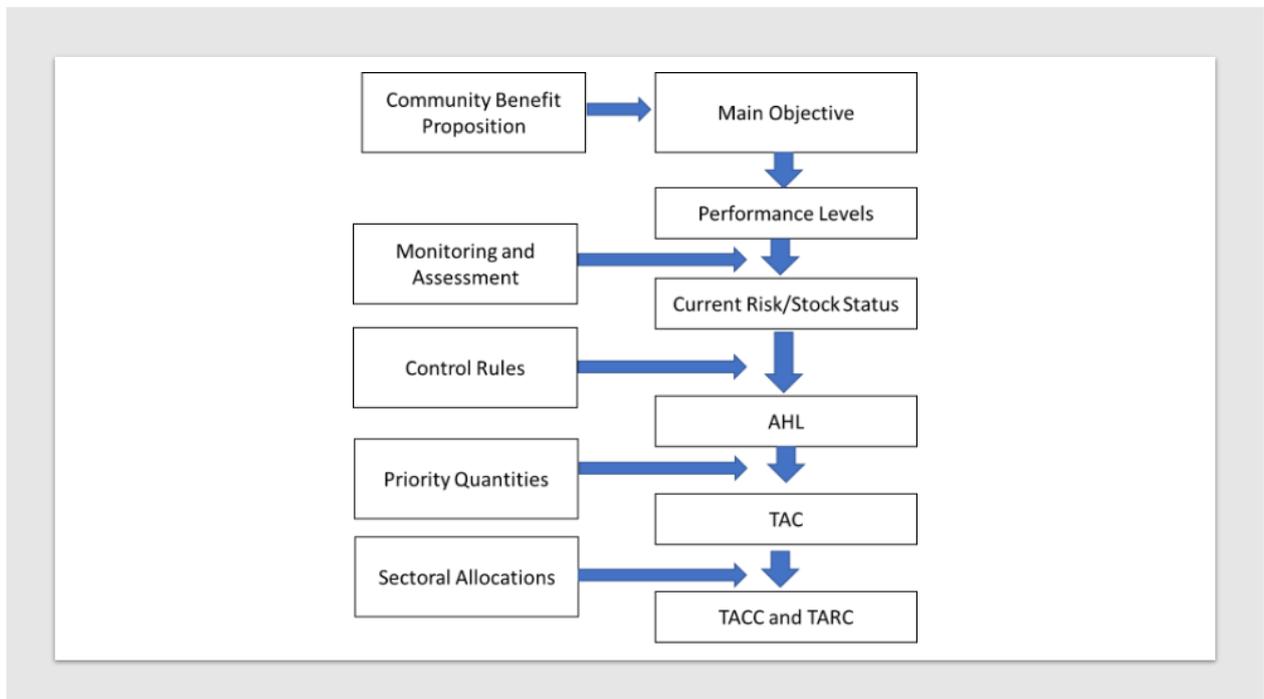


Figure 5. Summary of the processes and inputs used for determining the AHL, TAC and TACCs and TARCs for each fishing period for a resource. Note - the TACC for some resources may also need to be divided into different management zones or classes of shares.

¹¹ Noting that some of the specific data inputs and equations may need to change through time.

Key Outcomes from the Updated Policy

- By defining resources more broadly where stocks/fisheries have clear and significant interlinkages, a more cohesive EBFM outcome can be obtained through a coordinated harvest strategy that ensures all take from each resource is properly considered and appropriately managed.
- Having clear objectives that require target performance levels to be set will deliver improved management efficiencies by enabling development of a more complete set of HCRs and assessment principles to consistently calculate the AHL each season from which the TAC, TARC, TACC (and any subzones/classes) are all directly derived.
- If operating under an ARMS, there is also increased access rights security and flexibility as shares and Catch Entitlement can be transferred independently of one another. The Catch Entitlement for a fishing season can be sold to another authorised fishing operation within the sector as specified in the ARUP (and potentially between sectors¹²) for use during fishing period who then becomes responsible for any fishing infringements, not the shareholder.

Other HSP Considerations

Scope of Issues Covered

Target Species

As every ARMS/MPS will have objectives related to the target species, a harvest strategy to deliver appropriate management of the targeted species, as defined within the description of the managed resource, will be required. The specifics for these strategies will be affected by the complexity of the species within the managed resource.

Single Target Species: When the managed resource is effectively just a single stock (e.g. Western Rock Lobster), the harvest strategy may only need to generate a single AHL (and TAC, etc.) but this must accommodate catches from all sectors and where there are different management zones.

Species Suite: Where a resource includes a suite of 'like' species that cannot realistically be individually targeted, an indicator species approach (see Newman, et al., 2018 and below) that generates a single overall AHL may still be appropriate (e.g. Northern Demersal Scalefish).

¹² This would require Ministerial approval.

Multiple Target Species/Types: Where a managed resource covers multiple target species that can be targeted separately (e.g. abalone) or species types that are captured by different gears and overlapping fleets (e.g. a Shark Bay Invertebrate Resource), the harvest strategy will need to generate separate AHLs and TACs, etc. for the different species categories.

The calculation of these AHLs will need to consider any interactions the different fishing operations may have on the other species categories in order to generate the best overall 'EBFM outcome' for the 'resource'.

Bycatch, Habitat and Ecosystems

For the other ecological risk categories (byproduct, bycatch, protected species, habitat and ecosystems) that may be impacted by the fishing activities accessing a resource, determining whether direct management and therefore a 'harvest strategy' is required will continue to be based on the outcome of formal risk assessments (Fletcher, 2005; 2015).

Consequently, depending upon the composition of the managed resource, fishing sectors, fishing activities and the cumulative risks these generate, one or more additional 'ecological' objectives and their associated harvest control rules may be required within the ARMS/MPS and/or reflected within the relevant sectoral ARUP/Management Plan (e.g. Whale entanglement mitigation).

Priority of resource objectives for use in AHL calculation

In situations where the main objective for a resource has multiple elements and/or there are multiple species categories or fishing sectors that directly impact each other, a clear hierarchy of the relative priority of these elements will need to be established within the harvest strategy.

In general, the priority order for objectives will be to ensure (1) overall ecological sustainability¹³, (2) individual stock sustainability and (based on the main objective) (3-and onwards) the order of priority for any economic or social outcomes based on the priority outcomes to be achieved.

Multispecies fisheries and Species Suites

To efficiently manage the numerous multispecies finfish fisheries managed in WA, where practical, the use of one or more indicator species to monitor the status of the entire suite of species has been adopted (Wise et al., 2007; DoF 2011, Newman et al., 2018). This approach has been used to successfully develop the management arrangements for several multispecies finfish fisheries especially those where the fishing operations and their

¹³ Especially addressing broader ecosystem, habitat and TEPS risks.

management arrangements can only operate at the entire suite level rather than on individual species.

The selection of indicator species is based on choosing the most vulnerable species (both in terms of life history characteristics and catch levels) in the suite. This approach has been applied to the Northern Demersal Scalefish Fishery, the Pilbara Demersal Trawl/trap and Line fisheries, the West Coast Demersal Scalefish Fishery.

A key precautionary feature of this approach is that even if only one of the indicator species has breached the threshold or limit level, then the entire suite of species is deemed to have breached this level. In these circumstances, the appropriate changes to the management arrangements are to adjust the overall levels of effort or total catch of the entire resource which deals with the common situation for these fishing methods (e.g. trawl) not being able to selectively target individual species within the suite.

This is the most efficient and practical method for dealing with these types of fisheries because it reduces the number of detailed assessments needed. Furthermore, the precautionary response of lowering overall effort on the entire suite to reduce fishing mortality on the “at risk stock” also reduces the levels of discard mortalities that frequently occur and affect recoveries where separate quota-based management of each species have been applied.

Straddling and Migratory Stocks

Given WA’s size and geographic location, it has relatively few inter-jurisdictional issues compared to other jurisdictions. Furthermore, the Offshore Constitutional Settlement (DoF, 1996) resulted in the management of all fisheries that target large-scale straddling or migratory stocks (e.g. tuna) being undertaken solely by the Commonwealth, plus there are relatively few of these currently operating off the WA coast.

The Department currently manages one ‘shark’ fishery under a Joint Authority jurisdiction with the Commonwealth. There are only a few species directly managed by WA which are shared with an adjacent jurisdiction (e.g. Australian Herring and west Australian Salmon). In all cases, the aim of any Harvest Strategy is to ensure that the take of a stock by any other fishery or jurisdiction is formally recognised in the setting of appropriate annual catch or effort levels.

Determining Risk Levels

The assessment and management of risks is a critical part of any system designed to achieve fisheries objectives (DoF, 2002; Fletcher et al., 2002; Fletcher, 2005; Fletcher & Bianchi 2014; Fletcher, 2015). The Department has adopted a formal, bioregional level,

risk-based management framework to guide planning of its activities (Fletcher et al., 2010; 2012) based on the international standards for risk management and risk assessment (ISO 31000, 2018; SA HB 89, 2012).

The standard definition of risk “*the impact of uncertainty on achieving objectives*” is used. Similarly, all risk analyses involve determining, based on current or proposed management arrangements (risk controls), what potential consequences could occur associated for each objective and the likelihood that each of these consequence levels will actually occur not just any consequence occurs (SA HB 89, 2012). The higher the likelihood (probability) that a ‘worse’ consequence for an objective will actually occur, the greater is the level of risk (Table 1).

For target species, the risk levels will be determined using the weight of evidence approach that may involve up to five levels of quantitative stock assessment methods (see DPIRD 2021). The assessment of risk for other ecological categories (by-product, by-catch, habitat and ecosystems) and social and economic objectives will use the formal EBFM qualitative risk assessment processes as described in Fletcher (2015).

Table 1. Risk Calculation and Risk Levels that are applied to EBFM assessment of aquatic resources (see Fletcher 2015 for full details).

| | Consequence Level | | | |
|------------------------|-------------------|-----------------|-----------|----------------------|
| Likelihood | Minor 1 | Moderate 2 | Major 3 | Severe 4 |
| Remote < 5% | 1 | 2 | 3 | 4 |
| Unlikely > 5 < 30% | 2 | 4 | 6 | 8 |
| Possible > 30 < 50% | 3 | 6 | 9 | 12 |
| Likely > 50% | 4 | 8 | 12 | 16 |
| Risk Levels | | | | |
| Negligible 1-2 | Low 3-4 | Moderate 6-8 | High 9 | Significant 12-16 |

Precision, Precaution, Uncertainty and Risk

The precision of the indicators and performance levels used in the assessments to develop AHLs and the monitoring of catch shares/objectives should reflect the level of precaution used in the management settings. Where the inherent risks are low, imprecise indicators may be acceptable. Where the inherent risks are high, either more precise indicators or more precautionary performance levels need to be established.

The specific inclusion of uncertainty within the harvest strategy can occur either by setting more precautionary probabilities (i.e. > 50%) of the indicators being above theoretical threshold and limit levels, or by selecting more 'precautionary' limit/threshold levels given the imprecision of indicators. The indicator, performance and probability levels should therefore be developed as a package that recognises their cumulative effects, not independently adding precaution on top of one another that would result in unnecessary management interventions.

Cost effectiveness and Practicality

Consistent with achieving an application of precaution, a final and critical principle of ARMA, is that the harvest strategies and their associated monitoring systems must be cost effective and efficient. In determining the appropriate level of complexity, this must take into account the relative value of the resource versus the relative costs and practicality of collecting the required data and completion of the assessments such that the overall system can be implemented in a robust and ongoing manner relative to the value and inherent risks of the resource.

Application of the Policy

ARMA based policies and MAR framework

While the concepts and processes outlined in this policy have been designed to meet the requirements of harvest strategies to be developed for the Managed Aquatic Resource (MAR) framework provided for under ARMA, they will also be applied for the development of harvest strategies for other resources regardless of the legislative method under which they are managed.

Furthermore, as a harvest strategy is now just one of three key components required for the development of an ARMS or MPS (for non-MAR resources), the updated HS policy should be viewed in conjunction with the ARMA based Resource Allocation Policy (DPIRD, 2022). Together, these form the main policy documents to be used for the development of an ARMS or MPS.

Collectively, these two processes should result in addressing all of the elements required for the development of an ARMS/MPS as outlined in Table 2.

Table 2. Essential elements of the MAR framework listing the references to the relevant Section 16 (Content of ARMS) within ARMA¹⁴

| |
|---|
| <ol style="list-style-type: none">1. Description of the Resource<ul style="list-style-type: none">• Description of Resource (a)• Activities to be managed (d)• Details of fishing period (e) 2. Objectives, Allocations and Engagement<ul style="list-style-type: none">• Objectives to be achieved in managing the Resource (b)• Quantity to be maintained for ecological sustainability (c)• Quantities for customary fishing and public benefit uses (f)• Sectoral allocations (h,i) and resource shares (j)• Consultation 3. Harvest Strategy<ol style="list-style-type: none">3.1 Measuring Performance against objectives (k)<ul style="list-style-type: none">• Resource and Catch performance Indicators• Targets, thresholds and limits• Reference points and tolerance levels• Monitoring procedures 3.2 Determining Allowable Harvest Levels (f,g, j)<ul style="list-style-type: none">• Annual Risk Assessment Methodology• Control rules for Determining Allowable Harvest Level (AHL). 3.3 Calculating Sectoral 'TACs'<ul style="list-style-type: none">• Methodology for calculating 'TAC' (gi)• Sectoral catch entitlements (TACC, TARC – h, i)• Different Zone/Gear share distributions of TACC (gii). |
|---|

¹⁴ As amended 2020.

Specific Elements Required for the Harvest Strategy component of an ARMS or MPS

Consistent with the MAR framework (Fig. 3), the first two components (1. Description of Resource; 2. Objectives, Allocations and Engagement) both need to be completed prior to the development of the harvest strategy component. The policy and processes for completing the first two components are documented within the ARMA-based *Objective Setting and Allocations for Aquatic Resources- Policy, Principles and Processes* (DPIRD, 2022). Once these components are established the following harvest strategy requirements can then be determined.

1. Measuring Performance

- Based on the main objective as specified by the Minister, clarify what is to be achieved for the resource at an operational level by each of the relevant fisheries and sectors (**operational objectives**) including determining the priority among any competing operational objectives.
- Determine cost efficient **performance indicators** that can be used to measure performance against the main objective and (where relevant) any associated operational objectives.
- Based on achieving the main objective, establish appropriate **target, threshold and limit reference points/levels** for each performance indicator.
- Outline the **monitoring procedure and principles** to be used for the collection and analysis of the data needed to measure the performance indicators to determine resource status and performance against each of the reference levels relevant to the main objective.

2. Determination of the Allowable Harvest Level

- Outline the **assessment methodology, principles**¹⁵ that will be used to calculate current risk status in relation to meeting the main objective.
- Specify the **Harvest Control Rules**, that will be used to determine the AHL for the resource for each fishing season based on the current risk status to maintain or return to the target level(s) associated with achieving the main objective within an appropriate timeframe.

¹⁵ While it is recognised that the specific equations and data inputs may need to be adjusted through time, the principles these equations and inputs are designed to achieve must remain consistent for the life of the ARMS/MPS.

- Specify the **Acceptable Catch/Effort Tolerance** for each fishery/sector that will be used to evaluate the effectiveness of their current management arrangements in delivering their respective TACC and TARC levels as required by the Harvest Control Rules and allocation decisions.
3. Calculate 'TAC' and sectoral 'TACC and TARCs' (and any zonal separations)
- **The 'TAC'** for the coming fishing period(s) is calculated from the AHL once the quantities for customary fishing and public benefit uses as specified in the ARMS/MPS have been removed.
 - The **TACC and TARC** are calculated for each fishing period as proportions of the TAC using the specified commercial and recreational sectoral allocations.
 - Where relevant, determine the division of the TACC across the different types of resource shares (e.g. different management zones or gear types) are then determined.

Harvest Strategy Processes and Guidelines

The specific guidelines, processes and timelines that will be used to develop a Harvest Strategy for a managed resource based on the policies presented in this document and the companion *Objective Setting and Allocations for Aquatic Resources under ARMA* (DPIRD, 2022) will be finalised within the companion Harvest Strategy Operational Guidelines.

It is envisaged that much of the detailed set of operational guidelines that were presented in the 2015 HSP will still be relevant but these will still be updated once the HSP is finalised.

Similarly, the process diagrams developed for developing the objective and allocation settings that link to the harvest strategies which are presented in Appendix 1 will be updated to include the detailed set of steps that will be used for the harvest strategy development.

Glossary of Terms

| | |
|---|---|
| Allowable Harvest Level (AHL) | The total quantity of the managed resource available for a fishing season (inclusive of all priority and sectoral allocations) that is consistent with the current risk levels for stock sustainability and other components of the 'main objective' established for the use of this resource. |
| Catch Entitlement (aCE) | The quantity of the resource a share/licence holder is granted to take for a fishing season based on the relative number of shares/units owned and the TACC for the season |
| <i>Aquatic Resources Management Act 2016 (ARMA)</i> | Is a WA Act designed to ensure the ecological sustainability of the State's aquatic resources and aquatic ecosystems for the benefit of present and future generations which are managed, developed and used having regard to the economic, social and other benefits that the aquatic resources may generate. |
| Aquatic Resource Management Strategy (ARMS) | Means a strategy that has been developed and approved by the Minister to deliver on the main objective for a defined resource. |
| Aquatic Resource Use Plan (ARUP) | Means a resource use plan that is designed to deliver the objectives and other requirements of an ARMS |
| Commercial Fishing | Means fishing for a commercial purpose including taking of aquatic organisms for broodstock and other aquaculture purposes |
| Customary Fishing Uses | Means fishing by an Aboriginal person that is (a) in accordance with the Aboriginal customary law and tradition of the area being fished; and (b) for the purpose of satisfying personal, domestic, ceremonial, educational or other non-commercial communal needs; |
| Department of Primary Industries and Regional Development (DPIRD) | The WA government agency responsible for the administration of the ARMA and other related legislation |
| Fish Resources Management Act 1994 (FRMA) | This FRMA was implemented in 1995 to replace the Fisheries Act 1905 designed for the management of fish resources, including the development and management of fisheries and aquaculture and the conservation of fish and other aquatic resources and their habitats, and for related purposes. It covers the management of all fish resources in WA except for pearling which was covered under the Pearling Act (1994) which will be rescinded upon proclamation of ARMA. |

| | |
|---|--|
| Harvest Control Rules (HCR) | The pre-defined specific management actions to maintain target (catch/effort/catch rate) levels and/or avoid breaching thresholds or limits. |
| Harvest Strategy (HS) | Establishes clear and specifically articulated performance levels and the associated set of management actions designed to achieve each of the agreed objectives for the resource and relevant fishery sectors. |
| Integrated Fisheries Management (IFM) | The previous policy used to determine sectoral allocations between the commercial and recreational sectors |
| Limit Reference Level | The level outside of which indicates unacceptable performance for an objective which should generate a significant management response. |
| Main Objective | Defines the specific set of social and/or economic outcomes to be generated from use of the resource as determined by the Minister. |
| Managed Aquatic Resource (MAR) | Means an aquatic resource that has been formally declared under Section 16 of ARMA. |
| Marginal Use | Enables an incidental level of take of a resource by a sector for which a nominal allocation (less than 1%) of the TAC is made. |
| Maximum Economic/Experience Yield (MEY) | The theoretical catch or effort level for a commercial fishery that maximises average net economic returns over a number of years and maximises the experience for recreational fishers. Fishing to MEY will usually result in the equilibrium stock (biomass) of fish being approximately 20% larger than that associated with MSY. |
| Maximum Sustainable Yield (MSY) | The theoretical maximum sustainable average annual catch that can be removed from a stock over an indefinite period under prevailing environmental conditions. |
| Marine Stewardship Council (MSC) | An independent third-party body that has generated a set of standards for sustainable fishing. |
| Ministerial Policy Statement (MPS) | A policy statement made by the Minister for a resource that is consistent with the key component elements of an ARMS but without the formal statutory elements. These may be used as an interim step in the development of an ARMS or while fisheries continue to use the management plans developed under the FRMA. |
| Performance Indicators | A quantitative variable that has been selected to measure the performance of one or more objectives in conjunction with target, threshold and limits levels. |

| | |
|---|--|
| Priority Allocation Quantities | The combined priority quantities assigned for customary fishing and public benefit use each fishing season. |
| Public Benefit Uses | This is the quantity of a resource that is allocated for use in undertaking research to assist with the management of the resource |
| Recreational Fishing | Means non-commercial, non-customary fishing activities including those undertaken on fishing tours |
| Total allowable catch (TAC) | Means the quantity (which can be a weight or volume, time spent fishing, type or quantity of gear used) of a managed aquatic resource that may be taken by the commercial and recreational fishing sectors in a fishing period which is calculated as the AHL minus any priority quantity allocations. |
| Total allowable commercial catch (TACC) | Proportion of the TAC that can be taken by the commercial sector for a fishing season as defined by the commercial allocation in the ARMS/MPS |
| Total allowable recreational catch (TARC) | Proportion of the TAC that can be taken by the recreational sector for a fishing season as defined by the recreational allocation in the ARMS/MPS |
| Risk | <i>“the uncertainty associated with achieving objectives”</i> ISO31000 (2018) which is generally measured by some form of Consequence x Likelihood (AS HB 89, 2012). |
| Target Reference Level | The optimum level (which must be ‘above’ the biological threshold level), range or direction for an indicator(s) to deliver the economic and/or social outcome specified in the main objective. |
| Threshold Reference Level | The boundary for an indicator, outside of which determines when additional management actions begin to be required to avoid breaching the limit level |

References

- ARMA (2016). Aquatic Resources Management Act. Government of Western Australia.
- Bellchambers et al (2016). Adopting Marine Stewardship Council certification of Western Australian fisheries at a jurisdictional level: the benefits and challenges. *Fisheries Research* 183: 809-616.
- Caddy, J.F. and Mahon, R. (1995). Reference points for fisheries management. FAO Fisheries Technical Paper. No. 347. Rome, FAO. 1995. 83p.
- Caputi N, S. de Lestang, J. How, F. Trinnie, W. Fletcher (2018). Ecosystem-based fisheries management (or 'triple bottom line') assessments of the western rock lobster resource: Is there an optimal target for fishing? *Marine Policy* 94: 264–274.
<https://doi.org/10.1016/j.marpol.2018.05.015>.
- CoA (2007a). Commonwealth fisheries harvest strategy policy. Commonwealth Government, Department of Agriculture, Fisheries and Forestry, Canberra, Australia 55pp.
- CoA (2007b). Guidelines for the ecologically sustainable management of fisheries. Commonwealth Government. Department of Environment and Water Resources.
<http://www.environment.gov.au/system/files/resources/97ff9461-5ccf-49cb-9368-8bde5f243c0b/files/guidelines.pdf>.
- CoAG (1992). National strategy for Ecologically Sustainable Development. Council of Australian Governments. <http://www.environment.gov.au/resource/national-strategy-ecologically-sustainable-development>.
- DoF (2000). Protecting and sharing Western Australia's coastal fish resources. The path to integrated management. Fisheries Management Paper, Fisheries Western Australia No. 135 February 2000. 90pp.
- DoF (2002). Policy for the implementation of Ecologically Sustainable Development for Fisheries and Aquaculture within Western Australia. Fisheries Management Paper, Department of Fisheries, Western Australia. No. 157; 70pp.
- DoF (2010). A sea change for aquatic sustainability. Fisheries Occasional Publication, Department of Fisheries, Western Australia. No. 79. 29pp.
- DoF (2011). Resource Assessment Framework (RAF) for Finfish Resources in Western Australia. Fisheries Occasional Publication, Department of Fisheries, Western Australia No. 85 January 2011.

- DoF (2015). Harvest Strategy Policy for the Aquatic Resources of Western Australia. *Fisheries Management Paper No. 271*, Department of Fisheries, Western Australia. 44pp.
- DPIRD (2021). West Coast Demersal Scalefish Resource Harvest Strategy 2021-2025. Fisheries Management Paper No. 305. Department of Primary Industries and Regional Development. State of Western Australia.
- DPIRD (2022). Objective setting and allocations for aquatic resources under ARMA: Policy principles and processes. Aquatic Resource Management Paper No 3. Department of Primary Industries and Regional Development. State of Western Australia.
- FAO (2012). EAF Toolbox Fact Sheet – Qualitative Risk Analysis. http://www.fao.org/fi/website/EAFNETRetrieveAction.do?dom=eaftool&xml=eaf_tool_4.xml&lang=en.
- Fletcher, W.J. (2005). Application of Qualitative Risk Assessment Methodology to Prioritise Issues for Fisheries Management. *ICES Journal of Marine Research* 62: 1576-1587.
- Fletcher, W.J. (2008). Implementing an Ecosystem Approach to Fisheries Management: Lessons learned from applying a practical EAFM framework in Australia and the Pacific. In Bianchi, G. and Skjoldal, H.R. (Eds). 2008. *The Ecosystem Approach to Fisheries*. FAO-CABI Rome pp. 112-124.
- Fletcher, W.J. (2015). Review and refinement of an existing qualitative risk assessment method for application within an ecosystem-based management framework. *ICES Journal of Marine Research* 72: 1043-1056.
- Fletcher, W.J., G. Bianchi (2014). The FAO – EAF toolbox: Making the ecosystem approach accessible to all fisheries. *Ocean and Coastal Management* 90: 20-26.
- Fletcher, W. and Curnow, I. (2002). Processes for the allocation, reallocation and governance of resource access in connection with a framework for the future management of fisheries within Western Australia: A scoping paper developed for consideration and use by the Integrated Fisheries Management Review Committee. Fisheries Management Report, Department of Fisheries, WA. No. 7, 63 pp.
- Fletcher, W.J., Chesson, J., Fisher M., Sainsbury, K.J., Hundloe, T., Smith, A.D.M. and Whitworth, B. (2002). National ESD Reporting Framework for Australian Fisheries: The 'How To' Guide for Wild Capture Fisheries. FRDC Project 2000/145, Canberra, Australia. 120pp.

- Fletcher, W.J., Shaw, J., Metcalf, S.J. and Gaughan, D.J. (2010). An Ecosystem Based Fisheries Management framework: the efficient, regional-level planning tool for management agencies. *Marine Policy* 34: 1226–1238.
- Fletcher, W.J., Gaughan, D.J., Metcalfe, S.J. and Shaw, J. (2012). Using a regional level, risk-based framework to cost effectively implement Ecosystem Based Fisheries Management (EBFM). In: *Global Progress on Ecosystem-Based Fisheries Management*, edited by Gordon H. Kruse, Howard I. Browman, Keven L. Cochrane, Diana Evans, Glen S. Jamieson, Pat A. Livingston, Doug Woodby, and Chang Ik Zhang. pp 129-146 Alaska Sea Grant College Program doi:10.4027/gpebfm.2012.07.
- Fletcher, W.J.; Wise, BS; Hall, N.G; Fisher, E.A.; Harry, AV; Fairclough, DV; Gaughan, DJ; Travaille, K; Molony, BW; Kangas, M. (2016). Refinements to harvest strategies to enable effective implementation of Ecosystem Based Fisheries Management for the multi-sector, multi-species fisheries of Western Australia. *Fisheries Research* 183 (2016) 594–608. <https://doi.org/10.1016/j.fishres.2016.04.014>.
- Garcia, S.M. (1996). The precautionary approach to fisheries and implications for fishery research technology and management: an updated review. *FAO Fisheries Tech Paper* 350/2: 1-76.
- Govt. WA. (2021) Supporting continuous improvement in ESG outcomes for Western Australia. <https://www.wa.gov.au/system/files/2021-12/supporting-continuous-improvement-in-esg-outcomes-for-western-australia-november2021.pdf>.
- Hart, A., Fabris, F. and Caputi, N. (2009). Performance indicators, biological reference points and decision rules for Western Australian abalone fisheries (*Haliotis* sp) (1) Standardised catch per unit effort. *Fisheries Research Report No. 185* 28 pp. Department of Fisheries, WA.
- Hilborn, H. and Walters, C.J. (1992). *Quantitative Fisheries Stock Assessment. Choice, Dynamics and Uncertainty*. Chapman and Hall, New York.
- Hilborn et al., (2020) Effective fisheries management instrumental in improving fish stocks. *PNAS* 117: 2218-2224.
- ISO 31000, 2018. *Risk management – guidelines*. International Organisation of Standards, Geneva. Switzerland 16pp. <https://www.iso.org/iso-31000-risk-management.html>.
- Newman, SJ; Brown, JI; Fairclough, DV; Wise, BS; Bellchambers, LM; Molony, BW; Lenanton RCJ; Jackson, G; Smith, KA; Gaughan, DJ; Fletcher, WJ; McAuley, RB; Wakefield, CB (2018). A risk assessment and prioritisation approach to the selection

of indicator species for the assessment of multi-species, multi-gear, multi-sector fishery resources. *Mar.Pol.* 88: 11-22.

Sloan, S. R., Smith, A.D.M., Gardner, C., Crosthwaite, K., Triantafillos, L., Jeffries, B. and Kimber, N. (2014) National Guidelines to Develop Fishery Harvest Strategies. FRDC Report – Project 2010/061. Fisheries Research Report No. 2010/061. Primary Industries and Regions, South Australia 70pp.

Standards Australia (2012). Risk management – guidelines on risk assessment techniques. HB 89; 92pp. Standards Australia Limited. Sydney, Australia.

Wise, B.S., St John, J. and Lenanton, R.C. (2007). Spatial scales of exploitation among populations of demersal scalefish: implications for management. Part 1: Stock status of the key indicator species for the demersal scalefish fishery in the West Coast Bioregion. Final report to Fisheries Research and Development Corporation on Project No. 2003/052. Fisheries Research Report No. 163, Department of Fisheries, Western Australia, 130p.

Appendix 1 – Current ARMA Process outlines

Streamlined Objective Setting and Allocation Process

Where there are minimal sectoral overlaps associated with the current and future uses of a resource and/or a previous formal (including IFM) decision or new ‘in principle’ agreement on future uses and allocations amongst sectors for a resource are generally agreed, or if the Minister must declare a resource as a MAR for sustainability reasons under S14(3) ARMA, a streamlined process may be applied. This process includes the following set of steps:

Step 1: Minister’s Intention – The Minister indicates an intention to declare a MAR or establish an MPS. This notice of intention will include a description of the resource plus the indicative main objective and allocation settings for the resource for which the Minister may invite comments from stakeholders.

Following receipt of any comments and consideration of advice, the Minister will determine a formal proposed main objective and sectoral allocations for the resource.

Step 2: Formal Public Consultation – The proposed main objective and sectoral allocations must be released (as part of the whole ARMS which must also include all the harvest strategy components) for a statutory two-month public, with the same consultation period being applied for an MPS.

Step 3: Minister’s Final Determination – After consideration of comments from the formal public consultation stage, the Minister finalises the main objective and allocation decisions (plus the harvest strategy components) through the approval and publishing of the ARMS or MPS.

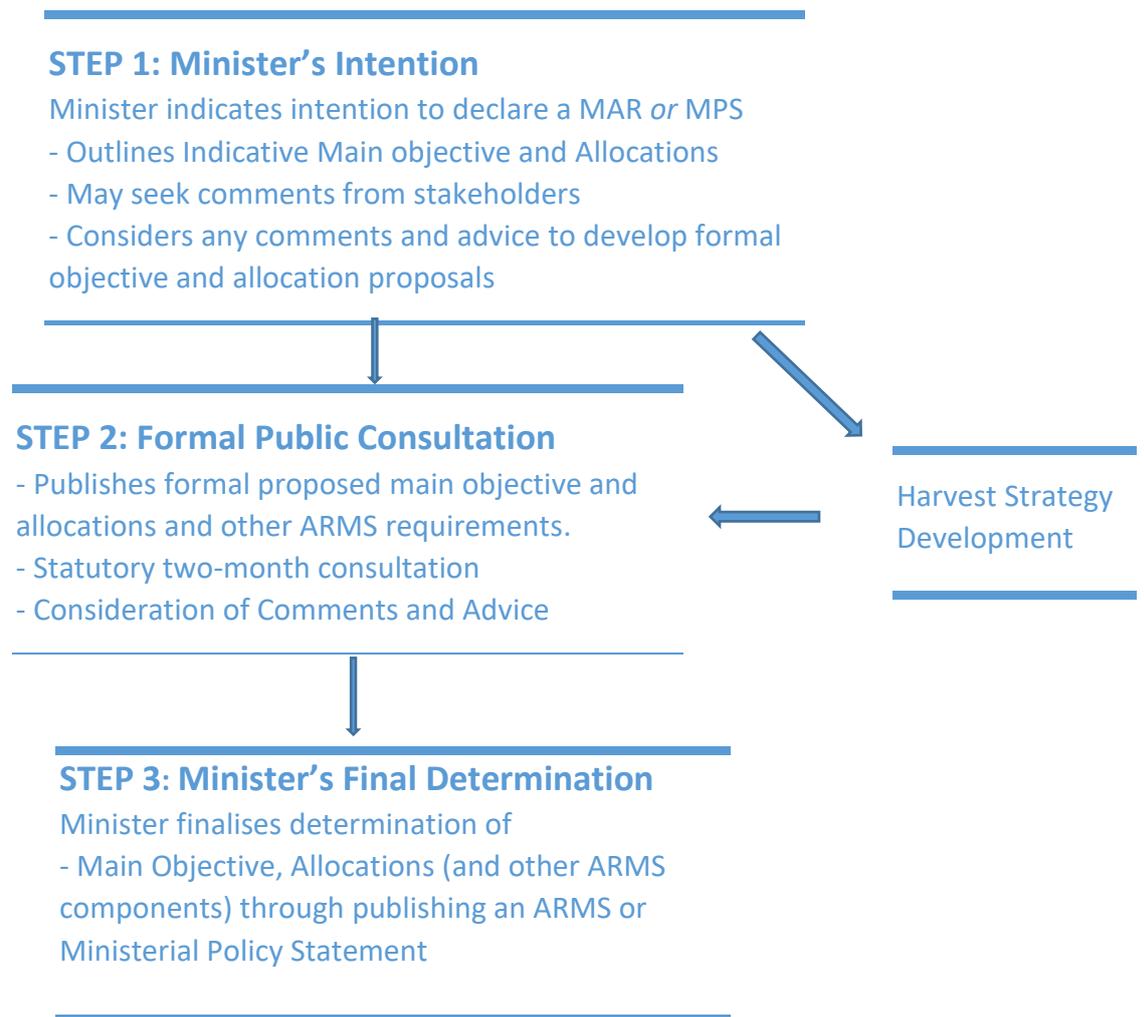


Figure A1. Outline of the three steps involved in completing the Streamlined Objective Setting and Allocation Processes as part of ARMS or MPS. Note: Development of the Harvest Strategy components to achieve the proposed main objective are required to enable formal consultation on a proposed ARMS/MPS.

Comprehensive Objective setting and Allocation Process

Where there is significant sectoral overlap and/or multiple potential future uses for a resource plus no 'in principle' agreement amongst sectors for allocations, a comprehensive process will be needed. This includes:

Step 1: Minister's Intention – The Minister indicates an intention to either (i) declare a MAR; or (ii) establish a formal Ministerial Policy position that includes a main objective and associated sectoral allocations for a non-ARMS fishery/resource. As part of this statement, the Minister may outline a scope for the potential future uses and associated allocations which will be considered for the future management of the resource.

Step 2: Development of a proposed Main Objective – To assist the development of the proposed objective, the Minister may seek further direct input from stakeholders on the community benefits they each ascribe to the resource; and/or appoint an expert panel to advise on the most suitable option(s) for future uses and the main objective that are consistent with any scope outlined in the letter of intent.

Where the Minister decides to establish a panel, this should consist of an independent chair, a representative of each key stakeholder sector and appropriate independent expertise.

Following receipt of any stakeholder comments and consideration of requested advice from the panel, the Minister will advise key stakeholders of the proposed set of future uses and resultant main objective.

Step 3: Development of proposed Sectoral Allocations – Based on the proposed main objective the Minister may (1) invite direct stakeholder comment on an indicative set or range of allocations and/or (2) appoint a panel (preferably the same as Step 2) to advise on the most appropriate set of allocations for achieving the main objective which may not necessarily reflect current catch shares.

Following receipt of comments and consideration of requested advice, the Minister will determine the proposed sectoral allocations for the resource and move to complete the statutory component of the ARMS process.

Step 4: Formal Public Consultation – The proposed main objective and sectoral allocations must be released (as part of the whole ARMS which must also include all the harvest strategy components) for a statutory two-month public consultation period, with the same consultation period being applied for an MPS.

Step 5: Minister's Final Determination – After consideration of comments from the public consultation stage, the Minister finalises the main objective and allocation decisions (plus all other elements of the ARMS/MPS) through approval and publishing of an ARMS or MPS.

STEP 1: Minister Announces Intention

Minister indicates intention to declare a MAR or establish a main objective/allocation decision.

- Provide any scope on future uses and associated allocations
 - Outline how input will be sought
-



STEP 2: Proposed Main Objective

Based on any scope, Minister seeks further input from stakeholders and/or expert panel on potential future uses. Based on comments and advice, Minister proposes a set of future uses and associated proposed main objective.

Independently chaired panel (preferred)



STEP 3: Proposed Sectoral Allocations

Based on Proposed Main Objective Minister

- (1) invites comments on indicative allocations, or
- (2) Appoints a panel to provide advice on allocations to meet main objective
- (3) Considers comments and advice to develop formal objective and allocation proposals

Independently chaired panel (preferred)



STEP 4: Formal Statutory Consultation

Announces proposed main objective and allocations and all other ARMS requirements.

- Statutory two-month consultation
- Consideration of Comments and Advice and develops final determination.

Harvest Strategy Development



STEP 5: Ministers Final Determination

Minister publishes final determination of the Main Objective and Sectoral Allocations through the ARMS or MPS

Figure A2. Outline of the set of 5 steps involved in the comprehensive Objective Setting and Allocation Process as part of ARMS or MPS. Note:- development of the Harvest Strategy components to achieve the proposed main objective are also required to enable formal consultation on a proposed ARMS/MPS.

THIS PAGE IS INTENTIONALLY BLANK