General Fishery Characteristics Text Template

How to use this Template

This is a template document for the text of the General Fishery Characteristics Section. It is intended to be used in conjunction with the excel template, which contains tables and figure definitions. The word and excel files will then be read in by an algorithm that converts them to a single RMarkdown file and eventually to a pdf output document. **In order for the algorithm to work correctly, it is important that you strictly follow the instructions on the next four pages!** (these instructions will not be included in the final output document).

To illustrate how to use the template, examples are provided for most sections. This version of the template contains examples that reflect fisheries that have been established a while ago (mostly southern Australian fisheries), primarily from the Southern and Eastern Scalefish and Shark Fishery (SESSF) or the eastern tuna and billfish fishery (ETBF). Please replace that example content with content that applies to your fishery and then delete the lines

TODO

EXAMPLE:

You can check whether there are any items left that you have not yet modified by searching for _TODO_.

Structure

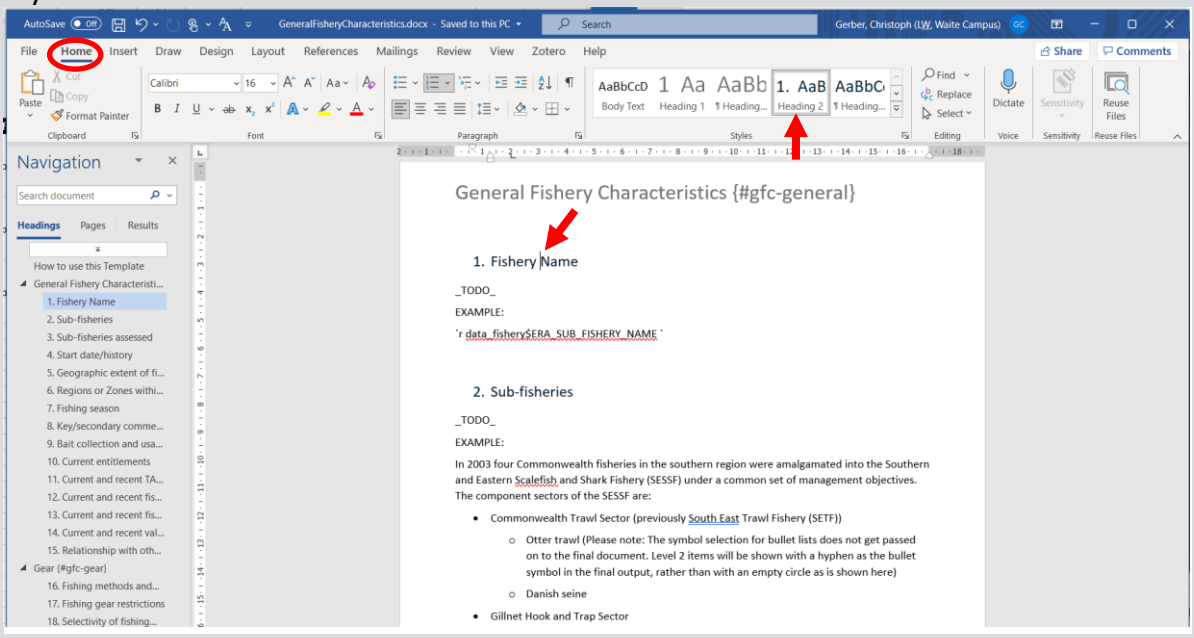
In order for the content to be converted to RMarkdown content correctly, it is important to have the correct styles applied to text and headings:

- Normal text should have the style *Body Text* applied
- The first level of headings (which group several individual items together) should have the style *Heading 1 no TOC* applied
- The second level of headings (describing individual items) should have the style *Heading 2* applied
- Text that has other styles applied (such as this instruction text) will be disregarded when converting to RMarkdown

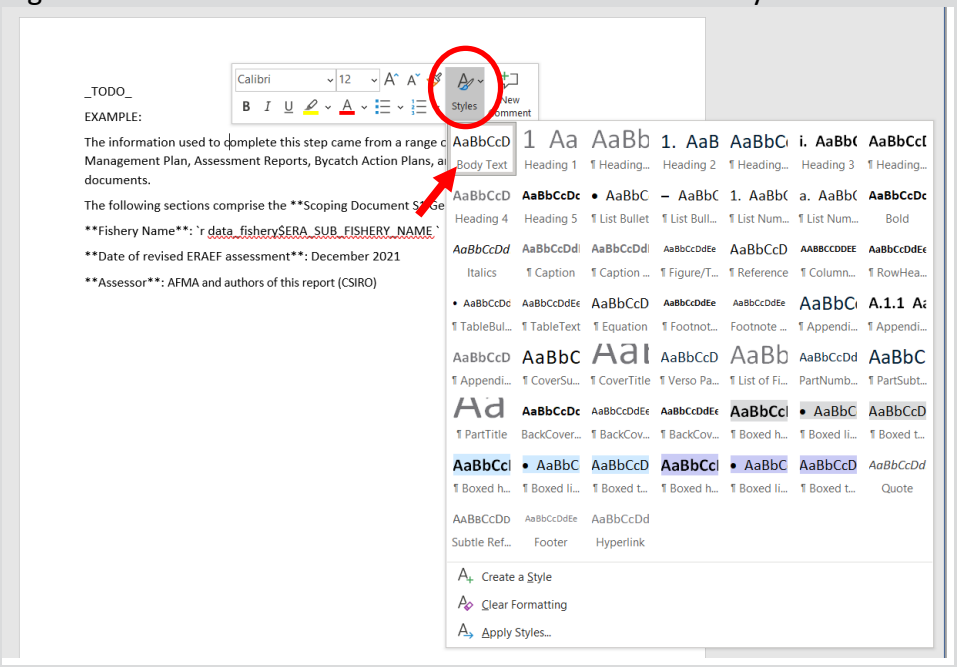
Making sure the correct style is applied is especially important when copy-pasting content from other documents. If you paste content from elsewhere, the important bit is not that the

text formatting looks exactly the same, but that the style is the same (style *Body Text*). There are two ways to check the style of any line of text:

- Left click within that line of text and then check which style is marked in the list of Word Styles on the "Home" ribbon:



- Right click within that line of text and then check which style is marked:



The structure of this document will be directly translated into RMarkdown, i.e. if you add another level 2 heading, there will be an additional item in RMarkdown as well.

Formatting

Please do not apply any formatting (e.g. bold, superscript, etc.) to text, as all the formatting will be lost when converting the text to RMarkdown. There is only one formatting option that will be converted to RMarkdown, namely, bullet lists. If you need superscripts or subscripts, you may insert them as special Unicode characters via *Insert -> Symbol.* Alternatively, you can use standard RMarkdown formatting commands such as:

italic = *italic* or _italic2_ = *italic2*

bold = **bold** or __bold__ = **bold**

x^2^ = x^2 or H~2~O = H_2O

You can also use RMarkdown commands for bullet lists, if you prefer, which gives you more freedom in what symbol to use: if you use Words built in bullet list feature, the Level1 will always use a circle as a symbol, and the Level 2 will always use a hyphen. In contrast, using RMarkdown syntax, you could also have a numbered or lettered bullet list (where the + represents a space):

Simple example:

*+item 1

++-+sub-item 1

++-+sub-item 2

*+item 2

Or a lettered/numbered list (where each + represent one space):

a)+item

b)+item

+++1.+subitem

+++2.+subitem

Please note that the indentation in the output document will be significantly further than the indentation here from the spaces used to create the RMarkdown list

Citations and Footnotes

You can add citations to your document, but again, for them to work correctly you will have to use RMarkdown commands. Here are a few examples for citations:

	How to type it into word	How it will appear in the end
Simple citation	Some sentence [@Hobday2007].	Some sentence (Hobday et al., 2007).
Citation with comment	Some sentence [e.g. @ Hobday2007].	Some sentence (e.g. Hobday et al., 2007).
Citation with the year only	Hobday et al. [-@Hobday2007] some text.	Hobday et al. (2007) some text.

All these examples will also add an entry to the list of cited literature in the final output document, if there is a corresponding entry in the literature database of the report. To make sure we have all the necessary details to create such an entry, please provide a list of all articles and documents that you cite at the end of this document in the section “References” to enable us to keep our literature database up to date.

To add a footnote, the text for the footnote can be added directly at the location where the reference to the footnote should appear in the normal text. The text that will go into the footnote needs to be enclosed by ^[ ] as per RMarkdown syntax ^[This is an example footnote.]. RMarkdown will take care of the numbering of footnotes automatically.

Cross-References to Figures, Tables, and Sections

Again, these have to be added using RMarkdown commands. Generally, cross-references are added with the \@ref(x) command, where x has to be replaced with the correct label/name for what you want to refer to. NOTE: This will only add the number (and a hyperlink), you need to write Figure, Table, Section, etc. if necessary). Here are a few examples:

	How to type it into word	How it will appear in the end
Cross-reference to a figure	(Figure \@ref(fig:effort-map))	(Figure 2.5)
Cross-reference to a table	As Table \@ref(tab:table-1) shows	As Table 1.1 shows
Cross-reference to a section	Section \@ref(gfc-general) shows…	Section 2.2.1.1 shows…
NOTE: To find out what label/name a figure or table have, please have a look at the excel file in the sheet “Figures” or “Tables”, respectively (Column *Reference Label*).		

If you want to be able to cross-reference sections contained within this word-template, please define what label you want to use to refer to that section. To do so, on the same line as the section head, add {#label}. NOTE: “label” part can consist of lowercase letters, numbers, and hyphens. E.g. {#gfc-general} is a valid label. This will not be printed in the final output, it is only to define the label for referencing that section. Providing a label is optional.

Content starts below here

General Fishery Characteristics {#gfc-general}

1. Fishery Name

`r data_fishery$ERA_SUB_FISHERY_NAME ` <!-- Note: you can leave the fishery name as is, and rmarkdown will adjust the fishery name automatically. -->

2. Sub-fisheries

TODO

EXAMPLE:

In 2003 four Commonwealth fisheries in the southern region were amalgamated into the Southern and Eastern Scalefish and Shark Fishery (SESSF) under a common set of management objectives. The component sectors of the SESSF are:

- Commonwealth Trawl Sector (previously South East Trawl Fishery (SETF))
    - Otter trawl (Please note: The symbol selection for bullet lists does not get passed on to the final document. Level 2 items will be shown with a hyphen as the bullet symbol in the final output, rather than with an empty circle as is shown here)
    - Danish seine
- Gillnet Hook and Trap Sector
    - Scalefish Hook – demersal longline
    - Scalefish Hook – auto-longline
    - Scalefish Hook – dropline
    - Scalefish trap
    - Shark gillnet
    - Shark Hook – demersal longline
- Great Australian Bight Trawl Sector
- East Coast Deepwater Trawl Sector

3. Sub-fisheries assessed

TODO

EXAMPLE:

The sub-fishery being assessed is the otter board trawl method in the Commonwealth Trawl Sector (CTS) of the Southern and Eastern Scalefish and Shark Fishery (SESSF).

4. Start date/history

TODO

EXAMPLE:

The CTS, one of Australia's oldest commercial fisheries, began as a trawl fishery in 1915. Between 1915 and 1950, the fishery was dominated by steam trawlers operating on the continental shelf in waters off New South Wales, fishing mainly for flathead and then jackass morwong and redfish. The early 1950s saw the use of Danish seine vessels by many operators but, from about 1970 on, otter board trawlers became the main type of boat used, as the Fishery expanded southwards and outwards to waters deeper than 200 metres. From 1976 onwards gemfish was the species most landed by operators in the Eastern Sector. The late 1970s saw the Fishery expand further into what became known as the South West Sector, in the waters off western Victoria and around Tasmania. Until the discovery of orange roughy in the early 80s, however, most landings still came from the waters off NSW and in eastern Bass Strait [@Williams2017, AFMA website].

The fishery underwent a structural adjustment in 2007 where eight of the 18 concessions were removed from the fishery. Catches in the CTS went from between 20,000-30,000 t annually, to between 10,000-15,000 t annually since the adjustment.

More recently, the fishery consists of an otter board trawl fleet extending south from Sydney, NSW, along the southeast Australian coast, including Tasmania, to Portland in western Victoria, as well as a Danish seine fleet based predominantly out of Lakes Entrance in eastern Victoria. Main target species are tiger flathead, school whiting, blue grenadier, pink ling, and silver warehou. Orange roughy has recently become a targeted species again after reopening the eastern spawning grounds and the Pedra Branca Hill off the southern coast of Tasmania.

5. Geographic extent of fishery

TODO

EXAMPLE:

The Commonwealth Trawl Sector extends south from Barrenjoey Point, NSW, along the southeastern Australian coast, including Tasmania, and west to Cape Jervis in South Australia (Figure \@ref(fig:geographic-extent)).

You can also include more than one figure per section if necessary. For example, you could add an extended map also showing the areas on the high seas, such as Figure \@ref(fig:geographic-extent2).

6. Regions or Zones within the fishery

TODO

EXAMPLE:

There are distinct management zones for orange roughy, as there are considered to be separate populations in certain zones. A number of quota species are managed as eastern and western stocks: gemfish and deepwater sharks caught in the western zone (generally west of longitude 147°) are managed separately from those caught in the east. Pink ling are assessed as eastern and western stocks; however the TAC applies across both stocks.

You may also want to include some figures here, such as Figure \@ref(fig:zone-map) from the eastern tuna and billfish fishery.

7. Fishing season

TODO

EXAMPLE:

The fishing season for all sectors of the Southern and Eastern Scalefish and Shark Fishery runs from 1 May to 30 April each year.

8. Key/secondary commercial species and stock status

TODO

EXAMPLE 1 (SESSF):

The SESSF is a multi-species fishery that catches over 100 species of commercial value. For the purposes of this analysis the key (C1) and secondary commercial species (C2) for the otter trawl sector have been defined as the species (or species groups) which contribute a significant proportion of the total landed catch.

For the otter trawl sector of the SESSF these are:

Blue grenadier (C1), tiger flathead (C1), flatheads (C1), pink ling (C1), silver warehou (C1), Gould's squid (C1), orange roughy (east; C1), mirror dory (C1), frostfish (C1), jackass morwong (C1), royal red prawn (C2), ocean jacket (C1), reef ocean perch (C2), latchet (C2), king dory (C2), silver trevally (C2), gemfish (west; C2), red gurnard (C2), eastern school whiting (C2) and redfish (C2).

A list of key and secondary commercial species and their stock status is included in Appendix \@ref(appdx-stock-status).

EXAMPLE 2 (ETBF):

Key commercial species:

- Albacore tuna (_Thunnus alalunga_; ALB)
- Bigeye tuna (_Thunnus obesus_, BET)
- Broadbill Swordfish (_Xiphias gladius_, SWO)
- Yellowfin tuna (_Thunnus albacares_, YFT)
- Striped Marlin (_Kajikia audax_, STM)
- Southern Bluefin tuna (_Thunnus maccoyii_, SBT)

Stock assessments are conducted over a broader region (Western and Central Pacific Ocean) and the reported status reflects the species status in this region.

Stock status:

Source: Larcombe et al. [-@Larcombe2016]; Patterson et al. [-@Patterson2016].

See also individual stock assessment reports for each of the species [Albacore tuna: @Harley2015; Bigeye tuna: @Harley2014; Broadbill swordfish: @Davies2013; Yellowfin tuna: @Davies2014; Striped marlin: @Davies2012; Southern bluefin tuna: @CCSBT2014].

- **Albacore tuna** (_Thunnus alalunga_): not overfished (Biomass) and not subject to overfishing (Fishing mortality). Last assessed: 2015. South Pacific.
- **Bigeye tuna** (_Thunnus obesus_): overfished (Biomass) and subject to overfishing (Fishing mortality). Last assessed: 2014. Western and central Pacific.
- **Broadbill swordfish** (_Xiphias gladius_): not overfished (Biomass) and uncertain as to overfishing (Fishing mortality). Last assessed: 2013. South-west Pacific.
- **Yellowfin tuna** (_Thunnus albacares_): not overfished (Biomass) and not subject to overfishing (Fishing mortality). Last assessed: 2014. Western and central Pacific.
- **Striped marlin** (_Tetrapturus audax_): uncertain, may be overfished (Biomass) and not subject to overfishing (Fishing mortality). Last assessed: 2012. South-west Pacific.
- **Southern Bluefin tuna** (_Thunnus maccoyii_): Last assessed: 2014. CCSBT. The 2014 assessment suggested that the SBT spawning biomass is at a very low fraction (9%) of its original biomass as well as below the level that could produce maximum sustainable yield [@CCSBT2014]. ABARES Fishery Status Report, Patterson et al. [-@Patterson2016]: overfished (Biomass) and uncertain as to overfishing (fishing mortality).

Both yellowfin and bigeye tuna are considered to be single stocks which extend across the western and central Pacific Ocean. From 2014 in both regional and internationally managed fisheries, bigeye tuna is considered overfished with respect to Biomass reference points and ‘subject to overfishing’ with respect to FMSY, with catch in the broader Pacific – especially of juveniles – needs to be reduced. Reliability of assessment: reasonable for bigeye, yellowfin and albacore in WCPO; otherwise unknown. Unreliable for AFZ because interactions of stock components in the WCPO and AFZ are uncertain. However, it is believed that the Australian fishery is not believed to

hinder recovery and rebuilding, based on the fixed TACC which accounts of less than 1% of the total catch on the stock. Therefore, the Australian system has a partial strategy in place.

Secondary commercial species:

There are no secondary commercial species in the ETBF.

9. Bait collection and usage

TODO

EXAMPLE (SESSF):

Not applicable

EXAMPLE (ETBF):

Bait used in the ETBF comes from a number of sources:

- fresh self-caught yellowtail scad and blue (slimy) mackerel;
- frozen local (WA) pilchards (small quantities), and imported squid and pilchards^[Here is an example footnote that could provide more information on where imported squid is from].

Most boats will use a combination of bait setting, alternating fresh live with thawed baits along the length of the line. Operators tend to identify squid bait with swordfish capture, and live bait with tuna and striped marlin.

Overall, the difference in CPUE between bought and self-caught baits appears to be very small. The type of species targeted influences the effectiveness of the bait used. Tuna and striped marlin have been shown to have a preference for self-caught (live bait) while swordfish tend to prefer bought bait (squid).

All boats using fresh bait, purse seine inshore for their own requirements, on state licences. Squid is not self-caught. Additionally, AFMA requires contact (i.e. a phone call) prior to these operations. Catch must be recorded to enable some assessment of inshore stocks to be maintained.

10. Current entitlements

TODO

EXAMPLE:

Current entitlements are listed in Table \@ref(tab:entitlements-table).

Depending on the fishery, you may also want to use Table \@ref(tab:entitlements-table-2) or Table \@ref(tab:entitlements-table-3).

11. Current and recent TACs, quota trends by method

TODO

EXAMPLE:

Total Allowable Catch for the last few seasons for quota species are shown in Table \@ref(tab:tac-table). Current and recent TACs for all key and secondary species with % of TAC caught are provided in Appendix \@ref(appdx-TAC).

12. Current and recent fishery effort trends by method

TODO

EXAMPLE ETBF:

Effort based on the total number of hooks set increased by 18% in 2015 relative to the previous year. This is due in part to increase in SBT quota availability and increased SBT targeting by ETBF vessels. A similar increase occurred based on the 2015-16 quota year relative to the 2014-15 (16%). The number of hooks per set has increased over the last five years (both calendar and quota years).

EXAMPLE SESSF (no text, only an examples of a table)

And yet another example table

13. Current and recent fishery catch trends by method

TODO

EXAMPLE:

Catch numbers for the last few years are shown in Table \@ref(tab:fishery-catch).

14. Current and recent value of fishery ($)

TODO

EXAMPLE SESSF:

The current and recent value for this sub-fishery is confidential and withheld in this report. See

ABARES Fishery Status Report 2017 [@Patterson2017].

EXAMPLE ETBF:

The value of this sub-fishery is $49.6 million (2015-16) and $35.7 million (2016-17).

See link for details. http://www.agriculture.gov.au/abares/research-topics/fisheries/fishery-status/eastern-tuna-billfish-fishery

15. Relationship with other fisheries

TODO

EXAMPLE SESSF:

Non-trawl fisheries operate in same area as the CTS and take many of the same species. Also, recreational catches may be significant for some species (e.g. flathead and silver trevally).

1. The following fisheries operate in the area coved by this fishery, either under Commonwealth jurisdiction or Joint jurisdiction between the Commonwealth and States:

* Bass Straight Central Zone Scallop fishery,
* East Coast Tuna and Billfish fishery,
* Small Pelagic fishery,
* Southern Bluefin Tuna fishery,
* Southern and Western Tuna and Billfish fishery and
* Southern Squid Jig fishery.

2. The following fisheries operate under Queensland jurisdiction in waters adjacent to the East Coast Deepwater Trawl Zone (ECDWZ) of this fishery:

* East Coast Trawl fishery and
* Sub-tropical Inshore Finfish fishery.

3. The following fisheries operate under New South Wales jurisdiction in waters overlapping or adjacent to this fishery:

* Abalone fishery,
* Fish Trawl fishery,
* Lobster fishery,
* Ocean Haul fishery,
* Ocean Trap and
* Line fishery.

4. The following fisheries operate under Victorian jurisdiction in waters overlapping or adjacent to this fishery:

* Abalone fishery,
* Rock Lobster fishery,
* Victorian Inshore Prawn Trawl fishery,
* Victorian Scallop fishery and
* Ocean Access fishery.

5. The following fisheries operate under Tasmania jurisdiction in waters overlapping or adjacent to the south east trawl, south east non trawl and southern shark sectors of this fishery:

* Abalone fishery,
* Rock Lobster fishery,
* Scalefish fishery,
* Tasmania Scallop fishery and
* Giant Crab fishery.

6. The following fisheries operate under South Australian jurisdiction in waters overlapping or adjacent to this fishery:

* Marine Scalefish fishery and
* Rock Lobster fishery

EXAMPLE ETBF:

Commonwealth fisheries that operate in the same region as the ETBF include the Southern Bluefin Tuna Fishery, Small Pelagic Fishery, Southern and Eastern Scalefish and Shark Fishery and the Coral Sea Fishery. The Southern and Western Tuna and Billfish Fishery (SWTBF) operates in waters adjacent to the ETBF. Many State finfish fisheries operate adjacent to the waters of the ETBF, however direct interactions are relatively limited given that most pelagic species caught in the ETBF do not venture into near shore waters and only a few species of inshore fish are susceptible to capture on pelagic longlines. Table \@ref(tab:other-fisheries-table) identifies the relationship between the ETBF and other fisheries.

Gear {#gfc-gear}

16. Fishing methods and gear

TODO

EXAMPLE Demersal trawling (SESSF):

Demersal trawling is the term used to describe the fishing method where a net is towed along, or just above, the ocean floor in depths of water ranging from a few metres to ~1300 metres (see Figure \@ref(fig:demersal-trawling)). A trawl net is attached to the vessel by two long wires, called warps which are attached to an otter board either side of the net. The net opening (mouth) is spread horizontally by the outward force acting on the otter boards as they are towed through the water. The bottom of the net opening is called the footrope and is heavier than the headline and normally in contact with the bottom. The footrope is often rigged with rubber rollers to minimise the damage to the seafloor and allow it to move across the substrate without becoming snagged. The top of the mouth (headline) is lifted vertically by a series of floats.

Otter trawling relies on the principle of herding fish inward from the otter boards and the sweep (wire from otter board to the headline and footrope) towards the mouth of the trawl net. Fish have a natural tendency to swim away from the otter boards, sweeps and net wings and fall backwards, towards the codend. The codend is the end of the net where the fish are caught. The size of the mesh in the codend is one of the most important factors in the size and shape of fish which are caught and those that escape.

A trawl shot involves the net being deployed from the stern of the vessel by way of winches. The net is then towed along the bottom, usually at about three knots for a period of time before being hauled up toward the vessel. The fish are contained in the codend, which is fastened with a rope to release the catch on the vessel deck.

EXAMPLE Pelagic longline (ETBF):

Longlining is the primary fishing method in the ETBF. Longline vessels in the ETBF vary in size, ranging from smaller inshore boats to larger, purpose-built boats capable of high seas fishing. Historically, the majority of domestic operators carried out other types of commercial fishing operations in conjunction with their tuna and billfish fishing activity. While this still continues, a large number of longline operators are now committed to tuna fishing on a full-time basis. This is most evident in northern NSW and southern Queensland where a relatively large fleet has been established to fish for broadbill swordfish, yellowfin and bigeye tuna on a year-round basis.

Pelagic longlines are set near the surface of the water and comprise of:

- A mainline, which is suspended near the surface by a floatlines attached to a series of floats (bouys or bubbles).
- Branchlines (or snoods), which hang off the mainline in between each float, and to which are attached baited hooks (See Figure \@ref(fig:pelagic-longline)).

Longlines can be many kilometres long and carry thousands of hooks (though the average number of hooks deployed per set in the ETBF during 2015 was approximately 1550). Pelagic longlines are not anchored and are set to drift near the surface of the ocean with a radio beacon attached to some floats so that the vessel can track them to haul in the catch.

17. Fishing gear restrictions

TODO

EXAMPLE:

SESSF operators are only permitted to fish using the gear/methods specified on their boat statutory fishing right (SFR) and/or fishing permit [@AFMA2017SESSF].

Mesh requirements:

* Must not be less than 90 mm at any part of net.

* 115 mm mesh in net mouth and wings (scalefish otter trawl only)

Codend requirements:

* At least 90 mm single twine mesh or at least 102 mm double twine mesh; or at least 90 mm double twine mesh with one or more bycatch devices

Bycatch Reduction Devices (BRDs):

* Single square mesh (≥ 90 mm) panel in upper side of codend bag (15 x 20 bars) or a large rotated mesh (T90) (≥ 90 mm) in upper codend (15 x 18 meshes).

18. Selectivity of fishing methods

TODO

EXAMPLE SESSF:

The mesh size in the cod-end is restricted to a minimum of 90 mm for single twine and 102mm for double twine. This optimises the catch and allows undersized target and non-target species to escape. No other trawl net specifications were available.

EXAMPLE ETBF:

In comparison to many other fishing methods, pelagic longlining is considered to be relatively selective. A lower diversity of species that are susceptible to longline gear are found in the upper water column in comparison to the range of species that may be impacted on by other methods such as demersal trawling. The species and size selectivity of the longline gear is dependent on a number of factors such as:

* the horizontal and vertical distribution of the gear given that certain species are found in selected areas and over selected substrates, and that species are found at various depths according to various environmental influences

* the variety of bait used since the gear is based on the foraging behaviour of fish and as feeding stimulants may be species-specific

* the hook and other gear design since the selectivity is related to the ability of the hook to penetrate the mouth of the fish.

However, in comparison to other tuna and tuna-like species fishing methods, longline fishing has the potential to interact with a wider range of species, some of which will be of high conservation value. In particular, these include environmentally protected seabirds and turtles, and commercially protected blue and black marlins and various shark species of concern.

19. Spatial gear zone set

TODO

EXAMPLE:

Otter board demersal trawling occurs along the continental shelf, shelf break, and continental slope to depths of ~1300 m. Deepwater closures are in place along the 700 m depth contour. Limited deepwater areas are open to fishing.

20. Depth range gear set

TODO

EXAMPLE:

Otter board trawling occurs in depths ranging from approximately 40 m to 1300 m.

21. How gear set

TODO

EXAMPLE:

The net is deployed from the stern of the vessel by way of winches. The net is then towed along the bottom, usually at about 3 knots for a period of time (highly variable, 4-6 hours but may be shorter or longer dependant on location or target species) before being hauled up toward the vessel.

Demersal trawlers tow a net along the ocean floor, in depths up to about 1300 m. The net is towed behind the vessel by long wires (the warps) and is deployed and retrieved from the stern of the vessel by winches. The net opening (the mouth) is spread horizontally by the outward force acting on the otter boards as they are towed through the water. The bottom of the net opening, the footrope, is weighted bringing the net opening close to the bottom and has ground gear, principally bobbins commonly known as “rockhopper” gear, attached to enable the gear to be

towed across the substrate with minimal hook-ups. The top of the mouth, the headline, is lifted vertically by floats. Vessels are generally equipped with electronic units to allow the proximity of the nets to the seabed to be monitored.

Demersal trawling relies on herding fish inward toward the path of the oncoming net mouth, rather than the speed of the tow. As the fish swim away from the warps and the net wings, they are enclosed and fall back towards the tapered body of the net. As the gear is hauled up toward the vessel the fish are contained in the end section of the net, the codend, which is fastened with a rope to release the catch into the vessel's fish pound.

Source: AFMA; http://www.afma.gov.au/portfolio-item/trawling/ accessed 9 Mar 2018.

22. Area of gear impact per set or shot

TODO

EXAMPLE:

This varies considerably as a function of tow duration, towing speed, and net width.

23. Capacity of gear

TODO

EXAMPLE SESSF:

Not available. Net size is not recorded for otter board trawling. It is possible that a requirement to collect this information could be added to observer duties in the future.

Source: AFMA

EXAMPLE ETBF:

Most Australian pelagic longline vessels are between 15 and 30 m long and set between 200 and 1200 hooks per fishing operation. Some longliners now routinely set more than 1200 hooks per day.

Australian longliners store their catch on ice, in ice slurry, brine or use brine spray systems.

24. Effort per annum all boats

TODO

EXAMPLE SESSF:

See "Current and recent fishery effort trends by method"

25. Lost gear and ghost fishing

TODO

EXAMPLE:

Whole or parts of nets are occasionally lost however no quantitative data is available. Gear retrieval depends on circumstances however ghost fishing is not considered to be a significant issue with this gear.

Issues {#gfc-issues}

26. Key/secondary commercial species issues and Interactions

TODO

EXAMPLE:

There remains uncertainty about the stock structure of blue-eye trevalla in southeastern Australia. Williams et al. [-@Williams2017] provided evidence for stock structure within the broad southern Australian distribution of Blue-eye Trevalla. A workshop is scheduled for early 2018 to consider these findings and the implications to the stock assessment and management of blue-eye trevalla.

Stock assessments are in place for each of the commercial species under quota in the SESSF. The status of species relevant to the Commonwealth Trawl Sector, an overview of stock status and fishing mortality is available in the ABARES Fishery Status Report 2017 [@Patterson2017].

The South East Resource Assessment Group identified the need to update the understanding of key species biology (growth, age at maturity etc.). This is currently a research priority on the SESSF Research Statement.

27. Byproduct and bycatch issues and interactions

TODO

EXAMPLE:

Byproduct species are defined as species which do not make a significant contribution to the overall catch but are sometimes landed for sale. Bycatch species are defined as species which are caught as part of fishing activities but are rarely landed. The ERA is the primary assessment tool to assess the impact on these species.

The Upper-slope Dogfish Management Strategy has been implemented since the last ERA was undertaken. This strategy provides a level of protection for two species of gulper sharks: Harrison's dogfish (_Centrophorus harrissoni_) and Southern dogfish (_C. zeehaani_). The management actions provide some protection for other dogfish species including Endeavour Dogfish (_C. moluccensis_) and Greeneye Spurdog (_Squalus chloroculus_).

28. Protected species issues and interactions

TODO

EXAMPLE:

Operators are required to report all interactions with protected species in their logbooks and AFMA reports quarterly to the Department of Environment and Energy (Table \@ref(tab:ps-interactions)).

Overall, there were 1329 protected species interactions within this assessment period (301 alive; 1028 dead), and most of the interactions were with Australian fur seals, and unidentified seals, most likely to have also been Australian fur seals. Interactions with fur seals occurred at the rate of nearly 150 per year. About a third of the interactions were with seahorses and pipefishes, all occurring in the early part of the assessment period. These were all as a result of entanglement with the gear.

Most bird interactions were with albatrosses, commonly Shy, and commonly fatal. The records indicate that these interactions were sometimes a result of collision with the gear and vessel rather than entanglement. The rate of interaction with birds was about 25 per year.

Interactions with other protected species such as sharks, mako, porbeagle, were reported infrequently i.e. ~1 interaction per year or 1 interaction per 5 years.

In the 2006 ERAEF assessment, it was estimated that 201 protected species occur within the area of the Commonwealth Trawl Sector. However, in this assessment, otter trawl operators have interacted with only 21 taxa: five chondrichthyan species, one teleost, six marine mammal taxa (four species and two unresolved to species level) and 10 marine bird taxa (seven species and three taxa unresolved to species level) at a rate of about 270 interactions per year.

Since 2017, all board trawlers were required to use one of three seabird mitigation devices which have been proven effective at reducing seabird interactions.

29. Habitat issues and interactions

TODO

EXAMPLE:

Due to the nature of board trawling and the species targeted, there are interactions with the seabed as part of fishing. Removal, modification or disturbance of seabed flora and fauna by this method does occur. Pitcher et al. [-@Pitcher2016] estimated that on average approximately 7.6 % of the available trawl grounds between 0-1500 m are trawled annually but it is unknown how much of the most vulnerable assemblages is impacted. However, there are substantial closures in place which afford protection to large areas of vulnerable midslope and deep-water habitats such those supporting fragile deepwater corals.

30. Community issues and interactions

TODO

EXAMPLE:

Removing one species or size range of the population, in addition, to changes to the community structure from which it is removed, will also change food web dynamics and energy transfer in the system.

Over the past decade, it has become evident that climate change is affecting the water temperatures and probably salinities and other water properties. This effect on species could cause changes in distribution and there is increasingly species are being more regularly sighted beyond previous known distributions. Some species might not be able to disperse or extend their range so readily and populations may decline as a result of their inability to adapt to new environmental conditions. While ecosystem models do account to some extent for cumulative pressures, the way in which they interact might not be linear and is currently the focus of research. Irrespective, whole of ecosystem-based advice is being sought and accepted by fishery management.

31. Discarding

TODO

EXAMPLE SESSF:

The level of discarding varies based on which area of the fishery a vessel is operating in and which species they are targeting. For example, discards are relatively low when fishing spawning aggregations of blue grenadier and orange roughy because operators target large spawning aggregations and there are typically few other species.

In contrast, fishing on the continental shelf for mixed species means operators will catch non-target species including undersized (non-marketable) target species. Estimated discard rates vary by species; ocean perch 19.6 %, mirror dory west 0.9 %, pink ling 9.6 % [@Castillo-Jordan2018].

Most of the discarded catch usually consists of non-quota species such as barracouta, southern frostfish and jack mackerel, which may have some commercial value, and non-commercial species including New Zealand dory, whiptails, skates, catsharks and dogfish.

EXAMPLE ETBF (with tables):

Generally occurs because the species is of no value, or where the return in the catch would not be adequate to cover the costs of further handling, or where retention is not allowed by management arrangements. Discards may include juvenile or damaged target and non-target species, which are often discarded back into the sea during fishing operations.

Blue and black marlin are not permitted to be taken in the ETBF. These species have been discarded in the ETBF over the 2011-2015^ period (see Table \@ref(tab:discarding-table)) based on the AFMA Commonwealth logbook database. In particular, a total of 7188 marlins (black marlin: 4008; blue marlin: 3180) were discarded over the 2011-2015 period.

The AFMA Observer Program also records species retained and discarded (in numbers) in the ETBF. A total of 352 species were discarded over the 5-year period (unweighted to fishery), including 644 blue shark and 51 long snouted lancetfishes. Annual percentage coverage rates are listed in Table \@ref(tab:coverage-table). Corresponding targets were unavailable.

Management: planned and those implemented {#gfc-management}

32. Management objectives

TODO

EXAMPLE:

The objectives of the Southern and Eastern Scalefish and Shark Fishery Management Plan 2003 are as follows:

a) to implement efficient and cost-effective fisheries management of the fishery on behalf of the Commonwealth;

b) to ensure that the exploitation of the resources of the fishery and the carrying on of any related activities are conducted in a manner consistent with the principles of ecologically sustainable development and the exercise of the precautionary principle and, in particular, the need to have regard to the impact of fishing activities on non-target species and the long-term sustainability of the marine environment;

c) to maximise economic efficiency in the exploitation of scalefish and shark resources within the fishery;

d) to ensure AFMA's accountability to the fishing industry and to the Australian community in the management of the resources of the fishery;

e) to reach Government targets for the recovery of the costs of AFMA in relation to the fishery;

f) to ensure, through proper conservation and management, that the living resources of the fishery are not endangered by over-exploitation;

g) to ensure the best use of the living resources of the fishery;

h) to ensure that conservation and management measures in the fishery implement Australia's obligations under international agreements that deal with fish stocks, and other relevant international agreements;

i) to ensure, as far as practicable, that measures adopted in pursuit of these objectives are not inconsistent with the preservation, conservation, and protection of all whale species.

33. Fishery management plan

TODO

EXAMPLE:

The fisheries Management Plan 2010 is a key document in managing the ETBF. It stipulates obligations, procedures and conditions when fishing in the ETBF. In particular, it covers information on:

• Total allowable commercial catch (TACC)

• Specific ecosystem requirements (e.g. information recorded on bycatch species; minimize interactions with marine mammals, marine reptiles, fish and seabirds

• Availability and limits of Statutory fishing rights (SFRs) and fishing permits

• Undercatch and overcatch obligations

• Area of the fishery

• Primary species of fish

Southern bluefin tuna (_Thunnus maccoyii_) is also taken in the ETBF, but covered by quota under the Southern Bluefin Tuna Management Plan.

The Commonwealth fisheries Harvest Strategy Policy [HSP; @DAFF2007] is not prescribed for fisheries under International agreements. However, a harvest strategy framework has been developed for the ETBF [@Campbell2012] and since then has been implemented for commercial catches of broadbill swordfish and striped marlin to calculate the Recommended Biological Commercial Catch (RBCC) for the 2016/17 quota year [@Campbell2016]. These estimates are then used to inform the Tropical Tuna MAC and the AFMA board in determining the TACC. Tropical tuna species (yellowfin, bigeye and albacore tunas) TACC are determined based on assessment of fishery indicators, stock status information and the position of the Australian Government. The harvest strategy is not applied to these species.

34. Input controls

TODO

EXAMPLE:

A vessel must have a boat Statutory Fishing Right (SFR) allowing a vessel to trawl. This SFR will entitle a vessel to use trawl gear in a specific area of water.

Other input controls include minimum mesh size in the codend to prevent the capture of juvenile fish and closures. Gear requirements are detailed earlier in this report.

Closures are legislated under the Southern and Eastern Scalefish and Shark Fishery and Small Pelagic Fishery (Closures) Direction 2016, Southern and Eastern Scalefish and Shark Fishery (Closures) Direction No. 11 2013, Southern and Eastern Scalefish and Shark Fishery (Closures) Direction No. 6 2013, Southern and Eastern Scalefish and Shark Fishery (Closures) Direction No. 2 2015 and under SFR conditions (see Appendix \@ref(appdx-trawl-closures)).

Australia's South-east Commonwealth Marine Reserves Network stretches from the far south coast of New South Wales, around Tasmania and Victoria and west to Kangaroo Island off South Australia. The reserves cover an area of 388 464 km^2^ with a depth of 40 m - 4600 m. The network includes 14 Commonwealth Marine Reserves, ranging in size from 537 to 162 000 km^2^. Zoning and maps for each of the 14 marine reserves are available from the Department of

Environment and Energy website: http://www.environment.gov.au/topics/marine/marine-reserves/south-east.

The Temperate East Network covers 383 352 km^2^ and includes eight marine parks. The network includes important offshore reef habitat at Elizabeth and Middleton Reefs, Lord Howe Island and at Norfolk Island. Several significant seamount ridges run parallel to the coast in this region. Zoning and maps for each of the eight marine parks are available from the Department of Environment and Energy website: http://www.environment.gov.au/topics/marine/marine-reserves/temperate-east.

You may also want to include a map, e.g. of marine reserves (Figure \@ref(fig:marine-reserves)).

35. Output controls

TODO

EXAMPLE SESSF:

All major target and byproduct species in the CTS of the SESSF are managed under quota. Quota is issued in the form of 'quota' SFRs and an operator must hold both the appropriate boat SFR and Quota SFRs to fish for quota species. Quota SFRs are tradable among sectors.

There are also State trip limits in place for some byproduct species (see Appendix \@ref(appdx-trip-limits)).

EXAMPLE ETBF:

The Eastern Tuna and Billfish Fishery is managed by a range of output controls (see below).

The AFMA Commission agreed to move the ETBF from an input-controlled system, controlling the number of hooks set to an output controlled system based on Individual Transferrable Quotas (ITQs) in December 2008. This was implemented in 2011.

The primary ETBF tuna and billfish species are managed through total allowable commercial catches as individual transferable quotas (ITQs), i.e. albacore tuna, bigeye tuna, yellowfin tuna, broadbill swordfish and striped marlin. There are no size limits for the quota species in the ETBF. There are limits in catch and numbers of species and on the species taken commercially in the ETBF (see Table \@ref(tab:output-control-table) and \@ref(tab:output-control-table-2).

NOTE: these tables are just an example, you may need to modify them or add additional tables e.g. on bycatch limits.

36. Technical measures

TODO

EXAMPLE:

A holder must not take flathead less than 280 millimetres in length when measured from the point of the snout to the tip of the tail.

Additional technical measures are discussed in other sections.

37. Regulations

TODO

EXAMPLE:

The Fisheries Management Regulations 1992 prescribes detail on the management arrangements implemented in Commonwealth fisheries. These have since been superseded by the [Fisheries Management Regulations 2019](https://www.legislation.gov.au/Details/F2019L00383), which is outside this assessment period. Specifically, they cover bans on vessels over 130 m, administration of and standard conditions for fishing concessions including VMS operation, carrying observers, processing fish, marine environment impacts, payments and fees, registers and administration and allocation of statutory fishing rights (SFRs), discarding offal at sea (not attributed to this fishery). Additional regulations were introduced regarding navigation in closures. Additional rules are contained in the Management Plan and SFR conditions.

Under the EPBC Act 1999, interactions with a protected species must be reported within seven days of the incident occurring to the Department of Environment and Energy. A Memorandum of Understanding between AFMA and the Department for the Reporting of Fisheries Interactions with Protected Species (Reporting MOU) streamlines those reporting requirements. AFMA reports its protected species interactions to the Department on a quarterly basis.

Amendments to the International Maritime Organisation's International Convention for the Prevention of Pollution from Ships (MARPOL) Annex V which came into force on 1 January 2013 prohibit the discharge of all garbage, from all ships, into the sea (except as provided otherwise, under specific circumstances). Fishers are encouraged to record loss of gear in vessel logbooks; however it is only compulsory for vessels operating in the Southern Ocean under the management of the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR).

38. Initiatives, strategies and incentives

TODO

EXAMPLE:

The SESSF Management Arrangements Booklet 2017 documents all management requirements. Bycatch and Discarding Workplans document planned actions to minimize the risk of interactions with bycatch and protected species.

All board trawl vessels are required to have an AFMA-approved Seabird Management Plan (VMP) which details vessel-specific approaches to mitigating interactions with seabirds. Operators must

use one of three mitigation devices which have been proven effective at reducing interactions with seabirds. Compliance is directed via targeted surveillance.

Trawl net bycatch reduction devices are also required in the form of a single square mesh (≥ 90 mm) panel in upper side of codend bag (15 x 20 bars) or a large rotated mesh (T90) (≥ 90 mm) in upper codend (15 x 18 meshes).

Industry codes of conduct include:

- Industry Code of Practice for Responsible Fishing 2006

- Industry Code of Practice for Responsible Fishing reducing seal interactions 2007

Industry Code of Practice for minimising catches of snapper in waters adjacent to Victoria.

39. Enabling processes

TODO

EXAMPLE:

AFMA is responsible for data collection and monitoring in this fishery. Commonwealth scientific log books have been compulsory in the south east trawl sector since 1985, and electronic logbooks will be compulsory for all full time trawl operators as of 1 May 2018. Prior to 1997, shark and non-trawl operators completed State logbooks. This data has been collated and is used in assessments.

Landings are also recorded through the quota monitoring system by catch disposal records. The collection of age-length data for scalefish was conducted by State agencies and often sporadic or duplicated prior to 1991. The Central Aging Facility (CAF) was established in 1991 to conduct age estimation for these fisheries.

Fish Ageing Services now provides ageing services for the main quota species in the SESSF. The Integrated Scientific Monitoring Program (ISMP) was implemented in 1997 to replace the Scientific Monitoring Program in the SETF. It provides statistically rigorous port-based and at sea monitoring in the south-east trawl, south east non-trawl and GAB trawl sectors of this fishery. ISMP provides important information on discards, non-commercial species, and non-quota commercial species.

Fishery independent trawl surveys (FIS) have been carried out since 2006. They were original planned as an annual summer and winter survey, however, are now carried out during the winter of every second year in the GABT and CTS. These surveys provide an independent index of abundance, as well as other important biological and environmental data, some of which are used in current stock assessments.

The assessment group structure comprises:

- SESSF Resource Assessment Group (SESSFRAG - an umbrella assessment group for the whole SESSF)

- South East Resource Assessment Group (formerly Shelf and Slope RAG)

- Shark Resource Assessment Group (SharkRAG)

- Great Australian Bight Assessment Group (GABRAG)

SERAG, SharkRAG and GABRAG are responsible for undertaking stock assessments for a suite of key species, and for reporting on the status of those species to SESSFAG.

SERAG is responsible for the assessment of scalefish species and SharkRAG is responsible for assessments of all shark and ray species taken by all sectors of the SESSF. The Great Australian Bight Assessment Group is responsible for assessment of a suite of species taken in the GAB trawl sector of the SESSF.

40. Other initiatives or agreements

TODO

EXAMPLE:

Relevant to the CTS, Offshore Constitutional Settlements (OCS) are in place between the Commonwealth and the States of New South Wales, Victoria, Tasmania and South Australia. These OCS agreements define who has jurisdiction for which species stock and puts trip limits in place where necessary.

In addition, there are a few national and international initiatives in place which impact management of the fishery. These include:

- Oceans Policy 1998
- National Plan of Action for the Conservation and Management of Sharks 2012
- United Nations Convention Law of the Sea
- FAO Code of Conduct for Responsible Fisheries
- United Nations Fish Stocks Agreement
- Declaration of the Harvest Operations of the Southern and Eastern Scalefish and shark Fishery as an approved wildlife trade operation, February 2016
- Environment Protection and Biodiversity Conservation Act 1999
- Stock rebuilding strategies for conservation dependent species:
  a. Orange roughy rebuilding strategy
  b. Eastern gemfish rebuilding strategy
  c. Redfish rebuilding strategy
  d. Blue warehou rebuilding strategy
  e. School shark rebuilding strategy
  f. Upper Slope dogfish Management Strategy
- Bycatch and discarding work plans for each sector of the fishery

Data {#gfc-data}

41. Logbook data

TODO
EXAMPLE:

Catch and effort data and all interactions with protected species are recorded on a shot-by-shot basis in Daily Logbooks. Data has been compiled into a centralised database by AFMA and is updated annually to CSIRO.

Electronic logbooks (e-logs) are an electronic alternative to submitting traditional paper logbooks. E-logs allow data to be received by AFMA in near real time, closer to actual fishing events. From 1 May 2018 it will be compulsory for all trawl vessels that have fished more than 50 days in the current or previous fishing season to have transitioned to e-logs.

42. Observer data

TODO

EXAMPLE:

The purpose of the Observer Program is to “provide fisheries managers, research organizations, environmental agencies, the fishing industry and the wider community with independent, reliable, verified and accurate information on the fishing catch, effort and practice of a wide range of boats operating inside, and periodically outside, the Australian Fishing Zone” (AFMA http://www.afma.gov.au/fisheries-services/observer-services/: accessed 29 June 2016).

AFMA observers are highly experienced in fishery observer work in Australia. They:

- collect data on independent boat activity and catch data (not recorded in official logbooks);
- collect data and samples for research programs, supporting marine management and other issues relevant to environmental awareness and fisheries management and
- monitor compliance of the boat with its fishing concession.

Observer data is collated in AFMA's centralised database and data have been made available outside AFMA in the form of observer trip reports and as raw data. Annual percentage coverage rates are listed in Table \@ref(tab:coverage-table).

43. Other data

TODO

EXAMPLE:

Additional data is obtained via Fishery Independent Surveys every second year in the CTS.

The Southern and Eastern Scalefish and Shark Fishery Five Year Strategic Research Plan 2016-2020 [@AFMA2016] identifies the research priorities for the fishery over the next five years to assist with the pursuit of the management objectives for the SESSF and to enable the effective implementation and appraisal of management arrangements.

44. Legislative instruments and directions

TODO

EXAMPLE:

Declaration of the Harvest Operations of the Southern and Eastern Scalefish and shark Fishery as an approved wildlife trade operation, February 2016. http://www.environment.gov.au/biodiversity/wildlife-trade/trading/commercial/operations

Environment Protection and Biodiversity Conservation Act 1999. https://www.legislation.gov.au/Series/C2004A00485.

FAO Code of Conduct for Responsible Fisheries. http://www.fao.org/docrep/005/v9878e/v9878e00.htm.

National Plan of Action for the Conservation and Management of Sharks 2012 Shark-plan 2. Licensed from the Commonwealth of Australia under a Creative Commons Attribution 3.0 Australia Licence. http://www.daff.gov.au/sharkplan2/.

Oceans Policy 1998. Commonwealth of Australia 1998, ISBN 0 642 54592 8.

Southern and Eastern Scalefish and Shark Fishery and Small Pelagic Fishery (Closures) Direction 2016

Southern and Eastern Scalefish and Shark Fishery (Closures) Direction No. 6 2013

Southern and Eastern Scalefish and Shark Fishery (Closures) Direction No. 11 2013

Southern and Eastern Scalefish and Shark Fishery (Closures) Direction No. 2 2015

Southern and Eastern Scalefish and Shark Fishery Management Plan 2003

United Nations Convention Law of the Sea. http://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf.

United Nations Fish Stocks Agreement. http://www.un.org/Depts/los/convention_agreements/texts/fish_stocks_agreement/CONF164_37.htm

References

Please list all the literature that you cite somewhere in this document or in the accompanying excel file. This list will not be converted to RMarkdown content automatically. But the details you provide will be used to create the corresponding entries in our literature database (which then feeds RMarkdown).

TODO

EXAMPLE:

AFMA. 'Eastern Tuna and Billfish Fishery (ETBF) Management Arrangements Booklet'. Canberra: Fishing Season. Commonwealth of Australia, 2016.

AFMA. (2017). SESSF Management Arrangements Booklet.

Campbell, R. 'Annual Catches, RBCCs and TACCs for the Eastern Tuna and Billfish Fishery'. Background document to Tropical Tuna Resource Assessment Group, 2016.

Campbell, R. 'Implementation of the ETBF Harvest Strategy and Calculation of the Recommended Biological Commercial Catches for 2013/14'. Working paper presented to the fifth meeting of the Tropical Tuna Resource Assessment Group. Canberra, 4–5 September 2012, 2012.

Castillo-Jordán, C., Althaus, F., & Thomson, R. (2018). SESSF catches and discards for TAC purposes – Final. CSIRO Oceans; Atmosphere.

CCSBT. 'Report of the Nineteenth Meeting of the Scientific Committee, Auckland, 1–6 September 2014'. Canberra: Commission for the Conservation of Southern Bluefin Tuna, 2014.

Department of Agriculture, Fisheries and Forestry. 'Commonwealth Fisheries Harvest Strategy - Policy and Guidelines', 2007.

Davies, N., S. Harley, J. Hampton, and S. McKenzie. 'Stock Assessment of Yellowfin Tuna in the Western and Central Pacific Ocean'. Report to the Western and Central Pacific Fisheries Commission, 2014.

Davies, N., S. Hoyle, and J. Hampton. 'Stock Assessment of Striped Marlin *(Kajikia Audax*) in the Southwest Pacific Ocean'. Report to the Western and Central Pacific Fisheries Commission, 2012.

Davies, N., G. Pilling, S. Harley, and J. Hampton. 'Stock Assessment of Swordfish (*Xiphias Gladius*) in the Southwest Pacific Ocean'. Report to the Western and Central Pacific Fisheries Commission, 2013.

Emery, Timothy J., Rocio Noriega, Ashley J. Williams, and James Larcombe. 'Changes in Logbook Reporting by Commercial Fishers Following the Implementation of Electronic Monitoring in Australian Commonwealth Fisheries'. Marine Policy 104 (1 June 2019): 135–45. https://doi.org/10.1016/j.marpol.2019.01.018.

Harley, S. J., Tremblay-Boyer, L., Hampton, J., & McKenzie, S. (2015). Stock assessment for south Pacific albacore tuna (WCPFC-SC11-2015/SA-WP-06; pp. 101 pp). Western; Central Pacific Fisheries Commission.

Harley, S.J., N. Davies, J. Hampton, and S. McKenzie. 'Stock Assessment of Bigeye Tuna in the Western and Central Pacific Ocean'. Western and Central Pacific Fisheries Commission, 2014.

Hobday, A. J., Smith, A., Webb, H., Daley, R., Wayte, S., Bulman, C., Dowdney, J., Williams, A., Sporcic, M., Dambacher, J., Fuller, M., & Walker, T. (2007). Ecological Risk Assessment for the Effects of Fishing: Methodology (Report R04/1072 for the Australian Fisheries Management Authority).

Larcombe, J., A. Williams, and J. Savage. 'Eastern Tuna and Billfish Fishery'. In Fishery Status Reports 2016, pp 359-381. Canberra: Australian Bureau of Agricultural and Resource Economics and Sciences, 2016.

Patterson, H., Stobutzki, I., & Curtotti, R. (2016). Southern Bluefin Tuna Fishery. In Fishery Status Reports 2016 (pp. pp 391–403). Australian Bureau of Agricultural; Resource Economics; Sciences.

Patterson, H., R. Noriega, L. Georgeson, J. Larcombe, and R. Curtotti. 'Fishery Status Reports 2017'. Canberra: Australian Bureau of Agricultural and Resource Economics and Sciences, 2017.

Pitcher, C. R., Williams, A., Ellis, N., Althaus, F., McLeod, I., Bustamante, R., Kenyon, R., & Fuller, M. (2016). Implications of current spatial management measures for AFMA ERAs for habitats — FRDC Project No 2014/204. CSIRO Oceans; Atmosphere.

Williams, A., Hamer, P., Haddon, M., Robertson, S., Althaus, F., Green, M., & Kool, J. (2017). Determining Blue-eye Trevalla stock structure and improving methods for stock assessment (FRDC Project No 2013/015; pp. 123 p.).