# <u>Groote Eylandt Bush Blitz</u> Diurnal Lepidoptera Butterflies and Moths

14–25 June 2021 Report submitted to Director of National Parks 4 April 2022 Jared Archibald



A male Tawny Coster Acraea terpsicore drinking from moist sand near Site JA21-13. Selfintroduced from Asia a decade ago, this species now ranges over much of northern Australia (Photo – J. Archibald)

Nomenclature and taxonomy used in this report is consistent with: The Australian Faunal Directory (AFD)

https://biodiversity.org.au/afd/home

## Contents

| Contents                               |                                                    |
|----------------------------------------|----------------------------------------------------|
| List of contributors                   |                                                    |
| Abstract                               |                                                    |
| 1. Introduction                        |                                                    |
| 2. Methods                             |                                                    |
| 2.1 Site selection                     |                                                    |
| 2.2 Survey techniques                  | 5                                                  |
| 2.2.1 Methods used at standard su      | rvey sites5                                        |
| 2.3 Identifying the collections        |                                                    |
| 3. Results and Discussion              |                                                    |
| 3.1 Un-named or not formalised ta      | xa7                                                |
| 3.2 Putative new species (new to s     | cience)                                            |
| 3.3 Exotic and pest species            |                                                    |
| 3.4 Threatened species                 |                                                    |
| 3.5 Range extensions                   |                                                    |
| 3.6 Genetic information                |                                                    |
| 4. Information on species lists        |                                                    |
| 5. Information for land managers       |                                                    |
| 6. Other significant findings          |                                                    |
| 7. Conclusions                         |                                                    |
| Acknowledgements                       |                                                    |
| References                             |                                                    |
| Appendices                             |                                                    |
| Appendix 1. List of diurnal Lepidopter | a recorded during the Groote Eylandt Bush Blitz 15 |

## List of contributors

| List of contributors to this report. |                         |                                                   |                               |  |  |
|--------------------------------------|-------------------------|---------------------------------------------------|-------------------------------|--|--|
| Name                                 | Institution/affiliation | Qualifications/area of expertise                  | Level/form of<br>contribution |  |  |
| Jared Archibald                      | MAGNT                   | Zoology/Fieldwork                                 | Principal Author              |  |  |
| Michael Hammer                       | MAGNT                   | PhD, BSc<br>(Hons)/Ichthyology/Project<br>Manager | Internal Review               |  |  |

## Abstract

A diurnal Lepidoptera fauna survey was carried out on Groote Eylandt, within the Anindilyakwa Indigenous Protected Area, western Gulf of Carpentaria, over ten days in June 2021. This survey was part of the Bush Blitz program of biodiversity surveys across Australia. Nineteen sites were sampled encompassing a range of habitats. A total of 43 diurnal Lepidoptera species were recorded. As no previous dedicated surveys had been made in this area, these records establish a baseline list of diurnal Lepidoptera for the island. Of these 43 species, twelve were sampled for the first time on the island, although observational records already existed for them. One species newly recorded for Groote Eylandt was observed but not collected, the Orange Migrant *Catopsilia scylla atesia*. Overall, Groote Eylandt appears to support a moderate diversity of diurnal Lepidoptera fauna but further surveys need to be conducted to ascertain what additional species are present on the island.



A selection of processed butterfly specimens collected duting the Groote Eyland Bush Blitz (Photo – J. Archibald)

## 1. Introduction

Within the insects, butterflies are perhaps the best known group owing to their spectacular appearance, diversity (including high levels of endemism) and generally conspicuous behaviour. They also play key roles as 'flagships' and 'bio-indicators' for inventory and monitoring for conservation and land management (Braby and Williams 2016). However, the Australian butterfly fauna still remains to be fully documented, with species discovery and description about 90% complete, spatial distributions still to be accurately mapped, and aspects of the biology of some species still unknown (Braby 2016).

The Anindilyakwa Indigenous Protected Area (IPA) covers approximately one million hectares of land and sea country across the Groote Eylandt Archipelago and is located in the western Gulf of Carpentaria. Groote Eylandt itself is Australia's fourth largest island and is situated 50km from the mainland. A low, highly dissected sandstone escarpment occupies much of its eastern side, and various habitats such as tropical open woodlands, coastal flood plains, swamps and mangrove forests are found across the island. Groote Eylandt continues to remain free of Cane Toads and other introduced vertebrate pests and is known as a stronghold for declining mammal species.

No surveys of diurnal Lepidoptera have been carried out on Groote Eylandt in the past meaning there is no species baseline list and consequently conservation and land management plans cannot currently consider this fauna.

This report summarises the results of a ten day targeted survey of diurnal butterflies and moths on Groote Eylandt in June 2021. It complements diurnal Lepidoptera data from previous Bush Blitz surveys across the Top End (Fish River Station, Wongalara Sanctuary, Judbarra National Park, and Bradshaw Field Training Area), to create a baseline upon which future scientific, Ranger and citizen science surveys can build.

## 2. Methods

#### 2.1 Site selection

Nineteen sites were sampled, including two Standard Survey Sites (SS1, SS2). The timing of the survey coincided with the end of an average Wet Season over the Top End of the Northern Territory. This meant that sampling occurred during what is normally a peak of lepidopteran activity and abundance and this proved to be the case. Due to constraints of accessibility to most areas on Groote Eylandt (lack of roads, and some roads closed for cultural reasons), helicopters shared across a large biological survey team were used extensively to access most sites. Due to the difficulty of gaining access to Groote Eylandt and the lack of any previous sampling, sites were targeted primarily in the more remote and upland areas which could not be reached by vehicles, with lowland areas being accorded less sampling pressure. As the Lepidoptera were sampled as part of a multi-taxa team (with Fish and Odonata), sites targeted included representative aquatic habitats across the island as this allowed maximum efficiency of sampling; nonetheless adjacent terrestrial habitat was also sampled at each site across a wide spatial area of the study region. A summary of sampling sites is shown in Table 1.



An example of an escarpment creek flowing along rock fissures with riparian habitat surrounding permanent pools. These sites were rich in lepidopteran diversity and would become refugia for many species in the Dry Season (Photo – J. Archibald)

| Table 1. Diurnal Lepidoptera Sampling Sites, GDA94 datum |                 |                  |                                                      |                      |  |
|----------------------------------------------------------|-----------------|------------------|------------------------------------------------------|----------------------|--|
| Site                                                     | Latitude<br>(S) | Longitude<br>(E) | Location                                             | Date                 |  |
| JA21-01                                                  | -13.8566        | 136.43651        | ALC Ranger Station, Pole 13, GE                      | 14-24 June 2021      |  |
| JA21-02                                                  | -13.98341       | 136.48137        | Top Crossing, Angurugu River, GE                     | 14-15 June 2021      |  |
| JA21-04                                                  | -13.8949        | 136.4167         | Cnr of Bougainvillea & Gray St, Alyangula,           | 15 June 2021         |  |
| JA21-05                                                  | -13.85644       | 136.42002        | Beach N of manganese loader, Alyangula               | 15 June 2021         |  |
| JA21-06                                                  | -14.02589       | 136.54871        | Top of escarpment SE of Angurugu, GE                 | 16 June 2021         |  |
| JA21-07                                                  | -14.02539       | 136.54805        | Base of escarpment SE of Angurugu, GE                | 16 June 2021         |  |
| JA21-08                                                  | -14.15535       | 136.42044        | Mouth of Second Creek, S of Emerald River            | 17 June 2021         |  |
| JA21-09                                                  | -13.98944       | 136.47568        | 1km SW of Top Crossing, Angurugu River               | 17 June 2021         |  |
| JA21-10<br>& B                                           | -14.10302       | 136.5842         | Kings Crossing, 19km SW of Angurugu, GE              | 18 & 23 June<br>2021 |  |
| JA21-12                                                  | -14.00959       | 136.64877        | 20km ESE of Angurugu, GE                             | 19 June 2021         |  |
| JA21-13                                                  | -14.09652       | 136.71021        | 30km ESE of Angurugu, GE                             | 20 June 2021         |  |
| JA21-14                                                  | -13.96042       | 136.63182        | 19km ENE of Angurugu, GE                             | 21 June 2021         |  |
| JA21-16                                                  | -13.63586       | 136.94499        | North East Island, NE of Groote Eylandt              | 22 June 2021         |  |
| JA21-17                                                  | -13.83433       | 136.41095        | Small creek 2km NW of Alyangula, GE                  | 23 June 2021         |  |
| Market<br>Garden                                         | -13.98168       | 136.46657        | Market Garden, Angurugu, GE                          | 1-14 July 2021       |  |
| Emerald<br>Rv near<br>SS2                                | -14.08351       | 136.43106        | 200m south of Emerald River mouth,<br>Groote Eylandt | 16 June 2021         |  |
| South<br>Point                                           | -14.2166        | 136.34586        | South Point, GE                                      | 17 June 2021         |  |
| SS1                                                      | -13.98549       | 136.484          | SE of Top Crossing, Angurugu River, GE               | 15 June 2021         |  |
| SS2                                                      | -14.08263       | 136.4314         | Mouth of Emerald River, GE                           | 17 June 2021         |  |

#### 2.2 Survey techniques

All sites sampled comprised an area of approximately 1.5–2.0 ha. Butterflies were recorded using visual observations or collected using a standard entomological sweep net (400mm internal diameter). Specimens retained as vouchers were placed in glassine envelopes and then frozen, as there was no time to process in the field. These specimens were pinned and air dried in October and November 2021. Sampling effort varied per site, but was typically around 2 to 3 hrs, either in the late morning or early afternoon when butterfly activity is at its greatest. However, as most sites were accessed by helicopter, available survey time was often dictated by helicopter scheduling.

#### 2.2.1 Methods used at standard survey sites

The Standard Survey Sites 1 and 2 (SS1 & SS2) were sampled as per the standard method proscribed for these sites. A two person team sampled for 30 minutes within each site. All species of Lepidoptera detected were recorded with some voucher specimens being collected and processed as described in 2.2 above.



ALC rangers on the hunt for butterfly specimens in vegetated coastal dune country at the mouth of the Emerald River. Their assistance during Bush Blitz was invaluable, and their enthusiasm was contagious (Photo – J. Archibald)

#### 2.3 Identifying the collections

Vouchered specimens were identified based primarily on Braby (2000, 2016, & 2018), as well as comparison with material in the Museum and Art Gallery of the Northern Territory (MAGNT) entomological collections. The specimen data was assembled in a FileMaker Pro database managed by the Natural Sciences Section at MAGNT and observational data manually added. A copy of this data will ultimately be accessed through the Atlas of Living Australia (ALA). The data has been recorded to the level of subspecies. Specimens that were not recorded to species level (i.e. where there was uncertainty in identification due to damage) were excluded.

## 3. Results and Discussion

Forty three species of diurnal Lepidoptera were recorded on Groote Eylandt. Appendix 1 lists all diurnal Lepidoptera recorded during the Groote Eylandt Bush Blitz. Collections made during this Bush Blitz will result in 109 specimens being added to public collections and 144 records added to publicly accessible databases. This survey has produced a baseline list of taxa for the island.

#### 3.1 Un-named or not formalised taxa

No un-named or not-formalised Lepidoptera taxa were found on Groote Eylandt.

#### 3.2 Putative new species (new to science)

No putative new Lepidoptera species were found on Groote Eylandt.

#### 3.3 Exotic and pest species

No exotic or pest species of Lepidoptera were found on Groote Eylandt.

However, during field work two species of invasive weeds were noted (see Table 2). Both Mission Grass and Hyptis are common weeds found across the Top End of the Northern Territory, and are considered Class B weeds under the NT Weeds Management Act 2001. Both species were observed along the verge of a number of roads and tracks near Angurugu. Neither of these species are likely to cause high impacts on Lepidoptera communities although their control should be prioritised so they do not spread across the island, thus altering the relative pristine habitats that abound on Groote Eylandt.

| Table 2. Exotic and pest species recorded on Groote Eylandt |                                                                                                                               |                                                            |                                                      |  |  |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------------------------------|--|--|
| Exotic/pest species                                         | Location Indication of abundance                                                                                              |                                                            | Comments                                             |  |  |
| Cenchrus polystachios<br>Mission Grass                      | On verges of roads<br>around Angurugu<br>township - mostly on<br>first few km of access<br>road to the south of the<br>island | Only noted in thick<br>monotypic stands on<br>road verges. | Class B Weed – to be controlled under the Act.       |  |  |
| <i>Hyptis suaveolens</i><br>Hyptis                          | Noted in dried stands at Site JA21-09.                                                                                        | Not seen elsewhere on the island.                          | Class B Weed – to be<br>controlled under the<br>Act. |  |  |



The range of butterfly species collected on Groote Eylandt was remarkable. This image shows species from the families Hesperiidae, Pieridae, Nymphalidae, and Lycaenidae (Photo – J. Archibald)

#### 3.4 Threatened species

No diurnal Lepidoptera species found on Groote Eylandt are currently listed as threatened under any of the state, national or international lists of threatened species schedules. These schedules include the Territory Parks and Wildlife Conservation Act, the EPBC Act - List of Threatened Fauna, and the IUCN Red List of Threatened Species.

#### 3.5 Range extensions

Of the 43 species of diurnal Lepidoptera sampled during the survey, thirteen species were recorded as range extensions (see Table 3). All 43 species had voucher specimens collected apart from one species, *Catopsilia scylla etesia*, that was recorded visually only.

No dedicated Lepidoptera survey had been conducted on Groote Eylandt before this Bush Blitz however various incidental specimens had been collected from the island since the 1920s, and also from neighbouring sites along the south and west Gulf of Carpentaria coast. These historic records, although useful, give only a fragmentary glimpse of the lepidopteran diversity found on Groote Eylandt. Human observational records (both by sight and imagery) have been made over the past two decades and uploaded to various public databases. These records are useful to a point, but it must be stressed that voucher specimens are imperative for documenting verifiable records. Observational records complement verifiable voucher specimens but cannot replace them in scientific value. Due to this survey, the presence of many lepidopteran species can now be confirmed with captured specimens, with visual and photographic records on public databases supplementing these vouchers.

The range extensions recorded span from 150 to 230km in distance, and extend from north, east and south existing records on the Gulf of Carpentaria coast, inland, or the Gove Peninsula. More studies need to be carried out to accurately identify the range of these lepidopteran species across northern Australia.



A Small Dusky-blue *Candalides erinus erinus* resting on a plant stem. This small species of Lycaenid was recorded at four sites across Groote Eylandt, including North East Island (Photo – J. Archibald)

| Table 3. Range extensions or significant infill records for lepidopteran species sampled |                                                 |                                                          |                                         |  |  |  |
|------------------------------------------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------|-----------------------------------------|--|--|--|
| Species                                                                                  | Location<br>sighted/observed                    | Distance from<br>nearest known<br>record (km)            | Comments                                |  |  |  |
| <i>Telicota augias krefftii</i><br>Bright-orange Darter                                  | JA21-14<br>Market Garden<br>Emerald River Mouth | ~160km SSE of<br>Gurrumura, NT                           | Range extension                         |  |  |  |
| <i>Catopsilia scylla etesia</i><br>Orange Migrant                                        | JA21-01                                         | ~200km ENE of<br>Roper River, NT                         | Range extension<br>(Visual record only) |  |  |  |
| <i>Appias paulina ega</i><br>Yellow Albatross                                            | Market Garden                                   | ~200km S of<br>Yirrkala, NT                              | Range extension                         |  |  |  |
| Euploea darchia darchia<br>Small Brown Crow                                              | JA21-13 / SS2                                   | ~200km S of<br>Yirrkala, NT                              | Range extension                         |  |  |  |
| <i>Hypolimnas misippus</i><br>Danaid Eggfly                                              | Market Garden                                   | ~200km ENE of<br>Roper River, NT                         | Range extension                         |  |  |  |
| <i>Candalides margarita gilberti</i><br>Trident Pencil-blue                              | Alyangula, GE                                   | ~170km SSE of<br>Dhamyidaka<br>Outstaion, NT             | Range extension                         |  |  |  |
| <i>Nesolycaena urumelia</i><br>Spotted Opal                                              | JA21-06 / JA21-07<br>JA21-10 / JA21-12          | ~150km SE of<br>Gapuwiyak-Balma<br>Track, NT             | Range extension                         |  |  |  |
| <i>Nacaduba biocellata biocellata</i><br>Two-spotted Line-blue                           | JA21-16                                         | ~200km SE of<br>Little Mooroongga<br>Island, NT          | Range extension                         |  |  |  |
| Theclinesthes sulpitius<br>Samphire Blue                                                 | South Point, GE                                 | ~175km N of Bing<br>Bong, NT                             | Range extension                         |  |  |  |
| <i>Theclinesthes miskini miskini</i><br>Wattle Blue                                      | JA21-06 / JA21-12<br>Market Garden              | ~200km E of<br>Wongalara<br>Sanctuary, NT                | Range extension                         |  |  |  |
| <i>Zizina otis labradus</i><br>Common Grass-blue                                         | JA21-04 / JA21-05<br>Market Garden              | ~230km E of<br>Wongalara<br>Sanctuary, NT                | Range extension                         |  |  |  |
| Euchrysops cnejus cnidus<br>Spotted Pea-blue                                             | Market Garden                                   | ~200km S of Eldo<br>Crossing, Gove<br>Peninsula          | Range extension                         |  |  |  |
| <i>Freyeria putli putli</i><br>Jewelled Grass-blue                                       | JA21-05 / SS2                                   | ~180km SSE of<br>Baralminar River, Range extension<br>NT |                                         |  |  |  |

#### 3.6 Genetic information

No genetic sampling of any diurnal Lepidoptera species was undertaken, however voucher specimens are suitable and available for tissue subsampling in the future.

## 4. Information on species lists

A total of 144 records (109 specimens and 35 observations) were made during this survey, representing 43 species of diurnal Lepidoptera. Of these 43 species, voucher specimens were obtained for 42; the other record being a visual observation. Sampling was carried out in excellent conditions for lepidopteran fauna with warm sunny days, plenty of flowering plants, and all drainage systems still flowing with fresh clean water from the Wet Season. Due to these conditions, it is felt that a representative survey of the lepidopteran fauna of Groote Eylandt was achieved.

However, as no previous surveys of Lepidoptera have been carried out on this island, this survey can only be considered the first baseline study of the Lepidoptera taxa for Groote Eylandt. Results of a review of ALA human observation records, and communications with Dave Webb and Matt Vini (both Groote butterfly enthusiasts/citizen scientists), ascertained that there are at least twelve extra Lepidoptera species extant on the island that were not recorded on this survey. Further surveys need to be undertaken on Groote Eylandt during different seasons, and in differing habitats to gain a comprehensive record of the Lepidoptera fauna of this island.

It is interesting to note that of the 30 species of diurnal Lepidoptera collected that had existing specimens lodged in public collections, fourteen of them were represented by a single specimen (or sometimes more) collected by Norman Tindale in 1921–22. These specimens are now a century old and represent the earliest known scientific collection of butterflies on Groote Eylandt, and underline the importance of voucher specimens held in collecting institutions. The Bush Blitz specimens will be equally as important and valuable as studies of butterflies on this island continue.



A female Common Grass-blue Zizina otis labradus sunning on a lawn at Alyangula. This species is found throughout Australia and was found at three sites on Groote Eylandt (Photo – J. Archibald)

The relative abundance of the lepidopteran fauna on Groote Eylandt during the survey period can also be outlined. The most abundant species were *Euploea corinna* and *Jamides phaseli* with both being recorded at eleven of the nineteen sites surveyed. As many sites were riparian habitats bordering open woodland (their preferred habitats) this was not an unexpected result. Fifteen species were only recorded from a single site with a single specimen. The richest survey site in terms of species diversity was JA21-13 — a jungle lined gorge on the escarpment edge with a total of fourteen species recorded. The sites with the lowest species diversity with only two species being recorded were South Point and JA21-17.

Standard Survey Sites 1 and 2 (SS1 and SS2) were located in quite different habitats. SS1 was situated in open tropical woodland with a shrubby understorey. At the time of sampling the understory Acacia shrubs were in flower, and there was little in the way of grasses present. SS2 was located near a beach at the mouth of the Emerald River. It included some mangrove forest, and a vegetated grassy dune areas with Beach Hibiscus and some eucalypts present. Six species of butterfly were recorded at SS1. All these species either favour open woodland habitats, or are known to frequent them so there were no unusual records made at this site. Nine species of butterfly were recorded at SS2, with a crossover between sites of three species (*Hypolycaena phorbas phorbas, Acraea terpsicore*, and *Arhopala eupolis asopus*). Four of the species found favour coastal habitats, four of them are known to frequent coastal areas (especially those that border open woodland), and one prefers grassy habitats. As SS2 was a reasonably diverse habitat, bordering open woodland, none of the species recorded were unexpected for the site.



A male Blue-banded Eggfly *Hypolimnas alimena darwinensis* that was caught at night by hand in a rocky gorge. This subspecies is found across the Top End, and this is the first specimen captured on Groote Eylandt since a collection by Norman Tindale in December 1921 (Photo – J. Archibald)

## 5. Information for land managers

Groote Eylandt is a large, habitat-diverse region that is a substantial protected area for a wide range of ecosystems. In relation to the diurnal Lepidoptera fauna of this area, the major recommendation for land managers would be the control of two major factors that cause habitat degradation and destruction; weeds and fire.

Although there was evidence of weeds in some urbanised or disturbed areas, weeds were conspicuous by their absence on Groote Eylandt. This is no doubt due to the strict Quarantine and Biosecurity controls that have been in place on the island for many years to keep out unwanted animal and plant species. As mentioned in 3.3, two species of Class B weeds were noted at a few sites. Wind, vehicles, and animals (seeds caught in their fur) are the main vectors for these weeds. Controlling weeds by physically removing them and using herbicides, careful control of vehicle and human movements through known weed areas, and constant monitoring will control and hopefully eradicate these infestations.

Some habitats, such as riparian areas and monsoon vine thickets surrounding permanent springs (e.g. JA21-07, JA21-14), are fire sensitive as well as being important Lepidoptera habitats (especially as refugia in the Dry Season). Identifying and protecting a patchwork/mosaic of key refugia in the landscape from hot fires would be beneficial. One location visited by helicopter on the escarpment (JA21-12) was a vegetated gorge that exhibited evidence that a massively hot fire had burnt through the site the year before. Huge paperbarks had been killed or badly damaged, and much of the riparian habitat had been badly affected by fire. There had been deep erosion of earthen banks during the Wet Season as the vegetation that normally consolidated it had been ravaged by the fire. This would be a very difficult area for fire control and the authors only point it out to make the land managers aware of what was seen.

Butterflies represent an ideal portal to improved understanding of biodiversity research and conservation, being an active and visual part of habitats and landscapes (country). Butterfly sampling techniques, identification and biology could form component of activities including school education programs, ranger survey capacity building, and two-way learning to document language names and traditional ecological knowledge.



Broken escarpment country on the east side of Groote Eylandt (Photo – J. Archibald)

## 6. Other significant findings

All significant finding have been recorded in earlier chapters of this report.

## 7. Conclusions

Groote Eylandt supports a moderate diversity of diurnal Lepidoptera that are characteristic of the tropical woodland, riparian, and escarpment communities of northern Australia. Further surveys at other times of year, as well as in differing habitats are likely to identify additional species on the property. This Bush Blitz survey provided an opportunity to survey a relatively un-sampled region of the Northern Territory for Lepidoptera fauna resulting in a significant baseline list that will be built on in the future.

## Acknowledgements

We thank the Traditional Owners of the Anindilyakwa Indigenous Protected Area, and especially of Groote Eylandt, for permitting us to conduct our surveys on their land. We recognise their ongoing cultural connection to land and sea country, and pay our respects to Elders past, present and emerging. We thank the Anindilyakwa Land Council for allowing us to conduct our survey. A huge thankyou to Anindilyakwa Land and Sea Ranger Coordinator Katie Oxenham and all the Rangers without whose help, knowledge, and enthusiasm would have made this Bush Blitz impossible. The field assistance and enthusiasm of teachers participating in TeachLive was a highlight of the fieldwork. Another huge thankyou goes to the Bush Blitz team for their help and support, to the helicopter pilots for their professional skills, and Robbie and Jo our amazing bush chefs. Special thanks also to Dave Webb whose enthusiasm for butterflies, both their capture digitally and as specimens, has no limits. Last but not least, a special thank you goes to Suzanne Horner for her unfailing patience, much needed support in IT matters, and the electronic analysis of data.



Numerous creeks flow from the escarpment into permanent pools surrounded by riparian habitat. These areas are home for many species of butterflies, and provide refugia in the Dry Season for many types of animals (Photo – J. Archibald)

### References

Australian Faunal Directory (AFD), <<u>https://biodiversity.org.au/afd/home></u> Dept of Agriculture, Water, and the Environment, Australian Government. Accessed March 2022.

Atlas of Living Australia (ALA), <<u>https://www.ala.org.au/></u> Commonwealth Scientific and Industrial Research Organisation. Accessed March 2022.

Braby, M.F. (2000). *Butterflies of Australia – Their Identification, Biology, and Distribution*. Vols 1 & 2. CSIRO Publishing, Collingwood, Victoria.

Braby MF, Bertelsmeier C, Sanderson C & Thistleton B. (2014). Spatial distribution and range expansion of the Tawny Coster butterfly, *Acraea terpsicore* (Linnaeus, 1758) (Lepidoptera: Nymphalidae), in South-East Asia and Australia. *Insect Conservation and Diversity* **7**, 132-143.

Braby, M.F. (2016). *The Complete Field Guide to the Butterflies of Australia*. 2nd Edition. CSIRO Publishing, Clayton South, Victoria.

Braby MF, Franklin DC, Bisa DE, Williams MR, Williams AAE, Bishop CL & Coppen RAM. (2018). *Atlas of Butterflies and Diurnal Moths in the Monsoon Tropics of Northern Australia*. ANU Press, Acton, Canberra, ACT

*EPBC Act List of Threatened Fauna* <<u>http://www.environment.gov.au/cgibin/</u> sprat/public/publicthreatenedlist.pl#other\_animals\_critically\_endangered> Dept of Agriculture. Waer, and the Environment, Australian Government. Accessed March 2022.

Insect Collection Database, Museum and Art Gallery of the Northern Territory. Accessed March 2022.

List of Threatened Animals Found in the Northern Territory <<u>https://nt.gov.au/environment/animals/threatened-animals</u>> Northern Territory Government. Accessed March 2022.

The IUCN Red List of Threatened Species. <<u>https://www.iucnredlist.org/</u>> International Union for Conservation of Nature and Natural Resources. Accessed March 2022.



Vegetated dunes nestled amongst escarpment outliers jutting into the sea. Site JA21-13 was just north of this area and was the richest site in terms of species diversity of diurnal Lepidoptera on the survey (Photo – J. Archibald)

## Appendices

## Appendix 1. List of diurnal Lepidoptera recorded during the Groote Eylandt Bush Blitz

Number of taxa: 43 (including subspecies and varieties but without double counting).

| Family       | Species                              | Common name               | Putative<br>new<br>species | Threatened<br>(EPBC Act) | Threatened<br>(State/Territory<br>Act) | Exotic/pest |
|--------------|--------------------------------------|---------------------------|----------------------------|--------------------------|----------------------------------------|-------------|
| Papilionidae | Cressida<br>cressida cressida        | Clearwing<br>Swallowtail  | No                         | No                       | No                                     | No          |
| Hesperiidae  | Pelopidas lyelli<br>lyelli           | Lyell's Swift             | No                         | No                       | No                                     | No          |
| Hesperiidae  | Telicota augias<br>krefftii          | Bright-orange<br>Darter   | No                         | No                       | No                                     | No          |
| Pieridae     | Catopsilia<br>pomona                 | Lemon Migrant             | No                         | No                       | No                                     | No          |
| Pieridae     | Catopsilia scylla<br>etesia          | Orange<br>Migrant         | No                         | No                       | No                                     | No          |
| Pieridae     | Eurema laeta<br>sana                 | Lined Grass-<br>yellow    | No                         | No                       | No                                     | No          |
| Pieridae     | Eurema alitha<br>novaguineensis      | Scalloped<br>Grass-yellow | No                         | No                       | No                                     | No          |
| Pieridae     | Eurema hecabe                        | Large Grass-<br>yellow    | No                         | No                       | No                                     | No          |
| Pieridae     | Elodina walkeri                      | Small Pearl-<br>white     | No                         | No                       | No                                     | No          |
| Pieridae     | Appias paulina<br>ega                | Yellow<br>Albatross       | No                         | No                       | No                                     | No          |
| Pieridae     | Cepora perimale                      | Caper Gull                | No                         | No                       | No                                     | No          |
| Nymphalidae  | Danaus petilia                       | Lesser<br>Wanderer        | No                         | No                       | No                                     | No          |
| Nymphalidae  | Danaus affinus<br>affinus            | Swamp Tiger               | No                         | No                       | No                                     | No          |
| Nymphalidae  | Euploea darchia<br>darchia           | Small Brown<br>Crow       | No                         | No                       | No                                     | No          |
| Nymphalidae  | Euploea corinna                      | Common Crow               | No                         | No                       | No                                     | No          |
| Nymphalidae  | Acraea<br>andromacha<br>andromacha   | Glasswing                 | No                         | No                       | No                                     | No          |
| Nymphalidae  | Acraea terpsicore                    | Tawny Coster              | No                         | No                       | No                                     | No          |
| Nymphalidae  | Junonia orithya<br>albicincta        | Blue Argus                | No                         | No                       | No                                     | No          |
| Nymphalidae  | Junonia villida<br>villida           | Meadow Argus              | No                         | No                       | No                                     | No          |
| Nymphalidae  | Hypolimnas<br>alimena<br>darwinensis | Blue-banded<br>Eggfly     | No                         | No                       | No                                     | No          |

| Nymphalidae | Hypolimnas<br>misippus               | Danaid Eggfly               | No | No | No | No |
|-------------|--------------------------------------|-----------------------------|----|----|----|----|
| Nymphalidae | Mydosama sirius<br>sirius            | Cedar Bush-<br>brown        | No | No | No | No |
| Nymphalidae | Hypocysta<br>adiante antirius        | Orange Ringlet              | No | No | No | No |
| Nymphalidae | Ypthima arctous<br>arctous           | Dusky Knight                | No | No | No | No |
| Lycaenidae  | Liphyra brassolis<br>major           | Moth Butterfly              | No | No | No | No |
| Lycaenidae  | Arhopala eupolis<br>asopus           | Purple Oak-<br>blue         | No | No | No | No |
| Lycaenidae  | Arhopala micale                      | Shining Oak-<br>blue        | No | No | No | No |
| Lycaenidae  | Hypolycaena<br>phorbas phorbas       | Black-spotted<br>Flash      | No | No | No | No |
| Lycaenidae  | Candalides<br>margarita gilberti     | Trident Pencil-<br>blue     | No | No | No | No |
| Lycaenidae  | Candalides<br>erinus erinus          | Small Dusky-<br>blue        | No | No | No | No |
| Lycaenidae  | Nesolycaena<br>urumelia              | Spotted Opal                | No | No | No | No |
| Lycaenidae  | Anthene seltuttus<br>affinus         | Dark Ciliate-<br>blue       | No | No | No | No |
| Lycaenidae  | Nacaduba<br>biocellata<br>biocellata | Two-spotted<br>Line-blue    | No | No | No | No |
| Lycaenidae  | Prosotas dubiosa<br>dubiosa          | Purple Line-<br>blue        | No | No | No | No |
| Lycaenidae  | Catopyrops<br>florinda estrella      | Speckled Line-<br>blue      | No | No | No | No |
| Lycaenidae  | Theclinesthes<br>sulpitius           | Samphire Blue               | No | No | No | No |
| Lycaenidae  | Theclinesthes<br>miskini miskini     | Wattle Blue                 | No | No | No | No |
| Lycaenidae  | Jamides phaseli                      | Purple<br>Cerulean          | No | No | No | No |
| Lycaenidae  | Catochrysops<br>panormus<br>platissa | Pale Pea-blue               | No | No | No | No |
| Lycaenidae  | Zizina otis<br>labradus              | Common<br>Grass-blue        | No | No | No | No |
| Lycaenidae  | Famegana<br>alsulus alsulus          | Black-spotted<br>Grass-blue | No | No | No | No |
| Lycaenidae  | Euchrysops<br>cnejus cnidus          | Spotted Pea-<br>blue        | No | No | No | No |
| Lycaenidae  | Freyeria putli putli                 | Jewelled<br>Grass-blue      | No | No | No | No |