

Rankin Cod (2023)

Epinephelus multinotatus



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STOCK STATUS OVERVIEW

Jurisdiction	Stock	Stock status	Indicators
Western Australia	Pilbara	Sustainable	Spawning stock level, age structure, catch, CPUE
Western Australia, Northern Territory	North Western Australia	Sustainable	Catch, indicator species status

STOCK STRUCTURE

Rankin Cod are widely distributed throughout the Indian Ocean. Within Australia, Rankin Cod are distributed from the Houtman Abrolhos Islands in Western Australia, north to the waters offshore from Darwin in the Northern Territory. Rankin Cod is exploited primarily in the North Coast Bioregion of Western Australia [Newman et al. 2020]. Catches of Rankin Cod taken in the Northern Territory are low. Rankin Cod is one of the indicator species used to assess the status of the demersal resources in the Pilbara subregion of the North Coast Bioregion [Newman et al. 2018].

Johnson et al. [1993] examined allozymes (allelic variants of enzymes encoded by structural genes) from samples of Rankin Cod from the Lacepede Islands, Bedout Island, Lowendal Islands, Ningaloo and Shark Bay. There was evidence of a low level of genetic variation, indicating extensive connectivity among populations over large distances (at least 1,400 km). It was noted that no adjacent samples differed significantly, suggesting a latitudinal clinal change [Johnson et al. 1993], and a high degree of connection across populations throughout the sampled range (1,400 km) in Western Australia. Stephenson et al. [2001] examined stable isotopes in sagittal otolith carbonates of Rankin Cod from four locations: Shark Bay (Gascoyne), Ningaloo (Gascoyne), Pilbara, and Broome (Kimberley). The results of Stephenson et al. [2001] indicated that adult Rankin Cod do not mix extensively.

There is no evidence of discrete breeding populations of Rankin Cod in Western Australia, indicating that there is one biological stock. Although adults do not mix extensively, they all contribute to the total adult spawning biomass and larval dispersal. However, the limited mixing of adults among locations indicates some potential for localised depletion and supports the use of regional fishery management boundaries in Western Australia (e.g. Pilbara and Kimberley). Given the large distances involved and uncertainty over actual mixing rates of juveniles and adults, the regionally separate stock assessments are appropriate for managing potentially different levels of fishing pressure and stock status of this resource in the Kimberley (and Northern Territory combined) and Pilbara regions.

Here, assessment of stock status is presented at the management unit level—Pilbara and North-western Australia.

STOCK STATUS

North Western Australia

Rankin Cod in the Kimberley are landed commercially in the Northern Demersal Scalefish Managed Fishery (NDSMF). Rankin Cod is assessed on the basis of the status of several indicator species (for example, Red Emperor and Goldband Snapper in the Kimberley region) within the North Coast Demersal Resource (NCDR) that represent the entire inshore demersal suite of species occurring at depths of 30–250 m [Newman et al. 2018]. The indicator species in the Kimberley have been classified as sustainable [Wakefield et al. 2023]. The level of risk associated with the sustainability of Rankin Cod in the Kimberley is assessed as low. This assessment of Rankin Cod is also supported by predictions for biomass and harvest rates from a data-limited Catch-MSY assessment model compared periodically to a model prediction for maximum sustainable yield (MSY).

Total catch of Rankin Cod in the Kimberley over the last 10 years (2013–22) have ranged from 46–100 t, with a mean annual catch of 70 t. This is an increase on the averages catches across the previous 10 years of 43 t. Recreational and charter catch are relatively low compared to the commercial catch, in the past 10 years where reliable catches estimates are available, the proportion of the total catch has averaged less than 3%. The Catch-MSY model applied to data on annual catches for this species (1990–22), indicate that the annual catches have generally been below the median model estimate for maximum sustainable yield (MSY), but catches have been increasing and were above the MSY estimate in 2016–17 and 2020–22. This is consistent with the predicted biomass estimates remaining above BMSY for the entire time series, with biomass declining as catches have been increasing. This is also consistent with fishing mortality remaining below FMSY. However, it is important to recognise that Catch-MSY is a data-limited technique with relatively strong assumptions, dependent on user inputs. For this assessment, these included specified ranges for initial depletion (0.4–0.8), based on likely but unknown catches from foreign fleets prior to the start of the time series, final depletion (0.15–0.7), based on recent catches relative to maximum recorded annual catch and the non-targeted nature, and low resilience ($r=0.1–0.6$, consistent with species longevity, of approximately 24 years in WA). Given the recent catches of this species are within the confidence of the predicted MSY, and status of the indicator species for the Kimberley, it is considered unlikely that the biomass of Rankin Cod in the Kimberley is depleted and recruitment is unlikely to be impaired.

For the Northern Territory part of the management unit, only relatively small catches are recorded in the Timor Reef and Demersal fisheries. Targeting of

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Rankin Cod by these fisheries is constrained by the fact that this species distribution largely resides outside of these fisheries boundaries. As a result, during the period 2013–22 the average annual catch by these fisheries was less than 4.0 t. Additionally, the generally offshore distribution of Rankin Cod in NT waters means that the recreational and Fishing Tour Operator landings are likely to be negligible. Consequently, the Northern Territory component is considered to only contribute a negligible catch to this stock. 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 North Western Australia management unit is classified as a **sustainable stock**.

Pilbara

Rankin Cod is one of the indicator species used to assess the status of the demersal scalefish resources in the Pilbara subregion of the North Coast Bioregion of Western Australia [Newman et al. 2018]. Rankin Cod is landed in the Pilbara Demersal Scalefish Fisheries (PDSF), which includes the Pilbara Fish Trawl (Interim) Managed Fishery, the Pilbara Trap Managed Fishery and the Pilbara Line Fishery in the Pilbara management region of the North Coast Bioregion of Western Australia [Newman et al. 2018]. The major performance measures for the Pilbara management unit of Rankin Cod are periodic assessments of spawning stock levels and fishing mortality estimated using an integrated age-structured model relative to standard reference levels and fishing mortality from catch curve analysis derived from representative samples of the age structure. Catch, effort and/or catch rates for the indicator species/fishing sector are also reviewed annually, to determine whether they are consistent with current harvest control rules (HCRs) for the resource [DPIRD 2017]. An assessment was undertaken in 2015 and included age composition collected during fisheries sampling in 2010/11.

The spawning biomass level of Rankin Cod overall (across all management areas) was assessed to be greater than 40% in the Pilbara Demersal Scalefish Fisheries in 2015 (the year the last integrated assessment was undertaken), using an integrated age structured model. Estimates of relative spawning biomass for Rankin Cod from the integrated assessment have fluctuated above the target level since 1990 [Wakefield et al. 2023]. The above evidence indicates that the biomass of this stock is unlikely to be depleted and that recruitment is unlikely to be impaired. The fishing mortality based assessments and associated uncertainty ranges indicated that the fishing mortality levels on Rankin Cod in 2015 were mainly between target and threshold levels in all management areas.

Total catch of Rankin Cod in the Pilbara over the last 10 years (2013–22) have ranged from 55–253 t, with a mean annual catch of 141 t. This is an increase in the average catches across the previous 10 years of 98 t. Recreational and charter catch are relatively low compared to the commercial catch, in the past 10 years where reliable catches estimates are available, the proportion of the total catch has averaged approximately 14%. The above evidence indicates that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

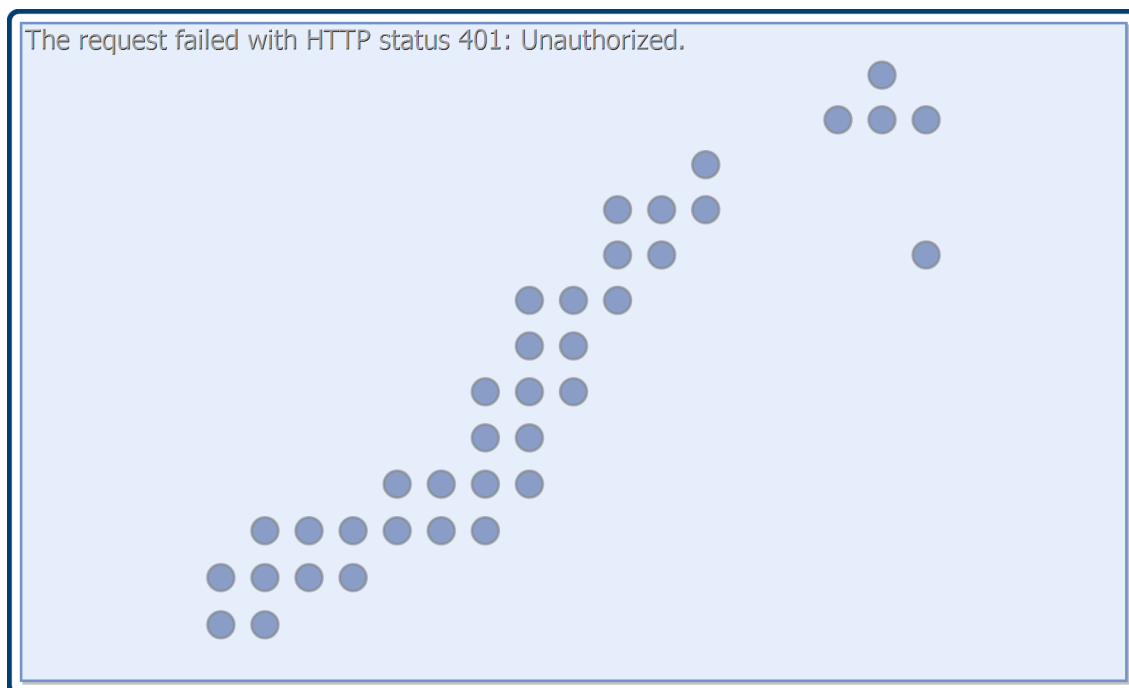
On the basis of the evidence provided above, the Pilbara management unit is classified as a **sustainable stock**.

BIOLOGY

Rankin Cod biology [Wakefield et al. unpublished data]

Species	Longevity / Maximum Size	Maturity (50 per cent)
Rankin Cod	24 years, 776 mm FL	2 years, 391 mm FL

DISTRIBUTION



Distribution of reported commercial catch of Rankin Cod

TABLES

Fishing methods	Northern Territory	Western Australia
Charter		
Hook and Line	✓	✓
Rod and reel		✓
Spearfishing		✓
Various		✓
Commercial		
Fish Trap	✓	✓

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Hand Line, Hand Reel or Powered Reels		✓
Otter Trawl		✓
Unspecified	✓	
Recreational		
Hook and Line	✓	✓
Spearfishing		✓

Management Methods		
	Northern Territory	Western Australia
Charter		
Bag limits		✓
Gear restrictions	✓	
Limited entry	✓	✓
Passenger restrictions		✓
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		✓

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Vessel restrictions		✓
Recreational		
Bag limits		✓
Gear restrictions	✓	
Licence (Recreational Fishing from Boat License)		✓
Possession limit	✓	✓
Spatial closures		✓

Catch		
	Northern Territory	Western Australia
Charter	Unknown	16.2 t
Commercial	2.9486 t	264.279 t
Indigenous	Unknown	Unknown
Recreational	Unknown	17.76 t ± 2.97 t se

Western Australia – Commercial (Management Methods). Rankin Cod forms part of the combined Total Allowable Commercial Catch for other mixed demersal species in the Gascoyne Demersal Scalefish Managed Fishery.

Western Australia – Active Vessels. Data are confidential as there were fewer than three vessels in Pilbara Fish Trawl Interim Managed Fishery (Western Australia) and Pilbara Trap Managed Fishery (Western Australia).

Western Australia – Recreational (Catch). Boat-based recreational catch is from 1 September 2020–31 August 2021. These data are derived from those reported in Ryan et al. [2022].

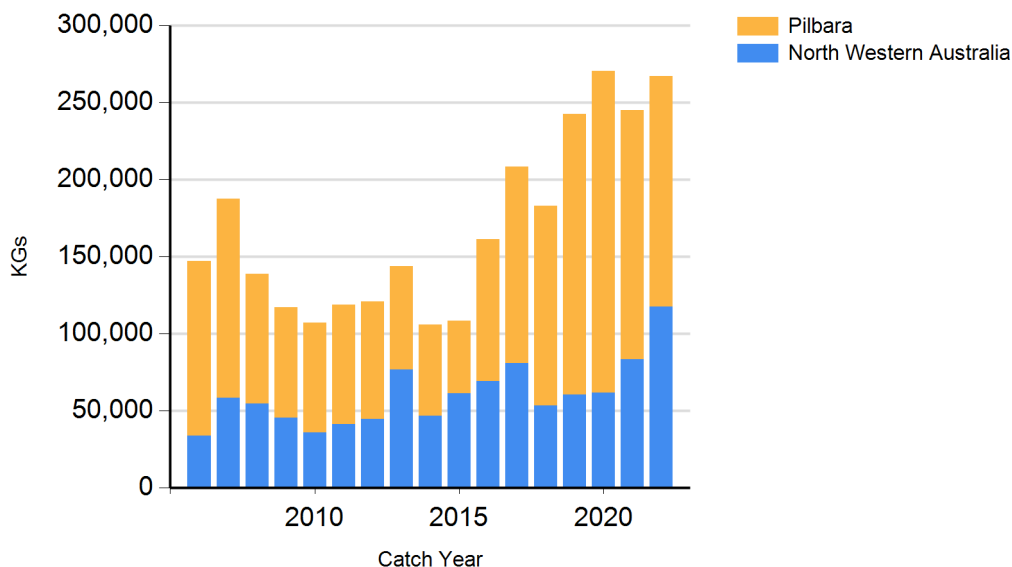
Western Australia – Recreational (Management Methods). A Recreational Fishing from Boat License is required for the use of a powered boat to fish or to transport catch or fishing gear to or from a land-based fishing location.

Western Australia – Indigenous (Management Methods). Subject to application of 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: “Unless expressly provided otherwise, nothing in this Act derogates or limits the right of Aboriginal people who have traditionally used the resources of an area of land or water in a traditional manner to continue to use those resources in that area in that manner.”

CATCH CHART



Commercial catch of Rankin Cod - note confidential catch not shown

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References	
Johnson et al. 1993	Johnson, MS, Hebbert, DR and Moran, MJ 1993, Genetic analysis of populations of north-western Australian fish species. <i>Australian Journal of Marine and Freshwater Research</i> , 44: 673–685.
DPIRD 2017	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.
Wakefield et al. 2023	Wakefield, C, Trinnie, F, Skepper, C, Boddington, Newman, SJ, and Steele, A 2023, North Coast Demersal Resource Status Report 2022. pp. 167–176. In: Gaughan, D.J. and Santoro, K. (eds.). 2023. <i>Status Reports of the Fisheries and Aquatic Resources of Western Australia 2021/22: The State of the Fisheries</i> . Department of Primary Industries and Regional Development, Western Australia, Perth, Australia.
Newman et al. 2018	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.
Ryan et al. 2022	Ryan, KL, Lai, EKM and Smallwood, CB 2022, Boat-based recreational fishing in Western Australia 2020/21. Fisheries Research Report No. 327 Department of Primary Industries and Regional Development, Western Australia. 221pp.
Stephenson et al. 2001	Stephenson, PC, Edmonds, JS, Moran, MJ and Caputi, N 2001, Analysis of stable isotopes to investigate stock structure of red emperor and Rankin cod in northern Western Australia. <i>Journal of Fish Biology</i> , 58: 126–144.