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Two new trapdoor spider species in the genus *Nemesia* Audouin, 1827 and the first report of this genus from Greece (Araneae, Mygalomorphae, Nemesiidae)

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The trapdoor spider genus *Nemesia* Audouin, 1827 is widely spread in southern Europe from Portugal to Roumania, but it has up to date never been reported from Greece. Here two new species *N. daedali* and *N. caranhaci* are described from Crete. Information on the burrow structure and natural history is given for both species.

Twee nieuwe soorten valdeurspinnen van het geslacht Nemesia en de eerste rapportage van dit geslacht uit Griekenland - Het verspreidingsgebied van het valdeurspinnen geslacht *Nemesia*, Audouin, 1827 beslaat geheel Zuid-Europa van Portugal tot Roemenië. Tot op heden was *Nemesia* echter niet bekend uit Griekenland. Hier worden twee nieuwe soorten, *N. daedali* en *N. caranhaci*, beschreven afkomstig van Kreta. Voorts worden gegevens verstrekt over de structuur van het hol, de prooi en de vindplaatsen van beide soorten.

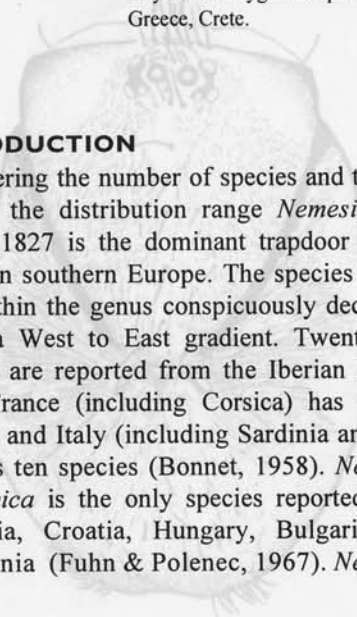
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Keywords: Mygalomorphae, Nemesiidae, trapdoor spiders, taxonomy, biogeography, new species, Greece, Crete.

INTRODUCTION

Considering the number of species and the extent of the distribution range *Nemesia* Audouin, 1827 is the dominant trapdoor spider genus in southern Europe. The species diversity within the genus conspicuously decreases along a West to East gradient. Twenty-four species are reported from the Iberian Peninsula; France (including Corsica) has fifteen species and Italy (including Sardinia and Sicily) has ten species (Bonnet, 1958). *Nemesia pannonica* is the only species reported from Slovenia, Croatia, Hungary, Bulgaria and Roumania (Fuhn & Polenek, 1967). *Nemesia*

is furthermore present on probably all islands in the Western Mediterranean from Ibiza to Malta, it is known from northern Africa with six or seven species, but it has never been reported from Greece or any of the Greek islands. Another trapdoor spider genus, *Cyrtocarenium* Ausserer, 1871 has its centre of distribution in Greece. In the course of my studies of *Cyrtocarenium* (Decae et al., 1982; Decae 1993) I have found *Nemesia* to be present alongside *Cyrtocarenium* in several locations. Here I describe two *Nemesia* species from Crete that I believe to be new to science.



CHARACTER DEFINITIONS

In the descriptive sections below, some terms are used that are not standard arachnological terminology, but that are practical in describing *Nemesia*. Definitions are as follows:

pseudoscopula (Fig. 10): densely packed pubescent hair on the ventral tibiae of the first two pairs of legs. Many *Nemesia* species have pubescence on several body parts, particularly on the carapace, leg- and palp segments, the sternum and the basal segment of the chelicerae. In few species the pubescence on leg segments is continuous with and indistinguishable from the tarsal and metatarsal scopulae. In such species the dense pubescence on the ventral and prolateral tibiae appears as an extension of the scopulae and as such it is applicable as a good taxonomic character, here termed the pseudoscopula.

comb(s) (Figs. 3 & 8): one of the characters to support the monophyly of the Nemesiidae is the presence of biserially dentate paired claws (Raven 1985). These dentations appear as two small combs, usually consisting of a row of three to ten teeth, one on either side of each of the paired claws. In the females of the genus *Nemesia* these combs are reduced (to less than three teeth) or absent from the paired claws on leg IV. In few species, reduction or absence of the combs occurs also in the claws of leg III and/or in the palpal claw, yielding useful taxonomic characters.

rastellar triangle: triangular zone covered with strong setae and rigid teeth apically on the basal segment of the chelicerae.

ABBREVIATIONS AND MEASUREMENTS

Eye group: AME = anterior median eyes; ALE = anterior lateral eyes; PME = posterior median eyes; PLE = posterior lateral eyes; REF = ratio (width/height) to describe the shape of the eye group

Body parts: CL = carapace length; CW = carapace width; SL = sternum length; SW = sternum width

Palp: PF = femur; PP = patella; PTi = tibia; PTa = tarsus.

Leg I: F I = femur; P I = patella; Ti I = tibia; M I = metatarsus; Ta I = tarsus.

Leg II: F II = femur; P II = patella; Ti II = tibia; M II = metatarsus; Ta II = tarsus.

Leg III: F III = femur; P III = patella; Ti III = tibia; M III = metatarsus; Ta III = tarsus.

Leg IV: F IV = femur; P IV = patella; Ti IV = tibia; M IV = metatarsus; Ta IV = tarsus.

All measurements were performed with the lateral borders of the segment in a horizontal plane. The length of each leg segment was measured in the retrolateral view after the leg had been detached from the spider's body.

Measurements (not being ratios) are given in millimeters and are accurate to 0.1 mm. Measurements were taken from drawings of the specimens made with the aid of a Wild M5181300 stereomicroscope (with drawing tube).

Nemesia daedali n. sp.

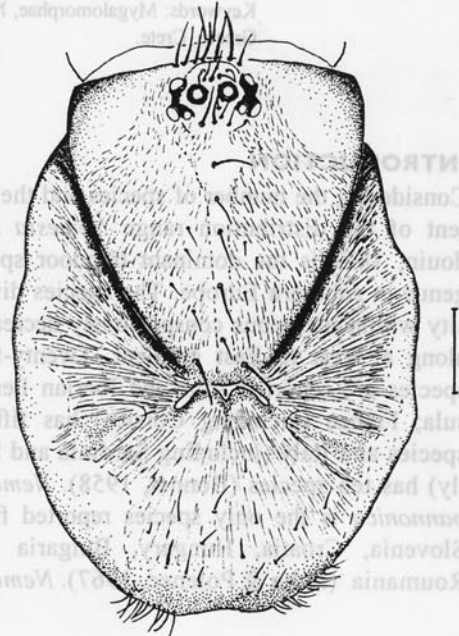
Figures 1-5

Material - Crete: Knossos (35° 21' N; 25° 09' E), 19-IV-1990, leg. A.E. Decae, 1 female, holotype, presently in collection Decae [nr 19/4/90-I], will eventually be placed in an institutional collection. - Kritsa 26-IV-1994, leg. A.E. Decae, 1 female, in collection Decae [nr 26/4/94-III]. Male not known.

DIAGNOSIS

A member of the genus *Nemesia* as redefined by Raven (1985; pp.95-96). Differs from Raven's description in the morphology of the receptacula of the spermathecae (basal lobes absent, see Fig. 4). Differs from all known species in the genus by the reduction of the comb on the inner prolateral claw of leg III (Fig. 3c) and in the strong development of a central longitudinal invagination of the fovea (Fig. 1).

Figure 1 *Nemesia daedali*, female holotype (Coll. Decae nr 19/4/90-I), carapace, dorsal view. Scale bar = 1.0 mm.



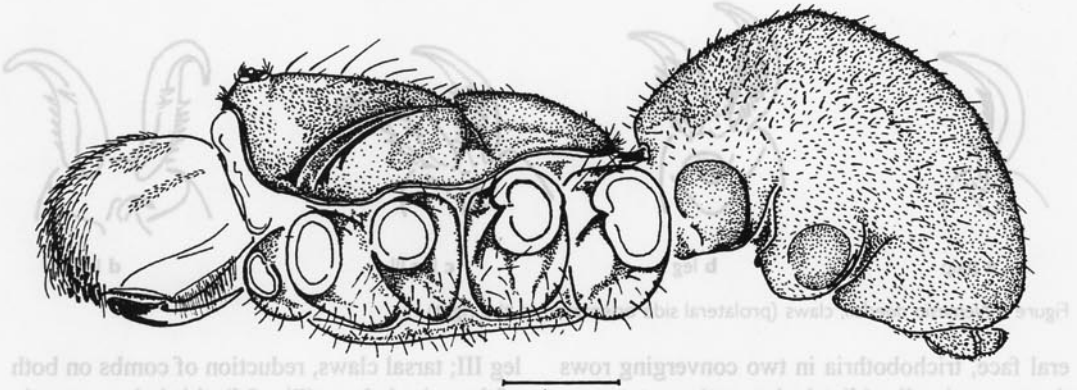


Figure 2 *Nemesia daedali*, female holotype (Coll. Decae 19/4/1990-1), lateral view of the body. Scale bar = 2.0 mm.

DESCRIPTION

Measurements: CL= 8.4; CW= 6.2; SL= 3.9; SW= 3.0; PF= 3.4; PP= 2.0; PTi= 2.2; PTa= 2.2; FI= 5.1; PI= 3.5; Ti I= 2.7; MI= 2.9; Ta I= 1.8; F II= 4.6; P II= 3.0; Ti II= 2.8; M II= 2.7; Ta II= 1.6; F III= 4.2; P III= 2.5; Ti III= 2.6; M III= 3.4; Ta III= 1.8; F IV= 5.6; P IV= 3.7; Ti IV= 5.9; M IV= 5.1; Ta IV= 2.0.

Leg formula: 4123.

Carapace: (Fig. 1): eyeformation wider than high (REF= 2.16); eyes grouped on an ocular tubercle as typical for the genus, the black pigmentation in the eye-space is atypically divided in two lateral patches separated by a lighter colouring between the AME, ALE and PLE of approx. equal diameter; caput not steeply arched (Fig. 2) and densely covered with silver white pubescence; tegument light brown along the crescent grading to dark brown along the edges; thorax slightly convex sloping down from the fovea towards the posterior edge, central parts greyish brown (in living spider greenish), peripheral parts creamy white, brushes of black setae on both posterior corners; fovea deep, recurved with a central, longitudinally orientated depression (Fig. 1).

Sternum: widest between the coxae of the second and third legs; sigila, three pairs, anterior two pairs circular and smaller than more oval shaped posteriors; tegument light brown and evenly covered with black setae with an under-cover of fine pubescence, as are the coxae.

Labium: wider than high, separated from sternum by two deep grooves, one on either side of the longitudinal body axis, greyish brown, sparsely covered with black setae; cusps absent.

Maxillae: with a small field of cusps on the inner corners, slightly darker brown than sternum and similarly covered with black setae, anterior edges creamy white with scopulae of reddish hair.

Chelicerae: basal segment dark brown, with dorso-laterally lighter patches of silver white pubescence and black setae along the crescent diverging distally into the triangular zone of the rastellum; rastellar process absent; rastellar teeth in two short perpendicular rows on the inner distal corner.

Cheliceral furrow: six teeth along the prolateral margin, a scopula of long reddish hairs along the retrolateral margin and a field of small, sharp, black pointed denticles on the furrow bottom.

Palps: femur, prolaterally glabrous with one singular distal spine, group of spines dorso-distally; patella, prolaterally row of three spines; tibia, ventral and prolateral spines, scopula ventro-prolaterally on the distal half of the segment, trichobothria dorsally in two longitudinal rows (one on either side of the longitudinal axis) over the length of the segment; tarsus, ventro-proximally one prolateral and one retrolateral spine (as typical for all *Nemesia* species except those in the subgenus *Haplonemesia* Simon, 1914), ventral field of short spines interspersed within the scopula, trichobothria in a roughly triangular field dorso-distally; tarsal claw with a prolateral comb (Fig. 3a) as typical for the genus.

Leg I: femur, prolaterally glabrous with one dorso-distal spine, a row of five dorsal spines and a dense cover of pubescence; patella, with two prolateral spines; tibia, two prolateral spines and three spines more ventrally on the retrolat-



Figure 3 *Nemesia daedali*, claws (prolateral side orientated to the right)

eral face, trichobothria in two converging rows dorso-proximally (distals longest); metatarsus, scopula ventrally over the length of the segment, interspersed with small spines, trichobothria in one irregular longitudinal row dorsally; tarsus, scopula interspersed distally with small spines, trichobothria in a roughly triangular field, distals longest; tarsal claws (Fig. 3b), as typical for the genus broad with well developed combs pro- and retrolaterally on both paired claws, the third claw smooth.

Leg II: femur, prolaterally glabrous with three parallel rows of dorsal spines (further as leg I); patella, as leg I; tibia, prolaterally a row of three spines (further as leg I); metatarsus, with one conspicuously long spine proximally on the prolateral face (further as leg I); tarsus, scopula ventrally divided by a longitudinal double row of small spines (further as leg I); tarsal claws, as leg I.

Leg III: femur, lacks a glabrous face and dorsal spines (as present in leg I and leg II), retrolaterally four spines, prolaterally two spines; patella, row of three prolateral spines and one central spine retrolaterally, dense field of short dorsal spines; tibia, with rows of slender spines on all faces except dorsally (further as leg I); metatarsus, as tibia (non-scopulate); tarsus, without scopula or spines, trichobothria as leg I; tarsal claws, paired claws with the comb on the inner face of the prolateral claw reduced (Fig. 3c), third claw smooth.

Leg IV: femur, retrolateral glabrous, two spines on the distal half of the segment, dorso-distally a small field of short spines, prolateral face with one distal spine; patella, prolateral spines absent, further as leg III; tibia, metatarsus and tarsus as

leg III; tarsal claws, reduction of combs on both of the paired claws (Fig. 3d), third claw smooth. All prosomal appendages, with the exception of the chelicerae are brown like carapace and sternum.

Abdomen: dorsally dark grey, laterally and ventrally light grey, evenly covered with black setae and denser fine hairs.

Spinnerets: short as typical for the genus.

Spermathecae: contorted (Blasco 1986) (Fig. 4).

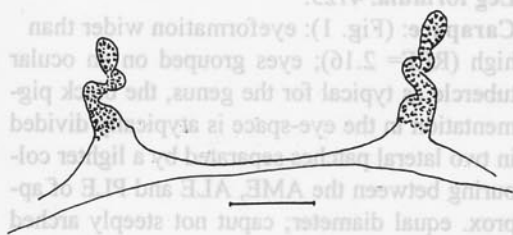


Figure 4 *Nemesia daedali*, holotype, spermathecae, dorsal view. (Coll. Decae nr 19/4/90-1)

Scale bar = 0.25 mm.

Derivato nominis: named after Daedalus, the ingenious mythological Greek architect, craftsman and inventor who built the Labyrinth at Knossos.

NATURAL HISTORY

The burrows of these spiders are found in steep clay banks along road cuts or river sides. The burrow (Fig. 5) is of the single-door branched wafer type (Moggridge 1874). It differs from Moggridge's description of the nest of *N. suffusa* Cambridge, 1874 (= *N. dubia* Cambridge, 1874) only in the very short length of the side shaft (in *N. dubia* this is 6 to 8 cm, in *N. daedali*

2 to 4 cm). The depth of the adult female burrow is about 25 cm, the diameter of the thin flexible waferdoor is approx. 16 mm. The top half of the burrow and the lower surface of the trapdoor is lined with flimsy silk. Indigestible remains of prey are stored at the burrow bottom and indicate that *N. daedali* feeds on a variety of crawling arthropods.



Figure 5 *Nemesia daedali*, schematic representation of the burrow.

***Nemesia caranhaci* n. sp.**

Figures 6-11

Material - Crete: Profitis Ilias (35° 13' N; 25° 10' E),

16-IV-1994, leg. A.E. Decae, 1 female, holotype;

16-IV-1994, leg. A.E. Decae, 2 females paratypes.

All material presently in collection Decae [nr 16/4/94-

IV holotype, nr 16/4/94-II paratype, nr 16/4/94-III

paratype], will eventually be placed in an institutional

collection. Male not known.

DIAGNOSIS

Belongs to the same species group as *N. daedali* (contorted spermathecae), but it differs from *N. daedali* in the much smaller size of the adult females, the presence of a tibial pseudoscapula on legs I & II (Fig. 10), the reduction of the comb on the palpal claw (Fig. 8a) and the structure of the burrow (Fig. 11).

Figure 7 *Nemesia caranhaci*, female paratype (Coll. Decae nr 16/4/90-III), lateral view of the body.

Scale bar = 2.0 mm.

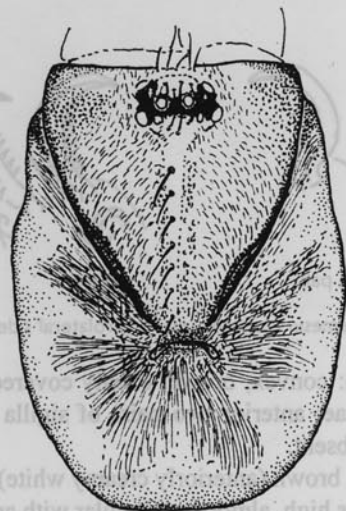


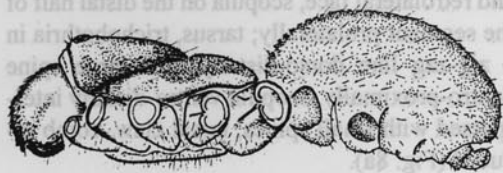
Figure 6 *Nemesia caranhaci*, female paratype (Coll. Decae nr 16/4/94-III), carapace, dorsal view. Scale bar = 1.0 mm.

DESCRIPTION

Measurements: CL= 5.0; CW= 3.7; SL= 2.7; SW= 2.1; PF= 2.5; PP= 1.5; PTi= 1.5; PTa= 1.5; F I= 3.3; P I= 2.3; Ti I= 2.2; M I= 1.9; Ta I= 1.3; F II= 3.0; P II= 2.8; Ti II= 2.0; M II= 1.9; Ta II= 1.2; F III= 2.8; P III= 1.8; Ti III= 1.5; M III= 2.2; Ta III= 1.3; F IV= 3.5; P IV= 2.7; Ti IV= 4.1; M IV= 3.1; Ta IV= 1.5.

Leg formula: 4123.

Carapace (Fig. 6): clothed with white pubescence that is particularly dense around the recurved fovea; eyeformation, wider than high (REF= 1.80), eyes grouped on an ocular tubercle as typical for the genus, the black pigmentation around the eyes is continuous; ocular tubercle, steeply edged on all sides, some black setae anterior and posterior of the eyes; caput, not strongly arched (Fig. 7), brown, with a longitudinal row of black setae along the crest, some setae on the clypeus edge; thorax, sloping downwards from the fovea to the posterior edge, brown with isolated patches of a creamy white along the periphery.



Scale bar = 2.0 mm.



Figure 8 *Nemesia caranhaci*, claws (prolateral side orientated to the right)

Sternum: convex, brown, evenly covered with black setae; anterior two pairs of sigilla indistinct or absent.

Labium: brown (anteriorly creamy white) twice as wide as high, almost rectangular with anterior corners rounded, separated from sternum by a deep groove, sparsely covered with black setae.

Maxillae: short row of cuspules on the inner corner, slightly darker brown than sternum and similarly covered with black setae, anterior edge creamy white and scopulate.

Chelicerae: basal segment, dark brown with dorsally one narrow longitudinal zone of white pubescence interspersed with black setae merging distally into the rastellar triangle; strongest rastellar teeth, in two short perpendicular rows on the apical and prolateral corner; prolateral face of basal segment smooth, with fine setae along the ventral edge.

Cheliceral furrow: typical for the genus with six teeth along the prolateral margin, a scopula of long reddish hairs along the retrolateral margin and a field of small, sharp black pointed denticles on the proximal furrow bottom.

Fang: smooth, keeled without serrations.

Palp: femur, dorsally and retrolaterally with fine pubescence, dorso-distally a group of spines; patella, dorsally few spiny setae; tibia, trichobothria in two distally converging rows, one on either side of the longitudinal axis, on the proximal half of the segment, spines on both the pro- and retrolateral face, scopula on the distal half of the segment prolaterally; tarsus, trichobothria in a zig-zag line dorso-distally, one large spine ventro-proximally, scopula ventro-distally interspersed with small spines; tarsal claw, comb reduced (Fig. 8a).

Leg I: femur, two pairs of dorsal spines and one singular spine distally on the prolateral face; patella, prolaterally two spines in a row; tibia, ventrally two long spines on the proximal half and one distal spine, prolaterally two spines, pseudoscapula on the ventro-prolateral face, trichobothria in two distally converging rows; metatarsus, few spines prolaterally, three long spines ventrally, dense scopula, trichobothria longest on the distal half of the segment; tarsus, spineless and fully scopulate, distal trichobothria longest; paired claws, with well developed combs on either side (Fig. 8b); third claw smooth.

Leg II: femur, dorsally some spiny setae and one singular spine distally on the prolateral face; patella, prolaterally one spine; tibia, ventrally two long spines and one distal spine, prolaterally two spines in the distal half of the segment, pseudoscapula on the ventro-prolateral face, trichobothria as leg I; metatarsus, prolaterally, three long spines in a row along the ventral edge, retrolaterally two spines along the ventral edge, one proximally and one distally, dense scopula, trichobothria as leg I; tarsus, small spines interspersed distally in the scopula, distal trichobothria longest; paired claws as leg I; third claw smooth.

Leg III: femur, retrolaterally a row of three spines along the dorsal edge, one singular dorso-proximal spine, prolaterally two spines, a rake of short spines dorso-distally; patella, prolaterally two spines, retrolaterally one spine, dense cover of short spines dorsally and prolaterally; tibia rows of two spines prolaterally and retrolaterally, ventrally three spines, trichobothria in two distally slightly converging rows on the proximal half of the segment; metatarsus,

numerous spines on all faces, trichobothria in one dorsal row; tarsus, spineless, trichobothria in two parallel rows; paired claws, combs on the inner surfaces of the prolateral claws reduced to one tooth (Fig. 8c); third claw smooth.

Leg IV: femur, dorsally row of five spines, one single spine distally on the retrolateral face, rake of short spines dorso-distally edge; patella, prolaterally dense cover of short spines; tibia, retrolaterally row of two spines, ventrally four spines, trichobothria as leg III; metatarsus and tarsus as leg III; paired claws, prolateral claw comb reduced on the outer side, absent on the inner side, both combs on retrolateral claw well developed (Fig. 8d); third claw smooth.

All prosomal appendages, with the exception of the chelicerae are in shades of brown as the carapace.

Abdomen: greyish with lighter and darker zones, but no clear pattern.

Spinnerets: as typical for the genus.

Spermathecae: contorted (Blasco 1986) (Fig. 9).

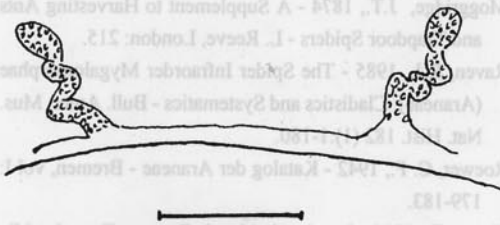
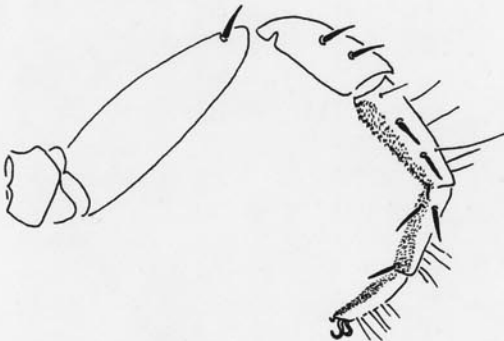


Figure 9 *Nemesia caranhaci*, holotype (Coll. Decae nr 16/4/94-IV), spermathecae, dorsal view. Scale bar = 0.25 mm.

Figure 10 *Nemesia caranhaci*, prolateral leg I (schematic) indicating the position of the tibial pseudo-scopula.



Derivatio nominis: Named after my friend Gilbert Caranhac, who found a closely related species for the first time in the Arachneon Mountains (Argolis, Peloponnesos) and with whom I share the best memories of many collection trips.

NATURAL HISTORY

Females of this species dig their burrows in stable patches of soil among the garigue. The burrow (Fig. 11) consists of an unbranched tube, approx. 20 cm deep, faintly lined with silk in only the uppermost part of the burrow. The trapdoor is of the cork-type (Moggridge 1873), approx. 9 mm in diameter and 3 mm thick. On the outside the door is slightly concave, on the inside convex and covered by a thin sheet of silk. The sides of the door are beveled so that, when closed, the door fits snugly in the burrow entrance. The outline of the trapdoor is almost perfectly circular except for the straight, approx. 6 mm long hinge. Remains of prey were found spun in packages into the burrow wall. Analysis indicates that ants constitute the main part of the diet.



Figure 11 *Nemesia caranhaci*, schematic representation of the burrow. [all drawings: A.E. Decae]

DISCUSSION

Nemesia taxonomy is presently obscured by various difficulties. Of the fifty species listed in Roewer (1942) and Brignoli (1983) thirteen species are known only by the males and seventeen species only by females. Basic to this phenomenon is that males and females are generally collected on different occasions and in different

situations. This is due to the fact that males are wandering spiders that, in the adult stage, can only be found during the mating season (one or two months a year), while females are sedentary creatures never voluntarily leaving their camouflaged burrows. Males are generally collected in pitfall trap samples. Females may be found accidentally after unintentional destruction of the burrow, or after a thorough and intentional search. Because different species of *Nemesia* occur sympatrically, it is often difficult to relate conspecific males and females. Another problem is to obtain sufficiently large samples of *Nemesia* for study, again because males are not always present and females are difficult to find and hard to collect. The large, fragmented distribution range of the genus and the fact that most trapdoor spiders, including probably all species of *Nemesia*, have poor qualities of dispersal (resulting in a very patchy distribution of most species) also contribute to the presently unclear taxonomy of *Nemesia*.

The description of two new species here, more than 230 years after Abbé Sauvages (1763) described the first species of *Nemesia* (*N. caementaria*) from Montpellier, indicates that there is still much to be discovered about these obscure but fascinating spiders.

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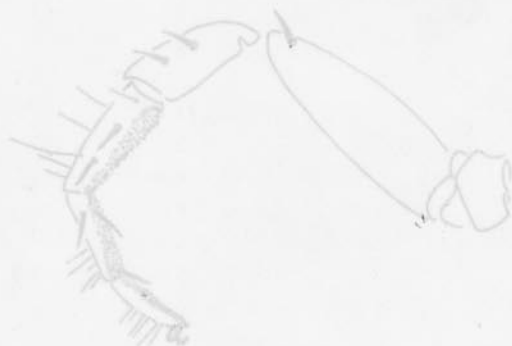


Figure 10 *Nemesia conchoc*, palpus (schematic) indicating the position of the tibia and fingers.

DISCUSSION

Nemesia taxonomy is presently obscured by various difficulties. Of the fifty species listed in Roewer (1942) and Brignoli (1983) thirteen species are known only by the males and seven species only by females. Basic to this phenomenon is that males and females are generally collected on different occasions and in different