Department of Primary Industries
Department of Regional NSW

NSW Stock Status Summary – 2023/24

Beachworms (*Onuphidae*)

Assessment Authors and Year

Chick, R.C. and Fowler, A. M. 2024. Stock assessment report 2023/24 – Estuary General Fishery (Hand Gathering) – Beachworms (Onuphidae). NSW Department of Primary Industries. Fisheries NSW, Port Stephens Fisheries Institute. 51 pp.

Stock Status

Current stock status	On the basis of the evidence contained within this assessment, Beachworms are currently assessed as **depleting**.

The weight of evidence summarised below, supports an understanding that the biomass of Beachworms is unlikely to be depleted, and that recruitment is unlikely to be impaired. However, for the period 2018/19 to 2022/23, evidence suggests the biomass declined, but the stock is not yet considered to be recruitment impaired. The weight of evidence is less supportive of an inference that the current level of fishing mortality is likely to cause the stock to become recruitment impaired.

Stock structure & distribution

Beachworms are polychaete worms in the family Onuphidae. In NSW, they are predominantly *Australonuphis teres* (stumpy or kingworm) and are harvested for bait from wave-exposed intertidal sandy beaches. Their distribution ranges from South Australia to Queensland (Dakin et al. 1952; Paxton 1979), with main populations of *A. teres* between Lakes Entrance in Victoria to Maroochydore in Queensland. Other species of Beachworms that occur in NSW and that are recognised as different species by fishers include *A. parateres* (slimy) and *Hirsutonuphis mariahirsuta* (wiry or white headed wiry), but they are less abundant than kingworms (Paxton 1996).

A genomic study on *A. teres*, sampled from hierarchically nested spatial scales along 900 km of NSW coast, identified six genetic groups with no clear geographic pattern to their distribution, suggesting considerable gene flow among populations (Padovan et al. 2020; Appendix 2). Little is known about the genetic structure of the other species of Beachworms but, as they also adopt a similar, broadcast spawning life history (Paxton 1986), with larval distribution a function of oceanographic processes and likely larval behaviour, it is highly probable they represent broad, interconnected populations. Although not supported by quantitative sampling, Paxton (1979) observed that *A. teres* lives where more wave action occurs, with *A. parateres* preferring more sheltered areas, and small *A. teres* living higher on the shore than larger individuals. Anecdotal evidence, from irregular observations from divers, indicates large *A. teres* occur at ocean depths >1.5 m and >200 m offshore. For the purposes of this assessment, it is assumed that Beachworms in NSW constitutes a single multi-species stock or management unit.

Scope of this assessment

This stock status summary presents information and results from the most recent assessment of the NSW Beachworm stock (Chick and Fowler 2024) that aimed to: 1) define the stock structure and provide a summary of the biology of the species; 2) assess and determine the biological status of NSW Beachworms; 3) summarise the available fishery statistics and additional data sources to inform the assessment; 4) outline information and data limitations and uncertainty; and 5) comment on the strategic direction of future research and the assessment. Assessment of the NSW Beachworm stock is based on a weight-of-evidence

approach, as the current understanding of stock structure and available data do not support a reliable model-based stock assessment.

Biology

Beachworms are dioecious i.e. separate male and female individuals. Sexual maturity is reached at 42 cm in length for A. teres, and 39 cm for A. parateres and they are presumed to be repeat spawners throughout their lifespan (Paxton 1979). Mature gametes have been observed throughout the year, with A. teres containing >100,000 eggs in the middle third of their body (Paxton 1986). As the size of Beachworms increases, the number of gamete-bearing segments and fecundity also increases. Paxton (1979) described mature oocytes of A. teres to be 250–260 µm in diameter and uniformly light green, whereas those of A. parateres are 260–280 µm in diameter and cream coloured. Beachworms are broadcast spawners. Spawning occurs throughout the year (Paxton 1986) with possible reproductive peaks in February and October (Fielder and Heasman 2000). Ontogenetic changes in morphology have been observed throughout juvenile development of various onuphid species, but not in detail for Beachworms (Paxton 1986).

Rates of growth of Beachworms have not been recorded, but Paxton (1979) found A. teres grew up to 100 cm and A. parateres grew up to 300 cm in length. The smallest Beachworms that have been collected were 30 mm in length (Paxton 1979). Independent surveys of A. teres from along the NSW coast included Beachworms between 91 and 954 mm long and ranging in age from <1 year to 9 years old (DPI unpublished, see Appendix 2). Population size structure appeared to be normally distributed, with individuals weighing between <1 g and 35.5 g (DPI unpublished).

Fishery statistics

Catch information

Commercial

State-wide fishery catch increased between 1984/85 and 1996/97 during an apparent developmental phase in the fishery, reaching a peak >35 t in 1996/97 (Figure 1). From 1997/98, catch generally decreased from >20 $t.yr^{-1}$ to about 10 $t.yr^{-1}$ between 2006/07 – 2009/10. The pattern of declining annual catches continued from 2009/10 (11.3 t; noting this was the time of transition to the current reporting system) to 2015/16 (~5.5 t). Since 2015/16, catches have averaged ~5 $t.yr^{-1}$ including a total catch of 7.3 t in 2018/19 (the last year prior to implementation of a TAC). Total catch has continued to decline with total catch in the last two years being the lowest two levels on record. In 2022/23, 3.2 t was reported, the lowest catch since 1984/85, and 5.3 t below the 2022/23 TAC (8.5 t; Figure 1). Importantly, these relatively recent (since 2009/10) patterns of change in catch for the State-wide fishery are not necessarily consistent with patterns at finer spatial scales.

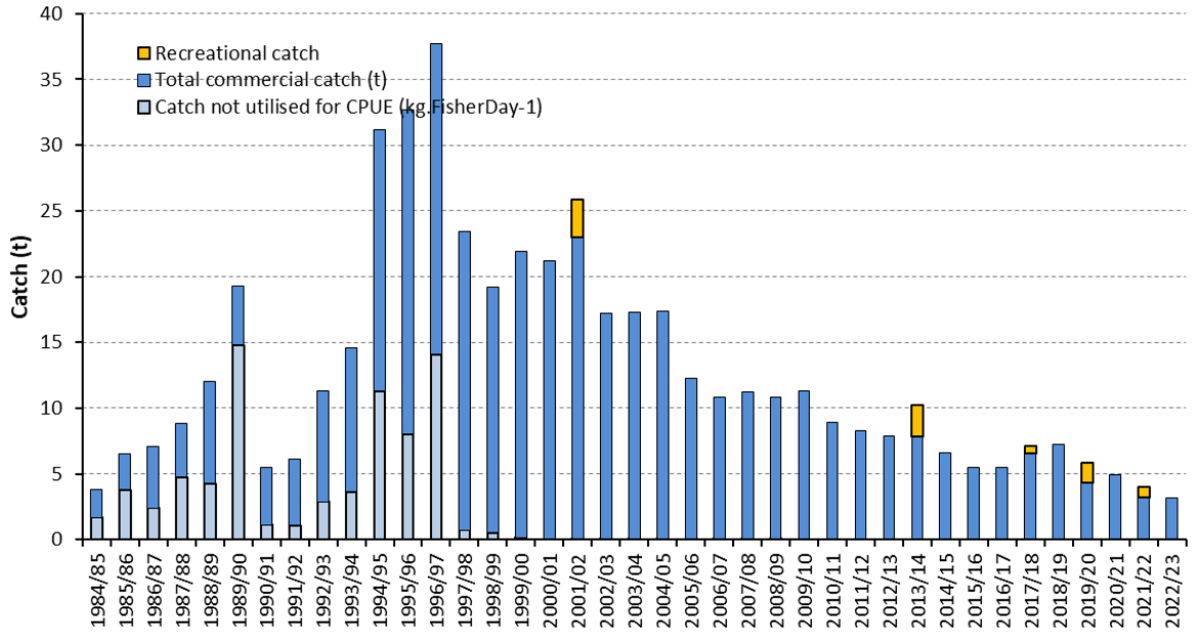

Figure 1. Annual commercial catch (t), from 1984/85 to 2022/23. Recreational catch estimates only available for 2000/01, 2013/14, 2017/18, 2019/20 and 2021/22.

Since 2009/10, catches of Beachworms have been reported from all Regions defined within the EGHG Fishery (Regions 1-7), although no catch was reported from Regions 2, 5 or 7 in 2022/23 (Figure 2). Catches from Regions 1, 3, 4 and 6 have accounted for an average of 98% (range 94% - 100%) of the annual State-wide catch since 2009/10. Catch from Region 3 has accounted for an average of 54% (range 37% - 72%) of annual State-wide catch. In 2022/23, 53% of the State-wide catch (1.7 t) was harvested from Region 3, the lowest catch recorded since 2009/10 (Figure 2 and Figure 3). Since 2009/10, catches from Region 4 have averaged 27% (range 7% - 46%) of annual State-wide catch. In 2022/23, catch from Region 4 was 0.88 t, the highest catch in 4 years but lower than in any other year prior between 2010/11and 2018/19. Catch from Region 1 has averaged 12% (range 8% – 18%) of the State-wide catch since 2009/10, and in 2022/23, was 0.5 t, one of the three lowest catches since 2009/10 (the other two lowest years being 2021/22 and 2019/20) and 16% of the 2022/23 State-wide total. Catches from Region 6 have been recorded every year since 2009/10 and averaged 5% (range 1% – 10%) of the State-wide total. In 2022/23, 0.13 t was harvested from Region 6, the lowest level recorded. Catches from other regions have been <4% of total catch in any year and those from Regions 2 and 5 have been more sporadic and commonly <1%. As a consequence, figures representing regional data have been limited to Regions 1, 3, 4 and 6. In 2022/23, catches from Regions 3 and 4 were 1.7 t and 0.88 t respectively, making up >80% of the total catch for the year (Figure 2 and Figure 3).

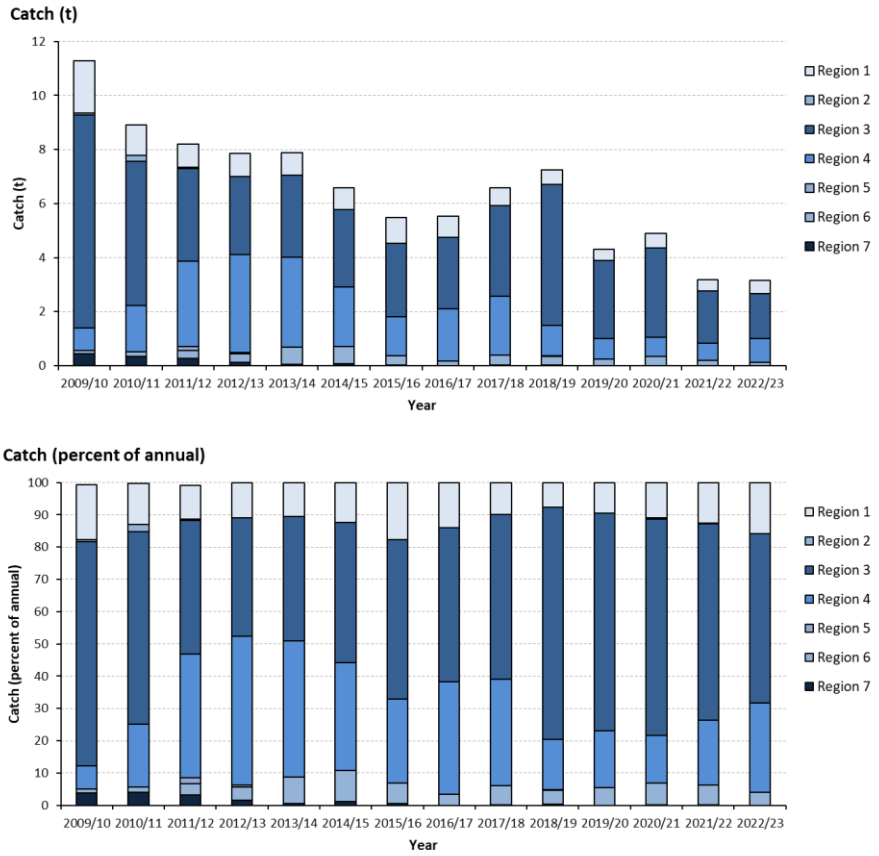

Figure 2. Total catch (t) of Beachworms and percent of total annual catch, stacked by Region from 2009/10 to 2022/23.

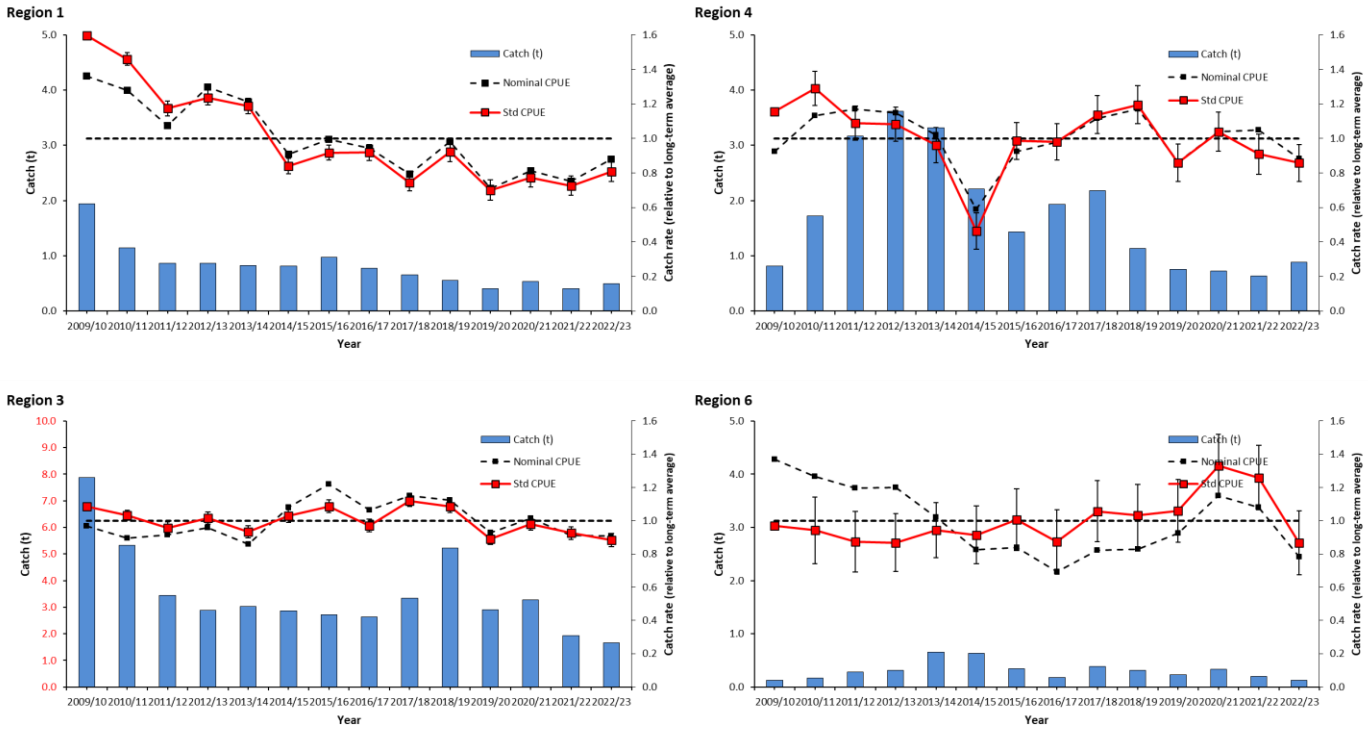

Figure 3. Region – Annual catch (t), standardised commercial catch rates (red lines with 95% confidence intervals) and nominal catch rates (dashed black lines) scaled to the series average (horizontal dashed black line) for each of the top 4 regions (by catch) from 2009/10 to 2022/23. Note: Y-axes in red are greater than others.

Recreational & Charter boat

In 2000/01, the recreational harvest (kept numbers) was estimated to be 285,663 ± 72,697 worms (mean ± SE). At an average weight of 10 g (as defined for the conversion of commercial numbers of Beachworms to weight), the 2000/01 estimate equates to a total recreational harvest of ~2.9 ± 0.7 $t.yr^{-1}$. In 2013/14, 2017/18, 2019/20 and 2021/22 the State-wide survey estimated the retained recreational catch of Beachworms at 239,085 ± 85,662; 54,046 ± 20,044; 150,299 ± 96,222; and 86,549 ± 47,666 Beachworms, respectively (i.e. ~2.4 ± 0.9 t; ~0.5 ± 0.2 t; 1.5 ± 0.96 t; and 0.9 ± 0.48 t, respectively; Figure 1). The 2017/18, 2019/20 and 2021/22 NSW surveys sampled one- and three-year licence holders present in the NSW Recreational Fishing Fee (RFF) Licence database, whereas the previous NSW survey in 2013/14 sampled households from the White Pages (West et al. 2015). Corrections made to the 2013/14 survey outcomes, to account for differences in survey designs, indicate the comparable recreational catch was 1.5 t ± 0.8 t (Murphy et al. 2020). Notably, Beachworm estimates from State-wide surveys are typically from a low sample size and the estimate from 2013/14 was associated with relatively high standard error (i.e. >40%; Murphy et al. 2020). Estimates of recreational catch represent 12%, 30%, 8%, 35% and 27% of the reported commercial catch for each of the years, respectively.

Indigenous

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) reported 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, annual catch of Beachworms by Indigenous fishers was estimated at between 1,869 and 4,350 worms (Schnierer 2011). Based on an average weight of 10 g, the catch from Aboriginal fishers in the Tweed region in NSW is estimated at <0.5 $t.year^{-1}$. Schnierer (2011) described Beachworms as among the top ten culturally most important species but they consisted of less than 5% of the total cultural catch in terms of total numbers of species. Total effort estimated from this area for the Aboriginal fishery was 542 hours or 92 days (Schnierer 2011). Cultural catch of bait, including Beachworms was also seen to be important in delivering economic benefits to the community (Schnierer 2011).

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 beaches, related to minor incidents in both the commercial and recreational fishing sectors. NSW Fisheries Compliance provide annual summaries of seizures of fish and invertebrates due to non-compliance. These reports do not indicate IUU activity related to seizures specific to non-compliance regarding Beachworms for the years 2010/11 to the most recent report in 2021/22 (https://www.dpi.nsw.gov.au/fishing/compliance/fisheries-compliance-enforcement).

Fishing effort information

Reported $effort_{dy}$ has generally reflected that of catch over the history of the fishery. It has increased from 945 FisherDays in 1984/85 to a peak of 7,442 FisherDays in 1996/97 (Figure 4). 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 EGHG fishers for each month where one method (hand gathering) was reported. From 1997/98 to 2008/09, effort$_{dy}$ generally decreased from >6,000 FisherDays to about 4,000 FisherDays. Since 2009/10, effort$_{dy}$ has continued to decline from ~3,000 FisherDays to ~1,300 FisherDays, reported in 2021/22 and 2022/23, the lowest levels of effort$_{dy}$ since 1984/85 (Figure 4). Similarly, effort in hours fished (effort$_{hr}$) has also generally declined from >10,000 hours in 2009/10 to <3,600 hours in 2021/22 and 2022/23, again, the lowest levels since 1984/85 (Figure 4).

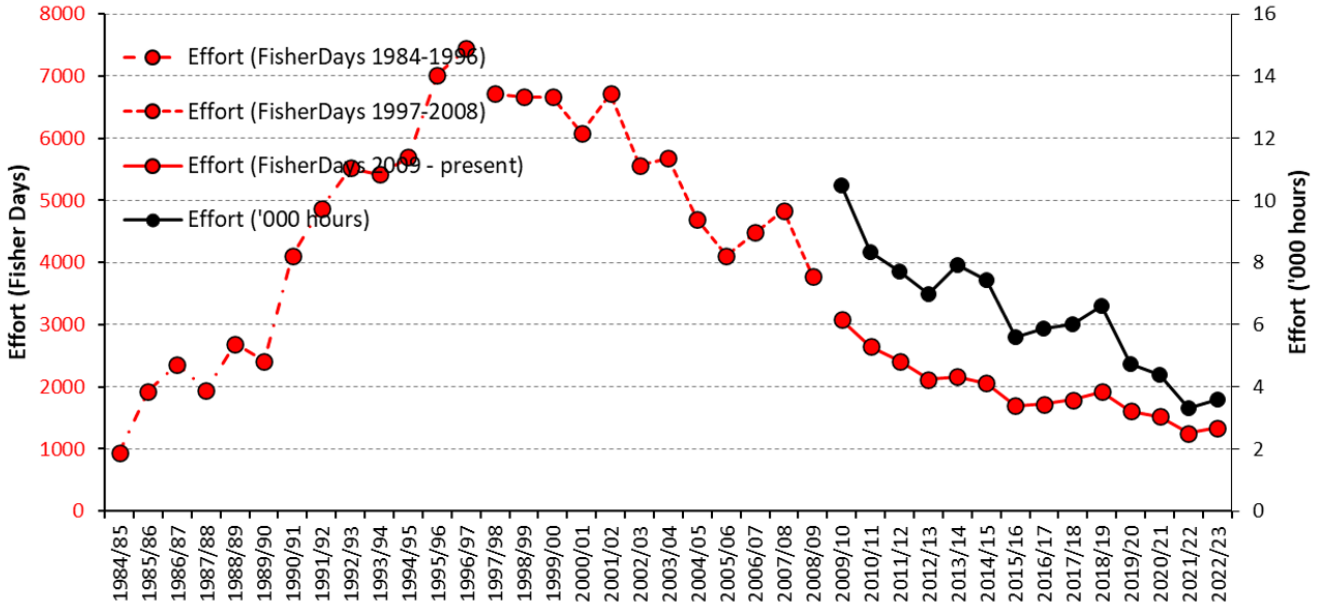

Figure 4. Total annual commercial effort (days and hours) fishing for Beachworms from 1984/85 to 2022/23.

Catch rate information

Catch per FisherDay (CPUE$_{dy}$) is a difficult indicator to interpret prior to 2009/10, for reasons outlined for the catch and effort$_{dy}$ time series. Nonetheless, CPUE$_{dy}$ was relatively low but highly variable (between 1 and 2.9 kg.day^{-1}) from 1984/85 to 1993/94. From 1994/95 to 2008/09, CPUE$_{dy}$ generally remained between 3-3.5 kg.day^{-1}, except between 2006/07 and 2008/09 when it declined below 3 kg.day^{-1} and to a 14-year low of 2.3 kg.day^{-1} in 2007/08. Since 2009/10, CPUE$_{dy}$ has been maintained above 3 kg.day^{-1}, with the exception of each of the last four years, where CPUE$_{dy}$ been below the long-term average (3.3 kg.day^{-1}, from 2009/10 to 2022/23) and in 2022/23 was 2.4 kg.day^{-1}, 28% below the long-term average (Figure 5). Catch per hour (CPUE$_{hr}$) from 2009/10 to 2021/22 has averaged 1.04 kg.hr^{-1}, reaching a peak of 1.22 kg.hr^{-1} in 2018/19. Since 2018/19, CPUE$_{hr}$ has declined with 3 of the last 4 year average levels being below the long-term average and in 2022/23, CPUE$_{hr}$ was 0.94 kg.hr^{-1}, the lowest level since 2014/15.

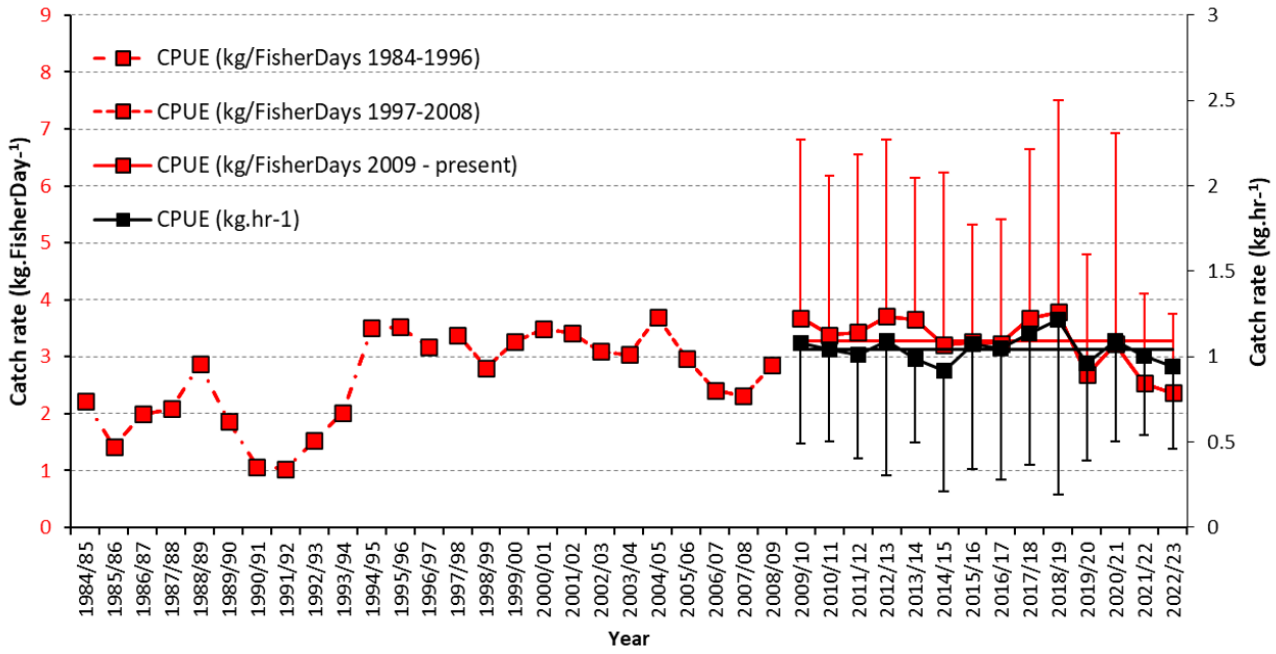

Figure 5. Average annual catch rate (kg.hr^{-1} and kg.FisherDay^{-1}, plus or minus one standard deviation from 2009/10) from 1984/85 to 2022/23.

Patterns of catch and trends in sCPUE vary among regions through time (Figure 3). In Region 1, catches in 2009/10 and 2010/11 exceeded 1 t.yr^{-1}, harvested by 4-5 fishers, and both catch and the number of fishers have generally decreased since. In 2022/23, catch was 0.5 t, harvested by 1 fisher (Figure 3). Over the same period $CPUE_{hr}$ has decreased substantially, from 0.84 kg.hr^{-1} in 2009/10, to levels consistently below the long-term average since 2014/15 and at an average of <0.5 kg.hr^{-1} (range 0.44 – 0.55 kg.hr^{-1}) over the last 4 years (these being the lowest four levels of CPUE recorded in Region 1) and 0.55 kg.hr^{-1} in 2022/23 (Figure 3). In Region 1, sCPUE has generally reflected that of nominal $CPUE_{hr}$, with average levels of sCPUE in the last 4 years being 25% (range 19%-30%) below the long-term average (Figure 3). In Region 1, the difference in the 3-year average levels of sCPUE from the first 3 years in the series to the 3 most recent years indicate sCPUE has declined by ~45%. Region 3 has regularly supported the majority of the fishery's catch. Catches declined from >5 t in 2009/10 and 2010/11, harvested by >20 fishers, to ~3 t from 2011/12 to 2020/21, harvested by ~15 fishers each year. In 2021/22 and 2022/23, catch was 1.9 t and 1.7 t, respectively and the lowest catches recorded in Region 3, harvested by 9 and 8 fishers, respectively (Figure 3). sCPUE has generally reflected that of nominal $CPUE_{hr}$ and was relatively stable, oscillating <10% above and below the long-term average level each 1-2 years since 2009/10 (Figure 3). Since 2019/20 sCPUE has been below the long-term average, has declined over the last two consecutive years, and in 2022/23 is 12% below the long-term average and at its lowest level since 2009/10. Annual catch in Region 4 has been more variable through time than that in other regions but has shown an apparent 5-6 year cyclical decline from 2012/13. Since 2017/18, catch has declined to a historic low in 2021/22, of 0.64 t, with the last four years catches being the four lowest catches on record. Over this period of time sCPUE has generally declined, with three of the last four years being below the long-term average and that in 2022/23 being the lowest on record and 14% below the long-term average (Figure 3). Since 2009/10, catches in Region 6 have averaged ~0.3 t, peaked at ~0.7 t in 2013/14 and have ranged between 0.13 – 0.4 t since 2015/16. In 2022/23, 0.13 t was harvested from Region 6, the lowest level recorded (Figure 3). sCPUE generally increased between 2009/10 and 2020/21, to a peak >30% above the long-term average. However, sCPUE has declined in each of the last two years and in 2022/23 was at its lowest level since 2016/17 and 13% below the long-term average (Figure 3).

Stock Assessment

Stock Assessment Methodology

Year of most recent assessment:

2024 (using data to the end June 2023)

Assessment method:

Assessment of the NSW Beachworm stock is based on a weight-of-evidence approach. This is done as the current understanding of stock structure and available data do not support a reliable model-based stock assessment.

Main data inputs:

- Catch (commercial, NSW EGHG Fishery) (t) – 2009/10 to 2022/23
- Standardised and nominal commercial catch rate (NSW EGHG Fishery) – 2009/10 to 2022/23
- Catch (NSW Recreational Fishery) (t) 2000/01, 2013/14, 2017/18, 2019/20, 2021/22

Data interpreted at state-wide, regional and beach scales.

Key model structure & assumptions:

Standardised catch rates (using cede v. 0.04) (Haddon, 2018). Assumption: annual catch rates are a relative index of abundance not unduly influenced by factors other than those accounted for through standardisation.

Sources of uncertainty:

General data limitations and uncertainty was considered in the weight-of-evidence approach.

There is uncertainty in the assessment and determination of stock status presented in this report. Fishery-dependent measures of fishery and stock performance have declined at the state-wide level, across key regions of the fishery and, at a local, beach scale, there are indicators of depleted stocks. However, changes in the operation of the fishery over recent years (e.g. introduction of TAC and ITQ since 2019) are coincident with these observed declines creating uncertainty regarding their accuracy to reflect changes to the stock (including inter-tidal, fished stocks and any sub-tidal, off-shore components) as opposed to changes in fishery operations.

Further sources of uncertainty include: i) the assessment is for the species complex of NSW beachworms and assumes the data available represents the broader species complex; ii) whilst genetic stock structure is known to be complex, with no clear geographic pattern to the distribution of 6 genetic groups of *A. teres* (Kingworms), there remain further uncertainties regarding the dynamics of biologically functional stocks and the reliance of persisting populations, at a beach or larger scale, on other stocks (e.g. larval sources) throughout the State; iii) recreational fishery data from moderately different sampling frames through time and with limited spatial resolution (not beach level) and a general trend of reduced recreational fishing activity, that may impact domestic demand for beachworms; iv) the influence of management arrangements (past and recent, including 'crewing' changes in 2023) on the utility and reliability of commercial fishery data; and v) unknown or unaccounted for factors influencing the available data and unrelated to abundance (e.g. economic/market and social factors), or directly influencing population abundance and productivity, and unrelated to fishing (e.g. environmental variables – such as low salinity on beaches as a result of heavy rain/flooding, as observed in NSW in recent years) and are generally unaccounted for in the assessment.

Factors other than fishing, including global phenomena (e.g. COVID-19 and associated social impacts - FAO 2021; and climate change), large scale, State-wide disruptions (e.g. natural disasters - bushfires in 2019/20) and also, more local factors (e.g. flooding, land-use influences and environmental factors), may affect change in the abundance, catchability and productivity of Beachworms and/or the operations of the fishery. How these factors may influence the reliability and continuity of the available data is not well known and are not considered in this assessment beyond their acknowledgement. Influences at local scales are likely to be spatially and temporally variable. Identifying and quantifying (where possible) the likely effect of these otherwise unaccounted for factors in limiting the potential of the Beachworm fishery would help inform the relative effects of fishing.

Status Indicators - Limit & Target Reference Levels

Biomass indicator or proxy	None specified This assessment used a weight-of-evidence approach, with data including: • Nominal $CPUE_{day}$ (state-wide) • Nominal $CPUE_{hr}$ (state-wide and beach) • Standardised CPUE (key Regions)
Biomass Limit Reference Point	None specified
Biomass Target Reference Point	None specified
Fishing mortality indicator or proxy	None specified This assessment used a weight-of-evidence approach, with data including: • Catch (state-wide, regional and beach)
Fishing mortality Limit Reference Point	None specified
Fishing Mortality Target Reference Point	None specified

Stock Assessment Results

The NSW Beachworm stock status is classified as **depleting**. This classification is consistent with definitions within the Status of Australian Fish Stocks (SAFS) national reporting framework (www.fish.gov.au/; Piddocke et al 2021) and is a change in the stock status classification of 'sustainable' determined in previous years, since 2019/20 (Chick and Barnes 2020). The weight of evidence provided in this report, and summarised below, supports an understanding that the biomass of Beachworms is unlikely to be depleted and that recruitment is unlikely to be impaired. However, for the period 2018/19 to 2022/23, evidence suggests the biomass declined, but the stock is not yet considered to be recruitment impaired. The weight of evidence is less supportive of an inference that the current level of fishing mortality is likely to cause the stock to become recruitment impaired. In fact, declining levels of catch suggest reduced levels of fishing mortality. Whether these reduced levels of catch together with biomass declines indicate a proportional increase in fishing mortality, such that overfishing is occurring, is not known.

A weight-of-evidence approach has been taken for the assessment and to support the stock status determination of 'depleting' for the NSW Beachworm stock. Evidence supporting this assessment includes:

i) low and declining levels of State-wide catch, below levels of the TAC and in 2021/22 and 2022/23, State-wide catches were 3.2 t, <40% of the allocated TAC (8.5 t); together with

ii) State-wide catch rate ($kg.day^{-1}$) showing a decline in average annual levels during the last 5 years, from historically high levels, to below the long-term average in each of the last 4 years and >20% below the long-term average in the last 2 years; and

iii) State-wide catch rate ($kg.hr^{-1}$) showing a decline in average annual levels over the last 5 years, from among historically high levels, to below the long-term average in 3 of the last 4 years and in 2022/23, 9% below the long-term average and at the lowest level for 8 years;

iv) regional catches (in Regions 1, 3, 4 and 6 which account for 98% (range 94% - 100%) of total annual catch each year from 2009/10, are generally low and at or among historically low levels;

v) standardised catch rates (sCPUE) in Region 1 has persisted at levels below the long-term average since 2014/15, and is among its lowest levels in the last 4 years, at an average of ~25% (range 19% - 30%) below the long-term average;

vi) sCPUE in Regions 3, 4 and 6 have shown declines in each of the last 2 years, to levels >10% below long-term averages in each region;

vii) a number of the top 10 beaches (by cumulative catch) demonstrate similar patters to that within Regions: Region 1 - Kingscliff Beach has been the only beach fished in Region 1 since 2020/21 and regional patterns described reflect those for Kingscliff; Region 3 – the majority of beaches in Region 3 (i.e. 5 of the 6 in Region 3 in the top 10) show low levels of catch over the last 2-3 years. South Stuarts Beach (Region 3) shows consistent and declining levels of CPUE (kg.hr^{1}) to 2018/19, to levels substantially below the long-term average and during periods of low catch, and no catch was reported in the last 2 years (indicating a locally depleted stock at South Stuarts Beach). Killick, Lighthouse and Dunbogan beaches (Region 3) show levels of CPUE (kg.hr^{-1}) at or below long-term averages for the last 4 years at each beach; Region 4 – Harrington, Booti Booti and Yagon beaches show low levels of catch over the last 3-4 years, to at or among the lowest levels since 2009/10. Levels of CPUE (kg.hr^{-1}) at each of these 3 beaches are at or below long-term average levels in at least 2 of the last 4 years, with all of those in 2022/23 showing declines from the previous year and at levels below long-term averages. Harrington Beach (Region 4) in particular, has had no catch reported in 2019/20 and 2020/21, followed by very low levels of catch in the last 2 years, and at levels of CPUE (kg.hr^{-1}) below the long-term average, and in 2022/23, to a level >45% below that long-term average (indicating a locally depleted stock at Harrington Beach); and

viii) State-wide levels of recreational catch have declined over the available time series from estimates in 2000/01 and 2013/14 of 2.9 t and 2.4 t, respectively, to estimates in 2019/20 and 2021/22 of 1.5 t and 0.9 t, respectively. Noting that these are likely minimum estimates given the sampling design.

A balanced interpretation of the weight of evidence provided supports an understanding that the biomass of Beachworms is unlikely to be depleted and that recruitment is unlikely to be impaired. However, for the period 2018/19 to 2022/23, evidence suggests the biomass declined, but the stock is not yet considered to be recruitment impaired. The weight of evidence is less supportive of an inference that the current level of fishing mortality is likely to cause the stock to become recruitment impaired. On the basis of the available evidence the NSW Beachworm stock is classified as **depleting**.

Stock Assessment Result Summary

Biomass status in relation to Limit	No biomass limits has been set. Weight of evidence supports an understanding that the biomass of Beachworms is unlikely to be depleted and that recruitment is unlikely to be impaired. However, for the period 2018/19 to 2022/23, evidence suggests the biomass declined, but the stock is not yet considered to be recruitment impaired.
Biomass status in relation to Target	No biomass target has been set.
Fishing mortality in relation to Limit	No fishing mortality limit has been set. Weight of evidence is less supportive of an inference that the current level of fishing mortality is likely to cause the stock to become recruitment impaired.
Fishing mortality in relation to Target	No fishing mortality target has been set.
Current stock status	**Depleting**

Fishery interactions

Fishing for Beachworms in the EGHG Fishery is done by hand with hand collection of individuals. There are limited, if any interactions with other fisheries. There are no recorded interactions with TEPS or other protected habitats.

Stakeholder engagement

EGHG Fishery stakeholders were invited to participate in online presentations of EGHG Fishery assessments for Pipi, Cockles, Beachworms and Nippers. Unfortunately, no stakeholders directly involved in the harvest of Beachworms attended. Issues raised, relevant to the assessment of EGHG Fishery species generally and some commentary relevant to the Beachworm assessment, from previous years, included those related to: catch and catch reporting, biological issues and observations, fisheries management and IUU fishing and extraneous factors, including environmental (direct and indirect impacts). Detailed descriptions of these issues are outlined in the assessment report (Chick and Fowler 2024).

Qualifying Comments

Importantly, there is uncertainty associated with the assessment outcome. Patterns or trends in the available data, supporting the assessment outcome, have become more apparent in the last 2-3 years, with the exception of those in Region 1, where data has indicated a decline over a longer period of time. However, whether declines and current levels of indicators of biomass are at levels that would trigger less precautionary, formal stock and fishery performance reference levels, defined by stakeholder groups, is not known. Moreover, whilst recent measures of catch and catch rates, to below long-term average levels, are apparent in all regions and their combination supports an understanding of a depleting stock, there are factors other than fishing that impact stock biomass, and factors other than stock biomass that effect fishing activity and fishery-dependent data (discussed below). Decerning any proportional influence of these sources of uncertainty, the fishery, and their interactions on changes in levels of biomass and mortality, at scales relevant to the stock and its management, is challenging and made more difficult in the absence of formal definitions of stock and fishery performance indicators and their reference levels. The State-wide classification is determined as an aggregate of information available at State-wide and finer spatial scales (e.g. beaches), with the later generally assumed representative of other populations throughout NSW, for which there are limited or no data.

References

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