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Revalidation of *Nemesia meridionalis* Costa, 1835 (Araneae, Mygalomorphae, Nemesiidae), and first description of the male

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Summary

Knowledge of the Italian trapdoor spider fauna started with Costa's 1835 description of the female of *Nemesia meridionalis*. In order to establish a suitable taxonomic basis for a planned revision of the Italian mainland *Nemesia* fauna it was felt necessary to revalidate the identity of this species. Because Costa's original specimens appear to be lost, we collected new specimens from Costa's type locality (Camaldoli near Naples). On the basis of this material, and older material from Costa's type locality collected and identified as *N. meridionalis* by Louis Fage (1917), we redescribe *N. meridionalis* and present, for the first time, a description of the male of this species.

Introduction

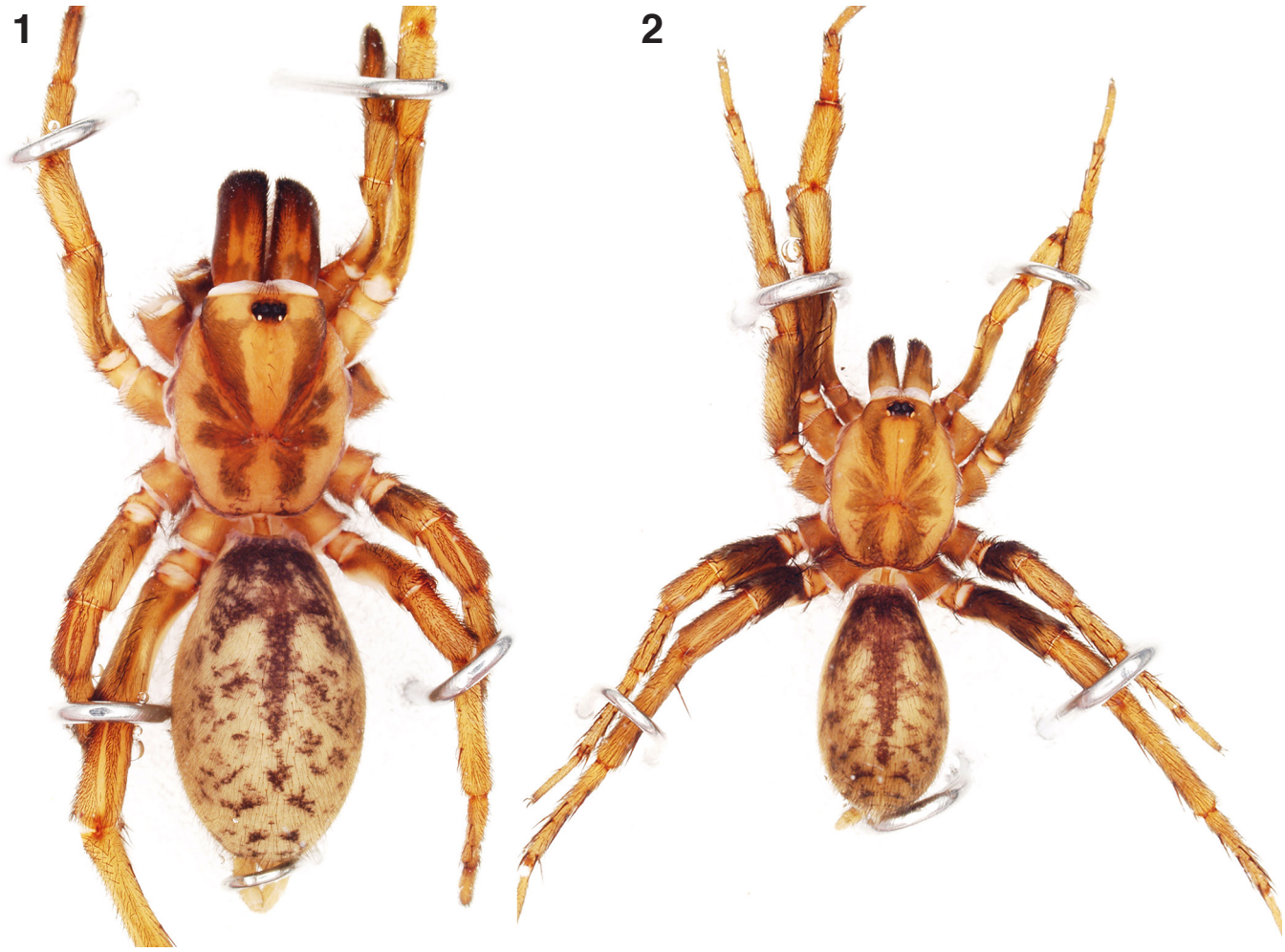
Nemesia meridionalis Costa, 1835 was among the first *Nemesia* species to be described from the Mediterranean region. The species was reported to occur in places around Naples (southwestern Italy). Costa (1835) published an extensive description of the female, including a colour drawing in dorsal view, and figures of the eye group, chelicerae, palps, and leg tarsi. Costa's morphological description is very detailed by early 19th century standards, but outdated and insufficient in detail to allow species recognition today. On the other hand, Costa's detailed information on the burrow structure, habitat, and locations where *N. meridionalis* can be found is not outdated. The male of *N. meridionalis* apparently remained unknown to Costa. In later taxonomical work the identity of *N. meridionalis* became confused because new investigators, unwarranted, reported on *N. meridionalis* from locations throughout the western Mediterranean (Simon 1873; Pickard-Cambridge 1873; Dalmas 1920; Frade & Bacelar 1931; Emerit 1992; Urones & Majadas 2002) without reference to Costa's original specimens. Although Simon and Pickard-Cambridge both corrected their earlier misidentifications of *N. meridionalis* in later works (Simon 1914; Pickard-Cambridge 1874) confusion about the true identity and distribution of *N. meridionalis* further increased after Louis Fage collected *Nemesia* specimens at Costa's original type locations around Naples. In a short note, Fage (1917) claimed that both *N. maculatipes* Doleschal in Ausserer, 1871 and *N. cecconi* Kulczyński, 1907 are probably synonymous with *N. meridionalis* and that the species, in contrast to other *Nemesia* species that all tend to be regional endemics, has a very wide distribution in the western Mediterranean (Fage 1917, p. 483: "*La distribution de cette forme, contrairement à celle des autres espèces du g.* Nemesia *s. str., est très vaste* …"). Unfortunately, Fage's claims were insufficiently founded (on superficial morphological resemblance only), leading to a lasting confusion about the identity and distribution of *N. meridionalis*. Particularly, reports in recent literature of *N. meridionalis* occurring on the Iberian Peninsula (e.g. Urones & Majadas 2002; Cardoso & Morano 2010; Morano & Cardoso 2011; Platnick 2012) are suspect and probably indicate confusion with *N. athiasi* (see Decae & Di Franco 2005; Decae, Cardoso & Selden 2007). The occurrence of *N. meridionalis* in France (Platnick 2012) is also insufficiently supported, and probably rests on an incorrect claim of *N. meridionalis* occurring on Corsica (Emerit 1992). Since none of the authors ever reporting on *N. meridionalis* has apparently seen Costa's original type specimen, and our search for this material also remained unsuccessful, we regard Costa's type(s) as lost. Recently, one of us (MI) has visited Costa's type location on Camaldoli hill above Naples in an effort to collect topotypic specimens on which a new diagnosis of *N. meridionalis* could be based. A further aim of this expedition was to find the as yet unknown male of *N. meridionalis*. Both efforts were successful and the results are given below.

Methods

A Ceti-Medo.2 stereomicroscope with camera lucida equipment was used for examining, measuring, and preparing illustrations. All specimen were hand collected in the field and preserved in 70% ethanol. Carapace photos were made with an Olympus E-500 camera equipped with 50 mm ED-macro lens and Olympus ring flash. All measurements not being ratios are given in millimetres (mm). Drawings were done in pencil. From all specimens, some legs were stored in 95% ethanol for future molecular analysis.

Morphological abbreviations: BL = total body length, Ca = length of cephalic part measured from anterior clypeus to fovea, CL = length carapace, CW = width carapace, L = left side, L1, L2 = lengths of legs I & II respectively measured as described for Pa, L3, L4 = lengths of legs III & IV respectively measured along the prolateral face from the trochanter/femur joint to the dorsal claw implant on the apical tarsus, Pa = length palp measured along the retrolateral face from the trochanter/femur joint to the dorsal claw implant on the apical tarsus, PLS = posterior lateral spinnerets, PMS = posterior median spinnerets, l/w = length/width ratio, POP = deep black periocular pigmentation, R = right side.

Institutional abbreviations: MNHN = Museum national d'Histoire naturelle, Paris; MCSNBG = Museo Civico di Scienze Naturali "E. Caffi" di Bergamo); NHMB (in specimen identification numbers) = Natural History Museum, Bergamo.



Figs. 1–2. *Nemesia meridionalis* Costa, 1835. **1** ♀ neotype specimen NHMB-191, note bicoloured chelicerae, crest zone with anterior light coloured cheeks, and central dark leaf pattern with black pubescence; **2** ♂ specimen NHMB-197, note bicoloured chelicerae, anterior truncated crest zone, central dark leaf pattern with black pubescence.

***Nemesia meridionalis* Costa, 1835** (Figs. 1–10)
[urn:lsid:amnh.org:spidersp:001228]

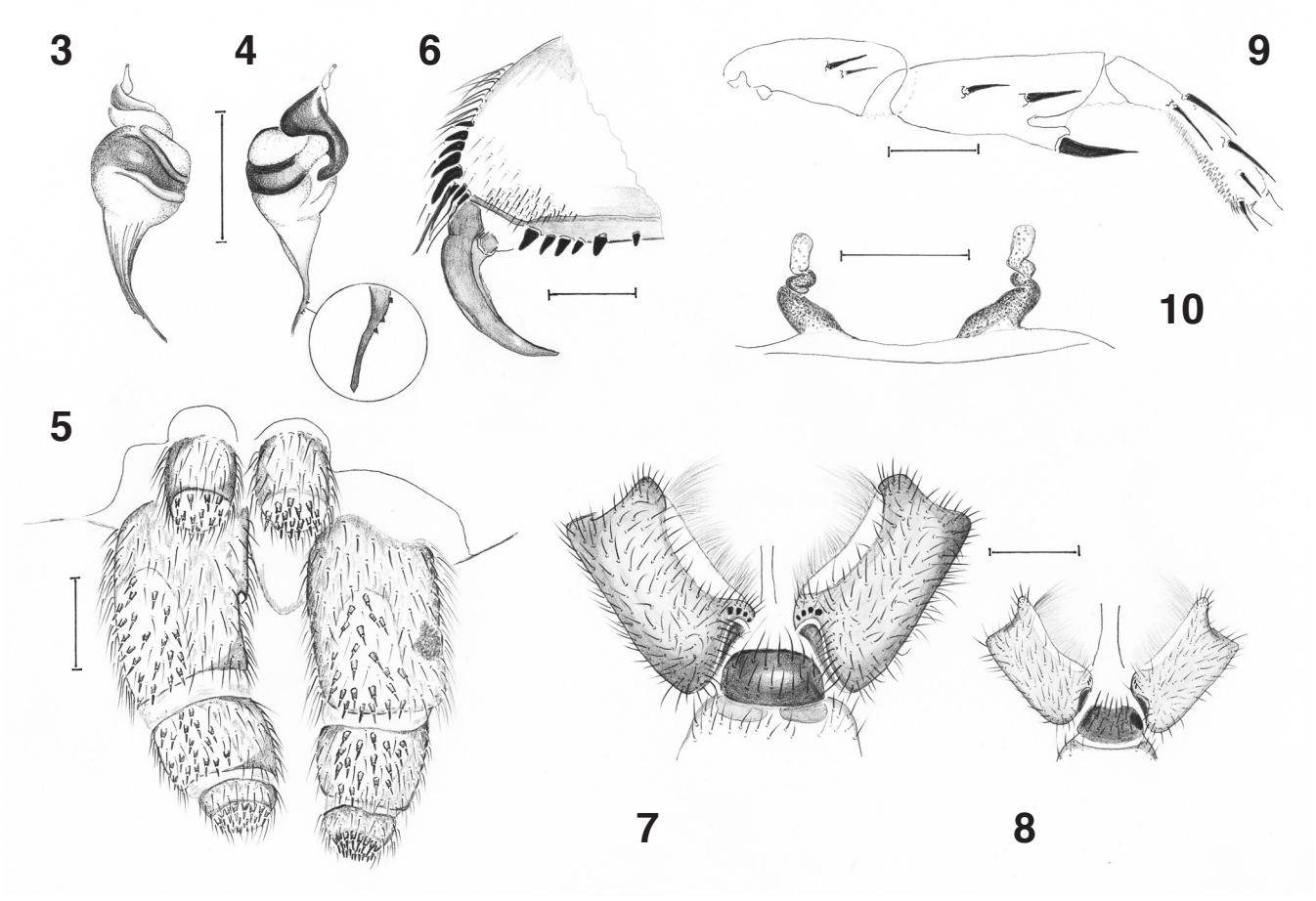
Mygale meridionalis Costa, 1835: 14-18, pl. 1, f. 2–3 (description of ♀).

Nemesia meridionalis Moggridge, 1873: 137–141 (English translation Costa), Fage 1917 (notes on ♀): 483; Blasco 1986: 333–350, f. 2b; Emerit 1992: 5–32, f. 5g.

Material examined: New material (5♀♀, 2♂♂) collected from natural burrows dug in soil in broadleaved woodland habitat (chestnut and oak). Specimens were collected at two locations: 1) Monastero di Camaldoli (1♀, 13 juv., leg. Isaia, Galindo & Soldato) 40.858226N 14.192770E, 435 m a.s.l.; 2) Parco urbano dei Camaldoli (4♀♀, 2♂♂, 1 juv., leg. Isaia) 40.863331N 14.196593E, 396m a.s.l. Collected juveniles are not included in the neotype sample. All specimens will be deposited in the MCSNBG collection and/or in the collection of the Department of Life Science and System Biology of Turin University. 2♀♀, leg. L. Fage P.58 MNHN Paris collected 1917 area Naples, Campania, Italy.

Diagnosis: *N. meridionalis* differs from all known *Nemesia* species by males having a proximally ribbed embolus (Fig. 3, best seen in dorsal view), combined with a row of three minute subdistal teeth (Fig. 4, best seen in ventral view). Females have three-partite tube-shaped spermathecae, widest at their bases (Fig. 10). The proximal parts are obliquely diverging, the central parts are twisted and projecting rostrally, the distal parts, also projecting rostrally, are simple tissue pockets. Glandular tissue is dense in proximal and central parts of the spermathecae and very thin distally. Typical for the species, in both males and females, are the bicoloured dorsal chelicerae without pubescence cover (Figs. 1–2), the dense black pubescence on the femora and on the dark parts of the carapace, the arrangement of spigots in distinct spigot fields, both on all segments of the PLS and apically on the PMS (Fig. 5), the presence of dark coloured maculae on the external basal segment of the PLS, the dark contrasting labium (Figs. 7–8), and prolateral spines on anterior patellae of females reduced to fine bristles.

Description: Female neotype (specimen code NHMB-191) measurements: BL 18.5, CL 5.7, CW 4.7, Ca 3.7, Pa 8.9, L1 13.9, L2 12.5, L3 11.9, L4 17.9. Carapace: cephalic part well elevated, highest at the location of the ocular process, wide wedge-shaped yellow crest-zone anterior extending in two bright yellow “cheeks”, one on either side of the eye-formation (Fig. 1), posterior regularly narrowing and sloping down from the eye-formation to the fovea, longitudinal central crest-row of fine bristles flanked with rows of finer bristles, lateral dark grey zones densely



Figs. 3–10. *Nemesia meridionalis* Costa, 1835. **3**–**4** ♂ palpal bulb. **3** dorsal view, note ribs on proximal embolus; **4** ventral view, note minute denticles (inset traced from photomicrograph at 150× magnification); **5** ♀ ventral spinnerets, note spigot fields and macula on proximal segment PLS, **6** ♀ right distal chelicera prolateral, note rastellum; **7**–**8** labium (dark coloured) and maxillae. **7** ♀, **8** ♂, note distal anterior process; **9** ♂ prolateral left patella, tibia and metatarsus leg I, spines, hook and scopula development; **10** ♀ spermathecae ventral view. Scale lines = 1.0 mm (6–9), 0.5 mm (3–5, 10). Female characters drawn after NHMB-191 (neotype), male characters after NHMB-197.

covered with fine black pubescence (Fig. 1). Thoracic part: weakly convex lateral edges, weakly concave posterior edge, lateral zones yellow around a central sharply outlined leaf pattern of dark zones radiating outward from the fovea. Dark zones densely covered with black pubescence, yellow zones less densely covered with silver pubescence and fine grey hairs. Fovea: recurved distally bending outward on both sides, with a distinct central groove. Eyes: eight, on steep black ocular process arranged in a rectangular formation (l/w= 0.5), lateral eyes oval and larger than more roundish median eyes, POP deep black, continuous between all eyes. Clypeus: narrow with few bristles along the anterior edge. Chelicerae: dorsally dark brown with light brown regions on the highest parts (Fig. 1), alternating longitudinal glabrous and bristle covered zones, lateral and ventral warm brown, cheliceral furrow lined with row of denticles (6R, 7L) prolateral and scopula retrolateral, group of fine cuspules at furrow bottom. Fangs: brown, sharp, long and slender with irregular serrated ventral ridge. Rastellum: compact group of teeth directly distal of prolateral fang implant (Fig. 6). Labium: l/w = 0.5, very dark brown with lateral maculae (see male). Maxillae: l/w = 1.9, darker than coxae of legs with small anterior distal process, short rows of well developed cuspules along anterior proximal edge (Fig. 7). Sternum: l/w = 1.3, colour as ventral maxillae, lighter than labium darker than ventral leg coxae, labial furrow of two large glabrous depressions, three pairs of circular sub-lateral sigilla, bristle and hair cover as leg coxae and maxillae. Abdomen: evenly covered with fine bristles dorsally and finer hairs ventrally, egg shaped, anterior dark coloured and narrow, posterior lighter coloured and rounded, dorsally patterned with a dark cardiac central zone flanked by broken dark chevrons and irregular pale blotches, ventrally grading from pale yellow anterior to light grey posterior. Spinnerets: (Fig. 5) PMS cylindrical, approximately twice as long as wide, less than their diameter apart, pale yellow densely covered with fine bristles on all sides, apical circular spigot fields. PLS overall colour and bristle cover as PMS, ventrally three segmented, proximal segment dorsally sub-divided, proximal segment ventrally longer than medial + distal segment, distal segment domed with apical circular spigot field, spigots on medial and proximal segment in distinct ventral spigot fields, proximal segment with vague prolateral maculae. Legs: patellae to tarsi mostly uniform brown, femora dorsal grey with dense black pubescence, internal faces pale yellow and largely glabrous, tarsi and metatarsi I&II with dense dark grey ventral and lateral scopulae, traces of maculae on some segments. Spines: reduced to bristles on anterior patellae, ventral and/or lateral on patellae III, tibiae and metatarsi, fine dorsal spines on all femora, anterior tarsi with minute spines in ventral scopulae. Claws: all paired claws with well

developed double rows of teeth slightly reduced on tarsi IV, 3rd claw small, strong downward curve. Palps: colour, spine and pubescence patterns as in legs, tarsi with dense dark scopulae extending on distal prolateral tibiae, ventral tarsus with strong short spines and bristles, lateral tarsi with one strong proximal spine on either side, tarsal claw smooth. Trichobothria: as in all known *Nemesia* species (see Decae, Cardoso & Selden 2007). Spermathecae: membranous, tube shaped, proximally widest and diverging, centrally twisted and bent upward, proximal and medial gland concentrations (Fig. 10).

Male: (specimen code NHMB-197) measurements, BL 12.9, CL 4.1, CW 3.1, Ca 2.5, Pa 5.7, L1 11.3, L2 10.3, L3 10.1, L4 14.3. Carapace: cephalic part slightly elevated, highest around the eye-formation, with a wide wedge-shaped orange-yellow central crest zone anteriorly sharply truncated, regularly narrowing and sloping down from the eye formation to the fovea (Fig. 2), longitudinal central crest row of fine bristles; anterior and lateral parts dark grey zones covered with fine black pubescence. Thoracic part: oval, posterior edge distinctly concave, dark grey zones covered with black pubescence radiating from the fovea, lateral zones pale yellowish brown, edges furnished with curved black bristles, anterior bristles curved backward, posterior bristles stronger and curved forward (Fig. 2). Fovea, eye-group and clypeus: as described for female. Chelicerae: dorsally with regions of different intensity of greyish yellow with three alternating longitudinal glabrous and bristle covered zones, proximally fully glabrous (Fig. 2). Fangs: sharper and more slender than in female with more regular serrated ventral ridge. Rastellum: somewhat reduced relative to female. Labium: l/w = 0.5, grey with dark brown maculae laterally, evenly covered with stronger upright bristles. Maxillae: l/w = 2.0, yellowish, same colour and bristle cover as ventral coxae, longer than wide, distinct anterior distal process (Fig. 8), row of 3 (4) cuspules on anterior proximal edge, dense pinkish scopula along anterior edge. Sternum: l/w = 1.3, yellow contrasting with paler ventral coxae and grey labium, evenly covered with bristles, separated from labium by a shallow glabrous labial furrow, posterior narrow projection between coxae IV, sigilla inconspicuous sub-marginal circular, slit organs one pair in anterior half, two pairs in posterior half. Abdomen: as in female. Spinnerets: as in female. Legs: dorsally brown from patella to tarsus, femora distinctly darker with dense covers of black pubescence, ventral pale grey, lateral grey with vague external maculae on distal femora and medial patellae. Spines: several evenly spread over all faces of all metatarsi and tibia III, over lateral and ventral faces of tibiae I, II and IV, patella III with three prolateral, one retrolateral and few dorsal spines, patella IV one retrolateral spine only, patella I & II one or two prolateral spines, all femora carry dorsal spines. Claspers: (Fig. 9) metatarsus I dorsally reddish brown, bent downward at about 1/3 from proximal, ventrally flattened distally slightly bulging, ventral scopula on distal half of segment modified to dense group of short spiky bristles, tibia I not much widened, spur low, hook slightly inward curved long sharp and not flattened, notch very deep. Claws: all paired claws with well developed double rows of teeth, 3rd claw small, strongly curved. Palps: colour as described for legs, femora densely covered with black pubescence, dorsal distal four spines, no spines on palp patellae, tibia rake with three apical spines and a single sub-apical spine, cymbium with numerous short spines. Bulb: (Fig. 3–4) simple pyriform, ribs at embolus base, embolus gradually tapering, slightly sigmoid with a prolateral row of three minute teeth proximal of the embolus tip. Trichobothria: as in all known *Nemesia* species (see Decae, Cardoso & Selden 2007).

See Table 1 for measurements of other specimens examined.

Specimen	Nº	Sex	BL	CL	CW	Ca	Pa	L1	L2	L3	L4
NHMB-190		♀	15.2	5.5	4.1	3.4	8.1	12.5	10.9	10.9	16.5
NHMB-195		♀	14.4	4.6	3.7	2.9	6.5	10.0	9.1	8.8	13.7
NHMB-194		♀	16.2	5.3	4.5	3.4	8.2	12.0	11.5	11.3	17.0
NHMB-193		♀	13.3	4.3	3.3	2.8	6.2	9.6	8.7	8.3	13.3
Fage-1917a		♀	18.2	5.5	4.3	3.5	8.2	12.5	11.3	11.0	17.1
Fage-1917b		♀	17.4	6.1	4.8	3.9	8.9	13.8	12.6	12.1	18.9
NHMB-196		♂	11.3	3.9	3.1	2.4	5.3	10.8	10.2	9.7	13.5

Table 1. Measurements of other specimen examined.

Discussion

Although the colour patterns in Fage's 1917 material have faded, all specimens checked are morphologically largely homogeneous. The following variations were found in individual specimens: NHMB-190 colour pattern carapace somewhat less pronounced, abdomen more like Costa's (1835, Plate 1, fig 3) type illustration than neotype. NHMB-195 maculae very pronounced on external patellae, internal patella IV and basal segment PLS, vague maculae on retrolateral tibia IV, egg development visible, spermathecae well developed showing this small specimen (BL = 14.4) is adult female, fang ridge virtually smooth, sigilla on sternum not very distinct, labial sigilla present. NHMB-194: except for very vague maculae on PLS, no maculae are evident in this specimen, the posterior edge of the carapace is not concave. NHMB-193: this specimen has white spots all over the body probably caused by a severe fungus infection, the abdominal pattern thus appears weathered away, maculae are not evident on legs, but present on PLS, POP is broken between AME and other eyes (not seen in other specimens), egg development is visible and spermathecae are well developed and typical for the species (see Fig. 10), showing this small specimen (BL = 13.3) is an adult female.

Claims found in the literature (Fage 1917; Dalmas 1922; Frade & Bacelar 1932) that *N. meridionalis* Costa, 1835 is synonymous with *N. maculatipes* Doleschall in Ausserer, 1871 from Sardinia are dismissed after checking male *N. maculatipes* specimens recently collected in Sardinia. These specimens have finer ribs on the proximal embolus and the row of tiny denticles on the embolus is missing. Also, they differ in other characters (presence of cheliceral pubescence, prolateral patellar spines not reduced) from the Naples material. Comparison of new *N. meridionalis* material with the single female presumed holotype specimen of *N. cecconii* Kulczińsky, 1907, present in the collection of the Natural History Museum in Turin, did not clarify the possible synonymy of these species (see Fage 1917).

Maculae, more or less distinct, on legs and spinnerets are found in a number of otherwise different species, including *N. cecconii*, *N. meridionalis* and *N. maculatipes*, distributed widely in the western Mediterranean region (see Introduction). The revalidation of *N. meridionalis* Costa, 1835 is an important starting point for future studies on the Mediterranean *Nemesia* fauna in general and the Italian mainland fauna in particular.

Acknowledgements

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