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Endangered White-spotted Ketsi Blue butterfly, *Lepidochrysops ketsi leucomacula*, in KwaZulu-Natal

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The appropriate management of the habitat of the endangered and endemic White-spotted Ketsi Blue butterfly, *Lepidochrysops ketsi leucomacula* Henning & Henning, 1994, is necessary for its survival. Much of the life history and ecology of this butterfly are unknown. The oviposition plant was found to be *Selago tarachodes* Hilliard and the plants that were observed to be visited by *L. k. leucomacula* for nectar all had pink flowers. Monitoring of two populations of *L. k. leucomacula* in protected areas commenced in March 2022. Surveillance and walked transects were the monitoring methods used. Observed threats to this endangered butterfly in protected areas were uncontrolled grazing by domestic livestock and mowing of its grassland habitat. Fencing of its grassland habitat may be a way to control these threats.

Introduction

The future of some South African threatened and endemic butterflies in the Family Lycaenidae, many of which have obligatory relationships with specific host plants and host ants, is precarious (Mecenero et al. 2020). Their populations appear to be in rapid decline towards extinction as evidenced by the relatively steep decline in the Red List Index for the Lycaenidae of conservation concern and for South African butterflies in general (Skowno et al. 2019; Mecenero et al. 2020). The main threats to the South African butterfly taxa of conservation concern are habitat loss and habitat degradation (Mecenero et al. 2020). Degradation of the habitat of threatened butterflies in the Family Lycaenidae can occur in protected areas as well as elsewhere (e.g., Rada et al. 2019) and site-specific management for threatened habitat-specialist lycaenid butterflies may be necessary (Armstrong & Louw 2013; Lu & Samways 2002a,b). Long-term monitoring and surveillance of populations of threatened lycaenid butterflies not monitored previously should be initiated and conducted inside protected areas at least, to detect changes in populations due to habitat degradation or other threats such as climate change and to enable timely conservation interventions (Armstrong & Louw 2013).

Lepidochrysops ketsi leucomacula is endemic to the coastal grasslands of the Pondoland region of South Africa, occurring discontinuously from Margate in the far southeastern part of KwaZulu-Natal to Port St Johns in the far northeastern part of the adjacent Eastern Cape (Van Wyk & Smith 2001; Mecenero et al. 2020; Perera et al. 2021). It is listed as Endangered on the South African Red List of Species (Regional Assessment) owing to habitat loss and degradation through urban and rural residential development and associated fire suppression, agricultural cultivation, subsistence farming, overgrazing

by livestock, tourism development and spread of alien plants (Armstrong & Williams 2018; Mecenero et al. 2020). This taxon had not been monitored previously, nor were details of its life history and ecology available apart from its broad habitat type and the genus of its oviposition plant (Mecenero et al. 2020; Williams 2022). The effective management of the habitat of endangered lycaenid butterflies in South Africa relies on the detailed knowledge of the life histories and ecology of the species (Mecenero et al. 2020; Lu & Samways 2002a,b). For example, the vulnerability of the various life-cycle stages of the butterflies and the responses of their host and nectar plants, as well as host ants, to fire season, fire frequency, fire intensity (type of fire) and time of day of burning can be used to formulate management guidelines for each species (Lu & Samways 2002a,b).

Monitoring of *L. k. leucomacula*, the flight period of which is from the beginning of November to the end of April (Mecenero et al. 2020), was initiated in March 2022 in Umtamvuna Nature Reserve at Port Edward and Solomon Gijima Dindikazi Nature Reserve at Margate in KwaZulu-Natal, South Africa. The aim of this short communication is to present novel details of its life history and ecology, which will assist in determining with further research which management actions are appropriate for the conservation of the butterfly and to indicate the threats to this species that occur in the two protected areas.

Materials and methods

Lepidochrysops ketsi leucomacula females that were ovipositing and males and females that were nectaring at flowers or resting on plants were photographed on 8 February 2022 at Umtamvuna Nature Reserve. Four line transects were set up on 30 March 2022 in one region of Umtamvuna Nature Reserve where *L. k. leucomacula* had been observed on the earlier date (Figure 1). The length of each transect is shown in Table 1. The lengths are different owing to the heterogeneity in the areas of suitable habitat in the monitored region of the reserve. The transects were walked along slowly and consecutively by two observers (the authors) together. The number of *L. k. leucomacula* that were observed within 3 m of the transect on one side (for the first two transects immediately adjacent to a grassed vehicle track) and within 3 m on either side of the third and fourth transects (that were not along a track and therefore not disturbed on one side) were recorded. The weather was partly cloudy and warm with a gentle breeze. The transects are intended as permanent transects for future monitoring occasions, except Transect 2, which was discarded because no *L. k. leucomacula* were observed along it on the first monitoring occasion. Monitoring was again conducted on 30 March 2023. Two surveillance visits to the Solomon Gijima Dindikazi Nature Reserve were conducted on 9 February 2022 and 31 March 2022. Owing to the absence of *L. k. leucomacula* at the time of the visits, line transects were not set up there.

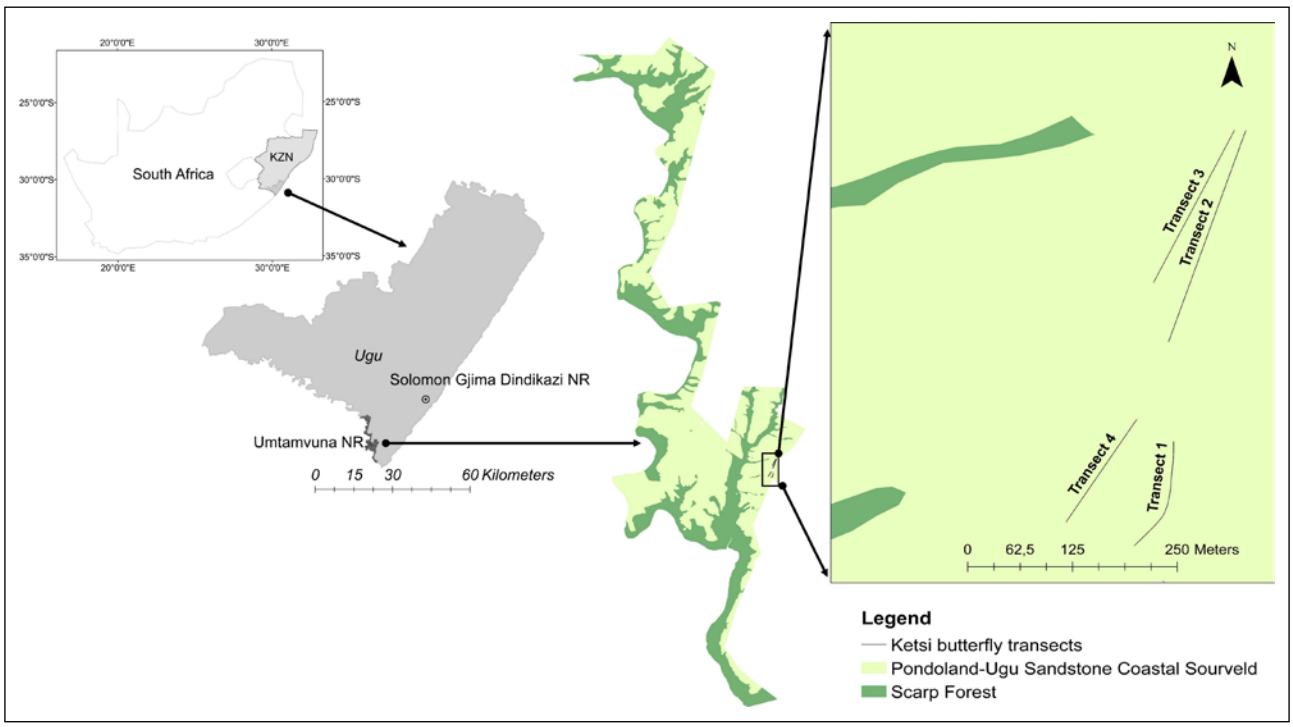

Figure 1. Map of study area, indicating the situation and vegetation types of the Umtamvuna Nature Reserve, KwaZulu-Natal, South Africa, and the relative positions of the four transects (Ketsi transects). Also indicated is the location of the Solomon Gijima Dindikazi Nature Reserve in the Ugu District Municipality. NR = Nature Reserve.

Table 1. Lengths of transects walked and areas searched, numbers of *Lepidochrysops ketsi leucomacula* (*Lkl*) observed, and calculated densities of the butterfly at Umtamvuna Nature Reserve on 30 March 2022

Quantity	Transect			
	1	2	3	4
Length (m)	143	275	210	152
Width (m)	3	3	6	6
Area sampled (ha)	0.043	0.083	0.126	0.091
# *Lkl* observed	6	0	6	2
Density (# *Lkl* / ha)	140	0	48	22

Results and discussion

Oviposition hostplant

We recorded *Selago tarachodes* Hilliard as the species of *Selago* utilised by the butterfly for oviposition (Figure 2A–D). This *Selago* species is endemic to the coastal grasslands of the northern Eastern Cape and southern and central parts of KwaZulu-Natal provinces in South Africa (Pooley 1998). Owing to its woody rootstock (Pooley 1998), this plant species likely resprouts after fire, but no information is available for its response to fire season, fire frequency and fire intensity.

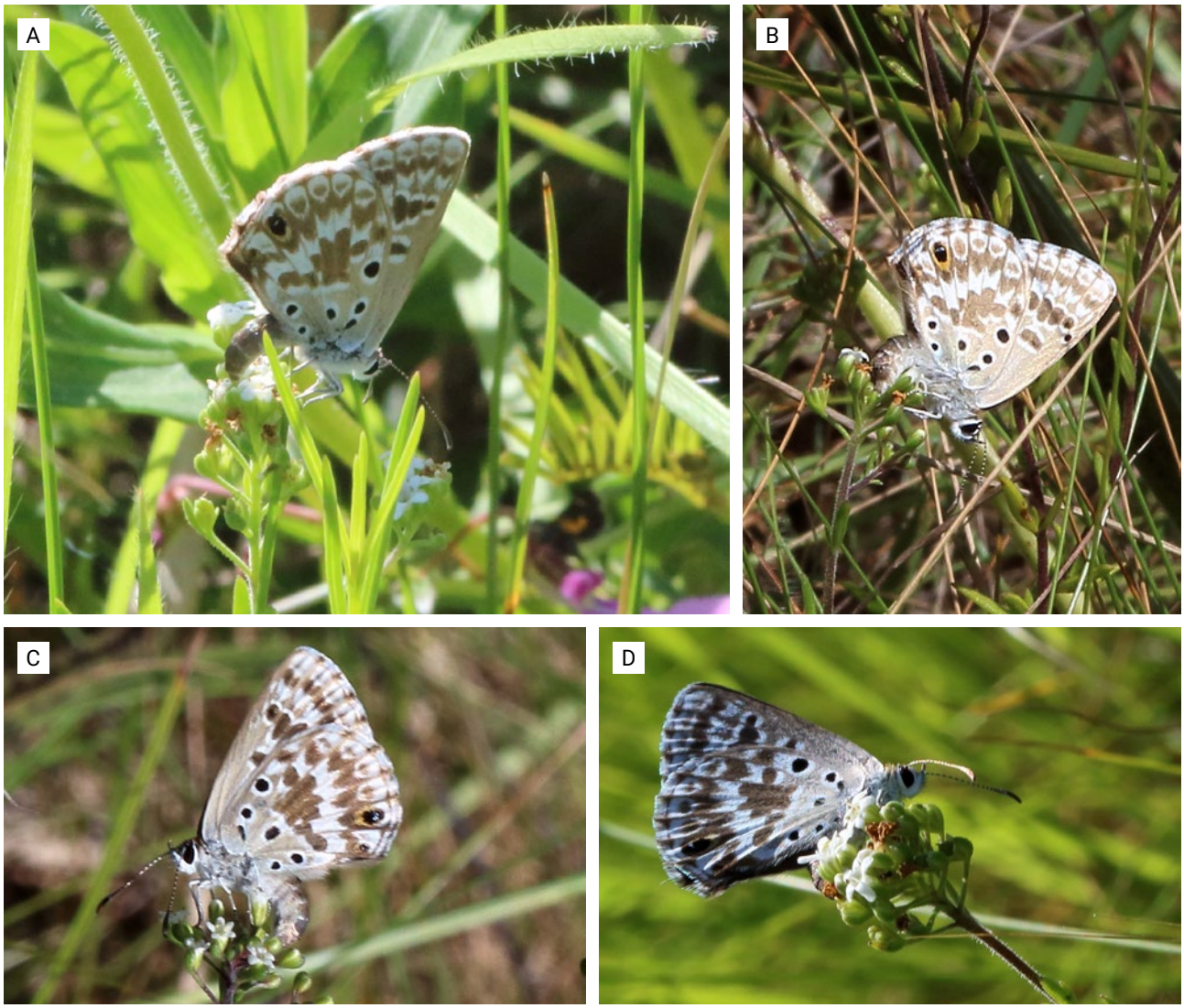

Figure 2. A–D, female White-spotted Ketsi Blue butterflies, *Lepidochrysops ketsi leucomacula*, ovipositing on the hostplant *Selago tarachodes* Hilliard. (Photos by the authors.)

Nectar plants

Lepidochrysops ketsi leucomacula was only observed utilising pink flowers for nectar at Umtamvuna Nature Reserve (Figure 3). Nectar plant species recorded were *Alepidea* sp., *Ophrestia oblongifolia* (E.Mey.) H.M.L.Forbes and *Tephrosia* cf. *grandiflora* (Aiton) Pers. Three pink-flowered *Tephrosia* species were recorded in the area, all of which might be utilised by *L. k. leucomacula* as nectar sources, namely *Tephrosia grandiflora* (Aiton) Pers., *Tephrosia macropoda* (E.May) Harv. and *Tephrosia multijuga* R.G.N.Young. There were other plants flowering at the same time in the habitat of the butterfly that had differently coloured flowers (e.g., Figure 4), but the butterfly was not observed to obtain nectar from any of these plant species. *L. k. leucomacula* therefore seems to be attracted to pink flowers.

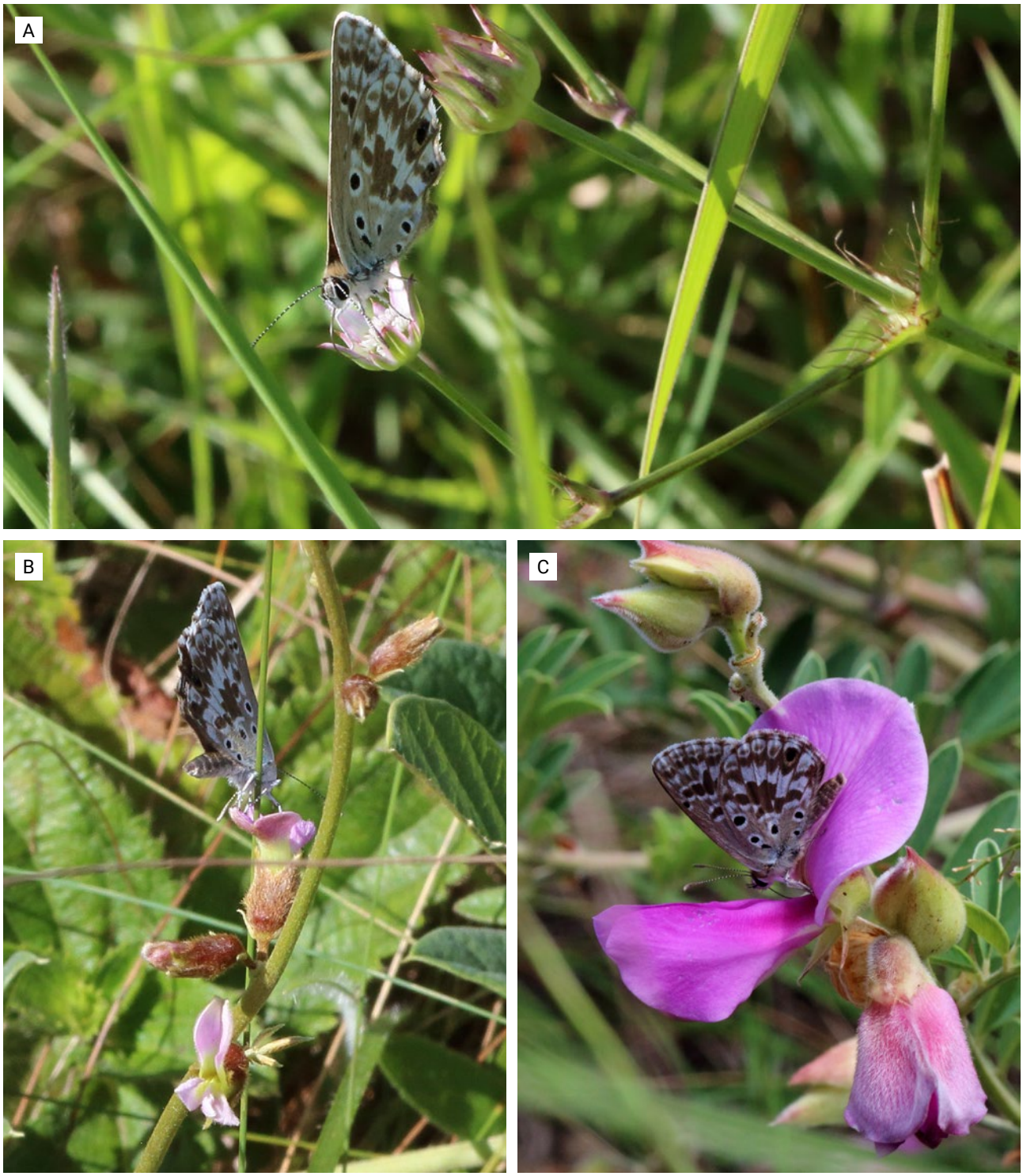

Figure 3. White-spotted Ketsi Blue butterflies, *Lepidochrysops ketsi leucomacula*, nectaring at various plant species with pink flowers. A, *Alepidea* sp.; B, *Ophrestia oblongifolia* (E.Mey.) H.M.L.Forbes; C, *Tephrosia* cf. *grandiflora* (Aiton) Pers. (Photos by the authors.)

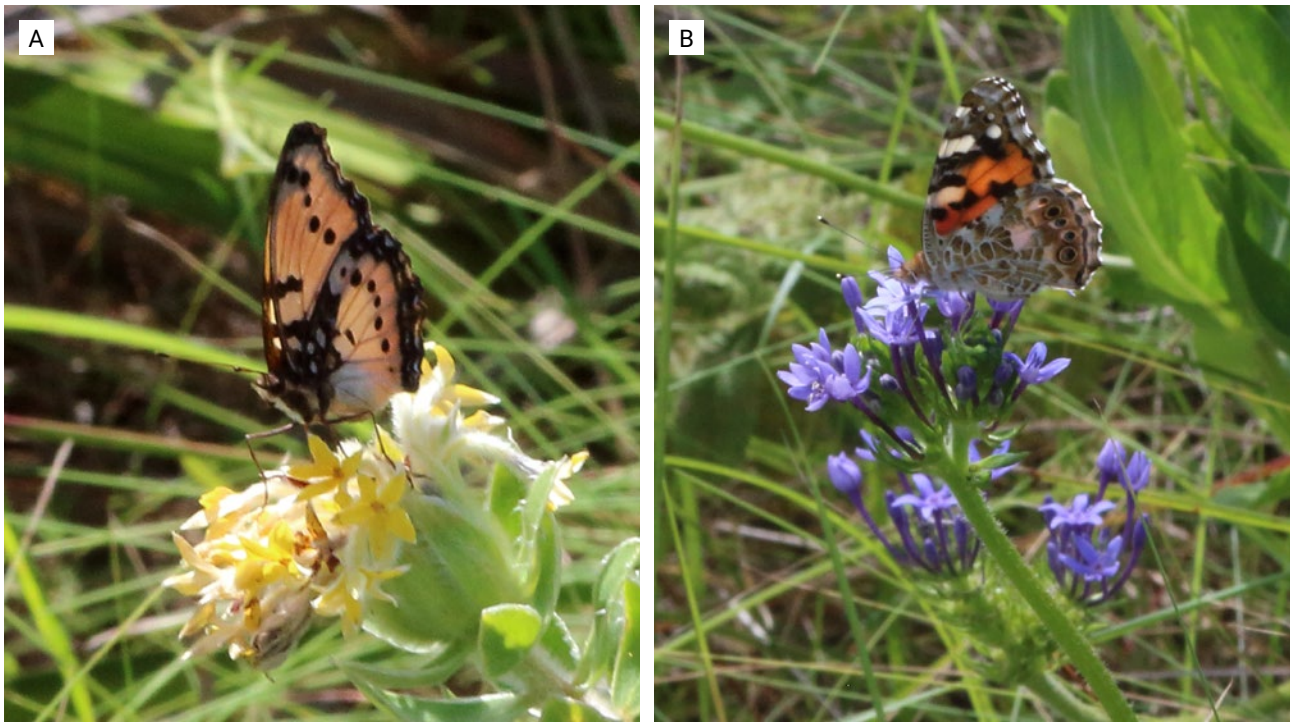

Figure 4. A, Southern Gaudy Commodore, *Precis octavia sesamus* Trimen, 1883, nectaring at *Lasiosiphon anthylloides* (L.f.) Meisn.; and B, Painted Lady, *Vanessa cardui* (Linnaeus, 1758), nectaring at *Pentanisia* sp. on 8 February 2022 in the habitat of *Lepidochrysops ketsi leucomacula* at Umtamvuna Nature Reserve. (Photos by the authors.)

Habitat

Lepidochrysops ketsi leucomacula inhabits primary grassland of the Pondoland-Ugu Sandstone Coastal Sourveld vegetation type in the Umtamvuna Nature Reserve where its oviposition plant occurs. The hostplant is found in relatively small open valleys and the butterfly appears not to fly amongst tall, thick vegetation. This grassland type is critically endangered in KwaZulu-Natal (Jewitt 2018).

Monitoring

The details of the transects and the numbers and calculated densities of *L. k. leucomacula* observed along each are presented in Table 1. Estimated densities of *L. k. leucomacula* varied from 0 to 140/ha. The calculated mean density over the four transects was 41/ha.

The surveillance area was mowed using a tractor in May 2022, an action not aligned with the adopted management plan for the reserve (Figure 5; Ezemvelo KZN Wildlife 2009). Once dried the raked grass cuttings were removed and taken off site. Two observers conducted monitoring using the same methods along Transects 1, 3 and 4 on 30 March 2023, starting at 10:30 when the weather was partly cloudy with a cold gentle breeze. No *L. k. leucomacula* were observed along Transects 1 and 4 (these transects sampled the mown area) and two *L. k. leucomacula* were observed along Transect 3 (in the unmown area). The oviposition hostplant was not observed along the transects in the mown area. Although mowing is a defoliation method, it is not necessarily equivalent to burning. The type of mower used, and the extent and frequency of mowing are factors that require consideration when implementing mowing as a management process in the habitat of threatened myrmecophilous butterflies (Bubová et al. 2015). The compaction of the soil (in which the host ant's nests and the associated *L. k. leucomacula* larvae are assumed to occur) by the tractor mowing the grass, may be detrimental to the conservation of this butterfly species. The tractor tracks were still evident on 30 March 2023. Mowing of the habitat of *L. k. leucomacula* should not be permitted because the loss or degradation of the habitat of an endangered butterfly species should be avoided so that the conservation status of the species does not decline further (Armstrong et al. 2013).

Figure 5. Tractor-mowed portion of the provincially critically endangered Pondoland-Ugu Sandstone Coastal Sourveld at the Endangered *Lepidochrysops ketsi leucomacula* monitoring area in Umtamvuna Nature Reserve in May 2022.

Conservation status of *Lepidochrysops ketsi leucomacula*

The conservation status of *L. k. leucomacula* appears to be deteriorating. One of the reasons appears to be inappropriate management of the butterfly species' habitat in the two protected areas in which the butterfly is known to occur in KwaZulu-Natal. No *L. k. leucomacula* were observed on the two surveillance visits to the Solomon Gijima Dindikazi Nature Reserve. The absence of these endangered butterflies was unexpected because the site is only about 25 km in a straight line from the Umtamvuna Nature Reserve site and the butterfly had been recorded there previously, including on 2 March 2017 by the first author. In fact, the Solomon Gijima Dindikazi Nature Reserve was proclaimed in 2021 to protect two threatened lycaenid butterflies, *L. k. leucomacula* and the Vulnerable Whitish Amakosa Rocksitter, *Durbania amakosa albescens* Quickelberge, 1981 (Mecenero et al. 2020). Various possibilities exist for why we saw no White-spotted Ketsi Blues. One reason could be that livestock have been allowed to graze the grassland and wetland areas (Figure 6). Livestock grazing and trampling of the colony sites are detrimental to the survival of the ant-associated Karkloof Blue butterfly, *Orachrysops ariadne* (Butler, 1898) (Armstrong & Louw 2013) and this may be the case also for the myrmecophilous *L. k. leucomacula*. Livestock

Figure 6. Livestock grazing in the Solomon Gijima Dindikazi Nature Reserve on 9 February 2022.

grazing of the primary grassland and wetlands in the small Solomon Gijima Dindikazi Nature Reserve is largely incompatible with the values for which the reserve was proclaimed.

The area of natural grassland left along the south coast of KwaZulu-Natal is so small that grazing land is not easy to find, and as a result protected areas may be grazed by livestock. The Solomon Gijima Dindikazi Nature Reserve needs to be signposted, and preferably fenced, and the management plan finalised and implemented to prevent the local extinction of *L. k. leucomacula* there. Appropriate protection and management of the butterfly's habitat in protected areas are essential for the continued long-term survival of *L. k. leucomacula* in KwaZulu-Natal.

Conclusions

The grassland habitats of threatened butterflies in protected areas are not immune to impacts caused by defoliation other than by fire at the appropriate intensities and fire return intervals. Where protection from defoliation by livestock or mechanical means (as opposed to fire) cannot be guaranteed by fencing the whole protected area, consideration should be given to fencing areas of grassland habitat required by endangered endemic invertebrate species, particularly those that have relatively small distribution ranges, to prevent their extinction, both locally and globally. Management of the habitat by fire at the appropriate time of year and fire return interval will be necessary. Monitoring of the two populations of *L. k. leucomacula* should continue to assess whether the mowing and grazing by domestic livestock has any long-lasting impacts. We hope that this short note will encourage more research into the life histories and ecology of threatened butterflies in South Africa and to further highlight that even in protected areas in South Africa threats to these butterflies may still operate without appropriate management of their habitats.

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References

Armstrong, A.J. & Louw, S.L., 2013, 'Monitoring of the eggs of the Karkloof Blue butterfly *Orachrysops ariadne*, for its conservation management', *Koedoe* 55,4: 1–11, Art. #1150, https://doi.org/10.4102/koedoe.v55i1.1150.

Armstrong, A.J., Engelbrecht, I. & Hamer, M.L., 2013, 'Chapter 5. Recommendations for the use of the Red List and Atlas by conservation practitioners', in S. Mecenero, J.B. Ball, D.A. Edge, M.L. Hamer, G.A. Henning, M. Kruger, E.L. Pringle, R.F. Terblanche & M.C. Williams (eds), *Conservation assessment of butterflies of South Africa, Lesotho and Swaziland: Red List and Atlas*, pp. 41–51, Saftronics (Pty) Ltd., Johannesburg & Animal Demography Unit, Cape Town.

Armstrong, A. & Williams, M., 2018, '*Lepidochrysops ketsi leucomacula* Henning & Henning, 1994. Southern African Lepidoptera Conservation Assessment (SALCA). Red List of South African Species'. South African Biodiversity Institute, Pretoria. http://speciesstatus.sanbi.org/assessment/last-assessment/0378/#. Downloaded on 7 July 2023.

Bubová, T., Vrabec, V., Kulma, M. & Nowicki, P., 2015, 'Land management impacts on European butterflies of conservation concern: a review', *Journal of Insect Conservation* 19: 805–821, https://doi.org/10.1007/s10841-015-9819-9.

Ezemvelo KZN Wildlife, 2009, 'Umtamvuna Nature Reserve Integrated Management Plan 2009–2013, Version 1.0.', Ezemvelo KZN Wildlife, Pietermaritzburg.

Jewitt, D., 2018, 'Vegetation type conservation targets, status and level of protection in KwaZulu-Natal in 2016', *Bothalia* 48,1:1–10, a2294, https://doi.org/10.4102/abc.v48i1.2294.

Mecenero, S., Edge, D.A., Staude, H.S., Coetzer, B.H., Coetzer, A.J., Raimondo, D.C., Williams, M.C., Armstrong, A.J., Ball, J.B., Bode, J.D., Cockburn, K.N.A., Dobson, C.M., Dobson, J.C.H., Henning, G.A., Morton, A.S., Pringle, E.L., Rautenbach, F., Selb, H.E.T., Van Der Colff, D. & Woodhall, S.E., 2020, 'Outcomes of the Southern African Lepidoptera Conservation Assessment (SALCA)', *Metamorphosis* 31,4: 1–160, https://www.metamorphosis.org.za/?p=articles&s=Details&pt=649&i=1593.

Lu, S-S. & Samways, M.J., 2002a, 'Behavioural ecology of the Karkloof Blue butterfly *Orachrysops ariadne* (Lepidoptera: Lycaenidae) relevant to its conservation', *African Entomology* 10: 137–147.

Lu, S-S. & Samways, M.J., 2002b, 'Conservation management recommendations for the Karkloof Blue butterfly, *Orachrysops ariadne* (Lepidoptera: Lycaenidae)', *African Entomology* 10: 149–159.

Perera, S.J., Herbert, D.G., Procheş, Ş. & Ramdhani, S., 2021, 'Land snail biogeography and endemism in south-eastern Africa: Implications for the Maputaland-Pondoland-Albany biodiversity hotspot', *PLoS ONE* 16,3, e0248040, https://doi.org/10.1371/journal.pone.0248040.

Pooley, E., 1998, *A field guide to wild flowers of KwaZulu-Natal and the eastern region*, pp. 1–630, Natal Flora Publications Trust, Durban.

Rada1, S., Schweiger, O., Harpke, A., Kühn, E., Kuras, T., Settele, J & Musche, M., 2019, 'Protected areas do not mitigate biodiversity declines: A case study on butterflies', *Diversity and Distributions* 25: 217–224, https://onlinelibrary.wiley.com/doi/pdfdirect/10.1111/ddi.12854.

Skowno, A.L., Poole, C.J., Raimondo, D.C., Sink, K.J., Van Deventer, H., Van Niekerk, L., Harris, L.R., Smith-Adao, L.B., Tolley, K.A., Zengeya, T.A., Foden, W.B., Midgley, G.F. & Driver, A., 2019, 'National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity. Synthesis report', South African National Biodiversity Institute, Pretoria.

Van Wyk, A.E. & Smith, G.F., 2001, *Regions of floristic endemism in southern Africa. A review with emphasis on succulents*, pp. 1–199, Umdaus Press, Pretoria.

Williams, M.C., 2022, 'Genus *Lepidochrysops* Hedicke, 1923', in: M.C. Williams, *Afrotropical butterflies and skippers: a digital encyclopaedia*, https://www.metamorphosis.org.za/?p=articles&s=Details&pt=315&i=1277.