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The *Nemesia* trapdoor spider fauna of the Maltese archipelago, with the description of two new species (Araneae, Mygalomorphae, Nemesiidae)

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Abstract. Contrary to what its name suggests, *Nemesia arboricola* is not strictly arboreal in habit. Here we compare female specimens of *N. arboricola* collected from arboreal and terrestrial nests. We furthermore describe the male of *N. arboricola* for the first time as well as two recently discovered species of *Nemesia* (*N. maltensis* sp. nov. and *N. cominensis* sp. nov.). *Nemesia maltensis* is described from both sexes, *N. cominensis* is described from the female and a juvenile male specimen. For *N. cominensis* we discuss the sexual dimorphism of juvenile male and female spiders. Field observations and laboratory observations show remarkable features of the Maltese *Nemesia* fauna that are unknown from *Nemesia* species found elsewhere. Particularly, the arboreal dwellings of *N. arboricola* and the absence of a trapdoor to close off the burrow entrance in *N. maltensis* appear to be exceptional. The composition of the Maltese *Nemesia* fauna, as located in the central Mediterranean, is finally discussed in relation to the different *Nemesia* species-complexes occurring in the eastern and western Mediterranean basin.

Keywords. Taxonomy, spider-nests, species-groups, Mediterranean.

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Introduction

Nemesia Audouin, 1826, is a Mediterranean genus of largely sedentary, terrestrial burrowing mygalomorph spiders that spend their lives in self-constructed, well camouflaged underground burrows (tunnels/nests) that are closed at the soil surface by a hinged ‘trapdoor’. One longstanding and

notable exception to terrestrial burrowing is *Nemesia arboricola* Pocock, 1903 from Malta. The original description of *N. arboricola* is based on a single female specimen (holotype in the Natural History Museum, London, see Kritscher 1994) that was reportedly found to construct its nest on the trunk of a tree (Pocock 1903). Over time the supposedly special arboreal habit of *N. arboricola* caused some confusion because Pocock had mistakenly imagined the nest of *N. arboricola* to be similar to arboreal nests that he knew from unrelated trapdoor spider species in the families Halonoproctidae Pocock, 1901, Migidae Simon, 1889 and Barychelidae Simon, 1889 (see Pocock 1897: 726). In fact, these species construct very different tree-nests from that of *N. arboricola*. The main difference is that the species that Pocock envisioned do not excavate burrows, as all other trapdoor spider species including *N. arboricola* do, but construct short cocoon-shaped, or cigar-shaped nests of silk and debris that they attach to the surfaces of tree trunks or other hard surfaces (Griswold 1987; Schwendinger 2003; Decae *et al.* 2021). Such spider nests have never been found in Malta. Terrestrial burrowing *Nemesia* species however were long found to be common in the Maltese Archipelago, but because of their non-arboreal habits, the inhabitant spiders were not regarded to be *N. arboricola*. Instead, they were mostly taken to be *N. macrocephala* Ausserer, 1871 or *N. caementaria* (Latreille, 1799) (Baldacchino *et al.* 1993). Fieldwork carried out in the last decennium of the 20th century (Kritscher 1994) and the early 21st century (Dandria 2001) however revealed that *N. arboricola* is not strictly arboreal and that the species excavates its burrows in various natural settings (Figs 45–53) like crevices between rocks and roots and, indeed, in soil or debris filled pre-existing holes in trunks of trees such as *Phoenix dactylifera* L., *P. canariensis* H. Wildpret, *Olea europaea* L. and *Ceratonia siliqua* L. These excavated ‘tree-nests’ of *N. arboricola* are qualitatively different from the nests of the Migidae, Halonoproctidae and Barychelidae mentioned above and from the nest that Pocock (1903) described in detail in his original paper on *N. arboricola*.

Here *N. arboricola* females collected from both arboreal and terrestrial nests are compared and their conspecific status is discussed. The male of *N. arboricola* is described for the first time. However, Baldacchino *et al.* (1993: fig. 1a), showing the distal palp and palpal organ of a male spider labelled “*Nemesia* (?) *macrocephala*” almost certainly is the first graphic representation of the *N. arboricola* male in literature.

We finally describe two newly discovered species of *Nemesia*. The first of these species is described from both sexes, while for the second species the adult male remains unknown, and the female and a juvenile male are here described.

Material and methods

Nest burrows of *N. arboricola* were located by visually searching the soil surface, tree trunks and rubble walls for the circular outline of their trapdoors. Females and juveniles of the two newly described species below were located by digging in soil with a small hoe; specimens of these species were taken alive and reared in plastic flower-pots filled with moistened soil in order to make observations of their burrows. For all three species, observations were made on the habitat, dimensions and internal structure of their nest burrows. Males were collected by hand when encountered in the field and by placing pitfall traps in locations inhabited by females. Retained specimens were stored in 70% ethanol. The study presented here is based on a sample of 21 *Nemesia* specimens collected between 1975 and 2021. For descriptive work, preserved individual specimens were placed in separate vials and given an individual identification number. TD-numbers for 3 ♀♀ and 1 ♂ collected in the 1970s and TC-numbers for 8 ♀♀, 8 ♂♂ and 1 juv. ♂ were provided accordingly (see sections Material examined below for individual numbers).

Microscopic observations were done with the aid of a Huvitz HSZ-645TR stereo microscope equipped with a Lysis HC-20CU camera operating on Panasis software and a Euromex iScoop compact microscope equipped with a Euromex VC-3031 camera. Both systems allow multiple focus photography and precision measurement. Habitus photographs of preserved specimens were made with an Olympus

E-M5II camera equipped with an M. Zuiko Digital ED 60 mm F2.8 macro lens and a ring-flash. Figures were composed using Photoshop Elements 2021, lettering was done with Apple Preview. Observation techniques on preserved specimens are described in Decae *et al.* (2021).

Terminology follows Decae *et al.* (2021), except for terms that are of particular descriptive value for the genus *Nemesia*. *Nemesia* males carry distinctive ‘armature’ on the pedipalps and first legs that supposedly have a function in copulation and qualify as secondary sexual characters. These characters vary between species or species groups and therefore are valuable for intra-generic diagnostics. The following terminology and abbreviations are used to describe these characters here:

- *tibial spur* (TS), a large, curved hook/spur, distally and prolateral on tibia I (Figs 29, 57)
- *tibial apophyse* (TA), apical outgrowth of ventro-prolateral tibia I that carries the tibial spur (Figs 29, 57)
- *clasper field* (CF), ventral side of curved proximal metatarsus I, furnished with short, stiff or spiky hairs (Figs 29, 57)
- *palpal tibial rake* (PTR), dorsal apical group of strong distally pointing spines on the palp tibia (Figs 21–22, 56).

Further morphological abbreviations used are:

- ALE = anterior lateral eye
- AME = anterior median eye
- AR = width anterior eye-row
- ATC = auxiliary tarsal claw
- av. = average
- BuL = bulb length (total length of palpal organ)
- BuW = bulb width (proximal globular part)
- cf. = compare with
- CL = carapace length
- CP = length cephalic part
- CW = maximum carapace width
- dia. = diameter
- dis. = distance
- EL = length of eye-group
- EmL = embolus length
- LL = labium length
- LW = labium width
- no. = number (referring to the collection identification code of a specimen)
- PFem = palp femur
- PLE = posterior lateral eye
- PLS = posterior lateral spinnerets
- PME = posterior median eye
- PMS = posterior median spinnerets
- PR = width posterior eye-row
- PTC = paired tarsal claw
- PTib = palp tibia
- sd. = standard deviation
- SL = sternum length
- SW = sternum width
- TBL = total body length (including chelicerae)

TibW = width of tibia
vs = versus

Methods and techniques of measurement follow Decae (2019: figs 1–6).

Institutional abbreviations

BMNH = British Museum of Natural History (now Natural History Museum, NHMUK), London, UK
NHMR = Natural History Museum Rotterdam, the Netherlands
NHMW = Naturhistorisches Museum Wien, Vienna, Austria

All measurements are given in millimetres.

Results

Class Arachnida Lamarck, 1801
Order Araneae Clerck, 1757
Suborder Mygalomorphae Pocock, 1892
Family Nemesiidae Simon, 1889
Genus *Nemesia* Audouin, 1826

Nemesia arboricola Pocock, 1903
Figs 1–4, 9–14, 23, 25, 27–53

Nemesia arboricola Pocock, 1903: 225–226 (♀).

Nemesia arboricola – Baldacchino *et al.* 1993: 40. — Kritscher 1994: 49–57, figs 1–18 (♀); 1996: 121 (♀). — Dandria 2001: 103–107, fig. 1 pl. 1 (tree nest). — Le Peru 2011: 77. — Decae 2012: 25, fig. 2 (species groups).

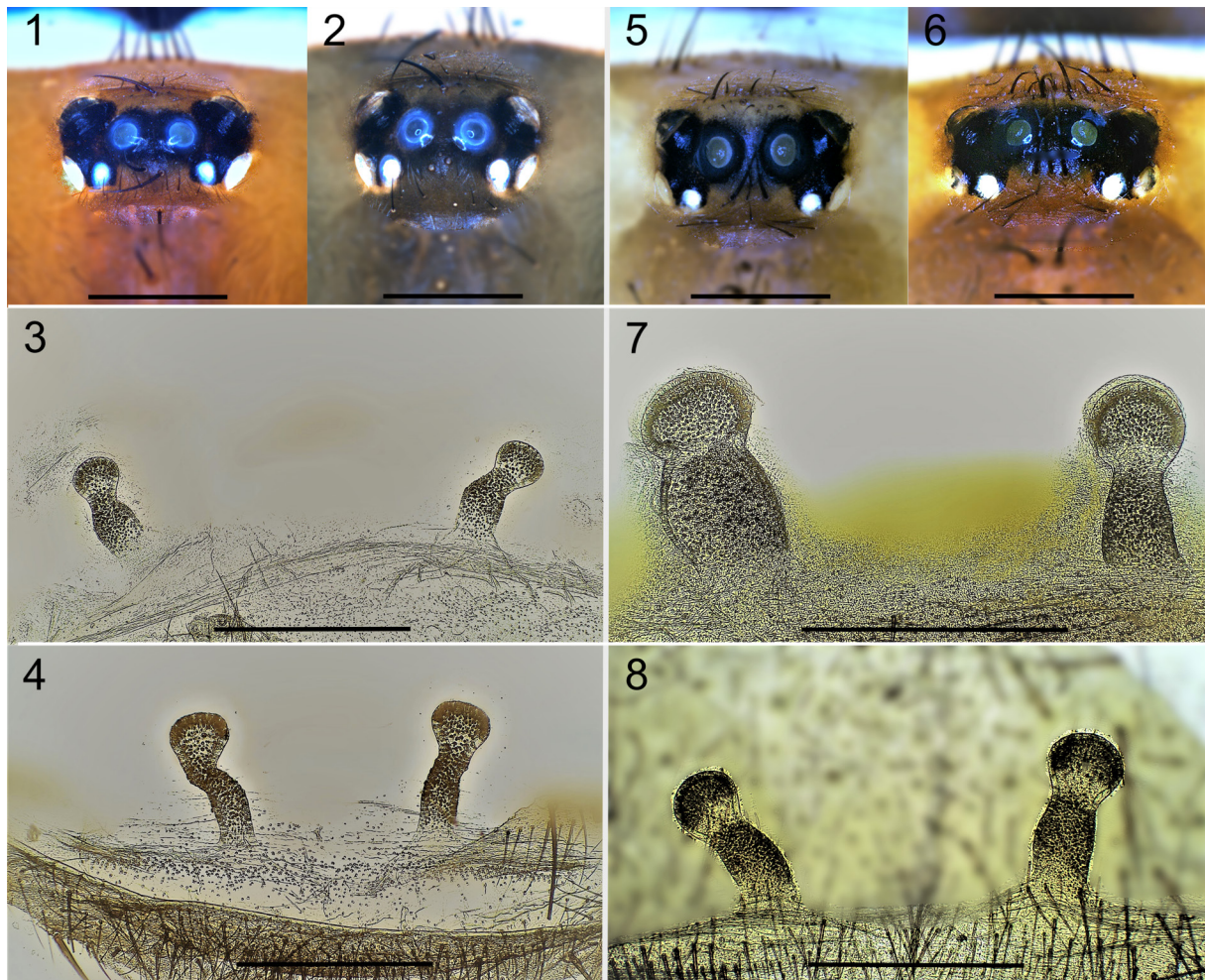
New diagnosis

Female

Nemesia arboricola from Malta is difficult to distinguish from *N. macrocephala* from nearby Sicily (Kritscher 1994). Females of the two species are among the largest *Nemesia* species known (fully grown females in both species range from 26 to 28 mm in total body length; the average in *Nemesia* is around 17.5 mm), and show only slight differences in their sexual and somatic morphology. Kritscher (1994) used the following three diagnostic characters to distinguish females of *N. arboricola* from those of *N. macrocephala*: (1) a different distance between the ALE and PLE, (2) a different shape of the spermathecal receptacles, (3) the presence or absence of labial cuspules. Pocock (1903) also reports the configuration of the eyes and the presence of labial cuspules as distinctive for *N. arboricola*. We found that, in general, the configuration of eyes and in particular the distance between the ALE and PLE (Figs 1–2 and 5–6) are unsuitable to distinguish *N. arboricola* from *N. macrocephala* on grounds of overlapping and highly variable measurements (dis. ALE–PLE av. 0.46, sd. 0.13 and av. 0.52, sd. 0.18, respectively). Although the shape of the receptacles appears to differ between the two species (Figs 3–4 and 7–8) it is difficult to quantify these differences. We therefore regard this character as only marginally reliable as diagnostic. We confirm Kritscher’s third diagnostic character (also noted in Pocock 1903) as truly diagnostic and agree that the presence of labial cuspules in females is distinctive for *N. arboricola* (Figs 9–10 cf. Figs 15–16). Furthermore, we found the dark coloured and speckled opisthosoma in *N. arboricola* (Figs 11–12) versus the lighter coloured opisthosoma with chevron stripes in *N. macrocephala* (Figs 17–18), and the thicker, slightly swollen, PMS (Figs 13–14 cf. Figs 19–20) in *N. arboricola* as diagnostic characters to distinguish females of the two species.

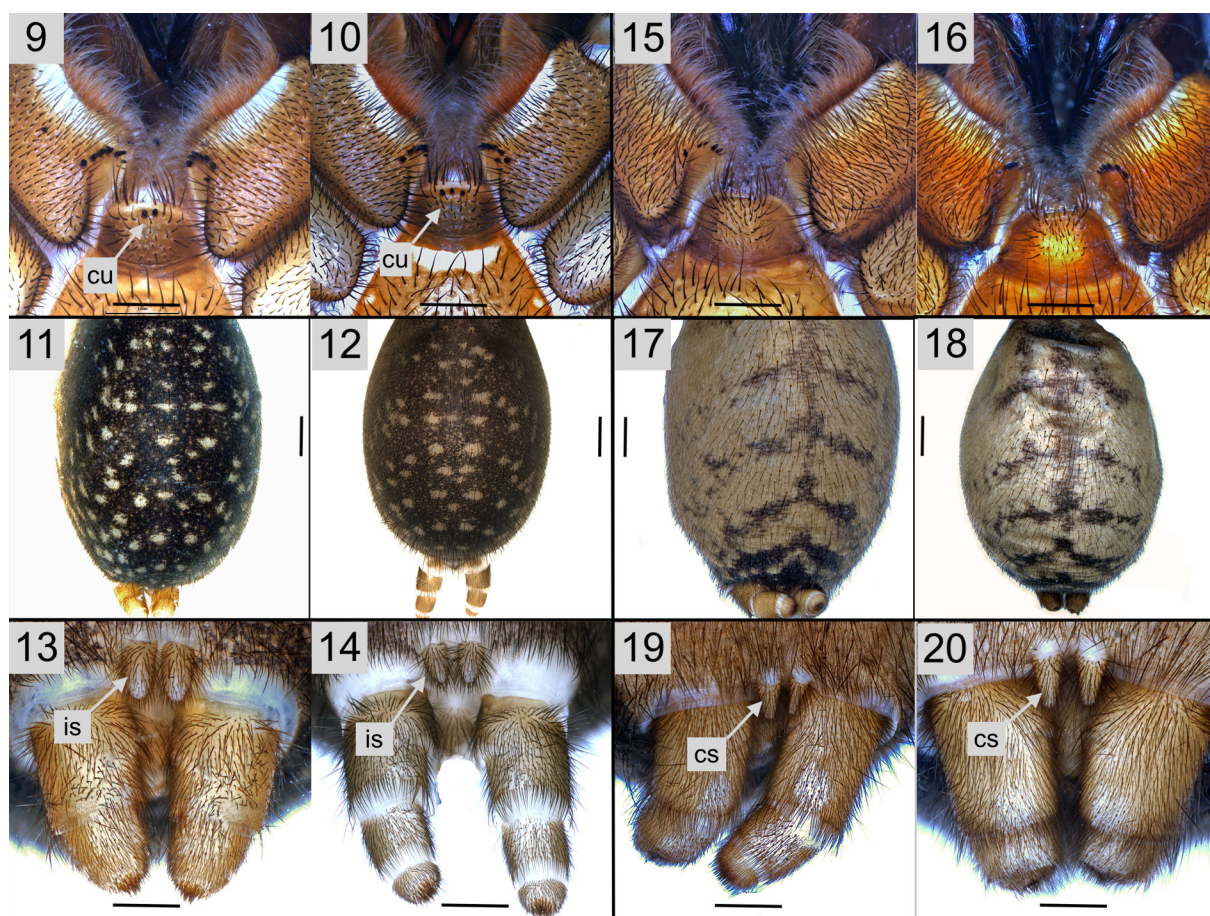
Male

Because the male of *N. macrocephala* remains unknown, no characters that might distinguish this species from *N. arboricola* can presently be given. The male of *N. arboricola* however differs from nearly all *Nemesia* species, for which the relevant information is available, by the absence of the PTR (see section ‘terminology’ above). The only other species known in which the PTR is missing is *N. simoni* O. Pickard-Cambridge, 1874 from southwestern France and northern Spain. To illustrate the presence and/or absence of PTR in different species of *Nemesia* species, Figs 21–24 show the dorso-distal male palps of four different



Figs 1–8. Characters reported to distinguish *N. arboricola* Pocock, 1903 from *N. macrocephala* Ausserer, 1871 in Kritscher (1994). **1–4.** *N. arboricola*; represented by two specimens (TC.016, NHMR, Figs 1 & 3, specimen collected from an arboreal-nest; TC.017, NHMR, Figs 2 & 4, specimen collected from a terrestrial nest). **5–8.** *N. macrocephala*; represented by two specimens (Isaia.046, Figs 5 & 7 and Isaia.047, Figs 6 & 8), both collected from terrestrial nests near the type locality, Palermo, Sicily. **1–2, 5–6.** Comparative eye-formations. Note the overlap and variation in distances between ALE and PLE (ALE–PLE *N. arboricola* ranges between 0.10–0.20, $n = 7$; *N. macrocephala* ranges between 0.14–0.22, $n = 2$). Furthermore, note the variation in general configuration of the eyes that renders species recognition on these characters uncertain. **3–4, 7–8.** Comparative shapes of spermathecae in ventral view. Note both similarities and differences in shape and differences in distance between receptacles of both species that renders unambiguous species recognition difficult, although spermathecal receptacles in *N. arboricola* shown here are somewhat smaller and finer built. Scale bars = 1 mm.

Nemesia species collected from geographically widely separated locations in the *Nemesia* distribution range (*N. bacelarae* Decae, Cardoso & Selden, 2007 from Portugal (Fig. 21), *N. cellicola* Audouin, 1826 from the Middle East (Fig. 22), *N. simoni* from southern France (Fig. 23) and *N. arboricola* (Fig. 24) from Malta). Note that species from opposite far ends of the distribution range and a new species from centrally located Malta (Fig. 56) feature a pronounced PTR only absent in *N. arboricola* and *N. simoni* (Figs 23–26). *Nemesia arboricola* males can be distinguished from those of *N. simoni* by their generally larger size (TBL » 13, n = 2 vs TBL » 11, n = 7) and on several aspects of its sexual and somatic morphology, its burrow structure and its distribution (compare the male description below with information given on *N. simoni* in Moggridge 1873). Figs 25–26 show distinctive differences in male palps (shape of tibia) and palpal organs of *N. arboricola* and *N. simoni*.



Figs 9–20. Characters distinguishing *Nemesia arboricola* Pocock, 1903 from *N. macrocephala* Ausserer, 1871. **9–14.** *N. arboricola*; represented by two specimens (TC.016, NHMR, Figs 9, 11, 13, specimen collected from an arboreal-nest; TC.017, NHMR, Figs 10, 12, 14, specimen collected from a terrestrial nest). **15–20.** *N. macrocephala*; represented by two specimens (Isaia.046; Figs 15, 17, 19 and Isaia.047; Figs 16, 18, 20), both collected from terrestrial nests near the type locality, Palermo, Sicily. **9–10, 15–16.** Presence or absence of labial cuspules. Note presence of labial cuspules (cu) in *N. arboricola* (Figs 9–10) versus absence of labial cuspules in *N. macrocephala* (Figs 15–16). **11–12, 17–18.** Colour pattern opisthosoma. Note dark coloured and speckled opisthosoma in *N. arboricola* (Figs 11–12) versus light coloured ophisthosoma with chevron lines (Figs 17–18) in *N. macrocephala*. **13–14, 19–20.** Differences in structure of PMS. Note thickened and slightly swollen PMS (is) in *N. arboricola* (Figs 13–14) versus slender, conical PMS (cs) in *N. macrocephala* (Figs 19–20). Scale bars = 1 mm.

Holotype

In collection BMNH, London, not examined. See Kritscher (1994) for a detailed description and photographs of the specimen (in very poor and fragile condition), and for conformation that *N. arboricola* is the common and widely distributed cork-door building *Nemesia* species found in the Maltese Archipelago.



Figs 21–26. Male diagnostic features for species of *Nemesia* Pocock, 1903. **21–22.** Dorsal palp tibia, PTR is present in all species of *Nemesia* for which information is available, here illustrated by two species from the eastern and western ends of the Mediterranean distribution range of the genus; *N. cellicola* Audouin, 1826 (21) from the Middle East and *N. bacelarae* Decae, Cardoso & Selden, 2007 (22) from Portugal. **23–24.** Dorsal palp tibia of the only *Nemesia* species known in which the PTR is absent; *N. arboricola* Pocock, 1903 (23) from Malta and *N. simoni* O. Pickard-Cambridge, 1874 (24) from the western Pyrenees. **25–26.** Difference in distal palp morphology (retrolateral view) showing differences in tibia and palpal organ that distinguish *N. arboricola* (25) from *N. simoni* (26).

Material examined

MALTA • 1 ♂; Comino; 36.02° N, 14.33° E; 23 Mar. 1975; P.J. Schembri leg.; (no. TD.4); NHMR • 1 ♀; Wied Incita; 35.88° N, 14.43° E; 25 Oct. 1980; P.J. Schembri leg.; (no. TD.1); NHMR • 1 ♀; Siggiewi, Buskett; 35.86° N, 14.39° E; 7 Sep. 1976; P.J. Schembri leg.; (no. TD.2); NHMR • 1 ♀; St. Paul's Island; 35.96° N, 14.40° E; 20 Apr. 1975; P.J. Schembri leg.; (no. TD.3); NHMR • 1 ♂; Gudja; 35.85° N, 14.50° E; 7 Nov. 2020; T. Cassar leg.; (no. TC-011); NHMW • 1 ♀; Zebbug; 35.87° N, 14.44° E, 27 Aug. 2020; T. Cassar leg.; (no. TC.014 terrestrial); NHMW • 1 ♀; Buskett; 35.86° N, 14.39° E; 5 Sep. 2020; T. Cassar leg.; (no. TC.015, arboreal); NHMR • 1 ♀; Valetta, Imsida; 35.89° N, 14.48° E; 20 Dec. 2017; (no. TC.016 arboreal); NHMR • 1 ♀; Comino; 36.02° N, 14.33° E; 11 Sep. 2020; T. Cassar leg.; (no. TC.017 terrestrial); NHMR.

Description

Male reference specimen (no. TD.4, NHMR)

PRESERVATION AND CONDITION. Specimen 45 years preserved in 70% ethanol, generally in good condition (Fig. 27), right bulb removed for detail study (Figs 31–35).

GENERAL COLORATION. Carapace uniform dark brown, chelicerae slightly darker than carapace, abdomen dorsal dark grey with light grey speckles in two parallel rows in the cardiac region (Fig. 27), abdomen ventral light yellowish brown, palps uniform dark brown, legs dark brown proximally grading to light brown distally, sternum uniform yellowish brown, labium dark brown.

CARAPACE. Longer than wide (CW/CL 0.8), with light grey pubescence cover (partly lost), bristles concentrated along the margins and posterior on the thoracic part, cephalic part slightly elevated, thoracic part bulging slightly up from the fovea before sloping down to the posterior margin (Fig. 28).

EYES. Ocular-tubercle (Fig. 28) dome-shaped, clypeus narrow sloping down from eyes, eye-group rectangular, twice as wide as long (EL/PR 0.51), AME about their diameter apart (dis.AME/dia.AME 0.94), dis.ALE–PLE < dia.ALE (ALE–PLE/ALE 0.60).

CHELICERAE. Rastellum with few very strong apical teeth, teeth of diminishing strength and size along distal prolateral margin of chelicerae, single, prolateral row of furrow teeth, fang proximally bent, ventral serrated ridge.

VENTRAL PROSOMA. Maxillae rounded distal lobe, cuspules absent; labium: wider than long (LW/LL 1.6) distally truncated, cuspules absent, labial furrow wide, with two distinct semi-circular sigilla; sternum: longer than wide (SW/SL 0.8) three pairs oval sigilla, even cover of bristles.

PALPS. Cymbium with distal group of spines, tibia proximally lightly inflated (TibW/PTib 0.4), PTR absent (Figs 23, 25), patella spineless, femur with few dorso-distal spines, longer than tibia (PFem/PTib 1.3); palpal organ: proximal bulbous part simple pyriform, embolus strong, stiff, curved in ventral and dorsal views (Figs 31, 33), straight and distally narrowing in prolateral and retrolateral views (Figs 32, 34), embolus tip blunt, and slightly flattened or slightly scooped (Fig. 35).

LEGS. All tarsi light coloured with fine ventral scopulae, all femora cylindrical with few spiny bristles dorsally, metatarsus I curved, CF with fine, short bristles (Fig. 29), ventro-apical spines and one central prolateral spine, tibia I distally widened, TA distinct, TS distally slightly sigmoid (Fig. 29), central row of three prolateral spines, patella I with a single prolateral spine, metatarsus and tibia II cylindrical with few spines, patella II with two prolateral spines, metatarsus and tibia III as II, patella III with single prolateral spine (Fig. 30), metatarsus IV > femur IV > tibia IV (Fem4/Met4 = 0.97, Tib4/Met4 = 0.83), patella IV 0–1 retrolateral patellar spine, PTC all tarsi double combs of teeth, leg formula: 4123.

OPISTHOSOMA. Ovoid, anterior narrowing, covered with bristles, PMS small, close together and less swollen than in females, PLS short, thick, proximal segment longer than medial + distal segment, spigots restricted to apical spigot field.

MEASUREMENTS. TBL = 13.0; CL = 6.9; CW = 5.7; CP = 3.8; AR = 1.07; PR = 1.07; EL = 0.55; dia.ALE = 0.25; dia.PLE = 0.21; dia.AME = 0.18; dia.PME = 0.17; dis.AME–AME = 0.17; dis.ALE–PLE = 0.15; SL = 3.6; SW = 2.9; LL = 0.6; LW = 1.0; Palp = 9.5 (1.3 + 2.8 + 1.8 + 3.6); Leg I = 20.3 (2.9 + 4.3 + 4.1 + 3.1 + 5.9); Leg II = 19.6 (2.6 + 4.6 + 4.2 + 2.9 + 5.3); Leg III = 19.5 (2.7 + 5.0 + 3.9 + 2.6 + 5.3); Leg IV = 25.0 (3.2 + 6.6 + 5.5 + 3.2 + 6.5); BuL = 2.11; BuW = 0.79; EmL = 1.06.

VARIATION MALES (n = 2). TBL = 12.8, 13.0; CL = 5.8, 6.9; CW = 5.0, 5.7; CP = 3.5, 3.8; AR = 1.07, 1.11; PR = 1.07, 1.08; EL = 0.55, 0.56; dia.ALE = 0.25, 0.27; dia.PLE = 0.21, 0.22; dia.AME = 0.18; dia.PME = 0.15, 0.17; dis.AME–AME = 0.17, 0.20; dis.ALE–PLE = 0.10, 0.15; SL = 3.1, 3.6; SW = 2.5, 2.9; LL = 0.5, 0.6; LW = 0.9, 1.0; Palp = 8.6, 9.4; Leg I = 18.0, 20.3; Leg II = 17.3, 19.7; Leg III = 16.9, 19.4; Leg IV = 22.5, 24.9; BuL = 1.88, 2.11; BuW = 0.71, 0.79; EmL = 0.78, 1.06.

Notes on female

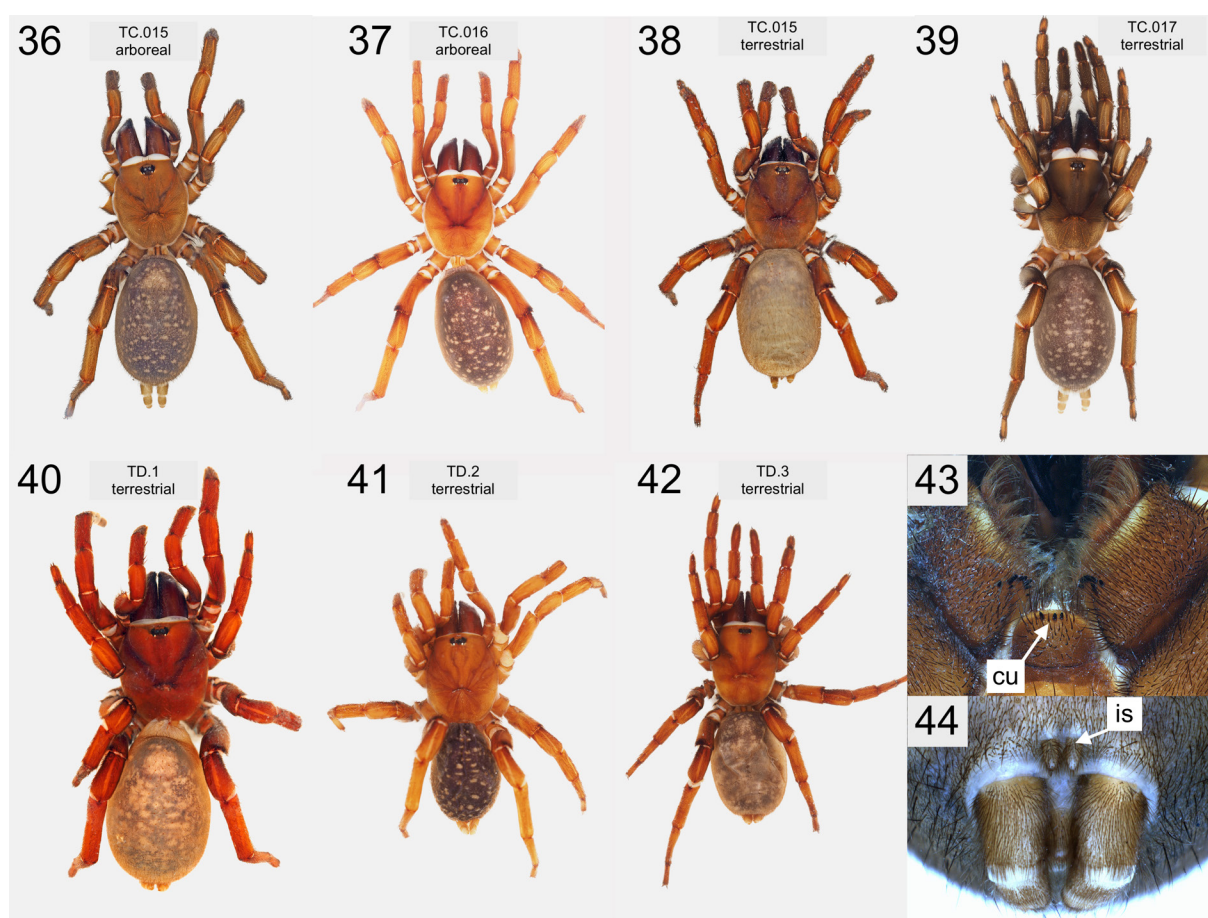
Females of *N. arboricola* have been described in proper detail by Pocock (1903) and Kritscher (1994). Here we compare specimens collected from tree-nests with specimens collected from terrestrial burrows.



Figs 27–35. *Nemesia arboricola* Pocock, 1903, ♂ reference specimen (TD.4, NHMR). **27.** Dorsal habitus. **28.** Prosoma lateral, note slight elevation of the cephalic part, ocular process and gradual posterior slope of thoracic part. **29.** Metatarsus and tibia leg I, note tibial apophysis (TA), tibia spur (TS), clasper field (CF). **30.** Prolateral patella III with single spine (SS). **31–34.** Right palpal organ in four different positions rotated clock-wise by 90°. **31.** Ventral view, **32.** Prolateral view. **33.** Dorsal view. **34.** Retrolateral view. **35.** Embolus tip at high magnification, note slightly scooped tip.

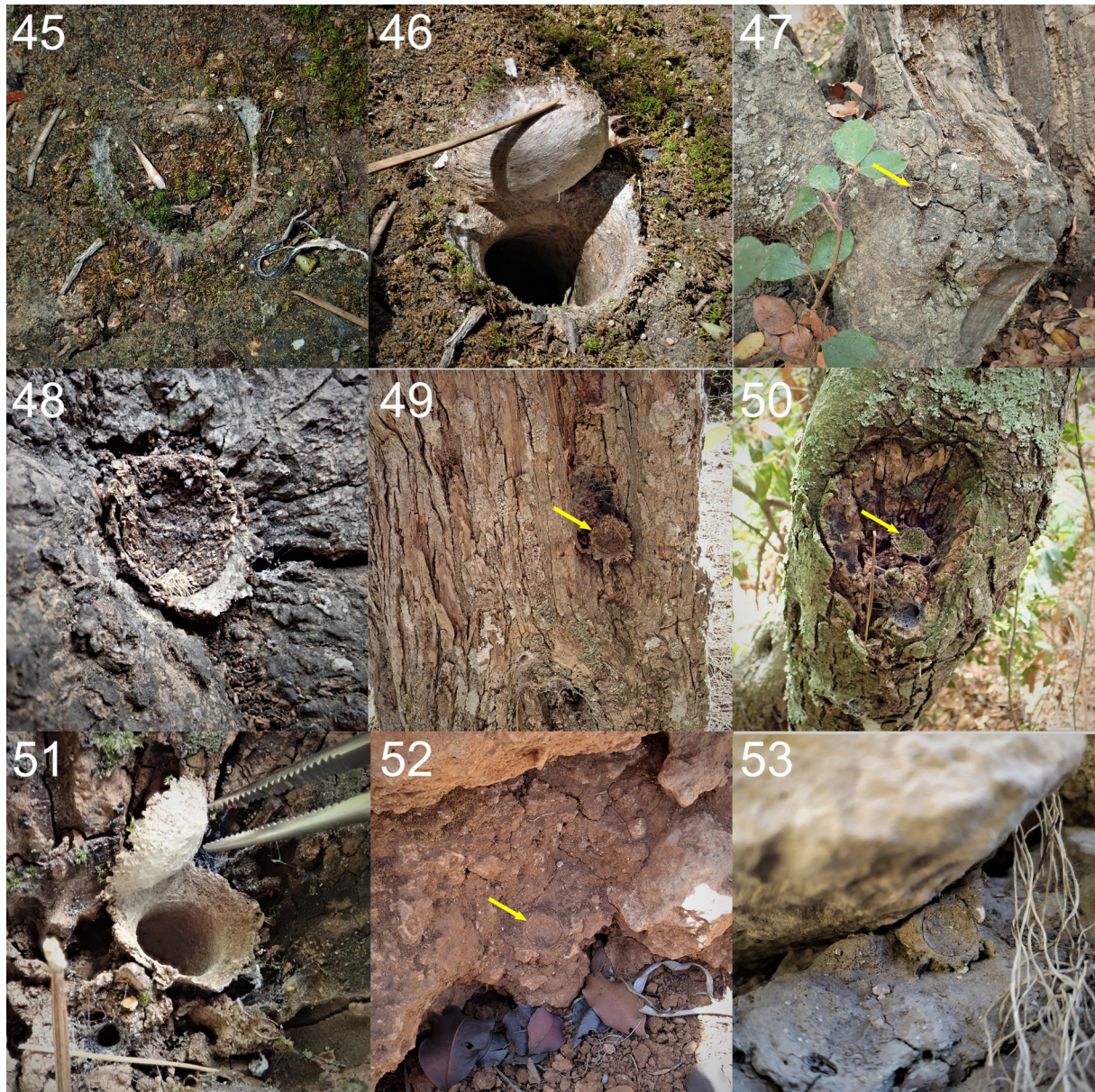
Figures 36–42, illustrate the variation in general appearance of the specimens in our study sample. Although individual variation in size, colour patterns and shades are evident, no qualitative morphological differences were found that would distinguish tree dwelling spiders from ground dwelling spiders at the species level. Moreover, all specimens in our sample closely fit the descriptions given by Pocock (1903) and Kritscher (1994). On these grounds we feel confident to state that arboreal and terrestrial specimens studied here are conspecific members of *N. arboricola* Pocock (1903). Figures 43–44, show characters common to all *N. arboricola* specimens (terrestrial and arboreal) studied, that distinguish *N. arboricola* from its supposed sister species, *N. macrocephala*.

Measurements, variation females (n = 7) TBL = 21.1–26.9 (av. 23.2, sd. 2.5); CL = 7.8–9.1 (av. 8.3, sd. 0.6); CW = 6.4–7.5 (av. 6.8, sd. 0.4); CP = 4.8–5.6 (av. 5.1, sd. 0.3); AR = 1.33–1.51 (av. 1.41,



Figs 36–44. Female characters in *Nemesia arboricola* Pocock, 1903. **36–42.** Variation in general appearance of seven female specimens contained in our study sample, with collection site indication and total body length (TBL). **36.** TC.015, NHMR, found on tree *Phoenix canariensis* H.Wildpret, TBL = 23.0. **37.** TC.016, NHMR, found on tree *Ceratonia siliqua* L., TBL = 23.3. **38.** TC.014, NHMW, terrestrial burrow at Zebbug, TBL = 21.1. **39.** TC.017, NHMR, terrestrial burrow on Comino Island, TBL = 26.9. **40.** TD.1, NHMR, terrestrial burrow at Wied Incita, TBL = 26.1. **41.** TD.2, NHMR, terrestrial burrow at Buskett, TBL = 20.0. **42.** TD.3, NHMR, terrestrial burrow at St Paul's Island, TBL = 22.3. **43.** Labial cuspules (cu) were present in all specimens shown. **44.** Swollen PMS were present in all specimens shown. The presence of labial cuspules and swollen PMS distinguish *N. arboricola* from the closely related *N. macrocephala* Ausserer, 1871.

sd. 0.07); PR = 1.29–1.51 (av. 1.38, sd. 0.09); EL = 0.53–0.77 (av. 0.71, sd. 0.09); dia.ALE = 0.26–0.41 (av. 0.35, sd. 0.05); dia.PLE = 0.21–0.34 (av. 0.29, sd. 0.04); dia.AME = 0.13–0.20 (av. 0.18, sd. 0.03); dia.PME = 0.14–0.23 (av. 0.18, sd. 0.03); dis.AME–AME = 0.20–0.34 (av. 0.26, sd. 0.05); dis.ALE–PLE = 0.10–20 (av. 0.16, sd. 0.04); SL = 3.8–5.2 (av. 4.7, sd. 0.5); SW = 3.6–4.1 (av. 3.8, sd. 0.2); LL =



Figs 45–53. *Nemesia arboricola* Pocock, 1903 excavates its burrows in various natural settings such as crevices between rocks and roots and pre-existing, soil filled cavities in rocks and tree trunks. **45.** Circular outline of a trapdoor in open, moss-covered soil. **46.** Same trapdoor opened to show its thick, plug-like structure that snugly fits into the borrow entrance opening. **47.** Trapdoor capping a burrow excavated in a soil filled hole near the base of a carob tree. **48.** The same trapdoor (47) in close-up. **49.** Trapdoor capping a burrow excavated in a soil filled hole in an olive tree. **50.** Trapdoor capping a burrow excavated in a soil filled hole in an unidentified tree. **51.** The same trapdoor (50) in close-up and opened. **52.** Circular outline of a trapdoor in dry soil at the bottom of a rubble wall. **53.** Exposed top of a burrow and trapdoor in soil between rocks of a rubble wall.

0.9–1.1 (av. 1.0, sd. 0.1); LW = 1.4–1.6 (av. 1.5, sd. 0.1); Palp = 11.9–13.5 (av. 12.5, sd. 0.8); Leg I = 16.1–18.7 (av. 17.1, sd. 1.0); Leg II = 14.6–16.9 (av. 15.4, sd. 0.8); Leg III = 14.5–16.9 (av. 15.5, sd. 0.9); Leg IV = 20.1–23.4 (av. 21.5, sd. 1.2).

Field observations

Nemesia arboricola constructs a simple tube-shaped burrow, capped with a sturdy lid (trapdoor) fitting neatly into the shaft (Figs 46, 51). Apparently older nests have been found with a layer of moss growing on the door surface (Fig. 45). The burrows are constructed in natural settings such as in tree trunks, between rocks in rubble walls and sloping ground (Figs 45–53). Tree-nests have been found between 150 cm and 8 cm above the ground surface in the trunks of ornamental palms (*Phoenix canariensis* and *P. dactylifera*), carob trees (*Ceratonia siliqua*) and olive trees (*Olea europaea*). In such tree-nests, spiders make use of pre-existing hollows and holes in the tree trunks into which they can snugly fit, or make use of hollows which are filled with woody debris and soil into which they can easily burrow. Burrows have also been found, at similar heights above the ground surface, in old rubble walls which hold back soil at field margins; here the spiders burrow into the clayey soil which fills the cracks between the individual stones. In both tree-nests and wall-nests, the burrow lids are flush with the vertical surface and dorsally hinged so that the trapdoor opens vertically upwards, with the shaft directed into the trunk/wall perpendicular to the vertical axis. *Nemesia arboricola* also nests directly in the ground, but always it seems under one of the following conditions: the ground must be steeply sloping or, if the soil is flat, located immediately beneath an overhanging structure such as large rocks or a rubble wall (Figs 52–53). No burrows have been found on level ground in full exposure ('in plain sight' as it were). Tree-nests and wall-nests vary from 4.5 cm to 9.5 cm in depth for mature individuals, with burrow width varying according to the size (maturity) of the individual. Ground-nests in deep soil have, on average, deeper shafts than tree or wall-nests. In all cases, the burrow shaft is relatively simple in construction; it has entire, thick lining of silk with no internal doors, plugs or other features; and it is unbranched.

The resident spiders themselves respond to disturbance by holding the hinged door very tightly; if the door is prised open using forceps (which takes considerable force) the spider may either retreat immediately head-up to the bottom of the shaft, or else repeatedly attempt to close the door while striking the forceps aggressively with its chelicerae. Recently hatched juveniles are retained within the mother's burrow, from which they disperse and apparently establish themselves in close proximity, as *N. arboricola* populations are always localized and often quite dense. Moulded exoskeletons are discarded from the burrow and may be observed outside near the burrows if they are sheltered from wind. During the aestivation period, the door to the burrow is sealed shut from the inside, but the door still remains exposed as under normal circumstances (i.e., the burrow lid is not concealed with soil during periods of inactivity). Most mature males emerge from their burrows and wander between the months of November and March, though a few individuals may appear outside this timeframe.

Nemesia maltensis sp. nov.

[urn:lsid:zoobank.org:act:BB791B03-F14E-4D15-9338-EE2E02244C4A](https://doi.org/10.21203/rs.3.rs-1111111/v1)

Figs 54–73

Diagnosis

Nemesia maltensis groups out with a species-complex that is common in the central and eastern Mediterranean Basin (Decae 2012). In this species-complex the palpal organ of males has striae (fine ribs) on the proximal embolus (Figs 59–62), and females have tube shaped, tripartite spermathecae in which the median part is folded and twisted (Fig. 69). Within this species-complex, *N. maltensis* fits in a central Mediterranean subgroup that has informally been named the *maculatipes* group (Decae *et al.* 2015). Species in this subgroup, such as *N. maculatipes* Ausserer, 1871 (Sardinia), *N. meridionalis* (Costa, 1835) (southern Italy), *N. sanzoi* Fage, 1917 (Sicily) and *N. pannonica* Herman, 1879 (Serbia)

have conspicuous dark coloured patches (maculae) on legs and/or the external proximal article of the PLS (Figs 58, 64–65, 67). Within the *maculatipes* group *N. maltensis* keys out with *N. meridionalis* on grounds of a similar morphology of the distal embolus in males being ornamented with a short row of tiny denticles (Fig. 63 cf. Isaia & Decae 2012: fig. 4). This character is not known from any other *Nemesia* species. Males of *N. maltensis* can be distinguished from those of *N. meridionalis* by the absence of an abrupt narrowing of the distal embolus (Figs 59–62 cf. Isaia & Decae 2012: fig. 3), females of *N. maltensis* can be distinguished from those of *N. meridionalis* by the relatively flat profile of the carapace (lateral view Fig. 65), lack of sharply defined light coloured spigot fields on the PMS and PLS (Fig. 68 cf. Isaia & Decae 2012: fig. 5), and absence of a strong colour contrast between the labium and the sternum and the indistinct central division of the labial furrow (Fig. 66 cf. Isaia & Decae 2012: figs 7–8).

Etymology

The name refers to Malta, the largest island in the Maltese Archipelago and the only Mediterranean island where the species is currently known to occur.

Type material

Holotype

MALTA • ♂; Buskett; 8–13 Sep. 2020; 35.856° N, 14.396° E; T. Cassar leg.; (no. TC.004); NHMR.

Paratypes

MALTA • 4 ♂♂; same collection data as for holotype; (no. TC.005 to TC.008); NHMR • 2 ♂♂; same collection data as for holotype; (no. TC.009, TC.010); NHMW • 2 ♀♀; same collection data as for holotype; 14 Mar. 2021; (no. TC.012, TC.013); NHMR.

Description

Male holotype (no. TC-004, NHMR)

PRESERVATION AND CONDITION. Specimen 6 months preserved in 70% ethanol, in good condition (Fig. 54), right bulb detached for study (Figs 59–63).

GENERAL COLORATION. Carapace yellowish with dark flanks of cephalic part and dark margin (Fig. 55), chelicerae brown, darker than carapace with dorsal lighter coloured patch, opisthosoma dorsal anterior dark greyish-brown, further light coloured with dark, irregular chevrons and a dark cardiac line (Fig. 54), opisthosoma ventral uniform creamy white, palps and legs lighter coloured than body in dorsal view and ventrally lighter coloured than dorsally, sternum and ventral coxae creamy white, labium conspicuously darker than other ventral parts.

CARAPACE. Longer than wide (CW/CL 0.8), covered with very fine silvery pubescence, curved bristles concentrated along the margins and posterior on the thoracic part, longitudinal row on the crest of the cephalic part and few forwardly projecting bristles on clypeus. Cephalic not elevated, thoracic part bulging slightly up from the fovea before sloping down to the posterior margin (Fig. 55).

EYES. Ocular-tubercle dome-shaped, clypeus narrow sloping down from eyes, eye-group rectangular, twice as wide as long (EL/PR 0.51), AME less than their diameter apart (dis.AME/dia.AME 0.87), dis.ALE–PLE less than $\frac{1}{2}$ dia.ALE (ALE–PLE/ALE 0.44).

CHELICERAE. Rastellum with few strong teeth on the apical prolateral corner of chelicerae, prolateral row of furrow teeth, fangs sharp, bent, ventral un-serrated ridge.

VENTRAL PROSOMA. Maxillae rounded distal lobe, few spiky cuspules on proximo-anterior margin. Labium: wider than long (LW/LL 0.7), cuspules absent, labial furrow narrow. Sternum: longer than wide (SW/SL 0.8) three pairs round sigilla, posteriors sub-marginal, evenly covered with bristles.

PALPS. Cymbium with distal group of spines, tibia with PTR strongly develop (Fig. 56), proximally inflated (TibW/PTib 0.6), patella spineless, femur longer than tibia (PFem/PTib 1.6) with group of slender spines dorsally on distal half of the article. Palpal organ, proximal bulbous part pyriform extending distally into a slender curved embolus. Embolus curved, distally gradually tapering to a sharp, bevelled tip. Striae on proximal embolus, few tiny denticles just proximal of the embolus tip (Figs 59–63).

LEGS. All tarsi with fine ventral scopulae. Leg: I: metatarsus and tibia modified, metatarsus curved, lateral longitudinal rows of spines over the length of the article, CF with dense brush of short bristles, tibia distally widened, TA reduced (Fig. 57 cf Fig. 29), TS smoothly upward curved (Fig. 57), spines present on all articles proximal of tarsus, patella with two prolateral spines. Legs I–III; tarsi without spines, other articles with numerous spines, maculae vague, most prominent on prolateral femur (apical) and patella (central). Leg IV, tibia > femur > metatarsus (Fem4/Met4 = 1.02, Tib4/Met4 = 1.07). Leg formula: 4123. PTC on all tarsi with ventrally two parallel combs of small teeth (genus character), ATC smooth.

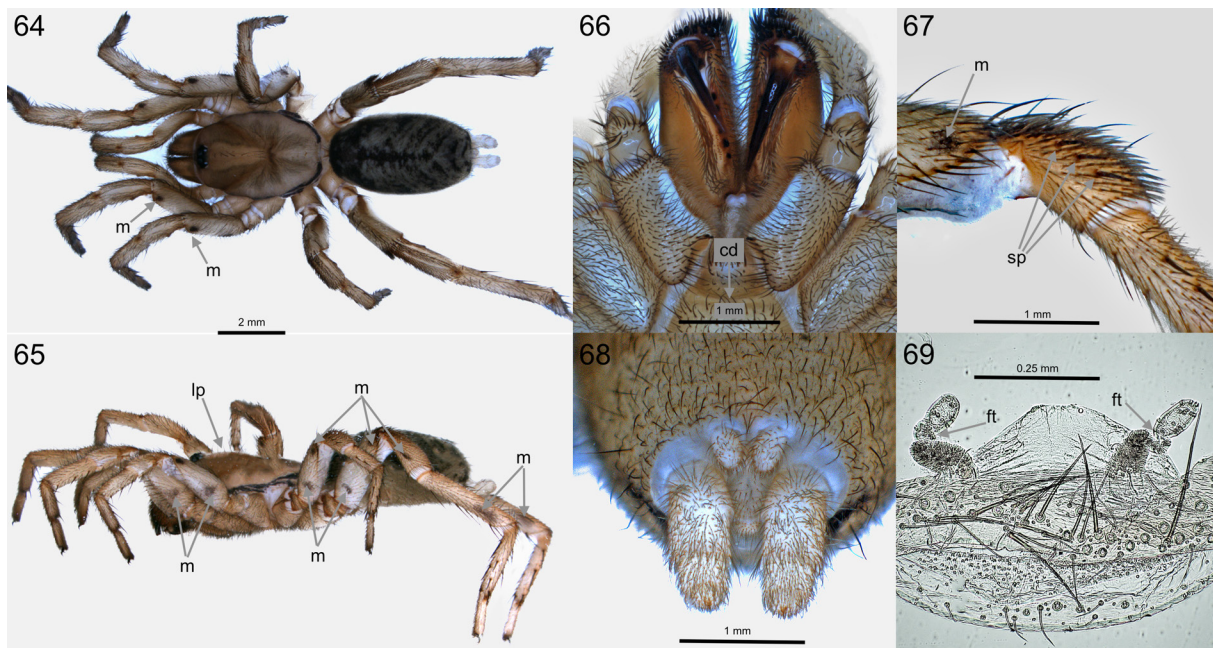


Figs 54–63. *Nemesia maltensis* sp. nov. holotype, ♂ (TC.004, NHMR). **54.** Dorsal habitus (note distinct dark flanks of cephalic part). **55.** Prosoma in lateral view (note dark margin of the carapace and cephalic part not elevated). **56.** Dorso-distal right palp (note strong development of PTR). **57.** Prolateral left metatarsus and distal tibia leg I (note CF with dense brush of short bristles, short TA and smoothly curved TS). **58.** Spinnerets, lateral view showing macula (MAC) on external proximal article of PLS. **59–63.** Right palpal organ in four different positions rotated clock-wise by 90°. **59.** Ventral view. **60.** Prolateral view. **61.** Dorsal view. **62.** Retrolateral view. **63.** Embolus tip at high magnification, note short row of tiny denticles (den) and bevelled tip.

OPISTHOSOMA. Ovoid, anterior narrowing with numerous forward directed bristles, dorsal bristles are backward directed, Spinnerets: PMS knob-shaped, spigots apically concentrated, PLS proximal article with external macula (Fig. 58), as long as medial + distal articles, spigots spread over ventral proximal and medial articles and on apical distal article.

MEASUREMENTS. TBL = 12.3; CL = 5.0; CW = 3.8; CP = 3.0; AR = 0.83; PR = 0.83; EL = 0.42; dia.ALE = 0.25; dia.PLE = 0.15; dia.AME = 0.15; dia.PME = 0.12; dis.AME–AME = 0.13; dis.ALE–PLE = 0.11; SL = 2.6; SW = 1.9; LL = 0.6; LW = 0.8; Palp = 4.9 (0.7 + 1.2 + 1.1 + 1.9); Leg I = 13.2 (2.0 + 2.6 + 2.6 + 2.4 + 3.6); Leg II = 12.5 (2.0 + 2.5 + 2.4 + 2.1 + 3.5); Leg III = 11.9 (2.0 + 3.0 + 2.1 + 1.7 + 3.1); Leg IV = 16.8 (2.3 + 3.9 + 4.2 + 2.4 + 4.0); BuL = 1.12; BuW = 0.39; EmL = 0.51.

VARIATION MALES (n = 7). TBL = 8.7–12.3 (av. 10.1, sd. 1.2); CL = 3.8–5.0 (av. 4.4, sd. 0.4); CW = 2.8–3.8 (av. 3.3, sd. 0.3); CP = 2.1–3.0 (av. 2.5, sd. 0.3); AR = 0.67–0.83 (av. 0.74, sd. 0.05); PR = 0.69–0.83 (av. 0.76, sd. 0.05); EL = 0.36–0.44 (av. 0.40, sd. 0.03); dia.ALE = 0.20–0.25 (av. 0.22, sd. 0.02); dia.PLE = 0.14–0.18 (av. 0.17, sd. 0.02); dia.AME = 0.13–0.15 (av. 0.14, sd. 0.01); dia.PME = 0.11–0.14 (av. 0.13, sd. 0.01); dis.AME–AME = 0.08–0.14 (av. 0.11, sd. 0.02); dis.ALE–PLE = 0.04–0.11 (av. 0.07, sd. 0.02); SL = 1.9–2.6 (av. 2.2, sd. 0.2); SW = 1.5–1.9 (av. 1.7, sd. 0.1); LL = 0.3–0.6 (av. 0.4, sd. 0.1); LW = 0.6–0.8 (av. 0.7, sd. 0.1); Palp = 4.0–4.9 (av. 4.6, sd. 0.3); Leg I = 10.4–13.0 (av. 11.7, sd. 0.9); Leg II = 9.5–12.5 (av. 11.0, sd. 1.0); Leg III = 9.0–11.8 (av. 10.3, sd. 0.9); Leg IV = 13.5–16.8 (av. 15.1, sd. 1.2); BuL = 0.96–1.12 (av. 1.06, sd. 0.06); BuW = 0.31–0.39 (av. 0.36, sd. 0.03); EmL = 0.47–0.52 (av. 0.52, sd. 0.02).



Figs 64–69. *Nemesia maltensis* sp. nov. paratype, ♀ (TC.012, NHMR). **64.** Dorsal habitus, note maculae on external femora I & II (m). **65.** Left lateral habitus, note numerous maculae on legs arrow indications (m) and the low carapace profile (lp). **66.** Ventral anterior prosoma, note indistinct central division (cd) in labial furrow. **67.** Prolateral patella III, note three spines (sp) in a row. **68.** Ventral spinnerets, note absence of distinct light coloured spigot fields. **69.** Spermathecae, ventral view, note median part of the receptacles being folded and twisted (ft).

Female paratype (no. TC-012, NHMR)

Note. The females available for description are small and might not be reproductive adults, the spermathecae of the here described paratype are however sufficiently developed for study. Specimens, 6 months preserved in 70% ethanol, in perfect condition.

GENERAL COLORATION. Carapace cephalic part has wide light brown crest-zone and is generally darker in colour than thoracic part, black margin prominent (Fig. 64), chelicerae bicoloured brown, slightly darker than carapace, abdomen dorsal as in male, palps and legs generally as in male, but dorsal femora lighter coloured and with prominent maculae (Figs 64–65, 67), sternum and labium slightly darker coloured than ventral coxae.

CARAPACE. Longer than wide (CW/CL 0.7), sparsely covered with very fine black pubescence, bristles centrally in longitudinal row on crest-zone. Cephalic part only slightly elevated and gradually sloping down over the thoracic part to the posterior margin (Fig. 65).

EYES. Ocular-tubercle as in male, eye-group rectangular, twice as wide as long (EL/PR 0.53), AME less than their diameter apart (dis.AME/dia.AME 0.92), dis.ALE–PLE less than $\frac{1}{2}$ dia.ALE (ALE–PLE/ALE 0.42).

CHELICERAE. Stronger developed than in male with distinct rastellum, prolateral row of furrow teeth with six conical teeth, fangs sharp, bent, ventral un-serrated ridge.



Figs 70–73. *Nemesia maltensis* sp. nov. observations. **70.** Natural habitat. **71.** Borrow top cut open, note virtual absence of a silk lining of the burrow shaft and the compacted soil from which the burrow walls derive most of their structural integrity. **72.** Natural burrow entrance flush with the soil surface, note absence of trapdoor. **73.** Two surface openings of the bifurcated burrow seen in an observation container.

VENTRAL PROSOMA. Maxillae small rounded distal lobe, few knobby cuspules on proximo-anterior margin. Labium: twice as wide as long (LW/LL 2.3), cuspules absent, labial furrow centrally divided (Fig. 66). Sternum: longer than wide (SW/SL 0.7), sigilla not distinguished.

PALPS. Femur and patella spineless, tibia ventral and prolateral sharp distally pointing spines and dorsal long parallel rows of trichobothria, tarsus, distally pointed, ventral half fully scopulate with group of sharp distally pointing spines, dorsal row trichobothria in central part of article, palpal claw with short proximal row of teeth.

LEGS. All femora with external maculae (Figs 64–65). Anterior legs with ventro-prolateral scopulae extending from tip of tarsus to distal patella, ventral spines on tibia and metatarsus. Posterior legs with dense groups of spiny bristles prolateral on distal femur and dorsal patella. Leg III, patella with three prolateral spines (Fig. 67) and one retrolateral spine. Leg IV patella spineless, tibia > femur > metatarsus (Fem4/Met4 1,1, Tib4/Met4 1,3). Leg formula: 4123. PTC and ATC as in male.

OPISTHOSOMA. Generally as in male, anterior bristle group less distinct, spinnerets without sharply defined spigot-fields (Fig. 68). Spermathecae, tripartite, tube shaped, proximal part with dense concentration of pigmented cells, proximally widest, median part folded and twisted (Fig. 69), distal part digitiform with few pigmented cells.

MEASUREMENTS. TBL = 9.7; CL = 3.9; CW = 2.9; CP = 2.3; AR = 0.71; PR = 0.74; EL = 0.39; dia.ALE = 0.18; dia.PLE = 0.13; dia.AME = 0.10; dia.PME = 0.10; dis.AME–AME = 0.10; dis.ALE–PLE = 0.05; SL = 1.7; SW = 1.3; LL = 0.3; LW = 0.6; Palp = 5.1 (1.1 + 1.1 + 1.1 + 1.8); Leg I = 8.3 (1.0 + 1.3 + 1.6 + 1.8 + 2.6); Leg II = 7.4 (1.0 + 1.3 + 1.4 + 1.5 + 2.2); Leg III = 7.1 (1.1 + 1.6 + 1.1 + 1.3 + 2.0); Leg IV = 11.3 (1.1 + 2.4 + 3.1 + 2.0 + 2.7).

VARIATION FEMALE (n = 2). TBL = 9.2, 9.7; CL = 3.4, 3.9; CW = 2.3, 2.9; CP = 2.0, 2.3; AR = 0.62, 0.71; PR = 0.61, 0.74; EL = 0.33, 0.39; dia.ALE = 0.18, 0.19; dia.PLE = 0.13, 0.16; dia.AME = 0.10, 0.12; dia.PME = 0.10; dis.AME–AME = 0.10, 0.11; dis.ALE–PLE = 0.05, 0.08; SL = 1.7, 2.1; SW = 1.3, 1.5; LL = 0.3, 0.4; LW = 0.6, 0.8; Palp = 4.2, 5.1; Leg I = 6.7, 8.3; Leg II = 6.3, 7.4; Leg III = 5.9, 7.1; Leg IV = 9.6, 11.3.

Observations

In the field (Fig. 70), the burrows of this species appeared to be completely lidless, with the burrow entrance opening at the ground surface directly (Fig. 72). The wall of the burrow is lined with almost imperceptibly thin strands of silk from the inside; but the burrow walls derive most of their structural integrity from the compaction of the soil around them (Fig. 71). In captivity, once soil was moistened, a female constructed a bifurcated burrow with two shafts opening at the soil surface with no lids (Fig. 73), joining together into one shaft deeper into the soil. Females were collected from burrows some 15 cm deep in the soil, congregated at the edge of a small boulder embedded in deep soil in a wooded area populated by trees of *Laurus nobilis* L., *Olea europaea*, *Rhamnus alaternus* L. and *Pinus halepensis* Mill. Burrow entrances always appeared at the soil surface at the edge of the boulder or, in one instance, at the base of the thick stems of an *Acanthus mollis* L. plant nearby. Males were collected in pitfall traps after several heavy rainfall events which occurred in September – the so called “first rains” which bring an end to the dry season.

Nemesia cominensis sp. nov.

[urn:lsid:zoobank.org:act:1194AF54-FEB0-4E94-BA86-708827BB2F1B](https://doi.org/10.21203/rs.3.rs-1194AF54)

Figs 74–94

Diagnosis

Nemesia cominensis females can be distinguished from all known *Nemesia* species by its general light colour (Figs 74–75) and the elongated, wiggly, tube-shaped spermathecal receptacles without a clear

differentiation in proximal, medial and distal parts (Figs 79, 87). It further differs from *N. maltensis* in the absence of maculae on legs (Fig. 75) and the elevated cephalic part (Fig. 75).

Etymology

The name refers to Comino, the third largest island in the Maltese Archipelago and the only Mediterranean island where the species is currently known to occur.

Type material

Holotype

MALTA • ♀; Comino Island; 36.012° N, 14.337° E; 11 Sep. 2020; T. Cassar leg.; (no. TC.002); NHMR:

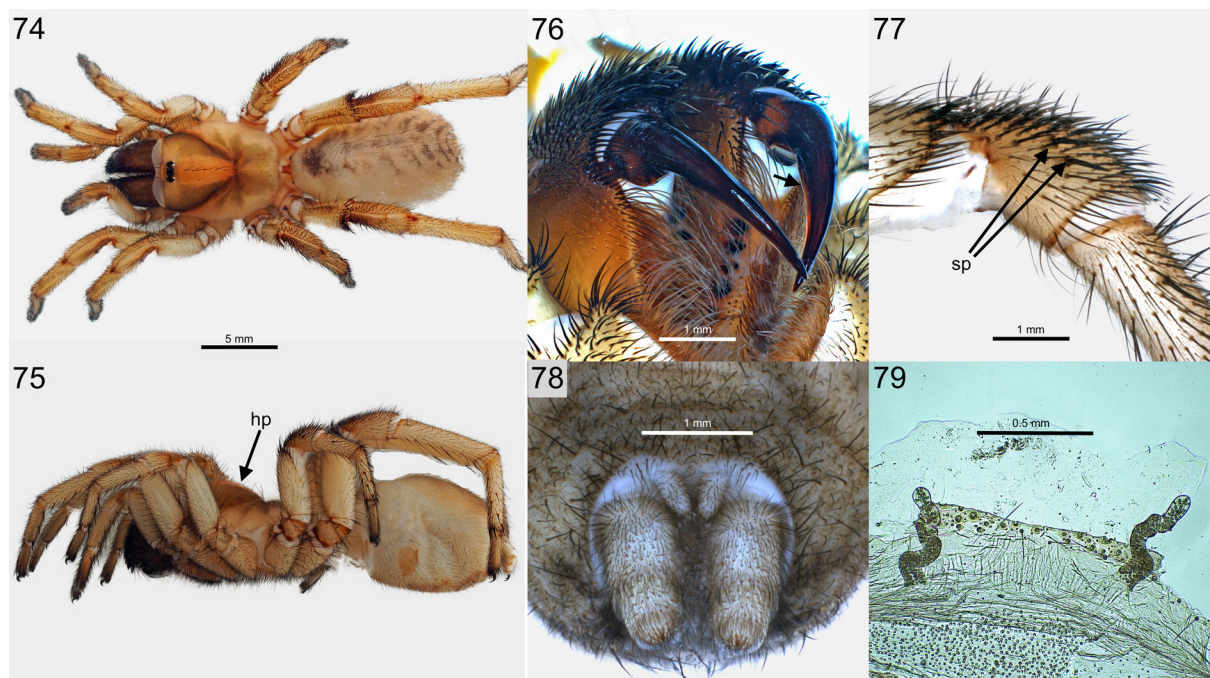
Additional material

MALTA • 1 ♀ subadult; same collection data as for holotype; (no. TC.001); NHMR • 1 ♂ subadult; same collection data as for holotype; 17 Sep. 2020; (no. TC.003); NHMR.

Description

Female holotype (no. TC-002, NHMR)

GENERAL COLORATION. General appearance as a relatively light-coloured *Nemesia* species (Fig. 74). carapace cephalic part with wide orange-brown crest zone and light grey flanks, thoracic part light yellow with vague grey folia pattern, chelicerae dark brown, distally darkest, palps and legs crème-coloured with dorsal yellow zones, sternum light yellow, labium and maxillae light brown, opisthosoma dorsal



Figs 74–79. *Nemesia cominensis* sp. nov. holotype, ♀ (TC.002, NHMR). **74.** Dorsal habitus. **75.** Lateral habitus, note the elevated cephalic part or high carapace profile (hp). **76.** Chelicerae in ventro-lateral view, note the hooked fangs and the finely serrated fang-keel (arrow indication). **77.** Prolateral patella III, note the two spines in line (sp). **78.** Spinnerets ventral view, note the digitiform PMS. **79.** Spermathecae with elongated, wavy, wiggly, tube-shaped receptacles.

creme-colour with light grey pattern of blotches and chevrons, ventral orange-brown zone between epigastric furrow and light-coloured spinnerets.

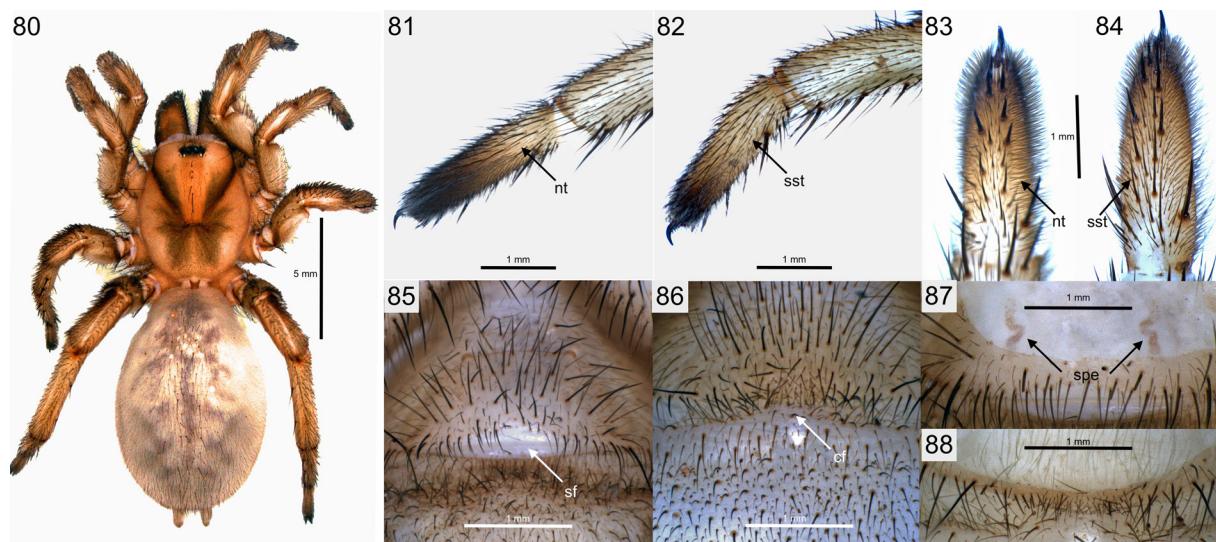
CARAPACE. Longer than wide (CW/CL 0.8), sparsely covered with very fine black pubescence, bristles centrally in longitudinal row on crest-zone and around the eyes. Cephalic part elevated; fovea only weakly recurved. Eyes: eye-group almost twice as wide as long (EL/PR 0.48), PR slightly wider than AR (PR/AR 1.03), AME slightly more than their diameter apart (dis.AME/dia.AME 1.10), distance ALE–PLE less than $\frac{1}{2}$ dia.ALE (ALE–PLE/ALE 0.44).

CHELICERAE. Strong, rastellum triangular group of strong teeth placed apically, prolateral row of 6 conical furrow teeth, retrolateral furrow scopula, field of tiny denticles at furrow bottom, fang proximally hooked, very fine serrations on fang keel (Fig. 76).

VENTRAL PROSOMA. Distal maxillae lobe reduced, three cuspules on proximo-anterior margin, labium: almost twice as wide as long (LW/LL 1.9), cuspules absent, labial furrow centrally divided. Sternum: longer than wide (SW/SL 0.8), with three pairs of light brown sub-marginal sigilla.

PALPS. Femur and patella spineless, tibia two ventro-lateral rows of sharp distally pointing spines and dorsal long parallel rows of trichobothria, tarsus ventral half fully scopulate with group of sharp distally pointing spines, dorsal trichobothria in V-formation, palpal claw with short proximal row of four teeth.

LEGS. Maculae absent (Fig. 75). Leg I ventro-prolateral scopulae extending to distal tibia, row of three ventro-prolateral metatarsal spines, spines on other articles spineless. Leg II scopula restricted to tarsus and metatarsus, spines and spiny bristles stronger developed than on leg I. Posterior legs with dense



Figs 80–88. *Nemesia cominensis* sp. nov. sub-adult, ♂ (no. TC.003, NHMR) vs sub-adult, ♀ (no. TC.001, NHMR). **80.** Dorsal habitus sub-adult male, note the similarity in general appearance with the adult female holotype (Fig. 74). **81.** Sub-adult female, palp tarsus, prolateral, note the slightly conical, normal female shape of the article (nt). **82.** Sub-adult male, palp tarsus, prolateral, note the slightly swollen shape of the article (sst). **83.** Similar as 81, but ventral view. **84.** Similar as 82, but ventral view. **85.** Epigastric furrow in sub-adult female, note the vulva structure (sf). **86.** Epigastric furrow in sub-adult male, note the absence of a vulva structure (cf). **87.** Genital zone sub-adult female with cuticle removed, note the presence of spermathecae (spe). **88.** Idem sub-adult male, note the absence of spermathecae.

groups of spiny bristles prolateral on distal femur and dorsal patella. Leg III, patella with two prolateral spines (Fig. 77) retrolateral spines absent. Leg IV patella spineless, tibia > femur > metatarsus (Fem4/Met4 1,1; Tib4/Met4 1,2). Leg formula: 4132. PTC and ATC identical to the ones of *N. maltensis* sp. nov.

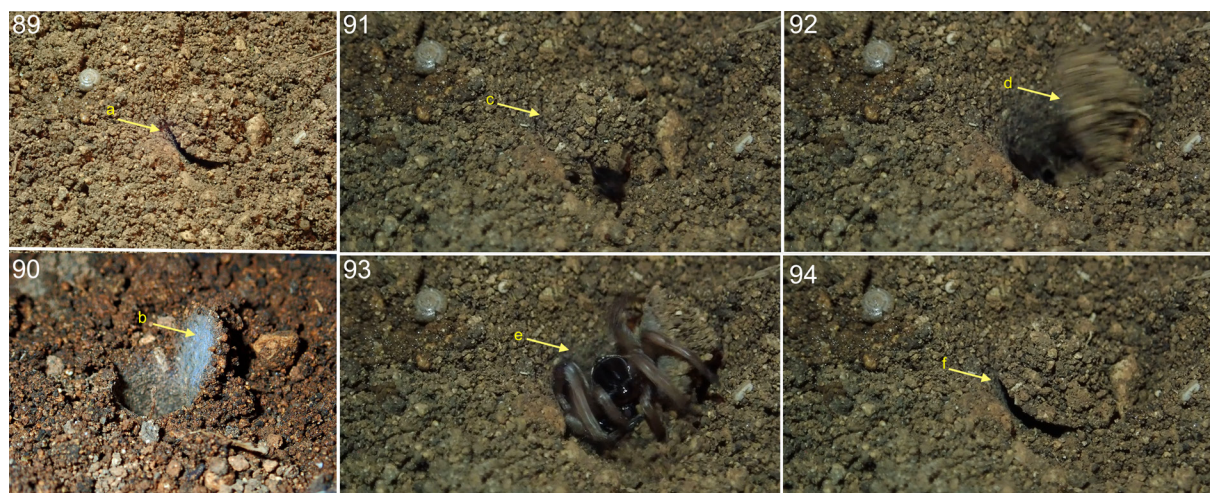
OPISTHOSOMA. Ovoid, anterior narrowing (Fig. 74), spinnerets without maculae or sharply defined spigot-fields, PMS digitiform (Fig. 78). Spermathecae, tube shaped, wavy, wiggly structures without much differentiation (Fig. 79).

MEASUREMENTS. TBL = 20.5; CL = 7.0; CW = 5.8; CP = 4.4; AR = 1.23; PR = 1.27; EL = 0.61; dia.ALE = 0.32; dia.PLE = 0.25; dia.AME = 0.20; dia.PME = 0.14; dis.AME–AME = 0.22; dis.ALE–PLE = 0.14; SL = 4.0; SW = 3.1; LL = 0.7; LW = 1.4; Palp = 10.3 (2.3 + 2.2 + 2.1 + 3.7); Leg I = 15.3 (1.8 + 2.6 + 3.1 + 3.1 + 4.7); Leg II = 13.0 (1.6 + 2.5 + 2.7 + 2.9 + 3.3); Leg III = 14.0 (1.6 + 2.5 + 2.7 + 2.9 + 4.3); Leg IV = 20.9 (2.0 + 4.6 + 5.5 + 3.6 + 5.2).

VARIATION FEMALE (n = 2). TBL = 14.5, 20.5; CL = 6.0, 7.0; CW = 4.9, 5.8; CP = 3.7, 4.4; AR = 1.12, 1.23; PR = 1.19, 1.27; EL = 0.55, 0.61; dia.ALE = 0.21, 0.32; dia.PLE = 0.20, 0.25; dia.AME = 0.16, 0.20; dia.PME = 0.13, 0.14; dis.AME–AME = 0.19, 0.22; dis.ALE–PLE = 0.14, 0.20; SL = 3.3, 4.0; SW = 2.6, 3.1; LL = 0.7; LW = 1.3, 1.4; Palp = 8.5, 10.3; Leg I = 12.6, 15.3; Leg II = 11.5, 13.0; Leg III = 11.3, 14.0; Leg IV = 17.8, 20.9.

Sub-adult male (no. TC-003, NHMR)

As in all species of *Nemesia*, sub-adult spiders are, except for their small size, similar to adult females in general appearance and somatic characters. Males and females of *Nemesia* can be distinguished in juveniles by internally checking the presence of spermathecae that are already detectable in small juvenile and sub-adult females (Fig. 87 cf. Fig. 88). Sub-adult males overlap in general body size with young females, but can be distinguished on the shape of the palp-tarsus that is slightly swollen (Figs 82, 84 cf. 81, 83) and the absence of a vulva structure in the epigastric furrow (Fig. 85 cf. 86).



Figs 89–94. *Nemesia cominensis* sp. nov. observations. **89.** Thin wafer-type trapdoor cracked open (a). **90.** Opened trapdoor (b). **91.** Closed trapdoor (c). **92.** Flash-attack by spider as a reaction on subtle movements near the trapdoor (d). **93.** Spider retreats after attack (e). **94.** Trapdoor remains ajar after retreat (f).

Observations

Nemesia cominensis constructs a thin, flimsy wafer-door lid to its burrow (Fig. 90), which is partly concealed by a thin layer of loose soil particles on top (Fig. 89). *Nemesia cominensis* captures its prey in the usual trapdoor spider fashion by laying in ambush under a cracked open trapdoor, launching a flash attack on small animals that wander within reach of the spider (Figs 91–94). Burrows are constructed in the ground in deep soil, with the door flush with the flat ground surface, and may be unbranched (single shaft) or bifurcated (two shafts joining to become one at the bottom, in a Y shape). During the aestivation period, the burrows have no lids whatsoever, and the burrow entrances are instead concealed and obstructed by up to about 2 cm of soil; they are also completely devoid of any silk lining. When the soil is moistened, the spiders resume their door-making and hunting; the first few millimetres of the burrow entrance are lined with a very thin layer of silk to which the door is attached, but the rest of the burrow still remains without silk lining. It is not known how deep the burrow shafts are in nature during the active period; in captivity an active burrow was constructed which reached 8 cm in depth but this was restricted by the size of the flower-pot; on location some spiders were found residing in aestivation burrows up to some 15 cm deep into the soil. Recently hatched spiders have been found after digging up aestivation burrows belonging to mature individuals, so it is assumed that the young are retained within the maternal burrow and disperse afterwards, taking up residence in close proximity (the sampled population was localized and dense). So far, this species has only been found to construct its burrows in relatively deep soil at the bottom of a shallow valley on the island of Comino, from which all of the aforementioned observations have been made. The difficulty in locating specimens may doubtless obscure the true distribution and ecological preferences of this newly described species from the Maltese Islands.

Discussion

Within the genus *Nemesia*, different regionally distributed species-complexes and further sub-groups can be distinguished (Simon 1914; Decae *et al.* 2015). Differences between the *Nemesia* species compositions of the eastern and western basins of the Mediterranean are particularly distinct in this respect (Decae 2012). Located in the centre of the Mediterranean where the different eastern and western *Nemesia* faunae meet (Decae 2012), the Maltese *Nemesia* species appear to take an intermediate position between East and West. Judged on morphology, *N. arboricola* has its closest relatives in the western Mediterranean (Decae 2012 group CF), whereas *N. maltensis* sp. nov. and *N. cominensis* sp. nov. are closer to eastern Mediterranean *Nemesia* species (Decae 2012 group AD). Malta (and adjacent regions in Sicily, Italy and Tunisia) may therefore act as focal point for future taxonomical, distributional and phylogenetic research aimed at elucidating the origin, intrageneric relations and dynamics of the highly diverse, complex, and yet understudied, Mediterranean *Nemesia* fauna.

Two other points that are worth discussing concern the apparently unique habits of *N. maltensis* sp. nov. and *N. arboricola*. Firstly, *N. maltensis* sp. nov. appears to be unique among *Nemesia* species in its nest building behaviour by constructing an underground nest without a trapdoor cover (Figs 71–73). Although open burrows have not been reported before for *Nemesia* species, such burrows are known from the related Mediterranean nemesiid genus *Brachythele* Ausserer, 1871. *Brachythele* and *Nemesia* have overlapping distributions in the north-eastern Mediterranean (personal observation, AED). Secondly, *N. arboricola* is the only arboreal *Nemesia* species currently known (Figs 47–51). As for the observed inclination of *N. arboricola* to construct its burrows in substrate-fillings of steep or vertical surfaces (rubble walls, tree trunks) it is worth noting that Balearic species such as *N. bristowei* Decae, 2005 and *N. randa* Decae, 2005 are also found to exploit vertical surfaces as burrow locations (Decae 2005). These species are commonly found in rubble walls on steep cliffs and even on overhanging surfaces (personal observation, AED) and might be expected to be found in trees as well, given the presence of suitable soil fillings.

A final point to be discussed is the information on the phenology of *Nemesia* species. The two males of *N. arboricola* (from our samples) were collected in different seasons (November and March respectively) indicating that there is no particular mating season for this species. A sample of 124 male collection date records, obtained from populations occurring throughout the Mediterranean shows that adult *Nemesia* males may be found all year round with the possible exception of midsummer. However, two waves of male collection/wandering are evident from our data. About one quarter (27%) of the males were collected in the first half of the year and about three quarters (73%) in the second half of the year with a peak in the months of September and October. Available data are currently insufficient to discern seasonal instances of male emergence at the species level.

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