

BLACKTIP SHARKS (2018)

Carcharhinus sorrah, *Carcharhinus tilstoni*, *Carcharhinus limbatus*



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STOCK STATUS OVERVIEW

Jurisdiction	Stock	Fisheries	Stock status	Indicators
Northern Territory	North and West Coast	BF, BNF, CNF, DF, ONLF, SMF, SPDF	Sustainable	Catch, mark recapture, CPUE, pup production
Northern Territory, Queensland	Gulf of Carpentaria	GOCIFFF, GOCLF, ONLF	Undefined	Catch, MSY
Queensland, New South Wales	East Coast	ECIFFF, EGF, N/A, OTF, OTLF	Sustainable	Catch, MSY

EGF Estuary General Fishery (NSW), N/A Not Applicable (NSW), OTF Ocean Trawl Fishery (NSW), OTLF Ocean Trap and Line Fishery (NSW), BF Barramundi Fishery (NT), DF Demersal Fishery (NT), ONLF Offshore Net and Line Fishery (NT), SMF Spanish Mackerel Fishery (NT), ECIFFF East Coast Inshore Fin Fish Fishery (QLD), GOCIFFF Gulf of Carpentaria Inshore Fin Fish Fishery (QLD), GOCLF Gulf of Carpentaria Line Fishery (QLD), BNF Bait Net Fishery (NT), CNF Coastal Net Fishery (NT), SPDF Small Pelagic Developmental Fishery (NT)

STOCK STRUCTURE

In the context of Australian fisheries, the Blacktip Shark species complex, part of the family Carcharhinidae (whaler sharks), comprises three species: *Carcharhinus tilstoni* (Australian Blacktip Shark), *C. limbatus* (Common Blacktip Shark) and *C. sorrah* (Spottail Shark). Whereas *C. tilstoni* and *C. sorrah* are distributed only within Australian and Indo–West Pacific waters, respectively, *C. limbatus* is globally distributed in tropical and warm temperate waters. In Australian waters, genetic studies have identified two biological stocks of *C. tilstoni* (a western stock extending from the western Northern Territory into northern Western Australia, and an eastern stock extending from the Gulf of Carpentaria to the east coast of Queensland and New South Wales), three biological stocks of *C. limbatus* (one across Western Australia and the Northern Territory, one in the Gulf of Carpentaria, and one on the east coast of Queensland and New South Wales) and a single biological stock of *C. sorrah* across northern Australia [Ovenden et al. 2007]. Stock boundaries between the western biological stocks of *C. tilstoni* and *C. limbatus* and those in the Gulf of Carpentaria are uncertain.

Carcharhinus limbatus and *C. tilstoni* are similar in appearance and can only be taxonomically differentiated by genetic analyses, precaudal vertebral counts or, in certain size classes, their differences in size of maturity [Harry AV 2011]. There are two new techniques - one using machine learning models and the other using differences in pelvic fin colouration - that may

assist in distinguishing between these two species, however, accurate field identification remains difficult and is not practical during fishing operations [Johnson et al. 2017]. Hybridisation between *C. limbatus* and *C. tilstoni* has also been recorded, though the impacts of this remain poorly understood [Harry et al. 2012, Johnson 2017, Morgan et al. 2011]. Because a suite of three species of differing stock structures is grouped together for this assessment, stocks have been assessed on the finest known scale—using the three biological stock areas identified for *C. limbatus*.

Here, assessment of stock status for the Blacktip Shark multispecies group is presented at the biological stock level—North and West Coast, Gulf of Carpentaria, and East Coast.

STOCK STATUS

East Coast The Queensland shark stock assessment included 12 species or species complexes that are retained for sale on the Queensland east coast and included MSY per annum estimates for *C. tilstoni* (144 t), *C. limbatus* (247 t) and *C. sorrah* (109 t) [Leigh GM 2015]. These results indicate that the Blacktip Shark species complex has a combined MSY of 499.5 t [Leigh GM 2015]. This estimate is well above the total catch of Blacktip Sharks reported from the east coast in 2017 (137 t) and the long-term catch range of 96–312 t per financial year (2003–04 to 2016–17). The stock assessment report, however, acknowledged that there are a number of data limitations for Queensland fisheries, particularly with respect to the species identifications and the quantity and reliability of available catch data.

Of significance, around 86 per cent of the Blacktip Shark catch on the Queensland east coast is reported in a multispecies logbook category titled 'Blacktip Whalers and Graceful Shark'. Data from this catch category cannot be split into individual species and, as a consequence, it is difficult to determine how much of this catch consists of Graceful Sharks (*C. amblyrhynchoides*), although this level is likely to be low [Harry et al. 2011]. From an assessment perspective, the inclusion of *C. amblyrhynchoides* data would still result in the total reported catch being below the combined MSY estimate for Blacktip Sharks. As total catch levels including the *C. amblyrhynchoides* data are below the combined MSY estimate, the Queensland east coast component of this stock is unlikely to be recruitment overfished.

Queensland has introduced a number of measures that reduce the likelihood of Blacktip Sharks being fished above the combined 499.5 t MSY estimate. In 2009 a precautionary 600 t annual total allowable commercial catch (TACC) limit (species combined), applying to all sharks and rays retained for sale on the Queensland east coast, was introduced. This TACC was introduced in conjunction with an 'S' fishing symbol that significantly reduced the number of licences permitted to target sharks in high quantities. Since the TACC was introduced, total shark catch on the Queensland east coast has ranged from 277–456 t (2010–17) and included between 96 and 227 t of Blacktip Shark (including *C. amblyrhynchoides*), equating to approximately 19–45 per cent of the combined MSY estimate for this complex (499.5 t) [Leigh GM 2015, QDAF 2018]. Species differentiation for the Blacktip Shark complex will improve in the near future with the introduction of a new Shark and Ray logbook on 1 January 2018, limiting the 'Blacktip Whaler' category to *C. limbatus* and *C. tilstoni* only, and listing Graceful sharks (*C. amblyrhynchoides*) and Spottail shark (*C. sorrah*) separately.

Commercial catch records for the New South Wales Ocean Trap and Line Fishery indicate that the annual reported commercial catch of Blacktip Sharks (comprising mostly *C. limbatus*) from New South Wales waters ranged from 13–66 t during the 10 year period spanning financial years from 1998–99 to 2007–08 [Macbeth et al. 2009]. However, significant use of catch reporting categories 'Unspecified Sharks' (5–204 t) and 'Unspecified Whaler Sharks' (7–26 t) during that period suggest that these historical quantities are most probably

underestimates. Since management intervention in this fishery in 2009, the tonnage of Blacktip Sharks caught has dropped substantially and the reliability of species-specific catch reporting has improved considerably [Macbeth et al. 2018]. A total of 22 t of Blacktip Sharks was landed in New South Wales during 2017. The catch of Blacktip Sharks in the New South Wales Shark Meshing Program is negligible, at less than 1 t. Collectively, these figures indicate that the overall catch of this species in New South Wales waters is insignificant in terms of impacting the East Coast stock.

Overall the information provided by both jurisdictions indicates that the stock is not considered to be depleted and that recruitment is unlikely to be impaired. Furthermore, the level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the East Coast multispecies biological stock is classified as a **sustainable stock**.

Gulf of Carpentaria

The Queensland Department of Agriculture and Fisheries commissioned a scientific assessment of shark stocks which provided MSY per annum estimates for *C. tilstoni* and *C. sorrah* in the Gulf of Carpentaria. This assessment produced qualified MSY estimates of 95 tonnes (t) for *C. tilstoni* and 29.4 t for *C. sorrah* [Leigh GM 2015]. This report also, however, acknowledged a number of data limitations for Queensland fisheries, particularly with respect to accuracy of species identifications and the quantity and reliability of available catch data.

In 2017, 103 t of *C. tilstoni* and 9 t of *C. sorrah* were reported from the Gulf of Carpentaria Inshore Finfish Fishery (GOCIFFF); catches that were above and below the respective MSY estimates. Species-specific data for the fishery showed that over the past 10 years the annual catches of *C. sorrah* (9–34 t) exceeded the MSY estimate twice, while catch of *C. tilstoni* (54–160 t) exceeded MSY seven times over the same period. An estimated 38–125 t was reported from the GOCIFFF each year for the period 2007–17 under the 'Blacktip Whaler Shark' catch category that includes Graceful Sharks (*C. amblyrhynchoides*). At present, catch reported in the 'Blacktip Whaler Shark' category cannot be differentiated into individual species.

The inability to assign more multispecies catch records to Blacktip Shark species makes it difficult to identify catch and effort trends for this species complex. Consequently, current catch levels and their impact on the biological stock are unknown, and there is insufficient information to confidently classify the status of this stock. This situation is expected to improve through time with the introduction of a new Shark and Ray logbook into the Gulf of Carpentaria on 1 January 2018, which limits the 'Blacktip Whaler' category to *C. limbatus* and *C. tilstoni* only and lists Graceful sharks (*C. amblyrhynchoides*) and Spottail shark (*C. sorrah*) individually.

On the basis of the evidence provided above, the Gulf of Carpentaria multispecies biological stock is classified as an **undefined stock**.

North and West Coast

The North and West Coast biological stock straddles two jurisdictions: The Northern Territory, west of the Wessel Islands–Western Australian border; and Western Australia.

In 2011, a stock assessment was undertaken for this biological stock utilising stock reduction analysis models, which rely on catch per unit effort data. The results from these models at the time estimated that the harvest rates for all species within the complex were less than 20 per cent of that required to reach maximum sustainable yield (MSY) and current pup production was approximately 80 per cent of unfished levels [Grubert et al. 2013]. Results from a mark-recapture study done for all species of Blacktip Shark in Northern Territory waters supports the stock assessment results [Bradshaw et al. 2013].

Catches for this Blacktip Shark stock peaked in 2012 but have subsequently decreased to relatively low levels. This decrease in catch was driven by changing operational practises in the Offshore Net and Line Fishery [Northern Territory Government 2017].

Although there is uncertainty regarding species composition and the magnitude of historical catches of Blacktip Sharks from Western Australia, these species have not been harvested in this jurisdiction since April 2009 [Molony et al. 2013], allowing the biomass to increase.

The most recent assessment [Grubert et al. 2013] estimated that biomass in 2011 was 80 per cent of the unfished 1970 level. As current catches are well below those recorded in 2011, when the catches were assessed as sustainable, it is unlikely that current catches are having a reductive impact on the stock. The stock is not considered to be recruitment impaired and the current level of fishing is unlikely to cause the stock to become recruitment impaired.

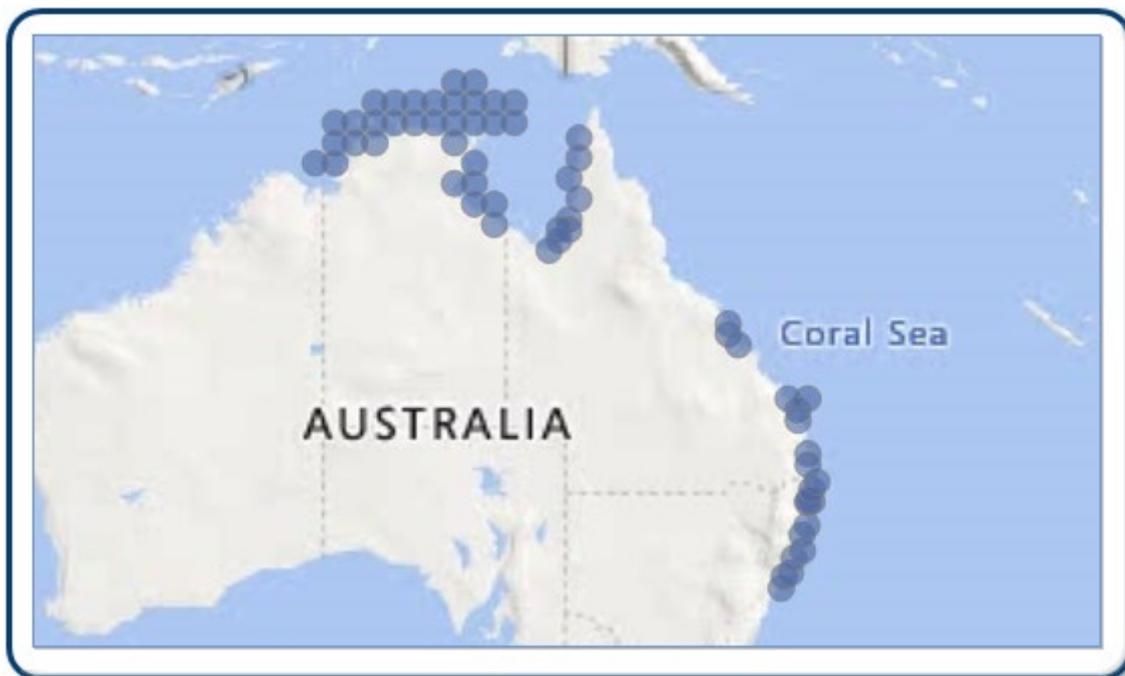
On the basis of the evidence provided above, the North and West Coast multispecies biological stock is classified as a **sustainable stock**.

BIOLOGY

Blacktip Sharks biology [Harry et al. 2012, Harry AV 2011, Last and Stevens 2009]

Species	Longevity / Maximum Size	Maturity (50 per cent)
BLACKTIP SHARKS	C. tilstoni: Females 15 years, males 13 years, 2 000 mm TL C. limbatus: Maximum age unknown, 2 500 mm TL C. sorrah: Females 14 years, males 9 years, 1 600 mm TL	C. tilstoni: 5–6 years, females 1 350–1 400 mm, males 1 200 mm TL C. limbatus: females unknown, males 1 800 mm C. sorrah: 2–3 years, both sexes 900–950 mm TL

DISTRIBUTION



Distribution of reported commercial catch of Blacktip Sharks

TABLES

Commercial	New South	Northern	Queensland	Western
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Catch Methods	Wales	Territory		Australia
Beach Seine		✓		
Demersal Longline	✓	✓		
Fish Trap		✓		
Gillnet		✓		✓
Hook and Line	✓	✓	✓	
Longline (Unspecified)				✓
Mesh Net	✓			
Net			✓	
Otter Trawl		✓		
Pelagic Gillnet		✓		
Purse Seine		✓		
Trawl	✓			
Unspecified	✓			✓

Fishing methods				
	New South Wales	Northern Territory	Queensland	Western Australia
Commercial				
Beach Seine		✓		
Demersal Longline	✓	✓		
Gillnet		✓		
Hook and Line	✓	✓	✓	
Mesh Net	✓			
Net			✓	
Otter Trawl		✓		
Pelagic Gillnet		✓		
Purse Seine		✓		
Trawl	✓			
Unspecified	✓			
Indigenous				
Handline		✓	✓	
Spearfishing		✓		
Recreational				
Handline	✓	✓	✓	✓
Management Methods				
	New South Wales	Northern Territory	Queensland	Western Australia
Charter				
Possession limit			✓	

Size limit			✓	
Spatial closures			✓	
Commercial				
Gear restrictions	✓		✓	✓
Limited entry	✓	✓	✓	✓
Spatial closures	✓		✓	✓
Total allowable catch	✓	✓	✓	✓
Vessel restrictions	✓	✓	✓	✓
Indigenous				
Bag limits	✓			✓
Native Title	✓			
Section 37 (1d)(3)(9), Aboriginal cultural fishing authority	✓			
Size limit				✓
Recreational				
Bag limits	✓			✓
Licence				✓
Possession limit		✓	✓	✓
Size limit	✓		✓	✓
Spatial closures	✓	✓	✓	✓

Active Vessels	New South Wales	Northern Territory	Queensland
	210 LICENCES in EGF, 179 LICENCES in OTF, 287 LICENCES in OTLF,	14 LICENCES in BF, 7 LICENCES in ONLF, 13 LICENCES in BNF, 3 LICENCES in CNF,	77 in ECIFFF, 29 in GOCIFFF, 0 in GOCLF,

EGF Estuary General Fishery(NSW)

OTF Ocean Trawl Fishery(NSW)

OTLF Ocean Trap and Line Fishery(NSW)

BF Barramundi Fishery(NT)

ONLF Offshore Net and Line Fishery(NT)

ECIFFF East Coast Inshore Fin Fish Fishery(QLD)

GOCIFFF Gulf of Carpentaria Inshore Fin Fish Fishery(QLD)

GOCLF Gulf of Carpentaria Line Fishery (QLD)

BNF Bait Net Fishery(NT)

CNF Coastal Net Fishery(NT)

Catch	New South Wales	Northern Territory	Queensland	Western Australia
Commercial	4.251t in EGF, 22.148t in N/A, 2.549t in OTF, 15.208t in OTLF,	0.28571t in BF, 0.14t in BNF, 1.40001t in CNF, 0t in DF, 77.3969t in ONLF, 0t in SMF, 0t in SPDF,	137.315t in ECIFFF, 200.047t in GOCIFFF, 0t in GOCLF,	
Indigenous	Unknown		Unknown	Unknown
Recreational	Unknown		Unknown	< 10 t of whaler sharks caught from boats is retained (Ryan et al. 2017), shore-based catches are undetermined

EGF Estuary General Fishery (NSW), N/A Not Applicable (NSW), OTF Ocean Trawl Fishery (NSW), OTLF Ocean Trap and Line Fishery (NSW), BF Barramundi Fishery (NT), DF Demersal Fishery (NT), ONLF Offshore Net and Line Fishery (NT), SMF Spanish Mackerel Fishery (NT), ECIFFF East Coast Inshore Fin Fish Fishery (QLD), GOCIFFF Gulf of Carpentaria Inshore Fin Fish Fishery (QLD), GOCLF Gulf of Carpentaria Line Fishery (QLD), BNF Bait Net Fishery (NT), CNF Coastal Net Fishery (NT), SPDF Small Pelagic Developmental Fishery (NT),

Western Australia – Commercial (Fishing methods) No commercial fishing has occurred in the Western Australia jurisdiction since April 2009.

Western Australia – Recreational (Management methods) A recreational fishing from boat licence is required for recreational fishing from a powered vessel in Western Australia.

Western Australia – Indigenous (Management methods) Subject to the defence that applies under Section 211 of the *Native Title Act 1993* (Cth), and the exemption from a requirement to hold a recreational fishing licence, the non-commercial take by Indigenous fishers is covered by the same arrangements as that for recreational fishing.

Northern Territory – Indigenous (Management methods) The *Fisheries Act 1988* (NT), specifies that "...without derogating from any other law in force in the Territory, nothing in a provision of this Act or an instrument of a judicial or administrative character made under it limits the right of Aboriginals who have traditionally used the resources of an area of land or water in a traditional manner from continuing to use those resources in that area in that manner".

Northern Territory – Charter (Management methods) In the Northern Territory, charter operators are regulated through the same management methods as the recreational sector but are subject to additional limits on license and passenger numbers.

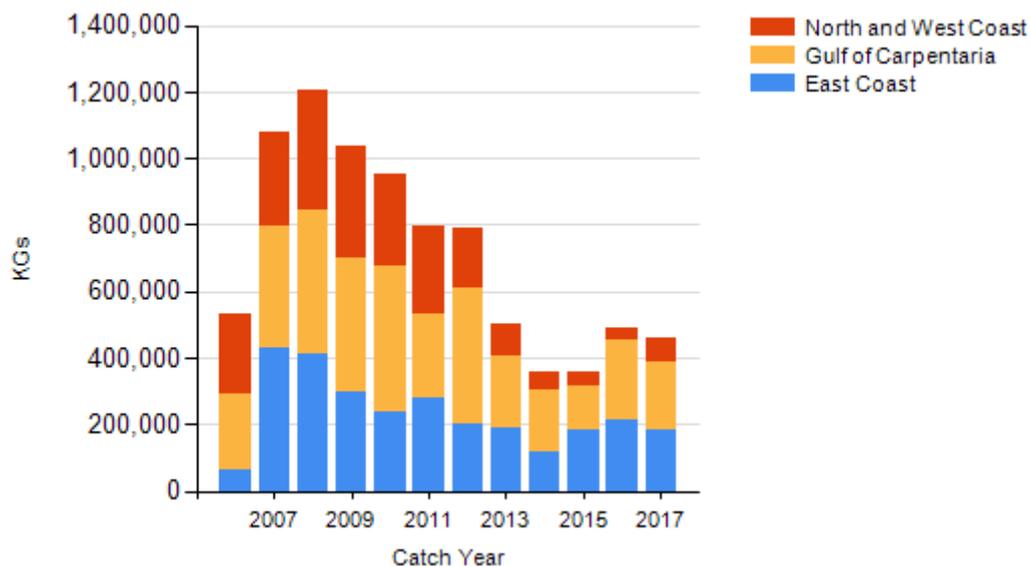
Queensland – Indigenous (Management methods) In Queensland, under the *Fisheries Act 1994* (Qld), Indigenous fishers in Queensland are able to use prescribed traditional and non-commercial fishing apparatus in waters open to fishing. Size and possession limits, and seasonal closures do not apply to Indigenous fishers. Further exemptions to fishery regulations may be applied for through permits.

New South Wales – Indigenous (Management methods) (a) Aboriginal Cultural Fishing Interim Access Arrangement—allows an Indigenous fisher in New South Wales to take in excess of a recreational bag limit in certain circumstances; for example, if they are doing so to

provide fish to other community members who cannot harvest for themselves; (b) The Aboriginal cultural fishing authority is the authority that Indigenous persons can apply to take catches outside the recreational limits under the *Fisheries Management Act 1994* (NSW), Section 37 (1d) (3)(9), Aboriginal cultural fishing authority; and (c) In cases where the *Native Title Act 1993* (Cth) applies fishing activity can be undertaken by the person holding native title in line with S.211 of that Act, which provides for fishing activities for the purpose of satisfying their personal, domestic or non-commercial communal needs. In managing the resource where native title has been formally recognised, the native title holders are engaged with to ensure their native title rights are respected and inform management of the State's fisheries resources.

New South Wales commercial fisheries with less than seven active fishers are not presented due to the Privacy Act.

CATCH CHART



Commercial catch of BLACKTIP SHARKS - note confidential catch not shown

EFFECTS OF FISHING ON THE MARINE ENVIRONMENT

ENVIRONMENTAL EFFECTS on BLACKTIP SHARKS

References	
122	Ovenden, JR, Street, R, Broderick, D, Kashiwagi, T and Salini, J 2007, Genetic population structure of Black-tip Sharks (<i>Carcharhinus tilstoni</i> and <i>C. sorrah</i>) in northern Australia, in J Salini, R McAuley, S Blaber, RC Buckworth, J Chidlow, N Gribble, JR Ovenden, S Peverell, R Pillans, JD Stevens, I Stobutzki, C Tarca and TI Walker (eds), Northern Australian sharks and rays: the sustainability of target and bycatch species, phase 2, Fisheries Research and Development Corporation, Cleveland, Queensland.
123	Harry, AV 2011, Life histories of commercially important tropical sharks from the Great Barrier Reef World Heritage Area, PhD thesis, James Cook University, Townsville.
124	Johnson, G.J, Buckworth, RC, Lee, H, Morgan, J AT, Ovenden, JR and McMahon, CR 2017, A novel field method to distinguish between cryptic carcharhinid sharks, Australian blacktip shark <i>Carcharhinus tilstoni</i> and common blacktip shark <i>C. limbatus</i> , despite the presence of hybrids. <i>Journal of Fish Biology</i> , 90, 1, 39–60.
125	Morgan, JA, Harry, AV, Welch, DJ, Street, R, White, J, Geraghty, PT, Macbeth, WG, Tobin, A, Simpfendorfer, CA and Ovenden, JR 2011, Detection of interspecies hybridisation in Chondrichthyes: hybrids and hybrid offspring between Australian (<i>Carcharhinus tilstoni</i>) and common (<i>C. limbatus</i>) Blacktip Shark found in an Australian fishery. <i>Conservation Genetics</i> , 13: 455–463.
126	Harry, AV, Morgan, JAT, Ovenden, JR, Tobin, A, Welch, DJ and Simpfendorfer, C 2012, Comparison of the reproductive ecology of two sympatric Blacktip Sharks (<i>Carcharhinus limbatus</i> and <i>Carcharhinus tilstoni</i>) off north-eastern Australia with species identification inferred from vertebral counts. <i>Journal of Fish Biology</i> , 81: 1225–1233.

STATUS OF AUSTRALIAN FISH STOCKS REPORT
BLACKTIP SHARKS (2018)

127	Grubert, MA, Saunders, TM, Martin, JM, Lee, HS and Walters, CJ 2013, Stock assessments of selected Northern Territory fishes, Fishery report 110, Northern Territory Government, Darwin.
128	Bradshaw, CJA, Field, IC, McMahon, CR, Johnson, GJ, Meekan, MG and Buckworth, RC 2013, More analytical bite in estimating targets for shark harvest. <i>Marine Ecology Progress Series</i> , 488: 221–232.
129	Northern Territory Government (NTG) 2017, Status of key Northern Territory fish stocks report 2015, Fishery report 118, Department of Primary Industry and Fisheries, Darwin.
130	Molony, B, McAuley, R and Rowland, F 2013, Northern shark fisheries status report: Statistics only, in WJ Fletcher and K Santoro (eds), <i>Status Reports of the Fisheries and Aquatic Resources of Western Australia 2012/13: The State of the Fisheries</i> , Western Australian Department of Fisheries, Perth, 216–217.
131	Queensland Department of Agriculture and Fisheries (QDAF) 2018, <i>Qfish</i> , State of Queensland, Department of Agriculture and Fisheries, Brisbane.
132	Leigh, GM, 2015, Stock assessment of whaler and hammerhead sharks (Carcharhinidae and Sphyrinidae) in Queensland, <i>Agri-Science Queensland</i> , Department of Agriculture and Fisheries, Brisbane.
133	Macbeth, WG, Butcher, PA, Collins, D, McGrath, SP, Provost, SC, Bowling, AC, Geraghty, PT and Peddemors, VM 2018, Improving reliability of species identification and logbook catch reporting by commercial fishers in an Australian demersal shark longline fishery. <i>Fisheries Management and Ecology</i> , 25: 186-202.
134	Harry, AV, Tobin, AJ, Simpfendorfer, CA, Welch, DJ, Mapleston, A, White, J, Williams, AJ and Stapley, J 2011, Evaluating catch and mitigating risk in a multispecies, tropical, inshore shark fishery within the Great Barrier Reef World Heritage Area. <i>Marine and Freshwater Research</i> 62:710–721.
135	Macbeth, WG, Geraghty, PT, Peddemors, VM, and Gray, CA 2009, Observer-based study of targeted commercial fishing for large shark species in waters of New South Wales, <i>Industry and Investment New South Wales. Fisheries Final Report Series 82</i> .
136	Last, PR and Stevens, JD 2009, <i>Sharks and rays of Australia</i> , CSIRO Publishing, Collingwood.
137	Ryan K, Hall N, Lai E, Smallwood C, Taylor S, Wise B. 2017. Statewide survey of boat-based recreational fishing in Western Australia 2015/16. <i>Fisheries Research Report No. 287</i> , Department of Primary Industries and Regional Development, Western Australia.