Coral Sea Marine Park

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Environmental Assessment of Islands, Islets and Cays of the Central Reef System

2024

Australian Government
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Cover photo: Aerial view of North East Cay (Herald Cays), Parks Australia.

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Contents

Voyagers: Top row (left to right), Martin Russell, Andrew McDougall, Fiona Hofman, Larry Brushe, Ian Anderson, John Prichard and Joy Brushe. Bottom row (left to right) Guy Weerasinghe, Fiona Hagger and Ernie Brandt.

Executive Summary

In July 2024, Parks Australia undertook a nine-day voyage in the Coral Sea Marine Park (CSMP), to assess the health of islands, islets and cays (here-on called islands) in the central region of the CSMP.

The islands visited and assessed:

- Mid Islet (Willis Islets)
- South Islet (Willis Islets)
- North West Islet (Magdelaine Cays)
- South East Cay (Magdelaine Cays)
- Georgina Cay (Lihou Reef)
- East Diamond Islet (Diamond Islets)
- Central Diamond Islet (Diamond Islets)
- West Diamond Islet (Diamond Islets)
- South West Islet (Coringa Islets)
- Chilcott Islet (Coringa Islets)
- North East Cay (Herald Cays)
- South West Cay (Herald Cays)

The *CSMP Island Health Project* is undertaken through a collaboration of agencies and experts, bringing a suite of specialist skills to provide assessments on ecosystem health and identify change and emerging pressures across several indicator areas including:

- description and mapping of vegetation communities;
- establishing permanent vegetation BioCondition monitoring sites to compare structure, floristc composition and ecosystem function over time and to provide benchmarks for Coral Sea terrestrial vegetation
- compiling comprehensive plant species lists;
- collecting data on bird breeding, population demographics and species diversity;
- surveying for introduced and invasive species;
- monitoring for threats and pressures to natural values, such as human activity;
- removing marine debris and recording type and weight;
- installing and maintaining Parks Australia information signs on vegetated islands;
- high resolution spatial drone imagery; and
- describing and checking for change of island geomorphology.

Assessments on the 2024 voyage are a continuation of Coral Sea Island Health voyages to the 60+ islands undertaken in November/December 2019 (Hemson et al. 2020), July 2021 (Chapman et al. 2022), May/June 2022 (McDougall and Brushe 2023) and July 2023 (Director of National Parks 2024), and represent a critical ongoing assessment and evaluation process that informs management of these ecosystems.

Key findings from the 2024 voyage:

- *Pisonia grandis* communities on North East Herald Cay were in good condition with no evidence of scale insect outbreaks or associated ant population increases. Some leaves on the *Pisonia grandis* communities on Magdelaine Cay South exhibited damage from insect attack.
- *Cordia subcordata* (sea trumpet) communities continue to exhibit varying degrees of dieback and recovery, indicating stress related to insect attack and climatic pressures.
- The nine introduced weed species (weeds) recorded during the 2023 vegetation survey of South Islet were all present in July 2024. The dominant weeds were *Cenchrus echinatus* (Mossman river grass) and *Euphorbia cyathophora* (dwarf poinsettia). The extent and density of *C. echinatus* in July 2024 was similar to the status in June 2023. Extent of *E. cyathophora* was similar to 2023 but the density was significantly less. Three weed species, previously recorded only in the Operational Area were found to have spread to natural areas outside the Operational Area in 2024.
- Parks Australia and the Bureau of Meterology staff undertook a scoping assessment to better understand the extent and distrbtuion of weeds on South Islet. Requirements of, and issues associated with development of an ecological restoration project that includes weed management were documented.
- Most of the *E. cyathophora* on South Islet and all weeds on the two access tracks were removed by hand pulling. Targeted weeds in the mown area were spot sprayed with glyphosate. Methodologies were established for weed management in selected manageable areas over the next 12 months by the on-island Bureau staff including photo monitoring and monthly reporting.
- Two new permanent BioCondition monitoring sites were established and surveyed during the 2024 voyage. There are now 29 Permanent BioCondition monitoring sites established on 15 islands across the CSMP.
- Sixteen plant specimens were collected for incorporation into Queensland Herbarium in Brisbane, the Australian National Herbarium in Canberra, and the Australian Tropical

Herbarium in Cairns including specimens of five species that have not previously been collected on the island on which they were collected. Two of these are the first records for the island for these species. The other eleven species were from South West Herald Cay to complement collections made during the 2019 voyage.

- A total of 26 bird species were recorded during this voyage; 15 seabird species (of which 13 were breeding), 5 migratory shorebird species and 6 land and wetland species, including the resident Coral Sea subspecies of the buff-banded rail (*Gallirallus philippensis tounelieri*). A new breeding site for New Caledonian fairy tern was discovered at North West Islet (Magdelaine Cays).
- New Caledonian fairy terns were observed nesting on Georgina Cay (Lihou Reef), two Herald petrels were observed prospecting for nest sites at Central Diamond Islet (Tregrosse Reefs), and more than 600 breeding pairs of red-tailed tropicbirds were counted on the Herald Cays.
- A total of 3,130 individual marine debris items (approximately 5.5 cubic metres weighing almost 1.3 tonnes) were removed from 11 islands. These items were weighed, identified and databased using Tangaroa Blue Foundation methodology.
- This voyage is the first time avian influenza surveillance was undertaken on these voyages.The detection of the H9N2 LPAI was quite distinct from other H9 influenza viruses detected in Australia in the recent past.

Recommendations

Biosecurity protocols and other recommendations contained in previous reports Hemson et al. (2020), Chapman et al. (2022), McDougall and Brushe (2023), and Director of National Parks (2024) are also relevant to this report.

Vegetation

- Continue to implement the South Islet (Willis Islets) Weed Management Project Plan, refining and adapting the Plan according to findings and progress. Access to South and Bird Islets should be restricted to Parks Australia and authorized personnel.
- Authorized personnel accessing islands should provide tracklogs recorded on a hand held GPS or a suitable mobile phone app to Parks Australia so areas traversed can be monitored by Parks Australia to check for transfer of weeds during these visits. Repeated access to infrastructure should be via the same routes.
- Continue to regularly monitor the health of *Pisonia grandis* communities on North East Herald Cay and South East Magdelaine Cay, particularly looking for signs of dieback, scale insects, exotic ants, sooty mould and *Hippotion velox* (hawk moth) activity as well as noting the presence or evidence of parasitoid wasps and ladybeetle *Cryptolaemus montrouzieri.*
- Continue to regularly monitor health and geographic extent of *Cordia subcordata* (sea trumpet) communities in the CSMP and undertake investigations to improve understanding of the role of insect attack and climate in dieback and recovery of these communities.
- Establish and survey additional permanently marked BioCondition monitoring sites on islands to obtain representative data to complete benchmarking of vegetation attributes

for the range of plant communities present in the CSMP. Suggested potential locations are listed in section 1.1.

- Repeat comprehensive island surveys, monitoring surveys of BioCondition sites and vegetation mapping approximately every 10 years on each vegetated island.
- Carry out Health Checks/Island Watch type surveys on each island visit, annually or biannually if possible, on key value islands. Include photographs of sites at known locations for comparisons over time.
- Complete the contemporary collection of plant species on each CSMP island. The location and species of which are yet to be collected is outlined in Part 1.1.

Birds

- Implement seasonal, or permanent island closures to protect New Caledonian fairy terns and Herald petrel populations. New Caledonian fairy tern are susceptible population decline due to a small global population (population collapse through disease), cryptic nests (easily unseen and potentially trampled by people), and egg and small chick exposure due to an exaggerated adult flight distance when nesting areas are approached by people. Similarly Herald petrel have been found nesting on only one island in the Coral Sea Marine Park (Central Diamond Islet), and are susceptible to risks when nesting areas are approached by people.
- Continue gathering baseline bird data for all islands. Comprehensive baseline information may take years to ensure seasonal variations, species diversity and habitat requirements are fully understood.
- Continue ground-based counts complemented with drone imagery when possible. This imagery will benefit bird and vegetation monitoring.
- Catalogue the presence and diversity of pelagic seabirds along the chain of seamounts from the Fraser Guyot to the Mellish Plateau.
- Initiate mark/recapture and/or satellite tracking studies of red-tailed tropicbirds in the Herald Cays to understand population movements and breeding phenology. Similar research on other species will be relevant.
- Workshop potential research opportunities identifying foraging areas for species and understanding population interactions between the CSMP and adjoining marine protected areas.
- Collate an audio and photographic index of bird species and their habitats.

Island Health Watch & Checks

- Continue to check islands for weeds, especially those islands where known human visitation has occurred. Early detection is vital to help prevent spreading and seed bank buildup. Chilcott Islet and East Diamond Islet should be carefully checked on the next Parks Australia visit, because these two islands had evidence of recent visitation.
- Consider outreach strategies to island visitors, to help communicate and educate on biosecurity principles to help reduce the spread of introduced and invasive species. The logbooks that are attached to Parks Australia signage on vegetated islands should continue to be checked and replaced as necessary.
- Consider timing the CSMP Island Health Voyages to occur in Autumn, the best time to survey insects and detect weeds.
- Use a consistent collection methodology and expert review of invertebrates on CSMP islands, such as the 10-branch-end method to survey scale insect and ant bait stations.

Compare each year's results with previous years and develop an identification guide for use when undertaking health checks and island watch surveys. Particular attention needs to be paid to those insects that have been previously found in the CSMP and that might detrimentally affect bird and turtle breeding efforts or Cordia and Pisonia communities (for example, hawkmoth *Hippotion velox*, scale insect *Pulvinaria urbicola*, and ants such as the pharaoh ant *Monomorium pharaonic* that aid scale insect, or the African big-headed ant *Pheidole megacephala* that may also affect bird/turtle breeding efforts).

- Consider the continued use of rodent tunnels. To date, no rodent species have been detected on CSMP islands. Hemson et al (2020) recommended that all islands be surveyed for rodents every few years. The frequency of surveys could be informed by the frequency of visitation.
- Use (and make available to other CSMP island value surveyors) recently obtained high-resolution aerial photogrammetry of CSMP islands to help identify Health Check/BioCondition assessment sites on future CSMP Island Health Voyages, to compare geomorphological changes over time, and help assess shifts in vegetation communities.
- Consider ways to house and share data collected each voyage, to maximise usage and assist researchers.

Marine Debris

- Continued collection and databasing of marine debris to compare with previous collections.
- Islands that are major 'accumulators' of marine debris have been identified from this voyage and previous voyages in recent years. These islands can be specifically targeted in future voyages to build a more comprehensive picture of the flow of marine debris and thus currents through the CSMP.

HPAI

- Continued surveillance to occur in the Coral Sea in collaboration with DAFF/NAQS. On specific voyages, opportunistic environmental faecal samples be collected (either by NAQS veterinary officers or Parks Australia staff) and tested through the existing diagnostic pathways.
- Monthly monitoring to be maintained by BOM staff at South Willis islet. While not early detection due to frequency of clearance, samples can be stored in the freezer and submitted via NAQS for longitudinal picture of virus ecology.
- Explore awareness building resources for recreational visitors to the region to understand what to be aware of.

Introduction

The Coral Sea Marine Park (CSMP) is in Commonwealth waters, immediately east of the Great Barrier Reef Marine Park, and abuts Papua New Guinea, Solomon Islands and New Caledonia waters. It extends from Cape York Peninsula to just north of Bundaberg in Queensland, Australia, encompassing an area of 989,836 km^2. There are over 500 reefs in 34 vast reef areas and over 60 islands in the CSMP.

The islands play a significant ecosystem service role in the broader health of the CSMP. As an example, the islands support globally significant seabird breeding populations that in turn service the health and requirements of the adjacent coral and fish ecosystem communities by providing a nutrient source (guano) that is critical to maintaining the diversity in these systems. 21 islands are vegetated containing rare habitats, and about 24 islands are within the Coringa-Herald and Lihou Reefs and Cays Ramsar site. The sand-cay habitats are used for nesting by the globally endangered and migratory green turtle (*Chelonia mydas*), and possibly other species of marine turtle.

Parks Australia manages the CSMP under the *Coral Sea Marine Park Management Plan 2018*. Parks Australia and the Great Barrier Reef Marine Park Authority (GBRMPA) have a Memorandum of Understanding (MOU) to enable management efficiencies between the two marine parks. As part of this MOU, the GBRMPA/Queensland Parks and Wildlife Service Joint Field Management Program (JFMP) has been assisting Parks Australia with monitoring and managing island ecosystems.

Since 2019 (excluding 2020), under the CSMP Island Health Project, Parks Australia have undertaken annual voyages to the CSMP. These voyages use relatively consistent monitoring methods to assess ecosystem indicators and determine overall island health. Reports of these voyages is at Australian Marine Parks website.

In July 2024 an assessment of islands of the central reef system was undertaken: Mid Islet (Willis Islets), South Islet (Willis Islets), Magdelaine Cay North (Magdelaine Cays), Magdelaine Cay South (Magdelaine Cays), Georgina Cay (Lihou Reef), East Diamond Islet (Tregrosse Reefs), Central Diamond Islet (Tregrosse Reefs), West Diamond Islet (Tregrosse Reefs), South West Islet (Coringa Islets), Chilcott Islet (Coringa Islets), North East Cay (Herald Cays) and South West Cay (Herald Cays), (Figure 1).

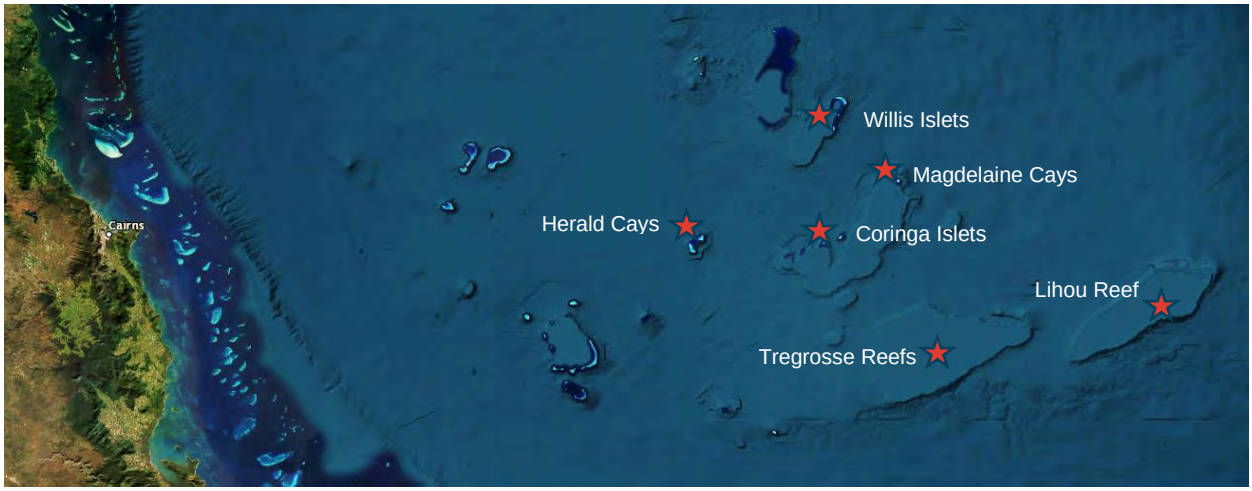

Figure 1. Map of islands visited during the 2024 Coral Sea Island health voyage.

Of all the voyages to date, this was the most cross disciplinary, including three CSMP Managers, staff from Tangaroa Blue Foundation, Department of Agriculture, Fisheries and Forestry (DAFF), Queensland Parks and Wildlife Service (QPWS), the Bureau of Meteorology (the Bureau), James Cook University (JCU) and volunteer botanists. Researchers from JCU undertook coral bleaching surveys and collected coral and invertebrate samples to assess genetic diversity (Figure 2). A report on this work is at Australian Marine Parks Website.

Figure 2: Researchers from James Cook University undertaking reef survey work: Cecelia Martin (left) and Magena Marzonie (right). Photo: Fiona Hagger, Parks Australia

On-ground scoping and planning work for the South Islet Weed Management Project was also undertaken. The '*Willis Island (South Islet – Willis Islets) Weed Management Project (WMP) Plan'* detailing the joint-agency ecological restoration collaboration between Parks Australia and the Bureau, has now been endorsed by both agencies.

Part 1 - Methods, General Results and Discussion

1.1 Vegetation - *Joy Brushe and Larry Brushe*

Methods

A handheld GPS was used to record and go to preselected site coordinates in the field. In addition to using uploaded coordinates on the GPS, the Avenza Maps App. was also used to assist in real time map navigation on the islands. Spatial PDF maps with point locations and mapped vegetation community boundaries overlying high resolution imagery were generated in the QGIS program and loaded onto Avenza Maps App. The Context Camera App. on an iPad was used to take photographs stamped with position coordinates, Datum, GPS accuracy, date, time, and direction for future comparisons at Health Check sites.

Permanent BioCondition Monitoring Sites

Permanent BioCondition monitoring sites are in representative areas within a range of vegetation communities where vegetation is in good (benchmark) condition. These monitoring sites are used to provide benchmark reference data for BioCondition[1] assessment for the same vegetation communities elsewhere on other CSMP islands and to guide vegetation management projects; document changes in vegetation over time; and assess the impact of climate change and other disturbances on vegetation.

BioCondition benchmarks are obtained by averaging survey data for each vegetation attribute from replicate benchmark reference sites located in pristine representative locations within each vegetation community within the CSMP. It is also desirable to include benchmark data obtained across different seasons to capture seasonal variation in the benchmarks. The 2019-2024 survey data from BioCondition reference sites will be used to determine benchmarks for future BioCondition assessments (Eyre et al 2017).

Figure 3. Permanent sites are marked using galvanized star pickets labelled with Parks Australia stainless steel identification tags. Photo: Joy Brushe

50m x 10m sites have been permanently marked with star pickets (Figure 3) located at the start (0m) and end of the central 50m transect. The star pickets are labelled with Parks Australia identification tags made of 316 grade stainless steel firmly attached with a 316 grade stainless steel cable tie to prevent movement in strong winds. To minimise visual impact, posts were driven deeply into the ground to an above ground height of approximately 0.7 metre.

The secondary site survey methodology of Neldner et al. (2019) with some slight modifications to accommodate island vegetation was used. The methodology used is described in Appendix 1. Plot orientation and data recorded at permanent BioCondition monitoring sites and Neldner et al. (2019). To ensure long term secure data storage and accessibility, data and photographs recorded at the permanent monitoring sites will be stored digitally by Parks Australia and in the Queensland Herbarium QBEIS database.

Plant collections

Plant specimens were collected, labelled in the field with tie-on jeweler's tags, pressed and dried. Field notes were recorded at the collection sites and included location, habit and habitat of each specimen. Plant specimens and associated field data have been sent to The Queensland Herbarium in Brisbane, the National Herbarium in Canberra and the Australian

[1] BioCondition is a site-based, quantitative, and repeatable, condition assessment methodology that provides a measure (expressed as a BioCondition score between 0 and maximum of 1 and BioCondition Class of 1, 2, 3 or 4 - one being the best) of how well a terrestrial ecosystem is functioning for biodiversity values. A suite of attributes (e.g., canopy cover, coarse woody debris, native plant species richness, litter cover) are assessed at a site and evaluated against benchmarks for those attributes. The benchmarks for attributes are derived from a reference state for the ecosystem, reference state being the natural variability in attributes of an ecosystem relatively unmodified since the time of European settlement (Eyre et al. 2015).

Tropical Herbarium in Cairns to incorporate into their pressed collection and associated specimen records databases. No drift seeds were collected during the 2024 voyage.

Import restrictions applying to South Islet, required all plant specimens collected during the voyage to undergo gamma irradiation on return to the mainland. Specimens were sent to Steritech Pty Ltd at Narangba, Queensland where they received gamma irradiation treatment at 25 kGray.

Botanical nomenclature

Scientific plant species names used in this report are according to the Census of the Queensland Flora 2023 (Bean 2024a, 2024b). Throughout this document, common names are shown in brackets following the scientific names.

Vegetation mapping and soil analysis

No vegetation mapping was undertaken during the 2024 voyage and no soil samples were collected for analysis.

General Results and Discussion

Vegetation condition in July 2024

Following the wetter than average years in 2021 and 2022 (Figure 4), most of the 12 months preceding the 2024 voyage had low or lower than average monthly rainfall totals according to the South Islet weather station data (Bureau of Meteorology website, viewed September 2024). The exceptions were January and March, which had 271.8mm and 313.4mm respectively. Cyclone Jasper passed through the Coral Sea close to Willis Islets in January 2024. The three months preceding the July 2024 voyage were very dry. The condition of the vegetation during the voyage reflected these drier conditions and although, generally, the vegetation was in good condition, it was not as dense and lush as observed in previous years and there was some evidence of canopy dieback in *Argusia argentea*, *Pisonia grandis* and *Cordia cordata* plants in exposed coastal locations.

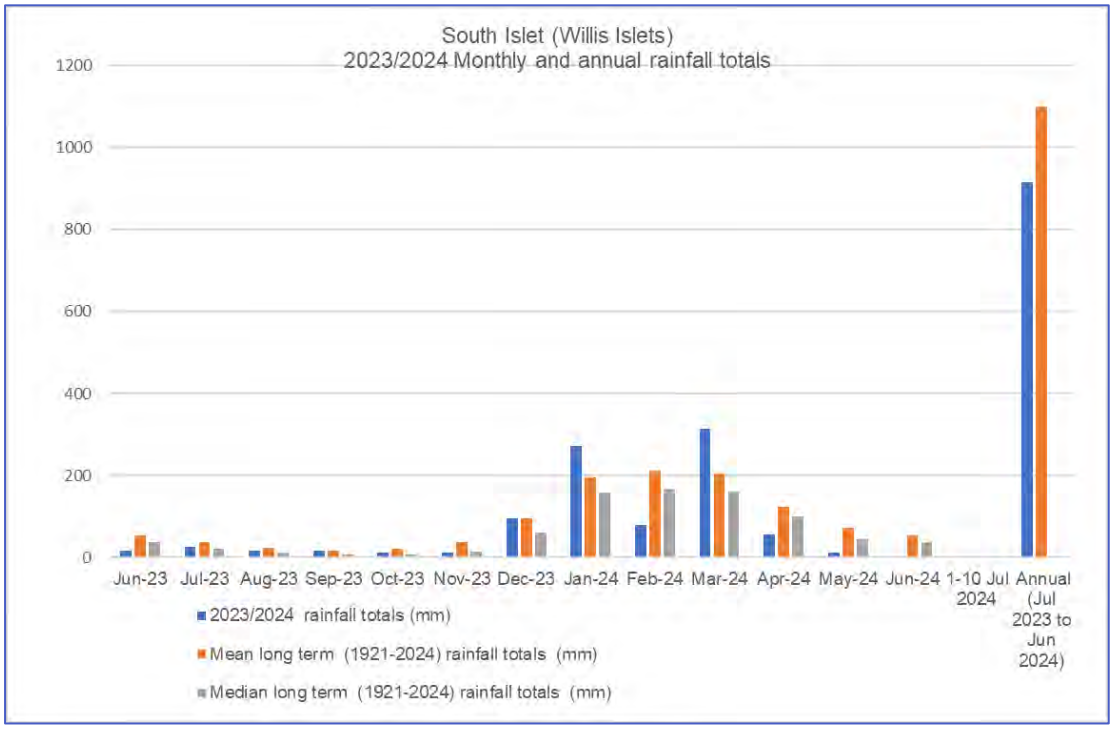

Figure 4. Comparison of recent (June 2023 to July 2024) and long-term (2021 to 2024 monthly rainfall data for South Islet (Australian Bureau of Meteorology website, viewed September 2024).

Evidence of insect damage on *Pisonia* and *Cordia* communities

Since the early 1990s, scale insect outbreaks associated with introduced ants and suspected drought conditions have possibly led to the complete loss of *Pisonia grandis* forests on South West Coringa Islet in the CSMP and caused severe damage to *Pisonia* forests on North East Herald Cay in the CSMP, Tryon Island and other islands on the Great Barrier Reef, islands in the Seychelles and Palmyra Atoll in Hawaii (Greenslade 2010, Freebairn 2006a,b,c,d,2007, Olds et al 2019).

No scale insect outbreaks were detected on this voyage. However, some *Pisonia* leaves on South East Madelaine exhibited damage from insect attack. The damaged area appeared to be recovering with new shoots.

Cordia subcordata is listed on the IUCN red list as “least concern” but is continuing to be monitored as, globally, its population is declining due to clearing for timber and development and it is also under threat from sea level rise (IUCN, 2024). *Cordia subcordata* on the CSMP islands has a history of decline, thought to be caused by herbivorous insect damage and prolonged dry seasonal conditions followed by re-establishment (Batianoff, 2010). *C. subcordata* is, however, reported to be capable of strong recovery, reshooting from the roots or basal shoots during wet periods (Hicks 1983 and 1984 in Batianoff 2001).

Cordia subcordata is now much less abundant on all islands than in 2006-2007 surveys and appears to have almost died out on some of the islands in the CSMP. Cordia stands are currently present on South East Cay, North East Cay (Heralds), Chilcott Islet, South West Islet (Coringa Islets) and East Diamond Islet. On the 2024 voyage the main *Cordia* stand on West Diamond Islet appeared to be dead - when last observed in 2021, these shrubs were heavily infested with scale insects. On South West Islet (Coringa), some of the Cordia patches which had previously been completely leafless in 2019 are resprouting, though some of the newly resprouted leaves exhibited damage from leaf-eating insects.

It is, therefore, important to continue to regularly monitor the health of *Pisonia grandis* and *Cordia subcordata* communities in the CSMP, particularly looking for signs of dieback, scale insects, exotic ants, sooty mold and *Hippotion velox* (hawk moth) activity as well as noting the presence or evidence of parasitoid wasps and ladybeetle predators. It is also important to ensure that there is always an available supply of the ladybeetle predator *Cryptolaemus montrouzieri* to deal with potential scale insect outbreaks.

Floristic data

The following species were recorded during the 2024 voyage in locations where they were not previously recorded during 2016 to 2023 voyages:

- *Boerhavia mutabilis* (pink flowered tar vine) on South Islet (Willis Islets) – not previously recorded on South Islet.
- *Plumbago zeylanica* (native plumbago) on Mid Islet (Willis Islet) – not previously recorded on Mid Islet.
- *Lepturus repens* (stalky grass) on Georgina Cay (Lihou Reef) – not recorded on Georgina Cay since 1984 (No herbarium specimen to confirm 1984 record).
- *Cordia subcordata* (sea trumpet) on South West Herald Cay – not previously recorded on South West Herald Cay.

Tables outlining the latest data on plant species recorded and collected from CSMP islands can be found in Appendix 2. Plant species recorded on all Coral Sea Marine Park islands and Appendix 3. Collection status of all plant species currently or previously present on all CSMP islands respectively. These updates include those species recorded and collected during the

2024 voyage, data which was not available for incorporation into the 2023 voyage report and now also includes 2016 records (Bush Blitz 2016) as currently established species

Table 1. Number of native plant species (excluding transient species) recorded and collected during the 2016 to 2024 voyages.

Island	Total number of species recorded	Number of species not previously recorded	Number of previously recorded species not currently present	Number of species collected
South East Cay (Magdelaine Cays)	17	1	3	11
North East Herald Cay	11	0	5	11
South West Herald Cay	13	2	1	13
Chilcott Islet (Coringa Islets)	13	1	1	13
South West Islet (Coringa Islets)	11	1	5	10
East Diamond Islet (Tregrosse Reef)	14	3	0	14
West Diamond Islet (Tregrosse Reef)	12	11	1	12
Central Diamond Islet (Tregrosse Reef)	11	11	0	11
South Diamond Islet (Tregrosse Reef)	9	3	0	9
South Islet (Willis Islets)	12	2	0	12
Mid Islet (Willis Islets)	10	2	0	10
North Cay (Willis Islets)	8	8	0	8
Cato Island	7	0	0	7
South West Cay (Lihou Reef)	7	1	0	7
Hermit Crab Cay (Lihou Reef)	7	0	0	7
Turtle Islet (Lihou Reef)	7	0	3	7
Lorna Cay (Lihou Reef)	7	7	0	7
Georgina Cay (Lihou Reef)	6	0	0	6
Bird Islet (Wreck Reefs)	6	1	0	6
Porpoise Cay (Wreck Reefs)	4	3	0	4
Herald Beacon Islet (Mellish Reef)	3	1	1	3
Total species on islands records	196	58	19	189

A total of 19 native island plant species have been recorded across the 21 vegetated CSMP islands during the 2016 to 2024 voyages. The following have been recorded on the 2016 to 2024 voyages but have not been collected during these voyages:

- South East Cay (Magdelaine Cays) - *Digitaria bicornis* (hairy finger grass), *Ipomoea violacea* (moonflower), *Pisonia grandis* (pisonia), *Plumbago zeylanica* (native plumbago), *Portulaca oleracea* (pigweed), *Tribulus cistoides* (bulls head burr).
- South West Islet (Coringa Islets) -*Tribulus cistoides.*

The following have previously been recorded but were not recorded on this trip. These species may still be present but not apparent due to changing conditions and limited time available for searching (note – transient species not included here):

- South East Cay (Magdelaine Cays)- *Colubrina asiatica* (Asian naked wood) last recorded in 2007, *Digitaria bicornis* (hairy finger grass) last recorded in 2019, *Digitaria ctenantha* (comb finger grass) last recorded in 1987 and *Ipomoea violacea* (moon flower) last recorded in 2019.
- North East Herald Cay - *Lepturus repens* (stalky grass), and *Stenotaphrum micranthum* (beach buffalo grass) both last recorded in 2006, *Achyranthes aspera* (chaff flower), and *Digitaria ctenantha* (comb finger grass), both last recorded in 1997.

- South West Herald Cay - *Stenotaphrum micranthum* (beach buffalo grass) has not been recorded since 2006.
- East Diamond Islet: *Ipomoea pes-caprae* subsp. *brasiliensis* (goats foot convolvulus) last observed in 2023.
- Central Diamond Islet: *Ipomoea violacea* (moon flower) last recorded in 2021.
- South West Islet (Coringa): *Boerhavia mutabilis* (pink flowered tar vine), and *Digitaria bicornis* (hairy finger grass), both last recorded in 2019.
- Chilcott Islet: *Boerhavia mutabilis* (pink flowered tar vine) last found in 2023, *Sporobolus virginicus* (marine couch) last recorded in 2006/2007.

The shrub*, Ximenia americana* (yellow plum) has not been recorded on North East Herald Cay since 1997, despite thorough searching by George Batianoff in 2006 and is no longer present on North East Herald (Batianoff 2008).

The following species have not been recorded for some time and are likely to no longer be present on these cays;

- West Diamond Islet: *Canavalia rosea* (coastal Jack bean) last herbarium record is 1961;
- Turtle Islet: *Ipomoea violacea* (moon flower) *Ipomoea pes caprae subsp. brasiliensis* (goats foot convolvulus) and Plumbago zeylanica (native plumbago) - last herbarium records are 1979, 1984 and 1980 respectively; and
- Herald Beacon Cay: *Lepidium englerianum* - last Herbarium record is 1961.

Two juvenile transient species were recorded on four islands during the 2016 to 2024 voyages. One, *Scaevola taccada* (sea lettuce), was collected on East Diamond Islet during the 2021 voyage but there was no sign of it when the collection site was revisited during later voyages. The other species was *Cocos nucifera* (coconut) seedlings which had germinated from drift fruit on the shoreline. No mature or naturalized *C. nucifera* were seen on any of the islands during the 2016 to 2024 voyages and this species is not considered to be part of the native CSMP flora. Other transient species recorded during the past are: *Calophyllum inophyllum and Guilandina bonduc,* recorded on NE Herald Cay in 1996 and 1997 respectively.

Eleven introduced weed species (weeds) have been recorded during the recent voyages, nine on South Islet (Willis) and three on Bird Islet (Wreck Reefs). One weed species, *Amaranthus viridis* (green amaranth) is present on both islands. Samples of all weed species have been collected from both islands.

The following three weed species, previously verified as present on South Islet, were not recorded during the 2020, 2023 or 2024 visits. It is likely that these species may still be present on South Islet:

- *Alternanthera pungens* (khaki weed) last recorded in 1995,
- *Cynodon dactylon* var*. dactylon* (common couch) last recorded in 2007.
- *Tridax procumbens* (tridax daisy) last recorded in 2007.

BioCondition Monitoring Sites

Figure 5. Joy and Larry Brushe implementing a new BioCondition site on Mid Willis Islet. Fiona Hagger ©

Two additional permanent BioCondition monitoring sites were established and surveyed during the 2024 voyage (Figure 5)

- Site M21b on Mid Islet (Willis Islets) is a standard 50x20m site, located in a more representative location within the interior *Argusia argentea* (octopus bush) community and relaces the smaller (30x10m) previous M21 site. Due to time constraints during the 2022 visit, the previous M21 site was poorly located and only partially surveyed.
- Site M26 is a new site located in a *Plumbago zeylanica* closed herbland on South West Herald Cay

There are now 29 permanent BioCondition monitoring sites established on 15 islands throughout the CSMP. These are listed and described in Appendix 4. Coral Sea Marine Park BioCondition permanently marked BioCondition monitoring sites established and monitored 2019-2024 Additional sites are still required to obtain sufficient representative benchmarks for some CSMP vegetation communities. Eleven potentially suitable additional sites, based on the most recent vegetation mapping are proposed in Table 2.

Table 2. Potentially suitable locations for additional permanent BioCondition monitoring sites.

Potential locations based on vegetation mapping	Additional sites required
South West Coringa Islet	Grassland - *Lepturus repens*
South West Coringa Islet	Vineland - *Ipomoea violacea*
South West Coringa Islet	Herbland – *Plumbago zeylanica*
South East Magdelaine	Grassland – *Sporobolus virginicus*
South Islet (Willis Islets)	*Argusia argentea* – interior (if weed free site can be found)
Chilcott	Herbland – *Boerhavia albiflora* var. *albiflora*
Chilcott	Herbland/Vineland - *Achyranthes aspera* with *Ipomoea violacea*
Chilcott	Herbland – *Plumbago zeylanica*
South West Herald Cay	Shrubland - *Abutilon albescens*
North East Herald Cay	Shrubland - *Abutilon albescens*
West Diamond	*Argusia argentea* – interior
TBD	Grassland – *Stenotaphrum micranthum*

Plant specimen collections

The following plant specimens were collected during the 2024 voyage, for incorporation into the Queensland Herbarium (Brisbane), National Herbarium (Canberra) and Australian Tropical Herbarium (Cairns) to verify their current presence in the collection locations:

- Specimens of *Boerhavia mutabilis* (pink flowered tar vine) and *Plumbago zeylanica*, not previously recorded on South Islet and Mid Islet (Willis Islets) respectively.
- A specimen of *Lepturus repens* from Georgina Cay where it has not been recorded since 1984 (Hill and Hogg 1984), collected by Fiona Hagger. There are currently no previous herbarium records of this species from Georgina Cay.
- 13 plant species growing on South West Herald Cay to complement specimen collections during the 2019 voyage.

The total number of plants specimens collected during the 2016 to 2024 voyages and the locations from which they were collected are listed in Appendix 3. Collection status of all plant species currently or previously present on all CSMP islands and total numbers collected per island are summarized in Table 1.

South Islet weed assessment

A comprehensive weed assessment on South Islet was undertaken during a five-day stay. Weeds growing on South Islet were examined to better understand the extent of the problem and scope of what is required. On-island discussions included possible methodologies for weed management, issues to be overcome and how a collaborative approach by Parks Australia and the Bureau could work to achieve ecological restoration. Outcomes of field discussions and observations were documented during the five-day visit and formed the basis of a submission for support for development and endorsement of a weed management project plan for South Islet. A *South Islet (Willis Islets) Weed Management Project Plan* (Parks Australia 2024) has since been endorsed by both Agencies.

Testing of on-ground weed management methodologies was also undertaken during the visit. *Euphorbia cyathophora* (dwarf poinsettia) was hand pulled from most of the island, excluding a small area seaward of the grey water outlet. The two access tracks were also weeded by hand.

Hand pulled weeds were placed into woven polypropylene bags for transport to an incineration site. Two methods of incineration were trialed. Compressing weeds in a large skip bin was also trialed to reduce the volume prior to incineration. Weed hygiene protocols and methodologies were developed.

Selected weeds in the operational area were spot sprayed with Weedmaster Duo 360 glyphosate (1%) with added surfactant and marker dye. A Silvan ProGrade 15 litre backpack spray fitted with a Solo circular spray hood to prevent drift and killing of non-target species was used. Weed hygiene protocols and methodologies were developed.

A monitoring methodology was agreed upon and initial monitoring was undertaken. Monitoring consists of taking monthly photographs from three marked permanent photo points and observational notes recorded in an Excel spreadsheet. The monthly monitoring not only provides information to assess weed management progress but will also provide a valuable record of seasonal vegetation changes.

A geospatially rectified PDF map overlaying the 2023 high resolution drone image was created using QGIS showing:

- the 2023 and 2020 weed locations

- the three photo monitoring points
- the boundaries of three manageable weed management areas in key bird nesting sites for ongoing weed management and monitoring over the next six to 12 months and the boundary of the mown operational area
- agreed access points to minimise weed spread.

The PDF map was loaded onto the Avenza Maps App. on mobile phones by on-island staff to enable easy and accurate navigation to vegetation management areas, access points and photo monitoring sites whilst avoiding locations infested with seeding *Cenchrus echinatus* (Mossman river grass) and shearwater burrows.

South Islet Bureau staff have continued with the monthly photo monitoring, recording of observational notes and follow up hand removal of weeds from vegetation management areas 1 and 2 (labelled “Reveg Areas” in Figure 27). They have also sprayed all weeds on both access tracks with glyphosate prior to movement of supplies and people along the tracks during the October 2024 staff change over.

Digital Data

In addition to reports, the following digital data was provided to Parks Australia

- BioCondition monitoring sites data (Excel file).
- Locations and GPS coordinates of the BioCondition monitoring sites (ESRI shapefiles).
- BioCondition monitoring site photographs.
- Locations and GPS coordinates of the Health Check monitoring sites (Excel file).
- Health Check monitoring site photographs.

1.2 Island Watch/ Health Checks – *Fiona Hagger*

The Island Watch tool was developed by QPWS as an early warning system for pest incursions (biosecurity surveillance) and the detection of other threats or changes to natural values, so that early management intervention can be undertaken (Armstrong, 2017). An Island Watch survey should be completed for each island visited during a trip.

Health Checks (HC), designed by QPWS (Melzer 2019), are qualitative tools for efficiently and routinely monitoring the condition of key values. They use criteria that can be applied across a diversity of values and are based on threatening processes and their impacts (e.g. weeds, cyclone impacts, dieback), or parameters (e.g. ground cover), that are good indications of condition. The assessor scores the condition of the value, at representative sites, using simple, predetermined visual cues. The HC report uses the International Union for Conservation of Nature condition categories (Good, Good with Some Concern, Significant Concern, Critical) and definitions to describe the overall condition of a value based on all the HC indicators relevant to the value (Osipova et al., 2014).

Figure 6. Fiona Hagger undertaking island watch assessments amidst *Pisonia grandis* communities on North East Herald Cay. Guy Weerasinghe ©

Methods

Modified QPSW Island Watch and Health Check methodologies have been incorporated into a purpose designed Parks Australia methodology for basic monitoring and health assessment of CSMP island ecosystems. This method was used during the 2024 voyage and data was recorded on island watch summary sheets designed by Parks Australia.

Value Assessments have been undertaken for the islands within the CSMP, and under this process the four key natural values of CSMP islands have been defined as island vegetation, birds, nesting turtles, and geomorphology. The CSMP-specific Island Watch assessment sheets focused on providing a high-level assessment of the condition of these four value areas, as well as the presence of any threats (for instance introduced/invasive species and human impacts). Each island had a dedicated assessment sheet, with sections attributed to high value vegetation communities and major threats to look out for on that specific island.

Islands were circumnavigated on foot and as much area covered as time permitted. All vegetation species recorded over time on each island were searched for and their presence, or lack thereof, recorded. Given the limited time available on each island, assessing the condition of rarely occurring (in the CSMP) or high value vegetation species such as *Pisonia grandis*, *Cordia subcordata*, and *Colubrina asiatica* (Asian naked wood) was prioritised.

Photos were taken of key sites (BioCondition sites, previous health check sites, and sites of high value species), which have been used to compare the condition against previous years recordings (and will be used for future comparative studies).

Previous CSMP Island Health Voyages have included the use of a drone to assist in tracking geomorphological changes in CSMP islands. A drone was not used on the 2024 voyage, so any shifts in island size and shape were considered by the naked eye and changes investigated through comparisons against previous island photographs.

Other surveys being undertaken simultaneously (such as bird or marine debris) were recorded, as well as the condition of any island infrastructure or maintenance work being undertaken on Parks Australia signage.

Figure 7. Fiona Hagger conducting Island Watch assessments on Georgina Cay, Lihou. Andrew McDougall ©

Results

Overall, the CSMP islands visited in 2024 are in good condition. With the known exception of South Islet (Willis), no weeds were detected. Rodent tracking tunnels were not deployed on this voyage (though have been used in previous years), but there were no signs of introduced vertebrate species on any of the islands. Similarly, while ant bait stations were not deployed this trip, no invertebrate species appeared to be affecting seabird breeding effort.

However, leaves of *Cordia subcordata* exhibiting damage from insect consumption are a potential cause for concern on South West Islet (Coringa). A *Cordia* stand on West Diamond that was last observed infested with scale insects in 2021 is now dead. Similarly, leaves on a *Pisonia grandis* community on Magdelaine Cay South showed obvious signs of insect damage. Detrimental insect consumption of *Cordia* and *Pisonia* is discussed in detail in section 1.1.

Turtle nesting pits were found on all islands visited, and although outside of common nesting season, evidence of recent nesting was found on North East Cay (Heralds) and Magdelaine Cay North. As has previously been the case, several deceased green turtles were found on Magdelaine Cay North, beyond the rocky shore edge on the prevailing windward side, trapped behind the rocks in deep crevices. Most were in advanced states of decomposition/remains of skeletons, with only two recently deceased.

Except for a recently smashed glass bottle on Chilcott Island, and tire marks on East Diamond Islet (from maintenance crews visiting the Aid to Navigation lighthouse), no signs of recent human visitation were observed. Both islands were checked for the presence of weeds and will continue to be monitored on future visits for introduced species.

Also worth noting is that during the 2024 visit, the south-western tail of Georgina Cay appeared slightly separated from the north-east of the island by a shallow body of water. Given the

observed fluctuations of this ‘separation’ over time, the body of water between the two areas observed in 2024 may be tidal-related and not necessarily a permanent sign of separation.

Discussion

Access to recent high-resolution aerial imagery of islands is critical to help identify and monitor shifts in the size and shape of CSMP islands. The islands in the CSMP provide important substrate habitat for vegetation to grow on, underpinning the health of natural island values. Monitoring the shape and change of CSMP islands is important to help predict a likely trajectory for island size and movement changes. This, in turn, will inform management actions. Furthermore, high-resolution imagery is of great help in locating previously recorded Health Check or BioCondition site coordinates. Mapping coordinates over island imagery ensures that the sites being assessed are located as closely as possible to the previous sites. In many sites across the CSMP islands, there are no stakes in the ground to permanently mark the spot (either not put in place, or have been lost/overgrown), GPS accuracy is poor under the canopy of *Pisonia* forests and achieving good image spatial accuracy can be difficult on the remote islands. High resolution aerial photogrammetry is currently being tested in the CSMP and may provide a promising array of island imagery to be used for improved remote sensing methodologies

Rodent tunnels were not deployed on the 2024 CSMP Island Health Voyage, although they have been used in previous years. Introduced rodents are a threat to seabird and turtle nesting islands and may significantly impact the reproductive potential of breeding populations by consuming eggs and hatchlings and may attack and kill adult seabirds. To date, introduced rodent species have not been detected on any CSMP islands, using rodent tunnels or through Island Watch surveys, Health Checks and seabird surveys. Hemson et al (2020) recommended that all islands be surveyed for rodents every few years. The frequency of surveys could be informed by the frequency of visits by all vessels. In addition, any tracks or droppings of unknown provenance, gnawed bird carcasses or other materials, and unexplained declines in seabird presence or nesting could all be used as cues to deploy rodent tracking tunnels (Hemson et al 2020).

Signs of invertebrate outbreaks or damage to vegetation/bird breeding efforts were searched for as part of the Island Health Watch survey, vegetation surveys and bird surveys. Aside from the opportunistic gathering of insects on the voyage, there was no methodology employed in 2024 to gather/find/identify insects. On the 2019 CSMP Island Health Voyage, the 10-branch-end method was used to survey scale insect[2], and ant bait stations have been deployed by QPWS rangers on CSMP voyages to assess the presence/absence of ant species. Employing a consistent methodology should be considered for future voyages.

Digital Data

Beyond the records and information contained in this report, the following has been retained by Parks Australia for future comparative usage:

- Photos of key vegetation sites and condition
- Modified QPSW Island Watch templates, suited to the CSMP environment
- Identification guides for vegetation (both native and introduced) and birds

[2] The method was developed by Chris Freebairn for monitoring scale insect at NE Herald and has also been used in the Capricornia Cays (Olds 2018). Hemson et al 2020

1.3 Birds – *Andrew McDougall (QPWS)*

Methods

Bird surveys were conducted on each of the visited islands, with the aim to catalogue species and breeding effort, as well as identify the presence of any threats. The voyage data focused on islands but also included sightings on exposed reef flats. No complimentary drone imagery was available on this voyage.

Field survey equipment included 12x50 binoculars, notebook, pencil, hand-held GPS (global positioning system), tally counters, a compact digital camera and a full-frame DSLR camera with lens options from 16-600mm.

Island surveys were conducted as follows:

- Record species observed on beaches while enroute to island from the main vessel. Birds on islands in the vicinity of vessel access points often disperse and are not recorded again. Photographic recording is preferred when conditions allow.
- Check for nesting birds susceptible to disturbance and alert other members of the shore party of their presence. These areas are designated as exclusion zones and are to be avoided. This protects small species such as black-naped terns (*Sterna sumatrana*) which have cryptic, easily disturbed or destroyed nests.
- Circumnavigate the island, recording roosting, non-breeding birds and beach nesting species.
- Collect data on breeding and non-breeding species. Data include total numbers of adolescents and adults, and breeding effort i.e., nil, nests, chicks and young.
- Reference books were available if required. Photographs were reviewed to confirm some species identification and to look for flags and bands on shorebirds or bands on seabirds

The survey was influenced by:

- available survey time (e.g. trip scheduling requirements or access restrictions due to tides or weather conditions)
- species behaviour and their breeding habitat preferences (thick vegetation might not be accessible or easy to collect accurate data)
- overall numbers (some species may dominate a site and take up most of the survey time).

Figure 8. Andrew McDougall taking a photo of a Herald petrel (circled in red) on Central Diamond Islet. Guy Weerasinghe ©

Results

A total of 26 species were recorded during this voyage; 15 seabird species (of which 13 were breeding), 5 migratory shorebird species and 6 land and wetland species including the resident Coral Sea subspecies of the buff-banded rail (*Gallirallus philippensis tounelieri*).

Species and breeding effort data are included in a standard species table (displaying all species observed during the voyage) for each island summary.

Notable observations:

- The discovery of a new breeding site for New Caledonian fairy terns at North West Islet (Magdelaine Cays).
- A second record for New Caledonian fairy terns nesting on Georgina Cay (Lihou Atoll).
- Two Herald petrels prospecting for nest sites at Central Diamond Islet (Tregrosse Reefs), (Figure 8).
- More than 600 breeding pairs of red-tailed tropicbirds on the Herald Cays.

Discussion

Survey completeness was affected by the time available on each island, the condition of the vegetation and how many breeding species were present. A thorough overview of brown noddy (*Anous stolidus*) breeding effort is often not possible due to their tendency to nest in a variety of habitats, particularly when they nest within thick vegetation. Brown noddy breeding effort and age class is simplified to ‘present’ for locations where total counts were not possible. This applies to other species found in dense ground, or forest vegetation when the allotted survey time restricted surveys to beach and strand species.

The total number of breeding New Caledonian fairy terns was fewer than the total number observed on Georgina Cay in 2022. It is suggested that the breeding colonies in 2024 were

fragmented and occupying islands not visited during this voyage – most likely other islands within the Lihou Atoll.

No introduced vertebrate/invertebrate species or weed species appeared to be affecting seabird breeding effort.

This voyage has highlighted the ongoing need to manage these important seabird populations.

Digital Data

- Reference photographs have been provided to Parks Australia and
- Breeding and diversity data has been lodged with Birdlife Australia's Birdata platform.

1.4 HPAI and Invertebrate sampling – *Guy Weerasinghe (DAFF)*

Over the last 4 years, Highly Pathogenic Avian Influenza has been of significant concern globally. It has caused mass mortality in many wild bird populations as well as impacted both wild and domesticated mammalian populations.

Australia does not have (at the time of publication) HPAI H5N1 (clade 2.3.4.4b) and has recently been elevating its surveillance and awareness systems to enable early detection.

The Northern Australia Quarantine Strategy (NAQS) is a mature surveillance program within the Department of Agriculture, Fisheries and Forestry (DAFF). It takes a multidisciplinary approach to monitor for the incursion of exotic diseases, pests and weeds that may enter northern Australia through both unregulated and regulated pathways. Historically, NAQS has had a focus on the 10,000km coastline of northern Australia (from Broome to Cairns, including the Torres Strait), however considering growing HPAI concerns around the world, the NAQS Animal Health team sought collaborations with several agencies and groups, including indigenous rangers and Parks Australia officers. As external territories are potential pathways for virus entry (through seabird movements as well as stopping points for migratory shorebirds), the development of influenza surveillance in these regions was determined to be a priority.

This voyage opportunity is the initial approach to developing a baseline understanding of influenza dynamics in the northern section of the Coral Sea. The objectives were:

- To initiate ongoing monitoring for avian influenza in the Coral Sea within the seabird population.
- To characterise any influenza types that may be circulating within the Coral Sea bird populations.

Ongoing surveillance will be a combination of single site surveillance via the only habited island (South Willis islet) as well as opportunistic surveillance by research and compliance groups visiting the region.

NAQS funded the diagnostic work conducted at the CSIRO Australian Centres for Disease Preparedness (ACDP), Geelong, Victoria, as well as the supply of sampling consumables and transport of the samples to the laboratory. Advice was sought within DAFF regarding the permit status of environmental samples brought over from an external territory for influenza surveillance and guidance was provided by the Animal and Biological Imports office (under the Biosecurity Animal Division of DAFF). The CSIRO ACDP Permit was utilised to enable effective biosecurity risk management. Further to the avian influenza work, NAQS entomologists assisted with the identification of several invertebrates collected during the voyage.

Methods

Environmental sampling for avian influenza surveillance was conducted on each island visited as well as general population health (in consultation with the QPWS Officer). Sample size per island was determined by several factors including abundance and diversity of birds present on each island, availability of fresh faeces and accessibility to sites for collection.

A total of 25 samples were planned to be collected per each island visited. This was determined using the following approach. An estimated prevalence of 1.7% influenza prevalence was used (based on Hall et al. 2019). The following equation was used to determine the planned sample size per island:

$n = (Z^2 \times P \times (1 - P))/e^2$

Where:

- Z = value from standard normal distribution corresponding to desired confidence level (Z=1.96 for 95% CI)
- P is expected true proportion
- e is desired precision (half desired CI width).

The desired precision (e) was 5% and a 95% confidence level was selected. With an unknown population of mixed bird species, an infinite population size was used.

Sample collection

Each island site was circumnavigated on foot and opportunistic fresh environmental faecal samples were collected with a flocked swab. Only fresh faeces were collected, usually on larger rocks where birds were perched, close to the water's edge. Bird identification was also conducted, and population estimates were made (and corroborated with the QPWS officer).

Once the sample was collected, the swab was placed in either a virus transport media or Copan eNAT media. The Copan eNAT media were used in the collections made by the NAQS Technical Manager, while most of the virus transport media were provided to the Operations lead officer at South Willis Islet. The Copan eNAT media were maintained at room temperature, while the swabs in viral transport medium were kept chilled in fridge at 4 degrees Celsius.

Influenza testing

Upon return to the mainland, the samples were packaged and sent to ACDP for testing. Swabs were pooled into groups of 3 and tested with a Type A influenza PCR. All the reactors were then tested individually. Positive swabs were then tested across a panel of influenza A PCRs including H5, H7, H9 and Australasian H5 lineage. If CT value was sufficiently low enough, sequencing was attempted using a minion sequencer. Briefly, Next Generation sequencing was performed using universal influenza A primers and a Rapid Barcoding library preparation compatible to the Oxford Nanopore MinION. To compare, general sequencing analysis was also conducted using universal influenza A primers and a Nextera XT library preparation compatible to the Illumina NexSeq2000. Any detections from VTM media could also be tested with haemagglutination inhibition test and virus isolation.

Entomological assessments

Opportunistic sampling of invertebrates was conducted. Specimens were collected into sterile jars, and 70% ethanol was poured in to maintain preservation for morphological identification. Specimens were submitted to an entomologist within NAQS for preliminary identification.

Results

Avian Influenza

A total of 231 environmental samples (n=200 in eNAT media and n=31 in VTM media) were collected from the Coral Sea region in the month of July 2024.

Of the swabs collected, three sets of pooled swabs (n=9 swabs in total) returned positive results to the Type A Influenza PCR. Follow up testing with single testing of each swab returned only positive PCR detections for 2 swabs (swab #131 and #182 – from East Diamond Islet and Chilcott Islet respectively). All reactor PCR swabs (n=9) were then tested with the Avian influenza PCR panel and only the two PCR confirmed swabs returned a positive for the H9 PCR. Both swabs then underwent Next Generation sequencing and the sample from East Diamond Islet had sufficient sequencing data to be subtyped (#131) as a low pathogenic H9N2. The other sample had insufficient data. The LPAI H9N2 was observed to have a mix of segments originating from Oceania, North America and Eurasia.

Terrestrial invertebrate specimens

Table 3. Specimens collected opportunistically.

Vial number	Contents	Island	Date	Findings
1	Spiders	East Diamond Islet	11/07/2024	Spider – Aranaeidae (juvenile)
2	Grasshopper Fly Leafhopper Spider tick (nymph) Ant.	Central Diamond Islet	?	Grasshopper – Acrididae, *Aiolopus thalassinus*? Fly – Sarcophagidae, *Sarcophaga* sp. Leafhopper – Delphacidae, *Toya* sp. Spiders – Aranaeidae Tick – Ixodidae, *Amblyomma* Ant – Formicidae, *Nylanderia obscura* gp.
3	Spider nest	East Diamond Islet	11/07/2024	Aranaeidae (juvenile)
4	Fly	Georgina Cay	11/07/2024	Sarcophagidae, *Sarcophaga* sp.
5	Spider	Georgina Cay	11/07/2024	Lycosidae (Wolf spider)
6	Spider	Boat on return	17/07/2024	Salticidae (Jumping spider)
7	Flies	Mid Islet (Willis Islets)	10/07/2024	Sarcophagidae
8	Spider	Chilcott Islet	14/07/2024	Clubionidae
9	Tick	Boat on return	17/07/2024	Ixodidae, *Amblyomma*? *loculosum*
10	Grasshopper	South West Herald Cay	16/07/2024	Acrididae, Catantopinae (nymph)
11	Spider, Bug, moth	South West Islet (Coringa)	14/07/2024	Spider – Salticidae (Jumping spider) Bug – *Pyrrhocoridae? Dysdercus* Moth – *Pterophoridae* (plume moth)
12	Grasshopper	Magdelaine Cay South	11/07/2024	Tettigoniidae, Phaneropterinae, *Phaneroptera gracilis*? (F)
13	Flat flies	North East Herald Cay	16/07/2024	Hippoboscidae, Ornithomyinae, *Ornithomya*

Insect samples were taken opportunistically. Although there was occasional evidence of insect damage on island vegetation, there was no evidence of serious pest problems. It is worth noting that neither the scale insect pest of *Pisonia grandis*, *Pulvinaria urbicola*, nor its introduced biocontrol agent, the ladybird beetle *Cryptolaemus montrouzieri*, were encountered. Due to a lack of insect sampling time and expertise, it is impossible to state that these species are no longer present, particularly as they have been found in recent years, however they were not observed on this trip.

An opportunistic phone photo of an evening brown butterfly, *Melanitis leda* was taken on the northern half of the eastern beach area of South West Cay (Herald Cays) (Figure 9). Coral Sea butterfly records are scarce. There appear to be no records of this species in the Coral Sea (according to the Atlas of Living Australia), with the closest record being a mainland sighting near Etty Bay, north Queensland, approximately 330km to the west, southwest of South West Cay.

Figure 9. *Melanitis leda*, evening brown butterfly. Observed while searching for red-tailed tropicbird nests. Andrew McDougall © Queensland Government

Discussion

This is the first detection of a low pathogenic influenza in the Coral Sea Australian External Territory. Much of this will be elaborated in a future scientific paper, however this detection raises further questions regarding the role these islands may play in virus flow between seabird and shorebird movements within the western Pacific region. When assessed against the existing Australian influenza dataset, this sequence appears to be related to an Australian H9-HA lineage that hadn't been detected since 2018.

The sequence of this virus indicates that the seabirds of the Coral Sea may carry reassortments of avian influenza segments for several regions (Oceania, North America and Eurasia), however this may be biased due to the limited surveillance across the Pacific Ocean.

This detection supports the need for ongoing surveillance in the Coral Sea (and other external territories) to better characterise influenza viruses in these regions as well as improve our awareness of how viruses may flow to and from the mainland of Australia as well as neighbouring countries.

This voyage also enabled the fine tuning of the sampling methodology of coral atoll seabird populations. The initial plan for sampling was to approach the edge of the vegetation on each

island and collect faeces from the nesting sites. However, it became abundantly clear after visiting the initial site (north Willis islet) that this was not a suitable method for these sites due to several factors – principally the undue stress put upon nesting birds, often seen with nests being temporarily vacated or crop regurgitation of food out of the nest (which in turn, would have impacts on any offspring in the nest as they are often unable to eat unless directly regurgitated into their mouth). Ultimately, the best approach on these sites involved the collector circumnavigating around each island and collecting off large rocks where birds may be congregating, near the water's edge.

1.5 Marine debris – John Prichard (data provided by Tangaroa Blue Foundation)

One of the activities of the Island Health Assessment voyage was to collect and remove most of the marine debris found on each of the islands (except South Islet – the Bureau of Meteorology's 'Willis Island' weather station staff regularly remove marine debris found on the island) to help maintain each island in as natural a state as possible.

Method

Collected marine debris was bagged, fumigated, sealed and tagged before being removed from each island. Items of marine debris that were too large to be bagged (such as fishing nets, crates, fish attracting devices (FADS) and large lengths of ropes) were washed in the sea in situ and then sprayed/fumigated on shore before being taken to the vessel.

Figure 10. Ian Anderson (Tangaroa Blue Foundation) weighing debris collected. Guy Weerasinghe ©

On board the vessel all marine debris was unbagged, sorted and categorised by Ian Anderson from Tangaroa Blue Foundation before being re-bagged and resealed. Tangaroa Blue Foundation provided an analysis of the marine debris collected from each island including information on 86 separate categories, and an overall count and weight of marine debris collected from each island. Consistent with previous voyage reports, the total number of marine debris items collected from an island has been used in this summary rather than the weight collected. This provides a more accurate comparison of the level of marine debris loads on the islands.

Results

The 3,130 marine debris items collected from 11 islands amounted to approximately 5.5 cubic metres, weighing almost 1.3 tonnes (Figure 10). 97% of the items (3,036) were made of plastics, rubber and PVC:

- 628 hard pieces of plastic
- 382 plastic lids and bottle tops
- 1,027 plastic bottles
- 481 soft plastics / small fragments
- 391 rubber thongs/footwear
- 28 rubber items
- 82 polystyrene foam items
- 101 plastic and foam fishing floats of varying sizes
- 17 metres of synthetic rope of varying diameter and lengths
- 22 square metres of synthetic fishing nets from lost or discarded fish aggregating devices (FADs)
- 10 FADs (FADs are not allowed in Australian waters and are likely to be from the broader Indo-Pacific, given the general water current and wind direction from the east).
- 8 GPS trackers for FADs and fishing gear

Table 4. Summary of marine debris removed from islands in July 2024, ranked greatest to least marine debris laod.

	Total count of marine debris items	Percentage of total marine debris	Length of south-easterly facing weather coastline	Last marine debris clean up
Magdelaine Cay North (unvegetated)	833	26.6 %	1.1 km	-
South West Islet (Coringa Islets) (vegetated)	447	14.3 %	0.48 km	June 2016
North East Cay (Herald Cays) (vegetated)	380	12.1 %	1.6 km	June 2023
South West Cay (Herald Cays) (vegetated)	307	9.8 %	0.19 km	June 2022
Chilcott Islet (Coringa Islets) (vegetated)	270	8.6 %	0.74 km	June 2023
East Diamond Islet (vegetated)	245	7.8 %	1.3 km	May 2023
Georgina Cay (Lihou Reef) (vegetated)	240	7.7 %	0.76 km	November 2022
Mid Islet (Willis Islets) (vegetated)	120	3.8 %	0.16 km	June 2022
Magdelaine Cay South (vegetated)	103	3.3 %	0.4 km	June 2023
Central Diamond Islet (vegetated)	98	3.1 %	0.39 km	November 2022
West Diamond Islet (vegetated)	87	2.8 %	0.54 km	November 2022
Totals	**3,130**	**100 %**		

Table 5. Summary of marine debris removed from islands in July 2024 in comparison with previouse years.

	May-Jun 2016	Jul 2021	May-Jun 2022	Nov 2022 (TBF)	May-Jun 2023	Total # collected 2021-2023	July 2024
Magdelaine Cay North	-	-	-	-	-	-	833
South West Islet (Coringa Islets)	✓	-	-	-	-	-	447
North East Cay (Herald Cays)	✓	-	2,504	-	891	3,395	380
South West Cay (Herald Cays)	✓	-	280	-	-	280	307
Chilcott Islet (Coringa Islets)	✓	-	-	-	1,113	1,113	270
East Diamond Islet	✓	1,142	889	3,067	905	6,003	245
Georgina Cay (Lihou Reef)	-	502	-	3,166	-	3,668	240
Mid Islet (Willis Islets)	-	-	171	-	-	171	120
Magdelaine Cay South	-	-	-	-	346	346	103
Central Diamond Islet	✓	946	-	1,150	-	2,096	98
West Diamond Islet	✓	411	-	601	-	1,012	87
Totals						**18,083**	**3,130**

Discussion

Magdelaine Cay North had the greatest marine debris load during this voyage. There are no known records of marine debris clean ups on this island. Previous marine debris collections from the CSMP have shown there may be a correlation between those islands with a relatively longer south-east weather coast having greater marine debris loads. The lack of clean ups and the relatively long 1.1km south-east weather coast are likely both contributors to Magdelaine Cay North's relatively high marine debris load.

South West Islet (Coringa Islets) had the second highest marine debris load (447), however has not been cleaned of marine debris by Parks Australia since 2016. The marine debris load on this island is relatively low considering the 8-year period between cleanups.

Of the islands that underwent marine clean ups on the most recent voyage (June 2023), North East Cay (Heralds Cays) had the largest marine debris load. Since the last clean-up 13 months ago, 380 items accumulated. This island has a relatively long southeast facing weather coastline of 1.6km.

South West Cay (Herald Cays) is situated roughly 8km from North East Cay and had similar marine debris load. South West Cay has a significantly shorter south-facing weather coast of just 0.19km. Chilcott Islet (270 items), East Diamond Islet (245 items) and Georgina Cay (240 items), all had similar marine debris loads, all of which were major reductions than the spike recorded in November 2022 and May/June 2023.

East Diamond Islet has been cleaned of marine debris more often than any other island in the CSMP. It has been cleaned of marine debris in June 2016, July 2021, June 2022, November 2022, June 2023 and now July 2024. In the 5 years between being initially cleaned in June 2016 and July 2021 a total of 1,142 marine debris items had accumulated on the island.

Part 2: Island Summaries

2.1 Mid Islet - Willis Islets

2.1.1 Vegetation

Table 6. Vegetation species found on Mid Islet on the 2024 voyage.

Abutilon albescens	lantern bush
Achyranthes aspera	chaff flower
Argusia argentea	octopus bush
Boerhavia albiflora var. *albiflora*	tar vine
Lepturus repens	stalky grass
Plumbago zeylanica	native plumbago
Portulaca oleracea	pig weed
Sporobolus virginicus	marine couch
Stenotaphrum micranthum	beach buffalo grass
Tribulus cistoides	bulls head burr

Plumbago zeylanica (native plumbago), a native island species not previously recorded on Mid Islet, was observed during the July 2024 visit. This species was present in the interior *Achyranthes aspera* (chaff flower) herbland. A specimen was collected and its distribution on the island mapped using a GPS. It is likely that it was present on the islet during the 2022 visit but was not obvious due to lack of ground truthing sites in the vicinity of the area surveyed in 2024. Also, the *P. zeylanica* was not obvious from a distance because of the dense cover of *A. aspera* at the time of the survey in 2022 (Figure 11). Figure 12 maps the 2022 vegetation map polygon boundaries, the 2024 mapped boundary of *P. zeylanica,* the location of the 2022 ground truthing sites and the 2022 high-resolution drone image used to describe and map the vegetation.

Figure 11. Photograph taken in 2022 in the area containing *Plumbago zeylanica* in July *2024*, no evidence of *P. zeylanica* in dense growth of *Achyranthes aspera* (chaff flower) in 2022. Joy Brushe ©

Figure 12. Map of Mid Islet (Willis Islets) showing location of *Plumbago zeylanica* relative to 2022 vegetation map polygon boundaries and ground truthing site locations.

In 1995, Donaldson reported that there were only two small plants of *Argusia argentea* (octopus bush) on Mid Islet (Willis Islets). Shrublands dominated by this species now exist around much of the shoreline as well as on the flats and lower slopes in the northwestern interior of the island. Some deceased *A. argentea* were observed around the perimeter of the vegetation, likely due to exposure, salt water intrusion or overwash

No weeds were detected.

Other observations

A large tree trunk on a high point on the interior plateau of Mid Islet is shown in Figure 13. Although it may have washed up during a past cyclonic event when the entire islet was awash, it is possible evidence of the past presence of larger woody trees, possibly *Cordia subcordata* (sea trumpet) on Mid Islet.

Figure 13. A large fallen tall tree trunk, possibly *Cordia subcordata* (sea trumpet) observed adjacent to the eastern coastline by Larry Brushe (left), Mid Islet (Willis Islet).

Permanent BioCondition monitoring site

BioCondition monitoring site M21b was established in an interior *Argusia argentea* (octopus bush) shrubland community during the 2024 voyage (Figure 14). This site replaces previous site M21 which was established and surveyed during the 2022 voyage (McDougall and Brushe 2023). Due to time constraints during the 2022 visit, the previous M21 site was poorly located and only partially surveyed. M21b is a standard 50x20m site, located in a more representative location than the smaller (30x10m) previous M21 site. The location of the centre transects of sites M21 and M21b are shown as the red lines in Figure 14. Star pickets and tags marking the original M21 site were removed.

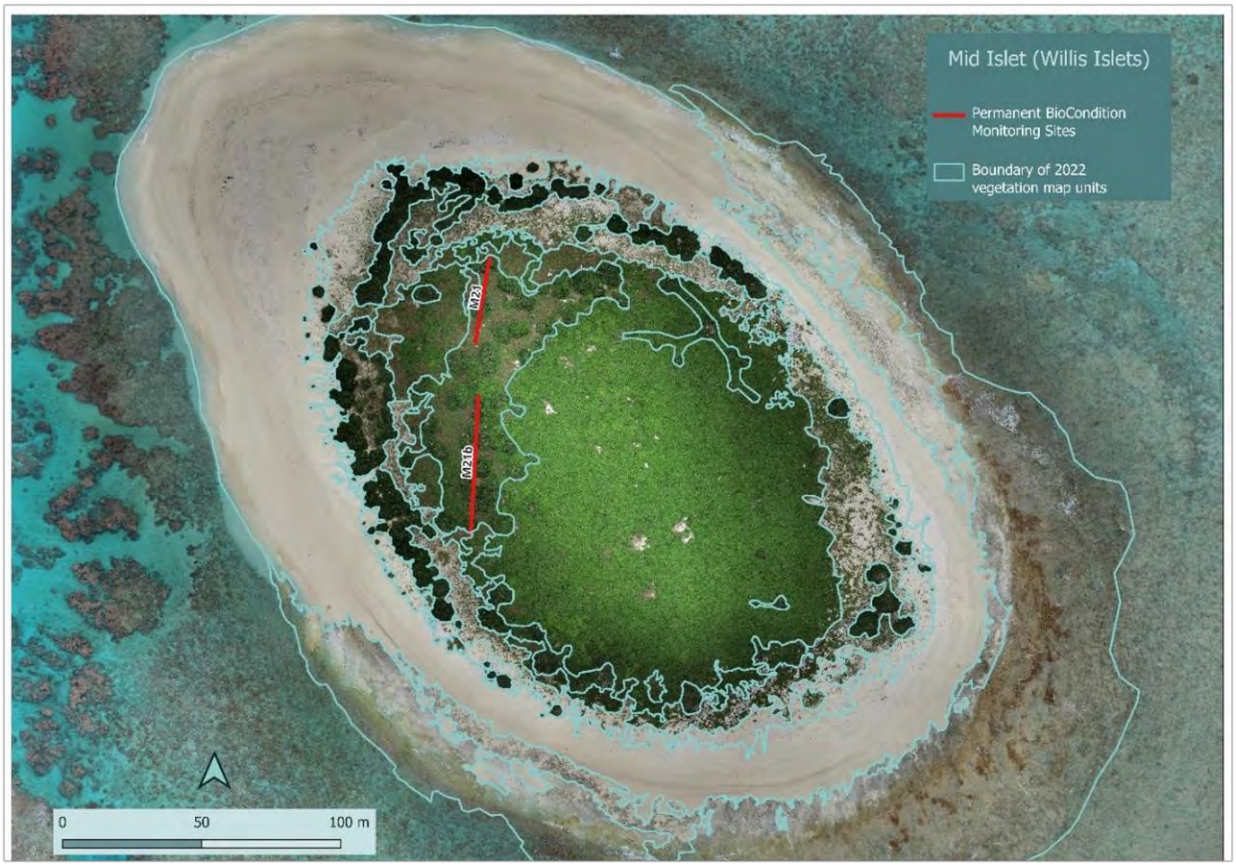

Figure 14. Mid Islet (Willis Islets) showing location of replacement BioCondition monitoring site M21b relative to original M21 site and to the 2022 vegetation map polygon boundaries.

Table 7 contains the BioCondition attribute data recorded at site M21b during the 2024 voyage. The BioCondition site photographs in Figure 15 are four of the 10 site photographs taken at site M21b in 2024. Photographs are all taken from the centre point of the centre transect, the first facing along the transect bearing and then consecutively facing 90^{o}, 180^{0} and 270^{0} from the direction of the centre transect bearing.

No soil samples were collected from Site M21b as soil from site M21 within the same vegetation community was collected and analysed in 2022 (McDougall et al, 2023).

Table 7. BioCondition monitoring data recorded on Mid Islet (Willis Islets) on July 10, 2024.

Site	Site M21b
Island	Mid Islet (Willis Islets)
Landform	Interior; terrace, slight slope from central plateau to beach
Soil	Greyish coarse calcareous sand
Vegetation community description	*Argusia argentea* shrubland with mid dense to dense ground layer dominated by *Sporobolus virginicus*
Transect start (WGS 84)	-16.213616 149.991885
Transect centre (WGS84)	-16.213831 149.991862
Transect end (WGS 84)	-16.214065 149.991861
Transect bearing (degrees)	181 degrees
Median canopy height/range (metres)	1.7 (1.0-2.0) m
Tree canopy cover %	N/A
Shrub canopy cover %	38.8%
Basal area m^2/ha (at 30 cm height, calculated from stem diameters)	12. 5 m^2/ha
Total number of large trees/ha	N/A
Total no of trees per ha	N/A
Total number of tree stems/ha	N/A
Total no. live shrubs/ha	700
Recruitment of ecologically dominant layer (%)	40 semi-mature (woody) live *Argusia argentea* per ha in G layer; no seedlings present
Tree species richness	0
Tree species present	N/A
Shrub species richness	2
Shrub species present (layer in brackets)	*Argusia argentea* (S), *Argusia argentea* (G), *Abutilon albescens* (G)
Median ground layer height/range (metres)	0.5 (0.1-0.8) m
Total ground layer cover of native island species (%)	72.2%
Grass species richness	1
Grass cover (%)	35.0%
Grass species present in order of decreasing cover - most abundant first (cover in brackets)	*Sporobolus virginicus (35%)*
Forb (including vines) species richness	3
Forb species cover (%)	27.2%
Forb species present in order of decreasing cover - most abundant first (cover in brackets)	*Boerhavia albiflora* var. *albiflora* (9.8%), *Tribulus cistoides* (9.8%), *Achyranthes aspera* (7.6%)
Native shrub ground cover (%)	10% (lower branches of *Argusia argentea* shrubs), *Abutilon albescens* (<0.1%)
Non-native plant cover (all strata) (%)	0.0%
Litter cover (%)	23.0%
Bare ground (%)	4.8%
Woody debris (m/ha of logs >0.5m long and >10cm wide)	0 m/ha
Soil pH	Not measured - previously recorded in 2022 at adjacent site M21 as 9.5
Notes	Some dieback in canopy of most *A. argentea* shrubs possibly because of recent cyclone followed by dry conditions;140 dead *A. argentea* per ha in shrub layer and 60 per ha in ground layer.

A.

B.

C.

D.

Figure 15. BioCondition monitoring site M21b, Mid Islet (Willis Islets) A. facing South, B. Facing West, C. Facing North, D. Facing East Joy Brushe ©

2.1.2 Island Watch

A Parks Australia Island Watch summary proforma for Mid Islet (Willis Islet) was completed by Fiona Hagger (Table 8).

Table 8. July 2024 Island Watch summary for Mid Island (Willis Islets).

Island Watch category Mid Islet (Willis Islets)
Key Natural Value Assessments
Birds
Formal bird survey by Andrew McDougall
Any new or unusual sightings, or any changes to condition of nesting/roosting habitat? No
Island Geomorphology
Significant island changes No
Severe storm/cyclone damage? No
Turtles
Turtles seen on island No live turtles (outside common breeding season)
Number of nests/body pits Turtle body pits were mostly located on the south/south-easterly part of the island (< 20 more recent body pits)
Any new or unusual sightings, or any changes to the condition of nesting habitat? No. Bureau staff undertake regular monitoring and reporting of marine turtle activity on South Islet for Parks Australia.
Native vegetation
Condition of key veg value: *Argusia argentea* (octopus bush) Some deceased bushes around the perimeter of the vegetation, likely due to exposure.
Condition of key veg value: herb/grassland and/abutilon Overall condition is good.
Threats
Weeds
Does the island appear weed free? No weeds detected.
If yes, species observed and brief description. -
Any future actions needed? No - other than continued biosecurity procedures for all visitors to island.
Pest/Invasive animals
Any signs of pest animals? Includes invertebrates like ants, grasshopper, scale insect etc. No incursions of pest animals found.
Species observed and brief description. N/A
Any future actions needed? (e.g. pest monitoring or control work) No – other than continued biosecurity procedures for all visitors to island.
Human impacts/ threats
Any evidence of fires? No
Trampling, digging by humans No
Marine debris notes Relatively little marine debris compared to other CSMP islands. A large mooring rope took up most of the total debris weight (at around 35kg).
Other
Infrastructure

Condition of infrastructure, any work required? Ongoing maintenance/cleaning of Parks Australia sign
Anything observed, anything new or of concern? No
Any other monitoring or surveys undertaken BioCondition site M21b was created within the interior *Argusia argentea* (Octopus bush) community. Debris removal and analysis – Ian Anderson (Tangaroa Blue Foundation), testing for signs of Highly Pathogenic Avian Influenza (HPAI) – Guy Weerasinghe (DAFF), coral bleaching surveys and collection of coral and invertebrate samples to assess genetic diversity – Margena Marzoni and Cecilia Martin (JCU).
By whom and where is information to be stored? Parks Australia to retain and be keeper of data.
Sites (locations) or whole island Most of the island was traversed by team – about 4 hours spent on island.

Figure 16. John Prichard cleaning Parks Australia signage. Fiona Hagger ©

2.1.3 Birds

Bird surveys on Mid Islet focused on sooty tern breeding effort and those species nesting on the beach and strand areas. Sooty tern breeding effort ranged from adults with eggs in beach and strand areas, to mobile young birds in smaller groups in the centre of the island. Crested tern were not on nests but were seen conducting courtship displays in flight. The observed buff-banded rail was far more cryptic than other rails used to human presence on South Islet, Willis Islets. No red-tailed tropicbird nests were found on Mid Islet this voyage. Very few nests have been recorded here in the past.

Table 9. Bird species and breeding effort on Mid Islet, Willis Islets.
Key: P= Present, U= Unknown, NR= Not recorded

Mid Islet, Willis Islets 10/07/2024		Breeding effort and life stages				
common name	**scientific name**	Nests	Chicks	Young	Breeding pairs	Adolescents and adults
red-tailed tropicbird	*Phaethon rubricauda roseotinctus*	0	0	0	0	3
Herald petrel	*Pterodroma heraldica*	0	0	0	0	0
great frigatebird	*Fregata minor*	0	0	0	0	1
lesser frigatebird	*Fregata ariel*	0	0	0	0	2
brown booby	*Sula leucogaster*	P	P	0	27	58
masked booby	*Sula dactylatra dactylatra*	P	P	0	31	44
red-footed booby	*Sula sula*	P	P	0	41	47
black noddy	*Anous minutus*	0	0	0	0	0
brown noddy	*Anous stolidus*	0	0	P	P	420
black-naped tern	*Sterna sumatrana*	0	0	0	0	0
bridled tern	*Onychoprion anaethetus*	0	0	0	0	0
crested tern	*Thalasseus bergii*	0	0	0	0	7
New Caledonian fairy tern	*Sternula nereis exsul*	0	0	0	0	0
roseate tern	*Sterna dougallii*	0	0	0	0	0
sooty tern	*Onychoprion fuscatus*	P	P	P	4710	>5000
lesser sand plover	*Charadrius mongolus*	0	0	0	0	0
Pacific golden plover	*Pluvialis fulva*	0	0	0	0	0
red-necked stint	*Calidris ruficollis*	0	0	0	0	0
ruddy turnstone	*Arenaria interpres*	0	0	0	0	0
wandering tattler	*Tringa incana*	0	0	0	0	0
buff-banded rail	*Gallirallus philippensis tounelieri*	0	0	0	0	1
eastern reef egret	*Egretta sacra*	0	0	0	0	0
nankeen night-heron	*Nycticorax caledonicus*	0	0	0	0	0
purple swamphen	*Porphyrio melanotus*	0	0	0	0	0
sacred kingfisher	*Todiramphus sanctus*	0	0	0	0	0
welcome swallow	*Hirundo neoxena*	0	0	0	0	0

Figure 17. Adult sooty terns roosting in the beach zone on Mid Islet.
Andrew McDougall © Queensland Government

Figure 18. Buff-banded rail (Coral Sea subspecies).
Andrew McDougall © Queensland Government

2.2 South Islet - Willis Islets

2.2.1 Vegetation

Weed Management Assessment

The map in Figure 19 shows the extent of areas dominated by weeds in June 2023 and sites where small patches of *Cenchrus echinatus* (Mossman river grass) and *Euphorbia cyathophora* (dwarf poinsettia) were recorded in October 2020.

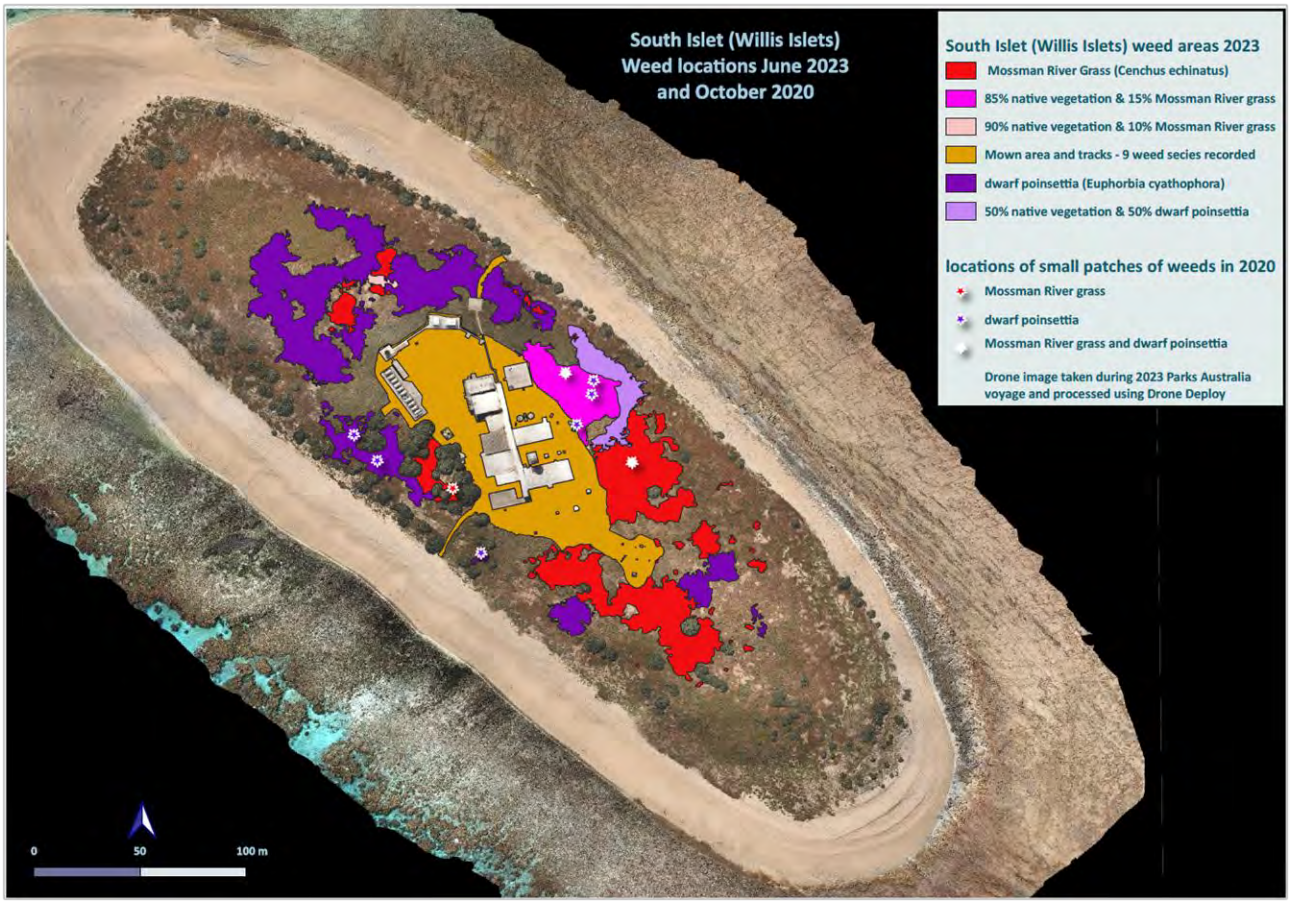

Figure 19. Distribution of areas dominated by weeds in June 2023 and location of small patches of weeds in October 2020.

Whilst the extent and densities of *Cenchrus echinatus* in July 2024 was very similar to that mapped in June 2023, some increases in extent were observed and some new small patches have established since the July 2023 visit. Where this species was present, it consisted of dense monocultures of *C. echinatus* which had matured, seeded and died back with no other species present in these areas. Very few birds were nesting in the *C. echinatus* compared with the number nesting in adjacent native vegetation (Figure 20 & 21).

Figure 20. Birds nesting in the green native vegetation. Dead standing *Cenchrus echinatus* (Mossman river grass) can be seen in the background. Joy Brushe ©

Figure 21: Very few birds can be seen nesting in this closer view of the dead standing *Cenchrus echinatus* (Mossman river grass) Joy Brushe ©

Whilst the extent of *Euphorbia cyathophora* (dwarf poinsettia) in July 2024 was similar to the June 2023 mapped extents, the cover (density) of this species had decreased dramatically between the 2023 and the 2024 visits (Figure 22). *E. cyathophora* is an annual species which typically grows, seeds quickly and prolifically, and then dies back. Seeds in the soil seed bank typically germinate following seasonal rain events and the cycle repeats. Most of the plants present in June 2023 had died. The relatively few isolated live plants present in July 2024 consisted predominantly of mature plants which had previously died back but were still alive and reshooting from the base (Figure 22.D). There were also occasional mature seeding plants that had not died. Either viable seeds are still present in the seedbank awaiting suitable conditions for germination or they have already

germinated after rain (possibly associated with Cyclone Jasper) but died before maturing during the dry period following germination. It is likely that viable seeds are still currently present in the soil and will germinate when seasonal conditions and moisture are favourable.

Figure 22. *Euphorbia cyathophora* (dwarf poinsettia). A. and B: the density of *Euphorbia cyathophora* (dwarf poinsettia) in the northern section of the island in June 2023. C: shows much of the same area taken from photo monitoring point 1 following weeding undertaken in the 2024 visit – Note good growth of native grasses in photograph C. D: shows senescing mature plants reshooting from base. Joy Brushe ©

Weed management work undertaken during 2024 visit

*Euphorbia cyathophora (*dwarf poinsettia) plants were removed from the island except for the area in the vicinity and downslope of the grey water outlet - this area was only partially weeded. Most of the weeds on the two access tracks were apparently dead. All live weeds on tracks were removed or dug out by hand as most of their foliage was dead and herbicide spray would likely to be ineffective. Most weeds in the operational area were spot sprayed avoiding the exotic mown grass, *Dactyloctenium aegypticum* (coast button grass), in order to maintain some vegetation cover. Spot spraying using Glyphosate with added surfactant and marker dye was applied at ground level using a circular hood proved to be successful in both preventing herbicide drift and avoiding non target species.

Weeds were placed into bags immediately upon removal to minimise seed dispersal within the weeding area and during transport for incineration. If large quantities of weeds are removed, it will logistically not be practical to transport them for disposal elsewhere. In this situation they can be composted close to where they were removed. This method has been successfully used previously in vegetation management projects on Great Barrier Reef islands. Weed hygiene protocols and methodologies developed during the field visit were also discussed and agreed upon.

Figure 23. Fiona Hofman, Bureau of Meteorology Environmental Officer hand pulling *Euphorbia cyathophora* (dwarf poinsettia) in the northern section of South Islet, July 2024. Joy Brushe ©

Figure 24. Sophie Logan (Bureau of Meteorology, South Islet) and Fiona Hofman hand weeding the LARC Track, July 2024. Joy Brushe ©

Figure 25. John Prichard (Parks Australia) spot spraying weeds, July 2024. Joy Brushe ©

Figure 26. Incinerating weeds in the island incinerator. Joy Brushe ©

South Islet (Willis Islets) Weed Management Project Plan

Following the July 2024 visit to South Islet, Parks Australia and Bureau management have both endorsed a *Willis Island (Willis Islets) Weed Management Project (WMP) Plan* (Parks Australia 2024) and have finalised a variation to the Statement of Intent, to include support and activities associated with the Willis Island WMP.

Follow up weed management and monitoring

Two priority areas for follow up weeding of regrowth *E. cyathophora* (vegetation management areas 1 and 2) were mapped in the northern section of the island. These areas are the highest priority for follow up regrowth weeding and were selected to exclude shearwater burrows - avoiding burrows avoids any potential safety issue associated with collapsing burrows - and excludes *Cenchrus echinatus* (Mossman river grass) - eliminating any risk of spreading this weed.

Wooden stakes were used to mark an extended weeding boundary in the northern section of the island (downslope (beach side)) in addition to mapped vegetation management areas 1 and 2, for additional weeding if regrowth can be managed within this larger area. Areas upslope of the wooden stakes will presently not be weeded by Bureau staff as they contain *Cenchrus echinatus* (Mossman river grass) and wedge-tailed shear water burrows.

An additional area (vegetation management area 3) containing small, isolated outbreaks of newly established *Cenchrus echinatus* (Mossman river grass) was mapped at the southern end of the island. Bureau staff can commence weed management in this area when they have the necessary permission and training to apply herbicide and work amongst *C. echinatus* without spreading it further. Preparatory work will also be required prior to commencing this work to establish a designated access point that avoids people having to walk through the existing *C. echinatus* on the boundary of the operational area.

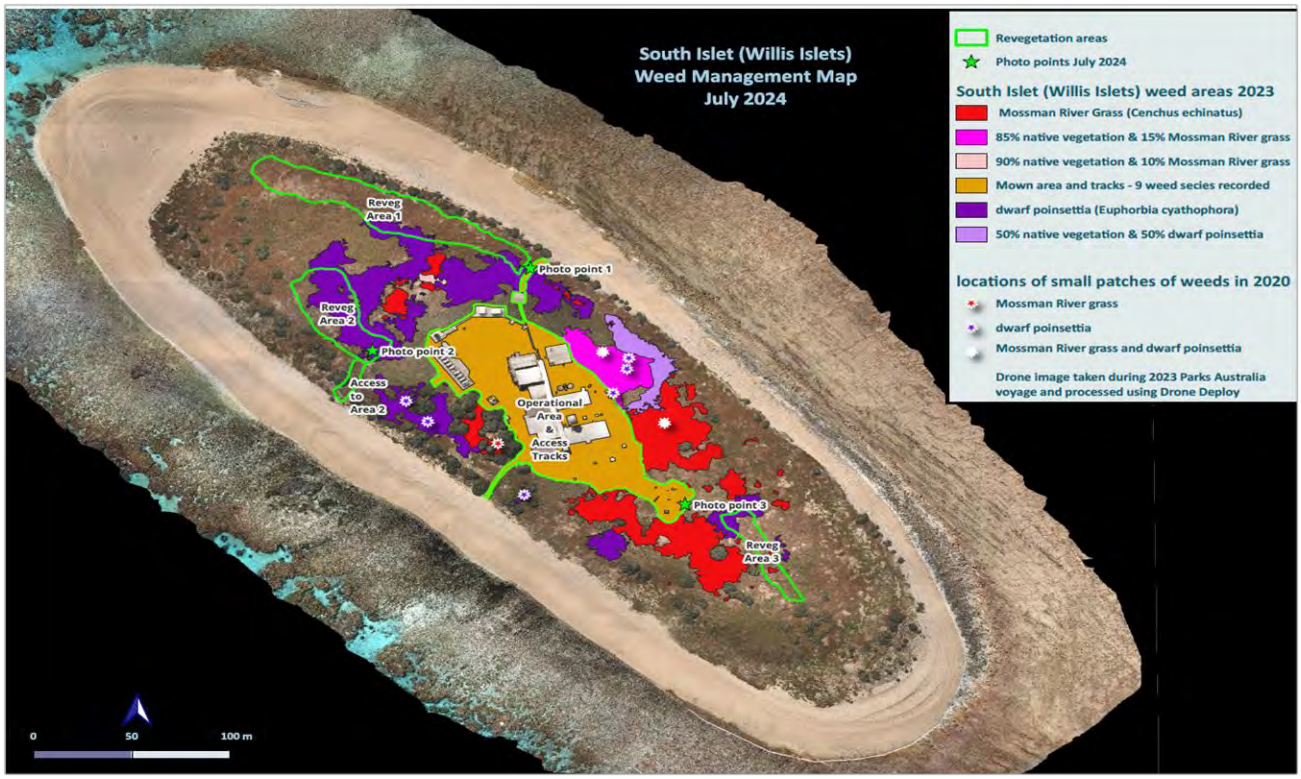

Figure 27. South Islet July 2024 vegetation management map showing photo points and priority weeding areas.

Equipment and consumables required for weed management on South Islet is maintained and stored in labelled containers in designated storage areas on the island.

Three photo monitoring points were established. On island Bureau staff have commenced monthly photo-monitoring and recording of observations from these monitoring points and from within vegetation management areas 1 and 2. They have also continued follow-up weeding on the northern flats including vegetation management areas 1 and 2. In addition to demonstrating success of the follow up weeding, The photo monitoring is already proving to be a valuable record of seasonal vegetation changes.

Figure 28. Photo point marked with stakes and a large coral rubble fragment. Larry Brushe ©

2.2.3 Island Watch/Heath Checks

A Parks Australia Island Watch summary proforma for South Islet (Willis Islet) was completed by Joy Brushe (Table 11).

In addition, comparative photographs, notes and location coordinates were taken at all 2023 health check sites (Director of National Parks 2024). Two additional sites were added for future comparison. Photo points for photographs taken on the 2024 voyage were accurately located in the field using the Avenza Maps App. on an iPhone with previously recorded site coordinates mapped over the 2023 high-resolution drone image.

This method ensured that the sites were located as closely as possible to the original sites. Photos taken on South Islet (Willis Islet) in 2023 were taken using a different aspect ratio and zoomed out further to cover a greater area than the area shown in the 2024 photos using the Context Camera App. The 2023 photos were cropped and zoomed in to cover, as close as possible, the same areas as the 2024 photos to provide better comparisons.

Location coordinates and brief descriptive notes recorded at the sites are listed in Table 10 and comparative photos are contained in Appendix 6. Comparative photographs taken at Health Check sites and BioCondition monitoring sites from 2019 to 2024

Table 10. Location coordinates and brief descriptive notes taken on 14/07/2024 at health check sites on South Islet (Datum = WGS84).
G = good, GC = good with some concerns, SC = significant concern, C = critical (Melzer 2019)

Site	Longitude	Latitude	Notes	Condition class
SWillis_HC_ *Argusia* 01	149.9632208	-16.28679028	Coastal *Argusia argentea* shrubland located at NW end post of BioCondition monitoring site M04; numerous dead *A. argentea* and most live ones have some dieback, *Lepturus repens* has dried off but is still alive, *Boerhavia albiflora* var. *albiflora* is in good condition; No weeds at photo point but *Cenchrus echinatus* and *Euphorbia cyathophora* are present upslope.	GC
SWillis_HC_ *Argusia* 02	149.9661715	-16.28854167	Located on SE shoreline; Some *A. argentea* are dead and dieback present in most; native ground cover in good condition; Red-footed boobies nesting and roosting in *A. argentea* branches, sooty terns abundant on ground, brown boobies nesting on ground, brown noddies also present.	GC
SWillis_HC_ *Argusia* 03	149.9657035	-16.28847917	Located in interior *A. argentea* shrubland at S end of island; minor dieback present in some *A. argentea* plants. Native ground cover at site in good condition. Small new outbreaks of *Cenchrus echinatus* near site. Red-footed boobies nesting and perching *in A. argentea* shrubs, brown boobies nesting on ground, sooty terns also present.	GC
SWillis_HC_ grass 02	149.9656792	-16.28787083	Located at N post of BioCondition monitoring site M03; *L. repens* and *Sporobolus virginicus* are in good condition; *C. echinatus* is abundant – appears to have increased in extent since 2023; Occasional *E. cyathophora* also present; Shearwater burrows present, sooty terns nesting in bare areas, also some brown noddies and brown boobies nesting.	SC
SWillis_HC_ grass 03	149.963909	-16.28665833	Located at NE post of BioCondition sit M01; *Lepturus repens* grassland at site, *Sporobolus virginicus* grassland upslope and downslope; large amounts of *C. echinatus* has invaded large areas in vicinity, *E. cyathophora* is also present in the vicinity; shearwater burrows present, only occasional brown noddies present in *C. echinatus*.	SC
SWillis_HC_ Ipomoea 01	149.9648632	-16.28720903	Located at centre of BioCondition monitoring site M02; Dominated by *Ipomoea pes-caprae*, and *Sporobolus virginicus,* both in good condition; *E. cyathophora* present but no *C. echinatus;* nesting brown noddies present.	SC
SWillis_HC_ *Lepturus* grassland	149.9633903	-16.28593819	*Lepturus repens* grassland located at northern tip of NE coastline; *L. repens* has dried off but is still alive and healthy, other native ground covers are in good condition; rubbly substrate	G
SWillis_HC_ *Sporobolus* grassland	149.96365	-16.28645764	*Sporobolus virginicus* grassland located on base of lower slope (terrace). Native grassland is in good condition but is near large infestation of *C. echinatus* upslope and *E. cyathophora* in the vicinity; Brown noddies present, sooty terns nesting in bare areas within the grassland.	GC
SWillis_HC_ *Stenotaphrum* grassland	149.965734	-16.28874375	*Stenotaphrum micranthum*/*Portulaca oleracea* open grassland located adjacent to southern end of SW shoreline; Vegetation in good condition, although quite dry, no weeds, abundant nesting sooty terns with chicks, some nesting brown boobies and brown noddies present.	G

Table 11. July 2024 Island Watch summary for South Islet (Willis Islets).

Island Watch Category South Islet (Willis Islets) completed by Joy Brushe
Key Natural Value Assessments
Birds
Formal bird survey Andrew McDougall
Any new or unusual sightings, or any changes to condition of nesting/roosting habitat? • Refer to 2024 report. • Large areas of *Cenchrus echinatus* (Mossman river grass) now covering large areas of former natural grassland habitat are not currently being used by nesting sooty terns or brown boobies (Figure 20&21). • Fewer birds on eggs that in 2023 visit and numerous dead chicks present.
Island geomorphology
Significant island changes Sand has been eroded from eastern beach with beach rock now exposed.
Severe storm cyclone damage No
Turtles
Turtles seen on island No (outside common breeding season)
Number of nests/body pits
Any new or unusual sightings, or changes to the condition of nesting habitat No. Bureau staff undertake regular monitoring and reporting of marine turtle activity on South Islet for Parks Australia.
Native vegetation
Condition of Key Value: *Argusia argentea* (octopus bush) shrublands • Generally good. • Some canopy dieback probably due to preceding dry period and/or impacts of Cyclone Jasper. • Recruitment of seedlings was observed in several places along the shoreline.
Condition of Key value: grassland/herbland/*Abutilon albescens* (lantern bush) shrublands • Large areas of native grassland have been replaced by dense swaths of *Cenchrus echinatus* (Mossman river grass) currently standing dead with attached and dropped seeds. • *Euphorbia cyathophora* (dwarf poinsettia) was present throughout the grasslands and herblands (Figure 27) but the number of live plants were significantly less than the number present in 2023, possibly due to dry conditions in the months preceding the 2024 survey. Areas mapped as *E. cyathophora* herbland in 2023 were dominated by native grasses in July2024. • Three other weed species have now spread from the operational area into the northern grasslands (refer to “threats” below). • Condition was good in areas where weeds were absent. • *Lepturus repens* (stalky grass) had dried off following dry period – normal occurrence, not a problem. • Large parts of areas mapped as *Tribulus cistoides* herbland in 2023 were dominated by native grasses (normal seasonal and climatic transitions), and in some places, Mossman river grass • Several *Abutilon albescens* (lantern bush) plants (an island native) were observed in the natural area adjacent to the NE end of the operational area. Only one plant was observed on the island in 2023. There are no *A. albescens* shrublands on the island.
Anything else of interest, and change or concerns? E.g. dieback, drought – All veg communities • A patch of *Boerhavia mutabilis* (pink flowered tar vine), a native island plant, was observed and collected. This species has not been recorded on South Islet (Willis Islet) previously. • *Tribulus cistoides* (bulls head burr), a summer annual, was not as prevalent in July 2024 compared to May/June 2023.
Threats
Weeds
Have the weed sites spread? Any new weed species • Extent of *Cenchrus echinatus* (Mossman river grass) was similar to 2023 mapped extent – possibly with small increase in extent. • Extent of *Euphorbia cyathophora* (dwarf poinsettia) was similar to the 2023 mapped extent, but the number of live plants were significantly less than the number present in 2023, possibly due to dry conditions in the months preceding the 2024 survey.

- Areas mapped as *E. cyathophora* herbland in 2023 were currently dominated by native grasses. Possible increase in number of dwarf poinsettia plants in vicinity of grey water discharge area compared to May/June 2023.
- Operational area was dominated by weeds (9 weed species observed). Several small outbreaks of *Dactyloctenium aegypticum* (coast button grass) were observed in the northern natural grassland areas. *Amaranthus viridis* (green amaranth) and *Gynandropsis gynandra* (cat whiskers) have spread from the operational area into adjacent natural areas in a few places.
- No new weed species were observed on the island.

Species observed and brief description

- Refer to information above and 2023 voyage report and weed map for weed species information.

Any future actions needed

- Weeds are a biosecurity threat to other CSMP islands.
- There is a threat of more weed species spreading from the mown areas to the natural areas and also a risk of further reducing available bird habitat.
- Discussions were held with Parks Australia and the Bureau during the 2024 voyage to address weed issues and solutions.
- Some weed management was undertaken and a monitoring system and an initial follow up developed.
- Access tracks need to be maintained weed free.

Pest/Invasive animals

Any signs of pest animals? Includes invertebrates like ants, grasshoppers, scale insect etc.
African big-headed ants (*Pheodole megacephala*) appeared to be present in lower numbers than during the 2023 visit.

Species observed and brief description

- African big-headed ants
- Some ticks were present - to be expected on bird nesting islands.
- Flies were quite abundant – probably not a problem.

Any future actions needed

- Ongoing visual monitoring to ensure no adverse effects on nesting seabirds.
- Perimeter of the buildings are sprayed periodically with insecticide to control ants, ticks and cockroaches.

Human impacts/threats

- Human occupation and operating weather station for over 100 years,
- Natural vegetation communities are absent from approximately 13% of the original vegetated area of island.

Any evidence of fires
Island incinerator and bonfire ashes on northern spit below high tide mark.

Trampling, digging by humans
Not in natural areas. Shearwater burrows filled in and nests and eggs removed from operation area.

Marine debris notes

- Bureau staff collect, categorise and provide weekly marine debris records to Parks Australia.
- Recent erosion on eastern beach has exposed a lot of metal fragments including considerable quantities of lead amongst the exposed rocks.

Infrastructure

Condition of infrastructure, any work required?

- CSMP sign is in good condition.
- Bird spikes were replaced by a bird hood this voyage.
- Unwanted stakes, star pickets and possibly remnants of unwanted old infrastructure may need to be identified and removed

Cultural values

Anything observed, anything new or of concern?
No

Monitoring and collections

Any other monitoring or surveys undertaken?

- Three weed photo-monitoring and observation points were established and initial observational data recorded during the July 2024 visit.
- Repeat photos, coordinates and notes taken at all 2023 health check sites and at two “new” sites”.

By whom and where is information to be stored • Established and recorded by Joy and Larry Brushe – ongoing data to be recorded by South Islet Bureau staff and reported monthly – stored by Parks Australia. • Joy Brushe – data to be stored and managed by Parks Australia.
Areas of island visited
Sites (locations) or whole island • Whole island visited. • Information recorded at photo and observation points shown and described in 2024 report. • Coordinates of health check sites and other details are also shown on context camera photographs taken at the sites.

2.2.2 Birds

Assessment of South Islet focused on general species diversity. Healthy populations of sooty tern and brown noddy were actively breeding, along with brown booby, red-footed booby and black noddy.

Since the 2023 visit, the influence of tropical storms and cyclones has noticeably altered the vegetation structure. Particularly in the eastern and northern sections of the island. Far fewer *Argusia* bushes were available in these areas for roosting and nesting. Black-naped and crested terns prefer to roost on the short, south-eastern end of the island, while Pacific golden plovers and wandering tattlers prefer the beach rock zone off the long north-east beach. One Pacific golden plover had an engraved blue flag (TO7) (Figure 29). The details have been sent to "BirdMark," with no details yet returned. No full breeding counts were attempted due to time limitation.

Table 12. Bird species and breeding effort on South Islet, Willis Islets.
Key: P= Present, U= Unknown, NR= Not recorded

South Islet, Willis Islets, 15/07/2024		**Breeding effort and life stages**				
common name	**scientific name**	Nests	Chicks	Young	Breeding pairs	Adolescents and adults
red-tailed tropicbird	*Phaethon rubricauda roseotinctus*	0	0	0	0	0
Herald petrel	*Pterodroma heraldica*	0	0	0	0	0
great frigatebird	*Fregata minor*	0	0	0	0	0
lesser frigatebird	*Fregata ariel*	0	0	0	0	0
brown booby	*Sula leucogaster*	P			P	P
masked booby	*Sula dactylatra dactylatra*	0	0	0	0	1
red-footed booby	*Sula sula*	P			P	P
black noddy	*Anous minutus*	P			P	P
brown noddy	*Anous stolidus*	P			P	P
black-naped tern	*Sterna sumatrana*	0	0	0	0	15
bridled tern	*Onychoprion anaethetus*	0	0	0	0	0
crested tern	*Thalasseus bergii*	0	0	0	0	7
New Caledonian fairy tern	*Sternula nereis exsul*	0	0	0	0	0
roseate tern	*Sterna dougallii*	0	0	0	0	0
sooty tern	*Onychoprion fuscatus*	P			P	P
lesser sand plover	*Charadrius mongolus*	0	0	0	0	0

Pacific golden plover	*Pluvialis fulva*	0	0	0	0	*12
red-necked stint	*Calidris ruficollis*	0	0	0	0	0
ruddy turnstone	*Arenaria interpres*	0	0	0	0	0
wandering tattler	*Tringa incana*	0	0	0	0	1
buff-banded rail	*Gallirallus philippensis tounelieri*	0	0	0	0	P
eastern reef egret	*Egretta sacra*	0	0	0	0	0
nankeen night-heron	*Nycticorax caledonicus*	0	0	0	0	0
purple swamphen	*Porphyrio melanotus*	0	0	0	0	0
sacred kingfisher	*Todiramphus sanctus*	0	0	0	0	0
welcome swallow	*Hirundo neoxena*	0	0	0	0	1

Figure 29. Pacific golden plover with engraved leg flag (TO7), Andrew McDougall © Queensland Government

Figure 30. Sooty tern, South Islet. Andrew McDougall © Queensland Government

2.3 Magdelaine Cay North - Magdelaine Cays

2.3.1 Island Watch

A Parks Australia Island Watch for Magdelaine Cay North was completed by Fiona Hagger (Table 13). Magdelaine Cay North was transversed over a four-hour visit, covering most of the island. No weeds or pests were detected, nor any adverse human impacts aside from the rather substantial marine debris load. As has been previously recorded, several deceased turtles were found beyond the rocky shore edge – the numerous large, exposed rocks and the significant depressions below dunal crests may have caused the turtles to become trapped or disorientated. Most were in advanced states of decomposition/remains of skeletons, with only two recently deceased.

The last time Parks Australia visited Magdelaine Cay North to conduct an island heath assessment was in 2019. At that time, the island was traversed in a zigzag manner with spot checks carried out on most of the island. No weeds or pest animals were found. A single coconut palm (60cm tall) was recorded, which was not found on the 2024 voyage. Large items of marine debris trapped amongst the broken rocks on the windward side of the island were recorded in 2019 as well, mostly appliances and equipment from large ships.

Table 13. July 2024 Island Watch summary for Magdelaine Cay North.

Island Watch category Magdelaine Cay North completed by Fiona Hagger
Key Natural Value Assessments
Birds
Formal bird survey by A. McDougall Yes
Any new or unusual sightings, or any changes to condition of nesting/roosting habitat? Yes – population of endangered *Sternula nereis exsul* (New Caledonian fairy tern) found on south-west of island – not previously detected on this island.
Island Geomorphology
Significant island changes No
Severe storm/cyclone damage? No
Turtles
Turtles seen on island No live turtles (outside common breeding season)
Number of nests/body pits Turtle body pits were abundant across the island, particularly in the northern part and along the western side of the island (<20 pits).
Any new or unusual sightings, or any changes to the condition of nesting habitat? As has previously been the case, several deceased green turtles were found beyond the rocky shore edge on the prevailing windward side, trapped behind the rocks in deep crevices. Most were in advanced states of decomposition/remains of skeletons, with only two recently deceased. Fresh turtle tracks thought to be approximately 1 week old were found on the Eastern end of the island.
Native vegetation
Unvegetated: Still unvegetated? Yes, excepting for a single unidentified very small seedling found in the south-west of the island.
Threats
Weeds
Does the island appear weed free? No weeds detected. As mentioned above, the single seedling found was unidentified and unlikely to survive.
If yes, species observed and brief description. N/A
Any future actions needed? No - other than continued biosecurity procedures for all visitors to island.
Pest/Invasive animals

Any signs of pest animals? Includes invertebrates like ants, grasshopper, scale insect etc. No incursions of pest animals found
Species observed and brief description. N/A
Any future actions needed? (e.g. pest monitoring or control work) No – other than continued biosecurity procedures for all visitors to island.
Any evidence of fires? No
Trampling, digging by humans No
Marine debris notes Considerable amount of small broken up debris, particularly found in the swail between the eastern beach side and the rocky shore on the west of the island. Marine debris removal through a Parks Australia voyage has not been undertaken since 2019.
Condition of infrastructure, any work required? No Parks Australia sign and no other infrastructure.
Anything observed, anything new or of concern? No
Any other monitoring or surveys undertaken Debris removal and analysis – Ian Anderson (Tangaroa Blue Foundation), testing for signs of Highly Pathogenic Avian Influenza (HPAI) – Guy Weerasinghe (DAFF), coral bleaching surveys and collection of coral and invertebrate samples to assess genetic diversity – Margena Marzoni and Cecilia Martin (JCU).
By whom and where is information to be stored? Parks Australia to retain and be keeper of data
Sites (locations) or whole island Most of the island was traversed by team – about 4 hours spent on island.

2.3.2 Birds

Table 14. Bird species and breeding effort on Magdelaine Cay North, Magdelaine Cays.
Key: P= Present, U= Unknown, NR= Not recorded

Magdelaine Cay North, Magdelaine Cays, 11/07/2024		**Breeding effort and life stages**				
common name	**scientific name**	Nests	Chicks	Young	Breeding pairs	Adolescents and adults
red-tailed tropicbird	*Phaethon rubricauda roseotinctus*	0	0	1	1	3
Herald petrel	*Pterodroma heraldica*	0	0	0	0	0
great frigatebird	*Fregata minor*	0	0	0	0	1
lesser frigatebird	*Fregata ariel*	0	0	0	0	0
brown booby	*Sula leucogaster*	0	0	0	0	3
masked booby	*Sula dactylatra dactylatra*	0	0	0	0	0
red-footed booby	*Sula sula*	0	0	0	0	0
black noddy	*Anous minutus*	0	0	0	0	0
brown noddy	*Anous stolidus*	0	0	0	0	0

black-naped tern	*Sterna sumatrana*	0	0	0	0	0
bridled tern	*Onychoprion anaethetus*	0	0	0	0	0
crested tern	*Thalasseus bergii*	0	0	0	0	14
New Caledonian fairy tern	*Sternula nereis exsul*	P	0	0	16	32
roseate tern	*Sterna dougallii*	0	0	0	0	0
sooty tern	*Onychoprion fuscatus*	0	0	0	0	10
lesser sand plover	*Charadrius mongolus*	0	0	0	0	0
Pacific golden plover	*Pluvialis fulva*	0	0	0	0	0
red-necked stint	*Calidris ruficollis*	0	0	0	0	0
ruddy turnstone	*Arenaria interpres*	0	0	0	0	1
wandering tattler	*Tringa incana*	0	0	0	0	1
buff-banded rail	*Gallirallus philippensis tounelieri*	0	0	0	0	0
eastern reef egret	*Egretta sacra*	0	0	0	0	0
nankeen night-heron	*Nycticorax caledonicus*	0	0	0	0	0
purple swamphen	*Porphyrio melanotus*	0	0	0	0	0
sacred kingfisher	*Todiramphus sanctus*	0	0	0	0	0
welcome swallow	*Hirundo neoxena*	0	0	0	0	0

This is the first record of New Caledonian fairy tern breeding on Magdelaine Cay North. In 2019 (see Melzer et al. 2019) one non-breeding adult was recorded and it was suggested this cay is a likely location for nesting by this species. During this visit, the New Caledonian fairy tern were actively courting and showing signs of either early nesting or imminent nesting. No physical nests were seen, but this species is known to spread their well camouflaged nests out along the length of an island (Further information is in 2.5.3 Birds). Birds often landed on pumice beds within the beach rock field.

Figure 31. New Caledonian fairy tern, Magdelaine Cay North (Magdelaine Cays).
Andrew McDougall © Queensland Government

Figure 32. Adult New Caledonian fairy tern with a fish to present to its mate - see Figure 33 A-D.
Andrew McDougall © Queensland Government

A.

Figures 33. A-D New Caledonian fairy tern presenting and accepting fish in a bonding/courtship display.
Andrew McDougall © Queensland Government

Several New Caledonian fairy tern behavioural calls were noted:

- A single, short, sharp call in general flight or when investigating people.
- A rolling four syllable call often when chasing/pursuing another bird.
- An occasional soft, churring, four or five syllable call while chasing/pursuing other birds.

Adults will not readily return to their nests, at least in the early stages of nesting and egg laying, so there is every likelihood some nest scrapes were present along the 930m south-eastern, high-tide aspect. Certainly, in a week or so after our voyage, nesting/incubation would probably have been more obvious. By the time eggs are about to hatch, the parents are more likely to stay at the nest (McDougall 2021). At least one pair of red-tailed tropicbirds had nested amongst the beach rock field, so there may be a chance some of the pumice deposits in these areas were elevated enough to allow for fairy tern nesting.

It is likely Magdelaine Cay North would support breeding colonies of black-naped, roseate and crested terns. The lack of vegetation is unlikely to make it desirable for nesting sooty tern and brown noddy. Unusually, this cay was not being used by brown or masked boobies. This cay does appear to be a significant nesting site for sea turtles, so perhaps there is too much disturbance during turtle season, and the larger seabirds have decided not to use it through the year.

Figure 34. Red-tailed tropicbird with young. This was the only nest located, but low numbers may have been present. Andrew McDougall © Queensland Government.

Figure 35. Locating New Caledonian fairy tern nests across 5 hectares of suitable nesting habitat was not possible during this short visit. Andrew McDougall © Queensland Government.

2.4 Magdelaine Cay South - Magdelaine Cays

2.4.1 Vegetation

Vegetation assessments and observations were undertaken by Fiona Hagger. Magdelaine Cay South has previously been visited and assessed as part of the Parks Australia Island Health Program in 2019 and 2023.

Table 15. Vegetation species found on Magdelaine Cay South on the 2024 voyage.

Scientific name/community	Common name
Abutilon albescens	lantern bush
Achyranthes aspera	chaff flower
Argusia argentea	octopus bush
Boerhavia albiflora var. *albiflora*	tar vine
Boerhavia mutabilis	pink flower tar vine
Canavalia rosea	coastal jack bean
Cordia subcordata	sea trumpet
Lepidium englerianum	beach peppercress (*note* – only 1 plant found)
Lepturus repens	stalky grass
Pisonia grandis	bird lime tree
Plumbago zeylanica	native plumbago
Portulaca oleracea	pig weed
Sporobolus virginicus	marine couch
Stenotaphrum micranthum	beach buffalo grass
Tribulus cistoides	bulls head burr

Other species found on previous visits that were not found include:

- *Ipomoea violacea* (moon flower) vineland – recorded as present on the 2019 Parks Australia voyage, where it was overtopping individual *Cordia* and *Pisonia*, and as patches of 'glades', mixed in with *Achyranthes*.
- *Digitaria bicornis* (hairy finger grass) – the only recording of this species in the CSMP was during the Parks Australia 2019 Island Health Voyage. It was found on Magdelaine Cay South and South West Coringa. *Digitaria bicornis* is a native species not endemic to Australia and listed as Least Concern in Queensland.
- *Colubrina asiatica* (Asian naked wood) - hasn't been seen on Magdelaine Cay South since 2007. Native to Australia and listed as Least Concern in Queensland.
- *Digitaria ctenantha* (comb finger grass) – hasn't been seen on Magdelaine Cay South since 1987. Native to Australia and listed as Least Concern in Queensland.

No weeds were detected.

Pisonia grandis

Closed scrub/low closed forest *Pisonia* – was in good condition, however some leaves exhibited damage from insect consumption (Figure 36). The damaged area appeared to be recovering with new shoots. No *Pulvinaria* scale insect was detected.

The last visit in 2023 did not record any insect damage to *Pisonia* leaves on Magdelaine Cay South; however, a 2001 voyage report notes a defoliated patch of Pisonia, heavily damaged by hawkmoth larvae (*Hoppotion velox)* (Smith & Papacek 2001). The damaged area was noted to be recovering well with lots of new shoots. In response to the hawkmoth

damage, the egg parasitoids *Trichogramma pretiosum* and *Trichogramma carverae* were released on SE Magdelaine in 2002 (Smith et al, 2004). In 2019, while a Parks Australia voyage recorded sightings of *H. velox*, the *Pisonia* forest on Magdelaine Cay South displayed a very low level of damage (5% or less) from *H. velox* larvae (Hemsen et al, 2020). The impact of the parasitoids, first released over two decades ago, may explain the considerable decrease in damage by hawkmoth larvae. It is recommended that the *Pisonia* forests on Madelaine Cay South continue to be monitored for any increase in damage, and if detected, insect samples from around *Pisonia* communities taken for identification.

Figure 36. Insect consumption of *Pisonia* foliage on Magdelaine Cay South. Fiona Hagger ©

Cordia subcordata

Almost complete dieback across *Cordia* shrublands – one patch was found in the centre of the island which had evidence of regrowth. There were no obvious signs of insect damage that was affecting growth. The poor state of *Cordia* on Magdelaine Cay South is consistent with recent visits by Parks Australia. In 2023, *Cordia* shrublands were experiencing almost complete dieback and there was no evidence of recruitment. In 2019, *Cordia* thickets were seemingly dead until closer inspection revealed a few leaves; one thicket had good foliage.

Argusia argentea (octopus bush)

Some dieback of *Argusia* bushes on the north-east perimeter of the island was observed. Overall condition was good. This is consistent with observations from the 2023 Parks Australia visit (Director of National Parks 2024).

Figure 37. Some dieback of *Argusia* bushes on the north-east perimeter of the island, on the prevailing windward side. Fiona Hagger ©

Herbland/grassland/*Abutilon* shrubland

Overall condition is good. Only one plant of *Lepidium englerianum* (beach peppercress) was found on the south side of the island.

2.4.2 Island Watch

A Parks Australia Island Watch summary proforma for Magdelaine Cay South was completed by Fiona Hagger (Table 16).

Table 16. Island Watch summary for Magdelaine Cay South (Magdelaine Cays).

Island Watch category Magdelaine Cay South
Key Natural Value Assessments
Birds
Formal bird survey by A. McDougall Yes
Any new or unusual sightings, or any changes to condition of nesting/roosting habitat? New sighting of sacred kingfisher (*Todiramphus sanctus*) for South Cay.
Island Geomorphology
Significant island changes No
Severe storm/cyclone damage? None detected
Turtles
Turtles seen on island No (outside common breeding season)
Number of nests/body pits Old turtle body pits were observed on the west side of the island (< 20).
Any new or unusual sightings, or any changes to the condition of nesting habitat? No
Native vegetation
Condition of key veg value: *Pisonia grandis* Closed scrub/low closed forest *Pisonia* –leaves exhibited damage from insect consumption (perhaps hawkmoth larvae). The damaged area appeared to be recovering with new shoots.
Condition of key veg value: *Cordia subcordata* Almost complete dieback across *Cordia* shrublands – one patch was found in the centre of the island which had evidence of regrowth.
Condition of key veg value: *Argusia argentea* (octopus bush) Some dieback of *Argusia* bushes on the north-east perimeter of the island, on the prevailing windward side (perhaps due to exposure).
Condition of key veg value: herb/grassland/abutilon Overall condition is good. Note that no *Ipomoea violacea* (moon flower) was found, which was previously been recorded on this island. Only one plant of *Lepidium englerianum* (beach peppercress) was found on the south side of the island.
Anything else of interest, and changes or concerns? Eg dieback, drought – all veg communities No
Threats
Weeds
Does the island appear weed free? No weeds detected.
Species observed and brief description. N/A
Any future actions needed? No - other than continued biosecurity procedures for all visitors to island.
Pest/Invasive animals
Any signs of pest animals? Includes invertebrates like ants, grasshopper, scale insect etc. Species observed and brief description. No scale insect detected on *Pisonia.* No caterpillars found on *Pisonia* either. A green grasshopper that had been caught in a spiderweb was taken for analysis.
Any future actions needed? (eg pest monitoring or control work) Monitoring to detect any further detrimental insect presence on *Pisonia* and *Cordia* communities recommended.

Human impacts/ threats
Any evidence of fires? No
Trampling, digging by humans No
Marine debris notes Follow up visit from last voyage in June 2023, where 115kg of debris was removed. This voyage 28kg, 103 items were removed.
Other
Infrastructure
Condition of infrastructure, any work required? Sign maintenance carried out – sign scrubbed to remove bird faeces, and a wooden plank secured on top to create an overhang to reduce bird faeces from covering up signage. A waterproof coat was also applied.
Cultural values
Anything observed, anything new or of concern? No
Monitoring and collections
Any other monitoring or surveys undertaken Debris removal and analysis – Ian Anderson (Tangaroa Blue Foundation), testing for signs of Highly Pathogenic Avian Influenza (HPAI) – Guy Weerasinghe (DAFF), coral bleaching surveys and collection of coral and invertebrate samples to assess genetic diversity – Margena Marzoni and Cecilia Martin (JCU).
By whom and where is information to be stored? Parks Australia to retain and be keeper of data
Areas of island visited
Sites (locations) or whole island Most of the island was traversed by team – about 4 hours spent on island.

2.4.3 Birds

Red-tailed tropicbird nests were not found. There appears to be suitable structure (both vegetatively and physically, i.e. beach rock), so it is surprising this cay is not a usual breeding site for the species.

Of the two frigatebird species, great frigatebirds nested exclusively throughout the upper strand vegetation. A mix of the two species nested within *Pisonia* groves through the middle, and towards the edges of the cay.

Two female great frigatebirds were observed with orbital ring colour variations. One with a blue/red mix (Figure 38) and another with a more solid red orbital ring. More than 99% percent of Coral Sea female great frigatebirds have solid blue orbital rings (Figure 39).

Sacred kingfishers were present on South East Cay however, numbers of this species are difficult to gauge, as these birds are silent, small, and unless flying, often difficult to locate once perched in vegetation.

Table 17. Bird species and breeding effort on Magdelaine Cay South, Magdelaine Cays.
Key: P= Present, U= Unknown, NR= Not recorded

Magdelaine Cay South, Magdelaine Cays, 11/07/2024		**Breeding effort and life stages**				
common name	**scientific name**	Nests	Chicks	Young	Breeding pairs	Adolescents and adults
red-tailed tropicbird	*Phaethon rubricauda roseotinctus*	0	0	0	0	0
Herald petrel	*Pterodroma heraldica*	0	0	0	0	0
great frigatebird	*Fregata minor*	P	P	0	P	P
lesser frigatebird	*Fregata ariel*	P	P	0	P	P
brown booby	*Sula leucogaster*	P	P	0	P	P
masked booby	*Sula dactylatra dactylatra*	P	P	0	P	P
red-footed booby	*Sula sula*	P	P	0	P	P
black noddy	*Anous minutus*	P	P	0	P	P
brown noddy	*Anous stolidus*	P	0	0	P	P
black-naped tern	*Sterna sumatrana*	0	0	0	0	0
bridled tern	*Onychoprion anaethetus*	0	0	0	0	0
crested tern	*Thalasseus bergii*	0	0	0	0	1
New Caledonian fairy tern	*Sternula nereis exsul*	0	0	0	0	0
roseate tern	*Sterna dougallii*	0	0	0	0	0
sooty tern	*Onychoprion fuscatus*	0	0	0	0	0
lesser sand plover	*Charadrius mongolus*	0	0	0	0	0
Pacific golden plover	*Pluvialis fulva*	0	0	0	0	0
red-necked stint	*Calidris ruficollis*	0	0	0	0	0
ruddy turnstone	*Arenaria interpres*	0	0	0	0	0
wandering tattler	*Tringa incana*	0	0	0	0	1
buff-banded rail	*Gallirallus philippensis tounelieri*	0	0	P	P	P
eastern reef egret	*Egretta sacra*	0	0	0	0	0
nankeen night-heron	*Nycticorax caledonicus*	0	0	0	0	0
purple swamphen	*Porphyrio melanotus*	0	0	0	0	0
sacred kingfisher	*Todiramphus sanctus*	0	0	0	0	2
welcome swallow	*Hirundo neoxena*	0	0	0	0	0

Figure 38. Female great frigatebird with orbital ring colour variation - Pacific Ocean birds are usually all blue.
Andrew McDougall © Queensland Government

Figure 39. Typical blue orbital ring of Coral Sea, female great frigatebirds.
Andrew McDougall © Queensland Government

Figure 40. *Pisonia grandis* groves host numerous seabird nests, including great and lesser frigatebirds, red-footed boobies, and brown and black noddies. Andrew McDougall © Queensland Government

Figure 41. Red-footed booby chick. Andrew McDougall © Queensland Government

2.5 Georgina Cay - Lihou Reef

2.5.1 Vegetation

Vegetation assessments and observations were undertaken by Fiona Hagger. Georgina Cay was previously visited by Parks Australia in 2021.

Table 18. Vegetation species found on Mid Islet on the 2024 voyage.

Scientific name/community	Common name
Abutilon albescens	lantern bush
Achyranthes aspera	chaff flower
Boerhavia albiflora var. *albiflora*	tar vine
Lepturus repens	stalky grass
Portulaca oleracea	pig weed
Stenotaphrum micranthum	beach buffalo grass

All five plant species recorded in 2021 were present, and in good condition, although the *Abutilon albescens* (lantern bush) communities were low in height and struggling.

A *Lepturus repens* (stalky grass) community was found on the southern side of the island on this visit (within the interior of the cay, on the south facing slope towards the beach), not previously recorded in 2021. It was in good condition with new green shoots, and abundant within the discovery site. The absence of *Lepturus repens* on Georgina Cay was noted on the 2021 visit – it was last reported as being present on Georgina Cay during the 1984 voyage (Hill and Hogg 1984), however no herbarium specimen records exist for its presence on Georgina Cay. A sample taken from the most recent 2024 voyage was sent to the Queensland Herbarium for their pressed collection and specimen database records.

Figure 42. *Lepturus repens* community on Georgina Cay. Fiona Hagger ©

2.5.2 Island Geomorphology

During the 2024 visit, the south-western tail of the island appeared slightly separated from the north-east of the island by a shallow body of water (Figure 43).

Figure 43. A body of water between two parts of the island observed in 2024. Fiona Hagger ©

Hill and Hogg (1984) described Georgina Cay as an elongated cay with the major eastern and minor western parts divided by 135 m wide shallow strait (1m deep). During a 1986 Australian National Parks and Wildlife Service survey, Grant et al. notes that the two sections were connected except for a few waves observed over washing the connection (Grant et al., 1998).

Satellite imagery from 2019 shows the unvegetated 'tail' section in the southwest separated from the vegetated northeastern section by a tidally inundated strait about 140m wide (Figure 44). When last visited by Parks Australia as part of the Island Health Program in July 2021, Andrew McDougall observed that the entire length of the unvegetated spit was intact and joined to the vegetated part of the cay. Additionally, 2021 drone imagery verified nil separation along its length (Figure 44). Given the observed fluctuations over time, the body of water between the two areas observed in 2024 may be tidal-related and not necessarily a permanent sign of separation.

Figure 44. Left: 2019 Satellite imagery of Georgina Cay, showing a shallow body of water between the south west and north eastern parts of the cay. Right: July 2021 drone image looking along south western end of Georgina Cay showing entire length of spit joined to vegetated section of cay.

2.5.2 Island Watch

A Parks Australia Island Watch summary proforma for Georgina Cay was completed by Fiona Hagger (Table 19).

Table 19. Island Watch summary for Georgina Cay.

Island Watch category Georgina Cay
Key Natural Value Assessments
Birds
Formal bird survey by A. McDougall Yes
Any new or unusual sightings, or any changes to condition of nesting/roosting habitat? No
Island Geomorphology
Significant island changes The south-western tail of the island was slightly separated from the north-east of the island by a shallow body of water.
Severe storm/cyclone damage? No
Turtles
Turtles seen on island No live turtles (outside common breeding season)
Number of nests/body pits A few old body pits found along the northern side of the island and south-west side, up in the vegetation.
Any new or unusual sightings, or any changes to the condition of nesting habitat? No
Native vegetation
Condition of key veg value: herb/grassland/abutilon

- All five plant species recorded in 2021 were present: *Boerhavia albiflora* var*. albiflora* (tar vine), *Achyranthes aspera* (chaff flower), *Portulaca oleracea* (pig weed), *Abutilon albescens* (lantern bush), *Stenotaphrum micranthum* (beach buffalo grass).
- Most in good condition, though the *Abutilon albescens* (lantern bush) communities were low and struggling.
- Healthy, abundant *Lepturus repens* (stalky grass) community found on the southern side of the island, not previously recorded on Georgina Cay.

Anything else of interest, and changes or concerns? Eg dieback, drought – all veg communities
N/A

Threats

Weeds

Does the island appear weed free?
No weeds detected.

Species observed and brief description.
N/A

Any future actions needed?
No - other than continued biosecurity procedures for all visitors to island.

Pest/Invasive animals

Any signs of pest animals? Includes invertebrates like ants, grasshopper, scale insect etc.
No incursions of pest animals found

Species observed and brief description.
N/A

Any future actions needed? (eg pest monitoring or control work)
No – other than continued biosecurity procedures for all visitors to island.

Human impacts/ threats

Any evidence of fires?
No

Trampling, digging by humans
No

Marine debris notes
35.2kg of debris removed, 240 items. Including 61 plastic drink bottles and 45 rubber thongs.

Other

Infrastructure

Condition of infrastructure, any work required?
Sign maintenance carried out – sign scrubbed to remove bird faeces, and a wooden plank secured on top to create an overhang to reduce bird faeces from covering up signage. A waterproof coat was also applied.

Note: The logbook that is attached to the sign for this island was missing and needs to be replaced.

Cultural values

Anything observed, anything new or of concern?
The collection of rock slabs and clam shells which signifies some kind of historic site is still in sound condition (Figure 45).

Monitoring and collections

Any other monitoring or surveys undertaken
Debris removal and analysis – Ian Anderson (Tangaroa Blue Foundation), testing for signs of Highly Pathogenic Avian Influenza (HPAI) – Guy Weerasinghe (DAFF), coral bleaching surveys and collection of coral and invertebrate samples to assess genetic diversity – Margena Marzoni and Cecilia Martin (JCU).

By whom and where is information to be stored?
Parks Australia to retain and be keeper of data

Areas of island visited

Sites (locations) or whole island
Most of the island was traversed by team – about 4 hours spent on island.

Figure 45. The collection of rock slabs and clam shells which signifies some kind of historic site on Georgina Cay. Fiona Hagger ©

2.5.3 Birds

Table 20. Bird species and breeding effort on Georgina Cay, Lihou Atoll.
Key: P= Present, U= Unknown, NR= Not recorded

Georgina Cay, Lihou Atoll, 12/07/2024		**Breeding effort and life stages**				
common name	**scientific name**	Nests	Chicks	Young	Breeding pairs	Adolescents and adults
red-tailed tropicbird	*Phaethon rubricauda roseotinctus*	0	0	0	0	0
Herald petrel	*Pterodroma heraldica*	0	0	0	0	0
great frigatebird	*Fregata minor*	0	0	0	0	0
lesser frigatebird	*Fregata ariel*	0	0	0	0	0
brown booby	*Sula leucogaster*	P			P	140
masked booby	*Sula dactylatra dactylatra*	P			>12	P
red-footed booby	*Sula sula*	0	0	0	0	0
black noddy	*Anous minutus*	0	0	0	0	0
brown noddy	*Anous stolidus*	P			P	1800
black-naped tern	*Sterna sumatrana*	0	0	0	0	7
bridled tern	*Onychoprion anaethetus*	0	0	0	0	0
crested tern	*Thalasseus bergii*	0	0	0	0	7
New Caledonian fairy tern	*Sternula nereis exsul*	P	0	0	7	15
roseate tern	*Sterna dougallii*	0	0	0	0	2
sooty tern	*Onychoprion fuscatus*	P	P	0	P	2200
lesser sand plover	*Charadrius mongolus*	0	0	0	0	1
Pacific golden plover	*Pluvialis fulva*	0	0	0	0	0

red-necked stint	*Calidris ruficollis*	0	0	0	0	0
ruddy turnstone	*Arenaria interpres*	0	0	0	0	9
wandering tattler	*Tringa incana*	0	0	0	0	1
buff-banded rail	*Gallirallus philippensis tounelieri*	0	0	0	0	0
eastern reef egret	*Egretta sacra*	0	0	0	0	0
nankeen night-heron	*Nycticorax caledonicus*	0	0	0	0	0
purple swamphen	*Porphyrio melanotus*	0	0	0	0	0
sacred kingfisher	*Todiramphus sanctus*	0	0	0	0	0
welcome swallow	*Hirundo neoxena*	0	0	0	0	0

A second New Caledonian fairy tern, breeding event (see McDougall 2021) was observed this voyage on Georgian Cay. The cay had split into two whereas in 2021 the cay was complete, with an unbroken, sandy spine along its entirety (Figure 46&47).

Figure 46. Georgina Cay with an overlay of the approximate break in the cay during the 2024 voyage. ©Queensland Globe

Figure 47. The western end of Georgina Cay showing the 2024 and 2021 New Caledonian fairy tern breeding locations and the 2024 break in the cay. ©Queensland Globe

Fourteen of the fifteen fairy terns were in full breeding plumage. Breeding was in very early stages with only two nests containing two eggs each and several sand scrapes present. The nesting substrate used in this breeding event was fine sands (Figure 48) compared to the coarse coral rubble used in 2021 (Figure 49).

In 2021 the breeding colony was compact, and the site shared with black-naped terns and roseate terns. The 2024 event was not densely colonial and spread loosely across the western portion of Georgina Cay. There were only 7 breeding pairs during this event, far fewer than the 52 recorded in 2021.

Adult birds appeared less defensive in both flight behaviour and calls at Georgina Cay (compared to North West Cay and both Magdelaine Cays). Only approximate adult counts were attempted for other species due to the available time on the cay.

Figure 48. A New Caledonian fairy tern nest on fine sand. Two eggs can be seen in a small scrape in the middle foreground next to the turtle nest pit where red arrow is pointing. Andrew McDougall © Queensland Government

Figure 49. New Caledonian fairy tern nesting substrate used during the 2021 Georgina Cay breeding event.
Andrew McDougall © Queensland Government

Figure 50. Adult New Caledonia fairy tern in breeding plumage.
Andrew McDougall © Queensland Government

2.6 East Diamond Islet – Tregrosse Reefs

2.6.1 Vegetation

Vegetation assessments and observations were undertaken by Fiona Hagger. East Diamond Islet has previously been visited and assessed as part of the Parks Australia Island Health Program in 2021, 2022 and 2023.

Table 21. Vegetation species found on East Diamond Islet on the 2024 voyage.

Scientific name/community	Common name
Abutilon albescens	lantern bush
Achyranthes aspera	chaff flower
Argusia argentea	octopus bush
Boerhavia albiflora var. *albiflora*	tar vine
Canavalia rosea	coastal jack bean
Cordia subcordata	sea trumpet
Ipomoea violacea	moon flower
Lepidium englerianum	peppercress
Lepturus repens	stalky grass
Plumbago zeylanica	native plumbago
Portulaca oleracea	pig weed
Stenotaphrum micranthum	beach buffalo grass
Tribulus cistoides	bulls head burr

Other species observed on previous visits that were not found include:

- A juvenile single plant of *Scaevola taccada* (Cardwell cabbage) was found on East Diamond Islet in 2021. Prior to 2021 it had not been recorded in the CSMP despite being common on Great Barrier Reef islands. This is a transient species, dispersed by ocean currents. It was noted in the 2021 CSMP voyage report that this species was unlikely to persist on East Diamond Island. In 2022 the *S. taccada* was no longer present at the site or anywhere else on the island.
- *Ipomoea pes-caprae* subsp. *brasiliensis* (goats foot convolvulus), a small community last observed in 2023 (collected in 2021) on the southeastern shoreline. Common on Great Barrier Reef islands but rare on the Coral Sea islands.

No weeds were detected.

Cordia subcordata shrublands

All *Cordia* sites visited displayed wind sheared canopy with severe wind damage to upper canopy. The damaged canopy cut an easterly diagonal across all the *Cordia* closed scrub bushes, perhaps a result of the drying easterly Trade Winds that are prevalent at the time of the voyage (winter months) (Figure 51). This is consistent with what was found on the 2023 visit.

The *Cordia* bushes in the interior of the island (at BioCondition monitoring Site 23 and Health check site 1[3]) had experienced significant dieback (again, particularly from the eastern side), and part of the site appeared dead - however some branches that appeared dead were still green beneath when the outer bark was scratched back (Figure 52&53). Dieback was present in this stand in 2021 as well (Chapman et al. 2022). The sites are well above the range of tidal surges, but very exposed to strong winds.

[3] Health Check site EDiamond_Cord_01: Lat -17.441352, Long 151.074294

In 2023 egging scale insect tended by ants was also observed on some of the *Cordia* plants at BioCondition monitoring site M23. This was not observed in 2024. Future visits should carefully check for evidence of *Pulvinaria urbicola.*

Figure 51. *Cordia* stand on the northern part of the island[4] displayed wind sheared canopy with severe wind damage to upper canopy. Fiona Hagger ©

Figure 52. Cordia stand in the center of East Diamond Islet (BioCondition monitoring site M23) in critical condition with dieback. Fiona Hagger ©

[4] Health check site EDiamond_Cord_02 Lat -17.439287, Long 151.075879

Figure 53. *Cordia* stand in the center of East Diamond Islet (BioCondition monitoring site M23) in critical condition with dieback. Fiona Hagger ©

Argusia argentea

Some die-off of *Argusia* bushes on the easterly perimeter of the island. Other bushes around the island were in good health.

Herbland/grassland/Abutilon communities

All species found in these communities were in good condition.

2.6.2 Island Watch

A Parks Australia Island Watch summary proforma for East Diamond Islet was completed by Fiona Hagger (Table 22).

Table 22. July 2024 Island Watch summary for East Diamond Islet.

Island Watch category East Diamond Islet
Key Natural Value Assessments
Birds
Formal bird survey by Andrew McDougall Yes
Any new or unusual sightings, or any changes to condition of nesting/roosting habitat? No
Island Geomorphology
Significant island changes No
Severe storm/cyclone damage? No
Turtles
Turtles seen on island No (outside common breeding season)
Number of nests/body pits <20 old body pits found along the western side of the island, particularly in the south-west corner
Any new or unusual sightings, or any changes to the condition of nesting habitat? No
Native vegetation

Condition of key veg value: *Cordia* All *Cordia* sites displayed wind sheared canopy with severe wind damage to upper canopy. The damaged canopy cut an easterly diagonal across all the *Cordia* closed scrub bushes. The *Cordia* bushes in the interior of the island had experienced significant dieback (particularly from the eastern side), and appeared dead - however some branches were still green beneath when scratched.
Condition of key veg value: *Argusia argentea* (octopus bush) Some die-off of *Argusia* bushes on the easterly perimeter of the island. Other bushes around the island were in good health.
Condition of key veg value: herb/grassland/abutilon populations (general) Good condition.
Anything else of interest, and changes or concerns? Eg dieback, drought – all veg communities No
Threats
Weeds
Does the island appear weed free? No weeds detected at time of visit
Species observed and brief description.
Any future actions needed? Tyre tracks were detected, leading from the beach, up into the highwater mark and entering vegetation towards AMSA's AtoN in the centre of the island. Concern about potential risk of introduced species. (note – we now know that the vehicle was used to repair a fault with the AtoN in mid-June, so only a month before our visit to the island.) Returning to the island to check the site for signs of weeds on the next Parks Australia voyage is advised.
Pest/Invasive animals
Any signs of pest animals? Includes invertebrates like ants, grasshopper, scale insect etc. No incursions of pest animals found
Species observed and brief description. N/A
Any future actions needed? (eg pest monitoring or control work) Some spider samples taken for analysis. No other future work required other than continued biosecurity procedures for all visitors to island and monitoring for pests.
Human impacts/ threats
Any evidence of fires? No
Trampling, digging by humans No clear evidence of destruction of eggs, chicks etc from vehicle used to service the AMSA tower. However, concern that this could occur.
Marine debris notes Marine debris removal was carried out on this island on the Parks Australia CSMP voyage in June 2023 (135kg removed then). Accordingly, relatively low loads of debris this trip – 49.5kg.
Other
Infrastructure
Condition of infrastructure, any work required? Sign maintenance carried out – sign scrubbed to remove bird faeces, and a wooden plank secured on top to create an overhang to reduce bird faeces from covering up signage. A waterproof coat was also applied. AMSA tower looked to be in good condition (Figure 54).
Cultural values
Anything observed, anything new or of concern? No.
Monitoring and collections
Any other monitoring or surveys undertaken Debris removal and analysis – Ian Anderson (Tangaroa Blue Foundation), testing for signs of Highly Pathogenic Avian Influenza (HPAI) – Guy Weerasinghe (DAFF), coral bleaching surveys and collection of coral and invertebrate samples to assess genetic diversity – Margena Marzoni and Cecilia Martin (JCU).
By whom and where is information to be stored? Parks Australia to retain and be keeper of data
Areas of island visited
Sites (locations) or whole island Most of the island was traversed by team – about 4 hours spent on island.

Figure 54. AMSA tower, East Diamond Islet. Fiona Hagger ©

2.6.3 Birds

East Diamond Islet appears to have had consistent breeding effort for all species during the previous few surveys. Adolescent black noddies occupied old nest sites within strand vegetation along the southeastern beach. Red-tailed tropicbird breeding numbers are comparable to previous surveys, however more nests were located along the northwestern beach than previous surveys. A small colony of crested terns, containing mobile chicks and young, were observed on the top of the eastern half of the island.

Table 23. Bird species and breeding effort on East Diamond Islet, Tregrosse Reefs.
Key: P= Present, U= Unknown, NR= Not recorded

East Diamond Islet, Tregrosse Reefs, 12/07/2024		**Breeding effort and life stages**				
common name	**scientific name**	Nests	Chicks	Young	Breeding pairs	Adolescents and adults
red-tailed tropicbird	*Phaethon rubricauda roseotinctus*	11	5	4	20	12
Herald petrel	*Pterodroma heraldica*	0	0	0	0	0
great frigatebird	*Fregata minor*	P	P	P	P	P
lesser frigatebird	*Fregata ariel*	P	P	P	>800*	>800*
brown booby	*Sula leucogaster*	0	0	0	0	0
masked booby	*Sula dactylatra dactylatra*	P	P	0	P	P
red-footed booby	*Sula sula*	P	0	0	P	P
black noddy	*Anous minutus*	0	0	0	0	P
brown noddy	*Anous stolidus*	0	0	0	0	0
black-naped tern	*Sterna sumatrana*	0	0	0	0	0
bridled tern	*Onychoprion anaethetus*	0	0	0	0	0

crested tern	*Thalasseus bergii*	0	P		20	22
New Caledonian fairy tern	*Sternula nereis exsul*	0	0	0	0	0
roseate tern	*Sterna dougallii*	0	0	0	0	0
sooty tern	*Onychoprion fuscatus*	P	P	P	P	P
lesser sand plover	*Charadrius mongolus*	0	0	0	0	0
Pacific golden plover	*Pluvialis fulva*	0	0	0	0	0
red-necked stint	*Calidris ruficollis*	0	0	0	0	0
ruddy turnstone	*Arenaria interpres*	0	0	0	0	0
wandering tattler	*Tringa incana*	0	0	0	0	0
buff-banded rail	*Gallirallus philippensis tounelieri*	0	0	0	0	P
eastern reef egret	*Egretta sacra*	0	0	0	0	0
nankeen night-heron	*Nycticorax caledonicus*	0	0	0	0	0
purple swamphen	*Porphyrio melanotus*	0	0	0	0	0
sacred kingfisher	*Todiramphus sanctus*	0	0	0	0	0
welcome swallow	*Hirundo neoxena*	0	0	0	0	0

* A count of lesser frigatebird breeding effort and adults in the vicinity of the tower on the eastern end of the island. The estimate was made from ground level and is likely an undercount.

2.7 Central Diamond Islet - Tregrosse Reefs

2.7.1 Vegetation

Vegetation assessments and observations were undertaken by Fiona Hagger. Central Diamond Islet has previously been visited and assessed as part of the Parks Australia Island Health Program in 2021.

Table 24. Vegetation species found on Central Diamond Islet on the 2024 voyage.

Scientific name/community	Common name
Abutilon albescens	lantern bush
Achyranthes aspera	chaff flower
Argusia argentea	octopus bush
Boerhavia albiflora var. *albiflora*	tar vine
Canavalia rosea	coastal jack bean
Lepturus repens	stalky grass
Plumbago zeylanica	native plumbago
Portulaca oleracea	pig weed
Stenotaphrum micranthum	beach buffalo grass
Tribulus cistoides	bulls head burr

The *Ipomoea violacea* (moon flower) that was recorded on Central Diamond Islet in 2021 was not found this trip; in 2021 it was present in the interior vegetation and dominated a mixed herbland. All species of vegetation examined were in good condition, except for some *Argusia* dieback on the exposed north-easterly corner of the island. No weeds were detected.

Figure 55. Herbland dominated by *Canavalia rosea* (coastal jack bean) and *Lepturus repens* (stalky grass), interior Central Diamond Islet. Fiona Hagger ©

2.7.2 Island Watch

A Parks Australia Island Watch for Central Diamond Islet was completed by Fiona Hagger (Table 25).

Table 25. July 2024 Island Watch summary for Central Diamond Islet.

Island Watch category **Central Diamond Islet (Tregrosse Reefs)**
Key Natural Value Assessments
Birds
Formal bird survey by A. McDougall Yes
Any new or unusual sightings, or any changes to condition of nesting/roosting habitat? No
Island Geomorphology
Significant island changes No
Severe storm/cyclone damage? None detected
Turtles
Turtles seen on island No (outside common breeding season)

Number of nests/body pits <20 old body pits (north / western side of the island
Any new or unusual sightings, or any changes to the condition of nesting habitat? No
Native vegetation
Condition of key veg value: *Argusia argentea* (octopus bush) communities Mostly in good condition – some dead and dieback on the exposed north-easterly corner of the island.
Condition of key veg value: herb/grassland/abutilon (general) All in good condition. No *Ipomoea violacea* (moon flower), previously recorded in 2021, was found.
Anything else of interest, and changes or concerns? E.g. dieback, drought – all veg communities No.
Threats
Weeds
Does the island appear weed free? No weeds detected
Species observed and brief description.
Any future actions needed? No – continued biosecurity procedures
Pest/Invasive animals
Any signs of pest animals? Includes invertebrates like ants, grasshopper, scale insect etc. No incursions of pest animals found
Species observed and brief description. -
Any future actions needed? (eg pest monitoring or control work) No – continued biosecurity procedures
Human impacts/ threats
Any evidence of fires? No
Trampling, digging by humans No
Marine debris notes 12.8kg of marine debris removed and analysed.
Other
Infrastructure
Condition of infrastructure, any work required? Sign maintenance – sign scrubbed to remove bird faeces, and a wooden plank secured on top to reduce bird faeces from covering up signage. A waterproof coat was also applied (Figure 56).
Cultural values
Anything observed, anything new or of concern? No
Monitoring and collections
Any other monitoring or surveys undertaken Debris removal and analysis – Ian Anderson (TBF), testing for signs of HPAI – Guy Weerasinghe (DAFF), coral bleaching surveys and coral and invertebrate samples to assess genetic diversity – Margena Marzoni and Cecilia Martin (JCU).
Areas of island visited
Sites (locations) or whole island Most of the island was traversed by team – about 4 hours spent on island. Additional observation: a very strong, unpleasant decomposition smell permeated the dry centre of the island. There was no obvious reason for the smell.

Figure 56. Martin Russell undertaking maintenance work on the Parks Australia signage on Central Diamond Islet. Fiona Hagger ©

2.7.3 Birds

The time available on Central Diamond Islet was dedicated to red-tailed tropicbird counts and locating Herald petrel nests. No Herald petrel nests were located; however, two adults were seen prospecting for nesting sites. The two birds continuously flew around the southeastern end of the island, at times only just above head height of the observers. It is likely this survey was early in the breeding season. An early August survey might yield a higher success rate of locating active nests.

Table 26. Bird species and breeding effort on Central Diamond Islet, Tregrosse Reefs.
Key: P= Present, U= Unknown, NR= Not recorded

Central Diamond Islet, Tregrosse Reefs, 13/07/2024		**Breeding effort and life stages**				
common name	**scientific name**	Nests	Chicks	Young	Breeding pairs	Adolescents and adults
red-tailed tropicbird	*Phaethon rubricauda roseotinctus*	17	4	22	43	23
Herald petrel	*Pterodroma heraldica*	P	0	0	1	2
great frigatebird	*Fregata minor*	P	P	P	P	P
lesser frigatebird	*Fregata ariel*	0	0	0	0	0
brown booby	*Sula leucogaster*	0	0	0	0	0
masked booby	*Sula dactylatra dactylatra*	P	P	0	P	P
red-footed booby	*Sula sula*	P	P	P	P	0
black noddy	*Anous minutus*	P	0	0	P	0
brown noddy	*Anous stolidus*	P	P	P	P	P
black-naped tern	*Sterna sumatrana*	0	0	0	0	0
bridled tern	*Onychoprion anaethetus*	0	0	0	0	0
crested tern	*Thalasseus bergii*	0	0	0	0	0
New Caledonian fairy tern	*Sternula nereis exsul*	0	0	0	0	0
roseate tern	*Sterna dougallii*	0	0	0	0	0
sooty tern	*Onychoprion fuscatus*	P	P	P	P	P
lesser sand plover	*Charadrius mongolus*	0	0	0	0	0
Pacific golden plover	*Pluvialis fulva*	0	0	0	0	0
red-necked stint	*Calidris ruficollis*	0	0	0	0	0
ruddy turnstone	*Arenaria interpres*	0	0	0	0	0
wandering tattler	*Tringa incana*	0	0	0	0	0
buff-banded rail	*Gallirallus philippensis tounelieri*	0	0	0	0	3
eastern reef egret	*Egretta sacra*	0	0	0	0	0
nankeen night-heron	*Nycticorax caledonicus*	0	0	0	0	0
purple swamphen	*Porphyrio melanotus*	0	0	0	0	0
sacred kingfisher	*Todiramphus sanctus*	0	0	0	0	0
welcome swallow	*Hirundo neoxena*	0	0	0	0	0

Figure 57. Adult Herald petrel, Central Diamond Islet. Andrew McDougall © Queensland Government

Figure 58. A single pair of Herald petrels were observed displaying and calling in flight.
Andrew McDougall © Queensland Government

2.8 West Diamond Islet - Tregrosse Reefs

2.8.1 Vegetation

Vegetation assessments and observations were undertaken by Fiona Hagger. West Diamond Islet has previously been visited and assessed as part of the Parks Australia Island Health Program in 2021.

Table 27. Vegetation species found on West Diamond Islet on the 2024 voyage.

Scientific name/community	Common name
Abutilon albescens	lantern bush
Achyranthes aspera	chaff flower
Argusia argentea	octopus bush
Boerhavia albiflora var. *albiflora*	tar vine
Cordia subcordata	sea trumpet
Ipomoea violacea	moon flower
Lepturus repens	stalky grass
Plumbago zeylanica	native plumbago
Portulaca oleracea	pig weed
Stenotaphrum micranthum	beach buffalo grass
Tribulus cistoides	bulls head burr
Ximenia americana	yellow plum

Cordia

The small patch of *Cordia* last seen on the southeastern interior of the island in 2021 was found to be dead (Figure 59), with the skeleton covered in *Ipomoea violacea* (moon flower) vine and showing no signs of re-shooting (Figure 60). When observed in 2021, the shrubs were heavily infested with scale insects.

A single, small *Cordia* plant (~80cm tall) was found on the east of the island, on the sand at the perimeter of vegetation.

Figure 59. Dead stand of *Cordia*, covered in *Ipomoea violacea* (moon flower) vine. Fiona Hagger ©

Figure 60. Deceased *Cordia* stand. Fiona Hagger ©

Argusia argentea (octopus bush) shrublands

Largely a healthy population. Magnificent, tall open shrubland of *Argusia* present on the western side of the island (Figure 61). Some dead *Argusia* plants along the vegetation perimeter on the eastern side of the island. This was also the case in 2021, with botanist Joy Brushe suggesting that given the location and the good condition of vegetation elsewhere on the island, was likely caused by saltwater inundation or saltwater infiltration of the root zone (Chapman et al. 2022).

Figure 61. A tall *Argusia* on West Diamond Islet. Fiona Hagger ©

Ximenia americana (yellow plum)

West Diamond Islet has the only *Ximenia americana* (yellow plum) community in the Diamond Islets and Lihou Reef islands, restricted to a small patch in the northeast of the island. It presents as dense, impenetrable shrubland approximately 3m tall (Figure 62). There was evidence of dieback on the canopy and on the outer branches (with the bare branches used by lesser frigate birds for nesting), but plenty of reshooting and green growth behind the bare branches.

Figure 62. *Ximenia americana* (yellow plum) shrubland on West Diamond Islet. Fiona Hagger ©

Herbland/grassland/*Abutilon* shrubland

Since the 2021 assessment, there have been some shifts in the extent of certain species. *Ipomoea violacea* (moon flower) is far more abundant, appearing almost as a monoculture across areas. Occurrences of *Achyranthes aspera* (chaff flower) plants were low. In 2021, *Plumbago zeylanica* (native plumbago) was recorded in only one of the 28 ground truthing sites, however this visit found a greater spread, with some extensive patches found beneath and around the tall *Argusia* plants on the north of the island (Figure 63).

Figure 63. *Plumbago zeylanica* (native plumbago) in far greater density than previously recorded on West Diamond Islet. Fiona Hagger ©

2.8.2 Island Watch

A Parks Australia Island Watch for West Diamond Islet (Tregrosse Reef) was completed by Fiona Hagger (Table 28).

Table 28. July 2024 Island Watch summary for West Diamond Islet.

Island Watch category West Diamond Islet (Tregrosse Reef)
Key Natural Value Assessments
Birds
Formal bird survey by A. McDougall Yes
Any new or unusual sightings, or any changes to condition of nesting/roosting habitat? no
Island Geomorphology
Significant island changes No
Severe storm/cyclone damage? No
Turtles
Turtles seen on island No live turtles (outside common breeding season)
Number of nests/body pits <20 old body pits in vegetation perimeter mostly on the north of the island, with a couple on the east and western sandy sides.
Any new or unusual sightings, or any changes to the condition of nesting habitat? No
Native vegetation
Condition of key veg value: *Argusia argentea* (octopus bush) Largely a healthy population. Magnificent, tall open shrubland of *Argusia* present on the western side of the island. Some dead *Argusia* plants along the vegetation perimeter on the eastern side of the island.
Condition of key value: *Ximenia americana* (yellow plum) Dense impenetrable shrubland approximately 3m tall, in good condition.
Condition of key veg value: *Cordia* The small patch of *Cordia* last seen on the southeastern interior of the island in 2021 was found to be dead, with the skeleton covered in moon flower vine and no signs of re-shooting. A single, small *Cordia* plant (~80cm tall) was found on the east of the island, on the perimeter of vegetation.
Condition of key veg value: herb/grassland/abutilon Changes in herb/grassland/abutilon communities since the last (2021) assessment. Moon flower is far more abundant, appearing almost as a monoculture across areas. Far fewer chaff flower was found. More plumbago found, with some big patches found beneath and around tall *Argusia* plants on the north of the island.
Anything else of interest, and changes or concerns? Eg dieback, drought – all veg communities No
Threats
Weeds
Does the island appear weed free? No weeds detected.
Species observed and brief description. -
Any future actions needed? No - other than continued biosecurity procedures for all visitors to island.
Pest/Invasive animals
Any signs of pest animals? Includes invertebrates like ants, grasshopper, scale insect etc. No. Samples taken for identification – a spider, tic, grasshopper, fly and ant.
Species observed and brief description.
Any future actions needed? (eg pest monitoring or control work) No - other than continued biosecurity procedures for all visitors to island.
Human impacts/ threats

Any evidence of fires? No
Trampling, digging by humans No
Marine debris notes 20kg removed, 87 items.
Condition of infrastructure, any work required? Sign maintenance carried out – sign scrubbed to remove bird faeces, and a wooden plank secured on top to create an overhang to reduce bird faeces from covering up signage. A waterproof coat was also applied.
Anything observed, anything new or of concern? No
Any other monitoring or surveys undertaken Debris removal and analysis – Ian Anderson (Tangaroa Blue Foundation), testing for signs of Highly Pathogenic Avian Influenza (HPAI) – Guy Weerasinghe (DAFF), coral bleaching surveys and collection of coral and invertebrate samples to assess genetic diversity – Margena Marzoni and Cecilia Martin (JCU).
By whom and where is information to be stored? Parks Australia to retain and be keeper of data
Sites (locations) or whole island Most of the island was traversed by team – about 4 hours spent on island. Biocondition site found and photographs taken from N/E/S/W directions, to be compared with similar 2021 photos.

2.8.3 Birds

West Diamond Islet is a complex site to record bird breeding effort because the habitats are fragmented and recording breeding effort is more difficult due to multiple sites e.g. scattered argusia bushes rather than a more linear distribution along the edge of other cays. General species diversity observations and breeding effort was recorded during the time allocated to this island. A single red-tailed tropicbird nest was found in the same area as a single red-tailed tropicbird nest was recorded on 12 July 2021 (this survey 13 July 2024).

Table 29. Bird species and breeding effort on West Diamond Islet, Tregrosse Reefs.
Key: P= Present, U= Unknown, NR= Not recorded

West Diamond Islet, Tregrosse Reefs, 13/07/2024		**Breeding effort and life stages**				
common name	**scientific name**	Nests	Chicks	Young	Breeding pairs	Adolescents and adults
red-tailed tropicbird	*Phaethon rubricauda roseotinctus*	0	0	1	1	1
Herald petrel	*Pterodroma heraldica*	0	0	0	0	0
great frigatebird	*Fregata minor*	P	P	P	P	P
lesser frigatebird	*Fregata ariel*	0	0	0	0	0
brown booby	*Sula leucogaster*	P	0	0	P	P
masked booby	*Sula dactylatra dactylatra*	P	0	0	P	P

red-footed booby	*Sula sula*	P	P	0	P	P
black noddy	*Anous minutus*	P	0	0	P	P
brown noddy	*Anous stolidus*	P	0	P	P	P
black-naped tern	*Sterna sumatrana*	0	0	0	0	2
bridled tern	*Onychoprion anaethetus*	0	0	0	0	0
crested tern	*Thalasseus bergii*	0	0	0	0	2
New Caledonian fairy tern	*Sternula nereis exsul*	0	0	0	0	0
roseate tern	*Sterna dougallii*	0	0	0	0	0
sooty tern	*Onychoprion fuscatus*	0	0	0	0	P
lesser sand plover	*Charadrius mongolus*	0	0	0	0	0
Pacific golden plover	*Pluvialis fulva*	0	0	0	0	1
red-necked stint	*Calidris ruficollis*	0	0	0	0	0
ruddy turnstone	*Arenaria interpres*	0	0	0	0	0
wandering tattler	*Tringa incana*	0	0	0	0	0
buff-banded rail	*Gallirallus philippensis tounelieri*	0	0	0	0	P
eastern reef egret	*Egretta sacra*	0	0	0	0	0
nankeen night-heron	*Nycticorax caledonicus*	0	0	0	0	0
purple swamphen	*Porphyrio melanotus*	0	0	0	0	0
sacred kingfisher	*Todiramphus sanctus*	0	0	0	0	0
welcome swallow	*Hirundo neoxena*	0	0	0	0	0

Figure 64. Adult male great frigatebird. Andrew McDougall © Queensland Government

Figure 65. Adult male lesser frigatebird at nest. Andrew McDougall © Queensland Government

Figure 66. A healthy, dynamic seabird breeding site with ground and tree nesting species present. Andrew McDougall © Queensland Government

Figure 67. An adolescent crested tern. This bird had sustained a bad leg injury and is probably the only reason it was present on the island. Andrew McDougall © Queensland Government

2.9 South West Islet - Coringa Islets

2.9.1 Vegetation

Vegetation assessments and observations were undertaken by Fiona Hagger. South West Islet has previously been visited and assessed as part of the Parks Australia Island Health Program in 2019.

Table 30. Vegetation species found on South West Islet on the 2024 voyage.

Scientific name/community	Common name
Abutilon albescens	lantern bush
Achyranthes aspera	chaff flower
Argusia argentea	octopus bush
Boerhavia albiflora var. *albiflora*	tar vine
Cordia subcordata	sea trumpet
Digitaria bicornis	hairy finger grass
Ipomoea violacea	moon flower
Lepturus repens	stalky grass
Plumbago zeylanica	native plumbago
Portulaca oleracea	pig weed
Tribulus cistoides	bulls head burr

The previously unrecorded pink flowered tar vine (*Boerhavia mutabilis*) that was observed in 2019 was not found.

Prior to a scale insect outbreak in the late 1990s *Pisonia* occupied most of the interior of South West Coringa (Hicks 1984). There was no longer evidence, in either the 2019 or 2024 visits, that it had ever been present on South West Coringa.

In 2019, stands of *Cordia* appeared to be struggling to survive; most were defoliated and appeared to be almost completely dead, and smothered by *Ipomoea* vines. Now, some of the *Cordia* patches which had previously been completely leafless in 2019 are resprouting (Figure 68). Some of the newly resprouted leaves had evidently been preyed upon by insects (Figure 69). Other areas of the *Cordia* patch were dead with no signs of regrowth (Figure 70).

Some die back of low *Argusia* along the north-east periphery, likely due to exposure and/or saltwater.

No weeds were detected.

Figure 68. *Cordia* re-sprouting. Fiona Hagger ©

Figure 69. Leaves exhibiting insect damage on surviving *Cordia* stands. Note the *Cordia* is producing new shoots and possibly flower buds on a stand that otherwise appeared dead. Fiona Hagger ©

Figure 70. Dead stands of *Cordia.* Fiona Hagger ©

2.9.2 Island Watch

A Parks Australia Island Watch summary proforma for South West Islet (Coringa Islets) was completed by Fiona Hagger (Table 31).

Table 31. July 2024 Island Watch summary for South West Islet (Coringa Islets).

Island Watch category South West Islet (Coringa Islets)
Key Natural Value Assessments
Birds
Formal bird survey by Andrew McDougall Yes
Any new or unusual sightings, or any changes to condition of nesting/roosting habitat? No
Island Geomorphology
Significant island changes -
Severe storm/cyclone damage? -
Turtles
Turtles seen on island No live turtles (outside common breeding season)
Number of nests/body pits <20 old body pits on the northern and western side of the island.
Any new or unusual sightings, or any changes to the condition of nesting habitat? No
Native vegetation
Condition of key veg value: *Argusia argentea* (octopus bush) Good condition overall, excepting dead *Argusia* along the north-east periphery.
Condition of key veg value: *Cordia* Some of the *Cordia* patches which had previously been completely leafless in 2019 are resprouting. Some of the newly resprouted leaves had evidently been preyed upon by insects. Other areas of the *Cordia* patch were dead with no signs of regrowth.

Condition of key veg value: herb/grassland/abutilon Good condition. *Abutilon* patches often consisted of dead or dry stems, surrounded by live plants that helped to enable confirmation of identification.
Anything else of interest, and changes or concerns? Eg dieback, drought – all veg communities no
Threats
Weeds
Does the island appear weed free? No weeds detected.
Species observed and brief description. -
Any future actions needed? No - other than continued biosecurity procedures for all visitors to island.
Pest/Invasive animals
Any signs of pest animals? Includes invertebrates like ants, grasshopper, scale insect etc. Several small moths were found around the *Cordia* shrubs. One was captured and identified as *Pterophoridae* or Plume Moth.
Species observed and brief description. -
Any future actions needed? (eg pest monitoring or control work) No - other than continued biosecurity procedures for all visitors to island.
Human impacts/ threats
Any evidence of fires? No
Trampling, digging by humans No
Marine debris notes 100.7kg removed, or 447 items. Large amount due to several years between visits (site last visited in 2019).
Other
Infrastructure
Condition of infrastructure, any work required? A new Parks Australia sign was constructed and erected, in place of the old signage.
Cultural values
Anything observed, anything new or of concern? The previous Commonwealth Gov signage (from approx. 2004) is sun-faded but still legible and standing. It remains in place, behind the newly implemented Parks Australia sign.
Monitoring and collections
Any other monitoring or surveys undertaken Debris removal and analysis – Ian Anderson (Tangaroa Blue Foundation), testing for signs of Highly Pathogenic Avian Influenza (HPAI) – Guy Weerasinghe (DAFF), coral bleaching surveys and collection of coral and invertebrate samples to assess genetic diversity – Margena Marzoni and Cecilia Martin (JCU).
By whom and where is information to be stored? Parks Australia to retain and be keeper of data
Areas of island visited
Sites (locations) or whole island Most of the island was traversed by team – about 4 hours spent on island.


Figure 71. Left: Andrew McDougall and Martin Russell. The previous Commonwealth Government signage (from approx. 2004) is sun-faded but still legible and standing. Right: Martin Russell stabilising the new Parks Australia sign. Fiona Hagger ©

2.9.3 Birds

Most of the low *Argusia* along the beach line had died back. Possibly due to excess salt and salt water exposure during cyclones and other storms. Many plants were reshooting from their bases. *Boerhavia*, vines and grasses at ground level appeared to be healthy and thriving. With the lack of substantial vegetation for nest building, black noddies were using moon vine, *Ipomoea alba*, leaves as a base for their nests.

A single nankeen night-heron flushed with a large group of sooty terns. It circled the island several times before settling back on the island. During its first loop, it was observed regurgitating a food scrap pellet into the water.

A single light phase eastern reef egret was observed. This species appears to be an irregular visitor rather than a permanent resident. Very few have been observed during the five voyages since 2019.

Figure 72. The iconic red-footed booby. Andrew McDougall © Queensland Government

Table 32. Bird species and breeding effort on South West Islet, Coringa Islets.
Key: P= Present, U= Unknown, NR= Not recorded

South West Islet, Coringa Islets, 14/07/2024		Breeding effort and life stages				
common name	**scientific name**	Nests	Chicks	Young	Breeding pairs	Adolescents and adults
red-tailed tropicbird	*Phaethon rubricauda roseotinctus*	0	0	0	0	0
Herald petrel	*Pterodroma heraldica*	0	0	0	0	0
great frigatebird	*Fregata minor*	P	P	0	P	P
lesser frigatebird	*Fregata ariel*	0	0	0	0	0
brown booby	*Sula leucogaster*	4	6	0	10	12
masked booby	*Sula dactylatra dactylatra*	9	15	0	24	28
red-footed booby	*Sula sula*	P	P	0	P	0
black noddy	*Anous minutus*	P	0	0	P	0
brown noddy	*Anous stolidus*	0	0	0	0	0
black-naped tern	*Sterna sumatrana*	0	0	0	0	0
bridled tern	*Onychoprion anaethetus*	0	0	0	0	0
crested tern	*Thalasseus bergii*	0	0	0	0	1
New Caledonian fairy tern	*Sternula nereis exsul*	0	0	0	0	0
roseate tern	*Sterna dougallii*	0	0	0	0	0
sooty tern	*Onychoprion fuscatus*	1300	>1500		>2800	2350
lesser sand plover	*Charadrius mongolus*	0	0	0	0	0
Pacific golden plover	*Pluvialis fulva*	0	0	0	0	0
red-necked stint	*Calidris ruficollis*	0	0	0	0	0
ruddy turnstone	*Arenaria interpres*	0	0	0	0	0
wandering tattler	*Tringa incana*	0	0	0	0	0
buff-banded rail	*Gallirallus philippensis tounelieri*	0	0	0	0	1
eastern reef egret	*Egretta sacra*	0	0	0	0	1
nankeen night-heron	*Nycticorax caledonicus*	0	0	0	0	1
purple swamphen	*Porphyrio melanotus*	0	0	0	0	0
sacred kingfisher	*Todiramphus sanctus*	0	0	0	0	0
welcome swallow	*Hirundo neoxena*	0	0	0	0	0

2.10 Chilcott Islet - Coringa Islets

2.10.1 Vegetation

Vegetation assessments and observations were undertaken by Fiona Hagger. Chilcott Islet has previously been visited and assessed as part of the Parks Australia Island Health Program in 2023.

Table 33. Vegetation species found on Chilcott Islet on the 2024 voyage.

Scientific name/community	Common name
Abutilon albescens	lantern bush
Achyranthes aspera	chaff flower
Argusia argentea	octopus bush
Boerhavia albiflora var. *albiflora*	tar vine
Cordia subcordata	sea trumpet
Ipomoea violacea	moon flower
Lepidium englerianum	beach peppercress
Lepturus repens	stalky grass
Plumbago zeylanica	native plumbago
Portulaca oleracea	pig weed
Stenotaphrum micranthum	beach buffalo grass
Tribulus cistoides	bulls head burr

The previously unrecorded pink flowered tar vine (*Boerhavia mutabilis*) that was found for the first time on Chilcott Islet on the 2023 visit was not found. Marine couch (*Sporobolus virginicus*), a perennial native grass that was recorded, but not collected) during the 2006/2007 survey (Batianoff et al. 2008), was not observed during the 2019, 2023 or 2024 visit.

In 2019, Hemson et al noted that the *Cordia* stands on Chilcott were struggling but were the healthiest observed on CSMP islands visited that year. Some leaves were present at about knee height and at about 2m height. In 2023, the overall Health Check results indicate a 'critical' rating for *Cordia* shrublands on Chilcott, with almost complete dieback across almost all *Cordia* shrublands observed and no evidence of recruitment. In 2024, the dominant *Cordia* stand on Chilcott (Healthcheck site 1)[5] appeared to be in a similar condition to 2023, with wind sheared canopy to the upper canopy. The damaged canopy cut a south-easterly diagonal across *Cordia* closed scrub bushes, perhaps a result of the drying easterly Trade Winds that are prevalent at the time of the voyage (winter months).

No weeds were detected.

Figure 73. Left: Patch of *Cordia subcordata* at Health Check Site 1 on Chilcott, 2019 (very dry conditions at the time). Right: same *Cordia* stand exhibiting with wind sheared canopy (2024).
Fiona Hagger ©

[5] Healthcheck Chilcott_Shrub_01 Lat -16.937147, Long 150.003996.

2.10.2 Island Watch

A Parks Australia Island Watch summary proforma for Chilcott Islet (Coringa Islets) was completed by Fiona Hagger (Table 34).

Table 34. July 2024 Island Watch summary for Chilcott Islet.

Island Watch category Chilcott Islet (Coringa Islets)
Key Natural Value Assessments
Birds
Formal bird survey by Andrew McDougall Yes
Any new or unusual sightings, or any changes to condition of nesting/roosting habitat? Unusual sighting of a red (buff)-banded rail
Island Geomorphology
Significant island changes No
Severe storm/cyclone damage? No
Turtles
Turtles seen on island No (outside common breeding season)
Number of nests/body pits >20 body pits found around island, mostly on the sandy northern side of the island.
Any new or unusual sightings, or any changes to the condition of nesting habitat? No
Native vegetation
Condition of key veg value: Cordia Die-off on the south-easterly side of *Cordia* closed shrub bushes.
Condition of key veg value: *Argusia argentea* (octopus bush) Good condition.
Condition of key veg value: general herb/grassland/abutilon communities Good condition. The previously unrecorded pink flowered tar vine (*Boerhavia mutabilis*) that was found on the 2023 visit was not found.
Anything else of interest, and changes or concerns? Eg dieback, drought – all veg communities -
Threats
Weeds
Does the island appear weed free? No weed species observed.
Species observed and brief description. -
Any future actions needed? No - other than continued biosecurity procedures for all visitors to island.
Pest/Invasive animals
Any signs of pest animals? Includes invertebrates like ants, grasshopper, scale insect etc. No incursions of pest animals found
Species observed and brief description. -
Any future actions needed? (eg pest monitoring or control work) No - other than continued biosecurity procedures for all visitors to island.
Human impacts/ threats
Any evidence of fires? No
Trampling, digging by humans No human impacts, however, evidence of recent human visitation – smashed glass on sand.
Marine debris notes

60kg removed, 270 items. Last clean-up was in June 2023.
Other
Infrastructure
Condition of infrastructure, any work required? Sign maintenance carried out – sign scrubbed to remove bird faeces, and a wooden plank secured on top to create an overhang to reduce bird faeces from covering up signage. A waterproof coat was also applied.
Cultural values
Anything observed, anything new or of concern? No
Monitoring and collections
Any other monitoring or surveys undertaken Debris removal and analysis – Ian Anderson (Tangaroa Blue Foundation), testing for signs of Highly Pathogenic Avian Influenza (HPAI) – Guy Weerasinghe (DAFF), coral bleaching surveys and collection of coral and invertebrate samples to assess genetic diversity – Margena Marzoni and Cecilia Martin (JCU).
By whom and where is information to be stored? Parks Australia to retain and be keeper of data
Areas of island visited
Sites (locations) or whole island Most of the island was traversed by team – about 4 hours spent on island.

2.10.3 Birds

Bridled tern were observed breeding along the southern half of the southeast rock scree. The heavily spotted, green/blue eggs were laid on bare rock shelves. No nest lining was used. Nests were difficult to locate, so an estimate has been given on the expected breeding pairs. Bridled tern were not recorded on any other islands during the voyage.

A lone, red-necked stint was recorded on the arm of beach rock on the northeastern tip of the island. Migratory shorebirds are uncommon on the Coral Sea islands, with ruddy turnstones and wandering tattlers most often seen.

Table 35. Bird species and breeding effort on Chilcott Islet, Coringa Islets.
Key: P= Present, U= Unknown, NR= Not recorded

Chilcott Islet, Coringa Islets, 14/07/2024		**Breeding effort and life stages**				
common name	scientific name	Nests	Chicks	Young	Breeding pairs	Adolescents and adults
red-tailed tropicbird	*Phaethon rubricauda roseotinctus*	6	0	3	9	7
Herald petrel	*Pterodroma heraldica*	0	0	0	0	0
great frigatebird	*Fregata minor*	15	3	32	50	17
lesser frigatebird	*Fregata ariel*	P	0	0	P	P
brown booby	*Sula leucogaster*	24	0	0	24	24
masked booby	*Sula dactylatra dactylatra*	23	48	8	79	105
red-footed booby	*Sula sula*	27	20	0	47	38
black noddy	*Anous minutus*	P	P	P	P	P
brown noddy	*Anous stolidus*	0	P	P	P	P
black-naped tern	*Sterna sumatrana*	0	0	0	0	16

bridled tern	*Onychoprion anaethetus*	4-8	0	0	4-8	8
crested tern	*Thalasseus bergii*	0	0	0	0	0
New Caledonian fairy tern	*Sternula nereis exsul*	0	0	0	0	0
roseate tern	*Sterna dougallii*	0	0	0	0	0
sooty tern	*Onychoprion fuscatus*	0	0	0	0	0
lesser sand plover	*Charadrius mongolus*	0	0	0	0	0
Pacific golden plover	*Pluvialis fulva*	0	0	0	0	0
red-necked stint	*Calidris ruficollis*	0	0	0	0	1
ruddy turnstone	*Arenaria interpres*	0	0	0	0	0
wandering tattler	*Tringa incana*	0	0	0	0	0
buff-banded rail	*Gallirallus philippensis tounelieri*	0	0	0	0	P
eastern reef egret	*Egretta sacra*	0	0	0	0	0
nankeen night-heron	*Nycticorax caledonicus*	0	0	0	0	0
purple swamphen	*Porphyrio melanotus*	0	0	0	0	0
sacred kingfisher	*Todiramphus sanctus*	0	0	0	0	0
welcome swallow	*Hirundo neoxena*	0	0	0	0	0

Figure 74. Bridled tern. Andrew McDougall © Queensland Government

2.11 North East Cay - Herald Cays

2.11.1 Vegetation/Health check

Table 36. Vegetation species found on North East Cay (Herald Cays) on the 2024 voyage.

Scientific name/community	Common name
Abutilon albescens	lantern bush
Argusia argentea	Octopus bush
Boerhavia albiflora var. *albiflora*	tar vine
Boerhavia mutabilis	pink flower tar vine
Cordia subcordata	sea trumpet
Ipomoea violacea	moon flower
Lepidium englerianum	beach peppercress
Pisonia grandis	bird lime tree
Portulaca oleracea	pig weed
Sporobolus virginicus	marine couch
Tribulus cistoides	bulls head burr

Other species found on previous visits that were not found include:

- *Achyranthes aspera* (chaff flower) last recorded on North East Cay in 1997
- *Lepturus repens* (stalky grass) last recorded in 2006.
- *Stenotaphrum micranthum* (beach buffalo grass) last recorded in 2006.

Pisonia grandis communities and *Cordia subcordata/Abutilon albescens* shrubland

Pisonia grandis communities on North East Herald Cay were traversed and comparative photographs taken of the interior *P. grandis* forests at previous 2019 and 2022 BioCondition monitoring and Health Check sites. Comparative photographs were also taken in the *Cordia subcordata /Abutilon albescens* shrubland at BioConditon monitoring site M24 for comparison with the 2023 photos. Location of the sites photographed in July 2024 are shown in blue in Figure 75. Location coordinates and assessed condition class at these sites are listed in Table 37. Comparative photographs are contained in Appendix 6. Comparative photographs taken at Health Check sites and BioCondition monitoring sites from 2019 to 2024

Figure 75. Map of North East Herald Cay showing location of previous BioCondition and Health Check sites where photographs and notes were taken during the 2024 voyage.

It was not possible to locate exactly the same photo point for the *Pisonia* forest BioCondition monitoring sites as there were no stakes in the ground to permanently mark these sites and GPS coverage under *Pisonia* canopies is poor.

The interior forests were in good condition with no evidence of scale insect outbreaks or associated exotic ant population explosions. Typical condition of the interior *P. grandis* forest is shown in Figure 76.

Figure 76. Healthy *Pisonia grandis* forest at Health Check site NEH02 in July 2024. Joy Brushe ©

Table 37. Location coordinates and condition class recorded on 16/07/2024 at Health Check sites on North East Herald Cay.
G = good, GC = good with some concerns, SC = significant concern, C = critical (Melzer 2019)

Site	Longitude (Datum – WGS84)	Latitude (Datum – WGS84)	Condition Class
NE Herald_HC_NEH01	149.1975069	-16.94300660	**G**
NE Herald_HC_NEH02	149.201126	-16.93967813	**G**
NE Herald_HC_5	149.2000632	-16.94129618	**G**
NE Herald BioCondition Monitoring Site_M24	149.2011479	-16.94379306	**GC**
NE Herald_HC_Windshear NE Coast	149.2023844	-16.93931556	**G**

Wind shorn *Pisonia grandis* communities were examined from the shoreline during a traverse around the shoreline perimeter of the cay. Dieback was present in the wind shorn *P. grandis* community on the northeastern shoreline (Figure 77&78). Canopy dieback is not uncommon in *P. grandis* exposed to strong winds, especially during dry periods and is not considered to be a problem.

Figure 77. Dieback in wind shorn *Pisonia grandis* community adjacent to the northeastern coastline in July 2024. Joy Brushe ©

Figure 78. Dieback in wind shorn *Pisonia grandis* community adjacent to the northeastern coastline in July 2024. Joy Brushe ©

During the December 2019 vegetation survey of North East Herald Cay, Hemson et al (2020) reported swaths of fallen *Cordia subcordata* (sea trumpet), that *C. subcordata* was much less abundant on all islands than during the 2006-2007 survey (Batianoff 2008) and that it appeared to have almost died out on some of the islands in the CSMP. Where there were once large patches only dead stems remained with few if any leaves and in some cases, only fallen dead trees.

Permanent BioCondition monitoring site M24, a *Cordia subcordata (*sea trumpet)*/ Abutilon albescens* (lantern bush) shrubland on North East Herald Cay was established and surveyed in

June 2023 and revisited during the 2024 voyage. Although large numbers of previously mature *C. subcordata* shrubs were dead at this site, many plants that had completely died back were observed to be reshooting during the 2022 and 2023 visits. These were continuing to grow and averaged three metres in height at the time of the 2024 visit (Figure 79&80). Some were flowering and fruiting. The vine*, Ipomoea violacea* (moonflower), shown in Figure 81, was abundant in the vicinity. There was also less evidence of attack by chewing insects than seen in the previous two visits. Photographs were taken at this site during the 2024 visit for comparison with those taken during the 2023 vegetation survey of this site (Director of National Parks 2024). Comparative photographs are contained in Appendix 6. Comparative photographs taken at Health Check sites and BioCondition monitoring sites from 2019 to 2024

Isolated *Cordia subcordata* plants were observed growing in a few other locations along the shoreline of North East Herald Cay. However, nearly all the *C. subcordata* in areas previously mapped as '*Cordia subcordata* closed scrub to low closed forest' (Batianoff et al 2008) are now dead and these communities are now *Abutilon albescens* shrublands or consist of bare patches containing fallen dead *C. subcordata* as described in Hemson et al (2020).

Figure 79. The height of surviving *Cordia subcordata* which regrew from the base of previous mature plants following dieback event in *C. subcordata* closed scrub at BioCondition monitoring site M24 on North East Herald Cay, July 2024. Note fallen dead *C. subcordata*. Joy Brushe ©

Figure 80. Regrowth *Cordia subcordata* BioCondition monitoring site M24 in July 2024. Left: low wind shorn *Pisonia grandis* forest in the background. Joy Brushe ©

Figure 81. The vine, *Ipomoea violacea* (moonflower) was abundant amongst the *C. subcordata* regrowth. Joy Brushe ©

Other observations

The *Abutilon albescens* ‘glade’, was referenced by Batianoff et al. 2008 and referred to in the 2019 CSMP Island Voyage Report as virtually monospecific (scattered *Boerhavia mutabilis* and *Ipomoea violacea* were present in places) shrublands to open shrublands. The large glade is found on the easterly side of the island, rimmed by *Pisonia*. The *Abutilon* glade was mostly dead or dry when visited in December 2019, though when visited in June 2022, this area was impenetrable, lush *Abutilon* shrublands. The 2024 visit found it to be once again shrubland to open shrubland of *Abutilon albescens,* though drier and not as lush as in 2022 (Figure 82).

Figure 82. Top: The *Abutilon albescens* ‘glade’, 2024 visit. Bottom left: the glade in 2022 – impenetrable, lush *Abutilon* shrublands. Bottom right: In the dry summer months of 2019 (note very dry conditions at the time). Fiona Hagger ©

Some dead *Argusia* plants along the vegetation perimeter on the eastern side of the island. New growth evident in the same area.

No weeds were observed in the areas traversed.

2.11.2 Island Watch

A Parks Australia Island Watch for North East Cay (Herald Cays) was completed by Fiona Hagger (Table 38).

Table 38. July 2024 Island Watch summary for North East Cay, Heralds Cays.

Island Watch category North East Cay, Herald Cays
Key Natural Value Assessments
Birds
Formal bird survey by Andrew McDougall Yes
Any new or unusual sightings, or any changes to condition of nesting/roosting habitat? No
Island Geomorphology
Significant island changes No
Severe storm/cyclone damage? No
Turtles
Turtles seen on island No – outside out of common breeding season. However, recent turtle nesting evidence was found on the south-west end of the island – approximately 10-12 hatchling tracks (Figure 83).
Number of nests/body pits <20 old body pits found on the south-westerly side of the island.
Any new or unusual sightings, or any changes to the condition of nesting habitat? No
Native vegetation
Condition of key veg value: Pisonia The interior forests were in good condition, with no evidence of insect attack. Some dieback present in the wind shorn community on the northeastern shoreline. Overall, good condition.
Condition of key veg value: Cordia Previously dead shrubs at BioCondition site M24 have reshooted. Nearly all significant *Cordia* communities mapped in 2006/7 are now dead. Two other *Cordia* plants were found beyond this patch. One was a small plant on the vegetation perimeter (~30cm height), on the sand on the northern part of the island. The other was a struggling ~1.5m high specimen in the *Abutilon albescens* 'glade' on the easterly side of the island. It has experienced dieback at some point and has re-shooted.
Condition of key veg value: *Argusia argentea* (octopus bush) Some dead *Argusia* plants along the vegetation perimeter on the eastern side of the island. New growth evident.
Condition of key veg value: herb/grassland/abutilon Good condition. The *Achyranthes aspera* (chaff flower), *Lepturus repens* (stalky grass) and *Stenotaphrum micranthum* (beach buffalo grass) were not found. The *Abutilon albescens* 'glade' shrubland to open shrubland of *Abutilon albescens.*
Anything else of interest, and changes or concerns? Eg dieback, drought – all veg communities No
Threats
Weeds
Does the island appear weed free? No weeds detected
Species observed and brief description.
Any future actions needed?
Pest/Invasive animals
Any signs of pest animals? Includes invertebrates like ants, grasshopper, scale insect etc. None detected

Species observed and brief description.
Any future actions needed? (eg pest monitoring or control work) No - other than continued biosecurity procedures for all visitors to island.
Human impacts/ threats
Any evidence of fires? No
Trampling, digging by humans None detected
Marine debris notes 314kg of marine debris removed, a total of 380 items.
Other
Infrastructure
Condition of infrastructure, any work required? Sign maintenance carried out – sign scrubbed to remove bird faeces, and a wooden plank secured on top to create an overhang to reduce bird faeces from covering up signage. A waterproof coat was also applied.
Cultural values
Anything observed, anything new or of concern? No
Monitoring and collections
Any other monitoring or surveys undertaken Debris removal and analysis – Ian Anderson (Tangaroa Blue Foundation), testing for signs of Highly Pathogenic Avian Influenza (HPAI) – Guy Weerasinghe (DAFF), *Pisonia* and *Cordia* sites checked by botanist Joy and assistant Larry Brushe, coral bleaching surveys and collection of coral and invertebrate samples to assess genetic diversity – Margena Marzoni and Cecilia Martin (JCU).
By whom and where is information to be stored? Parks Australia to retain and be keeper of data.
Areas of island visited
Sites (locations) or whole island Most of the island was traversed by team – about 4 hours spent on island. Some of the interior was unable to be accessed due to impenetrable vegetation.

Figure 83. Recent evidence of turtle nesting and hatchling tracks, despite being outside of the normal turtle laying season. Fiona Hagger ©

2.11.3 Birds

Only a brief visit was allocated for North East Cay, so an attempt was made to determine red-tailed tropicbird breeding effort. The previous two surveys (2022 and 2023) found unprecedented numbers of breeding pairs (McDougall et al 2023, McDougall 2024). Figure 84 shows the area inspected during the morning survey. Total numbers listed in Table 39 have been extrapolated and may represent an undercount of total numbers.

Tropicbird nests were located under young Argusia shrubs on the outer vegetation boundary against the beach, scattered throughout the strand zone between the beach vegetation and pisonia forest, underneath dense pisonia foliage and amongst the eastern rock scree and associated vegetation.

Leucistic (along with normal coloured) buff-banded rails were observed, along with purple swamphens (Figure 86).

No time was available to record masked booby and brown booby breeding effort, however, brown booby breeding effort was considerable, particularly on the southern half of the northwestern beach. Possibly 50 or more breeding pairs along a 500m stretch of beach.

Table 39. Bird species and breeding effort on North East Cay, Herald Cays.
Key: P= Present, U= Unknown, NR= Not recorded

North East Cay, Herald Cays, 16/07/2024		**Breeding effort and life stages**				
common name	**scientific name**	Nests	Chicks	Young	Breeding pairs	Adolescents and adults
red-tailed tropicbird	*Phaethon rubricauda roseotinctus*	P			*409	*415
Herald petrel	*Pterodroma heraldica*	0	0	0	0	0
great frigatebird	*Fregata minor*	P	0	0	P	P
lesser frigatebird	*Fregata ariel*	0	0	0	0	P
brown booby	*Sula leucogaster*	P	0	0	P	P
masked booby	*Sula dactylatra dactylatra*	P	0	0	P	P
red-footed booby	*Sula sula*	P	0	0	P	P
black noddy	*Anous minutus*	0	0	0	0	P
brown noddy	*Anous stolidus*	0	0	0	0	P
black-naped tern	*Sterna sumatrana*	0	0	0	0	0
bridled tern	*Onychoprion anaethetus*	0	0	0	0	0
crested tern	*Thalasseus bergii*	0	0	0	0	0
New Caledonian fairy tern	*Sternula nereis exsul*	0	0	0	0	0
roseate tern	*Sterna dougallii*	0	0	0	0	0
sooty tern	*Onychoprion fuscatus*	0	0	0	0	P
lesser sand plover	*Charadrius mongolus*	0	0	0	0	0
Pacific golden plover	*Pluvialis fulva*	0	0	0	0	0
red-necked stint	*Calidris ruficollis*	0	0	0	0	0
ruddy turnstone	*Arenaria interpres*	0	0	0	0	P
wandering tattler	*Tringa incana*	0	0	0	0	0

buff-banded rail	*Gallirallus philippensis tounelieri*	0	0	0	0	P
eastern reef egret	*Egretta sacra*	0	0	0	0	0
nankeen night-heron	*Nycticorax caledonicus*	0	0	0	0	0
purple swamphen	*Porphyrio melanotus*	0	0	0	0	3
sacred kingfisher	*Todiramphus sanctus*	0	0	0	0	2
welcome swallow	*Hirundo neoxena*	0	0	0	0	P

Figure 84. Survey area (yellow transect) for red-tailed tropicbirds during the 2024 voyage.
Andrew McDougall © Queensland Government

Figure 85. The unobtrusive sacred kingfisher is found on several islands within the Marine Park.
Andrew McDougall © Queensland Government

Figure 86. The purple swamphen is a resident breeding species on North East Cay.
Andrew McDougall © Queensland Government

2.12 South West Cay – Herald Cays

2.12.1 Vegetation

Table 40. Vegetation species found on South West Herald Cay on the 2024 voyage.

Scientific name/community	Common name
Abutilon albescens	lantern bush
Achyranthes aspera	chaff flower
Argusia argentea	octopus bush
Boerhavia albiflora var. *albiflora*	tar vine
Boerhavia mutabilis	pink flower tar vine
Cordia subcordata	sea trumpet
Ipomoea violacea	moon flower
Lepidium englerianum	beach peppercress
Lepturus repens	stalky grass
Plumbago zeylanica	native plumbago
Portulaca oleracea	pig weed
Sporobolus virginicus	marine couch
Tribulus cistoides	bulls head burr

Other species found on previous visits that were not found include:

- *Cordia subcordata* is a first record and collection of this species for NW Herald Cay. A single immature plant was growing on in an *Argusia argentea* community adjacent to the NE shoreline in the vicinity of BioCondition monitoring site M26.
- *Lepidium englerianum* (beach peppercress) which had not been recorded on South West Herald Cay since 2006 was recorded and collected during the 2024 visit.
- *Stenotaphrum micranthum* (beach buffalo grass) has not been recorded since 2006.

The *Argusia* along the vegetation perimeter of the eastern side of the island were mostly dead with no signs of re-shooting (Figure 87).

No weeds were detected.

Figure 87. Dead *Argusia* along the eastern side of South West Herald Cay. Fiona Hagger ©

Permanent BioCondition monitoring sites

During the July 2024 voyage, a BioCondition monitoring site, M26, was established in a *Plumbago zeylanica* closed herbland (Figure 88 & 89).

Table 41 contains the BioCondition attribute data recorded at site M26 during the 2024 voyage. The BioCondition site photographs (Figure 90) are four of the 10 site photographs taken at site M26 in 2024. Photographs are all taken from the centre point of the centre transect, the first facing along the transect bearing and then consecutively facing 90^{o}, 180^{0} and 270^{0} from the direction of the centre transect bearing.

No soil samples were collected from Site M26.

Figure 88. Joy and Larry Brushe establishing BioCondition site 26 on South West Herald Cay, with assistance from Fiona Hofman. Guy Weerasinge ©

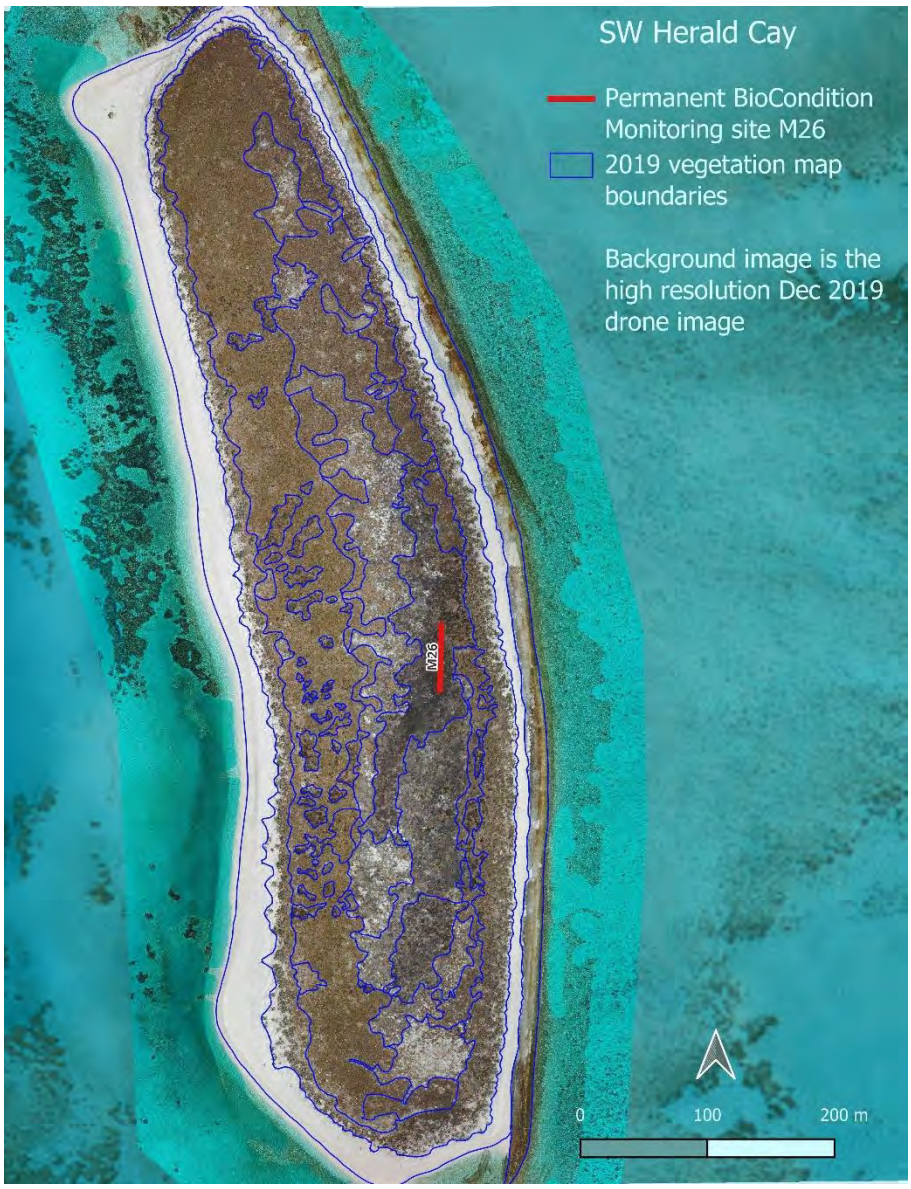

Figure 89. South West Herald Cay showing the location of BioCondition monitoring site M26 relative to 2019 vegetation map boundaries

Table 41. BioCondition monitoring site data recorded in BioCondition monitoring site M25 on South West Herald Cay on 16th July 2024.

Site	Site M26
Island	South West Herald Cay
Landform	Plateau in interior of coral cay
Soil	Calcareous sand with some organic content. No soil samples collected at this site.
Vegetation community description	Closed *Plumbago zeylanica* herbland
Transect start (WGS 84)	-16.985370 149.135252
Transect centre (WGS84)	-16.985596 149.13525
Transect end (WGS 84)	-16.985822 149.135242
Transect bearing (degrees)	175 degrees
Median canopy height/range (metres)	0.5 (0.1-0.8) m
Tree canopy cover %	N/A
Shrub canopy cover %	N/A

Basal area m^2/ha (at 30 cm height, calculated from stem diameters)	N/A
Total number of large trees/ha	N/A
Total no of trees per ha	N/A
Total number of tree stems/ha	N/A
Total no. live shrubs/ha	N/A
Recruitment of ecologically dominant layer (%)	N/A
Tree species richness	0
Tree species present	N/A
Shrub species richness	1
Shrub species present (layer in brackets)	*Abutilon albescens* (G)
Median ground layer height/range (metres)	0.6 (0.1-0.8) m
Total ground layer cover of native island species (%)	80.6%
Grass species richness	2
Grass cover (%)	3.0%
Grass species present in order of decreasing cover - most abundant first (cover in brackets)	*Sporobolus virginicus* (3%), *Lepturus repens* (<0.1%)
Forb (including vines) species richness	6
Forb species cover (%)	73.2%
Forb species present in order of decreasing cover - most abundant first (cover in brackets)	*Plumbago zeylanica* (63.6%), *Portulaca oleracea* (5.4%), *Tribulus cistoides* (4.3%), *Achyranthes aspera* (<0.1%), *Boerhavia mutabilis* (<0.1%), *Ipomoea violacea* (<0.1%)
Native shrub ground cover (%)	*Abutilon albescens* (4.4%)
Non-native plant cover (all strata) (%)	0.0%
Litter cover (%)	16.0%
Bare ground (%)	3.4%
Woody debris (m/ha of logs >0.5m long and >10cm wide)	0 m/ha
Soil pH	not measured
Notes	Large numbers of lesser frigate birds nesting in this vegetation throughout the interior of the cay.

A.

B.

C.

D.

Figure 90. BioCondition monitoring site M26, South West Cay (Herald Cays) taken on 16th July 2024. A. Facing South, B. Facing West, C. Facing North, D. Facing East. Joy Brushe ©

Plant collections

Thirteen plant specimens and associated site data were collected from South West Cay (Herald Cays) during the 2024 voyage including *Lepidium englerianum* (beach peppercress) which had not been collected on SW Herald Cay since 1983. The remaining 12 complement specimen collection during the 2019 voyage.

Other observations

The presence of large numbers of nesting lesser frigate birds as well as limited time prevented comprehensive searching of the entire cay. The perimeter of the island was traversed along the shoreline and areas on and adjacent to the shoreline were also examined. Only one complete traverse from east to west was undertaken, with limited searches of the interior in several places within a short distance from the shoreline.

2.12.2 Island Watch

A Parks Australia Island Watch summary proforma for South West Cay (Herald Cays) was completed by Fiona Hagger (Table 42).

Table 42. July 2024 Island Watch summary for South West Cay, Heralds Cays.

Island Watch category South West Cay (Herald Cays)
Key Natural Value Assessments
Birds
Formal bird survey by A. McDougall Yes
Any new or unusual sightings, or any changes to condition of nesting/roosting habitat? No
Island Geomorphology
Significant island changes No
Severe storm/cyclone damage? No
Turtles
Turtles seen on island No live turtles found – outside out of common breeding season. However, a deceased hatchling was found on the south east of the island, up in the perimeter of the vegetation.
Number of nests/body pits <20 old body pits found mostly on the western side of the island.
Any new or unusual sightings, or any changes to the condition of nesting habitat? No
Native vegetation
Condition of key veg value: *Argusia argentea* (octopus bush) The *Argusia* along the vegetation perimeter of the eastern side of the island were mostly dead with no signs of re-shooting. Some *Argusia* further inland from the eastern perimeter were showing signs of re-shooting, but not many.
Condition of key veg value: herb/grassland/abutilon Good condition, though not as lush and abundant as the June 2022 visit. All previously recorded species found, except for *Stenotaphrum micranthum* (beach buffalo grass) and *Lepidium englerianum* (beach peppercress).
Anything else of interest, and changes or concerns? Eg dieback, drought – all veg communities -
Threats
Weeds
Does the island appear weed free? No weeds detected
Species observed and brief description. -
Any future actions needed?

-
Pest/Invasive animals
Any signs of pest animals? Includes invertebrates like ants, grasshopper, scale insect etc. No
Species observed and brief description. -
Any future actions needed? (eg pest monitoring or control work) No - other than continued biosecurity procedures for all visitors to island.
Human impacts/ threats
Any evidence of fires? No
Trampling, digging by humans None detected
Marine debris notes 307 items removed, making a total of 116kg. Items collected included 3 FADs, 87 plastic drink bottles and 4 buoys.
Other
Infrastructure
Condition of infrastructure, any work required? Sign maintenance carried out – sign scrubbed to remove bird faeces, and a wooden plank secured on top to create an overhang to reduce bird faeces from covering up signage. A waterproof coat was also applied.
Cultural values
Anything observed, anything new or of concern? The previous Commonwealth Gov signage is still standing but is very sun-faded and largely covered with guano.
Monitoring and collections
Any other monitoring or surveys undertaken Debris removal and analysis – Ian Anderson (Tangaroa Blue Foundation), testing for signs of Highly Pathogenic Avian Influenza (HPAI) – Guy Weerasinghe (DAFF), BioCondition site established by botanist Joy and assistant Larry Brushe, coral bleaching surveys and collection of coral and invertebrate samples to assess genetic diversity – Margena Marzoni and Cecilia Martin (JCU).
By whom and where is information to be stored? Parks Australia to retain and be keeper of data
Areas of island visited
Sites (locations) or whole island Most of the island was traversed by team – about 4 hours spent on island.

2.12.3 Birds

Most red-tailed tropicbird nests were located on the eastern side of the cay. The vegetation had been stripped back from cyclone/storm influences and many of the tropicbird nests were very exposed. Most still found some sort of cover, whether it was thick grass, the base of shrubs or rocks. Many nests were in exposed ground depressions, well away from the beach edge. Much of the beach rock observed in earlier surveys was infilled or buried by sand.

A rudimentary “nest per linear metre of cay perimeter” was determined. Interestingly, South West Cay had one nest per 7.48m this season while North East Cay had one nest per 7.4m. This is an oversimplified summary of nest density, whereas nest numbers per square metre would be more informative. However, there was no capacity to calculate the total useable nest area on this voyage.

Despite the extrapolated count for North East Cay, it is likely the Herald Cays again hosted well over 600 pairs of red-tailed tropicbirds.

Table 43. Bird species and breeding effort on South West Cay, Herald Cays.
Key: P= Present, U= Unknown, NR= Not recorded

South West Cay, Herald Cays, 16/07/2024		Breeding effort and life stages				
common name	**scientific name**	Nests	Chicks	Young	Breeding pairs	Adolescents and adults
red-tailed tropicbird	*Phaethon rubricauda roseotinctus*	171	19	64	254	164
Herald petrel	*Pterodroma heraldica*	0	0	0	0	0
great frigatebird	*Fregata minor*	P	0	0	P	P
lesser frigatebird	*Fregata ariel*		P	P	*1800	P
brown booby	*Sula leucogaster*	U/NR	0	0	U/NR	P
masked booby	*Sula dactylatra dactylatra*	7	1	0	P	9
red-footed booby	*Sula sula*	P	0	0	P	P
black noddy	*Anous minutus*	0	0	0	0	0
brown noddy	*Anous stolidus*	P	P	P	P	P
black-naped tern	*Sterna sumatrana*	0	0	0	0	20
bridled tern	*Onychoprion anaethetus*	0	0	0	0	0
crested tern	*Thalasseus bergii*	0	0	0	0	20
New Caledonian fairy tern	*Sternula nereis exsul*	0	0	0	0	0
roseate tern	*Sterna dougallii*	0	0	0	0	0
sooty tern	*Onychoprion fuscatus*	P	P	P	P	P
lesser sand plover	*Charadrius mongolus*	0	0	0	0	0
Pacific golden plover	*Pluvialis fulva*	0	0	0	0	3
red-necked stint	*Calidris ruficollis*	0	0	0	0	0
ruddy turnstone	*Arenaria interpres*	0	0	0	0	4
wandering tattler	*Tringa incana*	0	0	0	0	0
buff-banded rail	*Gallirallus philippensis tounelieri*	0	0	0	0	P
eastern reef egret	*Egretta sacra*	0	0	0	0	1
nankeen night-heron	*Nycticorax caledonicus*	0	0	0	0	0
purple swamphen	*Porphyrio melanotus*	0	0	0	0	0
sacred kingfisher	*Todiramphus sanctus*	0	0	0	0	0
welcome swallow	*Hirundo neoxena*	0	0	0	0	0

* The lesser frigatebird breeding pair count is a very rough estimation, calculated post survey through photos and the approximate area used on the eastern half of South West Cay.

Figure 91. A large colony of ground-nesting lesser frigatebirds on the eastern half of South West Cay. Andrew McDougall © Queensland Government

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Appendices

Appendix 1. Plot orientation and data recorded at permanent BioCondition monitoring sites

Plots are located in representative areas within a vegetation community.

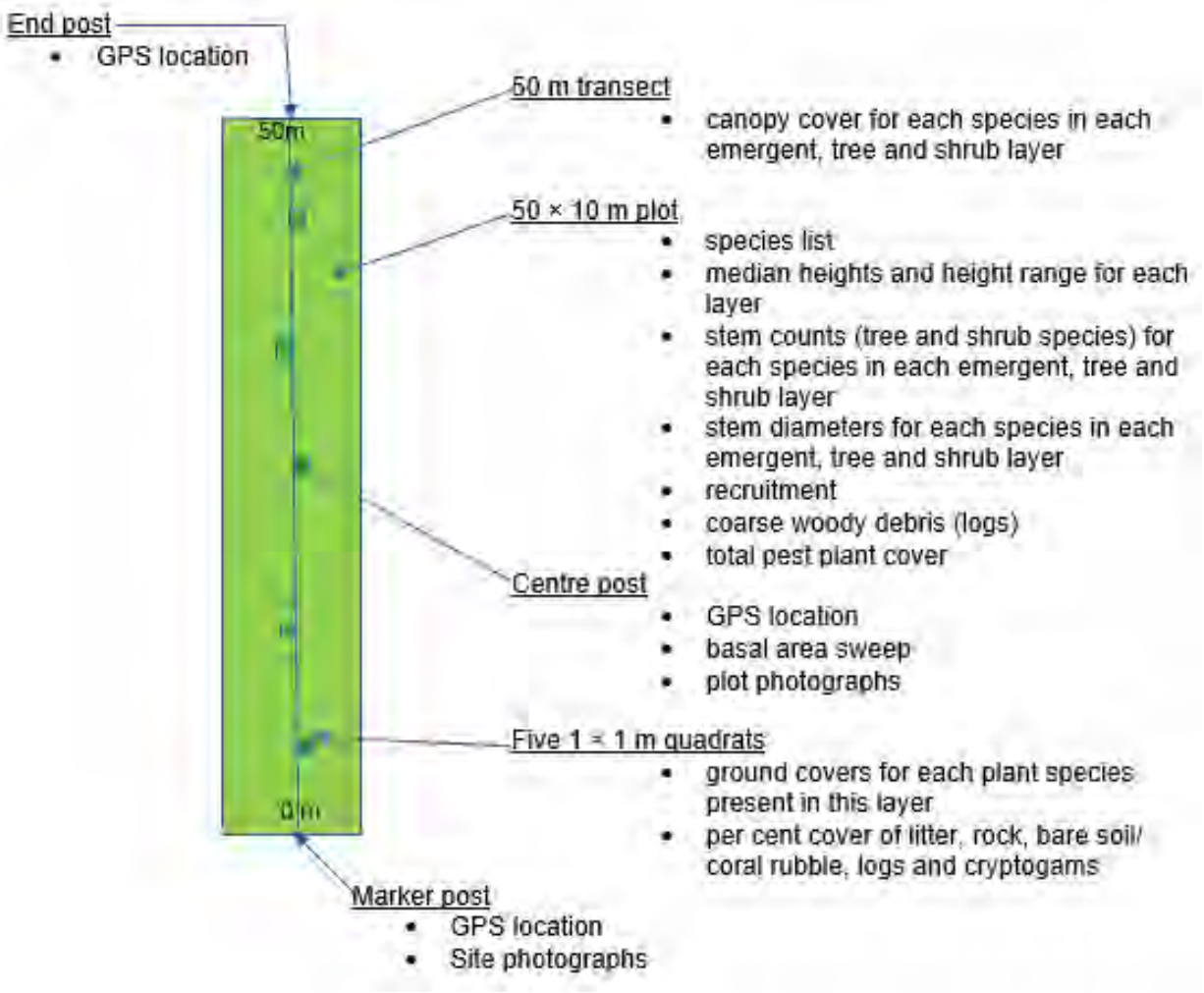


Figure A. 1 Plot orientation and data recorded at each permanent vegetation monitoring site.

Site descriptions

Site descriptions for each site are documented. These descriptions include all site attributes that do not change including GPS coordinates and location description, area/width of the vegetation represented by the plot, a position in landscape diagram, landform element, landform pattern, slope, altitude, substrate, plot size and plot orientation.

Other data recorded:

- site number, recorder names, date, start and finish time
- GPS location of plot centre and end points (WGS84 datum), location description, transect bearing
- vegetation structural layers present, median height and height range of each layer
- comprehensive species list for each layer
- ground layer per cent foliage projected cover for each vascular plant species, litter, bare ground, rock outcrop, logs and cryptograms

- per cent crown cover by species for each layer for the emergent, tree and shrub layers (if present)
- from the species list and cover measurements, the following can be derived:
    - vegetation cover in each layer – total and differentiated by growth form
    - native cover in each layer
    - introduced plant (weed) cover in each layer
    - species richness – total and differentiated by growth form for each layer
    - native species richness – total and differentiated by growth form
    - introduced plant (weed) species richness – total and differentiated by growth form
    - species richness in each layer present – total and differentiated by growth form
    - native species richness in each layer present – total and differentiated by growth form
    - introduced plant (weed) species richness in each layer present – total and differentiated by growth form
    - estimate of overall introduced plant (weed) cover (including herbaceous and woody weeds and plantings)
- stem counts of woody species (if present) per species per layer in the tree and shrub layers; including standing dead plants (count per hectare can be calculated for each species, growth form and layer)
- basal area sweep measurements of woody species (if present) per species per layer
- girth measurements for woody species if present to obtain average diameter of large trees or shrubs (basal area per hectare can be calculated for each species, growth form and layer)
- evidence of recruitment of woody species
- topsoil depth, colour and texture
- soil samples are collected for analysis
- total length of logs (coarse woody debris)
- presence of shearwater burrows or other evidence of bird nesting
- evidence of turtle nesting
- other disturbance type (e.g., evidence of wind damage to vegetation, wind erosion, saltwater inundation, fire, mowing/slashing, other human disturbance) and severity
- patch size
- community extent
- community area
- community context (extent of connectivity to other native vegetation communities)
- evidence of disease, death, dieback, presence of scale insect, insect attack and leaf drop
- recent mean monthly climatic data
- ten site photographs- a landscape and portrait from 0m looking along the transect and eight from the plot centre – a landscape and portrait photo facing the direction of the bearing and at 90, 180 and 270 degrees from the direction of the bearing.

Structure of vegetation communities was determined using **Table A.1**

Table A.1. Vegetation structure classifications based on growth form, height and cover.

Proj. foliage cover	>70%	>30–70%	10–30%	<10%
Crown class	Dense/closed	Mid-dense	Sparse	Very sparse
Crown cover %[1]	>80%	>50–80%	20–50%	<20%
GROWTH FORM[2]	**Structural formation classes (qualified by height)**			
Trees >30 m	tall closed forest TCF	tall open forest TOF	tall woodland TW	tall open woodland TOW
Trees 10–30 m	closed forest CF	open forest OF	woodland W	open woodland OW
Trees 2–10 m	low closed forest LCF	low open forest LOF	low woodland LW	low open woodland LOW
Shrubs 2– 8 m	closed scrub CSC	open scrub OSC	tall shrubland TS	tall open shrubland TOS
Shrubs 1–2 m	closed heath CHT or closed shrubland CS	open heath OHT or shrubland S	shrubland S	open shrubland OS
Shrubs <1 m	dwarf closed shrubland DCS	dwarf open heath DOHT	dwarf shrubland DS	dwarf open shrubland DOS
Succulent shrub	NA	succulent shrubland	succulent shrubland SS	open succulent shrubland OSS
Hummock grasses	NA	NA	hummock grassland HG	open hummock grassland
Tussock grasses	closed tussock grassland CTG	tussock grassland TG	open tussock grassland OTG	sparse tussock grassland STG
Herbs[3]	closed herbland CH	herbland H	open herbland OH	sparse herbland SH
Forbs	closed forbland CFB	forbland FB	open forbland OFB	sparse forbland SFB
Rush	closed rushland CR	rushland R	open rushland OR	sparse rushland SR
Vines	closed vineland CVI	vineland VI	open vineland OVI	sparse vineland SVI
Ferns	closed fernland CFN	fernland FN	open fernland OFN	sparse fernland SFN
Sedges	closed sedgeland CV	sedgeland V	open sedgeland OV	sparse sedgeland SV

Appendix 2. Plant species recorded on all Coral Sea Marine Park islands

Table A.2. Native island species recorded on all Coral Sea islands.

✓	Recently recorded - 2019 to 2024 Parks Australia voyages (Hemson et al 2020, Brushe 2021, Chapman et al, 2022 McDougall and Brushe 2023, Director of National Parks 2024) and /or the 2016 Bush Blitz voyage (Bush Bliyz 2016)
✓	Species was recorded prior to 2016
Dates in blue	The latest date recorded for species not recorded during 2016 to 2024 voyages. Dates are from herbarium records and the following reports: Hindwood, Keith & Serventy 1963, Heatwole 1967, Heatwole 1969, Stokes 1979, Stokes and McNamara 1979, Stokes and Skeat 1980, Skeat 1981, Skeat and Henry 1981, Shaughnessy and Hill 1983, Hicks 1983, Telford, 1991, Donaldson 1994, Batianoff 1997, Batianoff et al. 2008, Wilgar 93
	Species recorded on the island prior to the 2016 and 2019 to 2024 voyages
	No record for the island prior to 2019 to 2024 voyages
Life form:	G = grass, Ga = annual/short lived grass, Gp = perennial grass, Ha = annual/short-lived herb; Hp = perennial herb; V = vine; S = shrub, ST = tall shrub/small tree (2-5m); T = tree (>2m).
Dispersal mechanism:	B = Birds, O = Ocean Currents, W = Wind, H = Human activity.

Scientific name	Common name	Family	Life form	Dispersal mechanism	Reef or island group	Magdelaine Cays	Herald Cays		Coringa Islets		Tregrosse Reef				Willis Islets			Cato Reef	Lihou Reef					Wreck Reef		Mellish Reef	Total all cays	Total no of cays on which each species is confirmed as currently established during 2016 to 2024 voyages
					Cay	South Cay	North East Cay	South West Cay	Chilcott Islet	South West Islet	East Diamond	West Diamond	Central Diamond	South Diamond	South Islet	Mid Islet	North Cay	Cato Island	South West Cay	Hermit Crab Islet	Turtle Islet	Lorna Cay	Georgina Cay	Bird Islet	Porpoise Cay	Herald Beacon Cay		
					Vegetated area (ha)	32	42.7	14.7	13	10	10.4	9.8	10.9	4.2	4.9	3.4	18.9	14.8	5.7	8.1	2.5	6.4	2.8	8.4	0.2	3.8		
					Max elevation (m)	12	5	7	8	13.5	8	6	8	12	?6?9	7.5	?3	6	5	5	6	?3	6	3.5	3	2		
Boerhavia albiflora var. *albiflora*	tar vine	Nyctaginaceae	Hp	B		✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓	✓	✓	✓ ✓	✓ ✓	✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓		**21**
Achyranthes aspera	chaff flower	Amaranthaceae	Ha	B		✓ ✓	2007	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓	✓	✓ ✓	✓ ✓	✓ ✓	✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓	✓ ✓	✓ ✓	✓	✓		**20**
Lepturus repens	stalky grass	*Poaceae*	Gp	O B		✓ ✓	2006	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓	✓	✓ ✓	✓ ✓	✓ ✓	✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓		**20**
Portulaca oleracea	pig weed	Portulaceae	Hap	O B		✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓	✓	✓	✓ ✓	✓ ✓	✓ ✓	✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓	✓ ✓	✓ ✓	✓ ✓			**20**
Tribulus cistoides	bulls head burr	Zygophyllaceae	Hap	B O		✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓	✓	✓ ✓	✓ ✓	✓ ✓	✓	✓ ✓	✓	✓ ✓	✓ ✓	✓		✓				**18**
Stenotaphrum micranthum	beach buffalo grass	Poaceae	Ga	O		✓ ✓	2006	2006	✓ ✓	1994	✓	✓	✓	✓	✓	✓	✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓	✓ ✓	✓ ✓				**16**
Abutilon albescens	lantern bush	Malvaceae	S	B W		✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓	✓	✓	✓ ✓	✓ ✓			✓ ✓	✓ ✓	✓ ✓		✓ ✓					**15**
Argusia argentea	octopus bush	Boraginaceae	ST	O		✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓	✓	✓ ✓	✓ ✓	✓ ✓		✓ ✓				✓						**13**
Plumbago zeylanica	native plumbago	Plumbaginaceae	Hp	B		✓ ✓		✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓	✓	✓ ✓		✓					1980							**9**
Ipomoea violacea	moon flower	Convolvulaceae	Vp	O B		✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓	✓								1983							**8**
Boerhavia mutabilis	pink flower tar vine	Nyctaginaceae	Hp	B		✓ ✓	✓ ✓	✓	✓	✓ ✓					✓													**6**
Cordia subcordata	sea trumpet	Boraginaceae	ST	O		✓ ✓	✓ ✓	✓one plant	✓ ✓	✓ ✓	✓ ✓	✓			✓(one small plant)														**6**
Lepidium englerianum	beach peppercress	Brassicaceae	Ha	O		✓ ✓	✓ ✓	✓ ✓	✓ ✓	2007	✓ ✓						✓										1961		**6**
Sporobolus virginicus	marine couch	Poaceae	Gp	O B		✓ ✓	✓ ✓	✓ ✓	2007	1994					✓ ✓	✓ ✓	✓												**6**
Canavalia rosea	beach bean	Leguminosae	Vp	O		✓ ✓					✓ ✓	1961	✓																**3**
Digitaria bicornis	crabgrass	Poaceae	Ga	?B		✓				✓																			**2**
Ipomoea pes-caprae subsp. *brasiliensis*	goats foot convolvulus	Leguminosae	Vp	O							✓				✓ ✓						1984								**2**
Pisonia grandis	pisonia	Nyctaginaceae	T	B		✓ ✓	✓ ✓			1994																			**2**
Ximenia americana	yellow plum	Olacaceae	ST	?O			1997					✓ ✓																	**1**
Colubrina asiatica	Asian naked wood	Rhamnaceae	S	O		2007																							**0**
Calophyllum inophyllum	Alexandrian laurel	Clusiaceae	ST	O			1996 transient																						**0**
Cocos nucifera (not native to CSMP cays)	coconut	Arecaceae	T	H O			1997 transient								✓transient single juvenile plant ✓pot plant							✓ transient single seedling			✓ transient single juvenile plant		**0**
Digitaria ctenantha	comb finger grass	Poaceae	Ga	?B		1987	1997			1984																			**0**
Guilandina bonduc	knicker nuts	Caelalpiniaceae	Vp	O			1997 transient single seedling																						**0**
Scaevola taccada	Cardwell cabbage	Goodeniaceae	S	O							✓ transient-one juvenile not present in later voyages																		**0**
Current (confirmed 2016 or later) total number of established native-cay species						17	11	13	13	12	14	12	11	9	11	10	8	7	7	7	7	7	7	6	6	4	3	195	Total no of cays = 21
No of established species recorded for the first time during the 2016 to 2024 voyages						1	0	2	1	1	3	11	11	3	2	2	8	0	1	0	0	7	0	1	1	1	56	Total no of native cay plant species =19
No of established species previously recorded but not seen in 2016 to 2024 voyages						2	5	1	1	5	0	1	0	0	0	0	0	0	0	0	3	0	0	0	0	1	19	
Number of transient only species on each cay						0	3	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	9	
New cay species recorded during 2016 to 2024 voyages on the 17 cays which have been previously surveyed (Central Diamond Islet, North Cay (Willis Islets) and Lorna cay (lihou Reef) had not been surveyed prior to 2021/2022)																											30	

Table A.3. Weeds (introduced plant species) recorded on all CSMP Cays.

✓	Recorded during 2016 to 2024 Parks Australia voyages
%	Species was recorded prior to 2016
Date	The latest date recorded for species not recorded during 2016 to 2023 voyages (dates are from herbarium records and the following reports -Donaldson 1994, Batianoff et al. 2008) and Bureau of Meteorology 2012.
	Species recorded prior to the 2016 to 2024 voyages
	No record for this island prior to 2016 to 2024 voyages
Life form	Ga = annual grass, Ha = annual/short-lived herb; H = perennial herb
Dispersal mechanism	According to Batianoff et al 2012, weeds are introduced and spread by human activity

Scientific name	Common name	Family	Life form	Dispersal mechanisms	Willis Islets	Wreck Reef	Total Number of Islands with each species
					South Islet	Bird Islet	
Alternanthera pungens	khaki weed	Amaranthaceae	Ha	H	**1995**		1
Amaranthus viridis	green amaranth	Amaranthaceae	Ha	H	✓	✓ %	2
*Argemone ochroleuca**	Mexican poppy		H	H	**2012***		1*
Cenchrus echinatus	Mossman river grass	Poaceae	Ha	H	✓ %		1
Cynodon dactylon var. *dactylon*	common couch	Poaceae	Hp	H	**2007**	✓ %	2
Dactyloctenium aegyptium	coast button grass	Poaceae	Ha	H	✓ %		1
Digitaria ciliaris	summer grass	Poaceae	H	H	✓		1
Eleusine indica	crows foot grass	Poaceae	Ha	H	✓ %		1
Euphorbia cyathophora	dwarf poinsettia	Euphorbiaceae	Ha	H	✓ %		1
Euphorbia prostrata	red caustic creeper	Euphorbiaceae	Ha	H	✓ %		1
Solanum americanum	nightshade	Solanaceae	Ha	H		✓	1
Trianthema portulacastrum	black pigweed	Aizoaceae	Hp	H	✓ %		1
Tridax procumbens	tridax daisy	Asteraceae	Ha	H	**2007**		1
Gynandropsis gynandra	cat's whiskers	Capparaceae	Ha	H	✓ %		1

**Argemone ochroleuca* was reported as present in the Building Rectification Plan (Bureau of Meteorology 2012) but there are no other records for the presence of this species on South Islet.

Appendix 3. Collection status of all plant species currently or previously present on all CSMP islands

Table A.4. Plant species collected from CSMP Islands.

Collected during 2016 to 2024 voyages and previously collected prior to 2016

Currently present, latest collection is 2007 or earlier (to be collected at next opportunity).

First collected during 2016 to 2024 voyages.

Dates are the latest years of collection
Dates in cells with no shading are the latest dates that species not currently confirmed present were collected.
Information for Introduced plant species (weeds) is shown in red.

Scientific name	Common name	Family	Magdelaine Cays	Herald Cays		Coringa Islets		Tregrosse Reef				Willis Islets			Cato Reef	Lihou Reef					Wreck Reef		Mellish Reef	Total no of cays on which each species was collected 2016 to 2023	Total no of cays on which each species was collected for the first time between 2016 to 2024
			South Cay	North East Cay	South West Cay	Chilcott Islet	South West Islet	East Diamond Islet	West Diamond Islet	Central Diamond Islet	South Diamond Islet	South Islet	Mid Islet	North Cay	Cato Island	South West Cay	Hermit Crab Islet	Turtle Islet	Lorna Cay	Georgina Cay	Bird Islet	Porpoise Cay	Herald Beacon Cay		
Abutilon albescens	lantern bush	Malvaceae	2023	2016 2023	2019 2024	2023	2016	2016 2021	2021	2021	2021	2023	2022			2021	2021	2021		2021				15	5
Achyranthes aspera	chaff flower	Amaranthaceae	2023	1997	2024	2023	2016	2021	2021	2021	2021	2023	2022	2022	2022	2021	2021	2021	2021	2021	2022	2022	2023	20	9
Alternanthera pungens	kahki weed	Amaranthaceae										1995												0	0
Amaranthus viridis	green amaranth	Amaranthaceae										2023									2022			2	1
Argusia argentea	octopus bush	Boraginaceae	2019	2023	2024	2023	2016	2016 2021 2022	2021	2021	2021	2023	2022		2022				2021					13	5
Boerhavia albiflora var. *albiflora*	tar vine	Nyctaginaceae	2023	2022	2019 2024	2023	2016 2019	2016 2021	2021	2021	2021	2023	2022	2022	2022	2021	2021	2021	2021	2021	2022	2022	2023	21	6
Boerhavia mutabilis	pink flower tar vine	Nyctaginaceae	2023	2016 2022 2023	2024	2023	2016 2019					2024												6	3
Calophyllum inophyllum	Alexandrian laurel	Clusiaceae		1996 - transient																				0	0
Canavalia rosea	beach bean	Leguminosae	2019					2016 2021	1961	2021														3	1
Casuarina equisetifolia (planted)	coastal sheoak	Casuarinaceae										2007												0	0
Cenchrus echinatus	Mossman River grass	Poaceae										2023												1	0
Colubrina asiatica	Asian naked wood	Rhamnaceae	2007																					0	0
Cordia subcordata	sea trumpet	Boraginaceae	2019	2022 2023	2024	2023	2016	2016 2021 2022	2021			2023												8	3
Cynodon dactylon var. dactylon	common couch	Poaceae										2007									2022			1	0
Dactyloctenium aegyptium	coast button grass	Poaceae										2023												1	0
Digitaria ciliaris	summer grass	Poaceae										2023												1	1
Digitaria bicornis	crabgrass	Poaceae					2019																	1	1
Digitaria ctenantha	comb finger grass	Poaceae	1987	1997			1984																	0	0
Eleusine indica	crows foot grass	Poaceae										2023												1	0
Euphorbia cyathophora	dwarf poincettia	Euphorbiaceae										2023												1	0
Euphorbia prostrata	red caustic creeper	Euphorbiaceae										2023												1	0
Guilandina bonduc	knicker nuts	Caelalpiniaceae		1997 transient single seedling																				0	0
Gynandropsis gynandra	cat's whiskers	Capparaceae										2023												1	1
Ipomoea pes-caprae subsp. *brasiliensis*	goats foot convolvulus	Leguminosae						2021				2023						1984						2	1
Ipomoea violacea	moon flower	Convolvulaceae	2007	2016 2023	2024	2023	2016 2019	2021	2021	2021								1983						7	2
Lepidium englerianum	beach peppercress	Brassicaceae	2023	2016 2022 2023	2024	2023	1983	2021 2022						2022									1961	6	2
Lepturus repens	stalky grass	*Poaceae*	2019, 2023	2006	2024	2019 2023	2016	2016 2021	2021	2021	2021	2023	2022	2022	2022	2021	2021	2021	2021	2024	2022	2022	2023	20	9
Pisonia grandis	pisonia	Nyctaginaceae	2007	2016 2023			1991 (no longer present)																	1	0
Plumbago zeylanica	native plumbago	Plumbaginaceae	2007		2024	2023	2019	2016 2021	2021	2021	2021		2024					1980						8	5
Portulaca oleracea	pig weed	Portulaceae	2007	2023	2024	2023	2016	2016 2021	2021	2021	2021	2023	2022	2022	2022	2021	2021	2021	2021	2021	2022	2022		19	9
Scaevola taccada	Cardwell cabbage	Goodeniaceae						2021 (transient)																1	1
Solanum americanum	nightshade	Solanaceae																			2022			1	1
Sporobolus virginicus	marine couch	Poaceae	2019	2023	2019 2024							2023	2022	2022										6	1
Stenotaphrum micranthum	beach buffalo grass	Poaceae	2023	2006	2006	2019 2023		2016 2021	2021	2021	2021	2023	2022	2022	2022	2021	2021	2021	2021	2021	2022			16	8
Trianthema portulacastrum	black pigweed	Aizoaceae										2023												1	0
Tribulus cistoides	bulls head burr	Zygophyllaceae	2007	2016 2023	2019 2024	2023	2007	2016 2021	2021	2021	2021	2023	2022	2022	2022	2021	2021	2021	2021		2022			16	8
Tridax procumbens	tridax daisy	Asteraceae										2007												0	0
Ximenia americana	yellow plum	Olacaceae		1997					2021															1	0
Total no of species recorded on each cay 2016 to 2024			17	11	13	13	12	15	12	11	9	21	10	8	7	7	7	7	7	6	9	4	3	209 total records	
Total no of species collected on each cay 2016 to 2024			11	11	13	13	11	15	12	11	9	21	10	8	7	7	7	7	7	6	9	4	3	202 total collections	
Total no of species not collected prior to 2016 to 2024 voyages			0	0	3	1	1	11	11	11	8	5	7	8	0	1	0	0	7	2	3	3	1	83 first collections	

Notes:

- Identification of two specimens collected in 2019 (*Sporobolus virginicus* from South East Magdelaine Cay and *Lepturus repens* from South West Coringa Islet) was confirmed by Qld Herbarium but the specimens were not kept.
- Three specimens of *Boerhavia* (two from South West Coringa Islet, one from South West Herald Cay) collected in 2019 and kept by Qld Herbarium could not be identified as they were infertile.

Appendix 4. Coral Sea Marine Park BioCondition permanently marked BioCondition monitoring sites established and monitored 2019-2024

Table A.5. CSMP BioCondition sites established and surveyed between November 2019 and July 2024.

Grasslands, herblands & ephemeral shrublands
Lepturus grasslands
Sporobolus grasslands
Stenotaphrum grasslands/herblands
Herblands and vinelands
Abutilon shrubland -Dynamic - transitions with grassland/herbland

Shrublands and forests	
Abutilon/ Cordia shrublands	2019 - surveyed by QPWS (Rhonda Melzer and Bridget Armstrong)
Argusia coastal shrublands	
Argusia interior shrublands	2021, 2022, 2023 and 2024 - surveyed by Joy Brushe
Pisonia communities	

Reef or Island Group	Island	Site	Bearing (degrees)	Vegetation community summary description	Vegetation community full description	Coordinate location on centre transect	Latitude	Longitude	Datum	Dates surveyed
Herald Cays	North East Herald Cay	NEH01	30	*Pisonia community*	*Pisonia grandis* closed scrub to low closed forest	Start	-16.9432	149.19754	WGS84	2019
						End	-16.94287	149.19786	WGS84	
		NEH02	30	*Pisonia community*	*Pisonia grandis* closed scrub to low closed forest	Start	-16.93963	149.20119	WGS84	2019
						End	-16.93926	149.20142	WGS84	
		M24	25	*Abutilon/ Cordia* shrubland	*Abutilon albescens/ Cordia subcordata* closed shrubland with a very sparse ground cover dominated by *Ipomoea violacea* and *Boerhavia mutabilis*	Start	-16.944022	149.201028	WGS84	3/06/2023
						Centre	-16.9438372	149.2011496	WGS84	
						End	-16.943655	149.201271	WGS84	
	South West Herald Cay	M26	175	*Plumbago zeylanica* herbland	*Plumbago zeylanica* closed herbland	Start	-16.98537	149.135252	WGS84	16/07/2024
						Centre	-16.985596	149.13525	WGS84	
						End	-16.985822	149.135242	WGS84	
Magdelaine Cays	South East Magdelaine Cay	SEM01	190	*Pisonia community*	*Pisonia grandis* scrub to low closed forest	Start	-16.60173	150.3385	WGS84	2019
						End	-16.601998	150.338463	WGS84	
		M25	313	*Abutilon* shrubland -? Dynamic - transitions with *Lepturus* grassland	*Abutilon albescens* shrubland with a mid-dense ground layer dominated by *Lepturus repens*	Start	-16.603789	150.335946	WGS84	5/06/2023
						Centre	-16.603631	150.335812	WGS84	
						End	-16.603478	150.335664	WGS84	
Willis Islets	South Islet	M01	SSW	*Sporobolus* grassland	*Sporobolus virginicus* grassland	Start	-16.286683	149.963931	WGS84	19/10/2020
						End	-16.287095	149.963801	WGS84	
		M02	SSE	*Ipomoea pes-caprae* vineland/herbland	*Ipomoea pes-caprae* subsp. *brasiliensis/ Sporobolus virginicus* herbland	Start	-16.287024	149.964782	WGS84	19/10/2020
						End	-16.287404	149.965064	WGS84	
		M03	N	*Sporobolus* grassland	*Sporobolus virginicus* grassland	Start	-16.288353	149.965753	WGS84	19/10/2020
						End	-16.287901	149.965726	WGS84	
		M04	NW	*Argusia coastal* shrubland	A*rgusia argentea* dwarf shrubland	Start	-16.28711	149.963559	WGS84	19/10/2020
						End	-16.286805	149.963222	WGS84	
	North Cay	M20	236	*Boerhavia albiflora* var. *albiflora herbland* -with *Stenotaphrum* and *Portulaca*	Closed herbland dominated by *Boerhavia albiflora* var. *albiflora, Stenotaphrum micranthum* and *Portulaca oleracea*	Start	-16.112418	150.00349	WGS84	6/06/2022
						Centre	-16.112525	150.003292	WGS84	
						End	-16.112627	150.003078	WGS84	
	Mid Islet	M21	362	*Argusia* interior shrubland	*Argusia argentea* shrubland with a dense ground layer dominated by *Sporobolus virginicus* and lower foliage of *A. argentea* shrubs	Start	-16.213441	149.991876	WGS84	6/06/2022
						Centre	-16.213299	149.991892	WGS84	
						End	-16.213174	149.991921	WGS84	
		M21b	181	*Argusia* interior shrubland	*Argusia argentea* shrubland with mid dense to dense ground layer dominated by *Sporobolus virginicus*	Start	-16.213616	149.991885	WGS84	10/07/2024
						Centre	-16.213831	149.991862	WGS84	
						End	-16.214065	149.991861	WGS84	
Tregrosse Reef	West Diamond Islet	M05	70	*Lepturus/Ipomoea violacea* grassland/vineland	Closed grassland dominated by *Lepturus repens, Boerhavia albiflora* var. *albiflora* and *Ipomoea violacea*	Start	-17.428198	150.808531	WGS84	13/07/2021
						Centre	-17.42813	150.808768	WGS84	
						End	-17.428094	150.808999	WGS84	
		M06	215	*Argusia* coastal shrubland	*Argusia argentea* shrubland with a sparse ground layer dominated by *Boerhavia albiflora* var. *albiflora*	Start	-17.442672	151.072474	WGS84	14/07/2021, 2/06/2022
						Centre	-17.442822	151.072333	WGS84	

Reef or Island Group	Island	Site	Bearing (degrees)	Vegetation community summary description	Vegetation community full description	Coordinate location on centre transect	Latitude	Longitude	Datum	Dates surveyed
						End	-17.443009	151.072141	WGS84	
	East Diamond Islet	M07	53	*Argusia* coastal shrubland	*Argusia argentea* closed scrub with a mid-dense ground layer dominated by *Lepturus repens, Achyranthes aspera* and *Boerhavia albiflora* var. *albiflora*	Start	-17.443344	151.072302	WGS84	15/07/2021
						Centre	-17.443249	151.072508	WGS84	
						End	-17.443103	151.072692	WGS84	
		M08	14	*Achyranthes /Canavalia* herbland	Closed herbland dominated by *Achyranthes aspera, Canavalia rosea, Lepturus repens* and *Boerhavia albiflora* var. *albiflora*	Start	-17.44008	151.075571	WGS84	15/07/2021
						Centre	-17.439878	151.075664	WGS84	
						End	-17.439681	151.075759	WGS84	
		M23	225	*Cordia subcordata* shrubland	*Cordia subcordata* patchy open scrub with a sparse ground layer of Lepturus *repens* and *Tribulus cistoides* between patches, very little ground cover under *C. subcordata* patches	Start	-17.441297	151.074427	WGS84	31/05/2023
						Centre	-17.441425	151.074231	WGS84	
						End	-17.441539	151.07406	WGS84	
	South Diamond Islet	M09	112	*Abutilon* shrubland with *Plumbag*o	*Abutilon albescens* shrubland with a dense ground layer dominated by *Plumbago zeylanica* and *Achyranthes aspera*	Start	-17.658041	150.826521	WGS84	16/07/2021
						Centre	-17.658149	150.826732	WGS84	
						End	-17.658243	150.826926	WGS84	
Lihou Reef	Hermit Crab Islet	M10	90	Achyranthes herbland	Closed herbland dominated by *Achyranthes aspera*	Start	-17.415559	151.871255	WGS84	20/07/2021
						Centre	-17.415581	151.871482	WGS84	
						End	-17.415619	151.871733	WGS84	
		M11	98	*Lepturus/Achyranthes* grassland	Closed grassland dominated by *Lepturus repens* and *Achyranthes aspera*	Start	-17.414737	151.871298	WGS84	20/07/2021
						Centre	-17.414787	151.871534	WGS84	
						End	-17.414835	151.871759	WGS84	
	Turtle Islet	M12	73	*Lepturus* grassland	Closed grassland dominated by *Lepturus repens*	Start	-17.116218	152.00332	WGS84	22/07/2021
						Centre	-17.116203	152.003554	WGS84	
						End	-17.116176	152.003794	WGS84	
		M13	300	*Stenotaphrum*/*Portulaca* grassland/ herbland	Grassland dominated by *Stenotaphrum micranthum* and *Portulaca oleracea*	Start	-17.117094	152.003779	WGS84	22/07/2021
						Centre	-17.116973	152.003574	WGS84	
						End	-17.11685	152.003412	WGS84	
	Lorna Cay	M14	211	*Boerhavia albiflora* var. *albiflora* (open) herbland	Open herbland dominated by *Boerhavia albiflora* var. *albiflora*	Start	-17.121068	151.836403	WGS84	23/07/2021
						Centre	-17.121238	151.836264	WGS84	
						End	-17.12141	151.836102	WGS84	
		M15	43	*Lepturus/Achyranthes* grassland/herbland	Herbland dominated by *Lepturus repens and Achyranthes aspera*	Start	-17.121625	151.836492	WGS84	23/07/2021
						Centre	-17.121498	151.836687	WGS84	
						End	-17.121352	151.83685	WGS84	
Cato	Cato Island	M16	153	*Portulaca* herbland	*Portulaca oleracea* herbland	Start	-23.249362	155.542444	WGS84	26/05/2022
						Centre	-23.249548	155.542525	WGS84	
						End	-23.249778	155.542601	WGS84	
		M17	153	*Achyranthes* herbland with *Portulaca* & *Boerhavia*	Closed herbland dominated by *Achyranthes aspera, Portulaca oleracea* and *Boerhavia albiflora* var. *albiflora*	Start	-23.250598	155.53799	WGS84	26/05/2022
						Centre	-23.250792	155.538091	WGS84	
						End	-23.250997	155.538193	WGS84	
Wreck Reefs	Bird Islet	M18	282	Stenotaphrum/Achyranthes grassland/herbland	Closed grassland/herbland dominated by *Stenotaphrum micranthum* and *Achyranthes aspera*	Start	-22.171375	155.460598	WGS84	28/05/2022
						Centre	-22.17131	155.46038	WGS84	
						End	-22.171233	155.46015	WGS84	
		M19	85	*Achyranthes /Boerhavia albiflora* var. *albiflora* herbland	Closed herbland dominated by *Achyranthes aspera* and *Boerhavia albiflora* var. *albiflora*	Start	-22.172521	155.459354	WGS84	28/05/2022
						Centre	-22.17254	155.459602	WGS84	
						End	-22.1725596	155.4598238	WGS84	
Mellish Reef	Herald Beacon Islet	M22	190	*Lepturus* grassland	Closed grassland dominated by *Lepturus repens*	Start	-17.403012	155.870565	WGS84	29/05/2023
						Centre	-17.40322	155.87049	WGS84	
						End	-17.40343	155.870417	WGS84	

Appendix 5. Weed management monitoring photographs

4/07/2024 | **30/07/2024** | **28/08/2024**

Figure A. 2 Comparative photos taken at South Islet on 14/7/2024, 30/07/2024 and 28/08/2024 from Photo Point 1 facing the direction of bearings shown on the photograph information stamps.
Credits Larry Brushe (14/07/2024), Mary Jane McLeod (30/07/2024 and 28/08/2024) ©

4/07/2024	30/07/2024	28/08/2024

Figure A. 3 Comparative photos taken at South Islet on 14/7/2024, 30/07/2024 and 28/08/2024 from Photo Point 2 facing the direction of bearings shown on the photograph information stamps.
Credits Larry Brushe (14/07/2024), Mary Jane McLeod (30/07/2024 and 28/08/2024) ©

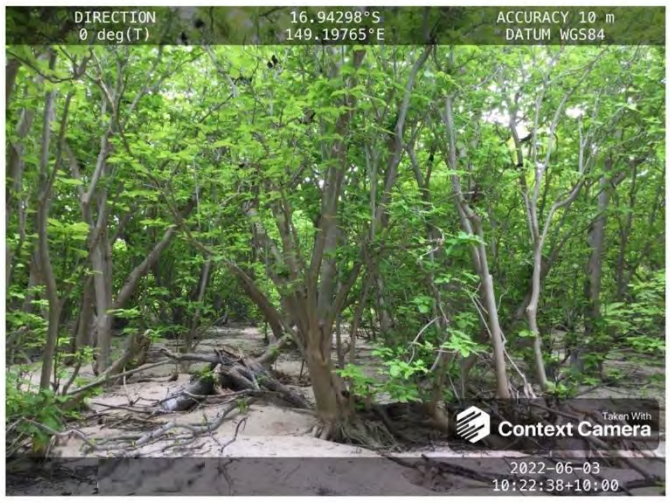
4/07/2024 | **30/07/2024** | **28/08/2024**

Figure A. 4 Comparative photos taken at South Islet on 14/7/2024, 30/07/2024 and 28/08/2024 from Photo Point 3 facing the direction of bearings shown on the photograph information stamps. Credits Larry Brushe (14/07/2024), Mary Jane McLeod (30/07/2024 and 28/08/2024) ©

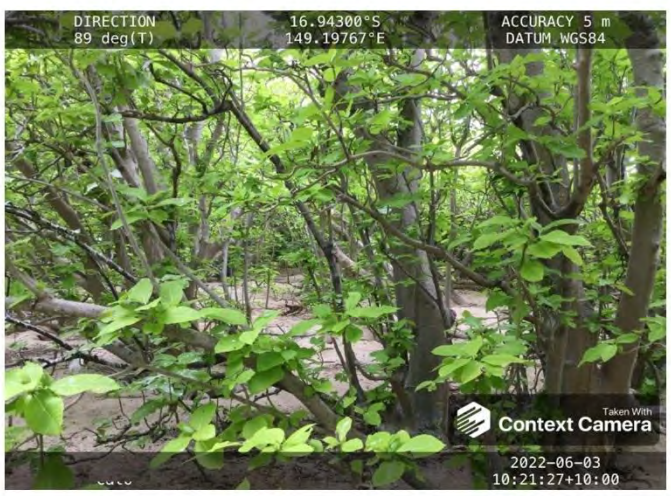
Appendix 6. Comparative photographs taken at Health Check sites and BioCondition monitoring sites from 2019 to 2024

2019 | **2022** | **2024**

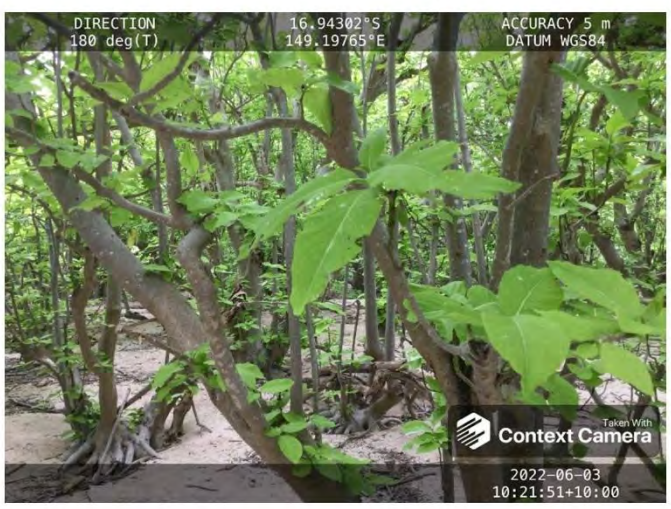
Facing North



Facing East



Facing South



Facing West

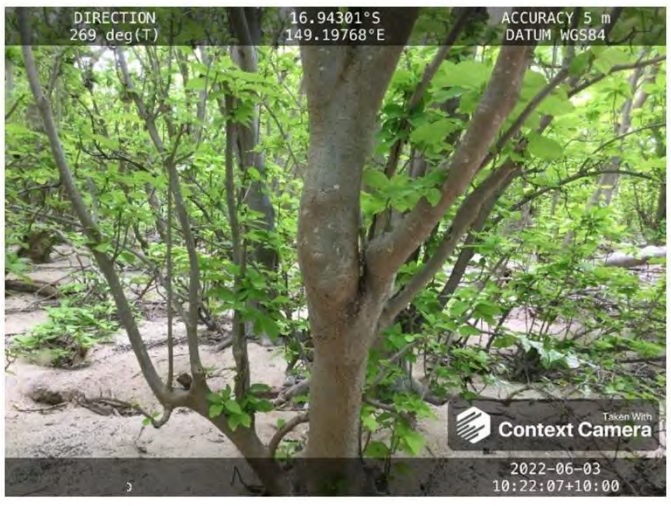


Figure A. 5 Comparison of photos taken in *Pisonia grandis* closed scrub to low closed forest on North East Herald Cay in November 2019 (left), June 2022 (centre) and July 2024 (right) near BioCondition monitoring site NEH01.
Credits QPWS (2019), Collette Bagnato (2022), Joy Brushe (2024) ©

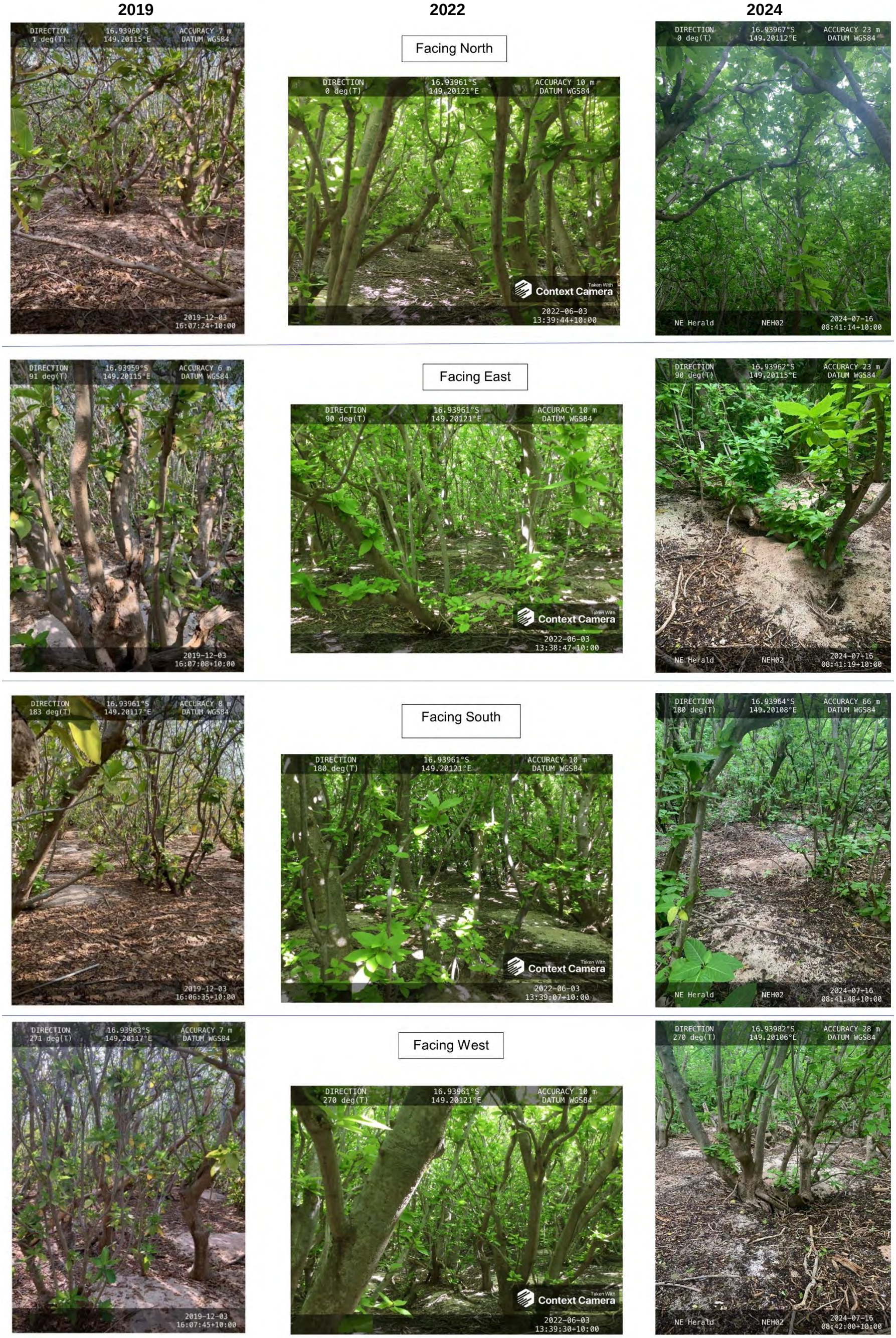


Figure A. 6 Comparison of photos taken in *Pisonia grandis* closed scrub to low closed forest on North East Herald Cay in November 2019 (left), June 2022 (centre) and July 2024 (right) near BioCondition monitoring site NEH02.
Credits QPWS (2019), Collette Bagnato (2022), Joy Brushe (2024) ©

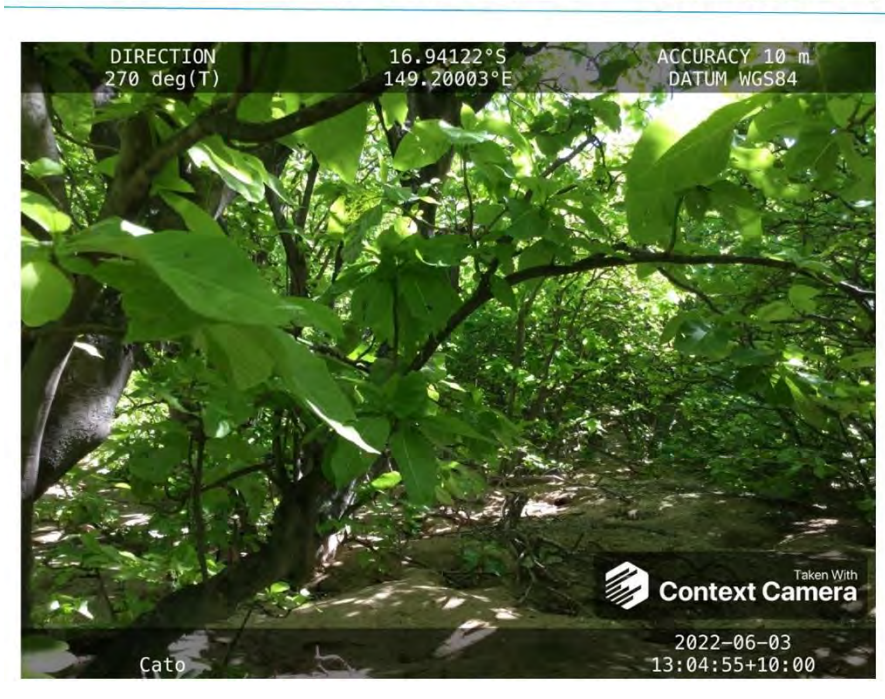
2022

2024

Facing North

Facing East

Facing South



Facing West

Figure A. 7 Comparison of photos taken in *Pisonia grandis* closed scrub to low closed forest on North East Herald Cay in June 2022 (left) and July 2024 (right) near Health Check site 5. Credits Collette Bagnato (2022), Joy Brushe (2024) ©

2023

Facing NNE

Facing ESE

Facing SSW

Facing WNW

2024

Facing North

Facing East

Facing South

Facing West

Figure A. 8 Comparison of photos taken in *Cordia subcordata/Abutilon albescens* shrubland on North East Herald Cay in May 2023 and July2024 near BioCondition monitoring site M24 Area was mapped as *A. albescens* open shrubland to shrubland with emergent dead *C. subcordata* in 2019. The 2023 and 2024 photos show reshooting of the apparently dead *C. subcordata* and partial recovery of the *C. subcordata/A. albescens* shrubland community. Credits Joy Brushe ©

2023		2024
		
	Facing East	
	Facing South	
	Facing West	

Figure A. 9 Comparison of photos taken at BioCondition Site M05 on West Diamond Islet in July 2024 and July 2021. The site contains closed grassland dominated by *Lepturus repens, Boerhavia albiflora* var. *albiflora* and *Ipomoea violacea*. Despite drier and less lush conditions in 2024, the three species can still be observed. 2021Credit Joy Brushe, 2024 credit Fiona Hagger

2023

2024

Facing North

Facing East

Facing South

Facing West

Figure A. 10 Comparison of photos taken in coastal *Argusia argentea* shrubland on South Islet at Health Check site Argusia_01 in June 2023 (left) and July 2024 (right) at the same site. Credits: Andrew Meiklejohn, QPWS (2023), Joy Brushe (2024) ©

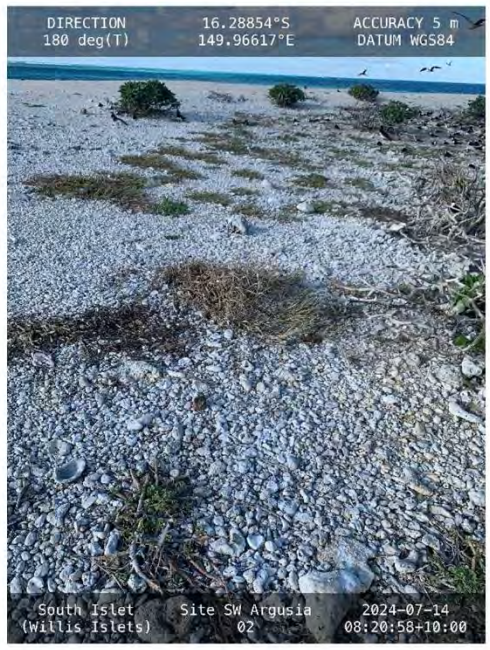
	2023		2024
Facing North			
Facing East			
Facing South			
Facing West			

Figure A. 11 Comparison of photos taken in coastal *Argusia argentea* shrubland on South Islet at Health Check site Argusia_02 in June 2023 (left) and July 2024 (right) at the same site.
Credits: Andrew Meiklejohn, QPWS (2023), Joy Brushe (2024) ©

2023

2024

Facing North

Facing East

Facing South

Facing West

Figure A. 12 Comparison of photos taken in interior *Argusia argentea* shrubland on South Islet at Health Check site Argusia 03 in June 2023 (left) and July 2024 (right) at the same site.
Credits: Andrew Meiklejohn, QPWS (2023), Joy Brushe (2024) ©

2023

2024

Facing North

Facing East

Facing South

Facing West

Figure A. 13 Comparison of photos taken in grassland/*Tribulus cistoides* herbland on South Islet at Health Check site Grass_02 in Jume 2023 (left) and July 2024 (right) at the same site.
Credits: Andrew Meiklejohn, QPWS (2023), Joy Brushe (2024) ©

2023

Facing North

2024

Facing East

Facing South

Facing West

Figure A. 14 Comparison of photos taken in *Sporobolus virginicus* grassland on South Islet at Health Check site Grass_03 in June 2023 (left) and July 2024 (right) at the same site. Credits: Andrew Meiklejohn, QPWS (2023), Joy Brushe (2024) ©

2023

Facing North

2024

Facing East

Facing South

Facing West

Figure A. 15 Comparison of photos taken in *Ipomoea pes-caprae* vineland on South Islet at Health Check site Ipomoea_01 in June 2023 (left) and July 2024 (right) at the same site
Credits: Andrew Meiklejohn, QPWS (2023), Joy Brushe (2024) ©

2023		2024
	Facing North	
	Facing East	
	Facing South	
	Facing West	

Figure A. 16 Comparison of photos taken in *Lepturus repens* grassland on South Islet at Health Check site Grassland 01 in June 2023 (left) and on the northern end of the island from a different photo point in July 2024 (right). The location of the 2023 photo point is not known as there was an error in the 2023 coordinates recorded at this site.
Credits: Andrew Meiklejohn, QPWS (2023), Joy Brushe (2024) ©

2023

2024

Figure A. 17 Photos taken on South Islet in *Stenotaphrum micranthum* grassland in July 2024 in new Health Check site Stenotaphrum_01. Joy Brushe (2024) ©