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New locations of butterflies from northern Arnhem Land, Northern Territory

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Abstract

The Northern Territory is a frontier in Australia for biological research in which new discoveries and locations of butterflies are frequently made. In this paper, I report 41 new point locations for 36 species in northern Arnhem Land. In particular, a number of significant range extensions and new spatial records are documented, including new locations for the Copper Jewel *Hypochrysops apelles* and Samphire Blue *Theclinesthes sulpitius* which are more than 500 km from their previous known occurrence in the Northern Territory. Notwithstanding Arnhem Land's remoteness and inaccessibility being key constraints for butterfly surveys, further sampling is recommended to obtain fine-scale distribution data to fill knowledge gaps and to assess the conservation status of particular species. As the majority of the region surveyed is now located within the recently declared Indigenous Protected Area (IPA) managed by Bawinanga Aboriginal Corporation's Djelk Rangers based in Maningrida, these recommendations will assist with the collection of baseline data for future monitoring. A greater focus on this invertebrate group may help to promote the potential use of butterflies as indicators of biodiversity and landscape health.

Introduction

Knowledge of geographical distributions of butterflies in northern Australia, particularly in the Northern Territory, is incomplete (Common & Waterhouse 1981; Dunn & Dunn 1991; Braby 2000). The ease and frequency with which new spatial locations are recorded for a number of butterfly species in the Northern Territory highlights the work to be done in inventory and survey (Miller & Lane 2004; Franklin *et al.* 2005; Franklin *et al.* 2007; Pierce 2008; Dunn 2009). Moreover, Sands and New (2002) recommended that a "coordinated inventory of the incidence and status of all butterfly species in Australia's National Parks and other high level reserves" is needed to assist with future butterfly conservation and management plans.

Braby (2008) acknowledged that although documentation of spatial distribution of Australian butterflies is reasonably good at a very broad scale, there are still substantial gaps, particularly at finer scales. The knowledge base of Northern Territory butterfly fauna, in particular, is very poor and species are conspicuously under-represented, especially in Arnhem Land, when compared with other regions

of the continent (Dunn & Franklin 2010). Not surprisingly, new locations of species outside known ranges in the Northern Territory are frequently reported. Franklin *et al.* (2005) reiterated Braby's (2000) comment that "in many cases, gaps in the ranges shown … do not necessarily reflect natural disjunctions", but represent simple lack of recording.

This paper highlights new locations for 36 butterfly species in northern Arnhem Land. These records extend previously known ranges for these species, with two being of particular significance in that they occur more than 500 km from the next nearest documented location within the Northern Territory.

Methods

The records documented here are based on quantitative sampling of sites as well as incidental observations made between April 2006 and November 2011. The majority of records are from northern Arnhem Land in the vicinity of Maningrida (12°02'S, 134°13'E) situated at the mouth of the Liverpool River. The overall area includes stone country of the Liverpool and Mann rivers in the west, near-coastal regions across the north, and floodplains associated with the Blyth River and Arafura Swamp; Elcho Island formed the eastern boundary. All major habitats were encountered, including mangroves, salt flats, savannah, riparian forest, vine thicket and monsoon forest, as well as settled areas.

Permission was sought from relevant traditional owners to trap and release butterflies using a standard entomological sweep net. On two occasions permission to collect was granted for three hesperiids – a family of butterflies particularly difficult to identify in the field and for which local information has been unavailable. Where a net was not available, species were observed in the field and occasionally photographs were sent to experts to assist with identification. Texts used for identification included Braby (2000) and a field key to the lycaenid butterflies of the Top End and Kimberley (Franklin & Bisa 2008).

Quantitative sampling of sites was employed over a specified, but not necessarily standardised, time frame. Approximately 25–30% of sites were revisited. The spatial area sampled among sites was not standardised, but generally it varied from 50–500 m radius from the point location. Postsampling I applied abundance classes that I had been using to record data during the past 10 years (i.e. 1–2, 3–5, 6–10, 11–50 and >50). These classes were devised for recording abundance data in a Microsoft Access database which I co-constructed and have maintained with the assistance of like-minded butterfly enthusiasts since 2002. For the purposes of this paper these classes have been categorised alphabetically as follows: A = 1–2; B = 3–5; C = 6–10; D = 11–50 and E = >50.

To determine whether my records were new point locations, I compared data with current distribution maps published in Braby (2000) and subsequent papers published in the scientific literature. A hand-held GPS using WGS84 datum was used to determine point locations. Where a GPS was unavailable, coordinates were obtained retrospectively using Google Earth.

Results

I confidently identified 58 species of butterflies from northern Arnhem Land. Of these, 36 species (62%) represent 41 new point locations (Table 1; Figure 1). Geo-coordinates for these 41 new point locations are listed in Appendix 1. Ten of these 36 species were recorded at just a single new location with abundance generally low (A or A–B), except for the Pale Pea-blue *Catochrysops panormus* (A–D) and Jewelled Grass-blue *Freyeria putli* (B–D) (Table 1). The remaining 26 species occurred at two or more new locations with one, the Orange Ringlet *Hypocysta adiante*, recorded at 23 new locations (Table 1).

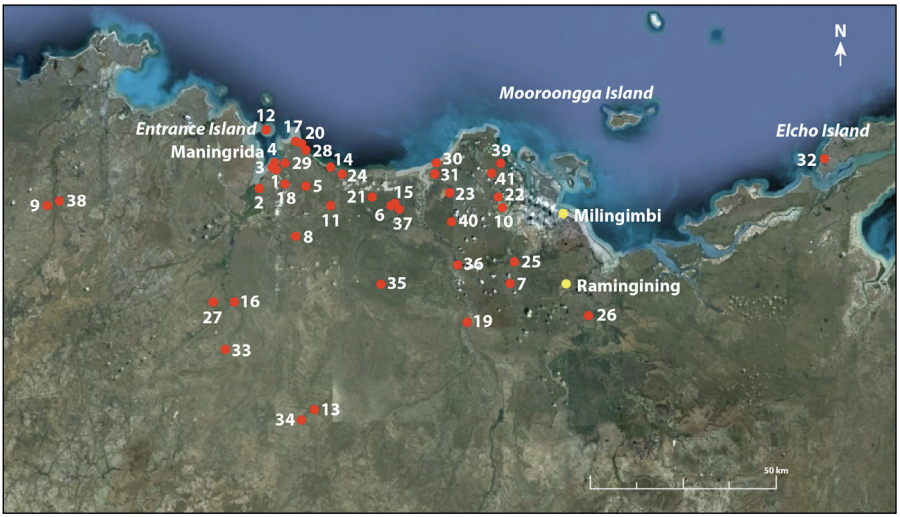


Figure 1. Map of northern Arnhem Land showing area surveyed and new point locations plotted. Adapted from Google Earth (2010).

Table 1. New point locations for 36 species of butterflies from northern Arnhem Land. Numbers refer to locations shown in Figure 1; the coordinates are listed in Appendix 1. Abundance scores refer to the number of adults recorded as follows: A = 1–2; B = 3–5; C = 6–10; D = 11–50; E = >50.

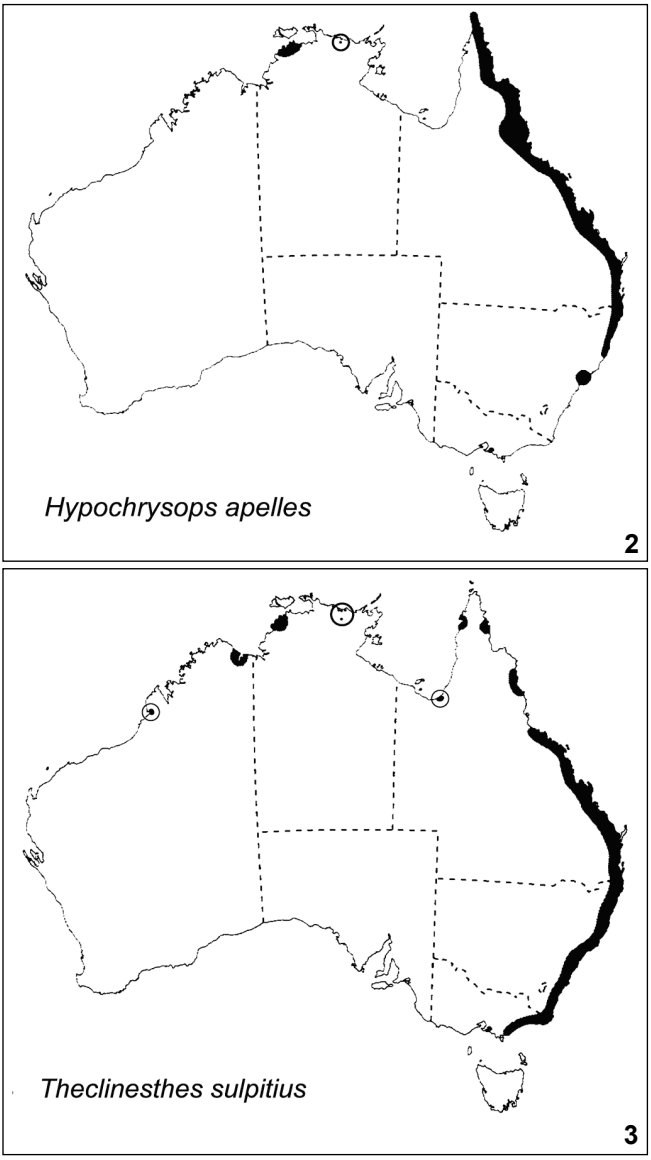
Species	Locations	Abundance
HESPERIIDAE		
Broad-banded Awl *Hasora hurama*	8, 16	A
Chrome Awl *Hasora chromus*	3	A
Sword-brand Grass-skipper *Neohesperilla xiphiphora*	4	A
Lyell's Swift *Pelopidas lyelli*	1, 2, 4, 8, 19, 40	A–B
Narrow-brand Grass-dart *Ocybadistes flavovittatus*	16, 36	A
Yellow Palm-dart *Cephrenes trichopepla*	4, 32	A
PAPILIONIDAE		
Clearwing Swallowtail *Cressida cressida*	1, 4, 18, 20, 22, 32	A–D
Fuscous Swallowtail *Papilio fuscus*	1, 3, 4, 5, 8, 9, 39	A
PIERIDAE		
Small Pearl-white *Elodina walkeri*	4, 12, 17, 32	A
Mangrove Jezebel *Delias aestiva*	1, 2, 3, 14, 23	A–D
NYMPHALIDAE		
Small Brown Crow *Euploea darchia*	15, 17, 21, 30	A–D
Swamp Tiger *Danaus affinis*	1, 2, 3, 4, 5, 6, 8, 9, 11, 14, 15, 16, 19, 20, 21, 26, 29, 30	A–D
Orange Lacewing *Cethosia penthesilea*	1, 2, 3, 4, 14, 15, 17, 24, 25, 28, 29	A–C
Chocolate Argus *Junonia hedonia*	2, 4, 5, 7, 9, 13, 15, 16, 19	A–C
Blue-banded Eggfly *Hypolimnas alimena*	2, 8, 9, 13, 15, 27	A–B
Evening Brown *Melanitis leda*	1, 2, 4, 13, 15, 16, 39	A
Dingy Bush-brown *Mycalesis perseus*	2, 4, 13, 16, 19, 21, 36	A–E
Cedar Bush-brown *Mycalesis sirius*	1, 2, 4, 5, 7, 11, 13, 15, 16	A
Orange Ringlet *Hypocysta adiante*	1, 2, 3, 4, 5, 7, 8, 9, 11, 13, 15, 16, 19, 20, 25, 26, 30, 32, 33, 34, 35, 39, 41	A–D
Dusky Knight *Ypthima arctous*	5, 7, 11, 13, 15, 16, 19, 34, 37, 38	A–B

Table 1. Continued.

Species	Locations	Abundance
LYCAENIDAE		
Copper Jewel *Hypochrysops apelles*	2	A–B
Purple Oak-blue *Arhopala eupolis*	1, 2, 3, 8, 9, 13, 15, 16, 19, 27	A–C
Black-spotted Flash *Hypolycaena phorbas*	2, 32, 33	A
Pale Ciliate-blue *Anthene lycaenoides*	2	A
Dark Ciliate-blue *Anthene seltuttus*	3	A
Purple Line-blue *Prosotas dubiosa*	32	A
Speckled Line-blue *Catopyrops florinda*	1	A
Samphire Blue *Theclinesthes sulpitius*	4, 10, 14, 31	A–D
Purple Cerulean *Jamides phaseli*	3, 4, 15, 17, 20, 29	A–B
Pale Pea-blue *Catochrysops panormus*	2	A–D
Spotted Grass-blue *Zizeeria karsandra*	3, 4, 12, 14, 20	A–C
Common Grass-blue *Zizina otis*	1, 4, 7, 20, 32	A–D
Black-spotted Grass-blue *Famegana alsulus*	1, 2, 4, 8, 11, 15, 19, 20, 29, 32, 34, 35	A–D
Dainty Grass-blue *Zizula hylax*	7	A
Spotted Pea-blue *Euchrysops cnejus*	1, 2, 4, 29	A–D
Jewelled Grass-blue *Freyeria putli*	14	B–D

The Copper Jewel *Hypochrysops apelles* (Figure 2) and Samphire Blue *Theclinesthes sulpitius* (Figure 3) were recorded more than 500 km from the only other documented locations in the Northern Territory. The Copper Jewel (Figure 4) was recorded in small numbers from three of seven surveys at location 2 – mangroves fringing the Liverpool River (Figure 6). The Samphire Blue (Figure 5) occurred at locations 4, 10, 14 and 31 where tidal influences and salt pans were evident (Figure 7). This species was encountered in large numbers at times, particularly during August of 2007 and 2009.

Several species uncommonly encountered (Chrome Awl *Hasora chromus*, Broad-banded Awl *Hasora hurama*, Sword-brand Grass-skipper *Neohesperilla xiphiphora*, Narrow-brand Grass-dart *Ocybadistes flavovittatus* and Dainty Grass-blue *Zizula hylax*) also have limited distributions in the Top End (Braby 2000). The remaining species encountered have broader distribution ranges in the Northern Territory.



Figures 2–3. Distribution maps of lycaenid butterflies with new point locations encircled: **2.** Copper Jewel *Hypochrysops apelles*; **3.** Samphire Blue *Theclinesthes sulpitius*. Adapted from Braby (2000); additional location data for Samphire Blue encircled black from Williams *et al.* (2006) and Pierce (2011).

Figures 4–5. Noteworthy lycaenid butterflies from northern Arnhem Land: **4.** Copper Jewel *Hypochrysops apelles* from location 2, 12 April 2008; **5.** Samphire Blue *Theclinesthes sulpitius* from location 10, 1 July 2007. (D. Bisa)

Figures 6–7. Butterfly habitat: **6.** For Copper Jewel *Hypochrysops apelles*, location 2; **7.** For Samphire Blue *Theclinesthes sulpitius,* location 14. (D. Bisa)

Discussion

The butterfly fauna of northern Arnhem Land is relatively poorly known, which is reflected in the many new records presented here. The detection of a number of noteworthy spatial records for the Northern Territory is significant, in particular new locations for the Copper Jewel and Samphire Blue. It is expected, however, that these species would occur more broadly in the Northern Territory as their larval food plants and preferred breeding habitats are well represented. For example, mangrove communities are widespread and common, especially along waterway margins and floodplains in Australia's tropical north (Wightman 2006). Specifically, the White-flowered Black Mangrove *Lumnitzera racemosa* identified by Meyer (1996) as the primary larval food plant of the Copper Jewel occurred at location 2, and Braby (2011) recently identified the Smooth-fruited Spur Mangrove *Ceriops australis* as a secondary larval food plant for this species. *Tecticornia* spp. have been identified as common larval food plants of the Samphire Blue (Meyer 1996; Braby 2011). The Grey Samphire *Tecticornia australasica*, and the glassworts *Halosarcia indica* and *H. halocnemoides* often associated with the presence of this species, were prevalent in tidal zones at various sites. It is therefore not surprising that Meyer and Wilson (1995), who first recorded the presence of the Samphire Blue in the Northern Territory, suggested that its range was likely to extend across the coastal regions of the Northern Territory and also into the gulf country of Queensland. Nonetheless, these new locations fill significant gaps in ranges for both these species and highlight the value of field-based surveys.

The presence of most other species reported here could have been predicted based on frequency and abundance records in surveys from similar habitats in the Northern Territory (Franklin & Bisa, unpubl.). Indeed, the ease and frequency with which the majority of northern Arnhem Land species were encountered suggests that with further sampling it is likely that many more new locations will significantly infill the ranges of many species.

Current butterfly distribution maps in the Northern Territory appear as point locations or synoptic interpolations therefrom. Other than Dunn and Dunn (1991), there are no point locality maps and the generalisation of those in Common and Waterhouse (1981) and Braby (2000) tend to obscure the point data, extent of sampling and extent of gaps. Interpolation, however, is reasonable and necessary, particularly in poorly surveyed regions, but it is clear that authors differ in the geographic extent and spatial scale to which they are willing to interpolate. For example, notwithstanding the increase in knowledge over time, Braby (2000) depicted the distribution of the Orange Ringlet in northern Australia more narrowly than did Common and Waterhouse (1981). It is possible that my reports of frequently encountered species will inspire confidence to redefine the geographical distributions of several species.

Although access to northern Arnhem Land can be difficult I recommend that further field research be undertaken in this biologically diverse region. The area is generally restricted to Aboriginal people or those with permits obtained from the Northern Land Council, and seasonal inundation during the monsoon period exacerbates isolation of the region by cutting off large areas. Additional point locations will assist with addressing distributional knowledge gaps and updating current generalised maps for the majority of butterfly fauna in the Northern Territory. Furthermore, as IPAs identified by the Commonwealth of Australia (2011) now encompass much of the region surveyed in this study, additional knowledge has the potential to assist with conservation and management plans under the umbrella of the National Reserve System. New (2010) also identified the importance of encouraging community ownership of conservation initiatives, of which establishing baseline data is deemed vital. Consequently, there now appears to be increased potential for conservation and land management agencies to engage local communities in raising the awareness of the value in establishing baseline data and monitoring biodiversity, including butterflies. Moreover, in relation to assessing the conservation status of butterfly fauna, Sands and New (2002) emphasised the need for identifying and managing threatening processes, several of which are particularly applicable to Arnhem Land (e.g. inappropriate fire regimes, adverse impacts of weeds, buffalo and pigs). Therefore, engaging wide-ranging support, including local Indigenous participation, to conduct further surveys will be essential. The potential benefits in Arnhem Land for all land managers and future generations could be immense.

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Appendix

Appendix 1. Geo-coordinates (latitude, longitude) for 41 new point locations in northern Arnhem Land from which butterflies were sampled.

Location	Latitude	Longitude	Location	Latitude	Longitude
1	12°03'18"S	134°13'53"E	**22**	12°06'38"S	134°46'46"E
2	12°05'46"S	134°11'30"E	**23**	12°06'23"S	134°39'35"E
3	12°03'02"S	134°13'26"E	**24**	12°03'28"S	134°23'53"E
4	12°02'48"S	134°13'31"E	**25**	12°16'36"S	134°49'02"E
5	12°05'36"S	134°18'26"E	**26**	12°24'09"S	135°00'37"E
6	12°08'30"S	134°30'45"E	**27**	12°22'00"S	134°05'00"E
7	12°19'11"S	134°48'33"E	**28**	12°00'27"S	134°18'17"E
8	12°12'41"S	134°17'02"E	**29**	12°02'31"S	134°15'15"E
9	12°08'01"S	133°40'25"E	**30**	12°02'32"S	134°37'20"E
10	12°08'21"S	134°47'20"E	**31**	12°04'05"S	134°37'10"E
11	12°08'07"S	134°22'01"E	**32**	12°01'17"S	135°34'19"E
12	11°57'32"S	134°12'38"E	**33**	12°28'59"S	134°06'58"E
13	12°37'06"S	134°19'23"E	**34**	12°38'56"S	134°17'59"E
14	12°02'55"S	134°21'55"E	**35**	12°19'33"S	134°30'05"E
15	12°07'59"S	134°31'28"E	**36**	12°16'20"S	134°40'49"E
16	12°21'39"S	134°07'54"E	**37**	12°08'38"S	134°31'35"E
17	11°59'02"S	134°17'06"E	**38**	12°07'27"S	133°41'28"E
18	12°05'15"S	134°15'17"E	**39**	12°02'04"S	134°47'26"E
19	12°24'52"S	134°41'54"E	**40**	12°10'13"S	134°39'39"E
20	11°59'37"S	134°17'40"E	**41**	12°03'34"S	134°45'46"E
21	12°07'28"S	134°28'05"E			