

RESOURCE ASSESSMENT FRAMEWORK

DRAFT VERSION 1.5

JANUARY 2005

Background

As part of the process of implementing the good governance aspects of ESD within the Department it is essential to ensure that the resource assessments completed by the Department are being done in an appropriate and consistent manner. This process can be assisted by the development and use of a suitable resource assessment framework for each unit/team to follow. Such a framework should outline what needs to be examined, why it needs to be examined and, most importantly, how it has been examined in the past and how it will be examined in the future.

Given the wide scope and number of assessments that are now being completed as part of the Departments activities, relying on disparate and generally undocumented methods to manage these processes is no longer acceptable. Moreover, the higher current level of staff turnovers requires that any methodologies used, the places where any data and stock assessment programs needed to complete these assessments, all need to be documented to a level that would allow any replacement staff to at least replicate previous assessments and, hopefully, complete new assessments with a minimal level of disruption or delay.

It should also be noted that completing this type of documentation is simply good practice even for situations where there isn't likely to be any staff turnover. Thus, this initiative should be seen as part of an overall best practice planning and management scheme for the Division in particular and the Department as a whole. In particular, it should be seen as part of the overall initiative to have protocols for the storage and maintenance of data. Other related processes include:

- changes to the directory structure on the network to facilitate locating completed assessments/models and the input data used in these assessments.
- the concatenation of databases to generate a single catch and effort database where month-based information for all sectors (commercial, rec, charter) can be located.
- making the database file structure for all biological databases and trip/daily logbooks systems as similar as possible.

Scope

Given the breadth of issues now being covered as the Department moves down the ecosystem-based/integrated fisheries/ESD management path, it is no longer feasible to use only one assessment framework. The renaming of this initiative as a resource assessment framework, rather than just as a stock assessment framework, reflects this shift and expansion of focus. Consequently, the following frameworks have been developed to be consistent with the National ESD framework currently being used to generate reports on each of our fisheries. Many of the headings are the same and, therefore, in some cases only a cut and paste will be required.

This assessment framework goes to a much greater level of detail than is usually provided in the ESD reports and can be likened to the development of the “business plan” for each team. Thus it covers the methodology in much greater detail and, as outlined above, documents the locations and issues associated with all of the information needed, not just the outputs from the assessments. Some of this information is not suitable for public knowledge for security reasons, therefore, only sections of these reports would be made generally available.

Structure

At this stage it is envisaged that at least four separate (but related) assessment frameworks will be needed to cover the types of issues the Department will need to report against in the coming years. These four frameworks will cover:

- (1) Individual species assessments
- (2) Broader ecosystem impacts of individual fisheries (bycatch and habitat impacts)
- (3) Regional Impacts
- (4) Social and economic impacts

Others may be generated if required.

In the current draft only the first framework, for individual species assessment, has been included. It is planned that the second framework will be completed by March. The other frameworks will be developed as they are required.

Summary of Process

The process should be:

1. Determine/Identify Management Objectives (operational ones not high level ones).
2. Given these objectives, determine what the “theoretical” Performance limits should be, and why (and how robust these limits are).
3. Undertake a Risk Assessment for the species/issue being examined (is this a high risk low risk etc species) against the current harvesting regime.
4. Examine current data and available assessment methods that can be used with these data and how well the theoretical performance measure can be translated into the possible indicators, given the data available – assess whether this package is sufficiently robust enough to monitor performance of this stock given the precautionary approach.
 - If it is – continue but possibly refine methods to ensure they are cost efficient

- If it is not – either change the monitoring to ensure that they will be sufficiently robust OR change the management so that the risk is reduced.
5. Review after some time period – the length of which is determined by the risk.

Framework 1 - Individual Species/Stock/Group Assessment

(This covers whole species assessments, assessments of separate stocks or groups of like species).

1. Operational Objective(s)

This should have been developed for ESD report. If not generate an objective using the examples already available for other fisheries as a guide. In doing this determine if the objective is only to maintain some level of abundance for this species (eg spawning biomass) or if there is some other additional/alternative (e.g. economic) objective.

2. Performance Measures

- Theoretical basis and justification

What is the basis for your decision and why? (this must be related to the objectives outlined above),

Thus, what would you measure if you could, what level(s) of this are appropriate/not appropriate and what is the evidence you have used to come to this conclusion.

For example the theoretical limit you could be using for a fish species is that it should be above 40% B_0 even though you can't measure B_0 due to a lack of data. Nonetheless, this concept can still be the basis of your management decisions because it is helping you decide what level of depletion/precaution is appropriate.

You need to explain why you have picked this theoretical limit - is it convention, a definitive study on this or a related species or just a number plucked from thin air? This way, if more information comes in then you can more easily determine if you need to alter your theoretical basis.

- Current operational limit and indicators being used

What are you currently using to measure performance and what value(s)/trends etc. are being used to determine actions (trigger points/limits, targets, etc).

- Acceptable Catch Range, methodology and justification

Outline the current acceptable catch range being used in your SoF reports - what is the basis for this range and why this was chosen. E.g. 80% CLs for the last 10 years as determined from double exponential smoothing.

What is the basis for using such a method and what are the limitations and when should it be re-calculated - e.g. a rolling five-year period, an initial 10-year period that does not alter??

Are there any standard calculations, data set manipulations/omissions that need to be done for this, and if so, where are these routines kept?

3. Risk Assessment/Priority for the Species/Stock

Risk Assessment/Priority for the Species/Stock

The priority for the level of effort that should be undertaken on the assessment of a species /stock should be a combination of the current risk to the stock and the current/likely future value of this species/stock to the community (measured as a combination of the GVP for the commercial sector, participation/use for the recreational sector and also their ecological/social value).

So a high risk but low value species should probably be rated as a higher priority than a Low risk but Moderately valued species. This is now taken into account by doubling the Current Risk to the Stock score. This does not mean we have to do research - adjusting the management may achieve the result of reducing the risk.

A. Risk To Stock

This can be assessed as a combination of the following elements (vulnerability to fishing, current catch/exploitation levels and current management. Use these guidelines to determine the level of vulnerability of the stock.

1. Biology

- *What habitats are they found in?*
- *What is the growth rate, at what age does the species/group reach sexual maturity and what is the maximum age?*
- *What are the estimates of natural mortality?*
- *What is their spawning dynamics including seasonality (short – long), relative fecundity, larval behaviour/dispersal?*
- *Do they form spawning aggregations?*
- *Are there sex changes, sexual dimorphism or territoriality?*
- *What size/age related migrations are there and what is the mixing amongst regions?*
- *What are the main methods of capture and would they be susceptible to hyperstability in catch rates?*

2. Relative Vulnerability to Fishing

- *Does their biology and behaviour make them more or less vulnerable to fishing?*
- *Have there been successful management of this species/group elsewhere?*
- *Have there been crashes and what was the recovery period?*
- *What are the patterns of annual recruitment – relatively consistent among years, moderately variable about a mean, or relatively long periods with little recruitment interspersed with good years every decade or so?*

1. Risk Score - Vulnerability

Low	1	Wide distribution, very short life cycles, very regular recruitment, much of the stock not vulnerable to fishing (king prawns)
Minimal	2	Age ranges of at capture of short to moderate <10 years, reasonably predictable recruitment (Lobsters, herring)
Moderate	3	Capture age range 10 – 30 or shorter lived and highly variable recruitment cycles or susceptible to overfishing (Snapper, pilchards, tiger prawns)
High	4	Long lived species > 30 years (Lutjanids etc), sex change
Extreme	5	Very localised species/stock distribution, low recruitment levels and long lived (abalone, long lived sharks)

Current Exploitation

Catch (and or effort) by sector

Commercial; Recreational; Other

2. Current Risk To Stock (based on current management and information availability)

This score is determined using the standard risk assessment techniques from the National ESD Framework given current management arrangements in place. This requires an assessment of the consequence and likelihood scores.

Table 1 - Consequence categories for the Major Retained/Non-Retained Species (modified from Fletcher et al., 2002)

Level	Ecological (Retained: target/Non-retained: major)
Negligible (0)	Insignificant impacts to populations. Unlikely to be measurable against background variability for this population.
Minor (1)	Possibly detectable, but minimal impact on population size and none on dynamics.
Moderate (2)	Full exploitation rate, but long-term recruitment/dynamics not adversely impacted.
Severe (3)	Stock reduced to levels that are directly affecting future recruitment levels of stocks/or severely affecting their capacity to increase (ie recruitment overfishing).
Major (4)	Stock and recruitment reduced to levels that are likely to cause at least local extinctions or significant species range contraction > 50% (i.e. may require listing of species in an appropriate category of the endangered species list)
Catastrophic (5)	Would definitely be eligible for an endangered IUCN category and extinctions are imminent (i.e. within the period of assessment).

Likelihood Table

The Likelihood Table that was developed also has qualitative criteria that range from 'remote' to 'likely'. Only one of these has been necessary so far (see Table 3)

Table 2 Likelihood Definitions

Level	Descriptor
Likely (6)	It is expected to occur
Occasional (5)	May occur
Possible (4)	Some evidence to suggest this is possible here
Unlikely (3)	Uncommon, but has been known to occur elsewhere
Rare (2)	May occur in exceptional circumstances
Remote (1)	Never heard of, but not impossible

The risk should be assessed at the level appropriate to the relevant reproducing population – or unit stock of the species, not some arbitrary spatially based unit. This qualitative table describes the suite of potential consequences that may occur to a population due to fishing. This extends from virtually no impact to complete extinction. This is the appropriate spread of consequences for this type of interaction.

The average target stock of a fishery will probably have at least a moderate level of consequence – this results from most fisheries having objectives related to fully harvesting species but not overfishing them. For those stocks where there is a chance that recruitment overfishing may occur, a higher consequence level should be chosen (but the likelihood of this actually occurring needs to be determined)

For example, abalone fisheries will often have potential consequence values in the 'severe' to 'major' categories, depending upon the effectiveness of management controls and compliance because they are especially prone to overfishing (but if management is working ok the likelihood of this occurring should not be greater than possible). Species with more robust dynamics, such as prawns, are unlikely to ever get past a 'severe' consequence.

Table 3 Risk Matrix – numbers in cells indicate risk value, the colours/shades indicate risk rankings.

		Consequence					
		Negligible	Minor	Moderate	Severe	Major	Catastrophic
Likelihood		0	1	2	3	4	5
Remote	1	0	1	2	3	4	5
Rare	2	0	2	4	6	8	10
Unlikely	3	0	3	6	9	12	15
Possible	4	0	4	8	12	16	20
Occasional	5	0	5	10	15	20	25
Likely	6	0	6	12	18	24	30

2. Risk Scores - use the previous table to determine combination

Risk Rankings	Risk Values	Risk Score
Negligible	0	1
Low	1-6	2
Moderate	7-12	3
High	13-18	4
Extreme	> 19	5

B . Information needed for current or agreed new Management Arrangements

3. Management Information Needs Score

This is a score of the current information level needed to make the current (or future agreed) management arrangements operate (this is not just the stock assessment part – but the ongoing inputs to allow the management regime to work.)

Information Level Scores

- Minimal 1 No data are used (or will be used) within a season or even between most years to manage activities (i.e. it is not managed directly)
- Minor 2 Little or no data used within a season and only minor levels of data are needed for assessments between seasons (CAES analyses only)
- Moderate 3 Some data may be used within a season but between seasons it is often necessary but not very sophisticated (CAES, Logbooks, some ancillary biological data).
- High 4 Some data are needed within a season and/or high levels are needed between seasons because management can alter greatly depending upon results (eg Logbooks, Age structure data for models).
- Substantial 5 An extremely large amount of data needs to be collected to enable the fishery management regime to operate each year due to real time management needs (eg Shark Bay and Exmouth gulf prawns)

C. Value to Sectors

4. Commercial GVP

GVP Scoring - Use the values from the Resource Assessment Framework (1-5) question 5, Current or likely GVP.

GVP Levels:

- 0 - not relevant no commercial value
- 1 - < \$ 0.5 mill
- 2 - \$0.5 -1 mill
- 3 - \$1-5 million
- 4 \$5-20 million
- 5 > \$20 million

5. Recreational Participation/Importance

What is the relative priority for recreational fishers targeting this stock(s) within the bioregion of the stock, or, at most, the zone of bioregion (not more locally than this).

Recreational Priority:

- 0 - not relevant (ie NOT A RECREATIONAL SPECIES)
- 1 - small incidental take only

- 2 - only a secondary species (eg flathead)
- 3 – highly targeted but only by a few (eg billfish)
- 4 – a popularly caught species but not one of the primary species
- 5 – one of the three- four primary target species for the bioregion/zone (eg snapper, dhufish, tailor, herring)

6. Ecological/cultural significance

Risk Scoring

What is the level of social concern or significance by the wider community for the species being addressed (ie what do non-recreational/non-commercial people think) – this will be of greater interest regarding iconic species and would be mostly used for bycatch issues.

SOCIAL ISSUES:

- 0 - Not Relevant
- 1 -Minimal additional social value
- 2 - Some broader community issues involved
- 3- Identifiable community concerns issues
- 4 - Issue is causing major troubles in region (eg Swan River fish kills)
- 5 - Statewide issue of public concern (e.g. catching dolphins/whales)

7. Customary Use/Significance

What level of customary use or significance does this stock have to indigenous communities of the area?

- 0 Minimal or None
- 1
- 2
- 3
- 4
- 5 High level of use or significance

Examples

Species	Vuln.	Current Exploit. Status	Manag. info needs	GVP	Rec signif.	Cultural	TOTAL
Red Emperor	4	3	4	3	2	2	18
Rankin Cod	4	4	3	3	2	1	17
Spangled	2	3	2	2	3	1	12
Goldband	4	4	4	3	1	1	17
Flagfish	2	2	1	1	2	1	7
Dhufish	3	4	3	2	4	3	19
Snapper	3	3	3	3	5	3	20
Flathead	2	2	1	1	2	1	9
Herring	2	2	1	2	5	1	13
Lobsters	2	3	4	5	4	3	21
Salmon	2	2	2	2	3	1	12
SB Tiger Prawns	3	3	5	5	1	2	19

4. Assessment of the Robustness of the Current/Possible Indicator – Performance limit Package

Is the current indicator/performance measure package suitably robust given the risk/priority of the species and the current management arrangements? This should include any recommendations from the EPBC applications process.

This analysis can conclude that the current system is

- (A) suitable,*
- (B) not robust enough and requires extra work or*
- (C) it could determine that too much is currently being done.*

The extra work outlined in (b) could either be in terms of extra management to reduce the risk to the stock or by extra monitoring and increase the robustness of the assessment.

5. Additional management actions needed

Are any additional management actions required?

6. Current Proposals/ Research Underway

7. Future Monitoring/Research

Outline what will be the monitoring program and over what time line this should be continued before review.

A. Stock Assessment method and frequency

What will be the method(s) used to monitor the stock?

This could involve more than one method and each of which could have different frequencies.

For an example, a full blown stock assessment modelling exercise which calculates current or likely future B_s compared against B_0 may only need to be done routinely every 3 years. In the intervening years the stock may be monitored by an examination of catch rates against set minimum levels (which if breached may trigger an additional modelling exercise).

Outline what and why the scheme has been chosen and what are the inputs to this.

B. Catch and Effort monitoring

Collection Method

What method is to be used –

Commercial - monthly CAES, logbooks, trip CAES, Daily CAES/ QMF etc.??

Recreational - ??

Other

Limitations and Restrictions

What are the known problems with the data:

some fictional examples include:

- the data from 1975 –1985 effort is known to be no good for species x due to market limitations, or*
- don't use blocks 95260 because it is wrong, only use boats F8889 and F456...*
- to calculate CPUE only use the top 10 catch boats .*

If this is documented it means that someone else coming along later (or even the same person at a later date) doesn't have to redo the analyses to find out about the pitfalls or have to guess at what you have been using.

What standardised queries are used?

If standard queries of the database are used to generate annual reports (e.g. SoF, MAC reports etc), where are these located so that others can replicate the generation of these outputs? Largely, this is the formalisation of the above criteria into computer routines/code.

Thus if a standard subset of data are used in analyses, a copy of these should be kept in the appropriate directory so they can be used again if needed.

Data required from other fisheries

Is any information needed from other fisheries to make these analyses work.

Database type, location and manager

Where are the catch and effort data maintained and who is the responsible manager.

C. Biological and other material required

General

Outline the additional data that need to be collected to complete the stock assessment that is identified above?

Sampling methods and frequency required

What methods are needed to collect this information and how often (monthly, yearly, every three years?) does it need to be collected.

What are the protocols needed to get good samples – do you need independent sampling, on board sampling, factory sampling, market sampling, Random, stratified etc.

Note - This is where you would include any statistical analyses that come from the proposed FRDC study on cost effective age composition monitoring.

Database type, location and manager

Where would this data be stored and in what format?

Who is the manager for the data?

D. Model (if applicable)

There are a number of questions that need to be answered to enable other to come along and utilise any models in the future.

Who wrote/modified the model?

What language is it written in and what ancillary programs are needed?

What version is the most current?

Are there any tricks that need to be recorded for others to use the model?

Where is the most Current Version of the Model located?

How often is the model to be updated?

Reviews

What reviews of this assessment have been undertaken?

This could be none, internal only, external via publishing of journal articles or from a full external review that has involved visits by experts.

References

What are the relevant references for this report?

BLANK Species/Stock Assessment Framework

1. Operational Objective(s)

2. Performance Measures

- Theoretical basis and justification
- Current operational limit and indicators being used
- Acceptable Catch Range, methodology and justification

3. Risk Assessment/Priority for the Species/Stock

A. Risk To Stock

1. Biology

2. Relative Vulnerability to Fishing

3. Current Exploitation

Catch by sector

Commercial

Sector 1

Sector 2

Recreational

Other

4. *Conclusions*

B .Current Management Arrangments

C. Value to Sectors

Commercial GVP

Recreational Participation/Importance

Ecological/cultural significance

D. Overall Priority

4. Assessment of the Robustness of the Current/Proposed Indicator – Performance limit Package

5. Additional management actions needed

6. Current Proposals/Research underway

7. Future Monitoring/Research

A. Stock Assessment method and frequency

B. Catch and Effort monitoring

Collection Method

Limitations and Restrictions

What standardised queries are used?

Data required from other fisheries

Database type, location and manager

C. Biological and other material required

General

Sampling methods and frequency required

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