Stock status summary – Ghost Nipper - 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. 2020. Stock assessment report 2019 – Estuary General Fishery (Hand Gathering) – Ghost Nipper (*Trypaea austaliensis*). NSW Department of Primary Industries. Fisheries NSW, Port Stephens Fisheries Institute. 59 pp.

Stock structure

The stock structure of nippers is unknown. However, there is likely to be some stock structuring. The biology of the species, together with the relatively low-energy estuarine environments they inhabit, suggest that local populations do not significantly contribute recruits to other estuaries, and that populations within estuaries could constitute functionally separate biological stocks.

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

Stock Status

On the basis of the evidence provided the NSW stock status of nippers is classified as **sustainable**.

A weight-of-evidence approach has used to assess the NSW stock status of nippers.

Data and information that support the classification are similar to that of the previous assessment, with data from the commercial fishery and more recent estimates of recreational catch extended to the end of the 2018/19 fishing period, and include: i) Species biology together with the low-energy environments inhabited by nippers suggest a level of stock structuring likely at the level of estuary and populations are resilient to processes affecting abundance (i.e. highly fecund, relatively short lived and small size-at-maturity); ii) state-wide levels of catch that have increased in the last 5 years with catch rates ($CPUE_{dy}$ and $CPUE_{hr}$) that have remained stable, since at least 2009/10; iii) Catches and catch rates ($CPUE_{hr}$) from Port Hacking (the estuary that has contributed an average harvest of 92% of the state-wide annual catch) have increased since 2009/10, with catches of ~4 $t.yr^{-1}$ in the last 5 years being caught at catch rates exceeding the long-term average; iv) Catches and catch rates ($CPUE_{hr}$) from Shoalhaven/Crookhaven River have increased since fishing began in 2013/14, with catch rates in the last two years exceeding the long-term average; v) consistent patterns of monthly catch for the whole fishery and in Port Hacking and Shoalhaven/Crookhaven River, indicating no substantial change in the availability of nippers to the commercial fishery; and vi) fishery-

independent surveys of nipper population structure and biomass from Port Hacking and Shoalhaven River, in 2015/6 and 2016/17 that indicate biomass levels capable of sustaining known catches with high confidence, and likely supporting current catches with confidence.

Catch trends

Commercial

State-wide fishery catch increased to ~2 t from 1984/85 to 1994/95 and has generally varied between~2 t and 4 t between 1995/96 and 2008/09 (Figure A1-1). Since 2009/10, annual reported commercial catches have generally increased, with >4 t being harvested in 6 out of the last 10 years, and in each of the last four years. This increase in recent years is partially a result of catch from previously unfished (Shoalhaven/Crookhaven River) or sporadically fished (Myall River) estuaries. In 2018/19 (the last year prior to implementation of a TACC), total reported catch was 4.4 t, harvested by nine authorised fishers. Importantly, these relatively recent (since 2009/10) patterns of change in annual catch for the state-wide fishery are not necessarily consistent with patterns of catch at smaller spatial scales i.e. estuaries.

Since 2009/10, commercial catches of Nippers have been reported from a total of 14 estuaries in NSW. The top four estuaries by cumulative catch since 2009/10 are Port Hacking (~38 t), Hawkesbury River, Shoalhaven/Crookhaven River and Myall River. Since 2009/10, annual catches of nippers from Port Hacking have contributed an average of 92% (range 80% – 99%) to the total state-wide annual catch.

Since 2009/10, annual catch from Port Hacking has averaged 3.8 $t.yr^{-1}$ (range 2.3-5.0 t), with a historical peak of 5.0 t in 2015/16. Annual catches in the five years form 2014/15 have been ≥3.5 $t.yr^{-1}$ and has averaged 4 $t.yr^{-1}$. This is marginally higher than the previous 5-year average (3.6 t), which included the three years of lowest reported catch.

(Information from other estuaries is not presented as ≤5 fishers contributed to the data.)

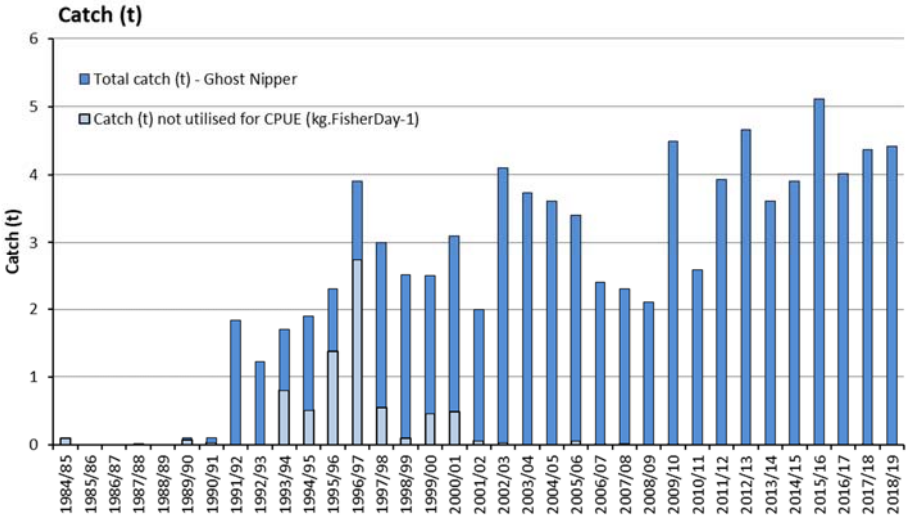

Figure A1 - 1 Annual commercial catch (t) of nippers and catch not allocated to fishing days (for the purpose of calculating catch rate ($kg.day^{-1}$), from 1984/85 to 2018/19.

Recreational and Indigenous cultural fishing

Recreational fishers either catch nippers or purchase commercially caught nippers for bait. In NSW, recreational fishers require a recreational fishing licence (unless exempt) to fish,

including the harvest of nippers. Each recreational fisher is limited to a bag limit of 100 nippers. Estimates of recreational catch (total number retained) are available from the National Recreational and Indigenous Fishing Survey (2000/01; Henry and Lyle 2003) and NSW state-wide surveys (2013/14; West et al. 2015; and 2017/18, DPI unpublished (preliminary data); see Appendix 2 - NSW Recreational fishing surveys).

In 2000/01, the recreational harvest (kept numbers) was estimated to be 2.5 million (±0.5 million SE). At an average weight of 3 g (whole, live weight, ≥10 mm carapace length, NSW DPI unpublished data), this estimate equates to a total recreational harvest of ~7.5 t (± 1.5 t). In 2013/14 and 2017/18, the state-wide survey estimated the retained recreational catch of Nippers was 1.3 ± 0.4 million and ~0.5 ± 0.13 million individuals (i.e. ~3.9 t ± 1.2 $t.yr^{-1}$ and ~1.4 t ± 0.4 $t.yr^{-1}$, respectively). These annual estimates of recreational catch represent 242%, 108% and 33% of the reported commercial catch for 2000/01, 2013/14 and 2017/18, respectively.

Information collected as part of the 2013/14 survey indicates about half of the total number of nippers caught (0.61 ± 0.24 million SE) was harvested in the summer months (December–February), with ~0.75 million harvested from areas on the northern coast of NSW (Port Stephens to Tweed Heads). The 2017/18 state-wide survey provides estimates of the spatial distribution of the estimated recreational catch into each of the coastal zones described in the survey (see Appendix 2 – Figure A2-3). The distribution of the recreational catch was almost evenly distributed away from the two central zones of NSW, to the northern and southern zones. Approximately half (770 kg; 54%) of the recreational catch in 2017/18 was evenly harvested from zones 1 and 2 (North and Mid North Coasts) and half (600 kg; 42%) in zones 5 and 6 (Mid South and South Coasts).

Estimates of catch in the survey periods indicate a declining trend in recreational catch, which may be partially explained by the differences in the survey sample frame (Appendix 2) and also increasing availability and use of artificial baits and lures over the period.

The benefits (and costs) of fishing generally and professional fishing to the cultural, broader social, health, wellbeing and economic value to Indigenous people and communities are substantial (Voyer et al. 2016). Schnierer and Egan (2012) described a case study in NSW of the impact of management changes on the viability of Indigenous commercial fishers and the contribution commercial fishing and aquaculture makes to Indigenous communities. Included in this case study are estimates of the contribution Indigenous commercial fishers make to Indigenous communities, including the contribution of between 5% - 20% of their annual commercial catch. The contribution made to Indigenous communities by Indigenous commercial fishers was, on average, 9.8% of annual catch and the contribution from broader Indigenous commercial fishers was greater than that made by fishers in the EGHG fishery, with this being a consequence of hand gathering being a "…traditional skill that is widely practiced by coastal families so they can fulfil their own needs." (Schnierer and Egan 2012). Moreover, Schnierer and Egan (2012) report substantial harvests of hand gathered species (principally Pipi) by Aboriginal fishers that were either not reported in commercial catch records, or reported as 'other' species and went unrecorded as species specific catches and were utilised for personal and community use.

Synthesis of catch composition from Indigenous cultural fishing in NSW indicated that there are at least 18 species in the Estuary General Fishery that overlap with Indigenous fisheries (Schnierer and Egan 2016). In a survey based in the Tweed region in 2010, annual catch of

nippers by Aboriginal fishers was estimated to be between 1,774 and 4,166 (Schnierer 2011). Based on an average weight of 3 g, the catch from Aboriginal fishers in the Tweed region in NSW is estimated at <15 kg.year^{-1}. Schnierer (2011) described nippers as among the top 10 culturally most important species and consisted of between 11% and 5% of the total cultural catch of invertebrates and total numbers of all species, respectively.

Illegal Unregulated and Unreported

The level of Illegal Unregulated and Unreported (IUU) fishing has not been quantified.

There are anecdotal reports of IUU fishing occurring at the scale of estuary, related to minor incidents in both the commercial and recreational fishing sectors. Further, NSW Fisheries Compliance provide annual summaries of seizures of fish and invertebrates due to non-compliance (dpi.nsw.gov.au/fishing/compliance/fisheries-compliance-enforcement). These reports indicate regular seizures of nippers each year from 2012/13 to 2016/17, with the exception of 2015/16 and also no report of nippers seized in 2017/18 (most recent report). Annual seizures have ranged between 2 029 and 8 900 individual nippers (i.e. 6 – 27 kg).

Effort trends

Commercial

Estimated effort in FisherDays (effort$_{dy}$) increased from less than 100 days (1984/85–1990/91) to more than 450 days during the late 1990s (Figure A1-2). Noting that during this period fishers were required to report their catch monthly and effort (in days fished) by gear type, not linked to catch unless only a single gear type was used and then not linked to species catch within a gear type. Therefore, prior to 1997/98 total effort$_{dy}$ reported within the EGHGF cannot be allocated to a species catch and is the total effort$_{dy}$ reported by the EGHG fisher for each month where one method was reported, and the species of interest was also reported in that month. In 1998/99, the number of days fished was 497 days, a historical maximum, and declined substantially over the following 3 years, to 135 days in 2001/02. From 2001/02 to 2008/09, effort$_{dy}$ remained below 200 days (Figure A1-2). The decline in days fished coincided with changes to commercial fishery reporting requirements and the difficulty in allocating effort to catch. Effort was linked to fishing method, irrespective of the catch reported. The substantial decline in effort$_{dy}$ is likely a function of an increased targeting of other species (e.g. Pipis) and fewer monthly catches of multiple species (including Nippers). In 2009/10, reported effort$_{dy}$ increased to 496 days, coinciding with the introduction of changes in commercial reporting, with fishers required to report hours spent hand gathering per fishing day and reporting at finer spatial scales. Since 2009/10, the number of days fished per year has generally increased, from an average of <500 days (average 471 days; range: 402-522 days) between 2009/10 and 2013/14 to >500 days (average 516 days; range: 484-558 days) between 2014/15 and 2018/19. In 2018/19, effort$_{dy}$ was 490 days.

Effort in reported hours fished (effort$_{hr}$) has remained relatively stable in most years since 2009/10, averaging 1749 hours (range 1509–2398 hours), with the exception of a substantially decline in 2010/11, likely associated with the individual fisher with low (<50% average annual) catch reported in that year and a spike in 2013/14, of 2398 hours, coinciding with new entrants to the fishery and their fishing previously unfished estuaries (e.g. Shoalhaven/Crookhaven River). In 2018/19, effort$_{hr}$ was 1740 hours (Figure A1-2).

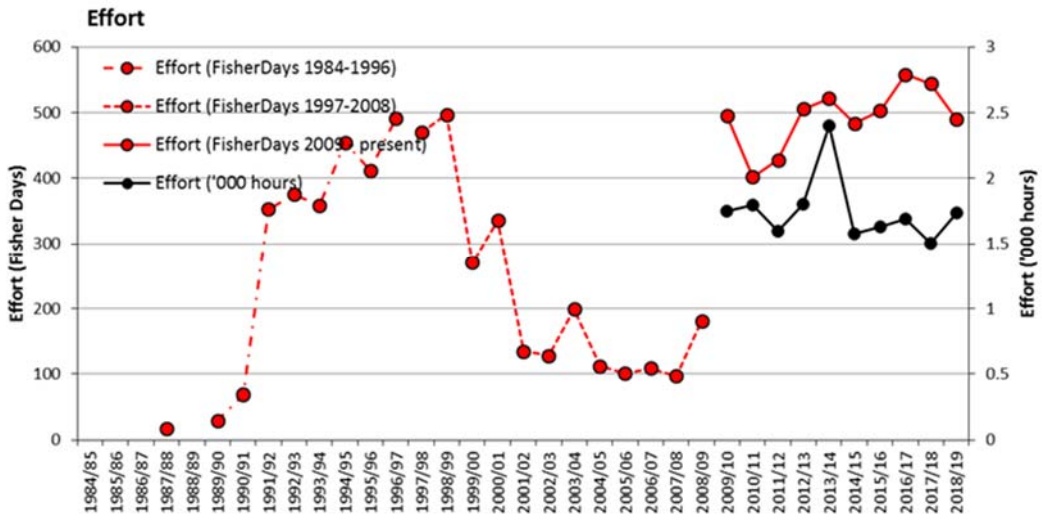

Figure A1 - 2 Annual commercial effort in units of FisherDays* (1984/85 to 2018/19) and hours (2009/10 to 2018/19). Note: changes in reporting requirements limit consistent interpretation of the effort (FisherDays) time series.

*Effort (FisherDays) (a) for July 2009 to present was estimated from the number of distinct fishing dates entered on daily catch returns for each fisher in each month where the method was used, irrespective of whether the species was reported on those days, to be consistent with earlier reporting; (b) for July 1997 to June 2009, was taken from the number of days fished hand gathering as entered on monthly catch returns; and (c) for July 1984 to June 1997, limited to catch records where only a single fishing method was entered on a monthly catch return. Therefore, joining the dots from 1996/97 to 1997/98 or 2008/09 to 2009/10 may not be an accurate representation of changes in catch rate across these years.

Recreational and Indigenous

There are no data describing the recreational fishing effort expended in harvesting nippers.

Schnierer (2011) report the total effort of Aboriginal fishers based in the Tweed region was recorded to be 542 hours or 92 days. Cultural catch of bait including nippers was also seen to be important in delivering economic benefits to the community (Schnierer 2011).

Catch rate

Commercial

Catch per FisherDay ($CPUE_{dy}$) is a problematic index to estimate and interpret prior to 2009/10, for reasons outlined for the $effort_{dy}$ time series. Using daily effort calculated as explained above, three distinct time periods, with clearly different CPUE trends, can be distinguished (Figure A1-3). $CPUE_{dy}$ increased from less than 10 $kg.day^{-1}$ (1984/85–2000/01) to a maximum of 33 $kg.day^{-1}$ in 2005/06, probably due to fewer multispecies catches per month and substantially less allocated effort. Between 2005/06 and 2008/09, daily catch rate declined substantially, reflecting substantially lower catches and sustained levels of relatively low effort, again likely a function of the challenges in allocating effort to catches during this period. Since 2009/10 (the first year of current commercial fisher reporting requirements), daily catch rate has been relatively stable, reflecting increasing levels of catch and effort and averaging 8.3 $kg.day^{-1}$. In 2018/19 the daily catch rate was 9 $kg.day^{-1}$ (Figure A1-3).

Since 2009/10, annual estimates of catch per hour ($CPUE_{hr}$) have averaged 2.4 $kg.hr^{-1}$ (range 1.4–3.1 $kg.hr^{-1}$) and have remained relatively stable in most years, with the exception of 2010/11 and 2013/14 when $CPUE_{hr}$ was 1.4 and 1.5 $kg.hr^{-1}$, respectively. As described for the substantial changes in the hourly effort series, these changes in $CPUE_{hr}$ coincide with and

partially reflect changes in the composition of fishers between years. Importantly, and as similarly described for fishery-wide levels of catch, change in levels of fishery-wide effort and $CPUE_{hr}$ are not necessarily consistent with patterns at smaller spatial scales

In Port Hacking, catch rate ($CPUE_{hr}$) has increased since 2009/10 and over the last 5 years have been above the long-term average (2.5 $kg.hr^{-1}$), although they have declined over the last 4 years from a historical high of 3.3. $kg.hr^{-1}$ in 2015/16 to 2.7 $kg.hr^{-1}$ in 2018/19.

(Information from other estuaries is not presented as ≤5 fishers contributed to the data.)

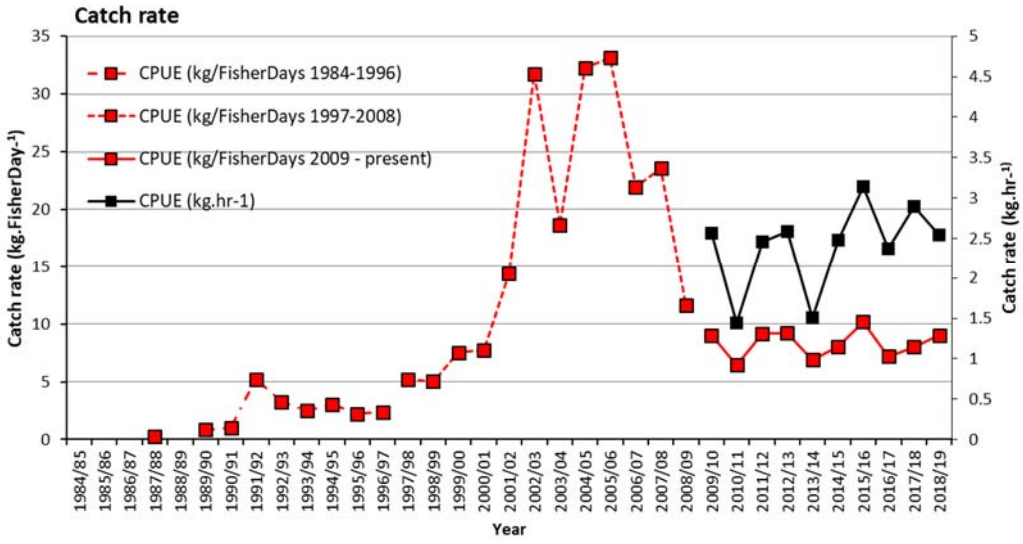

Figure A1 - 3 Annual commercial catch rate in units of $kg.FisherDays^{-1}$* (1984/85 to 2018/19) and $kg.hr^{-1}$# (2009/10 to 2018/19). Note: changes in reporting requirements limit consistent interpretation of the $kg.FisherDays^{-1}$ time series.

#CPUE ($kg.hr^{-1}$) calculated from average daily CPUE ($kg.hr^{-1}$), excluding records with catch >10 $kg.day^{-1}$, effort of 0 or >10 $hrs.day^{-1}$ and CPUE ($kg.hr^{-1}$) >5.5 $kg.hr^{-1}$. Data only available from 2009/10.

Stock assessment methodology	
Year of most recent assessment	2020 – **sustainable**
Assessment method	Review of indicators (weight-of-evidence)
Main data inputs	Catch (commercial) – 1984/85 to 2018/19 Catch (recreational) – 2000/01, 2013/14, 2017/18 $CPUE_{dy}$ – $kg.FisherDay^{-1}$ 2009/10 to 2018/19 $CPUE_{hr}$ – $kg.hr^{-1}$ 20009/10 to 2018/19 Fishery-independent survey-based estimates of biomass

Stock assessment methodology	
Main data inputs (rank) †	Catch (commercial) – 1984/85 to 2018/19: (medium quality), long historical time series, but some reporting changes and likely misreporting, limited quality control/error validations Catch (recreational) – 2000/01, 2013/14, 2017/18 (medium quality), different survey methods add uncertainty to comparisons through time. $CPUE_{dy}$ – $kg.FisherDay^{-1}$ 1984/85 to 2018/19: (low quality) compromised by significant reporting changes and inaccuracies in effort data. $CPUE_{hr}$ – $kg.hr^{-1}$ 2009/10 to 2018/19: (medium quality) relatively short time series, some misreporting, some quality control/error validations. Fishery-independent survey based estimates of biomass in recent years (medium quality) – unpublished data.
Key model structure and assumptions	NA – no quantitative, model-based approach was used in this assessment.
Sources of uncertainty evaluated	Known or likely uncertainties in the key indicators were taken into consideration in ranking of the quality of key indicators, and in reaching a conclusion regarding stock status.

† 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	NA - no formal indicators or reference points determined

Status indicators and limits – reference levels	
Biomass limit reference level	NA – no biomass limits or targets have been set
Fishing mortality indicator or proxy	NA - no formal indicators or reference points determined
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 stock status	Sustainable
Current stock status	Sustainable

Qualifying comments

Some uncertainty remains in the assessment, including: i) no definitive support for the inferred stock structure; ii) a discontinuous time series and uncertainty around pre-2009/10, commercial fishery data; iii) low levels of commercial fishery data from a substantial number of estuaries and at irregular times, from small numbers of fishers; iv) substantial but decreasing recreational catches that have uncertainty associated with comparisons through time (due primarily to differences in survey designs); v) unknown levels and distribution of Indigenous cultural catch; vi) unquantified levels of IUU catch; and vii) uncertainty of the reliability of fishery-independent surveys from 2-3 years ago, to inform current stock status. Importantly, change in levels of fishery-wide catch, effort and $CPUE_{hr}$ are not necessarily consistent with patterns at finer spatial scales (estuary).

Factors other than fishing, including environmental factors, likely affect change in the abundance and productivity of nippers and are not considered in this assessment.