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ABARES

Annual report to the Western and Central Fisheries Commission

Part 1: Information on fisheries, research and statistics 2011 Australia

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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 2012	YES

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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, is the focus of the annual report.

Total catches reported in logbooks for the ETBF increased from 4349 t in 2010 (4346 t longline, 3 t minor line) to 4508 t in 2011 (4470 t longline, 38 t minor line). This is a decline from a peak of 8229 t in 2002. Longline fishing effort has fallen from a peak of 12.40 million hooks in 2003 to 6.59 million hooks in 2011. The decrease in fishing effort from 2003 levels is the result of the strength of the Australian dollar, 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. Forty-nine vessels reported longlining in the WCPFC Convention Area during 2011. The number of vessels fishing for swordfish south of 20°S was 45. Longline logbook catches of albacore tuna decreased from 725 t in 2010 to 640 t in 2011. Longline catches of bigeye tuna decreased from 437 t in 2010 to 362 t in 2011. In contrast, longline catches of yellowfin tuna increased from 1315 t in 2010 to 1798 t in 2011. Longline catches of swordfish decreased slightly from 921 t in 2010 to 883 t in 2011 (837 t caught south of 20°S). Longline catches of striped marlin increased slightly from 248 t in 2010 to 282 t in 2011. Longline catches of skipjack decreased from 3 t in 2010 to 2 t in 2011.

There are no dedicated minor line vessels; most minor line catches are reported by vessels (e.g. longline) on their way to and from fishing grounds. In 2011, there were 10 vessels actively targeting tuna and billfish species using minor line. The number of vessels reporting using minor line has steadily decreased 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. Annual minor line effort increased from 9 lines in 2010 to 106 lines in 2011. There were no active vessels in the Eastern Skipjack Fishery in 2011.

The Australian Fisheries Management Authority (AFMA) observer program has deployed observers on domestic longliners since 2001 as part of a program to test the efficacy of seabird mitigation devices. Since July 2003, observers have been 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. In 2011, observers monitored 417 732 hooks in the longline fishery (6.3 per cent of the total number of hooks deployed). AFMA has also 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. E-monitoring will be introduced in the fishery in 2013.

In January 2012, the AFMA Commission agreed on total allowable commercial catches (TACCs) for the commercial sector of the ETBF. These apply to the 2012–13 season which commenced on 1 March 2012. The TACs for the five main target species are: albacore tuna (2500 t); bigeye tuna (1056 t); swordfish (1396 t); striped marlin (370 t); yellowfin tuna (2200 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). Unless otherwise stated, all catch and effort data provided are from the AFMA logbook database.

Longline

Japanese longliners began fishing off Australia's east coast in the late 1950s. Sporadic domestic longlining for yellowfin tuna[1] 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. There was a second wave of expansion of effort in northern Queensland waters in the 1990s, 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 1998. 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 allocated individual transferable quota system) and changes in the exchange rate.

Increased operating costs and fluctuating market returns saw many longliners targeting lower-value albacore tuna during the first half of 2006. However, decreases in the price of albacore tuna and unfavourable export conditions over the past several years, such as a strengthening Australian dollar, have prompted some longliners to move back to targeting bigeye tuna and swordfish, although this has not been the case in the past two years.

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. In the eastern AFZ, skipjack tuna are occasionally fished from southern New South Wales to north-eastern Tasmania.

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. Consequently, angling for tuna and billfish grew in popularity. The continental shelf is less than 8 nm wide in some places along the southeast coast of Australia, and anglers catch tuna and billfish from the shore at several locations. The Game Fishing Association of Australia (GFAA) was formed in 1938. In 2011, GFAA reported a membership of more than 8000 anglers, most based on the east coast of Australia. Many gamefishers tag and release much of their catch, especially marlins.

[1] Scientific names found in Appendix 1

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. Forty nine vessels reported longlining in the WCPFC Convention Area during 2011, down from a peak of 180 in 1997 (Figure 1). Total longline effort decreased from 7.88 million hooks in 2010 to 6.59 million hooks in 2011 (Table 1), consistent with an overall decline 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 quota management in 2011. The number of vessels in 2011fishing for swordfish south of 20°S was 45.

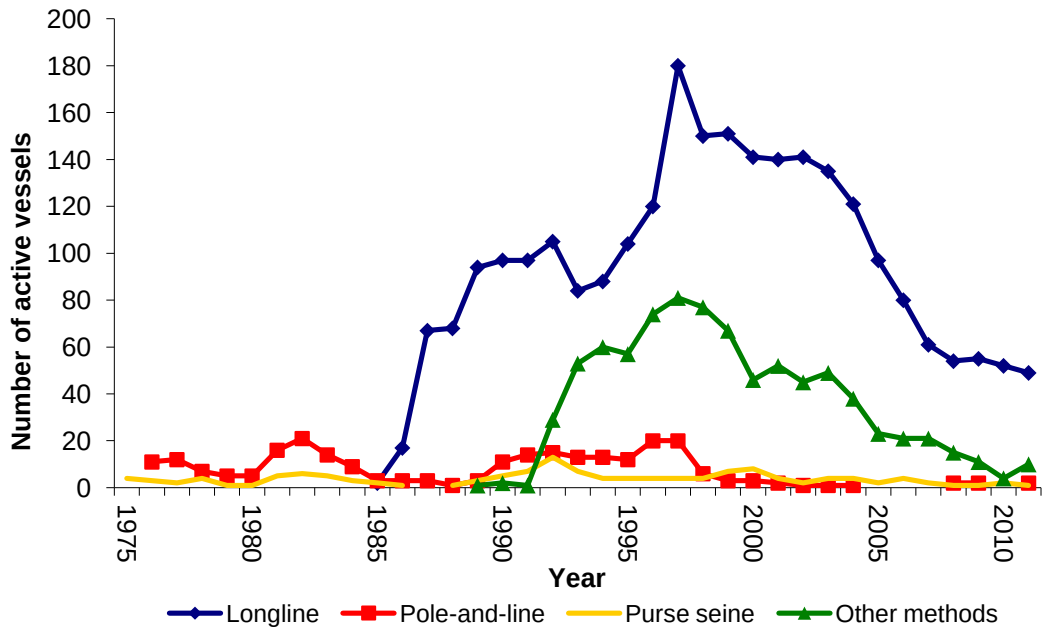


Figure 1. Historical annual vessel numbers for the Australian fleet, by gear (longline, purse seine, pole-and-line and other commercial methods [minor line including trolling, rod-and-reel and handline]) for the WCPFC Convention Area.

Table 1. Annual catch and effort estimates (whole weight) for the Australian fleet, by gear and primary species, for the WCPFC Convention Area, 2007–11.

Fishing method	Year	Effort (Longline–number of hooks (000's); purse seine–search hours; pole-and-line–days fished)	Primary species (t)					
			Albacore	Bigeye	Skipjack	Yellowfin	Striped marlin	Swordfish
All gears	2007	-	1834.1	891.9	13.4	1251.2	331.0	1132.5
	2008	-	1085.1	899.7	46.2	1478.3	374.2	1240.7
	2009	-	1343.6	619.4	12.6	1203.0	325.6	1111.8
	2010	-	725.1	438.7	3.6	1315.3	248.4	921.3
	2011	-	639.9	381.6	2.0	1809.5	282.2	883.3
Longline[2]	2007	8444	1834.1	891.9	13.4	1251.2	331.0	1132.5
	2008	8059	1085.1	899.7	30.6	1478.3	374.2	1240.7
	2009	8839	1343.6	619.4	10.9	1203.0	325.6	1111.8
	2010	7875	725.1	438.7	3.6	1315.3	248.4	921.3
	2011	6589	639.9	381.6	2.0	1809.5	282.2	883.3
Purse seine	2007	354	0.0	0.0	0.0	0.0	0.0	0.0
	2008	309	0.0	0.0	15.2	0.0	0.0	0.0
	2009	396	0.0	0.0	0.0	0.0	0.0	0.0
	2010	273	0.0	0.0	0.0	0.0	0.0	0.0
	2011	66	0.0	0.0	0.0	0.0	0.0	0.0
Pole-and-line	2007	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2008	8.0	0.0	0.0	0.4	0.0	0.0	0.0
	2009	15.0	0.0	0.0	1.7	0.0	0.0	0.0
	2010	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2011	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[2]Includes small catches from other commercial methods (minor line component including trolling, rod-and-reel and handline) to address issues of confidently.

Total longline catches reported in logbooks in the ETBF increased slightly from 4346 t in 2010 to 4470 t in 2011. This is down from a peak of 8229 t in 2002. Historical annual catches for the Australian fleet, by primary species in the WCPFC Convention Area are shown in Figure 2. Longline logbook catches of albacore tuna decreased from 725 t in 2010 to 640 t in 2011. Longline catches of bigeye tuna also decreased from 437 t in 2010 to 362 t in 2011, while longline catches of yellowfin tuna increased from 1315 t in 2010 to 1798 t in 2011. Longline catches of swordfish decreased slightly from 921 t in 2010 to 883 t in 2011 (837 t caught south of 20°S). Longline catches of striped marlin increased from 248 t in 2010 to 282 t in 2011. Longline catches of skipjack decreased from 3 t in 2010 to 2 t in 2011. Annual catch distributions of the main target species by the Australian longline fleet for 2007–11 are shown in Figure 3.

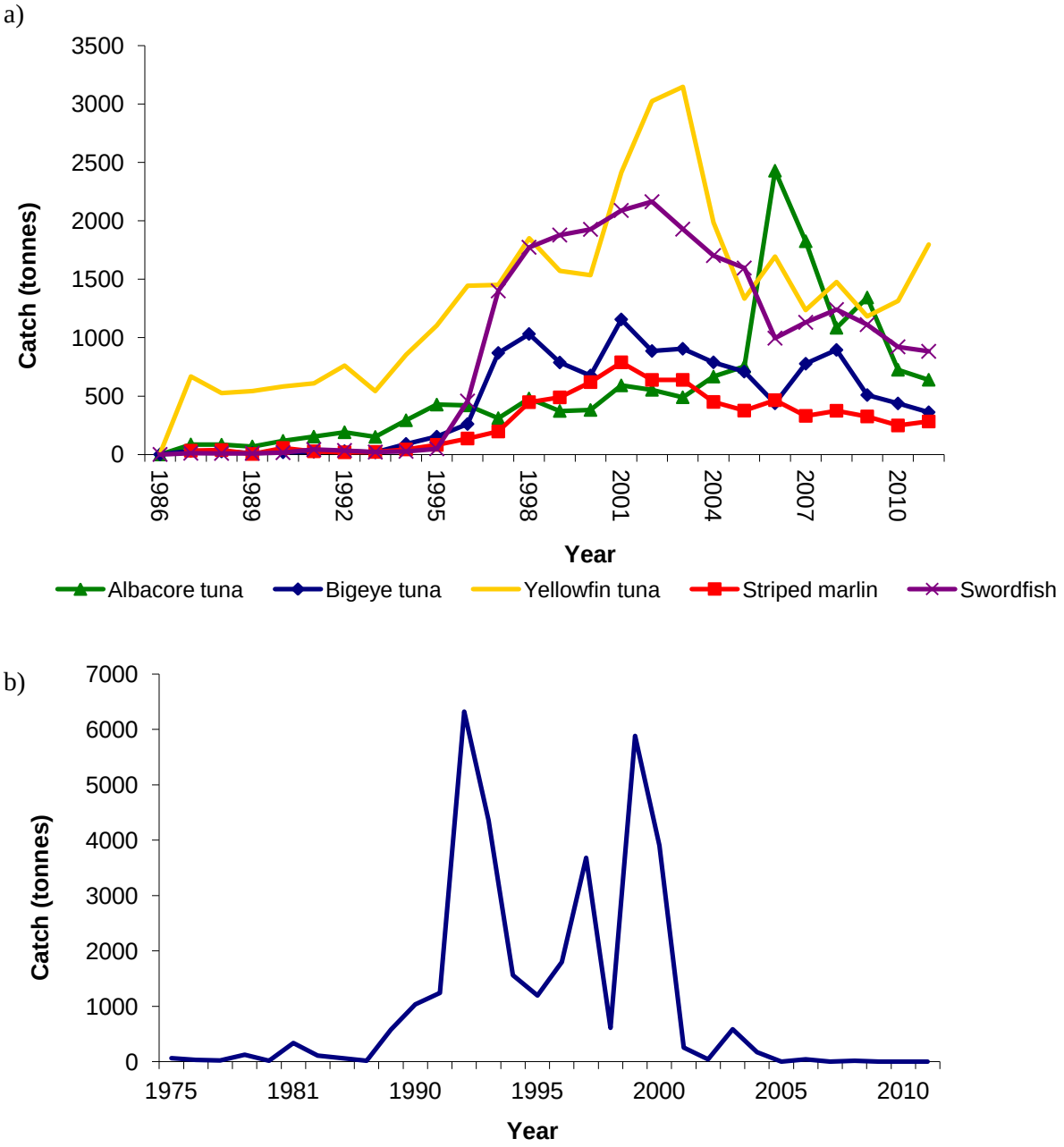
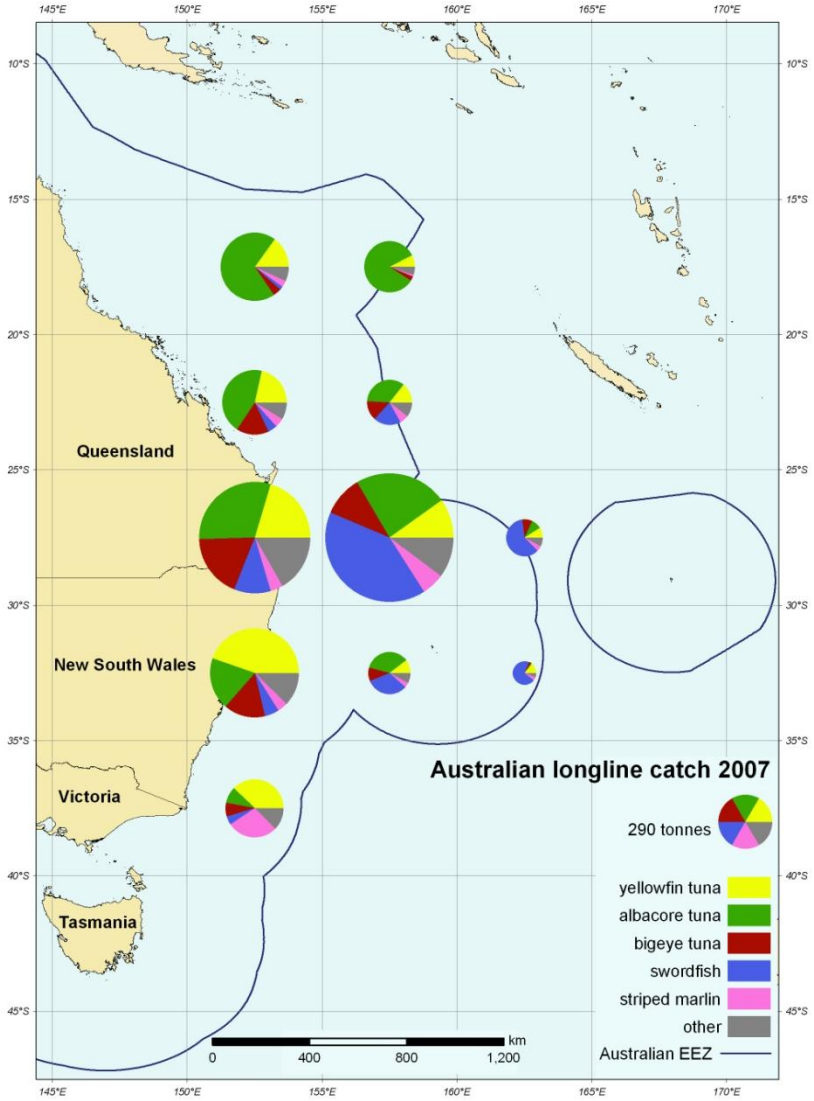


Figure 2 . Historical annual longline catch in the WCPFC Convention Area for (a) albacore, bigeye and yellowfin tuna, as well as striped marlin and swordfish, and purse seine catch (b) skipjack tuna.

a)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40°S
45°S
Queensland
New South Wales
Victoria
Tasmania
Australian longline catch 2007
290 tonnes
yellowfin tuna
albacore tuna
bigeye tuna
swordfish
striped marlin
other
Australian EEZ
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400
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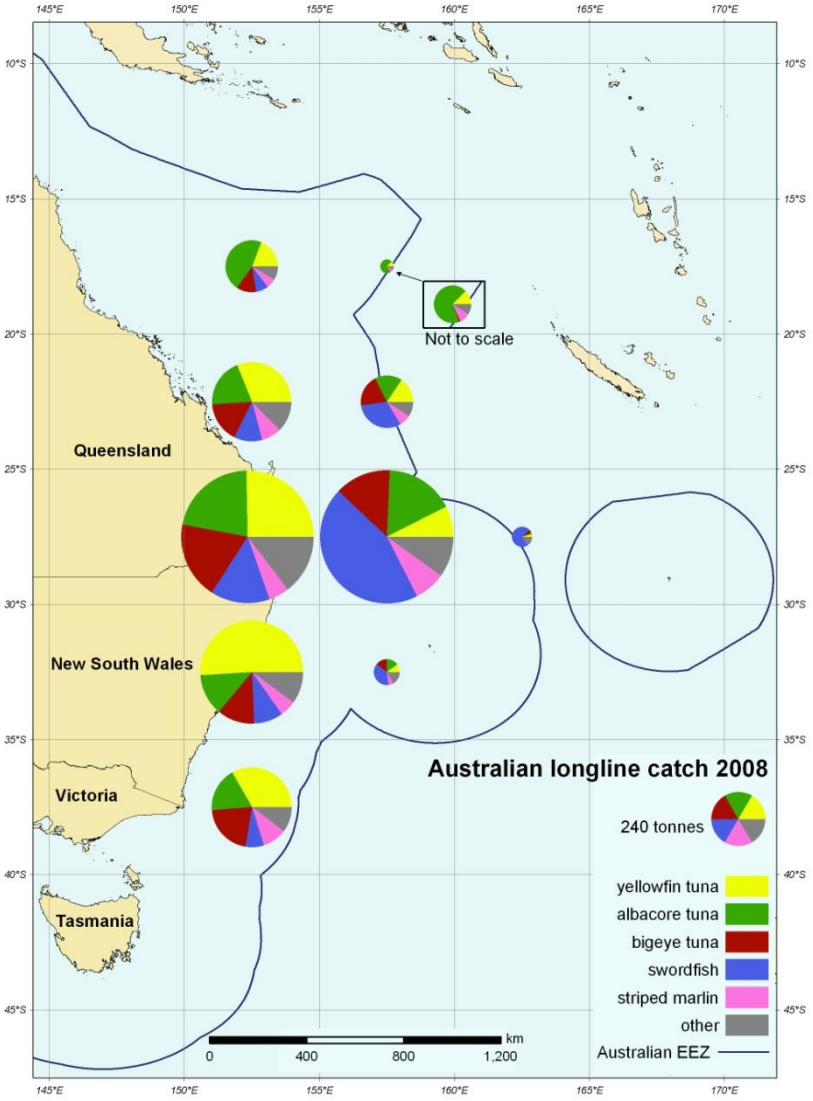
b)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35°S
40°S
45°S
Not to scale
Queensland
New South Wales
Victoria
Tasmania
Australian longline catch 2008
240 tonnes
yellowfin tuna
albacore tuna
bigeye tuna
swordfish
striped marlin
other
Australian EEZ
0
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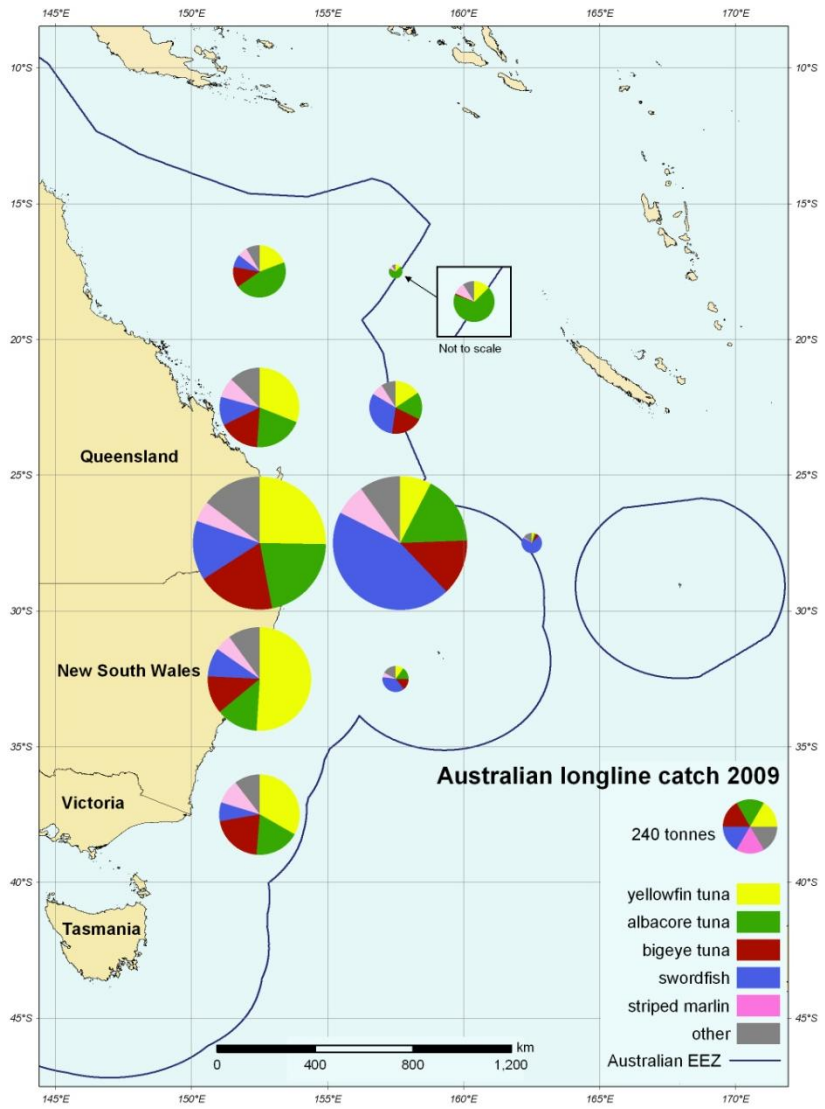
1,200
km

c)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Not to scale
Queensland
New South Wales
Victoria
Tasmania
Australian longline catch 2009
240 tonnes
yellowfin tuna
albacore tuna
bigeye tuna
swordfish
striped marlin
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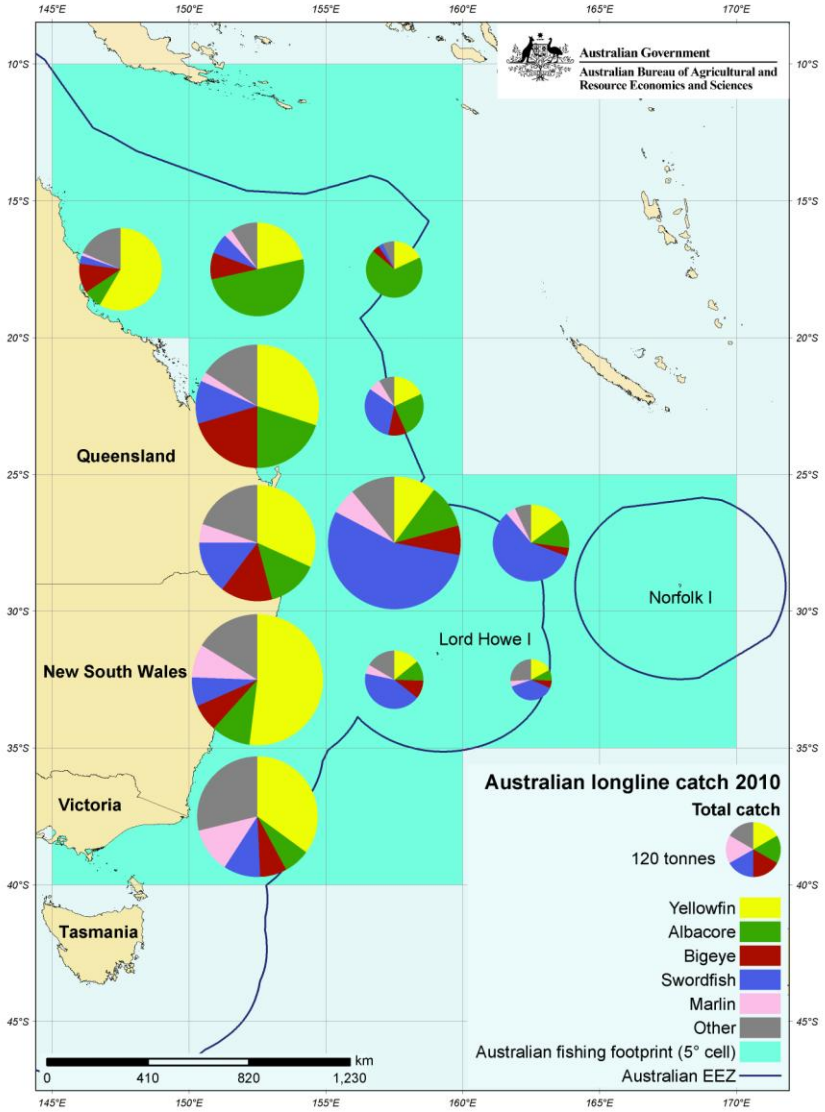
d)


Australian Government
Australian Bureau of Agricultural and Resource Economics and Sciences
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45°S
Queensland
New South Wales
Victoria
Tasmania
Norfolk I
Lord Howe I
Australian longline catch 2010
Total catch
120 tonnes
Yellowfin
Albacore
Bigeye
Swordfish
Marlin
Other
Australian fishing footprint (5° cell)
Australian EEZ
km
0
410
820
1,230

e)

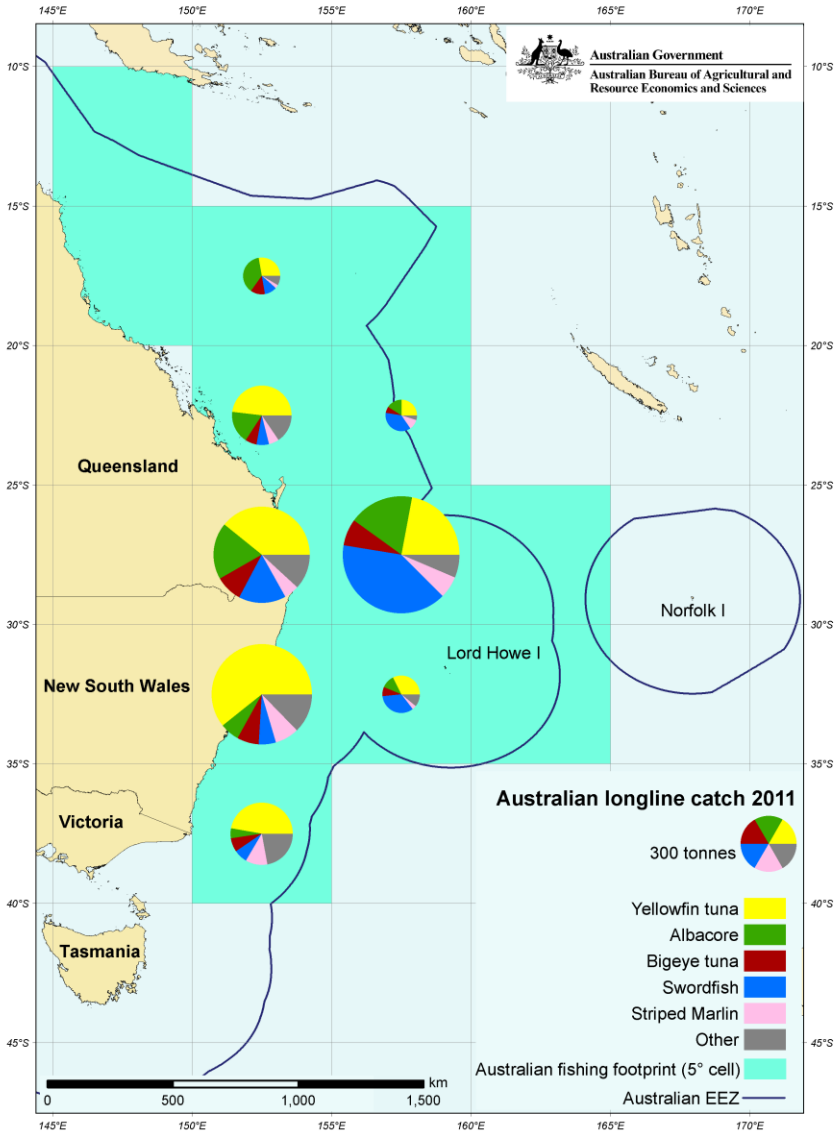


Figure 3 (a–e). Annual distributions of target species catch by the Australian longline fleet active in the WCPFC Convention Area, for 2007–11. Catches have been aggregated to five degree blocks to address issues of confidentiality (less than five vessels) and are scaled to the pie chart provided in the legend.

Retention of both blue marlin and black marlin by commercial longliners has been prohibited since 1998; no retained catches were recorded in 2011. Annual retained catch estimates of non-target, associated and dependent species, including sharks, by the Australian longline fleet from 2007–11 are presented in Table 2. Estimates of discards are in Table 3. Historically, the vast majority of the catch and effort by Australian longliners has been taken within the AFZ, with little effort on the adjacent high seas (Table 4).

Table 2. Annual retained catch estimates of 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 2007–11.

Group	Species	Longliners (t)					Other methods combined (t)				
		2007	2008	2009	2010	2011	2007	2008	2009	2010	2011
Scalefish	Escolar	101.1	78.1	43.9	27.2	24.6	0.1	0.0	0.0	0.0	0.0
	Mahi mahi	101.8	160.5	131.6	1.0	0.0	0.1	0.0	0.1	0.0	0.0
	Moonfish	112.8	64.4	74.2	35.1	24.7	0.0	0.0	0.0	0.0	0.0
	Northern bluefin tuna	3.8	2.7	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Ocean sunfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Oilfish	2.5	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1
	Ray's bream	60.4	39.2	34.9	13.0	4.2	0.0	0.0	0.9	1.3	0.6
	Rudderfish	146.7	169.0	147.5	88.9	40.1	4.4	5.7	9.7	7.4	7.3
	Sailfish	2.0	1.0	0.0	259.2	207.2	0.0	0.0	0.0	0.0	0.1
	Shortbill spearfish	13.0	10.9	13.8	16.6	13.0	0.0	0.0	0.0	0.0	0.0
	Southern bluefin tuna	6.9	22.4	194.8	151.8	84.3	0.0	0.0	10.0	0.0	1.1
	Wahoo	32.7	29.9	28.4	19.6	20.1	0.1	0.0	0.0	0.0	0.1
	Subtotal	583.7	578.1	672.8	612.4	418.2	4.8	5.7	20.8	8.7	9.3
Sharks	Blacktip shark	2.6	0.0	0.0	0.0	4.9	0.1	13.9	0.3	0.1	9.9
	Blue shark	9.0	5.8	23.1	13.2	8.6	0.3	0.4	0.4	0.7	0.6
	Bronze whaler	10.8	7.8	14.8	9.5	9.7	1.2	2.1	2.4	1.4	7.4
	Dusky shark	0.0	2.6	3.9	2.8	1.8	0.0	0.0	0.0	5.5	5.2
	Hammerhead	2.4	2.5	3.3	3.2	4.9	0.0	0.0	0.0	0.0	0.0
	Oceanic whitetip	3.7	2.0	3.7	2.9	1.9	0.0	0.0	0.0	0.0	0.0
	Scalloped hammerhead	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0
	Shortfin mako	35.7	50.5	64.7	45.1	45.6	0.8	2.3	1.9	2.8	7.8
	Silky shark	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Smooth hammerhead	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
	Thresher shark	0.0	0.0	0.0	0.0	0.0	0.4	1.2	2.6	1.1	5.6
	Tiger shark	2.8	2.8	4.3	3.7	3.5	0.0	4.2	0.0	0.0	0.0
	Subtotal	68.7	74.0	117.8	80.4	80.9	3.0	25.8	7.6	11.6	36.5
	TOTAL	**652.4**	**652.1**	**790.6**	**692.8**	**499.1**	**7.8**	**31.5**	**28.4**	**20.3**	**45.8**

Table 3. Annual longline discard estimates (numbers) of non-target, associated and dependent species, including sharks, by the Australian fleet in the WCPFC Convention Area, for 2007–11.

Group	Species	2007	2008	2009	2010	2011
Scalefish	Escolar	360	121	117	40	176
	Mahi mahi	69	70	114	198	343
	Moonfish	14	6	4	3	3
	Northern bluefin tuna	1	1	0	0	0
	Ocean sunfish	251	200	206	273	396
	Oilfish	83	4	0	1	10
	Ray's bream	162	21	28	18	7
	Rudderfish	95	151	315	135	112
	Sailfish	19	6	49	2	5
	Shortbill spearfish	60	56	82	56	41
	Southern bluefin tuna	26	331	1755	1662	203
	Wahoo	35	172	51	19	49
	Subtotal	1175	1140	2721	2407	1345
Sharks	Blacktip sharks	17	61	2	9	14
	Blue shark	1879	1807	2800	4441	3225
	Bronze whaler	334	266	403	288	975
	Dusky shark	53	296	716	237	300
	Hammerhead	23	8	41	33	139
	Oceanic whitetip	183	101	147	227	291
	Shortfin mako	130	150	468	326	355
	Silky shark	90	4	15	29	65
	Thresher shark	200	140	137	52	132
	Tiger shark	245	94	169	68	103
	Subtotal	3154	2927	4898	5710	5599
	TOTAL	**4329**	**4067**	**7619**	**8117**	**6944**

Table 4. Catch and effort by Australian longliners, by primary species, within the AFZ and on the high seas, 2007–11. 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	2007	8327 (98.6%)	1815.6 (99.5%)	770.5 (99.2%)	8.2 (100.0%)	1229.3 (99.4%)	327.8 (99.2%)	1083.9 (95.8%)
	2008	8006 (99.3%)	1080.4 (99.6%)	891.0 (99.6%)	18.0 (100.0%)	1472.6 (99.8%)	371.7 (99.3%)	1221.7 (98.5%)
	2009	8794 (99.5%)	1338.7 (99.6%)	507.1 (99.6%)	9.9 (100.0%)	1182.1 (99.9%)	325.6 (99.6%)	1092.0 (98.2%)
	2010	7825 (99.4%)	724.9 (99.9%)	436.0 (99.8%)	3.3 (100.0%)	1309.8 (99.6%)	246.5 (99.2%)	900.4 (97.7%)
	2011	6553 (99.4%)	638.6 (99.9%)	360.1 (99.6%)	2.0 (100.0%)	1789.3 (99.5%)	279.3 (99.0%)	869.9 (98.5%)
High seas	2007	117 (1.4%)	9.5 (0.5%)	6.4 (0.8%)	0.0 (0.0%)	7.6 (0.6%)	2.6 (0.8%)	47.1 (4.2%)
	2008	53 (0.7%)	3.9 (0.4%)	4.0 (0.4%)	0.0 (0.0%)	2.6 (0.2%)	2.5 (0.7%)	18.7 (1.5%)
	2009	45 (0.5%)	4.9 (0.4%)	1.8 (0.4%)	0.0 (0.0%)	1.2 (0.1%)	1.4 (0.4%)	19.5 (1.8%)
	2010	50 (0.6%)	0.2 (0.1%)	1.0 (0.2%)	0.0 (0.0%)	5.3 (0.4%)	1.9 (0.8%)	20.9 (2.3%)
	2011	37 (0.6%)	0.9 (0.1%)	1.4 (0.4%)	0.0 (0.0%)	8.2 (0.5%)	2.9 (1.0%)	13 (1.5%)

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

In 2011, there were no active purse seine vessels in the Eastern Skipjack Fishery. Total minor line catches (including trolling, rod-and-reel and handline) increased from 3 t in 2010 to 38 t in 2011. The number of vessels reporting using minor line has steadily decreased from a peak of 52 vessels in 2001. Minor line effort increased from 9 lines in 2010 to 106 lines in 2011. This is a decrease from a peak of 975 lines in 2007. 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 small proportion of total catches and occurred inside the AFZ.

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.

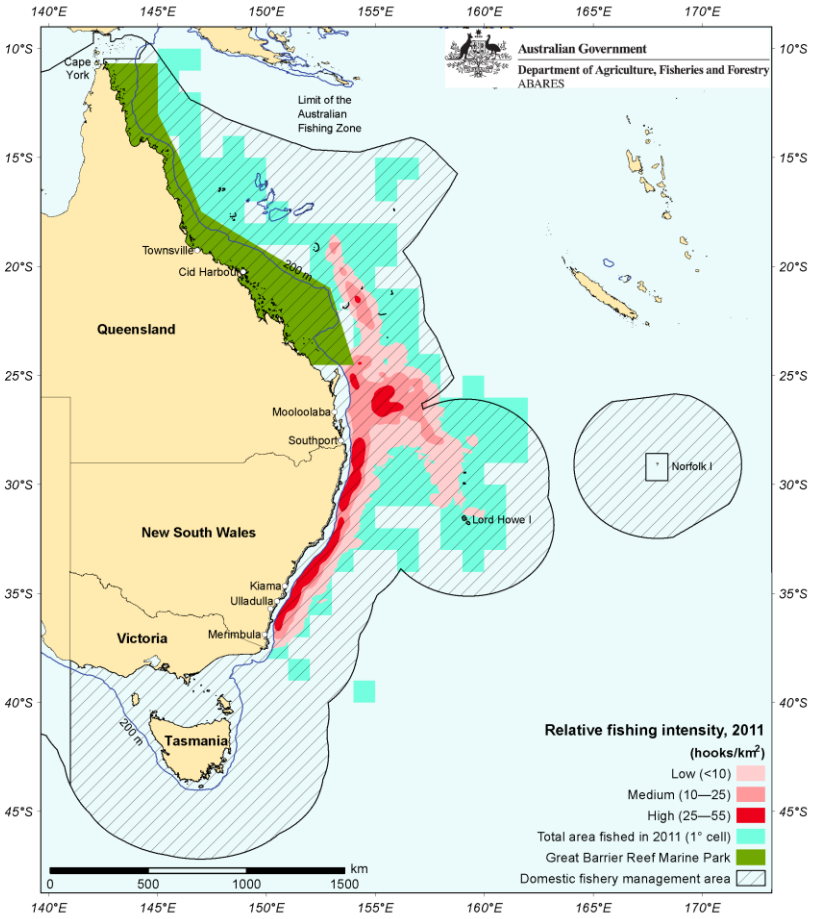


Figure 4. Longline effort distribution in the Eastern and Tuna Billfish Fishery (2011).

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 1200+ hooks. Fishers commonly operate around 150 days per year. Most trips are between 2 and 15 days; however, occasionally trips may extend up to 30 days. Typical fishing trips range from 40–300 nm from port, though some vessels may range up to 1000 nm or further to fish. The catch is gilled and gutted (depending on species) and stored on ice, in ice slurry or in refrigerated brine. Almost no bigeye tuna or swordfish, and less than five per cent of the yellowfin tuna catch, are taken by methods other than longlining.

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. There are no dedicated minor line vessels; 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, for 2007 to 2011. 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	Unknown	Subtotal	≤500	50–150	Unknown	
2007	27	33	1	0	61	2	0	0	63
2008	25	28	1	0	54	1	2	0	57
2009	27	27	1	0	55	1	2	0	58
2010	26	25	1	0	52	2	0	0	54
2011	24	24	1	0	49	1	2	0	52

Species of special interest

Seabirds and marine mammals

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 Sustainability, Environment, Water, Population and Communities on a quarterly basis. A summary of these interactions is presented in Table 6. Life status of the animal involved in the interaction is also recorded. In 2011, interactions were recorded with 6 green turtles (3 were noted to be alive, 2 were dead and the status of 1 was unknown), 1 unspecified turtle (alive), 2 leatherback turtles (alive) and 2 short-finned pilot whales (alive) No interactions with seabirds were recorded.

Fisheries interactions with seabirds, marine mammals and sea turtles in the ETBF, as recorded by AFMA observers, are presented in Table 7. In 2011, there were zero observed captures of marine mammals, 13 interactions with sea turtles (discussed in the section below; see Table 8) and one interaction with a cape petrel, which was observed to be dead.

Table 6. Interactions with species of special interest recorded in logbooks for the Australian longline fleet in the WCPFC Convention Area, 2007–11. Interactions not identified to species level are noted as unspecified (unspec).

Group	Common name	2007	2008	2009	2010	2011
Seabirds	Black-browed albatross	1	5	4	0	0
	Shy albatross	0	1	0	0	0
	Wandering albatross	3	0	0	0	0
	Yellow-nosed albatross	1	0	0	1	0
	Albatrosses (unspec)	4	2	0	1	0
	Sooty shearwater	0	0	0	2	0
	Shearwater (unspec)	0	1	0	0	0
	Subtotal	9	9	4	4	0
Turtles	Green turtle	6	0	1	7	6
	Hawksbill turtle	2	0	1	1	0
	Leatherback turtle	5	3	3	11	2
	Loggerhead turtle	2	3	5	4	0
	Pacific (Olive) Ridley	0	2	0	0	0
	Turtles (unspec)	2	0	3	2	1
	Subtotal	17	8	13	25	9
Mammals	False killer whale	1	0	0	0	0
	Humpback whale	0	0	1	0	0
	Melon-headed whale	0	1	0	1	0
	Short-finned pilot whale	2	0	4	2	2
	Whale (unspec)	1	0	2	1	0
	Seal (unspec)	0	1	0	0	0
	Subtotal	4	2	7	4	2
	TOTAL	**30**	**19**	**24**	**33**	**11**

Table 7. Observed captures of species of special interest for the Australian longline fleet in the WCPFC Convention Area, 2007–11. Interactions not identified to species level are noted as unspecified (unspec).

Group	Common name	2007	2008	2009	2010	2011
Seabirds	Black-browed albatross	2	2	3	0	0
	Shy albatross	0	1	1	0	0
	Southern royal albatross	0	0	0	0	0
	Wandering albatross	3	1	0	0	0
	Yellow-nosed albatross	0	0	0	1	0
	Albatrosses (other)	0	2	1	0	0
	Flesh-footed shearwater	0	0	0	0	0
	Short-tailed shearwater	0	0	0	0	0
	Sooty shearwater	0	0	0	0	0
	Wedge-tailed shearwater	0	0	0	0	0
	Petrels, prions and shearwaters	0	0	0	0	0
	Cape petrel	3	0	0	0	1
	Great skua	3	0	0	0	0
	Subtotal	11	7	5	1	1
Turtles	Green turtle	5	1	1	0	10
	Hawksbill turtle	1	0	1	1	0
	Leatherback turtle	3	3	5	2	2
	Loggerhead turtle	2	2	4	1	0
	Pacific (Olive) Ridley	0	2	0	0	1
	Turtles (unspec)	0	0	0	0	0
	Subtotal	11	8	11	4	13
Mammals	Common dolphin	0	0	0	0	0
	Humpback whale	0	0	0	0	0
	Short-finned pilot whale	1	0	0	3	0
	Australian fur seal	0	4	0	0	0
	Subtotal	1	4	0	3	0
	TOTAL	**23**	**19**	**16**	**8**	**14**

Sea turtles

In December 2008, the WCPFC passed CMM 2008-03 (Conservation and Management of Sea Turtles), which promotes sea turtle bycatch mitigation in shallow-set pelagic longline fisheries targeting swordfish. Under section 6 of this CMM, longline vessels must carry and use line cutters and de-hookers to handle and promptly release sea turtles caught or entangled, in accordance with WCPFC guidelines. Vessels should also carry and use dip-nets in accordance with these guidelines. Australia has always implemented this requirement and supported the development of safe sea turtle handling procedures in the ETBF and in the WCPFC more broadly.

Section 7 of this CMM requires longline vessels that fish for swordfish in a shallow-set manner to use at least one of the following three mitigation methods:

i. Use only large circle hooks;

ii. Use only whole finfish for bait.

iii. Use any other mitigation measure that has been reviewed by the Scientific Committee (SC) and the Technical and Compliance Committee (TCC) and approved by the Commission.

In 2009, Australia formally submitted The Eastern Tuna and Billfish Fishery Sea Turtle Mitigation Plan (the mitigation plan) (AFMA 2009), for review by the WCPFC Scientific Committee (SC) and Technical Compliance Committee (TCC), and approval by the Commission. The mitigation plan was designed to reduce the interaction rate of turtles in pelagic longline fisheries which target swordfish. Both the SC and TCC recommended that the Commission approve the mitigation plan, and it was approved by the Commission at WCPFC 6 and took effect 1 January 2010.

The mitigation plan stated that observed sea turtle interaction rates in the ETBF would be reported as part of Australia's Annual Part 1 Report to the Scientific Committee alongside the 'minimal levels' of sea turtle interactions approved by the WCPFC SC in 2009. The observed sea turtle interaction rates for 2011 are therefore presented in Table 8. These data show that there were 13 observed interactions in the ETBF in 2011 (10 green turtles, 2 leatherbacks and 1 Pacific (olive) Ridley) and the minimal levels for green turtles and leatherbacks were exceeded, as was the minimal level for 'all species combined'. Of the 13 turtles involved in the interactions, 11 were cut free or released alive, while two green turtles were recorded dead.

This is the second year that one of the minimal levels has been breached. In 2010, the interaction rate for leatherback turtles exceeded the minimal level; as a result, further measures to ensure the survivorship of captured turtles were undertaken (e.g. line cutters and dehookers supplied to ETBF vessels). The issue of turtle interaction rates in the ETBF was discussed at a meeting of the AFMA Tropical Tuna Resource Assessment Group (TTRAG) on 5–6 June 2012. The TTRAG has advised AFMA to revoke the mitigation plan and instead require the use of large circle hooks in Australia's shallow-set pelagic longline fisheries targeting swordfish, consistent with CMM2008-03.

Table 8. Observed numbers of interactions and observed interaction rates of sea turtles per 1000 observed hooks for the Australian longline fleet, in the WCPFC Convention Area for 2010 and 2011. Minimal levels are from WCPFC CMM 2008-03. Source: AFMA observer database.

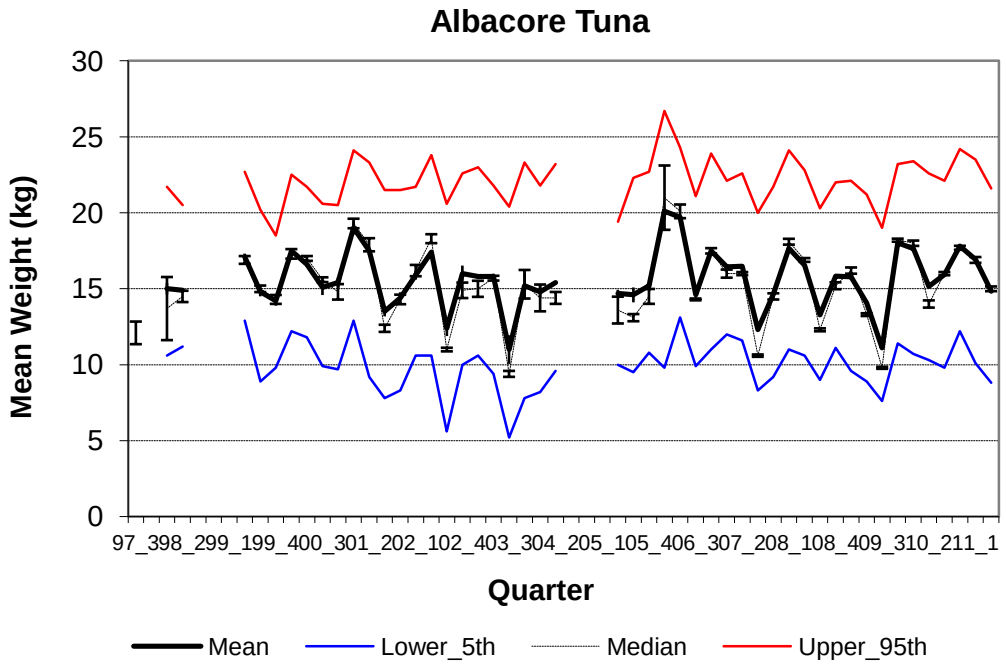
Species	Minimal levels	Number (Rate) 2010	Number (Rate) 2011
Green turtle	0.0048	0 (0.0000)	10 (0.0239)
Leatherback turtle	0.0040	2 (0.0070)	2 (0.0048)
Loggerhead turtle	0.0040	1 (0.0035)	0 (0.0000)
Other*	0.0040	1 (0.0035)	1 (0.0024)
TOTAL	**0.0168**	**4 (0.0140)**	**13 (0.0311)**

*Combination of hawksbill, flatback and Pacific (olive) Ridley turtles

Trends in size composition of retained catch

The size composition (based on processed weights; Figure 5) of albacore tuna has remained relatively constant over time. 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 has since increased to around 34 kg. The size composition of striped marlin has also remained relatively constant over time. The 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 a small increase to 42–43 kg in recent years. Yellowfin tuna shows both seasonal and interannual variation in processed weight, 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. Since the start of 2010 this mean shows a consistent increase, being 33.5 kg in mid-2011.

a)


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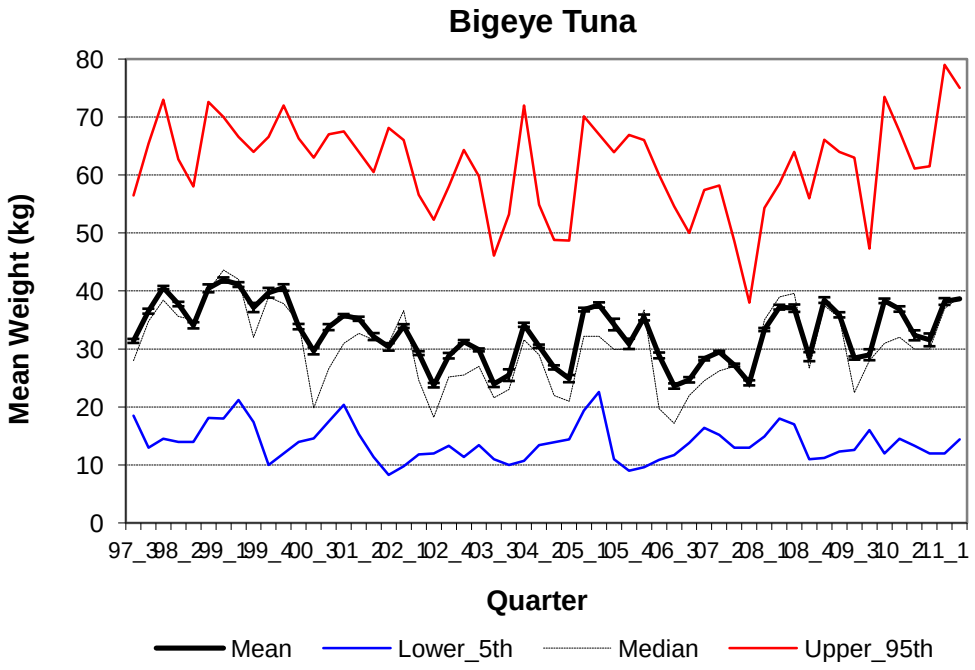
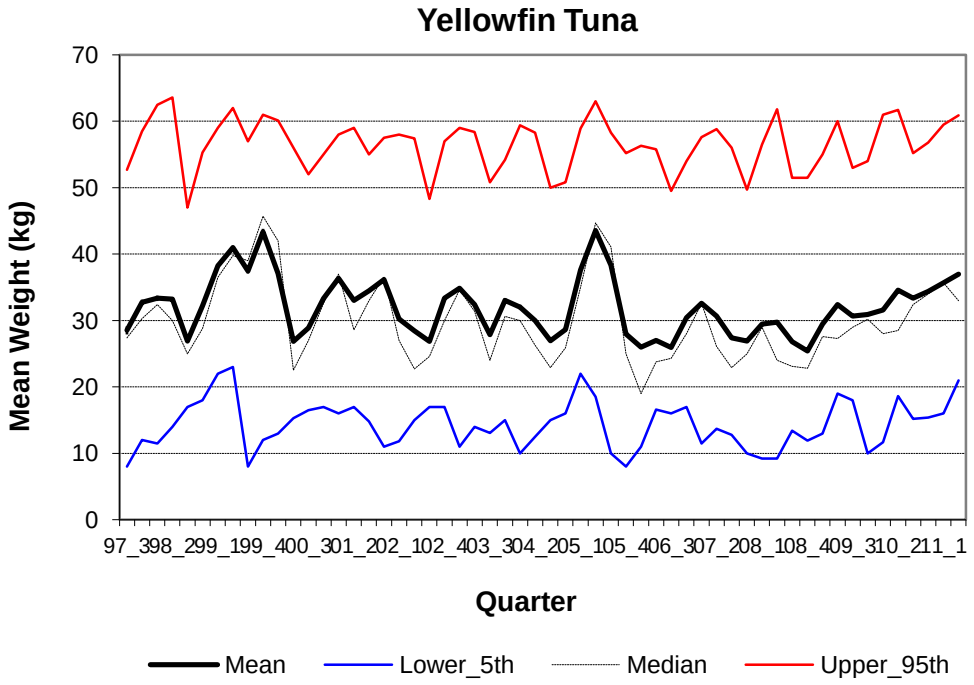
Quarter
Mean
Lower_5th
Median
Upper_95th

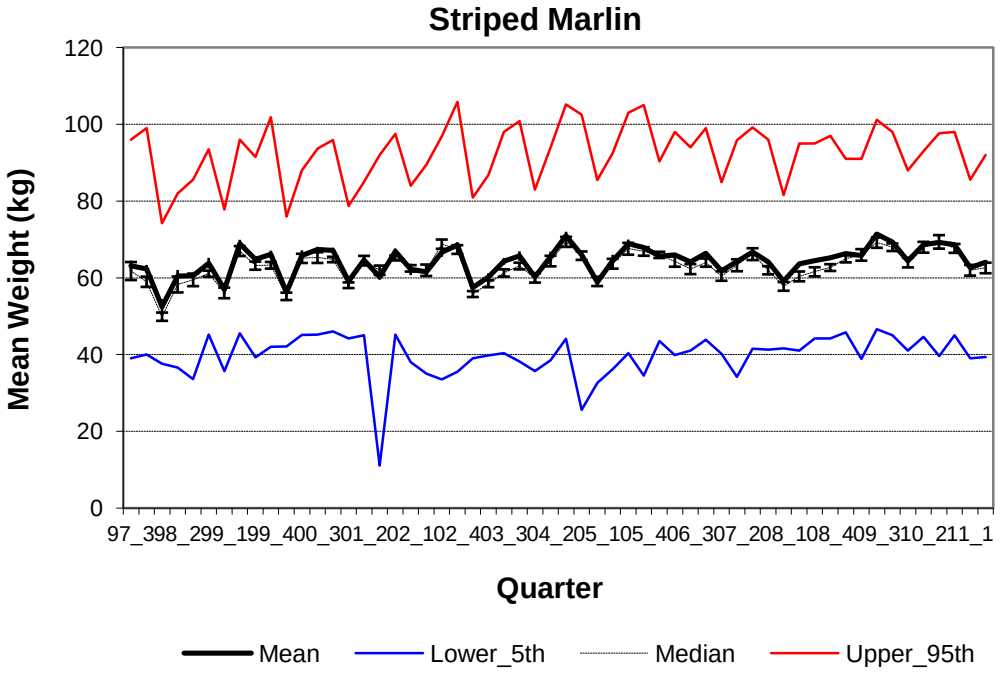
b)


Bigeye Tuna
Mean Weight (kg)
80
70
60
50
40
30
20
10
0
97_398_299_199_400_301_202_102_403_304_205_105_406_307_208_108_409_310_211_1
Quarter
Mean
Lower_5th
Median
Upper_95th

c)


Yellowfin Tuna
Mean Weight (kg)
70
60
50
40
30
20
10
0
97_398_299_199_400_301_202_102_403_304_205_105_406_307_208_108_409_310_211_1
Quarter
Mean
Lower_5th
Median
Upper_95th

d)


Striped Marlin
Mean Weight (kg)
120
100
80
60
40
20
0
97_398_299_199_400_301_202_102_403_304_205_105_406_307_208_108_409_310_211_1
Quarter
Mean
Lower_5th
Median
Upper_95th

e)

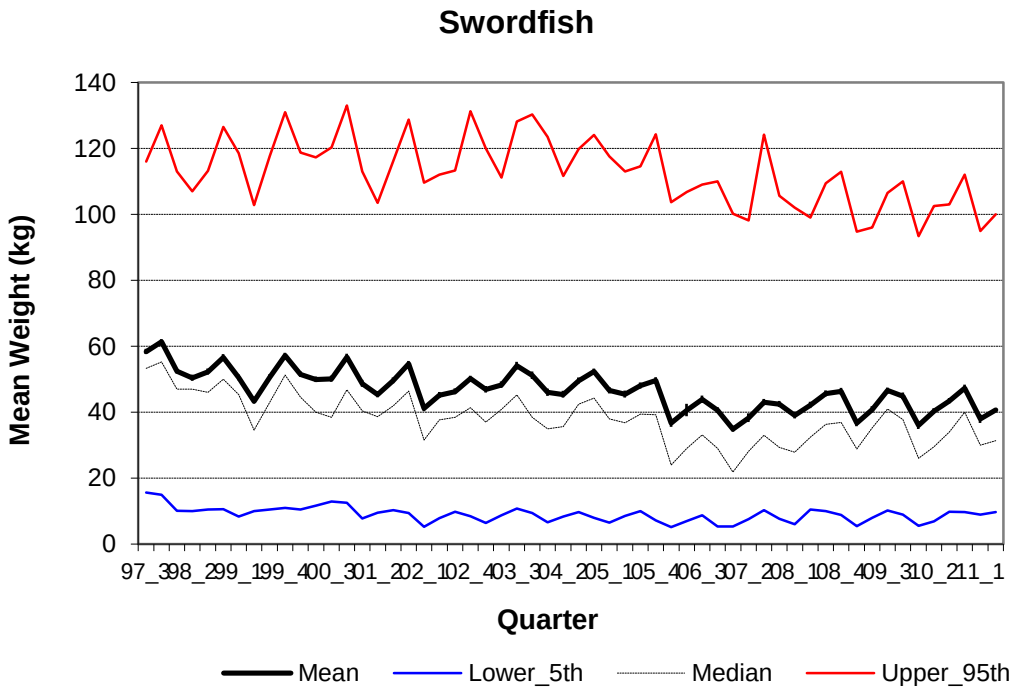


Figure 5 (a–e). Time series of quarterly mean, medium, lower 5th and upper 95th percentiles processed weights of a) albacore tuna, b) bigeye tuna, c) yellowfin tuna, d) striped marlin and e) swordfish sampled across the entire ETBF based on the data collected from the port sampling program in the ETBF.

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

Total gross value of production (GVP) of the ETBF decreased by 4 per cent in 2010–11, from $31.1 million in 2009–10 to $29.7 million in 2010–11 (2010–11 dollars). Yellowfin tuna remains the largest contributor to the total GVP of the fishery, accounting for $16.6 million or 55 per cent. Historically, yellowfin tuna has typically been the dominant species in the fishery in gross value terms, with the exception of 2007–08, when bigeye tuna was the dominant species following a historical high catch in that year. In 2010–11, the price and production volume of yellowfin tuna increased by 12 per cent and 40 per cent, respectively. This resulted in a 57 per cent increase in the contribution of yellowfin to the total GVP in the ETBF. In 2010–11, swordfish GVP was $5.4 million, accounting for approximately 18 per cent of total fishery GVP. This represents a 25 per cent reduction from the previous year, with the price and volume both decreasing (by 8 per cent and 19 per cent, respectively). The volume of bigeye tuna and albacore tuna also decreased in 2010–11, which resulted in a reduction in GVP for the two species (54 per cent to $2.9 million and 27 per cent to $1.8 million, respectively).

5 Dispatch of catch

The principal destination for Australian exports of tuna and swordfish is Japan, which received 78 per cent of total tuna exports (in value terms; excluding southern bluefin tuna) in 2010–11. Other markets of Australian tuna exports in 2010–11, in value terms, included the United States (7 per cent), New Zealand (6 per cent), Thailand (5 per cent) and Vietnam (2 per cent). Japan received approximately 87 per cent of Australian exports of swordfish in 2010–11 (in value terms). Japan is the main export market for bigeye and fresh yellowfin tuna. In 2010–11, the main export markets for fresh albacore were Japan, the United States, the United Kingdom and Spain; the main export market for frozen albacore was Thailand. Historically, skipjack tuna has mostly been canned and sold domestically; however, the sole remaining cannery in Australia (Port Lincoln) closed in early 2010. In 2010–11, the main export destination for skipjack tuna was Thailand.

6 Onshore developments

As part of the Australian Government Securing Our Fishing Future package, there was a substantial investment in onshore development, some of which benefited fishers in the ETBF. Funding was available through the Onshore Business Assistance and Fishing Community Assistance components of the package to assist businesses and communities affected by the reductions in fishing activity as a result of the package. Investments include the purchasing of new equipment, redevelopment and upgrade of facilities, diversification and expansion of operations and the development of programs aimed at increasing consumer awareness, some of which benefited fishers in the ETBF. This package was finalised in 2006.

7 Future prospects for the fishery

Commercial operators view the Australian skipjack fisheries as important developing fisheries as 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. Current business conditions are less than favourable, but activity and catches could increase, within management restrictions, if these conditions change.

In January 2012, the AFMA Commission agreed on total allowable commercial catches (TACCs) for the commercial sector of the ETBF. These apply to the 2012–13 season which commenced on 1 March 2012. The TACs for the five main target species are: albacore tuna (2500 t); bigeye tuna (1056 t); swordfish (1396 t); striped marlin (370 t); yellowfin tuna (2200 t).

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 nearly been 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.

Catch and effort logbooks have been introduced for charter operators in both Queensland (Queensland Charter Fishery logbook) and New South Wales (New South Wales Charter Fishing Boat Logbook Monitoring Program). The New South Wales Department of Primary Industries has also monitored catch and effort data from gamefishing tournaments (Park 2007).

Many anglers who target tuna and billfish voluntarily tag and release under the New South Wales Cooperative Gamefish Tagging Program, which was established in 1973. The data indicate the general distribution of recreational angling activities and trends in catches (masked by changes in effort levels), targeting and reporting of releases.

Observer program

AFMA observers have been deployed on domestic longliners since 2001. Since July 2003, observers have been 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. In 2011, observers monitored 417 732 hooks in the fishery (6.3 per cent of the total number of hooks deployed in the fishery) (Table 9).

AFMA has also 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. E-monitoring will be introduced in the fishery in 2013.

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 tuna, swordfish and striped marlin), though data on a range of other species have also been collected. Data are collated on a financial year basis (July–June the following year). During the 15 years that the program has run, over 1.8 million individual fish weights pertaining to the five main target species have been collected. Coverage rates (per cent of landed fish) for the target species are generally high, totalling around 64 per cent for yellowfin tuna, 80 per cent for bigeye tuna, 78 per cent for swordfish, 22 per cent for albacore tuna and 58 per cent for striped marlin (Table 9). Values presented for 2011 include the first six months only (January–July). Bulk weights for binned albacore tuna (covering between 45–68 per cent of the catch since 2006) and some other species are also collected. In total, these bulk weights cover 597 000 fish (including 391 000 albacore).

Table 9. 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, 2007–11.

Gear	Year	Operational catch & effort coverage	Observer coverage	Port sampling coverage					
				YFT	BET	ALB	SWO	STM	SKJ
Longline[a]	2007	100	5.3	67	81	13	83	70	0
	2008	100	10.4	62	74	15	82	76	0
	2009	100	6.4	78	87	23	87	82	0
	2010	100	3.6	81	98	24	95	83	0
	2011[b]	100	6.3	83	98	29	98	71	0
Purse seine	2007	100	7.4	0	0	0	0	0	0
	2008	100	0	0	0	0	0	0	0
	2009	100	2.3	0	0	0	0	0	0
	2010	100	2.6	0	0	0	0	0	0
	2011	100	0	0	0	0	0	0	0

[a] includes fish taken by minor line

[b] sampling rates for all species (except skipjack) pertain only to January–June in 2011

Abbreviations: yellowfin tuna (YFT), bigeye tuna (BET), albacore tuna (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 10). 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 program. 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. A small amount of transhipment occurs in the ETBF (within the AFZ) between domestic vessels, with the catch verified in catch disposal records.

Table 10. Annual catch estimates (converted whole weights) for the Australian longline fleet, for 2007–11 derived from catch disposal records. Estimates are in tonnes.

Year	Albacore	Yellowfin	Bigeye	Striped marlin	Swordfish	Other	Total
2007	1924.6	1389.6	1007.5	358.7	1352.7	833.5	6866.6
2008	1276.7	1650.3	1026.5	425.3	1483.2	822.4	6684.4
2009	1522.8	1386.6	726.4	360.6	1315.0	775.0	6086.5
2010	872.3	1549.0	521.9	278.6	1176.1	839.1	5237.0
2011	767.9	2154.5	442.7	329.8	1078.6	617.7	5391.2

Other

AFMA introduced the compulsory requirement for all Commonwealth endorsed fishing vessels to be fitted with Integrated Computer Vessel Monitoring Systems (ICVMS) in 2007. As of 4 July 2012, 98.5 per cent of Commonwealth nominated vessels 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 programs, key areas of recent 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 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 south-west Pacific swordfish (Wilcox, ongoing)

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 & Billfish 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)
- Analysis of satellite tagging data to support the stock assessment of striped marlin (Chambers, ongoing)
- Standardisation of commercial catch and effort data to support the stock assessment of striped marlin (Campbell, ongoing)

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 2009)

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)
- Estimating turtle bycatch rates in the ETBF (Tennant et al. ongoing)

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 and 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 and Findlay, J 2005, Byproduct: catch, economics and co-occurrence in Australia's pelagic longline fisheries, Bureau of Rural Sciences, Canberra.

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

Campbell, R and 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 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.

Evans, K, Kolody, D, Abascal, F, Holdsworth, J and 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 and 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.

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, NSW Department of Primary Industries, Fisheries Research Report Series, ISSN 1837-2120, Cronulla.

Gunn, J, Hampton, J and 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.

Keller, KR and 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 and 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 and 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 and 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.

Robins, CM, Bradshaw, EJ and 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 and 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 and 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, Dowling, N and 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 and 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 and 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 and Fuller, M 2007, Rapid quantitative risk assessment for fish species in selected Commonwealth fisheries, report to the AFMA, Canberra.

Appendix A - Scientific and common names

Common names	Scientific names
Albacore tuna	*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 nigricans*
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 (black oilfish)	*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*
Leatherback turtle	*Dermochelys coriacea*
Loggerhead turtle	*Carretta carretta*
Mahi mahi (dolphinfish)	*Coryphaena hippurus*
Melon-headed whale	*Peponcephala electra*
Moonfish (opah)	*Lampris guttatus*
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 bluefin tuna	*Thunnus maccoyii*
Southern royal albatross	*Diomedea epomophora*
Striped marlin	*Tetrapturus 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*
Yellowfin tuna	*Thunnus albacares*
Yellow-nosed albatross	*Thalassarche chlororhynchos*