

CORAL TROUTS (2018)

Plectropomus spp. & Variola spp.



Pia Bessell-Browne: Department of Agriculture and Fisheries, Queensland, **Ashley Williams:** Australian Bureau of Agricultural and Resource Economics and Sciences, **Thor Saunders:** Department of Primary Industry and Resources, Northern Territory, **Stephen Newman:** Department of Primary Industries and Regional Development, Western Australia

STOCK STATUS OVERVIEW

Jurisdiction	Stock	Fisheries	Stock status	Indicators
Commonwealth	Torres Strait Finfish Fishery	TSFF	Sustainable	Management strategy evaluation
Western Australia	Western Australia	GDSMF, GDSMF NDSMF PFTIMF PLF PTMF WCDGDLIMF WCDSIMF, NDSMF, PFTIMF, PLF, PTMF, WCDGDLIMF, WCDSIMF	Sustainable	Catch, indicator species status
Northern Territory	Northern Territory	ACL, CLF, DF, TRF	Sustainable	Catch, SAFE assessment
Queensland	Coral Reef Fin Fish Fishery	CRFFF	Sustainable	Quantitative Stock Assessment, standardised catch rate, catch
Queensland	Gulf of Carpentaria	GOCDFFTF, GOCDFFTF GOCLF	Undefined	Catch

TSFF Torres Strait Finfish Fishery (CTH), CLF Coastal Line Fishery (NT), DF Demersal Fishery (NT), TRF Timor Reef Fishery (NT), LFR Line Fishery (Reef) (QLD), GOCDFFTF Gulf of Carpentaria Developmental Fin Fish Trawl Fishery (QLD), GDSMF Gascoyne Demersal Scalefish Managed Fishery (WA), NDSMF Northern Demersal Scalefish Managed Fishery (WA), PFTIMF Pilbara Fish Trawl (Interim) Managed Fishery (WA), PLF Pilbara Line Fishery (WA), PTMF Pilbara Trap Managed Fishery (WA), WCDGDLIMF West Coast Demersal Gillnet and Demersal Longline (Interim) Managed Fishery (WA), WCDSIMF West Coast Demersal Scalefish (Interim) Managed Fishery (WA), ACL Aboriginal Coastal License (NT), GDSMF || NDSMF || PFTIMF || PLF || PTMF || WCDGDLIMF || WCDSIMF Various Fisheries combined due to 3 boat rule (WA), GOCDFFTF || GOCLF Gulf of Carpentaria Developmental Fin Fish Trawl Fishery || Gulf of Carpentaria Line Fishery (QLD)

STOCK STRUCTURE

The Coral Trout species complex, part of the family Epinephelidae, is found throughout Australia and is comprised of: Common Coral Trout (*Plectropomus leopardus*), Barcheek Coral Trout (*P. maculatus*), Bluespotted Coral Trout (*P. laevis*), Passionfruit Coral Trout (*P. areolatus*), Highfin Coral Trout (*P. oligocanthus*), Yellow-edge Coronation Trout (*Variola louti*) and White-edge Coronation Trout (*V. albimarginata*), with the Passionfruit Coral Trout not being found in the Northern Territory. The biological stock structures of these species are species-specific and spatially complex [Bergenius et al. 2005, Bergenius et al. 2006, van Herwerden et al. 2006, van Herwerden et al. 2009], and remain uncertain for some species.

Here, assessment of stock status for this multispecies group is presented at the management unit level—Torres Strait Finfish Fishery (Commonwealth); Coral Reef Fin Fish Fishery and Gulf of Carpentaria (Queensland); and at the jurisdictional level—Western Australia and Northern Territory.

STOCK STATUS

Coral Reef Fin Fish Fishery Common Coral Trout dominates catches in the Coral Reef Fin Fish Fishery (Queensland) [Leigh et al. 2014]. The most recent stock assessment of Common Coral Trout conducted in 2014 estimated that the biomass in 2012 was 60 per cent of the unfished (1962) level [Leigh et al. 2014]. Currently, catch levels are approximately 41 per cent of the estimated maximum sustainable yield (MSY) (2010 t), further providing evidence of the protection of stock biomass [Leigh et al. 2014]. Standardised catch rates have increased considerably in the past year, from a period of reduced catch rates that begun in 2009–10 [QDAF 2018]. Approximately 33 per cent of the Great Barrier Reef Marine Park is protected from fishing, providing additional protection to the biomass of this stock. The above evidence indicated that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired.

The 2014 stock assessment estimated that current catch levels are lower than the estimated MSY for the stock [Leigh et al. 2014]. In 2014, the total allowable commercial catch (TACC) was set at a maximum economic yield target of 60 per cent of unfished biomass, with the current TACC set at 917 t. Since 2014, there have been two mass coral bleaching events, two severe cyclones and crown of thorns outbreaks on the Great Barrier Reef (GBR) that have reduced coral cover throughout the GBR [AIMS 2018], reducing habitat and prey availability for Coral Trout [Pratchett et al. 2014, Rogers et al. 2018, Tobin et al. 2010]. Bleaching events can also influence Coral Trout growth rates [Hughes 2010], and spawning output [Johnson and Welsh 2010, Pratchett et al. 2013]. Loss of coral reef habitat and reductions in complexity have been found to result in reductions in fisheries productivity of approximately 35 per cent [Rogers et al. 2018]. Ongoing declines in coral cover may reduce the carrying capacity of GBR for Coral Trout species, which may influence the sustainability of this stock in the future. The above evidence indicates that the current level of fishing pressure is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the multispecies Coral Reef Fin Fish Fishery (Queensland) management unit is classified as a **sustainable stock**.

Gulf of Carpentaria Coral Trout is not a target species in Queensland-managed commercial fisheries in the Gulf of Carpentaria (GOC). They are taken as byproduct in the Developmental Fin Fish Trawl Fishery (Queensland) and Gulf of Carpentaria Line Fishery (Queensland), but only small catches are reported [QDAF 2018]. Coral Trout is a popular recreational species for GOC residents and visiting fishers who target reef fish, but estimates of the recreational catch are uncertain due to the small sample size. There is insufficient information available to confidently classify the status of this stock.

On the basis of the evidence provided above, the multispecies GOC

(Queensland) management unit is classified as an **undefined stock**.

Northern Territory

Only small catches are reported from the Fishing Tour Operator sector, Coastal Line Fishery, Demersal Fishery and Timor Reef Fishery. Because Coral Trout are only an incidental catch in these fisheries and are rarely caught by recreational fishers [West et al. 2012], a semi-quantitative sustainable assessment for fishing effects model [Zhou and Griffiths 2008] was used to assess the fishing mortality rate on this species, using data up to 2015. The model results indicated that there is a low risk of Coral Trout being overfished at current levels of harvest, as there is a very low overlap of the fisheries activity and the distribution of Coral Trout in Northern Territory waters. 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 pressure is unlikely to cause the stock to become recruitment impaired.

On the basis of the evidence provided above, the Coral Trout species group in the Northern Territory is classified as a **sustainable stock**.

Torres Strait Finfish Fishery

Annual commercial catches of Coral Trout in the Torres Strait Finfish Fishery (Commonwealth) (TSFF) have remained below 50 tonnes (t) since 2007. The Coral Trout stock in the TSFF has not been formally assessed, but a management strategy evaluation (MSE) was undertaken for the stock using catch data up to 2004 [Williams et al. 2007, Williams et al. 2011]. Four constant-catch scenarios, ranging from 80 to 170 t, were evaluated. The biomass in 2014 was estimated to be more than 60 per cent of assumed unfished level, and all catch scenarios achieved a biomass of at least 70 per cent of the unfished level, by 2025.

Although changes in the management and operation of the fishery since the MSE was completed may have diminished the relevance of the results for informing current management, the above evidence indicates that the biomass of this management unit stock is unlikely to be recruitment impaired [Marton et al. 2017]. The lower level of harvest in recent years is unlikely to cause the management unit to become recruitment impaired [Marton et al. 2017].

On the basis of the evidence provided above, the multispecies Torres Strait Finfish Fishery (Commonwealth) management unit is classified as a **sustainable stock**.

Western Australia

Coral Trout is not a target species in the demersal fisheries of Western Australia, but is landed as byproduct. Coral Trout are landed in many of the demersal fisheries of Western Australia. For example, they are a component of the Pilbara Trap Managed Fishery (PTMF), Pilbara Fish Trawl Interim Managed Fishery (PTIMF), Pilbara Line Fishery (PLF) and the Northern Demersal Scalefish Managed Fishery (NDSMF; in the Kimberley region of Western Australia). Coral Trout are therefore assessed on the basis of the status of several indicator species (for example, Red Emperor and Goldband Snapper in the Kimberley region) that represent the inshore demersal suite of species occurring at depths of 30–250 m [Newman et al. 2018a]. As outlined in the harvest strategy [DPIRD 2017], any management action is applied equally across all species in the demersal suite based on the status of the indicator species (e.g. increase or decrease in effort allocation). The major performance measures for these indicator species are estimates of spawning stock levels. The target level of spawning biomass is 40 per cent of the unfished level. The limit level is 30 per cent of the estimate of initial spawning biomass [DPIRD 2017]. As an example, indicator species assessments for Red Emperor, Rankin cod and Bluespotted Emperor in the Pilbara Demersal Scalefish Fisheries in 2015 (the year the last integrated assessment was undertaken), were estimated to be either above the target level or between the target and threshold level using an integrated age

structured model [Newman et al. 2018b]. Furthermore, the spawning biomass levels of the indicator species Red Emperor and Goldband Snapper were either greater than the target level or between the target level and the threshold level in the NDSMF in 2015 [Newman et al. 2018b]. The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired.

Only small catches of Barcheek Coral Trout and Common Coral Trout are reported, with very small catches of Yellow-edge Coronation Trout and White-edge Coronation Trout. The total commercial catch of all species within the Coral Trout complex in Western Australia in 2017 was 35.4 t. The catch of the Coral Trout complex in Western Australia has been low and stable for the past five years (2013–17), ranging from 15.4–35.4 t, with a mean annual catch of 21.9 t. The catches of Coral Trout are low and variable throughout their range in Western Australia. Coral Trout are landed by recreational and charter fishers [e.g. Ryan et al. 2017], with the total estimated recreational catch (~18 t; charter and recreational combined) being similar to the mean annual total landed commercial catch. Noting that in 2017, the commercial catch was approximately double that of the estimated total recreational catch. Given the low level of overall landings (~53 t) of all species of Coral Trout, across multiple fisheries in Western Australia, it is unlikely that any one species is recruitment overfished, or that the level of fishing mortality is likely to cause any species in the Coral Trout complex in Western Australia to become recruitment overfished. The above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

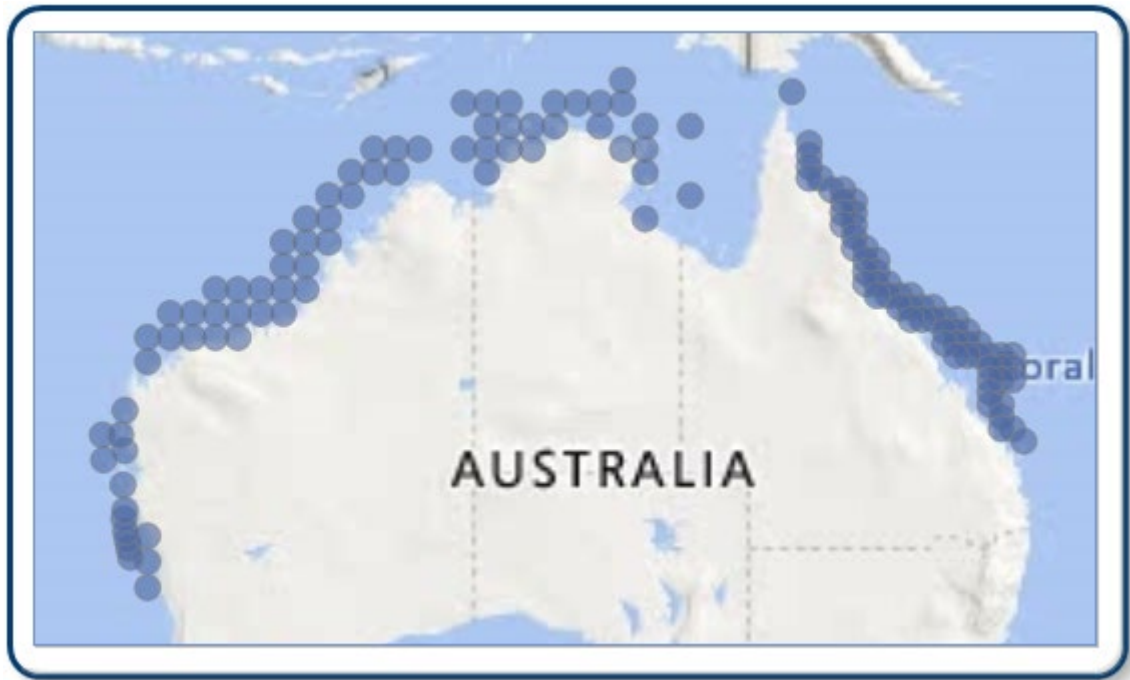
On the basis of the evidence provided above, the Coral Trout species group in Western Australia is classified as a **sustainable stock**.

BIOLOGY

Coral Trout biology [Ferreira 1995, Frisch et al. 2016, Heupel et al. 2010, Kailola et al. 1993, Mapleston et al. 2009, Mapstone 2004, Samoily 1997, Williams et al. 2008]

Species	Longevity / Maximum Size	Maturity (50 per cent)
CORAL TROUTS	Plectropomus leopardus: 17 years, ~650 mm FL P. maculatus: 13 years, ~650 mm FL P. laevis: 16 years, ~1 150 mm FL P. areolatus: 14 years, ~650 mm FL Variola louti: 7 years, ~520 mm FL V. albimarginata: 12 years, ~380 mm FL	All species are protogynous hermaphrodites (individuals are born female and later become male). Size at maturity and sex change also vary by location. P. leopardus: female ~280 mm FL, male ~500 mm FL P. maculatus: female ~300 mm FL, male ~440 mm FL P

DISTRIBUTION



Distribution of reported commercial catch of Coral Trout

TABLES

Commercial Catch Methods	Commonwealth	Northern Territory	Queensland	Western Australia
Beach Seine		✓		
Demersal Longline		✓		
Dropline		✓		✓
Fish Trap		✓		✓
Gillnet				✓
Hand Line, Hand Reel or Powered Reels				✓
Hook and Line		✓	✓	✓
Longline (Unspecified)				✓
N/A			✓	
Otter Trawl		✓		✓
Traps and Pots				✓
Trawl			✓	
Trolling		✓		✓
Unspecified	✓			✓

Fishing methods	Commonwealth	Northern Territory	Queensland	Western Australia
Commercial				
Beach Seine		✓		
Dropline				✓

Fish Trap		✓		✓
Gillnet				✓
Hand Line, Hand Reel or Powered Reels				✓
Hook and Line		✓	✓	✓
Otter Trawl		✓		✓
Trawl			✓	
Trolling				✓
Unspecified	✓			✓
Indigenous				
Hook and Line		✓	✓	✓
Spearfishing		✓	✓	✓
Recreational				
Hook and Line		✓	✓	✓
Spearfishing		✓	✓	✓
Unspecified		✓		
Management Methods				
	Commonwealth	Northern Territory	Queensland	Western Australia
Charter				
Gear restrictions			✓	✓
Licence				✓
Limited entry		✓		
Passenger restrictions		✓		
Possession limit			✓	✓
Spatial closures			✓	
Commercial				
Catch restrictions	✓		✓	✓
Gear restrictions	✓	✓	✓	✓
Limited entry	✓	✓	✓	✓
Size limit	✓		✓	✓
Spatial closures	✓	✓	✓	✓
Spatial zoning		✓		
Temporal closures				✓
Total allowable catch		✓		

Vessel restrictions	✓	✓	✓	✓
Indigenous				
Laws of general application				✓
Recreational				
Gear restrictions		✓	✓	✓
Licence (Recreational Fishing from Boat License)				✓
Possession limit		✓	✓	✓
Size limit				✓
Spatial closures		✓	✓	✓
Spatial zoning		✓		
Temporal closures				✓

Active Vessels	Northern Territory	Queensland	Tasmania	Western Australia
	14 LICENCES in CLF, 8 LICENCES in DF, 5 LICENCES in TRF, 12 LICENCES in ACL,	188 in CRFFF, 0 in GOCDFFTF,	2 Vessels in TSF,	6 in GDSMF,

CLF Coastal Line Fishery(NT)

DF Demersal Fishery(NT)

TRF Timor Reef Fishery(NT)

LFR Line Fishery (Reef)(QLD)

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

TSF Tasmanian Scallop Fishery(TAS)

GDSMF Gascoyne Demersal Scalefish Managed Fishery(WA)

ACL Aboriginal Coastal License(NT)

Catch	Commonwealth	Northern Territory	Queensland	Western Australia
Charter				4.78 t
Commercial	25.7494t in TSFF,	0.0055t in ACL, 0.335t in CLF, 0.3867t in DF, 2.861t in TRF,	849.705t in CRFFF, 0.117t in GOCDFFTF GOCLF,	35.4192t in GDSMF NDSMF PFTIMF PLF PTMF

				WCDGDLIMF WCDSIMF,
Indigenous	Unknown	Unknown	Unknown	Unknown
Recreational	Unknown	2.8 t (2010)	103 000 fish (~105 t) (2013)	13.06 t ± 1.42 t (S.E.)

TSFF Torres Strait Finfish Fishery (CTH), CLF Coastal Line Fishery (NT), DF Demersal Fishery (NT), TRF Timor Reef Fishery (NT), LFR Line Fishery (Reef) (QLD), GOCDFTF Gulf of Carpentaria Developmental Fin Fish Trawl Fishery (QLD), GDSMF Gascoyne Demersal Scalefish Managed Fishery (WA), NDSMF Northern Demersal Scalefish Managed Fishery (WA), PFTIMF Pilbara Fish Trawl (Interim) Managed Fishery (WA), PLF Pilbara Line Fishery (WA), PTMF Pilbara Trap Managed Fishery (WA), WCDGDLIMF West Coast Demersal Gillnet and Demersal Longline (Interim) Managed Fishery (WA), WCDSIMF West Coast Demersal Scalefish (Interim) Managed Fishery (WA), ACL Aboriginal Coastal License (NT), GDSMF || NDSMF || PFTIMF || PLF || PTMF || WCDGDLIMF || WCDSIMF Various Fisheries combined due to 3 boat rule (WA), GOCDFTF || GOCLF Gulf of Carpentaria Developmental Fin Fish Trawl Fishery || Gulf of Carpentaria Line Fishery (QLD),

Commonwealth Data Provided for the Commonwealth and Queensland align with the 2014–15 financial year.

Western Australia and Northern Territory Data provided for Western Australia and the Northern Territory align with the 2017 calendar year.

Commonwealth – Recreational The Australian Government does not manage recreational fishing in Commonwealth waters. Recreational fishing in Commonwealth waters is managed by the state or territory immediately adjacent to those waters, under its management regulations.

Commonwealth – Indigenous The Australian Government does not manage non-commercial Indigenous fishing in Commonwealth waters (with the exception of the Torres Strait). In general, non-commercial Indigenous fishing in Commonwealth waters is managed by the state or territory immediately adjacent to those waters. In the Torres Strait, both commercial and non-commercial Indigenous fishing is managed by the Torres Strait Protected Zone Joint Authority (PZJA) through the Australian Fisheries Management Authority (Commonwealth), the Department of Agriculture, Fisheries and Forestry (Queensland), and the Torres Strait Regional Authority. The PZJA also manages non-Indigenous commercial fishing in the Torres Strait.

Western Australia – Commercial (management methods) In Western Australia, different zones within fisheries may have different effort allocations.

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

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

Western Australia – Recreational (management methods) A Recreational Fishing from Boat Licence 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 – Indigenous 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.

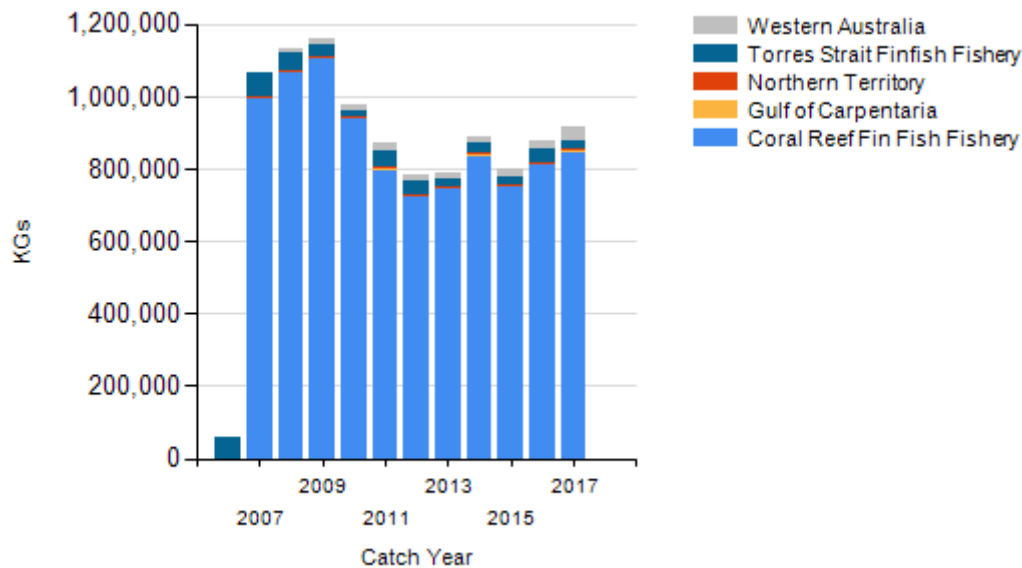
Northern Territory – Charter (management methods) In the Northern Territory, charter operators are regulated through the same management methods as the recreational sector but are subject to additional limits on license and passenger numbers.

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 – Indigenous (management methods) 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 Coral Trout - note confidential catch not shown

EFFECTS OF FISHING ON THE MARINE ENVIRONMENT

ENVIRONMENTAL EFFECTS on CORAL TROUTS

References	
1804	Frisch, AJ, Cameron, DS, Pratchett, MS, Williamson, DH, Williams, AJ, Reynolds, AD, Hoey, AS, Rizzari, JR, Evans, L, Kerrigan, B, Muldoon G, Welch, DJ and Hobbs, J-PA, 2016, Key aspects of the biology, fisheries and management of Coral grouper, <i>Reviews in Fish Biology and Fisheries</i> , 26: 303–325.
1805	Heupel, MR, Williams, AJ, Welch, DJ, Davies CR, Adams, S, Carlos, G and Mapstone, BD 2010, Demography of a large exploited grouper, <i>Plectropomus laevis</i> : Implications for fisheries management, <i>Marine and Freshwater Research</i> , 61: 184–195.
1806	Hughes, T 2010, Marine and Tropical Sciences Research Facility milestone report for program 2.5i.3, report to the Australian Government Department of the Environment, Water, Heritage and the Arts.
1807	Johnson, JE and Welch, DJ 2010, Marine fisheries management in a changing climate: a review of vulnerability and future options, <i>Reviews in Fisheries Science</i> , 18: 106–124.
1808	Kailola, PJ, Williams, MJ, Stewart, PC, Reichelt, RE, McNee, A and Grieve, C 1993, Australian fisheries resources, Bureau of Resource Sciences and Fisheries Research and Development Corporation, Canberra.
1799	Australian Institute of Marine Science 2018, Long-term Reef Monitoring Program – Annual summary report in coral reef condition for 2017–18
1800	Bergenius, MAJ, Mapstone, BD, Begg, GA and Murchie, CD 2005, The use of otolith chemistry to determine stock structure of three epinepheline serranid coral reef fishes on the Great Barrier Reef, Australia, <i>Fisheries Research</i> , 72: 253–270.
1801	Bergenius, MA, Begg, GA and Mapstone, BD 2006, The use of otolith morphology to indicate the stock structure of common Coral Trout (<i>Plectropomus leopardus</i>) on the Great Barrier Reef, Australia, <i>Fishery Bulletin</i> , 104: 498–511.
1802	DPIRD 2017, North Coast demersal scalefish resource harvest strategy 2017–2021. Version 1.0. Fisheries Management Paper No. 285. Department of Primary Industries and Regional Development, Government of Western Australia, Perth, Australia. 35p.
1803	Ferreira, BP 1995, Reproduction of the common Coral Trout <i>Plectropomus leopardus</i>

STATUS OF AUSTRALIAN FISH STOCKS REPORT
CORAL TROUTS (2018)

	(Serranidae: Epinephelinae) from the central and northern Great Barrier Reef, Australia, <i>Bulletin of Marine Science</i> , 56: 653–669.
1809	Leigh, GM, Campbell, AB, Lunow, CP and O'Neill, MF 2014, Stock assessment of the Queensland east coast common coral trout (<i>Plectropomus leopardus</i>) fishery, Queensland Department of Agriculture, Fisheries and Forestry, Brisbane.
1810	Mapleston, A, Currey, LM, Williams, AJ, Pears, R, Simpfendorfer, CA, Penny, AL, Tobin, A and Welch D 2009, Comparative biology of key inter-reefal serranid species on the Great Barrier Reef. Project Milestone Report to the Marine and Tropical Sciences Research Facility, Reef and Rainforest Research Centre Limited, Cairns, 55pp.
1811	Mapstone, BD 2004, The effects of line fishing on the Great Barrier Reef and evaluations of alternative potential management strategies, Technical report 54, CRC Reef Research Centre, CSIRO Marine Research and Fisheries Research and Development Corporation, Townsville.
1812	Marton, N, Williams, AJ and Mazur, K 2017, Torres Strait Finfish Fishery, in H Patterson, R Noriega, L Georgeson, J Larcombe and R Curtotti (eds), <i>Fishery status reports 2017</i> , Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra, 305–315
1813	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: DJ Gaughan and K Santoro, (eds.). <i>Status Reports of the Fisheries and Aquatic Resources of Western Australia 2016/17: The State of the Fisheries</i> . Department of Primary Industries and Regional Development, Western Australia, Perth, Australia. 237p.
1814	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. <i>Marine Policy</i> , 88: 11–22.
1815	Pratchett, MS, Messmer, V, Reynolds, A, Clark, TD, Munday, PL, Tobin, AJ and Hoey, AS 2013, Effects of climate change on reproduction, larval development, and adult health of coral trout (<i>Plectropomus</i> spp.), James Cook University, Townsville.
1816	Pratchett MS, Hoey AS, Wilson SK 2014, Reef degradation and the loss of critical ecosystem goods and serviced provided by coral reef fishes. <i>Current opinion in environmental sustainability</i> , 7: 37–43
1817	Queensland Department of Agriculture and Fisheries 2018, <i>Queensland Stock Status Assessment Workshop Proceedings 2018</i> . Species Summaries. 19-20 June 2018, Brisbane.
1818	Rogers A, Blanchard JL, Mumby PJ, Arlinghaus R 2018, Fisheries productivity under progressive coral reef degradation. <i>Journal of Applied Ecology</i> , 55: 1041–1049.
1819	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.
1820	Samoilys, MA 1997, Periodicity of spawning aggregations of coral trout <i>Plectropomus leopardus</i> (Pisces: Serranidae) on the northern Great Barrier Reef, <i>Marine Ecology Progress Series</i> , 160: 149–159.
1821	Tobin, A, Schlaff, A, Tobin, R, Penny, A, Ayling, T, Ayling, A, Krause, B, Welch, D, Sutton, S, Sawynok, W, Marshall, N, Marshall, P and Maynard, J 2010, Adapting to change: minimising uncertainty about the effects of rapidly-changing environmental conditions on the Queensland Coral Reef Fin Fish Fishery, final report to the Fisheries Research and Development Corporation, project 2008/103, Fishing and Fisheries Research Centre, James Cook University, Townsville.
1822	van Herwerden, L, Choat, JH, Dudgeon, CL, Carlos, G, Newman, SJ, Frisch, A and van Oppen, M 2006, Contrasting patterns of genetic structure in two species of the Coral Trout <i>Plectropomus</i> (Serranidae) from east and west Australia: introgressive hybridization or ancestral polymorphisms, <i>Molecular Phylogenetics and Evolution</i> , 41: 420–435.
1823	van Herwerden, L, Choat, JH, Newman, SJ, Lerray, M and Hillesroy, G 2009, Complex patterns of population structure and recruitment of <i>Plectropomus leopardus</i> (Pisces: Epinephelidae) in the Indo-West Pacific: implications for fisheries management, <i>Marine Biology</i> , 156: 1595–1607.
1824	West LD, Lyle JM, Matthews SR, Stark KE, and Steffe AS 2012, Survey of recreational fishing in the Northern Territory, 2009-10. Fishery Report-Department of Resources, Northern Territory Government, 109.
1825	Williams, AJ, Begg, GA, Little, LR, Currey, LM, Ballagh, AC and Murchie, CD 2007, Evaluation of the eastern Torres Strait Reef Line Fishery, Technical report 1, Fishing and Fisheries Research Centre, James Cook University, Townsville.
1826	Williams, G, Currey, LM, Begg, GA, Murchie, CD and Ballagh, AC 2008, Population biology of coral trout species in eastern Torres Strait: implications for fisheries management, <i>Continental Shelf Research</i> , 28: 2129–2142.
1827	Williams, AJ, Little, LR and Begg, GA 2011, Balancing indigenous and non-Indigenous commercial objectives in a coral reef finfish fishery, <i>ICES Journal of Marine Science</i> , vol. 68,

	no. 5, pp. 834–847.
1828	Zhou, S and Griffiths, SP 2008, Sustainability Assessment for Fishing Effects (SAFE): A new quantitative ecological risk assessment method and its application to elasmobranch bycatch in an Australian trawl fishery, Fisheries Research, 91(1): 56-68.