The relationship between *Gyrostigma rhinocerontis* and rhinos in East and southern Africa

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Introduction

Gyrostigma rhinocerontis, commonly known as the Rhino Bot Fly is uniquely the largest species of fly found in Africa, reaching lengths of up to 40mm, with an impressive wingspan of 70mm and a dark body, orange head and legs. It is specific to and entirely dependent upon either the black or white rhinoceros of the savannahs of East and southern Africa for the completion of its life cycle and subsequent reproduction. Sadly, it may well become extinct before the rhinos with which it has evolved and cohabited for millions of years.

The relationship between the Rhino Bot Fly and the rhinoceros

In former times, when rhino populations were healthy and large numbers would be found roaming throughout the savannah regions, one could support the view that *Gyrostigma*, along with other diseases and parasites, may have played a role in regulating the populations of these mega-herbivores, most likely when they were at high densities near ecological or social carrying capacities. (See, for instance: Shrader et al. 2025) The larval stages, attached to the rhino's stomach lining, often in huge numbers, would seem to certainly compete with the host by attaching and feeding on the gut lining, thus compromising nutrient uptake. In times of food shortage, drought, injury, or disease, one can envisage that this competition for nutrients could tip the balance, increasing the stresses and risks for weaker and older animals, thus rendering them more susceptible to starvation, disease and predation. *Gyrostigma* may contribute somewhat by helping to limit populations to numbers that can

Figure 1. *Gyrostigma rhinocerontis*, Rhino Bot Fly, This adult insect was reared by the author (CD) from larva to adult in May 1987, from host rhino Black rhinoceros "Kiserian" who was captured on the Athi Plains and translocated to Nakuru NP. The adult bears the reference number 680. © Bob Campbell.

be supported by available resources, thereby maintaining the overall health of ecosystems. This is in contrast to its historic labelling, whereby it was dismissed as an undesirable parasite with no apparent benefits. Currently, however, with rhino populations having been devastated much more directly through human impacts of poaching and habitat loss, issues related to *Gyrostigma's* potential benefits have not featured as priority areas for research.

Present and future concerns

Despite the massive funding and efforts being undertaken to conserve their black and white rhino hosts, *Gyrostigma* suffers from being little known, rarely observed and poorly understood. Now identified as a "harmful parasite", it is being forced into extinction through the precipitous population declines of its rhino hosts both in terms of range and numbers, as well as the highly effective and widespread use of antiparasitic drugs for domestic stock (e.g. *Ivermectin*) for many years. One smaller species of Rhino Bot Fly from East Africa (*Gyrostigma conjugens*) has almost certainly gone extinct already, last recorded from Tsavo East NP in the early 1960s. By the late 1980s, there were too few black rhinos in the Park left for it to parasitise.

The life cycle of *Gyrostigma* is as interesting as it is risky (Shrader et al. 2025). The adult female fly lays its eggs around the neck of the host rhino. These hatch in about six days and make their way actively towards the mouthparts to be licked and swallowed. Upon entering the digestive system of the rhino, they migrate to the gut lining, attach with their oral hooks and commence to feed and grow. As the 'youngster' develops, three larval stages may take weeks or months to complete. Once mature and with a length now of around 40mm, they will be deposited out of the anus to land unceremoniously in a heap of dung.

The timing and location of this 'landing' are crucial, as these larvae now need to quickly bury themselves into the soil where they will become pupae from which the adult flies will form within about six weeks. Emergence of the adult fly is meticulously timed, and the males emerge some 3–4 days before the females. This helps to promote outbreeding, but as neither the adult males nor females have mouthparts, there is only a finite energy source combined with a minimal lifespan of around 6–8 days and thus, a potential lottery with respect to the number of partners available to them with which to successfully perform their mating flights.

This solution to increasing the odds, no doubt pieced together over the aeons of coevolution, comes in the form of a rhino midden. Individual rhinos have overlapping territories but may not meet very often. Hence, the midden or dung heap has evolved as a communication/information centre. Individuals of all ages and both sexes intermittently deposit dung at these sites despite rarely meeting their fellow contributors. Through scenting at these dung piles, information exchange between overlapping but solitary rhinos is made possible around a variety of issues such as sex, age, dominance, territorial status and female oestrous state (Owen-Smith 1973). Additionally, the multiple individual dung contributions to these hotspots push up the number of deposited *Gyrostigma* larvae, thus ultimately ramping up the number of adult flies emerging and increasing the chances for successful mating. This is particularly important given that the adult flies are only active at dawn and dusk, providing yet another reason why sightings of these magnificent flies have been minimal.

Thankfully, it was possible for Dr Rob Brett and his KWS Capture Unit led by George Rakwan, to collect larvae from rhino faeces during translocation exercises. Charles Dewhurst, assisted by "chum" van Someren, were then able to rear these through to adult flies. These emergence studies, plus additional field studies of rhino middens by Charles Dewhurst and Graham Reid, have allowed important additions to our knowledge of the life cycle of these ephemeral creatures.

Despite being the largest known fly in the whole of Africa, albeit with a very short lifespan, and having an intimate relationship with an iconic flagship species, this may not be enough to save *Gyrostigma* from extinction. As it has only rarely been observed, it will perhaps never be fully appreciated. Now is undoubtedly a good time to celebrate this beautiful and bizarre creature both in its own right as well as for its potential contribution to rhino population dynamics and ecosystem health before it ultimately disappears, most certainly ahead of its rhino hosts.

Further research is encouraged to explore the relationships between black and white rhinos and

their parasites, such as *Putative filariosis* and trypanosomosis. Potential density impacts (of rhinos) indicate that the matter is quite complex and not straightforward. These impacts may depend on the specific life history of the parasites and interactions with other parasites in the ecosystem. Density-related factors are also influenced by habitat loss and disruption, as well as food availability.

An accessible link to read the first author's obituary published May 2025 in the Times, newspaper, London has been kindly provided by the first author's son: https://drive.google.com/file/d/1C--Ny0Od5LV_QwG-YqAvxBjnjzkoHgvM/view?usp=sharing

References

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