

NOTE

Observations on parasitoid interaction with *Zerenopsis lepida* (Walker, 1854) (Lepidoptera: Geometridae: Ennominae: Diptychini) at Entumeni Nature Reserve, KwaZulu-Natal, South Africa.

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OBSERVATIONS

On 27 March 2015 the authors were conducting research into the life history and ecology of the critically endangered *Callioratis millari* Hampson, 1905 (Geometridae: Ennominae: Diptychini) at the Entumeni Nature Reserve (ENR) near Eshowe in KwaZulu-Natal. This is part of a long term programme of research which sets out to better understand the ecological requirements of *C. millari* so that informed management decisions which take cognisance of the locally rich biodiversity, including *C. millari*, can be made (see Louw & Armstrong, 2018).

At 13:05–13:20 a cycad *Stangeria eriopus* (Kunze) Baillon, the only known host-plant of *C. millari* (Staude, 2001) and one of the host-plants of *Zerenopsis lepida* (Walker, 1854) (Staude & Sihvonen, 2014), was searched and a large batch of larvae (probably 3rd instar) of *Z. lepida* were found. *Z. lepida* are known to be gregarious in their first three instars (Staude & Sihvonen, 2014). The larvae were being attacked by several ichneumonid parasitoid wasps. Several photos and a video were taken of the interaction (Fig. 1).

The wasps (later identified as *Charops spinitarsis* Cameron, 1905 [Ichneumonidae] – see below) were approaching the larvae frontwards so they could see their targets, and they were jabbing at the larvae with their ovipositor between their legs. Several

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successful attacks were witnessed, but the larvae resisted strongly, grouping together, standing on their rear prolegs and lashing around trying to bite the wasp's head.

On 11 April 2015 from 11:20 to 11:25 at a *S. eriopus* plant of height class 0.5–1 m, nearby the initial observation, a similar observation was made. Several attempts were made by the wasp to oviposit in small, probably 2nd instar larvae of *Z. lepida* (Fig. 2). Once again the small larvae, anchored posteriorly, swung their bodies repeatedly in defence.

On 20 April 2015, two more wasps were observed 'attacking' *Z. lepida* larvae of varying instars on a single *S. eriopus* cycad, in the same vicinity where the first observations were made. Other wasps were observed parasitising about-to-hatch larvae still in their egg shells (Fig. 3). Another similar looking wasp was seen displaying similar interactions with 3rd instar *Z. lepida* larvae in an adjacent grassland patch in the protected area.

A sample was taken of the parasitoid wasp species for examination and deposited in the ARC (Agricultural Research Council) collection, Roodeplaat. The wasp was positively identified as *Charops spinitarsis* Cameron, 1905 (Ichneumonidae) (Figs 4 & 5). These images, as well as additional photographs are available on WaspWeb:

http://www.waspweb.org/Ichneumonoidea/Ichneumonidae/Campopleginae/Charops/Charops_spinitarsis.htm.

On 29 April 2015 three *C. spinitarsis* wasps were observed attacking three batches of *Z. lepida* larvae on a single cycad, again displaying similar behaviour (Figs 6 & 7).



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Figure 1 – Parasitoid wasp *Charops spinitarsis* attacking juvenile (3rd instar) *Zerenopsis lepida* larvae. Ovipositor can be seen at the tip of its reddish abdomen, as it jabs at the largest larva.



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Figure 2 – *Charops spinitarsis* attacking 2nd instar *Zerenopsis lepida* larvae.



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Figure 3 – *Charops spinitarsis* attacking emerging 1st instar *Zerenopsis lepida* larvae still in their egg shells.

DISCUSSION

The parasitoid wasp genus, *Charops* Holmgren, is taxonomically not well known. There are 28

described world species (11 of which occur in the Afrotropical region), but there are many undescribed species. *Charops* species have been recorded attacking various species of caterpillars in the families Erebridae, Geometridae, Lymantriidae, Hesperidae, and Noctuidae (Yu *et al.*, 2012). *C. spinitarsis* has been previously reared from *Aloa moloneyi* (Druce) (Erebidae, Arctiinae) (Risbec, 1960), but this is the first record of the species attacking *Z. lepida*, and the first observations

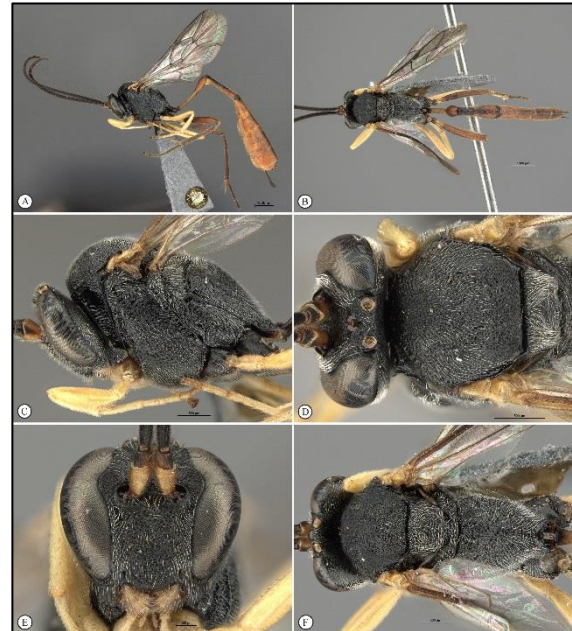


Figure 4 – *Charops spinitarsis* female (SANC-HYMI00001): A, habitus, lateral view; B, habitus, dorsal view; C, head and mesosoma, lateral view; D, head and mesoscutum, dorsal view; E, head, anterior view; F, head and mesosoma, dorsal view.

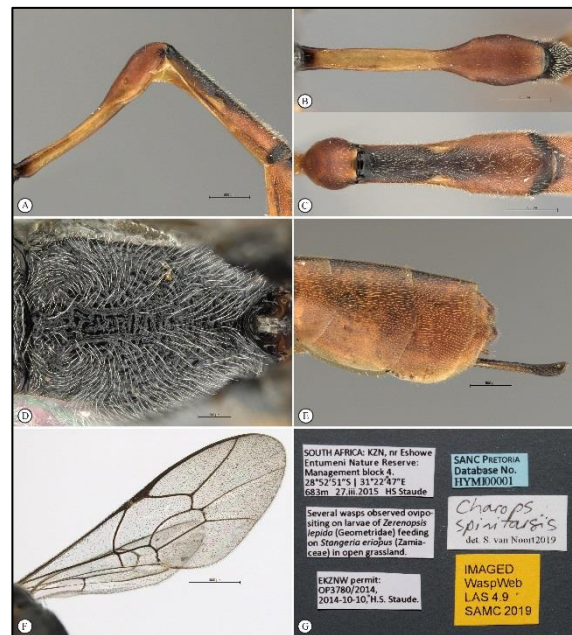


Figure 5 – *Charops spinitarsis* female (SANC-HYMI00001): A, tergites 1 & 2, lateral view; B, tergite 1, dorsal view; C, tergite 2, dorsal view; D, propodeum, dorsal view; E, metasomal apex and ovipositor sheaths, lateral view; F, wings; G, specimen data labels.

in the wild of the actual interaction between *C. spinitarsis* and *Z. lepida*.

Only a few reports on *Z. lepida* parasitoids have been published previously. Sommerer (2014) found that more than 50 % of 15 final instar larvae, collected on *S. eriopus*, at Ngoye Forest Reserve (NFR) in 2013, were parasitised by one of two parasitoids, *Charops* sp. (Ichneumonidae: Campopleginae) and *Drino* sp. (Tachinidae). Staude & Sihvonen (2014), by contrast, found that a single fly (Tachinidae) was



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Figure 6 – Two *Charops spinitarsis* wasps attacking a large group of 1st instar *Z. lepida* larvae.



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Figure 7 – Close up of *Charops spinitarsis* jabbing at a large group of 1st instar *Z. lepida* larvae.

the only parasitoid reared from all their rearing experiments of wild caught *Z. lepida* larvae and eggs, comprising the rearing of over 142 specimens from various localities. They mentioned that the larvae, collected by Sommerer, were collected singly on many individual plants at a time when most larvae in the brood had probably already pupated. It was their experience that larvae remaining on the host-plants after most others have pupated are generally parasitised, which may account for the unusually

high percentage of parasitised larvae in the Sommerer experiment.

The repeated observations made of *C. spinitarsis* interacting with *Z. lepida* larvae at ENR, indicates that it seems to be quite common at this locality. It seems possible that the presence of *C. spinitarsis*, controlling the numbers of *Z. lepida* larvae in a grassland locality, may well restrict the amount of damage to *S. eriopus* leaves by *Z. lepida*. This could possibly provide the balance essential for the survival of *C. millari*.

Parasitoids attacking early stages of hosts are thought to be effective control agents of these hosts because, unlike the impact of many parasites in the natural world, any chance of reproduction by the host individuals attacked by parasitoids are effectively eliminated. For the longer term stability of parasitoid-host interactions, persistence of *C. spinitarsis* in the landscape is an important consideration. Similar to some other organisms, certain parasitoids may have metapopulations (Hanski, 1999). Furthermore, spatial heterogeneity is a crucial component of all parasitoid-host stabilizing mechanisms (Briggs, 2004). This means that linked grassland corridors and heterogeneous grassland, which at ENR include patches of shorter grasses such as *Aristida* species and taller grasses such as *Cymbopogon* species (see also Terblanche, 2018) could be very important for the long term persistence of these parasitoids. *S. eriopus* in grassland areas are conspicuously shorter (often 0.5–1 m in height) than in adjacent forest so that some *S. eriopus* individuals could be more hidden from parasitoids in certain grassland patches. This heterogeneity of the grass layers could effect the search-efficacy of parasitoids and ultimately contribute to a balance in the parasitoid-host population dynamics. Persistence of these parasitoids could enhance the protection of individuals of plants (of *S. eriopus* in this case) from excessive herbivory and also relieve larvae of other cycad-feeding species within the Diptychini from strong competition with the more abundant larvae of *Z. lepida*.

Charops spinitarsis has never been observed at the nearby NFR, in spite of many hours spent observing hundreds of *Z. lepida* larvae on *S. eriopus* plants there over many years. The apparent absence of *C. spinitarsis* at NFR could be one reason for the apparent absence of *C. millari* there, in addition to other ecological factors such as excessive burning and grazing of the grasslands (Taylor, 2011). However, a model of the potential distribution of *C. millari* did not include NFR (A.J. Armstrong, unpublished data).

The presence of *C. spinitarsis* and *Z. lepida* should, in conjunction with other ecological factors, be taken into account when deciding on a suitable translocation locality for *C. millari*, and this parasitoid-host interaction in the context of the

presence of *C. millari* warrants further investigation.

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