Citizen science supports debris monitoring and management at multiple scales

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1 Purpose

There is a growing recognition that government and academic-led programs will not provide the spatial and temporal resolution needed to measure and manage marine debris. Nationally coordinated citizen science provides opportunities to inform effective management at multiple scales.

The Australian Marine Debris Initiative (AMDI) contains clean-up events from >24, 000 events and >4200 sites since 2004. It also contains thematic projects that identify potential sources through data on debris (i) abundance, (ii) distribution and (iii) composition (Gacutan et al. 2022).

<u>This poster:</u>

- Describes three projects at national, state, and local scales that use AMDI,
- Links inferences of debris to management applications, and
- Explores how AMDI is advancing citizen science across Australia.

2 AMDI & ReefClean program

National

10 years of the AMDI (2019 - 2020) were assessed for trends across Australia, with accuracy and reliability improved through rigorous filtering, restricting analysis to 43% of events in the database. Analyses were aligned to federal management area, with results included in Australia's 2021 **State of the Environment report**. The results identified the most common items and spatial distribution of debris across the continent (Fig 1a).
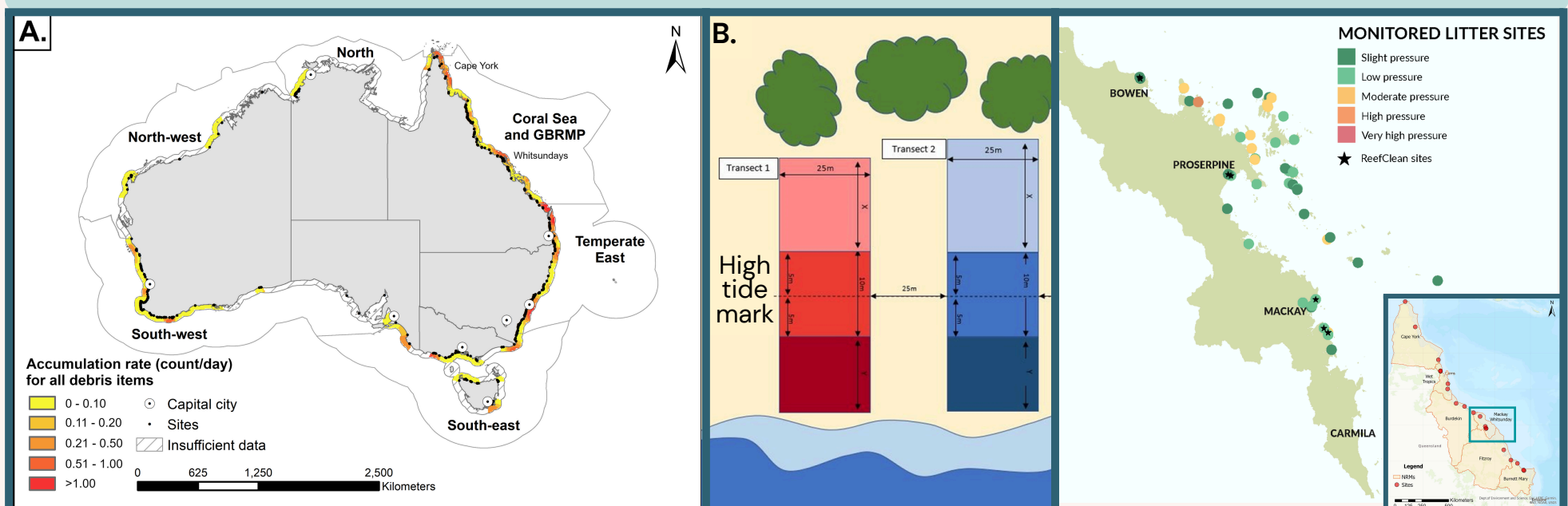
Local

ReefClean partnered with trained citizen scientists to sample 18 sites quarterly across Queensland, since March 2019. Four transects used per site, split to zones based on high-tide mark to sample debris > 5 mm (Fig 1B). ReefClean and AMDI events informed an annual **litter report card** (Fig 1C) to track the effectiveness of single-use plastic bans and other litter prevention strategies.

Figure 1. (A) National analysis of plastic using AMDI, (B) ReefClean transect method. (C) Both AMDI and ReefClean were used for litter report card monitoring.

3 Assessing risk across a State

Table 1. Matrix of risk posed by top 5 debris item and biological assemblages for the New South Wales Marine Debris Threat and Risk Assessment.

Debris item	Benthic	Cetaceans	Fish and sharks	Seabirds	Turtles
Microplastics	H	M	L	H	H
Plastic rope	M	H	L	L	L
Fishing line	–	M	L	H	L
Hard plastic fragments	M	H	L	H	M
Plastic bag	–	H	L	M	H

Figure 2. NSW Marine Estate, discretised into a 20 km grid, overlayed with (A) abundance of fishing traps and pots and (B) their estimated risk to cetaceans.
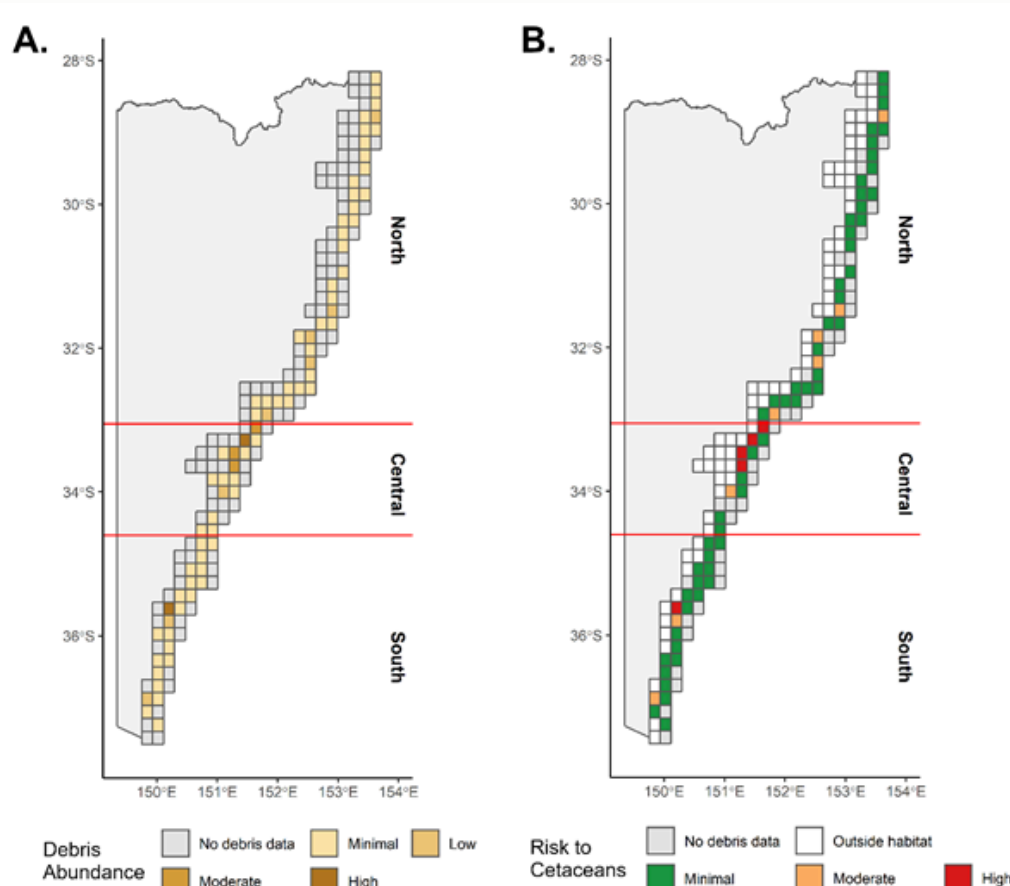
State

Decision making for plastic debris is challenged by uncertainty concerning (i) the impacts of debris on biota and (ii) the distribution of debris within the environment. We combined literature review, expert elicitation, empirical debris data and spatial modelling to estimate the risk of key debris items to biota for management of the New South Wales Marine Estate through a **Threat and Risk Assessment**.

The expert elicitation identified the severity of an interaction between biota and a plastic item, where microplastics, fishing items (plastic rope, fishing), and fragments were considered 'high' risk (Table 1). The exposure of biota to these items was estimated using four citizen science datasets, including the AMDI. Available data was combined onto a grid to provide a spatial understanding of risks per zone to inform and direct management efforts (Fig 2).

4 Conclusions

- National coordination of methods and classifications facilitates the use of citizen science in management, at greater spatial and temporal scales.
- Citizen scientists can be trained in scientific sampling techniques to build trust in the data.
- Citizen science is increasingly used in government reporting processes within Australia.

Refs Gacutan, Jordan, et al. "Continental patterns in marine debris revealed by a decade of citizen science." Science of The Total Environment 807 (2022): 150742.