Golden Snapper (2018)

Lutjanus johnii

Shane Penny: Department of Primary Industry and Resources, Northern Territory, **Amanda Dawson**: Department of Agriculture and Fisheries, Queensland, **Fabian Trinnie**: Department of Primary Industries and Regional Development, Western Australia, **Stephen Newman**: Department of Primary Industries and Regional Development, Western Australia

STOCK STATUS OVERVIEW

Jurisdiction	Stock	Fisheries	Stock status	Indicators
Western Australia	Western Australia	GDSMF, GDSMF || NDSMF || PFTIMF || PTMF || WL (NC, GC, WC), NDSMF, PFTIMF, PTMF, WL (NC || GC || WC)	Sustainable	Catch, indicator species status
Northern Territory	Darwin Region	CLF, CNF, DF, ONLF	Depleted	Catch, biomass, egg production
Northern Territory	Regional Northern Territory	ACL, CLF, DF, ONLF, TRF	Undefined	Catch
Queensland	East Coast	ECIFFF	Undefined	Catch
Queensland	Gulf of Carpentaria	GOCDFFTF, GOCLF	Sustainable	Catch, standardised CPUE

CLF Coastal Line Fishery (NT), DF Demersal Fishery (NT), ONLF Offshore Net and Line Fishery (NT), TRF Timor Reef Fishery (NT), ECIFFF East Coast Inshore Fin Fish Fishery (QLD), GOCDFFTF Gulf of Carpentaria Developmental Fin Fish Trawl Fishery (QLD), GOCLF Gulf of Carpentaria Line Fishery (QLD), GDSMF Gascoyne Demersal Scalefish Managed Fishery (WA), NDSMF Northern Demersal Scalefish Managed Fishery (WA), PFTIMF Pilbara Fish Trawl (Interim) Managed Fishery (WA), PTMF Pilbara Trap Managed Fishery (WA), ACL Aboriginal Coastal License (NT), CNF Coastal Net Fishery (NT), WL (NC || GC || WC) Open Access in the North Coast, Gascoyne Coast and West Coast Bioregions (WA), GDSMF || NDSMF || PFTIMF || PTMF || WL (NC, GC, WC) Various Fisheries combined due to 3 boat rule (WA)

STOCK STRUCTURE

Golden Snapper is a moderately long-lived (i.e. 30 years), late-maturing species that can reach a length of one metre [Cappo et al. 2013]. They are broadly distributed throughout the tropical and sub-tropical Indo-West Pacific and exhibit a biphasic life history pattern, where juveniles spend several years in estuarine and inshore reef habitats before migrating offshore (to a depth of at least 80 m) as they near sexual maturity [Allen 1985, Kiso and Mahyam, 2003, Tanaka et

al. 2011].

The distribution of this species within Australian waters extends from the Kimberley region in Western Australia, around the north of the continent to the southern Great Barrier Reef (around Rockhampton) [Travers et al. 2009]. A study of the stock structure of Golden Snapper across this range suggests that many adult populations may exist at a scale of tens of kilometres, although boundaries are unknown [Saunders et al. 2016].

Golden Snapper experience moderate to high harvest rates in some Australian fisheries (particularly those targeting adults of this late-maturing species) which can cause localised depletion. However, it is extremely difficult to collect relevant biological and catch-and-effort information to assess each adult population unit. There are known differences between the concentrated fishing effort around Darwin and the more diffuse effort in other surrounding areas of the Northern Territory, as such, the species is assessed and managed in different management units in the Northern Territory.

Here, assessment of stock status is presented at the jurisdictional level—Western Australia; and the management unit level—Darwin Region, and Regional Northern Territory (Northern Territory); Gulf of Carpentaria, East Coast (Queensland).

STOCK STATUS

Darwin Region

Golden Snapper are harvested by commercial and recreational sectors across most of the Northern Territory, with more than 90 per cent of the total catch occurring within the Greater Darwin Region (i.e. within a radius of approximately 150 km of this population centre). The Greater Darwin Region is therefore assessed as a distinct management unit from the rest of the Northern Territory. Within this region, Golden Snapper are a target species for recreational anglers contributing over 70 per cent of the total harvest, 18 per cent from Fishing Tour Operators and 5 per cent predominantly from the Coastal Line Fishery. No estimates of the Indigenous harvest of Golden Snapper are available for the Northern Territory. For the purpose of this assessment, only commercial logbooks and recreational data from the Greater Darwin Region have been used.

The most recent assessment [NTG 2018 unpublished] was an update of the 2014 Stock Reduction Analysis model [Grubert et al. 2013] including data up to and including 2017. The results indicate that the Greater Darwin Region remains overfished in 2017 (99 per cent probability) and existing fishing pressure is likely to maintain the level of overfishing. It estimated that biomass and egg production were 29 per cent and 23 per cent, respectively of the unfished biomass (1973), indicating this stock is recruitment overfished despite the improvements. Given the recent information on the stock structure of this species [Saunders et al. 2016], it is likely that the assessment incorporates several populations. As the model is driven by the populations that receive the highest harvest rates in the Northern Territory the assigned status can be assumed to be representative of these heavily fished areas, with other less accessible areas being more lightly-fished. The above evidence indicates that the stock is likely to be depleted and that recruitment is likely to be impaired.

In the Darwin area, abundance, catch and catch rate have substantially declined over the past 10 years [NTG 2017]. The fisheries accessing these exploited stocks operate inshore and include the Coastal Line Fishery, the Barramundi Fishery, Fishing Tour Operators and recreational fishers. Catch limits and area closures were implemented in 2015 to reduce harvest by an estimated 50 per cent to allow for the biomass of Golden Snapper stocks to recover [Grubert et al. 2013]. However, it is unlikely the measures introduced in 2015 will have allowed significant recovery of the species given their relatively slow growth. Furthermore, the results of the stock assessment indicate the stock continues to be overfished and the harvest rate is expected to prevent the stock from recovering from its recruitment impaired state. This is despite some above average recruitment events which have allowed stocks to increase. This level of fishing mortality is expected to prevent the stock from recovering from its

recruitment impaired state.

On the basis of the evidence provided above, Golden Snapper in the Darwin Region (Northern Territory) management unit is classified as a **depleted stock**.

East Coast

Golden Snapper off the Queensland east coast is mainly harvested by the recreational sector, and no stock assessment has been undertaken to estimate current biomass in relation to unfished biomass in this management unit. Estimated recreational landed catch remained stable between 2000 (around 31 t) and 2010 (around 33 t), but then declined to around 13 t in 2013–14 [Webley et al. 2015]. According to the 2013–14 recreational angler survey, two-thirds of recreationally caught fish were released [Webley et al. 2015]. However, given that this species suffers substantial post-release mortality from barotrauma [Welch et al. 2014], the total fishing mortality by this sector is likely to be higher than indicated by landed catch. The Indigenous harvest of this management unit is unknown.

The species is taken as minor byproduct in the East Coast Inshore Fin Fish Fishery (Queensland), predominantly by set mesh net. Annual commercial catches increased from less than one tonne per year from 2000–08 to a peak of 10 t in 2011. Catches from 2012 declined from this peak, and in 2017 the catch was around 9 t. There is insufficient information available to confidently classify the status of this stock.

On the basis of the evidence provided above, the East Coast (Queensland) management unit is classified as an **undefined stock**.

Gulf of Carpentaria

In the Gulf of Carpentaria management unit, Golden Snapper is mainly harvested by the commercial sector. There is no reliable estimate of recreational harvest. Harvest from the adjacent Northern Territory jurisdiction has been low in recent years.

Queensland commercial catches remained stable at 20–35 t annually over the decade to 2011, with most fish taken by the Gulf of Carpentaria Developmental Fin Fish Trawl Fishery (Queensland) (GOCDFFTF). Fish trawl effort in the Gulf of Carpentaria declined markedly from 2012–14 as a result of trawl effort being transferred to areas in the Northern Territory (outside the Gulf) for commercial reasons. In 2017, there was no catch in the trawl sector and line catch was less than one tonne.

Standardised catch rates (calculated to 2009) in the trawl fishery showed declines after 2006 to around half the long-term average [O'Neill et al 2011]. Observer surveys over the period 2004–06 also showed that most Golden Snapper caught in the GOCDFFTF were smaller than the size at maturity [unpublished data]. However, the maximum sustainable yield for the species in the eastern part of the Gulf of Carpentaria was estimated at approximately 61 t [Leigh and O'Neill 2016] and catch has never exceeded half this level. The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired. Furthermore, the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the Gulf of Carpentaria (Queensland) management unit is classified as a **sustainable stock**.

Regional Northern Territory

Regional Northern Territory Region encompasses all waters outside of approximately 150 km from Darwin. There are populations of Golden Snapper in waters off Arnhem Land, the Gulf of Carpentaria and offshore of population centers in the Northern Territory that are unlikely to be overfished because they have been subject to low fishing pressure [Saunders et al. 2016]. Less than 10 per cent of the total harvest of Golden Snapper in the Northern Territory occurs

outside of the Greater Darwin Region, of which Recreational anglers contribute nearly 90 per cent of the total catch of Golden Snapper. Less the 6 per cent of the total harvest is attributed to Fishing Tour Operators and Commercial Fisheries. No estimates of the Indigenous harvest of Golden Snapper are available for the Northern Territory. There is insufficient information available to confidently classify the status of this stock.

On the basis of the evidence provided above, Golden Snapper in the Regional Northern Territory management unit is classified as an **undefined stock**.

Western Australia

Golden Snapper are not a target species in the demersal fisheries of Western Australia but are landed in small quantities as byproduct. The total commercial catch of Golden Snapper in Western Australian demersal fisheries in 2017 was 1.4 tonnes (t). Golden Snapper are also landed by recreational (~3 t) and charter fishers (~4.5 t), primarily in the Kimberley region of Western Australia. The catch of recreational and charter fishers is greater than the commercial catch of this species. The low catches of Golden Snapper in Western Australia are derived from a limited area compared to the distribution of the species. The above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

Furthermore, Barramundi has been classified as a sustainable stock in the Kimberley Gillnet and Barramundi Managed Fishery (Western Australia) management unit [Newman at al. 2018a]. Barramundi is an indicator species [Newman at al. 2018b] for the North Coast Nearshore and Estuarine Resource (i.e. the aquatic resources in the nearshore and estuarine ecological suite as defined for the purposes of fisheries management). Given the sustainable status of Barramundi as an indicator species, there is a low level of risk to the biological sustainability all species harvested in the North Coast Nearshore and Estuarine Resource. The above evidence indicates that the biomass of Golden Snapper in Western Australia unlikely to be depleted and that recruitment is unlikely to be impaired.

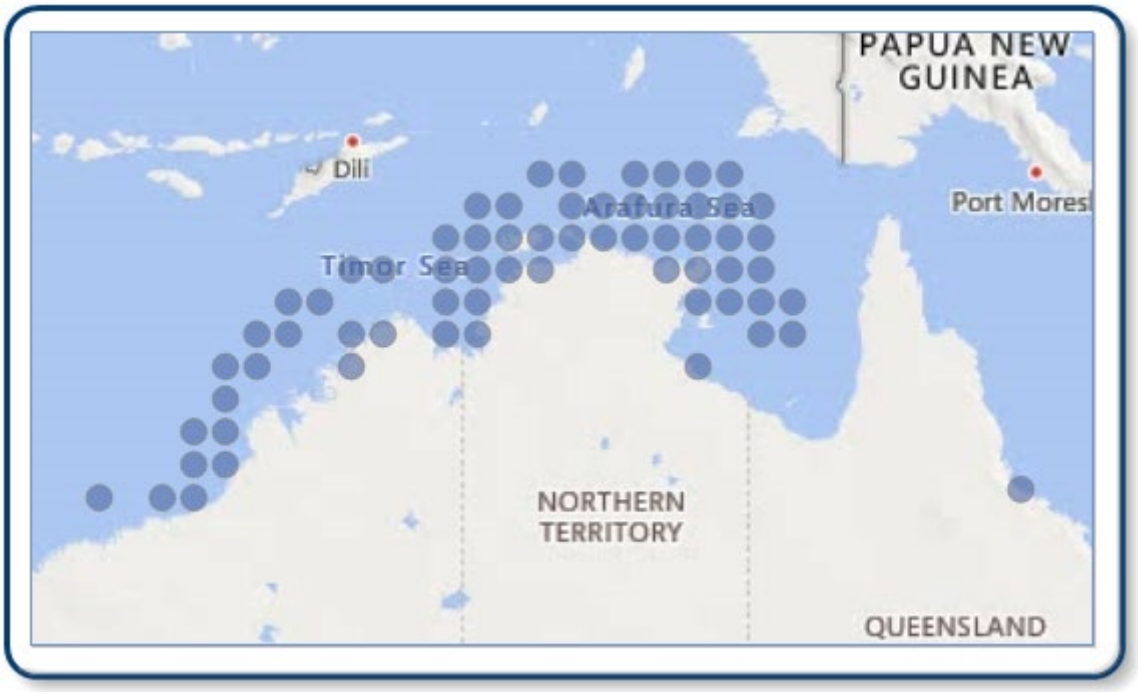
On the basis of the evidence provided above, Golden Snapper in Western Australia is classified as a **sustainable stock**.

BIOLOGY

Golden Snapper biology [Cappo et al. 2013, Hay et al. 2005, Welch et al. 2014]

Species	Longevity / Maximum Size	Maturity (50 per cent)
Golden Snapper	30 years, 990 mm FL, 15 kg	Varies by location and sex: Males 4–9 years and ~400–600 mm FL, Females 6–10 years and 400–650 mm FL

DISTRIBUTION



Distribution of reported commercial catch of Golden Snapper

TABLES

Commercial Catch Methods	Northern Territory	Queensland	Western Australia
Beach Seine	✓		
Demersal Longline	✓		
Dropline	✓		
Fish Trap	✓		✓
Gillnet			✓
Hand Line, Hand Reel or Powered Reels			✓
Hook and Line	✓	✓	
Net		✓	
Otter Trawl	✓		✓
Pelagic Gillnet	✓		
Trawl		✓	
Unspecified			✓

Fishing methods			
	Northern Territory	Queensland	Western Australia
Charter			
Hook and Line			✓
Commercial			
Beach Seine	✓		
Demersal Longline	✓		

Fish Trap	✓		✓
Hand Line, Hand Reel or Powered Reels			✓
Hook and Line	✓	✓	
Net		✓	
Otter Trawl	✓		✓
Pelagic Gillnet	✓		
Trawl		✓	
Unspecified			✓
Indigenous			
Hook and Line	✓		✓
Recreational			
Hook and Line	✓	✓	
Spearfishing	✓	✓	✓
Unspecified	✓		

Management Methods			
	Northern Territory	Queensland	Western Australia
Charter			
Bag and possession limits	✓		
Bag limits			✓
Gear restrictions		✓	✓
Licence			✓
Limited entry	✓		✓
Passenger restrictions			✓
Possession limit		✓	✓
Size limit		✓	✓
Spatial closures	✓	✓	✓
Spatial zoning			✓
Vessel limits	✓		
Commercial			
Effort limits			✓
Gear restrictions	✓	✓	✓
Limited entry	✓	✓	✓
Size limit		✓	
Spatial	✓	✓	✓

closures			
Spatial zoning			✓
Total allowable catch	✓	✓	✓
Total allowable effort			✓
Vessel restrictions	✓	✓	✓
Indigenous			
Laws of general application	✓		✓
Recreational			
Bag limits			✓
Gear restrictions	✓	✓	✓
Licence	✓		
Licence (Recreational Fishing from Boat License)			✓
Limited entry	✓		
Passenger restrictions	✓		
Possession limit	✓	✓	✓
Size limit		✓	✓
Spatial closures	✓	✓	✓

Active Vessels			
	Northern Territory	**Queensland**	**Western Australia**
	14 LICENCES in CLF, 8 LICENCES in DF, 7 LICENCES in ONLF, 5 LICENCES in TRF, 12 LICENCES in ACL, 3 LICENCES in CNF,	37 in ECIFFF, 0 in GOCDFFTF, 2 in GOCLF,	<3 in GDSMF, <3 in PFTIMF, <3 in PTMF, 34 in Charter, <3 in WL (NC || GC || WC), 4 in NDSF,

CLF Coastal Line Fishery(NT)

DF Demersal Fishery(NT)

ONLF Offshore Net and Line Fishery(NT)

TRF Timor Reef Fishery(NT)

ECIFFF East Coast Inshore Fin Fish Fishery(QLD)

GOCDFFTF Gulf of Carpentaria Developmental Fin Fish Trawl Fishery(QLD)

GOCLF Gulf of Carpentaria Line Fishery (QLD)

GDSMF Gascoyne Demersal Scalefish Managed Fishery(WA)

PFTIMF Pilbara Fish Trawl (Interim) Managed Fishery(WA)

PTMF Pilbara Trap Managed Fishery(WA)

ACL Aboriginal Coastal License(NT)

CNF Coastal Net Fishery(NT)

Charter Tour Operator(WA)

WL (NC || GC || WC) Open Access in the North Coast, Gascoyne Coast and West Coast Bioregions(WA)

NDSF Northern Demersal Scalefish Fishery(WA)

Catch			
	Northern Territory	Queensland	Western Australia
Charter	18.6 t in FTO	0.8 t	4.52 t
Commercial	0.0013t in ACL, 0.772236t in CLF, 0.166t in CNF, 32.6793t in DF, 0.9767t in ONLF, 1.03365t in TRF,	9.295t in ECIFFF, 0t in GOCDFFTF, 0.172t in GOCLF,	1.4237t in GDSMF || NDSMF || PFTIMF || PTMF || WL (NC, GC, WC),
Indigenous	Unknown	Unknown	Unknown
Recreational	19.42 t (unpublished 2014, Darwin Region)	6 000 fish (in 2013–14)	2.97 t

CLF Coastal Line Fishery (NT), DF Demersal Fishery (NT), ONLF Offshore Net and Line Fishery (NT), TRF Timor Reef Fishery (NT), ECIFFF East Coast Inshore Fin Fish Fishery (QLD), GOCDFFTF Gulf of Carpentaria Developmental Fin Fish Trawl Fishery (QLD), GOCLF Gulf of Carpentaria Line Fishery (QLD), GDSMF Gascoyne Demersal Scalefish Managed Fishery (WA), NDSMF Northern Demersal Scalefish Managed Fishery (WA), PFTIMF Pilbara Fish Trawl (Interim) Managed Fishery (WA), PTMF Pilbara Trap Managed Fishery (WA), ACL Aboriginal Coastal License (NT), CNF Coastal Net Fishery (NT), WL (NC || GC || WC) Open Access in the North Coast, Gascoyne Coast and West Coast Bioregions (WA), GDSMF || NDSMF || PFTIMF || PTMF || WL (NC, GC, WC) Various Fisheries combined due to 3 boat rule (WA),

Western Australia – Active Vessels Data is unreportable as there were fewer than three vessels operating in the PFTIMF, PTMF and WL.

Western Australia – Recreational (management methods) A Recreational Fishing from Boat License is required for the use of a powered boat to fish or to transport catch or fishing gear to or from a land-based fishing location.

Western Australia – Recreational (Catch) Boat-based recreational catch is from 1 September 2015–31 August 2016. These data are derived from those reported in Ryan et al. 2017.

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 – 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.

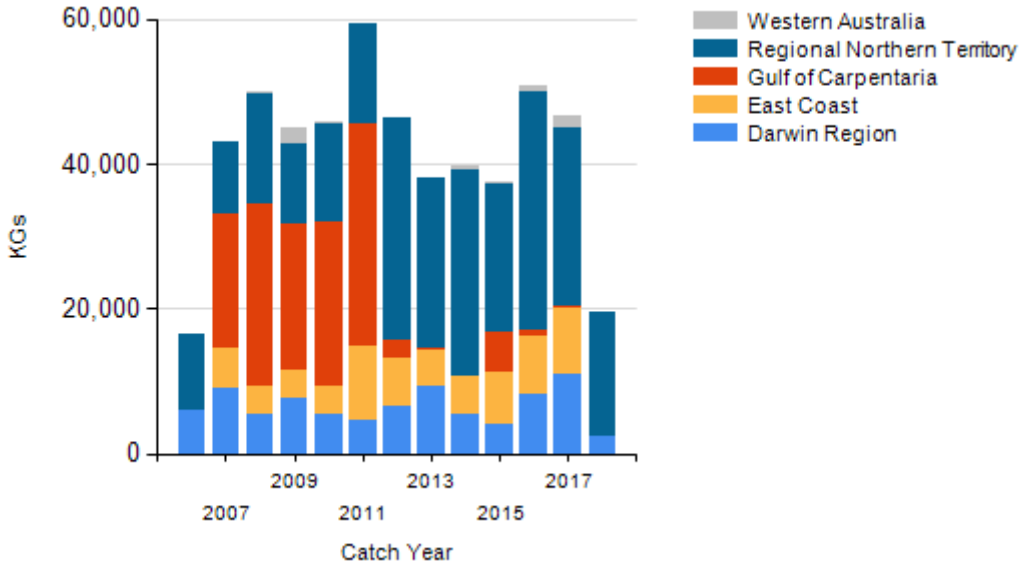
Northern Territory – Indigenous (management methods) The *Fisheries Act 1988* (NT), specifies that "…without derogating from any other law in force in the Territory, nothing in a provision of this Act or an instrument of a judicial or administrative character made under it

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".

Queensland – Commercial (fishing methods) In Queensland, Golden Snapper is trawled in only one of the Queensland fisheries in which it is caught commercially - the Gulf of Carpentaria Developmental Fin Fish Trawl Fishery. **Queensland – Commercial (catch)** East Coast Inshore Fin Fish Fishery (Queensland) catch is reported by financial year.

Queensland – Indigenous (fishing 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.

CATCH CHART



Commercial catch of Golden Snapper - note confidential catch not shown

EFFECTS OF FISHING ON THE MARINE ENVIRONMENT

ENVIRONMENTAL EFFECTS on Golden Snapper

References

1607	Allen, GR 1985, FAO species catalogue, volume 6, snappers of the world. FAO Fisheries Synopsis 125.
1608	Cappo, M, Marriott, RJ and Newman, SJ 2013, James's rule and causes and consequences of a latitudinal cline in the demography of John's Snapper (Lutjanus johnii) in coastal waters of Australia, Fishery Bulletin, 111(4): 309–324.
1609	Grubert, MA, Saunders, TM, Martin, JM, Lee, HS and Walters, CJ 2013, Stock assessments of selected Northern Territory fishes, Fishery report 110, Northern Territory Department of Primary Industries and Fisheries, Darwin.
1610	Hay, T, Knuckey, I, Calogeras, C and Errity, C 2005, Population and biology of the Golden Snapper, Fishery report 21, Northern Territory Government, Darwin.
1611	Kiso, K and MI Mahyam 2003, Distribution and feeding habits of juvenile and young John's snapper Lutjanus johnii in the Matang mangrove estuary, west coast of Peninsular Malaysia. Fisheries Science, 69: 563–568.
1612	Leigh, GM and O'Neill, MF 2016, Gulf of Carpentaria Finfish Trawl Fishery: Maximum Sustainable Yield, Agri-Science Queensland, Department of Agriculture and Fisheries, Queensland.

1613	Newman, SJ, Wakefield, C, Skepper, C, Boddington, D, Jones, R and Smith, E 2018, North Coast Demersal Resource Status Report 2017. pp. 127-133. In: Gaughan, D.J. and Santoro, K. (eds.). Status Reports of the Fisheries and Aquatic Resources of Western Australia 2016/17: The State of the Fisheries. Department of Primary Industries and Regional Development, Western Australia, Perth, Australia. 237p.
1614	Newman, SJ, Brown, JI, Fairclough, DV, Wise, BS, Bellchambers, LM, Molony, BW, Lenanton, RCJ, Jackson, G, Smith, KA, Gaughan, DJ, Fletcher, WJ, McAuley, RB and Wakefield, CB 2018, A risk assessment and prioritisation approach to the selection of indicator species for the assessment of multi-species, multi-gear, multi-sector fishery resources. Marine Policy 88: 11–22.
1615	Northern Territory Government (NTG) 2017, Status of key Northern Territory Fish Stocks Report 2015, Northern Territory Government Department of Resources, fishery report 118.
1616	O'Neill, MF, Leigh, GM, Martin, JM, Newman, SJ, Chambers, M, Dichmont, CM and Buckworth, RC 2011, Sustaining productivity of tropical Red Snappers using new monitoring and reference points, Fisheries Research and Development Corporation project 2009/037, Queensland Department of Employment, Economic Development and Innovation, Brisbane.
1617	Ryan, KL, Hall, NG, Lai, EK, Smallwood, CB, Taylor, SM, Wise, BS 2017, Statewide survey of boat-based recreational fishing in Western Australia 2015/16. Fisheries research Report No. 287. Department of Primary Industries and Regional Development, Government of Western Australia, Perth.
1618	Saunders, TM, Welch, D, Barton, D, Crook, D, Dudgeon, C, Hearnden, M, Maher, S, Ovenden, J, Taillebois, L and Taylor J 2016, Optimising the management of tropical coastal reef fish through the development of Indigenous capability. FRDC final report 2013/017.
1619	Tanaka, K, Hanamura, Y, Chong, VC, Watanabe, S, Man, A, Kassim, FM, Kodama, M and Ichikawa, T 2011, Stable isotope analysis reveals ontogenetic migration and the importance of a large mangrove estuary as a feeding ground for juvenile John's snapper Lutjanus johnii. Fisheries Science 77: 809–816.
1620	Travers, MJ, Potter, IC, Clarke, KR, Newman, SJ and Hutchins, JB 2009, The inshore fish faunas over soft substrates and reefs on the tropical west coast of Australia differ and change with latitude and bioregion. Journal of Biogeography, 37: 148–169.
1621	Webley, J, McInnes, K, Teixeira, D, Lawson, A and Quinn, R 2015, Statewide Recreational Fishing Survey 2013-14, Queensland Department of Agriculture and Fisheries, Brisbane.
1622	Welch, DJ, Robins, J, Saunders, T, Courtney, T, Harry, A, Lawson, E, Moore, BR, Tobin, A, Turnbull, C, Vance, D and Williams, AJ 2014, Implications of climate change impacts on fisheries resources of northern Australia, part 2: Species profiles, final report to the Fisheries Research and Development Corporation, project 2010/565, James Cook University, Townsville.