Department of Primary Industries
Department of Regional NSW

NSW Stock Status Summary – 2023/24

Eastern Blue Groper (*Achoerodus viridis*)

Assessment Authors and Year

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Stock Status

Current stock status	On the basis of the evidence contained within this assessment, Blue Groper is currently assessed as Sustainable.

Stock structure and distribution

The Eastern Blue Groper, *Achoerodus viridis*, is endemic to Australia. Historically reported to occur in warm temperate waters from Hervey Bay in southern Queensland down the east-coast to Wilson's Promontory in Victoria (Burchmore et al. 1985, Gillanders 1999), Blue Groper have more recently (since 2004) been observed in small numbers in the waters of north-eastern Tasmania (Casper et al. 2011, Curley et al. 2013), likely due to a range shift via the southerly flowing East Australian Current and potentially increased population size (Bray 2020). The stock structure of Blue Groper is not well understood. Adult Blue Groper are believed to be resident on inshore reefs (Gillanders 1999), with tagging indicating very small home ranges (Lee et al. 2015). Adult Blue Groper inhabit coastal reefs to depths of around 60 m, whereas juveniles are more common in shallower, nearshore areas including estuaries in seagrass and hard reef habitats (Gillanders and Kingsford 1996, Pine et al. 2022). Large Blue Groper are thought to be more abundant at greater depths (Gillanders and Kingsford 1993).

Biology

Blue Groper are monandric protogynous hermaphrodites, with all fish starting life as female before potentially changing sex to be male (Gillanders 1995). Juveniles are green/brown in colour, adult females reddish brown often with a darker red spot on each scale, and the terminal phase adult males are generally bright blue with yellow/orange lines or spots around the eyes (Bray 2020). Sex change is likely driven by social and behavioural factors including inter- and intra-sex interactions (Gillanders 1996).

Research has shown that Blue Groper mature as females at 1 to 2 years of age and can remain as females for up to 18 years before changing sex to males generally between 50 and 52 cm standard length (Gillanders 1996). Spawning occurs between July and October (Gillanders 1996).

Blue Groper is one of the largest species of wrasse (family Labridae), attaining at least 100 cm total length (Gillanders 1999). Males grow to significantly larger sizes than females, and population sex ratio is skewed towards females (Curley et al. 2013). Blue Groper are potentially very long-lived and slow growing. In NSW Blue Groper have been aged to 35 years old (Gillanders et al. 1995); however, longevity is likely greater with the closely related Western Blue Groper (*Achoerodus gouldii*) reported to attain at least 70 years of age (Coulsen et al. 2007).

Scope of this assessment

The assessment describes the stock structure, biology, fishery statistics and indicators used to assess the stock status for Blue Groper in NSW. The stock status classification is that used by the national Status of Australian Fish Stocks (www.fish.gov.au/).

Fishery statistics

Despite being fished since European settlement (Pepperell 2009) there are relatively few records of harvest of Blue Groper.

Catch information

Commercial

Blue Groper were historically sold in small quantities by commercial fishers prior to being banned for sale in 1980. Blue Groper were such a minor component of commercial harvest that the species was not listed on commercial fishers catch logbooks.

Recreational and Charter boat

Blue Groper were historically important to recreational fishers, and particularly to spear fishers. Following sustainability concerns after a reported 90% decline in recreational harvest from 1952 to 1967 (Young et al. 2014) a five-year fishing ban was implemented in 1969. Recreational fishing was permitted following this ban; however, spearfishing continued to not be permitted. Until recently (February 2024) recreational fishers in NSW could harvest Blue Groper using line-methods with a limit of two fish per person and a minimum legal size of 30 cm total length.

Recreational fishing for Blue Groper is considered a specialist, niche fishery and as a consequence estimated catches from the recreational sector are quite low and variable and primarily constitute a small bycatch component by Charterboats during the targeting of other species such as Snapper.

Indigenous

Blue Groper are known to have been harvested by Aboriginal people (Pepperell 2009); however, the quantity of harvests is unknown.

Illegal, Unregulated and Unreported

There is no estimate of the level of Illegal Unregulated and Unreported (IUU) fishing.

Stock Assessment

Stock Assessment Methodology

Year of most recent assessment:

2024

Assessment method:

The paucity of catch data available for this species means that stock modelling methods could not be used for the assessment. Consequently, a weight of evidence approach using all available data sets was used to determine used to for the status determination of this species. In addition to the recreational and Charterboat catches and length data, two independent surveys to assess the changes in relative abundance of Blue Groper over time were also used. These are the NSW Statewide Baited Remote Underwater Video (BRUV) Programme (Knott et al. 2021); and the combined Australian Temperate Reef Collaboration (ATRC) and Reef Life Survey (RLS) Programmes. Combined these programs sample the relative abundance and sizes of rocky reef fishes between 3 – 40 m depth across the major NSW bioregional divisions (Interim Marine and Coastal Regionalisation for Australia Technical Group 1998).

Main data inputs:

- Recreational trailerboat length data 1994 to 1996 (Steffe et al. 1996).
- Recreational catch data from the NSW Recreational Fishing Survey 2013-2022.
- Charterboat logbook length data 2001 to 2009.
- Length data from underwater visual census (UVC) sampling 2008 to 2023 (Australian Temperate Reef Collaboration (ATRC) and Reef Life Survey (RLS) Programmes https://atrc.au/ and https://reeflifesurvey.com/): Batemans Bioregion since 2005, Hawkesbury Bioregion since 2008 and Manning Bioregion since 2008 and Tweed Bioregion since 2008. Rocky reefs were sampled generally from 5 to 10 m depth.
- Length data from baited remote underwater video (BRUV; Knott et al. 2021, Rees et al. 2021) collected in the Batemans Bioregion since 2011, Hawkesbury Bioregion since 2019 and Manning and Tweed Bioregions since 2022. Rocky reefs were sampled from 20 to 40 m depth.
- Relative abundance (Max N) was sampled using Baited Remote Underwater Video collected from across the Batemans, Manning and Tweed Bioregions since 2011, and the Hawkesbury Bioregion since 2019. Rocky reefs were sampled from 20 to 40 m depth.

- Density was sampled from dive surveys Batemans Bioregion since 2005, Hawkesbury Bioregion since 2008 and Manning Bioregion since 2008 and Tweed Bioregion since 2008. Rocky reefs were sampled generally from 5 to 10 m depth within 50 m long transects with a width of 5 m.

Status Indicators - Limit and Target Reference Levels

Biomass indicator or proxy	Relative abundance derived from BRUV and UVC surveys
Biomass Limit Reference Point	Abundance indices derived from BRUV and UVC surveys relative to 2008.
Biomass Target Reference Point	None specified
Fishing mortality indicator or proxy	Harvest
Fishing mortality Limit Reference Point	F < M
Fishing Mortality Target Reference Point	None specified

Stock Assessment Results

Catch data

Approximately 20 years after the ban on harvesting Blue Groper, the recreational harvest from trailerboats in NSW during the mid-1990s was estimated at around 5,000 fish weighing approximately 16 t per year (Steffe et al. 1996). The niche nature of targeting Blue Groper by recreational fisher results in uncertainty around the estimated catches by the NSW Recreational Fishing Survey. Nevertheless, the surveys have indicated a declining trend in the catch of this species from 5337 individuals in 2013/2014 to 388 individuals in 2021-2022 (West et al. 2015, Murphy et al. 2023). Charterboat catches have averaged approximately 10 Blue Groper per year over the last decade. These data suggest that the fishing mortality on this species is likely to be extremely low and certainly well below their natural mortality.

Fisheries Independent Data

Results from the two independent measures of relative abundance and density indicated latitudinal variation. Blue Groper was more abundant in the central and southern bioregions than in the northern bioregion which is consistent with this species being a temperate (cool water) wrasse species. Density of Blue Groper consistently declined by 50 % on shallow reefs in Manning and Hawkesbury during the last decade (Fig. 3B), while their densities were relatively stable on deeper reefs (Fig. 3A). Given that Blue Groper is a cool water species and the reduced abundances of the fish in the inshore northern bioregions (Fig. 3B), it is possible that the warming waters along the NSW coastline (Hobday and Pecl 2014; Davis et al. 2023) may be leading to the reductions in its numbers on shallow rocky reefs. Similar declines corresponding to warming waters have also been observed for the Western Blue Groper along the Western Australian coastline (Parker et al. 2021).

Deeper reefs may, however, provide a temperature refuge for Blue Groper as their abundances were not observed to decrease in these habitats (Fig. 1A).

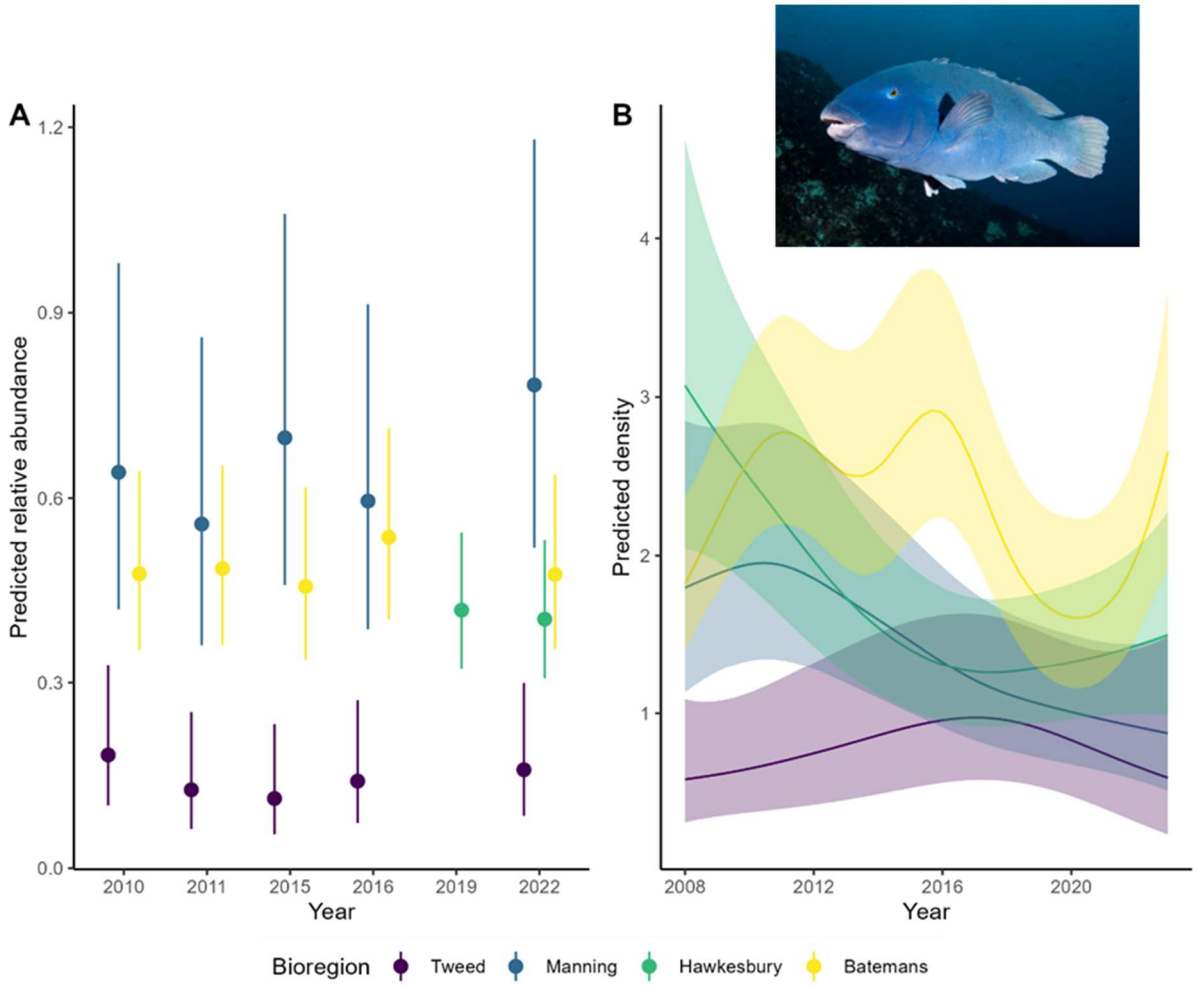

Fig. 1: Abundance patterns for Eastern Blue Groper (*Achoerodus viridis*) along the New South Wales coastline during the last 12 – 15 years. A) Mean abundance (Max N ± 95 % confidence intervals) from Baited Remote Underwater Video (2010 – 2022); B) Mean density per 250 m^2 transects from Underwater Visual Census (2008 – 2023; mean ± 95 % confidence intervals). [Reproduced from Knott et al. In review. *Marine and Freshwater Research*]

Length frequency

The length compositions of Blue Groper from trailerboat fishers and charterboat fishers were broadly similar, comprising fish mainly between 40 and 70 cm (Fig. 2). Length compositions from BRUV surveys were similar but included a greater proportion of fish between around 30 and 50 cm. Length compositions from UVC surveys comprised generally much smaller Blue Groper and relatively fewer fish greater than around 50 cm (Fig. 2). While the length frequencies are truncated towards smaller fish this is likely to directly influenced by this species biology whereby females are significantly more abundant compared to males. Consequently, the length frequencies are likely representative of relatively healthy stocks of Blue Groper with aggregations comprised of a single large male and numerous females and juveniles in association.

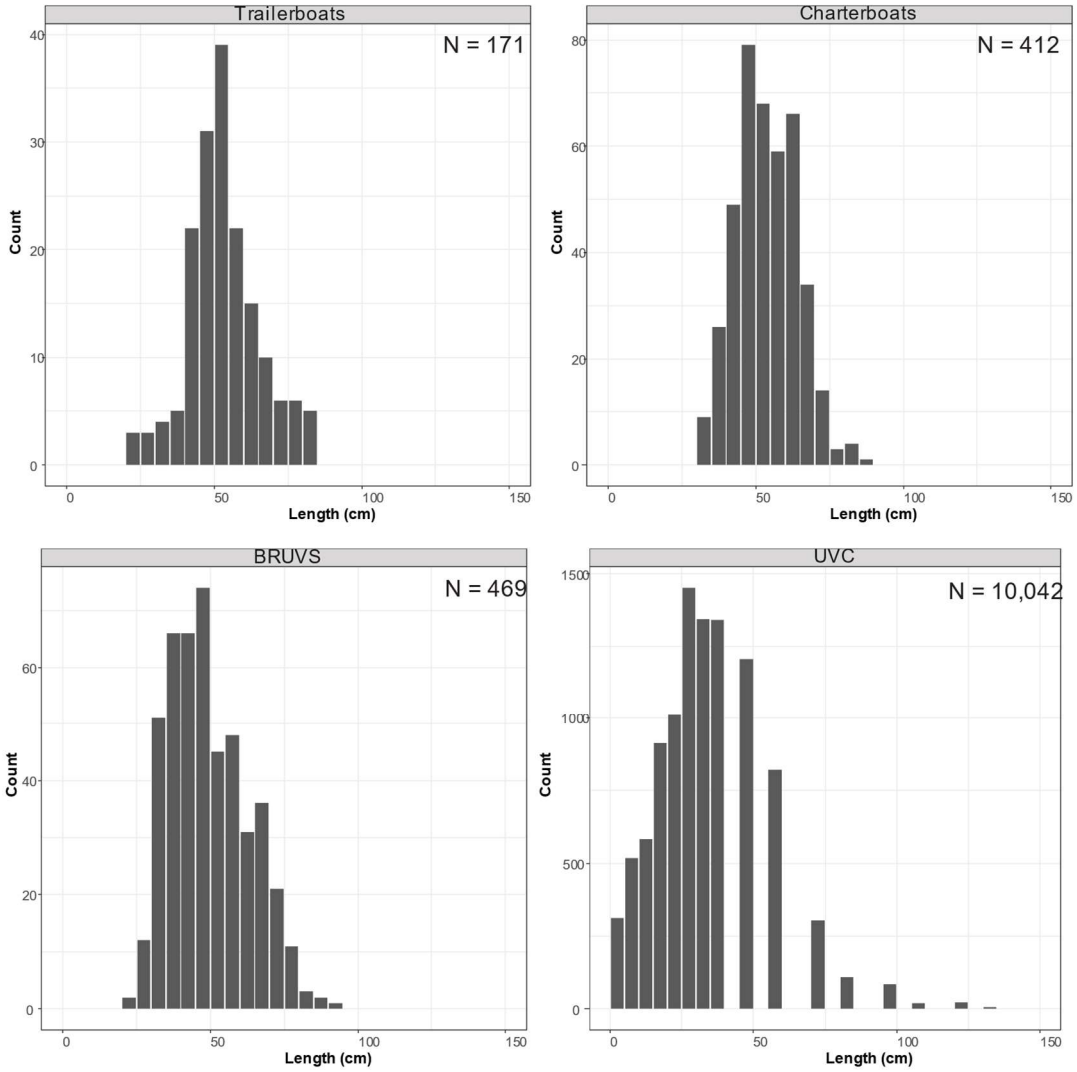

Figure 2. Length frequency data for Blue Groper from surveys of trailerboats 1994 to 1996, charterboat logbooks 2001 to 2009, underwater visual census (UVC) 2008 to 2023 and baited remote underwater video (BRUV) 2010 to 2022. Length is total length.

Summary

The current assessment indicates that several decades of relatively low fishing pressure has allowed the recovery from a severely depleted state in the 1960s and 1970s. This is evidenced by the relatively healthy length frequency distributions from multiple sources and underwater surveys indicating that this species has remained at relatively stable abundance levels for over a decade. There are however differing trends in the abundance of Blue Groper with latitude and depth which are likely to be due to environmental influences.

Stock Assessment Result Summary

Biomass status in relation to Limit	Stable relative abundance across surveys

Biomass status in relation to Target	N/A
Fishing mortality in relation to Limit	Near zero fishing mortality (harvest) so F << M
Fishing mortality in relation to Target	N/A

Qualifying Comments

On the basis of the evidence provided above, Blue Groper in New South Wales is classified as a Sustainable stock.

Blue Groper are vulnerable to fishing pressure and environmental change. Slow growth rate, considerable longevity, up to 18 years (but probably as high as 50 years) before changing sex from female to male, with complex social and territorial interactions all making population structure and productivity susceptible to impacts. Removal of the larger and older male Blue Groper through fishing can lower productivity through social disruption and lower fertilisation rates (Gillanders 1995). Fishing of the dominant larger males may mean that this sex changing species spends less time as functional females before changing to become male, resulting in fewer years of egg production than when no fishing occurs. There is evidence that Blue Groper cannot change into males until a critical size (potentially around 50 cm, Gillanders 1996), meaning that overfishing of the larger fish can result in a reduction in the number of spawning males, that may persist for some time until the remaining females can attain that critical size.

The International Union for Conservation of Nature (IUCN) Red list classifies Blue Groper as “Near Threatened” (Choat and Pollard 2010), due mainly to loss of key habitat and historical overfishing.

The ecological survey data (BRUV and UVC) suggest that Blue Groper abundance is declining in the northern waters of NSW primarily associated with climate change. These changes are similar to those observed for the Western Australian Blue Groper and for other temperate wrasse species on the East Coast of Australia (Knott et al. In review). These declines indicate that caution should be taken with managing this species and that population changes may be unrelated to fishing.

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