

A new species of *Myrmeleon* from Mozambique (Neuroptera: Myrmeleontidae)

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Abstract: *Myrmeleon milibangalala* sp. nov. is described from Maputo National Park, Mozambique and compared to small-sized *Myrmeleon* species from southern Africa, namely *Myrmeleon obscurus* Rambur, 1842, *Myrmeleon caliginosus* Hölzel & Ohm, 1983 and *Myrmeleon stigmalis* Navás, 1912. The characteristics of the new species are depicted on three plates. The species of the genus are typically found in coastal zones of continents and the habitat of the new species is described herein.

Keywords: taxonomy, antlion, Nature Conservation, Africa

Introduction

The genus *Myrmeleon* Linnaeus, 1767 is rich in species, the number of species on Earth is 176 (STANGE 2004), but this number is constantly changing, on the one hand new *Myrmeleon* species are described (PANTALEONI et al. 2010, BADANO et al. 2016, MICHEL & AKOUDJIN 2023), on the other hand species are transferred from the genus *Myrmeleon* to other genera and several species have been synonymised (MANSELL 1979, SURYANARAYANAN et al. 2025).

The species of the genus *Myrmeleon* are distributed all over the world except the Arctic regions. Based on STANGE's (2004) catalogue, there are 49 valid species in Africa. In southern Africa, which includes Angola, Botswana, Comoros, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Zambia and Zimbabwe, the number of valid species is about 15. Five species of *Myrmeleon* are known in Madagascar. Mozambique also has five species (OSWALD 2024), namely *Myrmeleon doralice* Banks, 1911, *Myrmeleon lanceolatus* Rambur, 1842, *Myrmeleon obscurus* Rambur, 1842, *Myrmeleon quinquemaculatus* Hagen, 1853, *Myrmeleon stigmalis* Navás, 1912. The type locality of the latter species was documented in Mozambique.

According to our knowledge (GEPP & HÖLZEL 1989, GRIFFITHS 1986, 1991), the larvae of *Myrmeleon* are pit building species. The pits of the species are found in open habitats, in places exposed to sunlight, wind and rain, mainly in the temperate zone. In protected microhabitats, larvae are not exposed to the effects of rain and wind. These are mainly characteristic of tropical areas, since the larvae must retreat to the shade due to the high temperatures.

Among the species of *Myrmeleon*, there are large e.g. *M. quinque maculatus*, medium e.g. *M. lanceolatus* and small e.g. *M. obscurus*. They are characterised by a high degree of morphological similarity, but can be distinguished by the features of the head, pronotum, and wings. Reproductive organs are also well differentiated, but a high degree of variability is possible in widely distributed species (HÖLZEL 1986). From a taxonomic point of view, the species of the genus are in need of revision almost everywhere, and the separation of several new species or the synonyms are expected (SURYANARAYANAN et al. 2025). This work will be supported in the future by molecular taxonomic studies of African *Myrmeleon* species, since the real distribution of the species is only hardly known due to the lack of faunal surveys.

Maputo National Park (MNP), formerly Maputo Special Reserve (MSR) was established on December 31, 2021, and is the amalgamation of the Ponta do Ouro Partial Marine Reserve and the Maputo Special Reserve (MSR), measuring approximately 1700 km². MNP is located on the south-eastern coast of Maputo Province in the Matutuine District of Mozambique and sits within the Maputaland-Pondoland-Albany biodiversity hotspot in the northern part of the East African Coastal Forests Ecoregion (MYERS et al. 2000). To better understand the insect fauna of this region, a series of entomological research expeditions resulting in many taxonomic works (VOLYNKIN & LÁSZLÓ 2018, LÁSZLÓ & VETINA 2019, BAŁOWSKI et al. 2020, YAKOVLEV et al. 2020, LÁSZLÓ et al. 2021, MILES et al. 2022, RINDOŠ et al. 2022, TABERER & LÁSZLÓ 2022, TAKANO & LÁSZLÓ 2022, 2024) were carried out in the park between November 2016 and February 2018 by the African Natural History Research Trust (ANHRT) in collaboration with the Museu de História Natural (MNM), Maputo and the National Administration of Conservation Areas (ANAC). Fieldwork teams spent a total of 64 days sampling and during the most recent of the three expeditions unusual *Myrmeleon* specimen, not matching any of the previously known species in the genus, was discovered.

In this study, we describe a new small *Myrmeleon* species with a very characteristic morphology from Mozambique.

Material and methods

The new species was collected at Ponta Milibangalala (geographical coordinates: 26°26'58.6"S, 32°55'29.8"E, 15 m asl.) in a mosaic habitat of dune grassland and dune forest which extends along the Indian Ocean coastline. Specimens were collected at light using a 125 W Mercury vapour bulb placed inside a white tent-like structure (Fig. 1). After collection, specimens were preserved in glassine envelopes, desiccated with silica gel and pinned and spread in the ANHRT laboratories on returning from the field.

Habitus photographs were taken using a Canon EOS 6DII digital camera equipped with a Canon 100 mm macro lens fixed to a stand, with the use of a lightbox. In some cases, images were stacked using Helicon Focus image stacking software and all photographs were processed using Adobe Photoshop version 25.9.1 software.

For dissection, the caudal segments of the abdomen were removed and heated in 10% KOH solution for five minutes. The abdomen was then rinsed in distilled water and photographed in glycerine on a concave slide using a Canon EOS 700D digital camera, connected to a Leitz Diaplan microscope using a Best Scientific 1.6X Canon B clamp Leitz microscope adaptor. Genitalia images were stacked using CombineZP software and edited in Adobe photoshop. The genitalia were then transferred to a micro vial filled with glycerine and pinned to the specimen for preservation.



Fig. 1: Antlion specimens were collected at light using a 125 W Mercury vapour bulb inside a square ground plan, white tent

Primary type label data were transcribed verbatim with “//” denoting a different label and “/” denoting a line break. Any additional label information is given in square brackets.

Abbreviations: ANHRT African Natural History Research Trust, Leominster, UK,

Taxonomy

Family **Myrmeleontidae** Latreille, 1802

Subfamily **Myrmeleontinae** Latreille, 1802

Tribe **Myrmeleontini** Latreille, 1802

Genus ***Myrmeleon*** Linnaeus, 1867

Type species: *Myrmeleon formicarium* Linnaeus, 1867, subsequent designation.

Myrmeleon milibangalala sp. nov. (Fig. 2)

lsid:zoobank.org:pub:AE4B5BDA-F365-448A-9CA5-D88038B4217E

Diagnosis: The new species has several characters that allow it to be easily distinguished from other *Myrmeleon* species in the southern African region. Some of its striking features among *Myrmeleon* species are its small size, the uniform dark colouration of the vertex, the remarkably large size of the club, the number of cross-veins (3-4) between Rs1 and Rs2 in the forewing, the pattern of the tergal segments (brown with small semicircular and yellow lateral spots on the caudal margins in lateral view), and male has a large pilula axillaris in the base of the hind wing.

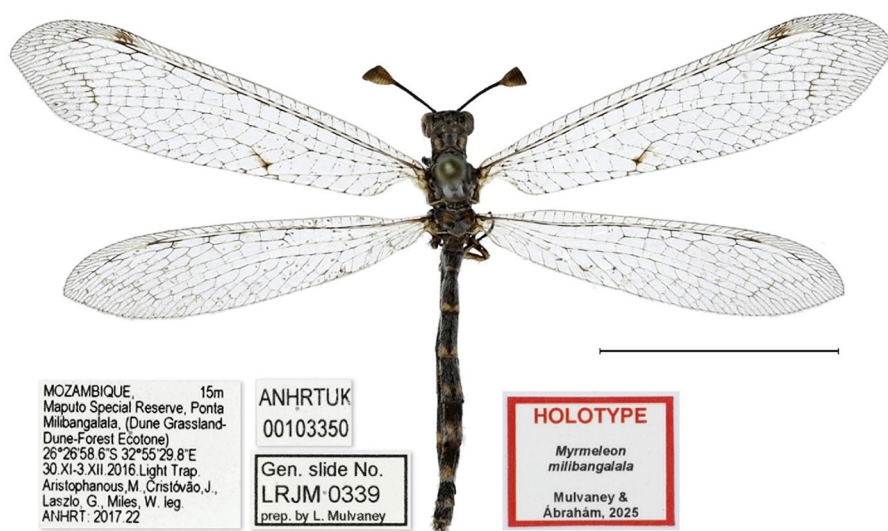


Fig. 2: Habitus of holotype male *Myrmeleon milibangalala* sp. nov. with labels (Scale bar: 10 mm)

The new species is morphologically similar to the relatively small-sized and wide-spread *Myrmeleon obscurus* Rambur, 1842, *Myrmeleon caliginosus* Hölzel & Ohm, 1983 and *Myrmeleon stigmalis* Navás, 1912. However, the latter species is significantly larger (length of forewing: 24–30 mm) than the new species and its tergal segments have a distinct reddish-yellow longitudinal stripe. The yellowish pattern on the abdomen of *M. obscurus* and *M. caliginosus* is on the anterior half of the tergites while that of the new species is on the caudal half of the tergites. The vertex of the new species is unicolour black but both similar species have yellow and black patterns.

Type material: Holotype // MOZAMBIQUE • ♂ 15 m / Maputo Special Reserve [MNP], Ponta / Milibangalala (Dune Grassland) / 26°26'58.6"S, 32°55'29.8"E / 30.xi-3.xii.2016 Light Trap / Aristophanous, M. Cristóvão, J., László, G., Miles, V. leg. / ANHRT:2017.22 // [Unique number:] ANHRTUK / 00103350 //

Paratypes: As the holotype • 8♂♂ and 11♀♀, unique numbers: ♂ ANHRTUK00103332, ♂ ANHRTUK00103336, ♂ ANHRTUK00103337, ♂ ANHRTUK00103342, ♂ ANHRTUK00103344, ♂ ANHRTUK00103346, ♂ ANHRTUK00103351, ♂ ANHRTUK00103355 (Gen slide no: LRJM0343), ♀ ANHRTUK00103331, ♀ ANHRTUK00103333, ♀ ANHRTUK00103334, ♀ ANHRTUK00103338, ♀ ANHRTUK00103339 (Gen slide no: LRJM0342), ♀ ANHRTUK00103341, ♀ ANHRTUK00103343, ♀ ANHRTUK00103347, ♀ ANHRTUK00103348, ♀ ANHRTUK00103349, ♀ ANHRTUK00103352.

// MOZAMBIQUE • 7♀♀ 15m / Maputo Special Reserve, Ponta / Milibangalala (Dune Grassland) / 26°26'58.6"S, 32°55'29.8"E / 17-21.ii.2018 MV Light Trap / László, G., Mulvaney, J., / Smith, L. Leg. / ANHRT:2018.2 // unique numbers: ♀ ANHRTUK00100574, ♀ ANHRTUK00100580, ♀ ANHRTUK00100581, ♀ ANHRTUK00100582, ♀ ANHRTUK00100607, ♀ ANHRTUK00100608, ♀ ANHRTUK00100625.

Additional material examined: Not included in the type material, because they are damaged.

As the holotype • 1♂ unique number: ANHRTUK00103353; MOZAMBIQUE • 1♀ 22m / Maputo Special Reserve, / West Gate (Sand Forest) / 26°30'14.2"S, 32°42'59.6"E / 21-30.xi.2016 General Coll. / Aristophanous, M., Cristóvão, J., / László, G., Miles, W. Leg. / ANHRT: 2017.22 // unique number: ANHRTUK00103330.

The holotype and paratypes are deposited in the entomological collection of ANHRTUK.

Description

Measurements. Holotype male. Antenna: 4 mm long; Body: 19 mm long; Forewing: 18.5 mm long, 5 mm wide; Hindwing: 16 mm long, 3.5 mm wide.

Paratype males (n=8). Antenna: 4 mm long; Body: 15-19 mm long; Forewing: 18.5-19.5 mm long, 5 mm wide; Hindwing: 14-16.5 mm long, 4 mm wide.

Paratype females (n=18). Antenna: 4.5 mm long; Body: 19-20 mm long; Forewing: 19.5-21.5 mm long, 5-5.5 mm wide; Hindwing: 16-18 mm long, 4.5 mm wide.

Head (Fig. 3A–B). Vertex slightly curved in frontal view, entirely dull black, with sparse short setae. Frons with shining black mark below scapes extending medially toward clypeus, frons otherwise yellow, hairless. Gena, clypeus and labrum also yellow and hairless. Basal margin of labrum slightly concave. Base of mandible subdominantly yellow and with dark brown apex and inner margin. Last two segments of maxillar palps yellow, third segment subdominantly dark brown. Last segment of labial palp spindle-shaped with oval sensory pit. One third distal part yellow, remnant part black. Otherwise, basal segments yellow. Eye larger than hemispherical bronze brown. Scape shining black with narrow yellow ring on frons. Pedicel dominantly black with narrow yellow basal and apical margins. Flagellar segments dark brown covering with short brown setae. Club remarkably large as long as one third of total length of the antenna. Most part brown dorsally and entirely yellow ventrally.

Thorax (Fig. 3B–C). Pronotum slightly trapezoid and slightly longer than wide, dark brown with two round yellow spots antero-laterally and two narrow indistinct yellow strips laterally. Anterior and posterior margins partly yellow. Short white setae covering pronotum but long sparse white hairs directed anteriorly on lateral margins. Meso and metanotum almost entirely dark brown with short sparse and white setae. Meso and metascutum with indistinct small yellow spots on each side; meso and metascutellum with narrow yellow caudal margins. Side dark brown with small yellow marks and sparse white setae.

Wings (Fig. 3E). Fore wing long elongated, longer than abdomen in resting position. Apices subacute, anal area obtuse. Venation moderately dense. Posterior Banksian-line visible. Membrane hyaline, indistinct light brown shadow at bifurcated veins along posterior margin in the anal and cubital areas. An oblique brown stripe extending from the junction of Cua₂ and origin of posterior Banksian line in cubital area. Also faint shadow along outer radial cross-veins. Veins dark brown alternating with pale. 6-7 radial cross-veins before origin of Rs. Usually 3-4 cross-veins between Rs₁ and Rs₂. 7 braches in Rs. Pterostigma brownish basally white distally with 6-7 cross-veins.

Hind wing similar to fore wing but without any shadow. Posterior Banksian line not visible. Pterostigma small, indistinct white with 4-5 cross-veins. 5 radial cross-veins before origin of Rs. Rs with 7 braches. Male pilula axillaris large, lenticular-shaped covering with dense reddish tiny setae upperside and dark brown underside. Long brown hairs on distal margin (Fig. 3D).

Legs. Foreleg, coxa dark brown outside and yellow inside with sparse and white hairs. Femur almost entirely brown with yellow strip basally covered with short, smooth, and white hairs. Femur longer than tibia. Tibia almost completely brown with small yellow spot basally on the outer third of part and with white setae outside, and reddish setose inner side and with some outstanding black bristles. Tibial spurs barely noticeable, tiny dark brown. Tarsal segments brown with yellow longitudinal line outside, segment 1 as long as segment 5. Segments 2-4 equal, total length equal length of segment 1 or segment 5. Claws short, reddish brown. Middle leg, coxa dark brown with white hairs.

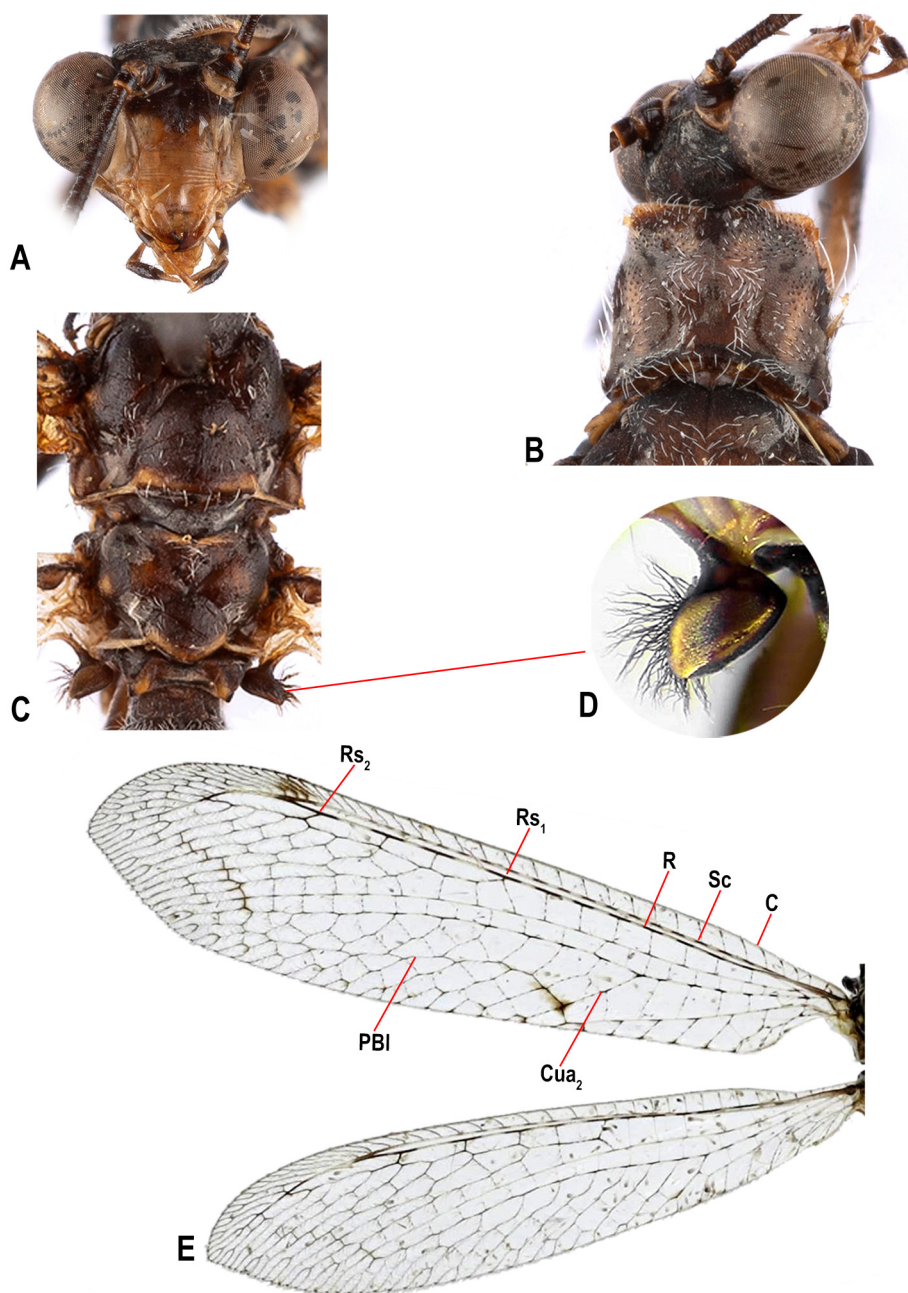


Fig. 3: A – Head in frontal view, B – Vertex and pronotum in dorsal view, C – Meso- and metathorax in dorsal view, D – male pilula axillaris in base of hindwing in dorsal view, E – Wings in dorsal view (Enlarged on different scales)

Abbreviations: C – Costa, Cua_2 – Cubitus anterior 2, Sc – Subcosta, R – Radius, Rs_1 and Rs_2 – Radius sector vein 1, and vein 2, PBI – Posterior Banksian line

Femur dominantly brown with longitudinal yellow stipe outside and with white setae and some upstanding rigid white bristles. Femur as long as tibia. Pattern on tibia similar to femur but setae black. Tibial spurs and tarsal segment similar to those of fore leg. Hind leg similar to middle leg, but yellow pattern more distinct on femur, tibia, and tarsal segments.

Abdomen: Brown with small semicircle-shaped and yellow lateral spots on caudal margins of tergal segments (Fig. 2). Sternites brown with yellow caudal margins. Setae of abdomen short, dense and white.

Terminalia and genitalia: Male (Fig. 4A–E). In lateral view, tergite 9 subrhomboid-shaped, brown with yellow hind margin. Ectoproct oval, brown with short, thick and yellow caudo-ventral protuberance. Protuberance with rigid, acute and black bristles. In ventral view, sternite 9 pentagonal-shaped brown, caudal margin yellow with black

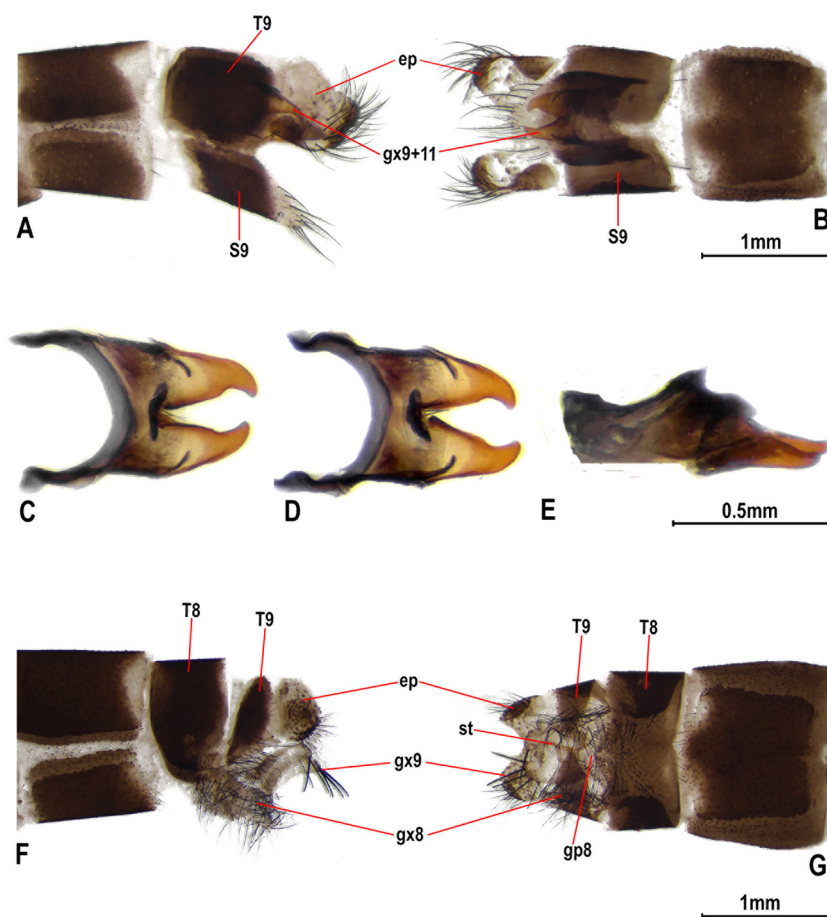


Fig. 4: Terminalia and genitalia A – male terminalia in lateral view, B – ditto in ventral view, C – male genitalia in lateral view, D – ditto in ventral view, E – Female terminalia in lateral view, F – ditto in ventral view

Abbreviations: gx – gonocoxites, gp – gonatal plate, T8, and T9 – tergite 8, and 9, ep – ectoproct S7, and S9 – sternite 7, and 9, st – spermatheca

hairs. In dorsal and lateral view, gx9+11 complex (gonarcus-parameres complex) similar shaped. Gx9 (parameres) elongated claw-shaped, outer margin evenly curved, ending in a blunt apex, inner margin initially curved, then straight. The apex and inner margin well sclerotized. 2 long gonatal setae. Gx11 (gonarcus) evenly curved in dorsal and ventral view. (Fig. 4C–E).

Female (Fig. 4F–G). In lateral view, tergal segment 9 brown with long black hairs ventro-caudally. Ectoproct oval, brown covering only with black hairs and without any strong digging setae. Gx8 slightly bent inward with long black hairs. Gx9 small globular with four or five long rigid and black bristles in a row directed ventro-caudally. In ventral view shape of spermatheca as in Fig. 4G.

Etymology: The new species is dedicated to the type locality, Ponta Milibangalala, Maputo National Park, Mozambique, situated within the Maputaland Centre of Plant Endemism. This region is globally recognised for its rich biodiversity, high levels of endemism and high conservation value. The name is a noun in nominative singular apposition.

Habitat and flight activity: The new species was collected at light in a dune grassland habitat, approximately 100 meters from the ocean, beyond a narrow strip of dune forest (Fig. 5). The area is characterised by a diverse mosaic of ecosystems, including dune vegetation, sand forest, sand forest-woodland mosaic, woodland mosaic, wooded grasslands, savannah, riverine vegetation, and mangroves (BirdLife International 2024, DNAC 2010). The light trap was set up near the edge of the dune forest, with a view overlooking the open dune grassland and the adjacent dune forest stretching across the grassland.

The vegetation in this area is well-developed, featuring low-lying grasses and shrubs interspersed with isolated trees, alongside patches of exposed sandy soil. The primary vegetation type is Poaceae (grasses) and a list of the species of grasses on comparable environments in NE South Africa can be found in TINLEY (1976). with other plant species recorded from the nearby foredune habitats include, such as *Ipomoea brasiliensis*,



Fig. 5: Habitat of *M. milibangalala* sp. nov. in the coastal zone of Maputo Special Reserve

Scaevola plumiera, *Arcotheca populifolia*, and the coastal bean bush *Sophora inhambanensis* (DNAC 2011).

The region receives an annual rainfall of 690-1000 mm and (October to March), average temperatures typically do not exceed 26.6°C (DE BOER & NTUMI 2001). The soil is primarily composed of Aeolian (wind-blown) sand deposits of marine origin, which are low in nutrients (PARK & DE BOER 2000, DE BOER & NTUMI 2001) and in A Natural History of Inhaca Island these sandy soils are reported as alkaline (7.5-8.4) (MACNAE & KALK 1969). The KZN coast experiences frequent onshore northeasterly sea breezes, especially during the summer months (JACKSON et al. 2014), which may influence local insect behaviour, with many likely seeking shelter within the vegetation during the windiest parts of the day.

Sampling was carried out seasonally at three times and in two different habitats (Table 1).

At the beginning of the swarm of antlion imagoes, males usually are on the wings first,

Table 1: Flight activity of the new species in different habitats

Sampling date	Habitat	Male	Female
21-30.xi.2016	Sand Forest	-	1
30.xi-3.xii.2016	Dune Grassland - / Dune-Forest Ecotone	10	11
17-21.ii.2018	Dune Grassland - / Dune-Forest Ecotone	-	7

then the number of females gradually increases and at the end of the swarm, females usually occur in higher numbers than males. Based on Table 1, it can be concluded that the imagoes of the new species are during the hot rainy summer season (November to March). The preferred habitat of the new species is the Dune Grassland - / Dune-Forest Ecotone.

Distribution: *Myrmeleon milibangalala* **sp. nov.** is Milibangalala in Maputo National Park, Mozambique and more specifically from Dune Grassland - / Dune-Forest Ecotone.

Discussion

The antlion fauna of Mozambique is poorly known, according to the LDL (OSWALD 2024), which is updated based on published but not revised publications; a total of 49 antlion species have been identified from Mozambique, excluding the owfly species. In the framework of the research projects that have just started, this number may increase significantly with new species and species found for the first time in the fauna. However, several species are likely to be synonymised. In southern Africa, the names of about 25 species classified in the genus *Myrmeleon* are known, of which about 10-11 are valid species.

The new species is probably an endemic species occurring in a previously unexplored special habitat. Coastal habitats can be very diverse in their vegetation structure, with open and closed sandy grasslands alternating with smaller and larger shrubby, grove-like and wooded areas. At the surface, sand dunes make the habitat even more diverse. Due to the diversity of the surface and the proximity of the sea, humidity also increases the diversity of habitats (PASCAL 2021).

In the southeastern coastal habitat of Africa, which extends from South Africa to Kenya, several species of antlions and owlflies prefer it, e.g. *Palpares inclemens* (Walker, 1853), *Syngenes longicornis* (Rambur, 1842), *Myrmeleon stigmalis* Navás, 1912, *Creoleon* sp. *Paraglenurus* sp. n. (under description), and an owlfly *Afroasca doboszi* Ábrahám, 2017.

The new species may possibly be restricted to specific microhabitats, influenced by environmental factors such as coastal winds or generally not attracted to light. Future studies should consider targeted searches for Myrmeleontidae using head torches and hand nets at dawn, dusk, and during the night as well as deploying automatic portable light traps directly on the beach during the same season that the type specimens was found.

It would be very interesting to conduct larval rearing experiments in this area to gain a better understanding of the life history of this elusive species. The larvae of *Myrmeleon* species are pit-builders. If the larvae build their pits in an open microhabitat on sandy soil, they are exposed to direct sunlight, rain, and wind. Therefore, it is likely that the larvae of the new species build their pits in protected microhabitats shaded by vegetation. This behavior provides the larvae of the new species with a better chance of survival on sandy soil surfaces, which are mainly exposed to sea breezes, heavy rain and strong heating from direct sunshine (ÁBRAHÁM 2003).

To conclude, the new species is another unique element of the Maputaland-Pondoland-Albany biodiversity hotspot and further highlights the conservation value of this biodiverse region.

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