



Coral Sea Commonwealth Marine Reserve

13–24 June 2016

Bush Blitz Species Discovery Program



Australian Government

Department of the Environment and Energy



bhpbilliton

Sustainable Communities



Australian
Biological
Resources
Study

What is Bush Blitz?

Bush Blitz is a multi-million dollar partnership between the Australian Government, BHP Billiton Sustainable Communities and Earthwatch Australia to document plants and animals in selected conservation areas across Australia.

This innovative partnership harnesses the expertise of many of Australia's top scientists from museums, herbaria, universities, and other institutions and organisations across the country.

Abbreviations

ABRS

Australian Biological Resources Study

ANIC

Australian National Insect Collection

ATH

Australian Tropical Herbarium

AVH

Australia's Virtual Herbarium

CSCMR

Coral Sea Commonwealth Marine Reserve

EPBC Act

Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)

IUCN

International Union for Conservation of Nature

QM

Queensland Museum

UNSW

University of New South Wales

WAM

Western Australian Museum

Summary

The Coral Sea Bush Blitz took place between 13 and 24 June 2016. Four islands of the Coral Sea Commonwealth Marine Reserve (CSCMR) were surveyed: East Diamond Islet, South West Coringa Islet, North East Herald Cay and South West Herald Cay, including the surrounding coral reefs. This Bush Blitz was undertaken in partnership with the Commonwealth Marine Reserves Branch of Parks Australia as part of the Great Coral Sea Clean-up and Bio-Discovery Voyage. The partnership aimed to develop a better understanding of marine debris, flora and fauna, and quarantine issues in the CSCMR.

In the survey, 175 taxa were collected. The reserve's flora and fauna has an inherently low biodiversity largely comprising widespread species that have broad Indo-Pacific or pan-tropical distribution patterns. The species that make it to the islands and persist are tough pioneer species, with characteristics that enable them to establish populations more readily than other species, e.g. if animals, then ability to migrate or to feed on a wide range of host plants; if plants, then generally opportunistic.

Only two putative new species were noted, both true bugs. However, the collections may include a number of other new species, but for many groups significant research is required to confirm this.

At least 94 species were documented for the first time in the reserve, improving information on species distributions. Among the records were notable range extensions for a moth and five barnacle species. The moth *Leucoptera* sp. "ZWICK/BB/06012017/LEP/LYON/003" (aff. *argodes*) is likely to represent a 9800 km expansion of its known distribution range (nearest record is Pakistan). Three barnacle species collected during the survey had not been reported previously in Australian waters. Another two barnacle species were recorded for the first time in eastern Australian waters.

Three plants of conservation significance were recorded, though none is EPBC-listed. Octopus Bush (*Argusia argentea*), Cordia (*Cordia subcordata*) and Birdlime Tree (*Pisonia grandis*) in the reserve provide valuable resources for the aboveground-nesting seabirds. The forests of Birdlime Tree in the CSCMR constitute 15% of Australia's entire extent of this vegetation community.

Two species of terrestrial reptiles were recorded on South West Coringa Islet and tissue samples were taken. These observations confirm older records from this locality. No reptiles were found at the other islets and cays surveyed.

The islands are in excellent condition with no evidence of animal or plant pest problems. The vegetation has recovered from the severe scale insect infestations recorded between 1991 and 2002, and today the vegetation communities show minimal evidence of dieback. It is worth noting that neither the scale insect pest, *Pulvinaria urbicola*, nor its introduced biocontrol agent, the ladybird beetle *Cryptolaemus montrouzieri*, was encountered during the survey. Good biosecurity will help maintain the islands as excellent representative examples of tropical sand cay ecosystems. Care is also needed to avoid transporting foreign species from the reserve to mainland Australia during removal of marine debris.

Endemic molluscs such as *Harpa queenslandica* and *Cymbiola perplicata* have been found only in the Diamond Islet reefs, suggesting that more endemic species may be found in the future.

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Introduction

This is a report for the Bush Blitz program, which aims to improve our knowledge of Australia's biodiversity. Bush Blitz is an initiative of the Australian Government, through the Australian Biological Resources Study (ABRS), in partnership with BHP Billiton Sustainable Communities and Earthwatch Australia. Bush Blitz aims to:

- promote, publicise and demonstrate the importance of taxonomy through species discovery
- undertake a national species discovery program
- support the science of taxonomy in Australia through training of students and early career researchers, and by providing grants for species description and resolution of taxonomically problematic, nationally important groups
- promote partnerships between scientific institutions, government, industry and non-government organisations
- inform reserve managers and other stakeholders of the results of Bush Blitz projects.

The Coral Sea Commonwealth Marine Reserve Bush Blitz

This Bush Blitz was undertaken in partnership with the Commonwealth Marine Reserves Branch of Parks Australia as part of the Great Coral Sea Clean-up and Bio-Discovery Voyage. The partnership aimed to develop a better understanding of marine debris, flora and fauna, and quarantine issues in the CSCMR. Marine Parks conducted island clean-ups and coordinated data collection on levels of micro-plastics and marine debris. Bio-discovery and bio-security surveys were undertaken through the Bush Blitz program. The two teams worked on separate vessels, meeting up during the voyage.

The Bush Blitz survey took place between 13 and 24 June 2016. The largest and most well-vegetated cays amongst the Coringa, Herald and Diamond islets were visited for terrestrial and marine surveys. Adverse weather conditions and the associated delays, thwarted the surveys planned for the islands of Chilcott and the Magdelaine Cays.

The islands of the CSCMR are remote and isolated and have rarely been surveyed by entomologists. The Coral Sea Bush Blitz provided a rare opportunity to increase the information about the reserve's fauna and to obtain fresh specimens for comparisons at the molecular level; earlier, in 2008, the flora of the Coringa-Herald group of islands was well surveyed. This Bush Blitz provided an opportunity to re-assess the condition of the vegetation and check for additional species, particularly weeds that may have established since 2008.

During the voyage, school teachers Shellie Cashmore and Keith Martin-Smith participated in Bush Blitz TeachLive, a collaborative program between Bush Blitz and the Australian Science Teachers Association. While in the field, the teachers taught their students via Skype, email and daily blogs. The teachers received a unique professional development experience that stimulated their understanding of taxonomy, enabled networking with other like-minded teachers and scientists, and developed new skills and ideas to bring into the classroom. Students were able to take a virtual expedition with their teachers helping them to engage in science, see their teachers as science role models, and connect with scientists as real people.

The ABRS provided the logistical coordination and overall leadership of the flora and fauna survey. Experts from the following organisations conducted the field and laboratory work:

- Australian National Insect Collection (ANIC)
- Australian Tropical Herbarium (ATH)
- Queensland Museum (QM)
- University of New South Wales (UNSW)
- Western Australian Museum (WAM)

Acknowledgements

The ABRS acknowledges the traditional owners of country throughout Australia and their continuing connection to land, sea and community. We pay our respects to them and their culture and to their elders both past and present.

The Bush Blitz team leader was Mim Jambrecina. Bush Blitz would like to thank the Commonwealth Marine Parks staff, in particular Andy Warmbrunn, for the overall coordination of the voyage. We give a special thank you to the excellent crew on the HMY Odyssey for keeping everyone safe, well fed and in good spirits through some challenging sea conditions. Lastly, a thank you to all the participants.

Reserve overview¹

Reserve name: Coral Sea Commonwealth Marine Reserve

Area: 989,842 km²

Land manager: Parks Australia

Description

The CSCMR protects the waters of the Coral Sea that fall within Australia's Exclusive Economic Zone. The reserve is located around 400 km east of Cairns and from 220 to 320 km from the outer edge of the Great Barrier Reef. The uninhabited islands and coral cays within the reserve are some of Australia's most remote.

The Coral Sea climate is subtropical, with warm weather and high humidity throughout the year. Although rain is frequent, the highest rainfall occurs during the summer monsoon. South-easterly trade winds dominate between May to August.

Conservation values

The environmental significance of the Coral Sea lies in its diverse array of coral reefs, sandy cays, deep-sea plains, canyons, plateaus and seamounts. These habitats share some similarities with those closer to the Australian mainland, but have evolved in unique ways. The reefs, for example, which on the Great Barrier Reef are dominated by corals, are built from a more varied association of calcified algae, sponge gardens and encrusting algae living alongside corals.

Distance from land has also isolated the Coral Sea from threatening processes that have affected marine environments closer to shore. The waters are often very clear and the reefs have no recorded history of disturbance by creatures such as the Crown of Thorns Starfish (*Acanthaster planci*) and the predatory Horn Drupe Snail (*Drupella cornis*).

The islands and sand cays are important breeding sites for seabirds such as the Red-footed Booby (*Sula sula*), Great Frigatebird (*Fregata minor*), and Red-tailed Tropicbird (*Phaethon rubricauda*), as well as for Green Turtles (*Chelonia mydas*), which are listed as endangered on the International Union for Conservation of Nature (IUCN) Red list. The reserve also supports the world's only confirmed spawning aggregation of Black Marlin (*Istiompax indica*). Other significant species include Whale Sharks (*Rhincodon typus*), Northern Bluefin and Yellowfin Tuna (*Thunnus orientalis* and *Thunnus albacares*), and Sperm, Humpback and Pilot Whales (*Physeter macrocephalus*, *Megaptera novaeangliae* and *Globicephala macrorhynchus*).

¹ Information sourced from the Commonwealth Marine Parks.

Methods

Taxonomic groups studied and personnel

A number of taxonomic groups were selected as targets for study. [Table 1](#) lists the groups surveyed and the specialists who undertook the fieldwork.

Table 1 Taxonomic groups surveyed and personnel

| Group | Common name | Expert | Affiliation |
|---------------------------------|--|----------------------------------|--|
| Reptilia | Reptiles | Ryan Shofner | UNSW |
| Insects of miscellaneous groups | Ants, wasps, flies, beetles, leafhoppers, grasshoppers, crickets and cockroaches | Nikolai Tatarnic | WAM |
| Lepidoptera | Moths | Andreas Zwick | ANIC |
| Heteroptera | True bugs | Ryan Shofner Nikolai Tatarnic | UNSW WAM |
| Arachnida | Spiders | Barbara Baehr | QM |
| Cirripedia | Barnacles | Andrew Hosie | WAM |
| Porifera | Sponges | Merrick Ekins | QM |
| Octocorallia | Soft Corals | Merrick Ekins | QM |
| Vascular plants | Vascular plants | Wendy Cooper John Westaway | ATH Federal Department of Agriculture |

The Bush Blitz team would also like to acknowledge the contributions of the following people:

- Andrew Amey (QM) confirmed the identity of the reptile specimens
- Brian Heterick (WAM) helped to identify the general invertebrate collections and Paige Maroni (Murdoch University) assisted with specimen curation and photography
- Gerry Cassis (UNSW) led the trug bug survey, confirmed identifications and undertook reporting
- You Ning Su (ANIC) identified the grasshopper and cricket specimens
- A number of scientists verified the identification of particular arachnid groups—Robert Whyte (QM) verified the jumping spiders (Salticidae); Volker Framenau (WAM) verified the orb-weaver spiders (Araneidae); Vladimir Ovtsharenko (American Natural History Museum) verified the ground spiders (Gnaphosidae); Mark Harvey (WAM) verified the pseudoscorpions; Owen Seeman (QM) verified the mites and ticks (Acari)
- Zoe Richards (WAM) identified the host species for the barnacle collections.

Site selection

All scientists surveyed two standard survey sites selected by Bush Blitz using modelling prepared by CSIRO. They were selected for location on the two largest and most well-vegetated islands that were visited: East Diamond (-17.44133E, 151.07388S) and North East Herald (-16.9444E, 149.19449S). Each standard survey site was centred on a point (permanently marked), but the actual area surveyed varied between taxa. Standard methodologies were used to sample these sites.

The use of standard survey sites provides a unique opportunity to examine broad-spectrum biodiversity. Among other benefits, this will enable CSIRO to test assumptions (e.g. about relationships between the diversity of different taxa) that underpin many conservation decisions. It will also allow comparisons between sites, and establish a basis for future monitoring by reserve managers.

Aside from standard survey sites, site selection and collection methods were at the discretion of the individual scientist. Site selection depended on access, suitability for trapping and time restrictions. Site locations were recorded using global positioning systems.

Survey techniques

A standard suite of survey techniques was used:

- **Reptiles** were captured by searching under debris and spotlighting at night.
- **Insect (miscellaneous groups) collections** (ants, wasps, flies, beetles, leafhoppers, grasshoppers, crickets and cockroaches) were made by hand-collecting, beating and sweeping of vegetation, using an aerial sweep net, and at a light trap.
- **Moths** were collected mainly at a light trap run throughout the night, which consisted of a white sheet illuminated by a 250W mercury vapour light powered by a quiet generator. The relatively few specimens that were disturbed and netted by hand during the day belonged to the same species as those collected at night.
- **True bugs** were collected by beating and sweeping of vegetation, particularly of flowers, fruits and seeds, also by collecting at a light trap and using an aquatic net.
- **Spiders** were collected mostly by searching likely habitats and sifting leaf litter, supplemented by 10 pitfall traps at the standard survey sites.
- **Barnacles** were collected using a hammer and chisel and extracted from their substrate in the laboratory. Collection was limited to snorkelling and reef-walking at low tide. Each island was circumnavigated at low tide to survey for intertidal species and any potential species attached to flotsam and jetsam. Each site was surveyed for at least 30 min.
- **Octocorals and sponges** were collected by free-diving down to a maximum of 10 m. Specimens were photographed in-vivo and, before being brought to the surface, were sealed inside a zip-lock bag together with sea water and a unique museum registration number. Back on the vessel the samples were photographed out of the water and preserved in 70% ethanol.
- **Plants** were collected by hand in the field and saturated in 70% ethanol for preservation and transport.

A subset of specimens representing all species collected was preserved in ethanol for future DNA studies.

Incidental collections were made of pseudoscorpions, mites and ticks. Observations of birds were also recorded.

Identification

The specimens taken were identified using available literature and the holdings of museums and herbaria. Fauna specimens were deposited with ANIC (moths), QM (spiders, sponges and corals), UNSW (true bugs) and WAM (barnacles and general invertebrate collections). Flora collections were deposited with ATH, and duplicates of plant specimens with NTH. All specimen data are available through the Atlas of Living Australia.

Results

Locational data for all collection or observation records are available to reserve managers. At least 94 taxa were new records for the reserve (some results are yet to be finalised), including two putative species new to science—these await formal identification. No EPBC-listed threatened animal species or threatened plants were observed. Twenty-eight exotic or pest animal species were observed but no weed species.

Table 2 provides a summary of the flora and fauna records for the reserve.

Table 2 Summary of flora and fauna records

| Group | Common name | Number of species collected | Species newly recorded for the reserve | Putative new species | Threatened species* | Exotic and pest species** |
|------------------|---------------------------|-----------------------------|--|----------------------|---------------------|---------------------------|
| Reptilia | Reptiles | 2 | 0 | 0 | 0 | 0 |
| Hymenoptera | Ants | 2 | - | 0 | 0 | 2 |
| Hymenoptera | Wasps | 5 | - | 0 | 0 | 0 |
| Lepidoptera | Moths | 36 | 33 | 0 | 0 | 23 |
| Diptera | Flies | 10 | - | 0 | 0 | 0 |
| Coleoptera | Beetles | 9 | - | 0 | 0 | 2 |
| Heteroptera | True bugs | 11 | 2 | 2 | 0 | 1 |
| Hemiptera | Leafhoppers | 4 | - | 0 | 0 | 0 |
| Orthoptera | Grasshoppers and crickets | 13 | 1 | 0 | 0 | 0 |
| Blattodea | Cockroaches | 2 | - | 0 | 0 | 0 |
| Araneae | Spiders | 12 | 8 | 0 | 0 | 0 |
| Acari | Mites and ticks | 2 | 1 | 0 | 0 | 0 |
| Pseudoscorpiones | Pseudoscorpions | 1 | 1 | 0 | 0 | 0 |
| Cirripedia | Barnacles | 11 | 10 | 0 | 0 | 0 |
| Cnidaria | Corals | 32 | 32 | 0 | 0 | 0 |
| Porifera | Sponges | 6 | 6 | 0 | 0 | 0 |
| Magnoliophyta | Flowering plants | 17 | 0 | 0 | 0 | 0 |
| Total | | 175 | 94 | 2 | 0 | 28 |

* Species listed under the Commonwealth EPBC Act.

** Includes native species that at times are pests or are exotic to this region.

Species lists

Lists of all species recorded during the survey are provided in [Appendix A](#). Species lists were compiled using data from participating institutions.

Some specimens have been identified only to family or genus level. This is partly because identification of specimens is very time-consuming, with detailed microscopic examination needed in many cases. Also, some groups are ‘orphans’: currently no experts are working on them, or are available to work on them, and the taxonomic literature is out of date; species-level identification is not possible for these groups. Unidentified Bush Blitz specimens are held in institutional collections where they are available for future study. Collections hold many such specimens, among them species not yet described (i.e. unnamed species) as well as described species that have not been identified. For example, ANIC holds tens of thousands of unidentified specimens. Specimens often wait decades before the resources become available for their study. A key component of Bush Blitz is the funding of studies of specimens collected on Bush Blitz surveys.

Nomenclature and taxonomic concepts used in this report are consistent with the Australian Faunal Directory, Australian Plant Name Index, Australian Plant Census, Spongemaps, World Porifera Database and World Register of Marine Species.

Discussion

Putative new species

Here we use the term ‘putative new species’ to mean an unnamed species that, as far as can be ascertained, was collected for the first time during this Bush Blitz. It is confirmed as a new species once it is named and its description published. Specimens collected during the Bush Blitz also include unidentified taxa that are already known from museum and herbarium collections—these are not counted as putative new species.

Fauna

Invertebrates

True bugs

Among the fauna specimens collected only two species of true bug were determined to be putatively new.

Table 3 Putative new invertebrate species

| Family | Species |
|------------------|------------------------------|
| True bugs | |
| Miridae | <i>Pseudoloxops</i> sp. nov. |
| Miridae | <i>Diomocoris</i> sp. nov. |

Threatened species

Australia is home to an estimated 580,000–680,000 species, most of which have not been described. Approximately 92% of Australian plants, 87% of mammals, 93% of reptiles and 45% of birds are endemic. Changes to the landscape resulting from human activity have put many of these unique species at risk. Over the last 200 years, many species have become extinct; many others are considered to be threatened, i.e. at risk of extinction.²

Fauna

Vertebrates

Reptiles

The Green Turtle's (*Chelonia mydas*) nesting period had ended by the time of the survey, but evidence of recent nests was noted. This species is listed under the EPBC Act as both Vulnerable and as a Marine and Migratory (Bonn) species.

² Chapman, A. D. 2009, *Numbers of Living Species in Australia and the World*, 2nd edn. Australian Biological Resources Study, Canberra.

Table 3 **Threatened vertebrate fauna species**

| Family | Species | Common name | Status | Abundance |
|-----------------|-----------------------|--------------|---|---|
| Reptiles | | | | |
| Cheloniidae | <i>Chelonia mydas</i> | Green Turtle | Vulnerable, Marine, Migratory (Bonn) | Recent nests were noted, though no turtles were seen as the breeding season had finished |

Flora

Flowering plants

No EPBC-listed threatened plants were recorded.

Exotic and pest species

Conservation reserves help to protect Australia's Rare and Threatened Ecosystems and provide refuge for species at risk. Invasive species can have a major impact on already vulnerable species and ecosystems, as well as economic, environmental and social impacts. The inclusion of exotic and pest species records as part of this report is designed to provide land managers with baseline information to assist with further pest management programs.

Fauna

Vertebrates

No pest vertebrate species were observed.

Invertebrates

Although a number of invertebrate species collected are, at times, considered pests, there was no evidence of pest problems on the reserve. It is worth noting that neither the scale insect pest of Birdlime Tree (*Pisonia grandis*), *Pulvinaria urticae*, nor its introduced biocontrol agent, the ladybird beetle *Cryptolaemus montrouzieri*, were encountered. Because of limited sampling time, it is impossible to state that these species are no longer present, however none of the scientists present saw either of these species.

While marine debris removal from the islands and surrounding seas is highly desirable and was a key part of this Bush Blitz, inadvertent transport of pest species between islands and between islands and the mainland was a concern. Debris collected during the marine clean-up was stored in the hull of a boat and transported to mainland Australia for disposal. Examination of this debris produced more geckos, spiders and, most notably, ants than were observed on the islands during surveys. The animals were sheltering in plastic waste—an entire ant nest was found between a polystyrene board and its plastic backing (vouchers retained for identification). Many of the species can establish in the hull of a boat and be transported further. Advice from AQIS is needed on the potential quarantine issues associated with garbage removal.

Moths

Most of the moths collected are species regarded as minor to major pests of agricultural crops, which reflects the invasive potential of these species. Most are adventives, that is opportunistic species that disperse readily. Often they feed on a wide range of plant species and thus can establish readily on remote islands. All of the species collected during this survey occur on mainland Australia; hence, the populations on the islands are not a threat to the mainland. Nor do the islands seem to be stepping-stones through which mainland Australia is reached by foreign species; instead the islands are most likely populated from the mainland. Genetic DNA barcodes for 21 specimens of 13 species showed no significant differences between populations on the islands and the mainland, indicating either frequent or recent gene flow between these populations. The abundance of pest species, the lack of endemic species and the isolation of these islands, might together indicate a recurring extinction of the moth populations on the reserve, followed by re-invasion from the mainland.

Ants

Two species of ant (*Nylanderia bourbonica* and *Cardiocondyla atalanta*) collected in the reserve are sometimes pests, though there is no evidence to suggest that they are causing damage in the reserve. *N. bourbonica* was not in lists from previous surveys of the reserve. This ant is a widespread tropical tramp species,³ probably originating from the old world tropics⁴. Thus it is unsurprising that it was found in the reserve. Ants collected from Coringa and Magdelaine Islands during a previous survey were identified as *Cardiocondyla* sp. cf. *nuda*. The specimens collected on South West Coringa Islet during this survey have been identified as *Cardiocondyla atalanta*, a cryptic sister species to *C. nuda*; conceivably, the previous identification was erroneous. *C. atalanta* is an Australian mainland species, the first records of which were from the Coral Sea from the Chilcott Island group; based on prevailing wind patterns it is thought to have been introduced on soil from Australia.⁵

Beetles

The beetle False Wireworm (*Gonocephalum torridum*) collected on the reserve is currently listed by the Queensland Department of Agriculture and Fisheries as a pest of crops.⁶ This species was collected at both East Diamond Islet and North East Herald Cay. Previously it was recorded from North East Herald, South West Herald and Magdelaine cays. A second species, the carrion beetle, *Dermestes ater*, is a potential pest species and was collected by light trap from South West Coringa Islet. Previously this beetle was recorded on North East Herald Cay.

True bugs

The Rutherglen Bug (*Nysius vinitor*) was collected from South West Coringa Islet. This small Australian native sap-sucking insect is a pest of many crops, e.g. sunflower, sorghum, canola and safflower. It breeds on a wide range of native and exotic plants, building up to large numbers in inland Australia when winter and spring rains allow the growth of vegetation. In spring, as the host plants start to dry off, large numbers of bugs will move into cropping areas, dispersing on the winds of storm fronts. It can build up to large numbers, seriously damaging fruit and vegetable crops.

³ Trager, J.C. 1984, A revision of the genus *Paratrechina* (Hymenoptera: Formicidae) of the continental United States. *Sociobiology* 9: 49–162.

⁴ Wilson, E.O., Taylor, R.W. 1967, Ants of Polynesia. *Pacific Insects Monographs* 14: 1–109; Deyrup, M., Davis, L., Cover, S. 2000, Exotic ants in Florida. *Transactions of the American Entomological Society* 126: 293–325.

⁵ Seifert, B. 2008, *Cardiocondyla atalanta* Forel, 1915, a cryptic sister species to *Cardiocondyla nuda* (Mayr, 1866) (Hymenoptera: Formicidae). *Myrmecological News* 11:43–48.

⁶ <https://www.daf.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/integrated-pestmanagement/a-z-insect-pest-list#D>

Table 8 lists the pest and exotic invertebrate species that were collected in the reserves.

Table 7 Pest invertebrate fauna species

| Family | Species | Common name | Abundance |
|-----------------|---------------------------------------|-------------|---|
| Ants | | | |
| Formicidae | <i>Nylanderia bourbonica</i> | – | 4 specimens collected from litter on South West Coringa Islet |
| Formicidae | <i>Cardiocondyla atalanta</i> | – | 4 specimens collected from litter on South West Coringa Islet |
| Moths | | | |
| Cosmopterigidae | <i>Pyroderces rileyi</i> | | – |
| Crambidae | <i>Achyra massalis</i> | | – |
| Crambidae | <i>Spoladea recurvalis</i> | | – |
| Elachistidae | <i>Ethmia nigroapicella</i> | | – |
| Erebidae | <i>Achaea janata</i> | | – |
| Erebidae | <i>Hypocala deflorata</i> | | – |
| Erebidae | <i>Pantylidia metaspila</i> | | – |
| Gelechiidae | <i>Ephysteris promptella</i> | | – |
| Gelechiidae | <i>Ephysteris silignitis</i> | | – |
| Gelechiidae | <i>Pectinophora</i> cf. <i>endema</i> | | – |
| Noctuidae | <i>Agrotis poliotis</i> | | – |
| Noctuidae | <i>Amyna axis</i> | | – |
| Noctuidae | <i>Chrysodeixis acuta</i> | | – |
| Noctuidae | <i>Helicoverpa armigera</i> | | – |
| Noctuidae | <i>Helicoverpa punctigera</i> | | – |
| Noctuidae | <i>Leucania stenographa</i> | | – |
| Noctuidae | <i>Spodoptera litura</i> | | – |
| Nolidae | <i>Earias huegeliana</i> | | – |
| Sphingidae | <i>Agrius convolvuli</i> | | – |

| Family | Species | Common name | Abundance |
|--------------------------|----------------------------------|---------------------|---|
| Moths (continued) | | | |
| Sphingidae | <i>Hippotion celerio</i> | – | – |
| Sphingidae | <i>Hippotion velox</i> | – | – |
| Tortricidae | <i>Crociosema plebejana</i> | – | – |
| Tortricidae | <i>Strepsicrates semicanella</i> | – | – |
| Beetles | | | |
| Dermestinae | <i>Dermestes ater</i> | Black Larder Beetle | 7 specimens collected on South West Coringa Islet |
| Tenebrionoidae | <i>Gonocephalum torridum</i> | False Wireworm | 6 specimens collected from both East Diamond Islet and North East Herald Cay |
| True bugs | | | |
| Lygaeidae | <i>Nysius vinitor</i> | Rutherglen Bug | collected from South West Coringa Islet; 18 specimens on host plant species <i>Portulaca oleracea</i> ; 5 specimens collected at a light trap |

Flora

No weed species were recorded; however, the origin (i.e. indigenous or exotic) of some species is not always obvious and sometimes difficult to determine. Purslane (*Portulaca oleracea*) is regarded as a naturalised (non-indigenous) species in parts of mainland Australia including Queensland.⁷ Given its wide distribution, presence in ‘intact’ interior island vegetation communities and non-invasive behaviour, Purslane is not considered an exotic weed of the Coral Sea Islands.^{8 9}

Lepidium englerianum is similarly listed by the Australian Plant Census as naturalised in Queensland but may be indigenous in the Coringa-Herald Nature Reserve. The same applies to Coconut Palm (*Cocos nucifera*), a single sapling of which was observed growing on East Diamond Islet. This plant, like all early colonising individuals, has a low likelihood of successfully establishing a population due to inherent low numbers.

⁷ Bean, A.R. 2007, A new system for determining which plant species are indigenous in Australia. *Australian Systematic Botany* 20: 1–43.

⁸ Batianoff, G.N., Naylor G.C. 2007, Assessment of *Pisonia grandis* forest condition and ecology at Coringa-Herald National Nature Reserve, Coral Sea. Report on the field survey of North East Herald Cay and South West Herald Cay: 27th November–6th December 2006. Queensland Herbarium (Environmental Protection Agency), Brisbane Botanic Gardens, Toowong QLD.

⁹ Batianoff, G.N., Naylor, G.C., Dillewaard, H.A. 2009, Plant strategies, dispersal and origins of flora at the northern Coral Sea Islands Territory, Australia, *Cunninghamia* 11(1): 97–106.

It is pleasing to see that the islands surveyed had no weed species. This is an exceptional condition for vegetation in the 21st century as most terrestrial environments have been subject to varying levels of disturbance, with the consequent arrival of exotic plants. That these islands remain weed free may be attributed to their remote location (i.e. no nearby source of weed seeds), low human visitation and extremely harsh environmental conditions for plant establishment (as illustrated by the low species diversity).

East Diamond Islet has a communications tower with a concrete slab at ground level. No weeds occur on the island including around the slab, suggesting careful biosecurity/plant hygiene management during construction.

Acknowledging that these are highly dynamic environments, good biosecurity will help to maintain the islands as excellent representative examples of tropical sand cay ecosystems.

Range extensions

At least 94 species were documented for the first time in the reserve, improving information on species distributions. Among the records were notable range extensions for a moth and five barnacle species.

Almost all moths recorded during the survey have wide distributions, often spanning continents. Taking this into account, the moth *Leucoptera* sp. "ZWICK/BB/06012017/LEP/LYON/003" (aff. *argodes*) is likely to represent a true expansion of its known distribution range. The wing pattern of the specimens collected on the reserve does not match any named or unnamed species in ANIC. The DNA barcode sequences generated for two specimens both match (98.7% similarity) a single sequence in BOLDSYSTEMS¹⁰ while other sequenced members of the genus do not match (only 85.3-79.0% similarity, 25 publicly available samples). The single specimen in BOLDSYSTEMS is recorded as being of the same family (Lyonetiidae) as the specimens collected from the reserve. The sequence in BOLDSYSTEMS originated from Islamabad, Pakistan—9,800 km north-west of the reserve. The genus *Leucoptera* includes several significant pest species and as yet is poorly studied.

Three barnacle species collected during the survey were not reported previously in Australian waters and a further two species were recorded for the first time in eastern Australian waters.

Table 9 Significant range extensions for invertebrates documented during this Bush Blitz

| Family | Species | Nearest previous record | Host | Comments |
|--------------|---|-------------------------|------|--|
| Moths | | | | |
| Lyonetiidae | <i>Leucoptera</i> sp. "ZWICK/BB/06012017/LEP/LYON/003" (aff. <i>argodes</i>) | 9,800km NW | — | Collected at Coringa- Herald NNR, South West Coringa Islet |

¹⁰ Bold Systems is a DNA barcode portal <http://v4.boldsystems.org/>

| Family | Species | Nearest previous record | Host | Comments |
|------------------|---------------------------|-------------------------|------------------------------------|---|
| Barnacles | | | | |
| Archaeobalaninae | <i>Acasta fenestrata</i> | Kimberley, WA | – | New record for eastern Australia; Indo-West Pacific species |
| Archaeobalaninae | <i>Acasta pertusa</i> | Red Sea | A sponge | New record for Australian waters; otherwise known only from type locality |
| Lithoglyptidae | <i>Berndtia purpurea</i> | Northern Territory | <i>Psammocora</i> sp. (coral) | New record for eastern Australia; Indo-West Pacific species |
| Pyrgomatidae | <i>Trevathana niuea</i> | Niue | <i>Coscinaraea columna</i> (coral) | New record for Australian waters; otherwise known only from type locality |
| Pyrgomatidae | <i>Trevathana paulayi</i> | Guam | <i>Symphyllia radians</i> (coral) | New record for Australian waters; also found in French Polynesia |

Other points of interest

Fauna

Vertebrates

Birds

All the islands visited supported enormous numbers of nesting seabirds. Breeding activity was concentrated in the later stages with well-developed young present, but included all stages from the

collection of nesting material, construction of nests and incubation of eggs, to presence of hatchlings, nestlings and fledglings.

The species listed in Table 10 were observed on each island in varying numbers (quantitative estimates of abundance were not feasible nor in scope). South West Herald Cay seemed to have extraordinary numbers of frigatebirds and thousands of screeching Sooty Terns. Brown Boobies were more numerous on Diamond and Coringa islands than on the Herald cays. North East Herald Cay had a relatively high density (perhaps hundreds) of Red-tailed Tropicbirds, seemingly with one under each Octopus Bush (*Argusia argentea*) and others sheltering under rock slabs (perhaps because there were no vacant Octopus Bushes).

Two species of wading shore birds (Charadriiformes) were observed—Ruddy Turnstone (*Arenaria interpres*) and Pacific Golden Plover (*Pluvialis fulva*)—both on the rocky shore at the northern end of North East Herald Cay. These migratory shorebirds were in transit, probably having departed relatively late from their southern feeding grounds for their summer breeding grounds in the far northern hemisphere.

Two members of the rail family (Rallidae) are resident in the Herald group—the Purple Swamp Hen (*Porphyrio porphyrio*) on North East Herald Cay, and Buff-banded Rail (*Hypotaenidia philippensis*) on both North East and South West Herald cays. Buff-banded Rail seemed common on South West Herald Cay, judging by the frequency of calls heard.

The only passerine bird encountered was a kingfisher (presumably Sacred Kingfisher *Todiramphus sanctus*), a pair seen distantly on North East Herald Cay and a single bird seen flying by the vessel anchored off South West Herald Cay.

Wedge-tailed Shearwaters (*Ardenna pacifica*) were not seen, but evidence of their old nesting burrows is widespread on most islands and particularly obvious under forests of Birdlime Tree on North East Herald Cay. The Wedge-tailed Shearwater is a colonial-breeding species and birds leave their breeding sites after fledging occurs, around May. The birds are thought to migrate to tropical waters in the northern hemisphere at that time of year.

Table 10 Seabirds species observed on the islands during this Bush Blitz

| Family | Species | Common name | Breeding | EPBC Act Status | Abundance |
|--------------|----------------------------|--------------|----------|----------------------------------|----------------|
| Birds | | | | | |
| Laridae | <i>Anous stolidus</i> | Common Noddy | Yes | Marine; Migratory (CAMBA, JAMBA) | Many thousands |
| Laridae | <i>Anous minutus</i> | Black Noddy | Yes | Marine | — |
| Laridae | <i>Onychoprion fuscata</i> | Sooty Tern | Yes | Marine | Many thousands |

| Family | Species | Common name | Breeding | EPBC Act Status | Abundance |
|----------------|----------------------------|---|------------------|---|---------------|
| Laridae | <i>Thalasseus bergii</i> | Crested Tern | No | Marine; Migratory (JAMBA) | Few |
| Fregatidae | <i>Fregata ariel</i> | Lesser Frigatebird, Least Frigatebird | Yes | Marine; Migratory (CAMBA, JAMBA, ROKAMBA) | Many hundreds |
| Fregatidae | <i>Fregata minor</i> | Greater Frigatebird, Great Frigatebird | Yes | Marine; Migratory (CAMBA, JAMBA) | Many hundreds |
| Phaethontidae | <i>Phaethon rubricauda</i> | Red-tailed Tropicbird | Yes | Marine; Migratory (CAMBA, JAMBA) | Hundreds |
| Procellariinae | <i>Ardeanna pacifica</i> | Wedge-tailed Shearwater | old burrows only | Marine; Migratory (JAMBA) | – |
| Sulidae | <i>Sula leucogaster</i> | Brown Booby | Yes | Marine; Migratory (CAMBA, JAMBA, ROKAMBA) | Hundreds |
| Sulidae | <i>Sula dactylatra</i> | Masked Booby | Yes | Marine; (JAMBA, ROKAMBA) | Hundreds |
| Sulidae | <i>Sula sula</i> | Red-footed Booby | Yes | Marine; Migratory (CAMBA, JAMBA) | Many hundreds |

Reptiles

The reptiles of Australia number over 900 species (Australian Faunal Directory); however, no terrestrial reptiles had been reported from the Coral Sea Islands in the herpetological literature. Scattered museum records and DNA samples of geckos from South West Coringa Islet exist, but no other information is available.

During this survey, two terrestrial reptile species were recorded, both geckos, and both from only one of the islands visited, South West Coringa Islet. The geckos were the Skin-shedding Dtella (*Gehyra mutilata*) and the Mourning Gecko (*Lepidodactylus lugubris*), two widespread Oriental-Pacific species that readily colonise islands. Only *L. lugubris* is known from the Australian mainland. More individuals than the seven officially recorded were seen; most escaped before they could be captured. In addition, gecko eggs that had recently hatched were found under a rock.

The populations of Skin-shedding Dtella and Mourning Gecko appear to be secure on South West Coringa Islet. However, the minute size of the island, small amount of adequate habitat, small population size and the frequency of cyclonic events makes the population of geckos on South West Coringa Islet vulnerable to extinction through habitat loss, inbreeding or other factors. Despite this risk, the first records of either species from this locality are from the 1980s, and the populations appear to have withstood (or perhaps been replenished by) many cyclonic events in that time. Possibly the population on South West Coringa Islet is bolstered through immigration from other populations.

The lack of records from other islets and cays of the Coral Sea Islands (except Willis Islet, from where there is one old record of the Mourning Gecko) is baffling, and further surveys throughout the Coral Sea Islands may confirm their presence or absence. Tissue samples were taken from seven specimens—six *G. mutilata* and one *L. lugubris*—to assist with future taxonomic research on the geckos for which the exact identity and taxonomic relationships are uncertain.

Invertebrates

Limited data exists on the insect fauna of the Coral Sea Islands. Most studies have focused on the impact and control of pests, such as the effects on Birdlime Tree of the scale insect, *Pulvinaria urbicola*, effects that have been exacerbated by the advent of mutualistic invasive ants, causing increases in the abundance of scales. Prior to the invasions of tramp ants and attempted biocontrol of *P. urbicola* using the ladybird beetle *Cryptolaemus montrouzieri*, little was known of baseline island insect faunas. This deficiency was addressed partially by Greenslade and Farrow, who summarised unpublished results from three opportunistic invertebrate surveys conducted in 1995, 1996, and 1997.¹¹ The most comprehensive survey of the region remains that of Greenslade and Farrow, who surveyed all four cays within the Coringa-Herald group. This latter survey, combined with Greenslade's previous data, resulted in an estimated faunal diversity of approximately 150 terrestrial invertebrate species, 70 of which are insects. This is a relatively low number when compared to an area of the same size and habitat diversity on mainland Australia, but not low for isolated islands. Surveys provide snapshots of what is encountered at the time and are unlikely to be comprehensive, given the life cycles of insects and the difficulties of collecting and identifying the immature stages of most species.

Insects of miscellaneous groups

During this survey, 40 insect taxa (ants, wasps, flies, beetles, leafhoppers, grasshoppers, crickets and cockroaches) were collected, representing 23 families. Most specimens were identified to family, with a few to genus or species. Further identification was impossible due to limited taxonomic expertise in some groups and because reference material from the region is unavailable.

Three of the specimens identified to species are new records for the reserve. Previous surveys generally identify taxa only to family level, leaving an incomplete baseline. It is impossible to tell if the taxa identified only to genus or family are the same as those recorded before; such information can only be gained by comparing specimens from each survey, which is beyond the scope of this study.

Moths

The survey identified a large number of moths, greatly expanding information about the species' composition on the islands. A total of 419 moths representing 36 species were collected. Most of these

¹¹ Greenslade, P., Farrow R. 2008, *Coringa-Herald National Nature Reserve – identification of invertebrates collected on the 2007 invertebrate survey*. Report to the Australian Government Department of the Environment, Water, Heritage and the Arts.

records are new for the reserve, but several of the species were recorded previously. The species composition is dominated by generalists and, except for one *Leucoptera* (Family Lyonetiidae), almost all are known to occur on the Australian mainland and are widespread.

While certainly not comprehensive (sampling was limited to one night on each island), the data confirm the impression from previous surveys:

- The moth fauna is more diverse than previous records indicate (due to improved sampling and identification)
- Relative to the mainland, the moth fauna on the islands is depauperate
- The moth fauna is dominated by pest species, which are often more mobile and establish populations more easily than other species, in part due to their larvae feeding on a large range of host plants
- There is no indication of genetic separation between the populations of the islands and of the mainland; together with other observations, this result indicates long-term cycles of extinction and re-invasion from the mainland.

True bugs

Thirteen species of true bug from seven families were collected from the reserve. Specimens were collected from seven host plant species.

Spiders, mites and pseudoscorpions

The arachnid fauna of the reserve are tough pioneer species, having made their way over 400 km of sea to live in the reserve, where they face regular destruction by flood or cyclone and must recolonise. The reserve appears to have a spider community of only 12 species from nine families. Eight species are new records for the reserve and four are un-named. No recent comprehensive revisions exist for the Australian spider families Clubionidae, Oonopidae, Salticidae, and Theridiidae, to which most of the un-named species belong, making it impossible to name them.

Most of the named species are known to be widely distributed or pan-tropical:

- *Neoscona theisi*, an orbweb spider, is a typical tramp on the Pacific Islands and was abundant on the reserve; *N. theisi* colonised the Octopus Bushes of Coringa Islet, East Diamond Islet and North East Herald Cay
- The Flat-bellied Ground Spider (*Trachyzelotes jaxartensis*) is a cosmopolitan species; it was found under stones only on Coringa Islet
- *Hogna crispipes*, a wolfspider, is common on mainland Australia and is a typical tramp on Pacific Islands; it was found at night, hunting on rocks on Coringa Islet, East Diamond Islet and North East Herald Cay
- *Opopaea deserticola*, a goblin spider, is common in litter on East Diamond Islet and South West Herald Cay and has a pan-tropical distribution
- *Pellenes bitaeniata*, a jumping spider, is the only species of that genus in Australia; *P. bitaeniata* is widely distributed on mainland Australia; the specimens of *P. bitaeniata* were found under rocks on East Diamond Islet and Coringa Islet
- The Stripy-legs Spitting Spider (*Dictis striatipes*) is a widespread and common spider found from China to northern Australia; only juveniles were collected on Coringa Islet
- The Dark Spitting Spider (*Scytodes fusca*) has a pan-tropical distribution and females were collected in the litter only on Coringa Islet

- The Northern Flower Spider (*Lehtinelagia evanida*) colonised only the Octopus Bushes of South West Herald Cay; it is widespread and common in Eastern Australia.

Incidental collections were made of an un-named pseudoscorpion, an un-named mite and a bird tick *Amblyomma loculosum*. The mites from the genus *Leptus* live in the litter underneath Octopus Bushes (*Argusia argentea*) on East Diamond Islet together with pseudoscorpions from the genus *Oratemnus*, which also occur in the litter of Coringa Islet. The distributions of the pseudoscorpion and mite are unknown, but they are probably widespread. The bird tick is widely distributed on the Pacific Islands. In the reserve, they are found frequently in the nests or in the litter beneath the nests of frigatebirds and boobies.

Molluscs

Endemic molluscs such as *Harpa queenslandica* and *Cymbiola perplicata* were found only on the Diamond Islet reefs, suggesting that more endemic species may be found in the future.

Barnacles

This was the first survey of shallow-water barnacles in the reserve. A previous study reported on the crustacean fauna but was focused on the Decapoda (crabs and shrimp) and a small number of other crustacean groups. During this survey 11 species of shallow-water barnacles were collected. The stalked barnacle, *Lepas anserifera*, was the only barnacle recorded previously in the reserve; all other species collected are considered to be new records for the reserve.

Commensal (coral or sponge-inhabiting) barnacles had low diversity and abundance despite many potential hosts. Members of the sponge family Thorectidae, a common host of sponge-inhabiting barnacles in other parts of Australia, were abundant in the lagoons.

The only barnacles collected from the intertidal were two species of *Lepas*, although these were attached to flotsam and jetsam. No free-living intertidal and subtidal species, common on the adjacent mainland, were encountered. The lack of these common members of shallow-water communities may be partly due to the low larval supply from neighbouring populations, small target for larvae and limited habitats for colonisation, as a result of the isolation and small size of the reefs and islets.

The reserve's isolation does not completely explain the paucity of barnacle species. The Rowley Shoals in Western Australia, for example, are a group of coral reef systems of comparable size and distance from the mainland, and are on a similar latitude. Yet, recent surveys of the Shoals have shown a much higher diversity of barnacles with more than twice the number of species reported for the Coral Sea, and including free-living intertidal species common on hard substrates.¹²

Octocorals and sponges

The reserve had never been surveyed for octocorals, so all records from this study are baseline data. The diversity of octocorals on the reserve is a subset of those found on the Great Barrier Reef—coral and sponge diversity has been shown to decrease longitudinally across the Pacific. All the named species have Indo-Pacific distributions.

Seven families, 15 genera and four OTUs (Operational Taxonomic Unit) of octocorals, two genera of Stylasterina and five sponge OTUs were collected. SCUBA diving was not undertaken, so the results are

¹² Andrew Hosie, unpublished data.

heavily skewed toward the shallow water soft coral species, mainly of the families Alcyoniidae, Nephtheidae and Xenidiidae that occur in the shallow and intertidal regions of the reef. Only one gorgonian was collected; they are usually present at depths over 20 m.

The status of octocorals around the world is poorly known, as indicated by the many un-named taxa collected during the survey. Potentially any of the un-named taxa could be new species, but major research is needed to find this out. Most of the taxa have been given a four digit QM OTU number corresponding to individual species descriptions that do not match described species. For these to be recognised as valid species or to be elevated to a new species, the original holotypes (if they still exist in museums in Europe) must be re-examined and re-described using modern microscopes, scanning electron microscopes and DNA methods. All would necessitate at least generic revisions of groups. The Melithaeidae family currently requires an entire family-level revision to assess the status of the known genera, before genus-level revisions can begin. Four new OTUs were collected on this trip, an unusual *Rhytisma* OTU, a novel Plumigorgia OTU and two unusual *Efflatounaria* OTUs. The genus *Efflatounaria* and family Xenidiidae are currently undergoing a molecular revision. The OTUs can be examined against the new descriptions once this paper is published.

The Coral Sea marine reserve cays investigated are crescent-shaped islands facing the predominantly south-easterly trade winds (Figure 1). They have a barrier reef on the eastern and southern sides, composed of spur and groove formations (Figure 2). The barrier reef frequently breaks the surface at low tide, and directly behind the reef and up to the island is a very shallow lagoon of only 1 to 2 m in depth (Figure 3). On the western or lee side of the islands there is a back reef lagoon populated by bommies on a sandy slope that gradually increases in depth. This back reef can be divided into two distinct zones, i.e. the very shallow waters directly off the beach up to 6 m deep and the formation of stand-alone coral bommies surrounded by large sandy regions in waters up to 50 m deep. On the south-western and north-western ends of the islets is a sandstone pavement that, extending from the beach, almost bisects the windward lagoon from the leeward lagoon. On most of the islets, the sandstone blocks occur intertidally almost around the entire islet and extend up to and above the high tide mark on the windward sides.

The barrier and back reefs of the Coral Sea Islets are composed of bare rock, with recovering corals of approximately 20 cm in diameter, mainly *Pocillopora* and *Acropora* species. In all environments the flora and fauna is dominated by coralline algae and species of the green macroalgae genus, *Halimeda*. *Phyllospongia lamellosa* is the most abundant sponge, especially in the windward lagoon and shallow parts of the lee lagoon, and in pavement areas. Of the soft corals, the family Alcyoniidae dominated the shallow reef areas both in terms of number of species and abundance, with the exception of the shallow water bommies that were dominated by *Xenias*. The genera of octocorals were consistent across the different islets surveyed.

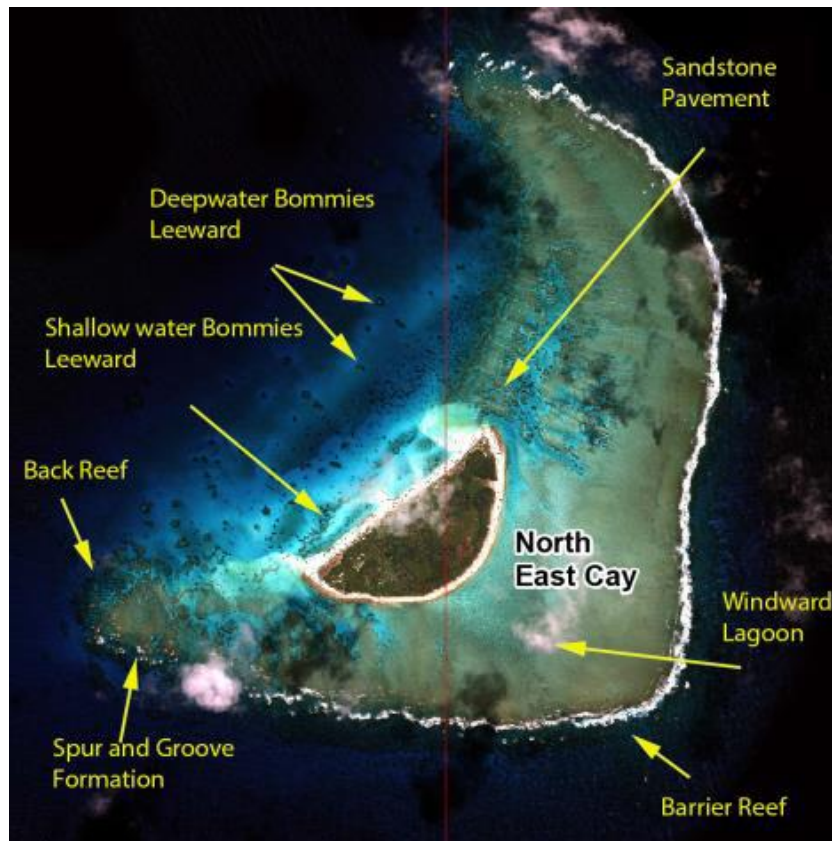


Figure 1 Satellite image of North East Herald Cay, showing typical reef formations in the Coral Sea
Imagery: 0.5m Worldview-2 26/7/2011

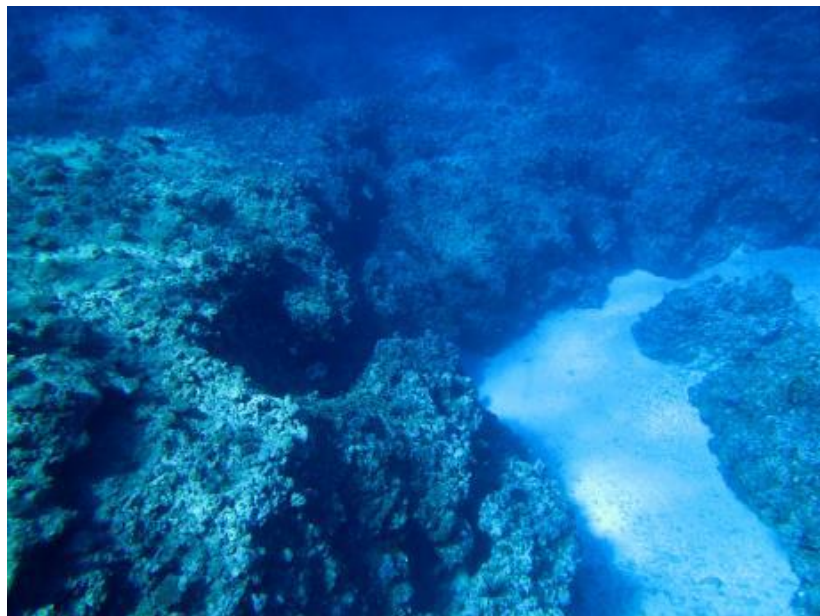


Figure 2 Spur and groove formation of the barrier reef
Photo Merrick Ekins © Copyright, Queensland Museum



Figure 3 Shallow lagoon behind the barrier reef on the windward side
Photo Merrick Ekins © Copyright, Queensland Museum

Flora

Flowering plants

The Queensland Herbarium surveyed the Coringa-Herald islands for terrestrial vascular flora nine years before this Bush Blitz survey. The early study resulted in a comprehensive report on the vegetation forms and flora of the islands within the Coringa-Herald National Nature Reserve; East Diamond Islet was not included.

It was expected that the same species would still be present on the islands, though there was a small possibility of encountering additional species of native or exotic plants transported via the sea or by birds, or human-assisted.

This survey confirmed presence of the species recorded in 2006 and 2007. The Australia's Virtual Herbarium (AVH) database was checked for further species, but all additional records had incorrect georeferences.

The islands appeared to be in excellent ecological condition, although time constraints precluded any systematic or quantitative vegetation assessment. Casual observation suggested that the vegetation communities appeared intact, healthy and relatively lush due to recent rains. Sand cay vegetation is exposed to periodic or continued disturbance from wind, cyclones, sun and salt, all of which place environmental stress on plant growth. Plants that occupy foredune habitats are particularly exposed to such stresses, and woody perennial species are perhaps the most vulnerable. Additional disturbance that these shrubs must tolerate include the considerable impacts of nesting seabirds, reducing photosynthetic capacity by damaging/reducing foliage cover and marine turtles inadvertently undermining root systems when burrowing to build their nests. The nutritional impact of excessive guano deposition at the base of shrubs heavily used by seabirds must be considerable.

Three species were observed that have particular conservation significance within the reserve: Octopus Bush, *Cordia* (*Cordia subcordata*) and Birdlime Tree. Octopus Bush grows as a shrub or low tree on

unconsolidated coarse marine sands on sand cays in the Pacific. It is a primary coloniser of foredunes and often forms narrow zones of plants immediately behind the high tide mark. Octopus Bush has a high tolerance of strong salt-laden winds and storm surges. It is a valuable structural resource for seabirds that nest above the ground. In fact, it is the single most important plant for birds on these islands, in particular those that lack Birdlime Tree. Octopus Bush suffers mechanical damage from nesting seabirds and from the excavations made by nesting sea turtles.

The small tree *Cordia* provides a valuable resource for above-ground nesting seabirds. It was recorded growing on East Diamond Islet, South West Coringa Islet and North East Herald Cay, where it occurred in dense monospecific stands (copses) that appeared to be clonal.

Birdlime Tree is the dominant and key component of the ecological community termed 'Littoral Rainforest and Coastal Vine Thickets' which is EPBC-listed. Low closed Birdlime Tree forest is restricted to a few scattered sand cays including North East Herald Cay where it is common and locally abundant. Forests of Birdlime Tree on the Coringa-Herald islands are of high conservation significance as they constitute 15% of Australia's entire extent of this vegetation community and provide important nesting habitat for the majority of seabird species of the Coral Sea.

Over recent decades, Birdlime Trees on tropical islands in the Indo-Pacific Region (including Australia) have exhibited significant dieback largely attributed to infestation by the scale insect, *P. urbicola*. The dieback observed during recent years, has also been attributed to prolonged dry seasonal conditions.

On South West Coringa Islet damage from scale insects was first recorded in 1991, with many trees defoliated the following year, and 80% of the forest devastated by 1997. This culminated in loss of the entire 16 ha of Birdlime Tree forest on South West Coringa Islet by 2002.

Scale insect infestation was first recorded on North East Herald Cay in 1997. To avert a catastrophe similar to that on South West Coringa Islet, the predatory ladybird, *Cryptolaemus montrouzieri*, was released to reduce the scale insect population. As a result, much of the forest of Birdlime Tree on North East Herald Cay escaped major damage. However, at about the time the scale infestation was reduced, larvae of a hawkmoth (*Hippotion velox*) and a noctuid moth were observed to be defoliating Birdlime Tree and *Cordia*. This damage, combined with prolonged dry conditions, caused dieback of Birdlime Tree and *Cordia* stands at North East Herald Cay.

The condition of the vegetation during the survey appeared to be healthy, possibly in response to recent rains. Birdlime Trees were in full foliage (they shed leaves in the dry season to reduce transpiration and water stress), and not showing dieback at this time though previous tree loss was evident in rotting fallen logs.

There were signs of feeding by hawkmoth larvae and grasshoppers but this was insignificant. During a night of collecting moths on North East Herald Cay, the sheet was dominated by a large number (an estimated 200 specimens on the sheet by the morning) of *H. velox*. While this hawkmoth species is known to feed on and potentially can defoliate Birdlime Tree, the trees showed no signs of excessive damage by caterpillars; the main damage to Birdlime Tree leaves appeared to be caused by the Giant Grasshopper (*Valanga irregularis*). Scale insect infestations were not observed on Birdlime Tree.

Cordia stands showed signs of minor dieback at growth tips, which may simply be its usual state from exposure to strong salt-laden winds rather than an effect of insect herbivory. Generally, this species appeared to be healthy, with stands regenerating, and without significant dieback albeit suffering from the mechanical impacts of nesting seabirds.

The area has recovered from the severe scale infestations recorded between 1991 and 2002. At the time of the Bush Blitz survey the vegetation communities showed minimal evidence of dieback. In addition to the absence of any weed species, the islands are healthy environments in excellent condition.

Glossary

Adventive: (of a plant or animal) occurring in but not native to the region in which it appears.

Exotic species: a species occurring outside its normal range.

Host plant: a species of plant that is used by larvae of insects and by some other arthropods as a place to feed and grow up.

Morphospecies: A group of individuals considered to belong to the same species on the grounds of morphology (physical features) alone.

Operational Taxonomic Unit (OTU): closely related individuals grouped by similarity.

Pest species: a species that has the potential to have a negative environmental, social or economic impact.

Putative new species: an unnamed species that, as far as can be ascertained, was collected for the first time during the Bush Blitz.

Range extension: increase in the known distribution or area of occurrence of a species.

Species range: the geographical area within which a particular species can be found.

Taxon (plural taxa): a member of any particular taxonomic group (e.g. a species, genus, family).

Taxonomy: the categorisation and naming of species. The science of identifying and naming species, as well as grouping them based on their relatedness.

Threatened species: fauna or flora that are listed under Section 178 of the EPBC Act in any one of the following categories—extinct, extinct in the wild, critically endangered, endangered, vulnerable, conservation dependent.

Type locality: the location where the holotype or syntypes (type specimen(s)) was or were found.

Type specimens (holotype, syntypes): the specimen, or set of specimens, on which the description and name of a new species is based.

Undescribed taxon: a taxon (usually a species) that has not yet been formally described or named.

Vascular plants: a lineage of plants that possess well-developed veins (vascular tissue) in their stems, roots and leaves. Vascular plants include the majority of familiar land plants: flowering plants, ferns, conifers, cycads and fern allies, but not mosses, liverworts or algae.

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FRONT COVER *Acropora* species at South West Herald Cay © Copyright, Keith Martin-Smith

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Coral Sea Commonwealth Marine Reserve

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