Stock status summary – Hapuku – 2020

This stock status summary presents available information to inform criteria required to determine a stock status consistent with the Status of Australian Fish Stocks reports (www.fish.gov.au). Where data are unavailable or insufficient to reliably inform the SAFS criteria outlined below this has been indicated by 'NA' in the preceding tables, rather than removing the criteria. This has been done to clearly indicate what data are and are not available for assessment and to highlight areas where alternate or additional data sources or analyses may be required to improve species status determination in the future.

Assessment authors and Year

Chick, R.C. and A.M. Fowler. 2020. Stock status summary – Hapuku 2020. NSW Department of Primary Industries. Fisheries NSW, Port Stephens Fisheries Institute. 9 pp.

Biology and stock structure

Hapuku (*Polyprion oxygeneios*) is a large demersal perciform broadly distributed in the temperate waters of all southern oceans between the latitudes of 28°S and 43°S (Paxton et al. 1989). The species occurs throughout NSW, with adults found on the continental slope in depths ranging from 200 m to 500 m.

Demographic information, including age, maturity, and fecundity, is unavailable for the species in NSW. Investigations from Western Australia and New Zealand indicate the species can attain a large size (up to 180 cm total length, TL) and weight (78 kg), are long-lived (up to 63 years), and moderate- to late-maturing (7–13 years; Francis et al. 1999; Wakefield et al. 2010). Francis et al. (1999) also indicate natural mortality (*M*) may be 0.1 or less.

A length sample obtained from the commercial fishing sector in NSW during the 1990s indicated that fish were of similar size to those caught in Western Australia and New Zealand (Francis et al. 1999; Wakefield et al. 2010).

The stock structure of Hapuku in NSW is unknown, but panmixia is 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 (Roberts 1996; Sedberry et al. 1996; Ball et al. 2000; Wakefield et al. 2010).

The scale of assessment is made at the jurisdictional level (state-wide).

Stock Status

On the basis of the evidence provided the NSW Hapuku stock is classified as **undefined**.

This determination is consistent with that of the previous assessment (Chick and Fowler 2018), which was supported by independent review (Breen 2018). Consistent with the previous assessment, a review of indicators (weight-of-evidence approach) has been taken to assess stock status. Continued uncertainty regarding Hapuku stock structure, biology and recreational catch, decreasing and low levels of commercial catch together with similar patterns in effort (days), and low and variable catches and effort between different commercial fishing methods, that exacerbate uncertainty surrounding estimates of catch rate, provide insufficient information with which to reliably determine a stock status.

Fishery statistics summary

Information presented in figures and tables below is summarised by fiscal year (July–June). For example, 2010 refers to the fiscal year 2009/10.

Changes in commercial fishery reporting requirements, sources of commercial fishery data and the continuity or otherwise of data sources through time are all factors considered in the full assessment. Between 1997/98 and 2008/09 (inclusive), fishers reported monthly catch and effort (in days). From 2009/10, monthly reports of daily catch and effort (hours) metrics have been required. To construct a longer time series of data (i.e. from 1997/98 to present), daily records from 2009/10 are re-aggregated into monthly catches (kg) by fisher and gear type, with effort in days per month estimated from the number of distinct fishing dates in each month when the method was used and there was a reported landing of the species of interest in that month, irrespective of whether the species was reported on each day, to be consistent with earlier reporting.

Management arrangements including input controls and modified Ocean Trap and Line (OTL) Fishery endorsements to restrict fishing east and west of the 100 fathom depth contour (i.e. OTL–Line East and OTL–Line West, respectively) are described in the NSW *Fisheries Management (Ocean Trap and Line Share Management Plan) Regulation 2006* (NSW DPI Fisheries 2017). Changes to the endorsement limited the number of fishers endorsed to access deep waters, and hence Hapuku, and prohibited OTL–Line West-endorsed fishers from landing Hapuku (as well as other species). Given the historical catch considerations in the allocation of the endorsements and the generally deep-water distribution of Hapuku, the change to this fishing endorsement is not considered to have substantially impacted on the catch of Hapuku through time. All reported catches of Hapuku are presented below, unless otherwise stated in the text and captions.

Catch information

Commercial catch

Single-species data is only available after 1997/98 when reporting for Hapuku was separated from congener *P. americanus* (Bass Groper).

In NSW commercial fisheries, Hapuku are principally caught in the OTL Fishery, with minor catches reported in the Ocean Fish Trawl and Ocean Prawn Trawl Fisheries. The OTL Fishery accounts for an average of 90% of total annual catch by weight (range: 74-100%, with the exception of 49% in 2018/19, likely due to misreporting of fishing method from relatively few reported catches).

Total annual reported commercial catch of Hapuku is relatively low (<10 t since 2003/04, <2 t since 2014/15; Figure 1). Catch has declined since 2002/03 (12.1 t) with 1.8 t caught in 2018/19. Droplining accounts for most of the total catch (mean: 76%, range: 33–99%). Although since 2009/10 the proportion of total catch from Droplining has generally declined. The trend in dropline catch was similar to total catch, with a decrease from 9.4 t (2002/03) to 0.6 t in 2018/19 (Figure 2). Handlining accounts for most of the remaining catch (mean 13%, range: 0–52%;). Trends in handline catch differed to trends in both total catch and dropline catch. Handline catch increased between 2010/11 (0.3 t) and 2014/15 (0.9 t), after which catch has been variable. Handline catch in 2018/19 was 0.3 t.

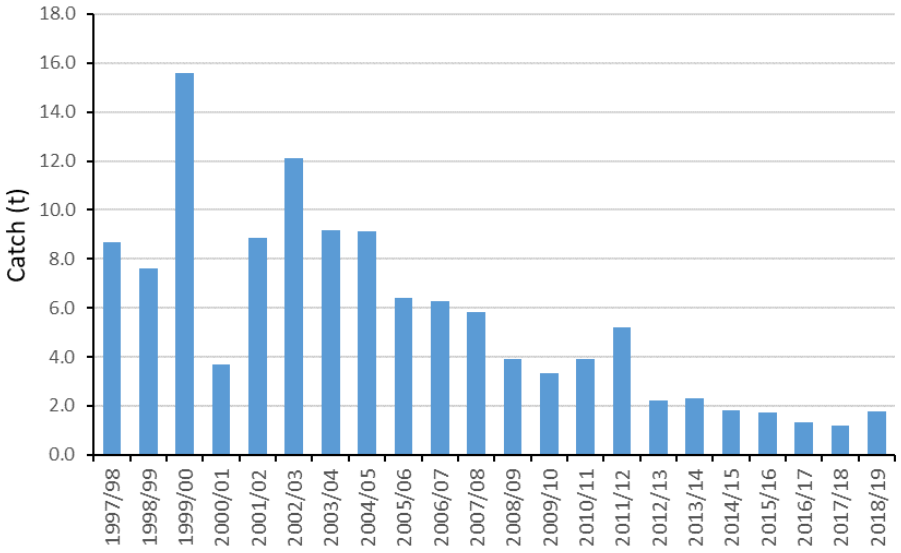

Figure 1 **All methods and fisheries combined – Total catch (t) of Hapuku from 1997/98 to 2018/19.**

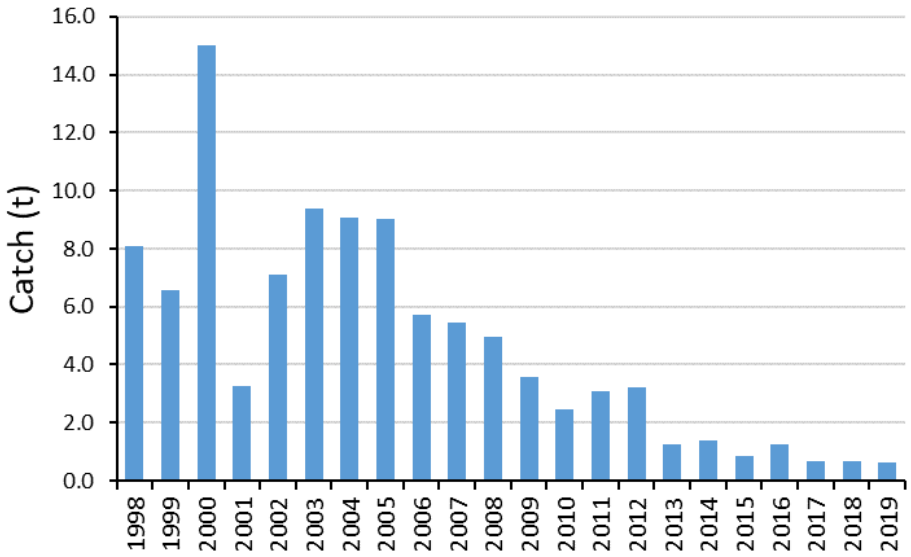

Figure 2 Droplining – Catch (t) of Hapuku from 1997/98 to 2018/19.

Recreational and Indigenous cultural catch

Recreational and Indigenous cultural catches of Hapuku are unknown. However, Henry and Lyle (2003) estimated the NSW annual recreational harvest of Rock Cod/Gropers (including Hapuku and nine other 'offshore/deep' species) in 2000/01, to be 4,770 (± 1,532) individuals. West et al. (2015) reported no recreational catch of Hapuku in NSW in 2013/14. The most recent state-wide survey of recreational fishing recorded negligible catch of Hapuku (2017/18, NSW DPI unpublished).

There is a combined recreational bag limit of five and a boat limit of ten Hapuku, Banded Rockcod, Bass Groper, Gemfish and Blue-eye Trevalla. The boat limit applies to all recreational fishers, including charter fishing. In 2016/17 the NSW charter fishing sector reported catching two individual Hapuku.

There is no understanding of the Indigenous cultural catch of Hapuku.

Illegal, Unregulated, Unreported (IUU) catch

The extent of Illegal Unregulated and Unreported (IUU) fishing is unknown.

Effort information

Commercial

Total effort (days) has generally decreased between 1997/98 and 2018/19, from ~1000 days to <100 days (Figure 3). The trend in dropline effort was similar to total effort, with a decrease over the same reporting period. Handline effort showed no clear trend between 1997/98 and 2011/12, but increased substantially, to >100 days in 2012/13 and 2013/14, after which effort has declined but varied considerably. In 2018/19, Handline effort was 86 days.

Recreational and Indigenous cultural catch

Data for recreational and Indigenous effort for Hapuku are unknown.

Henry and Lyle (2003) reported that recreational offshore (>5 km from shore) fishing effort in NSW was 1.3% of the state-wide total, equating to 101,480 (± 32,176) fishing events. West et al. (2015) reported offshore (>5 km) fishing effort comprised <2% (54,773 fisher days) of all reported NSW recreational fishing effort.

There is no understanding of the Indigenous cultural effort expended on fishing for Hapuku.

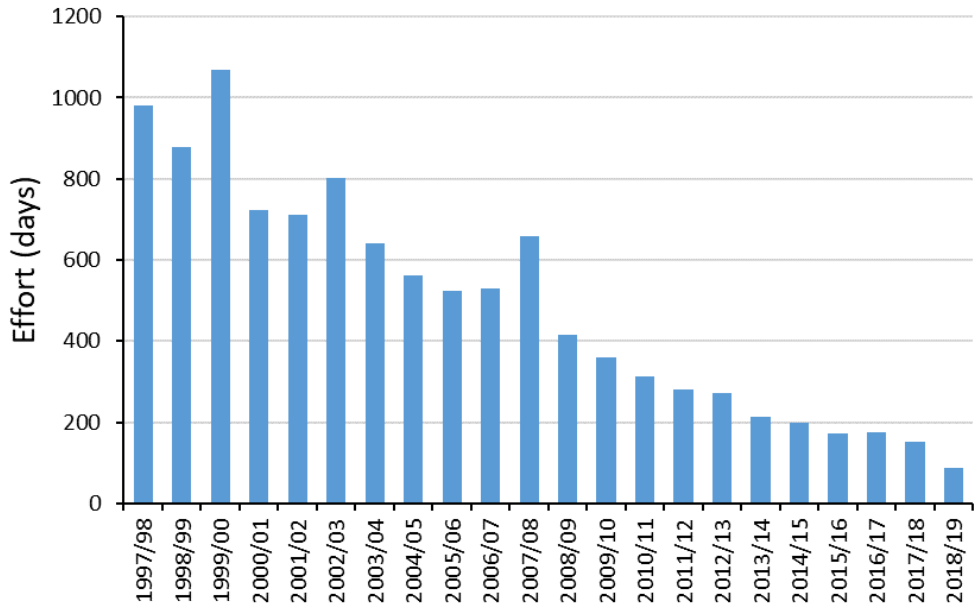

Figure 3 **All methods and fisheries combined – Total effort (days) for Hapuku from 1997/98 to 2018/19.**

Catch rate information

Commercial

Standardised catch per unit effort (CPUE) in kilograms per day ($CPUE_{dy}$) for droplining showed no significant trend between 1997/98 and 2018/19, with larger variance surrounding estimates after 2007/08 and particularly in 2018/19 (Figure 3). Prior to 2009/10, patterns of standardised and geometric mean CPUE were generally similar. From 2009/10 to 2013/14, standardised and geometric mean CPUE diverged before patterns again were generally similar from 2014/15. From 2009/10 mean estimates of standardised CPUE declined to a historical low in 2014/15, where it has generally remained, with some indication of an increase in the most recent year.

Median nominal $CPUE_{dy}$ for handlining also showed no clear trend between 1997/98 and 2018/19. Peaks in median $CPUE_{dy}$ were observed during 2002/03 and 2011/12. As similarly indicated in standardised Dropline $CPUE_{dy}$, Handline nominal median $CPUE_{dy}$ has increased in 2018/19.

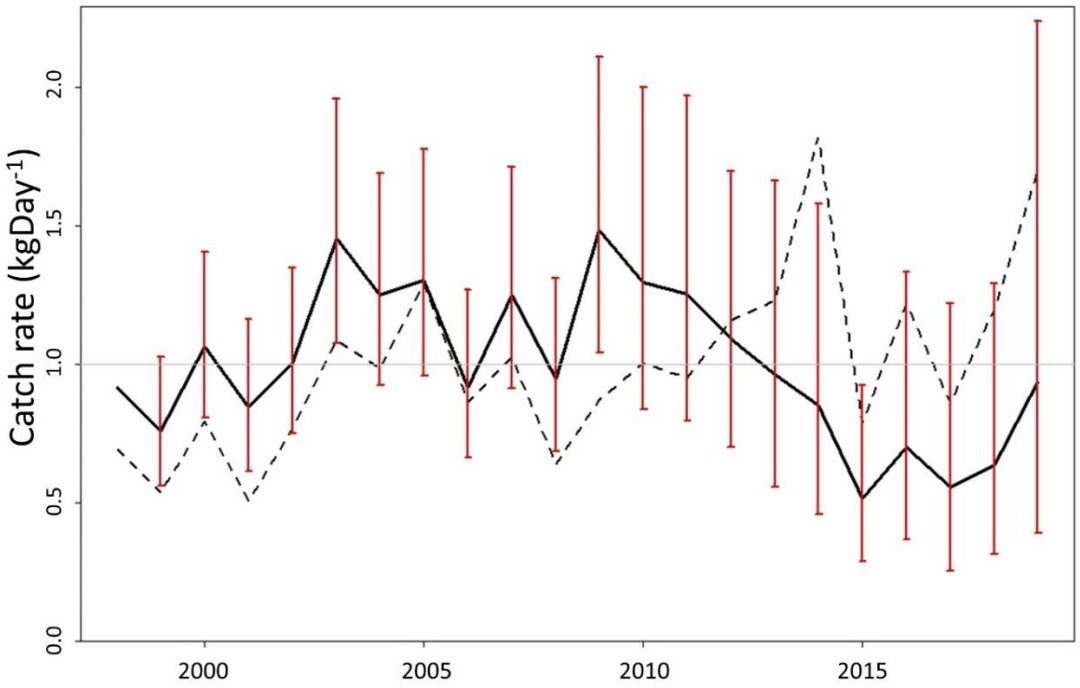

Figure 4 **Droplining – Standardised CPUE (black line, kg.day-1) for Hapuku from 1997/98 to 2018/19. Error bars represent 95% confidence intervals. Dashed line indicates the geometric mean CPUE (kg.day-1).**

Stock assessment - list of indicators	
Most recent assessment	2020 – **Undefined**
Assessment method	Weight of evidence
Main data inputs	Commercial catch (t) – 1997/98 to 2018/19 Standardised CPUE dropline (kg.day^{-1}) – 1997/98 to 2018/19 Median nominal CPUE handline (kg.day^{-1}) – 1997/98 to 2018/19
Main data inputs (rank)$^{+}$	Commercial catch – 2 (medium quality): historical time series, but some reporting changes and likely misreporting, limited quality control/error validations $CPUE_{dy}$ dropline: (low quality), compromised by significant reporting changes and inaccuracies in effort data (see Appendix 2 for further details)

Stock assessment - list of indicators	
	$CPUE_{dy}$ handline: (low quality), compromised by significant reporting changes and inaccuracies in effort data (see Appendix 2 for further details)
Key model structure and assumptions	NA – no model-based quantitative assessment approach was used
Sources of uncertainty evaluated	Known or likely uncertainties in the key indicators were taken into consideration in ranking data inputs to these indicators, and in reaching a conclusion regarding stock status based on the relative weighting of these indicators

† Main data inputs (rank)

1 – High quality: data have been subjected to documented quality assurance and peer review processes, are considered representative and robust and provide a high level of confidence to support fisheries management decisions.

2 – Medium quality: data have been subjected to some internal quality assurance processes, have some documented limitations, but are still considered sufficiently accurate and informative to be useful to inform management decisions with some caveats.

3 – Low quality: data have been subjected to limited or no quality assurance processes, may be compromised by unknown or documented limitations that have not been fully explored, but are considered the best available information and require a high level of precaution to be exercised when interpreted to inform management decisions.

Status indicators and limits – reference levels	
Biomass indicator or proxy	Standardised CPUE. Used to indicate whether biomass is likely to be increasing, decreasing or stable
Biomass limit reference level	NA – no biomass limits or targets have been set
Fishing mortality indicator or proxy	NA – no agreed proxy of fishing mortality has been defined
Fishing mortality limit reference level	NA – no fishing mortality limit has been set
Target reference level	NA – no fishing mortality targets have been set

Stock assessment results – review of indicators	
Biomass status in relation to limit	NA – no biomass limits or targets have been set
Fishing mortality in relation to limit	NA – no fishing mortality limit has been set
Previous SAFS stock status	Undefined (2018; NSW jurisdictional level)
Current SAFS stock status	Undefined (2018; scheduled for SAFS assessment in 2020)

Fishery interactions

Hapuku are primarily caught as bycatch when droplining for Blue-eye Trevalla (*Hyperoglyphe antartica*). Catches of Hapuku and associated fishery statistics may therefore be influenced by changes in the Blue-eye fishery.

In the Commonwealth, Hapuku are harvested in 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, to a lesser extent in the Great Australian Bight (GAB) Sector. Total annual catches across all sectors declined from an average catch of ~120 t from 2005-2008 to ~23 t from 2013-16 (AFMA 2018). Catch increased to approximately 48 t in 2017, mostly due to an increase in catches by the CTS (Chick et al. 2018).

Qualifying comments

NSW catch and effort logbook data vary spatially and temporally across different eras, delineated by changes in fisher reporting requirements and other management changes. Increased variance in the standardised commercial catch rate since 2009/10, coincides with changes in the reporting requirements of commercial fishers to record daily catch and effort and report those data monthly. Prior to 2009/10, commercial fishers were only required to record and report these data on a monthly basis, i.e. monthly catch and effort. It seems likely that the change to daily recording requirements, in addition to fewer and lower catches, has contributed to uncertainty in this potential indicator of fishery performance and proxy for changes in Hapuku biomass.

Recreational catch is poorly understood.

Factors other than fishing, including environmental factors, may affect changes in the abundance and biological functioning of Hapuku stock(s). Temporal and spatial variations in oceanographic conditions may influence productivity of this resource through availability of trophic resources impacting on growth, population connectivity, recruitment, or a combination of all of these.

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