

The first termitivorous jumping spider (Araneae: Salticidae)

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Summary

Microheros termitophagus, gen. and sp. n., a jumping spider (Araneae, Salticidae) from Zimbabwe and South Africa, preying on *Odontotermes transvaalensis* (Sjöstedt) termites inside the chimney of their mound, is described. Data on the natural history and reproductive cycle of this species are also provided.

Introduction

A number of species of spiders are associated with termites. Some of them inhabit termite nests and show distinct adaptations for underground life, e.g. the loss of eyes or absence of pigment (Cooke, 1964; Benoit, 1964; Bouillon, 1977). Unfortunately, both the biology and behaviour of these spiders are poorly known. Numerous other species from various families prey on termites and some are specialised hunters (Wilson & Clark, 1977; Dean, 1988; Jocqué, 1990; van den Berg & Dippenaar-Schoeman, 1991; Jocqué & Dippenaar-Schoeman, 1992; Dippenaar-Schoeman *et al.*, 1996a, b), but no jumping spider specialised in feeding on termites has been reported so far. Below we describe the first salticid preying regularly on termites and provide some information on its biology. This species was reported by Cumming (1993), provisionally assigned to the genus *Phlegra* Simon.

This salticid co-occurs on termite mounds with three other species: a land planarian *Microplana termitophaga* Jones, a nocturnal zodariid spider *Diores magicus* Jocqué & Dippenaar-Schoeman and a phorid fly *Termitophilomyia zimbraunsi* Disney; all prey on, or interact with termites, but are separated temporally (Cumming 1995, 1996).

Material and methods

Abbreviations used in the text: ap=apical, d=dorsal, Fm=femur, Mt=metatarsus, pl=prolateral, Pt=patella, rl=retrolateral, Ta=tarsus, Tb=tibia, v=ventral. Chaetotaxy: system adopted by Ono (1988). Measurements are given in millimetres. The sequence of leg segments in measurement data is as follows: femur+patella+tibia+metatarsus+tarsus.

Type specimens are deposited in the National Collection of Arachnida, Plant Protection Research Institute, Pretoria, South Africa.

Genus *Microheros*, new genus

Type species: Microheros termitophagus, n. sp.

Etymology: The generic name is a concatenation of the Greek words “mikros” and “heros” meaning “little hero”. Gender masculine.

Description: Medium sized spiders, 6.0–8.0 mm in length. Cephalothorax broadest posteriorly, rather low, in females a little higher, eye field short. Eyes in three rows, posterior row the same width or only slightly wider than anterior row, middle row about midway between anterior and posterior eyes. Long, dark bristles and short, thick setae on anterior part of ocular area. Clypeus medium height. Chelicerae with very small single tooth on retromargin and two teeth on promargin. Abdomen shield-shaped, in male with large scutum. Spinnerets rather long. Leg formula IV, III, II, I. Thick, short, terminal seta on tarsi of all legs ventrally, below the scopula; this seta is slightly longer on tarsi of legs III and IV. Coloration pattern: white stripes on dark, brownish-black background, two parallel stripes on carapace and one median on abdomen.

Diagnosis and affinities: The male and female are diagnosed by the structure of the copulatory organs (see below, under Diagnosis of the type species).

The general habitus of both sexes and coloration pattern are very similar to those of members of the Aelurillinae, especially *Phlegra* Simon, 1876. The single, sharp-ended tibial apophysis and presence of two ventral tibial protuberances on the male pedipalp align *Microheros* to *Langona* Simon, 1901. However, *Microheros* differs significantly from other Aelurillinae. This genus has an open, very deep cymbial pocket, while in typical members of this subfamily the cymbial pocket is closed, the embolus is hidden in it, and only the terminal end of the embolus is visible in a ventral view of the palp (Logunov, 1996a). Among Aelurillinae only *Proszynskiana* Logunov, 1996 has an open cymbial pocket. The structure of the embolus is the second feature differentiating *Microheros* from the Aelurillinae. The embolus in Aelurillinae is long, coiled at the tip of the bulbous or hook-shaped, but always compound. Logunov (1996b) demonstrates that it is composed of a simple embolus fused to a tegular apophysis. The embolus in *Microheros* is simple, but since a large tegular apophysis is also present, one cannot exclude the possibility that the embolic structure represents a more primeval type than in typical Aelurillinae. A simple embolus distinct from the tegular apophysis occurs in numerous *Stenaerillus* Simon, 1885, which like *Microheros* have a shield-shaped abdomen and long spinnerets. However, because of the structure of the embolic region the placement of *Stenaerillus* itself in the Aelurillinae is open to question. The relationships of *Microheros* clearly demand further studies.

Included species: Only the type species.

Microheros termitophagus, new species (Figs. 1–21)

Type material: Holotype ♂, ZIMBABWE, Harare (17°15'S, 31°02'E), garden, 31 March 1992, leg. M. S. Cumming (97/10 631). Paratypes: same data, 1♂ 1♀ (97/1062); SOUTH AFRICA, Transvaal:

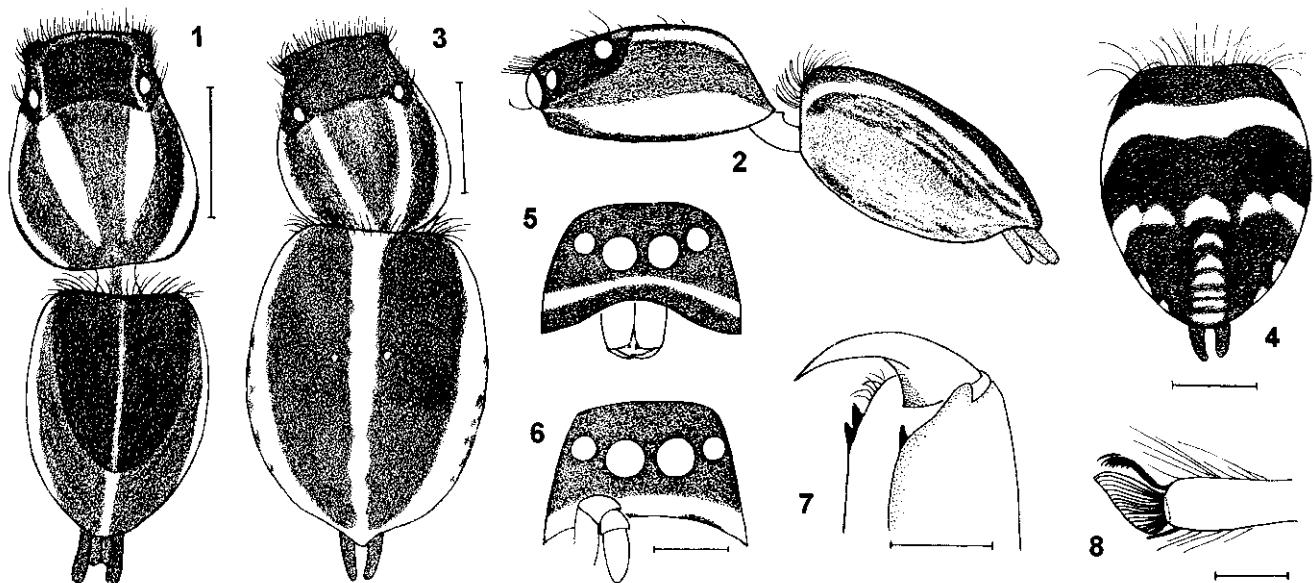
Mosdene, Naboomspruit (24°32'S, 28°36'E), 5 June 1980, leg. A. Le Roy, 1♂ 1♀ (81/557), same locality, 22 April 1987, leg. M. Filmer, 1♂ (87/544); Weavind Park, 14 April 1985, leg. A. v. d. Berg, 1♂ (85/132); all following specimens from the same locality: Rietondal (25°43'S, 28°13'E), 24 April 1986, leg. A. Mel, 1♂ (86/48); 14 May 1987, leg. L. Oosthuizen, 1♂ 2♀ (87/634); 21 May 1987, leg. L. Oosthuizen & A. v. d. Berg, 4♀, 1 juv. (87/684); 4 June 1987, leg. A. v. d. Berg, 7♀ (87/750); 11 June 1987, leg. L. Oosthuizen, 5♀ (87/757); 18 June 1987, leg. A. v. d. Berg, 4♀ (87/767); 25 June 1987, leg. A. v. d. Berg, 3♀ (87/774); 2 July 1987, leg. A. v. d. Berg, 3♀ (88/677); 16 July 1987, leg. A. v. d. Berg, 1♀ (87/813); 27 July 1987, leg. A. v. d. Berg, 1♀ (87/979); 9 August 1987, leg. M. Botha, 4♀ (87/805); 10 May 1988, leg. A. Biggs, 2♂ (88/434); 10 May 1988, leg. A. Biggs, 1♂ (88/436); 10 May 1988, leg. A. Biggs, 2♀ (88/474); 17 May 1988, leg. A. Biggs, 2♂ (88/478); 24 May 1988, leg. C. Barnard, 2♂ 2♀, 2 juv. (88/451); 7 June 1988, leg. C. Barnard, 3♀ (88/435); 13 June 1988, leg. A. Biggs, 4♀ (88/859); 21 June 1988, leg. C. Barnard, 2♀ (88/554); 26 June 1988, leg. A. Biggs, 10♀ (87/778); 18 July 1988, leg. A. Biggs & A. v. d. Berg, 1♀ (89/137); 2 August 1988, leg. C. Barnard, 5♀ (88/699); 2 August 1988, leg. C. Barnard, 1♀ (88/683); 16 August 1988, leg. A. Biggs, 2♀ (88/721); 6 September 1988, leg. C. Barnard & A. Biggs, 1♀ (89/145); 29 September 1988, leg. A. Biggs & A. v. d. Berg, 1♀ (88/9); 24 May 1989, leg. A. v. d. Berg, 2♂ 2♀ (89/503); 9 June 1992, leg. A. v. d. Berg, 1♀ (92/517); 9 June 1992, leg. A. v. d. Berg, 2♀ (92/534).

Etymology: The specific name refers to the feeding habits of the species.

Diagnosis: This species can be recognised by the structure of the copulatory organs. The male palp has a long, thin whip-shaped embolus, large tegular apophysis, and lobate tibial apophysis with terminal prickle. The epigyne is very small, gonopores linked by delicate chitinous rim.

Description: *Male:* Carapace length 3.0–3.2, width 2.3–2.4, height 1.2–1.3. Abdomen length 3.0–3.3, width 1.9–2.3. Ocular area length 1.0, anterior and posterior width 1.6. Length of leg segments: I 1.5+0.9+0.9+0.8+0.6; II 1.5+0.9+0.9+0.8+0.6; III 2.1+1.2+1.5+1.5+0.8; IV 1.9+1.0+1.4+1.8+0.9. Leg spination: I: Fm d 0-1-1-5 or 0-1-1-1-1-5; Pt pl 1; Tb pl 1-1, v 1-1ap; Mt d 0-1ap, pl, rl and v 1-1ap; Ta v 1ap. II: Fm d 0-1-2-5

or 0-1-1-2-1-5; Pt pl 1; Tb pl 1-1, rl 1-1ap, v 1ap; Mt d and v 2-2ap; Ta v 1ap. III: Fm d 1-0-2-5; Pt pl and rl 1; Tb d 1-0-0, pl and rl 1-1-1, v 1-1ap; Mt d 1-1, pl 1-1-2ap, rl 1-1-2ap, v 0-1-1ap; Ta v 1ap. IV: Fm d 1-1-5; Pt pl and rl 1; Tb d 1-0-0, pl and rl 1-1-1, v 1-1ap; Mt d 2-2-2 ap, pl 0-1-1ap, rl 1-0-1ap, v 0-1-1-1ap; Ta v 1ap. General appearance as in Figs. 1 and 2. Carapace oval, broadest posteriorly. Eye field rectangular, short, occupies one third of carapace length. Ocular area black, long dark hairs and short thick setae on its anterior part. Short whitish hairs form lighter line behind anterior median eyes and alongside lateral eyes. Thoracic part brown, with two yellowish-white longitudinal stripes, sides light. Thin brown line on lateral edges of carapace. Clypeus medium height, with narrow stripe composed of white hairs (Fig. 5). Chelicerae brown, retrolateral margins covered with white hairs; with two teeth on promargin and single small tooth on retromargin (Fig. 7). Labium and maxillae yellow, dense long hairs on inner margins of maxillae. Sternum yellowish with white hairs. Coxae and trochanters yellowish with apical brown lines and dark hairs. Abdomen oval, flattened dorsally, dark brown, with large black scutum; longitudinal narrow whitish stripe medially, more distinct behind scutum; sides light; long bushy dark hairs on anterior margin; venter rather light, with two brown longitudinal lines, sides smoky. Spinnerets long, black. Legs typical, length of leg III equal to IV, legs I and II rather short, with very short distal segments. Femora orange, with darker basal and distal patches, patellae and tibiae dark brown, metatarsi and tarsi light brown. Leg hairs brown. Spines very numerous and very long. Two serrate claws and claw tuft on tarsi, additionally single strong short seta ventrally on tip of tarsus (Fig. 8). Pedipalp orange, as in Figs. 9–12. Palpal tibia with two ventral protuberances (Fig. 9). Tibial apophysis with thin sharp prickle on tip (Figs. 10, 11, 16). Bulbus with very long anterior lobe,



Figs. 1–8: *Microheros termitophagus*, n. sp. **1, 2** General appearance of male, dorsal and lateral views; **3** General appearance of female, dorsal view; **4** Abdominal pattern of juvenile; **5** Face colour pattern of male; **6** Face colour pattern of female; **7** Cheliceral dentition; **8** Tarsus. Scale lines=2.0 mm (1–3), 1.0 mm (4), 0.5 mm (5, 6), 0.3 mm (8), 0.2 mm (7).

forming tegular apophysis, embolus very thin and long (Figs. 9–11, 14, 15). Small bump on ventral surface of palpal femur (Fig. 13).

Female: Carapace length 3.0–3.3, width 2.5–2.7, height 1.2–1.3. Abdomen length 4.0–4.6, width 3.0–3.7. Ocular area length 1.0–1.2, anterior and posterior width 1.6–1.7. Length of leg segments: I 1.4+0.9+1.3+0.6+0.6; II 1.4+0.9+0.9+0.7+0.6; III 1.9+1.3+1.8+1.8+0.8; IV 1.9+1.2+1.6+2.0+0.8. Leg spination: I: Fm d 0-1-1-5; Pt pl 1; Tb pl 1-1, v 1-1-2ap; Mt d 2ap, rl 1ap, v 2-2ap; Ta v 1ap. II: Fm d 0-1-2-5; Pt pl 1; Tb pl 1-1, v 1-1-2ap; Mt d 1-2ap, pl and rl 1ap, v 2-1ap; Ta v 1ap. III: Fm d 1-0-2-5; Pt pl and rl 1; Tb d 1-0-1, pl 1-2, rl 1, vl-0-2ap; Mt d 1-1-1ap, pl 1-1ap, rl 1-0-1ap, v 0-1-2ap; Ta v 1ap. IV: Fm d 1-0-1-5; Pt pl and rl 1; Tb d 1-1-2, pl and rl 1-1, v 1-1ap; Mt d 1-1-1-1ap, pl 1-1-1ap, rl 1-0-2ap, v 0-1-1ap; Ta v 1ap. General appearance as in Fig. 3. As male, but abdomen larger. Scutum absent, median stripe on abdomen wider than in male, abdominal sides covered with numerous dark dots—a characteristic feature of female coloration. Whole body covered with dense hairs of background colour. White stripe on clypeus wider than in male (Fig. 6). Epigyne very small, rather heavily sclerotised (Fig. 17). Internal structures as in Figs. 18–20. Gonopores small, situated posteriorly, seminal ducts rather thin, spermathecae composed of few chambers, accessory glands small.

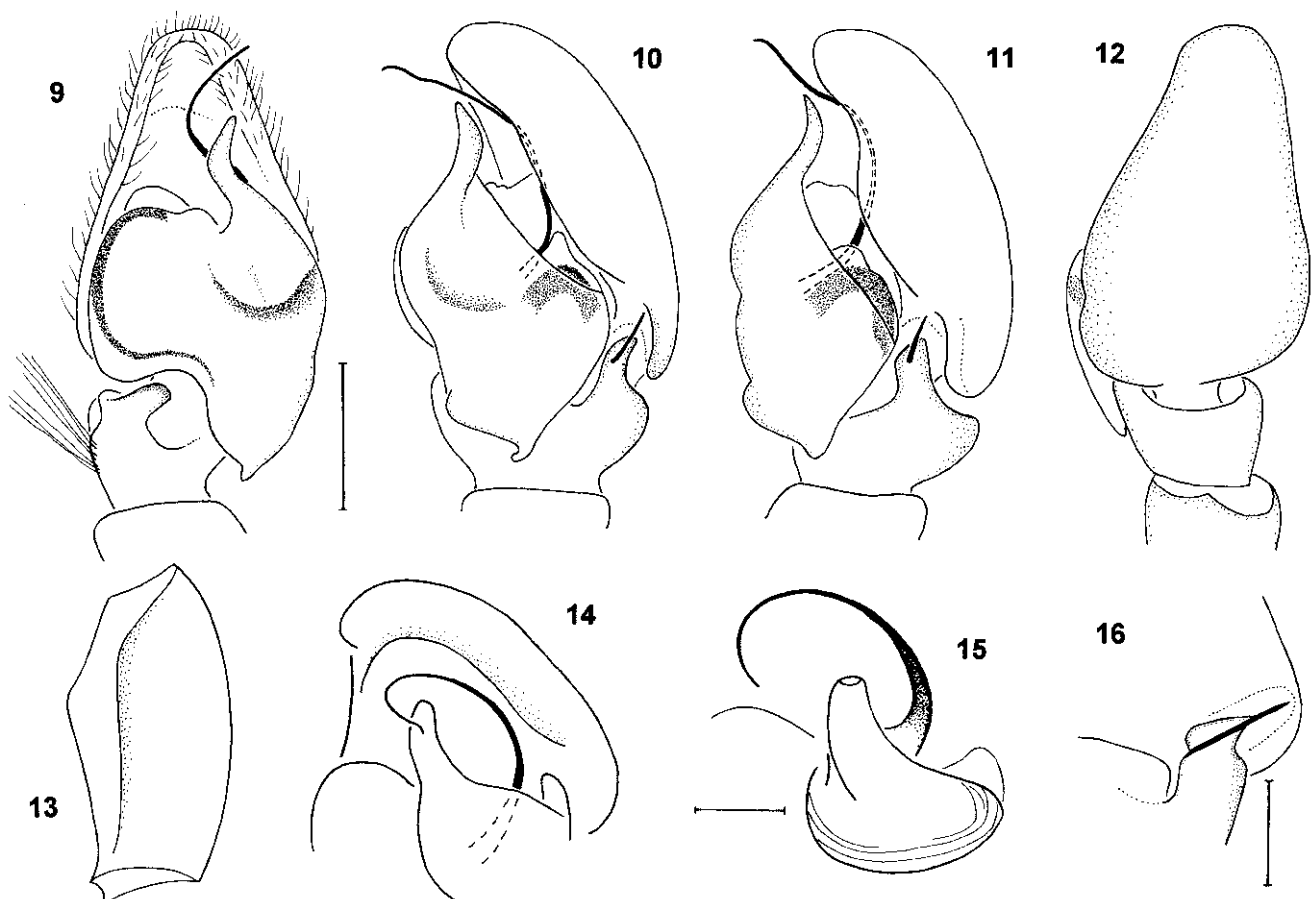
Juvenile: Early instar spider differs from adult not only in size but also in coloration. Carapace as in adult, blackish with two parallel longitudinal light stripes. Abdominal pattern composed of one longitudinal and two transverse white stripes (Fig. 4). Legs black, only basal two-thirds of femora yellow. Whole body covered with dense dark hairs.

Distribution: Zimbabwe and South Africa (Transvaal).

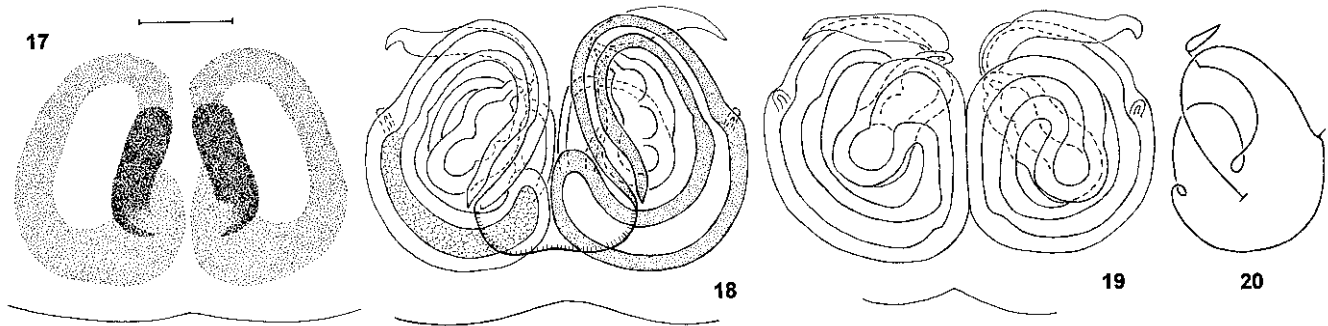
Natural history

Microheros termitophagus lives on the outside of *Odontotermes transvaalensis* (Sjöstedt) and other open-vented termite mounds, where it feeds, nests and mates. It has also been seen occasionally on compost pits, where termites are present. It appears in the open when the following micro-climatic conditions prevail: light-intensity exceeds 100,000 lux, the sun is higher than 35° above the horizon, air temperature exceeds 19°C, relative humidity is low and the substrate dry.

When on the mound it feeds exclusively on termite workers, both major and minor classes, but totally ignores the soldier caste. When artificially starved, and when on the compost pits, it will take small flies. Even small, early-instar *M. termitophagus* feed on termites, which are bigger than themselves, delivering a bite, then



Figs. 9–16: *Microheros termitophagus*, n. sp. 9–12 Palpal organ, ventral, ventrolateral, lateral and dorsal views; 13 Palpal femur, retrolateral view; 14, 15 Embolus, lateroapical and apical views; 16 Tibial apophysis, ventral view (bulbus removed). Scale lines=0.4 mm (9–14), 0.2 mm (15, 16).



Figs. 17–20: *Microheros termitophagus*, n. sp. **17** Epigyne; **18, 19** Internal structure of epigyne, ventral and dorsal views; **20** Diagrammatic course of seminal duct. Scale line=0.1 mm.

standing back while their venom takes effect. Older individuals simply nip down, grab a termite head-on (without jumping) and commence feeding immediately (Fig. 21). They appear oblivious to the range of termite defence strategies (biting, secretion of chemicals from various glands and the mouth, head-banging, chases), which are so effective against most potential predators. Their most noteworthy feature is their apparent lack of concern about the repellent secretions, both airborne and liquid, of the termites. The spiders merely step aside when termites occasionally rush them. Surprisingly, the termites take little notice of the spiders either; the percentage of defensive soldiers-plus-major workers seldom rises above 15% even when spider numbers are high. By contrast, up to 30% soldiers-plus-majors appear in response to the zodariid spider *Diores magicus* (M. Cumming, unpublished data) and to phorid fly invaders (Cumming, 1996). The termites appear to tolerate *M. termitophagus* predation and presence to a remarkable extent, and the relationship requires closer scrutiny.

Whilst the termite mound provides a rich and reliable, all-year source of easily captured and nutritious prey, it also has some drawbacks. The spiders become concentrated in known and vulnerable spots. Skinks, in particular, consume many spiders but birds and wasps are also important predators. Alarmed spiders either jump away, freeze on the spot or dive below the soil to escape. At night and during inclement weather they shelter beneath the loose soil and debris on the periphery of the mound, lying on their backs. Females usually construct a cocoon around themselves, studding it with soil and mound debris for camouflage. Eggs are probably laid in such cocoons.

Reproductive cycle

The reproductive cycle was studied in a Harare garden from 1991 to 1993. The times of juvenile emergence and adult death depended on climatic conditions. However, the mating season appeared to start at the same time each year. The following stages were delineated:

1. *Non-mating (late July to February)*: The juveniles emerge, feed on termites, moult several times (with accompanying changes in patterning) and grow. Sexual differences are not obvious, either in appearance or behaviour. There is little social interaction between

individuals; they mainly forage. The spiders hide in their cocoons during wet or overcast weather, sometimes disappearing for weeks on end. Some adult females from the previous season survive, the latest record being on 6 September 1992; however, the old females die before the new generation reach their final moult.

2. *Pre-mating (late February to early April)*: The spiders aggregate at the mound. Secondary sexual characteristics become obvious, with many social “games” of a learning, experimental nature. The females concentrate on feeding but there is a great deal of male:male threat and chase. A male may stake a claim on a tuft of grass, a stick, or a projection for some hours; he defends this elevated position against passing males by raising his abdomen to a 45° angle, holding legs III and/or IV stiffly sideways and maintaining this face-to-face stance for some seconds. The lower male usually backs off and hops away; occasionally there is a chase and, rarely, a confrontation between them. Many intermale confrontations also occur on the rim of the termite mound vent.

3. *Mating (mid-April to mid-May)*: Increased sociality and aggregations of spiders (up to 50 in the drought year, 1992) on the mound. The first copulations are observed between 9–14 April each year. A sense of excitement prevails and the rim of the termite vent becomes thickly lined with dragline silk. The males mate with multiple partners, and females accept a string of males, often in quick succession; one large, probably



Fig. 21: *Microheros termitophagus*, n. sp. catching a termite.

gravid, female was mounted 17 times by different or the same males, to all of whom she was indifferent. A successful mating follows a distinct pattern: Preliminary signalling is not pronounced and is often absent. The male normally, but not always, waits until the female is occupied in feeding. He normally mounts from the front, rapidly pounding her legs IV and/or abdomen with his vibrating legs I and II. He leans over, placing his far-side leg I across her abdomen (five of his legs are thus on the side to be inseminated and three on her far side); if she is receptive she turns her abdomen and he inserts his palp in her epigynum. Simultaneously, he stops tapping her with his legs and waggles his abdomen from side to side, rapidly at first then slowing down; his unusually long anterior spinnerets are widely splayed, which may have visual or olfactory significance. In a completed mating there are usually about 42 waggles (roughly 1/s) but many matings are only attempted or are aborted by indifferent females. After insemination on one side, the male may persuade the female to rotate her abdomen so that the genital opening on the other side can be penetrated, again with up to 42 waggles. The mating process is invariably quick, about two minutes maximum. Complete mating sequences are rare and a great number of variations occur. Intermale confrontations and mountings are commonly interspersed with male:female interactions, even by the same males. Females feed intensively but males infrequently; females are not usually aggressive towards males.

4. *Post-mating (mid-May to August)*: A very variable stage, dependent on the weather. Males continue to attempt mating with gravid females, usually unsuccessfully, and male:male display persists. However the males become thin and bald, losing the white hairs that conferred their abdominal stripe. The latest record of a male was on 19 July 1992. Females may survive into September if the weather is mild but they die in cold winters. Elderly females lose their stripes more slowly and their hairs become more grey, but they do not acquire the males' shiny patent-leather appearance. The earliest recorded juveniles were seen on 24 June 1992, but most hatch in late July.

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