SC-05-17

5th Meeting of the Southern Indian Ocean Fisheries Agreement (SIOFA) Scientific Committee

30 March to 3 April 2020, La Reunion

Bottom Fishing Impact Assessment (BFIA) for planned fishing activities by Australia in the Southern Indian Ocean Fisheries Agreement (SIOFA) Area – 2020 Update

Relates to agenda item: 6.5 Working paper ☒ Info paper ☐

Delegation of Australia

Abstract

This paper updates the SIOFA Scientific Committee on Australia's bottom fishing impact assessment for the SIOFA area. We have revised the historic Australian fishing footprint to include a small amount of fishing effort which was not included in the original footprint presented to SIOFA (Williams et al. 2011; Delegation of Australia 2018), and take into account updated bathymetric data. We also provide an assessment of Australia's intention to undertake fishing using integrated weight longline to target Patagonian toothfish (*Dissostichus eleginoides*) on Williams Ridge, according to CMM 2019/05, and potting for spiny lobsters (*Palinurus* spp. and *Jasus paulensis*) within its historical fishing footprint, from 2020/21.

Recommendations *(working papers only)*

It is recommended that the SC:

- **Notes** that in accordance with CMM 2019/01, paragraph 23, the SC shall consider and provide advice on bottom fishing impact assessments (BFIA) submitted under paragraph 22b or 27b, whether each BFIA meets an appropriate standard in light of international standards and the SIOFA Bottom Fishing Impact Assessment Standard, and formulates this advice for Australia's updated BFIA.

Australian Government

Department of Agriculture, Water and the Environment

Australian Antarctic Division

AUSTRALIAN ANTARCTIC PROGRAM

Bottom Fishing Impact Assessment (BFIA) for planned fishing activities by Australia in the Southern Indian Ocean Fisheries Agreement (SIOFA) Area – 2020 Update

Dirk Welsford[1], Philippe Ziegler[1], Dale Maschette[1,2] and Mike Sumner[1]

[1] Australian Antarctic Division, Department of Agriculture, Water and the Environment

[2] Fisheries and Aquaculture Centre, Institute of Marine and Antarctic Studies, University of Tasmania

Bottom Fishing Impact Assessment (BFIA) for planned fishing activities by Australia in the Southern Indian Ocean Fisheries Agreement (SIOFA) Area – 2020 Update

Dirk Welsford, Philippe Ziegler, Dale Maschette and Mike Sumner

1 Requirements for Bottom Fishing Impact Assessments by Australian Vessels in the SIOFA Area

Consistent with United Nations General Assembly (UNGA) resolutions 61/105, 64/72 66/68 and 71/123, Australia is committed to ensuring that bottom fishing activities are managed such that they avoid significant adverse impacts (SAI) to vulnerable marine ecosystems (VMEs).

Australia's commitment to avoiding SAI resulting from its fishing activities in the Southern Indian Ocean are exemplified by its actions in 2011, prior to the entry into force of the Southern Indian Ocean Fisheries Agreement (SIOFA) in 2012 and the first bottom fishing measures being adopted in 2016, of taking precautionary measures including:

- Prohibiting of the use of deepwater gillnets;
- Interim limitation of all bottom fishing activities to the historical fishing footprint of Australian vessels using bottom trawl and longline gears between 1999 and 2009;
- Providing a detailed Bottom Fishing Impact Assessment (BFIA) of historical and proposed bottom fishing activities using trawls and longlines in 2017 (Williams et al. 2011; Delegation of Australia 2018), and managing fishing activities accordingly.

Under SIOFA CMM 2019/01, paragraph 24 (e):

> "All BFIA, including the SIOFA BFIA, shall be updated when a substantial change in the fishery has occurred, such that it is likely that the risk or impacts of the fishery may have changed."

We have therefore developed the following document, following the SIOFA Bottom Fishing Impact Assessment Standard (BFIAS), to supplement and update the BFIA presented in 2018. We have revised the historic Australian fishing footprint to include low levels of fishing effort not included in the original footprint presented to SIOFA (Williams et al. 2011; Delegation of Australia 2018), and take into account updated bathymetric data. We also provide an assessment of Australia's intention to undertake fishing using integrated weight longline to target Patagonian toothfish (*Dissostichus eleginoides*) on Williams Ridge, according to CMM 2019/05, and potting for spiny lobsters (*Palinurus* spp. and *Jasus paulensis*) within its historical fishing footprint, from 2020/21.

2 Description and location of proposed bottom fishing activities

2.1 Updated fishing footprint

The Australian fishing footprint in the SIOFA area has been updated with a small amount of data from trawling and longlining on Williams Ridge in SIOFA Statistical Area 7 (Figure 1). These effort data had not been included in the previous analyses of Australian bottom fishing activities (Williams et al. 2011, Delegation of Australia 2018). These data consisted of five exploratory trawls in 1998 and 2000, and five longline hauls in 2003. At that time this region, including Williams Ridge, was subject to intensive illegal, unreported and unregulated (IUU) fishing by vessels targeting Patagonian toothfish (Delegation of Australia 2019).

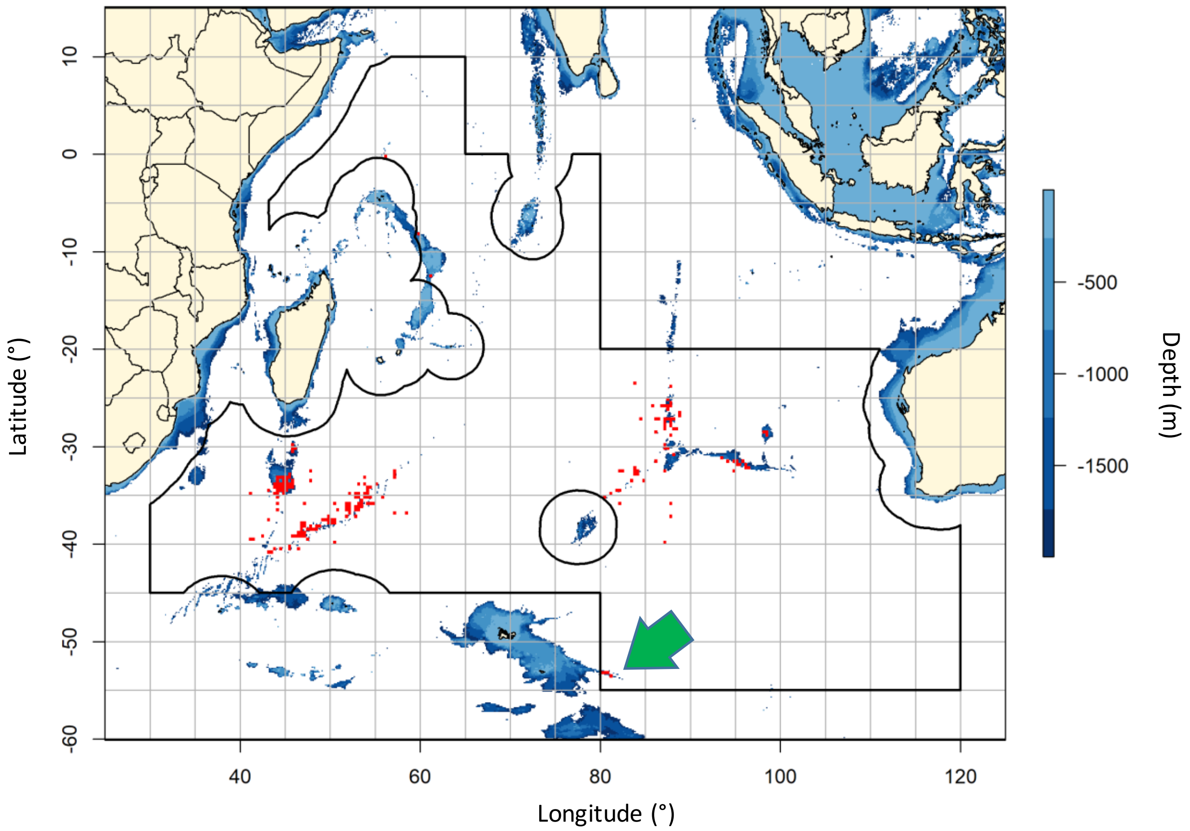

Figure 1. Australia’s updated historical bottom fishing footprint within the SIOFA area. 20’x20’ grid squares that contain at least one instance of bottom fishing activity between 1999 and 2009 (i.e. a demersal trawl or longline set) are indicated in red (see Williams et al. 2011 for methods). Note that this figure includes four grid squares on William’s Ridge (SIOFA Statistical Area 7, green arrow) that were not included in the previous calculations of Australia’s footprint. Bathymetry is based on GEBCO 2019 bathymetric data (GEBCO Compilation Group 2019) - seafloor deeper than 2000 m is uncoloured.

The area of Australia's fishing footprint was recalculated accordingly, relative to bathomes within the SIOFA area (Table 1). Inclusion of the fishing effort from Williams Ridge increased the total area of Australia's historical fishing footprint by 3280 km^2 or 1.4%. The fishing activity on Williams Ridge occurred in the upper (trawl) and mid (longline) continental slope bathomes, increasing the proportion of the Australian fishing footprint in the deep upper continental slope by about 2% to 46.9% and in the shallow mid-continental slope by 1% to 25.0%.

The areal extent of bathomes and the Australian fishing footprint in the SIOFA area were also recalculated using the SIOFA GIS shape file (FAO 2010), the GEBCO 2019 bathymetric data (GEBCO Compilation Group 2019), and the library 'raster' in R (Table 1). Using this approach as opposed to the GEBCO 2008 bathymetric data and ArcGIS (Williams et al. 2011), the estimated total SIOFA area increased by 0.2% (or 48,435 km^2) and the Australian fishing footprint by 0.05% (or 120 km^2). The total overlap of the Australian fishing footprint within the SIOFA area remained low and virtually unchanged at 0.85%. Changes in the estimated footprint, SIOFA area and overlap were small in depths deeper than 1000 m. The estimated area of the continental shelf (0-200 m) increased by over 14,500 km^2 whereas the shallow upper continental slope bathome (201-700 m) decreased by almost 11,000 km^2. While the Australian fishing footprint on the continental shelf was very small, the estimated overlap in the shallow upper continental slope bathome increased from 8.96% to 12.45% as a consequence.

Table 1. Estimated Australian historical fishing footprint (km^2), SIOFA area (km^2) and overlap (%) of Australian fishing footprint with total area by bathome, (a) as reported by Williams et al. (2011) using GEBCO 2008 bathymetry data and ArcGIS, (b) when Australia's trawl and longline hauls on Williams Ridge were included ('Williams et al. (2011) incl. Williams Ridge'), and (c) when recalculated using the GEBCO 2019 bathymetry data (GEBCO Compilation Group 2019) and the library 'raster' in R ('Recalculated (GEBCO 2019)' – this includes Australia's trawl and longline hauls on Williams Ridge).

Bathome	Name	(a) Williams et al. (2011)			(b) Williams et al. (2011) incl. Williams Ridge			(c) Recalculated (GEBCO 2019)		
		Footprint Area (km^2)	SIOFA Area (km^2)	Overlap (%)	Footprint Area (km^2)	SIOFA Area (km^2)	Overlap (%)	Footprint Area (km^2)	SIOFA Area (km^2)	Overlap (%)
0-200 m	Continental shelf	272	37,402	0.73	272	37,402	0.73	185	51,952	0.36
201-700 m	Shallow upper continental slope	2,773	32,101	8.64	2,875	32,101	8.96	2,651	21,288	12.45
701-1000 m	Deep upper continental slope	11,307	25,133	44.99	11,779	25,133	46.87	10,446	23,598	44.27
1001-1500 m	Shallow mid-continental slope	26,677	110,781	24.08	27,687	110,781	24.99	29,953	111,275	26.92
1501-2000 m	Deep mid-continental slope	33,795	260,633	12.97	34,388	260,633	13.19	35,506	266,320	13.33
> 2000 m	Unfished depths	151,074	26,414,597	0.57	152,178	26,414,597	0.58	150,558	26,454,649	0.57
All depths		**225,899**	**26,880,647**	**0.84**	**229,179**	**26,880,647**	**0.85**	**229,299**	**26,929,082**	**0.85**

2.2 Longlining targeting Patagonian toothfish

Australia intends to fish using demersal longlines to target Patagonian toothfish in SIOFA Statistical Area 7 (Williams Ridge), consistent with measures to regulate fishing on Williams Ridge agreed by the 6th Meeting of the Parties to SIOFA in 2019 in CMM 2019/15[3].

Since 2003, Australian vessels have targeted Patagonian toothfish with longline in the Australian exclusive economic zone (EEZ) at Heard Island and McDonald Islands (HIMI) within the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) Area, adjacent to Statistical Area 7. The history of this fishery is detailed in SC-04-21 (Delegation of Australia, 2019) and on the CCAMLR website[4].

The fishing gear to be used is identical to that described in Williams et al. (2011). The vessel will set integrated weight autolines, comprising of a 12 mm mainline with a lead core, weighted at 50g/m to achieve sink rates that mitigate seabird interactions, consistent with CCAMLR Conservation Measure CM 25-02[5] and Australian legislation (Figure 2). Hooks are attached to nylon snoods which in turn are attached to the mainline, around 1.4 m apart. Hooks are set as magazines of around 900 hooks, attached together in series, between nylon downlines with heavy chain and grapnels to hold the mainline on the seafloor, and windy buoys and GPS buoys marking the gear at the surface.

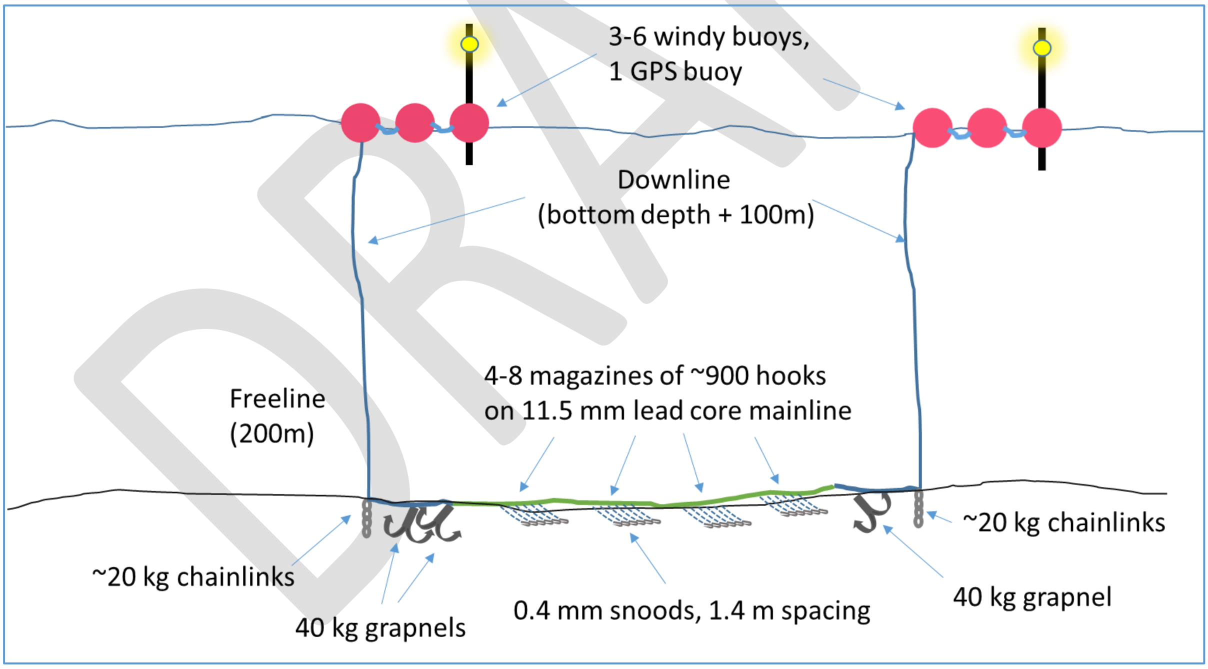

Figure 2. Diagram and indicative measures of the integrated weight autoline system intended for use by Australian vessels to target Patagonian toothfish within in SIOFA Statistical Area 7, as per CMM 2019/05.

---

[3] http://apsoi.org/sites/default/files/documents/cmm/CMM%202019_15%20Management%20of%20Demersal%20Stocks.pdf - accessed 30/1/2020

[4] https://www.ccamlr.org/en/document/publications/fishery-report-2018-dissostichus-eleginoides-heard-island-australian-eez - accessed 30/1/2020

[5] https://www.ccamlr.org/en/measure-25-02-2018 - accessed 30/1/2020

2.3 Potting targeting spiny lobster

Australia intends to fish using demersal pots to target spiny lobsters, mainly *Palinurus barbarae* and *P. delagoae,* within its historical fishing footprint across the SIOFA area (Figure 1). Australian vessels recorded limited effort and catches targeting Palinuridae (spiny lobsters) and Brachyura (crabs) using 'traps – unspecified' in the SIOFA area during 2002.

The pots have a truncated cone, around 0.65 m high, 1.4 m width at the base and 0.9 m wide at the top (Figure 3). They are constructed from 16 mm diameter steel rod with 20 mm diameter rod to reinforce the base and ensure the pots settle upright on the seafloor. The pots are covered in mesh, with a conical stocking leading into the pot towards the bait bag, sewn with biodegradable twine to ensure any lost pots do not 'ghost fish'. The vessel intends to trial setting single pots and strings of pots linked by 50 m of floating line, up to a maximum of 2.5 km total length.

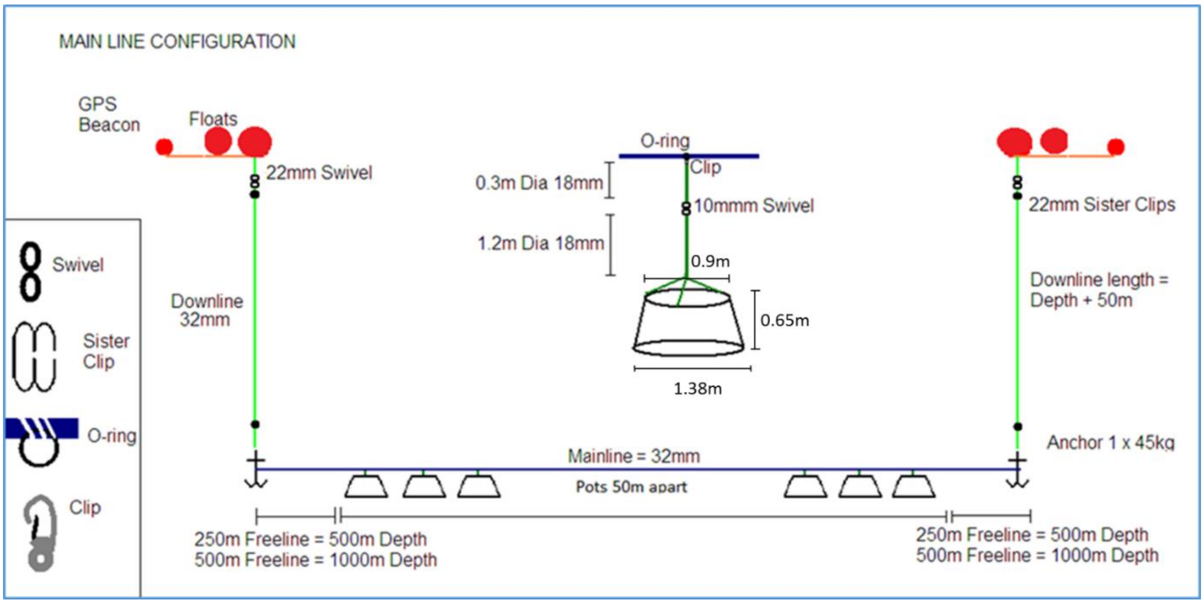

Figure 3. Diagram and indicative measures of the pot line system intended for use by Australian vessels to target spiny lobster across its historical fishing footprint in the SIOFA area.

3 Status and assessment of impact of intended activities on deep-water stocks and Vulnerable Marine Ecosystems (VMEs)

3.1 Patagonian toothfish

A substantial body of scientific information supports the hypothesis that the Patagonian toothfish populations found in SIOFA Statistical Area 7 are part of the same population and share similar characteristics of relative abundance and productivity with those found in the adjacent Divisions of the CCAMLR Area and within the EEZs of France and Australia around Kerguelen Islands and HIMI respectively (SIOFA SC4 para. 141). The characteristics of the HIMI stock was described in detail by Delegation of Australia (2019a). CCAMLR also reviewed an updated integrated stock assessment in 2019 (Ziegler 2019) and revised the total allowable catch limit for this stock on the basis of this assessment (CCAMLR 2019). The 2019 assessment indicated that the stock is currently close to its target reference point of 50% of the virgin spawning stock biomass and, due to estimated recent lower-than-average recruitment, is likely to decline below the target reference point over the next few years before recovering to the target reference point.

The most common bycatch encountered when targeting Patagonian toothfish with longlines in the HIMI EEZ are grenadiers *Macrourus whitsoni*, *M. caml, M. carinatus* and *M. holotrachys*, and the skate *Bathyraja irrasa*. Modelling of fish communities in this region predicts that the fish community on Williams Ridge is similar to that on the slope of the Kerguelen Plateau (Hill et al. 2017; 2019), and hence it is likely that any bycatch will be dominated by these same species. This is further supported by reports by the European Union (EU) that bycatch from Spanish vessels targeting Patagonian toothfish in Statistical Area 7 comprised primarily *Macrourus* spp. (EU 2019). The EU also reported a small bycatch of *Amblyraja taaf,* however this may be misidentified *B. irrasa.* While these two species have similar morphological features, *A. taaf* typically lives in depths down to 600 m in this region, which is shallower than depths typically fished by longline targeting Patagonian toothfish (Duhamel et al. 2005; Nowara et al. 2017).

Assessments of the biomass and status of these species within CCAMLR Division 58.5.2 indicates that these stocks can sustain annual removals of up to a maximum of 409 t for the *M. caml* and *M. whitsoni* species group, 360 tonnes for the *M. holotrachys* and *M. carinatus* species group, and 120 t of skates (Dell et al. 2016; Dell et al. 2019). Current bycatch totals in the HIMI EEZ have not reached these levels[6], and these catches are considered to be a low risk to the ecological sustainability of these species and the HIMI fishery as a whole (Bulman et al. 2018). Ecological risk assessments recently presented to SIOFA also highlighted that although there are some issues with taxonomic resolution of data, no Macrouridae or Rajidae were assessed as being at high or extreme risk of overfishing by demersal longline (Delegation of Australia 2019b; c). Hence, mitigation measures similar to those mandated by CCAMLR at HIMI are recommended below to avoid SAI to these stocks.

[6] https://www.ccamlr.org/en/document/publications/fishery-report-2018-dissostichus-eleginoides-heard-island-australian-eez - accessed 30/1/2020

3.2 Spiny lobster

Little information is available on the diversity, distribution and abundance of spiny lobster stocks in the SIOFA area. Australian vessels recorded limited effort and catches targeting Palinuridae (spiny lobsters) and Brachyura (crabs) using 'traps – unspecified' in the SIOFA area during 2002. Spanish-flagged vessels fished also for lobsters on Walters Shoals in 2006, which led to the description of a new lobster species, *P. barbarae* (Groenveld et al. 2006). The lobster species most likely to occur within Australia's historical fishing footprint are therefore *P. barbarae* and potentially *Palinurus delagoae*, which is recorded in depths down to 400 m on continental and insular slopes of South western Africa and south of Madagascar (Holthuis 1991). *Jasus paulensis* may also be encountered on the South-western Indian Ocean Ridge in the SIOFA area in depths down to 350 m (Sieben et al. 2019).

Any assessment of abundance or current stock status of spiny lobsters that may be captured in the SIOFA area is uncertain. However, as deep-water lobsters can be long lived and have relatively low productivity (Holthuis, 1991; Fennessy and Groenveld 1997; Groenveld 2000; Sieben et al. 2019), it is appropriate to take a precautionary approach to the mitigation of impacts on stocks until data are collected and an assessment can be undertaken. Similarly, as assessments of bycatch species are currently limited to low-information assessment approaches such as ecological risk assessment, a precautionary approach is also warranted, and measures are proposed below.

3.3 Vulnerable Marine Ecosystems (VMEs)

Proximity and similar environmental conditions indicates that the habitat where Patagonian toothfish are targeted in Statistical Area 7 are likely to support similar benthic communities to the deep slope of the western Kerguelen Plateau (Welsford et al. 2014; Hill 2019; Martin et al. 2019). Such deep-slope communities are characterised by low biomass and high biodiversity relative to shallower slope and bank areas. VME indicators (*sensu* CCAMLR 2009) likely to be encountered include sea pens (Pennatulaceans including *Umbellula* spp.) and basket stars (Euryalids) including *Gorgonocephalus* spp.), and these taxa are observed at low levels as bycatch by bottom longlines in the HIMI EEZ (AAD, Unpublished data).

Relatively little is known regarding the impact of potting for lobsters on VMEs in the SIOFA area. Little consolidated data exists on the benthic impacting on VMEs assemblages that occur along the Southeast and Southwest Indian Ridges where lobsters will be targeted. However, BFIAs by e.g. EU (2019) and anecdotal reports from other members indicate that these regions are likely to support slow growing sessile benthic invertebrates such as demosponges, glass sponges (Hexactinellids), stony corals (antipatharians and scleractinians), alcyonaceans (gorgonians and pennatulaceans) and basket stars (euryalids).

4 Monitoring, Management and Mitigation of impact of proposed activities

Australia will ensure that all vessels flying its flag comply with any Conservation and Management Measures (CMMs) adopted by SIOFA for the purpose of monitoring fishing activities in the SIOFA area. All vessels will carry tamper proof Vessel Monitoring Systems (VMS), and compliance will be ensured through the routine monitoring of VMS data by national authorities. Vessels will also be required to provide comprehensive fine-scale catch, bycatch and effort reports for all fishing activities, and fishery observers will be deployed aboard all vessels undertaking fishing activities.

4.1 Toothfish

Vessels will be required to carry out biological measurements on representative samples of catch and bycatch, including total length, standard length, sex, weight and reproductive developmental stage of fishes. Toothfish will be tagged and released at a rate that is prescribed by SIOFA CMMs (currently five per tonne of green weight retained). Any tagged fish recovered will be retained and measured for length, weight, sex and reproductive developmental stage, and otoliths removed for later analysis.

As noted above, the toothfish stock within SIOFA Statistical Area 7 is highly likely to have a similar status to the stock in the adjacent HIMI area, which is close to the target reference point (Ziegler 2019). To ensure that any catches taken in the SIOFA area do not lead to overfishing, Australian vessels will conduct all fishing activities consistent with the fishing effort limits defined under the measures to regulate fishing on Williams Ridge in SIOFA CMM 2019/15. Noting there have been efforts to tag and release toothfish in Statistical Area 7 and the adjacent CCAMLR fisheries, Australia undertakes to exchange all data from any fish recaptured with tags with the Members which tagged the fish, and CCAMLR as appropriate. Furthermore, Australia has already included all declared catches for Williams Ridge in assessments of the toothfish stock in Division 58.5.2 presented to CCAMLR and will continue to do so in future.

As noted above, the main bycatch species in Statistical Area 7 are likely to be the same as those encountered in the Australian EEZ at HIMI. Therefore, we intend to apply equivalent measures to avoid high bycatch rates to vessels fishing in Statistical Area 7, i.e. vessels will move 5 nm for a minimum five days away from any line it sets that catches in excess of 3 t of *Macrourus* spp. combined, or 2 t of skates, or 1 t of all other species combined [7].

4.2 Spiny lobsters

Vessels will be required to carry out biological measurements on representative samples of catch and bycatch, including total length, standard length, sex, weight and reproductive developmental stage for fish, and total carapace length, sex and reproductive developmental stage for spiny lobsters and any other crustacean bycatch. Details of any tagged individuals recovered will also be recorded.

Since the distributions and stock status of spiny lobsters within the SIOFA area are unknown, caution must be taken to ensure that any catches taken in the SIOFA area do not lead to overfishing. Hence, Australian vessels will limit effort during the 2020/21 season to a total of 2000 pot lifts. This fishing strategy will be revised accordingly as data accrues on catch and bycatch.

[7] https://www.ccamlr.org/en/measure-33-02-2019 - accessed 30/1/2020

To limit overfishing of immature lobster, vessels will move, for a period of at least five days, at least 5 nm away from the midpoint of the potline from where the catch of small lobsters <70 mm total carapace length (approximate size at 50% maturity based on data for *P. delagoae* (Groenfeld 2000) and *Jasus paulensis* (Sieben et al. 2019)) exceeds 25% of the catch. All berried females and undersize lobsters with a reasonable chance of survival will be returned to the water.

The likely bycatch level and species composition within pots is unknown. As such we intend to implement a move-on rule[8].

4.3 Vulnerable Marine Ecosystems (VMEs)

Australia already implements CMM 2019-02, but will voluntarily implement additional data collection measures, consistent with CCAMLR CM 22-07, including requiring comprehensive collection of data on bycatch of VME indicator species by line segment. Noting that pots are unlikely to retain bycatch of VME indicators, even where there are interactions on the seafloor, vessel crew will also opportunistically deploy of camera attached to pots, which have been successfully used to characterise the habitat where fishing is undertaken and to quantify the nature and extent of any interactions with benthic organisms (Kilpatrick et al. 2011; Welsford et al. 2014; Lamb et al. 2019).

Longlines are estimated to cause significantly less damage and mortality to vulnerable benthic organisms across an equivalent area compared to trawl hauls (Chuenpadgee et al. 2003; Pham et al. 2014; Clark et al. 2016), however the exact estimates of the magnitude of this difference is likely to vary between the environments where fishing is occurring, and the nature of fishing operations. Based on estimates from the HIMI toothfish fishery, a typical longline interacts with an area of the seafloor around 5% of a typical trawl (Table 2). When taxa and area of interaction were the same, a bottom-set integrated weight longline causes around one third of the mortality caused by trawl haul at HIMI, and hence the relative index of mortality for longline is approximately 1.6% of that of a trawl. Furthermore, as they are rarely set over exactly the same ground, leading to less cumulative impacts at any fished location, and are set deeper than 1200 m, where VME indicator species tend to be less abundant, the net impact of each longline is likely to be substantially less than each trawl.

Table 2. Illustrative estimates of area of interaction and relative impact on VME indicator taxa for different bottom fishing types. Values of A, B, C and E are taken from Welsford et al. 2014, except for the length and width of pots and pot lines which are taken from Figure 2 above.

Gear Type	A: Typical Length of fishing event (m)	B: Indicative width of seafloor interaction along length of gear (m)	C: Proportion of gear in contact with seafloor	D: Area of Interaction per fishing event (m^2, A × B × C)	E: Indicative proportion of VME indicator taxa damaged or killed within the area of interaction	F: Relative index of impact per fishing event (D × E)
Trawl	5,970.0	160	1	955,200	0.75	716,400.0
Longline	8,920.0	5	1	44,600	0.25	11,150.0
Single Pot	1.4	5	1	7	0.25	1.8
Pot line	2,500	5	0.03	450	0.25	112.5

[8] https://www.ccamlr.org/en/measure-33-03-2019 – accessed 7/2/2020

We also consider that measures to regulate fishing on Williams Ridge in SIOFA CCM 2019/05 substantially limits the amount of bottom fishing gear that can be set by any vessel and in total. We also note the large no-take Marine Reserve within the HIMI EEZ includes 65,000 km^2 of benthic habitat including the same latitudinal and depth range as Williams Ridge (Welsford et al. 2014; Fleming and Weragoda 2019), and hence is likely to protect representative assemblages that are similar to those on Williams Ridge, further reducing the risk that SAI may occur in the interim of other CMMs being developed by SIOFA for this area.

With the pot design described in this BFIA, contact between pots and the seafloor is even less than that for an equivalent length of bottom-set integrated weight longline, as only the base of the pot is in contact with the seafloor as opposed to the entire length of a bottom-set longline (Table 2). Consequently, the relative amount of area impacted is likely to less than longline and several orders of magnitude less than bottom trawling. In addition, limiting the number of pot lifts also mitigates the likelihood that Australia's potting will cause or contribute to SAI to VMEs.

5 Residual risk of Significant Adverse Impacts on deep-water stocks and Vulnerable Marine Ecosystems

5.1 Patagonian toothfish and associated bycatch species

Given the current monitoring, mitigation and management arrangements, including effort limitation under CMM 2019/5, as well as those measures outlined above, Australia considers that the residual risk of Australian vessels' activities targeting toothfish in Statistical Area 7 causing or contributing to SAI to deep-water stocks of Patagonian toothfish and associated bycatch species is **low**.

This assessment will be revised taking into account the results of all catches of toothfish in Statistical Area 7 and nearby in the CCAMLR Convention Area, and any revised assessment of the stocks in CCAMLR Division 58.5.2, when any new assessments collected on the composition, distribution and abundance of bycatch species becomes available.

5.2 Spiny Lobsters and associated bycatch species

Noting the above measures, Australia considers that the residual risk of Australian vessels' activities targeting spiny lobster in the SIOFA area causing or contributing to SAI to spiny lobsters or associated bycatch species is **low**.

This assessment will be revised taking in to account the results of all catches of spiny lobsters in the SIOFA area when a new assessment on the composition, distribution and abundance of bycatch species becomes available.

5.3 Vulnerable Marine Ecosystems (VMEs)

Noting the above measures, Australia considers that the residual risk of Australian vessels' activities using longlines in the SIOFA area causing or contributing to SAI to VMEs is **low**, and using pots is **very low**, and hence we are confident that the measures outlined will effectively prevent SAIs on VMEs.

This assessment will be revised when a new assessment on the composition, distribution and abundance of VME indicator species becomes available.

6 Acknowledgements

Thanks to Brodie Macdonald at the Australian Fisheries Management Authority, Franziska Althaus and Alan Williams of CSIRO, and Tim Lamb of the AAD for their assistance with collating Australia's catch and effort data. Thanks also to Rhys Arangio at Austral Fisheries, and the skippers, crew and observers on Australian vessels. Development of this report was supported by funding for the Australian Government Fisheries Research and Development Corporation (FRDC).

7 References

Bulman C.M., Sporcic M., Pethybridge H. & Hobday A. (2018). *Ecological risk assessment for effects of fishing. Final report for the demersal longline sub-fishery of the Heard Island and McDonald Islands Fishery 2010/11-2014/15*. Report for the Australian Fisheries Management Authority, CSIRO, Hobart.

Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) (2009). *CCAMLR VME Taxa Identification Guide*. Commission for the Conservation of Antarctic Marine Living Resources, Hobart, Tasmania, Australia, 4p. Available at http://www.ccamlr.org/pu/e/e_pubs/VME_guide.pdf.

Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) (2019). Report of the Thirty-eighth meeting of the Commission. CCAMLR Document CCAMLR-38.

Chuenpagdee R., Morgan, L.E., Maxwell, S.M., Norse, E.A. and Pauly, D. (2003) Shifting gears: assessing collateral impacts of fishing methods in US waters. *Frontiers in Ecology and the Environment* 1(10): 517- 524.

Clark M.R., Althaus F., Schlacher T.A., Williams A., Bowden D.A., & Rowden A.A. (2016). The impacts of deep-sea fisheries on benthic communities: a review. *ICES Journal of Marine Science*, 73: i51–i69

Dell J., Maschette D., Woodcock E. & Welsford D.C. (2015). Biology, population dynamics and preliminary assessment of the long-term yield of *Macrourus caml* by-caught by the Australian fishery at Heard Island and the McDonald Islands (CCAMLR Division 58.5.2). CCAMLR Document WG-FSA-15/63.

Dell J., Nowara G., Maschette D., Farmer B., Woodcock E., Ziegler P. & Welsford D. (2019). Monitoring of major by-catch species in the Heard Island and McDonald Islands fisheries. In: Welsford D., Dell J. & Duhamel G. (Eds) (2019). *The Kerguelen Plateau: marine ecosystem and fisheries. Proceedings of the Second Symposium.* pp. 329-339.

Delegation of Australia (2018). Australia's SIOFA Bottom Fishing Impact Assessment. SIOFA Document SC-03-06.2(08).

Delegation of Australia (2019a). Population structure of Patagonian toothfish (*Dissostichus eleginoides*) on the Kerguelen Plateau and consequences for the fishery in SIOFA Statistical Area 7. SIOFA Document SC-04-21.

Delegation of Australia (2019b). Draft manuscript for an ecological risk assessment for the effects of bottom fishing gears on deepwater chondrichthyans in high seas areas of the Southern Indian and South Pacific oceans. SIOFA Document SC-04-19.

Delegation of Australia (2019c). Preliminary ecological risk assessment for SIOFA teleosts. SIOFA Restricted Document SC-04-27.

Delegation of the European Union (2019). National Report - European Union. SIOFA Document SC-04-23_Rev1.

Duhamel G., Gasco N. & Davaine P. (2005). *Poissons des îles Kerguelen et Crozet: Guide régional de l'océan Austral*. (Patrimoines naturels; 63). Muséum national d'Histoire naturelle, Paris, 424p.

FAO (2010). SIOFA Area - obtained from the FAO as shapefiles. Available online at URL: http://www.fao.org/geonetwork/srv/en/main.home?uuid=cc7dbf20-1b8b-11dd-8bbb-0017f293bd28).

Fleming, J. & Weragoda, L. (2019). Expansion of the Heard Island and McDonald Islands Marine Reserve. In: Welsford D., Dell J. & Duhamel G. (Eds) (2019). *The Kerguelen Plateau: marine ecosystem and fisheries. Proceedings of the Second Symposium*. pp 307

Fennessy S.T. & Groenveld J.C. (1997). A review of the offshore trawl fishery for crustaceans on the east coast of South Africa. *Fisheries Management and Ecology* 4: 135-147.

GEBCO Compilation Group (2019). GEBCO 2019 Grid (doi:10.5285/836f016a-33be-6ddc-e053-6c86abc0788e)v.

Groeneveld J.C. (2000). Stock assessment, ecology and economics as criteria for choosing between trap and trawl fisheries for spiny lobster *Palinurus delagoae*. *Fisheries Research* 48:141-155.

Groeneveld J.C., Griffiths C.L. & van Dalsen A.P. (2006). A new species of spiny lobster, *Palinurus barbarae* (Decapoda, Palinuridae) from Walters Shoals on the Madagascar Ridge. *Crustaceana* 79 (7): 821–833.

Hill N.A., Foster S.D., Duhamel G., Welsford D., Koubbi P. & Johnson C.R. (2017). Model-based mapping of assemblages for ecology and conservation management: A case study of demersal fish on the Kerguelen Plateau. *Diversity and Distributions* 23: 1216 – 1230. https://doi.org/10.1111/ddi.12613.

Hill N.A., Martin A., Eléaume M., Duhamel G., Foster S. & Welsford, D. (2019). Comparison of independently derived benthic invertebrate and demersal fish ecoregionalisations for the Kerguelen Plateau. In: Welsford D., Dell J. & Duhamel G. (Eds) (2019). *The Kerguelen Plateau: marine ecosystem and fisheries. Proceedings of the Second Symposium*. pp 405-409.

Holthuis L.B. (1991). FAO species catalogue. Vol 13. Marine lobsters of the world. An annotated and illustrated catalogue of species of interest to fisheries known to date. *FAO fisheries Synopsis*. 125 (13):292 p.

Kilpatrick R., Ewing G., Lamb T., Welsford D. & Constable A. (2011). Autonomous video camera system for monitoring impacts to benthic habitats from demersal fishing gear including long-lines. *Deep Sea Research Part I: Oceanographic Research Papers*, 58: 486-491.

Lamb T., Maschette D., Wotherspoon S. & Kilpatrick R. (2019). Development of a deep-water camera system capable of deployment on fishing gear. In: Welsford D., Dell J. & Duhamel G. (Eds) (2019). *The Kerguelen Plateau: marine ecosystem and fisheries. Proceedings of the Second Symposium.* pp 271-278.

Nowara G.B., Burch P., Gasco N., Welsford D.C., Lamb T.D., Chazeau C., Duhamel G., Pruvost P., Wotherspoon S. & Candy S.G. (2017). Distribution and abundance of skates (*Bathyraja* spp.) on the Kerguelen Plateau through the lens of the toothfish fisheries. *Fisheries Research* 186:65-81.

Pham, C. K., Diogo, H., Menezes, G., Porteiro, F., Braga-Henriques, A., Vandeperre, F., & Morato, T. (2014). Deep-water longline fishing has reduced impact on Vulnerable Marine Ecosystems. *Scientific Reports 4*: 4837. https://doi.org/10.1038/srep04837

Sieben C., Groeneveld J.& des Clers S. (2019). Marine Stewardship Council (MSC) announcement comment draft report Southern Indian Ocean Saint Paul Rock Lobster Fishery on behalf of SAPMER. Control Union Pesca. https://fisheries.msc.org/en/fisheries/southern-indian-ocean-saint-paul-rock-lobster-fishery/@@assessments.

Williams A., Althaus F., Fuller M., Klaer N. & Barker B. (2011). Bottom Fishing Impact Assessment. Australian report for the Southern Indian Ocean Fisheries Agreement (SIOFA). CSIRO Marine and Atmospheric Research. https://doi.org/10.4225/08/585188bbd8b46 and SIOFA Document SC-03-06.2(07).

Ziegler P. (2019). Draft integrated stock assessment for the Heard Island and McDonald Islands Patagonian toothfish (*Dissostichus eleginoides*) fishery in Division 58.5.2. CCAMLR Document WG-FSA-2019/32.