

Hapuku (2018)

Polyprion oxygeneios



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STOCK STATUS OVERVIEW

Jurisdiction	Stock	Fisheries	Stock status	Indicators
Commonwealth	Commonwealth	HSF, SESSF (CTS), SESSF (GABTS), SESSF (GHTS)	Depleting	Catch, fishing mortality
Western Australia	Western Australia	GDSMF, GDSMF WCDSIMF WL (SC), WCDSIMF, WL (SC)	Sustainable	Spawning potential ratio, fishing mortality
Queensland	Queensland	RRFFF	Undefined	Catch, effort
New South Wales	New South Wales	N/A, OTLF	Undefined	Catch, effort, standardised catch rate
South Australia	South Australia	MSF	Negligible	

HSF High Seas Fishery (CTH), SESSF (CTS) Southern and Eastern Scalefish and Shark Fishery (Commonwealth Trawl Sector) (CTH), SESSF (GABTS) Southern and Eastern Scalefish and Shark Fishery (Great Australian Bight Trawl Sector) (CTH), SESSF (GHTS) Southern and Eastern Scalefish and Shark Fishery (Gillnet Hook and Trap Sector) (CTH), N/A Not Applicable (NSW), OTLF Ocean Trap and Line Fishery (NSW), RRFFF Rocky Reef Fin Fish Fishery (QLD), MSF Marine Scalefish Fishery (SA), GDSMF Gascoyne Demersal Scalefish Managed Fishery (WA), WCDSIMF West Coast Demersal Scalefish (Interim) Managed Fishery (WA), WL (SC) Open Access in the South Coast (WA), GDSMF || WCDSIMF || WL (SC) Various Fisheries combined due to 3 boat rule (WA)

STOCK STRUCTURE

The stock structure of Hapuku throughout Australian waters is unknown. Life history characteristics, similar to Bass Groper (*P. americanus*), suggest a broad population structure [Ball et al. 2000]. However, Beentjes and Francis [1999] inferred the likelihood of separate stocks within New Zealand based on tagging studies of Hapuku, despite recorded movements of up to about 1 400 km. Paul [2002] reported on the stock structure of Hapuku (and Bass Groper) in New Zealand, reviewing available data, concluding that stock structure could not be described, and there was insufficient data describing the life history characteristics to

distinguish different stocks. Wakefield et al. [2010] described differences in aged-based demography and reproduction of Hapuku among regions of Western Australia, and likely pan-oceanic mixing of the broader *P. oxygeneios* population (including Indian Ocean). No such investigations have been done on Hapuku throughout eastern and south eastern Australian waters to develop our understanding of stock structure. It is likely Hapuku in eastern and south eastern Australian waters constitute one or more stocks of a greater population and fisheries within this region access this stock or subset of stocks in support of their annual catches. Panmixia could be expected throughout the region, owing to the extended larval/juvenile phase (years) and large-scale genetic homogeneity of congener *P. americanus* which has similar life-history traits [Ball et al. 2000, Roberts 1996, Sedberry et al. 1996, Wakefield et al. 2010]. Evidence in support of a single biological stock, or stock structuring within broader Australian waters is limited.

Here, assessment of stock status is presented at the jurisdictional level—Commonwealth, Western Australia, Queensland, New South Wales and South Australia.

STOCK STATUS

Commonwealth Hapuku are captured in multiple sectors of the Southern and Eastern Scalefish and Shark Fishery (SESSF). Most of the catch is taken by demersal longlines in the Gillnet Hook and Trap (GHAT) Sector and by trawling in the Commonwealth Trawl Sector (CTS) and Great Australian Bight (GAB) Sector. Total annual catches across all sectors declined from over 110 tonnes (t) in 2008 to approximately 26 t in 2013. Since then, catches have increased to approximately 48 t in 2017, mostly due to an increase in catches by the CTS.

In 2012, a Sustainability Assessment for Fishing Effects (SAFE) analysis assessed Hapuku as precautionary extreme high risk in the SESSF due to the cumulative impacts of fishing from the CTS and demersal longline fishing in the GHAT Sector [Zhou et al. 2012]. A residual risk analysis that considered additional scientific information did not reduce the overall risk rating for Hapuku [AFMA 2014]. The SAFE analysis was based on catch data from 2007 to 2010, when the average catch was approximately 82 t, and indicated that it was plausible that Hapuku could have been subject to overfishing during those years.

Due to the risk rating from the 2012 SAFE assessment, Hapuku is currently a priority species in the application of an Ecological Risk Management strategy for the SESSF [AFMA 2015]. Specific management measures adopted by AFMA to reduce the impact of demersal longline fishing on Hapuku include a limit on the number of hooks deployed, spatial and temporal closures, and the mandatory installation of electronic monitoring on all auto longline vessels.

In 2018, a model-assisted catch-only assessment (Catch-MSY method) [Martell and Froese 2013] was fitted to catches of Hapuku across all sectors of the SESSF from 1986 to 2017 [Penney et al. 2018]. The Catch-MSY method uses population productivity (r) and carrying capacity (K) parameters of an underlying Schaefer production model to estimate the ranges in biomass and harvest rate that could have resulted in the annual catches. The assessment estimated biomass to have been above BMSY from 1986 to 2006 and between BMSY and 20 per cent of unfished biomass ($0.2B_0$) since 2007. The mean estimate of biomass in 2017 was approximately 33 per cent of B_0 (95 per cent CI of 11–55 per cent). Reported catch, mostly from the CTS, increased in 2017, but remained below the mean estimated MSY of 51 t. However, the harvest rate in 2017 was estimated to be 0.15, above the FMSY level of 0.11, as a result of the 2017 increase in reported trawl catch. Five year projections at the 2017 catch level of 48 t predicted that biomass would decline slowly at this catch level.

The estimated harvest rates from this assessment are consistent with

estimates of fishing mortality derived from the SAFE assessment by Zhou et al. [2012]. However, there is high uncertainty in the estimates of biomass depletion, harvest rate and MSY derived from catch data using the Catch-MSY analysis due to the deterministic and uncertain nature of the analysis, and uncertainty about the stock structure of Hapuku. Given the broad distribution of Hapuku within Australian waters, it is plausible that there are a number of separate biological stocks with limited connectivity across the extent of the SESSF and other jurisdictions, which may have been subject to different exploitation patterns. Resolving the stock structure of Hapuku would help reduce the uncertainty in the status of the species.

On the weight of available evidence, it is plausible that maintaining the current level of fishing pressure will cause the Commonwealth Hapuku stock to decline below its current level and lead to it being recruitment impaired. However, the available evidence indicates that the biomass of the stock is not likely to be depleted and that recruitment is unlikely to be impaired.

On the basis of the evidence provided above, Hapuku in the Commonwealth is classified as a **depleting stock**.

New South Wales

In New South Wales, Hapuku are primarily caught as a by-product in the Ocean Trap and Line (OTL) Fishery on dropline gear, where target species are commonly Blue-eye Trevalla (*Hyperoglyphe antarctica*). Since 1997–98, commercial catches of Hapuku have been reported independently to Bass Groper (*P. americanus*). Annual reported commercial catches of Hapuku have steadily declined since the reported peak of 15.6 t in 1999–2000. Within the last decade (2007–08 to 2016–17) the average annual commercial catch of Hapuku reported in New South Wales was 3 t, and within in the last five years (2012–13 to 2016–17) the average annual commercial catch was 1.8 t. Over the same periods of time trends in effort reflect that in catch. Together with information on the mean weight (7.6 kg) of Hapuku caught and retained in the OTL Fishery [Macbeth and Gray 2015], the commercial fishery for Hapuku over the last five years, is responsible for the harvest of an average annual number of < 250 individual fish. Standardised catch rates (kg per day) from droplining in the OTL Fishery has not shown any clear trend since 1997–98, with variance associated with the annual estimates being substantially larger since about 2009–10, associated with fewer reported catches [Chick and Fowler 2018].

Although New South Wales commercial catches are low, the impact of fishing on the Hapuku stock in New South Wales remains uncertain. Indigenous catches of Hapuku are unknown. Recreational catch of Hapuku is not well understood in New South Wales. Henry and Lyle [2003] estimated the New South Wales annual recreational harvest of Rock Cod/Groper (including Hapuku and nine other 'offshore/deep' species) to be 4 770 (\pm 1 532) individuals, with offshore (> 5 km from shore) recreational fishing effort representing 1.3 per cent of the State-wide total. West et al. [2015] reported no recreational catch of Hapuku in 2013–14, whilst also reporting offshore (> 5 km) fishing effort comprised < 2 per cent (54 773 fisher days) of all reported recreational fishing effort. Available estimates of recreational catch in New South Wales are considered unreliable as large-scale phone and diary surveys like those of Henry and Lyle [2003] and West et al. [2015] underestimate catches from small specific fisheries like the offshore recreational fishery.

A review of indicators (weight-of-evidence approach) was used to assess the status of Hapuku in New South Wales. There are insufficient data available to support more quantitative stock assessment methods. Current uncertainty regarding Hapuku stock structure and biology, low levels of catch and low numbers of reported daily catch between different commercial fishing methods that exacerbate uncertainty surrounding estimates of catch rate, together with uncertain levels of recreational catches, provide insufficient

information with which to determine a stock status [Chick and Fowler, 2018].

On the basis of the evidence provided above, Hapuku in New South Wales is classified as an **undefined stock**.

Queensland

Queensland's access to Hapuku is limited by their distribution [Kailola et al. 1993] and only minor catches are made in this jurisdiction. There is no formal assessment of Hapuku in Queensland waters. Historically, Hapuku has been targeted in the Deep Water Fin Fish Fishery (DWFFF) with an average harvest of 4 t between 1997–2002. Since this time, the average annual catch has declined below 1 t as overall effort in the fishery has reduced [QDAF 2018]. Current reported catch is incidental harvest from the Rocky Reef Fin Fish Fishery (RRFFF). Catch and effort in 2017 was low with a total of 45 kg and two days effort. There was no recreational harvest of Hapuku reported in Queensland's latest recreational fishing survey [Webley et al. 2015]. It is unlikely that the Queensland harvest is significantly impacting the overall stock but there is insufficient information available to confidently classify the status of this stock.

On the basis of the evidence provided above, Hapuku in Queensland is classified as an **undefined stock**.

South Australia

From 1997–98 to 2016–17, the total reported annual commercial catches of Hapuku in South Australia ranged from zero to two tonnes. The annual catch over this period averaged less than 200 kg. South Australia's recreational catch of Hapuku is not known but the species is not a major component of recreational landings. Stock status for Hapuku in South Australia is reported as Negligible due to historically low catches in this jurisdiction and the stock has generally not been subject to targeted fishing. Fishing is unlikely to be having a negative impact on the stock.

Western Australia

The Hapuku catch in Western Australia is predominantly by commercial line fishers operating along the lower west and particularly south coasts. An age-based assessment from sampling 2005 and 2006 south coast catches estimated fishing mortality (F) to be within target and threshold levels [Wakefield et al. 2010]. More robust modelling of the same data was undertaken in 2018, assuming variable recruitment and age-based selectivity. This updated and unpublished assessment generated two spawning potential ratio estimates (\pm 95 per cent confidence intervals) using the per recruit and dynamic pool methods: 0.48 (0.43–0.54) and 0.44 (0.38–0.50) respectively, indicating a high likelihood that spawning potential was above the threshold reference level of 0.30. Simultaneously generated estimates of F and natural mortality M per year were 0.045 (0.04–0.05) and 0.09, respectively, giving an F/M estimate of 0.50 (0.42–0.60), well below the threshold reference level of 0.67. The new analysis shows the breeding stock was adequate and fishing mortality sustainable at the time the sample was collected. Since then annual catches declined by about half until returning to 2005/2006 levels in the last two years.

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

BIOLOGY

Hapuku biology [Ball et al. 2000, Paxton et al. 1989, Wakefield et al. 2010]

Species	Longevity / Maximum Size	Maturity (50 per cent)
Hapuku	52 years Females 1 114 mm	Females 7.1 years, 760 mm

	TL Males 702 mm TL	TL Males 6.8 years, 702 mm TL
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DISTRIBUTION



Distribution of reported commercial catch of Hapuku

TABLES

Commercial Catch Methods	Commonwealth	New South Wales	Queensland	South Australia	Western Australia
Danish Seine	✓				
Demersal Gillnet	✓				
Demersal Longline	✓				
Dropline	✓	✓			✓
Gillnet					✓
Hand Line, Hand Reel or Powered Reels					✓
Handline (mechanised)	✓				
Hook and Line	✓	✓	✓		✓
Longline (Unspecified)					✓
Midwater Trawl	✓				
N/A				✓	
Otter Trawl	✓				
Rod and reel	✓				
Trotline	✓				
Unspecified		✓			✓

Fishing methods				
	Commonwealth	New South Wales	Queensland	Western Australia
Charter				
Hook and Line		✓	✓	
Various				✓
Commercial				
Demersal Gillnet	✓			
Demersal Longline	✓			
Dropline	✓	✓		✓
Hand Line, Hand Reel or Powered Reels				✓
Handline (mechanised)	✓			
Hook and Line		✓	✓	
Otter Trawl	✓			
Unspecified		✓		✓
Indigenous				
Hook and Line		✓		
Recreational				
Hook and Line		✓	✓	
Various				✓
Management Methods				
	Commonwealth	New South Wales	Queensland	Western Australia
Charter				
Bag limits		✓	✓	✓
Gear restrictions			✓	
Licence		✓		✓
Limited entry				✓
Seasonal closures				✓
Spatial closures				✓
Commercial				
Effort limits				✓
Gear restrictions	✓	✓	✓	✓
Licence	✓		✓	
Limited entry		✓	✓	✓

Quota			✓	
Spatial closures	✓	✓		
Spatial zoning				✓
Vessel restrictions		✓	✓	
Indigenous				
Bag limits		✓		
Customary fishing permits				✓
Native Title		✓		
Section 37 (1d)(3)(9), Aboriginal cultural fishing authority		✓		
Recreational				
Bag and possession limits				✓
Bag limits		✓	✓	✓
Gear restrictions			✓	
Licence		✓		
Licence (Recreational Fishing from Boat License)				✓
Seasonal closures				✓
Spatial closures		✓		✓

Active Vessels	Commonwealth	New South Wales	Queensland	South Australia	Western Australia
	2 Vessels in SESSF (GABTS), 2 Vessels in HSF, 12 Vessels in SESSF (GHTS), 13 Vessels in SESSF (CTS),	12 Fishing Business in OTLF,	2 in RRFFF,	0 Licences in MSF,	<3 in GDSMF, 4 in WCDSIMF, 19 in WL (SC), <3 in Charter,

HSF High Seas Fishery(CTH)

SESSF (CTS) Southern and Eastern Scalefish and Shark Fishery (Commonwealth Trawl Sector)(CTH)

SESSF (GABTS) Southern and Eastern Scalefish and Shark Fishery (Great Australian Bight Trawl Sector)(CTH)

SESSF (GHTS) Southern and Eastern Scalefish and Shark Fishery (Gillnet Hook and Trap Sector)(CTH)

OTLF Ocean Trap and Line Fishery(NSW)

RRFFF Rocky Reef Fin Fish Fishery(QLD)

MSF Marine Scalefish Fishery(SA)

GDSMF Gascoyne Demersal Scalefish Managed Fishery(WA)

WCDSIMF West Coast Demersal Scalefish (Interim) Managed Fishery(WA)

WL (SC) Open Access in the South Coast(WA)

Charter Tour Operator(WA)

Catch					
	Commonwealth	New South Wales	Queensland	South Australia	Western Australia
Commercial	0.31029t in HSF, 31.9008t in SESSF (CTS), 1.1253t in SESSF (GABTS), 15.2843t in SESSF (GHTS),	0.008t in N/A, 1.22t in OTLF,	0.045t in RRFFF,		41.9103t in GDSMF WCDSIMF WL (SC),
Indigenous	Unknown	Unknown	Unknown		Unknown
Recreational	Unknown	Unknown	Unknown		West Coast: 188 fish ± 90 std err South Coast: 121 fish ± 68

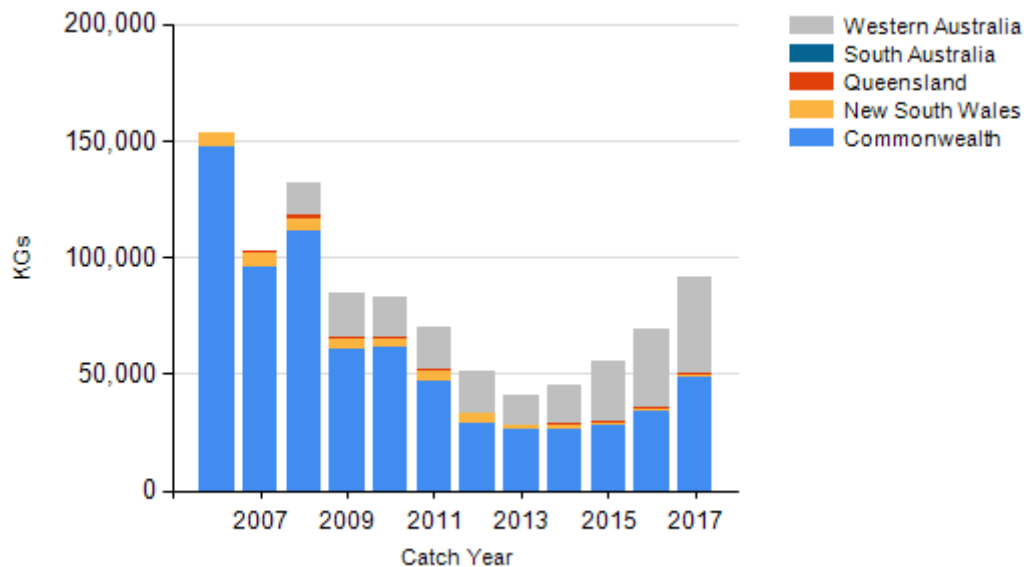
HSF High Seas Fishery (CTH), SESSF (CTS) Southern and Eastern Scalefish and Shark Fishery (Commonwealth Trawl Sector) (CTH), SESSF (GABTS) Southern and Eastern Scalefish and Shark Fishery (Great Australian Bight Trawl Sector) (CTH), SESSF (GHTS) Southern and Eastern Scalefish and Shark Fishery (Gillnet Hook and Trap Sector) (CTH), N/A Not Applicable (NSW), OTLF Ocean Trap and Line Fishery (NSW), RRFFF Rocky Reef Fin Fish Fishery (QLD), MSF Marine Scalefish Fishery (SA), GDSMF Gascoyne Demersal Scalefish Managed Fishery (WA), WCDSIMF West Coast Demersal Scalefish (Interim) Managed Fishery (WA), WL (SC) Open Access in the South Coast (WA), GDSMF || WCDSIMF || WL (SC) Various Fisheries combined due to 3 boat rule (WA),

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

Queensland – Indigenous (management methods) Under the *Fisheries Act 1994* (Qld), Indigenous fishers in Queensland are entitled 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) The 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 themselves. 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. 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.

CATCH CHART



Commercial catch of Hapuku - note confidential catch not shown

EFFECTS OF FISHING ON THE MARINE ENVIRONMENT

ENVIRONMENTAL EFFECTS on Hapuku

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