SCIENTIFIC COMMITTEE
FOURTEENTH REGULAR SESSION

Busan, Republic of Korea
8-16 August 2018

ANNUAL REPORT TO THE COMMISSION
PART 1: INFORMATION ON FISHERIES, RESEARCH, AND STATISTICS

WCPFC-SC14-AR/CCM-01

AUSTRALIA

Australian Government
Department of Agriculture and Water Resources
ABARES

Annual report to the Western and Central Pacific Fisheries Commission

Part 1: Information on fisheries, research and statistics 2017 Australia

H. Patterson, P. Hobsbawn, J. Larcombe

Research by the Australian Bureau of Agricultural and Resource Economics and Sciences

July 2018

Scientific data were provided to the Commission in accordance with the decision relating to the provision of scientific data to the Commission on the 30th April 2018	YES

Cataloguing data

This publication (and any material sourced from it) should be attributed as: Patterson, H, Hobsbawn, P & Larcombe, J 2018, *Annual report for the Western and Central Pacific Fisheries Commission Part 1: Information on fisheries, research and statistics 2017*, ABARES, Canberra, July. CC BY 3.0

Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES)

Postal address GPO Box 858 Canberra ACT 2601
Switchboard +61 2 6272 2010|
Facsimile +61 2 6272 2001
Email info.abares@agriculture.gov.au
Web agriculture.gov.au/abares

Acknowledgements

The authors wish to thank Rupert Summerson (ABARES) for creating the maps. The authors also acknowledge and appreciate the input of: David Mobsby (ABARES); Rob Campbell (CSIRO); Don Bromhead (AFMA); and Mat Kertesz and Jenny Baldwin (Department of Agriculture and Water Resources).

Contents

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 decreased from 4275 t (including <1 t minor line) in 2016 to 3914 t in 2017 (including <1 t minor line). 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 8.74 million hooks in 2017. The decrease in fishing effort from 2003 levels is the result of the strength of the Australian dollar (affecting terms of trade), increased operating costs and the surrender of permits under the structural adjustment component of the Australian Government Securing Our Fishing Future package, as well as the introduction of a quota management system. Thirty-nine vessels reported longlining in the WCPFC Convention Area during 2017.

The ETBF is a multi-target species longline fishery, targeting albacore, bigeye tuna, yellowfin tuna, swordfish and striped marlin. The profitability and viability of the fishery is dependent on the suite of species, each of which fluctuate in availability in the Australian region through time. Longline logbook catches of albacore decreased slightly from 862 t in 2016 to 785 t in 2017. Similarly, longline catches of bigeye tuna decreased from 747 t in 2016 to 375 t in 2017. Longline catches of yellowfin tuna also decreased slightly from 1508 t in 2016 to 1491 t in 2017. Longline catches of swordfish increased slightly from 923 t in 2016 to 976 t in 2017. Longline catches of striped marlin also increased slightly from 207 t in 2016 t to 245 t in 2017 while longline catches of skipjack increased from 1.6 t in 2016 to 7.1 t in 2017.

There are no dedicated minor line (including trolling, rod-and-reel and handline) vessels in the ETBF; most minor line catches are reported by vessels (e.g. longline) on their way to and from fishing grounds. In 2017, there were two vessels 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. This is partly due to the surrender of 49 per cent of permits under the structural adjustment component of the Australian Government Securing Our Fishing Future package, which was completed in 2006. There were no active vessels in the Eastern Skipjack Fishery (purse seine) in 2017.

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 per cent 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 2017 was 889,196, which is 10.2 per cent of the hooks deployed.

In February 2018, the AFMA Commission agreed on the total allowable commercial catches (TACCs) for the ETBF. These apply to the 2018–19 season which commenced on 1 March 2018. The TACCs for the five main target species are: albacore (2351 t); bigeye tuna (957 t); swordfish (960 t); striped marlin (311 t); yellowfin tuna (2054 t). The ETBF is transitioning to a calendar year season starting 1 January 2019. As a result, the TACCs are reduced for a 10 month season and the 2018 season will finish on 31 December 2018.

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). Note that scientific and common names are provided in Appendix I.

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) saw the likely 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 only 58 longline vessels remained and in 2016 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. Consequently, since 2006 the composition of catch has progressively included proportionally less albacore and more yellowfin and bigeye tuna and swordfish.

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). No dedicated minor line vessels remain in the fishery.

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

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-nine vessels reported longlining in the WCPFC Convention Area during 2017, down from a peak of 180 in 1997 (Figure 1). Total longline effort increased from 7.82 million hooks in 2016 to 8.74 million hooks in 2017 (Table 1). Overall, effort has declined from the peak effort of 12.40 million 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 2017 fishing for striped marlin south of 15°S was 38. Thirty-seven vessels fished for albacore and 35 fished for swordfish south of 20°S; there was no effort for albacore north of the equator.

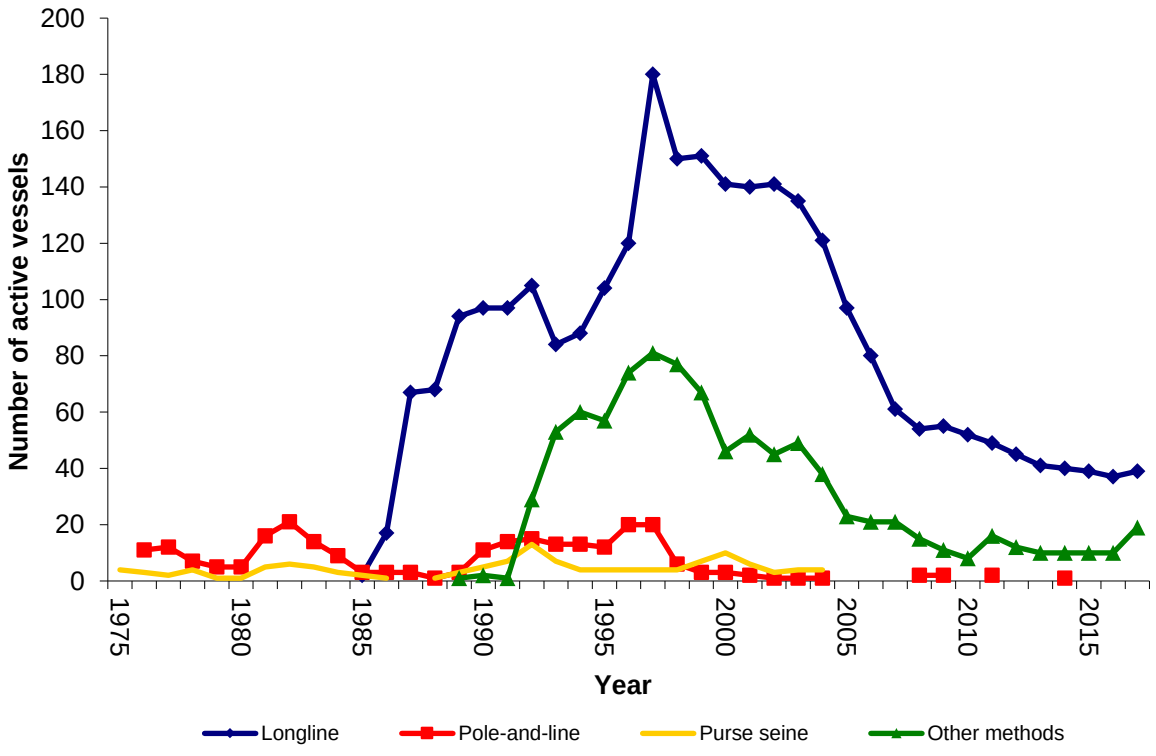


Figure 1. Historical annual vessel numbers for the Australian fleet, by gear (longline, purse seine, pole-and-line and other commercial methods [minor line including trolling, rod-and-reel and handline]) for the WCPFC Convention Area.

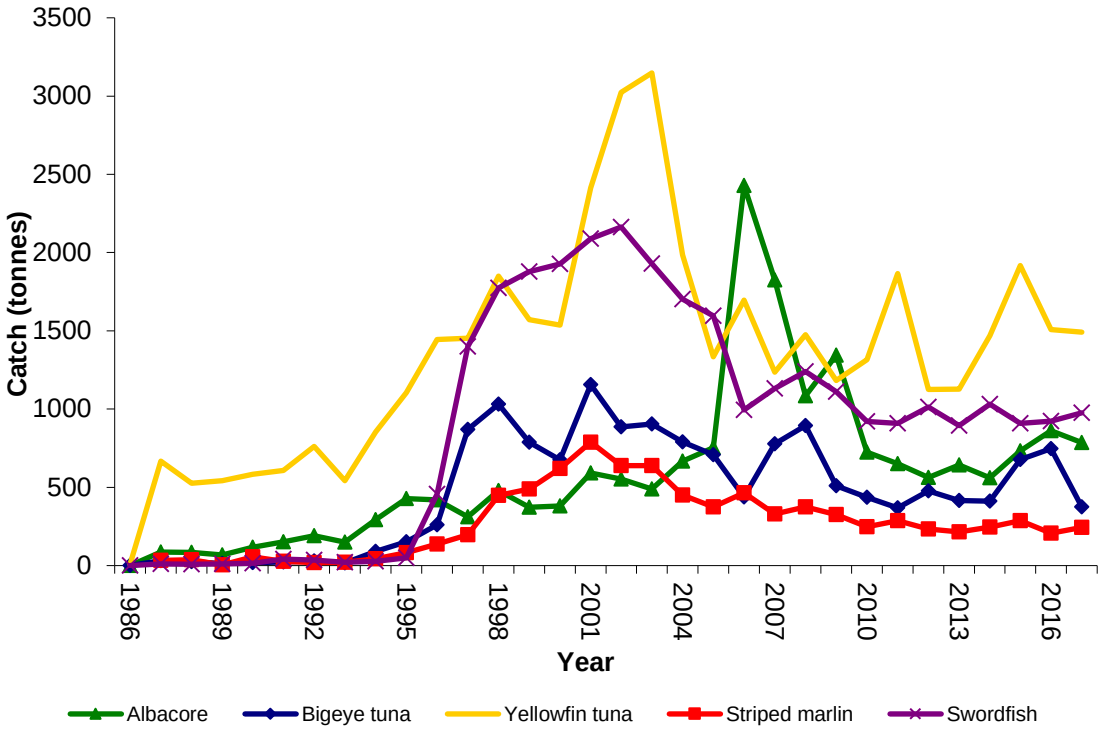
Table 1. Annual catch and effort estimates (whole weight) for the Australian fleet, by gear and primary species, for the WCPFC Convention Area, 2013–17.

Fishing method	Year	Effort [a]	Primary species (t)					
			Albacore	Bigeye	Skipjack	Yellowfin	Striped marlin	Swordfish
All gears	2013	-	643.2	422.4	2.6	1128.7	215.6	895.0
	2014	-	561.3	430.3	2.2	1473.8	245.6	1030.7
	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
Longline [b]	2013	6755	642.3	416.6	2.6	1127.6	215.6	895.0
	2014	6928	561.3	430.3	2.1	1472.8	245.6	1030.7
	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
Purse seine	2013	0	0	0	0	0	0	0
	2014	0	0	0	0	0	0	0
	2015	0	0	0	0	0	0	0
	2016	0	0	0	0	0	0	0
	2017	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 in the ETBF reported in logbooks decreased from 4275 t in 2016 to 3913 t in 2017. 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 decreased from 862 t in 2016 to 785 t in 2017 (688 t caught south of 20°S). Similarly, bigeye tuna longline catches decreased from 747 t in 2016 to 375 t in 2017. Longline catches of yellowfin tuna also decreased slightly from 1508 t in 2016 to 1491 t in 2017. Longline catches of swordfish increased slightly from 923 t in 2016 to 976 t in 2017 (941 t caught south of 20°S). Longline catches of striped marlin also increased slightly from 207 t in 2016 to 245 t in 2017 (all of which was caught south of 15°S). Longline catches of skipjack increased from 1.6 t in 2017 to 7.1 t in 2017. Annual catch distributions of the main target species by the Australian longline fleet for 2013–17 are shown in Figure 3.

a)



b)

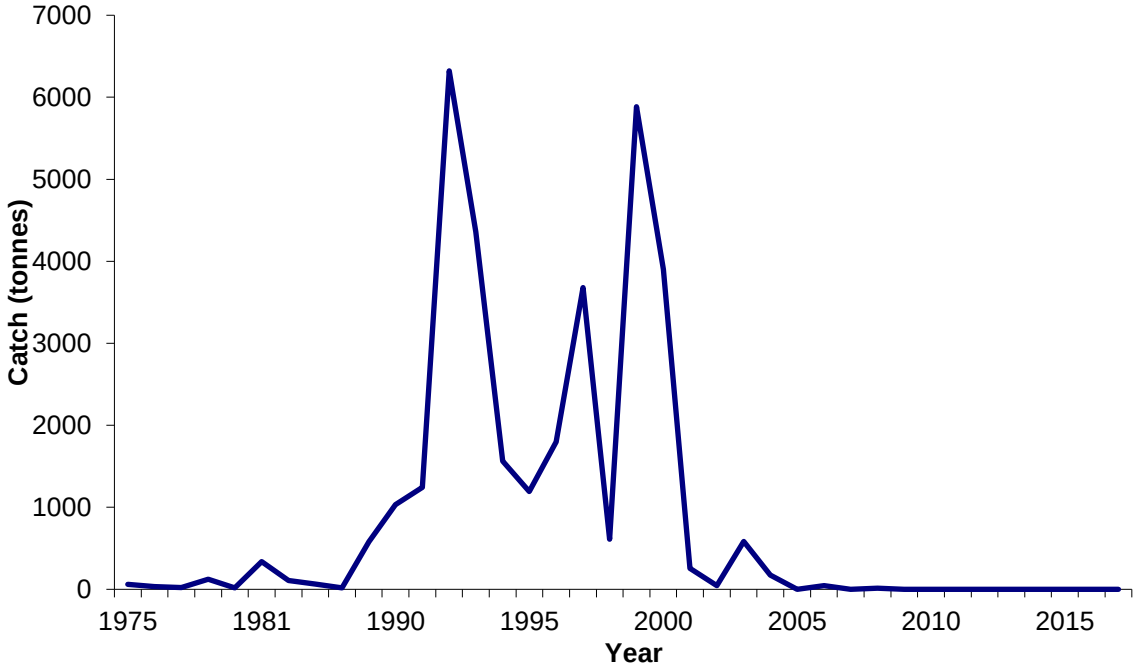
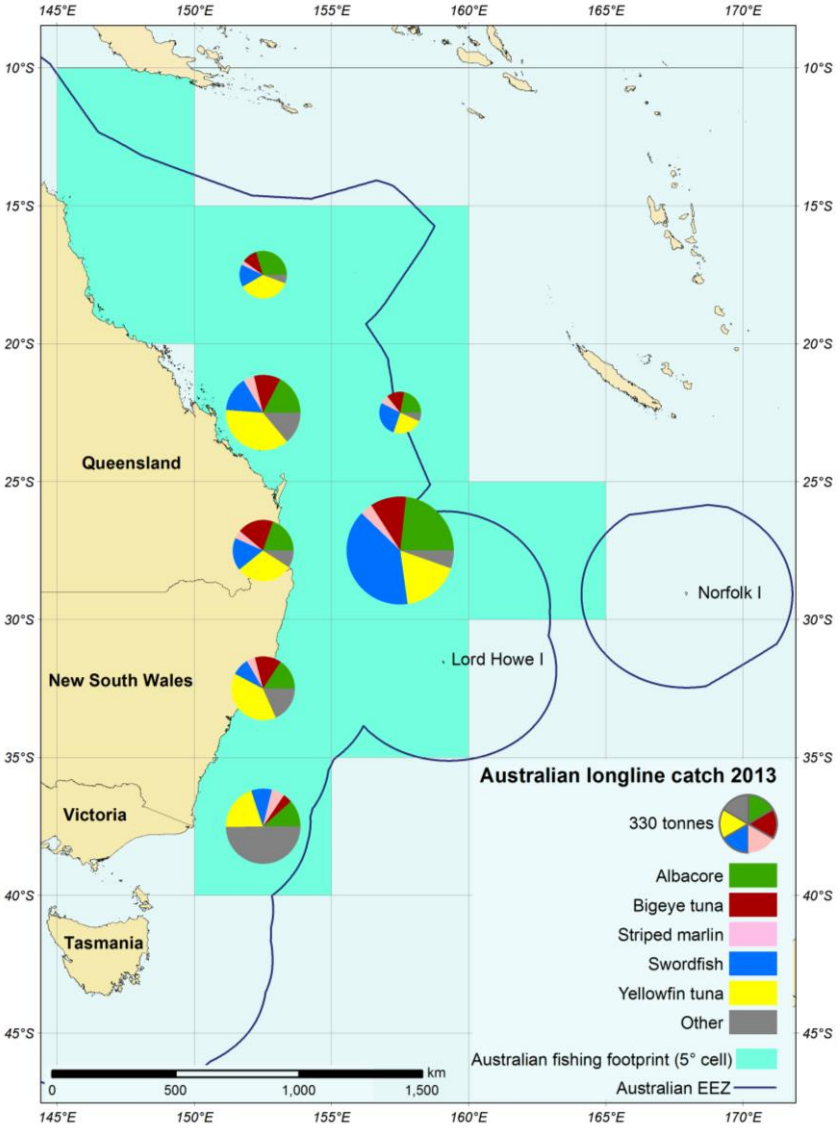
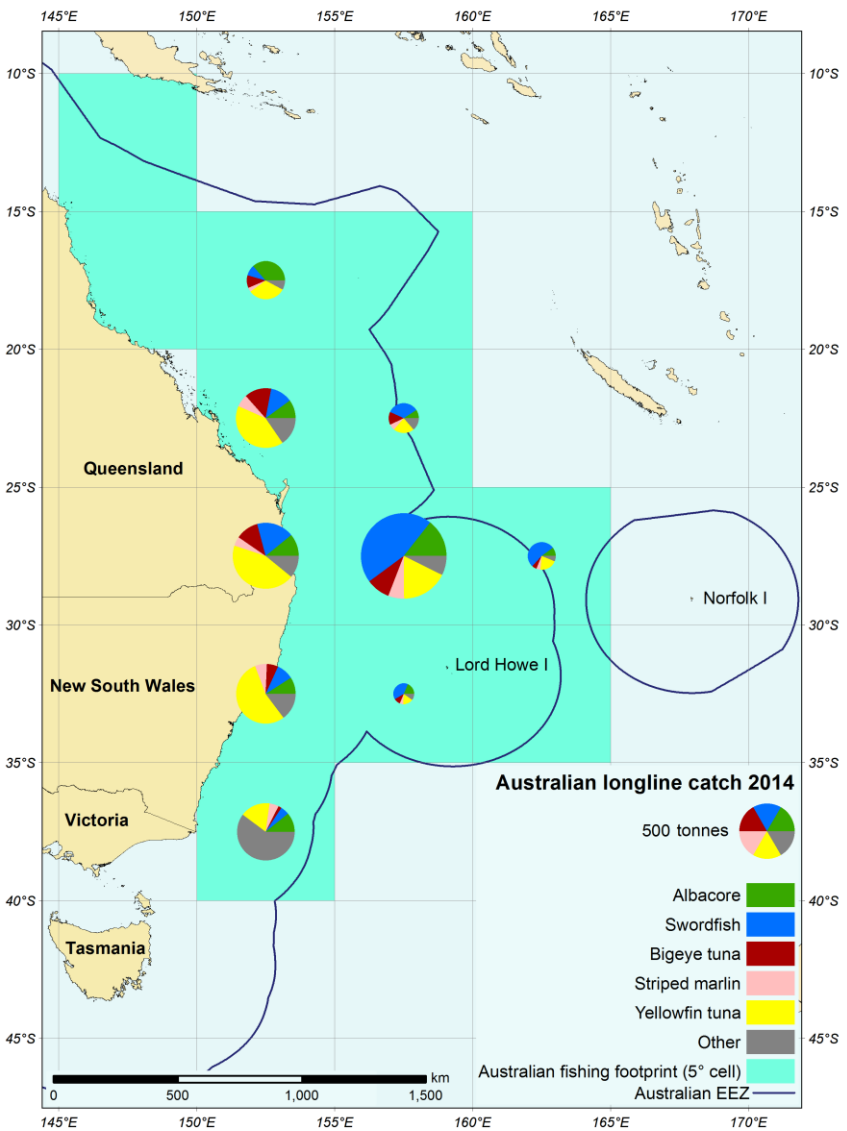


Figure 2. Historical annual longline catch in the WCPFC Convention Area for (a) albacore, bigeye tuna and yellowfin tuna, as well as striped marlin and swordfish, and (b) purse seine catch skipjack tuna.

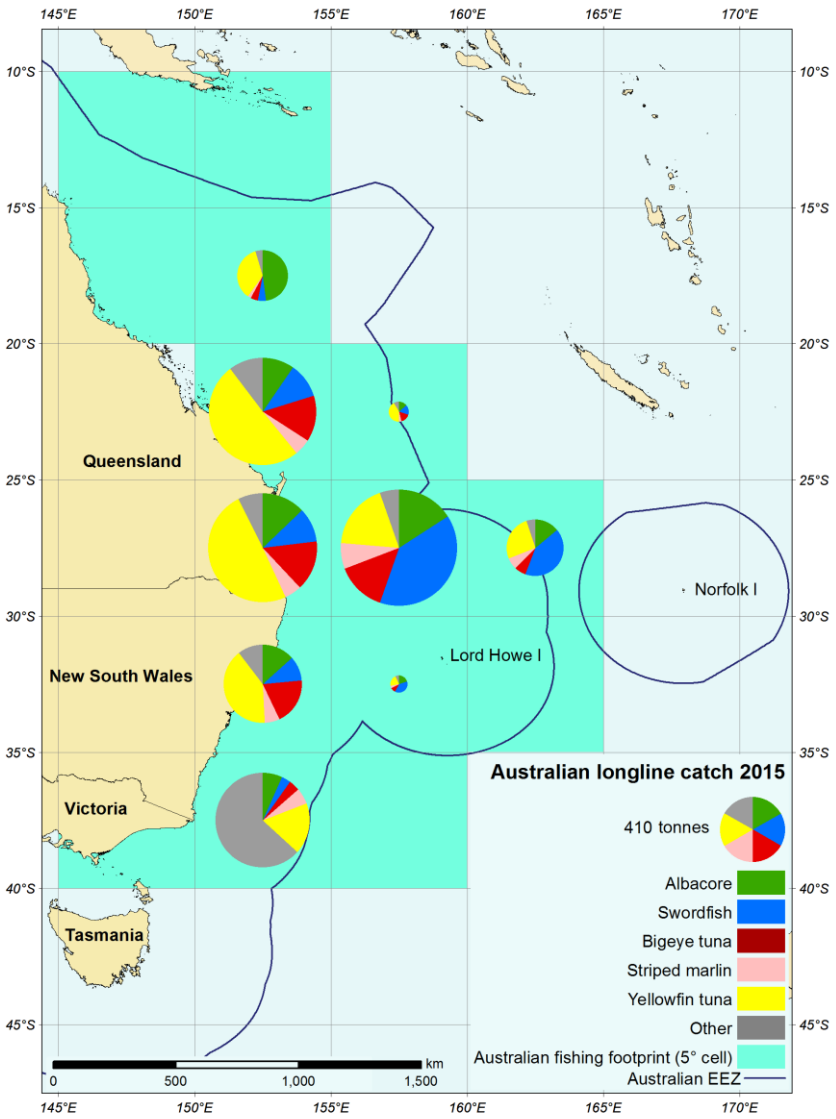
a)


145°E
150°E
155°E
160°E
165°E
170°E
10°S
15°S
20°S
25°S
30°S
35°S
40°S
45°S
Queensland
New South Wales
Victoria
Tasmania
Norfolk I
Lord Howe I
Australian longline catch 2013
330 tonnes
Albacore
Bigeye tuna
Striped marlin
Swordfish
Yellowfin tuna
Other
Australian fishing footprint (5° cell)
Australian EEZ
km
0
500
1,000
1,500

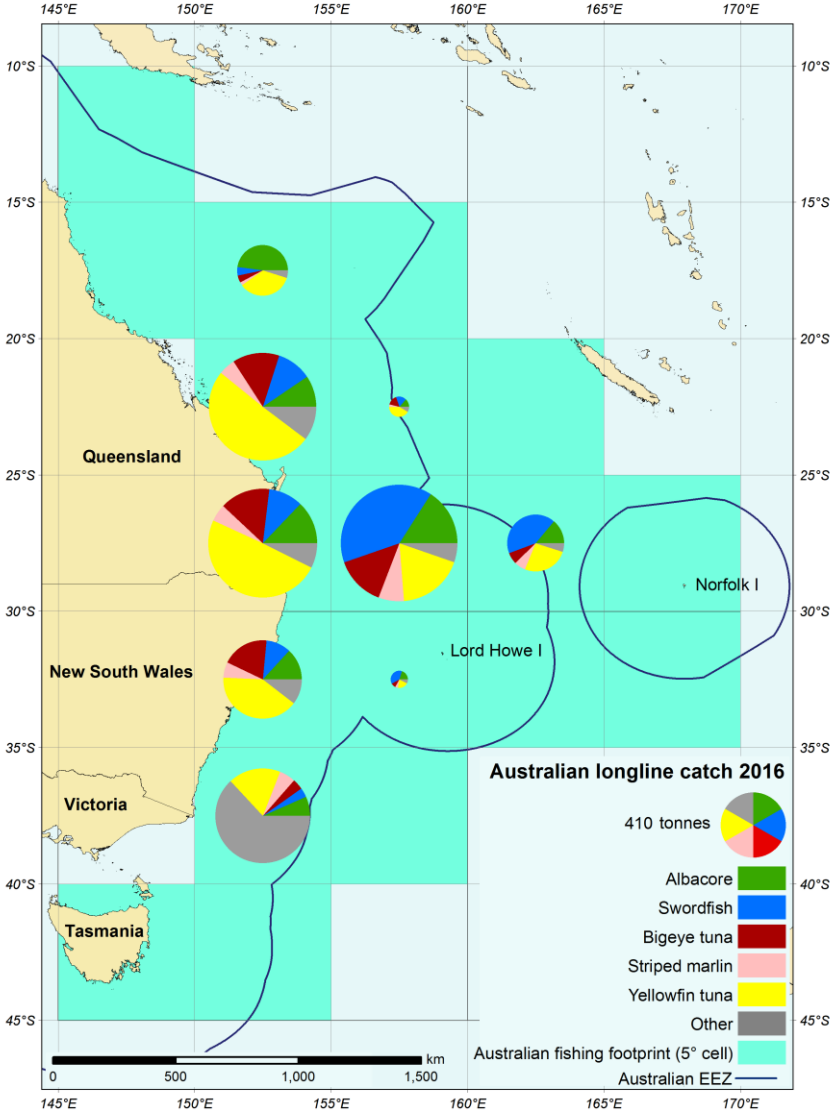
b)


145°E
150°E
155°E
160°E
165°E
170°E
10°S
15°S
20°S
25°S
30°S
35°S
40°S
45°S
Queensland
New South Wales
Victoria
Tasmania
Norfolk I
Lord Howe I
Australian longline catch 2014
500 tonnes
Albacore
Swordfish
Bigeye tuna
Striped marlin
Yellowfin tuna
Other
Australian fishing footprint (5° cell)
Australian EEZ
km
0
500
1,000
1,500

c)


145°E
150°E
155°E
160°E
165°E
170°E
10°S
15°S
20°S
25°S
30°S
35°S
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
0
500
1,000
1,500
km

d)


145°E
150°E
155°E
160°E
165°E
170°E
10°S
15°S
20°S
25°S
30°S
35°S
40°S
45°S
Queensland
New South Wales
Victoria
Tasmania
Norfolk I
Lord Howe I
Australian longline catch 2016
410 tonnes
Albacore
Swordfish
Bigeye tuna
Striped marlin
Yellowfin tuna
Other
Australian fishing footprint (5° cell)
Australian EEZ
0
500
1,000
1,500
km

e)

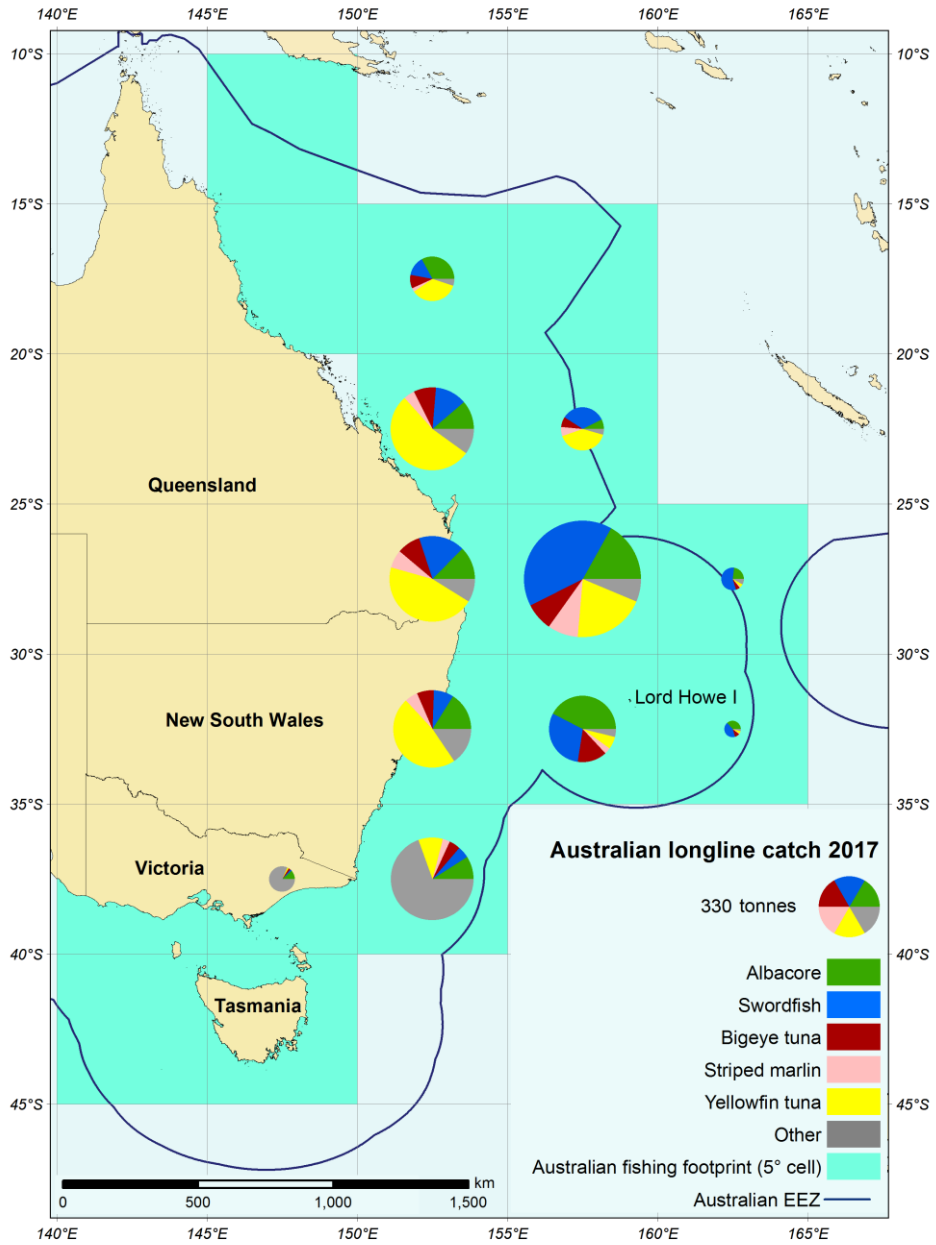


Figure 3 (a–e). Annual distributions of target species catch by the Australian longline fleet active in the WCPFC Convention Area, for 2013–17. Catches have been aggregated to five degree blocks to address issues of confidentiality and are scaled to the pie chart provided in the legend. Fishing footprint shows the total extent of waters fished at a spatial resolution of five degree square.

Annual retained catch estimates of major non-target, associated and dependent species, including sharks, by the Australian longline fleet from 2013–17 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 in Table 3.

Since 1 January 2013, retention of oceanic whitetip sharks by all commercial vessels has been prohibited. No retention was recorded in logbooks in 2017. Of the 49 oceanic whitetips observed caught, 30 were released alive, 18 were released in an undetermined condition and 1 was dead. Similarly, from 1 July 2014, retention of silky sharks has been prohibited and no retention was recorded in logbooks in 2017. In the 2017 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 http://www.afma.gov.au/wp-content/uploads/2014/08/170220_Final-2017-ETBF-Management-Arrangements-booklet.pdf

Retention of both blue marlin and black marlin by commercial longliners has been prohibited since 1998 and no retained catches were recorded in 2017. Historically, 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).

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

In 2017, 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 in the ETBF (including pole and line, trolling, rod-and-reel and handline) remained at <1 t in 2017. This catch was mainly composed of albacore (0.15 t) and skipjack tuna (0.19 t). The number of vessels reporting using minor line in the ETBF has steadily decreased from a peak of 52 vessels in 2001 to 2 in 2017 (using troll, rod-and-reel and handline). Minor line effort for 2016 was 24 lines, with an increase to 82 lines in 2017. Minor line effort peaked in 2007 with 975 lines. Effort in the minor line sector does not follow the same declining trend over time as the number of active vessels, as the peak effort in 2007 was during a year with only 21 vessels active. Minor line catches comprised a very small proportion of total catches and occurred inside the AFZ.

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 2013–17.

Group	Species	Longliners (t)					Other methods combined (t)				
		2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
Scalefish	Escolar	9.1	3.5	12.3	9.2	10.1	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	84.0	236.4	184.4	140.7	128.5	0.1	0.0	0.0	0.0	0.0
	Moonfish	12.8	13.1	10.6	11.6	5.1	0.0	0.0	0.0	0.0	0.0
	Ocean sunfish	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
	Oilfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Ray's bream	16.6	16.6	7.8	5.6	14.4	0.1	0.0	0.0	0.0	0.0
	Rudderfish	37.5	31.3	24.9	42.7	30.9	0.0	0.0	0.0	0.0	0.0
	Sailfish	1.1	0.7	0.4	0.6	1.3	0.0	0.0	0.0	0.0	0.0
	Shortbill spearfish	9.9	8.0	7.0	5.8	4.5	0.0	0.0	0.0	0.0	0.0
	Wahoo	17.6	7.7	5.8	6.0	6.2	0.0	0.0	0.0	0.0	0.0
	Subtotal	188.6	317.3	253.2	222.7	201.0	0.2	0.0	0.0	0.0	0.0
Sharks	Blacktip shark	1.5	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
	Blue shark	13.5	2.9	0.3	0.2	0.1	0.1	0.0	0.1	0.0	0.0
	Bronze whaler	4.3	2.4	0.7	0.1	0.0	2.5	0.0	0.0	0.0	0.0
	Dusky shark	2.8	0.4	0.3	0.1	0.6	0.0	0.0	0.0	0.0	0.0
	Hammerhead	3.2	1.0	0.3	0.0	0.2	0.0	0.0	0.0	0.0	0.0
	Longfin mako	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Oceanic whitetip	3.5	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Porbeagle	0.6	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0
	Shortfin mako	38.5	26.2	20.3	16.7	20.8	0.4	0.1	0.0	0.0	0.0
	Silky shark	1.4	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Thresher shark	0.4	0.2	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0
	Tiger shark	3.1	0.7	0.2	0.1	0.1	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	72.9	36.1	22.5	17.5	22.6	3.1	0.1	0.1	0.0	0.0
	TOTAL	**261.5**	**353.4**	**275.7**	**240.2**	**223.6**	**3.3**	**0.1**	**0.1**	**0.0**	**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 2013–17.

Group	Species	2013	2014	2015	2016	2017
Scalefish	Black marlin	800	1044	1421	1149	1170
	Blue marlin	456	776	1442	1425	1201
	Escolar	260	76	405	1364	1342
	Lancetfish	9576	10,160	11,420	18,136	24,452
	Mahi mahi	131	559	935	655	931
	Moonfish	1	9	8	18	9
	Ocean sunfish	534	658	1505	1551	2401
	Oilfish	0	2	10	9	47
	Ray's bream	11	46	144	258	340
	Rudderfish	572	928	1026	2378	2690
	Sailfish	54	33	60	125	79
	Shortbill spearfish	49	27	62	101	168
	Wahoo	39	43	62	63	73
	Subtotal	12,537	14,361	18,500	27,232	34,903
Sharks	Blacktip sharks	2	1	4	0	1
	Blue shark	6815	5385	9167	12,538	16,859
	Bronze whaler	328	411	755	1491	4143
	Dusky shark	412	496	1283	786	1847
	Hammerhead	76	88	211	237	487
	Longfin mako	8	7	5	6	18
	Oceanic whitetip	442	604	1143	1220	1359
	Porbeagle	3	2	7	8	124
	Shortfin mako	448	305	1066	1261	1448
	Silky shark	110	202	514	136	395
	Thresher shark	118	283	596	556	649
	Tiger shark	168	151	375	630	726
	Whale shark	0	0	0	0	0
	Subtotal	8930	7935	15,126	18,869	28,056
	TOTAL	**21,467**	**22,260**	**33,626**	**46,101**	**62,959**

Table 4. Catch and effort by Australian longliners, by primary species, within the AFZ and on the high seas, 2013–17. Proportions of catch and effort within the AFZ versus the high seas are provided in parentheses.

	Year	Effort ('000 hooks)	Primary species catch (t)					
			Albacore	Bigeye	Skipjack	Yellowfin	Striped marlin	Swordfish
Within AFZ	2013	6707	630.5	412.8	2.6	1121.9	212.8	871.1
		(99.0%)	(98.0%)	(98.9%)	(99.5%)	(99.4%)	(98.5%)	(96.9%)
	2014	6857	554.6	407.0	2.1	1461.2	243.4	1012.4
		(99.0%)	(98.8%)	(98.9%)	(100.0%)	(99.4%)	(99.1%)	(98.2%)
	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%)
High seas	2013	70	12.9	4.5	0	6.4	3.3	27.4
		(1.0%)	(2.0%)	(1.1%)	(0.0%)	(0.6%)	(1.5%)	(3.1%)
	2014	71	6.8	4.5	0	8.6	2.2	18.3
		(1.0%)	(1.2%)	(1.1%)	(0.0%)	(0.6%)	(0.9%)	(1.8%)
	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%)

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.

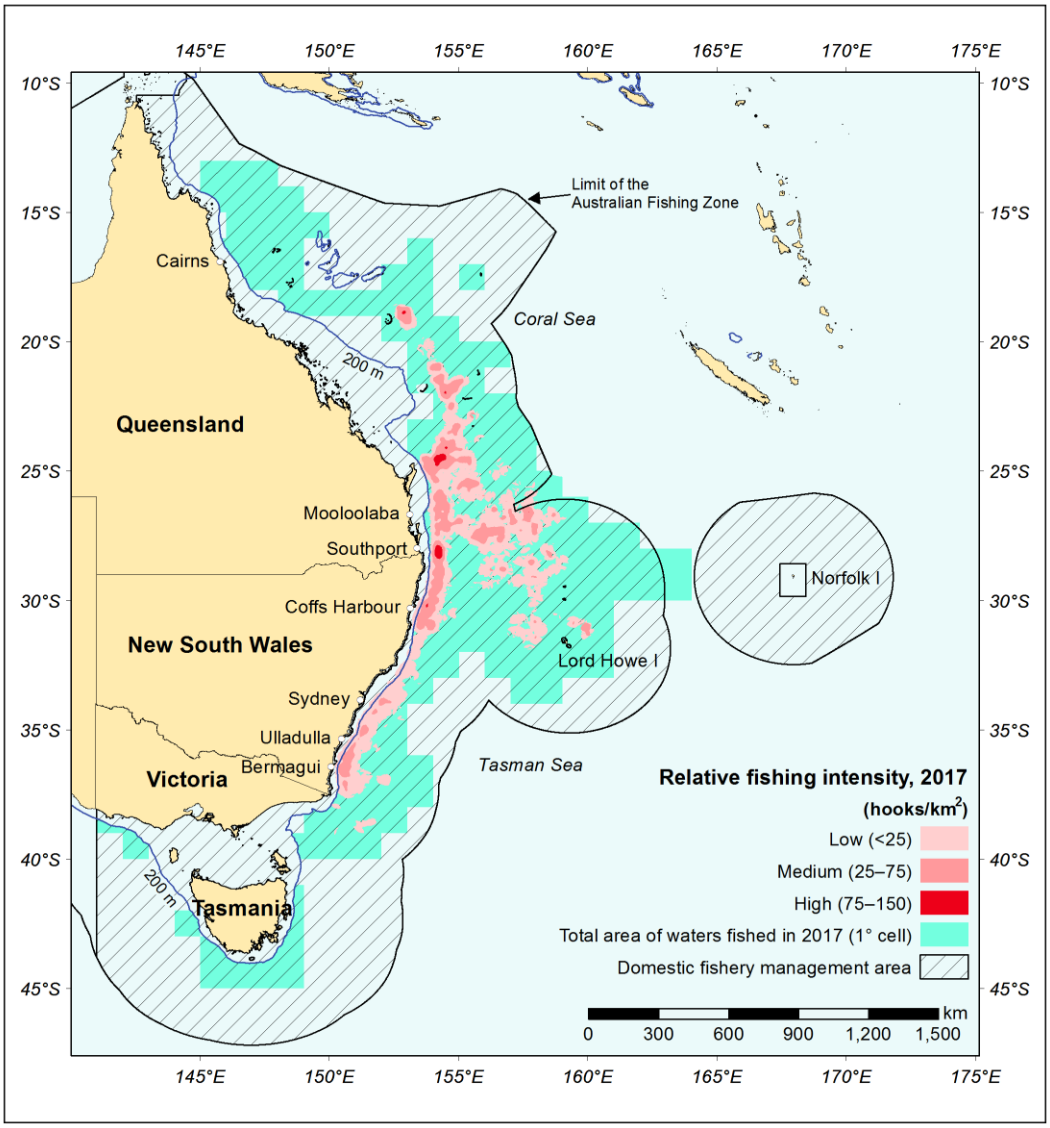


Figure 4. Longline effort distribution in the Eastern Tuna and Billfish Fishery (2017). Fishing footprint shows the total extent of waters fished at a spatial resolution of one degree square.

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 (seaward of 200 m depth) shelf 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. Purse seine and pole-and-line fishers often use satellite thermal imagery and spotters in aircraft to locate schools of fish. Most minor line catches are reported by vessels (e.g. longline) 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 2013 to 2017. 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	
2013	19	21	1	41	0	0	0	41
2014	18	21	0	40	0	1	0	41
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

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 of the Environment and Energy 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 2017, interactions were recorded with 95 green turtles (77 alive 19 dead and 1 in unknown condition), 52 leatherback turtles (all alive except for 1 in unknown condition), 26 loggerhead turtles (6 dead), 2 hawksbill turtles (1 alive and 1 dead), 5 Olive Ridley turtles (1 dead), 18 unidentified turtles (13 alive; 4 dead; 1 in unknown condition), 3 black-browed albatrosses (all dead), 1 wandering albatross (alive), 33 unidentified albatrosses (10 alive and 23 dead), 2 flesh footed shearwater (both dead), 1 sooty shearwater (dead), 1 unidentified cormorant (dead), 6 unidentified shearwaters (1 alive and 5 dead), 6 short-finned pilot whales (1 alive and 5 dead), 4 long-finned pilot whale (all alive), 2 toothed whales (alive), 6 unidentified whales (all alive), 1 false killer whale (alive), 4 melon-headed whale (all alive), 1 unidentified seal (alive), 1 dugong (dead), 1 bottlenose dolphin (dead), and 9 unidentified dolphins (all alive). From July of 2015, the logbooks of the Australian longline fleet were subject to potential verification through electronic monitoring. This has resulted in a rise in the reporting level of interactions with species of special interest for 2016 and 2017 in Table 6.

Observed captures are reported in Table 7. In 2017, there were 16 observed captures of sea turtles (13 alive and 3 dead); 4 captures of whales (3 alive and 1 of unknown life status); 1 capture of a dolphin (alive); and 2 captures of seabirds (both dead).

Sea turtles

The Eastern Tuna and Billfish Fishery Sea Turtle Mitigation Plan (the mitigation plan) (AFMA 2009) took effect 1 January 2010. However, in response to the turtle interaction rates in the ETBF under the plan, AFMA revoked the mitigation plan and from the start of the 2013 fishing season (1 March 2013) has required 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.

Seabirds and marine mammals

Australia has extensive mitigation measure 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 2017, 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, 2013–17. Interactions not identified to species level are noted as unspecified (unspec).

Group	Common name	2013	2014	2015	2016	2017
Seabirds	Black-browed albatross	0	1	8	5	3
	Shy albatross	0	1	0	0	0
	Wandering albatross	0	0	0	1	1
	Albatrosses (unspec)	0	0	6	20	33
	Sooty shearwater	0	0	0	0	1
	Flesh-footed shearwater	0	0	1	2	2
	Shearwaters (unspec)	0	0	0	0	6
	Australian gannet	0	0	0	1	0
	Cormorants	0	0	0	0	1
	Birds (unspec)	0	0	2	1	0
	Subtotal	0	2	17	30	47
Turtles	Green turtle	6	7	6	39	96
	Hawksbill turtle	0	0	2	2	2
	Leatherback turtle	7	4	13	32	52
	Loggerhead turtle	3	2	3	9	26
	Flatback turtle	0	0	0	1	0
	Pacific (Olive) Ridely turtle	0	0	0	0	5
	Turtles (unspec)	0	1	6	17	18
	Subtotal	16	14	30	100	199
Mammals	Melon-headed whale	0	0	1	0	4
	Baleen whales	0	0	1	0	0
	Toothed whales	0	0	0	2	0
	Short-finned pilot whale	0	0	3	5	6
	Long-finned pilot whale	0	0	0	1	4
	False killer whale	0	0	0	0	1
	Whales (unspec)	0	0	2	1	6
	Common dolphin	0	0	4	0	0
	Bottlenose dolphin	0	0	0	0	1
	Dolphin (unspec)	1	0	0	3	9
	Australian fur seal	0	0	0	1	0
	Seals (unspec)	0	0	0	0	2
	Dugong	0	0	0	0	1
	Subtotal	1	0	11	13	34
	TOTAL	**17**	**16**	**58**	**143**	**280**

Table 7. Observed captures of species of special interest for the Australian longline fleet in the WCPFC Convention Area, 2013–17. Interactions not identified to species level are noted as unspecified (unspec).

Group	Common name	2013	2014	2015	2016	2017
Seabirds	Black-browed albatross	0	2	0	1	0
	Shy albatross	0	0	4	0	0
	Albatrosses (other)	0	0	0	1	2
	Cape petrel	0	0	0	0	0
	Great crested tern	0	0	0	0	0
	Flesh-footed shearwater	0	0	0	1	0
	Wilson's storm petrel	0	0	1	0	0
	Subtotal	0	2	5	3	2
Turtles	Green turtle	6	1	2	0	2
	Hawksbill turtle	0	0	0	0	0
	Leatherback turtle	2	1	3	2	8
	Loggerhead turtle	1	2	0	0	0
	Pacific (Olive) Ridley	0	0	1	0	0
	Turtles (unspec)	0	0	1	0	6
	Subtotal	9	4	7	2	16
Mammals	Dolphin (unspec)	2	0	0	0	1
	Long-finned pilot whale	0	0	0	0	0
	Short-finned pilot whale	0	1	0	0	0
	Whales (unspec)	0	0	0	0	4
	Australian fur seal	4	0	0	0	0
	Subtotal	6	1	0	0	5
	TOTAL	**15**	**7**	**12**	**5**	**23**

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 2017.

Table 8a and 8b. Effort and observed seabird captures by fishing year for the ETBF south of 30°S (a) and for 23°N – 30°S (b) . 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
2013	31	1890	98	5.2	0	0.0
2014	26	1567	49	3.1	2	0.041
2015	32	1807	87	4.8	4	0.046
2016	31	2471	249	10.1	2	0.008
2017	32	2183	204	9.4	2	0.010

b) 23°N – 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
2013	32	4887	319	6.5	0	0.0
2014	34	5357	146	2.7	0	0.0
2015	31	6413	396	6.2	1	0.003
2016	30	5351	432	8.1	1	0.002
2017	35	6557	685	10.4	0	0.0

Table 9. Number of observed seabird captures in the ETBF, 2017, by species and area.

Species	South of 30°S	North of 23°N	23°N–30°S	Total Captures
Albatrosses (other)	2	0	0	2
Total	**2**	**0**	**0**	**2**

Table 10. Proportion of mitigation types used by the fleet 2013 to 2017.

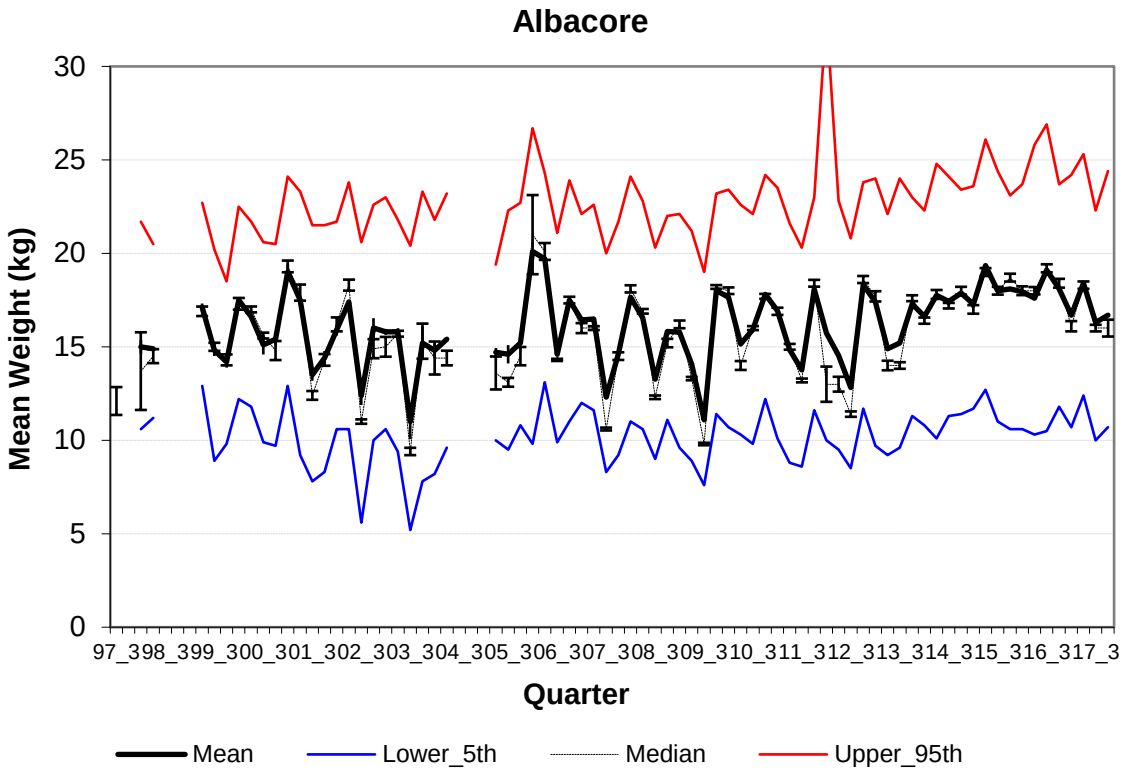
Combination of mitigation measures	Proportion of observed effort using mitigation measures				
	2013	2014	2015	2016	2017
TL + WB	0.81	0.88	0.78	0.88	0.90
TL + WB + NS	0.19	0.12	0.22	0.12	0.10
Total	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**

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

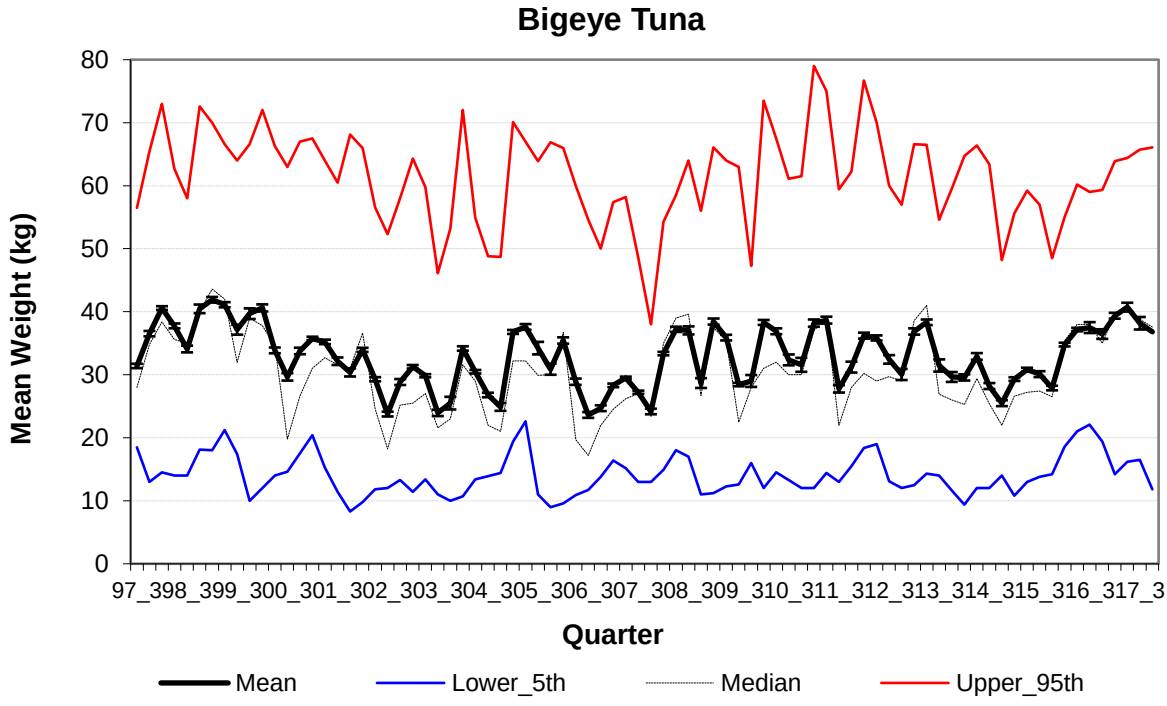
Trends in size composition of retained catch

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 kg by the end of 2016 and throughout 2017. 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 33kg by the end of 2016 and to around 38kg by the end of 2017. 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 53kg by the end of 2016 and throughout 2017. The running mean processed weight of striped marlin increased from around 62 kg during the first quarter of 2000 and remained within the range 63-66kg 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. 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 17 kg was also observed in 2015, increasing to around 18kg throughout 2016 and 2017.

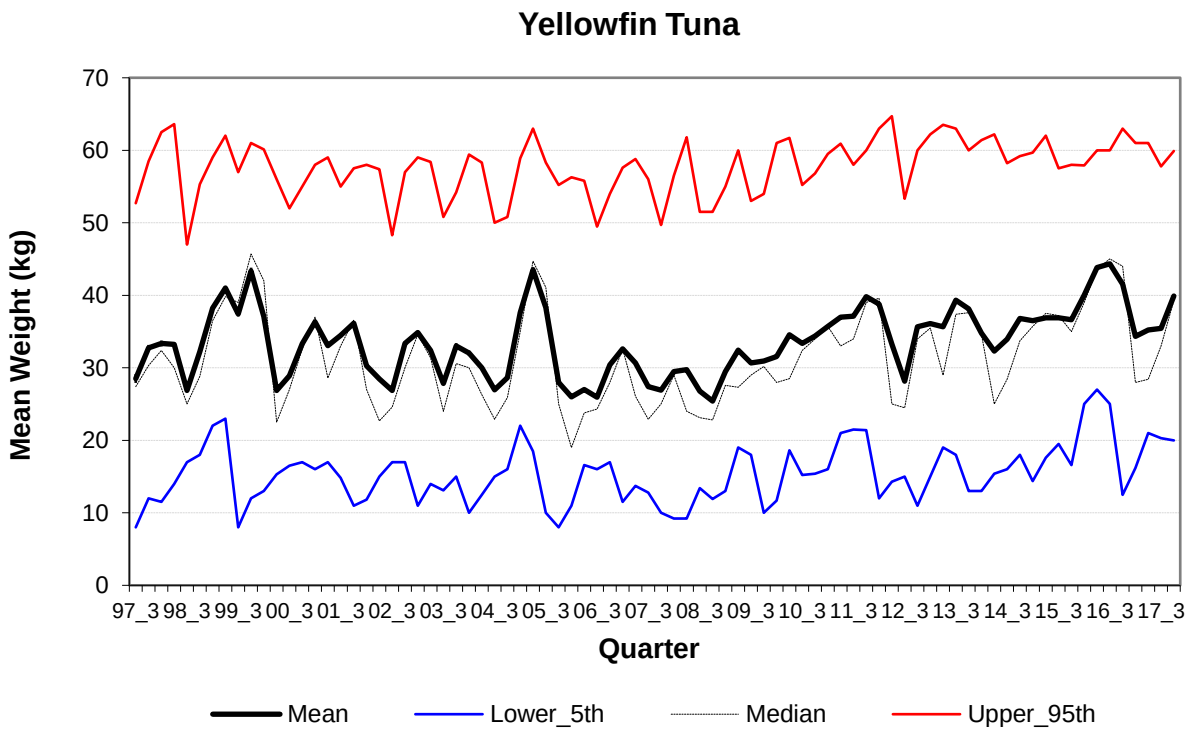
a)


Albacore
Mean Weight (kg)
30
25
20
15
10
5
0
97_398_399_300_301_302_303_304_305_306_307_308_309_310_311_312_313_314_315_316_317_3
Quarter
Mean
Lower_5th
Median
Upper_95th

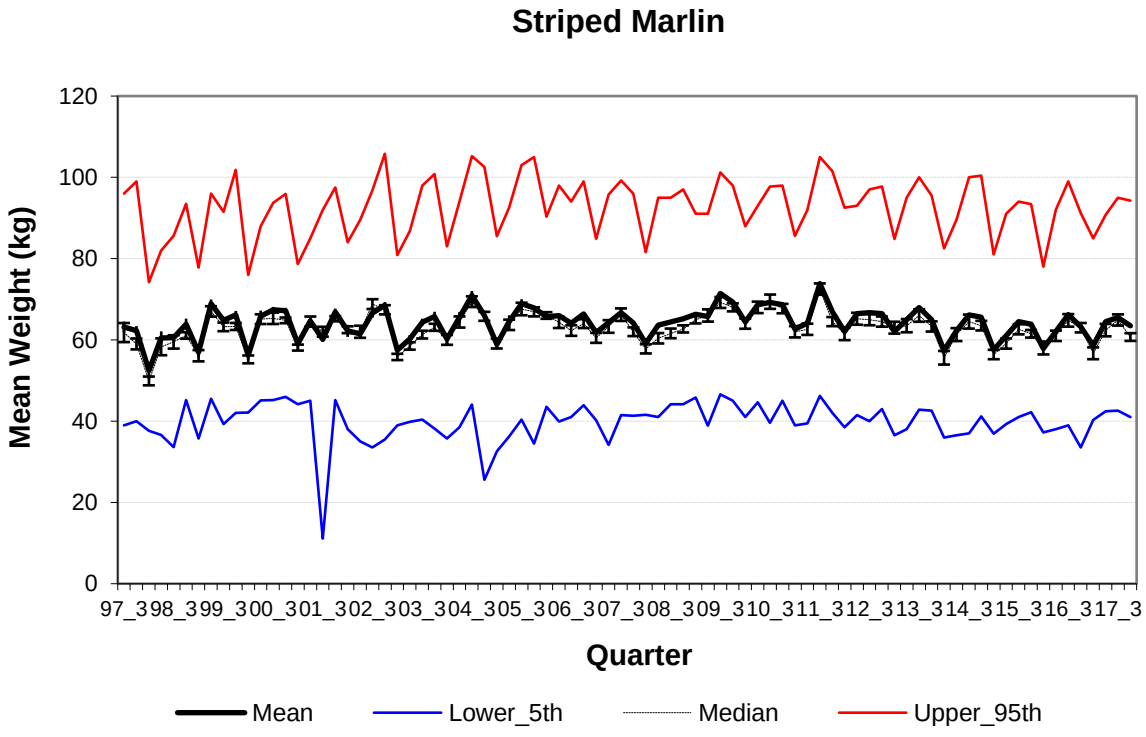
b)


Bigeye 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_3
Quarter
Mean
Lower_5th
Median
Upper_95th

c)


Yellowfin Tuna
Mean Weight (kg)
70
60
50
40
30
20
10
0
97_3 98_3 99_3 00_3 01_3 02_3 03_3 04_3 05_3 06_3 07_3 08_3 09_3 10_3 11_3 12_3 13_3 14_3 15_3 16_3 17_3
Quarter
Mean
Lower_5th
Median
Upper_95th

d)


Striped Marlin
Mean Weight (kg)
120
100
80
60
40
20
0
97_3 98_3 99_3 00_3 01_3 02_3 03_3 04_3 05_3 06_3 07_3 08_3 09_3 10_3 11_3 12_3 13_3 14_3 15_3 16_3 17_3
Quarter
Mean
Lower_5th
Median
Upper_95th

e)

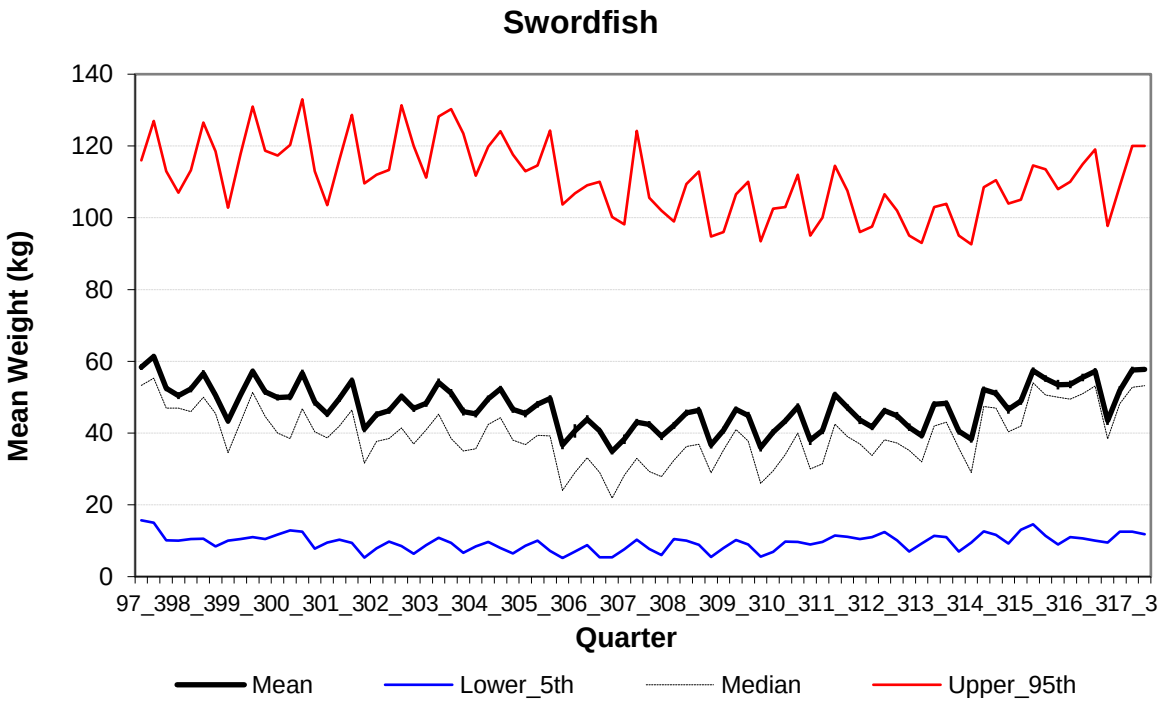


Figure 5 (a–e). Time series of quarterly mean, 8 month running mean, lower 5th and upper 95th percentiles processed weights of a) albacore, b) bigeye tuna, c) yellowfin tuna, d) striped marlin and e) swordfish sampled across the entire ETBF based on the data collected from the port sampling program.

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

The gross value of production (GVP) for the ETBF declined by 27 per cent in 2016–17 to $35.7 million and largely reflected total ETBF catch volume falling by 31 per cent to 4,537 t. Catch volume declined across all key ETBF species (albacore, bigeye tuna, striped marlin, swordfish and yellowfin tuna). The decline in GVP was largely the result of lower yellowfin tuna catch which more than halved in 2016–17. Despite a significant fall in production value for 2016–17 yellowfin tuna remained the single most valuable species caught in the ETBF accounting for 35 per cent of total GVP. The value of swordfish production increased by 3 per cent to $9.3 million reflecting an increase in average unit price more than offsetting a decline in catch volume. The value of bigeye tuna declined by 8 per cent to $7.3 million with the decline in catch volume more than offsetting an increase in average unit price. The value of albacore increased by 5 per cent to $4 million to reach its highest value since 2008–09.

5 Dispatch of catch

The value of Australian exports of fresh, chilled or frozen albacore, bigeye tuna and yellowfin tuna (the three key species of tuna caught in the WCPFC) declined by 35 per cent in 2016–17 to $16.4 million while export volume declined by 39 per cent to 1,541 tonnes. The United States was the main export market for these products (accounting for around two-thirds of export value) followed by Japan (25 per cent) and Spain (7 per cent). The decline in export value for these products was largely the result of a 61 per cent fall in the value of yellowfin tuna exports due to lower catches.

Swordfish is typically the second most valuable species group landed in the ETBF after yellowfin tuna. The value of swordfish exports increased by 9 per cent in 2016–17 to $7.5 million while the volume decreased by 10 per cent to 496 t. The United States was the main market for Australian swordfish exports in 2016–17 accounting for 84 per cent of export value in 2016–17 up from 72 per cent in 2015–16.

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.

In February 2018, the AFMA Commission agreed on total allowable commercial catches (TACCs) for the ETBF. These apply to the 2018–19 season which commenced on 1 March 2018. The TACCs for the five main target species are: albacore (2351 t); bigeye tuna (957 t); swordfish (960 t); striped marlin (311 t); yellowfin tuna (2054 t). The ETBF is transitioning to a calendar year season starting 1 January 2019. As a result, the TACCs are reduced for a 10 month season.

8 Status of data collection systems

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 per cent 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. AFMA is currently looking to move the fishery from predominantly paper logbook reporting to electronic logbook reporting over the next 12 months.

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 (i.e. on-board, fixed-mount digital video cameras) 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 replaces human observers in the ETBF for all in-zone observer requirements. At least 10 per cent of video footage of all hauls is reviewed to verify the accuracy of logbooks which are required to be completed for 100 per cent of shots. This review rate may be increased in some cases. In 2017, the coverage rate was 10.2 per cent (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 2017.

CCM Fleet	Fishery	No. of Hooks			Days fished			Days at sea			No. of trips			See notes
		Total est.	Obs.	%	Total est.	Obs.	%	Total est.	Obs.	%	Total est.	Obs.	%	
Australia	Domestic	8.74 million	889,196	10.2										Nil

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 2017 over 1.91 million individual fish weights pertaining to the five main target species have been collected. Coverage rates (per cent of landed fish sampled) for the

target species are generally high, and for the 5-year period between 2013 and 2017 have averaged around 82 percent for yellowfin tuna, 92 percent for bigeye tuna, 90 percent for swordfish and 86 percent for striped marlin, while for albacore 13 percent of landed fish have been individually sampled (Table 12). Individual fish weights for another 259,436 fish from 47 non-target species have also been collected. Bulk weights for albacore sampled in batches (covering on average 65 percent of the catch between 2013 and 2017) 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 1,014,777 fish for 34 species (including 653,154 albacore).

Table 12. Estimated annual coverage of operational catch and effort (logbooks), observer data (per cent hooks) and port sampling (per cent 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, 2013–17.

Gear	Year	Operational catch & effort coverage	Observer coverage	Port sampling coverage					
				YFT	BET	ALB	SWO	STM	SKJ
Longline[a]	2013	100	6.2	81	86	12	89	84	0
	2014	100	2.8	80	91	15	90	80	0
	2015	100	5.8[b]	83	94	17	91	85	0
	2016	100	8.7	84	94	13	95	91	0
	2017	100	10.2	84	90	8	87	91	0
Purse seine	2013	0	0	0	0	0	0	0	0
	2014	0	0	0	0	0	0	0	0
	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

[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

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.

There was no transhipment in the ETBF in 2017.

Table 13. Annual catch estimates (converted whole weights) for the ETBF for 2013–17 derived from catch disposal records. Estimates are in tonnes.

Year	Albacore	Yellowfin	Bigeye	Striped marlin	Swordfish	Other	Total
2013	772.9	1341.2	488.9	251.0	1062.1	317.5	4233.6
2014	736.9	1685.3	489.9	273.5	1183.1	862.5	5231.2
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	992.1	1713.1	449.3	286.0	1175.1	1041.3	5656.9

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 2017 there was a 96.4 per cent 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:

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 2018)
- Yellowfin tuna age and growth in the Western and Central Pacific Ocean (CSIRO, July 2017–December 2018)

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 et al. 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 programme (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 et al. 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, July 2016 – June 2019)
- 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–December 2018)
- Data management, assessment and implementation of harvest strategies for Australia's tropical tuna fisheries 9CSIRO, August 2017–October 2020)

Ecological research projects

- Ecological risk assessment for the effects of fishing (Webb et al. 2007)
- Rapid quantitative assessment (Zhou et al. 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)

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 et al. 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 sea lion	*Neophoca cinerea*
Bigeye tuna	*Thunnus obesus*
Black marlin	*Makaira indica*
Black-browed albatross	*Thalassarche melanophrys*
Blacktip sharks	*Carcharhinus* spp.
Blue marlin	*Makaira mazara*
Blue shark	*Prionace glauca*
Bronze whaler shark	*Carcharhinus brachyurus*
Buller's albatross	*Thalassarche bulleri*
Cape petrel	*Daption capense*
Common dolphin	*Delphinus delphis*
Dusky shark	*Carcharhinus obscurus*
Escolar	*Lepidocybium flavobrunneum*
False killer whale	*Pseudorca crassidens*
Flatback turtle	*Natator depressa*
Flesh-footed shearwater	*Puffinus carneipes*
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*
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.
Ray's bream	*Brama brama*
Rudderfish	*Centrolophus niger*
Sailfish	*Istiophorus platypterus*
Scalloped hammerhead	*Sphyrna lewini*
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 royal albatross	*Diomedea epomophora*
Striped marlin	*Kajikia audax*
Swordfish	*Xiphias gladius*

Thresher shark	*Alopias vulpinus*
Tiger shark	*Galeocerdo cuvier*
Wahoo	*Acanthocybium solandri*
Wandering albatross	*Diomedea exulans*
Wedge-tailed shearwater	*Puffinus pacificus*
Westland petrel	*Procellaria westlandica*
Whale shark	*Rhincodon typus*
Yellowfin tuna	*Thunnus albacares*
Yellow-nosed albatross	*Thalassarche chlororhynchos*

Appendix B: Mandatory mitigation measures in the ETBF 2018

(Source: AFMA website: http://www.afma.gov.au/wp-content/uploads/2018/03/2018-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
  - 'Smart Tuna Hooks' 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.

Sea turtles

Circle hooks

Large circle hooks must be used if less than eight hooks per bubble are set.

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.

References

AFMA 2007, *Eastern Tuna and Billfish Fishery Harvest Strategy Framework*, Australian Fisheries Management Authority, Canberra.

AFMA 2009, *Sea Turtle Mitigation Plan*. Australian Fisheries Management Authority Canberra.

Basson, M & Dowling, NA 2008, *Development of a robust suite of stock status indicators for the Southern and Western and the Eastern Tuna and Billfish Fisheries*, CSIRO Marine and Atmospheric Sciences, Hobart.

Bromhead, D, Ackerman, J, Graham, S, Wight, M, Wise, B & Findlay, J 2005, *Byproduct: catch, economics and co-occurrence in Australia's pelagic longline fisheries,* Bureau of Rural Sciences, Canberra.

Campbell, RA 2011, *Integrated analysis and assessment supporting implementation of the management and harvest strategy framework within the Eastern Tuna and Billfish Fishery - Compilation of Related Project Papers*, Final report to the Australian Fisheries Management Authority, Canberra.

Campbell, R 2012, *Aggregate and size-based standardised CPUE indicators for longline target species caught in the south-west Pacific*, WCPFC-SC8-2012/SA-IP-13, Scientific Committee, Eighth Regular Session, 7–15 August 2012, Korea.

Campbell, R 2017, *Data management, assessment and implementation of the harvest strategies for Australia's tropical tuna fisheries - Compilation of Related Project Papers*, Final report for project R2014/0822 to the Australian Fisheries Management Authority, Canberra.

Campbell, R & Hobday, A 2003, *Swordfish-environment-seamount-fishery interactions off eastern Australia*, Report to AFMA, Canberra.

Campbell, R & Young, J 2010, *Determination of effective longline effort in the Eastern Tuna and Billfish Fishery*, CSIRO Marine and Atmospheric Research Report to the Fisheries Research and Development Corporation, Rep. No. 2005/005, Hobart.

Campbell, RA, Zhou, S, Hoyle, SD, Hillary, R, Haddon, M & Hall, S 2017, *Developing innovative approaches to improve CPUE standardisation for Australia's multispecies pelagic longline fisheries*, CSIRO Marine and Atmospheric Research Report to the Fisheries Research and Development Corporation, Rep. No. 2014-021, Canberra.

Evans, K, Kolody, D, Abascal, F, Holdsworth, J & Maru, P 2012, *Spatial dynamics of swordfish in the south Pacific Ocean inferred from tagging experiments*, working paper WCPFC-SC8-2012, Scientific Committee Eighth Regular Session, 7–15 August 2012, Korea.

Farley, J, Clear, N, Leroy, B, Davis, T and McPherson, G 2003, *Age and growth of bigeye tuna (*Thunnus obesus*) from the eastern and western AFZ*, CSIRO Marine Research Report to the Fisheries Research and Development Corporation, Project 2000/100, Hobart.

Farley, JH, Williams, AJ, Davies, CR, Clear, NP, Eveson, JP, Hoyle, S & Nicol, SJ 2012, *Population biology of albacore tuna in the Australian region*, CSIRO Marine and Atmospheric Research Report to the Fisheries Research and Development Corporation, Project 2009/012, Hobart.

Farley, JH, Clear, NP, Kolody, D, Krusic-Golub, K, Eveson, P & Young, J 2016, *Determination of swordfish growth and maturity relevant to the southwest Pacific stock*, Final report to the Australian Fisheries Management Authority, Project R-2014/ 821, Canberra.

Ghosn, D, Collins, D, Baiada, C and Steffe, A 2012, *Catch per unit effort and size composition of striped marlin caught by recreational fisheries in southeast Australian waters*, WCPFC-SC8-2012/SA-IP-7, Scientific Committee, Eighth Regular Session, 7–15 August 2012, Korea.

Gunn, J, Hampton, J & Evans, K 2005, *Migration and habitat preferences of bigeye tuna,* Thunnus obesus, *on the east coast of Australia—a project using archival and conventional tags to determine key uncertainties in the species stock structure, movement dynamics and CPUE trends*, CSIRO Marine and Atmospheric Research Report to the Fisheries Research and Development Corporation, Project 1999/109, Hobart.

Hillary, R, Preece, A, Kolody, D, Evans, K, Davies, C 2016, *Development of an approach to harvest strategy management of internationally managed multi-species fisheries*, Final report for project R2013/203 to the Fisheries Research and Development Corporation, Canberra.

Keller, KR & Davie, P 2009, *Population biology and habitat preferences of striped marlin,* Kajikia audax, *in the southwest Pacific Ocean*, report for New South Wales Fisheries and the Australian Fisheries Management Authority, Canberra.

Kolody, D, Campbell, R & Davies, N 2008, *A MULTIFAN-CL assessment of south-west Pacific Swordfish*, working paper WCPFC-SC4-2008/SA-WP-6, Scientific Committee Fourth Regular Session 11–22 August 2008, Papua New Guinea.

Kolody, DS, Preece, AL, Davies, CR, Hartog, JR & Dowling, NA 2010, *Integrated evaluation of management strategies for tropical multispecies long-line fisheries*, CSIRO Marine and Atmospheric Research Report to the Fisheries Research and Development Corporation, Project 2007/017, Hobart.

Langley, A, Molony, B, Bromhead, D, Yokawa, K & Wise, B 2006, *Stock assessment of striped marlin (*Tetrapturus audax*) in the south west Pacific Ocean*, working paper WCPFC-SC2-2006/SA WP-6, Scientific Committee Second Regular Session 7–18 August 2006, Philippines.

Park, T 2007, *NSW Gamefish tournament monitoring – Angling Research Tournament Monitoring Program*, Fisheries Final Report Series, 94, NSW Department of Primary Industries, Cronulla Fisheries Research Centre, Cronulla, NSW, Australia.

Piasente, M, Stanley, B, Timmiss, T, McElderry, H, Pria, M, & Dyas, M 2012, *Electronic onboard monitoring pilot project for the Eastern Tuna and Billfish Fishery,* FRDC Project 2009/048, Australian Fisheries Management Authority, Canberra.

Preece, A, Campbell, R & Hillary, R 2012, *Investigation of possible changes in fishing strategies under quota management and implication for the ETBF harvest strategy*, CSIRO Marine and Atmospheric Research Report to the Australian Fisheries Management Authority, Canberra.

Robertson, G & van den Hoff, J 2010, *Static water sink rate trials to improve understanding of sink rates estimated at sea,* Third meeting of the Seabird Bycatch Working Group, SBWG-3 Doc 31, Agreement on the Conservation of Albatrosses and Petrels, 8–9 April 2010, Mara del Plata, Argentina.

Robertson, G, Candy, SG & Wienecke, B 2010a 'Effect of line shooter and mainline tension on the sink rates of pelagic longlines and implications for seabird interactions', *Aquatic Conservation: Marine Freshwater Ecosystems*, vol. 20, pp. 419–427.

Robertson, G, Candy, SG, Wienecke, B & Lawton, K 2010b, 'Experimental determinations of factors affecting the sink rates of baited hooks to minimize seabird mortality in pelagic longline fisheries', *Aquatic Conservation: Marine Freshwater Ecosystems* , vol. 20, pp. 632–643.

Robertson, G, Candy, SG & Hall, S 2013, 'New branch line weighting regimes to reduce the risk of seabird mortality in pelagic longline fisheries without affecting fish catch', *Aquatic Conservation: Marine Freshwater Ecosystems,* DOI: 10.1002/aqc.2346.

Robertson, G & Candy, SG 2014, 'Does propeller turbulence affect the sink rate of baited hooks and their availability to seabirds in pelagic longline fisheries?', *Aquatic Conservation: Marine Freshwater Ecosystems* vol. 24, pp. 179-191.

Robertson, G, Ashworth, Phillip, Ashworth, Peter, Carlyle I & Candy SG 2015, 'The development and operational testing of an underwater bait setting system to prevent the mortality of albatrosses and petrels in pelagic longline fisheries', *Open Journal of Marine Science* vol. 5, pp. 1-12.

Robins, CM, Bradshaw, EJ & Kreutz, DC 2007, *Marine turtle mitigation in Australia's pelagic longline fisheries,* Fisheries Research and Development Corporation Final Report 2003/013, Canberra.

Ward, P, Epe, S, Kreutz, D, Lawrence, E, Robins, C & Sands, A 2008, *Implementation of bycatch mitigation measures in Australia's pelagic longline fisheries: the effects of circle hooks on target and non-target catches*, Final Report to the Natural Heritage Trust, Bureau of Rural Sciences, Canberra.

Webb, H, Hobday, A, Dowdney, J, Bulman, C, Sporcic, M, Smith, T, Stobutzki, I, Fuller, M & Furlani, D 2007, *Ecological risk assessment for the effects of fishing: Eastern Tuna & Billfish Fishery: longline sub-fishery*, report for the AFMA, Canberra.

Wilcox, C 2012, *Defining regional connections in southwestern Pacific broadbill swordfish*, FRDC 2007/036, draft final report, Canberra.

Wilcox, C, Dowling, N & Pascoe, S 2011, *Predicting the impact of hook decrementation on the distribution of fishing effort in the ETBF*, CSIRO Marine and Atmospheric Research Report to the Fisheries Research and Development Corporation, Project 2008/028, Hobart.

Young, J & Drake, A 2002, *Reproductive dynamics of broadbill swordfish (*Xiphias gladius*) in the domestic longline fishery off eastern Australia*, FRDC 1999/108 Final Report.

Young, J and Drake, A 2004, *Age and growth of broadbill swordfish from Australian waters*, CSIRO Marine and Atmospheric Research Report to the Fisheries Research and Development Corporation, Project 2001/014, Hobart.

Young, JW, Lansdell, MJ, Hobday, AJ, Dambacher, JM, Griffiths, SP, Cooper, S, Kloser, R, Nichols, PD & Revill, A 2009, *Determining ecological effects of longline fishing in the Eastern Tuna and Billfish Fishery,* CSIRO Marine and Atmospheric Research Report to the Fisheries Research and Development Corporation, Project 2004/063, Hobart.

Zhou, S, Smith, T & Fuller, M 2007, *Rapid quantitative risk assessment for fish species in selected Commonwealth fisheries,* report to the AFMA, Canberra.