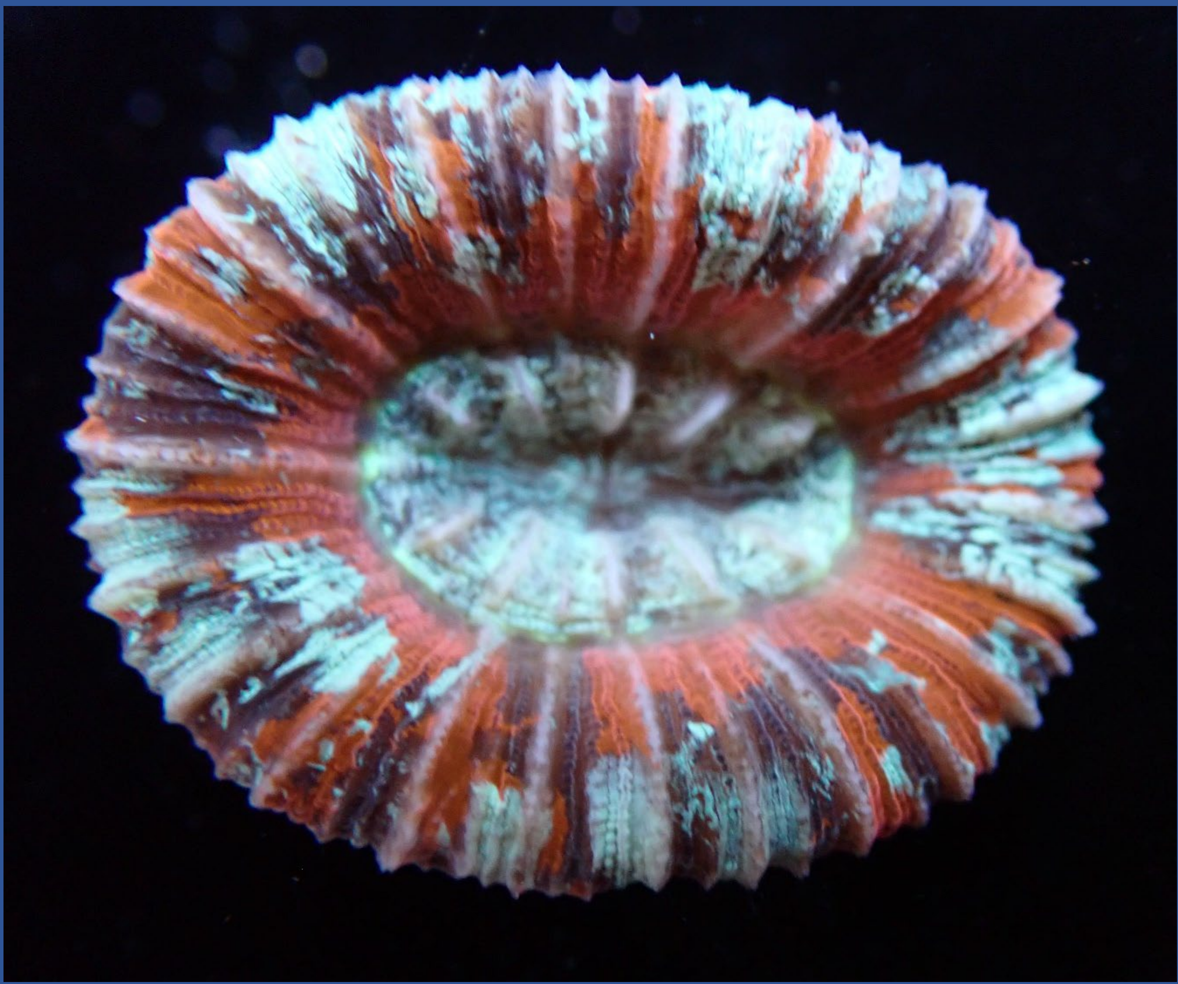
2024 Industry Report



Population size and growth estimates for *Trachyphyllia geoffroyi* and other specialty coral harvest species to underpin improved fishery management

Morgan S. Pratchett
Marine Biology and Aquaculture
College of Science & Engineering
morgan.pratchett@jcu.edu.au

Report prepared by Professor Morgan Pratchett

With assistance from Peter Doll, Andrew Baird, Kai Pacey, and Russell Kelley

Cataloguing Data

This publication (and any material sourced from it) should be attributed as: Pratchett MS (2024) Population size and growth estimates for Trachyphyllia geoffroyi and other specialty coral harvest species to underpin improved fishery management. 2024 Industry Report submitted to Pro-Vision Reef

On the cover: *Trachyphyllia geoffroyi. Photograph: Morgan Pratchett*

i. *Executive Summary*

The purpose of this study was to obtain fishery-independent data on distribution, abundance, and habitat affinities of *Trachyphyllia geoffroyi* (and other co-occurring specialty coral harvest species) on the Great Barrier Reef, which is a critical first step towards establishing biomass-based sustainable harvest limits. A total of 236 replicate belt transects (50 m long and 1m wide) were surveyed in a range of different depth strata across three different regions. This project provided unprecedented data on the abundance and habitat affinities of *Trachyphyllia geoffroyi*, as well as *Acanthophyllia deshayesiana*, *Catalaphyllia jardinei* and *Duncanopsammia axifuga*, in major harvest areas.

In addition to field-based surveys for specialty coral harvest species, this study assessed growth rates of select species (including *Catalaphyllia jardinei*, *Homophyllia* cf. *australis*, *Micromussa* cf. *pacifica*, and *Trachyphyllia geoffroyi*), in aquaria. A total of 94 corals collected across a broad range of survey locations were maintained in captivity for at least 6 months, recording changes in skeletal diameter, as well as tissue diameter and wet weight. This data may not necessarily reflect natural growth rates of the key study species, but partially address the critical lack of information on the growth of specialty coral harvest species.

Summary of key findings

- A total of 1,291 individual *Trachyphyllia geoffroyi* were surveyed on 236 transects, with mean densities ranging from 3.51 corals per 50m^2 (± 0.33 SE) in the Shoalwater Bay region, to 7.46 corals per 50m^2 (± 0.72 SE) in the Cairns region, and 12.67 corals per 50m^2 (± 1.62 SE) in the Mackay region.
- *Trachyphyllia geoffroyi* was the predominant specialty coral harvest species recorded during this study, accounting for 73.9% of corals recorded across all transects (n = 236). A total of 286 colonies of *Duncanopsammia axifuga*, 148 colonies of *Catalaphyllia jardinei*, and just 22 *Acanthophyllia deshayesiana* were recorded.
- Recorded densities of *Trachyphyllia geoffroyi* varied greatly within and among regions, making it very challenging to estimate overall abundance of this species
- Substantial and consistent growth was recorded for all four taxa, which was particularly evident based on changes in tissue diameter, though there were also significant increases in wet weight and skeletal diameter.
- Mean monthly increases in skeletal diameter were 0.98 mm for *Catalaphyllia jardinei*, 0.33 mm for *Homophyllia* cf. *australis*, 0.66 mm for *Micromussa* cf. *pacifica*, and 0.82 mm *Trachyphyllia geoffroyi*

1. Background

The Queensland Coral Fishery (QCF) targets a broad range of different hard coral (order Scleractinia) species, including both *specialty* coral harvest species, which generally have larger polyps (e.g., *Trachyphyllia geoffroyi* and *Homophyllia* cf. *australis*), and *other* coral species, which are mainly, *Acropora* spp. The Total Allowable Commercial Catch (TACC) across all specialty coral harvest species is 60,000 kg per annual fishing season (compared to 140,000 kg for other coral species), though corals harvested by the QCF are now subject to prescribed harvest limits that are specific to individual species or genera.

Prescribed harvest limits for individual taxa (e.g., *Acropora* spp) were introduced to address unconstrained growth in reported harvest levels (see Pratchett 2021; Queensland Legislation 2022, 2023), effectively constraining future harvest levels relative to average annual reported harvest levels for a specified 3-year reference period (from 2016-2017 through 2018-2019). It is important to realise, however, that prescribed harvest limits are not the same as sustainable harvest limits, and much of the necessary information to assess whether current harvest levels and limits are sustainable (Pratchett 2021), is not available.

The foremost information needed to establish sustainability-based harvest limits relates to the distribution, abundance, biomass, and habitat affinities of individual coral species (e.g., Harriot 2001, Donnelly 2013). In addition, demographic information, and especially growth and replenishment rates of individual species, are needed to establish natural turnover and resilience of wild stocks to harvesting (Pratchett 2021).

The primary objective of this study was to undertake field-based surveys to establish the distribution, abundance, and habitat affinities of *Trachyphyllia geoffroyi* on the Great Barrier Reef, which is a critical first step towards establishing biomass-based sustainable harvest limits. The explicit focus on *Trachyphyllia geoffroyi* dictated where sampling was undertaken, though we also collected complementary data on other co-occurring specialty coral harvest species, including *Acanthophyllia deshayesiana* and *Catalaphyllia jardinei*.

Field surveys were conducted in a range of different locations where *Trachyphyllia goeffroyi* were known to occur and had already been subject to recent or sustained harvesting. This provided information on the density, size distribution, and habitat associations of different specialty coral harvest species. To complement field-based survey data we also measured growth rates of select species (*Catalaphyllia jardinei*, *Homophyllia* cf. *australis*, *Micromussa* cf. *pacifica*, and *Trachyphyllia geoffroyi*) maintained in captivity at a commercial harvest facility.

2. Methods

2.1 *Study species*

This project was intentionally focused on sampling in areas where *Trachyphyllia geoffroyi* were known to occur, though within these areas, we conducted surveys across a broad range of depths and habitats to refine knowledge of habitat associations. Critically, we avoided sampling in areas with predominantly hard substrate (e.g., with terrigenous rock or extensive reef formation), but sampled near to reefs or continental islands in areas with predominantly soft substrate (e.g., sand or small rubble). The limited occurrence of hard substrates greatly restricted the relevance of this sampling for species that grow exclusively on hard substrates (e.g., *Micromussa lordhowensis* and *Homophyllia* cf. *australis*), even though they do occur within the same sampling areas. For the purpose of this report, we only present data on speciality coral harvest species that occur with the same habitat types (albeit in potentially different locations and at different depths) as *Trachyphyllia geogffroyi*, including *Acanthophyllia deshayesiana*, *Catalaphyllia jardinei* and *Duncanopsammia axifuga*.

2.2 *Study locations*

Sampling for this project was focussed on three distinct regions where *Trachyphyllia geoffroyi* are known to occur and have been harvested previously: i) Cairns, which encompasses a broad range of mid-shelf reefs in the northern Great Barrier Reef (extending from Cairns to Innisfail), ii) Shoalwater Bay, which encompassed shallow and mostly unconsolidated habitat surrounding inshore islands located just to the north of Shoalwater Bay (e.g., Collins Island), and ii) Mackay, where sampling was conducted in relatively deepwater habitats on the inside edge of reefs.

2.3 *Coral sampling*

Specialty coral harvest species were sampled along replicate 50 m transects that were run parallel to depth contours and in a range of depth strata. We used HipChain distance counters, or deployed 50 m long fiberglass tape measures, to ensure transect length and recorded all corals within a 1 m wide path along the length of the transect line. All specialty coral harvest species (including *Trachyphyllia geogffroyi*, *Acanthophyllia deshayesiana*, *Catalaphyllia jardinei* and *Duncanopsammia axifuga*) counted within the transect area, and measured (maximum diameter, to the nearest cm), as well as noting other specific attributes (especially colour) that affect likelihood of being harvested. Most notably, corals were categorised as being likely to be harvested versus not likely to harvested, based on colour, size and health.

To convert size estimates (diameter, in cm) into biomass, we used established size and weight relationships for *Trachyphyllia geogffroyi* (e.g., Pacey et al. 2023). The relationship between average diameter (cm) and weight (g) was established based on opportunistic sampling of 900 corals that had been harvested by commercial coral collectors, and represented using a two-parameter power function, following Pacey et al. (2023). The relationship for *Trachyphyllia geoffroyi* (weight (g) = 0.36 x diameter(cm)$^{2.89}$) was used to estimate total biomass per transect, accounting for the number and size of all corals recorded.

2.4 *Coral growth*

To establish growth rates of specialty coral harvest species, replicate colonies of four different taxa were collected from the wild in the first half of 2023 to be maintained in holding facilities of commercial coral collectors. Corals were initially placed within two distinct facilities, but there was very poor survivorship at one of the facilities, and so data presented is from only a single facility (Inter-Fish, Bundaberg). Once established (and mounted on standardised base plates), all corals were carefully measured, recording both the tissue (as apparent prior to any interference to the colony) and skeletal diameter, and weighed. Corals were maintained in the facility for a minimum of 6-months with measurements taken at approximately 3-month intervals to estimate monthly growth rates. Coral were fed every few days (as per normal holding procedures) and exposed to a very regular light and temperature regime, throughout the study period.

To measure growth, we recorded changes in three different and distinct measures of coral size (tissue diameter, skeletal diameter and submerged weight), which are averaged among replicate corals to provide estimates of mean monthly growth. Tissue diameter was measured by recording the maximum diameter of corals within holding tanks prior to any interference. This measurement is relevant for comparing to field-based measurements of coral size, but is likely to be subject to significant error, given the capacity for individual corals to inflate and deflate tissues rapidly in response to various stimulus. Each coral was then weighed (including the base plate) using an electronic balance that was placed above a holding tank allowing for measurements of weight whilst the entire coral was fully submerged in sea water, thereby accounting for any variation in the amount of sea water retained within the coral tissue. Skeletal diameter (maximum diameter to the nearest 0.1mm) was recorded using electronic callipers. Both submerged weight and skeletal density provide rigorous estimates of the calcium deposition necessary for coral growth.

3. Results

3.1 Distribution and abundance of specialty coral harvest species

A total of 1,291 *Trachyphyllia geoffroyi* were recorded across the 236 transects surveyed during this study, giving a mean density of 5.47 corals per 50m^2 (±0.38 SE). However, densities of *Trachyphyllia geoffroyi* varied greatly between regions (Figure 3.1), with densities recorded in Mackay 3.6 times higher (12.67 corals per 50m^2) than recorded in Cairns (3.51 corals per 50m^2). The other predominant corals recorded in the same survey areas were *Acanthophyllia deshayesiana*, *Catalaphyllia jardinei* and *Duncanopsammia axifuga*, though *Acanthophyllia deshayesiana* was only recorded in the Cairns region (not Mackay or Shoalwater Bay) and *Duncanopsammia axifuga* was not recorded in Mackay region (Figure 3.1). Recorded densities of other coral species were very moderate, though this is not necessarily reflective of the relative abundance of these different corals across a broader range of different habitats and locations. Notably very high abundance and biomass of both *Catalaphyllia jardinei* and *Duncanopsammia axifuga*, have been recorded in some habitats (Pratchett et al. 2020).

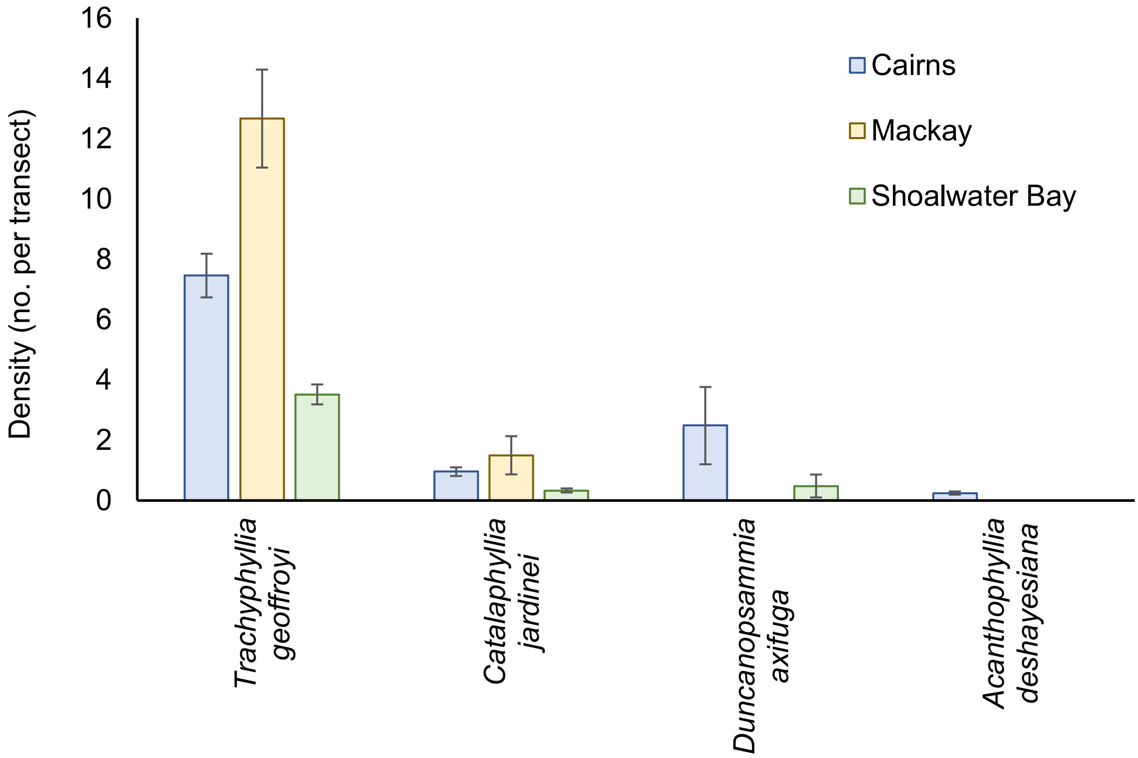


Figure 3.1. Variation in abundance (mean no. of corals recorded per 50 x 1m transect ±SE) of specialty coral harvest species (specifically, *Trachyphyllia geoffroyi*, *Catalaphyllia jardinei*, *Duncanopsammia axifuga*, and *Acanthophyllia deshayesiana*) across each of three distinct study regions.

Trachyphyllia geoffroyi were recorded across a wide range of depths, though the depth distribution was bimodal and discontinuous (Figure 3.2), with marked differences between regions. In the Cairns and Mackay regions, *Trachyphyllia geoffroyi* were never recorded at depths less than 16 m and were most abundant at 18-20 m depth. In the Shoalwater Bay however, *Trachyphyllia geoffroyi* were recorded at depths between 5 and 10m, with no obvious change in abundance among these depths. Moreover, *Trachyphyllia geoffroyi* were much smaller in Cairns, where the mean diameter was 5.55 cm diameter (±0.06 SE) and maximum diameter recorded was 11 cm, whereas the mean diameter recorded in Shoalwater Bay was 9.67 cm diameter (±0.14 SE) and maximum diameter recorded was 23 cm. Regional differences in the size and distribution of *Trachyphyllia geoffroyi* may be attributable to variation in environmental settings (e.g., water quality and distribution of substrates), but also suggest that there may be very distinct populations (if not species) in these different regions.

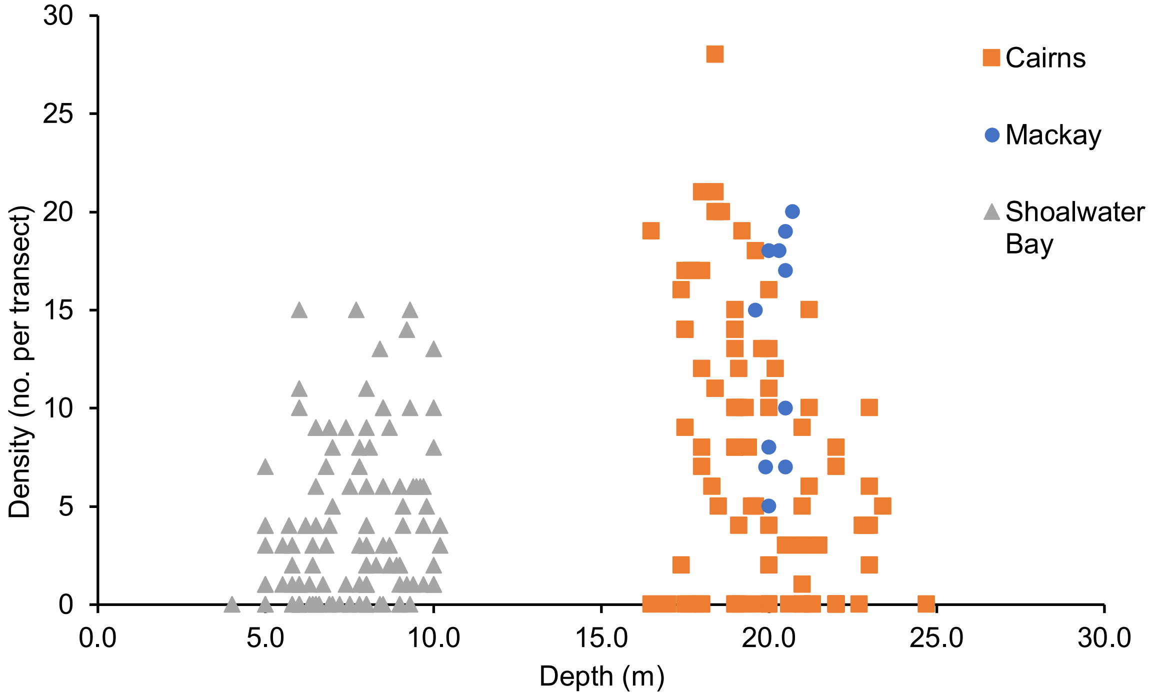


Figure 3.2. No. of *Trachyphyllia geoffroyi* recorded on transects run at different depth in each of the three distinct study regions.

The estimated weight of all colonies of *Trachyphyllia geoffroyi* recorded during this study (n = 1,291 corals) was 271.39 kg. Accounting for regional variation in both the size and abundance, the average biomass of *Trachyphyllia geoffroyi* recorded across all transects where it occurred was 1.42 kg per transect (50m^2). Average biomass recorded in Shoalwater Bay (1989.00 g per transect ± 181.91 SE) was much higher than recorded in Cairns (596.83

g per transect ± 52.00 SE) or Mackay (371.67 g per transect ± 56.38 SE). The proportion of *Trachyphyllia geoffroyi* that would likely be harvested (based on size, colour and health) was also much higher in Shoalwater Bay (56.3%), compared to Cairns (19.7% and Mackay (7.9%)

3.2 *Captive growth rates of specialty coral harvest species*

A total of 73 corals were collected and maintained in captivity to measure monthly growth rates. These included 24*Trachyphyllia geoffroyi* (which were between 22.2-38.6 mm skeletal diameter when initially collected) and 23 *Catalaphyllia jardinei* (23.8-48.3 mm skeletal diameter), which were collected from Mackay, 16 *Homophyllia* cf. *australis* (14.9-39.4 mm skeletal diameter) collected from Shoalwater Bay, and 10 *Micromussa pacifica* (27.2-43.2 mm skeletal diameter) from offshore reefs in the southern GBR. The specific identity and relevant nomenclature many of these corals is uncertain, and so tissue samples were retained for molecular analyses, but these data not presented here. Rather, these data will be analysed alongside a much broader range of tissue samples that have been collected over the last few years to help clarify the taxonomy of specialty coral harvest species.

All corals collected and maintained in aquaria exhibited consistent growth over the 6-month period from August 5th 2023 until February 11th 2024, as evident based on changes in both skeletal diameter (Figure 3.3) and submerged weight (Figure 3.4). The average monthly change in skeletal diameter was highest for *Catalaphyllia jardinei* (0.98 mm/ month), which resulted in nett increase in coral size of 5.87mm or 16.9% over the 6-month period. For *Trachyphyllia geoffroyi* the mean monthly growth rates was 0.82 mm/ month, resulting in overall change of 4.92 mm or 16.1%. For *Micromussa pacifica* the mean monthly growth rate was 0.66 mm/ month, resulting in overall change of 3.94 mm or 11.8%. The average monthly change in skeletal diameter was lowest for *Homophyllia* cf. *australis* (0.33 mm/ month), resulting in overall change of 1.98 mm or 7.3%. Changes in submerged weight over the 6-month study period were also highest for *Catalaphyllia jardinei* (2.52 g, 11.3%), but lowest for *Trachyphyllia geoffroyi* (0.95 g; 4.3%).

In contrast to skeletal diameter and submerged weight which exhibited sustained increases throughout the study period, increases in tissue diameter were most pronounced during the first 3-months (Figure 3.5). For *Catalaphyllia jardinei*, the tissue diameter increased 82.3% in just the first 3-months, but then did not change in the subsequent 3-month period.

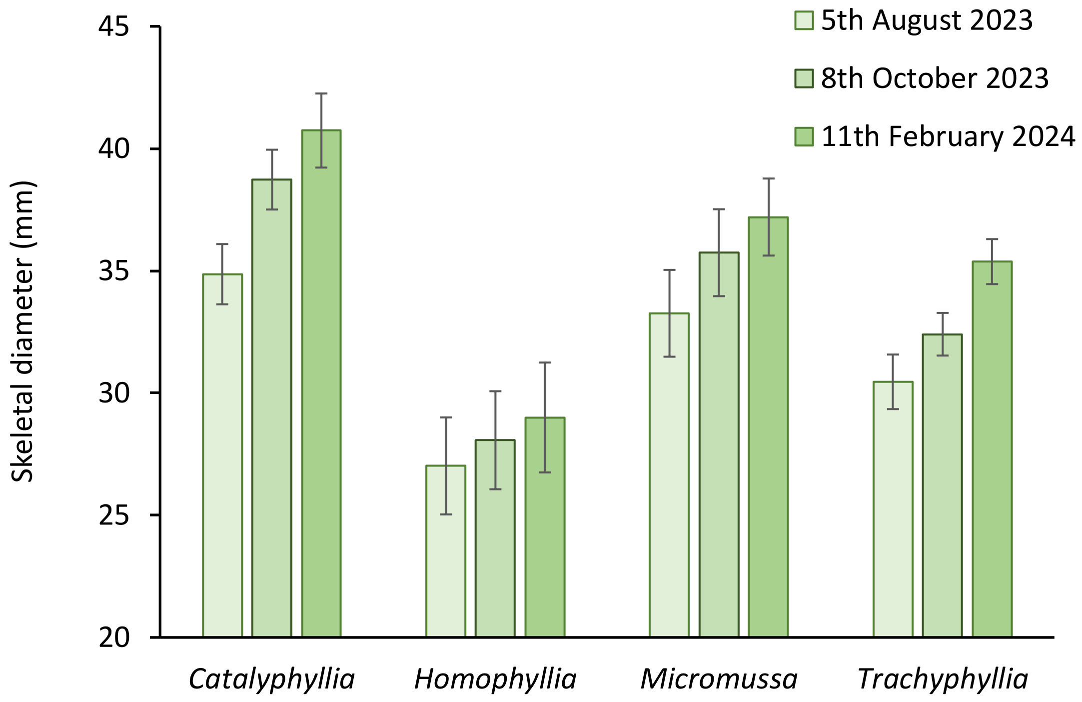


Figure 3.3. Skeletal diameter (mm) recorded for 73 corals measured over 6-months. Size is presented as the average (± SE) for each of four distinct taxa; *Catalaphyllia jardinei* (n = 23), *Homophyllia* cf. *australis* (n = 16), *Micromussa pacifica* (n = 10) and *Trachyphyllia geoffroyi* (n = 24).

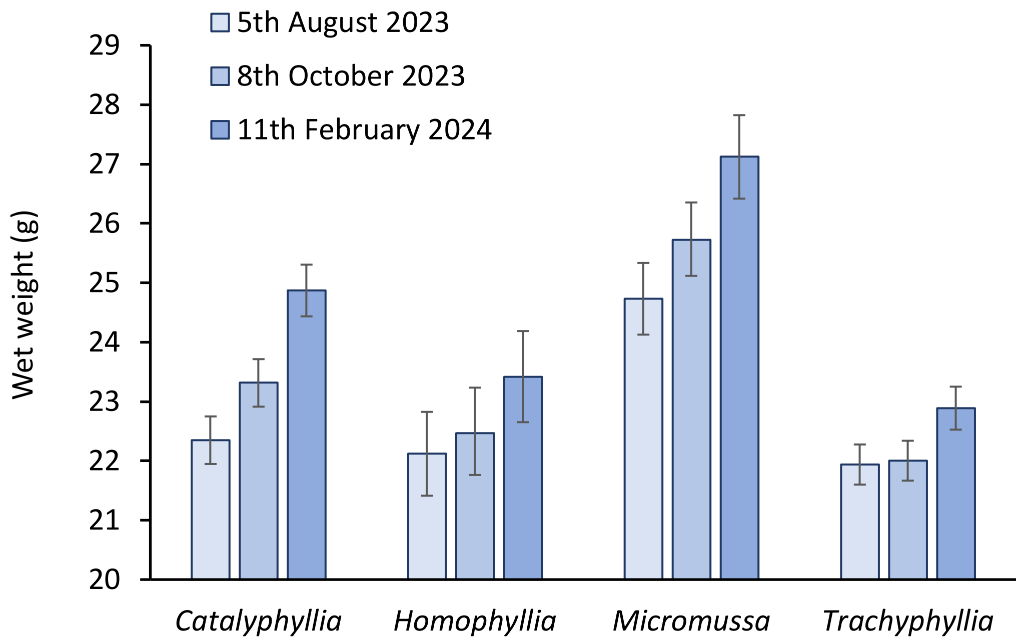


Figure 3.4. Submerged weight (g) recorded for 73 corals measured over 6-months. Size is presented as the average (± SE) for each of four distinct taxa; Catalaphyllia jardinei (n = 23), Homophyllia cf. australis (n = 16), Micromussa pacifica (n = 10) and Trachyphyllia geoffroyi (n = 24).

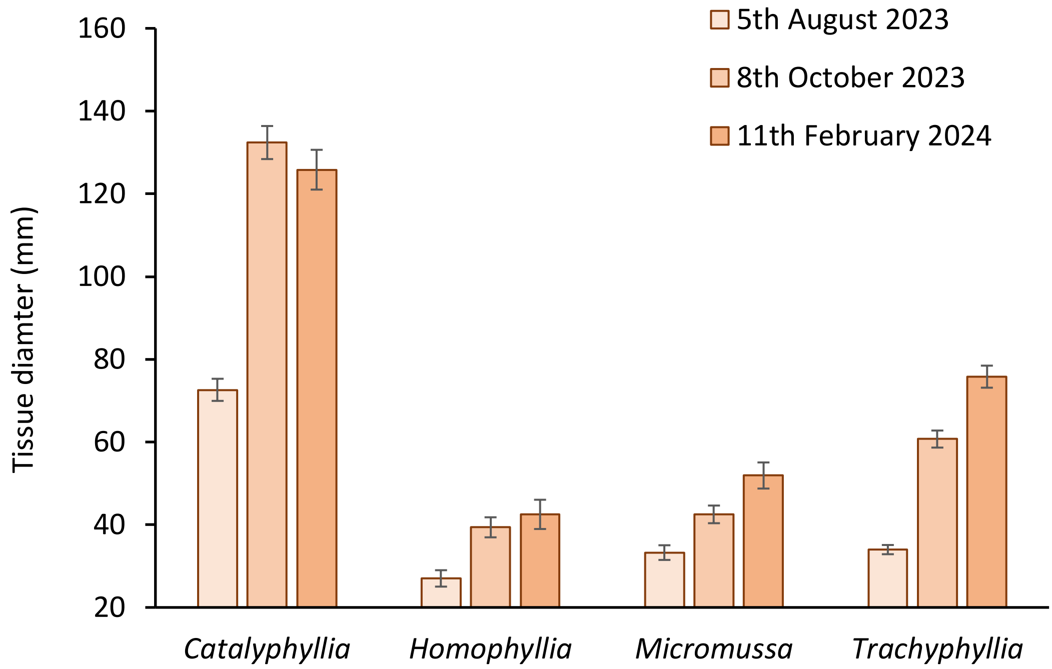


Figure 3.5. Tissue diameter (mm) recorded for 73 corals measured over 6-months. Size is presented as the average (± SE) for each of four distinct taxa; Catalaphyllia jardinei (n = 23), Homophyllia cf. australis (n = 16), Micromussa pacifica (n = 10) and Trachyphyllia geoffroyi (n = 24).

4. Discussion

Recently prescribed harvest limits established specialty coral harvest species were based entirely on catch history (e.g., Pratchett 2021), and do not therefore, account for the specific stock size or structure of individual coral taxa. As such, prescribed harvest limits may be unnecessarily restrictive for highly abundant or widespread corals, but also do not necessarily ensure that harvest levels and limits are sustainable. Much of the research required to establish sustainability-based harvest limits (and thereby reduce uncertainty regarding the risk posed by harvesting for specialty coral harvest species) is fairly routine and very tractable (Pratchett 2021). Indeed, the critical knowledge gaps and corresponding research required to establish sustainable harvest limits for individual specialty coral harvest species were articulated >20 years ago (e.g., Harriot 2001). The main issue, however, is that the geographic extent of sampling to establish stock size and structure needs to be commensurate with the spatial extent of harvesting, which has increased through time for many specialty coral harvest species (Pratchett 2021). For *Trachyphyllia geoffroyi*, harvesting on the Great Barrier Reef is largely reported from a few distinct areas, whereby ~40% of reported harvesting is from just 4 different 6x6 nm blocks, and there is no evidence of serial depletion in major harvest areas and corresponding effort shifts; rather, increased harvest levels since 2017-2018 were reported from the same harvest areas where there had been sustained harvesting since 2006-2007 (Pratchett 2021).

This study provides data on the stock size and structure of *Trachyphyllia geoffroyi* and other co-occurring specialty coral harvest species, based on intensive sampling across areas where there has been reported harvesting, and often sustained harvesting since at least 2006-2007. The overall abundance (5.47 corals per 50m^2) and biomass (1.42 kg per transect 50m^2) of *Trachyphyllia geoffroyi* is substantially higher than reported previously (Pratchett et al. 2020) and does question the relevance of the very moderate prescribed harvest limit imposed for this species (701 kg), especially compared to other coral species with much higher prescribed harvest limits (e.g., 3,715 kg for *Micromussa lordhowensis*). Notably, the currently prescribed annual harvest limit for *Trachyphyllia geoffroyi* could be harvested from just 2.47 hectares of suitable habitat, or 7.05 hectares, if considering that only 35.2% of corals are of suitable size, colour, and health across all regions. Moreover, this study has shown that *Trachyphyllia geoffroyi* is capable of growing at 0.82 mm per month (or approximately 1 cm per year). It is unknown to what extent such growth rates may actually be realised in the field, but these data partly redress the lack of demographic information (and presumed slow growth) that led to previous concerns about the potential vulnerability of *Trachyphyllia geoffroyi* to overfishing (e.g., Pratchett et al. 2020).

The next steps to establishing sustainable harvest limits for *Trachyphyllia geoffroyi* is to clarify the phylogenetic affinities and relevant nomenclature for potentially distinct populations in each of the regions. If for example, each of these populations are distinct (if not different species) then relevant harvest levels and limits will need to be applied for each region. It will then be necessary to develop comprehensive habitat and bathymetry maps for the relevant regions, which can then be used in conjunction with current density and biomass estimates to assess the overall stock size of *Trachyphyllia geoffroyi*. Sustainable harvest limits may then be inferred based on a fixed proportion of the total stock, as suggested by Harriot (2003). Moreover, comparative assessments of stock size and structure may be undertaken between fished versus comparable no-take marine reserves (Pratchett 2024). This latter approach is particularly relevant given that a key objective of Queensland's sustainable fisheries strategy is to ensure that the biomass of targeted stocks of all harvested species is > 60% of no-take biomass (Queensland Government 2016).

Beyond the focal species (*Trachyphyllia geoffroyi*) this study provides important data for a range of other specialty coral harvest species, especially *Catalaphyllia jardinei*. Importantly, *Catalaphyllia jardinei* appears capable of very rapid growth. Together with previous records of very high abundance and biomass (albeit in specific habitats; Pratchett et al. 2020), suggest that this species is likely to be resilient to harvesting. All relevant data will be made readily available to assist in future decisions and improved management of specialty coral harvest species, though it is clear that these data are not necessarily reflective of the full range of regions or habitats in which these corals may grow. For example, only a small number of *Acanthophyllia deshayesiana* were recorded during this study, and only in the Cairns region. Comparable sampling across a broad range of habitats in the northern and far northern sectors of the Great Barrier Reef would be necessary to effectively assess the stock size and structure for this species.

It is widely recognised that the lack of relevant data pertaining to the biology and vulnerability of fisheries target species represents a considerable constraint to effective management of Australian coral fisheries (Pratchett et al. 2020, Pratchett 2021). However, significant investment will be required to address relevant knowledge gaps across all specialty coral harvest species. As such, research should be prioritised for coral species that are critically important to the continued viability of Australian coral fisheries, and for which currently prescribed harvest limits appear counter to apparent stock size and trends. Data presented in this study suggests that sustainable harvest limits for *Trachyphyllia geoffroyi* will likely be higher than currently prescribed harvest limits, providing strong incentive to support and deliver the necessary research. However, it should also be recognised that sustainable harvest limits will need to be periodically assessed and potentially revised in the face of changing environmental and habitat conditions (Pratchett et al. 2020). While *Trachyphyllia geoffroyi* may be generally resistant to elevated temperatures (Pratchett et al. 2020), moderate levels of bleaching were recorded for *Trachyphyllia geoffroyi* in February 2024 (Pratchett et al. 2024). Climate change poses an existential threat to corals on the Great Barrier Reef and observed and projected increases in the incidence of mass coral bleaching and mortality (Hughes et al. 2018) may undermine the sustainability of coral harvesting.

5. Acknowledgements

The authors are grateful to Pro-Vision Reef for supporting the current research, as well as individual operators within the Queensland Coral Fishery that further contributed to the current project with in-kind support, especially Cairns Marine, Ultra Coral Australia, and Inter-Fish. This work was conducted with field and logistical assistance from Deborah Pratchett and Sam Coenradi. We respectfully acknowledge the Traditional Owners of the land and sea on which this work was conducted, as well as Elders past and present.

6. References

Atkinson, M., Kerrigan, B., Roelofs, A., & Smith, T. (2008). Non-Detriment Finding for CITES-listed corals in the Queensland Coral Fishery. *WG9-Aquatic Invertebrates Case Study*, 4, 28.

CITES (1983). Convention on International Trade in Endangered Species of wild fauna and flora (CITES), Washington. https://cites.org/sites/default/files/eng/disc/CITES-Convention-EN.pdf

Donnelly, R. (2013). Stewardship Action Plan 2013: mitigating ecological risks in a changing climate. Pro-vision Reef Inc., Cairns https://www.provisionreef.org.au/stewardship-action-plan/stewardship-action-plan-2013

Harriott, V. J. (2001). The sustainability of Queensland's Coral Harvest Fishery. CRC Reef Research Centre, Cairns.

Harriott, V. J. (2003). Can corals be harvested sustainably? *Ambio* 32, 130-133.

Hughes, T. P., Kerry, J. T., Baird, A. H., Connolly, S. R., Dietzel, A., Eakin, C. M. et al. (2018). Global warming transforms coral reef assemblages. *Nature* 556(7702), 492-496.

Jones, A. M. (2011). Raiding the Coral Nurseries? *Diversity* 3, 466-482.

McCormack, C. (2005). Ecological Assessment of the Queensland Coral Fishery: A report to the Australian Government Department of the Environment and Heritage on the ecologically sustainable management of the Queensland Coral Fishery. Queensland Government Department of Primary Industries and Fisheries (DPIF), Brisbane.

Pacey, K. I., Caballes, C. F., & Pratchett, M. S. (2023). Using size-weight relationships to estimate biomass of heavily targeted aquarium corals by Australia's coral harvest fisheries. *Scientific Reports* 13(1), 1448.

Pratchett, M.S., Caballes, C.F., Messmer, V., Wilson, S.K., Roelofs, A., Penny, S., Kelley, R., Newman, S. (2020). Vulnerability of commercially harvested corals to fisheries exploitation versus environmental pressures. Fisheries Research and Development Corporation (FRDC) Project No. 2014-029, Canberra.

Pratchett, M.S. (2021). Expert advice for the assessment of Australian coral fisheries - Queensland Coral Fishery 2006-2007 to 2019-2020, Department of Agriculture, Water and the Environment (DAWE), Wildlife Trade Assessments Section of the Wildlife Trade Office, Canberra. https://www.dcceew.gov.au/sites/default/files/documents/qld-coral-expert-advice-assessment-australian-coral-fisheries-2021.pdf

Pratchett MS (2024) Localised status assessment for specialty coral harvest species on the Great Barrier Reef, Department of Climate Change, Energy, the Environment and Water (DCCEEW). https://www.dcceew.gov.au/sites/default/files/documents/qld-coral-localised-status-assessment-2024.pdf

Queensland Government (2016). Green paper on fisheries management and reform in Queensland. Queensland Government Department of Agriculture and Fisheries, Brisbane. https://www.publications.qld.gov.au/dataset/f6af65c5-f1f6-48cf-8937-a74ebe467acb/resource/fef6ebad-2317-4c0a-99e1-5

Queensland Legislation (2022) Fisheries Legislation (Coral) Amendment Declaration 2022 - Explanatory Notes for SL 2022 No. 76. https://www.legislation.qld.gov.au/view/pdf/published.exp/sl-2022-0076

Queensland Legislation (2023) Fisheries Legislation (Coral) Amendment Regulation 2023 - Explanatory Notes for SL 2023 No. 44. https://www.legislation.qld.gov.au/view/pdf/published.exp/sl-2023-0044