

Extended abstract

Australia's Ecological Risk Assessment and Ecological Risk Management framework for fisheries

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Historically, target species were the focus of fisheries management. In the 1990s there was a shift to include non-target species. This shift was reflected in international agreements such as the United Nations Fish Stocks Agreement (UNFSA) (United Nations General Assembly, 1995). It was also reflected in Australian legislation and policy.

In December 2005, the Australian Government Minister for Fisheries, Forestry and Conservation issued a ministerial direction to the Australian Fisheries Management Authority (AFMA) under section 91 of the *Fisheries Administration Act 1991*. The ministerial direction included a requirement for the development of a world's best practice harvest strategy policy for Commonwealth fisheries.

In September 2007, the Australian Government released the 'Commonwealth Fisheries Harvest Strategy Policy and Guidelines'. AFMA has developed harvest strategies consistent with the policy in all major Commonwealth fisheries.

Following a review of the Harvest Strategy Policy and Guidelines, the revised *Commonwealth Fisheries Harvest Strategy Policy and Guidelines for the Implementation of the Commonwealth Fisheries Harvest Strategy Policy* were released on 21 November 2018 (Australian Government Department of Agriculture, 2019).

The shift to better include non-target species in fisheries management has resulted in clear benefits to non-target species. It has also resulted in increased public confidence in fisheries management and the fishing industry, including through third party fishery accreditation, such as the Marine Stewardship Council (MSC). For more information refer to the MSC website www.msc.org. Demonstrably sustainable management has had flow-on benefits to the point of sale, including preferred market access and better prices for accredited product (Rhys Arangio, Austral Fisheries, pers. comm.).

As fisheries management shifted towards ecosystem-based fisheries management, there was a need to undertake broader assessments in a way that was timely, cost effective and utilised existing data. This led to AFMA and the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) developing the Ecological Risk Assessment and Ecological Risk Management (ERA/ERM) framework. The framework is a hierarchical scientific risk assessment, designed to assess and monitor risks posed by Commonwealth fisheries to the ongoing sustainability of the marine environment. The framework, and the research behind it, is outlined in AFMA, 2019a and AFMA, 2019b.

Within the ERA/ERM framework, the marine environment has been divided into the following five ecological units:

- (i) commercial and byproduct species (i.e. anything that is sold)
- (ii) by-catch species (i.e. anything that is not retained for sale)
- (iii) protected species (birds, mammals, reptile and other species protected by environmental law)
- (iv) habitats
- (v) communities.

Species lists were developed for the first three components. The fourth and fifth components, habitats and communities, were broken down into smaller units. Figure 1 is an example of a demersal community and its components in the area of the Heard Island and McDonald Islands (HIMI) Fishery.

The assessment framework considers risks at three levels. Level 1 is a qualitative stage. Level 2 is a semi-quantitative stage. Level 3 is a quantitative stage. Each level of risk assessment is more detailed and requires

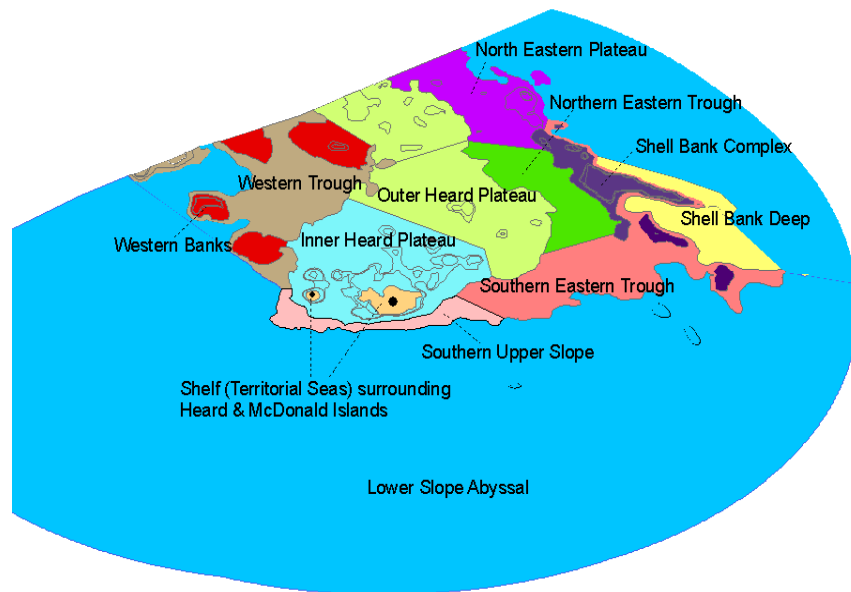


Figure 1: An example of a demersal community in the area of the HIMI Fishery (AFMA, 2019c).

more information. Those species, or units in the case of habitats and communities, that are identified as being at high risk from the fishing activity will move to the next level of assessment, or a management response can be introduced, such as area or temporal closures or mitigation measures. A risk management response could be implemented at any level if this is more cost effective than further assessment.

Higher levels of assessment are only conducted where a lower level assessment indicates it is necessary. If a species or unit is not identified as at high risk, no further action is required within that assessment period.

The Ecological Risk Assessment framework was applied to the HIMI Fishery in 2005 for each of the three methods used in the fishery – demersal longline, demersal trawl and midwater trawl. AFMA conducted a review of the ERA process and a revised ERA framework was applied to the HIMI Fishery in 2016. The following is an overview of the risk assessment framework, with a summary of the 2016 ERA of the HIMI Fishery.

Level 1 assessment

Level 1 qualitative assessment relies on expert judgement, which includes input from scientists and the fishing industry. The most vulnerable species, or unit, within each ecological component is chosen as a ‘worst case scenario’. For that species/unit, an analysis is conducted of the fishing effort and the consequence of the effort. The analysis also includes a confidence rating.

Those species that are scored 3 or above for intensity or consequence are considered at high risk. Subsequently, if the most vulnerable species/unit is scored at high risk, everything in that ecological component is required to be included in a Level 2 assessment, unless planned management interventions remove the risk. Conversely, if the most vulnerable species is not assessed as at risk, neither are the less vulnerable species in that component.

In the HIMI Fishery, target and byproduct species (ecological unit 1) were not considered in detail at Level 1 because comprehensive stock assessments (which are effectively Level 3 assessments) are in place.

For by-catch species (ecological unit 2), skates and rays were chosen as the most vulnerable unit because of their low productivity. The assessment concluded that:

- (i) intensity was moderate as catch is incidental and effort stable
- (ii) consequence on the population was moderate as the level of impact from fishing was detectable
- (iii) confidence was high because of high levels of observer coverage and logbook data.

Although the intensity and consequence were considered moderate, the scoring matrix meant that by-catch was considered to be at low risk from fishing activity.

For protected species (ecological unit 3), black-browed albatross were chosen as the most vulnerable unit because they are regularly seen on the fishing grounds, and their population is thought to have declined by 25%.

The assessment concluded that:

- (i) intensity was minor as there had been only one interaction between black-browed albatross and fishing gear over the 10-year data period
- (ii) consequence of the one interaction was a minor impact on the population
- (iii) confidence was high because of high levels of observer coverage and logbook data.

Again, although the intensity and consequence were considered moderate, the scoring matrix meant that protected species were considered to be at low risk from fishing activity.

Habitats (ecological component 4) had been previously assessed through an Australian Antarctic Division's 2014 project (Welsford et al., 2014). This project undertook a comprehensive assessment of the impacts of demersal fishing gears on benthic habitats at HIMI. The study concluded that overall an estimated 0.7% of the seafloor within the area of the HIMI Fishery has had some level of interaction with bottom fishing gear between 1997 and 2013. The ERA process determined that, given the results of this project, no further assessment under the ERA framework was required.

The assessment of communities (ecological unit 5) identified that the removal of toothfish is likely to have an impact on the food web. Uncertainty about food-web impacts has driven the need for a more detailed Level 2 assessment of ecological communities. This work is one of the challenges ahead.

Although Level 2 and 3 assessments were not required for the HIMI Fishery, with the exception of communities, the following provides an outline of the Level 2 and Level 3 assessment process.

Level 2 assessment

Level 2 within the ERA framework is a semi-quantitative approach which assesses risks posed by the fishery to species or units carried forward from Level 1. Level 2 requires more data than Level 1, but less data than Level 3. Level 2 includes biological data such as age, growth and maturity,

Two different analyses are used at Level 2, depending on availability of data – the Sustainability Analyses for Fishing Effects (SAFE) and the Productivity-Susceptibility Analyses (PSA).

Level 2 SAFE

SAFE has been developed in two forms:

- (i) base SAFE (bSAFE) which is a transparent, relatively rapid and cost-effective process for screening large numbers of species. It demands less data and is simpler to apply than a typical quantitative stock assessment. bSAFE is the preferred Level 2 assessment tool for all fish species and some invertebrates and reptiles with sufficient data
- (ii) enhanced SAFE (eSAFE) which has greater data and resource (both time and money) requirements and it is recommended to further assess species estimated to be at high risk via bSAFE, and where management action has not been taken. eSAFE enhances the bSAFE method by estimating varying fish density across their distribution range as well as species- and gear-specific catch efficiency.

Level 2 PSA

PSA is used for protected species, for which generally less data is available and/or the biological characteristics are often less known. PSA assumes that the risk to a species or unit will depend on two characteristics:

- (i) productivity of the species, which will determine the rate of recovery after potential depletion or damage by fishing
- (ii) susceptibility of the species to the fishing activities or gear.

PSA measures the potential risk of overfishing. Where there are still gaps in data or in the knowledge of that species, the absolute or actual risk cannot yet be quantified.

The scoring process is similar to Level 1. Scores are transferred onto the PSA plot (Figure 2). If a species falls into the red area it is at high risk from the fishing activity and a Level 3 assessment or a management response is required. Often a management response is the preferred action because of the costs and time involved in collecting data and undertaking a Level 3 assessment.

Level 3 assessment

If no management arrangements have been developed to mitigate risk for Level 2 high-risk species/unit, a level 3 assessment must be conducted. Level 3 is a fully quantitative assessment, and is more data rich than Levels 1 and 2. It is effectively a species stock assessment, such as the HIMI Fishery Patagonian toothfish stock assessment, and therefore allows uncertainty to be more precisely quantified.

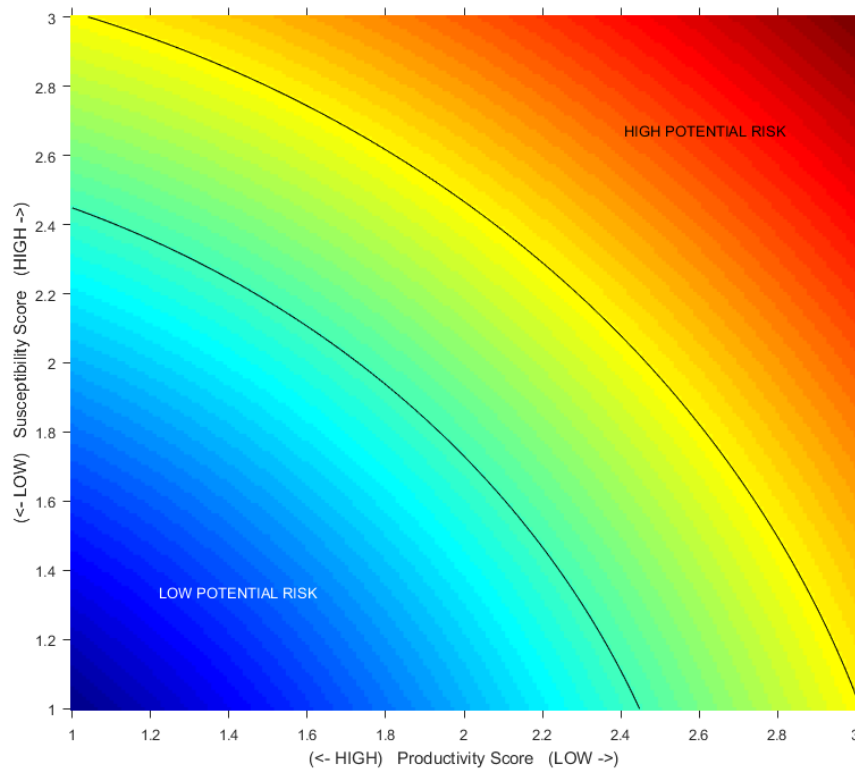


Figure 2: Example of a Productivity-Susceptibility Analyses plot (Alistair Hobday, CSIRO, pers. comm.).

Summary

The ERA for the HIMI Fishery's longline sector, demersal trawl sector and midwater trawl sector resulted in:

- (i) commercial, byproduct, by-catch and protected species requiring no further assessment
- (ii) habitats requiring no further research or management response
- (iii) communities require further assessment at Level 2.

The comprehensive data collected in the HIMI Fishery has underpinned the ERA. A strong working relationship between the scientific support of the Australian Antarctic Division, the AFMA observer program and the commercial fishing industry continues to provide reliable data to support effective management. Australia's fisheries management costs are largely recovered from the fishing industry. Industry has an important role to play in not only providing expert opinion, but also in evaluating the most cost-effective management options.

More information on the AFMA/CSIRO ERA/ERM framework can be found at AFMA's website www.afma.gov.au/sustainability-environment/ecological-risk-management-strategies.

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