BioOne COMPLETE

The Kleptoparasitic Habits of Musca albina Wiedemann, 1830 (Diptera: Muscidae)

Authors: Marshall, Stephen A., and Pont, Adrian C.

Source: African Invertebrates, 54(2) : 427-430

Published By: KwaZulu-Natal Museum

URL: https://doi.org/10.5733/afin.054.0221

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Downloaded From: https://complete.bioone.org/journals/African-Invertebrates on 28 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

African Invertebrates Vol. 54 (2): 427–430 Pietermaritzburg 8 October 2013

The kleptoparasitic habits of *Musca albina* Wiedemann, 1830 (Diptera: Muscidae)

Stephen A. Marshall[1] and **Adrian C. Pont**[2]

[1]School of Environmental Sciences, University of Guelph, Ontario, N1G 2W1 Canada; samarsha@uoguelph.ca
[2]Oxford University Museum of Natural History, Parks Road, Oxford, OX1 3PW United Kingdom; pont.muscidae@btinternet.com

ABSTRACT

Musca albina is reported as kleptoparasitic on dung-rolling scarab beetles in Namibia, where female flies were observed following dung-rolling *Scarabaeus damarensis* and ovipositing in partially buried dung balls. This is a first record of kleptoparasitism in the Muscidae.

KEY WORDS: *Musca*, true flies, behaviour, kleptoparasitism, Scarabaeidae, dung-rolling, beetles.

INTRODUCTION

Many scarabaeine dung beetles invest significant time and energy obtaining, moving and sequestering food resources, usually a ball of dung, in which their larvae will develop. The delay between obtaining and sequestering or consuming these food resources is often capitalized on by 'thieves', or kleptoparasites (Sivinski *et al*. 1999), including other scarab beetles (Howden 1955) and specialized phoretic Diptera in the family Sphaeroceridae. The association between *Scarabaeus* L. species and the Palaearctic sphaerocerid *Ceroptera rufitarsis* (Meigen) has been documented for over a century (Lesne 1896) and other species of the mostly Afrotropical genus *Ceroptera* Macquart are well known for their association with dung-rolling scarabs (Roubaud 1916; Marshall 1983; Sivinski 1983). *Ceroptera* and some other kleptoparasitic sphaerocerids have phoretic adults that cling to the adult beetles. Females of a few sphaerocerid species, such as the Nearctic *Norrbomia frigipennis* (Spuler), ride their hosts underground to oviposit in the buried dung store while others, including some African C*eroptera* spp., oviposit as the dung balls are being interred (Roubaud 1916). Kleptoparasitic behaviour has been noted in four genera of Sphaeroceridae and one species of sarcophagid, *Ravinia derelicta* (Walker), described by Sivinski (1983) as a facultative kleptoparasite in scarab dung balls. Coprophagous kleptoparasites have not been previously recorded in other fly families. We here describe and discuss kleptoparasitic behaviour in a Namibian population of the muscid *Musca albina* Wiedemann.

MATERIAL AND METHODS

The observations reported here result from a three-day period spent at Salambala forest in the Caprivi Region in north-eastern Namibia (Katima Mulilo District, 17°50.066'S 24°36.225'E, 18–20.xi.2012). Conditions were extremely hot and dry and most observations were made between 7–10 am each day, during which time the various insects associated with fresh human faeces were observed and photographed. By 10 am the diverse dung beetle community had usually removed all trace of fresh dung placed on the soil surface a couple of hours previously. A voucher specimen of one of the observed *Musca albina* is deposited in the Natural History Museum, London.

http://africaninvertebrates.org
urn:lsid:zoobank.org:pub:91DC43DA-4CC7-4F3A-A645-D0DE3E4F7AF0

Downloaded From: https://complete.bioone.org/journals/African-Invertebrates on 28 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

OBSERVATIONS

This study was undertaken primarily to obtain data on kleptoparasitic Sphaeroceridae, which were extremely abundant on *Pachylomera femoralis* Kirby (the largest scarabs visiting dung), but were absent on the co-occurring smaller scarabs, including *Garreta nitens* (Olivier), *Scarabaeus damarensis* Janssens and unidentified species of *Sisyphus* Latreille. Most surprisingly, the *Scarabaeus* that was the most abundant medium-sized scarab at the site appeared to have no associated Sphaeroceridae. The dung-rolling *Scarabaeus*, however, were associated with a distinctive small muscid species, *Musca albina*. Females of *M. albina* routinely perched on twigs or other perches near the dung-rolling *Scarabaeus*, but were never observed on the beetle, on the rolling dung ball, or on other available dung. Once a *Scarabaeus* had stopped rolling and started to dig a burrow under the dung ball, the rapidly subsiding ball was invariably mobbed by *Musca albina* females ovipositing in the dung ball. The only *M. albina* observed to alight on dung under other circumstances came down on a dung ball that had been artificially detained by impaling it with a twig. There was no apparent association between *M. albina* and other scarabs.



Figs 1–4. Kleptoparasitic *Musca albina* Wiedemann females: (1) perching near dung-rolling *Scarabaeus* (numerous individuals were observed perching near active scarabs, but none were observed to alight in the vicinity of source dung); (2) cluster on rapidly sinking dung ball (during the brief period the host scarab spends interring the dung ball the kleptoparasitic muscids arrive and swiftly oviposit); (3) single female with her ovipositor inserted into a partially buried dung ball; (4) female flies only alight on fully formed *Scarabaeus* dung balls, and only when stationary (no muscids were observed on actively rolling dung balls); artificially impeding motion of the ball by impaling it with a twig lured in this female.

Downloaded From: https://complete.bioone.org/journals/African-Invertebrates on 28 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

DISCUSSION

These observations indicate that *M. albina* exhibits kleptoparasitic behaviour and oviposits preferentially in partially buried dung balls of a single species out of a selection of possible local hosts. Perching behaviour in the vicinity of moving hosts suggests that visual cues drive host choice, a suggestion reinforced by the observation that flies alight on dung balls as soon as they stop being moved, but not before. Studies of host location and selection cues in kleptoparasitic Sphaeroceridae also suggest that visual, rather than chemical, cues are most important (Petersson & Sivinski 1996; Niogret & Lumaret 2009). The apparent lack of overlap between kleptoparasitic Muscidae (only on *Scarabaeus*) and kleptoparasitic Sphaeroceridae (only on *Pachylomera*) during this short, opportunistic study suggests that the partitioning of resources within communities of scarab-associated kleptoparasites would warrant further investigation.

Musca albina is a widespread Old World species, known from dry areas of the Afrotropical Region, North Africa and the Middle East, Central Asia, India and Sri Lanka. Its occurrence in Namibia was recently documented by Couri *et al*. (2012). It is a sun-loving species, and adults have been found clustering around domestic animals, to feed on sweat and other secretions, and on their faeces (e.g., Sychevskaya 1956). In Russia it is known as a zoophilous pasture and desert fly (Sychevskaya 1977; Veselkin 1984). The third instar larval mouthhooks and puparial posterior spiracles were illustrated by Skidmore (1985), based on a single puparium from Turkmenistan and presumably one of the series found on a dead tortoise (Vlassov & Stackelberg, cited in Hennig 1964). The puparium is white (Ferrar 1975). Nothing more is known regarding the biology and immature stages, other than the present observations of eggs being laid in dung balls as they are interred by the southern African scarab species *Scarabaeus damarensis*. Davis *et al*. (2010) note that *S. damarensis* is attracted to pig dung, but not to dung of cattle, sheep or elephants, which fits with our observations of this species rolling omnivore dung. We conclude that *Musca albina* has much more specialized habits than previously suspected. At least the Namibian population reported here is clearly kleptoparasitic and very specific in its oviposition behaviour, laying eggs only in dung balls being interred by one out of several co-occurring dung-rolling scarab species.

ACKNOWLEDGEMENTS

The senior author thanks Ashley H. Kirk-Spriggs for providing him with the opportunity to undertake fieldwork in Namibia, and for his helpful comments on the manuscript. We thank the Salambala Conservancy for giving us permission to carry out our work there. Bruce Gill kindly assisted with identification of the scarabs, based on photographs of live specimens.

REFERENCES

Couri, M.S., de Carvalho, C.J.B. & Pont, A.C. 2012. Taxonomy of the Muscidae (Diptera) of Namibia: a key to genera, diagnoses, new records and description of a new species. *African Invertebrates* **53**: 47–67.

Davis, A.L.V., Scholtz, C.H., Kryger, U., Deschodt, C.M. & Strümpher, W.P. 2010. Dung beetle assemblage structure in Tswalu Kalahari Reserve: responses to a mosaic of landscape types, vegetation communities, and dung types. *Environmental Entomology* **39**: 811–820.

Ferrar, P. 1975. Life-history and larviparous reproduction of *Musca fergusoni* J. & B. (Diptera, Muscidae). *Bulletin of Entomological Research* **65**: 187–198.

Hennig, W. 1964. Muscidae [Part, Lieferung 248.]. *In*: Lindner, E., ed., *Die Fliegen der palaearktischen Region*. Bd 63b. Stuttgart: Schweizerbart'sche Verlagsbuchhandlung, pp. 961–1008.

Downloaded From: https://complete.bioone.org/journals/African-Invertebrates on 28 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

Howden, H.F. 1955. Cases of interspecific "parasitism" in Scarabaeidae (Coleoptera). *Journal of the Tennessee Academy of Science* **31**: 64–66.

Lesne, P. 1896. Moeurs du *Limosina sacra*, Meig. (famille Muscidae, tribu Borborinae). Phénomènes de transport mutuel chez les animaux articulés. Origines du parasitisme chez les Insectes diptères. *Bulletin de la Société Entomologique de France* **1896**: 162–165.

Marshall, S.A. 1983. *Ceroptera sivinskii*, a new species of Sphaeroceridae (Diptera) in a genus new to North America, associated with scarab beetles in southeastern United States. *Proceedings of the Entomological Society of Washington* **85**: 139–143.

Niogret, J. & Lumaret, J.P. 2009. Identification of the cues used in the host finding behavior during the phoretic association *Ceroptera rufitarsis* (Diptera: Sphaeroceridae) and dung beetles (Coleoptera: Scarabaeidae). *Journal of Insect Behavior* **22**: 464–472.

Petersson, E. & Sivinski, J. 1996. Attraction of a kleptoparasitic sphaerocerid fly (*Norrbomia frigipennis*) to dung beetles (*Phanaeus* spp. and *Canthon* sp.). *Journal of Insect Behavior* **9**: 695–708.

Roubaud, E. 1916. Nouvelles observations de phorésie chez les Diptères du groupe des Borboridae. *Bulletin de la Société Zoologique de France* **41**: 43–45.

Sivinski, J. 1983. The natural history of a phoretic sphaerocerid Diptera fauna. *Ecological Entomology* **8**: 419–426.

Sivinski, J., Marshall, S. & Peterson, E. 1999. Kleptoparasitism and phoresy in the Diptera. *Florida Entomologist* **82**: 180–197.

Skidmore, P. 1985. The biology of the Muscidae of the world. *Series entomologica* **29**: xiv + 1–550.

Sychevskaya, V.I. 1956. Flies of medical importance in Kara-Kalpakia. *Entomologicheskoe Obozrenie* **35**: 347–358. [In Russian]

————1977. Pasture flies (Diptera) of Uzbekistan. *Entomologicheskoe Obozrenie* **56**: 79–87. [In Russian, with English summary; English translation in *Entomological Review* **56**: 58–64.]

Veselkin, G.A. 1984. Systematic position and ecological characteristics of zoophilous flies of the fauna of the USSR. *In*: Narchuk, E.P. & Zlobin, V.V., eds, *Flies of the fauna of the USSR and their role in ecosystematics*. Leningrad: Zoological Institute, USSR Academy of Sciences, pp. 23–26. [In Russian]

Downloaded From: https://complete.bioone.org/journals/African-Invertebrates on 28 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use