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PART 1: INFORMATION ON FISHERIES, RESEARCH, AND STATISTICS

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Department of Agriculture, Water and the Environment
ABARES

Annual report to the Western and Central Pacific Fisheries Commission

Part 1: Information on fisheries, research and statistics 2019 Australia

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Contents

Tables

Figures

Summary

Australian commercial fisheries for highly migratory species in the Western and Central Pacific Fisheries Commission (WCPFC) Convention Area are managed as part of the Eastern Tuna and Billfish Fishery (ETBF) (a mainly longline fishery with a small minor line component) and Eastern Skipjack Fishery (a purse seine fishery). The majority of fishing occurs in the longline sector of the ETBF and, as such, this is the primary focus of the annual report.

Total catches of WCPFC species of interest reported in logbooks for the ETBF increased from 3345 t (including <1 t minor line) in 2018 to 3838 t (including <1 t minor line) in 2019. This is a decline from a peak of 8229 t in 2002. Longline fishing effort in the ETBF has fallen from a peak of 12.40 million hooks in 2003 to 8.57 million hooks in 2019. Thirty-seven Australian vessels reported longlining in the WCPFC Convention Area during 2019.

The ETBF is a multi-species longline fishery, targeting albacore, bigeye tuna, yellowfin tuna, swordfish and striped marlin. The profitability and viability of the fishery is dependent on this suite of species, each of which fluctuate in availability in the Australian region through time. Longline logbook catches of albacore increased from 695 t in 2018 to 760 t in 2019. Longline catches of bigeye tuna decreased from 314 t in 2018 to 247 t in 2019. Longline catches of yellowfin tuna increased from 1278 t in 2018 to 1896 t in 2019. Longline catches of swordfish decreased from 820 t in 2018 to 695 t in 2019. Longline catches of striped marlin increased from 209 t in 2018 to 211 t in 2019. Longline catches of skipjack increased from 3.1 t in 2018 to 4.0 t in 2019.

There was one dedicated minor line (including trolling, rod-and-reel and handline) vessel in the ETBF; most minor line catches are reported by vessels (e.g. longline vessels) on their way to and from fishing grounds. In 2019, there was one vessel actively targeting tuna and billfish species using minor line in the ETBF. The number of vessels reporting using minor line has steadily decreased in the ETBF from a peak of 52 vessels in 2001. There were no vessels active in the Eastern Skipjack Fishery (purse seine) in 2019.

The Australian Fisheries Management Authority (AFMA) observer program began deploying observers on domestic longliners in 2001, initially as part of a program to test the efficacy of seabird mitigation devices. From July 2003, observers were deployed more broadly across the fishery with the aim of collecting additional fishery data, including information on fishing gear and the size and species composition of catches. AFMA conducted a trial of electronic monitoring (i.e. e-monitoring; on-board, fixed-mount digital video cameras) in 2009–10 to evaluate the effectiveness of this technology for a range of fishery monitoring purposes and to conduct a cost–benefit analysis. E-monitoring of the fishery became compulsory from 1 July 2015 for vessels operating within the Australian Exclusive Economic Zone. As a minimum, 10% of the hauls are reviewed and used to acquit information provided in logbooks. The total number of hooks observed from the e-monitoring system in 2019 was 999,899, which is 11.7% of the hooks deployed.

The AFMA Commission agreed on the total allowable commercial catches (TACCs) for the ETBF. These apply to the 2020 season which commenced on 1 January 2020. The TACCs for the five main target species are: albacore (2500 t); bigeye tuna (1056 t); swordfish (1250 t); striped marlin (351 t); and yellowfin tuna (2400 t).

1 Background

Australian commercial fisheries for highly migratory species in the Western and Central Pacific Fisheries Commission (WCPFC) Convention Area are managed as part of the Eastern Tuna and Billfish Fishery (ETBF) (a mainly longline fishery with a small minor line component) and Eastern Skipjack Fishery (a purse seine fishery). Scientific and common names are provided in Appendix I.

1.1 Longline

Japanese longliners began fishing off Australia's east coast in the late 1950s. Sporadic domestic longlining for yellowfin tuna commenced soon after, in the early 1960s. The declaration of the Australian Fishing Zone (AFZ) in 1979 resulted in Japanese longliners being licensed to fish in Australian waters under bilateral agreements. In the early 1980s, longlining increased markedly after successful air-freighting of fresh-chilled tuna to Japan. In the 1990s, effort expanded in the waters off northern Queensland, resulting in high catch rates of yellowfin and bigeye tuna.

In the mid-1990s, improved access to swordfish markets in the United States of America prompted many ETBF fishers to move to southern Queensland ports such as Mooloolaba to target swordfish. Japanese longliners were excluded from the AFZ from 1997. Longlining for swordfish has declined since early 2005 because of high fuel and bait costs, the introduction of a competitive total allowable catch (TAC) in 2006 (now an individual transferable quota system), and changes in the currency exchange rate.

The Securing our Fishing Future structural adjustment package (between 2005 and 2006) likely increased the exit of less-efficient vessels from the fishery. However, the number of longline vessels was already declining from a peak of 152 vessels in 1999; by 2007, 58 longline vessels remained, and in 2019 a total of 37 longline vessels were active.

Management through total allowable commercial catch (TACC) limits and individual transferable quotas (ITQs) commenced in 2011. Quota species are albacore, bigeye tuna, yellowfin tuna, swordfish and striped marlin. The level of latency in the ETBF, measured by the proportion of TACC not caught in the fishery, has varied across the key species since 2011. Yellowfin tuna, swordfish and bigeye tuna have had lower quota latency compared with albacore. Albacore is a relatively low unit-value catch compared with other species targeted in the fishery and the fleet is likely to actively target the higher unit-value species of the fishery over albacore. Targeting of the different species fluctuates depending on their availability within the fishing grounds (generally within the Australian EEZ) as well as in response to market prices. Swordfish remains a key species for the ETBF, however a steep increase in the price of the squid bait has resulted in a decline in swordfish targeting since 2018.

1.2 Pole-and-line, purse seine and minor line

The pole-and-line fishery expanded rapidly in the 1950s with the introduction of live-bait-and-pole techniques for southern bluefin tuna and sporadic catches of skipjack and yellowfin tuna. Pole-and-line fishing decreased in the late-1990s with little to no fishing by Australian fleets in the WCPFC Convention Area since then. The introduction of purse seining in the 1970s also increased catches. After peaking at 7000 t in the early 1990s, purse-seine effort and catches of skipjack have decreased dramatically, with zero to very low effort and catches in recent years,

although there is industry interest in re-invigorating the fishery. Minor line effort has been decreasing in the fishery over time, with a peak number of vessels in 2001 (52). There was one dedicated minor line vessel that operated in the ETBF in 2019.

1.3 Recreational fishing

Recreational and charter anglers have taken tuna and billfish off eastern Australia since the early 1900s. During the 1970s, recreational vessels capable of operating offshore became more readily available and angling for tuna and billfish grew in popularity. The continental shelf extends less than 8 nm offshore in some places along the southeast coast of Australia, allowing anglers to fish for tuna from shore at several locations. The Game Fishing Association of Australia (GFAA) was formed in 1938 and has a membership of several thousand anglers, most based on the east coast of Australia. Many gamefishers tag and release much of their catch, especially marlins.

2 Flag state reporting

2.1 Domestic longlining catch and effort

Unless otherwise stated, all catch and effort levels in this report are derived from those reported in Australian Fisheries Management Authority (AFMA) logbooks. Thirty-seven vessels in the Australian fleet reported longlining in the WCPFC Convention Area during 2019, down from a peak of 180 in 1997 (Figure 1). Total longline effort increased from 7.90 million hooks in 2018 to 8.57 million hooks in 2019 (Table 1). Overall, effort has declined from the peak effort of 12.40 million hooks deployed in 2003. This decline is mainly the result of the strength of the Australian dollar, increased operating costs, the surrender of permits under the structural adjustment component of the Australian Government Securing Our Fishing Future package, the introduction of hook limits in 2009 and the introduction of individual transferrable quota management in 2011. The number of vessels in 2019 fishing for striped marlin south of 15°S was 37. Thirty-four vessels fished for albacore and 34 fished for swordfish south of 20°S; there was no effort for albacore north of the equator.

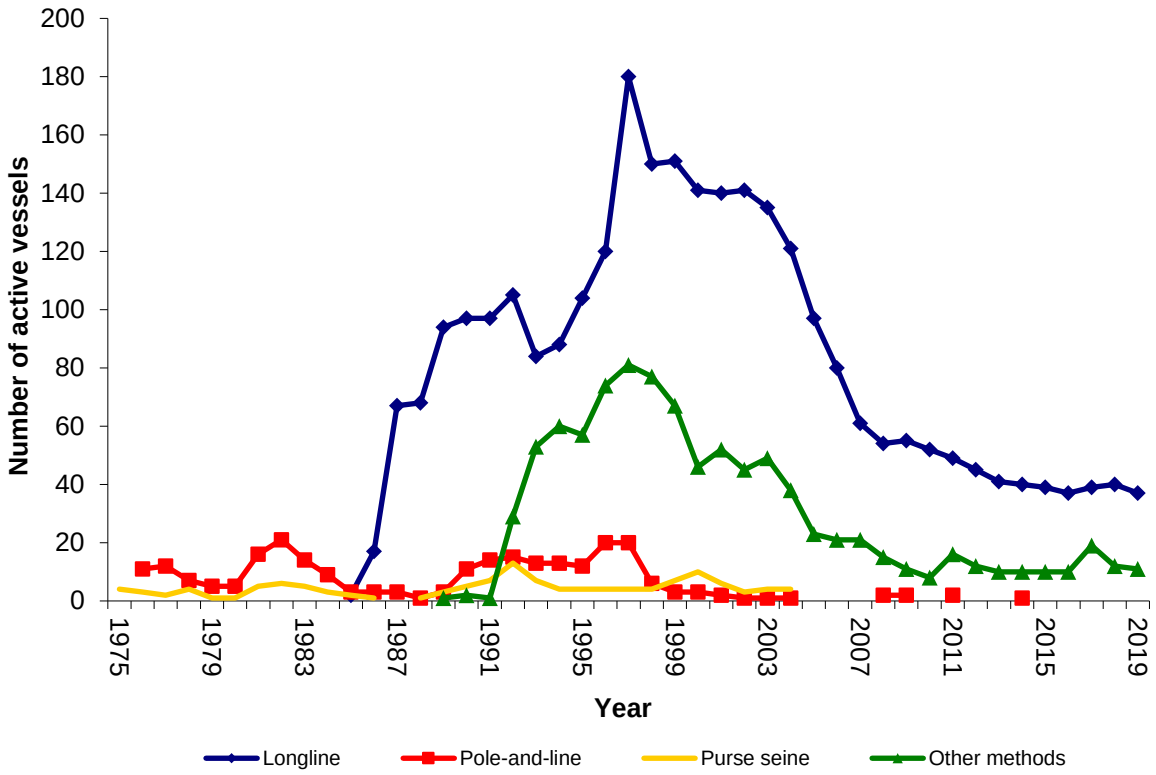


Figure 1. Historical annual vessel numbers for the Australian fleet, by gear (longline, purse seine, pole-and-line and other commercial methods [minor line including trolling, rod-and-reel and handline]) for the WCPFC Convention Area.

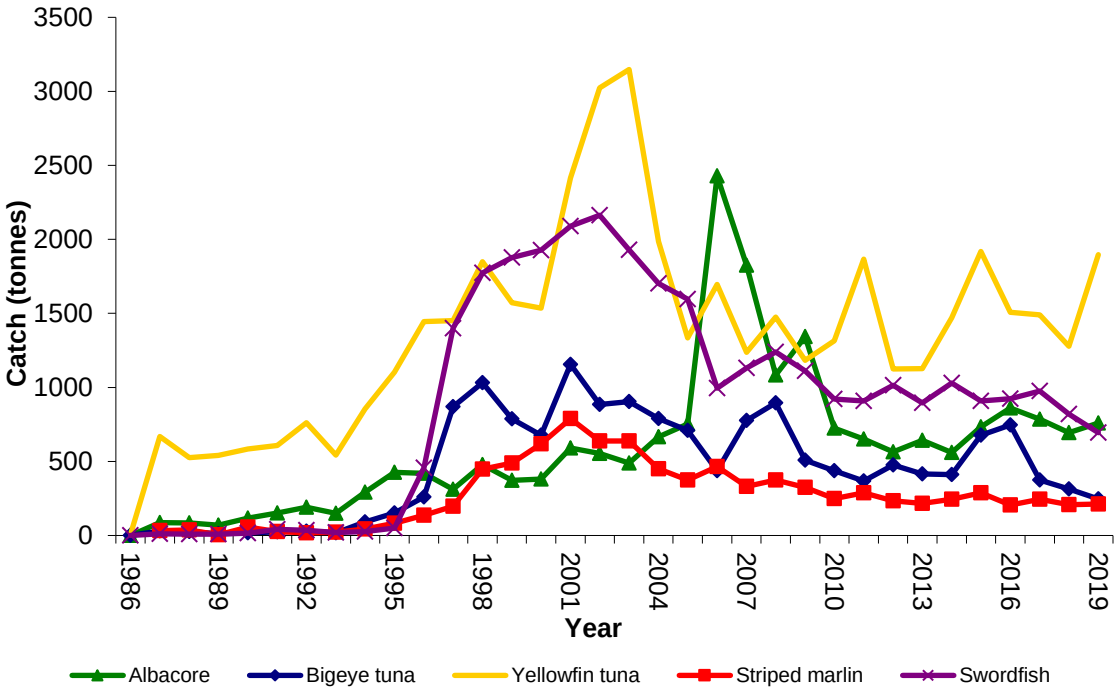
Table 1. Annual catch and effort estimates (whole weight) for the Australian fleet, by gear and primary species, for the WCPFC Convention Area, 2015–19.

Fishing method	Year	Effort [a]	Primary species (t)					
			Albacore	Bigeye	Skipjack	Yellowfin	Striped marlin	Swordfish
All gears	2015	-	733.4	686.9	3.5	1918.0	287.3	909.5
	2016	-	861.8	746.6	1.6	1507.7	206.5	923.0
	2017	-	785.1	374.8	7.4	1490.7	244.6	975.5
	2018	-	694.6	313.8	3.1	1278.2	208.9	819.9
	2019		759.9	246.6	4.1	1896.4	211.5	694.8
Longline [b]	2015	8218	733.3	686.9	3.5	1918.0	287.3	909.5
	2016	7823	861.8	746.6	1.6	1507.7	206.5	923.0
	2017	8737	785.0	374.8	7.1	1490.7	244.6	975.5
	2018	7896	694.6	313.8	3.1	1278.2	208.9	819.7
	2019	8567	759.9	246.6	4.0	1896.4	211.5	694.8
Purse seine	2015	0	0	0	0	0	0	0
	2016	0	0	0	0	0	0	0
	2017	0	0	0	0	0	0	0
	2018	0	0	0	0	0	0	0
	2019	0	0	0	0	0	0	0

Note: a Longline–number of hooks (000's); purse seine–search hours. **b** Includes small catches from other commercial methods (minor line component including trolling, rod-and-reel, handline and pole-and-line). Note: Australia is currently reviewing catch estimation methods and therefore values reported here may be amended in future reports.

Total longline catches of WCPFC species of interest in the ETBF reported in logbooks increased from 3344 t in 2018 to 3838 t in 2019. This is down from a peak of 8229 t in 2002. Historical catches for the Australian fleet in the WCPFC Convention Area, by primary species, are shown in Figure 2. Longline catches of albacore increased from 695 t in 2018 to 760 t in 2019 (646 t caught south of 20°S). Longline catches of bigeye tuna decreased from 314 t in 2018 to 247 t in 2019. Longline catches of yellowfin tuna increased from 1278 t in 2018 to 1896 t in 2019. Longline catches of swordfish decreased from 820 t in 2018 to 695 t in 2019 (637 t caught south of 20°S). Longline catches of striped marlin increased from 209 t in 2018 to 211 t in 2019 (all of which was caught south of 15°S). Longline catches of skipjack increased from 3.1 t in 2018 to 4.0 t in 2019. Annual catch distributions of the main target species by the Australian longline fleet for 2015–19 are shown in Figure 3.

a)



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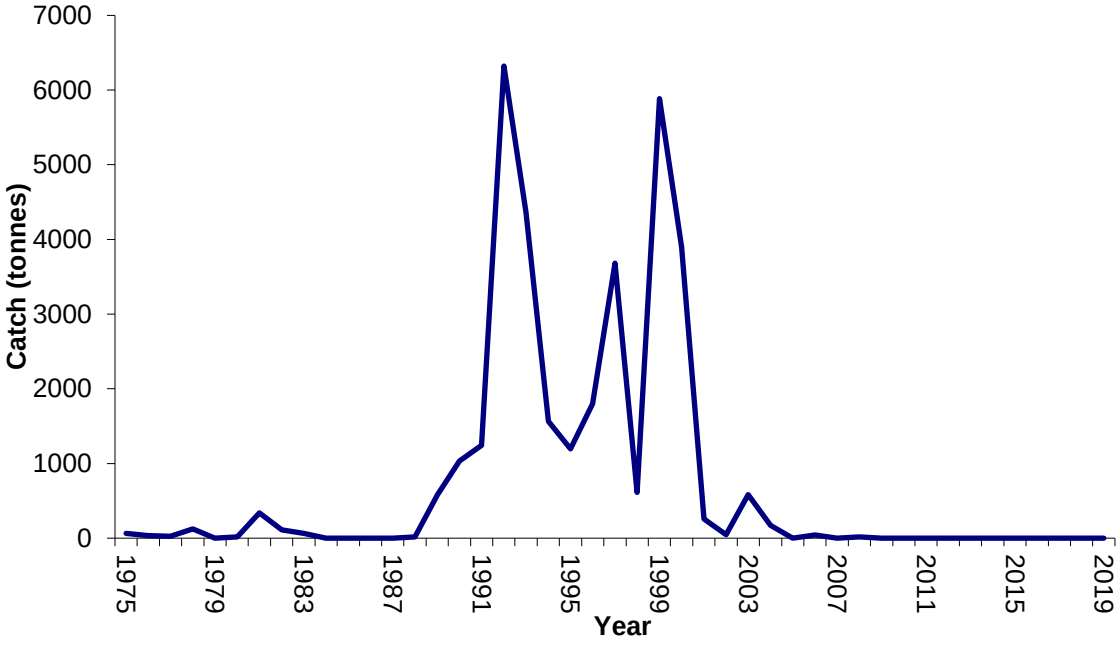
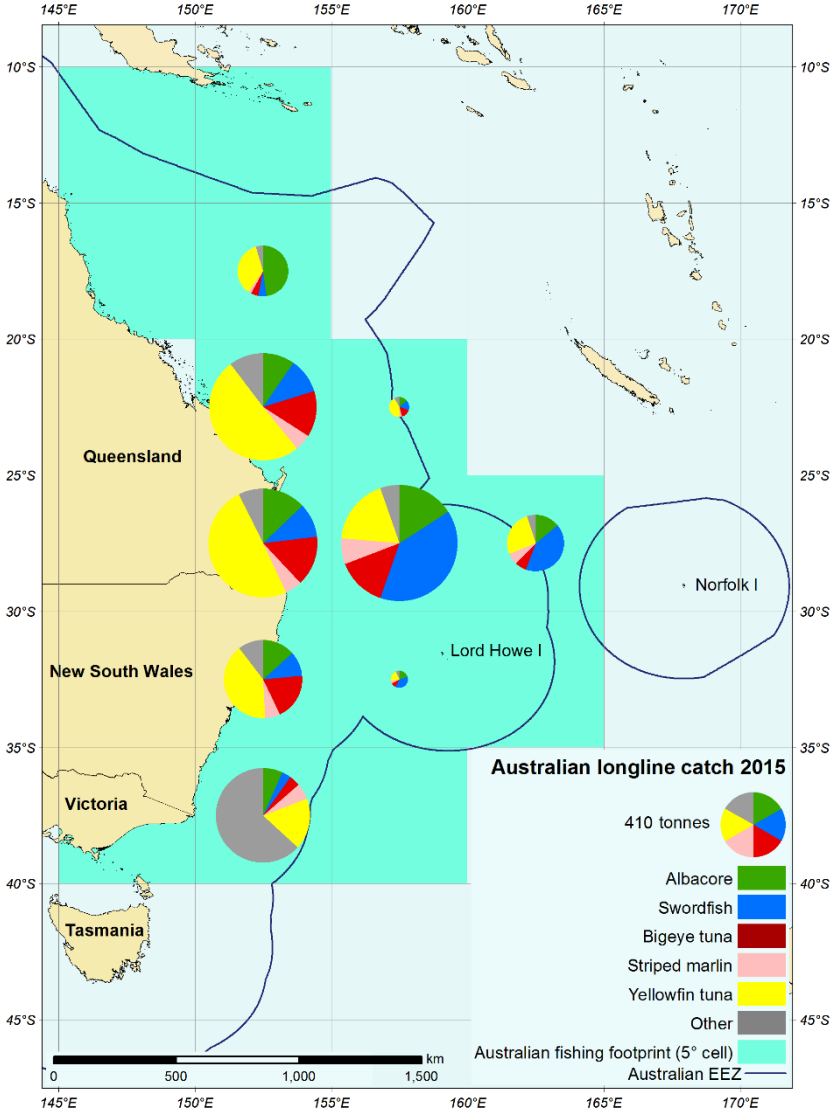


Figure 2. Historical annual longline catch in the WCPFC Convention Area for (a) albacore, bigeye tuna and yellowfin tuna, as well as striped marlin and swordfish, and (b) purse seine catch skipjack tuna.

a)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20°S
25°S
30°S
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40°S
45°S
Queensland
New South Wales
Victoria
Tasmania
Norfolk I
Lord Howe I
Australian longline catch 2015
410 tonnes
Albacore
Swordfish
Bigeye tuna
Striped marlin
Yellowfin tuna
Other
Australian fishing footprint (5° cell)
Australian EEZ
km
0
500
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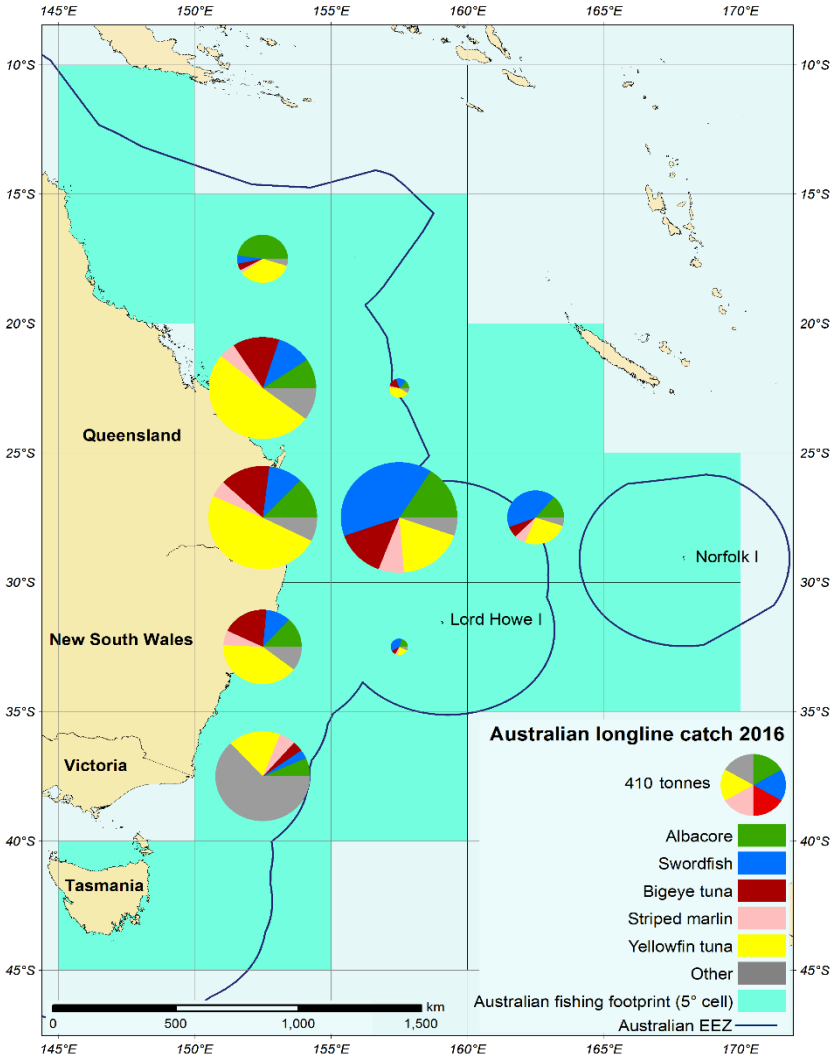
b)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Striped marlin
Yellowfin tuna
Other
Australian fishing footprint (5° cell)
Australian EEZ
km
0
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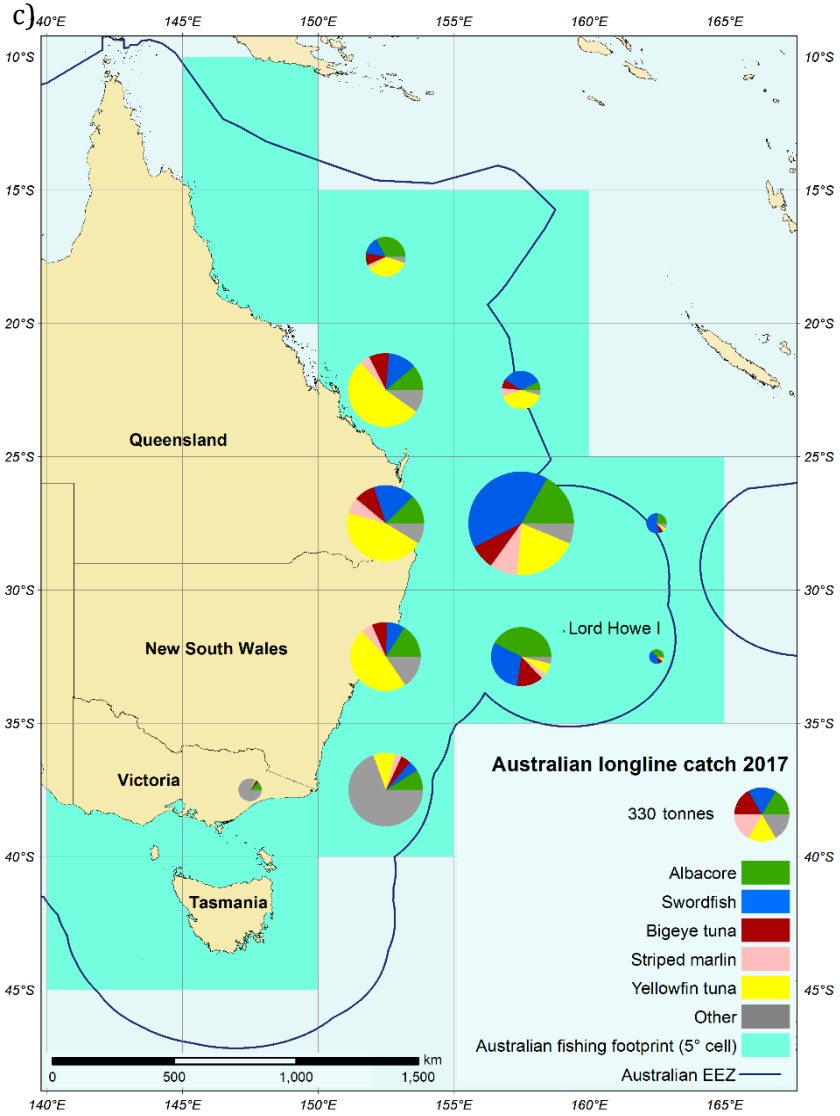
c)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Queensland
New South Wales
Victoria
Tasmania
Lord Howe I
Australian longline catch 2017
330 tonnes
Albacore
Swordfish
Bigeye tuna
Striped marlin
Yellowfin tuna
Other
Australian fishing footprint (5° cell)
Australian EEZ
km
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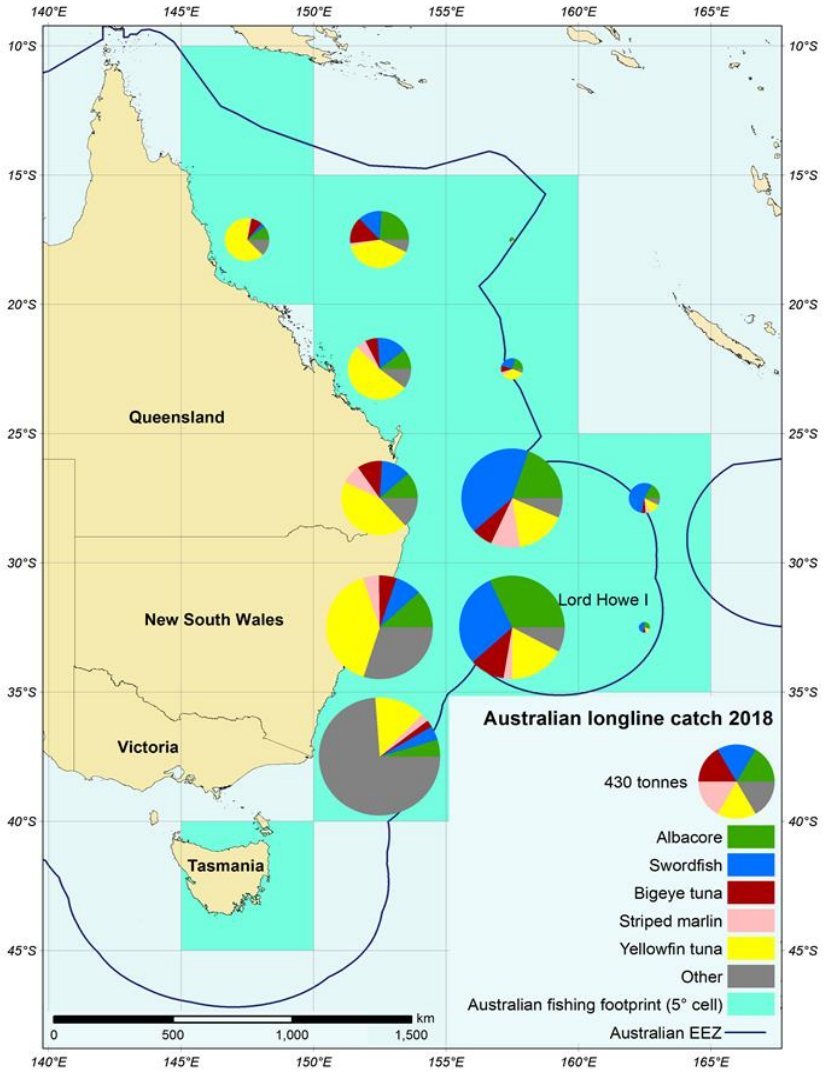
500
1,000
1,500

d)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Queensland
New South Wales
Victoria
Tasmania
Lord Howe I
Australian longline catch 2018
430 tonnes
Albacore
Swordfish
Bigeye tuna
Striped marlin
Yellowfin tuna
Other
Australian fishing footprint (5° cell)
Australian EEZ
km
0
500
1,000
1,500

e)

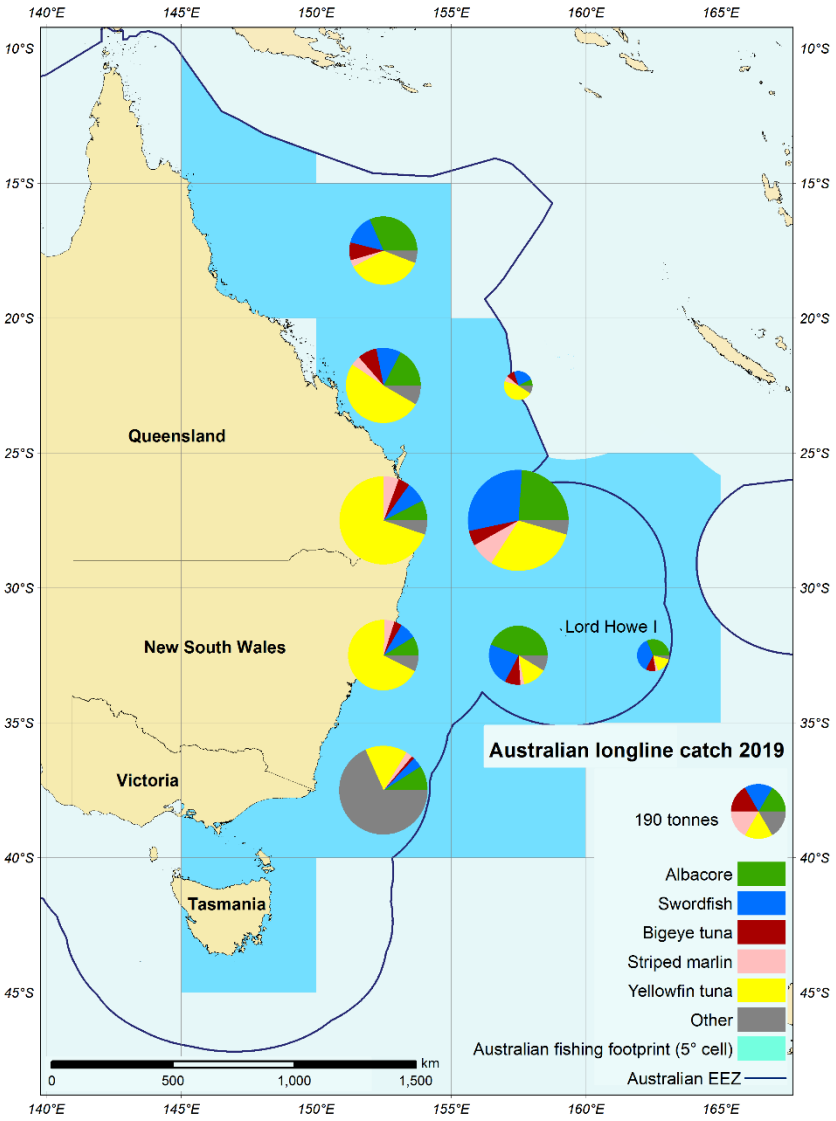


Figure 3 (a–e). Annual distributions of target species catch by the Australian longline fleet active in the WCPFC Convention Area, for 2015–19. Catches have been aggregated to 5-degree blocks to address issues of confidentiality. The diameter of the pie chart in each grid cell is proportional to the total catch of that grid cell. The diameter to catch relationship is provided in the legend. The pie charts also show the proportions of catch of each of the target species. The segments of the pie chart in the legend are for illustrative purposes only. Fishing footprint shows the total extent of waters fished at a spatial resolution of 5-degree square.

Annual retained catch estimates of major non-target, associated and dependent species, including sharks, by the Australian longline fleet from 2015–19 are presented in Table 2. Estimates of releases derived from logbooks are in Table 3. From July of 2015, the logbooks of the Australian longline fleet were subject to potential verification through e-monitoring coverage. This has resulted in a rise in the levels of discards reported in logbooks since 2016 (Table 3).

Since 1 January 2013, retention of oceanic whitetip sharks by all commercial vessels has been prohibited and no retention was recorded in logbooks in 2019 (Table 2) while 1072 were reported as discarded in logbooks (Table 3). Of the 52 oceanic whitetips observed caught, 38 were released alive, 13 were released in an undetermined condition and 1 was dead.
Since 1 July 2014, retention of silky sharks has been prohibited and no retention was recorded in logbooks in 2019 (Table 2) while 56 were reported as discarded (Table 3). In the 2019 calendar year, no silky sharks were observed caught in the ETBF.

Since 14 September 2014 hammerhead sharks must be reported by species under CITES listings. For the purposes of this report, however, we have continued to group hammerheads into a single group for consistency in data presentation.

Further restrictions on shark catches in the ETBF can be found at https://afma.govcms.gov.au/sites/default/files/2020_etbf_management_arrangements_booklet_-_final.pdf

Retention of both blue marlin and black marlin by commercial longliners has been prohibited since 1998 and no retention was recorded in logbooks in 2019, while 1511 black marlin and 987 blue marlin were reported as discarded (Table 3). The vast majority of the catch and effort by Australian longliners has been within the AFZ, with little effort on the adjacent high seas (Table 4).

2.2 Pole-and-line, purse seine and minor line catch and effort

In 2019, there were no active purse-seine vessels in the Eastern Skipjack Fishery and no interactions with whale sharks were recorded (CMM 2012-06). Total minor line catches of WCPFC species of interest in the ETBF (including pole and line, trolling, rod-and-reel and handline) was <1 t in 2019. The only catch of target species was skipjack (0.03 t). The number of vessels reporting using minor line in the ETBF has steadily decreased from a peak of 52 vessels in 2001 to one in 2019 (using troll, rod-and-reel and handline). Minor line effort peaked in 2007 with 975 lines.

Table 2. Annual retained catch estimates (tonnes) of major non-target, associated and dependent species, including sharks, by the Australian fleet, by gear (longliners and other methods combined), in the WCPFC Convention Area, for 2015–19.

Group	Species	Longliners (t)					Other methods combined (t)				
		2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Scalefish	Escolar	12.3	9.2	10.1	19.1	20.8	0.0	0.0	0.0	0.0	0.0
	Lancetfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mahi mahi	184.4	140.7	128.5	106.2	96.9	0.0	0.0	0.0	0.0	0.0
	Moonfish	10.6	11.6	5.1	11.6	10.1	0.0	0.0	0.0	0.0	0.0
	Ocean sunfish	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Oilfish	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
	Ray's bream	7.8	5.6	14.4	17.4	14.3	0.0	0.0	0.0	0.0	0.0
	Rudderfish	24.9	42.7	30.9	32.0	14.4	0.0	0.0	0.0	0.0	0.0
	Sailfish	0.4	0.6	1.3	0.9	1.1	0.0	0.0	0.0	0.0	0.0
	Shortbill spearfish	7.0	5.8	4.5	3.5	7.5	0.0	0.0	0.0	0.0	0.0
	Wahoo	5.8	6.0	6.2	4.1	5.1	0.0	0.0	0.0	0.0	0.0
	Subtotal	**253.2**	**222.7**	**201.0**	**194.8**	**170.7**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Sharks	Blacktip shark	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.0
	Blue shark	0.3	0.2	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
	Bronze whaler	0.7	0.1	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.0
	Dusky shark	0.3	0.1	0.6	0.0	0.1	0.0	0.0	0.0	0.0	0.0
	Hammerhead	0.3	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Longfin mako	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
	Oceanic whitetip	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Porbeagle	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Shortfin mako	20.3	16.7	20.8	17.4	17.6	0.0	0.0	0.0	0.0	0.0
	Silky shark	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Thresher shark	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Tiger shark	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Whale shark	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subtotal	**22.5**	**17.5**	**22.6**	**17.8**	**18.1**	**0.1**	**0.0**	**0.0**	**0.2**	**0.0**
	TOTAL	**275.7**	**240.2**	**223.6**	**212.6**	**188.8**	**0.1**	**0.0**	**0.0**	**0.2**	**0.0**

Table 3. Annual longline discard estimates (numbers) of major non-target, associated and dependent species, including sharks, by the Australian fleet in the WCPFC Convention Area, for 2015–19.

Group	Species	2015	2016	2017	2018	2019
Scalefish	Black marlin	1421	1149	1170	1333	1511
	Blue marlin	1442	1425	1201	1038	987
	Escolar	405	1364	1342	1192	1636
	Lancetfish	11,420	18,136	24,452	17,287	21,422
	Mahi mahi	935	655	931	864	708
	Moonfish	8	18	9	7	5
	Ocean sunfish	1505	1551	2401	2834	1381
	Oilfish	10	9	47	41	54
	Ray's bream	144	258	340	201	115
	Rudderfish	1026	2378	2690	1767	3852
	Sailfish	60	125	79	24	79
	Shortbill spearfish	62	101	168	115	171
	Wahoo	62	63	73	55	68
	Subtotal	**18,500**	**27,232**	**34,903**	**26,758**	**31,989**
Sharks	Blacktip sharks	4	0	1	0	6
	Blue shark	9167	12,538	16,859	13,816	13,406
	Bronze whaler	755	1491	4143	3477	4568
	Dusky shark	1283	786	1847	1648	2366
	Hammerhead	211	237	487	476	433
	Longfin mako	5	6	18	6	1
	Oceanic whitetip	1143	1220	1359	806	1072
	Porbeagle	7	8	124	4	1
	Shortfin mako	1066	1261	1448	1309	1220
	Silky shark	514	136	395	130	56
	Thresher shark	596	556	649	664	634
	Tiger shark	375	630	726	749	687
	Whale shark	0	0	0	0	0
	Subtotal	**15,126**	**18,869**	**28,056**	**23,085**	**24,450**
	TOTAL	**33,626**	**46,101**	**62,959**	**49,843**	**56,439**

Table 4. Effort by Australian longliners and catch by primary species, within the AFZ and on the high seas, 2015–19. The percentage of catch or effort within the AFZ or on the high seas is provided in parentheses.

	Year	Effort ('000 hooks)	Primary species catch (t)					
			Albacore	Bigeye	Skipjack	Yellowfin	Striped marlin	Swordfish
Within AFZ	2015	8197	730.1	674.8	3.4	1915.5	286.1	906.8
		(99.8%)	(99.6%)	(99.7%)	(98.9%)	(99.9%)	(99.6%)	(99.7%)
	2016	7691	855.9	742.4	1.6	1480.7	203.1	894.3
		(98.3%)	(99.3%)	(99.4%)	(100.0%)	(99.3%)	(98.3%)	(96.9%)
	2017	8663	784.3	373.5	7.1	1485.3	240.9	960.7
		(99.2%)	(99.9%)	(99.6%)	(100.0%)	(99.6%)	(1.5%)	(98.5%)
	2018	7783	692.6	311.2	3.1	1273.9	202.1	804.6
		(98.6%)	(99.7%)	(99.2%)	(100.0%)	(99.7%)	(96.7%)	(98.2%)
	2019	8539	757.6	245.9	4.0	1893.9	210.6	690.7
		(99.7%)	(99.7%)	(99.7%)	(100.0%)	(99.9%)	(99.6%)	(99.4%)
High seas	2015	20	3.2	1.7	0	2.4	1.2	2.6
		(0.2%)	(0.4%)	(0.3%)	(1.1%)	(0.1%)	(0.4%)	(0.3%)
	2016	132	5.9	4.3	0	10.0	3.4	28.7
		(1.7%)	(0.7%)	(0.6%)	(0.0%)	(0.7%)	(1.7%)	(3.1%)
	2017	73	0.6	1.3	0	5.4	3.8	14.8
		(0.8%)	(0.1%)	(0.4%)	(0.0%)	(0.4%)	(1.5%)	(1.5%)
	2018	113	2.0	2.6	0	4.3	6.8	15.1
		(1.4%)	(0.3%)	(0.8%)	(0.0%)	(0.3%)	(3.3%)	(1.8%)
	2019	27	2.3	0.7	0	2.5	0.9	4.2
		(0.3%)	(0.3%)	(0.3%)	(0.0%)	(0.1%)	(0.4%)	(0.6%)

2.3 Fishing patterns

Fishing patterns vary with target species, location and season. The management area of the ETBF extends from Cape York, at the northern tip of Queensland, to the border between Victoria and South Australia, including waters around Tasmania (Figure 4). In the WCPFC Convention Area, skipjack tuna are fished from southern New South Wales to north-eastern Tasmania.

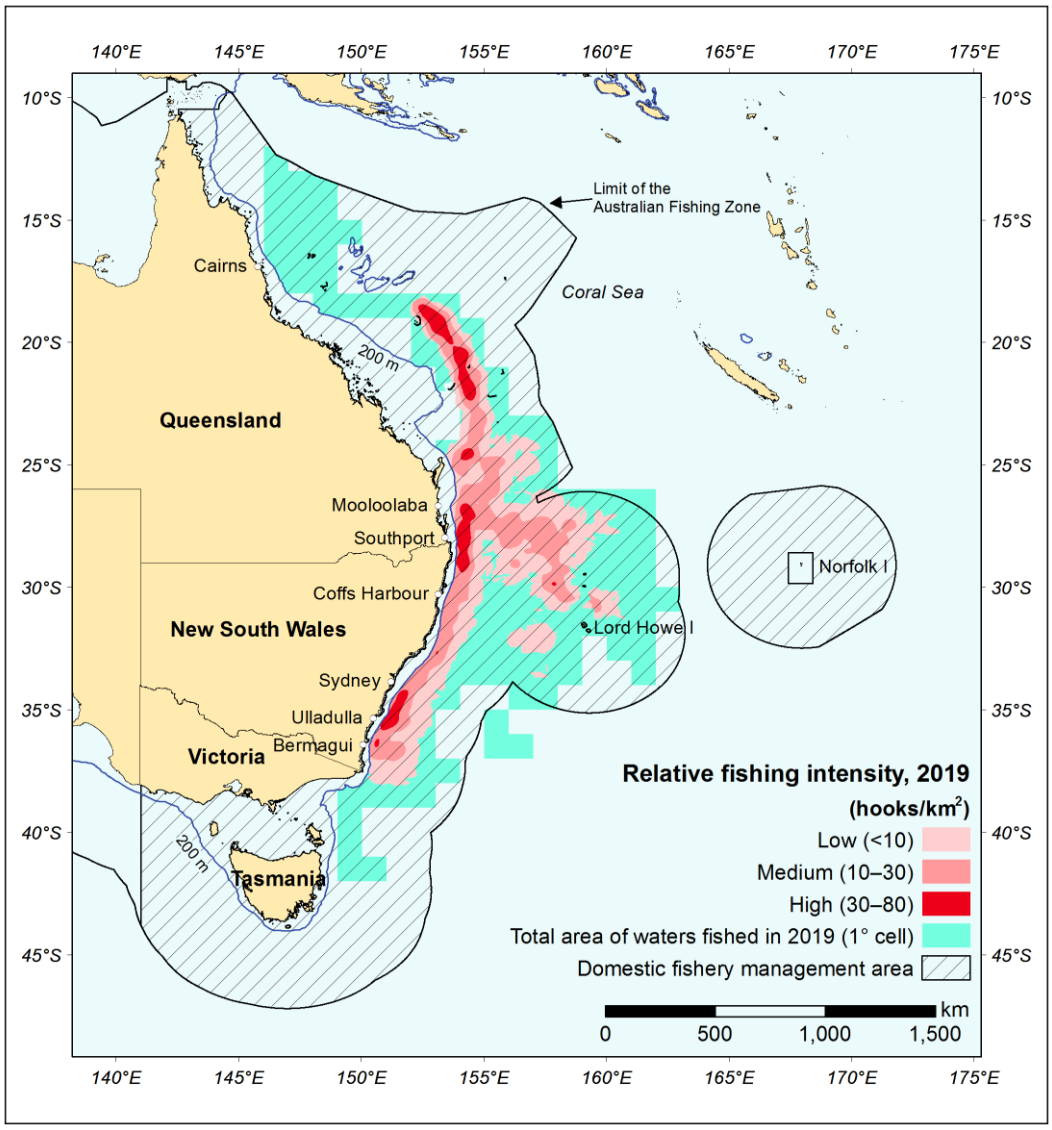


Figure 4. Longline effort distribution in the Eastern Tuna and Billfish Fishery (2019). Fishing footprint shows the total extent of waters fished at a spatial resolution of one degree square.

2.4 Fleet operations

Domestic longlining vessels are mostly 15–25 m long and use monofilament gear (Table 5). Vessels usually conduct one longline operation per day, or night, depending on the target species. A typical longline set will comprise about 1400+ hooks. Fishers commonly operate around 150 days per year. Most trips are between 2 and 15 days and typically range from 40–300 nm from port with effort mostly concentrated on the edge of the continental shelf (seaward of 200 m depth) but extending much further eastward off Mooloolaba (Figure 4). The catch is gilled and gutted (depending on species) and stored on ice, in ice slurry or in refrigerated brine.

Historically, most purse-seiners were 20–25 m long, but several were 40–45 m. Most poling vessels were 15–20 m long. Most minor line catches are reported by vessels (e.g. longline vessels) on their way to and from fishing grounds.

Table 5. Number of Australian vessels, by gear and size category, active in the WCPFC Convention Area, targeting WCPFC species, for 2014 to 2018. Gross registered tonnes (GRT) is the unit for vessel size.

Year	Longline				Purse seine	Pole-and-line	Troll	Total
Vessel size (GRT)	≤50	51–200	201–500	Subtotal	≤500	0–50	Unknown	
2015	16	23	0	39	0	0	0	39
2016	14	23	0	37	0	0	0	37
2017	16	23	0	39	0	0	2	41
2018	16	23	1	40	0	0	0	40
2019	10	26	1	37	0	0	0	37

2.5 Species of special interest

Australia implements a mandatory reporting scheme for fisheries interactions with protected species, which includes species of special interest. Interactions with these species are recorded by fishers in their logbooks and are reported to AFMA. These interactions are then forwarded to the Department Agriculture, Water and the Environment on a quarterly basis. A summary of these interactions, from logbooks, is presented in Table 6. Life status of the animal involved in the interaction is also recorded. In 2019, interactions were recorded with 52 green turtles (42 alive and 10 dead), 1 flatback turtle (dead), 53 leatherback turtles (52 alive and 1 dead), 12 loggerhead turtles (5 alive and 7 dead), 8 hawksbill turtles (4 alive and 4 dead), 9 Olive Ridley turtles (8 alive and 1 dead), 18 unidentified turtles (13 alive, 4 dead and 1 in unknown condition), 2 black-browed albatrosses (both dead), 1 shy albatross (dead), 3 wandering albatross (all dead), 50 unidentified albatrosses (15 alive and 35 dead), 1 cape petrel (dead), 37 unidentified shearwaters (1 alive and 36 dead), 2 short-tailed shearwater (1 alive and 1 dead), 5 unidentified birds (all alive), 4 short-finned pilot whales (3 alive and 1 dead), 4 false killer whale (all alive), 1 unidentified whale (alive), 3 common dolphins (2 alive and 1 dead), 1 bottlenose dolphin (alive), 7 unidentified dolphins (5 alive and 2 dead) and 2 New Zealand fur seals (1 alive and 1 dead). From July of 2015, the logbooks of the Australian longline fleet were subject to potential verification through electronic monitoring. This has resulted in an increase in the reporting level of interactions with species of special interest since 2016 (Table 6).

Observed captures are reported in Table 7. In 2019, there were 23 observed captures of sea turtles (17 alive, 3 dead and 3 of unknown life status); 2 captures of whales (both alive); 2 capture of a dolphin (both alive); and 11 captures of seabirds (3 alive and 8 dead).

2.5.1 Sea turtles

The Eastern Tuna and Billfish Fishery requires the use of large circle hooks in Australia's shallow-set pelagic longline fisheries targeting swordfish, consistent with CMM2008-03. Mitigation requirements in the ETBF for sea turtles are reported in Appendix II.

2.5.2 Seabirds and marine mammals

Australia has extensive mitigation requirements for seabirds in the ETBF which are shown in Appendix II. More specific seabird interaction information, including the observed capture rate and captures by species and area for 2019, is presented in Table 8 and Table 9. Table 10 provides the proportion of mitigation measures used.

Table 6. Interactions with species of special interest recorded in logbooks for the Australian longline fleet in the WCPFC Convention Area, 2015–19. Interactions not identified to species level are noted as unspecified (unspec).

Group	Common name	2015	2016	2017	2018	2019
Seabirds	Black-browed albatross	8	5	3	4	2
	Shy albatross	0	0	0	0	1
	Wandering albatross	0	1	1	6	3
	Albatrosses (unspec)	6	20	33	56	50
	Cape Petrel	0	0	0	0	1
	Sooty shearwater	0	0	1	1	0
	Short-tailed shearwater	0	0	0	1	2
	Flesh-footed shearwater	1	2	2	0	0
	Shearwaters (unspec)	0	0	6	17	37
	Australian gannet	0	1	0	4	0
	Cormorants	0	0	1	0	0
	Birds (unspec)	2	1	0	3	5
	Subtotal	**17**	**30**	**47**	**92**	**101**
Turtles	Green turtle	6	39	96	36	52
	Hawksbill turtle	2	2	2	5	8
	Leatherback turtle	13	32	52	68	53
	Loggerhead turtle	3	9	26	18	12
	Flatback turtle	0	1	0	0	1
	Pacific (Olive) Ridley turtle	0	0	5	7	9
	Turtles (unspec)	6	17	18	22	18
	Subtotal	**30**	**100**	**199**	**156**	**153**
Mammals	Melon-headed whale	1	0	4	0	0
	Baleen whales	1	0	0	0	0
	Toothed whales	0	2	0	0	0
	Short-finned pilot whale	3	5	6	7	4
	Long-finned pilot whale	0	1	4	1	0
	False killer whale	0	0	1	0	4
	Humpback whale	0	0	0	1	0
	Whales (unspec)	2	1	6	0	1
	Common dolphin	4	0	0	0	3
	Bottlenose dolphin	0	0	1	0	1
	Dolphin (unspec)	0	3	9	4	7
	Australian fur seal	0	1	0	0	0
	New Zealand fur seal	0	0	0	0	2
	Seals (unspec)	0	0	2	5	0
	Dugong	0	0	1	0	0
	Subtotal	**11**	**13**	**34**	**18**	**22**
	TOTAL	**58**	**143**	**280**	**266**	**276**

Table 7. Observed captures of species of special interest for the Australian longline fleet in the WCPFC Convention Area, 2015–19. Interactions not identified to species level are noted as unspecified (unspec).

Group	Common name	2015	2016	2017	2018	2019
Seabirds	Black-browed albatross	0	1	0	0	0
	Shy albatross	4	0	0	0	0
	Wandering albatross	0	0	0	0	1
	Albatrosses (other)	0	1	2	9	3
	Cape petrel	0	0	0	4	0
	Great crested tern	0	0	0	0	0
	Flesh-footed shearwater	0	1	0	0	0
	Wilson's storm petrel	1	0	0	0	0
	Petrels Prions and Shearwaters	0	0	0	0	6
	Shearwaters	0	0	0	0	1
	Birds (unspec)	0	0	0	1	0
	Subtotal	**5**	**3**	**2**	**14**	**11**
Turtles	Green turtle	2	0	2	0	5
	Hawksbill turtle	0	0	0	0	0
	Leatherback turtle	3	2	8	11	2
	Loggerhead turtle	0	0	0	0	0
	Pacific (Olive) Ridley	1	0	0	0	0
	Turtles (unspec)	1	0	6	14	16
	Subtotal	**7**	**2**	**16**	**25**	**23**
Mammals	Dolphin (unspec)	0	0	1	1	2
	Long-finned pilot whale	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	1
	Whales (unspec)	0	0	4	2	1
	Australian fur seal	0	0	0	0	0
	Subtotal	**0**	**0**	**5**	**3**	**4**
	TOTAL	**12**	**5**	**23**	**42**	**38**

CMM 2011-03 regarding the intentional setting of purse-seine gear on cetaceans entered into force on 1 January 2013. Such setting practices are prohibited in Australian purse-seine fisheries since the introduction of the *Environment Protection and Biodiversity Conservation Act 1999*. There were no reported interactions with cetaceans in purse-seine fisheries in 2019.

Table 8a and 8b. Effort and observed seabird captures by fishing year for the ETBF south of 30°S (a), for 25°S – 30°S (b) and for 23°N – 25°S (c). No seabird captures have been observed north of 23°N as there was no effort. For each year, the table gives number of longline vessels, total number of hooks (000's), number of observed hooks (000's), observer coverage (percentage of hooks that were observed), number of observed captures and the capture rate (captures per thousand hooks). Mitigation methods provided in Appendix II.

a) South of 30°S

Year		Fishing effort (000's hooks)			Observed seabird captures	
	Number of vessels	Number of hooks	Observed hooks	% hooks observed	Capture number	Capture rate
2015	32	1807	32	1.8	2	0.196
2016	31	2471	278	11.2	2	0.007
2017	32	2183	206	9.4	2	0.010
2018	37	3084	345	11.2	8	0.023
2019	33	2537	306	12.1	8	0.026

b) 25°S – 30°S

Year	Fishing effort (000's hooks)				Observed seabird captures	
	Number of vessels	Number of hooks	Observed hooks	% hooks observed	Capture number	Capture rate
2015	28	3608	52	1.4	0	0.000
2016	26	3718	326	8.8	1	0.003
2017	31	3816	391	10.3	0	0.000
2018	27	2917	298	10.2	5	0.017
2019	26	3264	391	12.0	3	0.008

c) 23°N – 25°S

Year	Fishing effort (000's hooks)				Observed seabird captures	
	Number of vessels	Number of hooks	Observed hooks	% hooks observed	Capture number	Capture rate
2015	24	2805	100	3.5	1	0.014
2016	20	1633	131	8.0	0	0.000
2017	22	2744	300	10.9	0	0.000
2018	22	1897	212	11.2	1	0.005
2019	18	2769	302	10.9	0	0.000

Table 9. Number of observed seabird captures in the ETBF, 2019, by species and area.

Species	South of 30°S	25°S–30°S	23°N–25°S	North of 23°N	Total Captures
Wandering albatross	1	0	0	0	1
Albatrosses (other)	1	2	0	0	3
Petrels, Prions and Shearwaters	5	1	0	0	6
Shearwaters	1	0	0	0	1
Total	8	3	0	0	11

Table 10. Proportion of mitigation types used by the fleet 2015 to 2019.

Combination of mitigation measures	Proportion of observed effort using mitigation measures				
	2015	2016	2017	2018	2019
TL + WB	0.78	0.88	0.90	0.85	0.84
TL + WB + NS	0.22	0.12	0.10	0.15	0.16
Total	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**

Note: Proportions were derived from the AFMA observer database and, from July 2015 onwards, from electronic monitoring data. TL = tori line, NS = Night setting, WB = weighted branch lines

2.6 Trends in size composition of retained catch

The size composition (based on processed weights) of yellowfin tuna shows both seasonal and inter-annual variation with the 8-quarter running mean remaining between 31–36 kg during the decade from 1997 to 2006 before decreasing to be below 30 kg between 2007 and 2009. This mean then increased to around 36 kg during the first quarter of 2012 and remained near this value until increasing to around 39–40 kg by the end of 2016 and throughout 2017 and 2018 before decreasing during 2019.

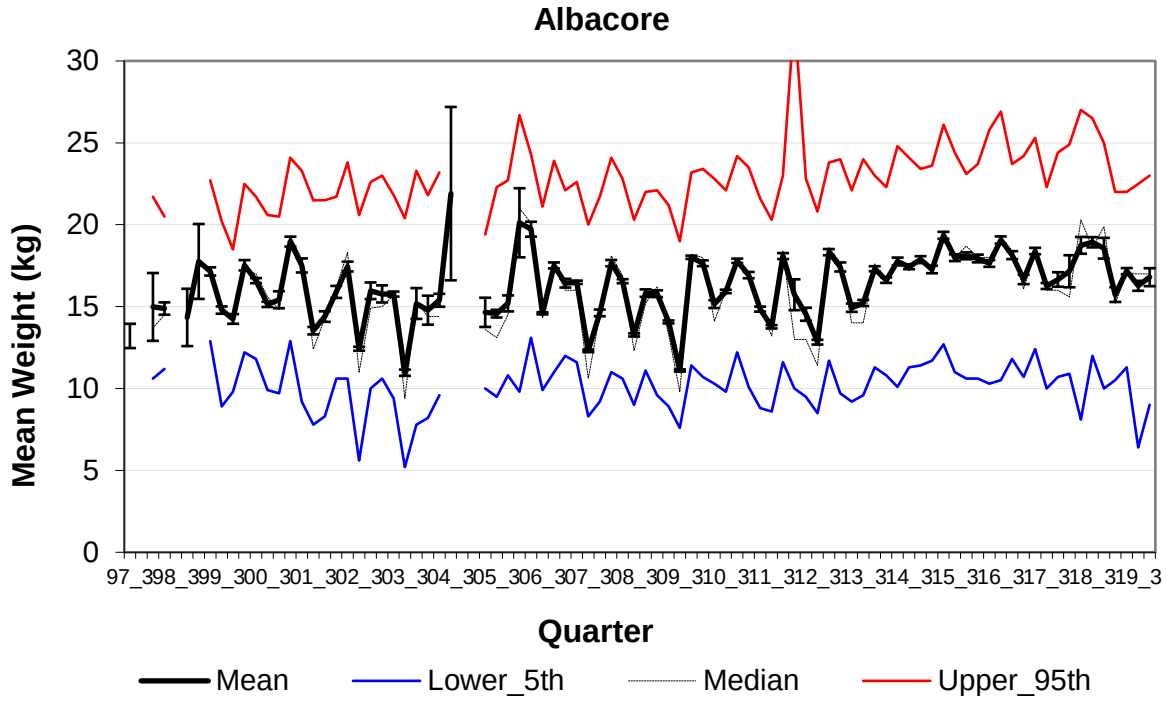
The 8-quarter running mean processed weight of bigeye tuna decreased from around 39 kg in the late 1990s to around 28 kg in 2004 then increased to 32 kg in late 2006 before decreasing again to 27 kg by late 2007. It increased again to around 34 kg by 2010 and remained stable around this weight until 2013, after which it decreased to around 29 kg during 2015 then increased again to around 33 kg by the end of 2016 and to around 38 kg by the end of 2017 before declining to around 35 kg by the end of 2019.

The running mean processed weight of swordfish shows a steady decline from around 53 kg in the late 1990s to around 40 kg in late 2007, but since then has shown an increasing trend reaching around 46 kg by the start of 2015 and 53 kg by the end of 2016 and throughout 2017 and 2018 before declining to around 51 kg by the end of 2019.

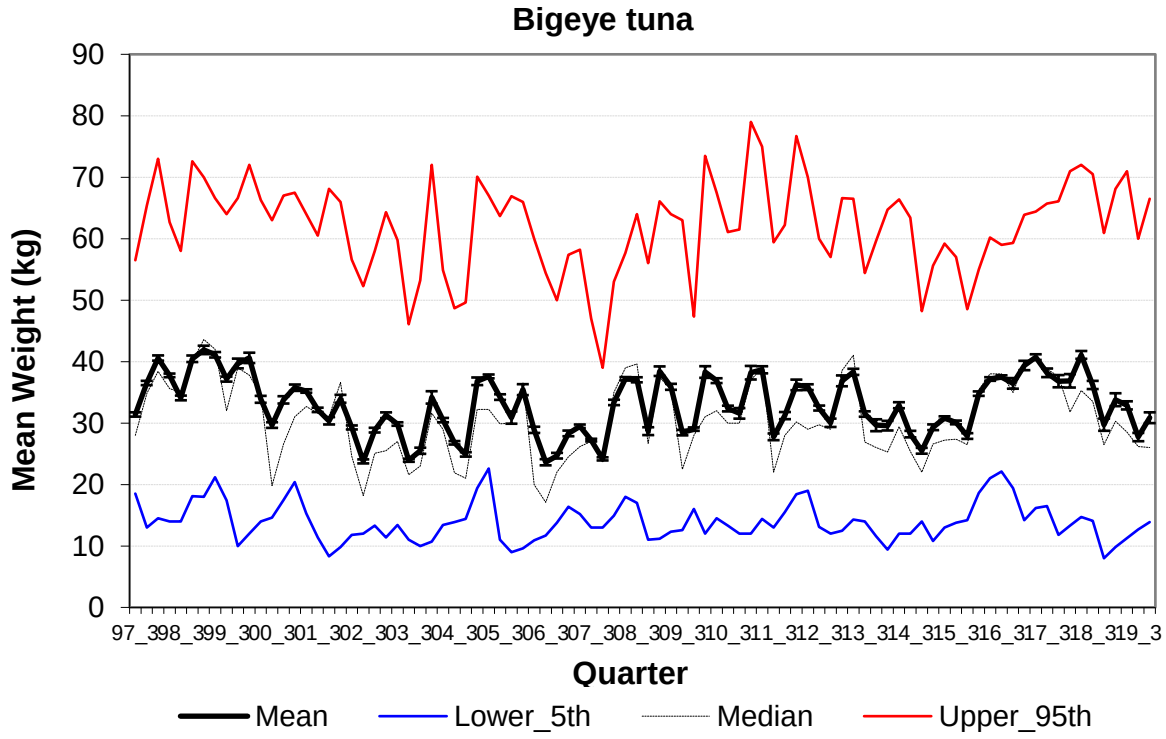
The running mean processed weight of striped marlin increased from around 62 kg during the first quarter of 2000 and remained within the range 63–66 kg between 2001 and 2009. It increased to 68 kg during the last quarter of 2010 and since then has steadily decreased to around 62 kg by the end of 2016 and throughout 2017 before increasing slightly to 63 kg throughout 2018 and 2019. The 8-quarter running mean whole weight of albacore has varied

between 14–17 kg between 1999 and 2014 with a low of around 14 kg in 2004 and a high of around 17 kg in 2006. A high mean weight of around 18 kg was also observed in 2016 to 2017 with a small decline during 2018 and 2019.

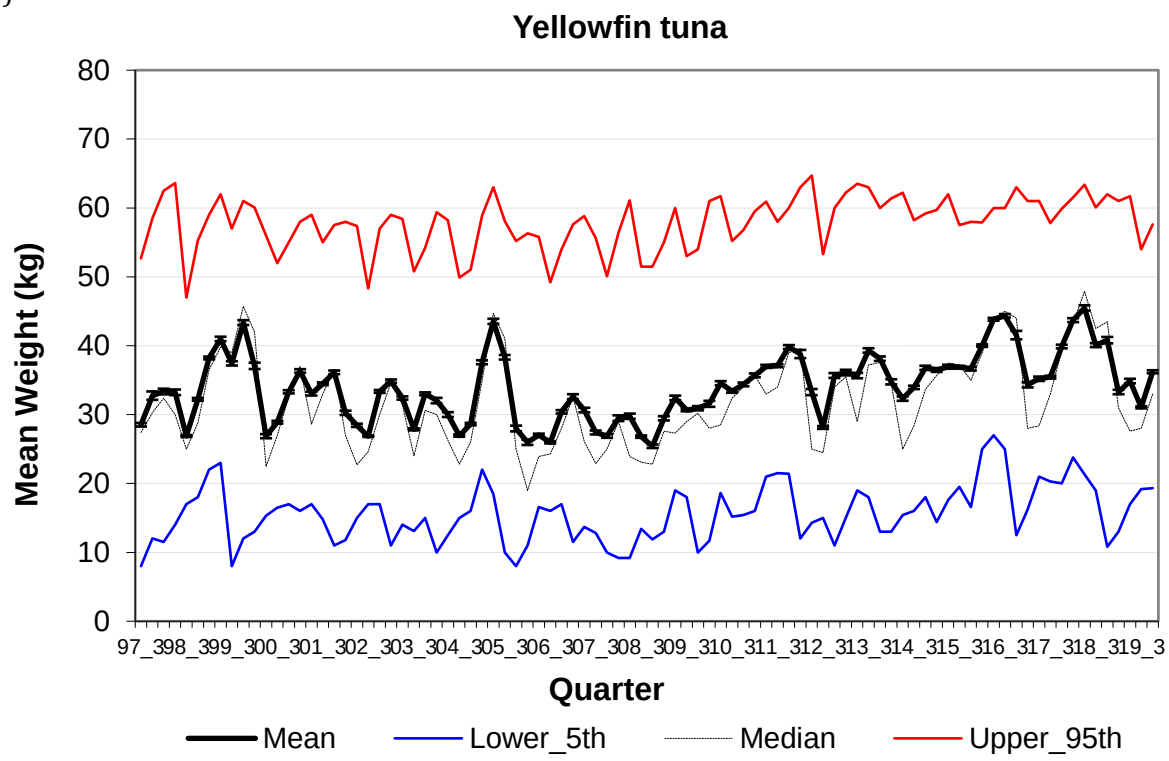
a)



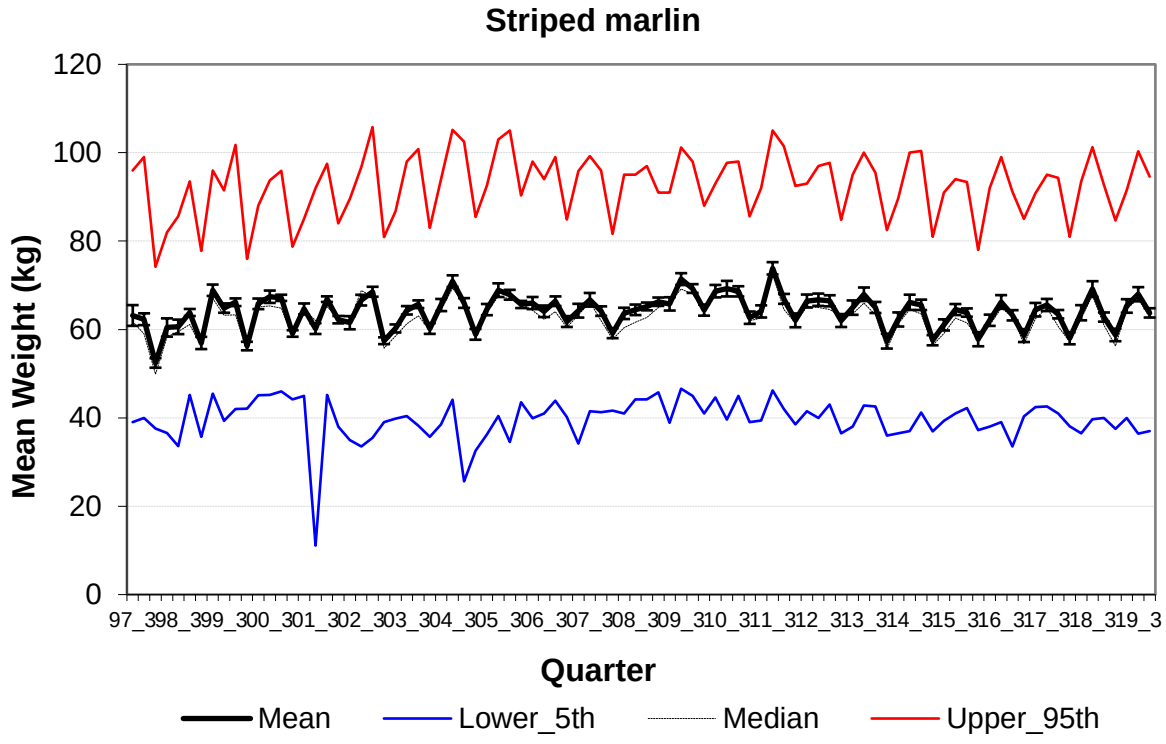
b)



c)


Yellowfin tuna
Mean Weight (kg)
80
70
60
50
40
30
20
10
0
97_398_399_300_301_302_303_304_305_306_307_308_309_310_311_312_313_314_315_316_317_318_319_3
Quarter
Mean
Lower_5th
Median
Upper_95th

d)


Striped marlin
Mean Weight (kg)
120
100
80
60
40
20
0
97_398_399_300_301_302_303_304_305_306_307_308_309_310_311_312_313_314_315_316_317_318_319_3
Quarter
Mean
Lower_5th
Median
Upper_95th

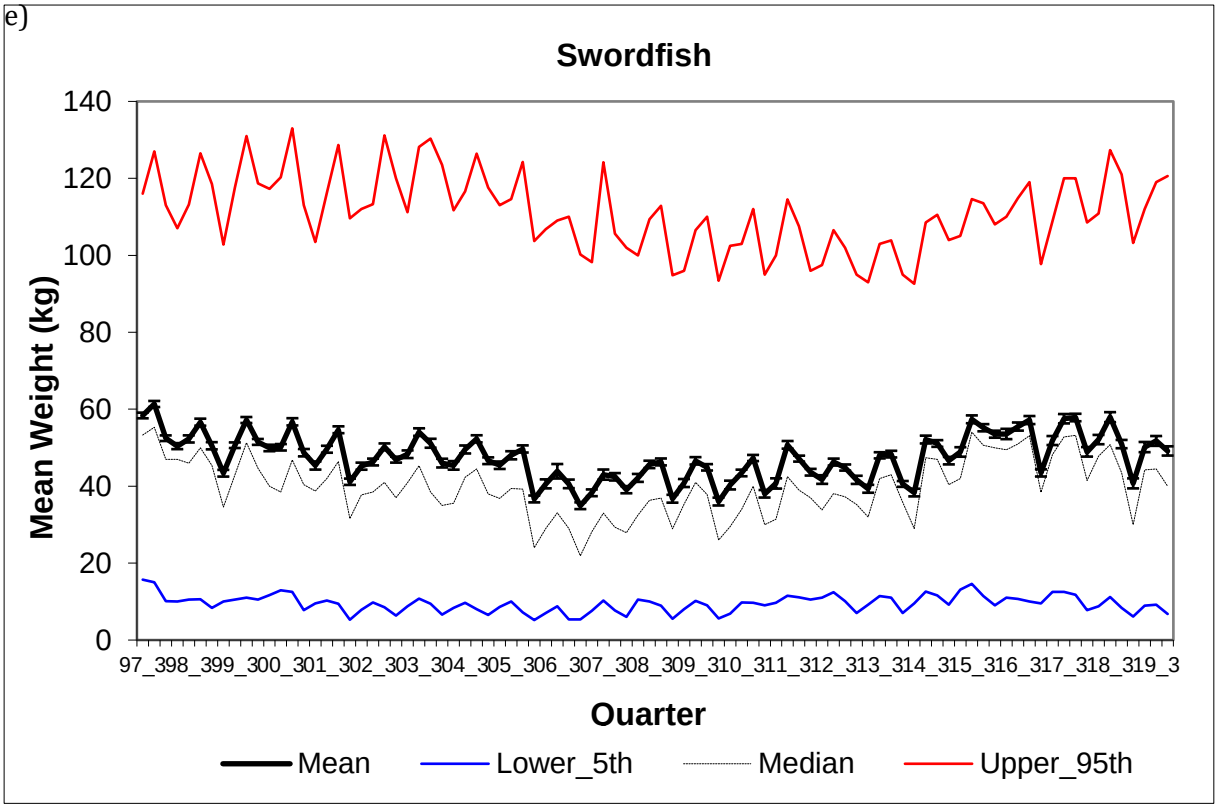


Figure 5 (a–e). Time series of quarterly means (with 95th standard error bars), median, lower 5th and upper 95th percentiles processed weights of a) albacore, b) bigeye tuna, c) yellowfin tuna, d) striped marlin and e) swordfish sampled across the entire ETBF based on the data collected from the port sampling program.

3 Coastal state reporting

There are currently no foreign fishing vessels licensed to operate in the AFZ. Japanese longliners were licensed to operate in the eastern AFZ from the late 1950s until November 1997.

4 Socio-economic factors

Between 2012–13 and 2015–16 landed catch in the ETBF increased by 16% to 6,572 t. This was driven by an increase in yellowfin tuna catch to its highest level (2,498 t in 2015–16) since 2002–03. Between 2015–16 and 2018–19 catch declined by 34% and was the result of a decline in landed catch among a number of key targeted species, but mainly yellowfin tuna.

In 2015–16, gross value of production (GVP) reached an 11-year high in real terms (2018–19 dollars) of $51.4 million as a result of increased catch and generally improved prices that year. GVP has since remained below the value achieved in 2015–16 despite prices for key species having generally improved during 2015–16 and 2018–19. The decline in GVP has been the result of falling catch volumes. GVP in the ETBF decreased by 16% in 2018–19 to $32.1 million and was largely the result of lower catch value of key targeted ETBF species – yellowfin tuna and swordfish.

5 Dispatch of catch

The value of Australian exports of albacore, bigeye tuna and yellowfin tuna (the three key species of tuna caught in the WCPFC) declined by 29% in 2018–19 to $11.0 million. Export value declined across all three tuna species and reflected a combination of lower export prices and lower export volumes. Swordfish is typically the second most valuable species group landed in the ETBF after yellowfin tuna. In 2018–19 the value of swordfish exports declined by 42% to $3.9 million.

6 Onshore developments

Nil

7 Future prospects for the fishery

Commercial operators view the Australian skipjack fisheries as an important development opportunity because significant catching capacity exists in Port Lincoln, South Australia. Currently, catches are low as a result of variability in the availability of skipjack tuna in the AFZ, variable participation levels, low profit margins and the closure of the Port Lincoln cannery; however, there is room for development in this fishery.

The AFMA Commission agreed on the total allowable commercial catches (TACCs) for the ETBF. These apply to the 2020 season which commenced on 1 January 2020. The TACCs for the five main target species are: albacore (2500 t); bigeye tuna (1056 t); swordfish (1250 t); striped marlin (351 t); and yellowfin tuna (2400 t).

8 Status of data collection systems

8.1 Logbook data collection and verification

AFMA introduced a logbook for domestic longliners in 1986. The logbook has been revised on several occasions. The latest (AL06—Australian Pelagic Longline Daily Fishing Log) was introduced in 2007; vessels began submitting AL06 logbooks in November 2007. Return of logbooks by Australian longliners improved when, in 1995, it became a condition of fishing permits and has been close to 100% in recent years. Logbooks have also been introduced for the skipjack tuna purse-seine fisheries; PS01—Australian Purse Seine Daily Fishing Log was distributed in July 2002 with the first skipjack tuna catch recorded in this logbook in December 2003. Weights from catch disposal records are verified; weights recorded on logbooks are an estimate only. From 1 July 2015 logbooks have been verified through e-monitoring. The fishery is also now moving from predominantly paper logbook reporting to electronic logbook reporting.

8.2 Observer program

AFMA observers were deployed on domestic longliners from 2001 to 2015. From July 2003 to 2015, observers were deployed more broadly across the fishery with more general duties, such as the collection of data on fishing gear and the size and species composition of catches.

AFMA implemented a trial of e-monitoring to evaluate the effectiveness of this technology for a range of fishery monitoring purposes and to conduct a cost–benefit analysis in 2009–10 (Piasente et al. 2012). E-monitoring became compulsory for all ETBF longline vessels from 1 July 2015. E-monitoring replaced human observers in the ETBF for all in-zone observer requirements, although the government maintains the right to place human observers on board vessels if there is a need to do so. At least 10% of the video footage from all hauls is reviewed to verify the accuracy of logbooks which are required to be completed for 100% of shots. This review rate may be increased in some cases. In 2019, the coverage rate was 11.7% (Table 11). During the reporting period, Australian vessels operated principally in Australian waters with occasional forays onto the high seas. Australia's national observer program is accredited under the WCPFC ROP.

Table 11. Summary of longline observer coverage (by hooks) for 2019.

CCM Fleet	Fishery	No. of Hooks			Days fished			Days at sea			No. of trips			See notes
		Total est.	Obs.	Obs %	Total est.	Obs.	Obs %	Total est.	Obs.	Obs %	Total est.	Obs.	Obs %	
Australia	Domestic	8.57 million	999,899	11.7										Nil

Note: Blacked-out cells are not applicable.

8.3 Port sampling program

The collection of individual processed fish weights from processors receiving longline caught fish from the ETBF commenced in mid-1997. The program mainly focuses on the five principal target species in the fishery (yellowfin tuna, bigeye tuna, albacore, swordfish and striped marlin), though data on a range of other species have also been collected. During the period from July 1997 to December 2019 over 2 million individual fish weights pertaining to the five main

target species have been collected. Coverage rates (% of landed fish sampled) for the target species are generally high, and for the 5-year period between 2015 and 2019 have averaged around 85% for yellowfin tuna, 94% for bigeye tuna, 92% for swordfish and 91% for striped marlin, while for albacore 9% of landed fish have been individually sampled (Table 12). Individual fish weights for another 261,060 fish from 46 non-target species have also been collected. Bulk weights for albacore sampled in batches (covering on average 77% of the catch between 2015 and 2019) and some other species are also collected. Where both the total batched weight and the number of fish have been recorded, these bulk weights cover 1,170,267 fish for 30 species (including 766,779 albacore).

Table 12. Estimated annual coverage of operational catch and effort (logbooks), observer data (% hooks) and port sampling (% coverage rate for the five main target species of individual fish weights collected from processors receiving longline-caught fish in the ETBF) for the Australian fleet active in the WCPFC Convention Area, 2015–19.

Gear	Year	Operational catch & effort coverage (%)	Observer coverage (%)	Port sampling coverage (%)					
				YFT	BET	ALB	SWO	STM	SKJ
Longline[a]	2015	100	5.8[b]	83	94	17	91	85	0
	2016	100	8.7	84	95	13	95	91	0
	2017	100	10.2	88	92	8	87	90	0
	2018	100	10.8	74	91	3	96	91	0
	2019	100	11.7	91	100	4	95	100	0
Purse seine	2015	0	0	0	0	0	0	0	0
	2016	0	0	0	0	0	0	0	0
	2017	0	0	0	0	0	0	0	0
	2018	0	0	0	0	0	0	0	0
	2019	0	0	0	0	0	0	0	0

[a] includes fish taken by minor line

[b] as 2015 was a transition year to e-monitoring, the observer rate was derived from both human observers and e-monitoring. All coverage after 2015 will be calculated from e-monitoring.

Abbreviations: yellowfin tuna (YFT), bigeye tuna (BET), albacore (ALB), striped marlin (STM), swordfish (SWO) and skipjack (SKJ)

Sources: Robert Campbell (CSIRO) and AFMA observer database

8.4 Unloading/transhipment

Catch disposal records are the formal method for monitoring unloads and were implemented in the ETBF in January 2006 (Table 13). Catch disposal records are completed by both the fisher and licensed fish receiver at the point of unload to obtain accurate data on fish numbers and verified weight by species. Skippers tend to under-estimate the weights reported in logbooks for most species, so the catch disposal record data have been reported in domestic official statistics since 2007. Compliance checks are conducted on unloads as part of a risk-based compliance programme. Weight estimates are also derived from the size-monitoring program and are likely to be more accurate than logbook data for that part of the time series.

Table 13. Annual catch estimates (converted whole weights) for the ETBF for 2015–19 derived from catch disposal records. Estimates are in tonnes.

Year	Albacore	Yellowfin	Bigeye	Striped marlin	Swordfish	Other	Total
2015	949.0	2177.0	785.1	347.4	1149.9	1039.6	6448.0
2016	1101.9	1765.1	871.6	244.0	1161.8	1150.9	6295.3
2017	992.2	1714.5	449.6	287.9	1179.9	1042.2	5666.3
2018	889.1	1516.5	367.5	245.6	1026.9	1448.0	5493.6
2019	923.8	2089.0	284.5	250.8	793.1	1133.9	5475.0

Three transhipment activities were undertaken in 2019, all of which were in exceptional circumstances relating to breakdowns (Tables 14 and 15).

Table 14. Transhipment quantities by weight for Australian longline vessels in 2019 within the WCPFC Convention Area.

	Location	Transhipped within Convention Area (CA)?	Caught within Convention Area (CA)?	Product Form? *	Fishing gear	Species	Tonnes
Offloaded	At Sea, In Zone	Within CA	Within CA	W	longline	ALB	3.51
	At Sea, In Zone	Within CA	Within CA	GG	longline	YFT	2.02
	At Sea, In Zone	Within CA	Within CA	GG	longline	BET	0.4
	At Sea, In Zone	Within CA	Within CA	HG	longline	BBL	1.22
	At Sea, In Zone	Within CA	Within CA	HG	longline	STM	0.32
	At Sea, In Zone	Within CA	Within CA	GG	longline	SBT	0.09

*Product forms: GG = Gilled and Gutted; HG = Headed and Gutted; W =Whole.

Table 15. Number of transhipment for Australian longline vessels in 2019.

		Transhipped within Convention Area (CA)?	Caught within Convention Area (CA)?	Fishing gear	Number of Transhipments
Offloaded	Port	Within CA	Within CA	Longline	0
	In Zone	Within CA	Within CA	longline	3

8.5 Other

AFMA introduced the compulsory requirement for all Commonwealth endorsed fishing vessels to be fitted with Integrated Computer Vessel Monitoring Systems (ICVMS) in 2007. For 2019 there was a 95.7% compliance rate of all Commonwealth nominated vessels that had a fully operational and functioning unit. Compliance with ICVMS requirements has increased markedly since mid-2008. AFMA uses the ICVMS to assist in planning inspections and operations, to assist the observer program in deploying scientific observers and to actively monitor compliance with closed areas.

A range of data is also collected via individual research projects (see the Research Activities section for more information).

9 Research activities

The Australian Government and the fishing industry allocate considerable funds to fishery research and monitoring each year. In addition to the logbook and observer programmes, key areas of research over the last twelve years and ongoing research include:

9.1 Biological research projects

- Reproductive dynamics of swordfish in the domestic longline fishery off eastern Australia (Young & Drake 2002)
- Age and growth of bigeye tuna from the eastern and western AFZ (Farley et al. 2003)
- Age and growth of swordfish from Australian waters (Young & Drake 2004)
- Population biology and habitat preferences of striped marlin in eastern Australia (Keller & Davie 2009)
- Population biology of albacore tuna in the Australian region (Farley et al. 2012)
- Spatial dynamics of swordfish in the south Pacific Ocean (Evans et al. 2012)
- Defining regional connections in southwest Pacific swordfish (Wilcox 2012)
- Determination of swordfish growth and maturity relevant to the southwest Pacific stock (Farley et al. 2016)
- Age, growth and maturity of bigeye tuna in the western and central Pacific Ocean (CSIRO, July 2016–June 2020)
- Yellowfin tuna age and growth in the Western and Central Pacific Ocean (CSIRO, January 2018–December 2020)

9.2 Assessment-related research projects

- Dynamics of the interactions of the fishery and swordfish on seamounts off eastern Australia (Campbell & Hobday 2003)
- Migration and habitat preferences of bigeye tuna on the east coast of Australia (Gunn et al. 2005)
- Stock assessment of striped marlin in the south-western Pacific Ocean (Langley et al. 2006)
- Developing harvest strategies for the ETBF (AFMA 2007)
- Developing robust stock-status indicators (Basson & Dowling 2008)
- Updating the stock assessment of swordfish in the south Pacific Ocean (Kolody, Campbell & Davies 2008)
- Determining the depths fished and the effective longline effort targeted at various species in the ETBF (Campbell & Young 2010)

- Integrated evaluation of management strategies for tropical multi-species long-line fisheries (Kolody et al. 2010)
- Eastern Tuna and Billfish Fishery size monitoring program (Williams et al. ongoing)
- Integrated analysis and assessment supporting implementation of the management and harvest strategy framework within the ETBF (Campbell 2011)
- Predicting the impact of hook decrementation on the distribution of fishing effort in the ETBF (Wilcox et al. 2011)
- Analysis of recreational fishing catch and effort data to support the striped marlin stock assessment (Ghosn et al. 2012)
- Standardisation of commercial catch and effort data to support the stock assessment of striped marlin (Campbell 2012)
- Changes in fishing strategies in the ETBF in response to the introduction of quota management (Preece, Cambell & Hillary 2012)
- Development of an approach to harvest strategy management of internationally managed multi-species fisheries (Hillary et al. 2016)
- Developing innovative approaches to improve CPUE standardisation for Australia's multi-species longline fisheries (Campbell et al. 2017)
- Data management, assessment and implementation of harvest strategies for Australia's tropical tuna fisheries (Campbell 2017)
- Determination of the spatial dynamics and movement rates of the principal target species within the Eastern Tuna and Billfish Fishery and connectivity with the broader western and central Pacific Ocean - beyond tagging (CSIRO; draft report submitted)
- Where have all the yellowfin tuna gone? Investigating the disjunct between commercial and recreational catches off NSW (Pepperell Research & Consulting Pty Ltd/CSIRO, July 2017–September 2020)
- Data management, assessment and implementation of harvest strategies for Australia's tropical tuna fisheries (CSIRO, August 2017–October 2020)
- ETBF swordfish and striped marlin harvest strategy revision and evaluation (CSIRO, November 2018–April 2020)

9.3 Ecological research projects

- Ecological risk assessment for the effects of fishing (Webb et al. 2007)
- Rapid quantitative assessment (Zhou, Smith & Fuller 2007)
- Determining the ecological impacts of longline fishing in the ETBF (Young et al. 2009)
- Revised ecological risk assessment for the effects of fishing (CSIRO, ongoing)
- Investigation of oceanographic and environmental factors impacting on the ETBF (CSRIO, July 2017–May 2020)

9.4 Bycatch research projects

- A review of byproduct interactions and economics in Australia's tuna and billfish fisheries (Bromhead et al. 2005)
- Marine turtle mitigation in Australia's pelagic longline fishery (Robins et al. 2007)
- The effects of bycatch mitigation measures, such as circle hooks and wire leaders, on target and non-target catches (Ward et al. 2008)
- Effect of line shooters on the sink rates of pelagic longlines and the effect on seabird interactions (Robertson, Candy & Wienecke 2010a)
- Factors affecting the sink rates of baited hooks and the impact on seabird interactions in pelagic longline fisheries (Robertson & van den Hoff 2010; Robertson et al. 2010b; Robertson & Candy 2013)
- Branch line weighting regimes to reduce the incidental catch of seabirds in pelagic longline fisheries (Robertson et al. 2013)
- The effects of propeller turbulence on sink rates of baited hooks (Robertson & Candy 2014)
- Development of an underwater bait setting system (Robertson et al. 2015)

Appendix A: Common and Scientific Names

Common names	Scientific names
Albacore	*Thunnus alalunga*
Albatrosses (other)	*Diomedeidae* spp.
Australian fur seal	*Arctocephalus pusillus doriferus*
Australian gannet	*Morus serrator*
Australian sea lion	*Neophoca cinerea*
Baleen whale	Mysticeti
Bigeye tuna	*Thunnus obesus*
Birds	Aves
Black marlin	*Makaira indica*
Black-browed albatross	*Thalassarche melanophrys*
Blacktip sharks	*Carcharhinus* spp.
Blue marlin	*Makaira mazara*
Blue shark	*Prionace glauca*
Bottlenose dolphin	*Tursiops truncatus*
Bronze whaler shark	*Carcharhinus brachyurus*
Buller's albatross	*Thalassarche bulleri*
Cape petrel	*Daption capense*
Common dolphin	*Delphinus delphis*
Cormorants	*Phalacrocoracidae*
Dolphin	Delphinidae
Dugong	*Dugong dugon*
Dusky shark	*Carcharhinus obscurus*
Escolar	*Lepidocybium flavobrunneum*
False killer whale	*Pseudorca crassidens*
Flatback turtle	*Natator depressa*
Flesh-footed shearwater	*Puffinus carneipes*
Great crested tern	*Sterna bergii*
Great skua	*Catharacta skua*
Great-winged petrel	*Pterodroma macroptera*
Green turtle	*Chelonia mydas*
Grey-headed albatross	*Thalassarche chrysostoma*
Hammerhead shark	*Sphyrna* spp.
Hawksbill turtle	*Eretmochelys imbricata*
Humpback whale	*Megaptera novaeangliae*
Lancetfish	*Alepisaurus sp.*
Leatherback turtle	*Dermochelys coriacea*
Loggerhead turtle	*Carretta carretta*
Long-finned pilot whale	*Globicephala melas*
Longfin mako	*Isurus paucus*
Mahi mahi	*Coryphaena hippurus*
Melon-headed whale	*Peponcephala electra*
Moonfish (opah)	*Lampris guttatus*
New Zealand fur seal	*Arctocephalus fosteri*
Northern bluefin tuna	*Thunnus orientalis*
Ocean sunfish	*Mola mola*
Oceanic whitetip shark	*Carcharhinus longimanus*
Oilfish	*Ruvettus pretiosus*
Pacific (olive) ridley turtle	*Lepidochelys olivacea*
Petrels, prions and shearwaters	*Procellariidae* spp.
Porbeagle	*Lamna nasus*
Ray's bream	*Brama brama*

Rudderfish	*Centrolophus niger*
Sailfish	*Istiophorus platypterus*
Scalloped hammerhead	*Sphyrna lewini*
Seals	Phocidae
Shearwaters	*Puffinus* spp.
Shortbill spearfish	*Tetrapturus angustirostris*
Shortfin mako	*Isurus oxyrinchus*
Short-finned pilot whale	*Globicephala macrorhynchus*
Short-tailed shearwater	*Puffinus tenuirostris*
Shy albatross	*Thalassarche cauta*
Silky shark	*Carcharhinus falciformis*
Skipjack tuna	*Katsuwonus pelamis*
Smooth hammerhead	*Sphyrna zygaena*
Sooty shearwater	*Puffinus griseus*
Southern bluefin tuna	*Thunnus maccoyii*
Southern royal albatross	*Diomedea epomophora*
Striped marlin	*Kajikia audax*
Swordfish	*Xiphias gladius*
Thresher shark	*Alopias vulpinus*
Tiger shark	*Galeocerdo cuvier*
Toothed whale	Odontoceti
Turtles	Testudinata
Wahoo	*Acanthocybium solandri*
Wandering albatross	*Diomedea exulans*
Wedge-tailed shearwater	*Puffinus pacificus*
Westland petrel	*Procellaria westlandica*
Whale shark	*Rhincodon typus*
Wilson's storm petrel	*Oceanites oceanicus*
Yellowfin tuna	*Thunnus albacares*
Yellow-nosed albatross	*Thalassarche chlororhynchos*

Appendix B: Mandatory mitigation measures in the ETBF 2020

(Source: AFMA website:
https://afma.govcms.gov.au/sites/default/files/2020_etbf_management_arrangements_booklet_-_final.pdf

Seabirds

At all times you must:

- Carry one or more assembled tori lines on board
- Not discharge offal while setting

When you are fishing south of 25°S you must:

- Deploy a tori line before commencing a shot when fishing between the hours of nautical dawn and nautical dusk
- A tori line if not required to be deployed when performing fishing operations between the hours of nautical dusk and nautical dawn
- Use only non-frozen bait
- Weight longlines with either a minimum of:
    - 60 g swivels at a distance of no more than 3.5 m from each hook ; or
    - 98 g swivels at a distance of no more than 4 m from each hook; or
    - 40 g weights immediately adjacent to the hook, or at no more than 0.5 m from the hook, with dead, non-frozen baits attached to the hooks or
    - 'hook shielding device' with a cap and weighing at least 38 g may be deployed directly at the hook as an alternative.

Your tori line must be:

- At least 100 m long
- Set up from a position on the boat that allows it to stay above the water for at least 90 m from the stern
- Have streamer attached at a maximum interval of 3.5 m
    - Streamers should be maintained, ensuring that their lengths are as close to the water as possible.
- Have a drogue at the end of the line to give sufficient drag to meet the 90 m aerial coverage criteria.

If you are fishing south of 40°S AFMA may require you to implement additional seabird mitigation measures as this is an area in which higher than average numbers of seabird interactions are possible.

Seabird Interaction Obligations

As of the 2020 fishing season, the requirements relating to breaches of the Seabird Threat Abatement Plan (TAP) have changed. If a vessel exceeds the seabird bycatch rate (0.05 birds per 1,000 hooks in any 5 degree zone) during a TAP season and has previously breached the 'past seasons' criteria one of the following seabird mitigation options must immediately be implemented:

- a daylight setting ban (ensure that all longline hooks are deployed only during the hours between nautical dusk and nautical dawn); or
- implement amended line weighting of either:
    - o 40g or greater attached within 0.5 metre of the hook; or
    - o 60g or greater attached within 1 metre of the hook; or
    - o 80 g or greater attached within 2 m of the hook, or
    - ACAP approved hook shielding devices on all hooks; or
- a northern shift in the area of operation (to at least 5 degrees north of the most northerly seabird interaction with the nominated vessel, as verified and notified by AFMA).

The 'past seasons' criteria is if a vessel has exceeded the seabird bycatch rate in any 5 degree zone, taking more than one seabird in each zone breached:

- in the last two consecutive Threat Abatement Plan (TAP) Summer and Winter seasons; or
- any two of the last three consecutive summer TAP seasons; or
- any two of the last three consecutive winter TAP seasons; or
- taken more than 10 seabirds in the last completed TAP season AFMA will notify operators in writing once they become aware of any breaches to the above 'past seasons' criteria.

If a vessel after implementing one of the seabird mitigation options listed above subsequently catches one additional albatross (dead) or two other seabirds (dead) one of the following must immediately be implemented:

- an additional mitigation measure from the list of seabird mitigation options above; or
- cease the use of live bait (if using) and only use dead bait; or
- relocate fishing activities to north of latitude 25 degrees south; or
- cease fishing using longlines for the remainder of the TAP season.

Sea turtles

Circle hooks

Large circle hooks must be used.

De-hooking device

At all times you must carry on board a minimum of one de-hooking device, with the following specifications:

- The device must enable the hook to be secured and the barb shielded so that the barb does not re-engage with the fish while the hook is being removed
- The device must be blunt with all edges rounded
- Where more than one size of hook is to be carried, a de-hooking device (or devices) must be carried that can be used with all hooks on the boat; and
- The shaft of the device must be a minimum of 1.5 metres in length.

Line cutting device

At all times you must carry on board a minimum of one line cutting device. The line cutting device must be constructed and used in accordance with the following specifications:

- The device must be constructed to allow the line to be cut as close to the hook as possible
- The blade of the device must be enclosed in a blunt rounded (arc-shaped) cover with the hook exposed on the inside of the arc; and
- The shaft of the device must be a minimum of 1.5 metres in length.

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