

# Assessing changes in threatened Black Rockcod *Epinephelus daemeli* abundance and length over the past 15 years.

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## INTRODUCTION

Black rockcod has been protected as a threatened species in NSW for more than 40 years and is currently listed as ‘Vulnerable’ under NSW and Commonwealth legislation. Before protection in 1983, their abundance had strongly declined due to targeted line and spearfishing. Although baseline data from 1983 does not exist, we have been monitoring their relative abundance and length at key sites in NSW over the past 15 years to assess recent recovery trends.

Black rockcod have life history traits that constrain their recovery. It is a large (>1.5 m) and long-lived (60+ year) reef-dwelling rockcod/grouper species in the family Serranidae. It has a restricted distribution, being endemic to the subtropical to warm temperate southwest Pacific: NSW, QLD, Lord Howe Island, Elizabeth-Middleton Reefs, the Kermadec Islands, and northern New Zealand/Aotearoa. They are a protogynous hermaphrodite that change sex from female to male at about 105 cm. Females become sexually mature at about 70 cm.

This study assessed the relative abundance and size of Black rockcod to inform how it is responding to the conservation and management actions being implemented to protect the species. Though protected as a threatened species they can still be unintentionally caught by line fishing methods and can suffer harm through barotrauma when brought to the surface. Therefore, spatial management can offer further protection to assist their recovery.



## METHODS

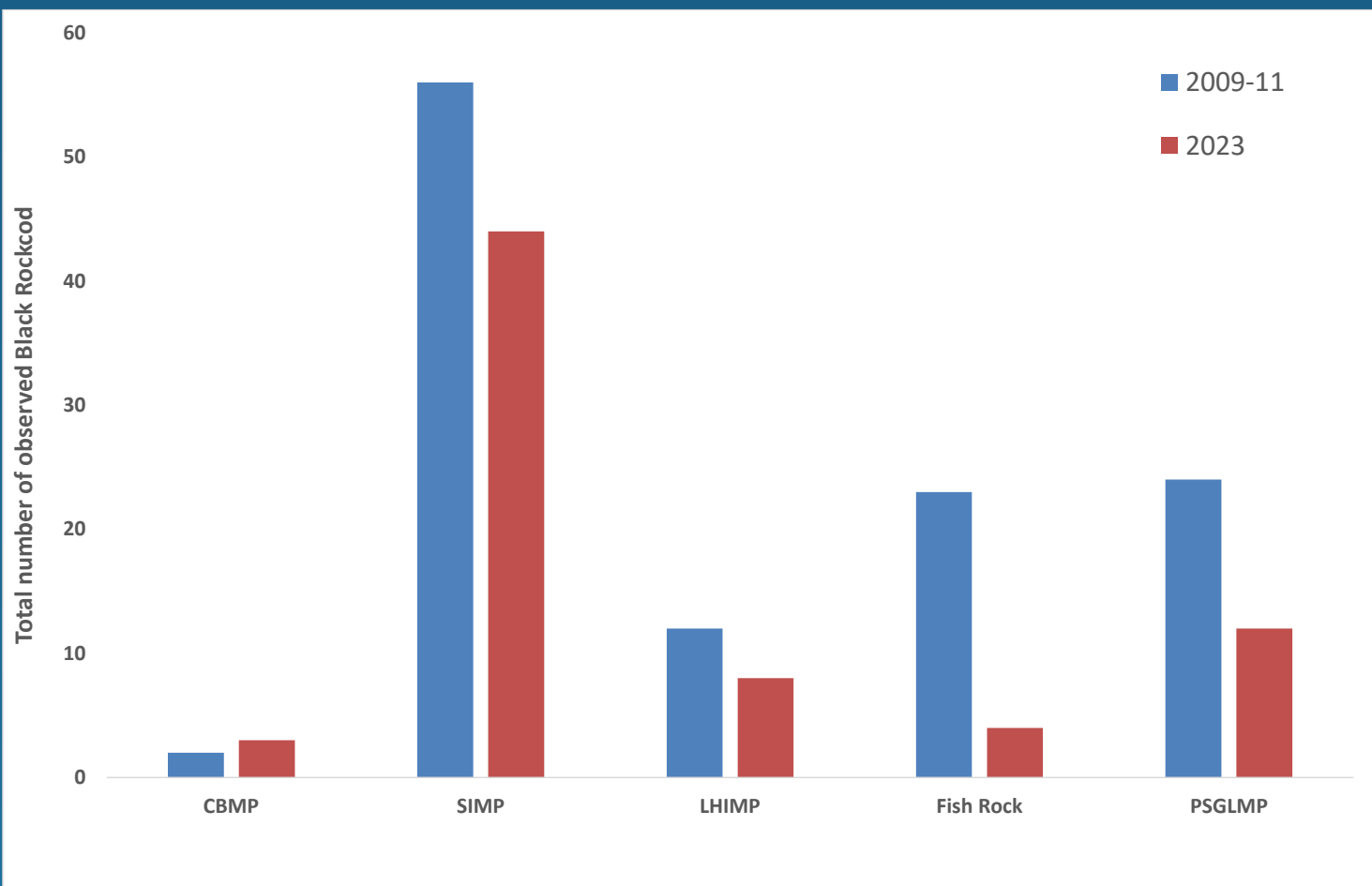
In 2009-2011, a broadscale survey (83 sites) to benchmark relative abundance and length of Black rockcod was undertaken in northern NSW (Port Stephens to Cook Island) and Lord Howe Island. Key long-term monitoring sites have been monitored annually most years (11 out of 15 years) between 2009 and 2024 in mainland Australia (19 sites) and less frequently at Lord Howe Island (18 sites). The initial 83 benchmark sites were resurveyed in 2023.

Surveys involved the authors swimming along each site for up to 45 mins searching for Black rockcod and recording any individuals, as well as estimating their length (or measured using a diver stereo-system), the habitat they were found in, the depth range surveyed and the depth that individual Black rockcod were found at. For some of the deeper sites (25+ metres), the timed swim was constrained to 30 minutes due to ‘no-decompression limits’.

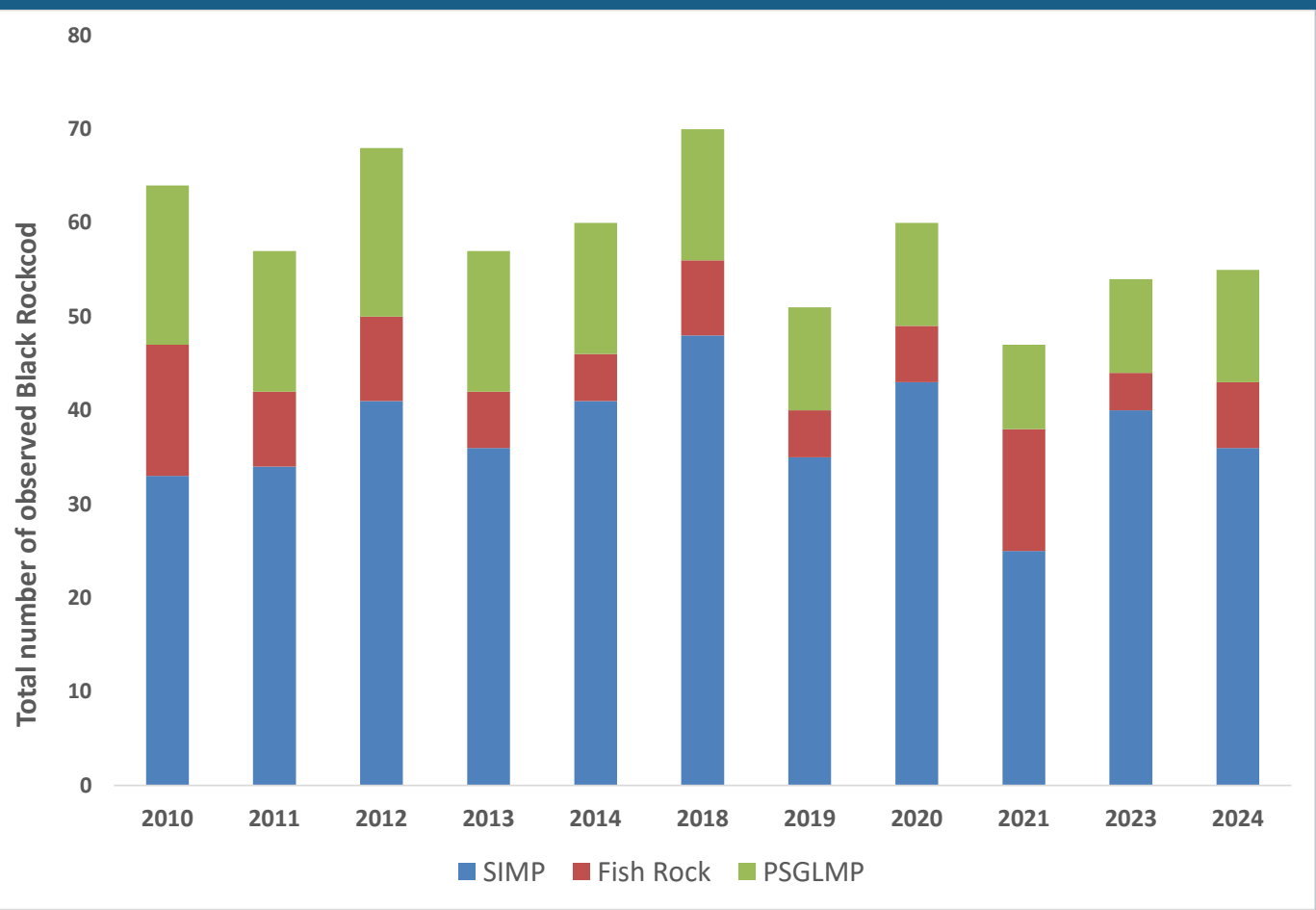
Spatial and temporal patterns in relative abundance and size indicate various comparative trends are used to inform and assess Black rockcod recovery.

## RESULTS

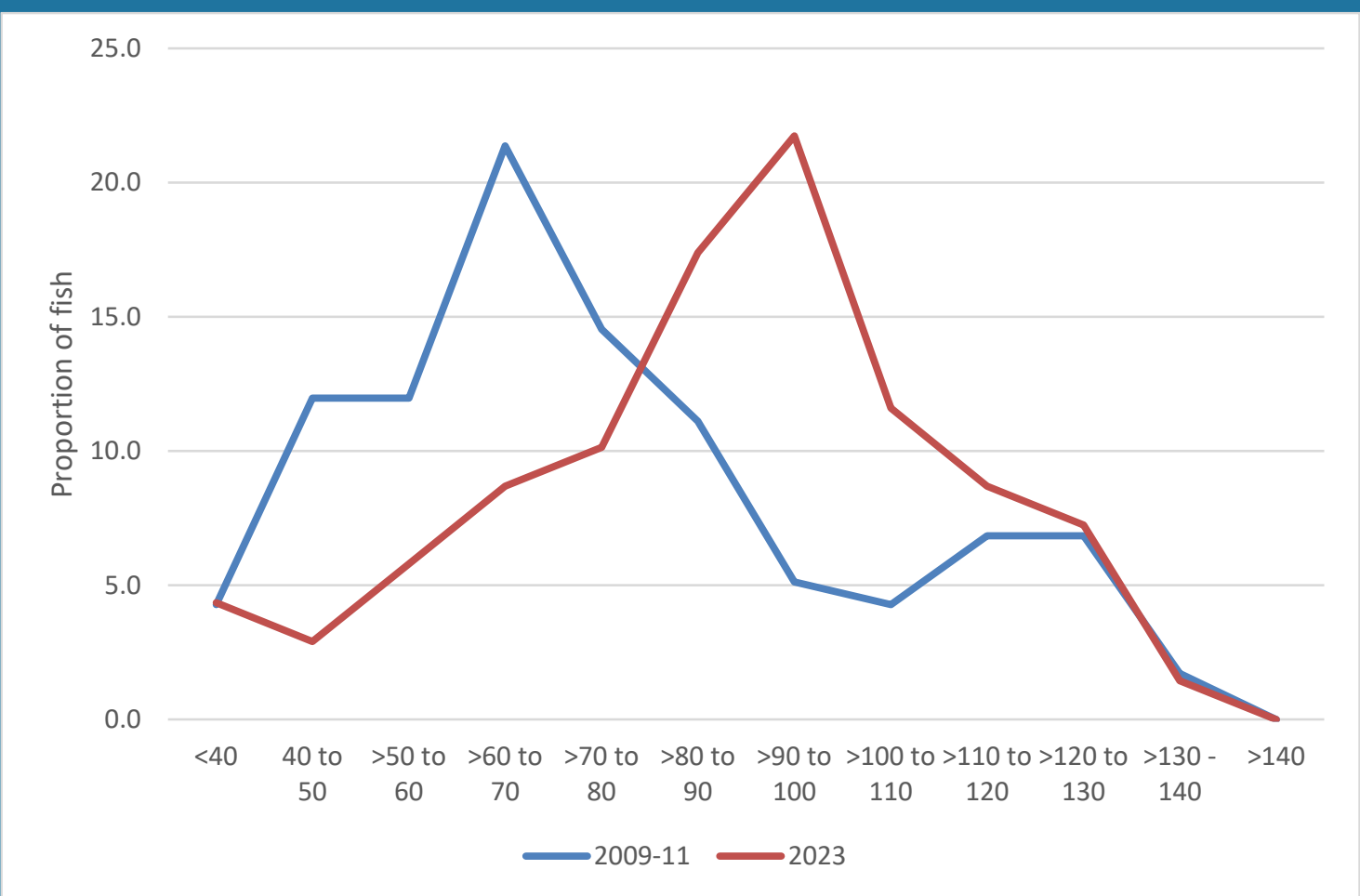
- The initial broadscale surveys conducted in 2009-2011, recorded a total of 117 Black rockcod occurring at 34 of the 83 sites (41% of sites) surveyed. The broadscale sites resurveyed in 2023 recorded only 66 Black rockcod; observed at 27 of the 83 original sites (32% of sites).
- There has been a recorded reduction of 43% in the relative abundance of Black rockcod at the broadscale survey sites over the past 15 years. There was also an 8% reduction in the proportion of sites where Black rockcod were observed (41% of sites reduced to 32% of the original 83 Sites).
- The lowest recorded relative abundance in the key site surveys (in 2021) has subsequently improved, though not yet to counts recorded before 2019.
- Size structure of Black rockcod was found to increase over the 15-year period at broadscale and key sites. There are more mature large females (90 to 100 cm length class).



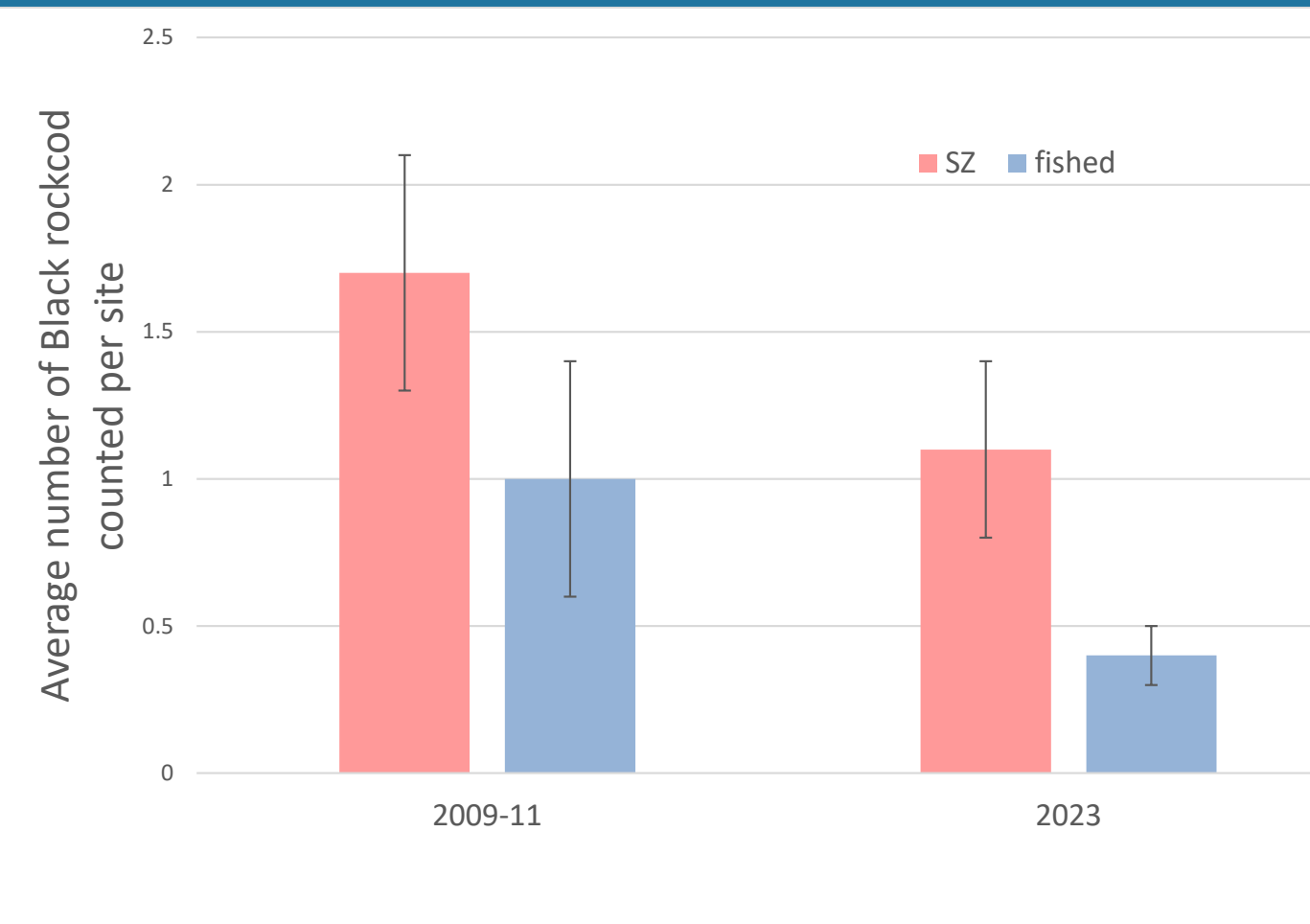
Total abundance 2009-11 and 2023, broadscale site su, CBMP = Cape Byron Marine Park; SIMP = Solitary Islands Marine Park; LHMP = Lord Howe Island Marine Park; Fish Rock = Smoky Cape region; PSGLMP = Port Stephens Great Lakes Marine Park



Count per location per year for Key monitoring sites 2010 to 2024



Proportion of individual fish per length class (10cm bins) in 2009-11 and in 2023 at broadscale sites



Average number of Black rockcod counted per site in 'no take' and 'fished' areas in 2009-11 and in 2023 at broadscale sites

## CONCLUSIONS

- Overall, relative abundance and distribution have not increased over the past 15-year period since the initial benchmark broadscale surveys were conducted.
- An increase in size structure with more mature large females is a positive benefit to the overall population in terms of reproductive potential.
- Due to their life-history traits, recovery of the Black rockcod will take time. Given our findings, they are unlikely to recover to the level of an ‘un-threatened’ population in the near to long (i.e. decadal-scale) future.
- How long before we see strong positive signs of recovery is unknown. However, the above mixed indications of recovery suggest that more active management may be needed to help assist the ongoing recovery of this threatened species.

