TORRES STRAIT FINFISH WORKING GROUP MEETING 2016.1

12-13 July 2016

TSRA Board Room (Torres Strait House)
Victoria Parade, Thursday Island

MEETING TIME:

Day 1: 9:00am – 5:00pm, Tuesday, 12 July

Day 2: 9:00am – 5:00pm, Wednesday, 13 July

AGENDA

1. **Preliminaries**
   - 1.1. Opening Prayer / Acknowledgement of Traditional Owners / Welcome / Apologies
   - 1.2. Adoption of Agenda
   - 1.3. PZJA requirements of WG members
   - 1.4. Declaration of Interests
   - 1.5. Actions Arising

2. **Fishery Update**
   - 2.1. AFMA management
   - 2.2. TSRA update
   - 2.3. Native Title
   - 2.4. PNG – National Fisheries Authority
   - 2.5. Strategic overview and update (including economic and market trends)

3. **Queensland Inshore Fin fish and Spanish Mackerel Fisheries – overview or management and stock status**

4. **Research**
   - 4.1. Traditional take catch estimates: past estimates (Dr. Busilacchi) and future research (CSIRO).
   - 4.2. Spanish mackerel stock assessment update (Dr Michael O'Neill and Andrew Tobin)
   - 4.3. Smart Phone project (UTAS)
   - 4.4. Research Priorities

5. **Management**
    5.1. Finfish Harvest Strategy
    5.2. Spanish mackerel and coral trout TACs
    5.3. Proposed leasing arrangements for 2016/17
    5.4. Removal of the western closure of the reef line fishery
    5.5. Finfish legislative instrument – consideration of measures
    5.6. Fish receiver System
    5.7. Vessel Monitoring System
    5.8. Future Management Priorities

6. **AFMA Finfish Fishery Budget 2016/17**

7. **Other Business**

Individuals wishing to attend the meeting as an observer can contact the Working Group Executive Officer – Steve Hall (steve.hall@afma.gov.au).

TORRES STRAIT FINFISH WORKING GROUP	Meeting No. 2016.1 12-13 July 2016
PRELIMINARIES Adoption of the Agenda	Agenda Item No. 1.2 For Discussion and advice

RECOMMENDATIONS

That the Working Group consider and adopt the Agenda.

TORRES STRAIT FINFISH WORKING GROUP	Meeting 2016.1 12-13 July 2016
PRELIMINARIES **PZJA Requirements of Working Group Members**	**Agenda Item No. 1.3** **For Noting**

RECOMMENDATIONS

That the Working Group **NOTE** that Protected Zone Joint Authority (PZJA) Consultative Forum members are required to adhere to conditions of membership as described in PZJA Fisheries Management Paper No. 1 (FMP1), upon acceptance of their appointment.

KEY ISSUES

1. FMP1 sets out the PZJA's policy for the operation and administration of PZJA consultative forums.
2. Noting that a number of FFWG members have been newly appointed, it is recommended that the Working Group briefly note the key guidelines for members and the Working Group as a whole.

DISCUSSION

Role of PZJA Consultative Forum Members

3. Consistent with FMP 1, Members are required to act in good faith in the best interests of the PZJA; to act honestly and exercise a reasonable degree of care and diligence in carrying out their duties; and must not use their position, or information obtained as a member, dishonestly or with the intention of gaining an advantage or of causing harm.
4. Members should perform all duties associated with their positions diligently, impartially, conscientiously, in a civil manner and to the best of their ability. In the performance of their duties they should act in such a way that will be held in a high regard by the community and by industry; treat other members and stakeholders with courtesy and sensitivity; and not take, or seek to take, improper advantage of official information gained in the course of their membership.
5. Members are not permitted to discriminate against or harass any colleague, client or member of the public. Discriminatory or harassing behaviour will not be tolerated and may result in the members' appointment being terminated.
6. Whilst members, as members of the community, have the right to make public comment and to enter into public debate on political and social issues, there are some circumstances in which public comment is inappropriate. These circumstances would be where there is an implication that the public comment, although made in a private capacity, is in some way an official comment of a PZJA forum. Public comment includes public speaking engagements, comments on radio and television and expressing views in letters to newspapers or in books, journals or notices or where it might be expected that the publication or circulation of the comment would spread to the community at large.

Role of PZJA Working Groups

7. The role of PZJA Working Groups is to provide advice on particular matters relevant to individual fisheries. The task of a Working Group is to discuss, negotiate and debate issues relevant to individual fisheries. In order to be manageable and cost effective, Working Groups will be no larger than is necessary to ensure the appropriate blend of knowledge and expertise is available to provide the required advice to a Management Advisory Committee and/or other PZJA consultative forums as appropriate.
8. Ordinarily the Working Groups deal with the fishery specific issues, including the specification of management objectives, research priorities for the particular fishery, management issues and strategies, and compliance issues. In addition to these tasks the WGs deal with a range of ad hoc issues. These are reported to a Management Advisory Committee and/or other PZJA consultative forums as appropriate.

TORRES STRAIT FINFISH WORKING GROUP	Meeting 2016.1 12-13 July 2016
PRELIMINARIES **Declarations of interests**	**Agenda Item No. 1.4** **For discussion and advice**

RECOMMENDATIONS

That the Working Group **DISCUSS** and **PROVIDE ADVICE** on members' potential or direct conflicts of interest.

KEY ISSUES

1. Consistent with the Protected Zone Joint Authority (PZJA) Fisheries Management Paper No. 1 (FMP1), which guides the operation and administration of PZJA consultative forums, members are asked to disclose and declare any conflicts of interests.

DISCUSSION

2. FMP1 recognises that members are appointed to provide input based on their knowledge and expertise and as a consequence, may face potential or direct conflicts of interest. Where a member has a material personal interest in a matter being considered, including a direct or indirect financial or economic interest; the interest could conflict with the proper performance of the member's duties. Of greater concern is the specific conflict created where a member is in a position to derive direct benefit from a recommendation if it is implemented.
3. When a member recognises that a real or potential conflict of interest exists, the conflict must be disclosed as soon as possible. Where this relates to an issue on the agenda of a meeting this can normally wait until that meeting, but where the conflict relates to decisions already made, members must be informed immediately. Conflicts of interest should be dealt with at the start of each meeting. If members become aware of a potential conflict of interest during the meeting, they must immediately disclose the conflict of interest.
4. Where it is determined that a direct conflict of interest exists, the forum may allow the member to continue to participate in the discussions relating to the matter but not in any decision making process. They may also determine that, having made their contribution to the discussions, the member should retire from the meeting for the remainder of discussions on that issue. Declarations of interest, and subsequent decisions by the forum, must be recorded accurately in the meeting minutes.

TORRES STRAIT FINFISH WORKING GROUP	Meeting 2016.1 12-13 July 2016
Preliminaries **Actions Arising**	**Agenda Item No. 1.5** **For Noting**

RECOMMENDATIONS

1. That the Working Group **NOTE** the progress of actions arising from the previous meeting held on 20 March 2012; and

2. That the Working Group **NOTE** the draft record of the last Finfish Working Group (meeting number 4, March 2012).

KEY ISSUES

Meeting record

1. The draft meeting record for Finfish Working Group 2012.1 is provided at Attachment 1. This record was not ratified. Due to the time elapsed since the meeting and changes in membership, it is no longer reasonable for the current members to ratify the record.

Actions arising

2. Progress against the actions arising from Working Group meeting 2012.1 is listed in Table 1.

ATTACHMENTS

1. Finfish Working Group meeting 2012.1 Draft Minutes

Table 1: *Progress against cction items from FWG No. 4*

Action Item	Action	Agenda	Agency	Completion Date	Status
1	AFMA to formally invite Ms Sara Busilacchi to present her PhD research findings at the next FWG meeting.	1.4	AFMA	Next FWG meeting	**Completed** Unable to attend. Summary of project outcomes will be discussed under Agenda Item 4.1
2	DEEDI to investigate recreational and charter catch data on target and by-product finfish species	2.1	DEEDI	Next FWG meeting	Verbal update to be provided at the meeting.
3	AFMA to develop a scoping paper on the benefits of monitoring catch for the next FWG.	2.1	TSRA and AFMA	Next FWG meeting	**Defer** Research is being undertaken to estimate traditional catches (Agenda Item 4.1). This project will raise awareness on the benefits of monitoring. The development of a harvest strategy will assist in understanding the link between information and available catch (Agenda Item 5.1)
5	Maps representing the Torres Strait Mackerel fishery that include the PNG jurisdiction should include the outside but near area adjacent to the	2.2	AFMA	Ongoing	**Completed** ABARES advised for future

	PNG coast.				*Fisheries Status Reports*.
6	IFAC members and TSRA to consult with communities, regarding views on removing the closure of the Reef line fishery in Western Torres Strait.	4.3	TSRA	Next FWG meeting	**Ongoing** To be discussed under Agenda Item 5.4
7	AFMA to continue to pursue recruitment of the vacant FWG non-traditional inhabitant industry member.	6.1	AFMA and TSRA	Next FWG meeting	**Completed** Note, this is now a permanent observer position currently held by Mr Tony Vass.

Australian Government
Australian Fisheries Management Authority

TORRES STRAIT FINFISH WORKING GROUP

MEETING 2012.1

MINUTES

20 MARCH 2012
AFMA OFFICE, THURSDAY ISLAND

CHAIR: MS MARY LACK

These are **DRAFT** minutes for consideration by the Torres Strait Finfish Working Group (FFWG). These minutes should not be considered as final until they are ratified at the next meeting of the FFWG.

Australian Government | Queensland Government | Torres Strait PZJA Protected Zone Joint Authority

AGENDA

1. Meeting Administration

1.1 Welcome Prayer and Apologies
1.2 Declarations of Interest
1.3 Review and Adoption of Agenda
1.4 Action items from Previous FFWG
1.5 Acceptance of Minutes from Previous FFWG meeting

2. Draft Finfish Management Plan

2.1 Provisions for Monitoring Take of By-product Species
2.2 Public Comments
2.3 Timeline for Implementation

3. Strategic Assessment Report and Wildlife Trade Operation (WTO)

3.1 Public Comment Period

4. Current Fishery Status

4.1 Catch Update
4.2 2011 Leasing Update
4.3 Opening of the Western Closure of the Fishery
4.4 Fisheries Management Instrument No.8

5. Torres Strait Compliance Update

5.1 Season Update

6. Other Business

6.1 Finfish Working Group Membership

Name	**Representative Organisation**	**Declaration of Interest**
Ms Mary Lack	Chair	Consultant
Dr Annabel Jones	AFMA	Manager, Thursday Island
Ms Melissa Brown*	AFMA	Senior Manager, Northern Fisheries
Mr Brendan Rayner	AFMA	Senior Fisheries Officer
Mr Steve Hall	TSRA	Fisheries Policy Officer
Mr Neville Nakata	TSRA	Fisheries Coordinator
Dr Ian Jacobsen	DEEDI	Senior Fisheries Management Officer
Mr Lyndon Peddell	QB&FP	Manager, Torres Strait

Mr Tony Vass	QSIA Industry	Quota Users Rep
Mr Dimas Toby	IFAC	
Mr Daniel Takai	IFAC	Commercial Buyer
Mr Gavin Mosby	IFAC	TIB Fisher, Director of Yorke Fisher Corporation
Mr Kiwat Lui	IFAC	
Mr Ned Larry	IFAC	

*Attendance via video conferencing

Observers:

Name	**Role**
Ms Lisa Cocking	Senior Fisheries Officer (AFMA – Canberra)
Mr Matthew Flood	ABARES/DAFF (Canberra)

Apologies:

Name	**Role**
Mr Shane Fava	Manager, Fisheries, TSRA
Mr Ralph Pearson-Bann	IFAC
Mr Cyril Gabey	IFAC
Mr Kenny Bedford	Fisheries Portfolio member (TSRA)

DECISION RECORD

1.4.1: The Finfish Working Group (FFWG) agreed to recommend to the TSFMAC that any further TPC-C licences to be issued by TSRA as Sunset licences have Reef Line and Mackerel fishery entries to allow for development of these fisheries by Traditional Inhabitants.

1.5.1: The FFWG agreed to accept the minutes from the previous FFWG meeting (31 March 2010) as a true and accurate record of the meeting.

2.2.1 The FFWG agreed to recommend the draft Torres Strait Finfish Fishery Management Plan 2012 with no amendments to the Torres Strait Fisheries Management Advisory Committee (TSFMAC).

6.1.1: The FFWG agreed to recommend to the TSFMAC that:

a) all CFG positions be replaced by IFAC members and the TSRA Fisheries Portfolio Member and not be assigned to individual members;
b) the QSIA membership on the FFWG be abolished; and
c) all other members be reinstated for a further three years.

ACTION ITEMS

Action Item	Action	Agenda	Agency	Completion Date
1	AFMA to formally invite Ms Sara Busilacchi to present her PhD research findings at the next FFWG meeting.	1.4	AFMA	Next FFWG meeting
2	DEEDI to investigate recreational and charter catch data on target and by-product finfish species	2.1	DEEDI	Next FFWG meeting
3	AFMA to develop a scoping paper on the benefits of monitoring catch for the next FFWG.	2.1	IFAC, TSRA and AFMA	Next FFWG meeting
5	Maps representing the Torres Strait Mackerel fishery that include the PNG jurisdiction should include the outside but near area adjacent to the PNG coast.	2.2	AFMA	Ongoing
6	IFAC members and TSRA to consult with communities, regarding views on removing the closure of the Reef line fishery in Western Torres Strait.	4.3	IFAC, TSRA	Next FFWG meeting
7	AFMA to continue to pursue recruitment of the vacant FFWG non-traditional inhabitant industry member.	6.1	AFMA and TSRA	Next FFWG meeting

Agenda Item 1.3 Agenda

The agenda was adopted as above.

Agenda Item 1.4 Action Items from Previous FFWG

The FFWG **NOTED** the status of the action items from the previous FFWH meeting. Action items were complete with the following comments noted:

Action Item 1: An invitation had not been extended to Ms Sara Busilacchi to present her PhD findings at this FFWG meeting so as to allow members to focus on considering the draft Plan. However, the action item will be carried over and the findings still have relevance to the Finfish fishery.

Action Item 2: The action item to discuss options for Processor Carrier Licences (TPC)-C license issued for the Finfish fishery had been partly addressed through the recent announcement of the TRL buyout. This included issuing two TPC-C licences to TSRA to lease out. The FFWG noted that it was not clear from the announcement if these TPC-C licences would only be for the Lobster fishery The FFWG strongly felt that it was essential that any TPC-C licences also old Finfish fishery entries to allow them to buy finfish product.

1.4.1: The Finfish Working Group (FFWG) **AGREED** to recommend to the TSFMAC that any further TPC-C licences to be issued by TSRA as Sunset licences have Reef Line and Mackerel fishery entries to allow for development of these fisheries by Traditional Inhabitants.

Action Item 3: Addressed at Agenda item 4.1

Action Item 4: Addressed under Agenda item 6.1.

1.5 Acceptance of Minutes from Previous FFWG meeting

1.5.1: The FFWG **AGREED** to accept the minutes from the previous FFWG meeting (31 March 2010) as a true and accurate record of the meeting.

Agenda Item 2.1 Provisions for Monitoring take of by-product Species

The FFWG noted that there had been concerns raised by communities that non-Islander fishers harvested by-product species such as Barramundi cod and Red Emperor under their Reef line entry. Concerns related to the sustainable management of these species are that they are not species subject to quota under lease arrangements and, therefore, harvest was not limited.

Catch records for the last two years (provided at Agenda item 4.1) indicate that the catch of Barramundi cod and Red emperor have been very low in recent years and at the current levels of effort in the fishery it is considered unlikely that these harvest levels would rise significantly. It was noted that while a TAC has not been recommended for these species, it is not likely that the current levels of harvest are unsustainable.

Mr Vass noted that while concerns for sustainability of by-product species was valid, non-Islander fishers encountered these species infrequently and it would not be financially viable for them to specifically target these species.

The group questioned whether catch information from the recreational and charter fishing was available to consider in the total harvest of reef line species (including by-catch species). Dr Jacobsen stated that charter operations were required to report on catch from this sector and would be available, however, recreational catch records are less accessible as there is no mandatory reporting for this sector. Some information may be available through the recreational fishing surveys previously conducted by DEEDI, noting that these surveys are Queensland wide and may have limited information for the Torres Strait area.

Dr Jones highlighted that under the Finfish Fishery Management Plan objectives, there are obligations to monitor catch and effort of by-catch species. These obligations would be developed further following the Plan's implementation to include identification of reference points and actions that would follow a reference point being reached.

The FFWG **NOTED** the objectives in the Finfish Fishery Management Plan and the role that these will play in managing the sustainable harvest of by-catch species in the Torres Strait Finfish fishery.

Action Item 2: DEEDI to investigate recreational and charter catch data on target and by-product finfish species.

Dr Jacobsen noted that in order to accurately measure the take of by-product species in the fishery, mandatory reporting for TIB fishermen must be implemented. Mr Hall explained that the need for reporting was not widely understood by communities and therefore further consultation was needed. Dr Jones advised that AFMA could develop a paper on the benefits of catch monitoring to improve this knowledge for communities.

Action Item 3: AFMA to develop a scoping paper on the benefits of monitoring catch for the next FFWG.

Agenda Item 2.2 Torres Strait Finfish Fishery Management Plan - Public Comments

The FFWG noted that two comments had been received by AFMA during the public comment period for the draft Torres Strait Finfish Fishery Management Plan 2012. One of the comments highlighted the need for consultation prior to a decision being made under the provisions in the Plan. AFMA tabled all provisions under the Plan that requires the PZJA to undertake consultation prior to a decision being made under the Plan. The FFWG noted the comments and agreed with the AFMA view that the current provisions in the Plan addressed the comments. The FFWG then agreed to endorse the draft Finfish Fishery Management Plan 2012 and recommend the Plan to the TSFMAC with no amendments.

2.2.1 The FFWG **AGREED** to recommend the draft Torres Strait Finfish Fishery Management Plan 2012 with no amendments to the TSFMAC.

Mr Vass questioned the area of the Mackerel fishery included in the Plan in that it did not include the outside but near area north of the Protected Zone northern boundary. Dr Jones explained that the area of the fishery included in the Plan is limited to that in the Australian jurisdiction as it is Australian legislation. The area Mr Vass refers to is in PNG waters and can not be included in the area covered by this Plan of management. Maps of the Mackerel fishery that include the PNG jurisdiction, do however, include the outside but near area near PNG.

Action Item 5: Maps representing the Torres Strait Mackerel fishery that include the PNG jurisdiction should include the outside but near area adjacent to the PNG coast.

Agenda Item 2.3 Timeline for Implementation of the Management Plan

The proposed timeline for implementation of the Torres Strait Finfish Fishery Management Plan was noted by the Group noting that circumstances such as government elections could delay implementation of the Plan. The FFWG **NOTED** the proposed timeline for implementation of the Finfish Fishery Management Plan 2012 and that external circumstances could cause delays.

Agenda Item 3.1 Strategic Assessment Report and Wildlife Trade Operation Public Comment Period

A Strategic Assessment Report for the Finfish Fishery has been developed by AFMA for the fishery managed under the proposed draft management plan as required under the EPBC Act. This Act requires all Commonwealth managed fisheries to undergo strategic assessment and assessment for export approval.. The report had been released by the Department of Sustainability, Environment, Water, Population and Communities for public comment period until 26 March 2012. The FFWG **NOTED** the progression of the Strategic Assessment Report and the Wildlife Trade Operation for the Torres Strait Finfish Fishery under the EPBC Act.

Agenda Item 4.1 Catch Update

The FFWG **NOTED** the update on the 2010 and 2011 finfish catch in calendar and financial years.

2010 Catch

	Islander Catch (Kg)	Non-Islander Catch (Kg)	TOTAL (Kg)
Coral Trout	4920	31275	36195
Barramundi Cod	254	672	926
Red Emperor	67	260	327
Mixed Reef*	460	1709	2169
Spanish Mackerel	10902	76680	87582

2011 Catch

	Islander Catch (Kg)	Non-Islander Catch (Kg)	TOTAL (Kg)
Coral Trout	460	31111	31571
Barramundi Cod	0	816	816
Red Emperor	0	314	314
Mixed Reef*	0	969	969
Spanish Mackerel	0	76552	76552

* Mixed reef includes all other reef species not listed here.

2009-10 Catch

	Islander Catch (Kg)	Non-Islander Catch (Kg)	TOTAL (Kg)
Coral Trout	5064	10538	15602
Spanish Mackerel	3782	70280	74062

2010-11 Catch

	Islander Catch (Kg)	Non-Islander Catch (Kg)	TOTAL (Kg)
Coral Trout	2058	40353	42411
Spanish Mackerel	7148	76720	83868

The FFWG noted the low TIB catch in 2011 was most likely due to the lack of fish buyers following the closure of freezer operations on eastern islands, reducing the opportunity for fishers to sell their catch locally. The FFWG identified that a peak catch of Spanish mackerel and Coral trout in 2010 was a result of a TPC-C boat based at Masig Island. The identified higher catch in this year highlights the impact availability of local fish buyers has on effort levels in the Traditional Inhabitants sector. Mr Mosby agreed that the lack of essential infrastructure at communities, such as freezers, was limiting Traditional Inhabitant fisher capacity to fish commercially.

DEEDI stated that current PZJA policy prohibits issuing of new licences (including TPC licences) to non-Traditional Inhabitants, noting that the recent announcement of the buyout in the Tropical Rock Lobster fishery included issuing of two TPC-C licences. The FFWG referred to the previous recommendation made at Agenda Item 1.4 regarding TPC-C licences being issued with Reef Line and Mackerel entries (1.4.4), noting that this could improve the difficulties currently experienced by Traditional Inhabitant fishers in being able to access local fish buyers.

Agenda Item 4.2 Finfish Leasing Arrangements

TSRA provided an update on current leasing arrangements in the Finfish fishery through leasing of Sunset licences. The Finfish Quota Forum have agreed to provide leases of Sunset licences for up to 5 years, with the leasing price reviewed annually to reflect changing market prices.

In 2011-12 there are seven operators leasing sunset licences with either Reef Line or Mackerel entries. 98 tonne of Spanish mackerel and 80.5 tonne of Coral trout has been leased out with these seven licences.

The Finfish Quota Trust account holding funds derived from leasing has approx. $550,000. These funds are currently being distributed to successful applicants who applied for funding. The allocated funds are being used for infrastructure development, freezer maintenance and fisher capacity with boats and fishing equipment. A further funding round is to be announced shortly.

Agenda Item 4.3 Opening of the Western Closure of the Reef Line Fishery

TSRA indicated that there was current community interest in removing the closure west of longitude 142°31’49” in the Reef line fishery. The closure is believed to reflect a historical jurisdictional boundary that was rolled over into the Finfish Fishery management arrangements when the fishery came under a single jurisdiction under the PZJA. AFMA confirmed that the closure only related to the Reef Line fishery and not to the mackerel fishery and this information should be provided through IFAC members to the communities. The FFWG felt that consultation with communities would be necessary before any amendments to the current closure of western Torres Strait to the Reef line fishery were considered.

Action Item 6: IFAC members and TSRA to consult with communities, regarding views on removing the closure of the Reef line fishery in Western Torres Strait.

Agenda Item 4.4 Fisheries Management Instrument No.8

The FFWG noted the recent implementation of Fisheries Management Instrument No.8, introducing previous recommendations of the FFWG and the TSFMAC, including the following provisions:

- the inclusion of net size restrictions for traditional fishing with a maximum of 10cm mesh size, 2.5m drop and 100m total length; and
- the introduction of the new maximum legal size limit for the leopard/square tail Coral trout (*Plectropomus areolatus*) of 62cm.
- and removing the restrictions on live finfish retention.

Agenda Item 5.1 Torres Strait Compliance Update

Mr Peddell, QB&FP, presented a compliance report for the Torres Strait. The FFWG raised the following points:

- That the current compliance regime of one officer to cover the entire Torres Strait was insufficient, particular with QB&FP policy requiring more than one officer to conduct a range of operations;
- Members felt more funds should be available for fisheries compliance in Torres Strait. DEEDI representatives stated that the compliance budget was allocated based on risk analysis and any additional enforcement capability would require additional budget that would have to be sought from non-government sources, such as licence fees. Hence, an increased compliance budget would most likely result in increased licence fees.
- The Chair noted that the concerns of the FFWG regarding compliance and that the issue was broader than the Finfish Fishery, and suggested the issue be raised at the TSFMAC.

Agenda Item 6.1 Finfish Working Group Membership

Dr Jones noted that the FFWG membership terms had lapsed on 30 June 2011and that the CFG positions had now been replaced by the IFAC members. Ms Cocking suggested that it may not be necessary to assign individual IFAC members as the Indigenous fisher representatives to the FFWG.

Mr Vass suggested the removing the Queensland Seafood Industry Association position as there is no longer non-traditional inhabitant licence holders in the Finfish fishery, and hence QSIA were no longer representative in this forum.

6.1.1 The FFWG **AGREED** to recommend to the TSFMAC that:

a) all CFG positions be replaced by IFAC members and the TSRA Fisheries Portfolio Member and not be assigned to individual members;
b) the QSIA membership on the FFWG be abolished; and

c) all other members be reinstated for a further three years.

Action Item 7: AFMA to continue to pursue recruitment of the vacant FFWG non-traditional inhabitant industry member.

Next Meeting

TBC.

TORRES STRAIT FINFISH WORKING GROUP	**Meeting 2016.1** **12-13 July 2016**
FISHERY UPDATE **AFMA Management**	**Agenda Item No. 2.1** **For noting**

RECOMMENDATIONS

That the Working Group **NOTE** the reported fishing activity for the Torres Strait Finfish Fishery.

KEY ISSUES

1. Fishing activity in both the Spanish mackerel and reef line fisheries has been relatively stable since the 2008 buyout and commencement of leasing arrangement (<u>Figures 1 & 2</u>). The annual catch of Spanish Mackerel was **83.9** tonnes in 2014-15 and **86.3** tonnes in 2015-16. Annual catches of coral trout were **20.5** tonnes in 2014-15 and **31.6** tonnes in 2015-16. The historical catch of other reef line species is in <u>Table 1</u>.
2. Finfish catches by Traditional Inhabitant licenced (TIB) fishers remains low. The TIB sector reportedly caught 110kg of Spanish mackerel and 40kg coral trout in 2014-15, and 35kg and 285kg, respectively, in 2015-16. However, this is likely to be an underestimate due to catch reporting being voluntary for the TIB sector. In addition to the catch reported to AFMA, the project *Smart phone technology for remote data collection in Torres Strait traditional inhabitant fisheries* reported that TIB fishers from Erub caught 249kg of Spanish mackerel and 3010kg of coral trout in 2013-14, and 491kg and 210kg, respectively, in 2014-15. This project will be further discussed in Agenda Item 4.3.
3. AFMA is aware of growing interest and preparation among some TIB operators to increase their effort in the Finfish Fishery.

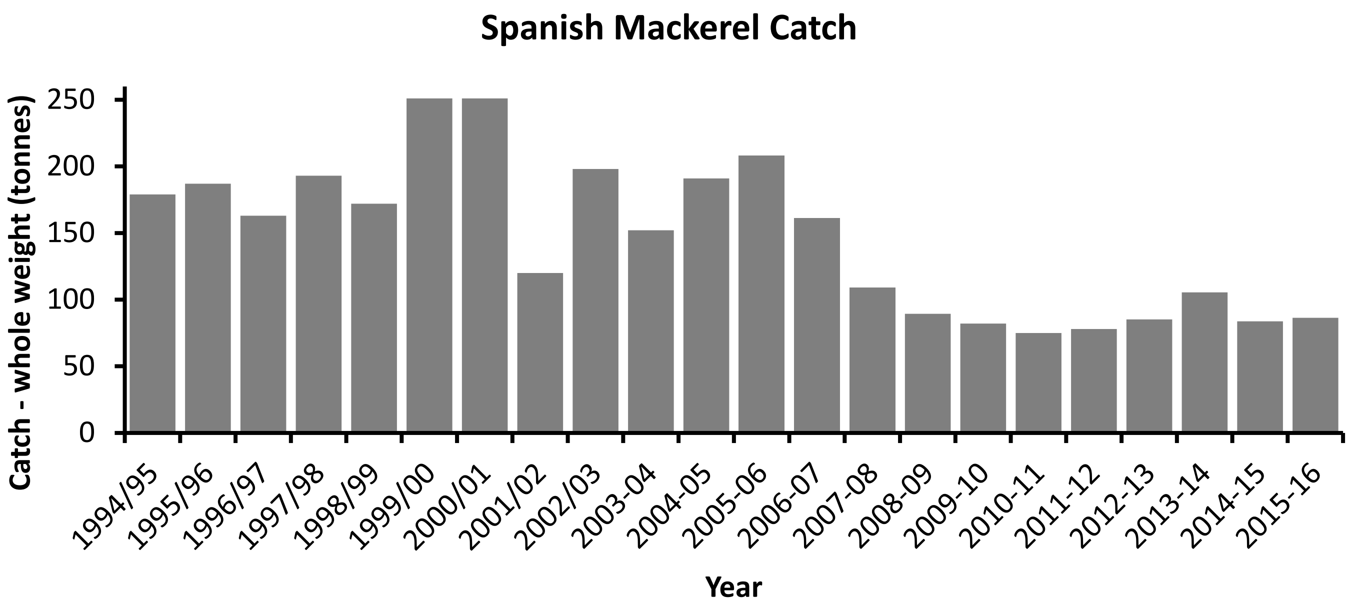


Figure 1: Torres Strait Spanish Mackerel Fishery historical catch records (source: AFMA docket book/logbook database).

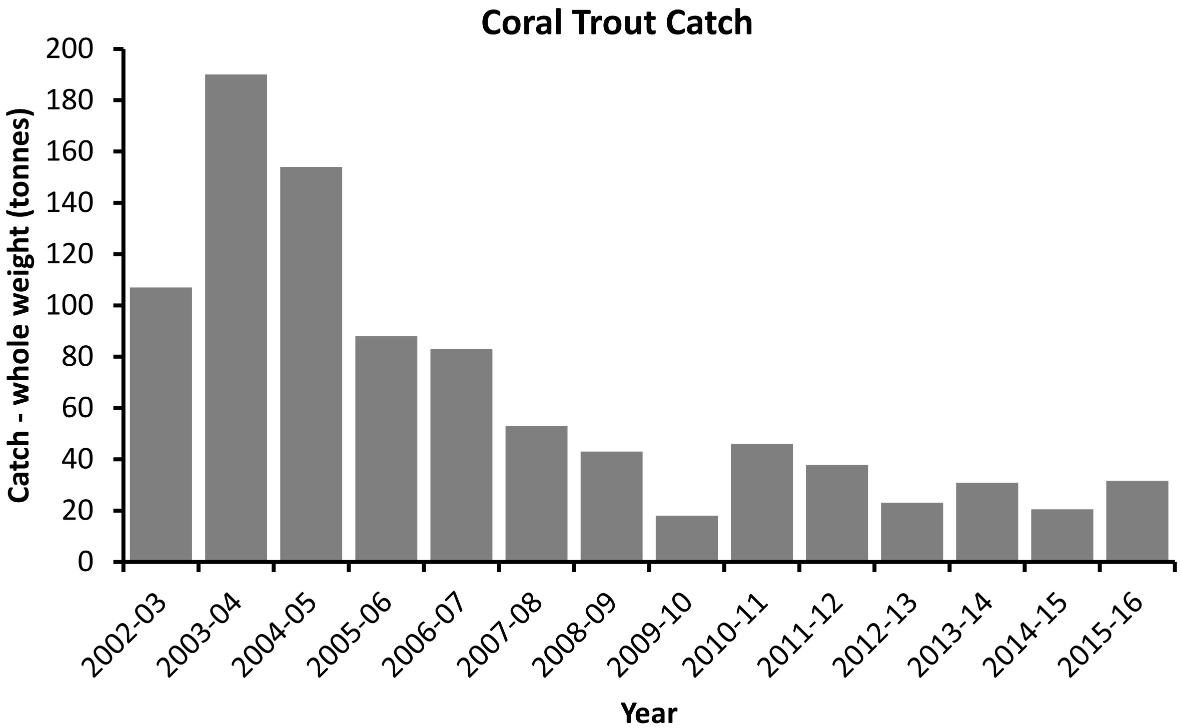


Figure 2: Torres Strait Reef Line Fishery historical catch records (source: AFMA docket book/logbook database).

Table 1. Annual catch of other reef line species as of 4 July 2016 (whole weight in kilograms) (source: AFMA docket book/logbook database)

	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Humpback Grouper - Barramundi cod	542	238	1086	757	429	786	646	1011
Red Emperor	222.5	70	398	202	125	160	207	230
Rock cods	125	280	728.5	1036.5	480	932	575	1001
Sea Bass	843	10	79	-	-	-	15	81
Spangled Emperor	197	68	244	29	35	-	8	37
Venus Tuskfish		93	341	145	34	79	-	-
Total (average 1.8t)	**1929.5**	**759**	**2876.5**	**2169.5**	**1103**	**1957**	**1451**	**2360**

TORRES STRAIT FINFISH WORKING GROUP	Meeting 2016.1 12-13 July 2016
FISHERY UPDATE **TSRA**	**Agenda Item No. 2.2** **For Noting**

RECOMMENDATIONS

That the Working Group **note** the fishery update to be provided by TSRA.

TORRES STRAIT FINFISH WORKING GROUP	Meeting 2016.1 12-13 July 2016
FISHERY UPDATES Native Title Update	Agenda Item No. 2.3 For Noting

RECOMMENDATIONS

That the Working Group **NOTE** any updates on native title matters from members, including the representative from Malu Lamar (TSI) Corporation RNTBC (Malu Lamar).

KEY ISSUES

1. On 7 August 2013 the High Court of Australia confirmed coexisting native title rights, including commercial fishing, in the claimed area (covering most of the Torres Strait Protected Zone). This decision gives judicial authority for Traditional Owners to access and take the resources of the sea for all purposes. Native titles rights in relation to commercial fishing must be exercisable in accordance with the *Torres Strait Fisheries Act 1984*.

2. Traditional Owners and native title representative bodies have an important role in managing Torres Strait fisheries. It is important therefore that the Working Group keep informed on any relevant native issues arising.

3. From discussions at other PZJA consultative forum meetings it has been agreed for a standing agenda item to be included in future PZJA Working Group meetings to allow a representative from the Malu Lamar to provide a native title update.

TORRES STRAIT FINFISH WORKING GROUP	Meeting 2016.1 12-13 July 2016
FISHERY UPDATE **PNG – National Fisheries Update**	**Agenda Item No. 2.4** **For Noting**

RECOMMENDATIONS

That the Working Group **note** the fishery update to be provided by representatives from the PNG National Fisheries Authority.

KEY ISSUES

1. Attendance by officials from the PNG National Fisheries Authority (NFA) is strongly welcomed. NFA officials will provide an update on the PNG finfish fisheries at the meeting.

2. At the last Annual Australia Papua New Guinea (PNG) Fisheries Bilateral Meeting held in Port Moresby in October 2015, the following was noted:

   - that Barramundi and jewfish are the key finfish species for the Western Province. PNG-NFA advised the status of these stocks is largely unknown however there is industry concern that stocks have been depleted.

   - advice from PNG-NFA that it aims to undertake research to assess the status of Barramundi stocks and review the management plan for the species. As part of the management plan review PNG-NFA aim to review the impacts of gear types noting lure fishing is becoming more prevalent over traditional netting.

   - advice from the PNG-NFA that juvenile jewfish are susceptible to trawling and that work being undertaken to develop and implement trawl bycatch reduction devices (BRD) will mitigate this impact. AFMA offered its expertise in BRD development as required by the PNG-NFA.

TORRES STRAIT FINFISH WORKING GROUP	Meeting 2016.1 12-13 July 2016
FISHERY UPDATES **Strategic overview and update on the fisheries (including economic trends)**	**Agenda Item No. 2.5** **For discussion and advice**

RECOMMENDATIONS

That the Working Group:

1. **NOTE** any fishery updates provided by Industry, Government and Research Members; and
2. **DISCUSS** and provide **ADVICE** on key issues affecting the fishery**.**

KEY ISSUES

1. It is important that the Working Group develops a common understanding of any relevant matters within adjacent jurisdictions and what issues if any, are having the greatest impact on industry and the management of the fishery. Such understanding will ensure proceedings of the Working Group are focused and may more effectively address each issue.

2. The Research Members will provide an update on trends and opportunities in global markets, processing and value adding. Industry is also asked to contribute advice on economic and market trends where possible.

TORRES STRAIT FINFISH WORKING GROUP	Meeting 2016.1 12-13 July 2016
Queensland Inshore Finish and Spanish Mackerel Fisheries **Overview of management and stock status**	**Agenda Item No. 3** **For Noting & Discussion**

RECOMMENDATIONS

That the Working Group **note** the verbal update by the Queensland Fisheries member management arrangements and stocks in the Queensland Inshore Fin fish and Spanish Mackerel Fisheries.

KEY ISSUES

1. The Queensland fisheries member (Queensland Department of Agriculture and Fisheries) will provide the Working Group with an overview of the Queensland Government management arrangements for Fin Fish and Spanish Mackerel stocks fished in Queensland waters and an general update on their stock status.

2. This is an important opportunity for the Working Group to gain a better understanding of the issues and management arrangements for finfish fisheries based in waters adjacent to the Torres Strait. The experience and information gained in Queensland may be used to better inform management approaches in the Torres Strait.

TORRES STRAIT FINFISH WORKING GROUP	Meeting 2016.1 12-13 July 2016
RESEARCH Traditional finfish catch: paste estimates and future research	Agenda Item No. 4.1 For discussion and advice

RECOMMENDATIONS

1. That the Working Group **note** and **discuss** estimates of traditional take of finfish as reported by *Busilacchi* 2008; and

2. That the Working Group **discuss** and **provide advice** on the implementation of the research project titled: *Monitoring the traditional take of finfish species in the TSPZ*

KEY ISSUES

1. Having an accurate estimate of total fishing mortality (total catch) is an important aspect of effective fisheries management. This information is not only used to inform stock assessments but also in determining sustainable TACs. TACs for commercial fisheries must take into account catches taken outside of the fishery (to be further discussed under Agenda Item 5.3).

2. For the TS Finfish Fishery mandatory catch reporting is conditional on quota leasing licences. Reporting is voluntary for the TIB sector and there is no routine monitoring program in place for Traditional fishing.

3. Dr Busilacchi's 2008 thesis: *The subsistence coral reef fish fishery in the Torres Strait: monitoring protocols and assessment* provides the most recent estimates of traditional take in the Torres Strait. Outcomes of Dr Busilacchi's study will be tabled at the meeting Attachment 1.

4. In 2015 the TSRA Finfish Quota Management Committee recommended that further research be undertaken to estimate current traditional fishing catch levels. The TSRA supported this recommendation and agreed to provide funding. A call for research proposals was undertaken through the Torres Strait Scientific Advisory Committee (TSSAC) resulting in AFMA contracting CSIRO to deliver the project titled: *Monitoring the traditional take of finfish species in the TSPZ.* A copy of the proposal is at Attachment 2.

5. Objectives of the monitoring project are to:

   a. Characterise current and future data needs for the targeted finfish resources.

   b. Quantify the traditional take of finfish species in the Torres Strait Protected Zone, including the spatial distribution of catches within or beyond the 10 nm zone of each community.

c. Deliver cost effective and acceptable monitoring options to key stakeholders including options for the long-term continuation of traditional take surveys (potentially across a range of species).

d. Involve and train Torres Strait islanders (through the My Pathways or Rangers program) to carry out monitoring during the program and into the future.

6. A project inception meeting was convened on 17 February 2016 to, among other things, gather information on various aspects of the consultation and implementation process for the project.

7. The Working Group should:

   a. note and discuss the traditional catch estimates reported in Dr Busilacchi's 2008 thesis; and

   b. discuss and provide advice as necessary on the implementation of the *Monitoring the traditional take of finfish species in the TSPZ* research project.

Attachments

1. Traditional catch estimates reported in Dr Busilacchi's 2008 thesis
2. Project proposal: *Monitoring the traditional take of finfish species*

Estimates of traditional finfish take in the Torres Strait

- The traditional catch of finfish by Erub, Masig and Mer in 2005/06 was estimated as 169 tonnes and included 62 different species (*Busilacchi 2008*) (Figure 1).
- This was a notable increase from catch estimated by CSIRO in the 1990s (Figure 2).
- Only a small proportion of the 2005/06 catch was Spanish mackerel or coral trout (CT), although this is still a significant quantity (approx. 20 tonnes).
- For the commercial species (including Spanish mackerel and coral trout) about 15% were taken for subsitence.
- The largest components of other species taken were Siganids (rabbitfish, spinefoot, parasa), mullet (thurud, wap) and trevally (whitefish).

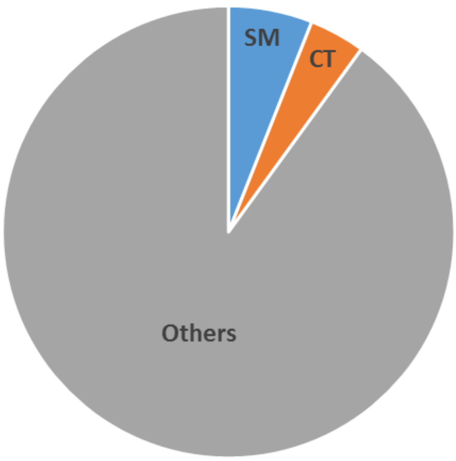


Figure 1. Traditional catch of finfish by Erub, Masig and Mer in 2005/06 (*Busilacchi 2008*).

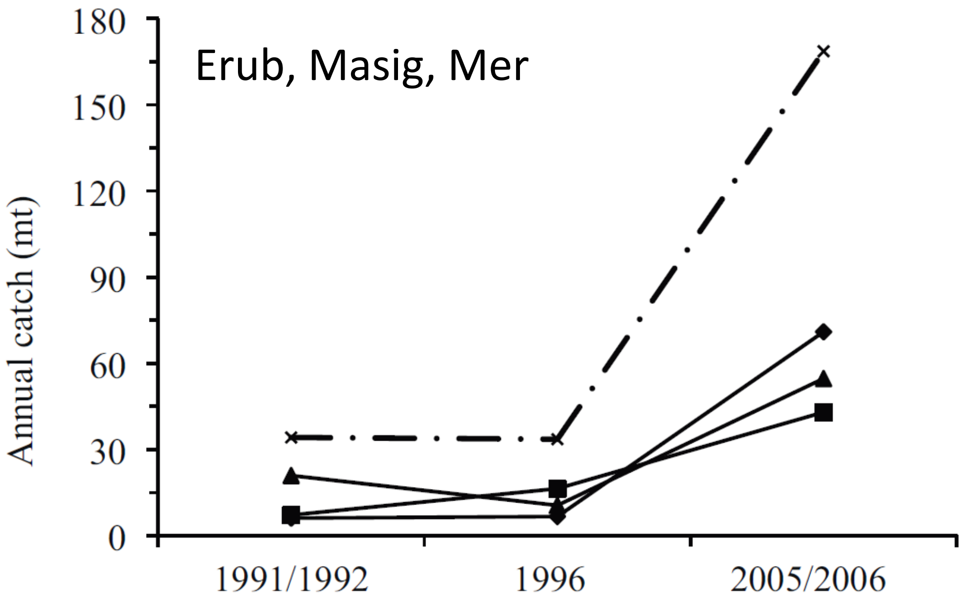


Figure 2. Traditional catch of finfish by Erub, Masig and Mer in 1991/92, 1996 and 2005/06 (*CSIRO 1992, 1996*; *Busilacchi 2008*). The dashed line is the total catch for all three communities.

Australian Fisheries Management Authority
FUNDING APPLICATION

The Australian Fisheries Management Authority provides funding for strategic research projects in Torres Strait Fisheries guided by advice from the Torres Strait Scientific Advisory Committee.

ADMINISTRATIVE SUMMARY

Project Details

Project Title Monitoring the traditional take of finfish species in the TSPZ

Planned Start Date 01/07/2015
Planned End Date 30/06/2017

Project Applicant
Organisation CSIRO Oceans and Atmosphere Flagship
Large Organisation (more than 20 people)
Yes

Project Budget Summary[1]

BUDGET[2]	TOTAL PROJECT COSTS					CONTRIBUTIONS			
Year	**Salary**	**Travel**	**Operating**	**Capital**	**TOTAL**	**AFMA Contribution**	**Applicant Contribution**	**Applicant In kind**	**Other In kind**
2015/2016	86,571	53,000	78,207		217,778	140,976	76,803		
2016/2017	57,089	8,000	52,935		118,024	58,843	59,182		
Totals	143,661	61,000	131,142		335,802	199,818	135,984		

External Review

Do you agree to any information being sent to external reviewers (if no please send separate advice to the AFMA) -
Yes

The TSSAC may engage external consultants to review applications. If you do not agree to information being sent to external reviewers, then select "No". Applicants should advise the TSSAC separately "in-confidence" of any information that they do not wish to be sent to a reviewer, and any potential reviewers they do not wish to be engaged.

Administrative Contact

Name
Given Name Debbie -
Family Name Vince

[1] Please list budget exclusive of GST
[2] Please list budget exclusive of GST

Position Finance Officer
Organisation CSIRO

Contact Details
Phone Number 03 6232 5525
Email debbie.vince@csiro.au

Principal Investigator

Please enter only one Principal Investigator details. The Principal Investigator would be expected to work for the applicant.

Name
Given Name Timothy
Family Name Skewes
Position Research scientist
Organisation CSIRO

Contact Details
Phone Number 07 3833 5963
Email tim.skewes@csiro.au

Co-Investigator

Enter Co-Investigator details. You can enter more than one Co-investigator.

Name
Given Name Emma
Family Name Lawrence
Position Statistician
Organisation Modelling & Indicator Analysis, CSIRO Digital Productivity

Contact Details
Phone Number 07 3833 5538
Email emma.lawrence@csiro.au

PROJECT DESCRIPTION

Project Challenge

C) Finfish (reef line, Spanish mackerel)
1a) Investigating improvement of efficient, long term monitoring for all sectors of the fishery.

Project Species

Identify and select the Species that this Application addresses.

The names are derived from the Australian Fish Names List.

Species Group	Finfish
Species	Coral trout (*Plectropomus* & *Variola* spp); Mackerel - Spanish (*Scomberomorus commerson*); other commercial finfish species

Background

Describe why and **how this application was developed**. In particular describe the strategic challenge that it addresses and how it relates directly to other current or recently completed projects. Do not repeat the information provided under Need or Other Related Projects. Detail the consultation with end-users and potential beneficiaries that took place while developing the application.

Finfish have been used by Torres Strait islanders for subsistence purposes for centuries (the "Traditional" fishery). The commercial Torres Strait Finfish Fishery (TSFF) began in the 1950's, with the Torres Strait Islander commercial catch ("TIB" licence) usually processed mainly through Island based freezers, while the non-islander catch sector uses mobile freezer boats. Finfish are also caught by non-islander recreational fishers and a small charter boat sector.

The Torres Strait Finfish Fishery (TSFF) is managed as two separate components: the Torres Strait Spanish Mackerel Fishery (TSSMF) predominately targeting Spanish mackerel (*Scomberomorus commerson*), and the Torres Strait Reef Line Fishery (TSRLF), mainly targeting Coral trout (*Plectropomus spp., Variola spp.*), with smaller catches of tropical snappers and emperors (Lutjanidae), trevally (Carangidae) and cods (Serranidae). There is also an inactive Torres Strait Barramundi Fishery (TSBF). Catch sharing arrangements (with PNG) also apply to the TSSMF under the Torres Strait Treaty.

Since the 2007-08 buy-back of TVH licenses, all catch entitlements reverted to the TIB sector. These entitlements are held in trust by the Torres Strait Regional Authority (TSRA). While entry into the fishery is limited to Traditional Inhabitants, non-Traditional Inhabitant fishers can still participate in the fishery by leasing a Sunset licence, administered by the TSRA. Leasing arrangements stipulate agreed conditions for fishing in the fishery including a Total Allowable Catch (TAC) and area closures. A Quota Management Committee (QMC) determines the quota that will be available annually for non-Traditional Inhabitant leasing. This amount is a balance between allowing for TIB harvest and the supply required by processors and suppliers. A 10nm closure around Erub, Mer, Ugar and Masig is also in place for non-Traditional Inhabitant fishers leasing temporary licences. Catch entitlements are also held in trust for Papua New Guinea as per catch-sharing arrangements outlined in the Torres Strait Treaty.

Currently finfish spatial catch (including target and by-product) and effort of non-traditional (Sunset) licence holders, and TIB fishers with vessels over 7 m in length is monitored through compulsory logbook (TSF01) returns, which are considered reliable. The small vessel TIB sector is monitored through the voluntary Torres Strait Seafood Buyers and Processors Docket Book (TDB01), via buyers at community and commercial freezers. The docket book recording was introduced by AFMA in January 2004, and records spatial catch data with sufficient precision for catch monitoring and stock assessment purposes. The subsistence portion of the catch of the TIB sector (estimated to be up to 15% of the catch), and the Traditional subsistence catch is currently not monitored, although there have been sporadic creel survey studies (e.g. Busilacchi, 2008). Most recently, smart phone technology to collect fisheries data TIB sector was trailed with limited success.

A management plan for the TSFF was finalised in 2013. The plan includes comprehensive management strategies for setting of a total allowable commercial catch. In 2007 the PZJA agreed on a nominal TAC of 134.9 t for Coral trout, which is currently used as a guide by managers and stakeholders to monitor the sustainability of the catch. In recent times, and since the buy-out of the TVH sector in 2007/08, the TSFF catch has been about 100 t -120 t/yr and worth more than $1 M, though the TIB sector catch is underestimated due to the difficulty of monitoring

While the known catch of commercial species is well under the combined indicative minimum MSY estimates of about 230 t

(80 t for coral trout and 150 t for Spanish mackerel), robust long time series catch data for the all sectors of the commercial and subsistence catch is required. This will realise the potential for significant economic development opportunity for the TSFF, while protecting the livelihoods of Torres Strait islanders,

Consultation

Specify the relevant consultation with Torres Strait Islanders industry, fisheries management and other parties undertaken before submission of this application, and the level of support for this application. **Particular emphasis should be included on meaningful engagement with relevant Traditional Owners and support from them for the project. Researchers should note that The TSSAC may require formal support from relevant communities for individual research projects if appropriate. Researchers should consider information in the document A Guide for Fisheries Researchers Working In Torres Strait[3].**
Researchers should clearer detail how they intend to engage Traditional Owners and what protocols they will follow in doing so. Enclose any documented support for this application from beneficiaries.

We have already begun, and will continue, extensive consultation with information end-users and custodians (AFMA, TSRA) to ensure that the program meets the needs of management of this important fishery. The project has a large community consultation component included. Regional representative bodies such as Malu Lamar and Island PCBs will be heavily involved in at least the initial discussions. Community consultation workshops will be held at representative regional sites and on-site visits to a range of communities are also included. A sustainable future plan for fishery monitoring and potentially the development of a co-management model will be developed in conjunction with AFMA, TSRA and community groups.

The project will be carried out in close collaboration with recruited islander monitoring staff and/or rangers. (Note no allocation has been made within this budget to cover salaries or perdiems for islander monitors). Extensive consultation will occur with Torres Strait communities and representative bodies. The planned outcome of this project is to transfer f the capability and the developed sampling protocol to Torres Strait Islander monitors.

Benefits from related projects will be captured where appropriate through consultation in the early phases of the project. These will include Sara Busilacchi (PNG and Torres Strait experience), Karina Ryan (WA fisheries), Steve Taylor (WA fisheries), Melissa George (NAILSMA), Shane Griffiths (CSIRO) and others as the project progresses.

Need

Define succinctly, in no more than 300 words, the need for the project and how it relates to relevant plans, stakeholder aspirations and strategies. Particular emphasis should be placed on need and benefits from the research for Traditional Owners. The need should describe why the application is needed. Do not repeat the information provided under Background.

Any fishery that is to be managed sustainably invariably requires accurate information on the catch, particularly when it is managed using output controls (TAC) and there are competing users for the catch. In this case, the quota managed Torres Strait finfish fishery (TSFF) is a vital fishery for the wellbeing of local Torres Strait Islander communities, both for subsistence and income. There is also additional potential for the fishery to provide financial benefit to Torres Strait communities through leasing. Estimates of the traditional (subsistence) catch of Islander communities are essential to protect the population from potential overexploitation and to protect the subsistence catch to ensure access by islanders to abundance fresh seafood. There is no comprehensive data on the current levels of traditional finfish catch in the TSPZ. This research proposal will describe the current monitoring and data collection process and context, and define future scenarios for long-term sustainable management of the fishery in conjunction with the key stakeholders.

Planned Outcomes

Quantify and/or qualify in terms of public and/or private benefits the Planned Outcome(s) that this project will contribute to achieving. In fewer than 300 words show how the Planned Outcome(s) will meet the Need, and specifically identify the sector(s) of the industry and/or community that will benefit directly from the Planned Outcome(s). Describe the relevance of the outcomes to fisheries management and the planned path for uptake.
.

The information from this project will ensure that the catch components of the fishery use an agreed and robust process for future monitoring management of a sustainable fishery; taking into account the needs for protecting islander livelihoods, ensuring sustainable catches and incorporating a cost effective monitoring and assessment process. The data collation and storage and future monitoring program will be undertaken by AFMA and the TSRA Fisheries portfolio.

Objectives

State succinctly the specific objective(s) of the project. Each objective should state in one sentence "what" is to be achieved rather than "why" (Need) and "how" (Methods).

1. Characterise current and future data needs for the targeted finfish resources.
2. Quantify the traditional take of finfish species in the Torres Strait Protected Zone, including the spatial distribution of catches within or beyond the 10 nm zone of each community
3. Deliver cost effective and acceptable monitoring options to key stakeholders including options for the long-term continuation of traditional take surveys (potentially across a range of species)
4. Involve and train Torres Strait islanders (through the My Pathways or Rangers program) to carry out monitoring during the program and into the future.

Methods

Describe the scientific/technical methods or protocol to be used including types of experiments, fish species involved, the data to be obtained and the means of interpreting the data. Explain clearly the statistical sampling and analysis to be undertaken. Provide support for any new methods and/or techniques to be employed. Detail the qualifications and skills of the key staff to be engaged on the project. A well constructed method will enable you to build your budget systematically. Describe how the research will be conducted in culturally appropriate ways (refer to '*A Guide for Fisheries Researchers Working in Torres Strait')*.

The research project will draw on available historical data from previous CSIRO monitoring of the Traditional catch on Yorke Island in 1984-86 (Poiner and Harris, 1994), and for all Torres Strait communities in 1991-2001 (Harris et al. 1997, Skewes et al. 2004), and a study of the traditional catch from three eastern Torres Strait communities in 2005/06 (Busilacchi 2013). Using targeted interviews, we will characterise the traditional finfish catch and fisher base (what, who, when and where); and then carry out a feasibility study of approaches, including the structure (census versus sampling approach) and methodology (traditional creel versus smartphone versus respondent driven sampling – i.e. using world best practice methodologies) to be applied during the field program. Robust statistical approaches will be applied to counter bias and ensure sufficient precision. The project will include data quality control and assessment to (1) ensure that allocated leased catch/effort does not impact the traditional indigenous catch and (2) provide accurate finfish catch estimates for stock assessment. We will consult widely with Islander communities to explain the need for and benefits of finfish monitoring.

The historical analysis of finfish data will be used to prompt discussion about the uses of fisheries data (including information feedback to communities), privacy issues, and other concerns they may have; as well as the preferred method for data capture. Data confidentiality and use will need to be fully negotiated and agreements made with traditional owners. This will result in a comprehensive and appropriate negotiated agreement signed on by traditional owners.

Once an agreed protocol for community consultation and data collection has been developed and endorsed by islander community members and representative leaders, we will design and implement the program. This will entail extensive field programs with onsite implementation of approaches with Islander trainee monitors and/or rangers. This will also be an opportunity to get further feedback form fishers directly and to refine the approach.

The capacity building and training for one or more community members, either through the My Pathways program or Rangers (after negotiations with the TSRA and other relevant community members) will be done during the implementation phase and also at dedicated training workshops on Thursday Island and potentially in Brisbane at the Queensland Ecoscience Precinct. These will include exposure to basic stock assessment principles and fishery population dynamics by world class fishery scientists.

Overall the project will take a whole-of-fishery and community approach to facilitate Islander ownership of the program, outlining the benefits of monitoring approaches and the risks associated these different scenarios. CSIRO has a long history of research and consultation, training and Islander interactions. We believe we have the social and cultural understanding and expertise in fisheries monitoring and use of data for stock assessments to successfully design, negotiate and deliver an acceptable monitoring program approach, and supply the training to allow establishment of a finfish catch monitoring program that will be effective into the future.

Risk Analysis

Identify the threats to the objectives being achieved. Describe the means of overcoming these threats. Use the sub headings "Threat" and "Contingency".

Threat: Key staff (T.S., E.L.) not being available to complete the project.
Contingency: This is a short term (1.5 year) project that should mitigate this risk. Also, there are other staff within CSIRO with similar skills to the Key staff that will have a close association with the project and that could complete the project (e.g. David Brewer).

Threat: Key data (fishery spatial catch data and fisher effort) not being available for collation.
Contingency: CSIRO has a long history of collecting catch data in Torres Strait, not only form the Traditional fishery but also TIB sectors in the TRL and Hand Collectable (beche-de-mer) fisheries. Management stakeholders (TSRA and AFMA) have expressed support, and Islander representative bodies have also expressed a willingness to facilitate the collection of fisheries data for sustainable use of mixed commercial/subsistence fisheries.

Performance Indicators

Identify measureable performance indicators against which the success of the overall project can be evaluated relative to the Project Objectives. Include any socio-economic indicators that would be relevant to the research project.

1. In principal agreement form all stakeholders, but particularly Islander communities, to participate in finfish monitoring.
2. Candidate monitoring protocols tested mathematically for overall accuracy, precision and long term viability.
3. Delivery of an acceptable monitoring program approach(es) including use of trained Islander observers.

Related Projects

List other research related to this project undertaken either by the applicant or other researchers, and state how such research will be integrated into or benefit this project. Indicate searches undertaken. Australian research can be found on databases such as ARRIP and ABOA. Searches are available on a fee for service basis from Seafood Services Australia (ph 1300 130 321).

It is also important where the application has been submitted previously to list any rejected applications and explain why they were rejected and how this application has addressed any feedback.

This research project will build on the outcomes and data from previous CSIRO monitoring of the Traditional catch on Yorke Island in 1984-86 (Poiner and Harris, 1994), and for all Torres Strait communities in 1991-2001 (Harris et al., 1997, Skewes et al, 2004), and a study of the traditional catch from three eastern Torres Strait communities in 2005/06 (Busilacchi 2013). It will also use the learnings from a current study into the use of smart phone applications for remote data collection (U Tas).

The outputs of this research will be suitable for integration in the TSFF management plan.

Outputs and Extensions

Describe the outputs that will arise from the project. Outputs are knowledge, processes and technology that when adopted will contribute to achieving planned outcomes. End-users are often in the best position to decide the most appropriate outputs, so consider having them describe their output needs. Outputs may take many forms including: publications, guides, codes of practice and models in print or electronic media.

Provide a Dissemination, Extension & Commercialisation Plan for extending the results of the project. **Particular emphasis should be included on communication and extension strategies that are suitable for Traditional Owners.** Include in the plan information on the organisation that will undertake the extension and on the relationships that will be developed with end-users in order to facilitate the adoption of the results.

The AFMA policy is to make project results publicly available, however, parties may agree to protect any intellectual property arising from the project. Unless there is a compelling reason otherwise, no protection or confidentiality will apply to results of AFMA funded projects. If protection of intellectual property is agreed to, the parties will agree on a strategy to do so. This may also result in the exchange of a separate intellectual property management agreement.

Notwithstanding the above, documenting the relative ownership of intellectual property resulting from the project is important particularly in the event that such intellectual property may have a commercial value. To ensure appropriate apportionment of ownership over intellectual property, detail any direct or related intellectual property owned by the applicant, the AFMA (or its predecessors) and/or any other organisation at the commencement of the project.

Each community will have a tailored and documented data collection, storage and feedback plan that will be formulated during community workshops. This will be a document kept by a suitable community repository, and by the TSRA and AFMA.

The project will produce material suitable for community feedback, both as noticeboard posters and community pamphlets.

A detailed catch monitoring manual will be designed and produced for local Indigenous fishery monitors and scheme managers.

Other community consultation and extension will include (i) fora with islander community members and representative leaders during planning, implementation and assessment phases; (ii) community interaction during field programs in conjunction with Islander trainee monitors and/or rangers; and (iii) through capacity building and training for one or more community members.

Intellectual Property

Identify the appropriate Intellectual Property category applicable to this application. Choose ONE from below.

Code	Description
1	Published, widely disseminated and promoted, and/or training and extension provided. Relates mainly to outputs that will be available in the public domain.
2	Published, widely disseminated and promoted, and/or training and extension provided. Related products and/or services developed. Relates mainly to outputs that will largely be available in the public domain, but components may be commercialised or intellectual property protected.
3	Published, widely disseminated and promoted, and/or training and extension provided. Related products and/or services developed. Relates mainly to outputs that may have significant components that are commercialised or intellectual property protected.

Some components of the project will contain intellectual property that may require protection e.g. individual catch data and/or collection protocols. This will be negotiated with community leaders and Islander stakeholders. Open disclosure will be encouraged as much as possible.

Flow Of Benefits

Estimate, as percentages of total benefit, the Flow of Benefits to the potential beneficiaries of this project. Careful consideration should be given to apportioning the Flow of Benefits as the TSSAC will seek advice from the nominated on the appropriateness and priority of the application, and on the potential benefits of the project following its completion.

There are a number of ways to apportion flow of benefits. For example, the flow of benefits across the commercial sector could be based on the relative gross values of production; across the recreational sector could be based on population; and across all fishing industry sectors could be based on the relative percentages of catch. The ABARES website contains more information on fisheries statistics.

Fishery (including aquaculture) Managed by:	Commercial(%)	Recreational(%)	Traditional(%)
ACT			
AFMA	10		90
NSW			
NT			
QLD			
SA			
TAS			

VIC			
WA			

Data Management

I have searched for existing data. (Refer to guidelines on how to search the Australian Spatial Data Directory and Oceans Portal) Yes

Provide a brief description of the resulting data from the project and how this data will be stored for future protection and access.

Data management should include a description of the data to be produced by the research and show details on the following aspects:

Data security or privacy issues, applying to the data.
Nominated data custodian, clearly identifying the party responsible for this data and the database/repository system that .the data will be stored in. AFMA may require researchers to provide copies of data and or metadata to them.

This project will produce data on the traditional catch of Torres Strait Islander communities. This will require a secure, maintained database within AFMA and/or the TSRA. The success of this project relies on a demonstrable ability to protect individual catch records form public exposure.

BUDGET

Milestone List

Identify the key milestones against which progress of the project will be measured. All tangible outputs for the project should be listed as milestones together with the dates by which their achievement is anticipated, and the criteria for verifying that the milestones have been achieved. All milestones must be costed.

To facilitate project management please base milestone dates on the completion of significant reportable activities rather than traditional calendar dates such as end of the month, financial or calendar year.

Due Date	Details	Justification	Salary	Travel	Operating	Capital
31/12/2015	Draft monitoring program/s and workplan for community workshops	Salary, travel and operating for draft monitoring program/s and workplan for community workshops.	17,239	12,199	10,524	0
31/03/2016	Community workshops completed.	Organise and carry out community workshops on selected east Torres Strait Islands to formulate and get agreement on a monitoring protocol. Salary costs include research effort to formulate monitoring strategy and carry out community workshops.	34,478	24,400	21,049	0
15/07/2016	Community monitors trained for collection of Traditional finfish data.	Salaries, travel and operating for training community monitors for collection of Traditional finfish data.	12,929	9,150	7,893	0
31/10/2016	Draft Final report, training manuals and communication materials.	Salaries, travel and operating related to production of Draft Final report and communication materials. Presentation of result to key stakeholders.	8,620	6,100	5,262	0
23/12/2016	Final report submitted after comments.	Salaries, travel and operating related to production of Final report and communication materials. Presentation of result to key stakeholders.	4,310	3,050	2,631	0

Cash Contributions

Contributor Name	Contributor Contact Details	Amount

Schedule of Payments

The schedule of payments is automatically generated. If there is a cash contribution associated with the project please specify the breakdown between the milestones.

Due Date	Details	Milestone cost	Schedule of payments
01/07/2015	Initial payment	19,981.80	19,981.80
31/12/2015	Progress report – Draft monitoring programs.	39,963.60	39,963.60
31/03/2016	Community stakeholder workshops complete.	79,927.20	79,927.20
15/07/2016	Community monitors trained.	29,972.70	29,972.70
15/02/2014	Draft final report	19,981.80	19,981.80
31/03/2014	Final report	9,990.90	9,990.90

Special Budget Considerations

Include information that may impact on the project budget. This could include revenue from the sale of publications or other items (e.g. fish sales or capital items) or details of potential co-funding arrangements.

Contribution by Applicant

Provide estimates of contributions (cash and in kind) made to the project to cover staff, facilities, vessels, and administrative support costs. Ensure any cash contributions from the applicant are captured here.

Year	Salaries	Travel	Operating	Capital	Justification
2015/16	34,629	0	42,174	0	Addresses strategic goals of CSIRO Oceans and Atmosphere Flagship
2016/17	22,836	0	36,346	0	Addresses strategic goals of CSIRO Oceans and Atmosphere Flagship

Contribution by Other

Provide estimates of contributions (cash and in kind) made to the project from other government and private investors to cover staff, facilities, vessels and administrative support costs. Ensure any cash contributions from other sources (not applicant or AFMA) are captured here.

Year	Name of Contributor	Salaries	Travel	Operating	Capital	Justification

TORRES STRAIT FINFISH WORKING GROUP	Meeting No. 2016.1 12-13 July 2016
RESEARCH **Spanish mackerel stock assessment update**	**Agenda Item No. 4.2** **For discussion and advice**

RECOMMENDATIONS

1. That the Working Group **note** and **discuss** the draft updated Spanish mackerel stock assessment.

KEY ISSUES

1. In 2014 AFMA funded the project titled: *Defining the status of Torres Strait Spanish mackerel to inform future fisheries allocation and sustainable fishing*. As part this project the 2006 stock assessment of Spanish mackerel (Begg *et al* 2006) has been updated.

2. Dr Michael O'Neil will present the findings of the revised stock assessment at the meeting. This work will inform future Working Group advice on both TACs (refer to Agenda Item 5.2) and research priorities (Agenda Item 4.4).

3. A key recommendation of the draft report is for:

   "Management to adopt a precautionary approach to setting target levels of commercial harvest until further data of total catches and fish age structures are available".

4. The draft report further advises that if future average harvests increase above 150 tonnes, then future catch rates of Spanish mackerel may erode. Despite uncertainty in estimated population sizes however, the authors considered recent harvest for 2007-2014 (64-105t) and population estimates all sustainable.

5. Further research priorities were identified noting that many that were identified by Begg *et al* 2006 remain. The development of a harvest strategy (Agenda item 5.1) will assist in evaluating the cost-catch-risk trade-off associated with further investment in finfish research. Relevantly the authors note that "*if future improvement in data is not cost effective or supported, then use of precautionary reference points to judge abundance (Standardised catch rates) indicator signals is essential for mitigation of indicator variance and uncertain management decisions*".

6. Specifically the report recommends a range of data improvements that would be required to service future harvest strategy procedures for Torres Strait Spanish mackerel (empirical or stock model based) including:
   - Verify records on fishing effort and harvest through logbook, docket book and electronic
     - reporting systems [*for harvest and/or standardised catch rate assessments*]. This
     - involves recording and validating:
     - trip harvests and average fish weights using unload/sale receipts,

  - number of dories used and hours fished each operation day,
  - the number of and fishing locations of the primary operation and dories using
  - VMS/GPS latitude and longitude coordinates,
  - number of fish caught each operation and dory day,
  - zero catches, and
  - days when fishing is stopped due to capacity limitations (too many fish).

- Monitor and estimate Spanish mackerel harvests taken by non-commercial sectors [*for stock model assessments*].

- Conduct regular (annual or biennial) long term monitoring of fish age-length structures that are spatially representative of the Torres Strait [*for mortality and/or stock model assessments*].

- Collect fine scale spatially representative genetic fish samples to test the single

Smart phone technology for remote data collection in Torres Strait Traditional Inhabitant finfish fisheries

Dan French, Klaas Hartmann and Jeremy Lyle

TRANSLATINGNATUREINTOKNOWLEDGE

Contents

Acknowledgements

This project was funded by the Australian Governments - Australian Fisheries Management Authority (AFMA). The project was supported and guided by input from AFMA and Torres Strait Regional Authority (TSRA) staff, members of the Torres Strait Scientific Advisory Council (TSSAC) and the Torres Strait Island Regional Council (TSIRC), the Prescribed Body Corporate (PBC) Councillors and community members of the Erub Island community and the Erub Island Fishing Management Authority. In particular, the assistance of traditional inhabitants Kenny Bedford, George Romano and Bert Matysek and Shane Fava, Brendan Raynor (AFMA) and Steve Hall (TSRA) has been invaluable.

This project is dedicated to the memory of Dr Ben Chuwen who passed away tragically in May 2012. It would not have been conceived if not for his inspiration and hard work. His knowledge, passion and leadership in the fishing industry will be sadly missed and his companionship as a friend and colleague will never be forgotten.

ACRONYMS

AFMA	Australian Fisheries Management Authority
CPUE	Catch Per Unit Effort
EFMA	Erub Island Fisheries Management Authority
MSE	Management Strategy Evaluation
PBC	Prescribed Body Corporate
PZJA	Protected Zone Joint Authority
TIB	Traditional Inhabitant Boat license
TSFF	Torres Strait Finfish Fishery
TSIRC	Torres Strait Island Regional Council
TSRA	Torres Strait Regional Authority
TSSAC	Torres Strait Scientific Advisory Council
TVH	Transferrable Vessel Holder license

Executive Summary

Data collection within the Torres Strait Traditional Inhabitant commercial finfish fishery is voluntary and has been inconsistent through time. Consequently, the quality of catch, effort and spatial data has been insufficient to undertake reliable stock assessments for this fishery. There are also no restrictions on the number of licenses available to traditional inhabitant fishers hence fishing effort has the potential to change considerably over a short period of time.

To address these concerns this project aimed to assess the viability of using smart phone technology to improve the quality of fisheries data collected from the Torres Strait Traditional Inhabitant commercial finfish fishery. A smart phone app was developed that provided fishers with a simple method of recording catch and effort data, which is transmitted to a central database when the phone is within mobile coverage. The smart phone app was distributed along with phones to eight key fishers on Erub Island.

Fishers indicated that the application was easy to use, however uptake was variable. Some users recorded no data whilst the most diligent user recorded approximately 67% of the catch they sold to the community freezer. Fishers indicated that the following factors influenced participation and indicate opportunities to increase the participation rate.

- The development of trusting relationships between project coordinators and participants
- Packaging the app with technology used by commercial fishers outside of this sector (e.g. chart plotters)
- Providing an appreciation of how the collected data can inform fisheries management, and be used to help improve economic returns at an individual level
- Automated reporting tools to provide instant and ongoing feedback about individual's fishing operations.

A catch recording app was also developed and deployed on a tablet at the Erub community freezer. A large proportion of the catch is sold through the freezer, hence this is an ideal data collection point. A comparison with the paper records (which are used to pay fishers and hence are relatively complete) showed over 99% accuracy and 100% completeness. This is a vast improvement from the previous paper based system where records were infrequently returned to AFMA or in some cases lost. The system provides operators with simple access to catch summaries and efficiency improvements compared with traditional record keeping. If the existing catch receipt system was completely replaced by the app this would ensure a high rate of catch reporting and real time data transfer at this point.

The individual and freezer apps recorded a combined total of 4755kg during this study, thereby demonstrating the feasibility of smart phone data recording in this fishery. The most challenging aspect is developing and maintaining user uptake of the reporting system. The fishery primarily consists of participants who fish sporadically and individually catch small quantities. Engaging with this large and changing target audience for individual catch reporting is challenging. Similar problems have been faced in other projects were data is recorded on a voluntary basis such as recreational fishing catch reporting and 'citizen science' projects. In these situations participation is also voluntary and the direct benefit to individuals is limited, thus without active engagement participation decreases over time.

The main scope for future cost effective data recording in this fishery is through locations where commercial harvests are processed or transported (‘bottlenecks’) through which a large proportion of the catch passes. The freezer app developed in this study could be further developed to replace the freezer accounting/book keeping system and by becoming integral to their accounting system would ensure that data is entered on an ongoing basis. However most communities don’t operate freezers and some avid fishers may choose to process and ship their catch independently. Another potential data collection point is the quarantine approval process. A voluntary reporting system at this point would have less potential to capture effort data but could capture a greater proportion of the overall catch and is more consistent across the Torres Straits than the existence of a community freezer.

Smart phones incorporate a GPS and thereby enable collection of spatial catch and effort data with high spatial resolution. This high resolution data would allow fisheries management issues such as serial depletion to be considered. For individual fishers it would enable the assessment of fishing efficiency and assist in fishing decision making. Fishers were uncomfortable recording this data due to privacy concerns; hence it was not recorded for this project. However if the possible benefits to individual fishers were better understood by them, this may in future provide an effective mechanism for encouraging uptake of the app.

This project has provided a proof of concept for this approach to data collection that has resulted in a substantial increase in the data collected from this poorly understood fishery. A broader application of this approach would need to tackle the highlighted issues regarding uptake and a diverse range of participants.

Objectives

1. Develop and implement and a smart phone application for remote data collection in Torres Strait Traditional Inhabitant Coral trout and Spanish Mackerel fisheries

2. Assess the robustness of data collected from Torres Strait Traditional Inhabitant fishers using data collected through independent monitoring

3. Identify barriers to uptake and develop recommendations for the further development of data collection with the Torres Strait commercial TIB Finfish fishery.

Background

The fisheries of the Torres Strait have been referred to as the region's most important natural resource, particularly when considering opportunities for economic development and ongoing subsistence. The Torres Strait Finfish Fishery (TSFF) is an important component of the region's fisheries contributing $1.13 million and 119.7 tonnes of catch in 2011-12 (Flood et al., 2012). Despite the potential for this natural resource to provide significant economic development opportunity for the region, fishing currently provides approximately 1% of the total employment within the Torres Strait.

Finfish have been targeted by Torres Strait islanders for centuries (Johannes and MacFarlane, 1991) for subsistence and more recently for commerce. Non-Traditional Inhabitants instigated the region's commercial finfish fishery in the 1950's (Haysom, 2001). Traditional Inhabitants entered the fishery in the late 1980's following the establishment of processing facilities on some of the major islands.

The TSFF operates as two distinct commercial sectors; Traditional Inhabitants operating under Traditional Inhabitant Boat (TIB) licensing agreements, and non-Traditional Inhabitants who operate under Transferrable Vessel Holder licencing (TVH) arrangements. In 2008, the Australian Government funded a 100% buyback of non-indigenous fishing licences. As a result, the Torres Strait Regional Authority (TSRA) holds the entire fishery in trust for Torres Strait islanders and grants Traditional Inhabitants access to the commercial fishery once they obtain a TIB licence. There are no restrictions on the numbers of TIB license holders and mandatory reporting of catch, effort and spatial data only applies to the non- traditional commercial sector of the fishery.

The TSFF is comprised of the Reef Line fishery, Spanish mackerel fishery and the Barramundi fishery (which is currently inactive (AFMA 2012)). Since the 1980s commercial fishing in this sector has predominantly occurred in the north-eastern region (Mapstone *et al*., 2003; AFMA, 2012; (Flood et al., 2012). The focal point of the traditional inhabitant (TIB) commercial fishery is located in north-eastern region which includes Erub, Masig and Mer islands (Figure 1). Here fishers predominantly target members of the coral trout complex, namely Common coral trout (*Plectropomus areolatus*), Bar-cheeked coral trout (*P. maculatus*), Passionfruit coral trout (*P. areolatus*) and Blue spot trout (*P. laevis*) and Spanish mackerel (*Scomberomorus commerson*).

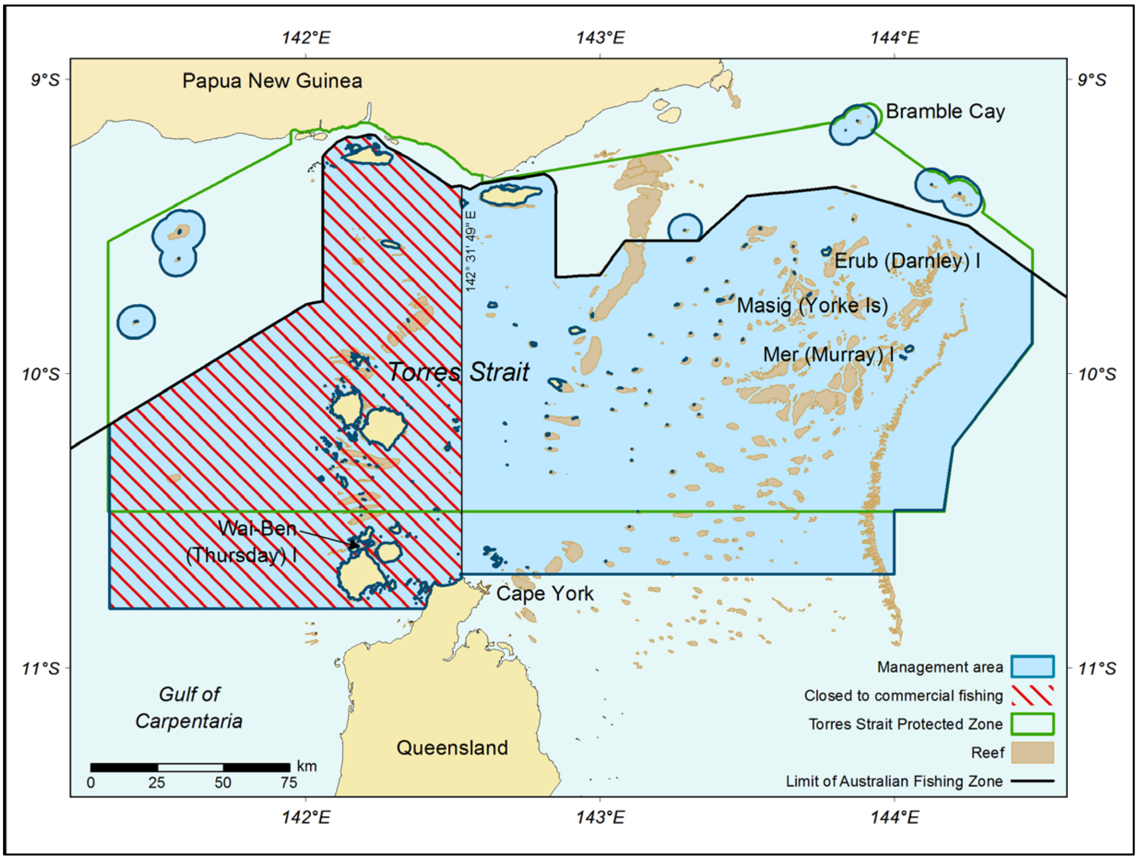


Figure 1: Area of the Torres Strait Finfish Fishery (Morgan et al., 2013)

Despite the relative ease of access, commercial activity within the fishery by the TIB sector is largely opportunistic and seasonal and the majority of recorded catch is taken by a relatively small number of operators. TIB commercial catch recorded for this fishery peaked just below 30 t in 2004 and has been in decline ever since. There are however a large number of fishers with TIB licences registered as active within the fishery with 161 entering catch for Spanish mackerel and 145 for reef fish via island freezers as of 30th June, 2010 (AFMA, 2012). Currently, TVH licence holders are few with only 4 active vessels licensed for Spanish mackerel and 1 active vessel targeting coral trout recorded during the 2011-12 season (Flood et al., 2012)(Figure 1).

Despite reductions in total catch, the TIB subsistence and commercial fishery has evolved from one largely concentrated around the fringing reefs of populated islands using traditional methods and gear to a fishery which now employees modern methods and technologies (A. J. Williams, Ballagh, Begg, Murchie, & Currey, 2008). Subsequently, there has been an increase in the ability to efficiently target species and thereby place additional pressure on the sustainability of local fish stocks. Many researchers and management agencies have noted the lack of data on stock status of many commercially targeted species within the region and despite a reduction in total commercial catch within the TIB sector additional stressors such as climate change (Morgan et al., 2013), increased effort (Anon, 2009), subsistence fishing (Busilacchi, Russ, Williams, Begg, & Sutton, 2012) and catch sharing (A. J. Williams, Little, & Begg, 2011) pose a threat to the ongoing sustainability of these fisheries.

The commercial finfishery

The TSFF recorded a total catch of 87.6 t of Spanish mackerel and 36.2 t of coral trout in 2010, however these totals are likely to have been underestimated due to the voluntary nature of reporting in the TIB sector (AFMA, 2012). The TIB sector harvest of coral trout peaked in 2004 with almost 30 t of landed catch recorded. The non-indigenous sector has recorded higher totals peaking at >144 t in 2001 (Williams et al., 2008a). Mean annual subsistence catch for Erub, Masig and Mer islands (2005-2006) has been estimated at 169t although this figure may be greater. Significantly, this level of catch is equivalent to commercial TIB and non-traditional sectors combined however, the composition of this sector varies from commercial catch with carangids, siganids, clupeids and mugilids dominating the subsistence sector (Busilacchi et al., 2012). Accurate fisheries assessments have been hard to complete due to a lack of reliable data. There is interest in improving data collection within commercial fisheries from both management authorities, the TSRA and indigenous fisheries boards who recognize the need for accurate catch data to help manage their fisheries (AFMA, 2012; Anon, 2009; A. J Williams et al., 2007).

Stocks of Spanish mackerel have been previously assessed as being fished at maximum sustainable levels in 2006 (G. A. Begg, Chen, O'Neill, & Rose, 2006) . Since then a reduction in participants in the fishery has resulted in a significant decline in catch and effort and harvest levels for the TSFF are now thought to be sustainable (AFMA, 2012). However, as no formal stock assessment for the reef line fishery has been conducted the current status of stock is uncertain (ABARES, 2012).

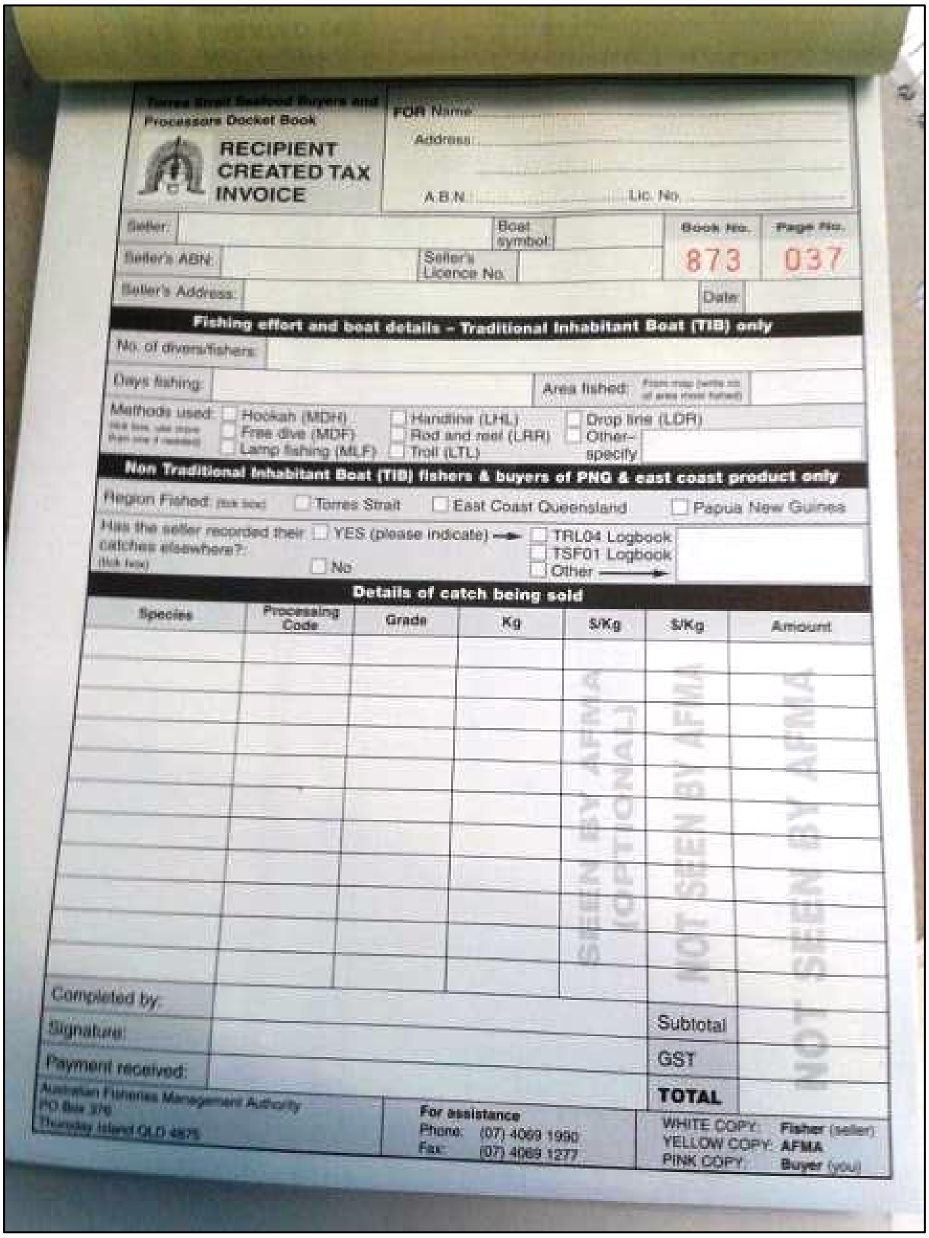
As an alternative to formal stock assessment, Management Strategy Evaluation (MSE) has been applied to coral trout in the TSFF for several harvest scenarios. Results indicate that biomass for this species group will remain at least 70% of assumed unfished levels by 2025 (A. J Williams et al., 2007) suggesting the stock is not overfished and is unlikely to be subjected to overfishing under these scenarios. Similarly, MSE for Spanish mackerel suggests this species is not overfished or subject to overfishing although the outputs of these models have been questioned and significant uncertainty regarding these conclusions remain (Begg et al., 2006). Begg (et al., 2006) also notes that biomass predictions relating to assumed unfished levels for Spanish mackerel are significantly lower than those estimated for coral trout thereby placing this species under greater risk of overfishing. Furthermore, these figures do not account for stock status on local reefs where the majority of fishing from the TIB sector occurs. In addition, there has been acknowledgement that data collection within the fishery lacks the temporal and spatial resolution required to obtain reliable estimates of catch and effort which can lead to notable bias in estimates of CPUE (G. A. Begg & Murchie, 2004; Mapstone, Tobin, Jones, & Begg, 2003).

The fisheries impacts on stocks of bycatch including important valuable species such as Barramundi cod (*Cromileptes altivelis*), Red emporer (*Lutjanus sebae*), snappers, cods, emperors, wrasse and shark are unknown. Bycatch has been observed to be significant and there are indications that this proportion of the commercial catch is under reported and poorly understood (A. J. Williams et al., 2008).

Data collection

It has long been acknowledged that a lack of reliable catch data within the TSFF poses a risk to the fishery (AFMA, 2012; Anon, 2009; A. J Williams et al., 2007). Since 1988 some commercial fishing data has been recorded at community freezers which process and sell catch to both local inhabitants and external markets (A. J Williams et al., 2007). Data is captured using a logbook system which records fisher details including licence numbers, the number and type of fish caught, weights and the location of catch at a very coarse spatial scale (Figure 2).

Catch data obtained from these records indicates that the majority of reported catch from the TIB sector comes from offshore reefs within the vicinity of Masig (Yorke), Mer (Murray), Erub (Darnley) and Ugar (Stephens) islands. In these regions demersal reef species and pelagic species are caught using hook-and-line gear and powered dories generally of 4-6m length.). Vessel size generally restricts TIB fishers to an area within a 40 km radius of their launch and a trip duration of one day or overnight due to a lack of onboard storage facilities (Williams et al., 2008). It is possible for larger vessels to start being used in the TIB sector, increasing the fishing capacity substantially.


Torres Strait Seafood Buyers and Processors Docket Book

RECIPIENT CREATED TAX INVOICE

FOR Name:
Address:
A.B.N. Lic. No.

Seller: Boat symbol: Book No. 873 Page No. 037
Seller's ABN: Seller's Licence No.
Seller's Address: Date:

Fishing effort and boat details – Traditional Inhabitant Boat (TIB) only

No. of divers/fishers:
Days fishing: Area fished:
Methods used: Hookah (MDH) Free dive (MDF) Lamp fishing (MLF) Handline (LHL) Rod and reel (LRR) Troll (LTL) Drop line (LDR) Other– specify

Non Traditional Inhabitant Boat (TIB) fishers & buyers of PNG & east coast product only

Region Fished: (tick box) Torres Strait East Coast Queensland Papua New Guinea
Has the seller recorded their catches elsewhere? (tick box) YES (please indicate) → TRL04 Logbook TSF01 Logbook Other → No

Details of catch being sold

Species	Processing Code	Grade	Kg	$/Kg	$/Kg	Amount
				SEEN BY AFMA (OPTIONAL)	NOT SEEN BY AFMA	NOT SEEN BY AFMA

Completed by:
Signature: Subtotal
Payment received: GST
TOTAL

Australian Fisheries Management Authority
PO Box 376
Thursday Island QLD 4875

For assistance
Phone: (07) 4069 1990
Fax: (07) 4069 1277

WHITE COPY: Fisher (seller)
YELLOW COPY: AFMA
PINK COPY: Buyer (you)

Figure 2- AFMA fisheries logbook catch entry docket

Data collected from commercial freezers is not representative of total catch within the region as many local freezers such as those on Erub, Darnley and Yorke island experience intermittent closure and fishers can ship their catch directly to the wholesalers by the fisher (in which case it is not recorded at the freezer). Furthermore, there is often a significant delay (in some cases several years) between when data is recorded and when it is received by fisheries management authorities. This undermines the authority's ability to assess the ongoing sustainability of the fishery and adapt to fluctuations in catch rates, recruitment variability and changing dynamics of the fishing fleet.

Need

Traditional Inhabitant commercial fishers of the Torres Strait require sustainable fisheries and economic development opportunities. Any such expansion of the fishery requires an accurate assessment of the current status of the fishery. In order to achieve this, the PZJA, AFMA and other stakeholders have identified the need to improve catch monitoring of the TIB sector of the TSFF in the region while engaging Traditional fishers in this data collection. Ideally this data would have high temporal and spatial resolution and be obtained with minimal delay. Data of this nature will provide baseline information and will begin the process of collecting the types of data required for future robust formal stock assessments for the TSFF. The data and analyses using it will enable fishery management decisions about matters such as fishing restrictions, resource sharing between sectors and temporal and/or spatial closures to be made in an open, transparent and robust way.

In addition, there is a need to improve the profitability of fishing for Traditional Inhabitant commercial fishers in order to increase participation in regional fisheries and facilitate local Traditional Inhabitant "ownership" and effective management of these natural resources. Improved catch and effort data is needed to support business cases that promote uptake in the fisheries. This project was designed to address these needs and provide a strong platform for future optimal utilization of these resources. Moreover, there is a need to identify opportunities for finfish fisheries that are yet to be exploited. Improved fisheries data collection will provide information that will help identify opportunities to expand the Traditional Inhabitant fisheries which may include identification of by-product species with commercial value. Importantly, the project also aims to develop capacity within the fishery that promotes co-management of the resources.

Methods

Study area

The TIB sector of the TSFF exists primarily within the North-Eastern region of the Torres Strait (Flood et al., 2012). This region (Figure 1) lies at the northern extremities of the Great Barrier Reef and is characterised by extensive coral reef networks and deeper waters than the largely shallow marine habitats and seagrass beds of the central and western regions of the Torres Strait (Harris, Butler, & Coles, 2008). The majority of catch from this fishery comes from local communities in the vicinity of Mer, Ugar, Masig and Erub islands.

Commercial catch from the TIB sector of the TSFF is typically processed by the community freezers or traded directly by individual fishers. Community freezers on several islands have undergone closure and at the time of this project only the freezer on Erub island was in operation. Consequently our study was based on Erub island, the most active commercial fishing community within the TSFF.

Commercial fishers on Erub island primarily operate on a seasonal basis targeting coral trout species, Barramundi cod and Spanish mackerel. Fishers operate from dories of 6m length or less and target Spanish mackerel from surrounding reefs and sea mounts whereas coral trout, Red emperor Barramundi cod and other reef species are collected from surrounding reefs generally within a 40 km radius (A. J. Williams et al., 2008). The fishery also targets reef species such as tropical snappers, emperors and rock cods but to a lesser degree (A. J. Williams et al., 2008). Catch processed by the freezer is generally recorded on broad spatial scale and records indicate that the fishery operates primarily within AFMA management zone 16.

The remote data collection app ("the application") developed was deployed and data collection commenced on the 1st January 2014 and is ongoing. This report covers data until the 31st October, 2014.

Community engagement and project scoping

The project relied on a high level of ongoing consultation to introduce, develop, refine and test the smart phone remote data collection application. Members of the Erub Island Fisheries Management Authority (EFMA) were directly consulted prior to submission of the project proposal to help guide the proposal. Regional fisheries officers from both AFMA and TSRA helped guide the project from the onset and introduce the project coordinators to members of the local Erub Island community during the initial stages.

Project coordinators visited Erub Island between the 8th to 14th of May 2013 at the start of the project to consult with PBC members and island councillor, members of the TSIRC, EFMA and the local professional fishing community. One on one meetings with individual commercial fishers, local radio announcements and a public meeting (see Appendix A) were used at this time to advise stakeholders of the purpose of our visit and provide an outline of the project. During the initial visit a number of TIB fishing operations targeting coral trout and Spanish mackerel were observed to become familiar with the approach taken to fishing for these species in this region. Observations of the transaction process between fishers and commercial processors using the traditional docket book system were also undertaken to better understand the software requirements for the application.

During consultation, feedback from professional fishers helped develop the application and identify any concerns local community members had regarding the project. The application was originally intended to report fishing effort at a higher spatial resolution than the AFMA fishing blocks (Figure 3). This is because more precise spatial data is needed so that it can be combined with detailed catch and length frequency data to conduct formal stock assessments, which are the most reliable way of estimating the sustainability of the fishery. It was also intended to include economic indicators such as distance travelled and fuel consumption to allow individual fishers to contrast their profit between different fishing strategies.

However, fishers expressed concerns about providing any data beyond that recorded in the existing voluntary logbooks. Feedback indicates that this may be a result of both the protection of an individual's intellectual property (which is common amongst both professional recreational fishing sectors) and a lack of understanding regarding the potential of what the data can be used for (i.e. to sustainably manage the local and regional fisheries and increase profitability for individual fishers and local fishing organisations). As a result, plans to include spatial and economic data capture as part of the application were suspended to ensure community acceptance of the application.

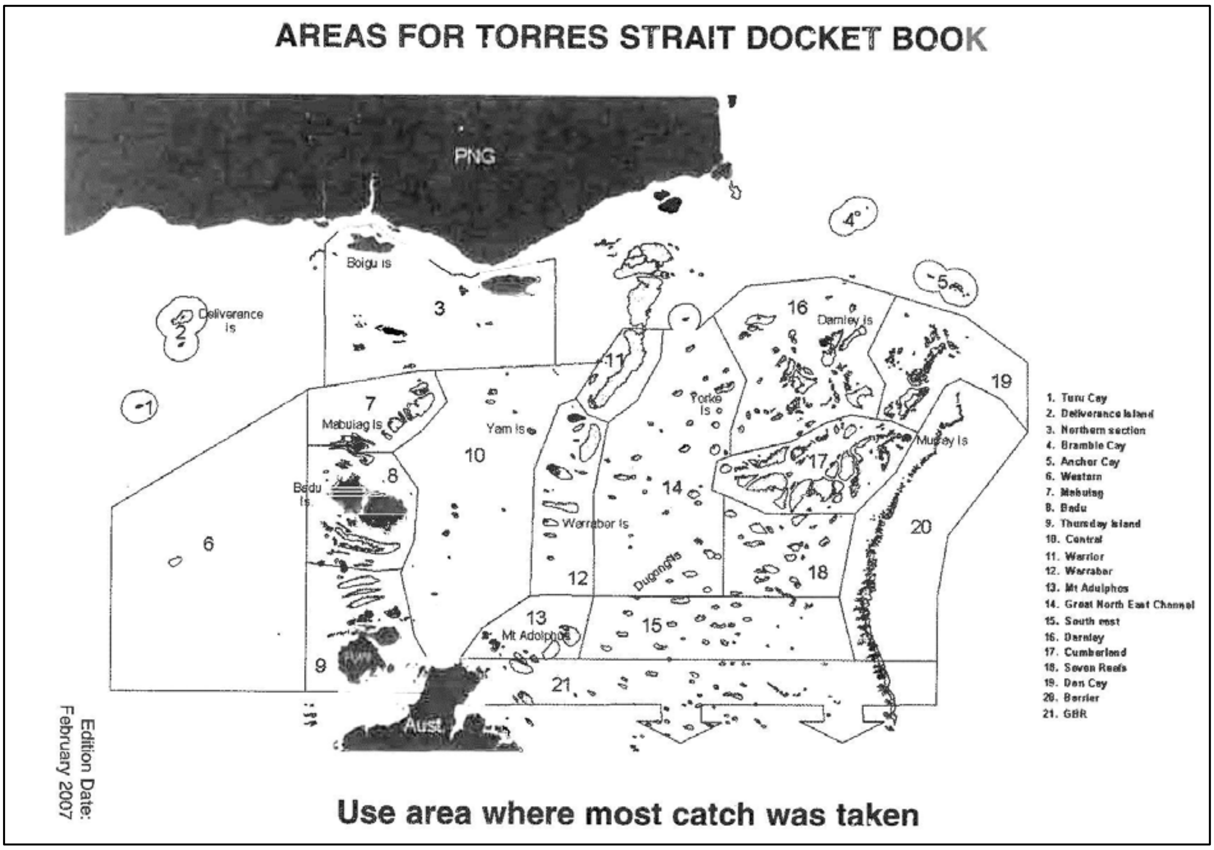


Figure 3 - AFMA reporting areas

Fishers also indicated that inclusion of features such as tide, weather and marine chart data would provide incentive to fishers to trial this type of data collection method as opposed to the application being designed solely as a fisheries management tool. As a result, additional mobile phone applications were provided to accompany the data collection application (Appendix B).

Feedback during consultation indicated support for the project from the local community who desire a role in data collection that ensures the ongoing sustainability of their marine resources and wish to improve their capacity to co-manage their fishery and opportunities for economic development in their communities.

Project participants were recruited in two stages. Four participants of the professional fishing community were nominated by EFMA representatives and recruited between the 26th of February and 4th of March 2014. In each circumstance, participants were approached and consulted using a strict code of ethics outlined within the Participant Consent Form (Appendix C). A second round of recruitment took place between the 4th and 9th of November 2014 during which another four participants were provided with mobile phones or, on one occasion, the mobile phone remote data collection application. In addition, a tablet with the data collection application was provided to the community freezer to capture catch and processing data usually recorded only via the existing docket book system.

During the recruitment process, project participants were trained how to use the app. Extensive training and support were provided to a local project champion. The project champion provided direct ongoing support to other project participants in the absence of project coordinators. Each participant was also provided a user manual which gave basic instruction on how to use both the project application and the additional fishing related applications installed on mobile phones as part of the project (Appendix D).

Participants were contacted on a regular basis (once per month during the active fishing season between March to May 2014 and October 2014 to March 2015) to provide support and encouragement and to seek feedback regarding their use of the application.

Project infrastructure

The remote fisheries data collection application was developed using the Android operating system. This is the most widely used smart phone operating system and in contrast to iPhone, the hardware is cheaper (phones are available from around $100) and thus a potential roll out would be more cost effective.

Mobile phones

Project participants were supplied with a Telstra “Blue tick” rated mobile phones (tested for providing the best coverage in remote and rural areas) and $30 prepaid credit on a monthly basis. The following phone models were supplied to participants:

- Samsung Galaxy Ace + (5 units)
- Samsung Galaxy Ace 3 (2 units)
- Samsung Trend + (2 units)

In addition, a Samsung tablet (Galaxy Note 10.1) was supplied to the community freezer for uploading catch and processing data. This device was updated monthly with $40 prepaid credit.

All devices were connected to Telstra 3G (NextG) and 4G networks which were predicted to provide coverage and data transfer speeds of up to 3Mbps in the vicinity of Erub Island (Figure 4). We discovered during out initial visit that actual mobile phone coverage on Erub was less than reported and inconsistent. As reliable data transfer was essential to properly test the viability of the app, Telstra Mobile Smart Antenna's® (operating on the Telstra's 850MHz Next G network) and high gain (6.5 – 7.5 dBi) YAGI antennas were installed at 2 locations to improve mobile phone reception in these areas (Appendix E). Critically one of these locations was the community freezer, such that any fisher delivering product to the freezer would be in mobile phone range for some period after their fishing trip. During this period the application would transmit any recorded data.

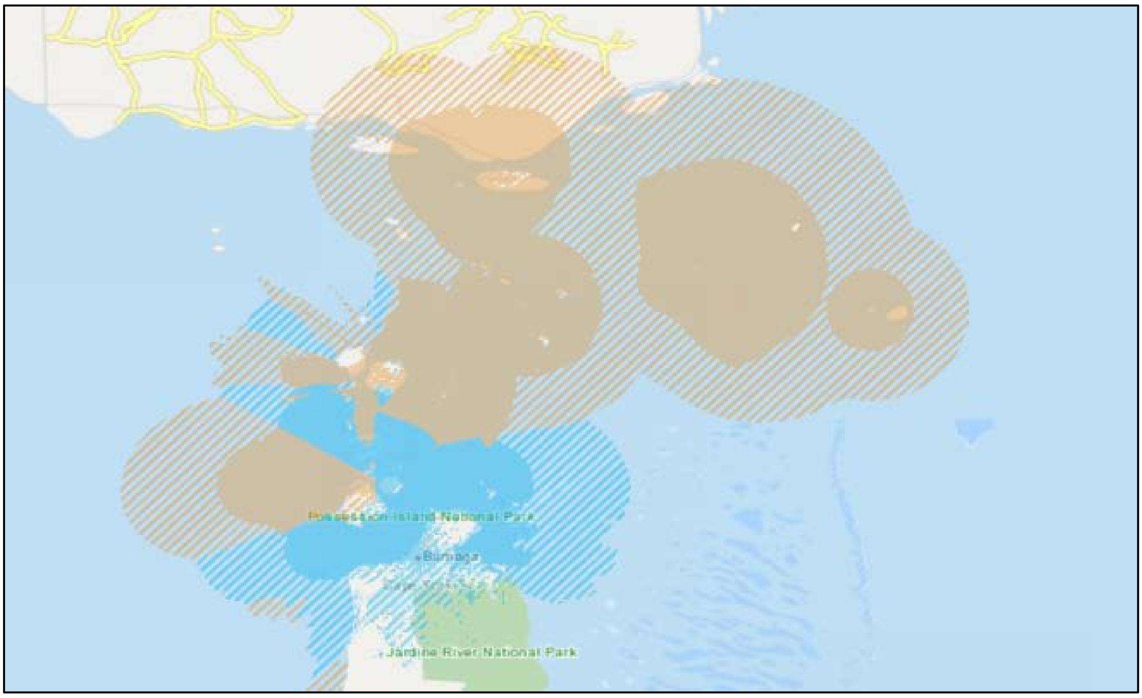


Figure 4 - Telstra coverage map for the Torres Strait (■ = 4G typical download speed 2 to 50 Mbps, ■ = Typical download speed 1.1 to 20 Mbps, ■ = Typical download speed 550 kbps to 8 Mbps, ■ = Typical download speed 550 kbps to 3 Mbps; A diagonal pattern indicates a location where an external antenna may be required).

Database and data types

A comprehensive data base was developed (see Appendix F), which provides a flexible framework for collecting catch and effort data. From the perspective of the system administrator it is possible to customise the data recording system by adding, removing or changing:

- Fishers
- Processors
- Species (allowing specification for hierarchical taxonomic groupings)
- Fishing gear types
- Methods for specifying weight (e.g. gutted weight)

The database also contains table for weather and tide information that was intended to be synchronised to phones, however it was decided that it was lower risk to provide this information through third party applications.

The customisable metadata is then used to allow effort recorded with reference to the available gear types and geographic regions and catch recording with reference to the available species and weight methods.

A separate system for recording users' GPS tracks (at low resolution) was also put in place. This would have provided a high level of spatial effort information. Better quality spatial data would more precisely identify geographic regions that are targeted by TIB fishers. This data can then be combined with detailed catch and length frequency information from fishers and processors to enable formal stock assessments to be undertaken to properly assess the sustainability of the fishery.

It was also proposed that users could record the location of individual catches throughout a fishing day. Individual catch data would allow for better estimations of total catch (including discarded by catch species) thereby allowing improved CPUE analysis. Better CPUE data can help fishers compare fishing locations and catch rates, thereby enabling them to identify effective fishing strategies that can be used to improve economic returns.

Tracking of spatial data was omitted after consultation with the community and the TSSAC indicated a reluctance to share this information.

Application design

The original app concept was simplified substantially to make it easier and faster to use. A day's fishing activity is recorded with a minimum amount of user input (see Appendix D for more details):

- The user presses a button to add a fishing day
- On the next effort entry screen the user specifies the date, the number of people that fished and the gear type
- Then the user adds the species they caught, choosing from a list of common species, and specifying the number and/or weight.

All the input options are completed using large buttons and options so that the interface can still be used in challenging conditions (e.g. the glaring sun).

A separate app was developed for the freezer. This adds an additional step where you select the fisher who delivered the fish on the effort entry screen. The freezer app also has the ability to add fishers to the database and display daily totals for the different species that were caught.

Data transmission

Mobile phones are frequently out of range on Erub. The app was therefore designed to accept information from the user regardless of mobile phone reception range. Upon returning to mobile phone range the app then transmitted the entered data.

The data was transmitted to a secure Django database operated by IMAS. This database was queried directly for the purposes of monitoring usage of the app and analysing data.

The system is designed to allow the rapid transfer of fisheries data to facilitate near real-time monitoring of the TIB commercial fishery and enable managers (be it traditional managers or agencies such as AFMA) to make better informed decisions that protect the long term viability of fish stocks (i.e. spatial closures, changes to nominal Total Allowable Catches etc.).

Results

Application design

Initial consultation with relevant members of the Erub Islands fishing community was facilitated by a TSRA representative and a member of the Torres Strait ranger program. This included an explanation of the details of the project and consultation regarding the needs of the fishing community. This feedback was used to both guide the design of the app and implementation of the trial program. Feedback from the community indicated that some elements within the initial project outline such as real time data entry of catch effort by fishers would not be practical and would possibly hamper the uptake as it would be seen as an imposition. It also became apparent that careful consideration would have to be given to the level of information sharing amongst fishers and management authorities as some fishers expressed concerns about sharing catch locations and other private fishing information. There was however consensus that the ability to monitor catch performance in terms of CPUE would be seen to have high value within the fishery.

Phone records and data entry

A total of eight project participants and the community freezer were recruited during the course of the project (Table 1). Phones (4) and tablets (1) were first distributed to fishers and operators of the community freezer from the 25th February. These participants back entered in data from 1st January 2014 from personal records and the freezer logbook respectively. A further participant joined the project on the 25th May and a further three participants on the 4th of October 2014.

Two phones have been damaged beyond repair to date. Requests have been made to install the app on privately owned phones, this has taken place however no records have been made by these participants.

Table 1 - Record of mobile phone distribution

Date	New phone distributed	Lost/Broken	Replaced
25/2/2014	4	2	1
25/5/2014	1		
4/10/14	3		

Seven of the eight participants recruited to the program have remained active in the fishery for the duration of the project. Three participants have entered their catch data on 37 occasions recording 502kg of fish. Eight of these entries were duplicated in the freezer catch records. Twenty-nine data entries (including cod, coral trout, mixed reef fish, Red emperor, shark, Shark mackerel, Spanish mackerel and one turtle) were recorded on the mobile phone application only, suggesting that fish caught on these occasions were used for purposes other than commercial sale to the community freezer or had not yet been entered into freezer records (the last data entry at the freezer during the sampling period was 8th October, 2014).

Uptake – individual participants

Feedback from participants regarding the design of the application indicates that users understand how the application functions and that the application is easy to use. Despite this, uptake by individual fishers has been low with only two fishers initially entering their catch data using the equipment supplied. This has since increased to three fishers (however, since this sampling period an additional fisher has begun entering catch data).

Three of the four initial project participants were interviewed and asked about their experience in using the phone and application. All participants stated that despite the fact that they had not yet used the application it was not from lack of understanding and that they think data collection is worthwhile both from a personal and industry perspective. They all indicated that they would enter data in the coming months, suggesting that increased support from project coordinators may be necessary to help participants feel more engaged with the project. It is also possible that despite contrary feedback, participants see data entry as unnecessary, a burden or an invasion of privacy or are uncomfortable sharing their data with this technology.

Data entry– Freezer

Catch and payment data for all processed fish is currently recorded using a written record at the freezer. This data was also entered into the freezer app which transmitted the data back to the central database in near real time.

Catch data (225 catch data entries detailing 176 individual fishing trips) was entered on a consistent basis between January 1 and October 31, 2014 at the community freezer using the mobile data processing application installed on the freezer tablet.

An independent audit of this data revealed 1 data discrepancy between 1st January 2014 and 8th November 2014. This amounted to a 3% rate of user error during this period. The discrepancy showed up as a catch and payment entry in the AFMA registered docket which was not entered into the freezer based app. This represents a high level of accuracy when compared to other large commercial fisheries where human data entry of catch and effort dockets typically has similar error rates.

Fishing effort

Commercial fishing data captured by the commercial freezer application indicates that effort in the fishery is highly sporadic, varying between 0 and 8 fishers per day (and 0 and 17 fishers per week) and seasonal (Figure 5; Figure 6; Figure 7). Total catch (Kg) is correlated closely with fishing effort (number of days fished per month). Between 1st January and 31st October, 2014 fishing effort (number of calendar days fished) was recorded for 88 of 325 days, or 27% of all available days during this period (Figure 5). The highest level of fishing effort recorded was 8 fishers on a single day and 17 fishers during a single week which occurred once and twice during this period, respectively (Figure 6). The average number of fishers per day fished was 1.9 fishers per fishing day however on 52.3 % of all these occasions only 1 fisher was recorded per day (Figure 7).

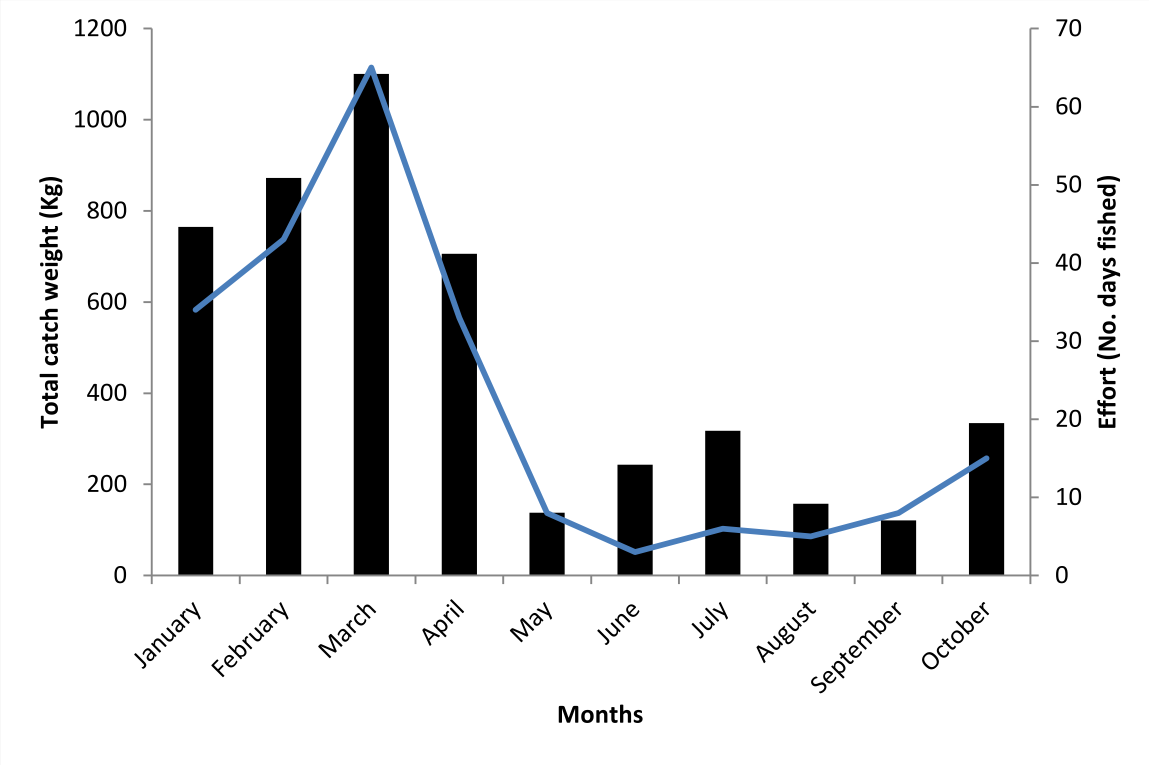


Figure 5 - Monthly total catch (Kg) is indicated by the bars and the effort (number of days fished by commercial fishers per month) between 1st January and 31st October 2014 is indicated by the lines.

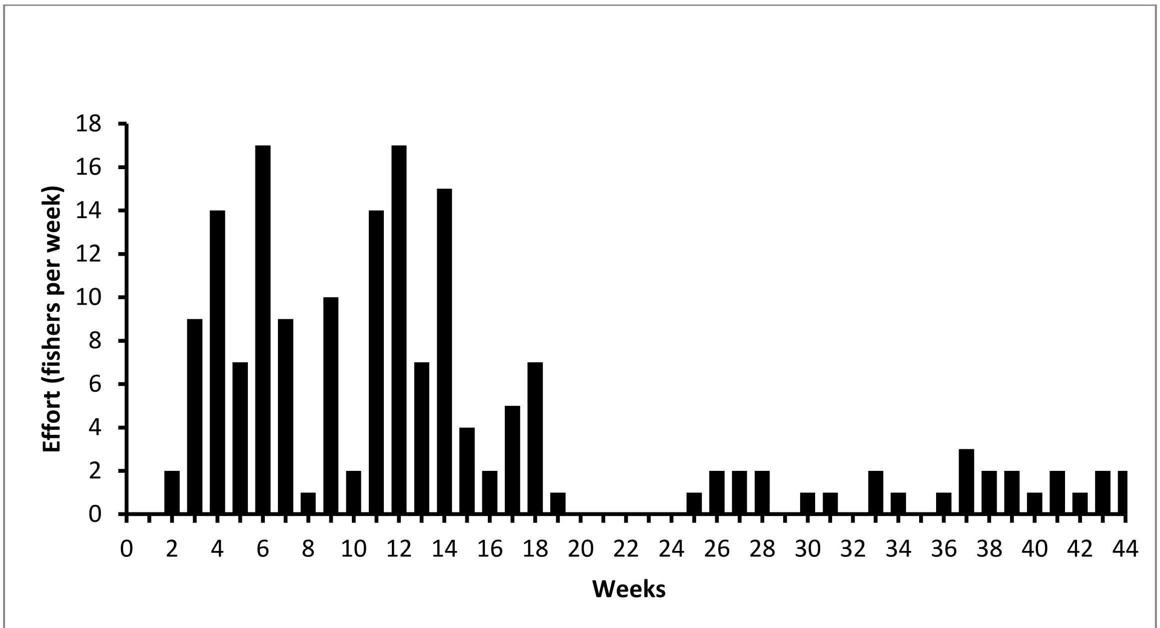


Figure 6 - Number of commercial fishers processing catch at the commercial freezer per week between the 1st January and the 31st October, 2014.

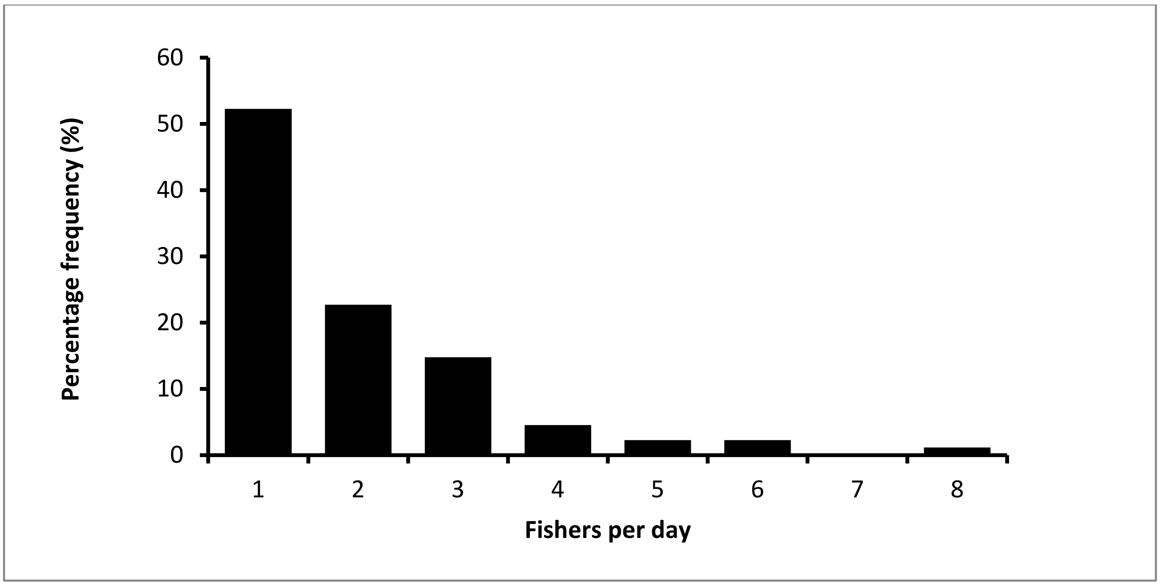


Figure 7 - Percentage frequency (%) of the reported number of fishers (at the community freezer) per fishing day.

Notably, fishing effort varied markedly amongst individual fishers with the top 2 ranked fishers processing catch 13 times as often as the lowest 3 ranked fishers (Figure 8.). Despite this, the top ranked fisher only recorded catch on 26 out of a possible 325 days during the sampling period. As would be expected, fishers who processed catch through the community freezer also contributed the largest quantities of catch per individual fisher with 60.1% of total catch (Kg) for the sampling period being attributed to the top 6 ranked fishers (Figure 9).

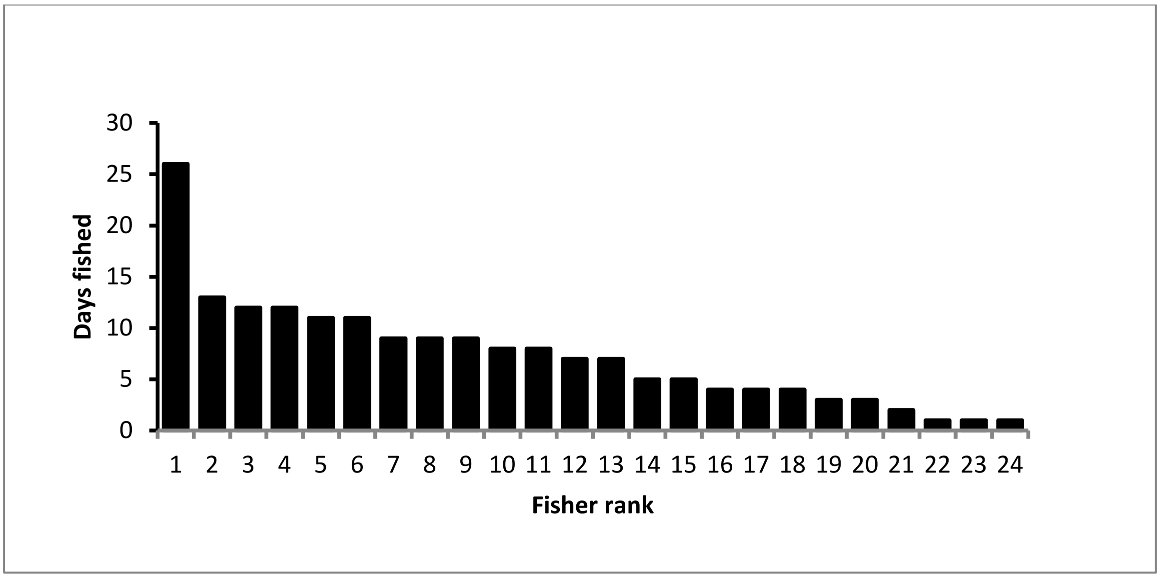


Figure 8 - Fisher rankings according to number of days fished (including those where catch was recorded for personal use) between 1st January and 31st October, 2014.

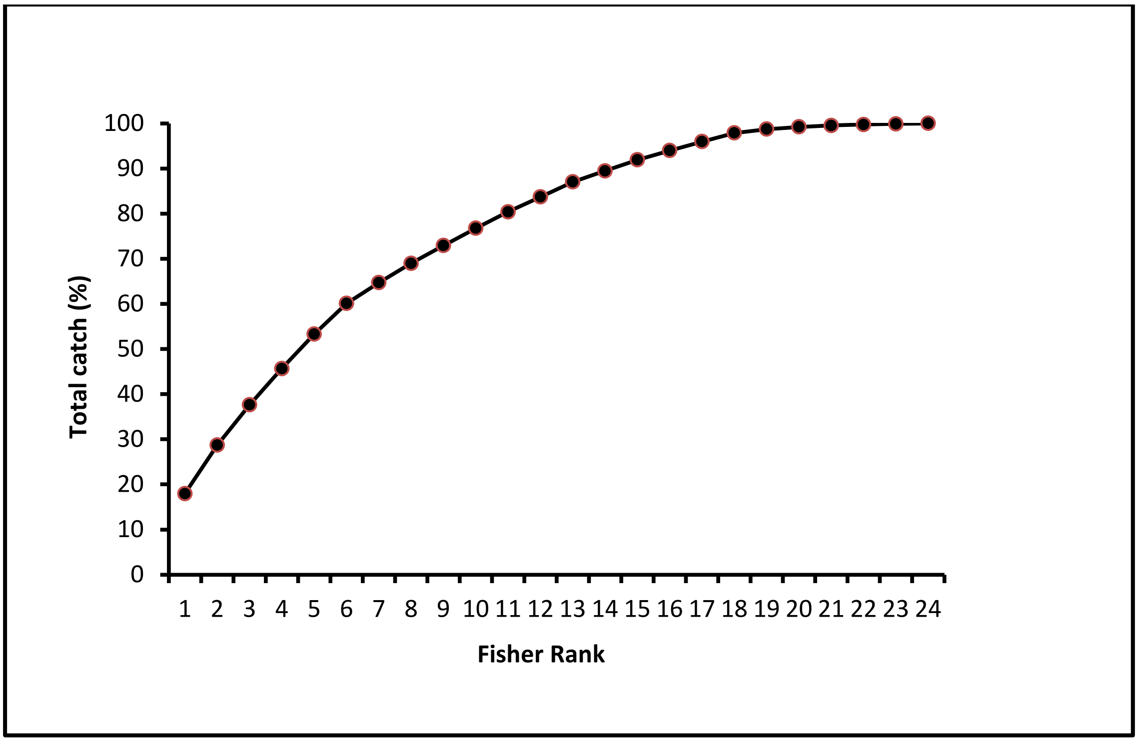


Figure 9 – Percentage contribution per fisher to total catch (Kg) recorded at the community freezer between 1st January and 31st October, 2014.

The fishery was effectively closed during the middle of the year with no fishing effort recorded for a period of 47 days between May 8 and June 23, 2014. The majority of fishing effort (77.6% of all days fished) was recorded in the first half of the year prior to May 8. As a result, the community freezer was closed for a period as of the 23rd of May, 2014 in correspondence with the onset of strong, persistent south-easterly trade winds during late autumn, winter and early summer months which make fishing in small vessels difficult.

Catch composition

Catch data was entered for 5 of the 14 species categories available via the application. These 14 catch categories were programmed for the most commonly caught species for this fishery as nominated by commercial fishers and AFMA prior to the application design (Table 2).

Table 2 - Remote data collection application catch categories.

Common name	**Scientific name**	**Islander name**	**Catch category**
Barramundi Cod	*Cromileptes altivells*		Barramundi Cod
Cobia	*Rachycentron canadum*		Cobia
Cod	*Serranidae* family excluding Barramundi cod and coral trouts		Cod
Spanish Mackerel	*Scomberomorus commerson*	Dabor	Spanish Mackerel
Dugong	*Dugong dugon*	Deger	Dugong
Red Emperor	*Lutjanus sebae*	Manam lar	Red Emperor
Mixed reef fish			Mixed reef

(trevally, wrasse etc.)			
Turtle	*Chelonia mydas*	Nam	Turtle
Coral trout	*Plectropomus* spp. and *Variola* spp.	Pakor	Coral trout
Shark	*Charchaarinus* spp. and *Trianenodon obesus*		Shark
Shark mackeral	*Grammatorcynus bicarinatus*		Shark mackeral
Small mouth nannygai	*Lutjanus erythropterus*		Small mouth nannygai
Tropical Rock Lobster	*Panulirus ornatus*		Tropical Rock Lobster

Catch was recorded using a total weight per species rather than the number of fish processed (although this option exists within the application). A total catch of 4755.4 Kg was recorded during the sampling period, which included catch not processed at the commercial freezer. Coral trout accounted for the majority of catch by weight, contributing 3219.7 Kg or 67.8% of all catch recorded at the community freezer (Figure 10; Table 1). Spanish mackerel was also commonly caught accounting for 740 Kg and 15.6% of all fish product processed. Catch per month for Spanish mackerel peaked at 243 and 173 Kg in June and July, respectively.

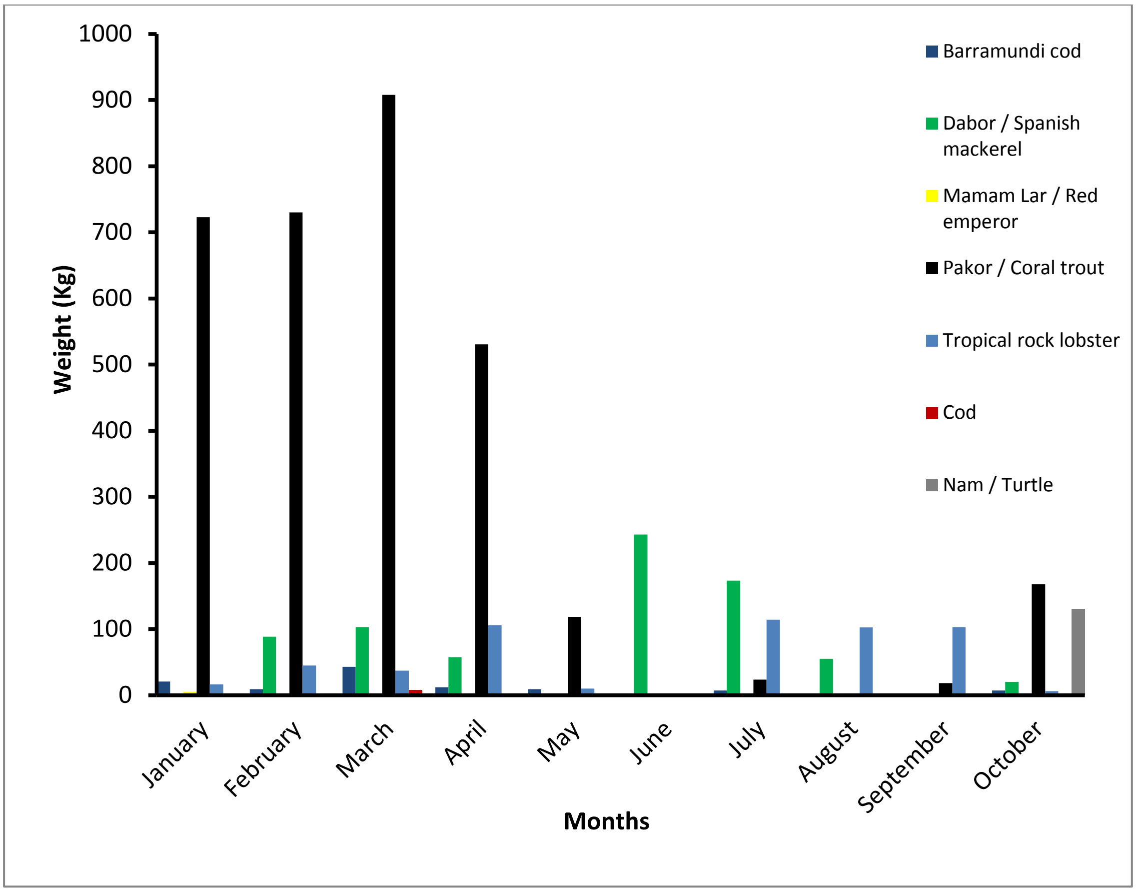


Figure 10 – Total monthly catch (Kg) per species category.

Table 3 - Monthly total catch (Kg)

Month	Barramundi cod	Spanish mackeral	Red emperor	Coral trout	Tropical rock lobster	Cod	Turtle	Monthly total
January	20.8		5	722.9	16.5			765.2
February	9	88.5		729.9	45			872.4
March	42.7	103	2	908	37.2	8		1100.9.
April	11.7	57.5		530.6	106.1			705.9
May	9			118.7	10			137.7
June		243						243
July	7.2	173		23.5	114			317.7
August		55			102.5			157.5
September				18	103			121
October	7	20		168.1	6		130	334.1
% contribution	**2.3**	**15.6**	**0.2**	**67.7**	**11.4**	**0.1**	**2.7**	
Total catch (Kg)	**107.4**	**740**	**10**	**3219.7**	**540.3**	**8**	**130**	**4755.4**

Catch per unit effort (CPUE)

Catch per unit effort data (CPUE) is a formal measure of the catch rate which has been recorded here as kg per fishing day for an individual. CPUE data is widely used in fisheries as an indication of the status of a stock. If CPUE decreases over time this may suggest that the abundance is decreasing, similarly increases in CPUE indicated increasing abundance. However many factors unrelated to abundance such as the fisher's skill, weather and seasons can influence CPUE and need to be taken into consideration when making inferences about the stock status.

In this case the fishery (and data entry) is sporadic in nature, there are a diverse range of participants and data collection occurred only over a one year period. Consequently from this initial dataset it is not possible to determine whether changes in catch per unit effort (CPUE) are due to changes in biomass or factors such as changes in fishers or seasons. The CPUE data presented in Table 4 and Figure 11 is purely to give an indication of typical catch rates during the study.

Table 4 – Catch per unit effort (Kg per day fished) for major species caught between January 12 and December 3 2014.

	Coral Trout			Spanish mackerel			Tropical rock lobster		
Season	**Total Weight (Kg)**	**Number of fishing days (n)**	**CPUE (Kg^{-1} fishing day)**	**Total Weight (Kg)**	**Number of fishing days (n)**	**CPUE (Kg^{-1} fishin g day)**	**Total Weight (Kg)**	**Number of fishing days (n)**	**CPUE (Kg^{-1} fishing day)**
Summer	1524	59	25.83	194.2	6	32.37	61.5	8	7.69
Autumn	1534.2	55	27.9	160.5	11	14.59	153.3	17	9.02
Winter	23.5	1	23.5	471	6	78.5	216.5	6	36.08
Spring	223	12	18.58	139	5	27.8	109	7	15.57

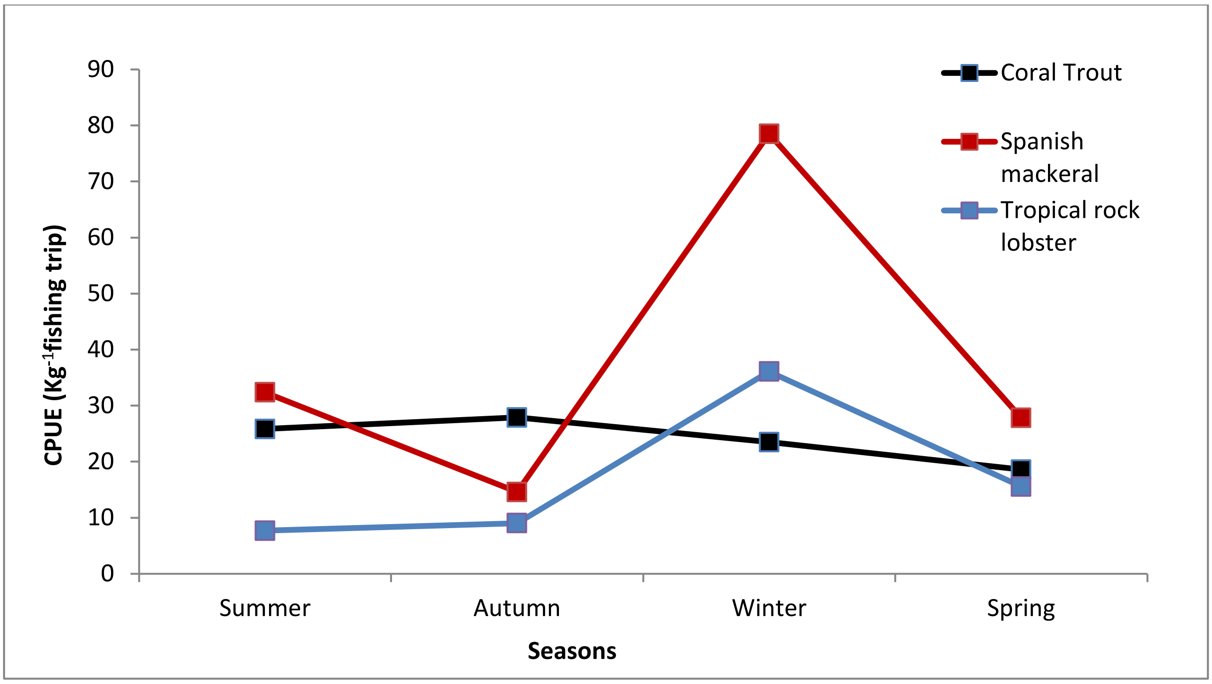


Figure 11 – CPUE for major species by season between January 12 and December 3 2014.

Discussion

Use of the remote data collection application has resulted in an unprecedented reporting rate of fisheries data from the community freezer on Erub Island, both in terms of the volume of data and timeliness. Only a single record was omitted during the period covered by this report. The application has the potential to replace the existing seafood buyers and processors docket book (TBB01) used in community freezers, thereby providing a regular and reliable source of data. However as of writing Erub is the only island with an operational freezer.

Prior to the introduction of the docket book system, catch data from the TIB sector of the TSFF was collected from freezer pay books, sales dockets and other disparate sources of information that were first examined by researchers in 2004 (G. A. Begg & Murchie, 2004). The types of data collected in that study lacked sufficient detail to conduct accurate estimates of catch and effort for the fishery and its targeted species (A. J. Williams et al., 2008). There has been a vast improvement in the level and detail of fisheries data collection from community freezers since the introduction of the docket book system in 2004. Despite these improvements, data transferred from docket books used to assess fisheries is done so sporadically and data may not be returned to AFMA for several years. If the community freezer system and fishing effort expands again to levels equivalent to or greater than those recorded prior to 2008 (AFMA, 2012), collation of fisheries data from docket books may also be expensive and onerous.

The successful adoption and use of the app at the community freezer can largely be attributed to the ease of use of the application (according to the operator), as repetitive data entry such as fisher details, licence numbers etc. are stored and automated so that these details only have to be entered once. The incorporation of an accounting system that could be used to record and print financial records to traders and council payment systems to eliminate duplication of paperwork and capture detailed price point data may be a valuable addition to possible future versions of the application software. This would allow for better financial management and reporting systems to be implemented that could be used to help improve economic returns for fishers and facilitate further recruitment of individuals to the commercial fishery via the development of attractive and rigorous business cases.

Despite stating that the app was easy to use only three of the eight recruited fishers recorded personal fishing data. There are several contributing factors. Firstly there was a high drop-out rate with fishers relocating, ceasing fishing or reporting damaged equipment. Secondly, commercial fishing activity has been sporadic and the coral trout fishery was closed for extended periods. The two most active fishers have recorded catch on 26 and 13 occasions in total since the trial was initiated, respectively. The next two highest ranked fishers recorded 12 days of fishing effort during the same period. Analysis of catch records from the community freezer indicates that the fishery is characterised by a large number of fishers that catch relatively small quantities, which complicates any attempt to engage the fishers in individual data recording.

Establishing regular contact with project participants has been challenging. Due to the lack of existing infrastructure, telecommunications are severely limited on much of on Erub Island and reaching participants via phone or email is difficult. The most reliable contact is with the local freezer manager and project champion, partly due the mobile phone coverage this project created at the community freezer and partly due to the establishment of a good working relationship. Facilitating the establishment of a local project champion has been essential to encourage acceptance of the app and develop a better understanding regarding the level of activity occurring within the fishery and activity of individual fishers. Contact with participants by phone or preferably in person has been critical for providing technical support, understanding their concerns/issues and encouraging use of the app.

Despite the lack of uptake with the app, many of the fishers have reported that they are actively using the other applications installed on their mobile phones as a part of the project. In particular, the inclusion of detailed marine charts to aid navigation has been met with strong approval and was a part of what was suggested would aid uptake during our initial consultation with the island commercial fishing community. Consultation and the inclusion of feedback to help develop the project has enhanced goodwill amongst the commercial fishing and wider community of Erub island. However like many other initiatives depending on voluntary reporting, ongoing usage by participants in the absence of a clear personal incentive is likely to be low.

The most cost effective opportunity for data collection is at the freezer where a large proportion of the product is processed. However this depends on the ongoing usage of the freezer by key fishers and on many other islands is not applicable. Another potential opportunity would be voluntary reporting to the quarantine officer at the time of quarantine approval. This has the potential to capture a large proportion of the catch, however effort data is less likely to be accurate.

Possible future data collection approaches

Recording at bottle-necks

The application deployed at the community freezer has provided data with high accuracy and completeness, furthermore 91.2% of the catch by weight was processed through the freezer. This highlights the potential for recording a large proportion of the total catch with a single application. However, a motivated freezer manager is required as the app is voluntarily and additional to the existing paperwork.

An existing paper based logbook system is integral for facilitating payment of fishers by the council office. If this paper based logbook were permanently replaced by a computer application this would consequently guarantee that any fish processed and paid for by the freezer would be recorded digitally and transmitted to AFMA with minimal delay.

At the time of writing, Erub had the only operational community freezer, hence this approach would require the identification of alternative bottle-necks on other islands.

Individual Fisher Application

During the study 8.8% of the catch (by weight) reported by fishers was not processed by the freezer. This data can only be captured through individual catch reporting. The nature of the fishery is that small quantities of catch are taken by a large number of fishers. Consequently the app would need to be widely distributed to cover an adequate proportion of fishers. Our analysis suggests that on Erub the top fourteen fishers would need to be included to obtain 90% of the catch processed by the freezer. Given the associated difficulties it seems that such a goal is unlikely to be achievable within realistic resource constraints. Reasonable uptake is likely to require the ongoing support from a local resident.

The following factors have been reported by users to influence participation and the reporting rates of individual fishers and would be essential considerations in any further development of the app:

1. Relationships –It was frequently stated in conversation that trusting relationships between communities and outside groups are generally only built over time and that programs/projects which are administered with limited consultation are likely to meet with resistance from local communities. This could be addressed by having a local representative in each community to help and encourage users.
2. Familiarity – Many fishers on Erub have not adopted technology frequently used by commercial fishers and some fishers were unfamiliar with smart phones and tablets. They were also unfamiliar with the way data is used in fisheries and the potential benefits. This was reported as effecting uptake of the app during this project. This can be mitigated by a user friendly interface, instructional material and a local support person in each community.
3. Functionality –The additional fishing related applications supplied to increase uptake of the app were reported to be especially popular and frequently used. Incentive to use the app could be increased by developing additional functionality of use to individual users – for example tools to analyse their individual data and help inform decision making. High resolution spatial effort data would be required to provide this functionality.
4. Reporting – The regular reporting of meaningful results is important to local fishers. An effective method of data delivery that allows the commercial fishing community to analyse their own catch data as well as understanding how their data is being used is essential.

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Appendices

Appendix A – Community Noticeboard Flyer

IMPROVING FISHING DATA COLLECTION AND CO-MANAGEMENT OPTIONS FOR ERUB ISLAND FISHERIES

INFORMATION SESSION

The Institute of Marine Studies (IMAS) of the University of Tasmania have been given funding to develop and trial a new smart phone application to help the local professional fishing community collect important fishing data.

The project will benefit the community by:

- **Increasing the islands ability to manage its own fishing resources**
- **Assisting fishers to more effectively target catch (by accurately assessing seasonal fishing trends including the effort and costs of catching fish, fish behaviour etc.)**
- **Helping to identify opportunities for economic development**
- **Increasing local skills and knowledge in fisheries science and management**
- **Monitoring the effects of climate change and detecting the effects of fishing pressure and species behaviour on local fish populations**

To ensure that the project provides maximum benefit to the community, a public meeting to discuss the project and gather local input will be held:

DATE – 9th MAY, 2014

TIME – 3 PM

LOCATION – Community space next to IBIS

Klaas Hartmann
Senior Research Fellow | Institute for Marine and Antarctic Studies
Email: Klaas.Hartmann@utas.edu.au
Tel: +61 3 6226 2999 | Mob: +61 418 227 647

Appendix B – List of additional mobile phone applications provided to participants

Application	Description
Fishing and Hunting Solunar Time PRO	Forecasting tool used to predict optimal fishing times
Fishing Knots Lite	Visual guide for tying fishing knots
My Fishing Mate Pro	Guide to fish species (includes biological, habitat, identification information etc.)
Navionics	Navigational charts and tools for the Torres Strait and beyond

Appendix C – Participant Consent Form

Private Bag 49 Hobart
Tasmania 7001 Australia
Phone + 61 3 6227 7277
www.imas.org.au

IMAS INSTITUTE FOR MARINE AND ANTARCTIC STUDIES

UTAS

Draft Protocol for Engagement 1_04-10-13

Smart phone technology for remote data collection in Torres Strait Traditional Inhabitant finfish fisheries

This draft protocol has been designed to define what will be discussed with potential project participants when gaining consent for their voluntary inclusion. It relates directly to the checklist outlined within the participant consent form for AFMA funded research project RR2012/0809: Smart phone technology for remote data collection in Torres Strait Traditional Inhabitant finfish fisheries.

Project co-ordinators will follow the following protocol when engaging potential participants to request their involvement in the project:

1. Consent from the participant to take part in the research study will be sought only after all points contained within the draft protocol have been discussed.
2. When discussing the nature and possible effects of the study with the participant project co-ordinators will focus on the following points:
   - The study has been designed to pilot an improved method of collecting commercial fishing catch data
   - Using this method, catch data will be recorded using an application developed for mobile phones
   - The program will be developed in consultation with project participants
   - Sensitive personal information will be protected by
3. Explained to the participant that the study involves recording the following details of commercial fishing expeditions -
   - the name of the fisher,
   - the number of fishers on board,
   - the time, duration and location (within a Torres Strait AFMA designated fishing grid) of fishing activity
   - the species and number of fish caught, and
   - limited commercial processing information
4. Explained that participation involves recording details of commercial fishing activity therefore potentially revealing sensitive fishing information such as location of fishing spots and any illegal fishing activity pertaining to closed fishing areas. These risks will be mitigated by reducing the accuracy of GPS data so that a fishers location will be limited to presence within regional AFMA fishing grid boundaries only and de-

identifying a fishers details for any reporting (as per Section 14 of the *Privacy Act 1988*).

5. Explained that all research data will be securely stored on the University of Tasmania's premises for five years from the publication of the study results, and will then be destroyed unless the participant gives permission for their data to be archived.

   The participant agrees to have my study data archived.

   Yes ☐ No ☐

6. Enquired that any questions that have asked have been answered to the participant's satisfaction.

8. Explained that the researcher(s) will maintain confidentiality and that any information the participant has supplied to the researcher(s) will be used only for the purposes of the research.

9. Explained that the results of the study will be published so that the participant cannot be identified as a participant.

10. Explained that the participant's participation is voluntary and that they may withdraw at any time without any effect.

    If the participant wish's, they may request that any data they supply will be withdrawn from the research until 1st of December, 2014.

Participant's name: ____

Participant's signature: ____

Date: ______________________

Statement by Investigator

☐ I have explained the project and the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation.

If the Investigator has not had an opportunity to talk to participants prior to them participating, the following must be ticked.

☐ The participant has received the Information Sheet where my details have been provided so participants have had the opportunity to contact me prior to consenting to participate in this project.

Investigator's name: ____

Private Bag 49 Hobart
Tasmania 7001 Australia
Phone + 61 3 6227 7277
www.imas.org.au

INSTITUTE FOR MARINE AND ANTARCTIC STUDIES

UTAS

Draft Protocol for Engagement 1_04-10-13

Investigator's signature: ____

Date: ____________________

NOTE: For any technical support or other enquiries contact Klaas Hartmann (phone 03 6227 7279 or email Klaas.hartmann@utas.edu.au) or Dan French (phone 0400 759 245 or email dan@frenchenviro.com).

Appendix D – User Manual

BIG1LOG USER GUIDE

Thanks!...for agreeing to take part in the pilot program for the Big1Log catch logger. Big1Log has been designed to make it easy for you record for personal use and to send catch report data to AFMA to help manage regional fish stocks. Accurate catch records can help you become more efficient when fishing by helping you understand when you are catching the most fish, what you are catching the most of, where your best fishing spots are and more.

If there are questions about your fishing that you want to know more about in particular let us know and we will do our best to help you find the answer.

As well as including the Big1Log catch logger on your phone we have installed additional fishing related apps (programs) to make your phone fun and more useful. These apps include:

- **Navionics** (a GPS and local set of detailed marine charts) to help with navigation, setting waypoints (which are only stored on the phone and not sent to us or AFMA), tide times and basic weather information
- **Fishing and Hunting Solunar Time** which predicts the estimated best times for fishing (although we can't guarantee that!),
- **My Fishing Mate Pro** which includes pictures and descriptions of local species and information on identification, life cycle etc., and
- **My Pre-Paid** which will tell you how much call and internet credit you have left for the month

The phones will be updated monthly (around the 25th of each month) using a $30 prepaid account which gives you $250 of calls and 500MB of data download. You are welcome to use this how you like however if you run out of credit you will have to pay for more yourself. Basically, the phones are yours to use how you like.

IMPORTANT -

To help us test and improve the Bog1Log app we ask that you please:

- Enter catch data every time you go fishing
- Only enter your own catch data, and
- Protect your fishing information and credit by using the passcode feature for your phone

NOTE: If you have trouble with your phone you can call Dan (0400 759 245) or Klaas (0418227647) or send us an email (danjwfrench@gmail.com or klaas.hartmann@utas.edu.au) and we will do our best to help you out. You can also send us a text message and include a photo, voice message or video of your problem.

Some Basic Phone Tips

To return to your last page you visited when using any program tap the hidden return arrow on the lower right of your screen which remains hidden until you tap it (it then lights up, we will call this button the "Return" button from now on).

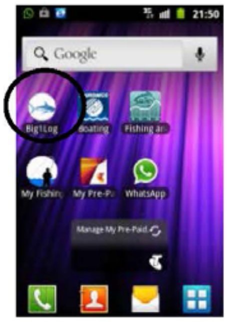
Alternatively, press the large central black button at the bottom of your phone (Home) which will return you to the main start up page.

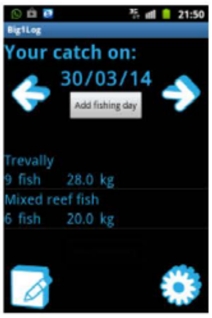
"Return" and "Home" buttons

Every phone has a help program which tells you how to use your phone. Look under settings (find this button) to access this service.

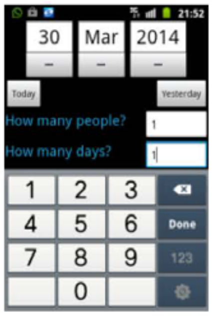
How to use Big1Log

- Tap on the Big1Log app button to switch it on





- Your last catch entry details are displayed
- Tap the large arrow at the top of the screen to view catch data you have entered on days before or after the date shown at the top of the screen. If your catch deatils don't fit completely on the screen place your finger on the list and swipe up to view all entries.
- If you want to add or change catch entries for the date displayed tap the symbol to the bottom left of your screen which looks like a pad and pencil.
- To add a new date for your catch data tap the "Add fishing day" button (at the top of the screen)



<u>NEXT</u>

- Select the correct date by pressing the "+" and "-" signs
    - Enter the number of people who fished and number of days you were fishing (optional) and press "Done"
    - Select the fishing method and tap "Next" to begin entering catch information
    - You then enter a screen with the date you selected and the title "Enter catch for" (see next page)

- To start entering catch information tap the "+" sign, then:
    - Tap the name of the species you caught
    - Use the "+" and "-" signs to enter the number and weight of your catch (or just number or just weight only)
    - Tap the drop down menu (box with arrow) to describe the way your catch has been processed (i.e. enter "whole" if you have weighed your Coral Trout whole and unprocessed)
    - When finished tap the "√" symbol at the bottom of the page

- If you have made a mistake you can change the number or weight of fish by tapping the "pencil" next to a species or you can tap the "rubbish bin" to delete your entry all together

- When you are finished tap the "√" symbol at the bottom of the page to go back to the main screen

- When you are finished entering catch data press the large black central button on the phone to exit the app….EASY!

How to use Navionics

- Tap on the "Navionics" app button to switch it on
- Tap "I Agree" button to access map page (this may take up to 30 seconds)
- To centre the map on your current location tap the arrow in the blue circle in the lower left corner of the screen
- Zoom in or out by moving 2 fingers in or out whilst touching the screen

- To mark a waypoint or find out how far it is, or the bearing to a location :
  - Centre the map over where you want to go tap the centre of the screen, the cross hair appears.
  - Centre this over your location of interest and tap the small question mark symbol on the right hand side of the cross hair to bring up a menu page.
  - Mark the location by tapping "Add to favorites". Enter the name of your waypoint in the text box by tapping the text box, then press the return button to hide the keypad and then press "Add"

  - Find out how far it is from your present location to the location you have highlighted by tapping "Distance from GPS" (which can be found the same way as marking a waypoint above). Move the location of the mark by placing your finger on the blue drop pin and drag it across the map to where you want to go. The bearing and distance change accordingly. Clear the track by tapping the blue symbol on the lower right of your screen.

- To access information about weather and tides for your location:
  - Tap the “Menu” button on the map page
  - Tap the “Weather and Tides” button (in menu)
  - Tap on the “Tides” or “Wind” button to get a more detailed forecast
- There are more features that you can explore such as creating routes, tracking paths and taking photos which will be tagged with the location it was taken. You can learn more about these features by going into the “Help” section (to find it scroll down the page) in the “Menu” page.

REMEMBER, IF YOU WANT TO LEAVE ANY SECTION OF A PAGE PRESS THE RETURN BUTTON ON THE LOWER RIGHT HAND OF YOUR PHONE (NEXT TO THE LARGE BLACK PUSH BUTTON CENTRE BOTTOM OF PHONE) WHICH WILL RETURN YOU TO YOUR PHONES HOME SCREEN

How to use Fishing and Hunting Solunar Time

- Tap on the app button to switch it on
- Tap "Forecast" button to access a single days predictions

- The screen shows you "Major" and "Minor" periods in the highlighted orange box.
    - A "Major" period indicates times predicted as having the greatest fish activity
    - A "Minor" period are also times of predicted increased fish activity but less so than a "Major" periods

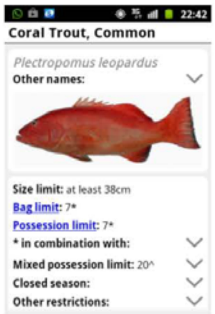
- To view the forecast for a whole month tap the "Calender" button. Months with more stars = days with better predicted fishing times. Click on a day for the best predicted fishing times
- The app also has weather predictions (from the home page) and the ability to change locations (Places) for forecasts of fishing times. Access these options by tapping on which ever option you want. To move locations for predictions put your finger on the Google map and drag it to the location you want.
- If you get stuck press the "i" button (inside the circle) at the top of the screen which will lead you to the help page or contact Dan or Klaas

How to use My Fishing Mate Pro

- Tap on the app button to switch it on
- Select your state (Queensland) by tapping the arrow on the right of your screen which is accessed from the "Select your state" button
- Tap the "Saltwater fish" or "Saltwater invertebrates" button to start looking for different species by name or picture. Scroll down the list by putting your finger on the screen and sweeping it up or down

- Tap the species you want more information on and scroll down the page using the same method as above

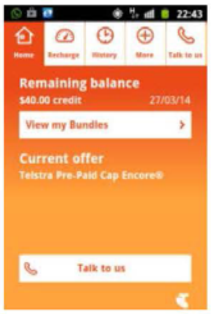
- Tap any arrows on the right of the screen to find out more information about that topic (i.e. tap on the "Distribution" drop down arrow to find out where the species lives or "Identification" to learn how to distinguish one species from another
- EASY!



How to check your remaining credit

- Tap on the "My Pre-Paid Telstra" app button to switch it on
- The page will display your remaining balance. Press "View my Bundles" button to see the details of your plan
- Your phone will be topped up with $30 credit each month. You can recharge your phone between these times with your own credit if you run out.

NOTE: We renew your credit to help you input fishing data. If you fail to consistently enter catch data please let us know why.



Other phone features

There are a large number of other things you can do with your phone such as:

- Take photos and videos
- Send emails
- Use the internet (you require reception to do so)
- Plan events in a calendar
- Use a calculator
- Store and play music (you need to transfer music files from your computer or download them from the internet to your phone)
- Access Facebook etc.

The best way to learn how to do many of these things is to simply experiment with your phone.

If you get stuck we have included a link to a complete user guide and instructional videos for your phone which can be accessed via the "Galaxy Ace" tab . If you have another model look for phone operation instructions under the help menu in "Settings" or for a user manual in the apps section.

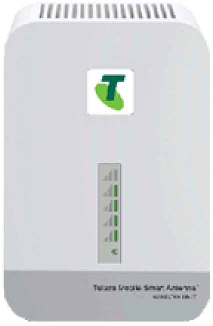
There are literally thousands of helpful apps and programs that you can download to make your phone more useful. Go to the Playstore app to explore whats there.

IF YOU ARE HAVING TROUBLE....

1. Turn your phone off, restart it and see if the problem still exists
2. Get in contact with Dan or Klaas. We have entered out phone number and email address in the contact section of your phone (the button 2nd to the left on the bottom of your Home page next to the telephone button)
3. Look at the instructions for the phone using the "Galaxy Ace" tab which is on the 2nd screen of your Home page (scroll to get to this from the opening Home page).
4. Use Google to search for the answer to your problem

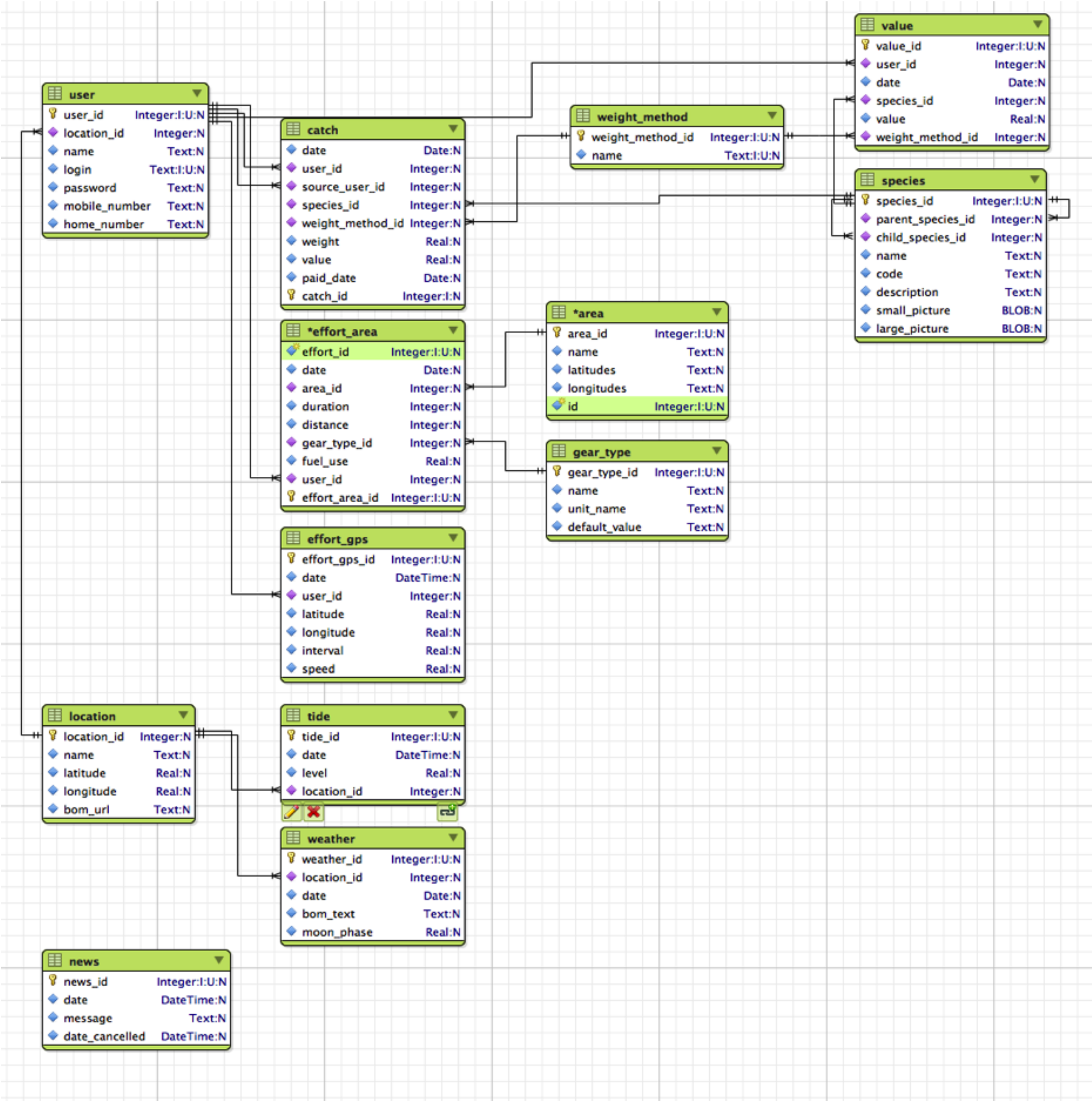
THANKS AGAIN AND PLEASE DON'T HESITATE TO GET IN TOUCH IF YOU ARE HAVING ANY ISSUES

Appendix E –Mobile Signal Boosting Infrastructure



Appendix F: Database Schema

A comprehensive database schema matching the original software specification was developed (see schematic). As a result of



TORRES STRAIT FINFISH WORKING GROUP	Meeting 2016.1 12-13 July 2016
RESEARCH **Future research priorities**	**Agenda Item No. 4.4** **For discussion and advice**

RECOMMENDATIONS

That the Working Group **discuss** and **provide advice** on future research priorities for the Finfish Fishery.

KEY ISSUES

1. Each year the Torres Strait Scientific Advisory Committee (TSSAC) makes a public call for funding applications to conduct research to support fisheries management decisions. The call for research identifies research priorities to be addressed. AFMA seeks advice from the PZJA fishery consultative forums on fishery specific research priorities.

2. Advice is sought from the Working Group on research priorities for the Finfish Fishery in both the short and medium term.

3. Attached for comment and guidance is the current TSSAC Operational Plan for Torres Strait Fisheries (Attachment 1). This plan has been used to guide research applications. The TSSAC however are moving towards making more targeted calls for research by identifying specific project scopes. Project scopes released last year are at Attachment 2.

4. There is one research application relevant to the Finfish Fishery under current consideration and one in progress.

    a. Application under consideration: Development of a Harvest Strategy. Developing a Finfish Fishery harvest strategy was identified as a high management priority. Further discussion on the application and development of the harvest strategy will be held under Agenda Item 5.1;and

    b. Research project in progress: *Defining the status of Torres Strait Spanish mackerel to inform future fisheries allocation and sustainable fishing* (discussed under Agenda item 4.2).

5. Previous research projects by Begg *et al* 2006 and Williams *et al* 2007 (listed below) and the recent work to revise the 2006 Spanish mackerel stock assessment (Agenda Item 4.2) have identified research needs for the fishery, The Working Group should have regard for these recommendations.

DISCUSSION

6. The annual research cycle of the TSSAC is described in Table 1. Key for members of the FFWG is ensuring that advice on strategic research direction for the fishery are

considered and provided to the TSSAC before the call for research is determined in November, and that members are able to provide comment on proposals received (pre-proposals in February, and final proposals in late April or early May).

Stock assessment of the Torres Strait Spanish mackerel fishery, Begg *et al* 2006

To improve and develop the Torres Strait Spanish mackerel fishery stock assessment:

1. Need to develop a long term monitoring program that provides a comprehensive and structured approach to the collection of appropriate age-structured data for Spanish mackerel from both the commercial and traditional non-Islander and Islander sectors. [**Urgent & Critical**]

2. Need for improved reporting in the compulsory commercial logbooks and Islander docket books. Reporting of catch in both numbers and weight for both individual fish and cartons needs to be more consistent and comprehensive. Fishers need to be encouraged to fill out logbooks in their entirety. Logbook data should be compared to unload/buyer dockets for validation and data checking. [**Urgent & Critical**]

3. Need for a better measure of effort in the commercial logbooks and Islander docket books to provide a more reliable indicator of CPUE, and in turn, stock abundance. Fishers should be encouraged to record search and fishing times, number of fishers, and days when zero catches occurred to minimise the effect of hyperstable catch rates when these data are used in catch rate analyses and assessment models. [**Urgent & Critical**]

4. Need to assess the historical commercial logbooks to reconcile differences between the AFMA and DPI&F databases. [**Important & Critical**]

5. Need for a comprehensive investigation into the population dynamics of Torres Strait Spanish mackerel, including growth, maturity, fecundity and spawning. Samples need to be collected throughout the year from a range of areas to validate biological patterns derived from LTMP data collections which are based on a limited sampling period in October from Bramble Cay. [**Important**]

6. Need to confirm the single stock assumption for Torres Strait Spanish mackerel. This assumption is currently based on a single collection from Bramble Cay. A more comprehensive sampling program is required to validate the single stock assumption and clarify stock boundaries, particularly those in the Gulf of Carpentaria, the east coast of Queensland and the Gulf of Papua. This sampling program could be integrated with that for a broader population dynamics study. [**Important**]

7. Need to assess the historical and current impact of neighbouring fisheries, particularly the Indonesian, Taiwanese and PNG gillnet and longline fisheries, on the Torres Strait Spanish mackerel fishery. [**Important**]

8. Need for a periodic review and update of the assessment as determined by the requirements of AFMA. Operational management objectives, performance measures and decision rules need to be defined for future management strategy evaluation. [**Critical**]

9. Need for a systematic and transparent stock assessment review process. This process should include the formation of a steering committee involving the representation of all relevant stakeholders, an independent peer-review of the assessment, and all related reports and presentations to have a clear and concise statement of the review process

that the assessment has undergone. The formation of a Resource Assessment Group could direct this process. [**Critical**]

Evaluation of the eastern Torres Strait Reef Line Fishery, Williams *et al* 2007

To improve fishery and biological knowledge and further develop the MSE:

1. Need to develop a long term monitoring program that provides a comprehensive and structured approach to the collection of appropriate age or length-structured data for the main target species from both the non-indigenous, Islander and traditional sectors.

2. Need for improved reporting in the compulsory commercial logbooks and Islander docket books. Reporting of catch in both numbers and weight needs to be more consistent and comprehensive. Fishers need to be encouraged to fill out logbooks in their entirety. Logbook data should be compared to unload/buyer dockets for validation and data checking.

3. Need for a better measure of effort in the commercial logbooks and Islander docket books to provide a more reliable indicator of CPUE, and in turn, stock abundance. Fishers should be encouraged to record search and fishing times, number of fishers, and days when zero catches occurred.

4. Need to obtain more reliable estimates of biological parameters for the target species in the ETS RLF such as the coral trout species and barramundi cod. Specifically, there is a need to collect small and young individuals to provide more reliable estimates of growth and maturity. There is also the need to determine whether spawning of coral trout occurs in other months of the year. Specifically, samples need to be collected during the months December through March.

5. Need to consider specific management arrangements for passionfruit trout, *Plectropomus areolatus*, such as an increase in the current minimum legal size or the introduction of a maximum legal size due to the larger size at sex change compared with other coral trout species.

6. Need to obtain a better description of the reefs and shoal areas that are fished by Indigenous fishers to provide a clearer picture of the total area in which Islanders are able to fish.

7. Need to obtain reliable estimates of subsistence harvest of reef fish to include in future assessments of the fishery.

8. Need to update the MSE once some of the needs listed above have been fulfilled and additional information is available. This may require determining whether stakeholder objectives have changed since the initial model run.

9. Need to obtain a better understanding of the source-sink relationships between reefs, larval dispersal, self-seeding and larval subsidy and to determine the sensitivity of management strategies to different models of larval migration.

Table 1 TSSAC research cycle

Month	Activity
November	The PZJA publishes its research priorities and scopes and makes a call for expressions of interests (EOI) to meet identified priorities for funding in 2016/17.
31 January	The PZJA call for research closes. The TSSAC Executive Officer consults with PZJA agencies and consultative forums on initial EOIs during February 2015.
early - March 2016	The TSSAC meets to consider initial EOIs and provide feedback to applicants. AFMA develops its initial research budget based on provisionally approved EOIs. The TSSAC Executive Officer provides formal TSSAC advice to applicants on initial EOIs. Successful applicants will be asked to develop their EOIs into full proposals to be submitted by late April.
Late - April 2016	Full proposals are due to be submitted to the TSSAC Executive Officer via email
May 2016	The TSSAC meets to consider full proposals and endorses the final AFMA research budget for the following financial year. TSSAC assess proposals against specific evaluation criteria The TSSAC Executive Officer provides formal TSSAC advice to applicants as to whether their full proposals have been endorsed for funding. AFMA budget handed down.

Attachments

1. 2015 TSSAC Operational Plan for Torres Strait Fisheries
2. 2016-17 TSSAC Call for Research

Australian Government
Australian Fisheries Management Authority

Torres Strait Scientific Advisory Committee

2015 OPERATIONAL PLAN FOR TORRES STRAIT FISHERIES

2015

BACKGROUND

This operational plan was developed by the Torres Strait Scientific Advisory Committee (TSSAC) to complement the Strategic Research Plan for Torres Strait Fisheries and describe:

1. The operational aspects of assessment and evaluating research proposals considered by the TSSAC including:
    a. How the TSSAC prioritise research projects;
    b. The criteria are used for assessing research proposals.
2. Current research areas identified by the TSSAC, through consultation with stakeholders, as priority areas for research.

The information in this document provides guidance to scientists developing research proposals, and the TSSAC in evaluating proposals. Documentation of these operational processes will also ensure the evaluation process undertaken by the TSSAC is conducted in a transparent and strategic way.

The TSSAC will update this document annually to ensure it remains relevant.

PART 1

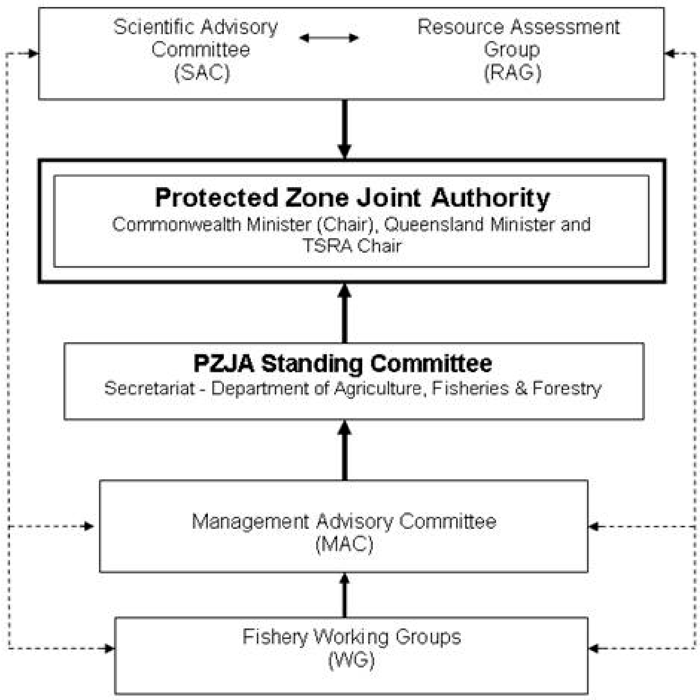
1.1 RESEARCH PRIORITISATION AND EVALUATION

The Torres Strait Scientific Advisory Committee (TSSAC) agreed on the following guidelines in assessing if research areas are considered high priority for funding. Priority research areas will:

- address an essential management need such as the threat to sustainability;
- address a fundamental management need such as surveys for stock assessment;
- strengthen and facilitate Torres Strait Islander engagement/development;
- be a strategic project that demonstrates value for money;
- have strong stakeholder support; or
- address areas of uncertainty such as for stock assessments.

Resource Assessment Groups (RAGs), Management Advisory Groups (MACs) and other (Protected Zone Joint Authority (PZJA)) consultative groups play a fundamental role in identifying priority research areas (Figure 1). The TSSAC will take into consideration the views of RAGs and other committees to assess research priorities across competing interests.

Figure 1: **PZJA Consultative Structure**



The TSSAC agreed at meeting No. 48 to assess research proposals against evaluation criteria grouped into two main areas of attractiveness and feasibility (see attachment A).

Explanatory Note:

Although all research items in this plan are considered to be priorities, some have more immediate need than others. Therefore, indicative levels of need have been assigned to each research priority. Tactical (T) research has immediate need and should be conducted as soon as practicable. Strategic (S) research should be carried out within the next couple of years. Longer term research priorities have been given an indicative future date. Researchers are encouraged to apply for research priorities with the shorter term T or S ranking.

Part 2

2.1 RESEARCH PRIORITIES

The TSSAC seeks input from PZJA consultative bodies to identify research areas and needs and these will be updated on an annual basis as required. In the absence of a dedicated turtle and dugong consultative body, the Torres Strait Fisheries Management Advisory Committee (TSFMAC) is to be responsible for identifying research priorities in the turtle and dugong fisheries.

	RESEARCH AREA	RESEARCH NEED	THEME [1]	NEED[2]	PRIORITY
A) Prawn	1) Fishery assessment[3]	1a) Stock assessment, fishing power, development of optimal harvest strategies[4], economic efficiency. 1b) Improve effort uptake	2, 3	S*	
	2) By-catch reduction and reduced interactions with TEP species[5]	2a) Investigate more efficient bycatch reduction devices. 2b) Assess the impact of trawl harvest on Islander subsistence fisheries. 2c) Assess the impact of trawl harvest on TS marine environment	2 2, 6, 4	S S	
B) Rock lobster	1) Providing advice for fisheries management	1a) Evaluation of alternative management strategies including harvest control rules and spatial and seasonal management controls 1b) Development of simulation operating models of the fishery to be used for the evaluation of management strategies. 1c) Regular updates of stock assessments to provides estimates of stock status and reference points 1d) Improved monitoring of catch and effort in all sectors of the fishery. 1e) Understanding the effect of the use of Hookah on:	2, 3 2, 3, 6	S S[6] T	1 2 1

[1] These themes relate to those detailed in the Strategic Research Plan.

[2] S = Strategic, T = Tactical. See 'Explanatory Note' above. S* Relates to effort trigger for harvest strategy of 4000 days

[3] Effort in the prawn fishery is currently less than 2000 days, which is about 1/3 of Australian allocated effort.

[4] Optimal harvesting will increase profitability of the fishery which is a major aim (objective?) for management in this fishery. This also has implications for Papua New Guinea (PNG).

[5] May be a need for further by-catch reduction research to allow Strategic Assessments to be undertaken within the next 5 years.

[6] Potential research providers should note that a currently funded project is investigating this area and new projects should add to this project rather than duplicate it.

		recruitment of stock on shallow reefs;			
	2) Continuation and improvement of data collection	2a) Fishery independent surveys of resource abundance 2b) Improved monitoring of commercial catch and effort in all sectors of the fishery. 2c) Estimate of non-commercial take of rock lobsters 2d) Alternative monitoring techniques of stock status, for example GPS tracking.	3, 6 1, 2	T T T S	1 1 2 3
	3) Understanding fishing behaviour	3a) Understanding the drivers and incentives in determining fishing behaviour in all sectors 3b) Understanding fishing behaviour under output controls: i. the impact of ITQs or competitive quota on the fishery; ii. the extent and impact of discard mortality; iii. the effect of changing market preferences on fishing behaviour under output controls; iv. the extent of value adding eg. moving to live product, targeting different sizes. v. the extent of high grading under output controls	3, 6	S S	2 2
	4) Movement and recruitment connectivity between areas within Torres Strait and between Torres Strait and neighbouring jurisdictions, including QLD and PNG	4a) Understanding of migration of settled lobster between, and within, jurisdictions. e.g. linkages between deep and shallow and among reefs 4b) Understanding of recruitment connectivity between, and within, jurisdictions. 4c) Management implications of movement and recruitment connectivity between, and within, jurisdictions. .	2, 5 2, 5 2, 5	S S S	1
	5) Environmental impacts	5a) Collect relevant baseline information to assess environmental change impacts on lobster populations 5b) Analyse the impact of environmental change on the fishery	2, 3	S	
C) Finfish (reef line, Spanish mackerel)	1) Efficacy of management arrangements	1a) Investigating improvement of efficient, long term monitoring for all sectors of the fishery. 1b) Developing efficient harvest strategies for the fishery	6 2, 6	S S	 1
	2) Fisheries assessment	2a) Development of an efficient stock status/abundance assessment.	2, 6	S	

		2b) Development of operational management objectives, performance measures and decision rules to inform future management strategy evaluation. 2c) Understanding the nature and magnitude of PNG cross jurisdictional finfish migration.	2, 6 2, 5	S S	
	3) Stock structure of Torres Strait Spanish mackerel	3a) Defining the spatial scale of management and connectivity of Torres Strait (TS) populations of Spanish mackerel with neighbouring jurisdictions (PNG: east and west of TS; and QLD adjacent to TS). 3b) Assessment of whether TS stocks of Spanish mackerel comprise a shared stock with PNG and/or QLD jurisdictions.		S S	M M
D) Hand Collectable Fisheries	1 Providing advice for fisheries management	1a) Evaluation of alternative management strategies including harvest control rules and spatial and seasonal management controls	2,3	S	1
	2 Stock abundance/assessment for TAC setting	1a) Complete stock assessment and estimate TAC for target species. 1b) Improved monitoring of catch and effort in all sectors of the fishery.	2, 3, 6 2, 3, 6	S (Yr 2013)	
	3 Efficacy of management arrangements	2a) Impact of overfishing on PNG Warrior Reef. 2b) MSE looking at the use of hookah for white teatfish. 2c) A study to look at the possibility of reducing the minimum size limit of the gold-lipped pearl oyster	2	T[7]	
	4 Knowledge of biology, ecology and distribution of target species	3a) Assessment of trochus habitat using Indigenous knowledge or remote sensing to inform stock assessment[8].	2, 3, 4, 6	S	
E) Turtle and Dugong fisheries	1) Interactions between habitat and turtle and dugong fisheries	1a) Estimate of catch by PNG and Cape York communities.	1, 2	N/A	
F) Torres Strait Islander development	1) Capacity building for Torres Strait Islanders in Torres Strait fisheries	1a) Identification of parallels with other fisheries internationally and learning opportunities for Torres Strait peoples.	4	S	

[7] The TSSAC will liaise with the PNG National Fisheries Authority regarding this research priority.

[8] Trochus is a small fishery with low effort so research in this area is not seen as urgent.

	2) Improved profitability for Torres Strait Islanders from fisheries	2a) Marketing opportunities within existing fisheries. 2b) Identification of alternate sustainable fishing opportunities. 2c) Business feasibility study for live coral trout and/or premium fresh fish on ice.	3, 4 3, 4 3, 4	S S T	
G) Engagement with Papua New Guinea	1) Collaborative research and data collection	1a) Review of areas where opportunities exist for collaborative research on shared fisheries stocks between PNG and Australia[9].	5	T	

[9] Funds for this more appropriately sourced from agencies such as DAFF, ACIAR and not AFMA, given the diplomatic and cross-border nature.

2.2 INDIVIDUAL FISHERY OBJECTIVES[10]

FISHERY	OBJECTIVE
Prawns	i) Ensure the optimum utilisation of the fishery resources within the TSPF is consistent with the principles of ecologically sustainable development and the exercise of the precautionary principle ii) Promote economic efficiency in the utilisation of the fisheries resources within the TSPF iii) Ensure cooperative, efficient and cost effective management of the Fishery iv) Manage the fishery's interaction with the marine environment including the incidental capture of non-target species and impacts on demersal habitats
Rock lobster	i) Maintain the spawning stock at levels that meet or exceed the level required to produce the maximum sustainable yield ii) In accordance with the Torres Strait Treaty, to protect the traditional way of life and livelihood of traditional inhabitants, in particular in relation to their traditional fishing for Tropical Rock Lobster iii) Provide for the optimal utilisation, co-operative management with Queensland and Papua New Guinea and for catch sharing to occur with Papua New Guinea iv) Monitor interactions between the prawn and lobster fisheries v) Maintain appropriate controls on fishing gear allowed in the fishery so as to minimise impacts on the environment vi) Promote economic development in the Torres Strait area with an emphasis on providing the framework for commercial opportunities for traditional inhabitants. To ensure that commercial opportunities available to all stakeholders are socially and culturally appropriate for the Torres Strait and the wider Queensland and Australian community vii) Optimise the value of the fishery, ensure cooperative, efficient and cost effective management of the Fishery
Finfish (reef line and Spanish mackerel)	i) To manage the resource to achieve its optimal utilisation ii) To maximise the opportunities for Traditional Inhabitants of both Australia and PNG to participate in the commercial fishery iii) To promote the fishery as a line fishery

[10] Fisheries Objectives were correct at the time of writing. Sources: Prawns – Draft Torres Strait Prawn Fishery Management Plan: Rock Lobster – PZJA 19: Finfish - Strategic and Export Reassessment Report, Torres Strait Finfish Fishery, AFMA 2008: Trochus - Strategic and Export Reassessment Report, Torres Strait Trochus Fishery, AFMA June 2008: Beche-de-mer - Strategic and Export Reassessment Report, Torres Strait Beche-de-mer Fishery, AFMA April 2008: Dugong and Turtle – PZJA website, February 2009 (these in turn being stated in subsidiary conservation and management arrangements agreed between Australia and Papua New Guinea): Pearl Shell, Crab and Barramundi –PZJA website, February 2009.

Individual Fishery Objectives (cont…)

FISHERY	OBJECTIVE
Finfish (reef line and Spanish mackerel)	iv) To continue monitoring of the fishery and enter into a catch sharing agreement with PNG.
Trochus	i) Manage the resource so as to achieve optimum utilisation ii) Maximise opportunities for traditional inhabitants of Australia iii) Encourage traditional inhabitants to participate in the fishery
Bêche-de-mer	i) Ensure the sustainable use of all sea cucumber in Torres Strait ii) Ensure that utilisation of the sea cucumber resources is for the direct benefit of the Australian traditional inhabitants of the Torres Strait iii) Ensure increased involvement in the management and control of all aspects of the fishery by the Australian traditional inhabitants of the Torres Strait iv) Promote a cooperative approach to management with Papua New Guinea v) In consultation with industry and traditional fishers, to ensure the recovery of the sandfish stock on Warrior Reef by adopting a precautionary approach when setting catch levels in the early years of rebuilding the fishery
Dugong and turtle	i) Conserve the stock vi) Manage the fishery as a traditional fishery
Pearl shell, crab and barramundi	i) Manage the resource so as to achieve optimum utilisation ii) Maximise opportunities for Traditional Inhabitants of Australia and PNG to participate in the commercial fishery

Attachment A.

Torres Strait Scientific Advisory Committee
Research Proposal Evaluation

Research Title	**Organisation:**
Research Themes:	**Date:**
Principal Investigator:	

Strongly **DISAGREE** ⟶ Strongly **AGREE**

Attractiveness	n/a	1	2	3	4	5	6	7	8	9	10
1. Is there a priority need for the research?											
2. Is/are the end-user/s identified?											
3. Do the outcomes have relevance and are they appropriate to the end-users?											
4. Should the outputs contribute towards outcomes and are they measureable?											
5. Cost Benefit Analysis. Is the anticipated benefit appropriate to the investment?											
6. Is there collaboration between stakeholders (i.e. between community and/or industry, researcher and management)?											
7. Are there links to previous research?											
8. Does the project add value to previous research?											
9. Does the project involve capacity development for Communities?											
10. Is there collaborative funding (cash and/or in-kind contributions)?											
11. Does the proposal actively engage Traditional Inhabitants and Torres Strait Islanders in the research?											
12. Are there employment opportunities for Traditional Inhabitants and Torres Strait Islanders?											
13. Are extension and communication well developed and appropriate; in particular to Traditional Inhabitants and Torres Strait Islanders?											
14. Is there a path to uptake and impact relevant to fisheries management?											

Feasibility	n/a	1	2	3	4	5	6	7	8	9	10
1. Are the methods well described and consistent with the objectives?											
2. Are the methods scientifically sound?											
3. Will the project be carried out in a culturally appropriate way?											
4. Does the applicant have the capacity to produce the outputs?											
5. Is the budget appropriate to meet the outputs and outcomes?											
6. Is there appropriate data management?											

Proposal Comments:

The Torres Strait Scientific Advisory Committee 2016 call for research

The Torres Strait Scientific Advisory Committee (TSSAC) assesses applications for funding of research for fisheries in the Torres Strait Protected Zone. In the 2016 research funding round the TSSAC is making a call for research identified by Protected Zone Joint Authority (PZJA) consultative forums that address fishery-specific research priorities and are consistent with the TSSAC Operational Plan for Torres Strait Fisheries.

Applicants must use the fishery-specific project scopes provided as a guide when developing their initial expressions of interest (EOI) to meet the identified need for the project.

To ensure relevance of EOIs to priorities, applicants are invited to discuss their applications with the relevant Fisheries Management contact prior to submitting an EOI. The TSSAC Executive Officer can be contacted by calling 07 4069 1990 or by emailing claire.wallis@afma.gov.au.

Please note that the research EOI must be submitted to the TSSAC Executive Officer by **31 January 2016.** Applicants will be advised in late March 2016, following the TSSAC's evaluation of the EOI, whether they should develop their EOI into a full proposal in consultation with AFMA management and PZJA consultative forums. Applicants will need to submit their full proposals to the TSSAC Executive Officer in **late April 2016.**

Instructions to applicants for completing and submitting EOIs

✓ Applicants **must** use the project scopes outlined below as a guide when developing initial EOIs to meet the identified need for the project. Applicants may also refer to the TSSAC Operational Plan for Torres Strait Fisheries 2015 for guidance

✓ Applicants **must** use the TSSAC Preliminary Research Proposal for Funding Application form to prepare their EOI.

✓ Applicants **must** include in their EOI:

- The projected costs and expected funding source, as well as alternatives.

- The proposed contractor's full legal identity/description, including each corporation's full description and Australian Company Number or the full names of all partners/joint venturers. A trading name and/or Australian Business Number should also be notified, but only if registered to the parties described.

✓ Applicants are encouraged to refer to the *Guide for Fisheries Researchers Working in the Torres Strait*

✓ Applicants **must** email their completed EOI to the TSSAC Executive Officer at claire.wallis@afma.gov.au by **31 January 2016.**

Torres Strait Fishery – specific project scopes

Fishery	Scopes
Tropical Rock Lobster Fishery	1. Torres Strait Tropical Rock Lobster Fishery Harvest Strategy
	2. Fishery independent survey, stock assessment and recommended biological catch calculation for the Torres Strait Tropical Rock Lobster Fishery
Finfish Fishery	3. Torres Strait Finfish Fishery Harvest Strategy

TSSAC research timetable for 2016

Month	Activity
November 2015	The PZJA publishes its research priorities and scopes and makes a call for expressions of interests (EOI) to meet identified priorities for funding in 2016/17.
31 January 2016	The PZJA call for research closes. The TSSAC Executive Officer consults with PZJA agencies and consultative forums on initial EOIs during February 2015.
early - March 2016	The TSSAC meets to consider initial EOIs and provide feedback to applicants. AFMA develops its initial research budget based on provisionally approved EOIs. The TSSAC Executive Officer provides formal TSSAC advice to applicants on initial EOIs. Successful applicants will be asked to develop their EOIs into full proposals to be submitted by late April.
Late - April 2016	Full proposals are due to be submitted to the TSSAC Executive Officer via email to claire.wallis@afma.gov.au.
May 2016	The TSSAC meets to consider full proposals and endorses the final AFMA research budget for the following financial year. TSSAC assess proposals against specific evaluation criteria The TSSAC Executive Officer provides formal TSSAC advice to applicants as to whether their full proposals have been endorsed for funding. AFMA budget handed down.

1. **Project title:** Torres Strait Tropical Rock Lobster Fishery Harvest strategy

Project need

An interim harvest strategy was adopted for the Torres Strait Tropical Rock Lobster Fishery in 2010. A final harvest strategy, consistent with the Commonwealth Fisheries Harvest Strategy Policy and Guidelines, and the *Torres Strait Fisheries Act 1984*, is sought. Harvest strategies improve certainty and accountability in the setting of Total Allowable Catches. In instances where model-based harvest strategies can't be applied due to lack of data or insufficient resources, some fisheries have adopted an empirical Harvest Strategy (eHS) that can perform adequately when compared to model-based strategies. For the Tropical Rock Lobster fishery it is intended for the harvest strategy to take into account a risk-based range of assessment options (e.g. a 'tiered' harvest strategy). This approach will assist and guide future decisions on research and data collection investment for the fishery. The Tropical Rock Lobster Resource Assessment Group and Working Group have identified a range of potential stock assessment options.

Desired outcomes

- Development of a harvest strategy for the Torres Strait Tropical Rock Lobster Fishery which prescribes data needs, data analysis and stock assessment procedures.
    - The harvest strategy should take into account stock assessment options identified by the Tropical Rock Lobster Resource Assessment Group and Working Group; and
    - Potential empirical harvest control rules should be reviewed and tested taking into account any relevant work already completed; and
    - Where relevant the Tropical Rock Lobster Integrated Management Strategy Evaluation tool developed by CSIRO should be utilised.
- Cost estimates provided for each stock assessment option identified in the harvest strategy.

Contacts

Dean Pease
A/g Senior Management Officer
Tropical Rock Lobster Fishery
07 4069 1990
dean.pease@afma.gov.au

Claire Wallis
Executive Officer
Torres Strait Scientific Advisory Committee
07 4069 1990
claire.wallis@afma.gov.au

2. **Project title:** Fishery independent survey, stock assessment and Recommended Biological Catch calculation for the Torres Strait Tropical Rock Lobster Fishery

Project need

A Total Allowable Catch must be determined for the Tropical Rock Lobster Fishery for the 2016-17 fishing season to support quota management and catch sharing arrangements between Australia and Papua New Guinea.

Since 1989 annual fishery-independent surveys of the Tropical Rock Lobster (TRL) population have been conducted. Following a decision to transition to quota management, both mid-year (May) and pre-season (November) surveys were completed in 2005 to 2008, 2014. In 2015 a pre-season survey only was carried out. These surveys have provided the basis for assessing sustainable catch levels for the fishery and provide critical long-term information on the relative abundance of recruiting TRL. Data collected from the surveys (including length frequency), along with CPUE and catch-at-age data have been used in an integrated fishery model to assess the stock and calculate a Recommended Biological Catch (RBC). Options for setting TACs without formal stock assessments but using empirical harvest strategies are also being explored.

A decision is yet to be made on whether or not to fund both mid-year and pre-season surveys in future years. Work is expected to commence soon to finalise a harvest strategy for the TRL Fishery (see Project Title 1). The type of harvest strategy that is adopted will provide a basis to better evaluate the risk-catch-cost trade-off of different stock assessment and monitoring options for the fishery.

Desired outcomes

2016-17 Fishing season

- Pre-season survey undertaken in accordance with established survey protocols developed by CSIRO.

- RBC calculated for the 2016-17 fishing season with updated fishery-independent and commercial catch data using either; a) the integrated fishery assessment model; <u>or</u> b) an agreed empirical harvest control rule to be developed in 2016 (see Project Title 1).

2017-18 Fishing season

- Subject to a final decision by AFMA (in consultation with advisory bodies) on the preferred stock assessment option, undertake either: a) mid-year survey and pre-season survey; <u>or</u> b) pre-season survey only. Surveys must be undertaken in accordance with established protocols developed by CSIRO

- RBC calculated for the 2016-17 fishing season with updated fishery-independent and commercial catch data using either; a) the integrated fishery assessment model with; <u>or</u> b) an agreed empirical harvest control rule to be developed in 2016 (see Project Title 1).

Applicants are asked to detail monitoring and data collection costs separate from the assessment costs.

Contacts

Same as for Project 1.

3. Project title: Torres Strait Finfish Fishery Harvest strategy

Project need

Since 2008 the Torres Strait Finfish Fishery has been reserved for Traditional Inhabitants. On behalf of Traditional Inhabitants, the Torres Strait Regional Authority lease-out fishing licences to non-Traditional Inhabitants. Leasing helps to maintain markets and generate revenue for the benefit of Torres Strait communities. While the fishery is currently underutilised initiatives are underway to increase participation by Traditional Inhabitants.

Total Allowable Catches (TAC) for the two key species in the Torres Strait Finfish Fishery, Spanish mackerel and coral trout, are based on historical catches and have remained unchanged since 2008. A harvest strategy for the fishery is sought to guide future TAC decisions. A harvest strategy, consistent with the Commonwealth Fisheries Harvest Strategy Policy and Guidelines, and the *Torres Strait Fisheries Act 1984*, would assist in guiding potential expansion in the fishery and the use of new stock status information.

It is intended for a harvest strategy to take into account a risk-based range of assessment options reflecting increases in stock assessment information (e.g. a ‘tiered’ harvest strategy). This approach will assist and guide future decisions on research and data collection investment for the fishery.

Desired outcomes

- Development of a harvest strategy for the Torres Strait Finfish Fishery which prescribes data needs, data analysis and stock assessment procedures. The harvest strategy should take into account a risk-based range of stock assessment options. Options for setting TACs without formal stock assessments but using empirical harvest strategies should be explored.

Contacts

Steve Hall
Senior Management Officer
Torres Strait FinFish Fishery
07 4069 1990
steve.hall@afma.gov.au

Claire Wallis
Executive Officer
Torres Strait Scientific Advisory Committee
07 4069 1990
claire.wallis@afma.gov.au

TORRES STRAIT FINFISH WORKING GROUP	Meeting 2016.1 12-13 July 2016
MANAGEMENT **Harvest Strategy**	**Agenda Item No. 5.1** **For discussion and advice**

RECOMMENDATIONS

That the Working Group:

1. **DISCUSS** and provide **ADVICE** on developing a harvest strategy for the Finfish Fishery; and
2. **DISCUSS** and provide **ADVICE** on the funding application to develop a harvest strategy for the fishery (Attachment 1).

KEY ISSUES

1. In response to Torres Strait Scientific Advisory Committee call for research, CSIRO have submitted a funding application to develop a harvest strategy for the Finish Fishery (Attachment 1). Dr Micheal O'Neil, Principal Fisheries Scientist, Agri-Science Queensland, Department of Agriculture and Fisheries, is a co-investigator of the proposed project.

2. The proposal was considered by the Torres Strait Scientific Advisory Committee (TSSSAC) on 28 June. Outcomes of the TSSAC meeting will be tabled at the meeting.

3. Comment is sought from the Working Group on the CSIRO funding application and advice on an appropriate workplan (in the context of the Working Group) and consultation strategy for developing the harvest strategy.

4. AFMA's preference is that the Working Group focus on developing a harvest strategy designed to guide fishery-level Total Allowable Catch decisions.

5. The Research Members will provide an update on CSIRO's proposed harvest strategy project and guide an initial discussion on the development of a harvest strategy.

DISCUSSION

1. The *Commonwealth fisheries harvest strategy policy and guidelines 2007* (Attachment 2) provides a framework to develop harvest strategies for Australia's Commonwealth managed fisheries. Harvest strategies provide a higher degree of confidence that fisheries are being managed for long-term sustainability and economic profitability.

2. Harvest strategies set out a pre-agreed decision making framework to control fishing intensity (catch and/or effort) in order to achieve defined biological, and economic objectives of the fishery. In the case of Torres Strait Fisheries a harvest strategy will also have regard to maintaining the traditional way or life and livelihood of Traditional Inhabitants.

3. Harvest strategies can provide two key benefits to industry:

    a. improved management certainty around total allowable catch or effort decisions. This is important for business planning and investment; and

    b. a tool to better assess the potential return on investments in research and data collection. It is open to industry to invest directly in research and data collection

4. A harvest strategy should be easy to understand, unambiguous, make sense and precautionary. The key elements of a harvest strategy are:

    a) <u>Objective</u>
    What you want to achieve. For example keeping the fishery sustainable and profitable

    b) <u>Reference Point</u>
    Benchmarks for achieving your objective. Includes both target and limit reference points. The Commonwealth Harvest Strategy Policy default TARGET reference point is to keep stock biomass at a level that results of Maximum Economic Yield or a biomass level that is 48 per cent of its agreed pre-fished levels. The policy LIMIT reference point (beyond which commercial harvesting for the species would be stopped) is to a stock level below 20 per cent of its agreed pre-fished levels.

    c) <u>Indicator</u>
    What you measure to determine where the fishery is compared with the reference points. For example Catch Per Unit Effort derived from fisher records or estimates of biomass derived from stock surveys (many other variants may be used).

    d) <u>Performance measure</u>
    Used to measure progress against (management) objectives, and is a measure of where an indicator (such as stock size) sits in relation to a reference point.

    e) <u>Decision Rule</u>
    Management response required to maintain or track towards the target reference point. For example increase or decrease the catch.

    f) <u>Meta Rule</u>
    A rule that provides guidance for dealing with exceptional circumstances (when the unusual happens). For example reduce the catch if certain indicators showing unusual trends.

Attachments

1. Research Proposal to develop Harvest Strategies for the Torres Strait Finfish Fishery
2. *Commonwealth fisheries harvest strategy policy and guidelines 2007*

Australian Government

Department of Agriculture, Fisheries and Forestry

Commonwealth Fisheries Harvest Strategy

Policy and Guidelines

September 2007

DEPARTMENT OF AGRICULTURE, FISHERIES AND FORESTRY

Australian Government

Department of Agriculture, Fisheries and Forestry

Commonwealth Fisheries Harvest Strategy

Policy and Guidelines

September 2007

Acknowledgements

Commonwealth Fisheries Harvest Strategy Policy

The Policy was developed by the Department of Agriculture, Fisheries and Forestry (DAFF), in close consultation with the Australian Fisheries Management Authority (AFMA) and the Department of the Environment and Water Resources (DEW). The Policy development was overseen by a Steering Committee comprising DAFF, AFMA, DEW, the Bureau of Rural Sciences (BRS), the Australian Bureau of Agricultural and Resource Economics (ABARE), Peter Franklin of the Commonwealth Fisheries Association and independent fisheries experts, including Ian Knuckey.

Guidelines

The Guidelines were prepared by a project team headed by David Smith (CSIRO) as part of the FRDC-funded project “Implementation of Harvest Strategies across AFMA’s Fisheries”.

The project team comprised the following members: David Smith (PI), Tony Smith, Cathy Dichmont, Campbell Davies (CSIRO), Andy Bodsworth (AFMA), Peter Gooday, David Galeano (ABARE), Kevin McLoughlin BRS), Ian Knuckey (industry), Malcolm Haddon (ScallopRAG) and George Jackson (SquidRAG).

Project Officer: Natalie Dowling (CSIRO).

The project was overseen by a Steering Committee comprising representatives from DAFF, AFMA, ABARE, BRS, CFA and CSIRO.

Meredith Prendergast provided logistical and clerical support.

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Foreword

Australia's Commonwealth fisheries are a valuable natural asset. They make an important contribution to both local and national economies, supply fresh, healthy seafood to consumers throughout the country and support valuable jobs and infrastructure, particularly in regional areas.

I am pleased to introduce the *Commonwealth Fisheries Harvest Strategy Policy* (the Policy), which provides a framework for the management of Australia's Commonwealth fisheries into the future. The Policy aims to maximise the net economic returns to the Australian community and at the same time ensure fish stocks remain at safe and productive levels. It reaffirms the Australian Government's commitment to world's best practice fisheries management, and is a key component of the Australian Government's $220m *Securing our Fishing Future* initiative.

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. This Policy satisfies that requirement.

The Policy provides a consistent framework for taking the available information about particular fish stocks and applying an evidence and risk-based approach to setting harvest levels on a fishery-by-fishery basis. The Policy also provides the fishing industry and other stakeholders with a more certain operating environment where management decisions for key species are more consistent, predictable and transparent.

I am confident that this approach will see Australia well positioned to ensure the future health of both our Commonwealth fish stocks and of our Commonwealth fishing industry.

ERIC ABETZ
Minister for Fisheries, Forestry and Conservation

10th September 2007

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Commonwealth Fisheries Harvest Strategy Policy

September 2007

Introduction

The Policy[1] provides a framework for the development of harvest strategies for key commercial species taken in Australia's Commonwealth fisheries. Harvest strategies consistent with the Policy will provide the Australian community with a high degree of confidence that commercial fish species are being managed for long-term biological sustainability and economic profitability. Harvest strategies will also provide the fishing industry with a more certain operating environment.

By its nature, fisheries management is an activity involving substantial elements of risk and uncertainty. Despite some significant advances in knowledge there is still uncertainty about the range, distribution, life cycle and population size of many commercial fish species and stocks. Given this, it is necessary to develop a consistent framework which will deliver an evidence-based, precautionary approach to achieving long-term sustainability and profitability drawing on available information.

The Policy incorporates the relevant requirements of the *Fisheries Management Act 1991* (the FM Act), the *Fisheries Administration Act 1991* (the FA Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act), together with the United Nations Fish Stocks Agreement and the Food and Agriculture Organization Code of Conduct for Responsible Fisheries, and is to be interpreted within the legislation. The Policy specifies the risk levels that are acceptable to the Australian Government in allowing access to, and use of fishery resources in Commonwealth fisheries.

The Policy was developed as a direct response to a Ministerial Direction[2] made to the Australian Fisheries Management Authority (AFMA) in December 2005 by the then Minister for Fisheries, Forestry and Conservation.

The Policy establishes outcomes to be achieved in Commonwealth fisheries and the need for harvest strategies to be established for managing these fisheries. The Policy allows for harvest strategies to be applied to single-species and multi-species fisheries. The Policy should be read in conjunction with the *Guidelines for Implementation of the Commonwealth Fisheries Harvest Strategy Policy*.

The Policy (and the associated Guidelines) contains default settings for some key elements of a harvest strategy. Fishery and species-specific harvest strategies will be consistent with the objective of the Policy, recognising the wide variety of species in Commonwealth fisheries - from low productivity, long-lived species such as sharks, to short-lived species with high natural stock variability such as prawns and squid.

Harvest strategies developed under the Policy will set out management actions that monitor and assess biological and economic conditions in a given fishery to control the fishing intensity in order to achieve defined biological and economic objectives. The management of fisheries using output controls is the Australian Government's preferred approach. However, this Policy recognises that stocks can be maintained relative to reference points using a range of management tools, including input and/or output controls.

AFMA has adopted Ecosystem Based Fisheries Management (EBFM) as its overarching framework for Commonwealth fisheries management. It must be emphasised that implementing a harvest strategy of itself will not achieve ecologically sustainable or profitable fisheries. Other processes are in place in

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[1] The Policy was prepared by the Australian Government Department of Agriculture, Fisheries and Forestry (DAFF), including the Bureau of Rural Sciences (BRS) and the Australian Bureau of Agricultural and Resource Economics (ABARE), with assistance from the Australian Fisheries Management Authority (AFMA), the Department of the Environment and Water Resources (DEW) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO). Consultation also occurred with key stakeholders, and national and international experts.

[2] An extract of the relevant part of the Direction is on Page 9.

Commonwealth fisheries management to help achieve broader ecosystem objectives, including undertaking comprehensive ecological risk assessments (ERA) accompanied by appropriate risk management responses. The Ministerial Direction provides for further initiatives in support of EBFM, including reductions to bycatch, fishery independent monitoring, and increased focus on spatial management. Harvest strategies, in combination with this package of measures, constitute a whole of government approach to sustainable fisheries management.

The experience of good fisheries management indicates that, in general terms:

- fisheries are more efficient, profitable, stable and sustainable, when stocks are larger than the stock size that produces the maximum sustainable yield[3] (referred to as B_{MSY});
- future productivity is at greater risk when stocks are reduced to a level where the recruitment of young fish relative to the portion of the stock subject to fishing declines precipitously (referred to as 'recruitment failure');
- fisheries should be managed on a whole stock basis, and in a way that takes species life history into account;[4]
- economic returns can be maximised and in general, overcapitalisation avoided when fish stocks are maintained, on average, at a target adult biomass level equal to the maximum economic yield (B_{MEY});[5] and
- if stock sizes fall below B_{MEY}, the associated increase in fishing costs is greater than the increase in fishing revenue, and as such is less efficient.

The Policy incorporates the above principles to provide a framework for the development of harvest strategies.

What is a harvest strategy?

A harvest strategy sets out the management actions necessary to achieve defined biological and economic objectives in a given fishery. Harvest strategies must contain:

- a process for monitoring and conducting assessments of the biological and economic conditions of the fishery; and
- rules that control the intensity of fishing activity according to the biological and economic conditions of the fishery (as defined by the assessment). These rules are referred to as control rules[6].

Control rules are designed to keep the fishery on track in pursuit of its defined objectives by specifying the management actions or decisions that need to be taken. For control rules to be clear and effective, the objectives need to be expressed in the form of quantifiable reference points. These reference points are used to guide management decisions. Management decisions should be pre-agreed actions linked directly to the biological and economic status of the fishery relative to these reference points.

With a harvest strategy in place, fishery managers and industry are able to operate with greater confidence, management decisions are more transparent, and there should be fewer unanticipated outcomes necessitating hasty management responses.

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[3] It should be noted that maximum sustainable yield is a theoretical maximum that can be taken from a stock in perpetuity.
[4] Life history characteristics include, among other things, longevity, fecundity and recruitment variability.
[5] Economic returns will only be maximised if a management regime is also in place that allows for fishing costs to be minimised and fishing revenue to be maximised.
[6] Control rules are sometimes also known as harvest control rules or decision rules.

Reference points for the status of fish populations or fishery management units (hereafter referred to as ‘stocks’) and the intensity of fishing activity are expressed as the amount of biomass (B) and the fishing mortality rate (F) respectively.

The fishing mortality rate (F) is the rate of deaths of fish due to fishing. As with B reference levels, F reference levels may be applied to entire stocks or segments of stocks (e.g. the adult or fished population) and should match the scale of the management unit.

Harvest strategies are commonly based around two types of reference points: ‘target’ reference points and ‘limit’ reference points. Target reference points express the desired status of stocks (B_{TARG}) and desired fishing intensity (F_{TARG}). Limit reference points (B_{LIM} and F_{LIM}) express situations to be avoided because they represent a point beyond which the risk to the stock as the basis of a commercial fishery is regarded as unacceptably high.

Core Elements of the Policy

Objective

The objective of this Policy is the sustainable and profitable utilisation of Australia’s Commonwealth fisheries in perpetuity through the implementation of harvest strategies that maintain key commercial stocks at ecologically sustainable levels and within this context, maximise the economic returns to the Australian community.

Strategy

To pursue the objective, harvest strategies for key commercial stocks taken in Australia’s Commonwealth fisheries will be designed to pursue maximum economic yield from the fishery and ensure those stocks remain above levels at which the risk to the stock is unacceptably high.

Harvest strategies will seek to:

- maintain fish stocks, on average, at a target biomass point (B_{TARG}) equal to the stock size required to produce maximum economic yield (B_{MEY})[7];
- ensure fish stocks will remain above a biomass level[8] where the risk to the stock is regarded as too high, that is B_{LIM} (or proxy)[9]; and
- ensure that the stock stays above the limit biomass level at least 90% of the time[8].

For a stock below $B_{LIM,}$ a stock rebuilding strategy[10] will be developed to rebuild the stock to B_{TARG}. Once such a stock is above B_{LIM} it may be appropriate for targeted fishing to re-commence in-line with the stock rebuilding strategy and harvest strategy.

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[7] In cases where B_{MEY} is unknown, a proxy of $1.2B_{MSY}$ (or a level 20% higher than a given proxy for B_{MSY}) is to be used for a single species fishery and in the case of a multi-species fishery judgement needs to be exercised. AFMA may approve the use of an alternative proxy for B_{MEY} if it can be demonstrated that a more appropriate alternative exists.

[8] For highly variable species that may naturally (i.e. in the absence of fishing) breach B_{LIM}, the harvest strategy for these species must be consistent with the intent of the Policy.

[9] B_{LIM} (or proxy) equal to or greater than ½ B_{MSY} (or proxy).

[10] Rebuilding strategy to be developed by AFMA and agreed to by the Minister for the Environment and Water Resources.

For stocks above B_{LIM} but below the level that will produce maximum sustainable yield (B_{MSY}) it is necessary to first rebuild stocks to B_{MSY}. Once stocks reach B_{MSY}, rebuilding shall continue toward B_{TARG} however the rate of rebuilding shall be determined in a way that considers the appropriate balance between short term losses and longer term economic gains.

For stocks above B_{TARG}, the rate of 'fish down' toward the target level will be determined by fishery-specific harvest strategies.

In single and/or multi-species harvest strategies, alternate reference points may be determined by AFMA if they better pursue the objectives of the Policy.

In meeting all of the outcomes harvest strategies are required to consider ecosystem interactions. One consideration is the relationship the species has with others in the food web or community, particularly if the harvested species is a keystone species. In such circumstances the biomass reference points described above may be increased to take account of a species' importance to the maintenance of the food web or community. As noted in the introduction, harvest strategies form only one part of a more comprehensive approach to EBFM.

Interpretation

The Policy is to be interpreted by reference to the *Glossary of Terms* at Attachment A.

Implementation

The Policy comes into effect from the time of its approval by the Minister for Fisheries, Forestry and Conservation. Harvest strategies consistent with the Policy will be implemented in all Commonwealth fisheries by 1 January 2008.

The *Guidelines for Implementation of the Commonwealth Fisheries Harvest Strategy Policy* provide direction on how to implement the Policy.

Those stocks that are estimated to be below B_{LIM} as at 1 January 2008 will be subject to a 12 month period of transitional arrangements. During this transitional period, targeted fishing for any of these stocks, not currently subject to zero catch, need not be reduced immediately to zero; however, management actions shall be directed to rapid rebuilding of these stocks. These transitional arrangements will apply for no more than one year and the Policy will apply to all stocks in full from 1 January 2009, which means that targeted fishing of key commercial species below B_{LIM} will cease from that date.

The incorporation of economics into the management of fisheries is essential given the legislative economic objective. AFMA will seek to ensure that there is economic capacity available to resource assessment groups (RAGs) and management advisory committees (MACs) to assist them to provide adequate advice to the AFMA Board.

Roles and Responsibilities

AFMA is responsible for the implementation of the Policy. It must develop and implement harvest strategies for all Commonwealth fisheries by 1 January 2008.

For those fisheries that have a MAC and/or RAG, the MAC and RAG is responsible for the provision of advice to AFMA on the implementation of the Policy in the fishery for which it is responsible.

For internationally-managed fisheries, the Minister for Fisheries, Forestry and Conservation, in consultation with other relevant Australian Government Ministers and AFMA, is responsible for determining Australia's negotiating position.

In cases where a stock falls below B_{LIM}, AFMA must, in agreement with the Minister for the Environment and Water Resources, determine the stock rebuilding strategy for that species or stock.

DAFF, including ABARE and BRS, will monitor the implementation of the Policy by AFMA.

The Australian Government will negotiate jurisdictional arrangements as required that support the objective of this policy.

Applying the Policy

The Policy applies to the key commercial species of all Commonwealth-managed fisheries. It takes into account mortality resulting from all types of fishing, including recreational and state managed-catches. It does not necessarily require that all types of fishing be regulated, nor does it prescribe the type of fishery management regulations that will be applied. It is possible that a harvest strategy could meet the Policy objectives without the need for additional management arrangements or regulations.

While the Policy does not prescribe the type of fishery management regulations that will be applied, it does require that they are designed to meet the targets specified under the harvest strategy. In situations where the adult biomass of a particular stock is greater than or equal to B_{TARG}, AFMA will have a high degree of discretion in how that stock is managed. AFMA will continue to have flexibility in the management of a particular stock where the adult biomass is between B_{TARG} and B_{LIM}. When the stock is below B_{TARG} the management response will be to set the control rules to take the stock back towards $B_{TARG,}$ with account taken of the life history and biology of the species, along with any relevant economic information. Where a harvest strategy applies to a multi-species fishery it may be appropriate for some species to be maintained below B_{MSY}, but always above B_{LIM}, to ensure that the fishery maximises net economic returns.

Highly Migratory/Straddling or Joint Authority Fisheries Stocks

In the case of fisheries that are managed under the joint authority of the Australian Government and another Australian jurisdiction or international management body/arrangement, this Policy does not prescribe management arrangements. However, the Australian Government will negotiate with the relevant body with an aim of ensuring sustainable fisheries by advocating this policy as an example of best practice in setting sustainable catch levels.

The Australian Governments position taken to regional fisheries management organisation/arrangement negotiations is underpinned by Australia's domestic legislative obligations. Therefore it is Australian Government policy to support catch level decisions taken by these organisations and arrangements. In the absence of agreement, Australia's domestic catch allocation decision would be consistent with the agreed whole of government position.

For fisheries issues that are not decided by an international management body or arrangement, DAFF and AFMA will consult on the management arrangements that will apply and AFMA will implement those arrangements.

Relationship of the Policy and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

While a stock biomass is above B_{LIM} there is no expectation that the species would be added to the list of threatened species (conservation dependent, vulnerable, endangered or critically endangered) under the EPBC Act.

If the stock biomass is at or is below B_{LIM} then those stocks may be the subject of action under both the fisheries and environment legislation as the risk to the species may be regarded as unacceptably high. If an AFMA developed stock rebuilding strategy was in place, of which the cessation of the strategy would adversely affect the conservation status of the species, consideration would be given to listing the species in the conservation dependent category.

If the stock biomass falls more substantially below B_{LIM}, there is an increased risk of irreversible impacts on the species. As such the species will likely be considered for listing in a higher threat category (i.e. vulnerable, endangered or critically endangered). A listing under such categories may, in accordance with the EPBC Act, require development of a formal recovery plan.

Where the biomass of a listed stock is above B_{LIM} and rebuilding towards B_{TARG}, consideration could be given to deleting the species from the EPBC Act list of threatened species, or amending the category it is in.

The relevant sections of the EPBC Act, primarily Part 13, will apply for any listing, amending, or deletion of a species from the list of threatened species.

The best available science will underpin all key decisions in the application of the Policy and relevant provision of the EPBC Act. Stakeholders will be well informed and agencies will ensure transparency.

Technical evaluation of harvest strategies

Harvest strategies should be formally tested in order to demonstrate that they are highly likely to meet the Core Elements of the Policy. Methods such as management strategy evaluation (MSE) can be used to test both generic and species specific harvest strategies. Such testing of management strategies is particularly important when information is incomplete and imprecise, and when the relationship between the control rule and management regulations is complex. In a number of instances, harvest strategies will be implemented without full prior screening using MSE methods, but these strategies should undergo subsequent and then periodic testing using such methods.

Amending Harvest Strategies

One of the key aims of the Policy is to provide for increased certainty and predictability in the operating environment surrounding Commonwealth-managed fisheries. Accordingly, amendments to the harvest strategies should occur infrequently once the strategies are fully established (every three-five years for most stocks).

However, it is recognised that it may be necessary to amend harvest strategies, for example when there is new information that substantially changes understanding of the status of a fishery, and leads to improved estimates of reference points.

Reporting and Review

AFMA is to report on the implementation of the Policy and of fishery-specific harvest strategies consistent with the Policy in its Annual Reports and otherwise as requested by the Minister for Fisheries, Forestry and Conservation.

The Policy is to be reviewed with a report to be provided to the Minister for Fisheries, Forestry and Conservation and the Minister for the Environment and Water Resources within five years of commencement. DAFF will initiate the review and ensure that stakeholders are engaged in the review process.

Extract from the Ministerial Direction to AFMA

The following is an extract from the letter of 16 December 2005 from the Minister for Fisheries, Forestry and Conservation to the Chairman of AFMA, issuing a Ministerial Direction under s91 of the Fisheries Administration Act 1991. Gazetted 20 December 2005, Commonwealth of Australia Gazette No S234.

2. AFMA must take a more strategic, science-based approach to setting total allowable catch and/or effort levels in Commonwealth fisheries, consistent with a world's best practice Commonwealth Harvest Strategy Policy that has the objectives of managing fish stocks sustainably and profitably, putting an end to overfishing, and ensuring that currently overfished stocks are rebuilt within reasonable timeframes, as set out below:

   a. Consistent with the United Nations Fish Stocks Agreement, and based on advice from CSIRO and other relevant scientists, the initial setting of the Commonwealth Harvest Strategy Policy, should be:

      i. in all Commonwealth fisheries the exploitation rate of target stocks in any fishing year will not exceed that giving the Maximum Sustainable Yield. The catch of target stocks in all Commonwealth fisheries will not exceed the Maximum Sustainable Yield in any fishing year unless otherwise consistent with a scientifically robust harvest strategy designed to achieve a sustainable target level and that does not result in overfishing or overfished stocks;

      ii. for the initial and default harvest strategy, reductions in exploitation rate and catch are to be implemented immediately when breeding stocks are assessed to have been reduced below 40% of pre-fished levels, and targeted fishing to cease when breeding stocks are assessed to have been reduced below 20% of pre-fished levels (known as a '20/40' harvest strategy). Alternative harvest strategies may be developed in specific cases where they meet the sustainability objectives and do not result in overfishing or overfished stocks;

      iii. the harvest strategy must achieve the objective of avoiding overfishing and avoiding overfished stocks with at least 80% probability (where lack of knowledge about a fish stock precludes decision making with this level of certainty, decisions on catch/units should reflect the application of the precautionary principle); and

      iv. noting that for internationally-managed fisheries to which Australia is a party (such as the Southern Bluefin Tuna Fishery and the Heard Island and McDonald Islands Fishery) the relevant international agreement will prevail where it includes an acceptable scientific process for setting sustainable catch levels. In such fora, Australia will advocate its domestic policy settings as an example of best practice.

   b. Participate in an expert review of the policy referred to in paragraph 2(a) above which will report to me by 30 June 2006.

      - The expert-based review of the above initial settings for the Commonwealth Harvest Strategy Policy will determine if, and by how much, these settings should be amended to ensure that the objectives in relation to sustainability and profitability, overfishing and recovery of stocks are met within specified time limits.
      - The expectation is that for some species, the adoption of more conservative harvest strategies with higher stock size thresholds (eg. '30/50' strategies), lower exploitation rates or a higher probability (e.g. 90-95%) of avoiding overfishing will be necessary to achieve these objectives.
      - The review will be led by the Department of Agriculture, Fisheries and Forestry (DAFF), will involve relevant bodies, and will be peer reviewed by international fisheries experts.

Guidelines for Implementation of the Commonwealth Fisheries Harvest Strategy Policy

September 2007

Executive Summary

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 (*FA Act). The Ministerial Direction included a requirement for the development of a world's best practice harvest strategy policy for Commonwealth fisheries and the implementation of harvest strategies consistent with that policy in all Commonwealth fisheries by 1 January 2007 (subsequently amended to January 2008).

Subsequently, the Australian Government Department of Agriculture, Fisheries and Forestry – Australia (DAFF) issued its initial draft Commonwealth Fisheries Harvest Strategy Policy (HSP). The HSP provides a framework for the development of harvest strategies for key commercial species taken in Australia's Commonwealth fisheries. Key objectives of the HSP are to stop overfishing, to recover overfished stocks, and to promote longer term profitability for the fishing industry.

The HSP reflects key domestic and international legislative and policy obligations for Commonwealth fisheries management. Additionally, it establishes a harvest strategy (HS) framework and default reference points to be applied in Commonwealth fisheries.

This Guidelines document sits between the HSP itself and the implementation of harvest strategies fishery by fishery. The aim of these *Policy Guidelines* is to provide practical assistance in the development of fishery specific harvest strategies under the HSP, and to illustrate the scope of application of the HSP. The Guidelines should ensure that a common approach and framework is applied across Commonwealth fisheries, to the extent possible for such a diverse set of fisheries.

The Guidelines are intended to support harvest strategy development across the full range of Commonwealth fisheries, including input and output managed fisheries, single and multi-species fisheries, large and small fisheries, and data rich to data poor situations. They also provide important contextual information to assist interpretation of the HSP, and to support harvest strategy development and implementation.

Specifically, the Guidelines provide practical advice to facilitate:

i) the interpretation of the HSP; and

ii) the application of the HSP to Australia's Commonwealth fisheries.

It is important to note that the Guidelines provide guidance and are not meant to be prescriptive. Throughout the document, use is made of example boxes to illustrate key points or to provide practical examples.

The Guidelines are organised into a series of Sections.

Sections 2 – 4 are introductory. They provide an overview of the HSP, briefly explain what a harvest strategy is, describe a process for development, outline the key operational objectives of the HSP, and describe harvest strategy design criteria.

Section 5 describes the concept of Maximum Economic Yield: how it should be calculated, used, and revised, and its application to multi-species and multi-method fisheries.

Section 6 briefly outlines the types of management tools available for use in implementing a HS, making the point that harvest strategies can be applied to input-managed fisheries as well as output-managed (e.g. quota) fisheries.

Section 7 describes approaches that can be taken with data poor species and fisheries. The important issues of uncertainty and risk are dealt with in **Section 8** and harvest strategies for highly variable species in **Section 9**.

Section 10 outlines recovery strategies and the key elements of stock rebuilding plans.

Section 11 provides specific examples of how to turn recommended biological catches from the harvest strategy into management advice such as Total Allowable Catch (TAC) and Total Allowable Effort (TAE), including spatial controls.

Section 12 provides advice on determining harvest strategies for developing fisheries, such that the fishery can develop economically but is controlled to meet the intent of the HSP.

Occasionally there may be circumstances where management action arising from application of a harvest strategy is not meeting the intent of the HSP. Clearly such circumstances should be the exception rather than the rule and examples are described in **Section 13**.

The technical aspects of Management Strategy Evaluation and its role in identifying and evaluating harvest strategies are outlined in **Section 14**.

Section 15 describes the process for amending harvest strategies over time.

1 Introduction

In December 2005 the then 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 (*FA Act). The Ministerial Direction included a requirement for the development of a world's best practice harvest strategy policy for Commonwealth fisheries and the implementation of harvest strategies consistent with that policy in all Commonwealth fisheries by 1 January 2007[10].

Subsequently, the Australian Government Department of Agriculture, Fisheries and Forestry – Australia (DAFF) issued its initial draft Commonwealth Fisheries Harvest Strategy Policy (HSP). The HSP provides a framework for the development of harvest strategies for key commercial species taken in Australia's Commonwealth fisheries. Harvest strategies consistent with the HSP will provide the Australian community with a high degree of confidence that commercial fish species are being managed for long-term biological sustainability and economic profitability. It also seeks to provide a more predictable operating environment for the fishing industry.

The HSP reflects key domestic and international legislative and policy obligations for Commonwealth fisheries management.

The HSP establishes a harvest strategy (HS) framework and default reference points to be applied in Commonwealth fisheries. This set of practical *Policy Guidelines* have been developed to assist with the implementation of fishery specific harvest strategies under the HSP and to illustrate the scope of application of the HSP and provide guidance on applying the HSP in various fishery circumstances.

The Guidelines are intended to support HS development across the full range of Commonwealth fisheries, including input and output managed fisheries, single and multi-species fisheries, large and small fisheries and data rich to data poor situations. Rather than expecting a full quantitative assessment for each species in each fishery, the HSP advocates a risk management approach, whereby exploitation levels reduce as uncertainty around stock status increases. This will ensure fisheries are managed at an acceptable level of risk to the Australian Government irrespective of our level of knowledge. For a low value fishery, AFMA and stakeholders may accept that catches will remain precautionary with supporting fishery research at low levels, to better match the management costs to the business environment for that fishery.

Harvest strategies should be applied to key commercial species, of all Commonwealth-managed fisheries. It takes into account mortality resulting from all types of fishing, including state managed and recreational fisheries. The HSP does not necessarily require that all types of fishing be regulated, nor does it prescribe the type of fishery management regulations that will be applied. It is possible that a HS could meet the policy objectives without the need for additional management arrangements or regulations.

1.1 Objectives and structure of the Guidelines

The Guidelines are intended to provide detailed practical guidance for the development and implementation of harvest strategies across the diverse range of Commonwealth fisheries. They also provide important contextual information to assist interpretation of the HSP, and to support HS development and implementation. The Guidelines are not meant to be prescriptive, and are to be interpreted in the light of the HSP.

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[10] In a subsequent letter to AFMA dated 9 October 2006, the Minister for Fisheries, Forestry and Conservation advised that full implementation of harvest strategies consistent with the revised Harvest Strategy Policy had been extended until January 2008.

The guidelines are organised into a series of Sections. **Sections 2 – 4 are introductory**. They provide an overview of the HSP, briefly explain what a HS is and describe a process for development; and outline the key operational objectives of the HSP and describe harvest strategy design criteria.

Section 5 describes the concept of **Maximum Economic Yield**, how it should be calculated, used and updated, and specifically how it applies to multi-species and multi-method fisheries.

Section 6 briefly outlines the types of **management tools** available for use in a harvest strategy, making the point that harvest strategies can be applied to input-managed fisheries as well as output-managed (e.g. quota) fisheries.

Section 7 describes approaches that can be taken with **data poor species and fisheries**. **Section 8** deals with **uncertainty and risk**, and **Section 9** harvest strategies for **highly variable species**.

Section 10 outlines **stock rebuilding strategies** and the key elements of **stock recovery plan**.

Section 11 provides specific examples of how to turn the recommended biological catches from the harvest strategy into **management advice** in terms of setting TACs and TAEs, including spatial aspects.

Section 12 considers advice on determining harvest strategies for **developing fisheries** such that the fishery can develop but is controlled to meet the intent of the HSP.

Section 13 deals with circumstances where management action arising from application of a harvest strategy is **not meeting the intention of the HSP**. Clearly such circumstances should be the exception rather than the rule and examples are described.

Finally, **Section 14** outlines the technical aspects of **Management Strategy Evaluation** and its role in evaluating harvest strategies. Section 15 discusses how harvest strategies should be **amended** over time.

2 Harvest Strategies

2.1 Introduction

A Harvest Strategy (HS) is defined on page 3 of the HSP. Key elements of any HS include:

- a process for monitoring and conducting assessments of the biological and economic conditions of the fishery; and
- rules that control the intensity of fishing activity according to the biological and economic conditions of the fishery (as defined by the assessment). These rules are referred to as control rules (but are sometimes also known as harvest control rules or decision rules).

Monitoring and stock assessment are commonly undertaken in Australian fisheries, but the use of control rules is more recent and is described further below. Stock assessment requires that all forms of fishing mortality be accounted for in the analyses, including recreational catches. The HSP reflects this and when developing a harvest strategy, catches from all fisheries/jurisdictions need to be considered.

The experience of good fisheries management indicates that, in general terms:

- fisheries are more efficient, profitable, stable and sustainable, when stocks are larger than the stock size that produces the maximum sustainable yield[11] (referred to as B_{MSY});

[11] It should be noted that maximum sustainable yield is a theoretical maximum that can be taken from a stock in perpetuity.

- future productivity is at greater risk when stocks are reduced to a level where the recruitment of young fish relative to the portion of the stock subject to fishing declines precipitously (referred to as 'recruitment failure');
- fisheries should be managed on a whole stock basis, and in a way that takes species life history into account;[12]
- economic returns can be maximised and in general, overcapitalisation avoided when fish stocks are maintained, on average, at a target adult biomass level equal to the maximum economic yield (B_{MEY});[13] and
- if stock sizes fall below B_{MEY}, the associated increase in fishing costs is greater than the increase in fishing revenue, and as such is less efficient.

The HSP incorporates the above principles to provide a framework for the development of harvest strategies. The relationship of the HS to the fishery management cycle is shown in Figure 1.

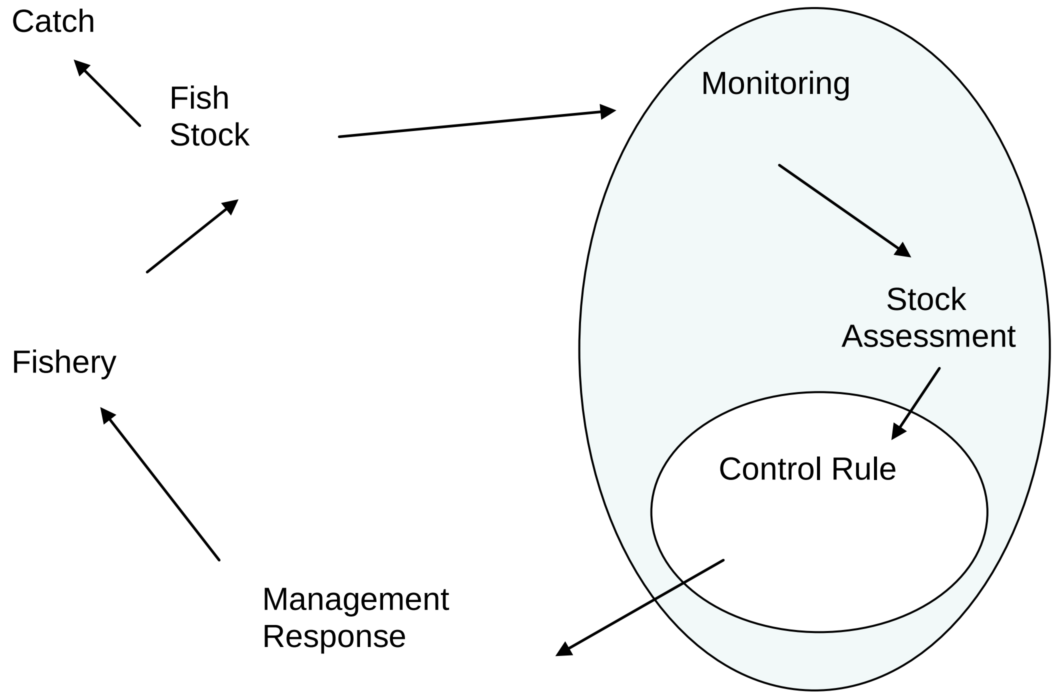

Figure 1: The fisheries adaptive management cycle. The HS is indicated by the shaded large oval.

Control rules specify the management actions to be taken in response to assessment information about the current (economic and biological) status of the stock. The form of the control rules will depend on the management tools being used in the fishery (see Section 6 below). If output controls are in use, the control rules will specify the level of catch (e.g. quota) for any given level of stock. Where input controls are used, the control rules will specify the levels of input (effort levels, size limits, season length etc) for a given status of the stock. For new or developing fisheries, control rules may specify interim input or output controls and the monitoring, survey or assessment requirements necessary before these can be changed. Control rules should specify unambiguous management responses, and not simply call for unspecified changes in catch or effort, or further review of the situation. The form of the control rule will also depend on the form and nature of the information available from the assessment. Control rules should be fishery and stock specific. The main criterion for selecting control rules, and harvest strategies, is that

[12] Life history characteristics include, among other things, longevity, fecundity and recruitment variability.
[13] Economic returns will only be maximised if a management regime is also in place that allows for fishing costs to be minimised and fishing revenue to be maximised.

they achieve management objectives (including the objectives of the HSP) in a cost effective and efficient manner.

Figure 2 gives an example of a harvest control rule that is consistent with the HSP and also provides an illustration of the terms "overfished" and "overfishing" (see also section 3.1). The harvest control rule is the line labelled on the right hand side by F_{TARG} and is shown as a function of the biomass level of the stock. It consists of a constant exploitation rate while the stock size is above B_{MSY}, and reduces to zero as the stock reduces to B_{LIM}.

As noted above, and developed in more detail below, control rules will often take the form of a direct relationship between a management measure (such as a catch level) and the current status of the resource. This is the simplest form of a control rule, but control rules may also take more complex forms, involving application of meta-rules. An example of a meta-rule might be an over-ride that limits change in the management measure (catch level) from one year to the next. For example it might be decided (for economic reasons) to limit the change in a TAC to +/- 30% of the previous year's value. If adopted, such meta-rules become a formal part of the harvest strategy, and their impact on achievement of the policy goals needs to be assessed (usually through formal analyses such as Management Strategy Evaluation [MSE] – See Section 14).

Further reading on harvest strategies can be found in the following references: Butterworth and Punt (1999), Punt (2006), Smith et al. (2007).

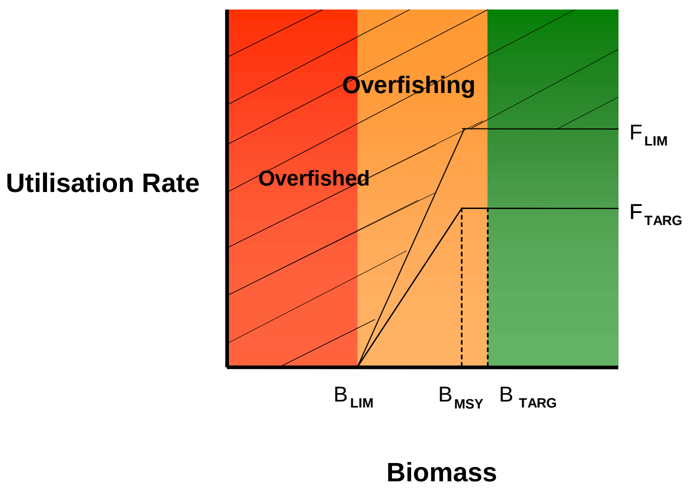

Figure 2. This figure shows an example of a harvest control rule that is consistent with the HSP. B_{LIM} is the limit biomass reference point, B_{MSY} is the biomass that gives the maximum sustainable yield, and B_{TARG} is the target biomass. The HSP specifies B_{TARG} as B_{MEY}, the biomass that gives the maximum economic yield. F_{LIM} and F_{TARG} are the limit and target fishing mortality rates respectively. In this example, the recommended biological catch (RBC) is calculated by applying F_{TARG} to the current biomass (assumed to be available from a stock assessment). The control rule specifies that as the biomass reduces below B_{MSY}, F_{TARG} is reduced to zero at B_{LIM}. In this figure, the red area indicates overfished ($B < B_{LIM}$), the hatched area overfishing ($F > F_{LIM}$), the green area where the stock is at or above the target, and the amber area where management action is required to rebuild the stock to B_{TARG}.

2.2 The relationship between harvest strategies and other management measures

Whilst necessarily focused on the management of key commercial species, harvest strategies are also a key element of the Commonwealth's overall Ecosystem Based Fisheries Management (EBFM) approach. It must be emphasised that implementing a harvest strategy of itself will not achieve ecologically sustainable or profitable fisheries. Other processes are in place in Commonwealth fisheries management to help achieve broader ecosystem objectives, including undertaking comprehensive ecological risk assessments (ERA) accompanied by appropriate risk management responses. The Ministerial Direction provides for further initiatives in support of EBFM, including reductions to bycatch, fishery independent monitoring, and increased focus on spatial management. Harvest strategies, in combination with this package of measures, constitute a whole of government approach to sustainable fisheries management.

In meeting all of the outcomes harvest strategies are also required to consider ecosystem interactions. One consideration is the relationship the species has with others in the food web or community, particularly if the harvested species is a keystone species. In such circumstances the biomass reference points described above may be increased to take account of a species' importance to the maintenance of the food web or community.

A contemporary management framework for most commercial fisheries will include a harvest strategy as well as other management tools, often using a combination of input and output controls. Harvest strategies should be developed with due consideration of these other management tools. For example it is possible that Total Allowable Catches (TACs) or Total Allowable Effort (TAEs) recommended under harvest strategies at a stock or regional level may not prevent localised depletion even if overall stock sustainability objectives are achieved. In such cases, tools such as spatial management may need to be implemented separately or form part of the harvest strategy.

An increasing focus on the management of discarded or bycatch species also suggests that effective gear controls and spatial management should be carefully considered in the design of single species harvest strategies.

The relationship of the Policy and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act*)* is described on page 7 of the HSP and discussed below in Section 3.2.

2.3 Highly Migratory/Straddling or Joint Authority Fisheries Stocks

In the case of fisheries that are managed under the joint authority of the Australian Government and another Australian jurisdiction or international management body/arrangement, this Policy does not prescribe management arrangements. However, the Australian Government will negotiate with the relevant body with an aim of ensuring sustainable fisheries by advocating this policy as an example of best practice in setting sustainable catch levels.

The Australian Governments position taken to regional fisheries management organisation/arrangement negotiations is underpinned by Australia's domestic legislative obligations. Therefore it is Australian Government policy to support catch level decisions taken by these organisations and arrangements. In the absence of agreement, Australia's domestic catch allocation decision would be consistent with the agreed whole of government position[14].

For fisheries issues that are not decided by an international management body or arrangement, DAFF and AFMA will consult on the management arrangements that will apply and AFMA will implement those arrangements.

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[14] The AFMA Board holds ultimate responsibility in determining TAC levels for all Commonwealth-managed fisheries as per the FMA.

2.4 Indicators, Performance Measures and Reference Points

In the following discussion of harvest strategies, terms such as “performance measure”, “indicators” and “reference points” are used commonly. In broad terms, a performance measure is used to measure progress against (management) objectives, and is a measure of where an indicator (such as stock size) sits in relation to a reference point. The indicator may be some direct observation (such as catch per unit effort - CPUE), or may be estimated using a stock assessment model (such as biomass). The reference point can be either a target (where you want to be) or a limit (where you don’t want to be) and is a particular level of an indicator (Figure 3).

The types of performance measures and reference points used reflect the level of knowledge of the species and/or fishery and the sophistication of the assessment.

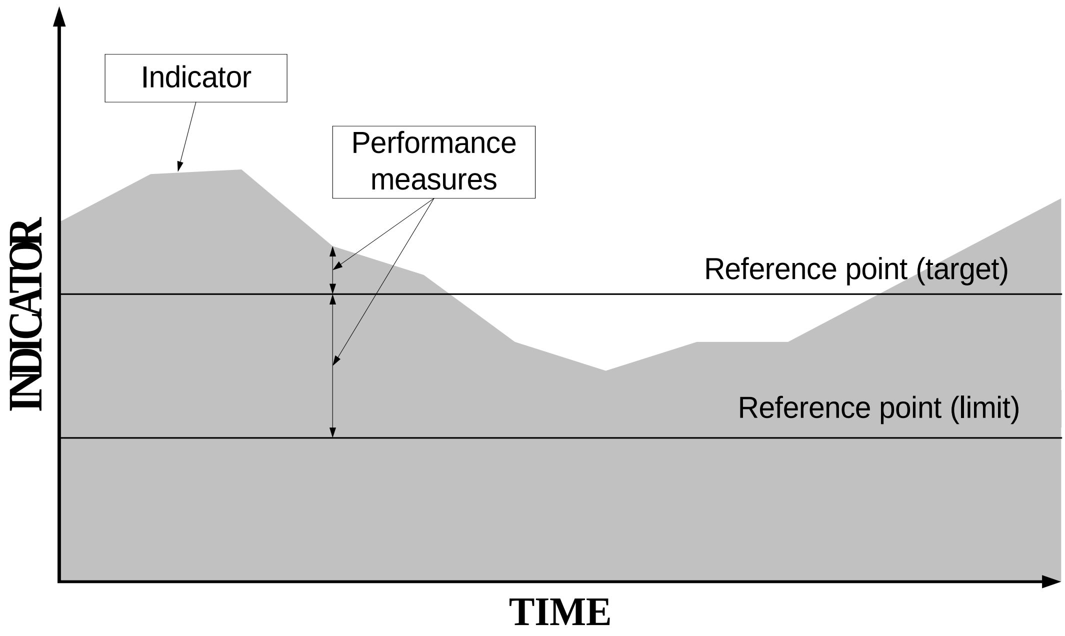


Figure 3: The relationship between indicators, reference points and performance measures.

2.5 Process for Developing Harvest Strategies

In managing Commonwealth fisheries, AFMA adopts a partnership approach through its Management Advisory Committees (MACs), Resource Assessment Groups (RAGs), and other stakeholder consultation groups and processes. These groups will play a key role in developing and reviewing harvest strategies before final approval by the AFMA Board.

It is anticipated that each HS will be developed by the appropriate RAG, working group or project team. Draft fishery harvest strategies should be critically evaluated by the Fishery RAG and MAC (Figure 4), taking into account the underlying principles and objectives of the harvest strategy as it relates to the adaptive fishery management cycle, the HS design criteria provided in Section 4, and the objectives stated in the HSP.

Figure 5 shows the technical process for establishing harvest strategies.

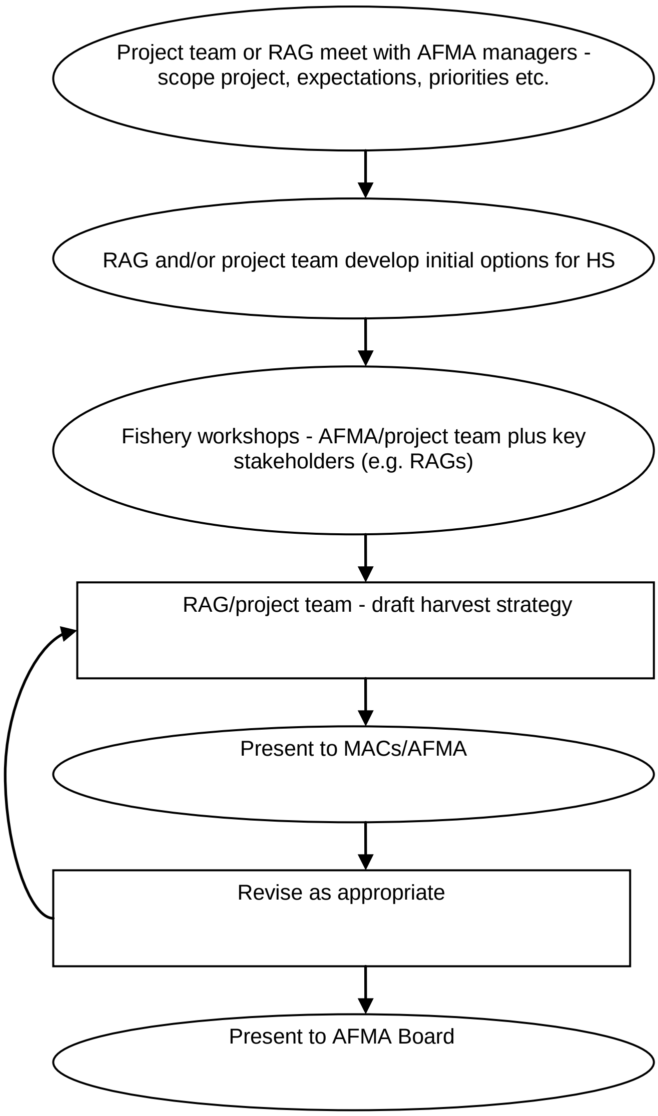


Figure 4: Flowchart indicating the engagement and consultative process for developing a harvest strategy.

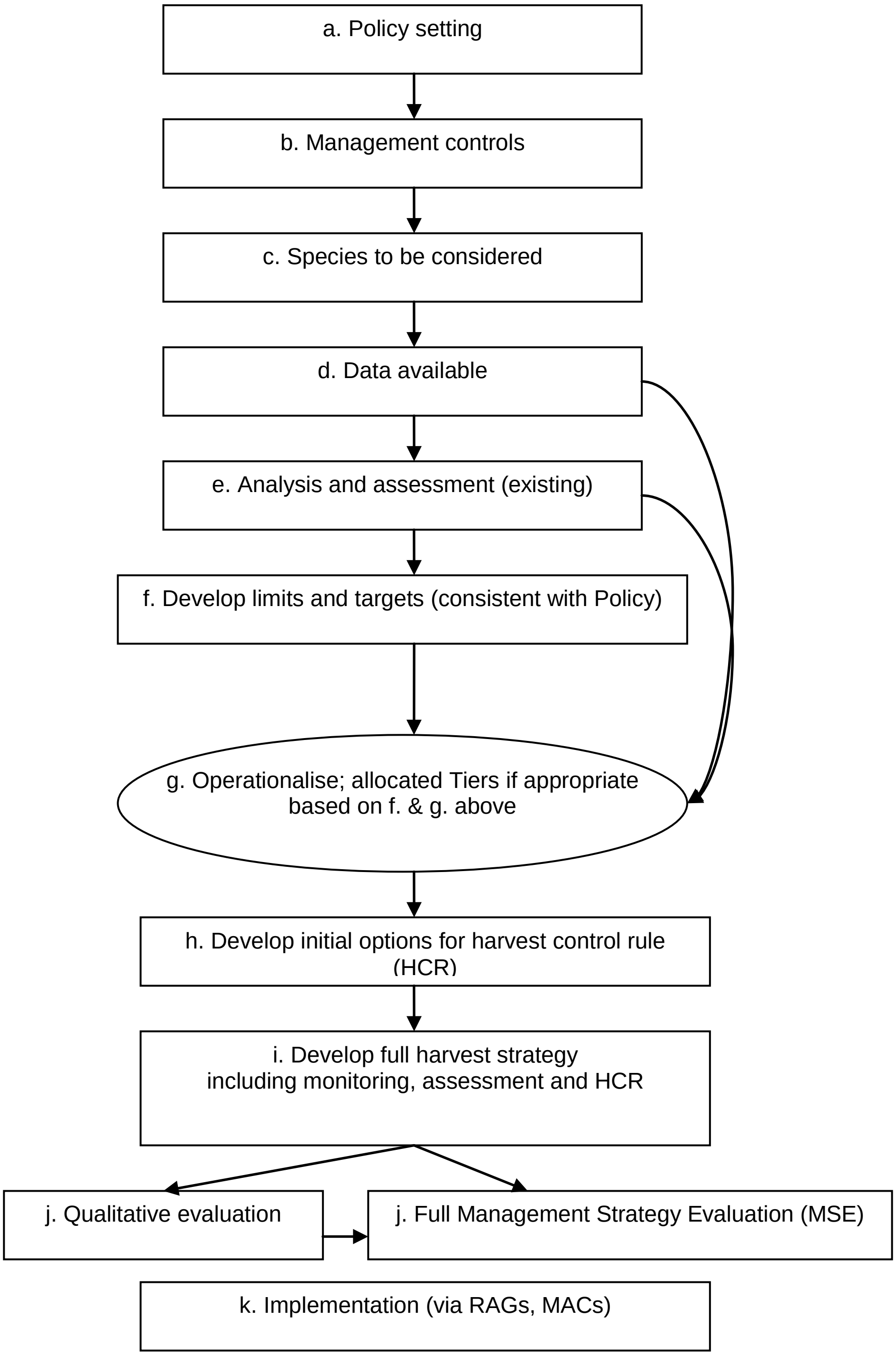


Figure 5: Flowchart indicating the technical process for developing a HS.

2.6 Cost Issues

The costs of initial development of harvest strategies have been substantially offset by a special funding allocation from the Australian Government as part of the *Securing Our Fishing Future* package. This funding of $2M per annum for years 2006-07, 2007-08, and 2008-09 has been apportioned relatively equally between compliance and monitoring, research (primarily harvest strategy development), and improved data collection as envisaged by the Ministerial Direction.

The initial development costs for harvest strategies across AFMA's fisheries are largely covered through the Minister's $2M per annum allocation. However, the subsequent costs of setting TAC/TAE for stocks and fisheries are not covered through this special funding allocation but are recoverable from Commonwealth fishers in accordance with AFMA's *Guidelines for categorizing research costs in accordance with the Cost Recovery Impact Statement (CRIS)* see http://www.afma.gov.au/information/publications/corporate/cris/cris.pdf

The incorporation of economics into the management of fisheries is essential given the legislative economic objective. AFMA will seek to ensure that there is economic capacity available to resource assessment groups (RAGs) and management advisory committees (MACs) to assist them to provide adequate advice.

Cost effective and efficient fisheries management is one of AFMA's legislative objectives. Harvest strategies and associated data collection, as well as evaluation processes, must be carefully evaluated against this objective.

Initial implementation costs and longer term operating costs should be quantified by the MAC/RAG. These should include implementation costs for alternative management tools if these are an integral part of the proposed HS, as well as ongoing monitoring, research and assessment costs associated with implementation of the HS. Selection of an appropriate harvest strategy for a stock or fishery should involve careful assessment of the costs and benefits (including management costs) of alternative strategies, given that any suitable HS must meet the minimum requirements of the HSP. Once harvest strategies are implemented, ongoing refinement and application of them will be considered as routine fisheries management activities and will also be subject to normal cost recovery processes under the CRIS.

3 Key Operational Objectives of the Harvest Strategy Policy

3.1 HSP Reference Points

Harvest strategies for key commercial species taken in Australia's Commonwealth fisheries will be designed to pursue maximising the economic yield from the fishery, and ensure fish stocks remain above levels at which the risk to the stock is unacceptably high.

The HSP specifies minimum standards for reference points as detailed below:

- B_{TARG} (or proxy) equal to or greater than B_{MEY}. In cases where B_{MEY} is unknown, a proxy of $1.2B_{MSY}$ (or a level 20% higher than a given proxy for B_{MSY}) is to be used[15]. AFMA may approve the use of an alternative proxy for B_{MEY} if it can be demonstrated that a more appropriate alternative exists;
- B_{LIM} (or proxy) equal to or greater than ½ B_{MSY} (or proxy);
- F_{LIM} (or proxy) less than or equal to F_{MSY} (or proxy)[16]; and
- F_{TARG} (or proxy) at the level required to maintain the stock at B_{TARG}.

[15] B_{MSY} is a significant interim goal between stocks rebuilding from B_{LIM} to B_{TARG}. Once a stock has reached B_{MSY}, it is the responsibility of the individual MAC and AFMA board to ensure that the stock is on a trajectory to achieve B_{MEY}.

[16] 'Fish down' strategies (where $F_{CURRENT} > F_{LIM}$) are acceptable only where there is strong evidence that stock biomass is well above B_{TARG} and there are effective monitoring arrangements in place to ensure that as B_{TARG} is approached, $F_{CURRENT}$ is reduced to F_{TARG}. For stocks above B_{TARG}, the rate of 'fish down' toward the target level will be determined by fishery specific harvest strategies.

The HSP also requires well defined control rules that determine the level of fishing allowable for a given level of biomass. These control rules should:

- ensure that the fishery is maintained at (on average), or returned to, a target biomass point B_{TARG} equal to the stock size required to produce maximum economic yield (B_{MEY}), or an appropriate proxy (see above);
- ensure fish stocks in the long term will remain above a biomass level where the risk to the stock is regarded as too high, that is B_{LIM}, or an appropriate proxy (see above);
- ensure that the stock stays above the limit biomass level at least 90% of the time (i.e. a 1 in 10 year risk that stocks will fall below B_{LIM}). The 90% probability will form a key performance criterion in evaluating prospective harvest strategies when conducting management strategy evaluation analyses. It is important to note that this is a minimum standard, and that most harvest strategies that achieve the targets on average should perform better than this standard with regard to the probability of exceeding the limits. For highly variable species that may naturally (i.e. in the absence of fishing) breach B_{LIM}, the harvest strategy for these species must be consistent with the intent of the Policy. Stocks that fall below B_{LIM} due to natural variability will still be subject to the recovery measures as stipulated in the HSP; and
- progressively reduce the level of fishing when a stock moves below B_{MSY} and moves toward B_{LIM}.

Harvest strategies that result in higher levels of stock protection than required by the reference points may be developed where it is appropriate and cost effective and efficient to do so.

The biomass limit reference point B_{LIM} is a key component in the HSP and will generally play a key role in development of harvest control rules. It defines the point at which a stock will be defined as "overfished", and the point in the harvest control rule below which there will be no further targeted fishery on that species, and a stock rebuilding strategy has to be set in place. In general, B_{LIM} should correspond to a biomass level, or level of stock depletion, at which the risk to the stock is unacceptably high, for example the point at which recruitment overfishing is thought to occur. Empirical studies of fished species from around the world (Myers et al. 1994) show that this level varies over a considerable range, but a common assumption is that either ½B_{MSY} or $B_{20\%}$ (the stock size corresponding to 20% of unfished biomass B_0) is a suitable proxy for B_{LIM}. These Guidelines suggest that the proxy for B_{MSY} in the absence of more specific information be 40% of B_0, which would also imply that B_{LIM} is at 20% of B_0[17].

It is recognised that the HSP cannot explicitly cater for every possible management circumstance across the diversity of Commonwealth fisheries. The HSP provides for the use of proxy settings for reference points to cater for unique fishery circumstances. This balance between prescription and flexibility will encourage the development of innovative and cost effective strategies to meet key policy objectives. Proxies must ensure stock conservation and economic performance as envisaged by the HSP. Such proxies, including those that exceed these minimum standards must be clearly justified. This justification will be a key consideration when fishery harvest strategies are evaluated for approval by the AFMA Board.

For fisheries where data and or knowledge are limited, or the management environment is such that it is not appropriate and/or cost effective to determine MEY, or 1.2 B_{MSY} as its proxy, harvest strategies should be developed that best meet the requirements of the HSP and AFMA's legislative objectives. In general this will involve maximising fishery level profits whilst meeting ESD and other key management objectives. The justification for adopting a particular target reference point (TRP) will also be carefully considered by the AFMA Board.

[17] Note that, for some fisheries, even when B_{MSY} can be calculated, a depletion reference point as a proxy, such as 40% B_0, is more likely to meet conservation objectives.

For those stocks that do not meet the requirements of the HSP by 1 January 2008 – i.e. those stocks that are expected to be below the adult biomass limit reference point as at 1 January 2008, the HSP states they will be subject to transitional arrangements. Targeted fishing for any of these stocks, not currently subject to zero catch, need not be reduced immediately to zero, but management actions shall be directed to rapid rebuilding of these stocks. These transitional arrangements will apply for no more than one year and the HSP will apply to all stocks in full from 31 December 2008, which means that targeted fishing of key commercial species below B_{LIM} will cease as of 1 January 2009.

3.2 Stock Rebuilding

For a stock below $B_{LIM,}$ a rebuilding strategy[18] will be developed to rebuild the stock to B_{TARG}. Once such a stock is above B_{LIM} it may be appropriate for targeted fishing to re-commence in-line with the stock rebuilding strategy and HS. The extent of breach, and the status of other stocks of the same species, will influence consideration of whether a given species or stock may be eligible for listing as 'conservation dependent', 'vulnerable' or a higher threat category under the EPBC Act.

For stocks above B_{LIM} but below the level that will produce maximum sustainable yield (B_{MSY}) it is necessary to first rebuild stocks to B_{MSY}. Once stocks are above B_{MSY}, rebuilding shall continue toward B_{TARG} however the rate of rebuilding may be slower and shall be determined in a way that considers the appropriate balance between short term losses and longer term economic gains.

While a species/stock biomass is above B_{LIM} there is no expectation that the species/stock would be added to the list of threatened species (conservation dependent, vulnerable, endangered or critically endangered) under the EPBC Act.

If the species/stock biomass is, at or below B_{LIM} it may be the subject of action under both the fisheries and environment legislation as the risk to the stock is now regarded as unacceptably high.

> *If an AFMA developed stock rebuilding strategy was in place, of which the cessation of the strategy would adversely affect the conservation status of the species, consideration may be given to listing the species in the conservation dependent category. An adequate rebuilding strategy is likely to be one with the characteristics of a recovery plan that would provide for the research and management actions necessary to stop the decline of, and support the recovery of, the species concerned.*

If the stock biomass falls more substantially below B_{LIM}, there is an increased risk of irreversible impacts on the species. As such the species will likely be considered for listing in a higher threat category (i.e. vulnerable, endangered or critically endangered). A listing under such categories may, in accordance with the EPBC Act, require development of a formal recovery plan.

> *For a conservation dependent listed species, were the rebuilding strategy to prove unsuccessful in meeting the interim targets and the biomass were to fall more substantially below B_{LIM}, (where there is an increased risk of irreversible impacts) then the species would likely be considered for listing under a higher threatened species category.*

Where the biomass of a listed species/stock is rebuilding toward to B_{TARG}, consideration may be given to deleting the species from the EPBC Act list of threatened species, or amending the category it is in. Deleting a species from the list of threatened species under the EPBC Act is effected via a legislative instrument issued by the Minister for the Environment and Water Resources. Advising the Minister that a recovering species that has rebuilt above B_{LIM} should be considered for delisting will be the responsibility of AFMA on the advice of the AFMA Board, however any person can initiate the process. The relevant

[18] Rebuilding strategy to be developed by AFMA and agreed to by the Minister for the Environment and Water Resources.

sections of the EPBC Act, primarily Part 13, will apply for any listing, amending, or deletion of a species in the list of threatened species.

In situations where the adult biomass of a particular stock is greater than or equal to B_{TARG}, AFMA will have a high degree of discretion in how that stock is managed. AFMA will continue to have flexibility in the management of a particular stock where the adult biomass is between B_{TARG} and B_{LIM}. When the stock is below B_{TARG} the management response will be to set the control rules to take the stock back towards B_{TARG}.

The best available science will underpin all key decisions in the application of the HSP and relevant provision of the EPBC Act. Stakeholders will be well informed and Government agencies will ensure transparency. See also section 10.

The relationship of the Policy and the EPBC Act is summarised below:

B_{TARG}		Strong economic performance. High stock resilience. No expectation to undertake consideration of listing as threatened species under EPBC Act
		No expectation of listing under the EPBC Act but harvest strategy in place to rebuild towards B_{TARG}
B_{LIM}	Conservation Dependent	Targeted catch set to zero. AFMA managed stock rebuilding strategy in place. May be listed as conservation dependent under the EPBC Act.
Eg $0.75B_{LIM}$	Listed Threatened Species	Markedly increased risk of irreversible impacts on the species. Likely consideration of listing as vulnerable, endangered or critically endangered under the EPBC Act. Such a listing may require development of a formal recovery plan under the EPBC Act.

3.3 Multi-species fisheries

In fisheries that target or catch a number of species (e.g. those using less selective gears such as trawling and longlining), it will be extremely difficult to maintain all species at the TRP because not all species can be effectively targeted and some species will be caught as incidental catches of the main target species. Importantly, MEY applies to the fishery as a whole and is optimised across all species in the fishery. As a result, some secondary species (e.g. lower value species) may be being fished at levels that will result in their biomass remaining below their target biomass reference point (i.e. B_{MEY}). In such circumstances, the estimated biomass of these secondary species **must** be maintained above their limit reference point, B_{LIM}.

Consideration should also be given to:

- demonstrating that economic modelling and other advice clearly supports such action;
- no cost-effective, alternative management options (e.g. gear modification or spatial management) are available; and
- the associated ecosystem risks have been considered in full.

Such an approach would be consistent with the intent of the HSP (See also Section 5.4).

4 Harvest Strategy Design Criteria

In addition to meeting the technical and operational requirements of the HSP, harvest strategies are required to meet a range of important design and implementation criteria. Many of these relate to efficient administrative and regulatory practice. They are detailed below.

4.1 Efficient and cost effective

The operational and regulatory framework associated with managing a fishery under a harvest strategy approach must be cost effective and efficient whilst achieving the objectives of the HSP to the required standard.

The HS must be developed to suit the management context of the fishery involved, having particular regard to the profitability of the fishery, the state of knowledge with respect to stock status and broader environmental impacts, the current and strategic business environment for the fishery, and other relevant factors.

4.2 Consistent with ESD principles

The principles of ecologically sustainable development are provided in Section 3A of the Commonwealth's *Fisheries Management Act 1991*. They require that:

- decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equity considerations;
- if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;
- the principle of inter-generational equity: that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;
- the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making; and
- improved valuation, pricing and incentive mechanisms should be promoted.

4.3 Maximise the net economic returns to the Australian community

To ensure that the Australian community receives the maximum benefit from the exploitation of fishery resources, regulatory decisions, including in this case the nature of harvest strategies, should be made within a process where the full costs and benefits of alternative approaches are considered. There are two key aspects to maximising the profitability of a fishery for which AFMA has responsibility to implement. The first is that catch is set at the level (MEY) that maximises the return created in the fishery over time. The second is that for this given level of catch, fishing costs are minimised and revenues maximised.

Detailed advice on the incorporation of economic efficiency measures within fishery harvest strategies is included in Section 5: "Economics and harvest strategies".

4.4 A high level of transparency in decision making

This principle requires that there is full consultation and disclosure of information with relevant parties that will be affected by the ongoing application of harvest strategies in Commonwealth fisheries. In general terms, this principle reflects the importance of affording procedural fairness to affected parties. Other key aspects include objectivity, consistency, and timeliness in communicating decisions. It should also be noted that the AFMA Board retains its role as the decision maker in setting catch or effort units in Commonwealth fisheries.

4.5 A high level of confidence that objectives will be met

In addition to meeting the probability requirements of the HSP with respect to maintaining stocks at target levels and avoiding depletion to limit reference point levels, the application of this principle to harvest strategies will require that they are robust to the uncertainty inherent in the assessment and management of fisheries. This principle also requires that some form of MSE is conducted for each HS (see Section 14). Regular monitoring of HS performance against key objectives of the HSP is also required.

4.6 Taking species' life history into account

The HSP recognises that each stock/species/fishery will require an approach tailored to fishery circumstances, including species characteristics. This is particularly relevant in the context of setting Target and Limit Reference Points consistent with the objectives of the HSP, and in developing stock specific stock rebuilding strategies and stock recovery plans for overfished stocks.

This principle recognises that some stocks are significantly less productive than others, and that these less productive stocks should be managed more conservatively to avoid over-fishing, and to ensure stock recovery within acceptable timeframes for depleted stocks. It also recognises that some stocks are highly productive, or are naturally variable in the absence of fishing, and need to be dealt with appropriately.

5 Economics and Harvest Strategies

5.1 What is MEY?

Economic considerations are important in determining appropriate targets for a harvest strategy. Economic efficiency in a fishery implies that that the fish stock is protected and that the net returns (profits) of fishers are maximised. This occurs when the sustainable catch or effort level for the fishery as a whole maximises profits. This point is referred to as maximum economic yield (MEY). However, economic efficiency will only be ensured if a management regime is also in place that allows for fishing costs to be minimised and fishing revenue maximised at the given MEY catch level. That is, two conditions must be met simultaneously to achieve economic efficiency in a fishery:

- MEY catch level is set. This will account for the impact of current catches on future fish stocks, catches and fishing costs.
- A management regime is in place that allows fishers to apply the appropriate level of inputs in a fishery. This will help ensure that fishing costs are minimised and fishing revenue maximised for the given MEY catch level.

These Guidelines are focused on the first condition: MEY.

MEY depends on a combination of biological and economic factors. In particular, it depends on the relationships between harvest, stocks and recruitment and on the way in which fishing behaviour, revenue and costs relate to those factors. A simplified static representation of these relationships for a single stock is shown in Figure 6, where it is assumed that there is no uncertainty about the state of nature. When a real bio-economic model is built, it is dynamic and the underlying biological data from the stock assessment are used. However, Figure 6 highlights the general conclusions regarding MEY.

Figure 6 illustrates a typical surplus production model for a fishery as a whole. The vertical axis is dollar amounts and the horizontal axis measures fishing effort (for example, nominal fishing days). The total revenue curve is drawn from a sustainable yield curve. That is, the sustainable yield is multiplied by the price of fish. Initially each unit of fishing effort increases the total catch and revenue. However, because the size of the fish stock is being reduced, the extra catch (and hence extra revenue) taken by each additional unit of fishing effort will progressively reduce. There is a point where the additional unit of effort will not increase the total catch and total revenue any further — this is the point of maximum sustainable yield (MSY). At still higher levels of fishing effort total catch and total revenue is reduced. This is because the increased fishing effort impacts the whole fishery — the biomass size is reduced and consequently catch per unit of effort is reduced.

The total cost curve is assumed to be increasing and linear in effort. These costs include payments for wages, fuel, repairs, etc as well as depreciation and a normal return on capital invested in the fishery.

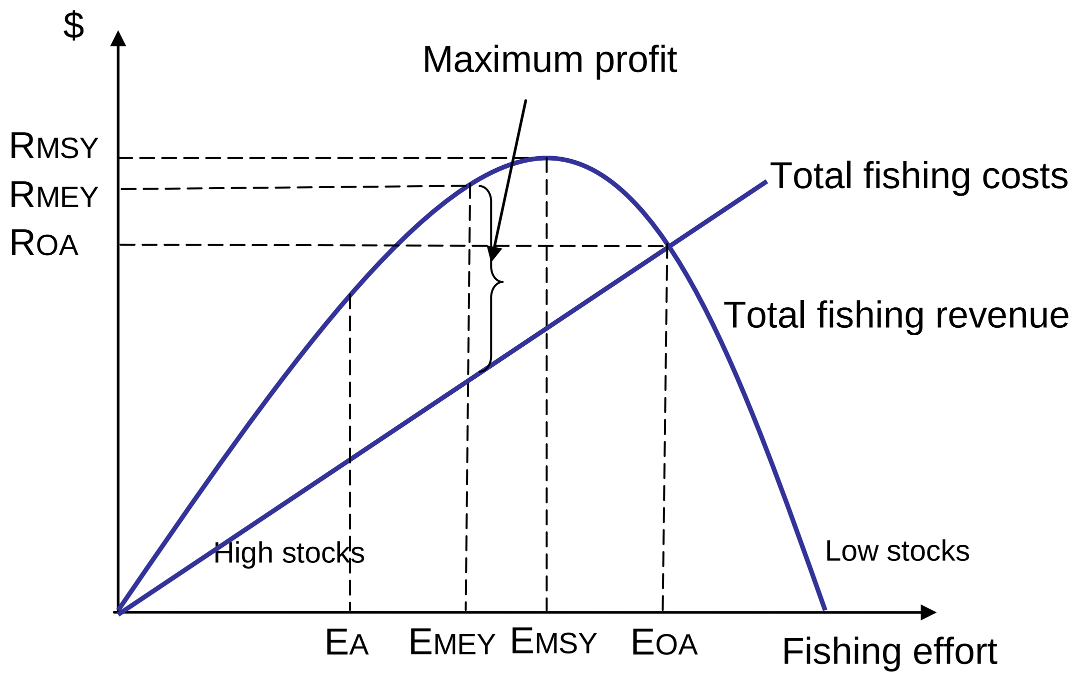


Figure 6: Maximum economic yield (see text for explanation).

MEY occurs at the effort level that creates the largest difference between the total revenue and total fishing costs, thus maximising profits. The level of effort that corresponds with MEY will change given a change in any of the following factors:

- fish prices;
- exchange rates;
- input costs (fuel, gear, etc.); and
- other factors such as changes in fishing technology and management controls.

In an open access fishery or where the level of effort set is well beyond MSY, all fishers acting in their own interest are induced to fish more, but because they do not take into account the effect of their fishing activity on other fishers in the fishery — including the increased cost of harvesting because of stock depletion — all fishers are eventually worse off. For illustrative purposes, assume that the initial effort level in a fishery is E_A, where economic returns are positive. At this point, economic profits are relatively large because the stock is ‘thick’ so fish are easy to catch. This means less time is spent fishing and costs are lower.

Large economic profits induce new fishers to enter and those already fishing to expand their effort. This process continues so long as economic returns remain positive, all the way to effort level E_{OA}, where total revenue is just equal to total costs. There is no incentive for one fisher to reduce their effort because the profits this would create will be dissipated by another fisher expanding their effort. Point E_{OA} is undesirable for two reasons: first, because economic returns are zero and, second, because it would have been possible to obtain greater catch with less effort, greater profits and larger stocks at point E_{MEY}. When left unmanaged or significant latent effort is present, effort in a fishery will not gravitate naturally to a point where economic efficiency is maximised. The level of effort that enables profits to be maximised is E_{MEY}. At E_{MEY}, the difference between total fishery revenue and total fishing costs is greatest, so economic profits are maximised.

5.2 Calculating MEY

In cases where the stock recruitment relationship and economic parameters can be estimated with a reasonable degree of certainty, a bio-economic model can be used to help determine MEY (see northern prawn example below). Bio-economic models are usually optimisation models. That is, they are used to estimate a set of control variables, such as fleet size or aggregate catch, that maximise a given variable, such as profit.

Calculating MEY — an example from the northern prawn fishery

Maximum economic yield (MEY) estimates for the Northern Prawn Fishery (NPF) are obtained from a bioeconomic model that combines stock assessment parameters with a profit function. The profit function measures the difference between the discounted total revenue and the total costs of fishing. The revenue function contains a harvest relationship that accounts for the effect of different stocks of prawns, given changes in fishing effort, on harvest. Key economic parameter values have defined mean values, drawn from ABARE survey data, as well as standard deviations to partially account for the effect of uncertainty.

In the NPF, MEY estimates are obtained for both brown and grooved tiger prawns. Endeavour prawns are treated as an 'economic bycatch', adding to revenues but not the costs of fishing. Banana prawns are not accounted for in the model. Model output generates measures of the stock of prawns at MEY to the stock of prawns at maximum sustainable yield, along with measures of optimal effort and catch at MEY. An updated version of the model developed by ABARE and CSIRO now calculates the dynamic MEY value, that is, the economically optimal pathway to reach the MEY value. Results are presented at NORMAC each year. The model is calibrated for the current price of prawns, the cost of fuel and all other major input expenditures. Model results are also generated based on 3 to 5 year forecasts of the price of prawns and the cost of fuel, with annual updates.

ABARE's bioeconomic model of the tiger prawn component of the northern prawn fishery indicates that the current (2006) biomass of brown tiger prawn stocks is below the level associated with MSY. The ratio of biomass size at MEY (B_{MEY}) to biomass size at MSY (B_{MSY}) for brown tiger prawns is estimated to be 1.54. That is the biomass at MEY is estimated to be 1.54 times the biomass at MSY. Also the calculated optimal number of days fished per boat is 110 days, which results in an MEY target of approximately 50 boats.

ABARE has calculated the ratio of B_{MEY} to B_{MSY} for several of the stocks in the Commonwealth trawl sector of the southern and eastern scalefish and shark fishery (see Box below). Estimates of this ratio vary from 1.03 for tiger flathead to 1.47 for Cascade Plateau orange roughy.

Calculating MEY— an example from the Commonwealth trawl fishery

ABARE has constructed a bioeconomic model of selected stocks for the Commonwealth trawl sector of the southern and eastern scalefish and shark fishery. Solutions to the bioeconomic model are obtained by maximising the discounted profits subject to a specification for harvest functions — the production function mapping fishing inputs to the harvest of fish — and the appropriate stock-recruitment relationship. All initial conditions for biomass are taken from virgin biomass measures provided by CSIRO.

The results of the model are preliminary and the model likely requires further calibration based on biological studies and economic data. The results of the model are in two forms:

- Harvests and stocks in steady state (that is optimal harvests after stock rebuild)
- Harvests during the rebuild phase.

The preliminary results indicate that for four of the major stocks (orange roughy, pink ling, spotted warehou and tiger flathead) considerable stock rebuilding is required to maximise profits (table 1). That is, historical levels of harvest and fishing effort have resulted in current stock sizes that are below the stock level B_{MEY}. Also in table 1 the stock level associated with MEY relative to MSY is shown and for each species B_{MEY} is above B_{MSY}. The optimal harvests at the steady state are also shown in table 1. However, during the rebuild phase, harvests need to be set lower than 2004 catch levels to allow the stock to rebuild to B_{MEY}.

Table 1: Results of bioeconomic model of the Commonwealth trawl sector of the southern and eastern scalefish and shark fishery.

Species	**B_{MEY}/B_{CUR}**	**B_{MEY}/B_{MSY}**	**Optimal harvest at steady state (MEY)**	**Initial harvest TAC during rebuild ***	**Harvest (2004)**
			tonnes	tonnes	tonnes
Orange roughy – Cascade	1.64	1.47	995	665	1600
Spotted warehou	1.30	1.08	4117	3114	4100
Pink ling (trawl)	1.80	1.29	1397	914	1073
Tiger flathead	1.05	1.03	3830	2980	3200

* This is the initial TAC during the rebuild phase. The TAC will increase through time over the rebuild period up to the optimal TAC at steady state.

For data-poor fisheries, estimates of MSY are often not possible. In cases where estimates of B_0 are available, but estimates of MSY are not, the HSP identifies B_{40} as a proxy for MSY. For many species, this proxy is likely to be an over or under estimate of the actual MSY for that stock.

When B_{MEY} is unknown, the HSP sets the proxy of $B_{MEY} = 1.2\ B_{MSY}$. While this may over or underestimate the true value, if the unit cost of catch is dependent on the size of the stock, and practical discount rates apply, B_{MEY} will always be larger than B_{MSY}. In most cases, MEY occurs at higher biomass levels than at MSY. In cases where it can be demonstrated that B_{MEY} is less than $1.2B_{MSY}$, then such a target could be used. It is important that consideration is given to the costs associated with determining more accurate estimates of MEY. It is possible that any benefits (particularly for low value species) from a more accurate estimate of MEY would be outweighed by the costs of calculating it. In addition, if little is known about the biology or economics of a stock, then it is likely that the more conservative target of $1.2B_{MSY}$ is appropriate.

In some cases, future catches at MEY will be higher than current levels. For example, the bioeconomic work conducted for the SESS indicates that long run MEY harvest of flathead is around 3800 tonnes per year, which is higher than the current TAC and catches. While it might be the case that long run optimal catches are higher than current levels, it will be the case that catches will need to be reduced for a period to allow stocks to rebuild to those levels. This will impact negatively on fishing revenue and profits during this period, but the higher future profits will more than offset this short term loss.

The following provides examples of the implication of using a proxy $1.2B_{MSY}$. Empirical results based on recent stock assessments for 5 SESSF quota species (see table below) show the expected reduction in long term replacement yield in moving from B_{MSY} to B_{MEY} (40% B_0 to 48% B_0, the latter approximating 1.2 B_{MSY}) for several key shelf, upper slope and mid slope species.

SPECIES/STOCK	% REDUCTION IN CATCH
Blue grenadier	11
Pink ling	10
Eastern Zone orange roughy	11
Flathead	9
Morwong	9

These results show that, in the long term, the reduction in catch (sustainable yield) is on the order of 10%. Further, if it is assumed that CPUE increases in proportion to biomass, then CPUE should increase by 20% in moving from 40% B_0 to 48% B_0, which, for a 10% reduction in catch, would imply that the effort to achieve this catch would decrease by 25% (E_{MEY}/E_{MSY} = 0.9/1.2 = 0.75). Put another way, 90% of the MSY catch can be achieved with only 75% of the effort at (the suggested proxy for) MEY. This reinforces the longer-term economic benefits of MEY as the TRP.

5.3 How often should MEY be updated?

MEY is a dynamic concept — changes to fishing costs and fish prices will result in MEY changing both within and between seasons. However, it is not likely to be feasible or worthwhile to adjust MEY with respect to short term or temporary fluctuations in factors affecting MEY. Rather, basing MEY around expectations of future values of key factors (fish prices and fishing costs) over the medium term (3-5 years) would seem appropriate for most fish stocks. If major changes occur to factors affecting MEY in the interim, such as a significant change in the diesel price or exchange rate that were unexpected, then a review could be conducted and MEY adjusted if necessary. For shorter lived species such as prawns and squid, a shorter time horizon may be more appropriate.

5.4 MEY in multi-species/multi-method fisheries

Where multiple species are normally caught together, the question is raised as to how to set harvest levels for individual species. While several species may be caught at the same time, they are likely to have different biological and economic characteristics. If harvest strategies are determined for each species in isolation, it is possible that the harvesting of one species in accordance with the TRP would lead to harvests (and hence biomass) inconsistent with the TRPs for other species. Therefore, in a multi-species fishery it is important that harvest strategies for species be determined in conjunction with each other. Given the different biology and economic characteristics of different species, there are likely to be trade-offs between the profits of different species. By optimising MEY across the fishery, some individual stocks may be below B_{MSY}. That is, in order to maximise the overall profits of a fishery, it may be necessary to forego some profits of one species in order to generate higher profits from another. Note that the estimated biomass of **all** species must be maintained above their limit reference point, B_{LIM}. Maximising the profit of the combined catch (subject to environmental constraints) may be a complex task given the uncertainty of the catch composition between shots or seasons, but is one that must be faced irrespective of the TRP. MEY in a multi-method fishery can be calculated by considering the differences in the cost and revenue structures of each sector of the fishery.

6 Management Tools

Harvest strategies have most commonly been applied to TAC-managed fisheries and whilst output controls in the form of Individual Transferable Quotas (ITQ's) within a TAC framework remain the government's preferred management approach they are nonetheless one of many potential fishery management tools or levers. Harvest strategies can be developed using input controls as well and this will be the case for some fisheries.

Input or output controls may be used as:
- the primary harvest strategy tool within a fishery;
- one of a suite of input/output controls within a harvest strategy; and
- a separate management tool outside of a harvest strategy, and often to meet broader EBFM objectives.

Within harvest strategies the management response to decision rules should reflect management objectives related to that particular management circumstance. For highly depleted stocks this response will be focused on rapidly reducing risks to stocks and the dependant fisheries. As stated in Section 2 above, the decision rule and its management response should be clear and effective. Ambiguous decision rules should be avoided. The remainder of this section illustrates various approaches to decision rules and harvest strategies using real examples from Australia and overseas. Note that these examples are illustrative – the control rules in these examples are not necessarily consistent with the Commonwealth Harvest Strategy Policy.

The South Australian Pilchard Fishery (as described in Example Box below) is a useful example of an output-managed fishery with a well-defined series of decision rules governing the setting of an annual Total Allowable Commercial Catch (TACC). In this case the rules are a function of two aspects of the state of the stocks – the current biomass and the strength of recent year classes.

The management tools used for a fishery will vary depending on the extent, timeliness, and quality of data available. There is also a strong connection between the fishery's management objectives, the selection of appropriate management tools, the data strategy and supporting research and scientific work, and the available resources. All should be carefully considered in the context of the fishery concerned, including its economic performance.

The Falkland Island squid fishery (Example Box) illustrates the application of a harvest strategy to a short lived species. Within-season monitoring and analyses are used to change season length, and the incorporation of target reference points related to escapement (the proportion of the stock remaining unharvested at the end of the fishing season) are used to set fishing effort levels at the start of the season. One form of analysis is undertaken while fishing is occurring, and once the season is closed a full post-season assessment occurs.
Management controls and levers can also be combined, as illustrated by the Tasmanian Scallop fishery (Example Box), which combines a TAC with rotational spatial management (note that this is not currently implemented as a formal Harvest Strategy).

Alternatively, a series of simple decision rules may be invoked using a suite of indicators derived from fishery data. The Example Box below illustrates the decision rule proposed for the Eastern Tuna and

Billfish Fishery/Western Tuna and Billfish Fishery, Tier 3-4 fisheries for which no formal local stock assessments exist.

South Australian Pilchards: TACC

To set the total allowable commercial catch (TACC) two performance indicators are used:

- Estimate of spawning biomass derived from an annual egg survey (termed the daily egg production method DEPM).
- Presence of age classes.

The decision rules are:

- If the estimate of spawning biomass is less than 100,000 the TACC should be set at 10% of the spawning biomass or at 5000 t (which ever is greater).
- If there is evidence that the 2 and 3 year old age classes are weak or of average strength (e.g. < 40% of the catch) and the estimate of spawning biomass is between 100,00 and 150,000 t then the TACC should be set at 10% of the spawning biomass.
- If there is evidence that the 2 and 3 year old age classes are strong (e.g. > 40% of the catch) and the estimate of spawning biomass is between 100,00 and 150,000 t then the TACC should be set at 12.5% of the spawning biomass.
- If there is evidence that the 2 and 3 year old age classes are weak or of average strength (e.g. < 40% of the catch) and the estimate of spawning biomass is between 150,000 t and 250,000 t then the TACC should be set at 12.5 % of the spawning biomass.
- If there is evidence that the 2 and 3 year old age classes are strong (e.g. > 40% of the catch) and the estimate of spawning biomass is between 150,000 t and 250,000 t then the TACC should be set at 15 % of the spawning biomass.
- If there is evidence that the 2 and 3 year old age classes are weak or of average strength (e.g. < 40% of the catch) and the estimate of spawning biomass is greater than 250,000 t then the TACC should be set at 15 % of the spawning biomass.
- If there is evidence that the 2 and 3 year old age classes are strong (e.g. > 40% of the catch) and the estimate of spawning biomass is greater than 250,000 t then the TACC should be set at 17.5 % of the spawning biomass.

For further information, see Shanks (2005)

Falkland Island squid: input controls and within-season control rules

- A limited entry, input controlled fishery. The major annual effort control mechanism is in-season management (through changing the season length) (two fishing seasons per year).
- Pre-recruit surveys are not feasible: no estimate of stock size based on new data is available prior to fishing. The season is shortened or lengthened based on reference points for the two target species.
- Initial target reference point: proportional escapement should not fall below 40% (proportional escapement defined as the ratio between the number of spawners surviving under a given level of fishing mortality, and the number of spawners under no fishing mortality).
- Target subsequently changed to absolute escapement levels. In years that the spawning stock levels fall below threshold levels, the season is closed early.
- Before the start of the season, when the recruitment size is unknown, fishing effort levels are based on historical average recruitment and past escapement levels. Once fishing commences, daily reporting from fishing vessels allows almost real time stock assessments using modified Delury depletion models. Once the season is closed, post season assessment is undertaken with the full data set.
- There are ooccasions where catch rates for one species increase at the end of a fishing season, which is contrary to the assumptions behind the Delury methodology of a closed population. Modifications of this closed population assumption have been developed and tested, but no easy solution was found. In years where the depletion method does not work, annual trends in catchability coefficients together with individual vessel CPUE data are used to estimate stock size. Fishing effort is adjusted at six monthly intervals to reflect recommendations from revised stock assessments. This Delury method has now been adapted in a Bayesian framework and therefore uses priors for, amongst others, catchability.

For further information, see Barton (2002) and Basson *et al*. (1996).

Tasmanian Scallops: rotational management with TAC

The fishery is managed by opening specific scallop beds on a rotational basis, while the remainder of the fishery remains closed. Rotational management allows for i) automatic high escapement, and ii) at least 3-4 years for the scallops to grow.

To establish which beds are to be opened, a system of surveys undertaken by industry volunteers (bonus quota incentive) are undertaken:

1) Broad area surveys on size, condition and distribution. These surveys occur on a 3-4 year rolling rotation and enable management to determine which beds are to be opened. A 3-4 year rotating system applies in that the beds identified here are opened at a rate of one or two per year, commencing with those in the best condition. Note that this obviously requires at least 3 beds to be identified as being in a fishable condition, otherwise there is no benefit to be had from rotation, unless a bed is sufficiently big that it can be subdivided.

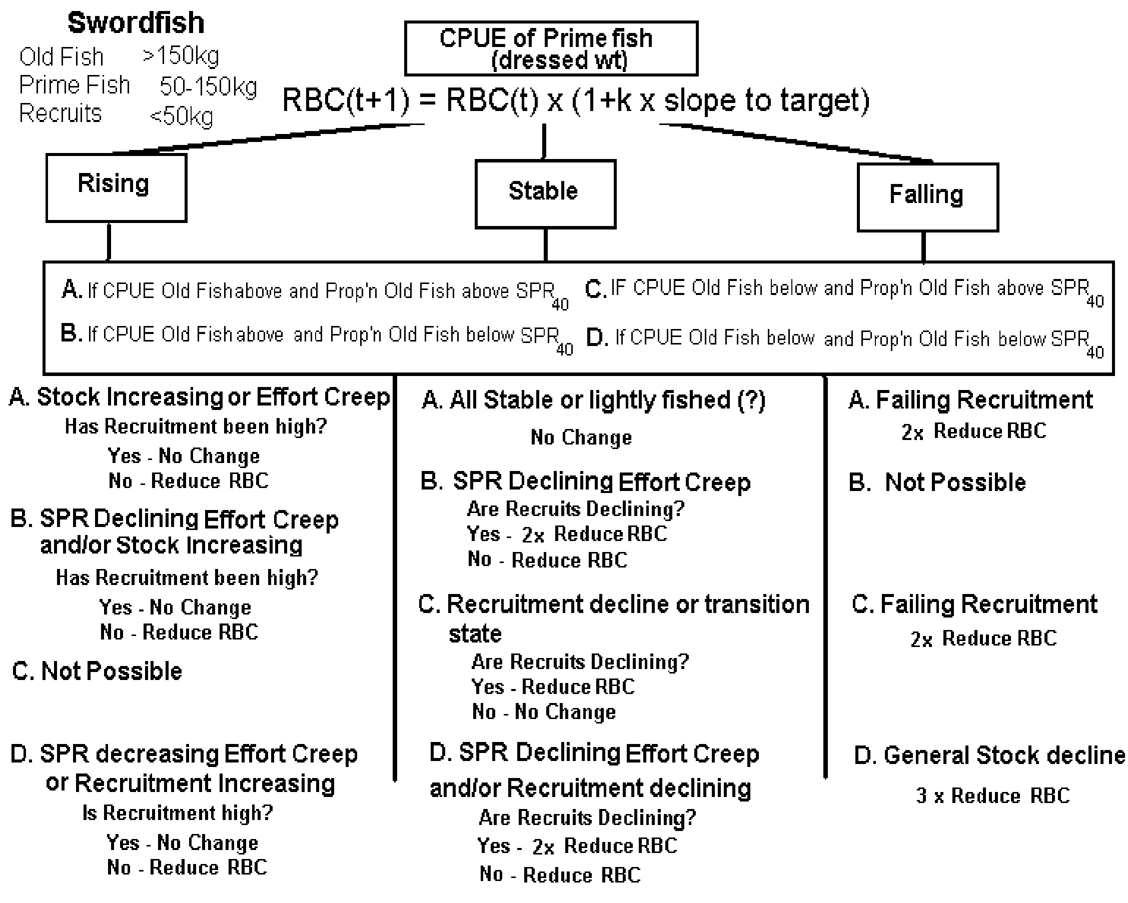
2) Prior to an identified bed potentially being opened for the year, a second, fine-scale pre-season survey is conducted whereby scallop condition (meat weight and roe size) is checked. If scallop condition is sub-optimal, industry have taken the initiative and not fished the bed remains until conditions improve.

Industry have also included an approach where they subdivide the bed and thoroughly fish each section before moving on to the next – this improves the overall scallop condition to the processor and appears to maximise the yield, as opposed to cross-sectioning the entire bed and wasting scallops through damage.

Eastern and Western Tuna and Billfish Fisheries (ETBF/WTBF) draft harvest strategy: RBC/TAE via decision tree based on simple CPUE decision rule and further modified according to size-based indicators

Recommended biological catch is determined via a simple Tier 4 (see Section 7) CPUE-based decision rule of the form RBC = (1 + α * slope-to-target) * C_{CUR}, where C_{CUR} is the CPUE trend for prime-sized fish over recent years (currently the last 5 years). The slope-to-target term considers the recent CPUE trend in the context of a target CPUE to be achieved within a specified timeframe (currently 5 years).

The RBC is then adjusted according to information obtained from size-based indicators, specifically the catch rates of old ($CPUE_{old}$) and young fish ($CPUE_{recruits}$) and the proportion of old fish (PropOld) in the catch. The latter is included as an indicator that is independent of any bias that may be associated with CPUE. $CPUE_{old}$ and PropOld are compared to reference values corresponding to 40% of virgin spawner biomass per recruit (obtained from a simulation), while recent trends in $CPUE_{recruits}$ are considered. The schematic below illustrates the decision tree framework:



7 Dealing with Different Levels of Information, Assessments and Data Poor Species

It is recognised that information about many stocks is limited or uncertain, and that it may not be possible to make direct use of the target and limit reference points described in the HSP. Where only moderate or poor information is available, scientifically defensible proxies for reference points and corresponding control rules to achieve the intent of the HSP will need to be specified. Where information to quantify risk levels is unavailable, a precautionary approach will be taken to fishery management leading to more conservative outcomes to account for the uncertainty.

Where information is generally good, but insufficient to reliably estimate B_{MSY} or B_{MEY} and associated reference points, the HSP specifies that the following proxies will apply:

- the proxy for B_{MSY} will be equal to or greater than 40% of the adult biomass (B_0) that would occur on average in the long term (under prevailing environmental conditions) if there was no fishing mortality; and
- the proxy for F_{MSY} will equal the fishing mortality rate that reduces the spawning output of a fishery on average to 40% of the output if there was no fishing mortality.

Additionally, there will be situations where neither B_{MSY} nor B_0 can be estimated. In such cases alternative approaches to setting proxies for reference levels will need to be formulated and applied using the available information. The HSP does not prescribe default proxies for such cases, as these will need to be fishery specific, including in the case of developmental fisheries. However, the settings will need to be consistent with the HSP and the precautionary approach, and tested using MSE approaches (see section 14).

Having little information regarding the biological and economic characteristics of a stock does not necessarily justify that additional information be collected. The benefit of collecting further information needs to be set against the cost of collecting the additional information (see box on 'Investment in information' below for more detail).

A tiered approach to control rules is encouraged in order to cater for different levels of certainty (or knowledge) about a stock (e.g. Smith and Smith 2005, Goodman et al, 2002). Such an approach provides for an increased level of precaution in association with increasing levels of uncertainty about stock status, such that the level of risk is approximately constant across the tiers. In this approach, each species is assigned to one of a number of Tier levels depending on the amount and type of information available to assess stock status, where Tier level 1 represents the highest quality of information available (e.g. a robust quantitative stock assessment). Consistent with the above, target exploitation rates will decrease as Tier levels increase. For example, Figure 7 shows a possible relationship between the TACs for higher tier levels expressed as a percentage of Tier 1 TACs.

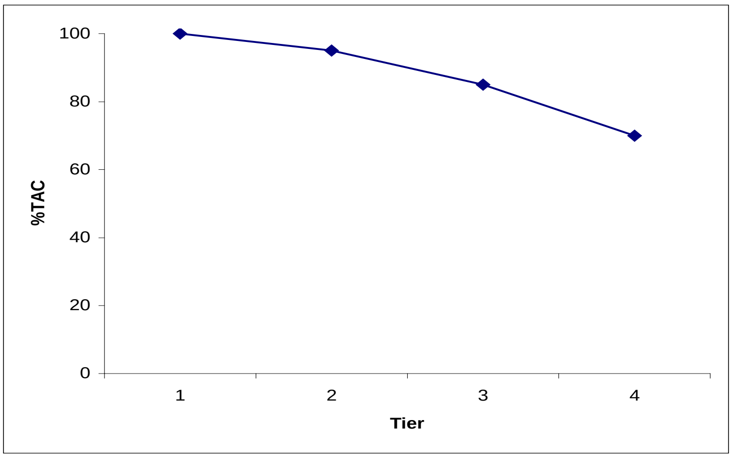


Figure 7: Theoretical example of the relationship between the TAC for higher Tier Levels as a percentage of a Tier 1 (high information) TAC.

An example of the use of a Tiered approach to harvest strategies is the Southern and Eastern Scalefish and Shark Fishery (SESSF) – see Box below. In this fishery there are 34 stocks or species groups under quota management, and the harvest strategy framework developed and first applied in 2005 consists of four Tiers. Each stock is assigned to a Tier based on the quality of information available to assess stock status, and the control rules associated with each Tier are designed to be increasingly precautionary as the Tier level increases (uncertainty increases). Whether the Tier rules do act in this precautionary manner is being tested using MSE.

The SESSF 4 Tier Harvest Strategy Framework

Adopted a 4 Tier system

- Tier 1: robust quantitative assessment
- Tier 2: preliminary quantitative assessment
- Tier 3: estimates of F from catch curves (age/length data)
- Tier 4: trends in CPUE

Each Tier has its own harvest control rule which is used to determine a recommended biological catch (RBC). The RAGs advise on which species and stocks belong at which Tier level, with these decisions reviewed by SESSFRAG. The RBCs provide the best scientific advice on what the total kill (landings plus discards) should be for each species/stock and are used to advise on TACs.

- Tier 1: $F_{TARG} = F_{40}$, $B_{TARG} = B_{40}$, RBC = Catch[$F_{TARG} \rightarrow B_{CUR}$]
- Tier 2: $F_{TARG} = F_{50}$, $B_{TARG} = B_{50}$, RBC = Catch[$F_{TARG} \rightarrow B_{CUR}$]
- Tier 3: RBC = □ * C_{CUR} where □ can vary from 0 to 1.2 depending on the ratio of F/M
- Tier 4: RBC = (1 + b*slope) * C_{CUR}
  - For Tiers 3 and 4, C_{CUR} is the average catch over the past four years, and includes landings <u>plus discards</u>
  - "slope" in Tier 4 is the slope in the trend in CPUE over the past 4 years (longer where CPUE is cyclical)

The Tier 1 and 2 harvest control rules are similar in form to that depicted in Figure 2. For further details see Smith and Smith (2005) and Smith et al. (2007).

The Tier 3 and 4 control rules in the SESSF HSF are but two examples of the type of approach that can be taken when full quantitative stock assessments are not available. An approach used in many fisheries is based on spawning stock biomass per recruit (SSBR). Specifically, a target fishing mortality is set that reduces the SSBR to some percentage of unfished levels (assuming constant recruitment). A fishing mortality that reduces SSBR to 50% (F_{50}) would in general be consistent with the target provisions of the HSP. Information requirements are similar to that for Tier 3 in the SESSF example above:

- estimates of natural mortality M;
- selectivity ogive (e.g. from catch curves);
- size/age at first maturity;
- weight at age or fecundity and maturity ogive if available; and
- an estimate of current fishing mortality rate F_{CUR} (e.g. from a catch curve).

The ratio of F_{50} to F_{CUR} could be used as a basis for determining the RBC.

There are many examples of triggers currently used in Australian fisheries that could be considered as part of a harvest strategy in data poor situations (see also section 12 on Developing Fisheries). Some examples of such triggers are given below, based on a variety of easily obtained fishery-dependent indicators such as catch, effort and size composition of the catch:

- Catch - outside range of reference years or greater than X % change from mean of reference years;
- Catch - greater than X % change in any one year;
- Catch - change in distribution of catch by area;
- TAC - catch is less than X % of TACC;
- Effort - greater than upper limit;
- Effort - outside range of reference years, percentage change as in catch;
- CPUE (catch rate) - falls below X % of reference year or years;
- CPUE (catch rate) - greater than X % change in any one year;
- CPUE - statistically significant trend over X years;
- Mean size - statistically significant trend over X years;
- Size/age composition - significant change in distribution;
- Recruitment indices - statistically significant trend over X years;
- Recruitment indices - greater than X% change relative to mean of reference years; and
- Proportion immature - falls below X % of reference years.

These examples relate primarily to biological considerations but a similar approach can be applied from an economic perspective. Economic data is an important input into the development of a harvest strategy. The minimum set of economic data required is information on the gross value of production by species (which is available for all Commonwealth fisheries), as well as information on the costs of fishing. This will allow for an assessment of the likely net economic returns being generated in a fishery. This cost of collecting fishing cost information will vary depending on the size and structure of the fishery and the level of accuracy required/justified (see box on 'Investment in Information'). Less expensive estimates of major fishing costs may be possible using logbook/effort data. More rigorous economic data may be collected via face to face surveys of operators. While the cost of collecting more rigorous economic data is larger, the major cost of more accurate estimates of MEY is not in the data collection, but in the construction of a bio-economic model.

For stocks or fisheries where some data are available (for example estimates of natural mortality and fishing mortality), then at the very least MEY will involve higher stock levels than a purely biological target. The degree to which B_{MEY} is above B_{MSY} will depend on a number of factors. For example, for a given B_{MSY}, B_{MEY} will be higher:

- the ‘flatter’ the sustainable yield curve;
- the ‘steeper’ the total cost curve;
- the lower are fish prices; and
- the higher fishing costs.

For many stocks, there will be little biological and economic information on which to base an estimate of MEY. For such stocks, a HS may be based on relatively little information and decision rules may be essentially empirical. It is important to note that this does not necessarily mean that significant expenditures are justified to reduce this uncertainty. For example, in small value fisheries it is unlikely that significant expenditure could be justified to collect the additional information required to undertake a quantitative stock assessment (see box on Investment in Information). For such stocks, data may be limited to catch levels and trends CPUE. In such cases, parallel monitoring of the profitability of operators in the fishery could also be conducted to determine the level of profits in the fishery. If profits are low, this indicates that the target level of biomass may be too low (that is, effort is set above the level that generates MEY).

Monitoring the profitability of operators could be possible through the calculation of net returns, productivity indices or profit decompositions. However, some assessment of the likely benefits of such analysis should be undertaken relative to the costs.

Latent effort may also be used as a simple indicator of profitability. A fishery operating at or near MEY will be generating above-average returns and will be attractive for permit/quota holders to enter. If significant latent effort exists, above average returns are likely to have been competed away to the point where it is no longer attractive for permit/quota holders to enter the fishery. In this case, the target level of effort set in the fishery is likely to be too high, or effort creep is likely to have reduced the effectiveness of the management tool. If no or little latent effort exists in a fishery and CPUE is stable or increasing, an assessment could be carried out regarding the likely benefits of collecting additional information in order to refine the estimates of allowable harvest.

In a quota-managed fishery, sale and lease prices of quota can also provide an indication of the profitability of the fishery. How much a fisher is willing to pay for quota depends on the likely profits that the quota will generate. Over time, fishers competing for quota will result in the price of quota changing until it reflects the profits that can be made. It follows that low quota prices are associated with low profits and high quota prices are associated with higher profits.

It is important to note that there are several factors that can affect the profitability of a fishery. Some of these factors may be the result of fishery management (such as increased fishing costs due to an inappropriate management regime) and others may be external to the management regime (such as a change in the foreign exchange rate which could impact on prices for fishing inputs and outputs). Regardless of whether the factor is internal or external, a management response would be required to adjust the level of effort/catch so it is consistent with MEY.

The important point is that control rules have to be clearly articulated when biological and economic triggers and indicators such as these are used.

Investment in information

An issue that is often overlooked in the development of risk management policies concerns the appropriate amount of information needed by decision makers to make informed judgments about whether the risks being taken in managing a fishery are acceptable. This issue applies equally to both the scientific and economic aspects of risk analysis. More information is generally better than less. Yet the collection, interpretation and dissemination of information is not costless. As a result, there is an obvious trade-off that must be made concerning the quantity and quality of information that decision makers require and the level and cost of risk protection that is likely to result. Assessing such trade-offs is not always straightforward.

Information should be gathered to the point where the expected benefit from gathering additional information equals the cost of obtaining that information. Additional information will produce benefits if it reduces the probability of making a wrong decision. So the expected net benefit from additional information depends on how much it reduces the chance of making a wrong decision, the cost of a wrong decision and the cost of gathering the information (Schuele et al. 1997).

Collecting information is costly. Having little information regarding the biological and economic characteristics of a stock does not necessarily justify that additional information be collected. The benefit of collecting further information (to improve the harvest strategy and perhaps increase profits) needs to be set against the cost of collecting the additional information. The collection of additional information should only occur if these benefits are likely to outweigh the costs.

It is important that any evaluation of the benefits and costs of collecting additional information be viewed in net present value terms. That is, all the benefits and costs in future years should be discounted to a single figure in today’s dollar terms. This is particularly important when costs are incurred up front and the benefits are likely to accrue in the future.

An issue that requires consideration is the process by which species within a fishery harvest strategy framework move between tier levels. Through investing in new information it may be possible to move from a higher to a lower tier. There will be a trade-off here, however, between the potentially higher yield at the new tier level and the cost of the investment, which will require close examination. The framework needs to specify how much precaution is built into the difference between tier levels as this provides the incentive for investing in information required to move to a new tier level (see Figure 7 above).

Ideally, harvest strategies should be tested using scientifically defensible methods (e.g. management strategy evaluation including the use of operating models). Such testing of management strategies is particularly important when information is incomplete and imprecise, and when the relationship between the control rule and management regulations is complex. This approach is examined in more detail in Section 14. The point here is that such testing can also assess the costs and benefits of moving between tier levels, including the value of information.

It is also important to recognise that control rules within a harvest strategy need not be limited to only adjusting catch or effort in a fishery. They can include responses such as initiating a survey or improving the quality of an assessment. This latter form of decision rule may be appropriate for data-poor and/or developing fisheries, where multiple TAC/TAE reference points would be in place, and as the less extreme of these are reached, a survey is undertaken to improve the understanding of stock status before further exploitation.

For example, an initial TAE could be set as a small proportion of the historical high level, and the decision rule once this benchmark is reached could be to undertake a more extensive survey of the fishery. If this warrants an increase in the TAE, subsequent responses at higher benchmark levels of effort could be to adjust season length, or set a total catch alongside the TAE, or invoke some form of spatial management. At its most extreme, the decision rule would be to reduce the TAE. Alternatively, the status quo could be maintained until monitoring indicates that effort should be reduced.

8 Dealing with Uncertainty and Risk

The HSP provides clear direction in relation to preferred exploitation rates and stock status for key commercial species taken in Commonwealth fisheries. This is articulated through the specification of target and limit biomass reference points, and related probability thresholds for meeting target reference points, and avoiding limit reference points. In this sense, the HSP provides direction on the level of risk acceptable to government in relation to the stock status of key commercial species in Commonwealth fisheries.

The management of commercial fisheries is significantly complicated by scientific and process uncertainty inherent in the assessment and subsequent management of stocks. For stock assessments, and related supporting science, there are many sources of uncertainty. The more significant sources of uncertainty that will require explicit consideration in the development and application of harvest strategies include:

- observation error (e.g. survey variability);
- process error (e.g. recruitment variability); and
- model error (uncertainty about key assumptions or parameters).

Under most circumstances, these factors compound within assessment and management processes to generate substantial uncertainty about stock status, and the response of stocks to changing management arrangements.

A key management objective of the HSP is to ensure that harvest strategies meet the probability and risk thresholds specified in the HSP regardless of the level of uncertainty in assessments. This is an explicit recognition of the need for precaution in the face of uncertainty. In general terms it requires that increasing assessment or management uncertainty will be mitigated by reducing exploitation rates.

Where stock status is very uncertain, this may mean that the stock will be maintained on average well above the theoretical target level – B_{MEY}. This approach has been adopted in current harvest strategies for the SESSF, and is examined in detail in Section 7 above.

The correct interpretation of the risk criterion in the HSP is that the stock should stay above the limit biomass level at least 90% of the time (i.e. a 1 in 10 year risk that stocks will fall below B_{LIM}), under the application of the HS. This is different from an interpretation that says that there should be a 90% probability that the stock should be above the limit in each and every year. However, there may be highly variable species (e.g. some small pelagic species such as pilchards) where this criterion is violated even in the absence of fishing. The HS for such species will need to reflect this and the risk criterion be suitably amended (but still consistent with the intent of the HSP). This might be done by specifying a limit to the increase in frequency of breaching the limit reference point under the application of the harvest strategy, or by altering B_{LIM} itself for such species. Stocks that fall below B_{LIM} due to natural variability will still be subject to the recovery measures as stipulated in the HSP (see also Section 10).

It is feasible to consider strategies for achieving a given risk level where assessments generate an estimate of current biomass and an associated level of uncertainty. However, this situation is the exception rather than the rule. The most reliable method for determining whether a given harvest strategy meets the risk criterion is via an MSE analysis. This is examined in detail in section 14 describing MSE. The MSE allows an evaluation of the robustness of the whole harvest strategy (monitoring + assessment + control rule) (as per Figure 1), and allows explicit calculation of the probability of breaching B_{LIM}, even for stocks where current biomass can not be calculated.

The utility of MSE can be significantly compromised by the absence of clearly specified management objectives, particularly target and limit reference points, and risk criteria. These are now clearly specified in the HSP, significantly facilitating MSE of harvest strategies for those fisheries where it is appropriate.

The HSP provides for flexibility in the development and specification of control rules within harvest strategies. This recognises the wide range of fishery, stock, and data circumstances to which the HSP will be applied. Some control rules may include estimates of risk directly in the control rule, but this is not a necessary feature. The more important point is that the control rule is part of the overall harvest strategy and has a high likelihood of maintaining stocks at or near the targets, and meets the probability requirements of the HSP in relation to avoiding depletion to, or below, the limits. This is best determined using MSE, as well as ongoing monitoring and performance review.

Harvest strategies should be developed to minimise any implementation uncertainty (such as translating RBCs into input control measures) that might undermine achievement of the HSP objectives. This uncertainty should also be accounted for in MSE analyses.

9 Dealing with High Variability

9.1 Short-lived species

Short-lived species (e.g. squid, prawns, scallops) have stocks comprised of very few or often only one year class and the stock abundance may vary tenfold on an annual basis depending on the recruitment success in a particular year. In these cases, one could expect the TAC/TAE to vary significantly on an annual basis reflecting stock abundance or an appropriate fishing mortality. With highly variable species it is important to develop a harvest strategy that meets the intent of the HSP. However, as noted above, stocks that fall below B_{LIM} due to natural variability will still be subject to the recovery measures stipulated in the HSP.

A number of adaptive management approaches may be used to deal with this:

- pre-season surveys to provide estimates of abundance to which the control rule is applied;
- within season monitoring and triggers, e.g. NPF banana prawns (see Box below) and Falkland

Island Squid (see Box in Section 6 above); or

- allowing a set number of spawning events prior to harvest, e.g. Scallops.

Banana Prawns (*Fenneropenaeus merguinesis*) caught in the Northern Prawn Fishery
The common banana prawn season is about 1.5 months. The catch rates of this fishery generally follow a decay curve. However, in exceptional years, the catch rates start and remain very high for a long period. In these cases, the following control rules apply to extend the season for 2 weeks. The incidental catch of juvenile tiger prawns are also included in the rules, to reduce the chances of the extending the banana prawn season at the expense of tiger prawns. With this particular control rule the season can only extended. However, there is no reason why a rule could not be developed that reduces or increases the season length.
Control rule to extend the banana prawn season:

The current control rule which will determine whether an extension will be made (or otherwise) is:

(a) *If the average daily catch rate of banana prawns for the 4th week of the first season exceeds or equals 500 kg/boat/day.*
AND
(b) *If the pro-rata total tiger prawn catch for the whole 4 weeks is less than 26.4 tonnes (6.6 t/week*4)*
THEN
(c) *The season is extended for a further 2 weeks*
AND
(d) *All existing spatial closures and other management measures will be extended*
This decision rule is applied only if all catch data (kg/day, or total catch and total days) for the whole fleet (or >95% of NORMAC members and advisors) is informally supplied for the period 7-14 May by 9 am 15th May.

To facilitate the assessment of whether an extension to the season is appropriate based on the control rule, *a "representative sample"* of the catch rates for the season across the fleet is required. This can take the form of:

Either

(a) Providing a copy of the logbooks from each of these boat which are fishing for week 4 to AFMA, which shows the catch of banana and tiger prawns per day fished;

OR

(b) Providing company records indicating the total catch (broken down by banana and tiger prawns) for week 4 and the number of days fished per boat during that week.

9.2 Longer-lived species

For longer-lived species, it is possible that the RBC derived from application of a control rule may vary significantly from year to year within the assigned Tier level of a species. There may be a number of reasons for this, but they generally fall into three categories: stock abundance, stock availability and uncertainty. The latter is discussed in Section 7.

Stock abundance should be the main factor against which an RBC is determined, ensuring that fishing mortality remains below and stock biomass remains above appropriate reference levels. This is true if the indicators used in a HCR are a precise and accurate index of stock abundance. Unfortunately, variability in stock availability and a range of uncertainties tend to create noise around the indicators of stock abundance. For this reason, RBCs may change for reasons other than changing stock abundance. These issues are discussed below.

Stock abundance

For long-lived species with fairly constant recruitment, (e.g. orange roughy, redfish), stocks are comprised of many year classes and stock abundance should not vary greatly from year to year. In such species, the RBC should remain relatively stable from year to year.
Other species (such as blue grenadier) are moderately long-lived, but their stock abundance may oscillate considerably due to the influence of highly variable recruitment, with sometimes many years between periods of high recruitment. In these cases, we would expect the RBC to vary in multi-year cycles reflecting these periods.

Variable availability

Regardless of the species categories mentioned above, or whether stocks are at high or low abundance, there may be some portion of the stock that is unavailable to the fishery. This is not of great importance, in a relative sense, if the unavailable portion does not change over time (e.g. juvenile fish remain in nursery areas outside of the fishery), but it is important if the availability changes over time. Examples of this might include fish migrating to areas where they can not be captured by the fishery at certain times of the year or over multiple years (e.g. fish only come inshore to the fishery in certain oceanographic conditions such as periods of high upwelling; or fish avoid areas of certain water temperatures; or migrate outside the bounds of the fishery in some years). In such cases, it may be difficult to distinguish changes in availability from true changes in abundance.

10 Stock Rebuilding Strategies and Stock Recovery Plans

Stock rebuilding strategies and stock recovery plans come into play when stocks fall below B_{LIM} and specific additional management measures need to be undertaken. They may also represent an important link between the HSP and the EPBC Act. In general, stock rebuilding strategies (developed by AFMA under fisheries legislation for species which fall below B_{LIM} and are either not listed or listed as conservation dependent) and stock recovery plans (if formally required under EPBC Act for a species listed under a threat category of vulnerable or higher) will define targets for rebuilding and maximum timelines to achieve this. There may be substantial additional management costs involved in giving effect to stock rebuilding strategies and stock recovery plans and this is another reason to avoid having stocks in this situation.

There are likely to be a number of alternative time paths to rebuild a stock that has been fished down to a level below its B_{TARG}. One option may be to rebuild the stock in the shortest possible time frame (harvests would be zero). Another option may be to rebuild the stock over a set period of time or number of generations of fish. However, the optimal time path to rebuild a stock has an economic component. In determining the optimal time path to rebuild a stock, there is a trade-off between lost profits in the short term and the speed at which the stock is rebuilt. Clearly, reducing catch/effort to levels consistent with rebuilding a stock to levels consistent with the target biomass reference point will not immediately lead to an increase in revenues and profits. It takes time for the size of the fish stock to rebuild to levels associated with MEY. For example, a harvest strategy that reduced harvests to zero would result in larger lost profits in the short term, but the higher profits of a rebuilt stock would be earned sooner. A dynamic optimal control model can be used to balance this trade-off so that the net present value of future profits is maximised. However, such models are difficult and expensive to construct and only likely to be available in high value fisheries.

Even in the absence of a formally designated “stock rebuilding strategy or stock recovery plan”, any HS that defines a management response for any given level of stock (or some other proxy indicator of stock status) already explicitly defines a stock rebuilding strategy. For example the current SESSF harvest strategy for Tiers 1 and 2 produce an RBC of zero if the stock falls below B_{20} (with greater than 50% probability), but would allow some limited targeting once the stock recovers to above B_{20} (defined by the upward sloping exploitation rate between B_{20} and B_{MSY}). Several issues arise in considering whether this alone is adequate as a recovery strategy:

- Clearly, a zero RBC below B_{LIM} provides the maximum possible recovery rate. However, achieving zero catches in a multi-species fishery may be difficult. The rebuilding strategy may impose additional constraints on bycatch allowance, up to and including closure of the fishery. The analysis of rebuilding strategy options and timelines can be complex and is further complicated by the social, economic and policy dimensions of such decisions.
- Even for a species managed by TACs, additional conservation measures may be appropriate if the stock is below B_{LIM}. These might include gear restrictions and seasonal and spatial closures (e.g. to avoid spawning locations and times for the species of concern). A rebuilding strategy would define such additional measures although these could also be defined under "normal" harvest strategy conditions.
- The issue of when to allow targeted fishing after a stock recovers to above B_{LIM} is also pertinent. For stocks that have recovered from below B_{LIM}, and have not been listed in vulnerable or a higher threat category[19], targeted fishing will be allowed as long as fishing does not interfere with the agreed stock rebuilding strategy, as agreed to by AFMA and the Minister for the Environment and Water Resources.
- It is also quite feasible that an updated stock assessment suggests that the stock actually never fell below B_{LIM} due to uncertainty in assessment advice.
- Recovery times are generally implicit in the HS.

Typically recovery times are defined as the minimum of 1) the mean generation time plus ten years, or 2) three times the mean generation time. Note that the mean generation time is defined as the average age of a reproductively mature animal in an unexploited population.

10.1 Key elements of a stock rebuilding strategy/stock recovery plan

The core elements that make up an effective stock rebuilding strategy are largely consistent across fisheries jurisdictions. The core elements of the stock recovery plans are legislated under the EPBC Act. For most harvest strategies the management responses necessary to ensure recovery will form part of the HS and will operate under nearly all management circumstances. In cases where a stock is depleted to or below B_{LIM}, the transition between management action under the HS and more dramatic responses under a separate stock recovery plan may be more formalised. It is possible however that a HS be constructed and tested to operate in "normal" circumstances, as well as cases where depletion has reached or exceeded B_{LIM}.

In general a stock rebuilding strategy must include, but is not limited to, the following requirements:

- clear specification of objectives including rebuilding targets and timeframes;
- performance criteria to evaluate the effectiveness of the rebuilding strategy against its objectives;
- actions required to achieve the objectives of the rebuilding strategy;
- key threats to the recovery of the stock/species in question and strategies to counter these threats;
- the estimated duration and cost of the recovery process, including the apportionment of costs across government and other stakeholders;
- parties affected by the implementation of the rebuilding strategy; and
- significant related environmental impacts (positive or negative) arising from the implementation of the rebuilding strategy.

[19] Species which have been listed as vulnerable or in a higher threat category cannot be targeted until the Minister for the Environment and Water Resources has made a decision to delete the species from the list or move the species to the conservation dependant category.

It is important to note that there may be additional cost burdens associated with monitoring for recovery of species that are subject to a rebuilding strategy. This is due to the fact that some of the usual data streams that are used to develop stock status indicators (such as CPUE and commercial catch at size or age data) may cease or not be comparable with previous data. A more dedicated fishery independent monitoring program may have to be developed.

A stock rebuilding strategy must also be considered against the usual criteria for evaluating regulatory proposals. In brief, these are:

- consistency with relevant international and domestic legislation and policy;
- cost effective and efficient; and
- consistency with ESD principles.

11 Translating Recommended Biological Catches (RBCs) into Total Allowable Catch/Effort

RBCs are derived from the application of a harvest strategy and represent a total target mortality from all sources of fishing. This section discusses how to achieve the RBC given the control measures available for a particular stock and fishery.

11.1 Setting TAC/TAE from RBCs

The over-riding objective of the HSP is to ensure that fishing mortality in Commonwealth fisheries is managed to meet the key objectives of the HSP. The HSP applies to fish stocks throughout their range and to mortality resulting from all types of fishing. When setting TACs/TAEs from RBCs, catches attributable to all types of fishing must be taken into account. This includes all fishing-induced mortality (for example, discards or state catches, and recreational catches).

Whilst fishing mortality from other sectors and jurisdictions is considered in setting RBCs for Commonwealth fisheries, this does not necessarily mean that the TAC/TAE determined for Commonwealth fisheries will be unilaterally reduced in the absence of appropriate stock based management action from other sectors and/or jurisdictions.

11.2 Translating RBCs to TAEs

In data and resource-rich fisheries where MSE analysis and/or formal stock assessments are undertaken, or for which fishery simulations are available, the estimate of catchability, q, may be used to obtain the TAE that yields catches corresponding to the RBC given by the harvest control rule. Clearly, this requires some knowledge of catchability, q, and how this parameter is likely to change with time and/or effort creep. Alternatively, TAEs may be directly estimated within an assessment and then translated into a target fishing mortality, F that then feeds back into the assessment model.

For fisheries where there is moderate availability of data but no formal MSE or assessment, a TAE may be translated from the RBC on the basis of the historical relationship between catch and effort. A simple theoretical or statistical relationship can be fitted (e.g. simple linear regression, or GLM/GAM) to predict the effort required to achieve a given level of catch. Reliable logbook data will be imperative in such an approach.

For data-poor fisheries, a TAE may have to be set directly as the average or maximum effort from a period during which there is no evidence of abundance decline, and multipliers applied that are set according to the perceived status of the stock relative to a reference point. Alternatively, a TAE could be directly set at some proportion of the current level of “active” effort in the fishery.

Note that levels of effort (and hence mortality rates) required to achieve a given level of catch will be less than expected if the production curve (see Figure 6) is under-estimated and more than expected if the production curve is over-estimated. If the production function is overly optimistic, then the level of fishing effort required to take the catch quickly reaches a point where it is significantly greater than the 'target' level. However, if the production curve is 'conservative' and under-estimates the true production curve, the actual level of fishing effort required to take the catch will always be less than the target or expected level and actually declines at higher levels of 'target' fishing effort.

11.3 Determining RBCs in a Spatial Context

In fisheries where spatial management is in place or is to be part of the fishery management for a species, RBCs or TAEs may be calculated separately for each designated area using spatially disaggregated data. Alternatively, an overall RBC/TAE may be allocated among areas according to historical proportions of catch or effort. Within-area monitoring against spatially explicit indicators should take place. This requires reliable spatially explicit fishery data. More generally, an overall RBC/TAE may be set with no spatial restrictions in the first instance, but with spatial monitoring to occur.

Note that spatial management may also be in the form of imposing restricted effort within spawning seasons, and/or spawning/nursery areas. It may also involve rotational harvesting, as with the Tasmanian scallop fishery example referred to in Section 6.

The identification of areas of key habitat may also be an important aspect of spatial management. Limited fractions of an overall RBC/TAE may be allocated to these key habitat areas.

Management should seek to avoid the potential "cascading" effects of imposing spatial closures with no adjustment to the overall RBC/TAE. In this context, fishers may relocate to a smaller area, subjecting it to further fishing pressure and potentially leading to localised depletion of stocks. It is important to remember that spatial management is not an alternative to an RBC but may rather be a means to more effectively implement it.

12 Developing Fisheries

For developing fisheries, the main difficulty is that there is usually little biological information available and probably no time series of catch or catch rate data, much less a formal stock assessment, on which to base a HS. In these particular cases there is a requirement to balance the desire to develop a new fishery with the need to ensure any development is sustainable and the stocks are not put at risk. Harvest strategies for developing fisheries should also work to prevent over-capitalisation. Precautionary initial catch settings, good information and feedback are the key to this balance. Shown below is the proposed HS for the Great Australian Bight (GAB) deepwater fishery which integrates catch controls and spatial management.

Although there are difficulties with lack of knowledge and uncertainty in a developing fishery, there are also some unique opportunities to collect information that will be invaluable in the future research and management of the species. Highest amongst these is the ability to collect information on the age and size structure of the population before there has been any significant fishing. From this information, estimates of natural mortality (one of the most difficult biological parameters to measure) can be obtained. Furthermore, this information from the start of exploitation provides a critical baseline of data against which the progress and exploitation of the developing fishery can be compared.

Recognising the above, one of the more difficult aspects of fisheries assessment is that it is often difficult to measure the catch potential of a fishery until it has begun to make an impact on stock indicators. In other words, you can not determine the sustainable take of a species until you can begin to notice that fishing is impacting on the stock.

An appropriate control rule for developing fisheries should therefore explicitly link the mandatory collection of critical biological information with an incremental precautionary development and expansion of the fishery to its target reference level.

The following generic steps should be implemented once it is established that there is a developing fishery.

Review available information

Often, there is considerable literature already available on a particular species or genera from other fisheries, including internationally. This information may provide general indicators of life history, stock size, harvest levels that will help inform decisions about the appropriate development of the fishery.

Conduct a risk assessment

Based on information already available, conduct a risk assessment of the species as outlined in the ERA for a target species. This will highlight general risk levels comparative to other species and also indicate important gaps in knowledge.

Set an initial conservative catch / effort trigger

Although the initial catch trigger may vary greatly depending on the species and fishery, this level needs to be demonstratively precautionary.

Monitoring and development

The ability to continue to take a species under the initial catch trigger is allowed only if a minimum level of information is collected by those involved in the fishery. Once the initial catch trigger limit is reached in any one year, the targeted fishing for that species shall cease.

Data analysis

The trigger limit can not be exceeded in any one year until the length and age data are formally analysed and reviewed. As a minimum, a growth curve should be established and a catch curve analysis performed to get initial estimates of mortality. This can form the basis of a Tier 3 analysis, but as a catch history has not been established, another mechanism to develop the fishery needs to be established. It is suggested that, following the analysis of the data, and assuming there are no issues of concern arising from interpretation of age or length data, the trigger limit may be increased by a percentage (dependent on the species and HS) of the initial catch limit in any one year. Any increase is only allowed if a minimum level of analysis is performed.

13 Exceptional Circumstances

One of the main benefits of harvest strategies is that they provide an agreed and transparent process for arriving at management decisions. In particular, the harvest control rules provide an unambiguous prescription for the management response, given information about stock status. However experience has shown that there may be circumstances where management action arising from application of the HS is clearly not meeting the intention of the HSP. Such circumstances should be the exception rather than the rule, but a well considered HS should make provision for such “exceptional circumstances”. These would be circumstances, invoked under pre-agreed criteria, which result in an over-ride of the management advice arising from straightforward application of the HS.
Such provisions should complement the HS and increase the likelihood of achieving management objectives. Examples that may warrant the use of exceptional circumstances provisions include:

- where assessments have not been completed due to unforeseen circumstances (e.g. a planned resource survey did not eventuate);
- where there has been an exceptional change in the nature of the fishery that can not be accommodated in the existing assessment method (e.g. a closure to a substantial part of the

fishery, unrelated to concerns about impacts of fishing, that substantially alters catch and effort data); and
- where there has been a change in the ecological environment of the fishery unrelated to impacts of fishing (e.g. a fish kill, or climate induced changes).

In general, the use of exceptional circumstances should result in more precautionary management actions, given that in most instances the exceptional circumstances will have had the effect of increasing uncertainty, though there may also be cases where new information could lead to higher catches. The important point is to have both the criteria for invoking exceptional circumstances and the response to them clearly specified and agreed ahead of the need to apply them. There is little in the formally published literature about the application of exceptional circumstances, but a recent unpublished report is MCM (2007).

14 Management Strategy Evaluation

14.1 What is MSE?

Management strategy evaluation (MSE) is a formal scientific procedure for testing adaptive or feedback management strategies. MSE has been defined as “assessing the consequences of a range of management options and laying bare the trade-offs in performance across a range of management objectives” (Smith et al.1999). Most of the applications of this approach have been to single species harvest strategies (Butterworth and Punt 1999), although some multi-species fisheries have been assessed (Punt et al.2001; De Oliveira et al.2004) and the method has been extended recently to assess whole fishery management systems (Smith et al.2007).

The key steps in MSE include:
- defining management objectives;
- turning management objectives into quantifiable performance measures;
- selecting a set of management strategies;
- developing an “operating model” of the system;
- predicting the consequences of applying each strategy using the operating model;
- summarising performance and highlighting trade-offs between meeting different objectives; and
- communicating the results to decision makers.

In the context of HS development, performance measures for evaluating management objectives will largely be defined by the HSP. In particular, target and limit reference points and the definition of risk are clearly outlined in the HSP, and as such, performance measures will be set relative to these definitions. Having such formalised, pre-existing and unambiguous definitions represents a large step forward in the development of an MSE for any fishery.

The operating model is usually a formally coded mathematical or statistical model of the population dynamics of the fishery, and represents the most plausible representation of the resource status and productivity and the fishing dynamics. The operating model is used to generate observations in the form of pseudo fishery data such as catch and CPUE, and these are then used in the management procedure.

A key aspect of the MSE approach is to test for “robustness” of management strategies by specifically incorporating various sources of uncertainty in the operating model and analysis, including those in the underlying population dynamics and biology of the resource, random/environmental effects, uncertainty in the methods and data used to assess the status of the resource, and uncertainty in the ability to implement management actions. In this way, the MSE approach overcomes some of the problems and limitations discussed in sections 7 and 8 of these guidelines.

While MSE analyses to date have generally not included an economic component, this should be included where appropriate data are available. Performance measures should be included and the operating model should include an economic representation providing observations of the likely profits in a fishery under various management scenarios.

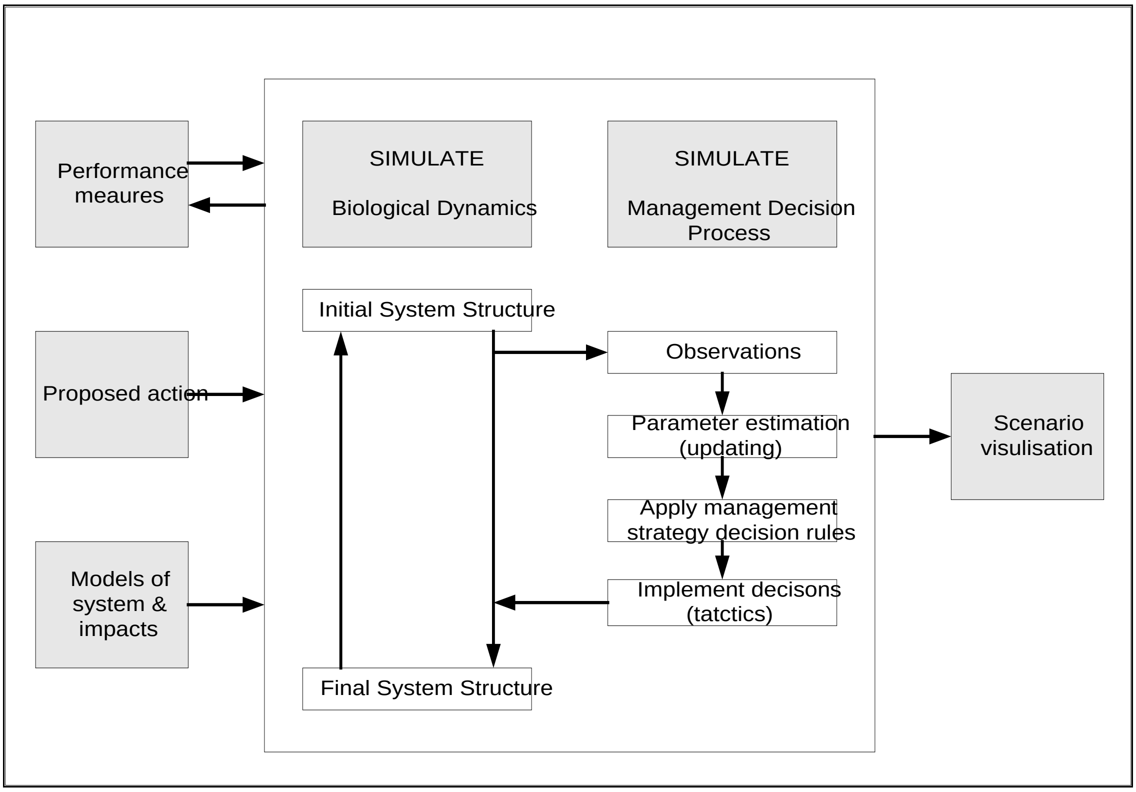


Figure 8: Outline of the analytical structure involved in MSE. After Punt et al. (2001)

14.2 When should MSE be used?

MSE should be used to test both generic and species specific harvest strategies. Such testing of management strategies is particularly important when information is incomplete and imprecise, and when the relationship between the control rule and management regulations is complex.

Ideally, MSE should be used prior to implementation of a HS, to help design a robust HS that will meet management objectives. This will not be possible or practical in all instances, so some harvest strategies will be developed using “expert judgement” to design the combinations of monitoring, assessment and control rules that would appear to meet the objectives, and implemented without full prior screening using MSE methods. Where possible, in these instances, MSE should be undertaken after initial implementation to subsequently and periodically ensure that the harvest strategies are robust, and to help refine them over time. In this context, harvest strategies must be flexible enough to adapt given the outcomes of MSE undertaken after their implementation.

Even for minor or data poor fisheries, it may still be worthwhile to develop MSE analyses, using assumptions/information for related species and/or from similar fisheries elsewhere in the world to substitute for where information gaps exist. Such initial MSE analyses can be updated as more reliable information becomes available. Sensitivity analyses using the MSE framework can also identify key information inputs to which the performance of the harvest strategies are sensitive, and in this way can help to prioritise monitoring and research needs.

MSE will be relevant in two broad sets of circumstances. The first is to develop and test “generic” strategies for broad classes of fishery, or for particular stages of fishery development (e.g. developing fisheries). The second is to develop harvest strategies for specific stocks and fisheries. Each approach will use operating models to guide harvest strategy development, but for the latter case the operating models will have to be carefully tuned to the specific circumstances of each fishery. This typically requires a reasonable time series of fishery-dependent data and information regarding the population dynamics, biology and economics of the fishery.

In all MSE analyses, but particularly those for data poor fisheries, it is important to be explicit about the associated uncertainties in the projected harvest strategy outcomes. While incorporating various sources of uncertainty in the operating model and analysis are a fundamental strength of MSE, these must be carefully explained and defined in the context of interpreting the MSE outcomes.

14.3 What resources are required for an MSE analysis?

An MSE analysis is a time and resource intensive undertaking. Most such analyses have typically been developed over a minimum two year time frame, and require high level skills in stock assessment and modelling, which are often in short supply. They are also computationally intensive.

Information resources are also important in conditioning or tuning the operating models for specific fisheries. Typically logbook data are required along with at least educated guesses or informed hypotheses regarding population growth, mortality, recruitment and possibly seasonal and spatial dynamics.

A final requirement is to establish good channels of communication with industry and decision makers, so that the process may be transparent to all relevant parties and that useful input and feedback may be obtained from these sectors in the development of the framework.

Fortunately, many of the major Commonwealth fisheries, and the major stocks within those fisheries, have already been the subject of MSE analyses, although some of these will have to be revisited in the light of the new policy directions and requirements under the HSP. To date there have been fewer MSE analyses on minor or data poor stocks and species, and the harvest strategies and MSE approaches for such stocks are generally not well developed

15 Amending Harvest Strategies

One of the key aims of the HSP is to provide for increased certainty and predictability in the operating environment surrounding Commonwealth-managed fisheries. Accordingly, amendments to the harvest strategies should occur infrequently once they are fully established (every three-five years for most stocks). However, the HSP recognises that it may be necessary to amend harvest strategies more regularly. The HSP identifies that this may be due to the following:

- there is new information that substantially changes understanding of the status of a fishery, leading to improved estimates of indicators relative to reference points. One example is where a harvest strategy is implemented without full prior screening using MSE methods (see section 14). In such an instance, harvest strategies must be flexible enough to adapt given the outcomes of MSE undertaken after their implementation; or
- external drivers that increase the risk to a fishery and fish stocks. In such cases, it may be necessary to use emergency authorities available to AFMA to implement a rapid response to reduce fishing intensity.

Additional reason to amend harvest strategies include:

- It is clear that harvest strategies are not working effectively and the intent of the HSP is not being met. For example, next years RBC is unduly influenced by previous RBCs, irrespective of stock status, i.e. the estimates are auto-correlated. This was identified as a potential issue in the Tiers 3 and 4 of the SESSF harvest strategy framework. In most cases this will occur when harvest strategies are implemented without formal testing or evaluation using such methods as MSE.

It is anticipated that such amendments to harvest strategies would occur infrequently once they are fully established (every three-five years for most stocks).

The process for amending harvest strategies should follow that for the initial development described in Section 2.5. The RAG or working group outlines the reasons for the proposed change and demonstrates their scientific basis. The MAC should support any proposed changes followed by approval by the AFMA Board.

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Attachment A: Glossary of Terms

(This glossary covers references in both the Harvest Strategy Policy and the Guidelines)

ABARE: Australian Bureau of Agricultural and Resource Economics.

AFMA: Australian Fisheries Management Authority.

AFZ: Australian Fishing Zone.

(B) - Biomass: total weight of a stock or of a component of a stock; for example, the weight of spawning stock biomass is the combined weight of mature animals.

(B_{LIM}) - Biomass limit reference point: the point beyond which the risk to the stock is regarded as unacceptably high.

(B_{MEY}) - Biomass at maximum economic yield: average biomass corresponding to maximum economic yield as estimated from the assessment model applied.

(B_{MSY}) - Biomass at maximum sustainable yield: average biomass corresponding to maximum sustainable yield.

(B_{TARG}) - Target biomass: the desired condition of the stock.

(B_0) - Mean equilibrium unfished biomass: average biomass level if fishing had not occurred. Sometimes the pre-exploitation level is used as a proxy.

BRS: Bureau of Rural Sciences.

Bycatch: species taken incidentally in a fishery where other species are the target, and which are always discarded.

Byproduct: species taken incidentally in a fishery that have some commercial value and are retained for sale.

Control rules: (also referred to as harvest control rules and decision rules) agreed responses that management must make under pre-defined circumstances regarding stock status.

DAFF: Department of Agriculture, Fisheries and Forestry.

DEW: Department of the Environment and Water Resources.

EPBC Act: *Environment Protection and Biodiversity Conservation Act 1999.*

Ecologically sustainable development: using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.

Fish down: a fish stock that has not been heavily fished may have a large number of older fish. When such stocks are fished, catches are highest at first, but the rate cannot be sustained once the abundance of older fish has been reduced. Removing the older fish in this way is termed fish down [note: it could also be defined as the period of fishing from B_0 to when B_{TARG} is reached].

FA Act: *Fisheries Administration Act 1991.*

(F) - Fishing mortality: the instantaneous rate of deaths of fish due to fishing a designated component of the fish stock. F reference points may be applied to entire stocks or segments of the stocks and should match the scale of management unit.

(F_{LIM}) - Fishing mortality limit reference point: the point above which the removal rate from the stock is too high.

(F_{MEY}) - Fishing mortality at maximum economic yield: fishing mortality rate which corresponds to the maximum economic yield.

(F_{MSY}) - Fishing mortality at maximum sustainable yield: fishing mortality rate which achieves to the maximum sustainable yield as estimated by the assessment model applied. Note: F_{MSY} is generally greater than F_{MEY}.

(F_{TARG}) - Fishing mortality: the target fishing mortality rate.

FM Act: *Fisheries Management Act 1991.*

Food and Agriculture Organization (FAO): of the United Nations.

Generation time: the average time taken for an individual to replace itself within the population.

Input controls: indirect restraints placed by management to reduce amount of fish caught; for example, gear restrictions and closed seasons.

Keystone species: an organism that has a greater role in maintaining ecosystem function than would be predicted based on its abundance.

Key commercial species: a species that is, or has been, specifically targeted and is, or has been, a significant component of a fishery.

MAC: Management Advisory Committee of AFMA.

Management Strategy Evaluation: a procedure whereby alternative management strategies are tested and compared using simulations of stock and fishery dynamics.

Maximum Economic Yield (MEY): The sustainable catch or effort level for a commercial fishery that allows net economic returns to be maximised. Note that for most practical discount rates and fishing costs MEY will imply that the equilibrium stock of fish is larger than that associated with MSY. In this sense MEY is more environmentally conservative than MSY and should in principle help protect the fishery from unfavourable environmental impacts that may diminish the fish population.

Maximum Sustainable Yield (MSY): the maximum average annual catch that can be removed from a stock over an indefinite period under prevailing environmental conditions.

Output Controls: management measures directly limiting fish catch or landings (for example by quota).

Overfished: a fish stock with a biomass below the biomass limit reference point.

Overfishing: A stock is experiencing too much fishing and the removal rate from the stock is unsustainable.

- Fishing mortality (F) exceeds the limit reference point (F_{LIM}). When stock levels are at, or above, B_{MSY}, F_{MSY} will be the default level for F_{LIM}.
- Fishing mortality in excess of F_{LIM} will not be defined as overfishing if a formal ‘fish down’ or similar strategy is in place for a stock and the stock remains above the target level (B_{TARG}).
- When the stock is less than B_{MSY} but greater than B_{LIM}, F_{LIM} will decrease in proportion to the level of biomass relative to B_{MSY}.
- At these stock levels, fishing mortality in excess of the target reference point (F_{TARG}) but less than F_{LIM} may also be defined as overfishing depending on the harvest strategy in place and/or recent trends in biomass levels.
- Any fishing mortality will be defined as overfishing if the stock level is below B_{LIM}, unless fishing mortality is below the level that will allow the stock to recover within a period of 10 years plus one mean generation time, or three times the mean generation time, whichever is less.

Precautionary approach: (not to be confused with what is also sometimes referred to as the precautionary principle) where there are threats of serious irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary approach, public and private decisions should be guided by (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment and (ii) an assessment of the risk-weighted consequences of various options.

RAG: Resource Assessment Group of AFMA.

RBC: Recommended biological catch. The total mortality from fishing by all sources – derived from application of the harvest control rule.

Recruitment overfishing: occurs when excessive fishing effort or catch reduces the spawning stock biomass to a level below which future recruitment levels may be jeopardised; this spawning biomass level should correspond closely to the biomass limit reference point.

Reference point: an indicator of the level of fishing (or stock size), used as a benchmark for interpreting the results of an assessment.

Spawning stock biomass: (also called spawning biomass) the total weight of all adult fish in a population.

Species: members of a species of fish that can breed with one another and produce fertile (capable of reproducing) offspring. In this way, a species maintains its 'separateness' from other species; for example, the yellowfin tuna and bigeye tuna are two distinct tuna species whereas the general term 'tuna' includes all tuna species.

Stock: a functionally discrete population of a species that is largely distinct from other populations of the same species. Such a population may be regarded as a separate entity for management or assessment purposes. Some species form a single stock (e.g. southern bluefin tuna), while others form several stocks (e.g. albacore tuna in the Pacific Ocean are divided into separate northern Pacific and southern Pacific stocks).

Stock recovery plan: a formal management process put in place under the EPBC Act to rebuild a stock when the measure of its status (e.g. its biomass) is substantially below the biomass limit point (B_{LIM}, i.e. it is assessed as overfished). Stock recovery plans should include elements that define rebuilding targets, rebuilding time horizons and control rules related to the rate of progress.

Stock rebuilding strategy: a management process developed by AFMA to rebuild a stock to the target biomass reference point (B_{TARG}) when the measure of its status is at or is below the biomass limit point (B_{LIM}). The strategy is required to be approved by AFMA and the Minister for the Environment and Water Resources.

Sustainable Yield: the average catch that can be removed from a stock over an indefinite period without causing a further reduction in the biomass of the stock. This could be either a constant yield from year to year, or a yield that fluctuates in response to changes in abundance.

TAC: total allowable catch.

TAE: total allowable effort.

Targeting: fishing selectively for particular species or sizes of fish.

Target species: see key commercial species.

United Nations Fish Stocks Agreement: The Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, 1995.

TORRES STRAIT FINFISH WORKING GROUP	Meeting 2017.1 16-17 March 2017
MANAGEMENT **Coral Trout Recommended Biological Catch 2017-18 Season**	**Agenda Item No. 3.2** **For discussion and advice**

RECOMMENDATIONS

That the Working Group **discuss** and **provide advice** on 2017-18 TAC for coral trout taking into account any relevant new information and estimates of other fishing mortality (traditional and recreational take).

KEY ISSUES

1. The TACs for coral trout is based on historical catch data from 1995-2000 and have remained unchanged since 2008. The TAC for coral trout is **134.9** tonnes

2. The Working Group is being asked to provide advice on the TAC for 2017-18 fishing season. Noting that a TACs for coral trout has not been considered by the Working Group for some time however, the Working Group may consider providing advice on the current TAC as required.

3. Once a harvest strategy is agreed for the fishery there will be clear decision making framework for providing advice on future recommended biological catches and TACs. In the interim the Working Group, should take into account all available information and consider whether or not there is justification to recommend changes to the current TAC levels.

RELEVANT INFORMATION

Catches taken outside the fishery

1. Australian Government policy is to use the *Commonwealth Fisheries Harvest Strategy Policy and Guidelines 2007*. Consistent with this policy, all sources of mortality must be taken into account when setting a TAC. This generally means the TAC equates to the Recommended Biological Catch for the species minus expected catches to be taken outside of the fishery.

2. The Working Group should provide advice on estimated traditional and recreational catches. Whilst there are no formal estimates of recreational take in the Torres Strait, estimates have been made for traditional take (Busilacchi et al. 2013).

Stock assessments

3. There has been no formal stock assessment coral trout however a management strategy evaluation (MSE) has been undertaken (Williams *et al.* 2007). Four constant-catch

scenarios, ranging from 80-170t, were tested and all predicted biomass of at least 70 per cent of the assumed unfished levels.

4. The coral trout Torres Strait stock is considered as not overfished or subject to overfishing (ABARES 2016).

Catches in the fishery

5. Catches of coral trout have been well below the recommended TACs following a 2008 structural adjustment in the fishery. Low catches are not considered indicative of underlying stock trends, rather a reflection of low levels of effort due the limited entry through leasing sunset licences with additional conditions including large exclusion zones around eastern Torres Strait communities. The exclusion zones are now set aside for the Traditional Inhabitant Boat licenced (TIB) sector and contain productive fishing grounds that were accessible to the non-traditional inhabitant fishers prior to 2008.

6. In the 2015-16 fishing season, holders of leased permits caught 20.5 tonnes of coral trout. Due to the current season catches of coral trout being taken from less than five boats, these data remain commercial in-confidence in line with AFMA's Information Disclosure Policy. TIB fishers reportedly caught 285kg of coral trout in the 2015-16 season. Reported catches for the traditional inhabitant sector are likely underestimates.

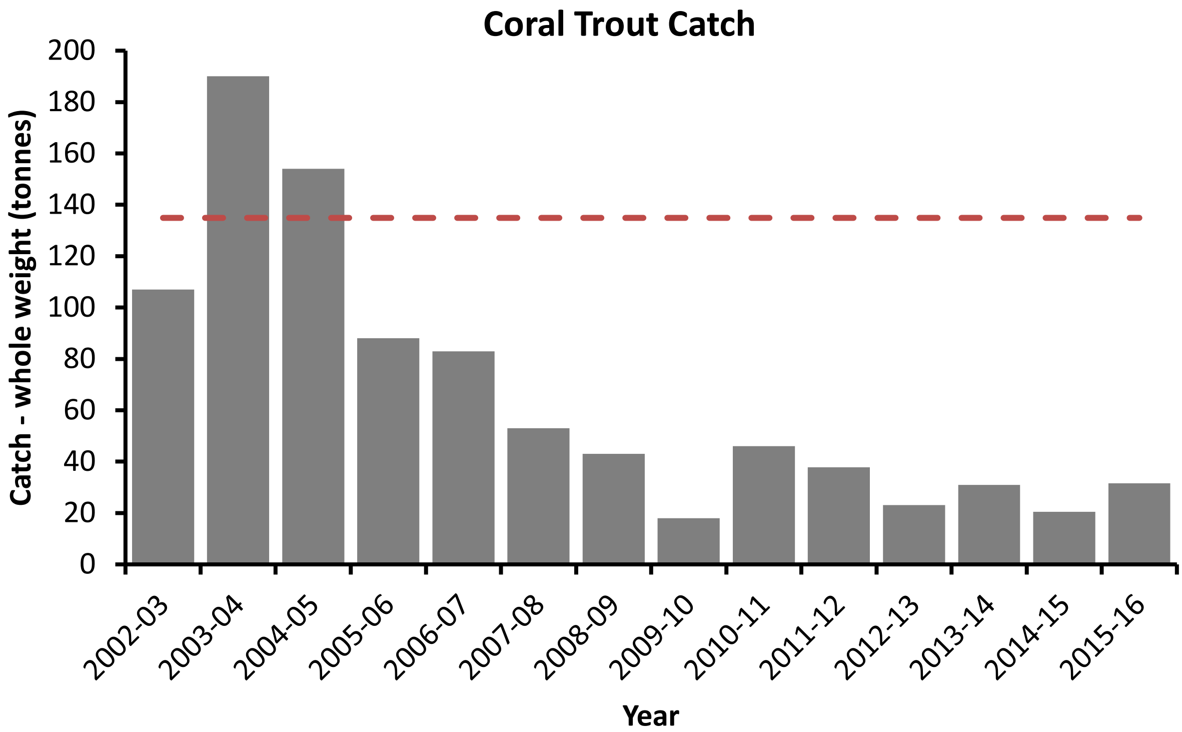

Figure 2: Torres Strait Reef Line Fishery historical catch records including the TAC (134.9t) (source: AFMA docket book/logbook database).

TORRES STRAIT SCIENTFIC TECHNICAL FINFISH WORKING GROUP	10 November 2016
MANAGEMENT **Spanish mackerel stock assessment review**	**Agenda Item No. 2** **For Discussion and Advice**

RECOMMENDATIONS

That the Technical Working Group:

1. **DISCUSS** and **PROVIDE ADVICE** to the Finfish Working Group on the Spanish mackerel stock assessment update and the preferred model for setting a TAC for the Torres Strait Spanish Mackerel Fishery for 2017-18 onwards.
2. **DISCUSS** and **PROVIDE ADVICE**
3. **NOTE** that at its meeting on 12-13 July 2016, the Finfish Working Group recommended the following:
    a) for the 2017-18 Spanish mackerel fishing season that**:**

- TAC setting advice to be finalised subject to consideration of updated stock assessment and advice from the newly convened Technical Scientific Working Group;
- Technical scientific working group to review stock assessment update to allow for full consideration of inputs and outcomes. Technical scientific working group to report back to FWG;
- The technical scientific working group should comprise the follow members:
    - Scientific members
    - Two industry members: Tony Vass, Kenny Bedford
    - Andrew Tobin
    - Nicole Murphy
    - Government
- The technical scientific working group should consider the following:
    - Disproportionate effort in Bramble Cay
    - Local factors – unexpected factors (eg environmental and/or climate change related effects)
    - Changes in accessible area of the fishery (closures)
    - Estimates of TIB, Traditional, Recreational catches
    - Logbook data quality
    - Stock structure

- Catch rate objectives (effort & catch)

- Recognising the importance of precautionary approach, as an interim approach (noting Harvest Strategy to be developed) TAC should not exceed best estimates of MSY after taking into account all other sources of fishing mortality; and

b) that subject to further consideration by the Technical Scientific Working Group of coral trout to byproduct catch ratios when targeting coral trout and total take of 'other species' by other sectors – there should be no further increase above 30 tonnes until systems are in place to independently verify catches, a species-specific risk assessment has been undertaken and where applicable catch triggers and control rules have been agreed.

KEY ISSUES

Spanish mackerel stock assessment and TAC setting

1. In 2014 AFMA funded the project titled: *Defining the status of Torres Strait Spanish mackerel to inform future fisheries allocation and sustainable fishing*. As part this project the 2006 stock assessment of Spanish mackerel (Begg *et al* 2006) has been updated.

2. Dr Michael O'Neill presented the findings of the revised stock assessment to the Finfish Working Group at their meeting on 12-13 July. This work will inform future Working Group advice on both TACs and research priorities. Dr O'Neill will present the stock assessment in further detail to the Finfish Scientific Technical Working Group to assist in its review of the four stock analyses (draft report attached – see pages 34-39) in the stock assessment and making a recommendation on the most appropriate model for setting a TAC.

3. A key recommendation of the draft report is for:

   "Management to adopt a precautionary approach to setting target levels of commercial harvest until further data of total catches and fish age structures are available".

4. The draft report further advises that if future average harvests increase above 150 tonnes, then future catch rates of Spanish mackerel may erode. Despite uncertainty in estimated population sizes however, the authors considered recent harvest for 2007-2014 (64-105t) and population estimates all sustainable.

5. Further research priorities were identified noting that many that were identified by Begg *et al* 2006 remain. The development of a harvest strategy (Agenda item 5.1) will assist in evaluating the cost-catch-risk trade-off associated with further investment in finfish research. Relevantly the authors note that "*if future improvement in data is not cost effective or supported, then use of precautionary reference points to judge abundance (Standardised catch rates) indicator signals is essential for mitigation of indicator variance and uncertain management decisions*".

6. Specifically the report recommends a range of data improvements that would be required to service future harvest strategy procedures for Torres Strait Spanish mackerel (empirical or stock model based) including:

   - Verify records on fishing effort and harvest through logbook, docket book and electronic

- reporting systems [*for harvest and/or standardised catch rate assessments*]. This
- involves recording and validating:
- trip harvests and average fish weights using unload/sale receipts,
- number of dories used and hours fished each operation day,
- the number of and fishing locations of the primary operation and dories using
- VMS/GPS latitude and longitude coordinates,
- number of fish caught each operation and dory day,
- zero catches, and
- days when fishing is stopped due to capacity limitations (too many fish).

- Monitor and estimate Spanish mackerel harvests taken by non-commercial sectors [for stock model assessments].
- Conduct regular (annual or biennial) long term monitoring of fish age-length structures that are spatially representative of the Torres Strait [for mortality and/or stock model assessments].
- Collect fine scale spatially representative genetic fish samples to test the single

'Other' reef line species

1. Since 2008 the TSRA has leased-out fishing licences with individual catch entitlements for coral trout and Spanish mackerel on behalf of traditional inhabitants. For the first time TSRA are proposing to lease-out catch entitlements for unspecified reef species through contractual arrangements. This proposal has been recommended by the Finfish Quota Management Committee and endorsed by the TSRA Board.
2. Specifically the proposed TSRA leasing arrangements are to lease-out across seven licences:
   - 99 tonnes of Spanish mackerel;
   - 74 tonnes of coral trout; and
   - 28.5 tonnes of 'other' reef fish species.
3. Not all licences are proposed to be granted a catch entitlement for 'other' reef fish species. AFMA does not have any detail on the proposed fishing plans of individual operators but understands that at least one operator is primarily interested in exploring the commercial viability of targeting 'mixed' reef fish in the fishery.
4. Average annual catches of 'other' reef fish species from 2008/09 is 1.8 tonnes (Table 1). Over the same period the average ratio of coral trout and 'other' reef fish species has varied between 5-7 per cent (Table 1).
5. At its meeting in February 2007 the FWG recommend monitoring identified fish species (or species group) by monitoring total annual catch and setting trigger reference points for these species such that:
   a) total annual catch (by species or species group) not be > highest recorded annual catch;
   b) the ratio of total annual catch of coral trout and other species (by species or species group) does not increase by >20% in any one year; and
   c) the ratio of total annual catch of coral trout and other species (by species or species group) does not decrease by >20% in any one year.

6. The proposed leasing arrangements, if fully caught, would trigger the above recommended trigger point of not increasing by more than 20 percent at the species group level and likely at the species level. In 2014-15 and 2015-16 the catch ratio of coral trout to other species was 7 per cent (Table 1). The proposed leasing arrangements equate to a catch entitlement ratio of 38.5 per cent. This is an increase of greater than 20 percentage points.
7. The Working Group is yet to develop recommended actions for responding to breaches of trigger reference points. The development of Harvest Strategy (Agenda Item 5.1) is expected to not only review current management approaches but set out clear control rules and management responses.
8. Currently there are no limits on the take of 'other' reef fish species in the fishery. This approach is commensurate to the overall management risk associated with the low levels of effort and reported catch of all 'other' species combined (average 1.8 tonnes since 2008/09).
9. Supporting growth in the fishery is consistent with the *Torres Strait Fisheries Act 1984* objective to manage commercial fisheries for optimum utilisation. Any proposed expansion however must be managed in a way that is sustainable and is underpinned by a program aimed at gathering sufficient information to allow the PZJA to assess whether fishing is sustainable. Such an approach provides certainty and transparency for stakeholders.
10. Advice from the Working Group is sought on the possible impacts of the proposed increased catches in 'other' reef fish species and if relevant, what measures (monitoring or otherwise) are recommended to support such catch increases. As a guide only, the Working Group may consider among other things, the following:
    a) information needs to support future assessments;
    b) species-specific risks from increase effort (noting AFMA does not yet have any information on preferred target species);
    c) any unintended impacts on catch reporting; and
    d) adequacy of available monitoring tools to verify fishing activities; and
    e) the need to manage expansion across the fishery as a whole. AFMA is aware of growing interest and preparation among some TIB operators to increase their effort in the Finfish Fishery.

Table 1. Annual catch of reef line species as of 4 July 2016 (whole weight in kilograms) (source: AFMA docket book/logbook database)

	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Humpback Grouper - Barramundi cod	542	238	1086	757	429	786	646 (2)	1011 (2)
Red Emperor	222.5	70	398	202	125	160	207 (2)	230 (2)
Rock cods	125	280	728.5	1036.5	480	932	575 (2)	1001 (2)
Sea Bass	843	10	79	-	-	-	15	81 (2)
Spangled Emperor	197	68	244	29	35	-	8 (2)	37
Venus Tuskfish		93	341	145	34	79	-	-
Total (average 1.8t)	**1929.5**	**759**	**2876.5**	**2169.5**	**1103**	**1957**	**1451**	**2360**

Coral trout (average 26t)	28872.5 (2)	10537.7 (2)	40585.2 (2)	35552 (2)	22001 (2)	30889.5 (2)	20529 (3)	31609 (2)
% byproduct/coral trout	**7%**	**7%**	**7%**	**6%**	**5%**	**6%**	**7%**	**7%**

(x) denotes number of fishers reporting catch if more than one

BACKGROUND

Finfish Buyout and Leasing Arrangements

In 2005, the Protected Zone Joint Authority (PZJA) agreed to transition towards greater Traditional Inhabitant ownership in the Torres Strait Finfish Fishery (Spanish mackerel and reef line). The key purpose of this decision was to fulfil obligations under the Torres Strait Treaty to promote economic development and employment for Traditional Inhabitants in the Torres Strait, and to provide PNG with its entitlement of the allowable commercial catch of finfish.

In 2007, the PZJA successfully completed a buyout of all non-Traditional Inhabitant (TVH) Torres Strait Finfish catch entitlements. Traditional Inhabitants of the Torres Strait now hold 100 percent of the Australian allocation of Torres Strait commercial finfish entitlements.

A condition of the buyout was to lease back licences to the TVH sector until the TIB sector can increase its catch to a level close to its full allocation. Leasing arrangements ensure that the Torres Strait finfish markets and continuity of supply chains are maintained. During the buyout process the TSRA Board agreed to hold and administer finfish quota in trust on behalf of Traditional Inhabitants of the Torres Strait. Revenue raised from the leasing will be reinvested into community fishing initiatives aimed at building the capacity of Traditional Inhabitant fishing industries.

The Torres Strait Finfish Quota Management Committee (FQMC) was established to preside over finfish leasing arrangements and provide recommendations to the TSRA Board. The FQMC comprises of four community fisher representatives from Erub, Masig, Mer and Ugar, and the four TSRA Board members for these communities, an additional TSRA Board member on an annual rotational basis and the Portfolio Member for Fisheries.

From the notional global total allowable catch (TAC) of 188 tonnes of Spanish mackerel and 135 tonnes of coral trout for the Torres Strait Spanish mackerel and reef line fisheries. Under the catch sharing arrangements of the *Torres Strait Treaty (1985)*, 40 percent of Spanish mackerel is allocated to PNG, however, this has never been taken up. PNG confirmed at the 2015 Fisheries Bilateral meeting that they will not be utilising the Torres Strait Finfish Fishery in the 2016-17 season. As a result, the global TAC for both Spanish and coral trout is available for TIB licence holders to utilise either through fishing or by leasing to TVH fishers.

TORRES STRAIT FINFISH WORKING GROUP	Meeting No. 2016.1 12-13 July 2016
MANAGEMENT **Removal of the western closure – Reef Line Fishery**	**Agenda Item No. 5.4** **For discussion and advice**

RECOMMENDATIONS

That the Working Group **DISCUSS** and **PROVIDE ADVICE** on removing the western closure in the Reef Line Fishery.

KEY ISSUES

1. Commercial harvest of reef fish is undertaken in the north eastern region of Torres Strait (Figure 1). Commercial fishing for reef fish west of 142˚32'E is prohibited under the *Torres Strait Fisheries Management Instrument No. 8 - Torres Strait Finfish Fishery.*

2. The western closure is believed to reflect a historical jurisdictional boundary that was rolled over into the Finfish Fishery management arrangements when the fishery came under a single jurisdiction under the PZJA. The closure only relates to the Reef Line Fishery and not to the Spanish mackerel Fishery.

3. At the last Finfish Working Group meeting (20 March 2012), TSRA indicated that there was community interest in removing the western closure. It is understood this interest remains.

4. The Working Group is asked to provide advice on the potential management implications with removing the closure. In forming its advice the Working Group should have regard for the objectives of the *Torres Strait Finfish Fishery Management Plan 2013*:

    a. To acknowledge and protect the traditional way of life and livelihood of Traditional Inhabitants, including their rights in relation to traditional fishing for finfish;

    b. Harvest levels are at, or below levels that maintain biological viable stocks of target and non-target species;

    c. To provide for the use and conservation of Torres Strait Finfish resources in a way that minimises impact of the marine environment;

    d. To optimise economic viability of the fishery; and

    e. To provide for optimal utilisation, cooperative management, and for catch sharing to occur with PNG.

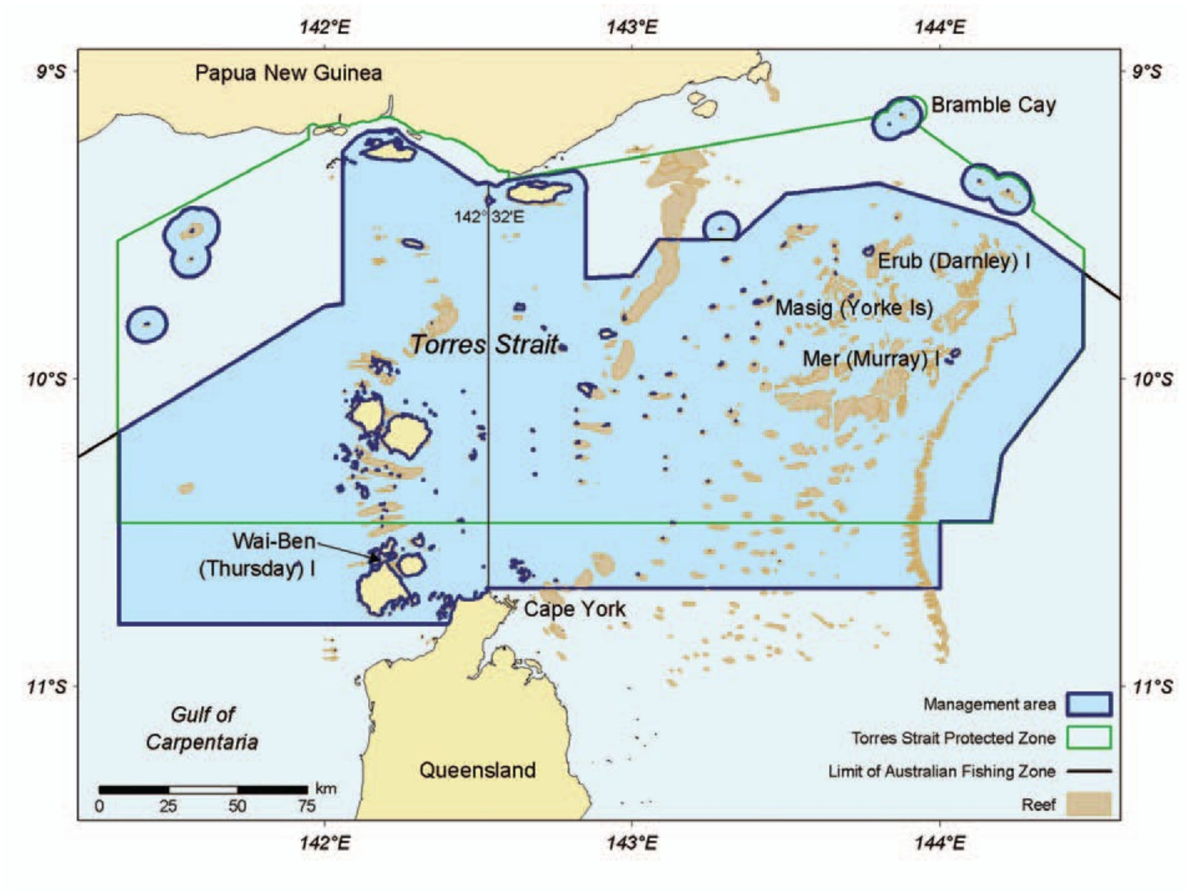

Figure 1. Area of the Torres Strait Reef Line Fishery

TORRES STRAIT FINFISH WORKING GROUP	Meeting No. x / Out-of-session date
MANAGEMENT **Legislative instrument for making**	**Agenda Item No. xx** **For discussion and advice**

RECOMMENDATIONS

That the Working Group:

1. **DISCUSS** and **PROVIDE ADVICE** on on the proposed making of the instrument.
2. **NOTE** the remaking of the Torres Strait Spanish Mackerel Fishery legislative Instrument.

KEY ISSUES

1. In accordance with section 35(1)(a) of the *Torres Strait Fisheries Act 1984* the PZJA may make legislative instruments to regulate commercial fishing. Instrument exists for all Torres Strait Fisheries. These instruments are subject to the sunsetting provisions in the *Legislative Instruments Act 2003*. The instrument relevant to the Torres Strait Spanish Mackerel Fishery expires on 1 October 2016.
2. *Fisheries Management Notice No. 79, Torres Strait Spanish Mackerel Fishery, prohibitions relating to the taking, processing and carrying of Spanish mackerel (gear and size restrictions and take and carry limit)* is at Attachment 1. The instrument sets out prohibitions relating to the taking, processing and carrying of mackerel (gear and size restrictions and take and carry limits).
3. AFMA has made preparations for the PZJA to remake the instrument without change as soon as possible following the Federal and TSRA Board elections. AFMA wrote to all Spanish mackerel fishery licence holders and consulted with all members of the Finfish Working Group (FWG) inviting comment on the proposed remaking of the instrument (Attachments 2 & 3). AFMA received one comment from FWG Research Member Dr Michael O'Neill (Attachment 4).
4. Dr O'Neill advised that the minimum size limit of 50cm for grey mackerel was well below the size at maturity and should be set nearer to 75cm, which is the minimum size limit for Spanish mackerel. Dr O'Neill also noted that the minimum size limit for grey mackerel in the QLD east coast fishery was 60cm, but even this is not adequate considering the biological parameters of this species (i.e. previous research established that the size at sexual maturity for grey mackerel to be between 65-75cm fork length (FL) for females and 55cm (FL) or greater for males[1].
5. Native title notification was also undertaken in accordance with the *Native Title Act 1992* (Attachment 5). One response provided by TSRA (Attachment 6).

[1] Cameron, D. and Begg, G. (2002). *Fisheries biology and interaction in the northern Australian small mackerel fishery*. Final report Projects 92/144 & 92/144.02, Fisheries Research Corporation Division, Department of Primary Industries, QLD, Australia.

6. Noting that the fishery is reportedly inactive, the lapse in legislative arrangements is considered low risk to the sustainability of the stock. It is expected that the PZJA will be able to consider remaking the instrument later in the year.
7. Remaking an instrument does not impede future reviews and/or amendment of the management arrangements in the fishery.

Attachments

1. Sunsetting FMN No. 79 – Spanish mackerel
2. Letter to licence holders re sunsetting FMN
3. Torres Strait FMI No. 13 DRAFT – Spanish mackerel
4. Submission on Spanish mackerel (Dr Michael O'Neill) March 2016
5. Native Title Notification
6. TSRA response to NT Notification

Torres Strait Fisheries Act 1984

Fisheries Management Notice No. 79

TORRES STRAIT SPANISH MACKEREL FISHERY

PROHIBITIONS RELATING TO THE TAKING, PROCESSING AND CARRYING OF SPANISH MACKEREL (GEAR AND SIZE RESTRICTIONS AND TAKE AND CARRY LIMIT)

The Protected Zone Joint Authority, acting in accordance with the powers conferred on the Authority by paragraph 35(1)(a) of the *Torres Strait Fisheries Act 1984*, and the Minister in accordance with the powers under section 16 of the *Torres Strait Fisheries Act 1984*, makes the following notice.

Dated this ……22……… day of …September 2006

Eric Abetz

ERIC ABETZ

Minister for Fisheries, Forestry and Conservation and member and Chair of the Protected Zone Joint Authority.

CITATION

1. This Notice may be cited as Torres Strait Fisheries Management Notice No. 79.

COMMENCEMENT

2. This Notice commences on the day after registration.

THIS NOTICE TO APPLY WITH OTHER NOTICES

3. This Notice applies in conjunction with any other Notice in force in the area of the Spanish Mackerel Fishery.

REVOCATION OF FISHERIES MANAGEMENT NOTICE NO 74

4. Fisheries Management Notice No. 74, dated 28 November 2005 is revoked.

INTERPRETATION

5.1 In this Notice, unless the contrary intention appears “the Act” means the *Torres Strait Fisheries Act 1984*.

5.2 Terms used but not defined in this Notice have the same meaning as in the Act and the *Torres Strait Fisheries Regulations*.

5.3 “mackerel” means fish of the species Spanish mackerel (*Scomberomorus commerson),* school mackerel *(Scomberomorus queenslandicus*), grey mackerel *(Scomberomorus semifasciatus),* spotted mackerel *(Scomberomorus munroi) and* shark mackerel (*Grammatorcynus bicarinatus).*

5.4 “finfish” means all fish of the *Superclass Pisces* other than mackerel.

5.5 “TVH licence” means a fishing boat licence issued under section 19(2) of the Act that is not a Traditional Inhabitant Boat (TIB) licence.

PROHIBITION (GENERAL)

6. Pursuant to paragraph 16(1)(a) of the Act, the taking, processing or carrying of mackerel is prohibited.

EXEMPTIONS FROM PROHIBITION

7. Pursuant to paragraph 16(1A)(d) of the Act, a person is exempt from the prohibition in paragraph 6 if:

   a) a person holds a licence granted under either subsection 19(2) or 19(3) of the Act that entitles that person to take, process or carry mackerel; or

   b) where a person holds a licence granted under either subsection 19(2) or 19(3) of the Act that entitles that person to take, process or carry finfish, takes or carries at any one time, not more than 20 kilograms of mackerel in any form; or

   c) where a person holds a licence granted under either subsection 19(2) or 19(3) of the Act other than a licence of a kind referred to in paragraph (a) or (b), takes or carries at any one time:

(i) not more than 20 kilograms of mackerel in any form; or

(ii) where a quantity of finfish is also being carried, the combined weight of mackerel and finfish are not more than 20 kilograms; or

d) a person using a boat holds a licence that was issued under the law of Papua New Guinea that is endorsed by Australia under Section 20 of the Act, authorising that boat to be used to take Spanish mackerel in the area of Australian jurisdiction; or

e) a person is using a boat in the course of traditional fishing.

SIZE LIMITS

8.1 Pursuant to paragraph 16(1)(b)(ii) of the Act, it is prohibited to take mackerel that when measured in accordance with Paragraph 8.2, are less than the minimum size limits specified in Schedule 1.

8.2 For the purposes of paragraph 8.1, the length of a mackerel is measured from the point of the snout (or tip of the lower jaw, if that tip protrudes beyond the snout), to the extremity of the tail or caudal fin, whichever is longer.

EXEMPTION TO SIZE LIMITS

9. Pursuant to paragraph 16(1A)(d) of the Act a person engaged in traditional fishing is exempt from the prohibition in paragraph 8.1.

GEAR RESTRICTIONS

10. Except as provided in paragraph 11, pursuant to paragraph 16(1)(c) of the Act, it is prohibited to take mackerel by any method other than trolling, handlining or droplining in the Australian jurisdiction.

GEAR RESTRICTIONS - BRAMBLE CAY/BLACK ROCKS

11. Pursuant to paragraph 16(1)(c) of the Act, holders of TVH licences operating in the Australian territorial sea surrounding Bramble Cay and Black Rocks are prohibited to take mackerel:

a) between the hours of 0930 and 1500 (eastern standard time) each day during the months of August to December; and

b) by any method other than trolling.

EXEMPTION TO THE BRAMBLE CAY/BLACK ROCKS RESTRICTIONS

12. Pursuant to paragraph 16(1A)(d) of the Act a person engaged in traditional fishing is exempt from the prohibitions in paragraphs 10 and 11.

SCHEDULE 1

SPECIES	MINIMUM SIZE
Spanish mackerel (*Scomberomorus commerson)*	750 millimetres
Spotted mackerel *(Scomberomorus munroi)*	600 millimetres
School mackerel *(Scomberomorus queenslandicus*)	500 millimetres
Grey mackerel *(Scomberomorus semifasciatus)*	500 millimetres
Shark mackerel *(Grammatorcynus bicarinatus)*	500 millimetres

18 March 2016

ZENGREY NONA
PO BOX 74 NEW MAPOON COMMUNITY
VIA BAMAGA QLD 4876

Dear licence holder

RE: Remaking of two Torres Strait Fisheries Legislative Instruments

Two Torres Strait Fisheries Legislative Instruments (Torres Strait Fisheries Management Notices 76 and 79) relating to the Trochus and Spanish mackerel fisheries will expire in the coming months. Legislative Instruments are used in Torres Strait Fisheries to ensure fishing is conducted in line with the objectives of the *Torres Strait Fisheries Act 1984*.

All legislative instruments expire around 10 years after they are determined so need to be periodically reviewed and remade to ensure ongoing protection and regulation of the relevant fisheries. AFMA is seeking to remake the two instruments in exactly the same form and wording as the current instruments (Attachments 1 and 2). There will be no changes to the rules and regulations for the two fisheries under these new instruments.

What do the instruments do?

The two Instruments prohibit people from fishing in the Trochus and Spanish mackerel fisheries without a valid fishing licence. The instruments also outline the minimum size limits for both Spanish mackerel and trochus, and the gear and methods that can be used to catch these species. There are no new rules coming in with the remaking of the instruments, and exactly the same rules will apply in the two fisheries as they are under the current Instruments. These instruments do not affect traditional fishing.

If these rules were not in place, anyone could fish for trochus and Spanish mackerel, and there would be no size limits or gear restrictions for fishing. This would put the fisheries and species at risk of overfishing.

Efficient and effective legislation

Before the PZJA remakes these instruments, we must assess whether these instruments are still proving to be the most effective and efficient form of regulation regarding their content and rules.

AFMA believes these instruments continue to provide the most efficient and effective management of the Trochus and Spanish mackerel fisheries and allow the PZJA to pursue the objectives of the Act. The Instruments ensure that only people licenced to fish in the fishery can continue to fish. The arrangements contained in the instruments are still required to ensure the future sustainability of the fisheries. Importantly it should be noted that remaking the instruments does not preclude future review and amendment of the arrangements. Any such reviews would include consultation with fishers through the relevant PZJA forums.

You are invited to comment on the remaking of the Instruments, in particular regarding the efficiency and effectiveness of the Instruments in protecting the relevant fisheries.

Please make any submissions to steve.hall@afma.gov.au or by calling Steve Hall on 07 4069 1990 by 15 April 2016.

Yours sincerely

Steve Bolton
Senior Manager
Northern Fisheries and Co-management

TORRES STRAIT FINFISH WORKING GROUP	Meeting 2016.1 12-13 July 2016
MANAGEMENT Fish Receiver System	Agenda Item No. 5.6 For discussion and advice

RECOMMENDATIONS

That the Finfish Working Group:

1. **DISCUSS** and **PROVIDE ADVICE** on replacing the current Torres Strait Seafood Buyers and Processors Docket Book system with a mandatory Fish Receiver System for the all Torres Strait Fisheries, excluding Torres Strait Prawn Fishery by 1 December 2017 noting that the system will require:

    a) all licence holders (including Traditional Inhabitants) to only dispose of commercially caught fish in those fisheries (not including fish caught during the course of traditional fishing) to a holder of a Fish Receiver licence; and

    b) it will be mandatory for holders of Fish Receiver licences to comprehensively report details of all fish received (landed) for each fisher.

2. **NOTE** that AFMA would work with stakeholders to finalise the operational details of the Fish Receiver System

KEY ISSUES

1. A voluntary reporting system is in place for buyers of fish caught in the Torres Strait known as the docket book system. In the absence of mandatory catch reporting for Traditional Inhabitants, the docket book system is the principle source of catch data for the Traditional Inhabitant sector.
2. A voluntary reporting system is less reliable when the opportunity cost to the fisher from reporting is high, such as when catches begin to approach Total Allowable Catch levels (TAC) or individual catch entitlements (eg individual quota holdings) – where there is perceived greater benefit from not reporting.
3. A Fish Receiver System is a management tool designed to monitor landed catches and can improve the accuracy of catch information for a fishery. Fish Receiver Systems are in place for all Commonwealth managed fisheries where there is a statutory management plan and quota. The system can provide a more accurate source of information for reconciling catch against quota.
4. A Fish Receiver System is currently not recommended for the Torres Strait Prawn Fishery (TSPF). The TSPF fishery is managed by effort units, a mandatory logbook program is in place and a Vessel Monitoring System provides independent monitoring of effort.
5. While AFMA has an established Fish Receiver System, consultation with stakeholders is needed to identify any possible modifications necessary to ensure the system is optimised for Torres Strait fisheries. An awareness program will also be required to explain the new arrangements to industry.

6. Like most monitoring tools, limitations can apply to Fish Receiver Systems. Fish Receiver Systems can be less effective where vertically integrated companies both catch and receive fish. There is also a risk of too many individuals becoming fish receivers and this can increase monitoring costs. This risk will need to be managed but at present is considered low for the Torres Strait where the majority of product is landed locally before being shipped or airfreighted out of the region.
7. AFMA has commenced a review of its fish receiver system to investigate possible options for improvement and will share the findings with the PZJA and its consultative forums. AFMA does not however recommend waiting for the review before implementing a fish receiver system for Torres Strait Fisheries. It may be several years before a solution is agreed and is likely to be dependent on improved independent monitoring (for example electronic monitoring).
8. The proposed Fish Receiver System is intended to replace the existing docket book system. The current docket book system costs around $9,000. Costs are forecast to increase by $10,000 to cover landings not currently reported in the docket books. These costs may be reduced overtime as electronic reporting options are developed. In the absence of any cost-recovery arrangements, the costs of the Fish Receiver System will be covered within AFMA's existing budget.

TORRES STRAIT FINFISH WORKING GROUP	Meeting 2016.1 12-13 July 2016
MANAGEMENT **Vessel Monitoring System**	**Agenda Item No. 5.7** **For discussion and advice**

RECOMMENDATIONS

That the Finfish Working Group:

1. **DISCUSS** and **PROVIDE ADVICE** on implementing mandatory Vessel Monitoring System (VMS) for all commercially licenced primary and carrier vessels operating under the *Torres Strait Fisheries Act 1984* by 1 July 2017 where;
   a) a primary boat is the boat nominated to the licence as the primary commercial fishing boat for the licence from which tender boats are authorised to operate;
   b) freight shipping vessels are exempt; and
   c) exemptions may be provided for carrier vessels that are 6 meters or less in length.
2. **NOTE** that VMS will help the PZJA to efficiently and cost-effectively monitor the movement of commercial fishing vessels; and
3. **NOTE** that effective monitoring improves the integrity of management arrangements and can better support industry flexibility to choose how they wish to operate to maximise returns from their fishing businesses.

KEY ISSUES

1. VMS can enable more efficient and well targeted compliance operations as fisheries develop and management arrangements change. VMS is a cost-effective tool for monitoring vessel movement in commercial fisheries and is widely used in Australian fisheries. AFMA uses VMS as the primary means of monitoring fishing activity across the entire Commonwealth fleet. VMS has been mandatory in Commonwealth fisheries since 2007 and in the Torres Strait Prawn Fishery since 2005.
2. Independent monitoring tools such as VMS also assist in meeting the PZJA's legislative objective to manage commercial fisheries for optimum utilisation. With improved and independent monitoring, the PZJA can support industry flexibility to choose their preferred method of operation. VMS for example could support more flexible arrangements for Carrier Boat Licences or vessels endorsed in multiple jurisdictions [Carrier Boat licences authorise transshipment of catches at sea).
3. It is proposed that the cost for purchasing and maintaining VMS units will be the responsibility of industry. Units suitable for the Torres Strait are approximately $1350. It would be open to industry however to make their own choice on which VMS unit they purchase provided it complies with AFMA type approved standards. AFMA primarily (but not exclusively) utilises the Pacific Island Forum Fisheries Agency type approval process which sets out the requirement for a specific VMS model to be granted type approval.
4. The expected VMS operating costs for a fleet of 33 vessels (current total number of primary and carrier boat licences, excluding the Prawn Fleet) is estimated around $22 000 yearly. In the absence of any cost recovery arrangements for Torres Strait Fisheries (except the Torres Strait Prawn Fishery) these costs will be covered within AFMA's existing budget.

5. Based on the conditions applied across Commonwealth Fisheries and the Torres Strait Prawn Fishery, the proposed general operating conditions for a VMS system would be:

   a) all VMS units installed must meet AFMA approved standards;

   b) a VMS unit must be fitted and working on the boats nominated to fishing licence at all times;

   c) the VMS must stay on at all times – even if the boat is tied up in port, or out fishing under a state fishing permit/concession, or if you are doing repairs on your boat;

   d) the VMS unit may only be switched off if you have prior written approval from AFMA;

   e) it is the licence holders responsibility to fit and maintain a working VMS; and

   f) failure to have a working VMS will be an offence.

TORRES STRAIT FINFISH WORKING GROUP	Meeting No. 2016.1 12-13 July 2016
MANAGEMENT **Future Management Priorities**	**Agenda Item No. 5.8** **For discussion and advice**

RECOMMENDATIONS

That the Working Group **discuss** and **provide advice** on future management priorities for the fishery.

KEY ISSUES

1. Based on discussions convened in the meeting and / or advice from individual members the Working Group is asked to provide advice on future management priorities for the finfish fishery (management issues to focus on). Where necessary, the Working Group should aim to assign an order of priority to items and a desired timeline.

2. Importantly the Working Group will need to have regard for resourcing. AFMA's budget for finfish fisheries is tabled under Agenda Item 6 for information.

3. Having agreed management priorities and a work plan aims at achieving a more efficient management process.

TORRES STRAIT FINFISH WORKING GROUP	Meeting No. 2016 - 1 12-13 July 2016
AFMA Finfish Fishery Budget 2016/17	**Agenda Item No. 6 For Noting**

RECOMMENDATIONS

1. That the Working Group **NOTE** AFMA's Finfish Fishery budget for 2016/17.

KEY ISSUES

2. Each year, AFMA's annual operating budget is determined by the Australian Government. AFMA uses part of its budget to provide management services to the Protected Zone Joint Authority. AFMA's Torres Strait budget is apportioned across a range of activities and fisheries.
3. AFMA consults on its budget with all Commonwealth managed fisheries. Consultation with industry provides accountability and assists with driving management efficiency and priority setting. Whilst Torres Strait fisheries management costs are not currently cost recovered, industry and management are likely to benefit in the same way from understanding and discussing AFMA's budgeting arrangements.
4. AFMA's budget for the Finfish Fishery, excluding staff costs (direct costs only), is $58 125. The budget primarily covers the convening of two Finfish Working Group meetings. The budget does not include any community visits. A detailed breakdown of the budget is provided in **Attachment 1**[1]**.**
5. In addition to the budgeted costs described above, AFMA is also assessing the CSIRO funding application to develop a harvest strategy for the Finfish Fishery (refer to Agenda item 5.1).

Attachments

Attachment 1 – Breakdown of projected 2016/17 budget for Finfish Fishery

[1] Please note that this budget does not include other AFMA operating costs, including overheads, research administration, logbook programs, data management, or licensing costs.

Breakdown of AFMA finfish budget

Consultants and Contractors
Total budget costs for consultants and contractors are $11,865 which covers the sitting fees of FWG members.

Member	**1 day meeting**	**2 day meeting**	**Total**
FWG Chair*	1464	2196	3660
Scientific Member	549	1098	1647
Industry Member	549	1098	1647
Industry Member	549	1098	1647
Industry Member	549	1098	1647
Industry Member	549	1098	1647
		Total	**$11,895**

*PZJA forum Chairs are entitled to a sitting for one day's preparation

Travel and subsistence

Total 2016/17 budget costs for travel and subsistence are $46,527 (based on two one day meetings on Thursday Island).

Member	Origin	Plane Fare	Accommodation	Taxi/ferry/parking	TA	Venue Hire	Total
Meeting admin.	-	-	-	-	-	535/day	535
Chair	ACT	1574.58	440	160	304	-	2478.58
Scientific Member	Bris	1574.58	440	160	304	-	2478.58
Scientific Member	Bris	1574.58	440	160	304	-	2478.58
TVH Permanent observer	Cairns	770	440	160	304	-	1674
AFMA Executive Officer	TI	0	0	0	77.2	-	77.2
AFMA staff	TI	0	0	0	77.2	-	77.2
Industry - Gudumalulgal	Dauan	4000	440	35	304	-	4779
Industry – Kaiwalagal/NPA	Horn Island	0	0	35	152	-	187
Industry - Kulkalgal	Poruma	856	440	35	304	-	1635
Industry – Kemer Kemer Meriam	Ugar	4000	440	35	304	-	4779
Industry - Maluialgal	Mer	1142	440	160	242.5	-	1984.5
					Total for 1 day meeting		$23,163.64
						Grand Total	**$46,327.28**

Notes

Taxi fare/parking/vehicle allowance rate	$80/day/person
TA rate/day/person	$121.25
Airfare Qantas	Quoted by QBT for fully flexible flights
Airfare Cape Air Transport	Based on quotes for flights in 2015

Other Administrative costs

Total budget costs for administration and publications are $2,775

Account	Item	Explanation	Quantity	Unit cost	Total	Comments
Printing & publishing	Printing and binding	Logbook reissue	10	154.73	1702	1547.27 exc GST
	Torres News Advertising	Comment on FF HS	1	380	380	
				Grand total	**$2,082**	

Notes

Newspaper advert	Based on quotes for PZJA forum membership EOI
Printing and binding	quote from Cross+Hamilton printers on 23/10/2015 for HC01 logbooks

Please note that this budget does not include AFMA salaries and on-costs, and other AFMA operating costs, including overheads, research administration, logbook programs, data management, or licensing costs.

TORRES STRAIT FINFISH ACTION PLAN

Development of a Torres Strait Islander and Aboriginal Traditional Inhabitant Commercial Finfish Fishery Action Plan
Final Report for FRDC Project 2014-240

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FRDC Project 2014-240.
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Researcher Contact Details

Name: Andy Bodsworth
Address: PO Box 510
Dickson, ACT 2602
Phone: 0439 602769
Fax: N/A
Email: andybods@cobaltmrm.com.au

FRDC Contact Details

Address: 25 Geils Court
Deakin ACT 2600
Phone: 02 6285 0400
Fax: 02 6285 0499
Email: frdc@frdc.com.au
Web: www.frdc.com.au

In submitting this report, the researcher has agreed to FRDC publishing this material in its edited form.

Contents

Project Acknowledgements:

We would like to thank Torres Strait Traditional Inhabitants' and their communities including Prescribed Body Corporates (PBC's) and community fisheries associations for sharing their traditional knowledge and supporting our visits. We would also like to thank TSRA and the Fisheries Research and Development Corporation (FRDC) for supporting and funding the project; thanks also to the TSRA Fisheries Program staff who also arranged most of the community visits.

Commercial fishermen that have previously, or are still operating in Torres Strait Fisheries, some currently leasing TSRA held finfish sunset licences and catch quota, have also been very generous with their time and knowledge. We appreciate their commitment and their important role in maintaining the value and market access for the fishery, and supporting future growth and value for the fishery under 100% traditional ownership.

EXECUTIVE SUMMARY

Background

The Torres Strait Finfish Fishery (TSFF) is a line fishery taking predominantly coral trout and Spanish mackerel and focused on productive coral reef and cay areas in the north-eastern part of Torres Strait. Commercial fishers include a Traditional Inhabitant Boat (TIB) sector and a non-traditional inhabitant sector. These were previously referred to as Transferable Vessel Holder (TVH) fishers. Finfish species are also caught throughout the region by traditional inhabitant fishers for personal and family consumption and traditional trade.

In 2008, the Australian Government funded a buyback of all finfish TVH fishing licences and the fishery is now 100% owned by Torres Strait Traditional Inhabitants. These commercial 'sunset licences' and associated catch quota are leased back on an annual basis to commercial fishers (many of whom are ex-TVH fishers) to raise revenue to support finfish related business development and capacity building to benefit traditional inhabitants and their communities.

In years immediately before the buyback of commercial licences (e.g. from 2003–2007) the value of finfish catches taken by commercial fishers in the TSFF averaged around $3.37 million per year. It has declined since then and the value of landed catch per year is now around $1.1 million (Marton and Skirtun, 2014).

The Torres Strait Regional Authority (TSRA) commissioned development of the Finfish Action Plan to achieve the following objectives:

1. Increasing Traditional Inhabitant commercial fishing participation in the Torres Strait Finfish Fishery.
2. Increasing Torres Strait Islander and Indigenous employment in fishing and related industries by advancing successful commercial activities in the finfish fishery, including post-harvest matters such as potential markets and marketing strategies.
3. Safeguarding the sustainability of the finfish fishery as traditional ownership and participation in the fishery develops.

Methods

The consultant and TSRA Fisheries Program representatives conducted community consultation visits to Poruma, Erub, Masig, Iama, Warraber, Dauan, Saibai, and Mer Island between March and May 2015, and met with community fisher representatives from Ugar Island in Cairns in late May 2015. These visits were used to:

- introduce the Finfish Action Plan (FAP) project, and discuss the nature of the fishery and its potential value to communities;
- understand community capabilities and infrastructure relevant to finfish business development;
- speak with community members about their aspirations and ideas for greater finfish participation; and
- explore drivers and barriers relevant to that participation.

Meetings were also used to introduce the concept of a Program Logic approach to finfish related investment. This is a logical and sequential framework of investment and activities designed to enable progress over time toward greater finfish business participation and benefits for communities.

Further information to support development of the FAP was obtained through face to face and telephone interviews with current commercial fishers leasing sunset licences, and regional supply chain businesses. Previous Torres Strait finfish and broader fisheries research and consulting reports were also reviewed.

Results

As identified in previous finfish related studies, current TIB sector finfish participation ranges from no commercially focused fishing in some communities, through a range of smaller volume fishing operations up to more established and commercially focused operations. The consultations did not identify any traditional owned finfish focused businesses where fishers were completely reliant on fishing related income.[1]

Combining income support payments (centrelink) with some income from finfish fishing is the most common approach, with many of these fishing operations not operated on a strong business basis (e.g. many participants are not focused on managing costs and revenues and taxation requirements).

Information collected suggests drivers for greater finfish fishery participation and business viability, and barriers to those are focused around the three key areas illustrated below.

Assets & equipment	Fishing knowledge & training	Vision, goals, a plan
• freezers, ice machines, processing/filleting areas • boats, motors, fishing gear, fuel availability • funding (finfish lease $, My Pathway/income support related training, business loans etc) • essential gear maintenance skills and confidence	• fishing and processing training & practice • fisheries focused small business training in communities • local fishing and business support & mentors • Accessible knowledge about key fishing issues, prices, resources, templates and guidelines	• motivation to succeed • individual & community goals • a logical investment structure for fisheries related development • community fisheries associations, supportive private businesses • more localised investment & action plans

Fishing and freezer business models

To support development of the Action Plan and program logic and provide practical examples, a range of indicative finfish business models were developed. These draw on financial information obtained through community meetings and interviews with TVH fishers and supply chain

[1] There are successful larger scale TIB commercial fishing operations currently however the majority of their effort is focused on TRL with some opportunistic finfish catches.

representatives. Scenarios using single and twin dinghy operations, larger 7-8m “ice boats” fishing for 2-3 day trips, and larger TVH style freezer boat operations have been modelled.

These scenarios use a range of current finfish prices and varying catch levels ranging from lower level single dinghy annual catch of 1.5 tonnes per fisher up to TVH operations taking up to 40 tonnes of Spanish mackerel. Freezer viability at a range of scales has also been modelled.

As reported in previous finfish and broader fisheries viability studies, the finfish business modelling demonstrates that TIB fishing operations must increase substantially in terms of both catch and consistent fishing effort for businesses at any scale to become genuinely viable under the modelled scenarios and assumptions.

For example a TIB fisher selling Spanish mackerel trunks (or barrels) to the local freezer at $6.50 per kg is less able to capture higher value from the catch than the TVH fisher selling finished fillets direct to a wholesaler in Cairns. A high level of fixed costs for businesses means viability is closely tied to fish prices – businesses that are able to shorten their supply chain and sell at a higher price to end buyers are noticeably better off.

The financial modelling showed that 1500kg/year of Spanish mackerel or coral trout is really only profitable at freezer prices if boat capital costs are low (e.g. small loan required and /or boat not replaced every 10 years). A bigger effort resulting in 3,000kg/year is more likely to be profitable, especially if some processing occurs and some fish can be sold as fillets. There is little likelihood of effort below 1,500kg/yr being profitable unless there are no capital costs related to boat and motor.

In the mixed species TIB fishing scenario (mackerel, coral trout and some frozen TRL tails) the modelling shows a similar pattern. Low effort (50 days) is unlikely to be profitable without zero boat capital costs, while the bigger effort (100 days) is more likely to be profitable and can cover the capital costs. For the TVH model at higher catch volumes and with greater value adding the economies of scale mean that even with the higher costs of fishing there is positive net income.

TVH profitability is reduced, however, once the cost of buying the quota is included (for example $1 per kg of mackerel caught). The quota cost based on lease of a sunset licence and quota of 15t at a lease price of $15,000 will reduce profit each year by that amount. TVH vessels are operating on very low margins in the current cost and revenue environment.

For freezers, modelling indicates that *without including the cost of labour* a small freezer would need to buy around 1500kg each of Spanish mackerel and coral trout, process this into fillets and then sell to a wholesaler in order to cover operating expenses. The 2009 AEC report examined profitability issues for freezers of different sizes and found that for finfish only large scale freezers with consistently high throughput would cover their operational costs.

Previous studies and consultation during this project emphasise the very significant challenges and risks associated with running a larger scale commercially viable freezer focused on finfish products. There are a range of essential pre-requisites to set up and maintain such an operation (Figure 8).

Enabling successful business development

It is well accepted that establishing and running a successful business is difficult, and even more so for people in remote Torres Strait communities that do not have exposure to contemporary business processes and role models. With a new business failure rate of around 80% in mainland Australia it is not surprising that fishing businesses in Torres Strait communities face an up-hill battle.

Four over-arching pre-requisites for successful fishing related business development **Motivation, Margins, Markets,** and **Mentoring** are suggested for application across five key outcome areas (or investment themes) identified to guide the Action Plan Program Logic. These are discussed in more detail in the Fishing Business Development section of the report.

The fundamental importance of supporting traditional inhabitant fishers that have shown, or are showing entrepreneurial skills; and careful investment to enable greater motivation for others likely to succeed in finfish related businesses cannot be overstated.

Finfish Action Plan Program Logic

The information collected throughout the project and subsequent analysis, including business modelling and new business development aspects have all informed the development of a proposed Finfish Action Plan Program Logic. This is a series of foundational activities and inputs designed to contribute over time to build the capacity and opportunity for traditional inhabitants to develop and sustain viable finfish related business activities.

The five key outcome areas (or investment themes) developed under the Program Logic cover fishing & processing skills; freezers & infrastructure; finfish business models; small business support, and finfish governance & leadership. These are illustrated below.

Foundational inputs

- Implementation funding
- Assess skills & equipment
- Build engagement & motivation, identify fishing business mentors
- Small business training & develop fishing business models
- Fishing & processing training
- Support entrepreneurs & extend their influence
- Understand freezer costs & how to ensure viability

Immediate activities, investment

- A knowledge hub to share knowledge & support developing businesses
- Training to increase fishing & processing effectiveness
- Community level finfish action plans & trained people to progress them
- Developing robust & viable finfish related business plans, including for freezers

increasing outcomes

- Stronger relationships with commercial fishers & seafood businesses
- Catching more fish at less cost, getting better prices
- Stronger business skills & more confidence
- Increasing % of finfish catch taken by traditional inhabitants
- A viable larger scale freezer in the eastern region, some private freezers with safe food accreditation

Key outcomes from the program logic

The Program Logic for the Action Plan is focused on the following key activities and outcomes:

- Using the 4M's approach, informed by business modelling and practical examples to enable viable TIB sector finfish business models at a range of scales; increasing in risk and complexity over time as capabilities and confidence grow;
- Recognising the valuable role played by existing successful TIB fishing businesses and fisheries entrepreneurs that can showcase successful TIB fishing businesses, extend benefits and act as role models for other fishers;
- Encouraging strong collaboration between TIB and TVH fishers to enable the value of the fishery to be maintained and increased as TIB fishing and business skills develop, and recognising that there is strong mutual benefit from such collaboration and maintaining a TVH presence in the fishery for the medium term;
- More active capacity building investment for the eastern region recognising their competitive advantage in this regard (i.e. most productive catching locations), and development of a finfish related business and governance "hub" centred on this region;
- Encouraging a similar competitive advantage based approach to fisheries resources for other Torres Strait communities. For finfish this may require a less active investment approach for communities best served by other fisheries such as TRL. Lower volume and value finfish operations for these communities may be appropriate in conjunction with other species;
- A finfish business development 'knowledge hub' building on existing and prior TSRA and other economic development investment should be further developed to facilitate knowledge sharing including business models, practical examples, price and market information. It can also operate as a network for business support and ongoing engagement and motivation of TIB fishers and potential fishers;
- Facilitating wherever possible capacity building opportunities for traditional inhabitants to take a more active role in finfish industry development and fisheries management and governance under their 100% ownership of the resource.
- The finfish fishery is an integral part of the broader Torres Strait fisheries "sea-scape" and there are significant benefits from a more strategic TIB fishing industry development approach that recognises and draws on aspects of the current *Roadmap to 100% ownership* process. Activities arising from the Finfish Action Plan and the road-map process should be mutually supportive.

Implementation

The Program Logic structure developed for the Finfish Action Plan is well suited to structured monitoring and evaluation to ensure progress against desired outcomes. A monitoring and evaluation plan has been developed using key evaluation questions tailored to the desired hierarchy of outcomes illustrated in the program logic.

An annual evaluation process is recommended to enable progress and adapt and refine the approach.

A communications and stakeholder engagement plan has also been developed. This is designed to raise awareness and understanding of the action plan, encourage participation and motivation, and extend valuable knowledge and support to traditional inhabitant fishers and related businesses. The finfish action plan knowledge hub outlined earlier is an important part of this ongoing stakeholder engagement process.

Implementing the Action Plan in full and achieving the level of progress in the timeframes suggested by the Program Logic and associated outcomes requires substantial resources and commitment. A dedicated implementation team, perhaps set up as part of a broader Torres Strait fisheries industry development initiative to assist the transition to 100% traditional ownership, would significantly increase the likelihood of the Finfish Action Plan and broader fisheries objectives being achieved.

INTRODUCTION

The Torres Strait Finfish Fishery

The Torres Strait Finfish Fishery (TSFF) is a line fishery targeting Spanish mackerel (trolling) and coral trout (reef-line). There is a commercial traditional inhabitant sector fishing under Traditional Inhabitant Boat (TIB) licences, and a commercial (Transferable Vessel Holder – or TVH) sector. The TVH sector fish using licences and catch quota leased from the Torres Strait Regional Authority (TSRA) on behalf of traditional inhabitants[2]. Finfish species are also caught by traditional inhabitant fishers for personal and family consumption and trade.

In 2008, the Australian Government funded a buyback of all finfish TVH fishing licences and the fishery is now 100% owned by Torres Strait Traditional Inhabitants. These 'sunset licences' and associated catch quota are leased back on an annual basis to commercial fishers (many of whom are ex-TVH fishers) to raise revenue to support finfish related business development, capacity building and related investments to benefit traditional inhabitants and their communities. This ongoing commercial fishing, particularly in the absence of a similar scale of TIB sector commercial fishing, maintains fishery production and value, including supply chain infrastructure and markets.

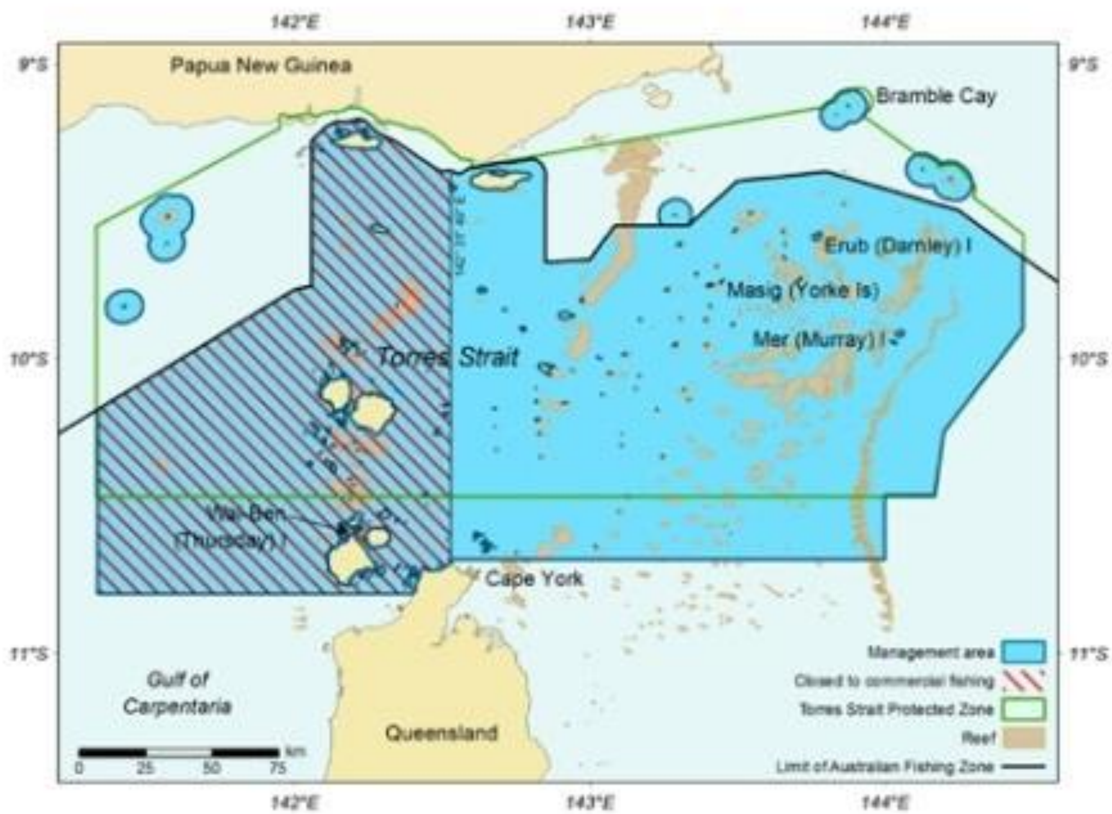

FIGURE 1: AREA OF THE TORRES STRAIT FINFISH FISHERY (MARTON &SKIRTUN, 2014)

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[2] These are referred to as sunset licences and are issued on an annual basis to provide for commercial fishing by TVH style operators with the proceeds of the lease being returned to a trust fund held by TSRA on behalf of traditional inhabitants.

Commercial fishers catch mainly Spanish mackerel (*Scomberomorus commerson*) and several coral trout species' including common coral trout (*Plectropomus areolatus)* leopard trout *(P. leopardus*), passionfruit trout (*P. areolatus*), bar cheeked trout (*P. maculatus*), and blue spot trout (*P. laevis*). Other commercially valuable finfish species taken include stripey bass (*Lutjanus carponotatus*), barramundi cod (C*romileptes altivelis*), tomato cod (C*ephalopholis sonnerati* or C. *miniata*) and emperors (*Lethrinus Sp*.) (Mapstone et al, 2003).

In years immediately before the buyback of commercial licences (i.e. from 2003–2007) the value[3] of finfish catches taken by commercial fishers in the TSFF averaged around $3.37 million per year. It has declined since then and the value of landed catch per year is now around $1.1 million (Marton and Skirtun, 2014).

For the reef-line component of the fishery, the more valuable coral trout species make up most of the landed catch from both the TIB and TVH sectors. Approximately 40t of coral trout quota has been leased out to commercial fishers for the 2015-16 fishing season.

For the Spanish mackerel sector, catch peaked at 251t in the 2000-01 fishing season and reduced to below 100t in 2008-09. It has remained below this level since then. Under 100% Traditional ownership TVH fishers have remained active under the sunset licence leasing arrangements with current catches ranging from around 60 to 80t per year.

Commercial fishers operating under sunset licences are also subject to additional management restrictions including 10-mile fishing exclusion zones around the four main eastern finfish islands (Mer, Erub, Masig, and Ugar) to reduce risks of localised over-fishing around these communities. There are also limits on the number of lines to be used, and the number of hooks per line. There are commercial size limits and some no-take species[4].

Non-commercial catches of finfish species' by traditional inhabitants are believed to be comparable or higher than the current combined commercial catch levels of the TIB and TVH lease sector. The retained catch composition of non-commercial traditional fishers is more varied with a significantly greater proportion of jacks and trevallies (Carangidae) and mullet (Mugilidae) (Marton and Skirtun, 2014)

Nearly all of the TSFF commercial catch has been taken from the Eastern area of Torres Strait with the Erub, Mer, Masig and Ugar Island communities located close to the most productive fishing locations. Finfish species are also taken opportunistically throughout Torres Strait however the focus of the commercial fishery has been the eastern region. The fishery is currently closed to commercial fishing west of a line at 142°32' east. Table 1 on the following page provides an overview of catch, effort and management details for the fishery.

[3] This is the Gross Value of Production or GVP from the fishery. It reflects the initial value of landed catch rather than the value after fish have been further processed into fillets or other portions depending on market demands.

[4] Further background information about the Torres Strait Finfish Fishery is available from the PZJA website: see http://pzja.gov.au/the-fisheries/torres-strait-finfish-reef-line-fishery/#.Vd_8Afmqqko

TABLE 1: CATCH, EFFORT AND MANAGEMENT SUMMARY DETAILS FOR THE TSFF (MARTON & SKIRTUN, 2014)

Fishery statistics a	2011–12 fishing season		2012–13 fishing season	
Stock	**Catch (t) b**	**Real value (2011–12)**	**Catch (t)**	**Real value (2012–13)**
Coral trout	37.8	$0.53 million	22.0	$0.18 million
Spanish mackerel	78	$0.59 million	82.6	$0.59 million
Other	3.9	$0.04 million	1.2	$0.01 million
Total fishery	**119.7**	**$1.16 million**	**105.8**	**$0.78 million**
Fishery-level statistics				
Effort (days) TSSMF TSRLF	Spanish mackerel: TIB—20 TVH—407 Coral trout: TIB—43 TVH—184		Spanish mackerel: TIB—5 TVH—370 Coral trout: TIB—0 TVH—140	
Fishing permits	TIB: 150 mackerel endorsements, 134 line endorsements TVH: 5 mackerel and/or line licences		TIB: 102 mackerel endorsements, 103 line endorsements TVH: 5 mackerel and/or line licences	
Active vessels TSSMF TSRLF	Spanish mackerel: TIB—not available TVH—4 Coral trout: TIB—not available TVH—1		Spanish mackerel: TIB—1 TVH—4 Coral trout: TIB—0 TVH—1	
Observer coverage	0 days		0 days	
Fishing methods	Coral trout and mixed reef species: handline, rod and line Spanish mackerel: trolled baits and lures, handlines			
Primary landing ports	Cairns (Queensland), Torres Strait Island fish receivers on Erub (Darnley) and Masig (Yorke) islands			
Management methods	Input controls: limited entry, vessel restrictions, prohibited species Output controls: size limits, amount of leased quota			
Primary markets	Domestic: frozen International: frozen			
Management plan	Torres Strait Finfish Fishery Management Plan 2013			

a Fishery statistics are provided by fishing season, unless otherwise indicated. Fishing season is 1 July to 30 June. Real-value statistics are provided by financial year and are in 2012–13 dollars. b Catch figures include both TVH and TIB catch; however, reporting by the TIB sector is not mandatory, so additional unreported catch and effort are likely.

Notes: TIB Traditional Inhabitant Boat. TVH Transferable Vessel Holder.

The Finfish Action Plan

The Torres Strait Regional Authority (TSRA) initiated the Finfish Action Plan project to guide future investment aimed at increasing the value of the fishery under 100% traditional ownership and increasing Traditional Inhabitant participation in the fishery. Benefits from increased participation are likely to come from economic development associated with businesses catching, processing and/or selling fish, or marketing Torres Strait sourced finfish. Related businesses might include viable finfish focussed freezer operations in communities' or other businesses supporting fishing through the sale of bait and fishing gear; or repairs to fishing equipment such as dinghies and outboard motors.

The objectives of the Action Plan project are:

4. Increasing Traditional Inhabitant participation in the Torres Strait Finfish Fishery.
5. Increasing Torres Strait Islander and Indigenous employment in fishing and related industries by advancing successful commercial activities in the finfish fishery, including post-harvest matters such as potential markets and marketing strategies.
6. Safeguarding the sustainability of the finfish fishery as Traditional ownership and participation in the fishery develops.

These objectives also align with more strategic fisheries and Torres Strait economic development objectives, and higher level legislative and policy objectives for the region.

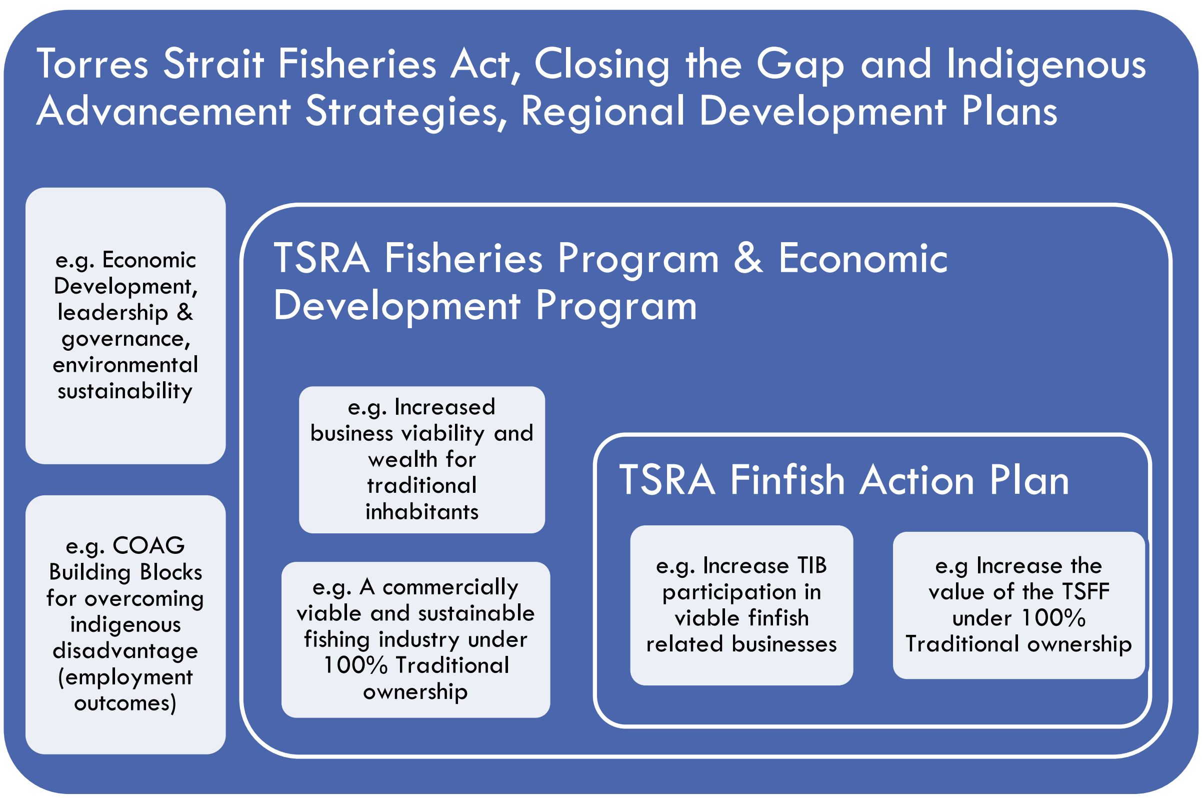


FIGURE 2: FINFISH ACTION PLAN ALIGNMENT WITH KEY TORRES STRAIT STRATEGIC DEVELOPMENT PLANS & PRIORITIES

The methods used to develop the Finfish Action Plan are summarised below. The project has been jointly funded by the TSRA and the Fisheries Research and Development Corporation (FRDC).

Project Start Nov/Dec 2014

- Meetings with TSRA on Thursday Island to collect initial information and discuss the project
- Review recent reports about the fishery, finfish quota leasing arrangements, Torres Strait economic development & strategic plans etc.

Stage 2 Feb/Mar 2015

- Do an economic and business survey using face to face and telephone interviews of people catching and processing finfish, and working in other finfish fishery businesses
- Seek approval from Traditional Inhabitants to visit northern, central and eastern TS communities; and talk about people's needs and ideas for finfish fishery businesses; and the skills needed.

Stage 3 Apr/May 2015

- Evaluate all of the information collected from other reports, finfish business interviews and the community consultations
- Develop an Issues Paper covering issues, challenges and opportunities for developing finfish fishery businesses
- Use this Issues Paper to guide development of a Program Logic based Action Plan to support successful and sustainable finfish businesses, owned and operated by Traditional Inhabitants.

Project Completion Aug - Dec 2015

- Develop the Finfish Action Plan & a monitoring and evaluation plan to support successful implementation
- Refine the draft Finfish Action Plan after discussion with TSRA and Traditional Inhabitant representatives
- Develop a practical Communications Plan to facilitate extension and implementation of the Action Plan and how it can enable lasting benefits to Traditional Inhabitants and their communities.

FIGURE 3: KEY STAGES AND METHODS USED TO DEVELOP THE TORRES STRAIT FINFISH ACTION PLAN

ENABLING TRADITIONAL INHABITANT FINFISH FISHERY PARTICIPATION

Community consultation for the Finfish Action Plan

A series of community consultation meetings and discussions with local fisheries business owners were conducted during the FAP project. TSRA Fisheries Program staff, the Fisheries Portfolio leader and TSRA Board Member for Erub Kenny Bedford, and project consultant Andy Bodsworth visited the Warraber, Poruma, Iama, Dauan, Saibai, Erub, Masig and Mer communities between March and May 2015 and also met with some Traditional Inhabitants and fisheries leaders from the Ugar Island community in Cairns in late May 2015.

FIGURE 4: TSRA FISHERIES PORTFOLIO MEMBER KENNY BEDFORD AT THE SAIBAI MEETING

Information from the community meetings has been one of the most important inputs for developing the Action Plan. A comprehensive summary of the issues raised and key discussion points during the community consultation meetings is provided at Appendix 1.

Collecting information to develop the Action Plan

Through the community consultations, interviews with commercial fishers and supply chain businesses, and reviewing previous Torres Strait finfish and broader fisheries research and consulting reports a range of information has been collected to support development of the Action Plan. This information covers:

- Traditional Inhabitants' hopes for the future of the finfish fishery under their 100% ownership e.g. what should that fishery look like in the future? And what sort of benefits might it bring to individuals and communities;
- How current TIB and commercial finfish fishing operations accessing the TSRA-held sunset licences currently work, and the value (not just financial) that those fishing businesses provide;
- Practical and more detailed examples of successful TO owned fishing businesses, and the challenges and lessons learned by these local business owners, aimed at helping other local fishers get started in business;
- Valuable information and insights from meetings with commercial finfish fishers currently leasing out TSRA-held sunset licences and providing revenue for investment back into developing the fishery under 100% Traditional ownership;

- A summary of all of the information discussed at all of the community and individual Finfish Action Plan meetings held so far for the project;
- Insights and lessons from a range of previous fishery-related projects and reviews by TSRA, other consultants, and Traditional Inhabitants that can help increase TO participation in finfish businesses and increase the value of the fishery.

What sort of Traditional Inhabitant finfish fishing is happening now?

FIGURE 5: TRADITIONAL INHABITANT SPANISH MACKEREL AND CORAL TROUT CATCH

Finfish fishing in the Torres Strait communities visited for the project ranges from no commercially focused fishing, through a range of smaller volume fishing operations up to more established and commercially focused operations. The consultations did not identify any traditional owned finfish businesses where fishers were completely reliant on fishing related income[5] (e.g. full time commercial fishers not receiving some level of income support and/or training assistance). The most common examples of current finfish fishery participation by traditional inhabitants were:

- A small number of more serious fishers that earn income from finfish fishing and run their operations with more of a business focus. They are fishing for Spanish mackerel and/or coral trout, and retaining other more valuable species. Very few, if any, of these fishers are not receiving some level of income support payments;
- More serious fishers, most of whom receive some level of income support payments, that earn most of their fishing income from a combination of species with a primary focus on more valuable fisheries like tropical rock lobster (TRL), with ancillary or opportunistic catches of finfish species and/or Beche de Mer (BDM);
- Combining income support payments (centrelink) with some income from fishing is a common approach in many communities; many of these operations do not appear to be run on a

[5] There are successful larger scale TIB commercial fishing operations currently however the majority of their effort is focused on TRL with some opportunistic finfish catches.

business basis (e.g. participants do not seem to have a strong understanding of their costs and revenues and taxation related issues);

- People who fish primarily at weekends or at other times such as holidays, and/or when the weather is favourable; with fish used mainly for family and personal consumption, or some informal trade within a community.

Some specific examples of finfish related businesses owned and operated by Torres Strait Islanders include:

- A small number of small scale but successful finfish businesses buying fish, or catching fish themselves and selling their catch in their community, to Thursday Island (TI) based buyers including local restaurants, and some selling product direct to Cairns buyers via the barge service or via local charter flights if there is space available;
- A small number of TIB fishers running larger vessels with onboard freezing capability and several dories. Such operations are focused on TRL both live and frozen tails however also take finfish species such as Spanish mackerel opportunistically and when the TRL season is closed. These businesses sell direct to end buyers and operate much like the non-indigenous commercial sector;
- A fisher on one community was until recently operating a small fish and chip retail shop on his community using his own locally caught fish;
- The Erub Island community freezer run by the Erub Fisherman's Association buys local finfish and cray tails, processes a range of different fish species', and sells commercial grade fish to local buyers including restaurants at TI and Cape York, Cairns and Townsville based wholesalers and retailers.

What sort of Finfish Fishery do Traditional Inhabitants want?

People in some communities emphasised the long history of fishing in the Torres Strait, and that fishing is a very important aspect of Torres Strait culture. Several people said that fishing is one of the few local activities that offers really good opportunities to build prosperity and self-reliance for island communities. Many of the people that took part in the community meetings expressed their interest in developing or being part of successful fishing businesses. Several community elders suggested fishing activities and businesses can make a large and positive difference for the community. They suggested that not everyone wants to have a really busy, high-value fishing business. Some want more of a balance with a more relaxed lifestyle – and some additional money coming in from fishing.

What might encourage people to do commercial finfish fishing, or stop them?

Previous studies exploring Torres Strait finfish related business development have identified a number of barriers to greater Traditional Inhabitant participation. The community meetings held during the Finfish Action Plan project also identified barriers to participation, including many mentioned in earlier reports. The issues identified are summarised in the following table.

TABLE 2: SUMMARY OF BARRIERS AND DRIVERS FOR FINFISH RELATED BUSINESS PARTICIPATION

What encourages people to go finfish fishing?
Having the knowledge and the confidence to go fishing safely and be able to catch fish effectively
Access to experienced fishers, including going fishing with them to help gain knowledge and confidence
Having enough money to buy fuel, bait, ice and other essentials so they are ready to go fishing when weather/tides are good
Some people are born fishers, are proud to be recognised as full time fishers, and work hard to be successful
Seeing other people around them becoming successful fishers and/or those fishers making extra money for themselves or their families
Not having many other options to do interesting and potentially profitable work in their home community
A well-run community fisheries association, or supportive local businesses to support and encourage fishers and enable their access to other fishing support services, including buying in bulk or arranging better deals on gear and equipment to keep operating costs lower
Having fishing related activities recognised as an approved training activity under income support activities (i.e. being subsidised under income support to learn about fishing)
What sort of things stop people from going fishing, or from having a successful fishing business?
Not enough business experience and confidence to start their own small fishing business; or no access to someone that can help with business skills
Not enough time to do business training, especially if it is done away from their home community
Lack of suitable fishing equipment and supplies e.g. dinghies, motors, fishing gear, eskies, ice
No one to sell their fish to; e.g. no community or private freezer, or a buyer boat
Not enough money to buy a dinghy or motor – or to pay off a loan for a dinghy/motor; or not enough money to buy fuel to go fishing and then make some money
Too much income earned from fishing might mean they lose access to important and more secure and reliable income support payments
Access to productive fishing locations might be difficult, the finfish closure west of 142°31'49" or lack of access to another community's home reefs might influence where people can fish
Having confidence and knowledge for certain kinds of fishing; e.g. knowing what tricks and techniques (anchoring methods, bait types and rigs) to use for catching good numbers of coral trout
Cultural and/or community obligations and/or *Ailan Kustom* might stop people from fishing regularly
Access to start-up capital, or access to business loans and grants; or the skill and experience to write successful business plans or proposals to access such start-up capital
Gaining and/or maintaining safe food accreditation for community based or private freezers

These barriers to greater finfish business participation, and drivers that might enable it can be categorized into aspects related to knowledge and training, people's confidence and motivation, and issues related to equipment and infrastructure. These are illustrated in Figure 6: pieces of the finfish participation puzzle...

FIGURE 6: PIECES OF THE FINFISH PARTICIPATION PUZZLE…

The importance of freezers…

During community visits there was a lot of discussion about freezers, and their importance for supporting successful commercial fishing activities. Many people suggested the absence of a larger scale freezer in their community is one of the main reasons that people are not going out fishing. The main points made about freezers during consultations were:

- A choice of freezers in a community (e.g. private and/or community focused freezers) can be a good thing as it introduces competition and provides different options for buyers and sellers. But too many freezers may reduce the amount of product available to the point that a freezer is no longer viable.
- Some people reiterated the critical importance of the community having access to its own freezer so that it was not reliant on a commercial or privately owned freezer that might provide very little if any community benefits;

- Unlike crayfish, there were substantial processing costs for finfish for the freezer. Staff have to be paid to do the processing and unless there was a good amount of fish coming into the freezer, the costs of processing and keeping staff could mean the freezer is not viable;
- One fisher on Erub maintained his own small freezer, processed his own fish after catching them, and sold direct to other buyers. This works well for him and his business is successful. Some other fishers use larger chest freezers, maybe with a small fan fitted to improve effectiveness, that can keep their fish at or below minus 18 degrees Celsius;
- People discussed the option of a mobile freezer that could be transported on the barge and plugged in ready to go; it could be relocated to other communities depending on the need for it;
- A mobile freezer like this could also be designed to fit on a trailer and be built with highly corrosion-resistant materials, including plumbing fittings that could be easily connected to fresh and salt water for processing and cleaning (similar to the mobile desalination units in some communities).

FIGURE 7: LOCALLY CAUGHT FINFISH IN THE SNAP PART OF THE ERUB COMMUNITY FREEZER

- Not enough fish being caught and sold to a freezer destroying the business viability of that freezer operation;
- Freezers could be a modular design, with more capacity added later if necessary. An appropriate fish processing area that can be easily cleaned and maintained to meet hygiene and safe food requirements is important;
- Larger freezers are not always necessary, and getting secure access to land for a larger freezer site may be difficult;
- Safe food accreditation so that a freezer can legally sell product to registered buyers is very important but can be challenging to obtain and maintain, particularly AQIS requirements for export registered freezers and processing establishments.
- Keeping a freezer running successfully for many years in a remote coastal environment is very challenging. It needs trained people who are committed to making the freezer work and keeping the product coming in. Some communities have people with lots of experience running

a freezer and this knowledge and experience has potential to significantly increase the likelihood of successful freezer operations.

Whilst there are examples of larger scale community based freezers operating successfully in the past for various periods, there are currently no commercially viable community or privately run finfish focused freezers in the region. The Erub Island facility is still running to the credit of those involved, however this freezer is suffering financially from lack of throughput and is also subsidised by TSIRC with respect to power costs.

Investing in a community run larger scale freezer, without strong confidence that the fundamental operating requirements will be met entails very significant financial risk. Figure 8 below illustrates the most important pre-requisites.

FIGURE 8: ESSENTIAL PRE-REQUISITES FOR A VIABLE LARGER SCALE FREEZER OPERATION

The Importance of Community Fishing Support Networks

Participants in several communities noted the challenges with communication and collaboration between fishermen within and across different Torres Strait communities. This includes difficulties accessing practical knowledge and information that can support more effective fishing and business practices. The Importance of access to experienced fishing and business mentors has also been widely recognised in previous studies and capacity building measures for business success in more remote Aboriginal and Torres Strait Islander communities.

Some existing finfish related businesses operate independently as private businesses with support from a business partner or other collaborative private structure (e.g. the Torres Blue partnership between fishers on Poruma Island and Cairns based seafood buyer Independent Seafood Producers (ISP); whilst others operate more as a community based enterprise. The most common framework for these more community focused structures is the Community Fishers Association (CFA) and these exist on several communities. Most CFA's are run as corporations with association members (usually fishers or potential fishers) and directors who may also be experienced fishers or community leaders. Effective CFA's have the potential to be a very valuable enabler for greater fisheries business success and to support the extension of fisheries related benefits throughout a community. A simplified and more consistent approach to the governance structure of these associations, and foundational training and support to make sure they are effective, could significantly improve fishing related benefits for individuals and communities.

A key challenge for the CFA model is balancing formal governance and accountability with practicality. For example corporate governance requirements have the potential to consume significant time and resources that might otherwise be directed to enabling fishing participation and greater business success.

One option is to operate the community fishers association as one of several community business units with formal corporate governance and oversight provided by a more experienced and dedicated corporation. For example the *Kailug* style approach at Masig Island where the overarching corporation provides high level management and support for specific business units. For example these might include the fishermen's Association, a community arts enterprise, or a local tourism based business.

Ugar Island's Kos and Abob Fisheries Corporation: taking a business-like approach to finfish development

Consultation with Traditional Inhabitant and fishing representatives from Ugar Island provided an opportunity to see how they were developing their capacity to fish commercially for finfish, particularly mackerel, in the waters surrounding their community.

Kos and Abob Fisheries have developed a well thought out business plan to build their commercial fishing participation, develop the necessary supporting facilities, and work closely with established regional supply chain businesses to ensure consistent supply of high-quality finfish to ensure the best possible price back to fishermen.

The corporation and its directors are working closely together with their fishers and the community to implement their business plan. They are very well situated, in the heart of productive finfish territory, to set up sustainable and profitable finfish businesses for private as well as community benefit.

Apart from their strong desire to make their business plan succeed, the group also benefit from a close relationship with an experienced business mentor who is helping them to develop and implement their finfish development strategy.

A Director of the Corporation said "*we know that if we want to get things moving (develop our fisheries) we need to do it ourselves*".

This sort of model may allow business units such as the Fishermen's Association to focus squarely on fishing business support activities and investments, providing economies of scale or the purchase of equipment and fishing gear, and building the capacity of local fishers to operate viable businesses and contribute to regional fisheries management and governance initiatives. Higher-level corporate governance, including auditing, overall strategy and risk management may be done efficiently by the corporation.

Private joint venture business arrangements such as the Torres Blue venture at Poruma Island also offer a good model to combine established viable fishing related businesses with community businesses, providing knowledge and experience, and access to capital and/or assets and equipment that may otherwise be difficult to access for new businesses. The relative benefits these sort of arrangements offer each party need to be carefully considered, including from a more strategic capacity building perspective.

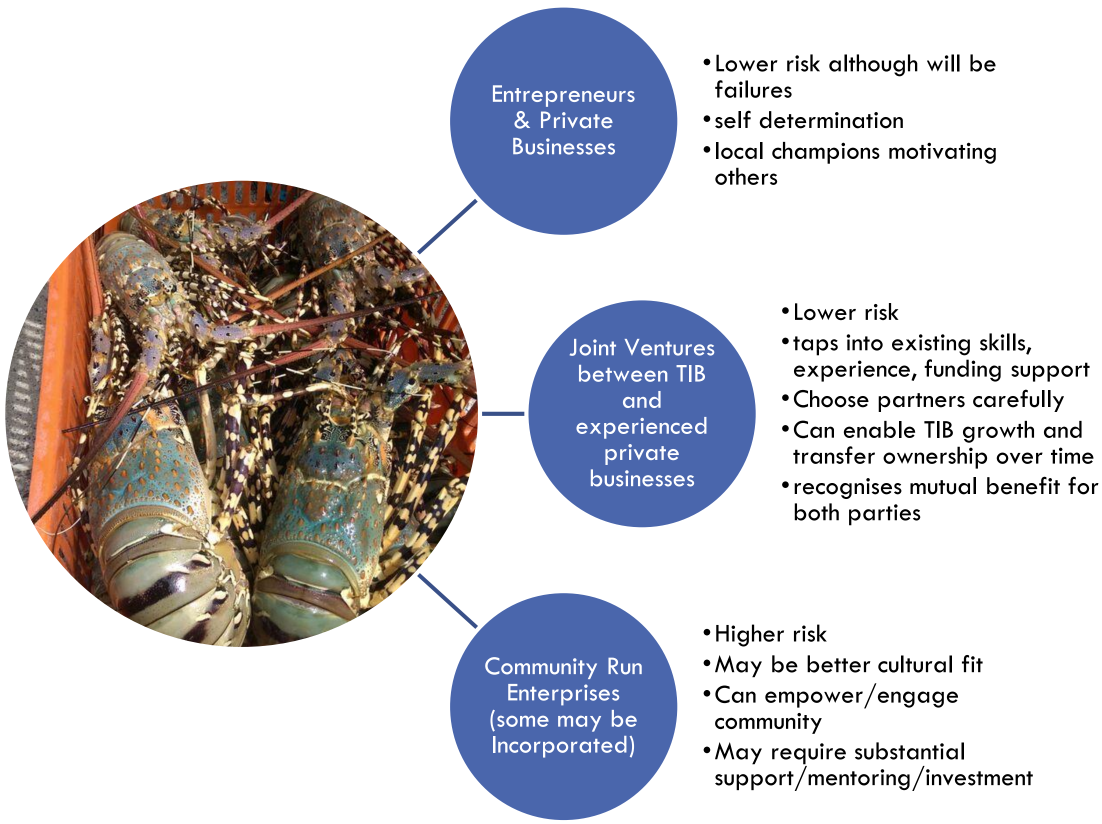


FIGURE 9: PRIMARY OPTIONS FOR TORRES STRAIT FISHING BUSINESS DEVELOPMENT AND SUPPORT

Income from TSRA leasing out sunset licences (ex-TVH licences)

Income earned from the leasing of commercial finfish fishery licences is held in a separate account by TSRA and is very important for supporting development of the fishery on the basis of advice from traditional inhabitants. Traditional inhabitant views and suggestions for investments are considered by the Torres Strait Finfish Quota Management Committee (FQMC) with annual recommendations then made to the TSRA Board for decision.

There is approximately $1 million in lease revenue that has been received from leasing these licences since 2008. Most of this has come from the lease of Spanish mackerel licences and quota with only a small amount (up to 40 tonnes) of the sustainable coral trout catch quota being leased recently.

Approximately $500,000 of the lease funds collected remain for future investment in finfish-related activities. There is also an opportunity to supplement existing finfish lease funding from other funding sources available for Torres Strait economic and fisheries development. There have been several recent initiatives whereby funding through My Pathway and other sources has been used to support fisheries-related training and capacity development. These include training in fish processing and related supply chain activities at the Australian Maritime College in Tasmania, and recent commercial fishing training aimed at improving the effectiveness and efficiency of dinghy based TIB fishers targeting coral trout, Spanish mackerel and other valuable species.

There are some difficult questions about how money available from the finfish leasing should be allocated across different Torres Strait communities. Some communities have historically been more active in finfish fishing; while others rely more on the valuable TRL fishery. To date communities located close to the main commercial finfish fishing areas have been the primary recipients of merit based funding grants to support finfish related business development.

Competitive Advantage - Developing a Finfish Fishery Hub in the Eastern Region

The more Eastern Torres Strait Communities particularly Ugar, Masig, Erub and Mer Islands are located within the most productive and valuable finfish fishing areas. Nearly all of the commercial catch in previous years has been taken in this region. These communities are well-placed to become a regional hub for the fishery under 100% Traditional ownership. The more central western and northern communities have more established TRL fishing businesses and supporting infrastructure, and the TRL fishery offers those communities significant potential for profitable fishing operations.

In recent years investment funding sourced from the leasing of finfish quota to TVH style operations has been focused on finfish related economic development opportunities for the eastern regions. As part of this there is a valuable opportunity for these communities to collaborate with each other to generate higher catch volumes and economies of scale that can underpin viable businesses and infrastructure such as freezers.

There is also an opportunity to develop the fisheries management and governance capabilities of traditional inhabitants to enable their future self-management of finfish and other fisheries resources in the region. Opportunities to partner with established commercial fishing and seafood supply chain businesses to enable more rapid and successful finfish business development across this Eastern region are also important.

For other regions, finfish business development is likely to offer less overall return. These areas are better placed focusing their fisheries business development on species and fisheries that are most abundant in those locations. For most of the Torres Strait communities, developing TRL related fishing businesses offers the most potential as progress is made toward 100% ownership of that fishery.

For finfish business development in these other regions, the most efficient approach is likely to be provision of knowledge and business support services as required and where there is a high level of confidence that businesses with a significant finfish component can be operated profitably. A more generic fisheries business capacity building program for these areas might focus more on TRL whilst also developing the capabilities and opportunities for multi-species fishing businesses that include a proportion of finfish catch.

Adding to and refining existing TSRA initiatives[6] to extend knowledge about finfish and other commercial fishing methods and opportunities via a fisheries "knowledge hub." This should be easily accessible across the entire region, providing valuable information including business network services to enable current information about finfish market prices, interested buyers, techniques for marketing and value adding, business mentors, business models for finfish or multi-species operations and related information.

Using internet and social media based platforms (e.g. Facebook) to support a contemporary knowledge hub and networking structure can offer a great deal of business development information, and build a community of practice to support effective development of viable finfish related businesses in a very cost-effective way. This lower cost more passive investment approach for communities that do not have access to high value or volume finfish catches can help to deliver valuable business outcomes and an appropriate scale very efficiently.

Smart-phone fishing…

Dan French – a fisheries scientist and consultant – has been working on an AFMA-funded project with Erub Island Finfish Fishers to develop and test a smartphone app to collect catch information, improve fishing efficiency and make it easier for people to run their fishing business successfully.

One of the most important functions is to accurately and easily record daily catches. This is like a fishing diary – helping fishers identify the best times and places to fish, and the best combination of conditions and circumstances. The app can also record distances travelled and fuel used to help work out the most profitable way to fish for certain species.

Fishers can then improve and fine-tune their fishing operations to increase their catches, be more sustainable and reduce their fishing costs.

[6] For example TSRA currently funds an "into business" workshop series in communities, business mentoring services, and provides a range of training opportunities.

The value of having experienced ex-TVH fishers leasing out commercial finfish licences

FIGURE 10: COMMERCIAL MACKEREL FISHING BOAT AT BRAMBLE CAY

The opportunity for traditional inhabitants to earn income from leasing coral trout and Spanish mackerel quota to commercial fishers for an appropriate fee is a valuable one. Particularly when TIB fishing capacity is being developed to take over from previous TVH style fishing operations. As well as the direct income earned, the value from having experienced commercial fishermen available to share their knowledge about effective fishing practices, and to support development of more efficient fishing practices is substantial.

Experienced ex-TVH commercial fishers also understand the critical importance of working closely and cooperatively with Traditional Inhabitants from nearby communities. A relatively small number of experienced and committed commercial fishers are more likely to maintain friendly and constructive relationships with traditional inhabitants in their communities.

One of the impacts from the transfer of previous TVH finfish licences to Traditional Inhabitants in 2008 was that the supply of both mackerel and coral trout to regional markets was significantly reduced. For any fishery there is a significant risk that inconsistent supply of product will result in the loss of valuable markets. For example, tropical snapper species from fish-trap fisheries in the Northern Territory are caught in good quantities and are consistently available at competitive prices. Once markets are lost they can be very difficult to regain.

Developing a unique Torres Strait seafood brand also has the potential to increase prices and the overall value of seafood sourced from Torres Strait. However developing and maintaining such a brand takes time and is not easy. First and foremost it relies on consistent supply of high-quality fish. At the moment the quality of Torres Strait finfish caught by commercial fishers leasing the TSRA-held licences is very high and both the volume and quality of this product underpins the overall value of Torres Strait finfish in existing markets.

To maintain and increase the value of traditional inhabitant finfish businesses under 100% ownership it is critically important that TIB fishers and related supply chain businesses work closely together for mutual benefit.

Case study - a successful multi-species fishing business at Erub Island

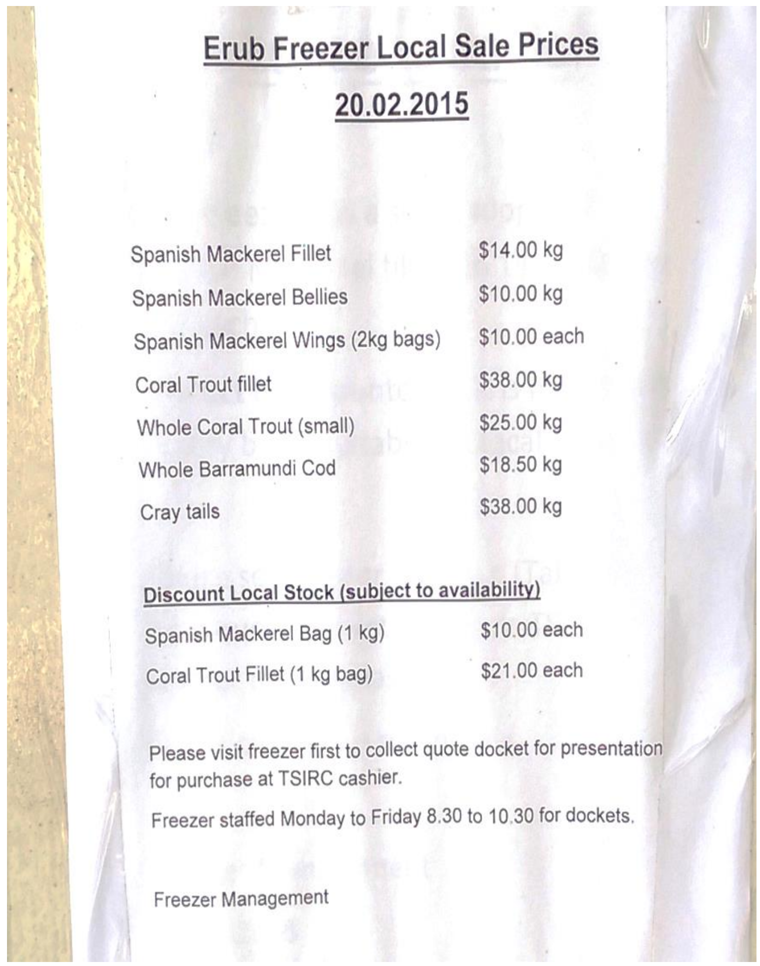
Mr. Les Pit is an experienced fisherman living on Erub Island who fishes commercially when he can on the weekend and during holidays. He mainly fishes for cray, spearing them while free diving. Les also has a full-time job with the council (TSIRC) as the Engineering Manager for the Erub community.

Les agreed to share some of his own fishing business experiences in case they can help other Traditional Inhabitants develop their own successful fishing operations. In a good day's fishing he and his family members might get 100kg of cray tail. Les also fishes for finfish sometimes, although says they are more work to catch and process, and yield less profit than cray.

When Les is fishing for coral trout or mackerel, usually when the cray season is closed, he bleeds the fish as soon as he catches them and then puts them in his esky on saltwater ice he's made in his freezer. Depending on the size of the fish, and what the freezer wants, Les will either fillet the fish or leave them whole.

Les said that he is very particular about the quality of his product. The product has to be perfect – Les pays attention to this from the moment he catches the cray or the fish; his initial processing done on board or on the way home, any later processing at home, and then packing in his freezer.

Les chooses to sell all of his finfish to the community freezer at Erub because he knows how important it is for the community to get enough fish to keep the freezer running. He probably gets about $5 per kg less selling to the freezer than he would selling direct to his buyers.



Erub Freezer Local Sale Prices

20.02.2015

Spanish Mackerel Fillet	$14.00 kg
Spanish Mackerel Bellies	$10.00 kg
Spanish Mackerel Wings (2kg bags)	$10.00 each
Coral Trout fillet	$38.00 kg
Whole Coral Trout (small)	$25.00 kg
Whole Barramundi Cod	$18.50 kg
Cray tails	$38.00 kg

Discount Local Stock (subject to availability)

Spanish Mackerel Bag (1 kg)	$10.00 each
Coral Trout Fillet (1 kg bag)	$21.00 each

Please visit freezer first to collect quote docket for presentation for purchase at TSIRC cashier.

Freezer staffed Monday to Friday 8.30 to 10.30 for dockets.

Freezer Management

FIGURE 11: ERUB COMMUNITY FREEZER PRICE LIST – FEBRUARY 2015

Les suggested a lack of fishing experience, and role models; people not looking after their fishing gear and equipment; and sometimes a lack of commitment or willingness to work hard at fishing, are all things that can stop people from being successful. He worked as a boy on Bluey Bedford's prawn trawler. It was hard work but he learned a lot of valuable skills. Later Bluey encouraged Les to buy a small secondhand freezer, suggesting this would be a good investment. (And it was!)

What does a Maizub Kaur (Bramble Cay) Spanish mackerel fishing operation look like?

Most of the Spanish mackerel caught in the Torres Strait finfish fishery comes from the Bramble Cay area. The peak mackerel season normally runs from early August until early December, depending on how much quota the boats have, how long they're willing to fish in such a remote and challenging location, and their catch rates. Primary fishing vessels range in length from around 9 to 15 metres, supporting 2–3 dories each.

The mackerel caught by line around Bramble Cay are usually caught by trolling garfish baits on long wire leaders. Once the fishing session is complete the dories return to their primary vessel. The mackerel are filleted and then snap frozen soon after capture. They are recognised as a very high-quality product.

Fishing usually continues for around two weeks before boats transit to the Endeavour Bay barge, normally anchored around Masig Island. They resupply their diesel fuel from the mother ship (both the dories and

primary vessel use diesel), transfer their frozen mackerel fillets and get other supplies as needed. Fuel is a major expense, and fishers use around 1600 L to get up to Bramble Cay, and the same to get home to Cairns. Freight for frozen mackerel fillets is around $0.41 per kilogram. Fillets are normally packed in 12 kg cartons and the price fishers get is normally around $12 per kg of fillets.

Some community examples and ideas for investing the Finfish Lease money…

- *Ask new fishers for their ideas about how to go fishing for the least cost. For example a new fisher might have an old but seaworthy aluminium dinghy but no motor. His uncle has an outboard that needs repairs, and finfish lease funding might be able to provide packages of safety equipment for some community fishers. This way the boy is using his business ideas and he's out fishing and catching fish for the freezer just for the price of the motor repair and the safety equipment.*

- *Initiatives to increase finfish participation for the community were discussed around four years ago by Erub's Fisheries Management Association (EFMA). Ten existing dinghies and new motors were purchased and made available as micro loans with repayments set at $300 per month. Participants signed an agreement/contract to this effect. This initiative has helped but was less successful than hoped, with several recipients not meeting their repayment commitments.*

- *EFMA also arranged for a welder to come to the community to repair damaged aluminium dinghies. At a cost of $16,000 – in the 10 days that the welder was available – 28 dinghies were repaired. This was successful for cost-effective dinghy repairs although did not increase actual fishing activity very much.*

- *During community meetings there were some difficult discussions about the value obtained from finfish investments on Erub Island. One person suggested these were failures and made it more difficult for other communities to obtain funding for finfish-related initiatives. Most people recognised there had been some hard but valuable lessons which could help other communities better understand and manage similar risks.*

- *New or less experienced fishers could be provided with less valuable dinghies and smaller motors by the Community Fisheries Association. They could then prove their fishing ability with less cost, and demonstrate they are willing to look after the Associations fishing assets (e.g. dinghies and motors) but without too much initial cost or risk.*

- *As well as the more motivated or full-time fishermen, training should be provided to weekend fishermen as well. They also have the ability to support the community freezer by catching fish on the weekends and selling to the freezer.*

TORRES STRAIT FINFISH FUTURES

What might some future Traditional Inhabitant finfish businesses look like?

Participants in community meetings spoke about a range of future options and models to encourage finfish fishing activity. They felt that the opportunity to choose the most suitable business models was important. This might be a more entrepreneurial private business model, or a community, or more co-operative model.

People also wanted information to help them choose the best approach depending on their circumstances and preferences. In many cases people supported the idea of a mixed fishing business model based on the most abundant and/or valuable mix of species available locally. For example some fishers are mainly fishing for cray during the season, perhaps also fishing for mackerel when the cray season is closed, and also harvesting Beche de Mer (BDM) opportunistically.

People agreed that examples of actual finfish businesses, with costs and revenues, would be helpful to understand what is involved. For example information about how much fish they need to catch to break even, or make a profit.

FIGURE 12: TYPICAL 5 TO 6 METRE DORIES WIDELY USED IN TIB FISHING OPERATIONS

Examples of possible future finfish businesses that could work well in Torres Strait communities are provided below:

- A simple and widely accessible approach, at least in the shorter term, is people fishing from 5 to 6 m dories with 40 to 90 hp two-stroke motors and good quality eskies. They could fish out of their home communities, selling their product to a community or private freezer. A variation on this is a more vertically integrated Dinghy-based operation where a fisher also maintains a small private freezer, processes their own catch and sells direct to end buyers for a higher price per kg (similar to the approach used for TRL tails by Mr. Les Pit on Erub).

FIGURE 13: TREVALLY FROM WARRABER ISLAND

- The next level may be slightly larger boats in the 7 to 8 m range with good eskies and the ability to carry good quantities of ice for two or three day trips. Bluey Bedford from Erub suggested boats like these some years ago calling them 'ice boats'. He felt they were a good balance of simplicity and enough fishing and catch storage capacity to support larger community-based freezers. People could stay overnight on these boats, fish in rougher weather conditions more safely, and carry more product – perhaps 200-300kg of fish. Using ice rather than freezers allowed consistently high quality product to be landed to a community freezer where skilled fish processors are available. Fish could then be more rapidly frozen in larger quantities using blast freezers and then stored at low temperatures in the storage freezer.

- The next level up from this might be similar to the previous TVH style operations where boats of greater than 10 m supporting several dinghies fish for mackerel or coral trout, filleting and freezing their product on-board. This would be very similar to the style of TVH operations operating before the 2009 buyout and now leasing TSRA held sunset licences and quota. These freezer boats can also act as mobile buyers for communities that don't have freezer access, or where freezers are unserviceable.

- Whilst more complex and challenging to operate successfully, A live coral trout fishing business, exporting catch to valuable Asian markets, may also be a future business model either via a joint venture arrangement with an experienced live trout fisher, or down the track when traditional inhabitant fishers have developed the necessary business and operating skills to make this more complex and higher risk operation viable.

Finfish Fishery Business Models

Boat business modelling

This section presents the results of modelling several options for finfish focused fishing businesses. The models use cost and income information obtained from community consultations, interviews with TVH style operators leasing TSRA held sunset licences, and information from previous studies (e.g. Fairhead & Hohnen 2007, AEC 2009). Some preliminary finfish catch and effort information from the recent AFMA funded project to trial a smartphone application (app) at Erub Island for TIB sector catch reporting has also been used.

Spanish mackerel modelling results

The cost models are presented for three TIB fisher businesses catching at different levels to help identify economies of scale and points where these businesses become profitable. It is important to note there are a range of variables that can significantly impact viability, including assumed catch rates. For example small scale dinghy models are based on conservative catch rates of around 30kg per fisher per day. With effective training these catch rates may reasonably be doubled, or increased even further, substantially improving returns.

- Single person using a single dinghy and doing 50 fishing days to catch 1,500 kg/year;
- Single person single dinghy doing 90 fishing days to catch 3000 kg/year
- Two boats and two people (one paid) with 90 fishing days each (6000 kg/year)
- A smaller scale TVH style cost model is presented for comparison (catching 15,000 kg/year using quota leased under the TSRA held sunset licence arrangement, and employing 2 additional workers/crew).

The annual costs of fishing at each of these scales is shown below, with details on the break-up of costs shown in Appendix 2.

	Tonnes / year			
	1.5	3	6	15
Annual fishing cost ($)	13,800	20,414	42,090	69,830

The high level of fixed costs means profitability is closely tied to prices obtained for the catch (either whole or fillets). For mackerel a fillet price of $13/kg equates to $8.125/kg of wet fish[7].

For each scale (e.g. annual catch) of fishing operations, model results are presented at 4 different fish sale prices:

- $6.5/kg (mackerel barrels local freezer price)
- $8.125/kg (effective whole fish price for $13/kg fillets)
- $10.2/kg (average sale price in 2005-06[8] for this scale of fishing)

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[7] Information from ex TVH fisher T. Vass providing fillet to whole fish ratios

[8] Where older prices have been used for modelling they have been adjusted for inflation to approximate current pricing.

- $13/kg (fillet price applied to whole fish).

With this range in price the value of catch at each catch volume varies significantly. Clearly the TIB fisher selling to the local freezer at the low-processing price of $6.50 is less able to capture higher value from the catch than the TVH fisher selling finished fillets direct to a wholesaler. In the remote and challenging Torres Strait operating environment this ability to shorten the supply chain makes a significant difference to business performance.

Catch value ($)

	Tonnes / year			
	1.5	3	6	15
at $6.50/kg	9,750	19,500	39,000	97,500
at $8.125/kg	12,187	24,375	48,750	121,875
at $10.2 per kg	15,300	30,600	61,200	153,000
at $13/kg	19,500	39,000	78,000	195,000

Boat Cash Income is income from fish sales (kg caught x price/kg) less costs. The results for Boat Cash Income based on the 4 fishing models and 4 price points are shown in the following table.

Boat Cash Income ($)

	Tonnes / year			
	1.5	3	6	15
at $6.50/kg	-4,050	-914	-3,090	27,670
at $8.125/kg	-1,612	3,961	6,660	52,045
at $10.2 per kg	1,500	10,186	19,110	83,170
at $13/kg	5,700	18,586	35,910	125,170

Because the fishing costs to achieve the modelled catch volumes are largely fixed, net boat cash income is determined by the prices received.

- For the single dinghy 1500kg/yr TIB fisher the operation is only making money at a price above around $9/kg per whole fish.

- For the single dinghy 3000kg/yr TIB fisher the operation has better economies of scale and can make money above around $7/kg per whole fish – so selling fillets is potentially profitable.
- For two dinghies at 3000kg each per year the financial performance is about the same as 1 boat at 3000kg per year.
- For the TVH model the economies of scale mean that even with the higher costs of fishing there is positive net income even at the low price of $6.50/kg per whole fish.

So far the financial modelling has not included the cost of ownership of the boat and equipment (though it does include provision for repair and maintenance). Ownership costs have two parts:

1. Depreciation – the accounting term for the expected loss of value of the capital asset over time, used to take account of the need to replace the equipment – in this case over a 10-year period. For example for a dinghy and motor setup worth $30,000 new (e.g. 6m hooker dory, 70 hp two stroke motor and trailer), the depreciation can be approximated by 10% of that (replacement) cost each year over 10 years. So if this money was set aside each year the boat owner would be able to replace the equipment with new in 10 years' time. Not all TIB fishers will feel they need to make provision to replace their equipment every 10 years, and many will not place such a high value on depreciation, looking more at the daily or annual cash income they might receive.
2. Loan costs – takes account of the annual cost in paying off a loan if a loan is required to buy the capital equipment (boat, motor, and trailer). A commercial loan of $30,000 over 10 years at 7% interest requires $4,176 per year to pay off interest and principle. Not all TIB fishers will need to borrow this whole amount, and the less borrowed the lower this cost item will be.

Boat Business Profit is Boat Cash Income less depreciation (to factor in equipment replacement costs over 10 years).

	Tonnes / year			
	1.5	3	6	15
Replacement cost ($)	30,000	30,000	60,000	100,000
Depreciation ($)	3,000	3,000	6,000	10,000

Boat Business profit

	Tonnes / year			
	1.5	3	6	15
at $6.50/kg	-7,050	-3,914	-9,090	17,670
at $8.125/kg	-4,612	961	660	42,045

at $10.2 per kg	-1,500	7,186	13,110	73,170
at $13/kg	2,700	15,586	29,910	115,170

The table above shows that once depreciation is included, boat business profit is negative for fishers catching 1500kg/yr at current prices, though it profitable for a single fisher catching 3000kg per year or a pair of dinghies catching 6000kg/yr. Once again the TVH approach, though more capital intensive, is also profitable at all prices modelled.

Boat Business Profit less loan cost shows commercial viability of model once investment (loan costs) are included.

	Tonnes / year			
	1.5	3	6	15
Annual loan cost ($)	4,176	4,176	8,352	14,000

Post loan cost profitability

	Tonnes / year			
	1.5	3	6	15
at $6.50/kg	-11,226	-8,090	-17,442	3,670
at $8.125/kg	-8,788	-3,215	-7,692	28,045
at $10.2 per kg	-5,676	3,010	4,758	59,170
at $13/kg	-1,476	11,410	21,558	101,170

If a loan is required to finance the fishing operation, the financial modelling shows that the 1500kg/yr operation is not profitable, while the 3000kg/yr and 6000kg/yr operations can be if fillets are sold rather than barrels. Once again the TVH model is profitable at each price point modelled. TVH profitability is reduced, however, once the cost of buying the quota is included – estimated at around $1 per kg of mackerel caught. So the quota cost (at a 15 t annual harvest) of $15,000 would reduce the post loan profit each year by that amount.

The following table presents a summary of the financial viability modelling outcomes.

1 boat, 1 fisher 50	1 boat 1 fisher	2 boats 2 fishers	TVH	Catch price

	fishing days	90 fishing days	180 fishing days		
Catch annual (t)	1.5	3	6	15	
Catch/boat/day (kg)	30	33	33		
Boat business profit	-7,050	-3,914	-9,090	17,670	at $6.50/kg
loan	4,176	4,176	8,352	14,000	
post loan	-11,226	-8,090	-17,442	3,670	
Boat business profit	-4,612	961	660	42,045	at $8.125/kg
loan	4,176	4,176	8,352	14,000	
post loan	-8,788	-3,215	-7,692	28,045	
Boat business profit	-1,500	7,186	13,110	73,170	at $10.2 per kg
loan	4,176	4,176	8,352	14,000	
post loan	-5,676	3,010	4,758	59,170	
Boat business profit	2,700	15,586	29,910	115,170	at $13/kg
loan	4,176	4,176	8,352	14,000	
post loan	-1,476	11,410	21,558	101,170	
Quota cost	0	0	0	15,000	

Main assumptions:

Around $100/trip for fuel

$30,000 boat/gear loan over 10yrs at 7%pa and 10% depreciation per year over 10 years

Spanish mackerel quota leased at $1/kg whole weight

Modelling outcomes:

1 boat 1.5t/yr (higher volume TIB fisher) loses $11,226/yr if they receive freezer price and borrow to buy boat

1 boat 3t/yr (highest volume TIB fisher) loses $8,090 per annum for 90 days fishing if they receive freezer price and borrow to buy boat

2 boats working together, 6t/yr lose $17,442 per annum for 90 days fishing each if they receive freezer price and borrow to buy boat

TVH (15t/yr) boat makes around $13,000 per annum after quota cost (at $8.125/kg whole fish or $13/kg for fillets)

Ice boat

$/kg	Catch value	BCI	BBP	loan	Post loan profit	Quota if non TIB group
6.5	130,000	-25,250	-35,250	14,000	-49,250	20,000
8.125	162,500	7,250	-2,750	14,000	-16,750	20,000
10.2	204,000	48,750	38,750	14,000	24,750	20,000
13	260,000	104,750	94,750	14,000	80,750	20,000

BCI = boat cash income (value of fish caught less costs)

BBP = boat business profit (BCI less depreciation)

Main assumptions:

Catch 20t/yr

$100,000 boat/gear loan over 10 years at 7%pa and 10% depreciation per year over 10 years

3 day trips at $300/trip x 60 trips/annum

Modelling outcomes:

Loss made at $6.50/kg

Loss made at $8.125/kg

Net profit of $24750 at $10.2/kg (if no quota cost),

Net profit of $80,750 at $13/kg (if no quota cost)

Freezer boat

$/kg	Catch value	BCI	BBP	loan	Post loan profit	quota
6.5	260,000	29,550	-5,450	49,000	-54,450	40,000
8.125	325,000	94,550	59,550	49,000	10,550	40,000
10.2	408,000	177,550	142,550	49,000	93,550	40,000
13	520,000	289,550	245,440	49,000	196,440	40,000

Main assumptions:

Catch 40t/yr

$350,000 boat/gear loan over 10 years at 7%pa and 10% depreciation per year over 10 years

4 day trips at $400/trip x 20 trips/annum

Modelling outcomes:

Loss made at $6.50/kg

Loss made at $8.125/kg if quota fee paid

Net profit of $53,550 at $10.2/kg,

Net profit of $156,440 at $13/kg

Coral Trout modelling results

Coral trout prices are higher than Spanish mackerel prices, making the financial modelling of coral trout fishing more positive. Current coral trout prices[9] are:

- Whole fish (bled, guts in) $10/kg at a local freezer
- Fillets $25-40 (equivalent to a whole fish price of $15.625/kg assuming that 1kg of fish yields 0.625kg of fillets).

As these prices are above the equivalent Spanish mackerel prices and the fishing effort is similar, fishing for coral trout is modelled as a more profitable operation.

[9] Prices are indicative based on current Erub Island freezer prices and information from regional supply chain businesses.

Following the same approach as set out above for Spanish mackerel, the following table summarises the financial modelling of the 4 different approaches to coral trout fishing.

	1 boat, 1 fisher 50 fishing days	1 boat 1 fisher 90 fishing days	2 boats 2 fishers 180 fishing days	TVH	Catch price
Catch annual (t)	1.5	3	6	15	
Catch/boat/day (kg)	30	33	33		
Catch value	15,000	30,000	60,000	150,000	at $10/kg
Fishing cost	13,800	20,414	42,090	69,830	
Boat cash income	1,200	9,586	17,910	80,170	
Boat business profit	-1,800	6,586	11,910	70,170	
Post loan profitability	-5,976	2,410	3,558	56,170	
Catch value	23,438	46,875	93,750	234,375	at $15.625/kg
Fishing cost	13,800	20,414	42,090	69,830	
Boat cash income	9,638	26,461	51,660	164,545	
Boat business profit	6,638	23,461	45,660	154,545	
Post loan profitability	2,462	19,285	37,308	140,545	
Quota cost	0	0	0	22,500	

The financial modelling shows that with a similar catch effort and associated costs the higher prices obtainable for coral trout makes for a more profitable fishing operation. Small scale (1500 kg/yr) TIB fishing is net cash positive but is not profitable once depreciation and loan costs are included. But at 3000kg/yr both these costs can be included and the operation is still profitable. The two boat model is also profitable, as is the TVH coral trout model.

Mixed species fishing modelling results

Many TIB fishers would catch a mix of species over a year. The following table summarises the financial modelling for a mixed species single boat operation. The first option is based on a single dinghy running 50 fishing days per year (as modelled above) divided into 20 days Spanish mackerel

(30kg per fisher per day) , 20 days coral trout (using catch of 25kg per fisher per day), and 10 days rock lobster (20kg of frozen tails per fisher per day). Prices are local freezer prices (ie $6.50/kg for mackerel barrels, $10/kg for whole coral trout and $25/kg for lobster tails).

The second option doubles the fishing days to 100 and keeps the species mix.

Catch value 50 days/year

	days	kg/day	per year (kg)	Value ($)	freezer price ($)
SM	20	30	600	3,900	6.5
CT	20	25	500	5,000	10
TRL	10	20	200	5,000	25
	50		1,300	13,900	

Catch value 100 days/year

	days	kg/day	per year (kg)	Value ($)	freezer price ($)
SM	40	30	1,200	7,800	6.5
CT	40	25	1,000	10,000	10
TRL	20	20	400	10,000	25
	100		2,600	27,800	

	50 fishing days	100 fishing days
Annual catch (kg)	1,300	2,600
	$	$
Annual fishing cost	13,800	20,414

Catch value	13,900	27,800
Boat cash income	100	7,386
Depreciation	3,000	3,000
Boat business profit	-2,900	4,386
Loan	4,176	4,176
Post loan profitability	-7,076	210

The financial modelling shows a that both 50 day and 100 day operations are cash positive, but only the 100 day operation yields enough income to cover depreciation and equipment loan costs as well.

Scale of TIB fishing

Current TAC levels are in the order of 120 tonnes/year for Spanish mackerel and 80 tonnes/year for coral trout. Of this total amount, generally around 100 tonnes per year are leased to TVH fishers for Spanish mackerel and 50 tonnes for coral trout. TIB fishers are able to catch around 20 tonnes per year of Spanish mackerel and 30 tonnes per year of coral trout.

Information from Fairhead and Hohnen (2007) and preliminary information from the Erub Island Smartphone Project (D. French pers. com) suggests most TIB fishers operate at low effort levels. In 2005-06

> "… approximately a dozen fishers accounted for around 70 per cent of islander commercial catch in 2004-05 and 2005-06. At the other end of the scale, there were around 50 fishers in the same years who sold less than 100 kilograms of finfish." (Fairhead & Hohnen p7)

The following table is an indication (not based on survey data) of how the catch effort might be distributed across the total tonnages available. It models a small number of 'higher volume' fishers and a long tail of low volume fishers.

	Annual catch (kg)						
	3,000	1,500	1,000	500	250	100	Total fishers
Number of fishers (mackerel)	1	3	3	5	10	50	72
Number of fishers (trout)	1	4	4	10	25	50	94

							Total catch (kg)
			Total catch weight				
mackerel	3,000	4,500	3,000	2,500	2,500	5,000	20,500
trout	3,000	6,000	4,000	5,000	6,250	5,000	29,250

The catch modelling shows that based on typical patterns of fishing intensity there could be 4 Spanish mackerel (predominantly) and 5 coral trout (predominantly) fishers selling 1500kg or more per year. The financial modelling showed that 1500kg/year of Spanish mackerel or coral trout is really only profitable at freezer prices if boat capital costs are low (e.g. small loan required and /or boat not replaced every 10 years). A bigger effort resulting in 3,000kg/year is more likely to be profitable, especially if some processing occurs and some fish can be sold as fillets. There is little likelihood of effort below 1,500kg/yr being profitable unless there are no capital costs related to boat and motor.

In the mixed fishing scenario the modelling shows the same pattern – the low effort (50 days) is unlikely to be profitable without zero boat capital costs, while the bigger effort (100 days) is more likely to be profitable and can cover the capital costs.

Combined with the catch modelling there are signs that up to 4 fishers could be (just) profitable in the Spanish mackerel fishery and up to 5 in the coral trout fishery. The likelihood of profitability increases with more processing and with lower boat capital costs.

Freezer modelling results

Costs for small (2m x 2m) snap and store freezer. Cost estimate $12,000, bought on a commercial loan at 7% over 10 years. Power cost estimated at $250/month.

Annual operational expenses	$
Loan repayment	1,670
Depreciation	1,200
Freight	2,500
Packaging	500
Power	3,000
Certification/licensing	500
Total	9,370

For a small community or privately owned freezer to be commercially viable these costs would have to be covered through income earned on value-adding to whole fish bought from fishers, processed into higher value fillets and then sold to wholesalers. The buy and sell price and fillet yield are shown in the following table.

	buy price (per kg)	wastage	filet yield (kg)	fillet price (per kg)
SM	6.5	0.625	4.0625	13
CT	10	0.625	6.25	25

Financial modelling

	buy kg	buy cost ($)	sell kg	sell value ($)	Net cash income ($)
SM	500	3,250	312.5	4,062.50	
CT	500	5,000	312.5	7,812.50	
		8,250		11,875.00	3,625

The financial modelling indicates that *without including the cost of labour* a small freezer would need to buy around 1500kg each of Spanish mackerel and coral trout, process this into fillets and then sell to a wholesaler in order to cover the operational expenses. The 2009 AEC report examined profitability issues for freezers of different sizes and found that for finfish only large scale freezers would have the throughput required to be able to cover their operational costs.

The finfish supply chain, marketing and branding

There are considerable challenges maintaining larger commercial freezers across the Torres Strait region and there is a history of these larger community freezers closing over time, primarily due to not having enough fish coming through consistently to keep the freezer economically viable. For example the freezer at Erub Island has recently been the only larger scale community-based freezer still operating. This freezer also receives some external support that is helping to keep it running and maintain broader community benefits.

One of the business challenges for a larger community freezer is that it is an additional link in the Torres Strait finfish supply chain and this introduces extra costs. The freezer cannot afford to pay too much for its fish because it has to factor in freezer operating costs such as power and payments for fish processing staff. Despite these additional costs the freezer must still meet the price being offered by wholesale or retail buyers in Cairns and elsewhere.

Increasing the value and/or reducing the costs in this supply chain – including freezer costs and revenues – is a key part of improving the benefits from the fishery back to Traditional Inhabitants and their communities.

In addition to reducing running costs for fishing and supply chain operations, adding value to finfish caught locally – through innovative or more cost-effective processing techniques, better marketing and eventually product differentiation through branding offers potential to improve profitability of Torres Strait finfish products.

High quality fish equals more buyers and better prices

Les Pit at Erub says the fish and crays he provides for sale have to be perfectly packed and in perfect condition. He pays attention to this from the moment he catches them, with careful handling and plenty of saltwater ice on the boat, careful processing at home, and then packing in his 2-tonne home freezer.

Les says that because he is always careful with the quality and packing his buyers trust him. They pay him a good price and they put the money in his bank account as soon as his fish is loaded onto the barge at Erub.

Previous community freezers at Mer and Masig Islands

Although both these freezers are no longer running several people commented that they were recognised for supplying high quality locally caught finfish for sale.

Several Cairns-based buyers also mentioned the consistently high quality of fish caught by these fishers and sold through their freezer.

Both communities' have a range of people with good experience helping to run a larger scale fishing focused freezer facility. They could help less experienced people and together get a freezer running successfully.

These sort of skills are one of the key foundations for running a viable larger scale freezer, and re-establishing the reputation for high quality Torres Strait finfish caught by traditional inhabitant fishers.

A Torres Strait Seafood brand reflecting the unique cultural and environmental attributes of Torres Strait seafood has potential to increase prices and/or improve market access. The foundation of such a brand is the underlying product quality and the confidence that these products can be consistently supplied to markets. A brand is a unique promise to buyers about a particular product, service or experience, and the promise needs to be kept for the brand to survive and prosper.

Finfish products sourced from Torres Strait must be consistently high quality and provided in quantities that sustain markets for these products. Without these underlying foundations there is little point in developing a specific seafood brand, or investing in market development.

FIGURE 14: PEARL ISLAND SEAFOODS IS A LOCALLY OWNED AND OPERATED TORRES STRAIT SEAFOOD SUPPLY CHAIN BUSINESS

These foundational requirements are well understood by some local seafood businesses, including those smaller finfish businesses that are running successfully in places like Erub Island (Les Pit and the Erub Freezer) and Warraber Island (e.g. Mr. Patrick Mills).

The quality and consistency of fish being sold to the freezers is critical to maintaining good prices and the reputation of Torres Strait fish. One or two mistakes in supplying product for the freezers could mean that buyers source their fish from elsewhere and valuable markets for Torres Strait finfish could be lost.

Future governance – traditional inhabitants managing finfish resources

The current and future sustainability of the finfish fishery is critically important to its longer term value and success. Although the Finfish Action Plan project is not focusing on how the Torres Strait Finfish Fishery should be managed under 100% Traditional ownership it is important to recognise the importance of environmentally sustainable fishing practices and maintaining the productivity of finfish populations that underpin the future value of the fishery.

Greater traditional inhabitant involvement in finfish governance and management has the potential to provide fisheries related employment outcomes and ensure a closer and more effective alignment between fisheries management arrangements and the specific objectives of traditional inhabitant fishers and their communities. These potential benefits are recognised in one of the TSRA fisheries program aims to: *ensure that Torres Strait Islander and Aboriginal people are engaged in the management of the region's fisheries resources.*

Having 100% ownership of the fishery and developing the capacity to obtain the best benefits for communities from that ownership entails important responsibilities. Currently the Australian Fisheries Management Authority (AFMA) manages the fishery on behalf of the PZJA under the Torres Strait Finfish Fishery Management Plan 2012, in a manner consistent with the Torres Strait Fisheries Act 1984.

Although the finfish fishery management plan has only been recently finalized it will need modification over time to reflect specific Traditional Inhabitant management objectives, and the strategies to achieve those objectives. AFMA also oversees the Finfish Fishery Working Group as an expertise based consultative group to guide the management of the fishery, and recommend management changes through the PZJA process.

An accurate understanding of catches taken by TIB fishers and non-commercial traditional fishers, as well as any commercial fishers leasing TSRA sunset licences, is fundamentally important if the fishery is to be managed sustainably whilst also maintaining high catches to deliver greater economic benefits. Carefully targeted fisheries research, and the engagement of traditional inhabitants in this research and management process is an important opportunity.

By developing the capabilities of the more eastern finfish communities, including a collaborative business development and governance structure across the region, there is an opportunity to establish this area as the finfish business and management hub. Developing a range of fishing industry and management leadership roles and a supporting training and development framework can enable career progression through several valuable and interesting industry development or fisheries management related positions.

This sort of structure could include a focus on finfish related governance industry development however should form part of a broader capacity building program for Torres Strait fisheries management and governance.

Fostering Indigenous Fishing Business in the Torres Strait

There have been several previous studies exploring aspects related to finfish fishery development for traditional inhabitants to gain greater benefit from the TSFF[1]. The findings and recommendations from these earlier reports are generally consistent; they emphasised the need to:

1. Address motivational barriers presented by the structure and availability of income support programs (e.g. security and availability of income support payments may act as a disincentive to people fishing more seriously);
2. Increase margins by looking at ways of increasing 'economies of scale' by fishers working together either with multiple boats (co-op style) or larger boats;
3. Support growth/expansion of larger scale fishing effort by TIB fishers;
4. Work closely with and mentor interested and motivated fishers to maximise productivity and business efficiency – training and mentoring in fishing and business skills;
5. Enable appropriate access to finance to help fishers increase the scale and throughput of their fishing operations;
6. Improve access to markets through stronger value chain and local buyer (freezer) capacity.

Nearly all Torres Strait Islander commercial fishing is conducted around income support payments and obligations, with fishing done on a part time basis to supplement income. Fishing effort is generally low and lacks consistency and there are very few serious and full time fishermen. Fishing is conducted from small boats undertaking mainly day trips over relatively short distances. Most TIB sector commercial fishermen are not operating on a proper business basis (e.g. their true costs and returns from fishing are poorly managed and understood). The poor understanding of a business approach impacts on the ability to raise loans, cover repayments, cover costs, make an income and keep boats operating.

Previous reports have all concluded that TIB commercial fishermen need to shift to a more business minded approach and increase fishing effort substantially to operate viably. Reports also note that viable catch rates appear achievable as long as fishing effort is consistent.

Fishing Business Development

Establishing a successful business is difficult, and even more difficult if you are a traditional inhabitant living in a remote Torres Strait community. Aboriginal and Torres Strait Islander communities have often not had exposure to the same kind of business processes and role models that other communities have and are less likely to be successful without some external help.

The business community throughout mainland Australia has a business failure rate of approximately 80% in the first five years of business. With even more challenges to overcome it is not surprising that businesses in Torres Strait communities also have a high failure rate.

To ensure a greater level of success for new fishing business ventures, business support and development services are required. Even with a range of support services in place, the level of assistance may not be enough to ensure success. The suite of services necessary includes training, mentoring, and personal support for new business owners' and expert advice for more technical areas. A successful outcome cannot be expected by simply providing some equipment and hoping the individual will automatically know what to do in other key aspects of their business management.

Many of these imperatives are currently being addressed by existing and/or planned TSRA investment priorities. Currently these include a comprehensive program of small business training and development workshops (i.e. *into business* workshops), small business and entrepreneurship mentoring panels, and marine and fisheries focused training and development under income support programs. For example the Torres Strait Marine Pathways Program (TSMPP) has recently enabled Coxswains training for school leavers so they have an opportunity to promptly start marine related employment on leaving school if desired.

The essential foundations of starting up and running a successful business can be categorized into several fundamental areas. These are described below as the '4 Ms'

Motivation: Is the person best placed to take up the opportunity likely to be motivated? Without some drive and passion there is no way anyone will bother to take the risks in investing time and capital to exploit the good idea? What other income and business options does the best placed person have? Is there room in their life to wade into a new enterprise? And are there good enough reasons and motivations to do so?

Margin: Is there likely to be a real profit margin in the business? The idea may look great to an outsider, but will a rough estimate of costs in getting sales versus sales expected show that there is a profit margin to be made?

Market: Is there actually a market for the great idea, and can the person best placed to take it access the market? This is particularly important in regional areas if the great idea involves selling to people a long way away. How strong is the supply chain? How good are the networks and relationships that will be crucial to getting the product or service to customers?

Mentoring: How well suited to business is the person best placed to take up the great idea? Are they familiar with the nature of business intended, and do they have a good basis in the product or service, and contacts in the marketplace? Almost all start-ups gain great benefit from the experience of others, and the mentoring process is a powerful way of mitigating the main risks that start-ups may fail – lack of experience and business acumen. Mentoring can be a formal process, or an informal relationship. This too is a particular issue in regional and remote areas where there may not be many 'tracks in the sand' ahead, or people around who have had a successful venture.

The 4M's form a natural sequence and each one needs to be strong. If any of the 4 Ms is weak then the great idea is very unlikely to turn into a viable business.

Most people starting a business will have a very good understanding of the technical aspects of their business; for example many Torres Strait Islanders understand their sea-country intimately and many also understand some aspects of the fishing industry. However very few people have necessary knowledge and skills related to the financial aspects of running a business, including the marketing and sales aspects that may also be crucial to success.

The following information provides an important checklist for consideration when establishing any sort of small business and is equally relevant for finfish related business development.

A checklist for small business start ups

1. **Be clear about "why?"** Being a business owner is not for everyone – it is challenging, there is a lack of certainty, it can be very hard financially and it will take a lot of work. People need to be very clear about why they want to start their own business.
2. **Who are the customers?** This needs to be very clear from the outset, then clarity can be achieved in branding, location, marketing, pricing – everything.
3. **Who is the competition?** And how is this business different from the existing competition?
4. **Understand the rules and regulations** that might affect the business.
5. **Finances and securing finance is necessary.** There is a need for outside assistance from an accountant and where to source startup capital.
6. **Pricing**. Many new start businesses do not charge enough for their time or discount heavily to attract customers – not a good strategy.
7. **How to attract customers.** The business needs a very good marketing plan clearly identifying how to attract customers.
8. **Seek advice.** Involve expert advisers in the setup of the business. Ensure you have access to advice from an accountant, a solicitor, a marketing adviser and others such as graphic designer, website developer, and IT consultant as necessary.
9. **Insurances in place.** As a minimum Public Liability is usually necessary.
10. **Seek a mentor** and business advice.

Indigenous businesses face many impediments when becoming established. Most commonly they include cultural issues, such as local custom, and lack of:

- Access to finance

- Business management skills
- Role models
- Support on an ongoing basis
- Information and capacity to find out the answers to questions as they arise.

A workbook prepared previously for the then *Aboriginal and Torres Strait Islander Commission* (ATSIC) to accompany applications for business loans emphasised the importance of Motivation and personal readiness for getting into business. Before getting to the funding application, loan applicants were asked to self-assess how ready they are for business against four themes:

Part 1 focused on personal character explored how people were likely to react to the challenges and highs and lows of running a business.

Part 2 looked at people's health and how they would keep the business going if they couldn't work for a period of time.

Part 3 looked at people's experience – do they have the basic skills to make their business work?

Part 4 explored the reasons and motivations for going into business – what do people want from their business?

With satisfactory answers to these Motivation screening questions, the workbook then stepped loan applicants through a condensed business viability (or Margin) assessment. The emphasis given to these two soft criteria – coming before development of a viable business plan underpinning the loan application - highlights the critical nature of these criteria in nurturing viable Indigenous business start-ups. Entrepreneurialism and business generally are not the cultural norm in most Indigenous communities so extra attention on these areas is fundamentally important for business success.

Phase1. Start up and Training

Business Management Training – short course similar to the New Enterprise Incentive Scheme for Aboriginal Business.

This will enable fishers who are interested in establishing their own businesses to use their business as a real time example and apply their learnings from the training to the business as they start up. Access to finance may be an issue at this stage. Very few lending institutions will lend money on a business plan so if finance is needed assistance from government in the form of grants or low interest loans will be needed. Alternately the expertise of a finance broker may provide the solution.

Phase 2. Establishment

While in the establishment phase business operators will need hands-on personal support. They will need the services of a business advisor – preferably Aboriginal/Torres Strait Islander – who can visit regularly and be on the other end of the phone to provide information, business advice and assistance and help with identifying solutions to issues as they arise. Access to professional advice such as legal and accounting will be necessary during this phase and will come at a cost.

Phase 3. Operation and Growth

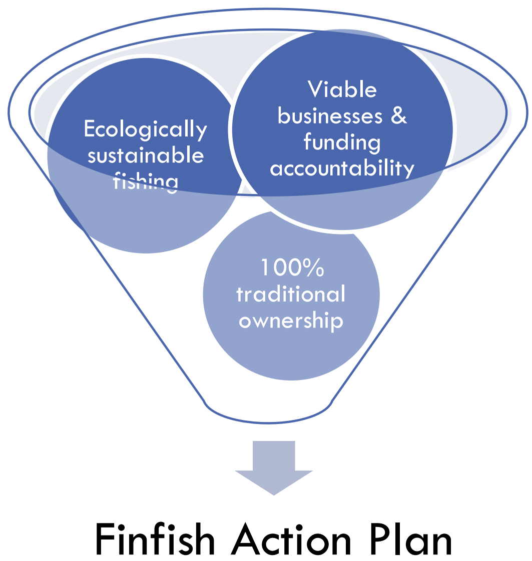
Ongoing support to the individual business operator is critical. A mentor should be allocated to the business operator who will be expected to be in touch weekly at first then monthly for structured sessions. As the business grows mentoring can be provided on an as-needs basis. Access to professional advice such as legal and accounting will continue to be necessary during this phase.

THE FINFISH ACTION PLAN PROGRAM LOGIC – BRINGING IT ALL TOGETHER

The Finfish Action Plan Program Logic is the basis of the Action Plan. It is a systematic sequence of recommended investment areas, activities and desired outcomes expected to enable strong progress toward more profitable and successful finfish fishery businesses owned and operated by Torres Strait traditional inhabitants.

Design Criteria for the FAP Program Logic

The FAP project objectives outlined in the initial section of this report (also based on TSRA fisheries and economic development priorities, and broader government Aboriginal and Torres Strait Islander and regional development objectives) provide the central criteria to guide overall development of the Finfish Action Plan Program Logic (or investment framework) (illustrated below).



The Program Logic is designed to be a very effective pathway from where the fishery is now to a point where it generates sustained economic and other value to communities, is fully owned and operated by Traditional Inhabitants, and related businesses are largely self-sustaining.

These different stages of growth for finfish related capabilities and businesses require tailored and sequential strategies to overcome the usual barriers and challenges associated with running a successful small business. There are also a range of unique challenges associated with running a successful fishing related business in the remote areas of Torres Strait related to logistical challenges, development of fishing and business skills, and cultural factors.

An important aspect of developing a strong Program Logic is understanding how likely it is that a sequence of investments and activities will result in measurable progress toward a chosen goal. This could be described as: *If we invest in and do this activity we expect it to result in this outcome…* For example assuming that providing funding for a larger scale community freezer will result in a viable freezer operation and increase fishing participation and broader business success for that community.

By using a program logic based approach, and testing this assumption in a systematic way, it becomes clear that there are several other underlying factors that will determine whether or not that freezer investment is likely to result in greater business success and related employment outcomes for the community. These include issues like:

- Do people really want to go fishing? Do they care if the freezer is successful or not?
- Do they have alternative ways to generate income?
- Are they better off taking live rock lobster for a higher price than available for finfish?
- Does the community have the right mix of skills and experience, and the funding, to keep the freezer running?

These additional "success factors" (or they may be barriers to progress) can then be included in the program logic, or accounted for in other ways. In summary the Program Logic based approach used to develop the Action Plan provides:

- A systematic method and tools to develop a pathway from current practice to a desired objective/s;
- A way to build stakeholder understanding and ownership of the activities, including the investment and effort required to achieve an important goal;
- A way to understand the relevance of proposed activities and investments, and the likelihood that they will be successful;
- A framework to enable regular monitoring and evaluation of progress toward the desired objective/s;
- A framework to enable learning and improvement (adaptive management) to stay on track toward the objective/s.

To illustrate the key outcome areas that underpin the Action Plan, the program Logic structure is divided into five investment themes (also referred to as key outcome areas). They are illustrated below.

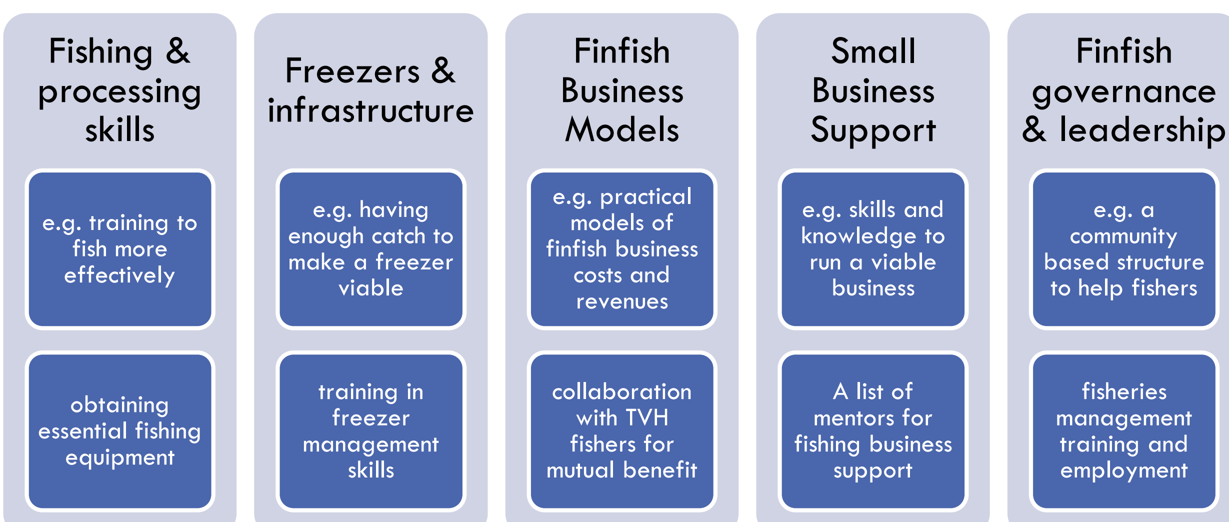


FIGURE 15: FAP INVESTMENT THEMES

Information supporting development of the Program Logic

The methods used to develop the Action Plan were designed to efficiently collect reliable and accurate information to guide and underpin development of realistic and feasible finfish fishery business outcomes. The diagram below illustrates the range of information, including TSRA's own strategic planning and regional economic development objectives, collected and then evaluated to help build the Program Logic framework.

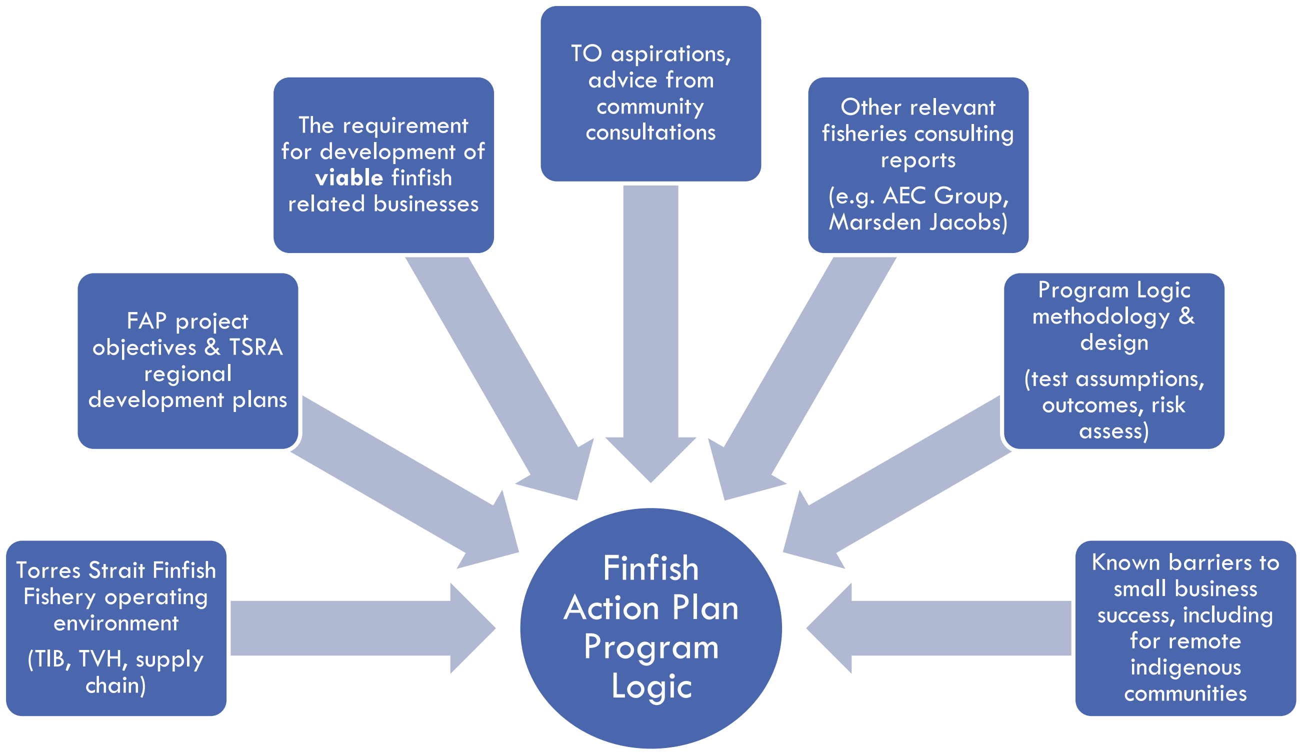


FIGURE 16: INFORMATION SOURCES AND INPUTS USED TO DEVELOP THE FAP PROGRAM LOGIC

Common themes running through the Program Logic

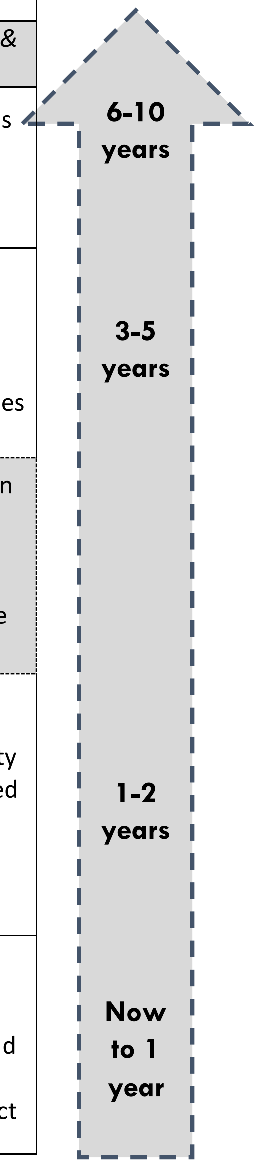
One of the most important aspects of the Action Plan is the need for a Program Logic that recognises the fundamental importance, and also the considerable challenges, of initiating and supporting the development of viable Torres Strait Islander fishing businesses in a very remote and challenging operating environment.

Throughout the project, particularly during community consultation, and as a result of reviewing previous consulting reports related to fisheries development, the critical importance of addressing the 4M's of successful business development has been a recurring theme. Without focused attention on these critical attributes of **Motivation, Margins, Markets**, and **Mentoring** it is very unlikely that the longer term FAP outcomes will be achieved.

Program Logic Diagrams – The Finfish Action Plan Architecture

TABLE 3: OVERVIEW OF THE FAP PROGRAM LOGIC & INVESTMENT AREAS

Goal: Profitable and Sustainable Torres Strait Islander Finfish Businesses				
	Fishing & processing skills development	*Freezers & fishing related infrastructure*	*Fishing Business Models & business support*	*Fisheries related governance & leadership*
Longer term outcomes: Higher level FAP results.	Highly efficient catching sector Consistent high quality/value product tailored to markets	Viable freezers & supporting infrastructure across key finfish communities	Spectrum of viable finfish business types represented regionally (dinghy to freezer boats, perhaps live coral trout)	TO's have a lead role in Torres Strait fisheries governance, finfish fishery management, and industry development
Intermediate outcomes: Evidence of increasing increased finfish business value & participation	Greater catching efficiency measured via CPUE, improved catch quality delivers better prices. Increased % of full time fishers. Improved gear reliability and sea-safety	Larger finfish communities (e.g. Erub, Mer) w' viable freezers Viable private freezers regionally Improved access to capital for infrastructure via robust business skills & planning	Viable yet more complex operations (e.g. collaborative higher volume, may include TVH style freezer boats. Stronger markets, supply chain presence	Community Fishers Associations are supporting viable fisheries businesses. Some key fisheries management/governance roles filed by TO's
Anticipated practice & attitude change (Observable changes that will illustrate and enable progress)	Greater desire to fish and operate commercially Community support for fishers Greater adoption of useful technology	Acceptance that un-viable facilities will fail and close down. Strong asset management Growing collaboration, Joint Ventures w' established supply chain businesses	Businesses at viable scale, incl multi species models, ice boats. Awareness of starting small & growing a business. TIB/ TVH / supply chain collaboration. Marketing nous.	Improved collaboration within and across communities TO's seeking leadership positions Regional fisheries governance performance is valued
Immediate activities and outputs (the next sequence of activities and outputs leading toward higher level goals)	In situ training (small business, fishing & processing, gear maintenance, sea safety) Knowledge hub established to support learning & practice Alignment of income support programs with Action Plan activities	Business plans for viable freezers and/or infrastructure developed Pre-requisites to viable larger scale freezers met Some uptake of viable smaller scale private freezers, ice machines. Safe food accreditation (domestic and/or export)	lower risk finfish and multi species fishing businesses (dinghy's, banana boats) Knowledge hub established Business models available Committed mentors identified Marketing strategy developed	Targeted support for proven performers. Committed mentors available. Community Fishers Associations supported (guidelines, mentors). Development of regional fisheries roles & strategic planning
Foundational inputs, activities (these are the building blocks of future finfish business success)	Funding to support FAP (incl finfish lease $, grants, loans) Some training underway (e.g. Erub fishing skills) TSRA initiates FAP project	Viable business models for freezers documented Pre-requisites for viable freezers identified, TSRA initiates FAP project, Funding to support FAP	Community consultation and skills audit, FAP funding, collaboration with TIB and ex-TVH fishers, Grass roots engagement to build business motivation	Community consultation, Capabilities and skills audit Explore governance needs and options, Funding to support FAP, TSRA initiates FAP project



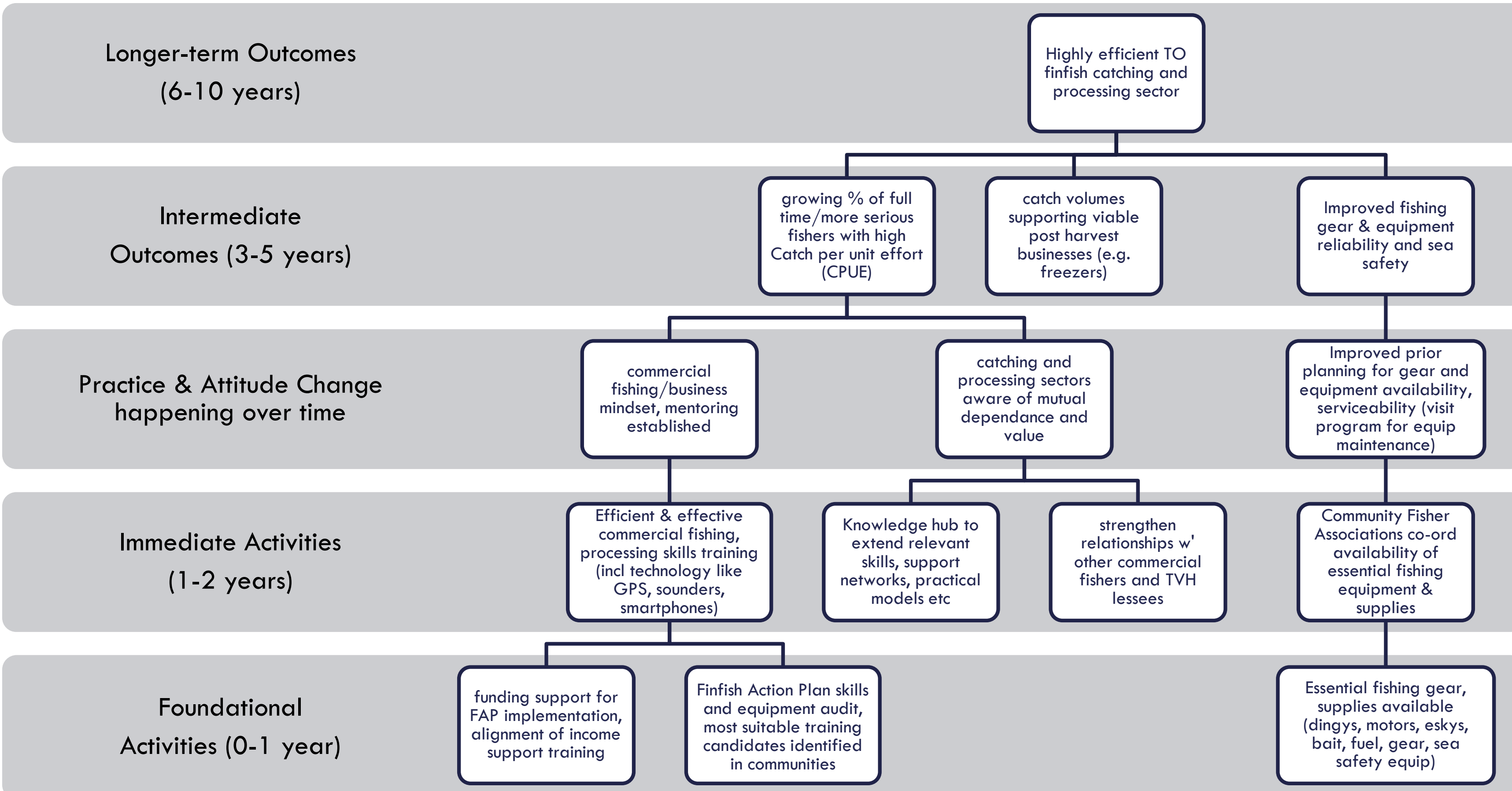


FIGURE 17: PROGRAM LOGIC FOR EFFECTIVE FINFISH FISHING & PROCESSING

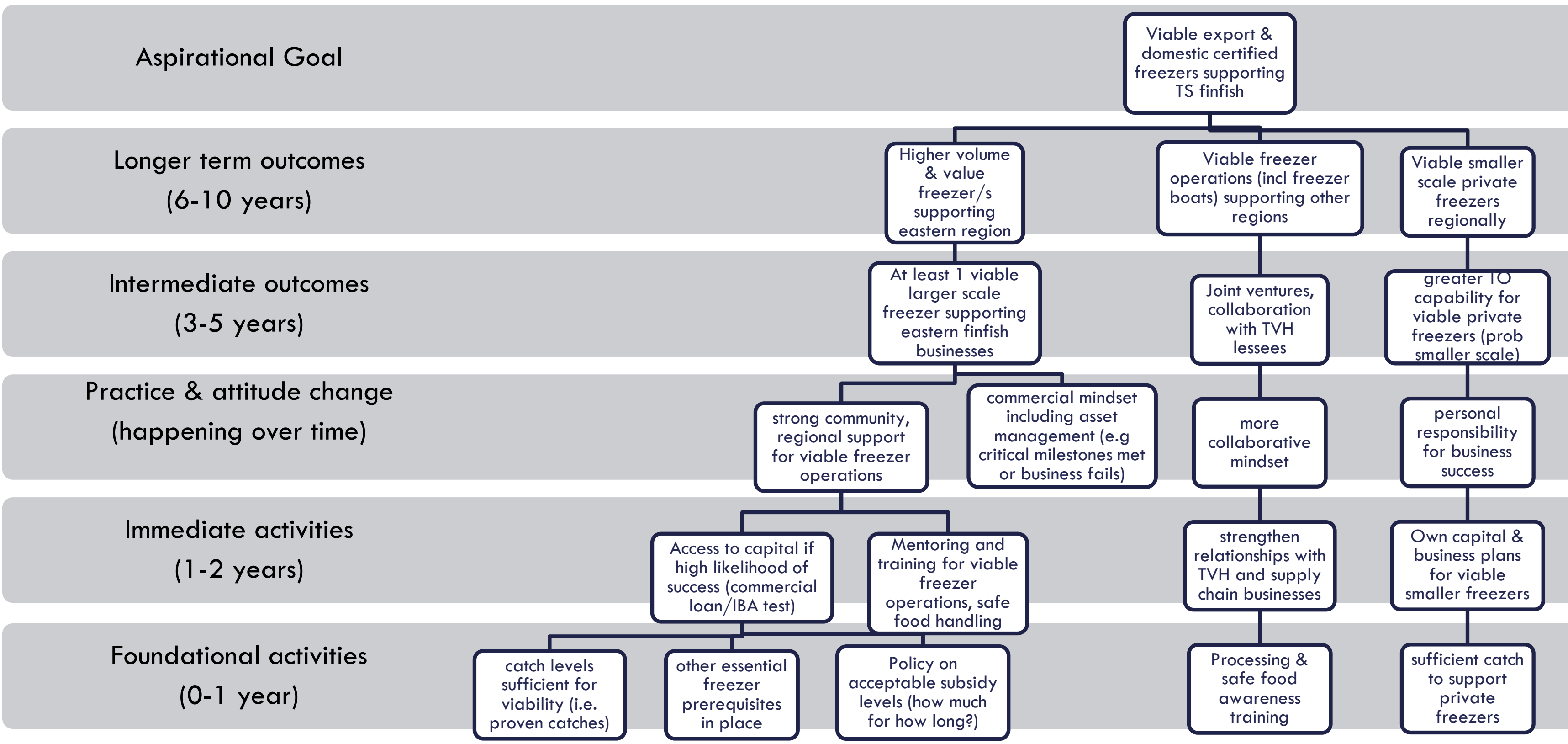


FIGURE 18: PROGRAM LOGIC FOR FREEZERS AND INFRASTRUCTURE

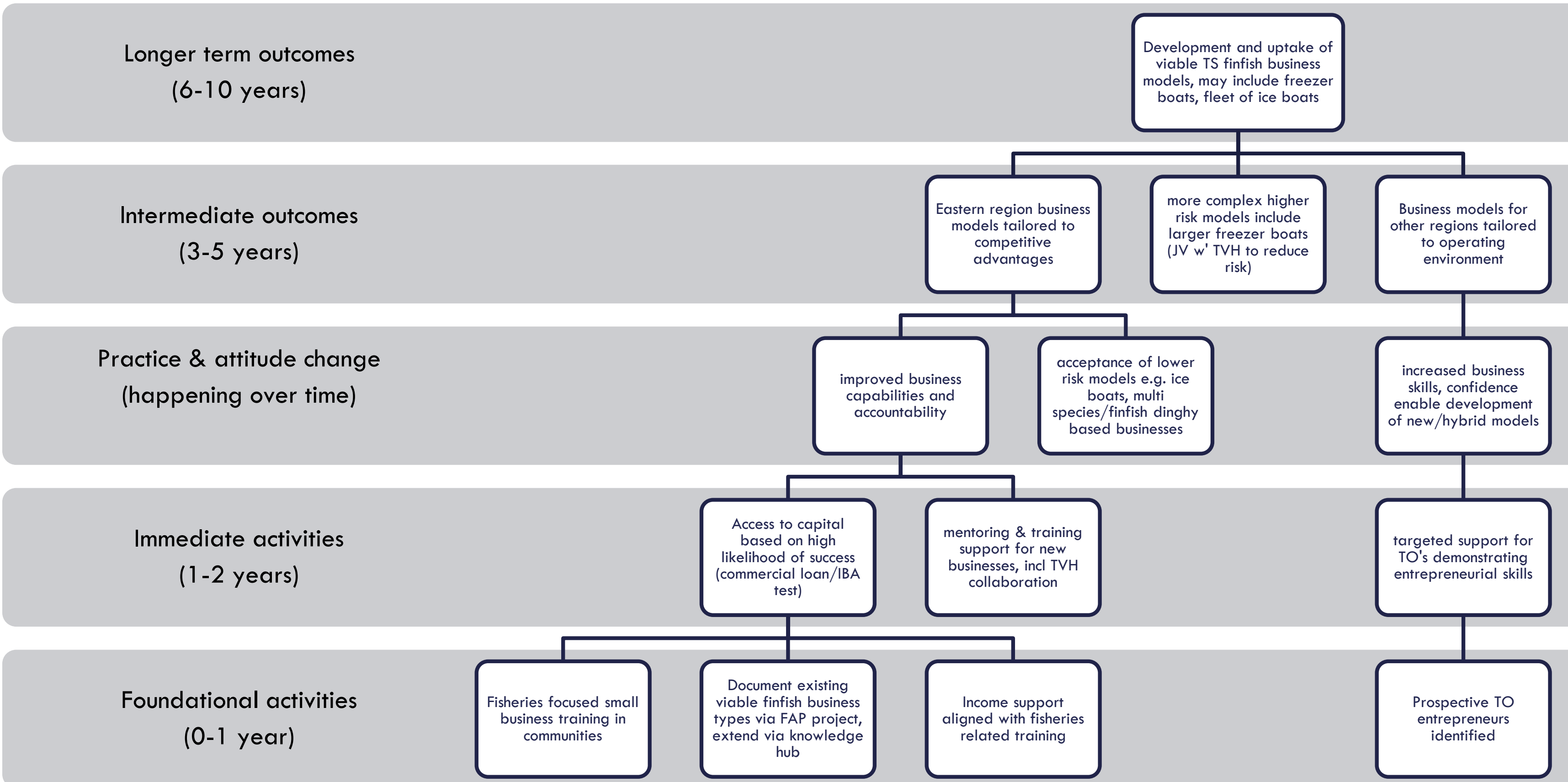


FIGURE 19: PROGRAM LOGIC FOR FINFISH BUSINESS MODELS

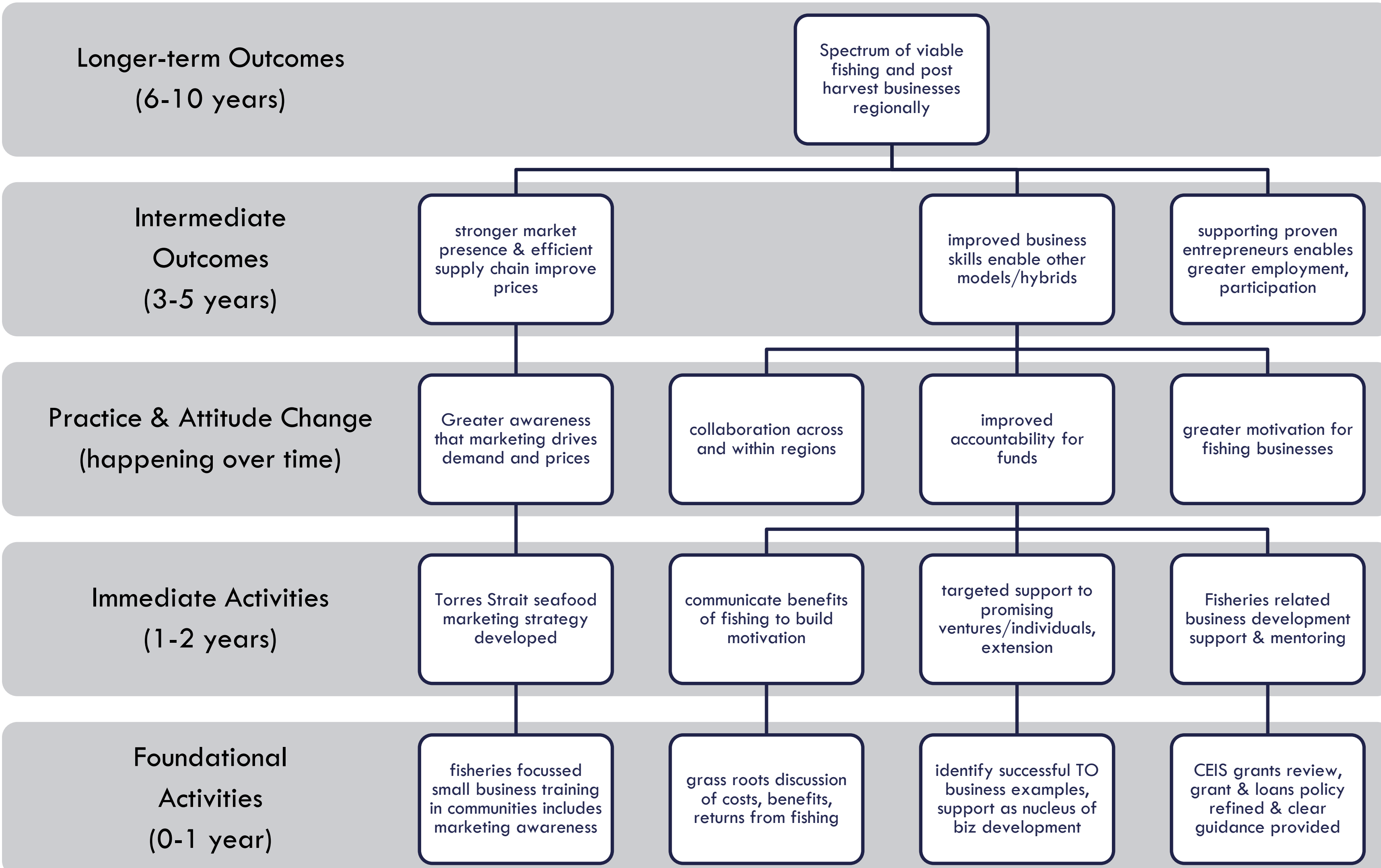


FIGURE 20: PROGRAM LOGIC FOR FINFISH BUSINESS SUPPORT

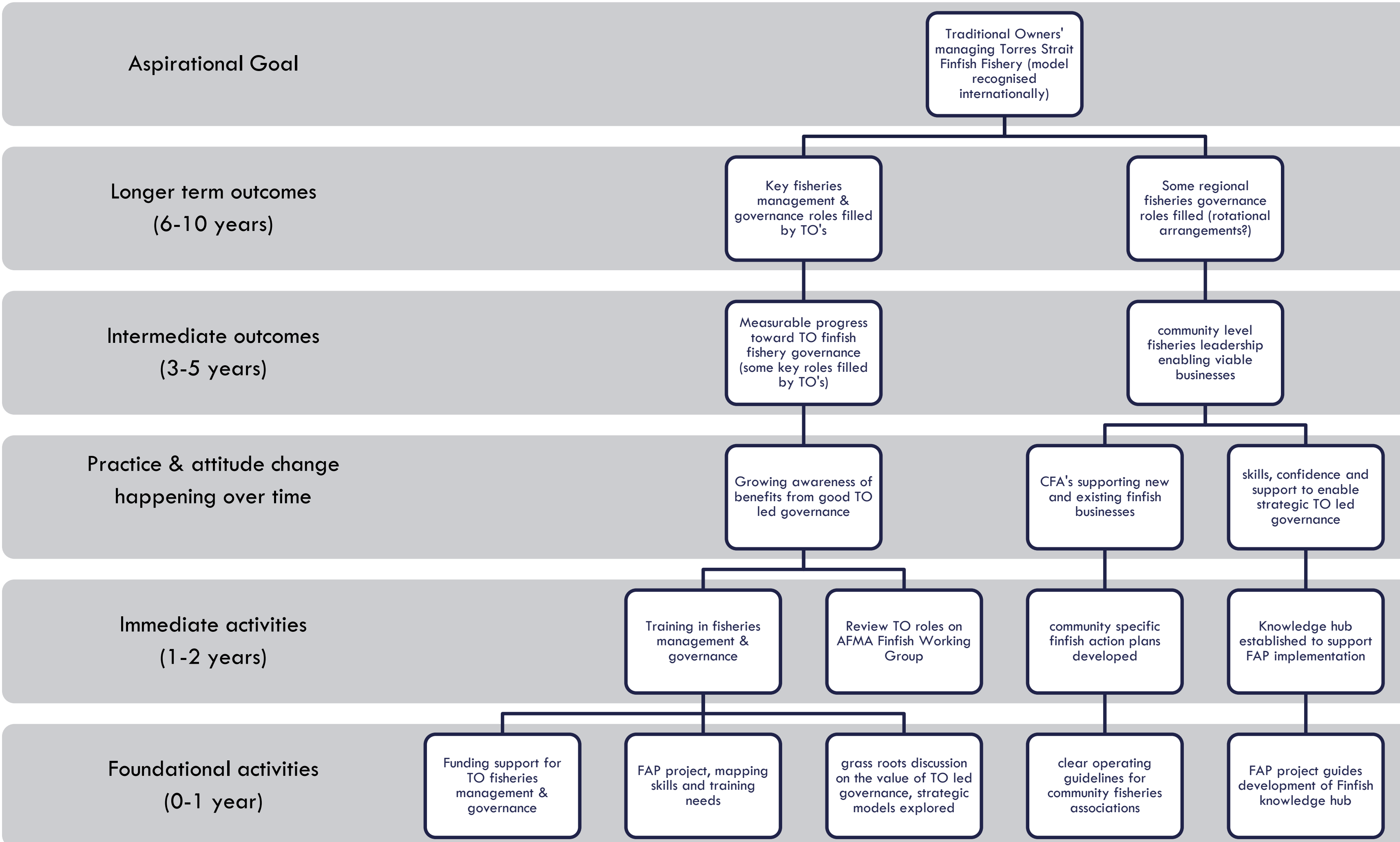


FIGURE 21: PROGRAM LOGIC FOR FINFISH & FISHERIES GOVERNANCE & LEADERSHIP

Applying the Program Logic – External Support

There are two broad scenarios for external support to enable progress toward the overall Finfish Action Plan goal of *Profitable and Sustainable Torres Strait Islander Finfish Businesses*. The chosen approach depends largely on the relative roles of government, Torres Strait Islanders themselves, and the commercial fishing industry (both TVH style lessees and supply chain businesses).

The level of explicit government support (e.g. human resources and funding for capacity building, income support aligned with fisheries development[10]), and the level of private fishing industry investment (including direct employment and training, and joint venture opportunities) will be key determinants of overall progress. These overarching finfish industry development options are described further below.

Option 1: Focused & Leveraged Fishing Industry & Supply Chain Development

This is the recommended approach and is consistent with both the design of the Finfish Action Plan Program Logic, and related TSRA and government strategic development plans for Torres Strait. The approach assumes substantial government investment guided by the FAP program logic structure, with substantial collaboration and leverage from related government agencies and related regional economic and fisheries development programs. Under this scenario TSRA and related fisheries management and economic development programs will actively engage with and manage investment programs and projects to position Torres Strait Islander businesses and communities for optimum benefits from a sustainably managed finfish fishery. This also reflects a high level of strategic alignment between tiers of government, TSRA, and other indigenous business development entities that seek to improve return on investment by leveraging off demonstrated entrepreneurial skills.

TSRA and its fisheries and economic development programs would also have a lead role in engaging support from other relevant government agencies and departments, and regional fisheries and supply chain businesses to help make this process efficient, including national R&D leverage where possible. This can augment limited investment resources whilst Torres Strait Islander businesses become more established. Managed well this approach is likely to deliver the best fisheries and economic development outcomes in the least time.

Option 2: Organic Fishing Industry and Supply Chain Development

Under this scenario TSRA leads implementation of the Finfish Action Plan alongside an efficient best practice ESD based finfish fishery management plan reflecting 100% Traditional ownership and desired regional economic development outcomes. This framework guides finfish development investment and activities. The emphasis is on Torres Strait Islander businesses and the broader regional seafood industry to use their resources efficiently to grow TS finfish fishery production and business opportunities more organically. Under this scenario the pace of change and the realization of aggregate benefits from 100% traditional ownership of the fishery would be slower. Explicit objectives would be developed more by industry than government. It could take many years to develop a cohesive and higher value catching and supply chain platform for the region.

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[10] Note that a fishing related activity conducted under an income support program triggers a range of important obligations associated with the regulatory framework for income support. These include appropriate insurance coverage for the activities, declaration of fishing related income, accountability for other benefits arising from the training activities etc.

COMMUNICATIONS PLAN

Stakeholder categorization & information requirements

Stakeholder category and role	Stakeholder Organization	Information Requirement
Key Stakeholders for project management Project sponsor/client	TSRA FRDC	**During project:** Clear understanding of the project approach, methods, risks, communications, and budgets. Progress updates on outputs and high level project management. Timely advice on significant project issues, risks or variations. **On Completion:** Endorsement of Milestone completion. Consideration and comment for outputs.
Key Stakeholders for FAP implementation Direct beneficiaries of the Finfish Action Plan (FAP)	TSRA, Community Fishers Associations, Fishers and prospective fishers. Regional seafood industry supply chain businesses, Torres Strait community leaders	**During project:** An understanding of the project approach and methodology via initial meetings and communications during the project. Project updates via project website and direct communication as required. Opportunity to contribute to findings and recommendations as required by client **On Completion:** Key literature and relevant reports made available centrally via project website (as a precursor to more targeted information extension via knowledge hub).
Primary Stakeholders PZJA Agencies, and others with a direct governance, financial or cultural interest in the TSFF (see next column) Torres Strait Media (Torres News)	QLD DAFF AFMA (Torres Strait Office, TSSAC, Finfish Working Group) PZJA, Malu Lamar Commercial fishing lessees for TSRA Finfish Sunset Licences FRDC Indigenous Fisheries Reference Group	**During project:** An understanding of the project approach and methodology via initial meetings and communications during the project. Project updates via project website and direct communication as required. Opportunity to contribute to findings and recommendations as required by client Key literature and relevant reports made available centrally via project website (as a precursor to more targeted information extension via knowledge hub). **On Completion:** Access to project findings and recommendations subject to client advice.

Communications plan – purpose and objectives

Communications Plan Purpose & Objectives

Finfish Action Plan stakeholders have been categorized above to enable targeted and efficient communications associated with FAP implementation. The primary purpose of communication supporting implementation of the Action Plan is to:

1. Efficiently provide relevant information to defined stakeholders to enable their understanding of the FAP, including objectives and the benefits for different stakeholder groups. This is intended to build their understanding of, and support for, the Action Plan.
2. Efficiently extend background information and more specific information and project knowledge/outputs to specific stakeholders to increase the effectiveness of the Action Plan and maintain stakeholder engagement over time.
3. Provide communications and supporting information in a way that is freely available to benefit all relevant parties, avoiding information being "locked up" by individuals, or within groups, committees (use information push and pull strategies)

Activity ID	**Information** *(what)*	**Stakeholders** *(who)*	**Timeframes** *(when)*	**Messages & Methods** *(how)*
1.1.	Project progress (status, deliverables, major issues or risks). Milestone reports.	Key	Ongoing	In person during consultation visits and related meetings. Also via email, phone and posted to FAP project website. Formal project milestone reports to FRDC in accordance with contract.
1.2.	Initial information about the project and project progress updates	Primary	Updates every 2 months throughout project.	All appropriate background information and regular progress updates posted to publicly accessible project web page. Articles prepared for Torres News (initial article, mid project update).
1.3.	FAP implementation progress updates - ongoing for life of FAP implementation (available to all stakeholders) (for primary and secondary	**Torres News**: update on FAP implementation progress and outcomes every 6 months. Purpose is to maintain interest and engagement of stakeholders, showcase progress and successes, build motivation for fishers and related businesses and build and maintain community support. **FAP Knowledge Hub** (including a FAP implementation website and Facebook page): monthly progress updates and finfish community building material to maintain engagement. Regular extension of practical information and resources to support and motivate existing and emerging finfish related businesses and community fishers associations. Include local examples, champions and case studies. **Info-graphic focused brochure**: a clear and simple brochure that summarises the purpose, key elements and desired outcomes of the FAP (approx. 4 pages). For wide distribution to communities to support initial FAP implementation. To be available via the FAP website and also distributed via TSRA, AFMA and the Community		

		Fishers Associations. Updated brochure to be prepared annually showcasing achievements and outcomes as FAP implementation progresses. **TSRA Fisheries Program Newsletter:** regular FAP update articles in each edition of the newsletter. Purpose is to maintain awareness and engagement with the FAP implementation program. Articles should showcase progress and outcomes and the benefits these are bringing to traditional inhabitants. Should also illustrate the program logic based structure of the action plan and the need to undertake foundational activities to build a viable platform for subsequent activities and investments. **Community Fishers Association meetings and informal networks:** CFA's should have an ongoing role in keeping their members up to date with FAP implementation and seeking member feedback on related issues, including barriers to implementation and/or refinements to the implementation approach. The Chair or a member of the CFA could act as a FAP implementation champion, or mentor as appropriate. **AFMA Finfish Fishery Working Group (FFWG)**: subject to discussion between TSRA and AFMA, there may be a role for AFMA's FFWG to assist with FAP related communications and engagement. Similarly a more strategic overarching approach to the development of Torres Strait fisheries industry development and governance may provide opportunities to integrate FAP implementation with broader capacity building, and develop leverage off these processes. **Torres Strait Community Radio:** community based FAP champions to provide regular community updates and listener Q&A sessions to seek community feedback, ideas and maintain community and fisher engagement with the FAP and its desired outcomes (approximately every 3-6 months). **FAP Facebook page:** Knowledge hub coordinator to initiate and provide oversight of a FAP implementation focused Facebook page. Community based FAP champions and community fishers' association members to take the lead on providing regular updates, chat, images etc supporting FAP implementation for their community. Activity from fishers and related business representatives should be encouraged to build a FAP implementation "community" and maintain engagement and community support networks.		
1.4.	Communication of FAP progress based on reporting from the monitoring & evaluation plan.	Key & Primary Stakeholders	Annually as part of formal progress reporting	Performance reporting based on Key Evaluation Questions from the FAP monitoring and evaluation plan. These evaluation questions are based on the activities and desired outcomes described in the FAP Program Logic. A plain English summary of FAP progress could be provided via the primary communications channels (e.g. Knowledge hub, FFWG meeting, TSRA fisheries newsletter etc).

MONITORING & EVALUATION PLAN

The monitoring and evaluation plan (M&E Plan) has been developed to enable cost effective and efficient evaluation of progress through the program logic based steps of the Action Plan. The M&E Plan is based on the Program Logic outcomes hierarchy and provides a comprehensive and relevant framework to assess progress against desired outcomes and overall FAP objectives. Evaluating performance according to the program logic structure will also enable refinement of lower level investment strategies and actions if these are not adequately contributing to the desired outcomes. The M&E Plan has been designed to operate on an annual basis.

Level in Program logic	Monitoring question	Suggested indicators	Does the indicator data exist?	Performance reporting (who, when?) [11]
Longer term outcomes				
Majority of sustainable TS Finfish harvest is taken and sold by traditional inhabitant businesses.	Are traditional inhabitants catching and marketing the majority (e.g. greater than 75%) of the sustainable harvest of TS finfish?	Annual catch information tied back to business ownership details	Subject to accurate and reliable catch reporting and business details (e.g. ORIC database or equivalent)	Annual fishery performance reporting
Highly efficient TO finfish catching and processing sector	Are operating costs and business performance broadly equivalent to other established commercial reef-line fisheries? Is Catch Per Unit Effort (CPUE) comparable to or higher than similar fisheries (noting that CPUE will also vary with catchability and stock abundance)	Standardized CPUE if available Time series of catch rate data using the best available catch & effort information	Some comparative and/or baseline data available from earlier research; catch monitoring projects underway	Annual fishery performance reporting
Higher volume & value freezer/s supporting eastern region; viable freezer operations supporting other regions (incl freezer boats and smaller scale private freezers)	Is there a higher volume viable freezer operating reliably to service eastern region finfish businesses? Are there viable freezers operating in other regions commensurate with the scale of local finfish businesses?	Freezer business performance (viability) Qualitative feedback from fishers and community leaders	Yes if freezer/s operating commercially Qualitative feedback to be initiated as part of annual performance reporting	Annual fishery performance reporting

[11] Where possible the FAP M&E Plan uses existing performance indicators and data to help assess the level of progress against desired outcomes. Performance reporting under this M&E Plan should be done annually. Should there be an overarching TS Fisheries strategic plan to guide effective development of TS fisheries under 100% traditional ownership then (for efficiency) the FAP M&E Plan and performance reporting against that could be integrated with that overarching process.

Level in Program logic	Monitoring question	Suggested indicators	Does the indicator data exist?	Performance reporting (who, when?) [11]
Development and uptake of viable TS finfish business models for catch and post-harvest (may include freezer boats, fleet of ice boats)	Is there a range of viable business models in operation (scale, throughput) tailored to the local operating environment?	Qualitative information on the nature of existing viable finfish related businesses Quantitative via regional employment statistics	Qualitative and quantitative feedback to be initiated as part of annual performance reporting	Annual fishery performance reporting
Traditional Owners' managing Torres Strait Finfish Fishery (model recognised internationally)	To what extent are traditional inhabitants responsible for managing the TSFF? How many traditional inhabitants are employed in fisheries management, governance or fisheries business development roles?	Qualitative via annual review, including feedback from established management committee/s (e.g. finfish working group) Quantitative via regional employment statistics	Performance framework to be developed as part of over-arching TS Fisheries Governance model	Performance reporting as part of development of future TS Fisheries governance arrangements
Intermediate outcomes				
growing % of full time/more serious fishers with increasing fishing efficiency	What is the percentage increase of more serious/full time fishers per community? Is CPUE and/or ratio of revenue to costs increasing over time?	Numbers of full time/more serious fishers (full time are not on income support, more serious are earning a greater % of income from finfish than previously)	Requires an annual survey of community fishing practices to be developed as part of annual reporting	Annual fishery performance reporting
catch volumes supporting viable post-harvest businesses (e.g. freezers)	Are finfish catch volumes from each community sufficient to maintain viable freezers and related businesses?	Annual catch reporting, annual business performance data	Subject to accurate and reliable catch reporting and business performance details	Annual fishery performance reporting
Improved fishing gear & equipment reliability and sea safety	Is reliability and availability of key fishing equipment improving? Is sea safety improving for finfish related fishing businesses?	Qualitative via formal feedback from fishers, Community Fishers Associations. Quantitative via AMSA reporting.	Qualitative feedback process to be initiated, AMSA regional sea safety data is compiled annually.	Annual fishery performance reporting

Level in Program logic	Monitoring question	Suggested indicators	Does the indicator data exist?	Performance reporting (who, when?) [11]
At least 1 viable larger scale freezer supporting eastern finfish businesses	Is there a viable larger scale freezer in operation for the eastern finfish region (subject to lenders policy on subsidy levels)	Business performance data; qualitative feedback from community fishers and leaders	Yes if freezer operating commercially. Qualitative feedback to be initiated as part of annual performance reporting	Annual fishery performance reporting
Sufficient private freezers operating viably to support existing fishing businesses	Are there smaller scale private freezers available to support catching businesses where needed?	Number of private, safe food accredited freezers operating in each community compared to current benchmark.	Qualitative and quantitative feedback to be initiated as part of annual performance reporting	Annual fishery performance reporting
more complex higher risk models include larger freezer boats (JV w' TVH to reduce risk)	Are more complex and/or higher value viable fishing businesses becoming established?	Qualitative data from community fishers associations and business owners. Turnover and other relevant business performance data.	Yes for viable businesses, qualitative data to be collected via annual fishery performance reporting	Annual fishery performance reporting
stronger market presence for finfish & efficient supply chain improve prices	Is the market position of TS sourced finfish strengthening? Is the average quality of TS sourced finfish products improving? To what extent are improved marketing and supply chain efficiencies contributing to improved prices?	Qualitative feedback on market position, and average quality of wet and processed product, price data for TS sourced finfish. Indicators to be developed as part of a finfish marketing strategy	Prices available via freezer operating data and via supply chain. Some private business data exists for smaller freezers.	Annual fishery performance reporting
supporting proven entrepreneurs enables greater employment and participation for traditional inhabitants	How well supported do self-starting/entrepreneurial businesses feel? To what extent are employment and other benefits being enabled by these businesses?	Business performance data; qualitative feedback from entrepreneurs and community fishers and leaders	Qualitative and quantitative feedback to be initiated as part of annual performance reporting	Annual fishery performance reporting
Measurable progress toward TO finfish fishery governance (some key roles filled by TO's)	To what extent have traditional inhabitant fisheries management and governance capability and outcomes improved?	Qualitative data from TSRA, AFMA. Quantitative data on employment participation	Qualitative feedback process to be initiated. Some quantitative data available via	Annual fishery and overall fisheries strategic plan performance reporting

Level in Program logic	Monitoring question	Suggested indicators	Does the indicator data exist?	Performance reporting (who, when?) [11]
	What is the nature of these improvements?		economic development progress reporting	
community level fisheries leadership enabling viable businesses	To what extent do traditional inhabitant finfish businesses feel supported by their Community Fishers Association (or equivalent supporting group)?	Qualitative data from community fishers associations and fishers/business owners.	Qualitative feedback process to be initiated as part of annual performance reporting.	Annual fishery and overall fisheries strategic plan performance reporting
Immediate outputs/activities				
Efficient & effective commercial fishing, processing skills training (incl technology like GPS, sounders, smartphones)	How many fishers have been trained in fishing skills and techniques? To what extent has this training improved their skills, confidence and motivation for commercial fishing?	Numbers trained from training project performance reporting Qualitative evaluation as part of training program	To be developed as part of the training package.	Training outcomes reporting and annual fishery performance reporting
Knowledge hub to extend relevant skills, support networks, practical models etc	Is an internet (webpage) and social media based (Facebook) knowledge hub in place? How useful is the knowledge hub in supporting business development and existing businesses?	Presence or absence of the knowledge hub Qualitative feedback from fishing related businesses, prospective fishers and community fishers associations	Qualitative and quantitative feedback to be initiated as part of annual performance reporting	Annual fishery and overall fisheries strategic plan performance reporting
Access to capital if high likelihood of success (commercial loan/IBA test), or own capital & business plans developed for viable smaller freezers	What % of finfish related loan applications meet IBA or equivalent commercial lending tests? How many of these have been approved for funding?	Proportion of successful TS Finfish related loan applications	Collated as part of ongoing IBA administration, should be available from commercial lenders	Annual fishery and overall fisheries strategic plan performance reporting
targeted support for TO's demonstrating entrepreneurial skills	To what extent are new and/or established finfish business entrepreneurs being supported to extend benefits more widely?	Qualitative feedback from finfish related business entrepreneurs, community fishers associations	Qualitative feedback to be initiated as part of annual performance reporting	Annual fishery and overall fisheries strategic plan performance reporting

Level in Program logic	Monitoring question	Suggested indicators	Does the indicator data exist?	Performance reporting (who, when?) [11]
Torres Strait seafood marketing strategy developed	Has a contemporary and appropriate TS seafood marketing strategy been developed?	Presence or absence, has the strategy been reviewed by experienced seafood marketing professionals that understand the TS operating environment?	Qualitative feedback to be initiated as part of annual performance reporting	Annual fishery and overall fisheries strategic plan performance reporting
Community specific finfish action plans developed	Do the primary eastern finfish communities (Erub, Mer, Ugar, and Masig) have a tailored finfish business development plan (or action plan)?	Presence or absence, and qualitative feedback from fishing related businesses, prospective fishers and community fishers associations	Qualitative feedback to be initiated as part of annual performance reporting	Annual fishery and overall fisheries strategic plan performance reporting
Training in fisheries management & governance, review TO roles on AFMA Finfish Working Group	To what extent has a training program, including practical placements/experience for TS fisheries and finfish related management been implemented	Presence or absence, and number of trainees or positions identified for placements	Qualitative feedback to be initiated as part of annual performance reporting	Annual fishery and overall fisheries strategic plan performance reporting
Foundational Inputs and activities				
Essential fishing gear and supplies available (dinghy's, motors, eskies, bait, fuel, gear, sea safety equip)	Is there adequate essential fishing gear and equipment to support the level of fishing underway, or that is very likely to occur?	Qualitative feedback from fishers and community fishers associations	Qualitative feedback to be initiated as part of annual performance reporting	Annual fishery and overall fisheries strategic plan performance reporting
Catch levels sufficient for freezer viability (i.e. proven catches). Other essential freezer pre-requisites in place.	For any planned freezer investment (particularly consideration of a larger scale freezer) has the community demonstrated the ability and willingness to catch enough fish to ensure ongoing freezer viability?	Recent catch records assessed against proposed freezer scale and throughput (informed by FAP and other freezer viability modelling).	Catch records are sporadic, some private records are available. Some data via Erub smartphone project.	Annual fishery and overall fisheries strategic plan performance reporting
CEIS grants review, grant & loans policy refined & clear guidance provided, to include guidance about acceptable subsidy levels for larger facilities/investments if required (how much for how long?)	Has clear guidance about how to apply for and construct a business loan application been provided to communities? Is there appropriate information available from funding sources about the level of subsidy that may be accepted until a facility becomes viable?	Presence or absence of such guidance (subject to lending requirements).	Qualitative feedback to be initiated as part of annual performance reporting	Annual fishery and overall fisheries strategic plan performance reporting

Level in Program logic	Monitoring question	Suggested indicators	Does the indicator data exist?	Performance reporting (who, when?) [11]
Finfish processing & safe food awareness training	Has fish processing and safe food awareness training been conducted? How many people have been trained for each community?	Qualitative and quantitative information about training	Qualitative feedback to be initiated as part of training package and annual performance reporting	Training organization and via annual fishery and overall fisheries strategic plan performance reporting
Fisheries focused small business training provided to selected fishers and the most prospective candidates in communities (includes marketing basics)	Has fisheries focused small business training to selected fishers and prospective fishers been provided?	Qualitative and quantitative information about training	Qualitative feedback to be initiated as part of training package and annual performance reporting	Training organization and via annual fishery and overall fisheries strategic plan performance reporting
Document existing viable finfish business types, particularly foundational level business types, via FAP project, extend via knowledge hub	Have viable business types and models been identified and documented, have they/will they be made available via the FAP knowledge hub.	Presence or absence of relevant business models in FAP report and knowledge hub.	Qualitative feedback to be initiated as part of annual performance reporting	Annual fishery and overall fisheries strategic plan performance reporting
grass roots discussion of costs, benefits, returns from fishing, including the value of TO led governance and fisheries management	To what extent has grass roots engagement of fishers and prospective fishers occurred to build motivation and confidence for fishing related business development and TO governance?	Number of community meetings held, presence or absence of communications and engagement material to support this activity	Qualitative feedback to be initiated as part of annual performance reporting	Annual fishery and overall fisheries strategic plan performance reporting
clear operating guidelines to support community fishers associations	Have clear and simple operating guidelines to support effective and efficient community fishers associations been developed and distributed?	Presence or absence of guidelines, qualitative and quantitative information about distribution and relevance of CFA guidelines	Qualitative feedback to be initiated as part of annual performance reporting	Annual fishery and overall fisheries strategic plan performance reporting
Funding support for FAP implementation, income support options aligned with fisheries related training	To what extent has funding been identified/provided to support FAP implementation? To what extent has income support training/funding been reconciled with finfish business development needs?	Funding allocations for FAP related program/project management, including funding leveraged from other relevant programs	Included in relevant program budget and approvals Available via income support program administration	Corporate performance reporting, annual reports Annual fishery and overall fisheries strategic plan performance reporting

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APPENDIX 1: COMMUNITY VISIT SUMMARY

TSRA Finfish Action Plan Project (FRDC 2014–240) Community Visits Summary

Purpose, scope and structure of community visits

Project visits to central and eastern Torres Strait communities were held over the period 9–19 March 2015, and later from 4–6 May. The visit schedule and all subsequent arrangements were made by TSRA staff and Cobalt MRM. Mr. Kenny Bedford (TSRA Portfolio Member for Fisheries and Member for Erub), Mariana Nahas (TSRA Project Manager Fisheries and Economic Development Program), and Andy Bodsworth (Director Cobalt MRM) conducted the visits. Opportunistic meetings were also held with key stakeholders on Thursday Island over this period; and by Andy Bodsworth in Cairns enroute Thursday Island and return. The final visit schedule was:

1. Poruma Island 9 March 2015
2. Erub Island 10–11 March 2015
3. Masig Island 12–13 March 2015
4. Iama Island 16–17 March 2015
5. Warraber Island 18–19 March 2015
6. Dauan Island 4 May 2015
7. Saibai Island 5 May 2015
8. Mer Island 6 May 2015
9. Ugar Island 25 May 2015 (meeting with community members in Cairns).

The main purpose of the consultation was to:

- Introduce the Finfish Action Plan (FAP) project and provide communities with an up to date understanding of the Torres Strait finfish fishery, including the nature of the fishery, its potential value to communities, and current processes to lease TSRA-held sunset licences back to commercial fishers;
- Conduct a capability/skills and infrastructure audit;
- Consult with Traditional Inhabitants about their aspirations and ideas, and drivers and barriers to participation in finfish fishing activities, and development of a more profitable and sustainable fishery under 100% Traditional ownership;
- Introduce the concept of a FAP Program Logic (a logical framework of investment and activities designed to enable progress over time toward greater finfish participation and benefits for TO communities).

Meetings were held in an informal conversational way, with participants typically seated in a semi-circle. All of the meetings were moderately well attended with between 10 and 20 participants.

The visit to Warraber Island coincided with fine weather and favourable tides for night hunting of cray. Most fishermen took advantage of this with few of them available for the meeting. Warraber community members and fishers took part in smaller group discussions with the project team.

Detailed draft records of each community meeting, and other one on one meetings over the period, have been prepared and circulated to community representatives and/or participants for their review and comment.

Meeting introductions & project overview

For each meeting TSRA Fisheries Portfolio member Mr. Kenny Bedford asked a suitable community representative to open the meeting with a prayer. Mr. Bedford requested Traditional Inhabitants from each community welcome participants to their country, and acknowledge community elders and leaders. He then thanked participants for the opportunity to visit and hold the meetings.

Mr Bedford then provided an overview of the purpose of the FAP project, the broader environment for fisheries in Torres Strait and the finfish fishery now under 100% traditional ownership. He emphasised the valuable opportunities this provided for TOs.

In his introductory overview for each meeting Mr. Bedford noted:

- Finfish fishery sunset licences and quota for coral trout and Spanish mackerel were now held in trust by the TSRA and leased annually to commercial fishers (including some experienced ex-TVH fishers).
- This process has resulted in approximately $1 million in lease revenue to date, of which around $500,000 remained for future investment in finfish related activities.
- Future investment should be done carefully and strategically to get the best possible value from the lease revenue; and an investment plan was needed. The FAP project was focused mainly on this strategic fishery development plan and guidance on investment priorities to increase TO participation and raise the success of finfish related businesses.
- Possible investment could be toward training, increasing business skills and support for new finfish related businesses, opening up markets and increasing TO presence across the finfish and broader Torres Strait fisheries supply chain.

Mr. Andy Bodsworth then introduced himself as an independent fisheries consultant working under contract to TSRA to deliver the FAP project. In his introductory comments Mr. Bodsworth noted:

- The current gap in catch value from the fishery (gross value of production) in years before 2007 was around $3.3 million and is currently around $1.1 million. That was a gap in the value of fish caught of around $2.2 million for the finfish fishery at catch levels considered sustainable;
- An offer to lease a licence may contain other aspects of value to TSRA/communities, and price alone may not be the only important component – for example, training in fishing may be highly valued by some communities. The fishery is valuable to TOs in other ways, such as culturally, or in the broader value of sustainability and environmental health. The project would also provide advice to TSRA about evaluating the value of lease offers made by commercial fishers.
- The idea of program logic or a series of steps that build on each other over time to get to an agreed goal (for example, a goal could be that Torres Strait mackerel is recognised

internationally as premium quality and sustainably caught fish). This series of activities and logical steps was the basis of a strategic investment plan referred to by Mr. Bedford.

- Prospects for a unique Torres Strait seafood brand; including factors that would help to build that brand, or could damage the brand if high quality standards and a consistent supply of fish were not maintained over time.

Ms. Nahas also introduced herself, providing a brief overview of the TSRA fisheries team, and program objectives.

Discussions during the meetings and responses to questions posed to participants are summarised below, grouped under subject / theme headings. A summary of skills, training, experience and assets relevant to greater TO finfish participation is being compiled and will be provided as an Annex to this visit summary.

Current scale of Indigenous involvement in finfish fishing

Finfish fishing in the Torres Strait communities visited reportedly ranged from very little targeted fishing (e.g. Poruma) to more established and commercially focused operations (e.g. Erub). Discussions included the different species of fish available to each community as well as seasons and conditions affecting this availability (e.g. species available to Dauan and Saibai TOs are different to those for the eastern communities but are still commercially valuable, and good eating fish).

Current finfish participation

The types or categories of finfish participation identified during meetings were:

- A small number of full time or close to full time fishers that earn all or most of their income from finfish fishing either for mackerel or coral trout, or both species and bycatch species taken in these sectors;
- Full time or close to full time fishers that earn all or most of their income from a combination of species but with a primary focus on more valuable fisheries like tropical rock lobster (TRL); with ancillary or opportunistic catches of finfish species and/or Beche de Mer (BDM);
- Part time fishers that earn up to half their income from fishing activities; with other income provided via government income support payments (currently *My Pathway*);
- People that fish primarily at weekends or at other times such as holidays, and/or when the weather is favourable; with fish used mainly for family and personal consumption.

Opportunities to increase participation

Meeting participants pointed to a number of barriers – lack of money, interest, confidence – that are holding back greater finfish fishing participation. They also identified a range of opportunities that could help increase Indigenous finfish fishing including:

- A training vessel, currently used for cray fishing at Poruma Island that might also be valuable for developing finfish skills;

- Motivated fishers working together and supporting each other as part of a 'fishing gang' in a community (as done at Erub Island to support the community freezer);
- Some communities (e.g. Masig Island) now have more fishermen actively working in cray and BDM fisheries. Now could be a good time to build on this activity and motivation via targeted investments to increase participation and initiate successful finfish related businesses;
- Potential to develop a Garfish fishery at Warraber Island to support fishers targeting mackerel throughout Torres Strait (noting that garfish are one of the most sought after mackerel baits, and can be difficult to source at a good price);
- Business models that focus on a mixture of fishing types, taking advantage of seasonal variations in finfish availability and recognising peak seasons for other valuable Torres Strait fisheries like TRL and BDM (e.g. more focus on finfish fishing around the central communities during the annual TRL closure).

Participants in the central communities (e.g. Iama and Warraber Islands) noted their focus on TRL; suggesting that training and targeted skills development to close the gap between more subsistence focused finfish activity and the more commercial and highly productive fishing techniques of the TVH finfish sector may be valuable.

A participant noted that for Ugar Island finfish were critically important, just as for other communities in the central and western areas crayfish resources are their most important fisheries. Ugar participants reported they have about five fishermen who are fishing at close to full time levels but that still rely on income from Community Development Employment Program (CDEP). They emphasised the importance and value of their traditional knowledge in relation to mackerel, including the movement of these fish with the weather and seasons. This was valuable knowledge and tied to the community's ownership of sea country resources.

Participants emphasised that there was lots of fishing expertise in the community, including the ability to run successful finfish fishing operations.

Similarly, people suggested there should be more opportunities to discuss finfish fishery related issues and capability development, including opportunities to use My Pathways training to support future finfish fishing.

Business types and needs

The most common finfish business type identified from the community consultations is a small scale, largely independent fishing operation. Fish are sold locally or used for personal and/or family use. Some people work in small family teams; such as husband and wife or father and sons.

Many fishers work part time, and some fish full time. Several of the younger fishers have transitioned from part time to more full time fishing; those that have made a successful transition have had some training in business planning or had an opportunity to work with a mentor.

The range of gear and equipment needed to establish and run a successful fishing business – training, fuel, boat and motor, equipment etc – was also discussed at the community meetings.

Business models

Participants spoke about different business models to encourage finfish fishing activity. They felt that the opportunity to choose the most suitable model was important. This might be a more entrepreneurial model (e.g. a joint venture arrangement similar to the Poruma Island Torres Blue arrangement with Independent Seafood Producers (ISP)); or a community, more cooperative model. People should have the information to help them choose the best approach depending on their circumstances and preferences.

In many cases, people thought a mixed fishing business model was the best approach; e.g. fish for cray during the season when prices were good, fish for mackerel when the cray season closed, and take BDM opportunistically.

People from Dauan Island also emphasised this mixed approach. Around 15 years previously Dauan fishers had operated a fishing boat around 15 metres long that had fished extensively in the area, mainly using gillnets for a range of species. Participants noted that because of their earlier fishing experience on the commercial vessel, they had good skills to undertake commercial finfish fishing. There were experienced coxswains on the island with good fishing and fish processing experience.

The previous vessel worked well; they sold blacktip shark trunks, mixed reef fish fillets, Barramundi fillets and operated with up to 9 crew. People generally enjoyed working on the boat and thought it was a successful fishing operation.

A Mer Island participant suggested their community needed a larger boat that could operate with local fishers on board, running out and fishing for a fortnight before coming in and changing crew; operating on a rotational basis. A participant mentioned the possibility of a mother ship style operation, where local fishers could fish to that master vessel. Smaller dinghies with smaller motors such as some already in the community could be used to support this operation. One mentioned a relative living on Thursday Island who had put in a business plan for a larger boat, and this had been approved, and the boat was now operating successfully. He asked why this was not the case for the Mer Island application for a vessel?

Several Mer Island participants referred to an earlier fisheries business plan that had been submitted to TSRA some years ago; they noted this plan had been prepared by a professional consultant with a lot of community input. They have not heard what has happened to the business plan, and did not want to repeat the process; they were sick and tired of the talk and the politics, and wanted action.

Combining income support payments with some income from fishing is a common approach in several communities. People also suggested some of the indigenous business models operating in New Zealand could be applied to fishing in Torres Strait, and this is currently being investigated by TSRA; as are models operating in Greenland for traditional fishing.

Business needs

Participants that have moved into full-time fishing agreed that business training was an important part of their ability to develop a successful fishing business. Some suggested local case studies, or examples, of successful local businesses would help others to overcome common barriers, and help provide the confidence and motivation for people to incrementally develop their own successful businesses.

Fishing on the weekend is an important opportunity for people and can significantly increase participation and catches; however a lack of fuel, gear, and bait at the time people can go fishing is a common barrier.

The immediate costs of fuel and fishing gear are stopping some people from fishing. Money to buy fuel and other supplies is needed, or management of fishing and/or other income (e.g. maintain cash-flow) is needed to overcome this initial cash shortage. For example, one young fisher mentioned that he goes fishing locally on the reef flat areas with a dragnet to catch some mixed fish to sell locally; and from the cash proceeds he is able to buy some fuel, collect some bait and go fishing for coral trout or mackerel that he can then sell to the community freezer.

People mentioned the importance of fishing for cray for many of the communities visited. Cray are a high value catch and also involve less processing and thus less cost. Cray are either supplied live for the best prices or as frozen tails. At Erub Island, finfish species and cray tails are handled by the freezer, and whole smaller coral trout and fillets are sold. Mackerel are received as trunks with heads off, and gutted; these are then filleted by the freezer staff and sold as fillets.

Mr Bedford noted that the quality and consistency of fish being sold to the freezers was critical to maintaining good prices and the reputation of Torres Strait finfish. One or two mistakes in supplying product for the freezers could mean that buyers sourced their fish from elsewhere and valuable markets for Torres Strait finfish could be lost.

Fishing-related activities/businesses along the supply chain

Participants mentioned the possibility of fishing related businesses to support fishing, which might include fishing tackle and boat/motor maintenance opportunities, looking after hookah gear etc.

Across the meetings there was considerable discussion about freezers, and their important role. One of the challenges is that a community freezer like the one on Erub Island is an additional component in the supply chain and this adds to costs. The freezer cannot afford to pay too much for its fish, because it has to be able to sell the fish at the price offered by buyers and still earn enough to cover operating costs.

Community freezers

People thought that simplifying the supply chain from fishers to the end buyers may help community freezers operate more cost effectively and enable them to continue to operate. Other points made about freezers include:

- A choice of freezers in a community (e.g. private and/or community focused) could be a good thing as it introduces competition and different options for buyers and sellers;
- Unlike crayfish, there were substantial processing costs for finfish for the freezer. Staff have to be paid to do the processing and unless there was a good amount of fish coming into the freezer the costs of processing and keeping staff could reduce profitability, and may mean the freezer is not viable;
- One fisher on Erub maintained his own small freezer, processed his own fish after catching them, and sold direct to other buyers. This worked well for him and his business has been operating successfully for many years;

- People thought the option of a portable freezer that could be used seasonally, or moved to take advantage of a good run of fish in an area, may be a good thing to trial. A large freezer may not be necessary, and getting secure access to land for a larger freezer site may be difficult;
- Participants at Yam Island felt that a freezer with a 5 tonne holding capacity and a 1 tonne snap freeze capacity would be about right with regard to product available and their barge schedules. The freezer could be a modular design, with more capacity added later if necessary. It was also very important to have an adequate processing area that could be easily kept clean to meet hygiene and safe food requirements; Key supply chain businesses (buyers) for Torres Strait fisheries were identified at the Poruma Island meeting as Pearl Island Seafoods, MG Kailis, and ISP.

Case Study – a seafood buyer on Saibai Island and his home based fishing operation

A local buyer on Saibai Island has a TIB licence under the amnesty arrangements, and a carrier boat and buyer endorsement. He is the main buyer on Saibai and sells product to Rebel marine on Thursday Island. He buys TRL and mud crabs mainly but also catches some fish and sells fillets locally – mainly barramundi and jewfish.

He was kind enough to show Mr. Bodsworth around his small home based buying operation. He uses 3 or 4 large chest freezers under his verandah on a concrete slab. They are approximately 900 litre capacity. A new one has recently been provided by Rebel Marine. Most of the product he buys and sells on to Rebel is TRL tails. He buys them for the same price that Rebel buys them and Rebel pay him a commission.

He and members of his family also fish for other species including various finfish and mud crabs, and some of the fish is filleted by him and sold locally. He has plenty of filleting experience. He is interested in getting some prices that people are willing to pay for jewfish, barramundi and mackerel fillets. He also mentioned that efforts are currently underway with the council to have a mobile freezer with snap capability set up on Saibai for broader community benefit.

Traditional Inhabitants' aspirations for the fishery

People noted the long history of fishing in the Torres Strait, and that it is an important aspect of the region's culture. Fishing also offers opportunities to build prosperity for island communities. Many of the people that took part in the community meetings would very much like to have, or be part of successful fishing businesses.

Participants thought that running a professional fishing business could provide opportunities to be more self-sufficient, allow them to re-invest into a business, buy a good car, take a holiday, or upgrade their fishing boat and motor. Others said that life in the island communities was quite relaxed, and not everyone wanted to work hard and go fishing all the time. Some would like more of a balance with a relaxed lifestyle and perhaps some additional money coming in from fishing.

Many believe that fishing activities and businesses can make a large and positive difference for the community. Some participants suggested that if young people in the community were actively and happily engaged in fishing activities and making money to support them and their families they were less likely to become involved in less positive activities (e.g. excessive alcohol, or harmful drugs)

Yam Island participants said that the community should be able to work together to support people developing their fisheries skills or new businesses, and help them through difficult periods. On Yam for example, there were several highly experienced fishermen living in the community that had worked previously in a range of other fisheries, including commercial mackerel fishing.

Dauan participants discussed prospects for fitting together a mix of species in different fisheries to help become viable full time fishers - cray in season; barramundi and jewfish during the dirty water time; Spanish mackerel and other species during clearer water at other times of the year. BDM were also available at some of the reefs in the area.

There was extensive discussion among Mer Island participants about TO aspirations and fishing. A participant emphasised the importance of the recent native title findings in relation to Torres Strait sea claims, and that these native title developments are a very positive step for the Mer community, and other Torres Strait TOs. One noted that around 80% of the productive finfish waters existed within Mer Island traditional sea country. He reiterated that those valuable fisheries resources must be fished by the community, so that the community would benefit from them.

Suggested investment priorities for money from the leaseback of finfish licences

A range of suggestions arose at the meetings as to how money raised from the leaseback of finfish sunset licences and catch quota should be invested.

Gear and equipment

Ideas about equipment such as dinghies, and best value for money, included:

- Upgrading and/or providing basic essential safety equipment for fishers such as PFDs and position locator beacons;
- Buy slightly smaller outboard motors (e.g. rather than a 60hp motor use a 30hp one). This could make a big difference in the initial cost while still providing much the same opportunity to catch fish;
- Similarly, new fishers could be provided with less valuable dinghies and smaller motors, so they could prove their commitment and fishing ability with less cost, and demonstrate they are willing to look after community fishing assets;
- If buying community dinghies, these should be provided to fishermen with a proven track record of fishing so the risk of them not participating is reduced;
- Ask the new fishers, or the local boys, for their ideas about how to go fishing for the least cost. For example, one boy might have an old aluminium dinghy that was still seaworthy but has no motor – perhaps his uncle has offered for the boy to use his outboard if he can get it repaired – and then community funding might be able to provide packages of safety equipment. This way the boy is using his ideas and seeing the benefit, and there is another person or two out fishing just for the price of the motor repair and the safety equipment;

- It is very important to get value for the money spent. One community had received welding training and learned to build dinghies – they had built three new dinghies which do not appear to be used, and had then bought two more expensive dinghies from a commercial supplier.
- Some participants suggested fishers may not need bigger boats as were used by previous TVH fishers; boats of 7–8 m that can carry 200–300kg of fish in a good esky may be adequate where fishing grounds are closer to communities and boats do not need to be at sea for extended periods;

Other investment ideas/comments

Other comments in relation to investment of leaseback funds, included lessons learned from investments thus far and using the funds in a careful way:

- Initiatives to increase finfish participation for the community were discussed at length around four years ago by Erub Fisheries Management Association (EFMA). It was agreed that 10 fisherman starter packages would be arranged, using money from the finfish licence leasing funds. Ten existing dinghies were purchased in response to 10 applications. These were made available as micro loans with repayments set at $300 per month and participants signed an agreement/contract to this effect. This initiative was less successful than hoped, with less than half of the recipients meeting their repayment commitments and/or other terms of the agreement;
- EFMA also arranged for a welder to come to the community to repair damaged aluminium dinghies. At a cost of $16,000, 28 dinghies were repaired in the 10 days that the welder was available. This was successful in terms of cost effective dinghy repairs and having these assets available for fishing although did not of itself increase actual fishing activity very much;
- Some suggested identifying key people in each community that have fishing-related skills or the motivation to start a successful business was a very important part of ensuring success for these type of initiatives;
- There is a need to update some of the existing community proposals to invest the finfish leasing funds currently available to those communities. The FAP project would provide valuable information, and lessons learned from other communities that could help communities decide on the best way to spend their funds;
- There was a robust discussion about the value obtained from investments on Erub Island; a participant suggested these initiatives were largely failures and had thus made it more difficult for other communities to obtain funding for finfish related initiatives. Participants generally agreed there had been some hard but valuable lessons learned by people at Erub in relation to their finfish related activities and investments. These lessons can help other communities obtain better value by not making similar mistakes, or help them better understand and manage risks in advance;
- It was very important that the money from the finfish licenses was invested carefully in areas where My Pathways or alternative funding sources were not available. There was an opportunity to use funding from different programs to complement the money available from leasing of the sunset licences;

- As well as the more motivated or full-time fishermen, training should be provided to weekend fishermen as well. They also had the ability to support the community freezer by catching fish on the weekends and selling to the freezer;
- Hiring a manager for a community freezer, or using funding support to bring in skills that are not available in the community;
- Many participants noted the advantages in starting small finfish operations initially. Providing an opportunity for people to prove themselves and their commitment to fishing, or to looking after community provided equipment.

Some participants relayed broader community concerns that the funds available for finfish development from leasing out the sunset licences were being spread too thinly across the region. For example, some communities in parts of Torres Strait are more reliant on, and get direct and flow on benefits from participation in the TRL fishery, or from BDM.

The area and resources relevant to particular sea claims were also important. Traditional Inhabitants of a certain sea claim area should be able to benefit from the resources in that area. If money is spread too thinly, the investment will be less effective in developing the unique resources found in a particular area.

At the Mer Island meeting participants talked about the finfish license leasing arrangements and suggested those fish should be caught by TOs. Mr Bedford suggested leasing that catch out to commercial fishers until TOs were ready to fish for themselves and benefit directly was a valuable interim arrangement.

A participant mentioned three fibreglass dinghies with motors and trailers that had been purchased from the finfish leasing money provided to Mer Island. He also noted that those dinghies had not been used, and that community members needed to participate in fishing to generate benefits. He asked how decisions to share income from the finfish leasing arrangements would be made; how would this money be allocated fairly noting that TOs from Mer Island, Darnley Island, and others in the eastern region were the custodians of those sea-country resources?

Ugar Island participants emphasised that the finfish lease money should not be spread too thinly amongst all of the Torres Strait communities. The focus should be on the eastern communities to develop as a hub of finfish activity. Participants emphasised that transparency in how the finfish lease money is spent is very important. If there is not a high level of transparency, people across the different communities won’t trust each other. They noted that the TSRA Board discussion about how the finfish lease money should be allocated across the region was very important. They strongly believed that the benefits from finfish should go to the region where the fisheries were most important and where most of the activity historically (and currently) was occurring.

The Blue Mist fishing vessel purchased by Erub Island Fisheries Association

The EFMA has initiated a range of activities and investments to improve participation in finfish fishing. More recently it held detailed discussions about options to invest $70,000 of funds from the finfish trust. The group agreed that they needed a larger boat rather than 2 fully outfitted dinghies as suggested. A suitable boat was located and purchased after considerable searching (the boat was called *Blue Mist*).

The *Blue Mist* was steamed to Erub from Cooktown by a local skipper and crew and moored at Erub Island. The EFMA had a roster to take care of and routinely check the boat whilst at anchor/moored. It appears the vessel had some leaks which were manageable as long as the automatic bilge pump was serviceable; however something happened to the bilge pump/generator and the boat sank. The following points (and lessons) were mentioned in relation to the EFMA's *Blue Mist* experience:

- During initial discussions about how to best invest available finfish lease money there was lots of interest and enthusiasm from local and prospective fishers about having a vessel like the *Blue Mist*. Several people said they would take the boat fishing and around 20 people from Erub had recently completed coxswain's training;
- The opportunity for a larger boat and the subsequent successful journey of the boat back to Erub was a real milestone in the development of the EFMA, and potentially for Erub based fishing operations, it generated a lot of enthusiasm in the community;
- Despite many people expressing their interest initially, there was a lot of reluctance for any one person to take responsibility to skipper the boat and actually take it fishing; this might reflect a lack of confidence and experience (despite recent coxswain's training) to take the boat fishing;
- Someone observed that people are often happy to go fishing with someone else who takes responsibility for the boat and any fishing associated risks;
- Confidence and experience appear to be major factors stopping people from having a go at fishing. There are now generations of people in some communities with very little if any practical experience of boating and fishing.

Infrastructure / processes that can be improved to increase participation

Community meetings identified many ideas and opportunities that may increase participation in finfish fishing. As outlined above, several meetings discussed the topic of freezers for communities in detail, noting:

- Freezers must be the appropriate size. Don't over-invest in a larger freezer, but also don't under-invest. If the Finfish Action Plan is successful it is important that a freezer can support the amount of product being taken and hold enough until the barge is available to take product to Cairns or Thursday Island;
- A backup freezer is important; this may be a snap as well as a storage area, so that if one part of the freezer breaks down the other part can be used until repairs can be made. This backup could also be made available by having several private freezers, as well as a community freezer;
- People discussed the option of a mobile freezer that could be brought on the barge and plugged in ready to go; it could be relocated to other communities to meet demand, or if better use could be made of it. Perhaps design it to be located on a trailer and built with highly corrosion resistant materials, including plumbing fittings that could be easily connected to fresh and saltwater for processing and cleaning (similar to the mobile desalination unit on a trailer at Warraber Island);
- Some communities have several members with extensive experience managing freezers and processing fish. These people could play a very important role in teaching others the skills and knowledge needed to run a community freezer successfully;

- Participants on Yam Island reiterated the critical importance of the community having access to its own freezer so that it was not reliant on the existing commercial freezer run by Pearl Island Seafoods. Several participants also said that the private freezer had provided very little if any community benefits, despite the owner suggesting it would;
- Like Ugar island participants, those at the Saibai meeting raised the idea of a regional hub for finfish operations – if there was not enough fishing in any one place to support a freezer then have a small freezer on Saibai that fishers from Dauan could also sell too. Dauan might have people that were skilled at repairing fibreglass dinghies, and a fishing tackle shop;
- Funding support for a freezer was a critically important for Ugar Island TOs, as they have a good business plan but need the funding to support it. They noted that their previous applications for funding had not been approved, and this was holding up development. They also recognise that if they want to get things moving they will need to do it themselves.

Other points mentioned were:

- One way to increase participation is to provide easy access to a buyer. For example, where there is no freezer, a larger fishing boat with a freezer on board could take fish. When the fishing vessel *New Providence* was located off Ugar Island there was an increase in catches in that area;
- Skilled people or skills located within a cluster of communities (e.g. an outboard motor mechanic in one community, fibreglass repair skills in another) was a way to cost effectively maintain key fishing support skills and assets and equipment;
- Planning for intended fishing operations is very important. For example, in the black teat fish trial, communities were provided with salt, containers and training in advance of the opening, which meant they were ready to process product as they caught it and get a better price;
- People at the Saibai meeting discussed simple ways to get people out fishing at low cost, including: using existing dinghies and outboards; providing good quality eskies; and ensuring ice and fuel were available to fishers when needed, e.g. when tides and weather conditions were suitable;
- A Mer island participant emphasised the importance of good administration, stating that there were people with the necessary practical fishing skills in the Mer Island community; but that the administration was very important. The ideas had to come from the community from the ground up not top–down;

Minimising additional costs on commercial fishers leasing the TSRA-held finfish licences

People generally agreed it was important not to impose additional costs on commercial fishermen that were leasing the finfish licences and quota. Several people said that the money available from leasing out the licenses and quota in the finfish fishery was a blessing. This money could be reinvested to help TOs learn and develop their finfish businesses. It was important to recognise the benefits that the commercial fishers leasing the licenses would bring to the communities.

TSRA noted there had only been one applicant to fish 35 tonnes of coral trout quota. This lack of competition could affect the price offered. There was also a risk that not enough fishing meant that markets and skills may decline. A benefit of having a smaller number of fishers may be that communities are more accepting of those fishing operations.

A participant at the Ugar island meeting suggested that a 30 foot commercial fishing boat with a freezer on board would be a good platform to support fisheries development in the eastern region. This boat could train and employ crew from different communities and give them opportunities to learn everything about a fishing operation including how to skipper a vessel. The commercial fishers leasing licenses could help with this training, and the transition to a TO fishing vessel.

Constraints on greater Traditional Inhabitant involvement in finfish fishing; and possible solutions

Some of the identified challenges for development of finfish related businesses were common across the region; for example, the need for community freezers, and the capabilities and support to keep them running.

Identified constraints

- People lacking confidence and experience to start up and run their own fishing business was a constraint noted in most meetings. This related to both setting up and running a fishing business, and actual involvement in fishing activities. Some suggested it may be a fear of failure stopping people from getting started, and it was suggested people need to step up and take a risk to be successful in their new fishing ventures. It was recognised that these sort of barriers to new business activities are common across Australia;
- A Dauan participant mentioned that one of the barriers to more fishing – particularly areas away from the island, is that it is very expensive to get accommodation; and also difficult to stay with family or relatives on other islands for any length of time. Participants from Dauan Island also noted the problems sometimes caused by runoff from the Fly River nearby in PNG that had poisoned some areas;
- Participants in several communities noted the challenges with communication and collaboration between fishermen and Community Fishermen's Associations. These were delaying progress on initiatives that could increase finfish participation;
- One of the Community Fishermen's Associations had already developed a plan to invest funds available from the lease money. This plan had now been stalled for several years; and was holding back fishermen from developing their fishing operations;
- Having enough money to buy fuel to go fishing is difficult for some people. Some participants reported periodic problems with the fuel supply and sometimes the credit card auto payment system not working for several weeks at a time;
- Mer Island participants discussed why fishing wasn't taking place. Land available for the freezer site had been an issue that was now solved, and start-up capital was not available and had delayed progress. Other blockages included disagreements and politics at the community level. People had not heard back from TSRA about why their application for fisheries business funding had not been successful;
- Ugar Island participants emphasised that gaining access to an operational freezer was the most important priority, and that everything was on hold until the freezer was up and running;
- One of the barriers to the development of Ugar Island fisheries is the lack of deep-water access to the island, the proposed dredging operation to make this channel is very important. Another barrier was that sometimes TOs in their communities don't work together for broader benefit. An example is efforts to develop a collaborative fisheries model for the eastern

communities – there needs to be agreement about who undertakes and leads the main activities to support this aspiration.

Identified solutions

In response to discussion about constraints on participation, a number of solutions were suggested:

- People agreed that examples of actual finfish businesses, with costs and revenues, would be helpful to understand what is involved. For example, information about how much fish they need to catch to break even, or make a profit. Fishermen needed to understand how much they had to catch to cover their costs and then make a profit;
- Some suggested the Community Fishermen's Association should be there to actively support the fishermen and their ideas, and this would increase participation;
- Ugar participants noted the importance of the eastern region working together to develop finfish fishing businesses to support their region;
- Dauan participants suggested a 24hr fuel credit card system was important. At other meetings people thought that the current fuel bowser system for several communities where they accessed fuel via their credit card generally worked well;
- For communities without a freezer the benefits of a small freezer to make ice was suggested, or an ice machine that could provide ice for people's eskies' so that they could go fishing and keep their fish in good condition. For example, this would enable fishermen to fish productive areas between Masig and Erub, and then sell fish to the Erub freezer. This could be a very cost effective way to increase fishing. There may also be a need to upgrade some people's esky so that they could keep fishing throughout the day, keep plenty of ice, and provide high-quality fish at the end of their trip.
- The prospect of catching garfish for bait for mackerel fishermen operating in Torres Strait was discussed at the Dauan meeting, and the need to talk with these fishermen to find out exactly what sort of garfish would be most valuable and how they should be packed to be of most use;
- A participant suggested that government needed to develop good policy support for TOs working in fishing, and to support their fishing industry development;
- A participant emphasised the importance of people in the community taking action themselves, and not blaming other people for the lack of progress, or expecting too much to be done by government. He said that it was very important that those who had done recent training could use those fisheries skills before they were forgotten.

A Mer Island participant suggested a study examining the value of catch available in the traditional waters of the community. Once the value of this resource was known the community might choose to lease them to traditional fishers from other communities. Several participants noted that this would be the next development in terms of native title ownership of sea country resources in Torres Strait. It was suggested work needed to be undertaken to clarify and define the boundaries of sea country belonging to each community. This approach is similar to that taken by indigenous communities in the areas of mainland Australia, for example where mining royalties are paid to the TOs of land where the mining occurs. Participants agreed that these were critically important issues, and their importance was growing. They noted that the agreement for 10 nautical mile exclusion zones around communities was reached before the more recent native title sea claim decision.

Finfish related skills and training

Comments about skills and training that arose at the community meetings focused on issues such as My Pathways, skills development and business training.

My Pathways/income support related training

A participant said that training such as that offered through My Pathways is a valuable opportunity, but that it should focus more on employment opportunities in the communities. For example there are great opportunities to build successful fishing businesses on Islands like Masig – someone said "We have a goldmine right here, we just have to open the door."

People felt it was important to help trainees transition away from My Pathways, and to identify as fishermen. People agreed that My Pathways provided important opportunities for training, but that progression to more practical activities was important so that people had the confidence to start their own businesses.

Mr. Bedford mentioned the advantages of having a cluster approach to skills and capabilities that could support fishing. He noted that two Masig Island fishers had recently been trained in fish processing skills in Tasmania under the My Pathways program. Perhaps they could build on this opportunity by working with the Erub freezer team practicing the skills they had learned and supporting the freezer operation.

The training being arranged for Erub would be suitable for Mer Island fishers also. My Pathways are going to investigate this opportunity.

Business and other training

Everyone agreed that business training was very important, and was a blockage stopping people from fishing. Business training should be provided in the communities and focused on aspects relevant to fishing businesses.

People at the Yam meeting also emphasised the importance of business training, and the prospect of husband-and-wife fishing businesses, with a husband fishing and his wife or partner looking after the financial aspects of the business.

A participant explained the challenges of having to leave the community to undertake professional training. This is very difficult to do this because the cost of living is very high and people can't afford to take too much time away from their work.

There was also interest in learning how to use fishing technology to improve catches, including equipment such as depth sounders and GPS units. Fishing training is being arranged for Erub fishers and this may also be valuable for other communities. People agree that this type of practical training could help fishers fish more effectively and increase their catch rates.

Saibai Island participants asked about who are the right people to train their TO fishers, and how to select these people. They noted that some community fishers have experience working on commercial mackerel boats in the Gulf and elsewhere, particularly catching and filleting.

Mer Island participants identified the following training ideas that could increase fishing by TOs:

- skills in using GPS and sounders

- how to anchor correctly to maximize coral trout catch
- business training, including information about marketing of catch, cash flow management, start-up costs, and how to access other funding loans and grants.

APPENDIX 2: FINFISH BUSINESS MODELLING SCENARIOS AND KEY ASSUMPTIONS

Cost model details - 1 dinghy

The core operational expenses have been derived from Fairhead & Hohnen (2007), with costs increased by effective CPI (2006 to 2015) of 10%, with fuel cost increase of 15% to reflect fuel price changes. Fairhead & Hohnen detailed costs were derived from surveys completed by fishers in the 2004-5 and 2005-06 fishing seasons. While surveys did include 5 completed by TIB fishers (of 31 active licensees), the averages show that the completed surveys were from the most active fishers, those catching the largest weight of mackerel each year. 12 islander fishers accounted for 70% of the total TIB catch (p7) with many catching very small amounts (e.g. 50 sold under 100kg of mackerel in the year). Only 3 TIB fishers were catching 3000kg or more (p8) in a year. So while the cost structures in the table below are based on detailed data captured from TIB fishers, the numbers are biased towards those of the small number of fishers catching larger volumes.

The base modelling scenario was 1 fisher, 1 dinghy fishing 50 days per year and catching an average of 30kg of mackerel per day for an annual total of 1,500kg.

The modelling showed high sensitivity to sale price, as the boat cash income became negative with prices under $9.50/kg. A typical price paid by freezers (the most common point of sale for single person operations) for mackerel barrels (head off, guts removed, tail on) in 2015 was $6.50/kg. Most TIB fishers sell mackerel in this form as they do not have the facilities to sell fillets to other buyers. The fillet price is higher at around $13/kg, but each kilogram of fillet equates to 1.6kg of wet fish, which brings the effective fillet price down to $8.12/kg of whole wet mackerel.

Another determinant of profitability is the value and ownership of the boat and other equipment. To keep the modelling on a consistent basis it was based on a cost of $30,000 for dinghy and equipment, with depreciation of this at 10% per annum over 10 years (ie replacement every 10 years). The cost of borrowing this amount has also been included through a loan over 10 years at 7% to buy this equipment was also factored in, not because each TIB fisher would have borrowed this amount to finance their operation, but to ensure a level playing field for each model and comparable assessments of the business case for each scale of operation. The loan servicing (principal and interest repaid over 10 years) is shown separately to make it clear how much this cost would impact on profitability. Many TIB fishers would not have borrowed this amount, in which case their breakeven point would be at a lower sale price. It is likely that most TIB fishers would treat their boat and equipment as a resource to be used and would not intuitively include the depreciation 'cost' or loan 'cost' in their figuring of the profitability of their fishing activities.

The cost models are presented for three TIB fisher operational scales to look for economies of scale and to identify the profitable scales of operations:

- Single person singly dinghy 50 fishing days
- Single person single dingy 90 fishing days
- Two boats and two people with 90 fishing days each

Economies of scale may be achieved with increased fishing effort.

Almost doubling the fishing days from 50 to 90 and a consequential annual catch of 3 tonnes/year helps distribute the relatively fixed costs across higher returns. Overall, if 3 tonnes can be caught in 90 fishing days the annual boat business profit increases.

4 fold catch increase – 6 tonnes/year

Two boats operating a total of 90 days a year and catching a total of 6 tonnes provides further economies of scale, even with wages ($15,000 per annum) paid to one fisher.

10 fold catch increase – 15 tonnes/year

Scaling up this model to 15 tonnes/year reflects the average TVH income and expenditure pattern identified.

For each scale model results are presented at 4 different fish sale prices:

- $6.5/kg (mackerel barrels freezer price
- $8.125/kg (effective whole fish price for $13/kg fillets
- $10/kg (average sale price in 2005-06 for this scale of fishing
- $13/kg (fillet price applied to whole fish).

Boat Cash Income is income from fish sales (volume x price/kg) less costs.

Boat Business Profit is Boat Cash Income less depreciation (to factor in equipment replacement costs over 10 years).

Boat Business Profit less loan cost shows commercial viability of model once investment (loan costs) are included.

The following table sets out our 'standardised' cost structure for a TIB fisher with their own equipment. We recognise that individual fishers will have their own costs which are either over or under this standardised cost structure, which will reflect their fishing history (equipment and skills) and the places they fish. The figures are based on those presented in the AEC report in 2009, with interest and repayments amended to reflect current commercial interest rates and other cash costs increased by 10% to account for price inflation since that time. Balancing the variations in annual costs across individuals, the table below is believed to be both realistic and representative, and has been used as the foundation of the scenarios set out below. The figure of around $10,500 for annual ownership cost (based on boat and equipment purchased via a loan) is broadly accepted.

Annual ownership costs

	2009 AEC p48 ($)	Ownership cost 2015 ($)
Interest & repayments[1]	4,000	4,176
Repairs & maintenance[2]	1,500	1,650
Depreciation (boat & motor) [3]	2,000	3,000
Licenses & registration	150	165
Insurance	350	385
Sundry expenses	1,000	1,100
	9,000	10,476

Notes: 1 based on loan for boat, motor and equipment of $30,000 at 7% per annum over 10 years

2 Estimated on 10 year asset life

3 Straight line method on $30,000 value over 10 years

Single person single dinghy 50 days and 1500kg/year

	2015
Fuel	5973.1
Wages	101.2
Freezer charges	0
Admin	525.8
Bait	907.5
Freight	0
Gear	1664.3
Licence/wharfage	146.3
Repairs	2754.4
Travel	721.6
Other costs	1005.4

	13799.6

Trip length	1 day
Fishing days	50
Catch (t)	1.5
Catch/day (kg)	30
Catch value $	12187.5
$/kg	8.125
Boat cash income	-1612.1
less depreciation	3000
boat business profit	-4612.1
loan	4176
Post loan profit	-8788

Main assumptions:

Around $100/trip for fuel

$30,000 boat/gear loan over 10yrs at 7%pa and 10% depreciation per year over 10 years

Quota $1/kg

Single person single dinghy 90 days and 3000kg/year

This model shows some economies of scale in running costs, and is at the upper end of what TIB fishers are catching each year.

	2015
Fuel	8959.65
Wages	202.4
Freezer charges	0
Admin	525.8
Bait	1361.25
Freight	0

Gear	2496.45
Licence/wharfage	146.3
Repairs	4131.6
Travel	1082.4
Other costs	1508.1
	20413.95

Trip length	1 day
Fishing days	90
Catch/day (kg)	33
Catch (t)	3
Catch value $	24375
$/kg	8.125
Boat cash income	3961.05
less depreciation	3000
boat business profit	961.05
loan	4176
Post loan profit	-3215

Two dinghies, two people (one paid $15,000 per year), 90 fishing days each

	2015
Fuel	11946.2
Wages	15000
Freezer charges	0
Admin	2103.2
Bait	2722.5
Freight	0
Gear	2496.45

Licence/wharfage	585.2
Repairs	5508.8
Travel	721.6
Other costs	1005.4
	42089.35

Trip length	1 day
Fishing days	180
Catch/day (kg)	33
Catch (t)	6
Catch value $	48750
$/kg	8.125
Boat cash income	6660.65
less depreciation	6000
boat business profit	660.65
loan	8352
Post loan profit	-7692

Cost model TVH boat

Fuel	15000
Wages	30000
Freezer charges	0
Admin	478
Bait	4950
Freight	0
Gear	4539
Licence/wharfage	133
Repairs	10016

Travel	1968
Other costs	2742
	69826
Trip length	3 days
Catch (t)	15
Catch value $	121875
$/kg	8.125
Boat cash income	52049
less depreciation	10000
boat business profit	42049
loan	14000
Post loan profit	28,049

Main assumptions:

Catch 15t/yr

$100,000 boat/gear loan over 10 years at 7%pa and 10% depreciation per year over 10 years

3 day trips at $300/trip x 60 trips/annum

Note that the post loan boat business profit is close to that nominated by one of the TVH fishers interviewed who said he needs to make a profit of $20,000 to make the trip worthwhile.

Ice boat

Using the cost model developed by AEC in 2009 and updating costs to 2015 shows the cost/income stream for an ice boat setup catching 20 tonnes per year. Cost of ice boat estimated at $100,000.

Ice boats	2015
Freight	
Interest & repayments	14000
Repairs & maintenance	5500
Depreciation (boat & motor)	10000

Licenses & registration	550
Insurance	5500
Sundry expenses	5500
Processing/packaging	0
Provisions	11000
Wages	82500
Fuel $300/trip * 60	20700
Trip length	3 days
Catch (t)	20
Catch/trip (kg)	333
Catch value $	162500
$/kg	8.125
Boat cash income	7250
less depreciation	10000
boat business profit	-2750
loan	14000
Post loan profit	-16750
Quota	20000

Freezer boat

Using the cost model developed by AEC in 2009 and updating costs to 2015 shows the cost/income stream for a freezer boat setup catching 40 tonnes of mackerel per year. Cost of freezer boat estimated at $350,000.

	2015
Accreditation	300
Freight	13200
Interest	49000
R&M	5500
Depreciation	35000
Licenses and reg	550
Insurance	13200
Misc Exp	11000
Processing/packaging	5500
Provision	5500
Wages	82500
Fuel $400/trip * 20	9200
	230450
Catch (t)	40
Catch value $	325000
$/kg	8.125
Boat cash income	94550
less depreciation	35000
boat business profit	59550
Capital	49000
Post loan profit	10550
Quota	40000

TORRES STRAIT FINFISH WORKING GROUP	Meeting 2016.1 12-13 July 2016
Finfish Fishery Action Plan	**Agenda Item No. 7.1** **For Noting**

RECOMMENDATIONS

That the Working Group:

1. **NOTE** the Finfish Fishery Action Plan

KEY ISSUES

Following limited success from past grant funding released from the revenue generated by the leasing of licences in the Torres Strait Finfish Fishery, the Finfish Quota Management Committee (a committee of the TSRA Board), requested that the TSRA engage a consultant to prepare an investment strategy for the revenue funds through an action plan for the fishery.

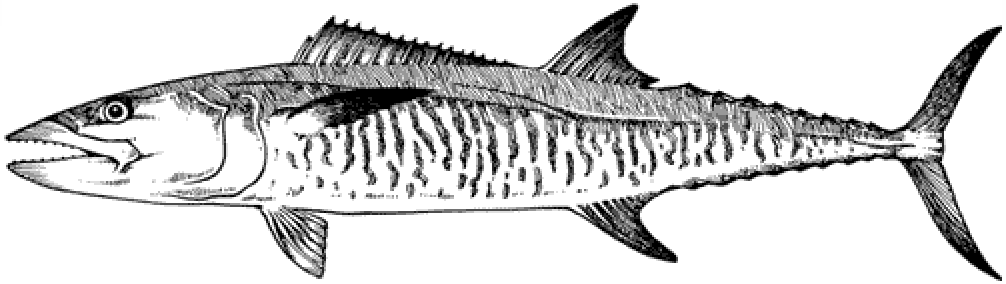
The TSRA worked in collaboration with FRDC on this project and engaged Cobalt NRM (Andy Bodsworth) to develop the Action Plan.

DISCUSSION

The Finfish Fishery Action Plan was developed to help guide the TSRA Board in the investment of revenue generated through the leasing of licences in the Finfish Fishery as well as other potential investment the TSRA may make towards the development of this fishery.

Attachments

Finfish Fishery Action Plan



Scomberomorus commerson

Torres Strait Spanish mackerel

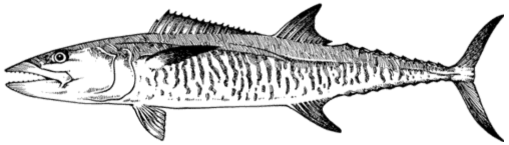
Stock assessment II, 2015

Torres Strait AFMA Project Number: RR2014/0823

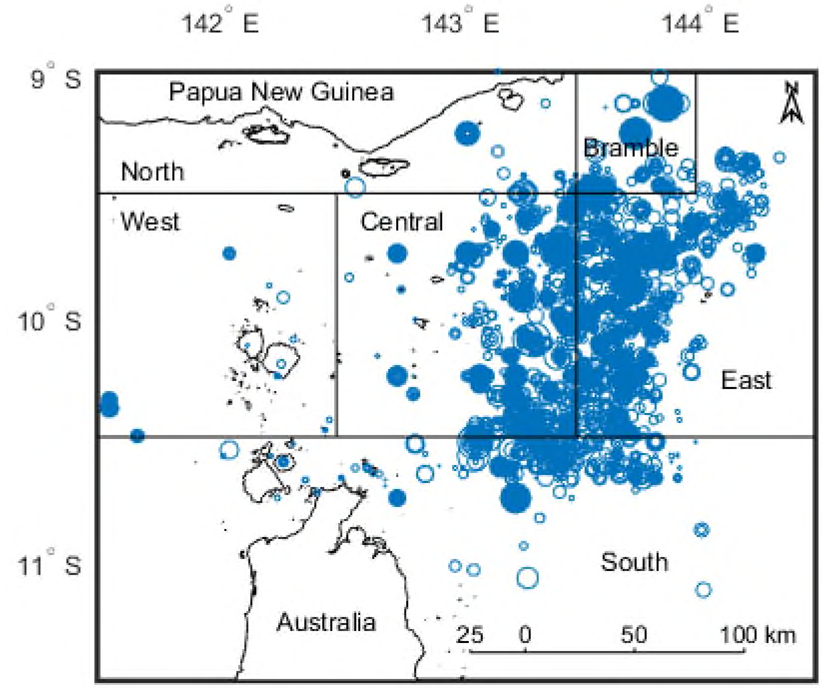
Update of stock assessment I published in 2006.

JCU/DAF

Queensland Government



Methods

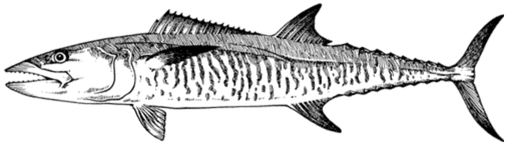


Data

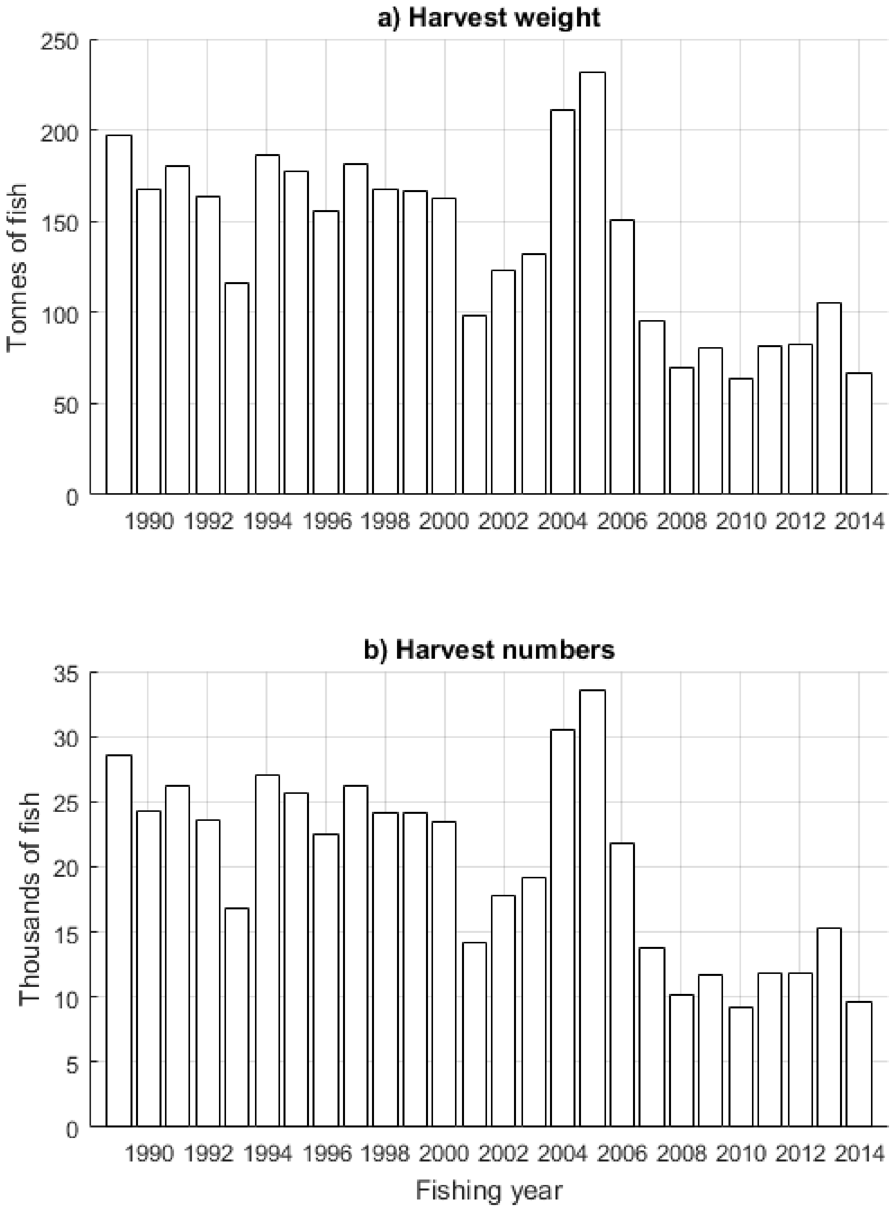
- AFMA compulsory logbook
- AFMA docket book records
- Winds and lunar phases
- Fish age-length 2000-02

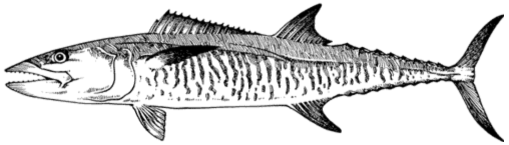
Analyses

- Generalised linear models for standardised catch rates
- Age-structured stock model for population dynamics

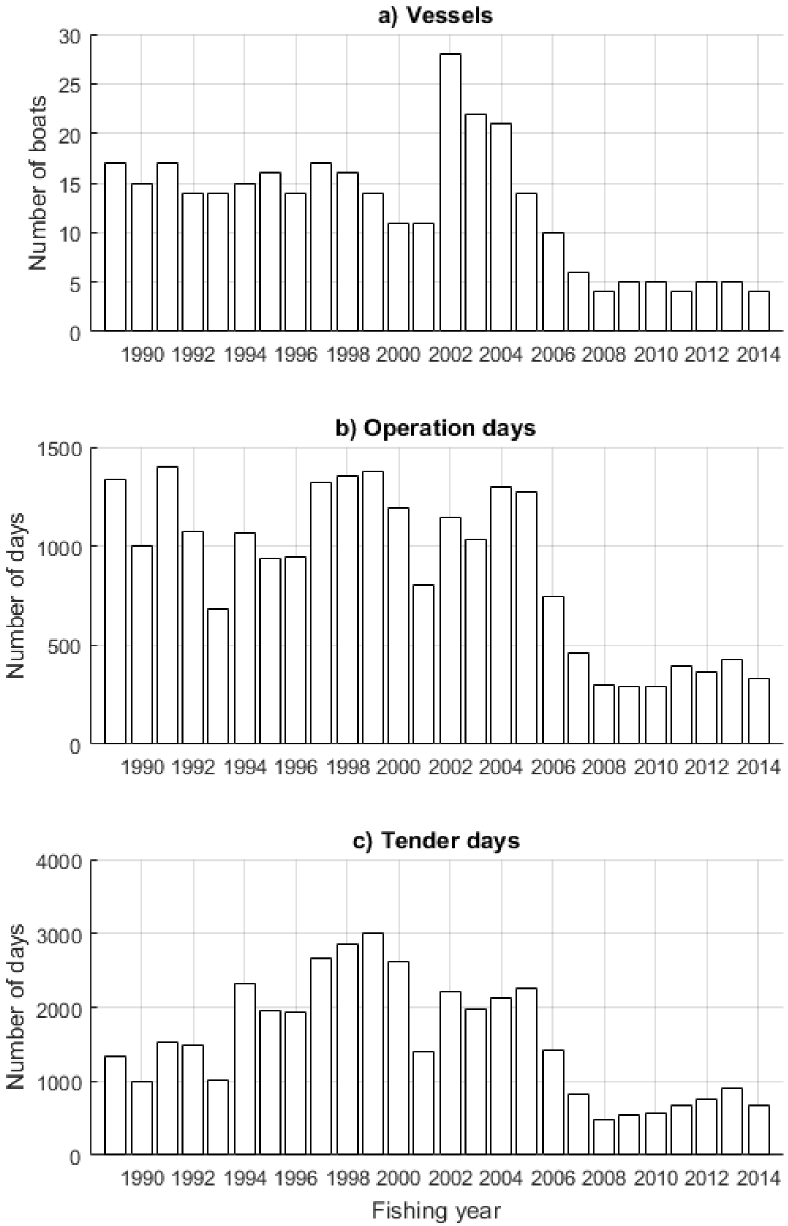


Harvest data

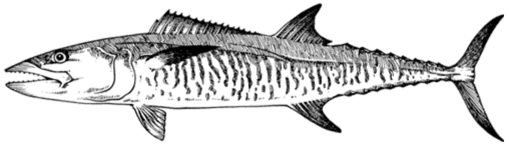


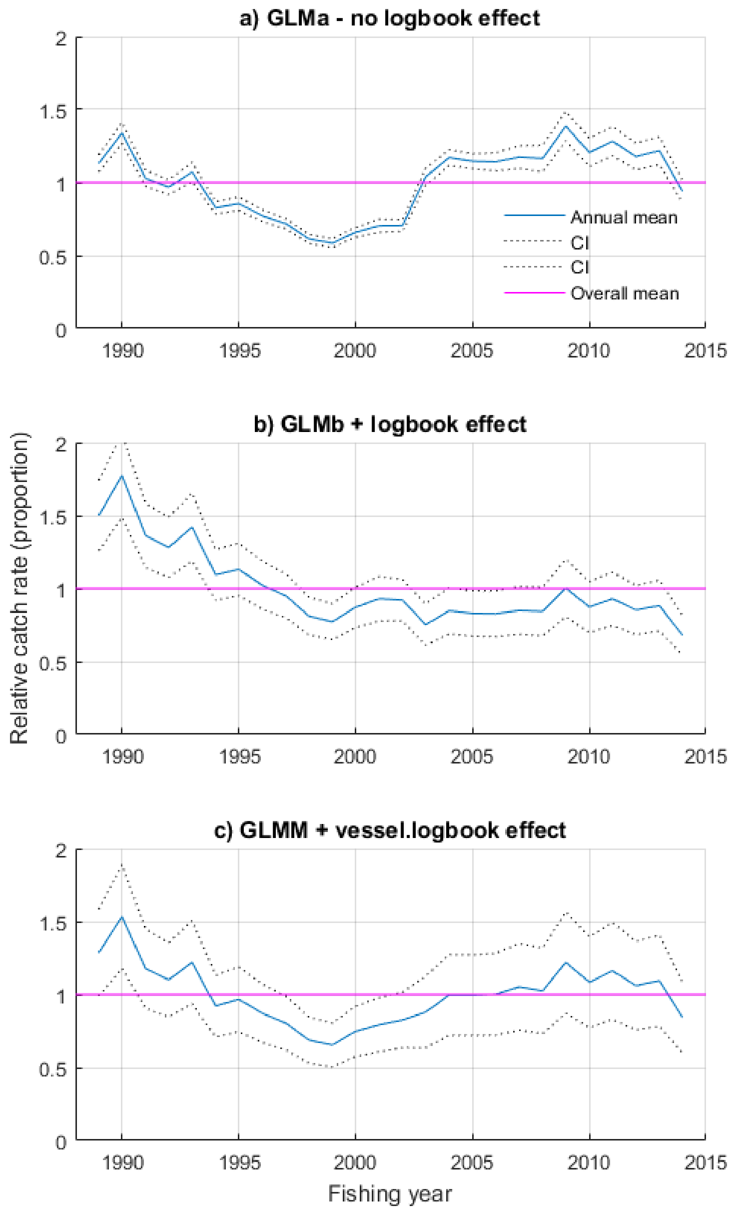


Effort data

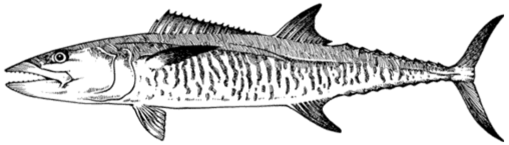

a) Vessels
Number of boats
b) Operation days
Number of days
c) Tender days
Number of days
Fishing year
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014

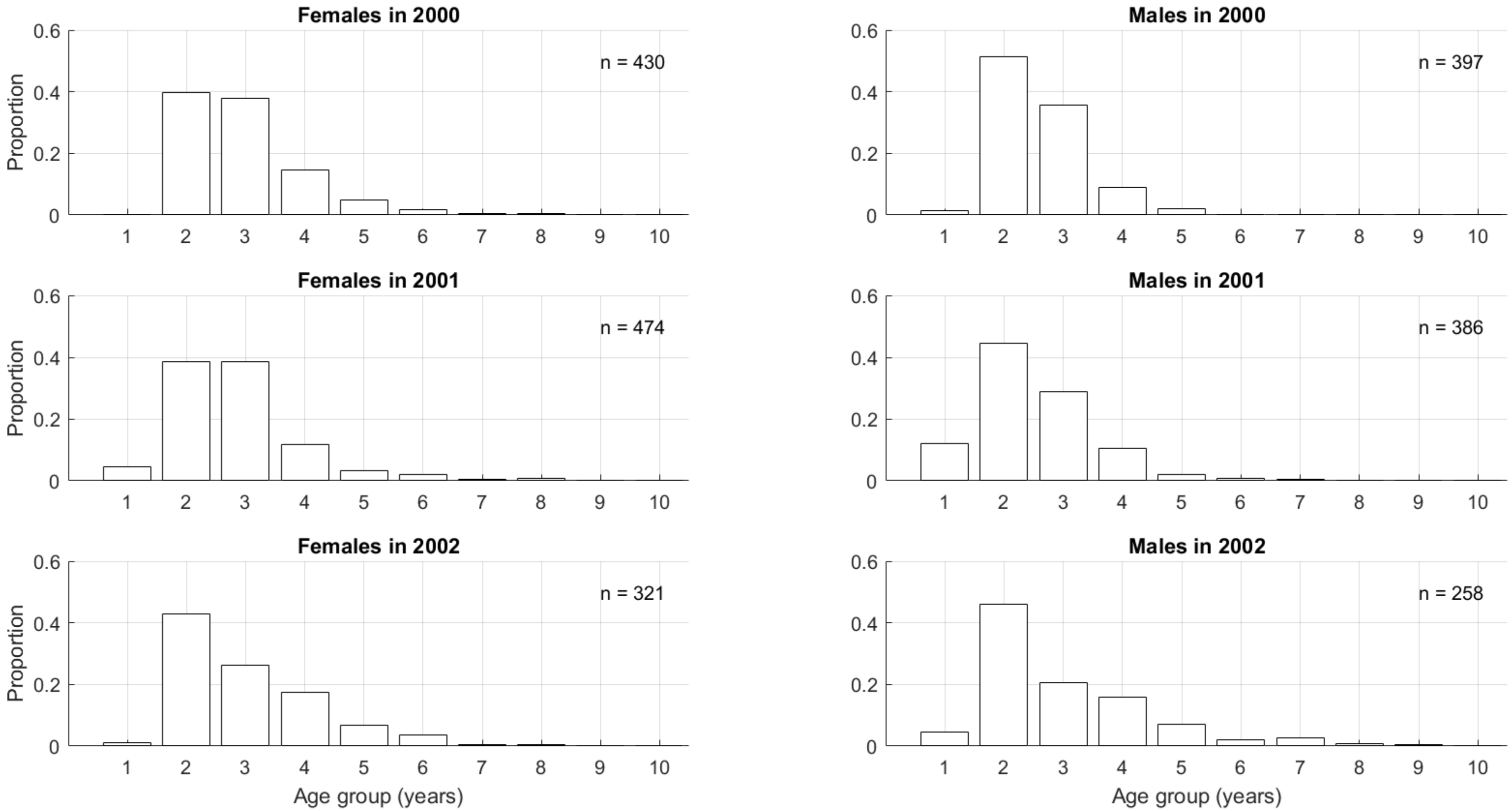
Standardised catch rates



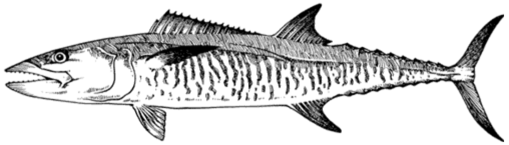


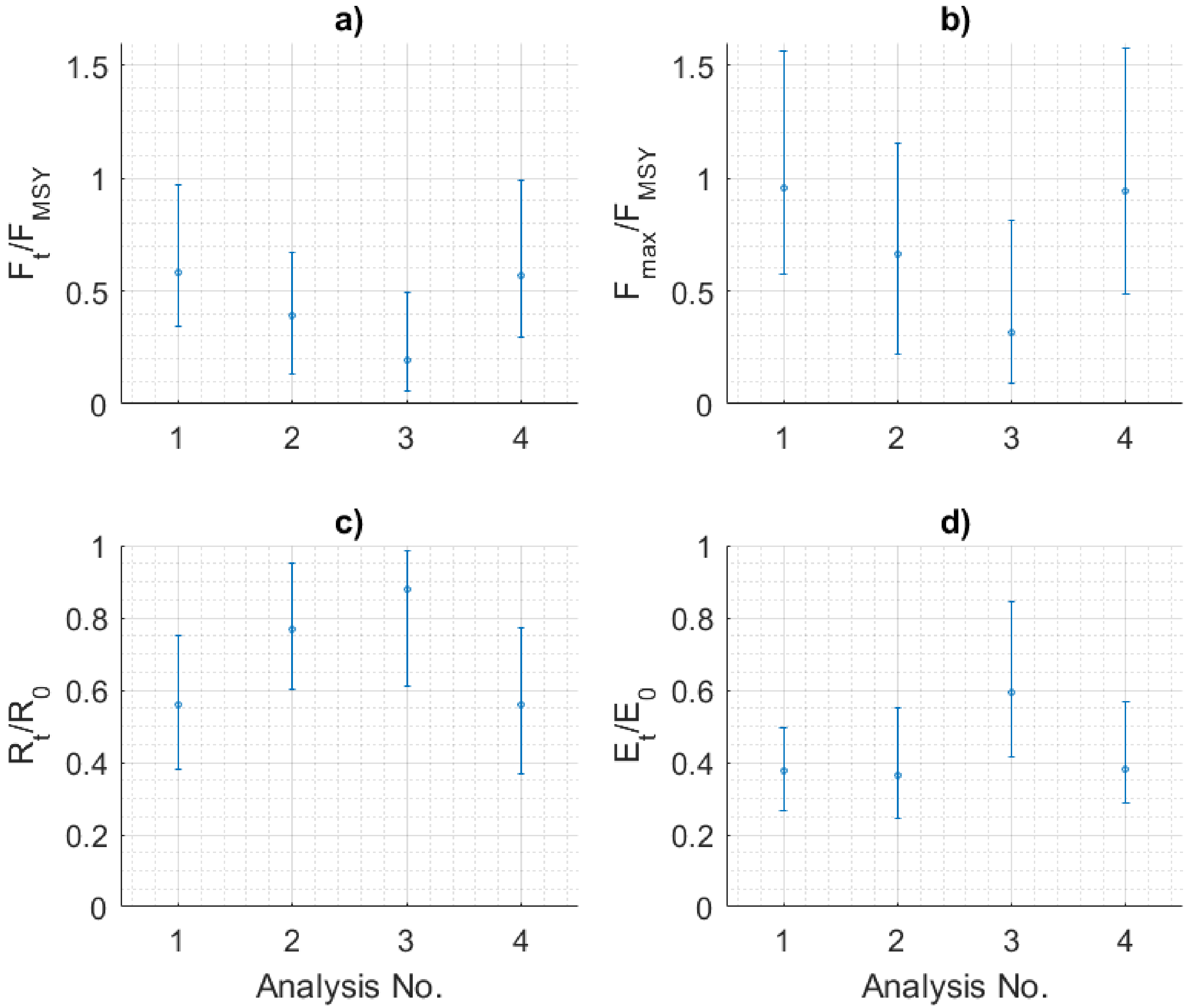
Fish age data

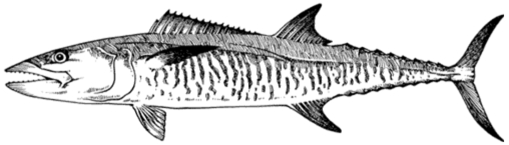




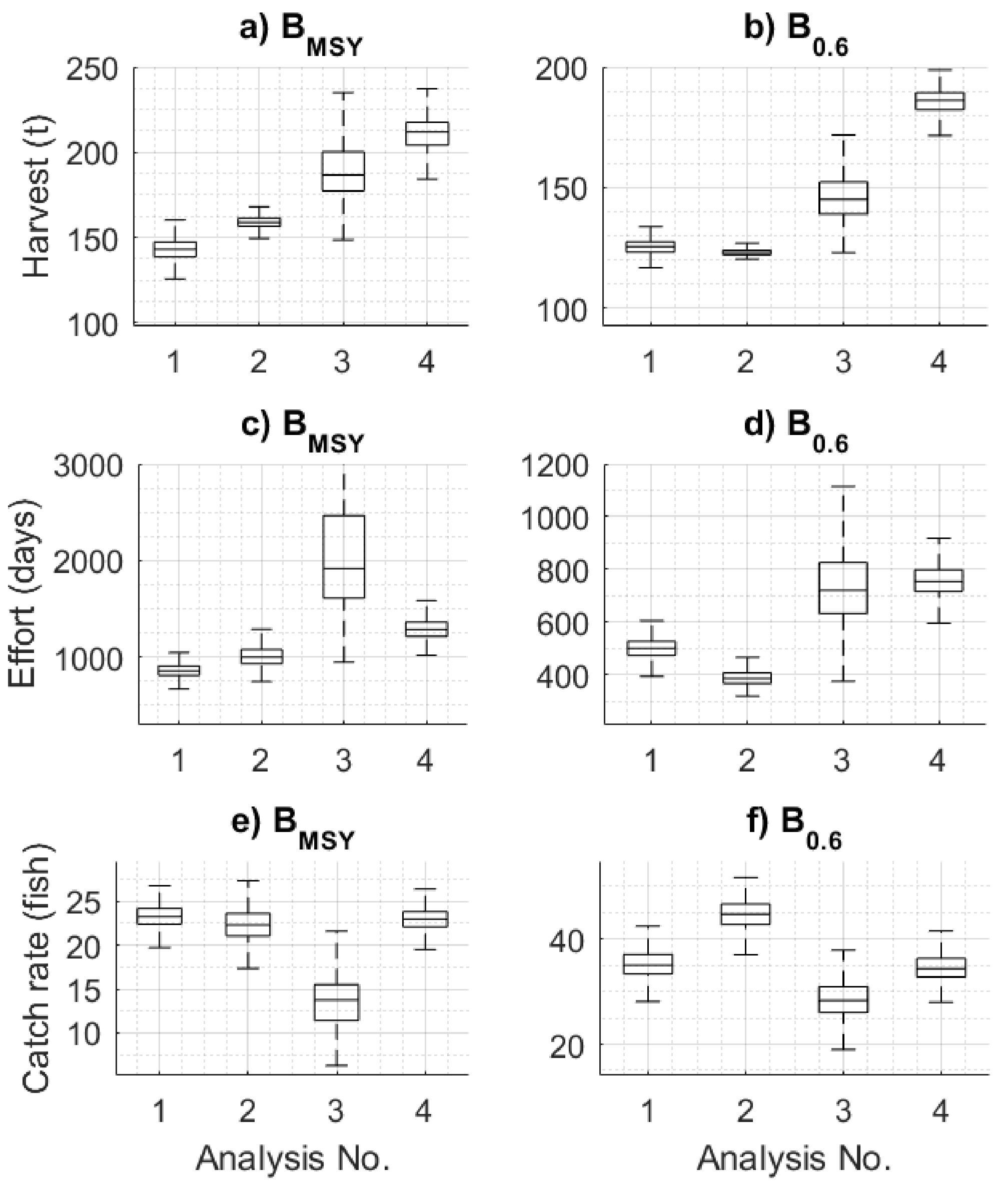
Stock status results



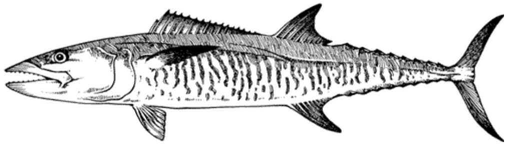




Reference points

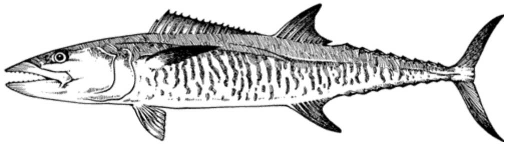


Conclusions



- Recent harvests 2007–2014 and population estimates were sustainable.
- Leasing and quota process should consider the revised estimates and uncertainty, and
- Consider benchmarking a target reference point clearly above B_{MSY} to ensure healthy population biomass and catch rates of Spanish mackerel.

Recommendations



- Verify records on fishing effort and harvest through logbook, docket book and electronic reporting systems [*for harvest and/or standardised catch rate assessments*]. This involves recording and validating:
  - trip harvests and average fish weights using unload/sale receipts,
  - number of dories used and hours fished each operation day,
  - the number of and fishing locations of the primary operation and dories using VMS/GPS latitude and longitude coordinates,
  - number of fish caught each operation and dory day,
  - zero catches, and
  - days when fishing is stopped due to capacity limitations (too many fish).
- Monitor and estimate Spanish mackerel harvests taken by non-commercial sectors [*for stock model assessments*].
- Conduct regular (annual or biennial) long term monitoring of fish age-length structures that are spatially representative of the Torres Strait [*for mortality and/or stock model assessments*].
- Collect fine scale spatially representative genetic fish samples to test the single stock assumption and define stock boundaries [*for stock model assessments*].