Small Pelagic Fishery Harvest Strategy

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Contents

BACKGROUND

This Small Pelagic Fishery (SPF) Harvest Strategy (HS) reflects obligations under the *Commonwealth Fisheries Harvest Strategy Policy and Guidelines 2007* (HSP).

This SPF HS is similar to harvesting approaches successfully applied in other large fisheries for small pelagic species (e.g. South Australian Sardine Fishery, USA Pacific Sardine Fishery) and has been developed to account for key fishery specific attributes. These are that:

- recent catches are limited by economic constraints and are considered by the SPF Resource Assessment Group (SPFRAG) to be below the maximum sustainable level, and there is potential for sustainable expansion of the fishery
- the schooling behaviour of all SPF species, combined with the main harvesting methods (purse seining and mid water trawling) means that catch per unit effort (CPUE) provides minimal information about stock status
- there is the potential for large, unpredictable inter-annual variations in availability and abundance of small pelagic species
- the HS adopts exploitation rates providing for limit reference point of 20 per cent of unfished biomass and a target reference point of 50 per cent of unfished biomass, which are based on the default CHSP settings of 20 per cent and 48 per cent respectively
- there is potential for localised depletion should a persistent reduction in fish abundance in a limited area, caused by fishing activity, over spatial and temporal scales that causes a negative impact on predatory species and/or other fisheries occur
- small pelagic species are important for both commercial and recreational fisheries
- in considering the ecosystem impacts of harvesting small pelagic species Smith *et al. (*2015) indicates that depleting SPF target species has only minor impacts on other parts of the ecosystem and that the food web in southern and eastern Australia does not appear to be highly dependent on SPF target species
- small pelagic species are caught in high volumes and have low unit value. Additionally, there are high capital costs associated with the large scale catching units and specific processing infrastructure required. As a result, fishing operators need to have heightened efficiency
- there are considerable economies of scale in the fishery and the most efficient way to fish may include large scale factory freezer vessels.

SPF HARVEST STRATEGY

OBJECTIVES

Consistent with the HSP, the objective of the SPF HS is:

The sustainable and profitable utilisation of the Small Pelagic Fishery in perpetuity through the implementation of a harvest strategy that maintains key commercial stocks at ecologically sustainable levels and, within this context, maximises the net economic returns to the Australian community.

SCOPE

This SPF HS applies to each zone of the fishery and is used to develop advice on Recommended Biological Catches (RBCs) and Total Allowable Catches (TACs) for each quota species. RBCs derived from the SPF HS apply to fish stocks throughout their range and to mortality resulting from all types of fishing.

There is also capacity to establish finer scale spatial management within zones on the basis of new information about stock structure or practicalities of stock assessment.

This HS applies to:

- Jack mackerels (*Trachurus declivis*, and *T. murphyi*,)
- Blue mackerel (*Scomber australasicus*)
- Redbait (*Emmelichthys nitidus*)
- Australian sardine (*Sardinops sagax*) in Commonwealth waters adjacent to NSW.

PRINCIPLES FOR RECOMMENDING TACs FROM RBCs

Recommended TAC's are calculated by subtracting significant mortality arising from other sources of fishing mortality from the RBCs. Adjustments for catches taken in other fisheries will be based on a five year average of recorded annual catches.

In the absence of formal catch sharing arrangements for straddling SPF stocks between State and Commonwealth fisheries, commensurate adjustments to catch limits cannot be assured between jurisdictions.

AFMA considers that catch sharing arrangements should be pursued with the relevant States as a matter of priority to provide certainty of access to SPF resources.

ASSESSMENT AND MONITORING

The SPF HS is based on a fishery-independent stock assessment technique, known as the Daily Egg Production Method (DEPM). This technique is recognised nationally and internationally as being an effective and cost-efficient method for estimating the spawning biomass of small pelagic fishes. If alternative techniques are developed for assessing small pelagic stocks, these will be considered by AFMA in the context of the SPF HS. In addition to the DEPM assessment, the SPF HS also involves monitoring of fishery-dependent data such as catch and effort and size/age catch structure information.

Despite the limitations of fishery dependent data for assessment of small pelagic fishes, continued fishery dependent monitoring provides more information over time and has the potential to be indicative of stock stress, recruitment variability or even changes in fishing practices. These data are also collected to provide the potential to incorporate into population dynamics' models.

The DEPM was developed specifically for small pelagic fishes and explicitly recognises the life history of these species (Lasker 1985). The DEPM provides estimates of spawning biomass that are calculated from information on daily egg production and daily fecundity (Lasker 1985). It is important that the DEPM surveys are conducted over a suitable time period to ensure that peak spawning times are sampled. If a DEPM survey does not sample the entire targeted spawning area, the estimate of spawning stock biomass will underestimate the size of the spawning stock. It is also recognised that there is potential for non-spawning fish to occur outside the spawning area which could introduce potential negative biases to the estimated spawning biomass.

In the event that alternative assessment methods are identified and proven to be more cost-effective, the HS may be amended to incorporate decision rules appropriate for those assessments.

An Annual Fishery Assessment is required for the RBC setting processes under Tier 1, Tier 2 and Tier 2b - Atlantis. An Annual Fishery Assessment is a fishery assessment covering the previous financial year (i.e. 1 July to 30 June). Progressive information available from the season to date, if available, may also be considered. The Annual Fishery Assessment must include:

- length-frequency and otolith information from catches for each stock fished. Guidelines have been developed on the quantity of length-frequency data and otolith information required on an ongoing basis
- catch and effort data as well as annual information on the age structure of catch
- spatial and temporal patterns of effort/catch, and
- should aim to determine the likelihood of localised depletion or change in the size/age structure of the catch that cannot be adequately explained by reasons other than a decline in abundance.

To apply Tier 2b – Atlantis, the Atlantis-SPF model must be updated with any available new information from the previous financial year.

SPFRAG will take into account the appropriateness of the spatial and temporal representation of catches and the adequacy of sample sizes. Adequate sampling of catches for size/age data is required for the species/zone to remain at the Tier 1, Tier 2 level.

HARVEST STRATEGY FRAMEWORK

This HS supports the orderly development of the fishery and provides an adaptive management approach for ongoing refinement of the strategy.

A tiered HS framework is appropriate for the SPF because it will accommodate growth of the fishery and the consequent collection of additional information to support stock assessment. Underpinning the tiered approach is the need to balance risk with knowledge by establishing exploitation rates that are initially very conservative and which increase (but remain conservative) as additional information (i.e. quantitative measures of spawning biomass) becomes available. The framework includes four tier levels with different information needs and harvest control rules:

- Tier 1, based on a quantitative stock assessment and an Annual Fishery Assessment, provides the greatest certainty in RBC setting and allows the highest potential harvest rate
- Tier 2 provides a medium level of assessment based on an Annual Fishery Assessment and allows a lower potential harvest rate
- Tier 2(b) – Atlantis provides a lower levels of assessment based on an Annual Fishery Assessment and Atlantis - SPF modelling
- Tier 3 is the lowest level of assessment and applies when the requirements of other Tier levels are not met.

The framework allows the level of investment in research and assessment to be varied to match commercial interest in exploiting the resource. It is understood by SPFRAG that assessment costs are likely to increase as the fishery moves towards a Tier 1 assessment. It is also recognised, however, that an increase in assessment rigour may not necessarily result in a commensurate increase in the RBC. Rather, the RBC will be dictated by the status of the stock.

Tiers apply to individual species within a spatial management unit. The Tiers defined in this HS recognise that:

- the SPF quota species have different biological characteristics and accordingly exploitation rates should be species-specific
- the relevancy of information that individual estimates of spawning biomass provide on current stock status declines over time
- information is needed on the stock status of each spatial management unit
- exploitation rates will reflect levels of knowledge about stock status.

DECISION RULES AND REFERENCE POINTS

This HS adopts exploitation rates providing for the limit reference point of 20 per cent of unfished biomass and a target reference point of 50 per cent of unfished biomass, which are based on the HSP default settings. This follows recommendations that, both singly and in combination, depleting SPF target species has only minor impacts on other parts of the ecosystem and that none of the higher trophic level predators in south east Australia has a high dietary dependence on SPF species (Smith *et al* 2015).

Importantly, the exploitation rates applied are maximum limits only. As prescribed in the decision rules, SPFRAG must consider all available information on the status of the stocks when forming its advice on RBCs.

While maintaining the precautionary approach, evidence of spawning activity or non-spawning adult fish outside the spawning area sampled will be taken into account, using the expert opinion of the SPFRAG, when spawning biomass estimates from the DEPM surveys are used to set RBCs.

TIER 3

Assessment and monitoring

An annual review of catch and effort data must be conducted to inform the level of fishing that should be permitted.

RBC decision rules

The RBC for each stock within each management zone will be recommended by SPFRAG based on available information including biology, historical catch and spatial area of a zone but may not exceed 500t.

TIER 2

Assessment and monitoring

An Annual Fishery Assessment must be undertaken. Noting the developing nature of the fishery, the review may also include consideration of the maximum Tier 2 catch limits based on any additional information.

RBC decision rules

The RBC for each stock within each management zone will be recommended by SPFRAG based on available information including biology, historical catch and spatial area of a zone

but may not exceed the Maximum exploitation rates for Tier 2 assessments, and the length of time that the stock can stay at Tier 2, set out in **Table 1.**

Table 1: Tier 2 maximum RBC exploitation rates

Species	Western Zone	Eastern Zone	Maximum time at Tier 2
Australian sardine	N/A	10%	5 seasons
Blue mackerel	7.5%	7.5%	5 seasons
Jack mackerels	6%	6%	10 seasons
Redbait	5%	5%	10 seasons

TIER 2(b) ATLANTIS

Assessment and monitoring

Tier 2(b) Atlantis may be applied where:

- a stock is not eligible to remain at Tier 2 either because the maximum time at Tier 2 has been exceeded or because a Daily Egg Production Method survey has never been undertaken for the stock
- an Annual Fishery Assessment is undertaken
- the Atlantis-SPF is updated with any available new information.

RBC decision rules

The RBC for each stock within each management zone will be recommended by SPFRAG based on available information including biology, historical catch and spatial area of a zone but may not exceed the Tier 2 maximum exploitation rate applied to the lower bound of the 95 per cent confidence interval range of biomass estimates obtained from Atlantis - SPF.

TIER 1

Assessment and monitoring

Assessments must be based on a spawning biomass estimate derived from a DEPM survey within the last five years and an Annual Fishery Assessment. Adequate sampling of catches for size/age data is required for the species/zone to remain at a Tier 1 level.

The aim of the Annual Fishery Assessment is to provide supporting advice regarding the level of fishing that should be permitted.

RBC decision rules

The RBC for each stock within each management zone will be recommended by SPFRAG based on the DEPM survey and all available information including biology, historical catch

and spatial area of zone. The RBC must not exceed levels resulting from the relevant harvest rate listed in **Table 2** below.

Table 2: Tier 1 maximum exploitation rates

Species	Western Zone	Eastern Zone	Maximum time at Tier 1 without a DEPM
Australian sardine	N/A	20%	5 seasons
Blue mackerel	15%	15%	5 seasons
Jack mackerels	12%	12%	5 seasons
Redbait	10%	10%	5 seasons

A survey is classified as 0 years of age for the first fishing season commencing 1 May following the completion of the survey. It is then classified as age 1 year for the fishing season commencing 1 May the subsequent year. This effectively provides the opportunity for a survey to be used to set the RBC for a period up to 6 years following the survey. The intention of the HS is that the results of a DEPM survey can be applied to set the RBC for 5 fishing seasons and that to remain under a Tier 1 assessment it will be necessary to repeat surveys at a minimum of every 5 years. This aging definition recognises that there is usually a delay in processing the data from surveys and that in most circumstances the results of the survey will not be available to inform RBC setting processes until the survey is age 1 year. In the event that the results of a survey are available to set the RBC before age 1 the age of the survey is to be accelerated by 1 year so that it can be used to set the RBC for no more than 5 seasons.

NOTE: Once the last DEPM survey has been used to recommend the TAC for five years, that stock must be assessed under Tier 2, Tier 2(b) Atlantis or Tier 3 depending on the level of assessment and monitoring conducted for that stock.

To remain at Tier 2 or Tier 2(b) Atlantis, the assessment and monitoring program for that stock/species must remain at the level specified for that Tier.

METARULE

If a member of the SPFRAG or SEMAC considers that following the decision rules would not pursue the objectives of the HSP, SPF HS or other policies or legislation relevant to the fishery (e.g. Bycatch Policy, EPBC Act) then that member/party can request the SPFRAG/SEMAC or AFMA to reconsider the appropriateness of the action prescribed by the decision rules.

Any such request must be made in writing to AFMA and be accompanied by supporting documentation. Upon receipt of such a request, the RAG and subsequently the MAC would consider the request and either of these groups or AFMA may seek further information from the party making the request and/or suitable experts before making a decision.

Following consideration of the request and relevant advice, the AFMA Commission may deviate from the decision rule to increase or decrease catch limits and/or set other such measures as it considers necessary to pursue the relevant management objectives.

EXPLORATORY FISHING AND RESEARCH CATCH

Additional catch allowances over and above the harvest limits prescribed in the Tier rules may be considered to support an exploratory fishing and research program. A research program, agreed to by the RAG and MAC, must be developed as part of a fishing plan detailing the proposed fishing activities, prior to the approval of any increase in catch by AFMA. The following information may be collected as part of the research plan:

- length frequency data from each shot
- aging data from across the defined area (for example 500 otoliths per species)
- gonad condition of sub-sample of fish to determine spawning condition
- ad hoc plankton sampling if fish are in spawning condition
- detailed information of the oceanic conditions (depth/water temp, wind, wave moon etc.)
- samples for a concurrent DEPM assessment (spawning adults).

The research program must also include a report providing an analysis of the data collected. The RAG may provide guidance on the anticipated costs associated with this analysis and report writing.

ACCOUNTING FOR ECOLOGICAL IMPACTS

On the basis of all available information including independent observations of the fishery, the potential ecological effects of the SPF will also be considered by SPFRAG when setting RBCs using the following decision rules.

1. If evidence of significant interactions with threatened, endangered or protected species exists, SPFRAG must recommend one or more of the following:
    - that a program be established to mitigate interactions
    - an appropriate reduction in the RBC
    - that the stock/s be reduced to a lower level Tier (i.e. with a smaller catch).
2. If, as a result of fishing, there is evidence of localised depletion or a concerning trend/change in age/size structure, SPFRAG must recommend one or more of the following:
    - an appropriate reduction in the RBC
    - appropriate spatial or other management measures.
3. If, as a result of fishing in the SPF, there is evidence of changes in ecosystem function (e.g. reduced breeding success of seabirds), SPFRAG must recommend one or more of the following:
    - an appropriate reduction in the RBC
    - appropriate spatial or other management measures
    - that a program be established to:
        - assess the potential impacts of the fishery on the ecosystem

- investigate potential ecological performance indicators for the fishery
- report management performance against those indicators.

REVIEW

The 2015 SPF HS will be reviewed after one year and then at least once every three years. The review should consider:

- whether the SPF HS adequately responds to changes in productivity over time
- the relevancy and appropriateness of exploratory fishing requirements.

REFERENCES

Lasker, R. (1985). An egg production method for estimating spawning biomass of pelagic fish: application to northern anchovy, *Engraulis mordax*. *NOAA Tech. Rep. NMFS*, 36: 1 – 99.

Smith, A., Ward T, Hurtado F, Klaer N, Fulton E, and Punt A. (2015). *Review and update of harvest strategy settings for the Commonwealth Small Pelagic Fishery - Single species and ecosystem considerations*. Hobart. Final Report of FRDC Project No. 2013/028.