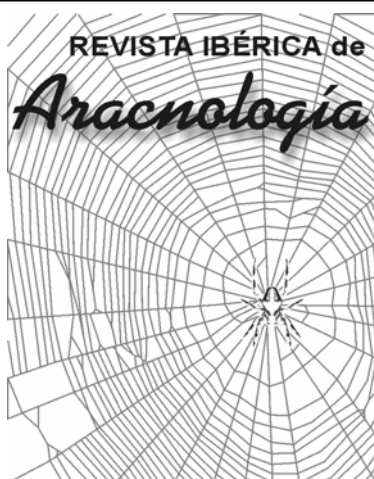




ARTÍCULO:

Taxonomic Review of the Portuguese Nemesiidae (Araneae, Mygalomorphae)

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ARTÍCULO:

Taxonomic Review of the Portuguese Nemesiidae (Araneae, Mygalomorphae)

Arthur Decae, Pedro Cardoso & Paul Selden

Abstract:

The occurrence of the trapdoor spider family Nemesiidae in Portugal is reviewed on the basis of recently collected material. The new sample of well over a hundred specimens (of which 97 were used for description) collected from locations throughout the country, contains six different species, five of which we classify in the genus *Nemesia*, and one species that we place in the recently erected genus *Iberesia*. Three species, *N. athiasi*, *N. fagei* and *N. uncinata*, could be recognised from descriptions in the literature although no type material was found. New information and figures of these species are provided. Two species, *N. bacelarae* sp. n. and *N. ungoliant* sp. n. are newly described and illustrated. A description of the female of *N. uncinata* and extended information on *Iberesia machadoi* are presented for the first time. The Portuguese species list is discussed and updated.

Key words: *Nemesia*, *Iberesia*, new species, systematic biology, biogeography, Portugal, Spain.

Revisión taxonómica de los Nemesiidae (Araneae, Mygalomorphae) portugueses

Resumen:

En este trabajo se presenta una revisión de los Nemesiidae de Portugal basada en recientes capturas. La muestra de estudio asciende a más de 100 ejemplares (de los cuales 97 fueron utilizados para las descripciones) procedentes de todo el país y está compuesta por seis especies diferentes: cinco representantes del género *Nemesia* y una especie perteneciente al género recientemente descrito *Iberesia*. Tres especies, *N. athiasi*, *N. fagei* y *N. uncinata* han podido ser identificadas a partir de las descripciones existentes en la literatura, aunque no se ha localizado el material tipo de las mismas. Presentamos nueva información e ilustraciones de estas especies. Se describen e ilustran dos nuevas especies: *N. bacelarae* sp. n. and *N. ungoliant* sp. n., se describe por primera vez la hembra de *N. uncinata*, y se proporciona extensa información sobre *I. machadoi*. Finalmente se comenta y actualiza la lista de las especies de Nemesiidae portugueses.

Palabras clave: *Nemesia*, *Iberesia*, especies nuevas, biología sistemática, biogeografía, Portugal, España.

Introduction

The trapdoor spiders of the family Nemesiidae collected in the course of a wildlife conservation study in Portugal (Cardoso 2004) proved difficult to identify at the species level. The problem arose from a lack of up to date taxonomic information in the literature and the unavailability of type material. Knowledge of Portuguese trapdoor spiders largely rests on the publications of Frade & Bacelar (1931) and Bacelar (1932, 1933a, 1933b), who worked at a time when modern key characters to distinguish species of European Nemesiidae (particularly the morphology of sexual organs and spinnerets) were not practically used (Decae & Cardoso 2005). Our enquiries and searches for the type material of *N. athiasi*, *N. gravieri*, *N. berlandi*, and

N. fagei were unsuccessful. Notwithstanding this drawback we could recognise most species from their original descriptions in the literature. Here, we present an update of the species list of Portuguese Nemesiidae (see Cardoso 2000a for an earlier version) with descriptions of two new species, *Nemesia bacelarae* sp. n. and *N. ungoliant* sp. n., and the first description of the female of *N. uncinata* Bacelar 1933a. We recognise the following six nemesiid species to occur in Portugal: *N. athiasi* Franganillo, 1920, *Nemesia bacelarae* sp. n., *N. fagei* Frade & Bacelar, 1931, *N. uncinata* Bacelar, 1933a, *N. ungoliant* sp. n. and *Iberesia machadoi* Decae & Cardoso, 2005. New information on all these species is provided.

Material

A total of 97 specimens were used for description in this study. The bulk of the material (66 specimens) was collected in a program using pitfall traps carried out by P. Cardoso and co-workers between 1997 and 2003 (see Decae & Cardoso 2005 for more detailed information). This sample contained primarily male spiders of four different species (*I. machadoi*, *N. bacelarae*, *N. ungoliant*, *N. uncinata*). Also included in this study were hand-collected specimens of *N. fagei*, from H. Buchli's 1961/1962 collections¹ (n = 15), *N. uncinata* females from P. Selden's 1996 collection (n = 4), *N. athiasi*, *N. ungoliant* and *I. machadoi* females from A. Decae's 1999 collection (n = 12).

Methods and Terminology

Methods used in collecting are described in Decae & Cardoso 2005. The methods of study follow Decae 2005 and Decae & Cardoso 2005. SEM photography was carried out by Cardoso at the Zoological Museum of the University of Copenhagen. Specimens chosen for SEM work were gradually transferred from 70% to 100% ethanol in 10% steps. They were then critical-point dried, coated in platinum and placed in appropriate stoppers for SEM.

ABBREVIATIONS. most terms and abbreviations used are standard in arachnological literature and/or are previously explained in Decae 2005 and Decae & Cardoso 2005. For convenience the following abbreviations are here given: BL = total body length measured from the apex of the chelicerae to the most caudal tip of the abdomen; CL = length carapace, CW = width carapace; SL = length sternum; SW = width sternum; LP = length palp; LL1 = length leg I; LL2 = length leg II; LL3 = length leg III; LL4 = length leg IV; AR = length anterior eye row; PR = length posterior eye row; EL = length eye-formation; Clyp = clypeus length measured in a

straight line from the anterior edge of the left ALE (anterior lateral eye) to the anterior edge of the carapace; POP = deep black periocular pigmentation; MTF4 ratio = relative lengths of metatarsus, tibia and femur of leg IV; PMS = posterior median spinnerets; PLS = posterior lateral spinnerets. MNHN = Museum National d' Histoire Naturelle, Paris; NMR = Natuurhistorisch Museum Rotterdam; ZMUC = Zoological Museum University Copenhagen.

QUALITATIVE CHARACTERS. traditional descriptions of *Nemesia* species have focused on colour and spine patterns, and descriptions of the eye formation. Such information is of descriptive value but is rarely sufficient for species diagnosis. Descriptions of the male palpal organ found in the literature are of diagnostic value although older information and figures are generally too superficial to make conclusive determinations possible.

Here, we give more detailed diagnostic information on the morphology of the sexual organs of both males and females and descriptions of the following qualitative characters that were found to be of diagnostic value: Crest zone, the colour pattern of the integument and the settings of setae on the crest of the caput were found to vary consistently between most species. Pubescence, the presence or absence and the colour of pubescent hair on the carapace, chelicerae and leg segments may be of important diagnostic value in Nemesiidae at the species level. POP, the pattern of the deep black pigmentation between and around the eyes has diagnostic value. Fovea, the shape of the fovea and in particular the presence or absence of a short central groove that runs perpendicular to the main recurved transversal groove of the fovea contains diagnostic information. Fang ridge, the ventral prolateral ridge on the fangs may be smooth, neatly serrated or irregularly broken (see Decae 2005 Figs. 2.6–2.8) in different species (and sometimes in different sexes of one species). Furrow teeth, the number of teeth and the position of the largest tooth on the prolateral edge of the cheliceral furrow is rather constant within species, and variable between species. In our descriptions we number the furrow teeth from distal to proximal (e.g. 'tooth 5 largest', in a row of six teeth means that the tooth most proximal but one is the largest in the row). Cuspules, the number, pattern and shape of the maxillary cuspules may vary between species. Spinneret morphology, (Figs. 38, 40, 42, 44, 46, 48) is an important diagnostic character in *Nemesia* species both to distinguish females and to relate conspecific males and females. PMS, are always reduced in *Nemesia* and always absent in *Iberesia* (see Decae & Cardoso 2005 Figs. 1-9 & 1-10), the shape of the PMS and the pattern of spigots however, are of important diagnostic value at the species level in *Nemesia*. PLS, the relative length of the basal segment (seen in ventral view) and the pattern of spigots on this segment are of diagnostic value. Maculae, the presence of dark pigmented blotches (maculae) on the external leg segments and/or on the external basal segment of the PLS (Fig. 38) is a conspicuous character that has had much attention in litera-

¹Buchli's collection contains two specimen of special interest. One is a female collected in 1937 by H. Mendez at Foz do Rio Mira. It is present with the remarkable 'burrow plug' which *N. fagei* constructs (see Frade & Bacelar 1931 and Bacelar 1933b). The other is a male collected by F. Frade in August 1935.

ture and has led to much confusion in *Nemesia* taxonomy. The presence or absence of maculae is of diagnostic value when used in combination with other characters. MTF4 ratio, the relative lengths of metatarsus, tibia and femur of leg IV are of diagnostic value and given here e.g. as $Me4 > Ti4$; $Ti4 = Fe4$ (metatarsus IV is longer than tibia IV, and tibia IV is as long as femur IV).

DISTRIBUTION OF SPECIES: Although our knowledge on species distribution in the Iberian Peninsula is rapidly growing, it is still far from complete. This is especially true for taxa, such as the Nemesiidae, that contain a large number of endemics that usually are very restricted in space (Melic 2001). A way of trying to overcome this impediment is to use ecological niche modelling. Using confirmed and georeferenced data on the one hand, and data on climatic variables in space on the other, it is possible to infer the potential distribution ranges of species. Most of the existing techniques try to determine the range of environmental variables in which the species is known to exist and extrapolate the known distribution to sites where the species has not actually been found, but where environmental conditions are similar to the ones found in the known area of distribution (e.g. Segurado & Araújo 2004, Elith et al. 2006). This bioclimatic envelope, when transferred to a spatial analysis tool, is reflected in a map with the potential distribution of the species. The potential distribution is a measure of adequacy of the area suitable to the species, taking the climatic variables into account. From all the options available, some require both presence and absence data and others rely on presence data alone. Given that absence data are usually very hard to obtain for spiders (and most invertebrates) our options are somewhat restricted. We have chosen to use the DOMAIN method (Carpenter et al. 1993) for a number of reasons: (1) it uses presence-only data; (2) it is one of the best methods overall, usually as efficient as more complex methods (e.g. Elith et al. 2006; Hernandez et al. 2006); (3) it is simple to use and moreover implemented in free GIS software (<http://www.diva-gis.org>); (4) its results are easily amenable to expert knowledge scrutiny. Expert knowledge is critical with automated methods, because these usually do not consider historical and biological factors, which may restrict the true distribution of the species to an area smaller than its potential distribution. Because we realise that our 'expert knowledge' of the species we discuss is necessarily incomplete we have chosen to present tentative modelling of the distributions of Portuguese nemesiids with likely extensions into Spain. To do so we have primarily relied on the DOMAIN results. The maps produced by this method are scaled, with probabilities of presence attributed to 1km^2 squares covering the entire Iberian Peninsula. We used a conservative approach, with the cut-off value being the maximum value for probability of occurrence that would connect all areas with known records (between 60% and 80% in all cases). We then proceeded to eliminate areas that were part of the predicted potential distribution but that contained no known records and that remained isolated, irrespective of their size. In this

way we have limited the potential distribution to an area that should be closer to the realised niche. To make our results amenable to future research the following detailed information is provided: we used 19 bioclimatic variables as provided by the Worldclim database (see Hijmans et al. 2005) derived from temperature and rainfall values, with a spatial resolution of about one square kilometre: annual mean temperature, mean monthly temperature range, isothermality, temperature seasonality, maximum temperature of warmest month, minimum temperature of coldest month, temperature annual range, mean temperature of wettest quarter, mean temperature of driest quarter, mean temperature of warmest quarter, mean temperature of coldest quarter, annual precipitation, precipitation of wettest month, precipitation of driest month, precipitation seasonality, precipitation of wettest quarter, precipitation of driest quarter, precipitation of warmest quarter, precipitation of coldest quarter. In the resultant modelling we claim only to visualise potential (not actual) distributions. Of course, any model is only as good as the data that it relies on, but we believe to have created distribution maps that approach reality better than maps showing only the few known localities for each species (Figs. 49–54).

Taxonomy

Nemesia athiasi Franganillo, 1920

Figs. 1, 2, 13, 14, 25, 26, 37, 38, 49

TYPES. *Nemesia athiasi* Franganillo, 1920: p. 140. Female, Portugal. Frade & Bacelar 1931: p. 237. Bacelar 1932: p. 18, 21. Roewer 1942: p. 179. Bonnet 1958: p. 3036. Melic 2001: p. 85. Cardoso 2000a: p. 20. **NEW SYNONYMY:** *N. gravieri* Frade & Bacelar 1931: 228, f. 12–13 (*Dm*). Bacelar 1932: p. 20. Schenkel 1938 p. 1–14: Perez de San Román and de Zárate 1947. Cardoso 2000a: p. 20. Cardoso 2000b: p. 35. Melic 2001: p. 77. **NEW SYNONYMY:** *N. meridionalis* Frade & Bacelar, 1931. (**MISIDENTIFICATION** in part, as reported from Portugal): p. 228–230. Bacelar 1932: p. 20. Bacelar 1933b: 292–293. Buchli 1969: p. 178, 191. Blasco 1985: p. 9. Blasco 1986: p. 345–346. Cardoso 1998. Cardoso 2000a: p. 20. Cardoso 2000b: p. 35.

DIAGNOSIS. Differs from most *Nemesia* species by the occurrence, absent in some males, of maculae (dark pigmented blotches) on the external surfaces of leg segments and the basal segment of the PLS (Fig. 38). This character is shared with the species of the *N. maculatipes*-group (Dca 2005, p. 166–167) that is distributed in Italy and on islands in the western Mediterranean. *N. athiasi*, however, differs from the *N. maculatipes*-group by having serrated fang ridges (smooth ridges in the *N. maculatipes*-group), short, straight spermathecae (Fig. 37), (long and twisted in the *N. maculatipes*-group), and a sub-apical serrated ridge on the embolus tip (Fig. 26), (absent in the *N. maculatipes*-group).

COMMENTS. We have not been able to find Fran-

ganillo's type material, nor the specimen studied by Frade & Bacelar that led them to conclude that *N. athiasi*, Franganillo, is insufficiently described and probably synonymous with *N. meridionalis* and/or *N. sanzoi* (Frade & Bacelar 1931 p. 237). Also, we did not find the type of *N. gravieri*, Frade & Bacelar 1931 that we regard synonymous with *N. athiasi*. We have indications (but no certainty) that all this material is lost. Our results and conclusions are based on recently collected spiders from various locations in Portugal in which we recognise the species from the texts of the original descriptions of *N. athiasi* Franganillo, 1920 and *N. gravieri* Frade & Bacelar, 1931.

DESCRIPTION. MALES (N = 14)

MEASUREMENTS (mm): BL=11.2–14.9, CL=4.5–5.9, CW=3.7–4.9, SL=2.4–2.8 SW=1.9–2.3 LP=6.1–7.2, LL1=16.1–17.8, LL2=15.9–17.5, LL3=15.7–17.6, LL4=20.6–22.8.

PATELLAR SPINE FORMULAE

PSPvar (n=14) [p=0 (1–2); I=0 (1–2); II=1(2–3); III=1(0–2–3); IV=2(1–3)]

RSPvar (n=14) [p=0–1; I=0–1–2; II=1–2–3; III=2 (1–3); IV=3 (1–2–3–4–6)]

QUALITATIVE CHARACTERS

General appearance medium sized *Nemesia* species with a distinct colour pattern on the carapace (Fig. 1), maculae might be vague or absent. Pubescence black on slopes of caput, white in narrow longitudinal zones on the basal segments of the chelicerae. Crest zone wide yellowish brown tapering towards the fovea, crest setae in one well developed though somewhat irregular row, flanked on either side by rows of smaller setae. Caput low (Fig. 13). POP dark black connecting all eyes. Fovea usually (7 out of 9 specimens) without a central groove. Fang ridge serrated (rarely smooth: 1 out of 14 specimens). Furrow teeth six (no. 5 is largest, no. 1 smallest). Cuspules usually 4 to 6 in mostly irregular rows, total range observed 0–7. Spinnerets as in female. Maculae clearly present on legs and basal segment of PLS in 8 out of 19 observed specimens, less clear or even absent in the other 11 specimens. MTF4 ratio $Me4 \geq Ti4 > Fe4$.

FEMALES (n = 6)

MEASUREMENTS (mm)

BL=13.3–20.0, CL=4.6–7.1, CW=3.7–5.9, SL=3.1–4.3, SW=2.8–3.5, LP=6.7–11.7, LL1=10.6–18.6, LL2=9.4–17.0, LL3=9.2–16.2, LL4=14.6–23.8.

PATELLAR SPINE FORMULAE:

PSPvar (n=5) [p=0; I=0; II=0 (1); III=0 (1); IV=2(1–3)]

RSPvar (n=5) [p=0 (1); I=0 (1–2); II=0 (1–2); III=2; IV=2 (1)]

QUALITATIVE CHARACTERS

General appearance (Fig. 2) as given for males, but maculae always present (Fig. 38). Pubescence locally dense on carapace, black radiating from the fovea. Crest zone wide, distinct in colour, tapering towards the fovea, single row of crest-setae. Caput elevated (Fig. 14). POP connecting all eyes. Fovea without central longitudinal groove. Fang ridge serrated. Furrow teeth usually six (7

and 8 in two specimens). Cuspules club-shaped 4 tot 14 in irregular row, or double rows. Spermathecae (Fig. 37). Spinnerets (Fig. 38). PMS reduced, somewhat cone-shaped. PLS spigots restricted to the ventral distal half, length proximal segment $\geq$ median + distal segment. Maculae present on the legs, not always distinct on the spinnerets. MTF4-ratio $Ti4 > Fe4 > Me$.

DISTRIBUTION (Fig. 49). Table 1. Summarises all currently recorded collection sites for *N. athiasi*. The species is distributed in north-eastern, western and southern Portugal. Dots in Fig. 49 indicate locations where *N. athiasi* was collected. On grounds of the method we used for range estimation (Carpenter et al. 1993) the species is expected to be distributed towards the east into Castilla y León and Andalusia, Spain.

NATURAL HISTORY AND NEST TYPE. A population of *N. athiasi* was found near Porto de Mós (N39°36.140, W008°49.046) at the entrance of the Parque Natural das Serras de Aire e Candeeiros by Decae on 17 July 1999. The burrows are dug in pockets in limestone outcrops on a *garigue* covered slope at the edge of a forest. Locally, burrows occur close together, with trapdoors of adult spiders less than 10 cm apart: in other places burrows occur more isolated. All burrows had branching tubes (e.g. see Moggridge 1874p. 214, Plate XVII) with two surface openings. Each entrance is closed off by a dorsally (highest part of the burrow rim) hinged trapdoor, both of approximately similar size and shape. The typical 'wafer-type' trapdoors that Moggridge described for some *Nemesia* species in southern France are flexible silken constructs. The wafer-door of *N. athiasi* is stiffer. Adult females have trapdoors with diameters ranging from 13 mm to 17 mm, the corresponding entrance openings are between 7mm and 8.5mm. In July the spiders are probably in aestivation because the trapdoors are sealed with silk from the inside. No egg-sacs or juvenile spiders were found in the burrows of adults. The branching burrow shafts meet at a depth of approx. 5 cm behind the trapdoors. Here they converge into a single shaft that extends to 15–25 cm into the ground. The upper 2/3 of the burrow shaft, including both entrance tunnels, is lined with thin silk that extends upward into the burrow rim, the hinge and the under covering of the trapdoors. The deepest parts of the burrows are apparently not lined with silk. In some burrows remains of prey were found. Analysis of remains shows ants, beetles and woodlice being regular prey of *N. athiasi*. Wandering males were collected between August 13th and November 28th.

Nemesia bacelarae sp. n.

Figs. 3, 4, 15, 16, 27, 28, 39, 40, 50

TYPES. Male holotype: leg. P. Cardoso, nr. PMC0522A coll. 05 September 2001, deposited at the MNHN Paris no. AR14324. Female paratype: leg. P. Cardoso, nr. BAP06 coll. 23 April 2002, deposited at the MNHN Paris no. AR14325. Other paratypes (5 males and 1

female) included in the type collection are deposited in the NMR under the numbers: 9972.4042 - 9972.4047, and six males and one female are deposited in the ZMUC (under collection numbers yet to be appointed).

TYPE LOCALITY. Bruçó, Tras-os-Montes, Portugal (N41°15.253, W006°43.542). A reforestation area planted with *Pseudotsuga menziesii*.

ETYMOLOGY. Named in honour of Amélia Bacelar who laid the basis for our knowledge of the trapdoor spider fauna of Portugal.

DIAGNOSIS. Differs from all known *Nemesia* species by the 'fish-hook' tooth on the embolus (Fig. 28). Females differ from all *Nemesia* species by the spermathecae with a wide proximal part, narrow median part that bends toward ventral, to connect with the globular distal part (Fig. 39).

DESCRIPTION. MALE holotype.

MEASUREMENTS (mm) BL=11.9, CL=5.0, CW=3.9, SL=2.6, SW=2.1, LP=6.3, LL1=14.8, LL2=13.5, LL3=12.6, LL4=17.6.

PATELLAR SPINE FORMULAE:

PSP [p=1-1; I=1-2; II= 2-2; III= 2-2; IV= 2-2]

RSP [p=0-0; I=0-0; II= 0-0; III= 1-1; IV= 1-1]

Dorsal habitus (Fig. 3). **Carapace** light brown, anterior and lateral caput greyish brown, lateral caput speckled and blotched with irregular light brown dots, pubescence greyish covering the whole carapace, crest setae only in anterior half of the crest zone, fringe-, and thorax setae present but not very strongly. **Clypeus** darkest part of caput, length equals approx. diameter ALE, 9 marginal setae in two sets of different strength. **Caput** low, narrow in front (Figs. 3 and 15). **Eye-group** rectangular almost twice as wide as long, AR/EL = 1.8, AR/PR = 1.0, ALE largest ALE/PLE = 1.1, AME less than one diameter apart, **POP** dark shiny black connecting all eyes. **Fovea**: smoothly recurved, central groove absent. **Chelicerae** light brown, not contrasting with the colour of the carapace, lateral longitudinal zones with short setae and whitish pubescence, seven furrow-teeth, rastellum not very strong, fang-keel serrated. **Maxillae** colour as sternum, distal process small and rounded, six maxillary cuspules in irregular rows on either side. **Sternum** light yellowish brown, setae cover even, but absent from three small central areas, edge setae longer and stronger than those more centrally placed, anterior sigilla difficult to observe, centrals round touching sternum edge, posteriors egg-shaped and less than their longest diameter from the sternum edge. **Labium** light colour not contrasting with sternum, labial furrow shallow. **Legs and palps** dorsal colour as carapace, ventral as sternum, no pattern, dorsal femora with dense black pubescence (most prominent in legs III and IV), spine patterns no external spines on first three appendages, trichobothria patterns as typical for the genus, scopulae very light and not extending on the tibia, paired claws with well developed double rows of denticles. **Abdomen** evenly covered with fine hairs and bristles, dorsal light

greyish yellow with slightly darker anterior setae field, vague cardiac line and two indistinct chevrons just above the spinnerets, ventral uniform light yellow. **Spinnerets** similar colour as ventral abdomen, **PMS** reduced club-shaped, **PLS** basal segment and median segments approx. equal length, distal segment shorter with well developed apical spigot field. **Clasper hook** somewhat flattened, smoothly bent towards prolateral. **Clasper field** on slightly bulging integument just proximal of ventral middle metatarsus, and placed towards prolateral. **Bulb** with clear fishhook embolus. **MTF4 ratio** $Ti4 \geq Me4$, $Me4 = Fe4$.

FEMALE paratype

MEASUREMENTS (mm)

BL=17.2, CL=6.1, CW=4.6, SL=3.2, SW=2.5, LP=9.0, LL1=13.7, LL2=12.5, LL3=11.9, LL4=18.7.

PATELLAR SPINE FORMULAE:

PSP [p=0-0; I=0-0; II= 0-0; III= 2-2; IV= 0-0]

RSP [p=0-0; I=0-0; II= 0-0; III= 0-0; IV= 0-0]

Dorsal habitus (Fig. 4). **Carapace** different shades of brown without a clear pattern, darkest on the lower and posterior lateral caput, around the fovea and in two narrow lines along the implant on the chelicerae, crest zone lighter brown, crest setae in one row with parallel groups of finer setae on either side, fringe setae indistinct, back pubescence in and along the cervical furrows, white pubescence in the lower crest zone. **Clypeus** length approx. equal to diameter of ALE, short row of 5 strong forward curved marginal setae. **Ocular process** anterior rounded with small group of backward curved setae. **Caput** slightly elevated (Fig. 16), abruptly narrowing towards fovea (Fig. 4). **Eye group** rectangular, AR/PR= 1.0, more than twice as wide as long, PR/EL= 2.2, ALE largest, ALE/PLE = 1.3, AME one their diameter apart. **POP** broken between AME and between AME and the lateral eyes. **Fovea** lightly recurved without central groove. **Chelicerae** darker brown, contrasting with the colour of the carapace, crest of the basal segment lighter brown, a narrow lighter zone with white pubescence longitudinally on flanks, eight furrow teeth all strongly developed and closely set, rastellum triangular fields of strong rigid spikes directly bordering the fang implant. **Fang ridge** irregularly serrated. **Maxillae** with small anterior distal process, cuspules club shaped, placed in rows. **Sternum** yellowish brown, darker along the edges, dense cover of black setae along the edges and in the lateral zones, less dense in the central parts. Sigilla well defined anterior and median pair round, posterior pair oval. **Labium** twice as wide as long, labial furrow glabrous, wide, gently sloping. **Legs and palps** ventral coxae shading in colour from warm orange-yellow on the maxillae to pale creamy yellow on coxae IV. Legs generally coloured as carapace, ventral and lateral femora lighter creamy yellow, spines most numerous and with strongest development on metatarsi III and IV and lateral spines on Tibia IV, trichobothria patterns as typical for the genus², scopula dense on palp tarsus, tarsi and metatarsi I and II, more lightly extending on distal palp tibia and prolateral tibiae I and II.

Abdomen evenly covered with fine hairs and bristles, uniform grey dorsally, brownish ventrally. Spermathecae (Fig. 39) as described in diagnosis. Spinnerets (Fig. 40). PMS cone shaped with a narrow top, PLS basal segment longer than median + distal segment together, maculae absent. MTF4 ratio $Ti4 > Fe4 > Me4$.

VARIATION.

MALES (n = 12)

MEASUREMENTS (mm):

BL=11.0–13.0, CL=3.9–5.4, CW=3.0–4.2, SL=2.1–3.2, SW=1.7–2.2, LP=5.7–6.7, LL1=13.0–16.1, LL2=12.0–14.8, LL3=11.3–14.2, LL4=17.0–20.2.

PATELLAR SPINE FORMULAE:

PSPvar [p=2–1; I=2 (0–1); II=2(1); III=2(1–3); IV=2(0–3)]

RSPvar [p=0; I=0; II=0 (1); III=1 (2); IV=1 (0–3)]

FEMALES (n = 3)

MEASUREMENTS (mm):

BL=16.5–17.9, CL=5.7–6.3, CW=4.5–4.8, SL=3.2–3.5, SW=2.5–2.6, LP=9.0–9.4, LL1=13.7–13.9, LL2=12.5–13.0, LL3=11.9–12.5, LL4=18.7–19.1.

PATELLAR SPINE FORMULAE

PSPvar [p=0; I=0; II=0 (1); III=2; IV=0]

RSPvar [p=0; I=0; II=0; III=0; IV=0]

DISTRIBUTION (Fig. 50), Table 1. Summarises all currently recorded collection sites for *N. bacelarae*. The species is distributed in north-eastern, central western Portugal. Dots in Fig. 50 indicate sites where *N. bacelarae* was collected. The method we used for range estimation (Carpenter et al. 1993) expects the species also to be found in southern Portugal and in Castilla y León, Spain.

NATURAL HISTORY AND NEST TYPE. All specimens known were collected in pitfall traps; hence no information on the burrow of *N. bacelarae* is presently available. The species was collected in various habitat types ranging from natural Oak forests to cultured plantations of *Eucalyptus spec.*, and from maquis type of bush land to reforestation areas. Wandering males were collected between September 5th and November 5th.

Nemesia fagei Frade & Bacelar, 1931

Figs. 5, 6, 17, 18, 29, 30, 41, 42, 51

TYPES. *Nemesia fagei* Frade & Bacelar, 1931 (Dmf); Bacelar 1933b: 291–292; 1937: 1571–1576, f. 3–4 (Dm); Wiehle 1960: 459, f. 2 (m); Blasco 1986: 346, f. 1A (f). Cardoso 2000a: p20.

DIAGNOSIS. Males differ from all known *Nemesia* species by the shape of the embolus being regularly curved,

and pointed under low magnification Fig. (29) and slightly scooped and twisted under high magnification Fig. (30). Females are distinguished by the concentration of glandular tissue in the proximal part of the spermathecae extending into a collar that connects the proximal part of the spermathecae with the distal part (Fig. 41). It is the only species known to construct a curious ‘bullet-shaped’ burrow plug (Frade & Bacelar 1931; Bacelar 1933b).

COMMENTS. All specimens studied are from Buchli’s collection that is housed in the MNHN in Paris. Most of the specimens were apparently hand collected as juveniles by Buchli in 1961 and 1962 and raised to adulthood in his laboratory.

DESCRIPTION. MALES (n = 4)

MEASUREMENTS (mm): BL=7.0–11.0, CL=2.8–4.3, CW=2.1–3.1, SL=1.6–2.2, SW=1.2–1.7, LP=4.1–6.1, LL1=8.1–12.8, LL2=6.9–11.2, LL3=6.6–10.5, LL4=9.9–15.1

PATELLAR SPINE FORMULAE

PSPvar [p=0; I=0; II=1(2); III=1(0); IV=3(0–2)]

RSPvar [p=0; I=1(0); II=1(0); III=0³; IV=1]

QUALITATIVE CHARACTERS:

General appearance small, light coloured⁴ *Nemesia* with dark line around the carapace and dark dorsal pattern on the abdomen (Fig. 5). Caput low (Fig. 17). Pubescence absent (very thin in 1 specimen in 4). Crest zone single row of strong central setae flanked by rows of fine bristles. POP connecting all eyes. Fovea central groove generally absent (present in 1 specimen in 4). Fang ridge serrated (smooth in 1 specimen in 4). Furrow teeth six. Cuspules absent. PMS and PLS as described for female. Maculae absent. MTF4 ratio $Ti4 > Me4$, $Me4 = Fe4$.

FEMALES (n = 13)

MEASUREMENTS (mm): BL=11.5–17.2, CL=3.7–5.2, CW=2.8–4.1, SL=2.1–3.0, SW=1.5–2.3, LP=5.1–8.0, LL1=7.9–11.9, LL2=6.8–10.7, LL3=6.0–10.1, LL4=11.2–14.9]

PATELLAR SPINE FORMULAE

PSPvar [p=0; I=0; II=0; III=0; IV=0(1–3)]

RSPvar [p=0(1); I=0; II=0(1); III=0; IV=0]

General appearance as described for males (Fig. 6). Pubescence absent. Crest zone slightly darker in colour than surrounding integument. Caput slightly elevated (Fig. 18). POP usually broken between the AME and the other eyes. Fovea central groove generally absent (present in 1 specimen out of 13). Fang ridge serrated. Furrow teeth six. Cuspules 3 to 5 in rows (rarely 1 or 2). Spermathecae (Fig. 41). Spinnerets (Fig. 42). PMS reduced digitiform. PLS spigots on the ventral basal segment restricted to the distal half. Maculae absent. MTF4 ratio $Ti4 > Fe4 > Me4$.

²In approx. forty species of *Nemesia* and *Iberesia* examined the patterns of trichobothria were found to be constant. On the tarsi a central dorsal zigzag line, on the metatarsi a compact distal group followed by an almost straight line, on the tibia two, towards proximal, diverging lines. Distal bothria in all groups and lines longest, proximals shortest

³Groups of short strong spines on this segment, no singular spines.

⁴The fact that the specimens used in this description have been preserved for over 40 years in alcohol might have had an effect on their colour.

DISTRIBUTION (Fig. 51). Table 1. Summarises all currently recorded collection sites for *N. fagei*. To date, the species has only been found in coastal Alentejo and the Algarve. On the basis of the method we used for range estimation it is expected to be found in coastal south-western Spain unless the Guadiana River proves to be a barrier to its dispersal.

NATURAL HISTORY AND NEST TYPE. Details of the remarkable habits and nest-type of this species, as well as other information on its natural history, are given in Frade & Bacelar (1931) and Bacelar (1933b, 1937). We have no reliable information on the season that the males of *N. fagei* emerge and wander in search of females. The males in Buchli's collection were reared in captivity and emerged in March and in May. One field record of a male of *N. fagei* was taken in August 1935.

***Nemesia uncinata* Bacelar, 1933**

Figs. 7, 8, 19, 20, 31, 32, 43, 44, 52

TYPES. *N. uncinata* Bacelar, 1933a: 285–287, f. 1–3 (Dm). Bonnet 1958: p. 3043. Jerardino et. al. 1988: p. 358. Jerardino et. al. 1991: p. 145. Cardoso 2000a: p. 20. Cardoso 2000b: p. 35. Melic 2001: p. 77.

DIAGNOSIS. differs from all other *Nemesia* species by the grossly enlarged bulb with short ornamented embolus (Figs. 31–32) and the simple dome shaped spermathecae (Fig. 43).

COMMENTS. *N. uncinata* was described by Bacelar (1933 p. 287) as the possible male of *N. hispanica*. Although the male of *N. hispanica* remains unknown it is clear that *N. uncinata* is a separate species.

DESCRIPTION. MALES (n = 2)

MEASUREMENTS (mm) BL= 14.8, CL=6.6, CW=1.3.

PATELLAR SPINE FORMULAE

PSPvar [p=1; I=2; II=2; III=3; IV=3]

RSPvar [p=0; I=1; II=1; III=1(0); IV=1]

General appearance medium to large sized *Nemesia* of an overall slender and brownish appearance, with bands of silvery pubescence on the chelicerae and the anterior carapace, and black pubescence on the central carapace (Fig. 7). Carapace with narrow purplish fringe line. **Caput** low (Fig. 19). **Chelicerae** contrast in colour with carapace. **Dorsal femora** with dense black pubescence and numerous spines on tibiae and metatarsi of all legs. **POP** connecting all eyes. **Fovea** crescent shape, central groove absent. **Fang ridge** smooth. **Cuspules** absent. **Spinnerets** as in female. **Maculae** absent. **MTF4 ratio** Ti4>Me4, Me4=Fe4.

FEMALE REFERENCE SPECIMEN

nr. 22/08/96-2, Praia da Oura, Albufeira, Algarve (N37°05.273, W008°13.477) leg. P. Selden.

MEASUREMENTS (mm) BL=20.5, CL=7.7, CW=5.9, SL=4.1, SW=3.1, LP=11.7, LL1=18.0, LL2=17.0,

LL3=16.2, LL4=23.5.

PSP [p=2–2; I=2–2; II=2–2; III=2–2; IV=0–0]

RSP[p=0–0; I=0–0; II=0–0; III=0–0; IV=0–0]

General appearance the adult female is a medium-sized *Nemesia* of an overall slender shape and brownish colour with conspicuous silvery pubescence on the chelicerae and the anterior carapace, the warm brown chelicerae contrast in colour with the yellowish carapace (Fig. 8). **Carapace** yellowish brown with narrow purplish fringe line, anterior carapace darkest with two lighter patches on either side lateral of the eye group, dense silvery pubescence, caput-thorax junctions rich reddish brown. **Caput** elevated (Fig. 20). **Ocular process** steep in front. **Eye group** posterior row longer than anterior row (AR/PR = 0.93), width > length (PR/HE = 2.19), AME one diameter apart, diameter ALE = PLE. **POP** broken between ALE-PLE and between ALE-AME. **Chelicerae** dark reddish brown with longitudinal zones of brilliant white pubescence, colour contrasts with that of carapace. **Fangs**: long, slender, sharp with a smooth keel. **Rastellum** compact group of strong teeth on a small rastellar process. **Abdomen** dorsal, central zone, creamy white with a complex pattern of dark pigmentation, lateral and ventral zones greyish. Fine setae with undercover of fine hair. **Ventral prosoma** yellow, brownish around the edges. **Sternum** with evenly distributed setae, posterior sigilla 'egg-shaped'. **Labium** slightly darker than sternum, labial furrow comparatively narrow. **Maxillae** five strong somewhat spiky cuspules in irregular rows. **Legs and palps** uniform brown except for the dark dorsal zone and the white pubescence on all femora. **Spermathecae** (Fig. 43). **Spinnerets** (Fig. 44), **PMS** vestigial digitiform. **PLS** basal segment longer than medium and distal segment together, spigots on proximal segment in a triangular field, colour slightly lighter than ventral abdomen.

VARIATION.

FEMALES (n = 4)

MEASUREMENTS (mm):

BL=20.5–23.2, CL=7.7–8.6, CW=5.9–6.6, SL=4.1–4.5, SW=3.1–3.5, LP=11.7–12.5, LL1=18.0–19.4, LL2=17.0–18.4, LL3=16.2–17.5, LL4=23.5–26.6.

PATELLAR SPINE FORMULAE

PSPvar [p=2; I=2; II=2; III=2; IV=0]

RSPvar [p=0; I=0; II=0; III=0; IV=0]

DISTRIBUTION (Fig. 52). All currently recorded collection sites for *N. uncinata* are given in Table 1 and are indicated as dots in Fig. 52. The estimated distribution range (dark zones in Fig. 52) is restricted to the Algarve.

NATURAL HISTORY. We have no information about the structure of burrow of this species. The species is apparently not uncommon in the far south of Portugal, though very limited in its distribution. The males wander in autumn. Two males were collected in pitfall traps in a *Eucalyptus* plantation in the first week of October. A third male (not included in our description) was col-

lected by S. Huber during heavy rain in the last week of October 2006 near Alte in the Algarve.

***Nemesia ungoliant* sp. n.**

Figs. 9, 10, 21, 22, 33, 34, 45, 46, 53

TYPES. Male holotype: leg. P. Cardoso, nr 5004-1 collected 24 Sept. 2002, deposited at the MNHN Paris Nr. AR14327; FEMALE PARATYPE: leg. P. Cardoso, nr. 5003-2 collected 24 Sept 2002, deposited at the MNHN Paris Nr. AR14328. Other paratypes (11 males and 2 females) included in the type collection are deposited in the NMR under the numbers: 9972.4029–9972.4034, and seven males are deposited in the ZMUC (under collection numbers yet to be appointed).

TYPE LOCALITY. Barrenta (N39°34.316, W008°45.686) *Eucalyptus* plantation.

ETYMOLOGY. Named after Tolkien's mythical spider acting in "Silmarillion" and other writings.

DIAGNOSIS. The dark, shiny appearance, the lack of pubescent hair on the carapace, the double row of crest setae, and the high elevation of the caput in females, *N. ungoliant* resembles the species grouped in the 'sub-genus' *Haplonemesia* (Simon 1914). It differs from the *Haplonemesia* in lacking the diagnostic palpal spine pattern of this group, the much smaller size of the adult spiders, the morphology of the spermathecae which are straight (compare Fig. 45 with Blasco, 1986 p.346 Fig. 1c) instead of bent and the embolus being slightly hooked instead of smoothly curved (compare Fig. 33 with Frade & Bacelar 1931p.223 Figs. 1-2)

DESCRIPTION. MALE holotype.

MEASUREMENTS (mm) BL=10.4, CL=4.2, CW=3.4, SL=2.2, SW=1.7, LP=5.5, LL1=12.6, LL2=12.4, LL3=12.2, LL4=16.4.

PATELLAR SPINE FORMULAE:

PSP [p=1-1; I=1-1; II= 2-2; III= 2-2; IV= 1-1]

RSP [p=0-0; I=0-0; II= 0-0; III= 1-1; IV= 1-1]

Dorsal habitus (Fig. 9). **Carapace** colour almost uniform brown, with slighter darker areas around the eyes and the fovea, pubescence absent, crest setae in irregular central longitudinal group setae of different strength flanked on either side by a sub-row of thinner setae, fringe setae. **Clypeus** shorter than one diameter of ALE with five equal-sized edge setae. Fringe setae and thorax setae strongly developed. **Caput** slightly elevated (Fig. 21). **Eye group** trapezium with AR as shortest parallel side (AR/PR=0.9), width > 2x height (AR/EL=2.3), ALE largest (ALE/PLE=1.4), AME's less than their diameter apart. **POP** dark black, connecting all eyes. **Ocular process** low and sloping both in front and behind. **Fovea** sickle shaped recurved, central groove absent. **Chelicerae** basal segment uniform brown, not contrasting with colour of carapace, lateral lines indistinct, seven furrow teeth, fang-keel serrated. **Maxillae** distal process very small, cuspules, three on either side, in

short rows and pointed in shape. **Sternum** colour uniform yellowish brown, same colour as ventral coxae and maxillae, uniform setae cover, anterior and median sigilla round, posterior sigilla oval, distanced about their longest diameter from the sternum edge. **Labium** colour slightly darker than sternum, labial furrow shallow, wide, glabrous. **Legs and palps** brown with greyish longitudinal dorsal zones and black pubescence dorsally and laterally on the femora, spines on all segments including the ventral tarsi, trichobothria patterns as typical for the genus, scopula thin, all paired claws with double combs, maculae absent. **Abdomen** dorsally dark colour, ventrally lighter, dense group recurved setae in anterior dorsal group, no clear colour pattern. **Spinnerets** similar colour as ventral abdomen. **PMS** club-shaped, reduced. **PLS** basal segment longer than median + distal segment, maculae absent. **Clasper hook** strong and inwardly curved, clasper field restricted to central ventral metatarsus. **MTF4 ratio** Me4<Ti4, Ti4=Fe4.

FEMALE Paratype

MEASUREMENTS (mm) BL=20.0, CL=6.1, CW=4.8, SL=3.5, SW=2.8, LP=8.0, LL1=11.1, LL2=10.6, LL3=10.8, LL4=17.3.

PATELLAR SPINE FORMULAE

PSP [p=0-0; I=0-0; II= 0-0; III= 2-2; IV= 0-0]

RSP [p=0-0; I=0-0; II= 0-0; III= 0-0; IV= 0-0]

Dorsal habitus (Fig. 10). **Carapace** greyish brown on the flanks of the caput and central thorax, lateral thorax lighter yellowish brown, warm reddish brown along the caput-thorax junction, distinct light coloured patches on either side of the eye formation, crest zone orange brown, wide slightly narrowing towards the fovea, crest setae in well developed double row flanked on either side by a sub-row of thinner setae, fringe setae absent, pubescence absent. Clypeus half the length of the eye-formation (measured from the base of ALE), six edge setae. **Caput** strongly elevated (Fig. 22).

Eye group rectangular, AR/PR=1.0, slightly more than twice as wide as long, PR/EL=2.1, ALE largest ALE/PLE= 1.3, AME one diameter apart. **POP** concentrated around the AME and behind the ALE and PLE, all anterior eyes greyish, all posterior eyes pearly. **Ocular process** steep in front sloping behind furnished with strong setae. **Fovea** wide, regular sickle-shaped, central longitudinal groove absent. **Chelicerae** basal segment almost uniform brown shading to a somewhat lighter brown ventrally, dorsally contrasting in colour with legs and carapace, lateral longitudinal zones indistinct, seven furrow teeth. **Fang ridge** serrated. **Maxillae** with small anterior distal process, five club shaped cuspules in irregular rows. **Sternum** uniform yellowish brown, evenly covered with black setae, anterior and median sigilla round, posterior sigilla oval, distanced about their longest diameter from the sternum edge. **Labium** slightly darker in colour than sternum and separated by a wide shallow furrow. **Legs and palps**: dorsal anterior appendages slightly darker brown than legs III and IV, all appendages uniform colour with the exception of the lateral and ventral femora and the ventral coxae IV that are

lighter coloured, no lateral spines on external tibiae and metatarsi I & II, trichobothria as typical for the genus, scopula on palp-tarsi and tarsi and metatarsi I and II, only slightly extended on distal prolateral tibiae, combs on paired claws III and IV reduced, maculae absent. Abdomen greyish yellow with vague dorsal pattern of darker chevrons and irregular blotches. Spermathecae (Fig. 45) as described in diagnosis. Spinnerets (Fig. 46). PMS reduced, cone-shaped with one or two spigots at the apex. PLS basal segment with few small spigots in distal half, more than twice as long as median + distal segments, no clear maculae, but some separate irregular darker pigmented blotches present. MTF4 ratio $Me4 < Ti4$, $Ti4 = Fe4$.

VARIATION.

MALES (n = 17)

MEASUREMENTS (mm) BL=8.2–14.5, CL=3.7–5.0, CW=3.3–4.2, SL=2.0–3.2, SW=1.7–2.1, LP=5.2–7.0, LL1=11.7–15.0, LL2=11.2–14.2, LL3=10.6–13.7, LL4=15.5–18.5.

PATELLAR SPINE FORMULAE

PSPvar [p=1(0); I=1(0–2); II=2(1–3); III=2(1–3); IV=2(1–3)]

RSPvar [p=0; I=0; II=0(1–2); III=1 (2); IV=1(2–3)]

FEMALES (n = 5)

MEASUREMENTS (mm) BL=17.7–20.9, CL=5.3–6.4, CW=4.4–5.2, SL=3.1–3.5, SW=2.4–2.8, LP=7.8–8.0, LL1=11.1–11.2, LL2=10.4–10.6, LL3=10.4–10.8, LL4=15.9–17.3.

PATELLAR SPINE FORMULAE

PSPvar [p=0; I=0; II=0; III=2(0–3); IV=0(1–2)]

RSPvar [p=0; I=0; II=0 (1); III=0(2); IV=0]

DISTRIBUTION (Fig. 53). Table 1 Summarises all currently recorded collection sites of *N. ungoliant*. The distribution range of *N. ungoliant*, central and northern Portugal seems to overlap largely with *N. bacelarae*. Both species are as yet not reported from locations out side Portugal. The distribution presented in Fig. 53 is an estimation based on ecological niche modelling; the dots indicate actual collection sites of *N. ungoliant*.

NATURAL HISTORY AND NEST TYPE. The majority of our specimens were collected in forested areas, both natural and planted. At present we have no information on the nest of *N. ungoliant*. Wandering males were collected in late summer and early autumn, between August 28th and October 31st.

Iberesia machadoi Decae & Cardoso, 2005

Figs. 11, 12, 23, 24, 35, 36, 47, 48, 54

Decae & Cardoso (2005): 5–8, f. 1–4, 6–7, 9, 12, 15 (Dmf).

DESCRIPTION. General appearance (Figs. 11–12) large, robustly built Nemesiidae missing the PMS (Fig. 48). Males with typical dark caput (Fig. 23), BL= 16.7–18.2;

CL= 6.7–8.2. Females with strongly elevated caput (Fig. 24), BL= 19.9–29.1; CL=6.5–10.0.

COMMENTS. This species was recently described. The figures and information on the natural history of *I. machadoi* presented here complete the comparative overview of all the Portuguese nemesiids currently known and make the paper suitable to be used as a general, though maybe incomplete, identification guide for Portuguese Nemesiidae.

DISTRIBUTION (FIG. 54). Table 1 Summarises all currently recorded collection sites for *N. machadoi*. The species has a wide distribution in Portugal and seems only to be absent from the northern-most parts of the country. The method that was used for range estimation indicates that the distribution of *I. machadoi* may extend into Andalusia, southern Spain. Dots in Fig. 54 indicate actual collections sites of *I. machadoi*.

NATURAL HISTORY AND NEST TYPE. *I. machadoi* constructs a classical cork-type burrow (Moggridge 1873, Plates VII and VIII) of approx. 20 cm deep which is often dug in exposed patches of soil (road and creek banks, bare ground along railway tracks and on hill slopes). The species occurs in a variety of habitat types that range from shady woodlands to dry *garigue* and from public parks to olive yards. Egg-sacs are produced in summer when the spiders aestivate closing their burrow with a thick clay plug just under the trapdoor. Wandering males were collected in autumn, between October 17th and November 19th.

Key to Portuguese Nemesiidae species based on the morphology of genital structures

MALES

1. Proximal bulb enlarged, very wide and bulbous, distal bulb very strong with short embolus, tip of embolus sharply bent and 'gouge shaped' with a strong triangular side tooth (Figs. 31–32) *N. uncinata*
2. Embolus broad, abruptly tapering near the tip and sharply bent convex side with a small but conspicuous 'serrated ridge' (Figs. 25–26) ... *N. athiasi*
3. Distal embolus elongated and slightly sigmoid with a distinct 'fish-hook' proximal on the embolus tip (Figs. 27–28) *N. bacelarae*
4. Embolus slightly hooked with a smooth, 'curled-up' ridge near the embolus tip (Figs. 33–34) *N. ungoliant*
5. Embolus regularly curved, 'claw-shaped' with a slightly twisted tip (Figs. 29–30) *N. fagei*
6. Embolus long, somewhat irregularly curved, ending in a short counter curve at the tip. Embolus tip slightly enlarged, 'torpedo-shaped' and preceded by a sharp ridge with two prominent teeth (Figs. 35–36) *I. machadoi*

FEMALES

1. Spermathecae dome shaped evenly covered with dense glandular tissue (Fig. 43) *N. uncinata*
2. Spermathecae short (approx. as long as wide), proximal tubular part approx. as short as distal globular part.....4.
3. Spermathecae distinctly longer than wide.....6.
4. Proximal part conical, distal part of spermathecae spherical thinly covered with glandular tissue. (Fig. 37) *N. athiasi*
5. Proximal part short and tubular, distal part of spermathecae flattened on top, glandular tissue concentrated in a thick, dense collar around the connection of the proximal and distal parts (Fig. 41) *N. fagei*
6. Proximal part longest, distally gradually tapering and connecting directly with distal part (Fig. 45) *N. ungoliant*
7. Proximal part wide at the basis, abruptly tapering before connecting under an angle with the distal part (Fig. 39) *N. bacelarae*
8. Proximal part wide and irregularly shaped, a distinct narrow tubular middle part connecting the proximal to the distal part (Fig. 47) ... *I. machadoi*

Discussion

In her *Inventário das Aranhas migalomorfas da Península Ibérica* Amélia Bacelar (1932) reported the occurrence of six different *Nemesia* species in Portugal. Three species, *N. berlandi*, *N. gravieri* and *N. fagei*, were newly described one year earlier from specimens of Portuguese origin found in the collection of the Museum Bocage, in Lisbon (Frade & Bacelar 1931). The other three species, *N. dubia*, *N. hispanica* and *N. meridionalis*, with type localities in France, Spain and Italy respectively, were identified in specimens collected in Portugal (Frade & Bacelar 1931). A year later Bacelar (1933a) added a seventh species to the Portuguese list by describing *N. uncinata* from a male spider collected in southern Portugal. The species list of Nemesiidae occurring in Portugal we present here is reduced to six species again, although our removal of *N. berlandi* is only tentative. Furthermore there are indications of the presence of still other species present within Portuguese borders, but we have no conclusive information so far. Only one species of Bacelar's (1932) original list, *N. fagei*, still features on our list. All changes we made in the list and our motivation to do so are discussed below.

N. berlandi Frade & Bacelar 1931 was described from female specimens (the male has not been described) collected near Fagilde in north-central Portugal. The species has, to our knowledge, not been reported from any other location and a search by Cardoso at the type locality has not been successful. Also we have not been able to trace any specimen in museum collections attributed to this species by earlier workers in the field, although Blasco (1986 p.346 Fig. 2^E) figures the sper-

mathecae of *N. berlandi* with a note: *d'après Buchli*. Though we have examined Buchli's unpublished manuscript that gives the original illustration of the figure Blasco reproduced, we failed to find the specimen that was used to produce it. Buchli's figure of the spermathecae of *N. berlandi* does not fit any of the species in our sample and we are therefore inclined to regard *N. berlandi* as a possible seventh species, occurring in Portugal that escaped our collection efforts.

N. gravieri was described from a single male specimen collected at Alcacerdo Sal, south-central Portugal. This species, as *N. berlandi*, has been reported from its type locality only. Contrary to *N. berlandi* however, *N. gravieri* is abundantly present in our sample. It is immediately recognised from the conspicuous maculae on the legs and the basal segment of the PLS. This obvious character is mentioned in the species description of *N. gravieri* (Frade & Bacelar 1931 p. 230), and also in the earlier description of *N. athiasi* Franganillo, 1920⁵ probably collected in the Lisbon area. The maculate character, in Bacelar's days, was considered diagnostic for yet another *Nemesia* species (*N. meridionalis* Costa 1835) from Italy that is known from the female only (Frade & Bacelar 1931 p. 228). Consequently Frade & Bacelar diagnosed all maculate females in the collection of the Museum Bocage Lisbon as *N. meridionalis* and included this species on the Portuguese species-list (Bacelar 1932). They went on to regard Franganillo's (1920) description of *N. athiasi* as insufficient and claimed that his species is probably synonymous with *N. meridionalis* (Frade & Bacelar 1931 p. 237). It is a bit of a puzzle why Frade & Bacelar did not record the first maculate male they found in Portugal also as *N. meridionalis*, but instead described it as a new species, *N. gravieri*. Currently, several maculate *Nemesia* species are known (see Decae 2005 for a detailed discussion) and it is clear that the species occurring in Portugal differs from those occurring elsewhere (see our diagnosis of *N. athiasi*). Since Franganillo clearly described maculae in *N. athiasi*, we regard *N. gravieri* as a junior synonym of *N. athiasi*. We also remove *N. meridionalis* from the Portuguese list on grounds here explained and we regard the specimens diagnosed by Frade & Bacelar as *N. meridionalis* from Portugal to be *N. athiasi*.

N. dubia Pickard-Cambridge, 1874 is another *Nemesia* species with a confused taxonomic history. It is clear, however, that *N. dubia* is common in southwestern France and probably also in Catalonia (type locality eastern Pyrenees). We have studied several specimens of both sexes collected at the type locality and nearby areas that make us conclude that the morphology of the sexual organs of this species clearly differs from all species we have found in Portugal. Therefore we remove *N. dubia* from the Portuguese species list.

⁵ "Mamillarum superiorum primus articulus magna macula nigra ornatus." Franganillo, 1920. p. 140.

N. hispanica, Koch 1871 has long been considered the most commonly occurring trapdoor spider in Portugal. However, we have argued before (Decae & Cardoso 2005) that this idea rested on misidentification. *N. hispanica* is not present in our sample of Portuguese species, but because it is common in Spain, it might well be discovered on the Portuguese side of the border in the future. Until then however, we remove *N. hispanica* from the Portuguese species list.

N. uncinata was described from a male specimen, and although Bacelar expressed some doubt about the separate identity of *N. uncinata*, stating that it might be the unknown male of *N. hispanica* (Bacelar, 1933 p. 287). It is now clear that, on grounds of the unusual morphology of the sexual organs in both sexes, *N. uncinata* is a distinct species and properly features on the Portuguese species list.

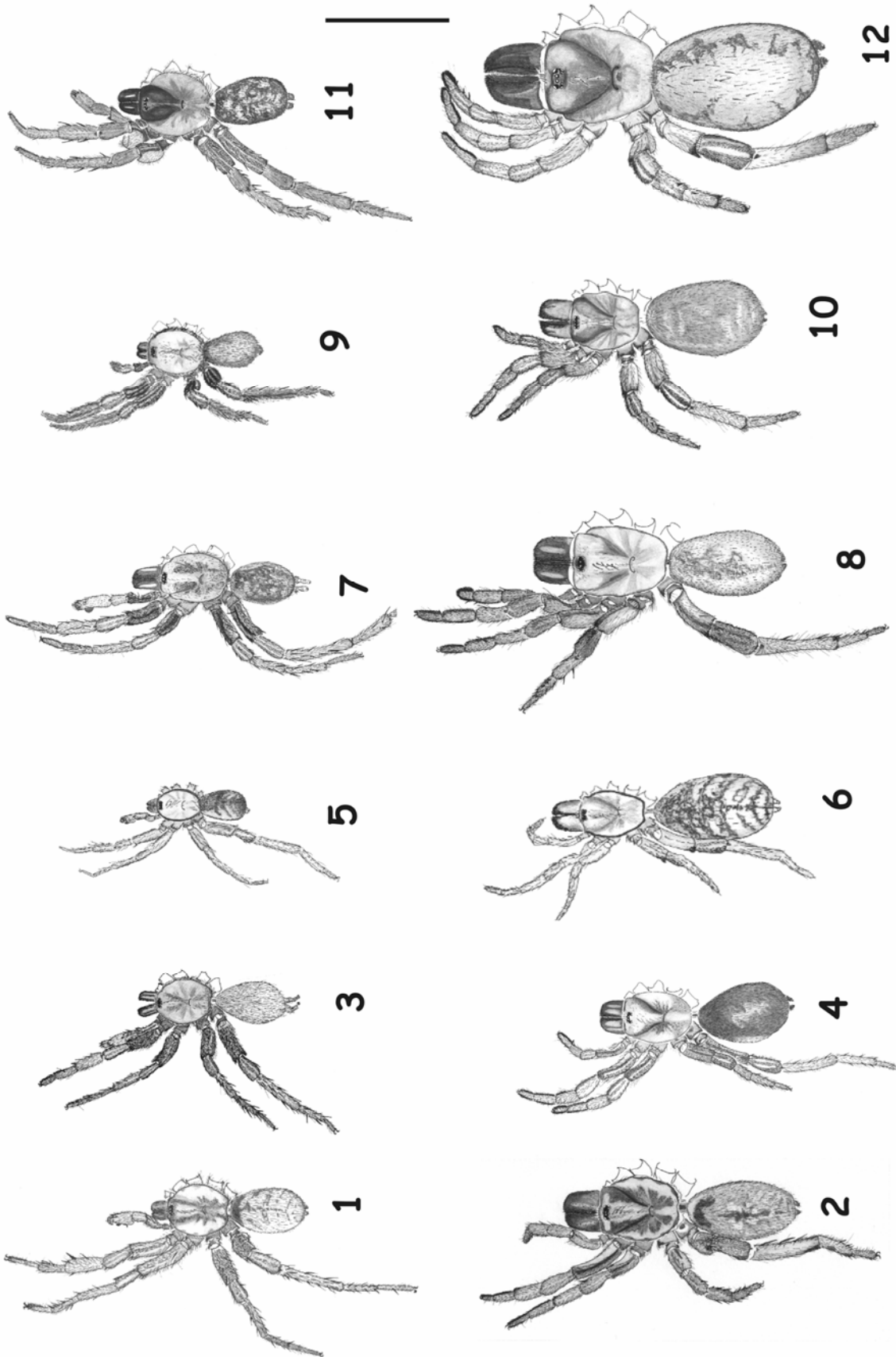
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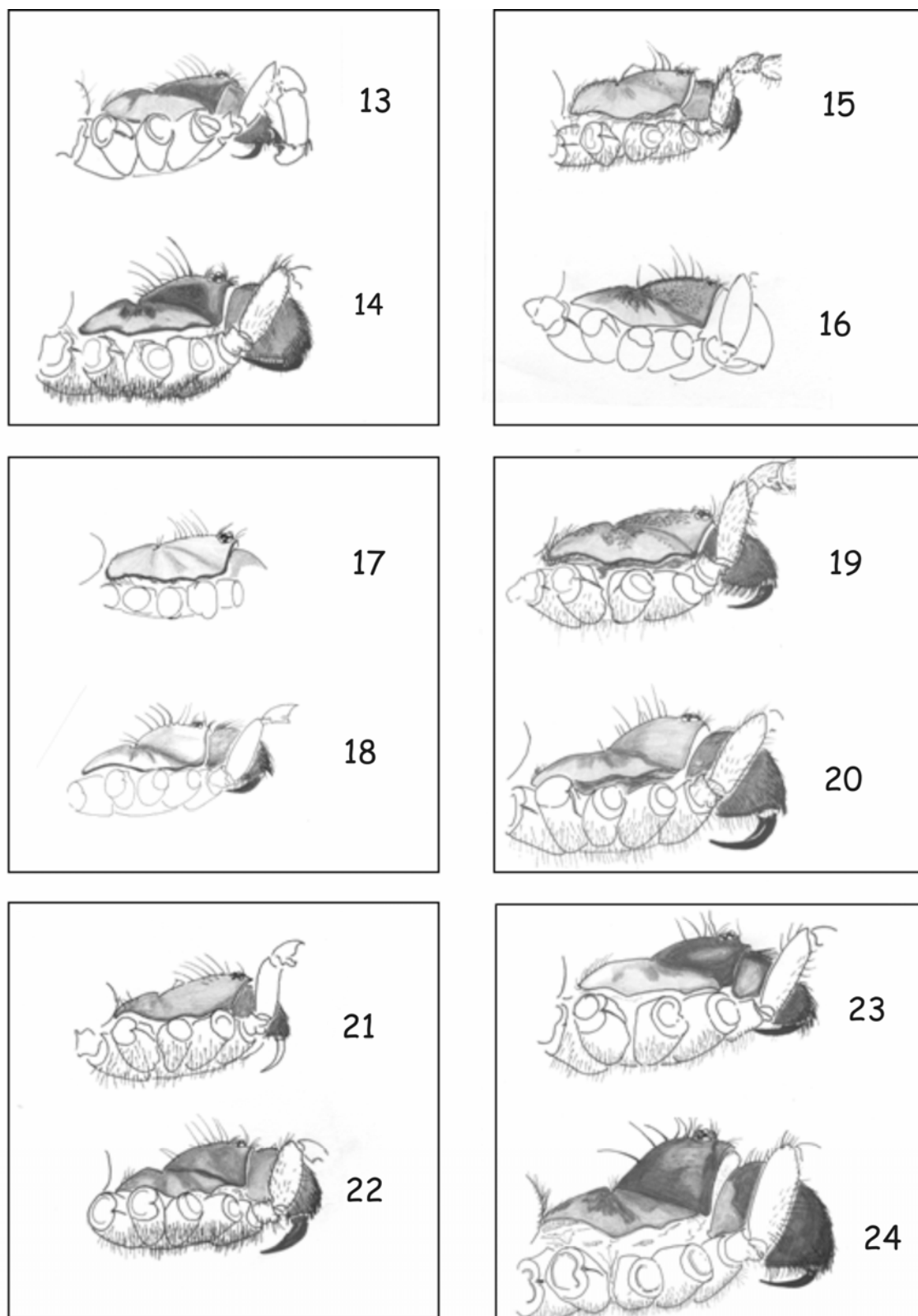
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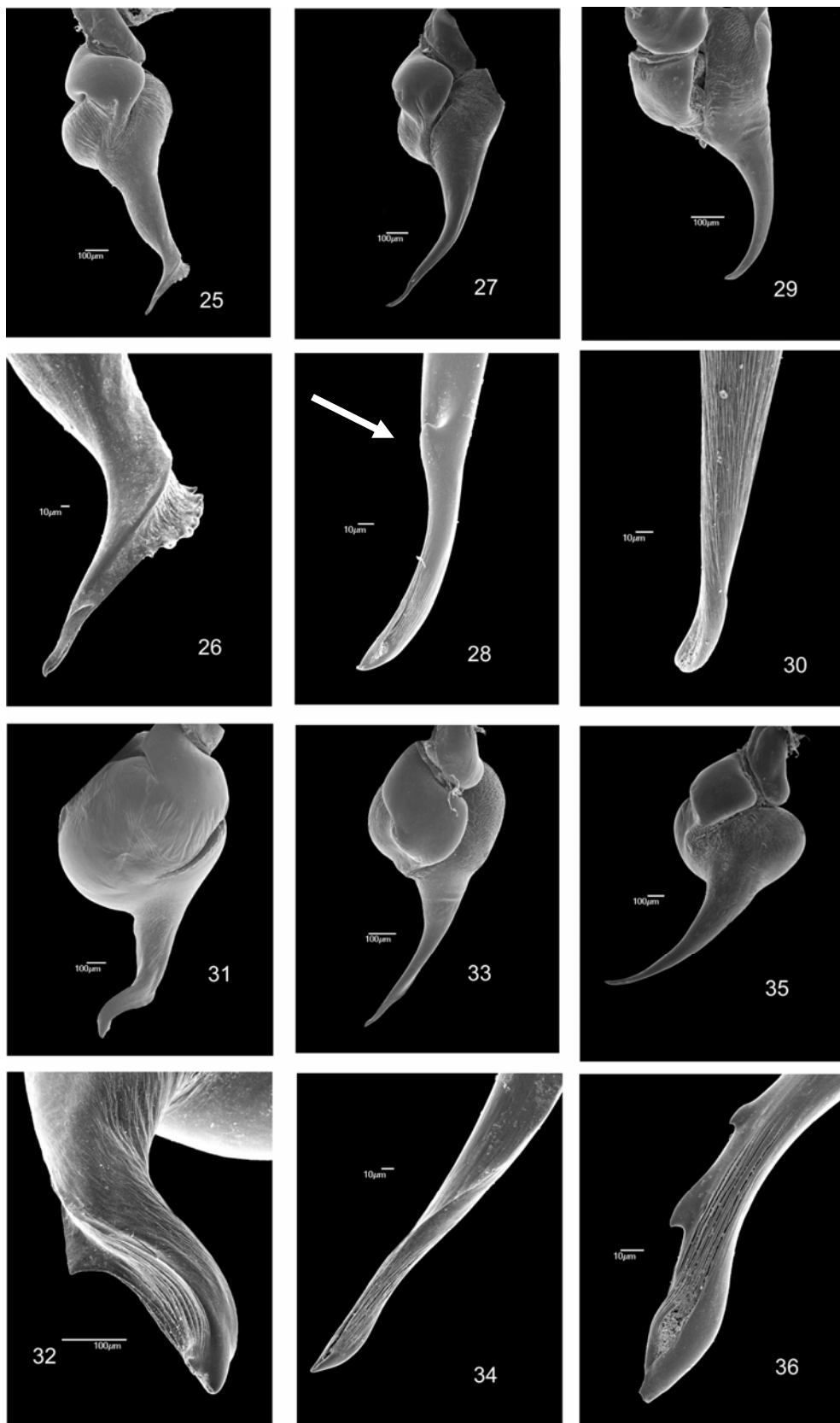
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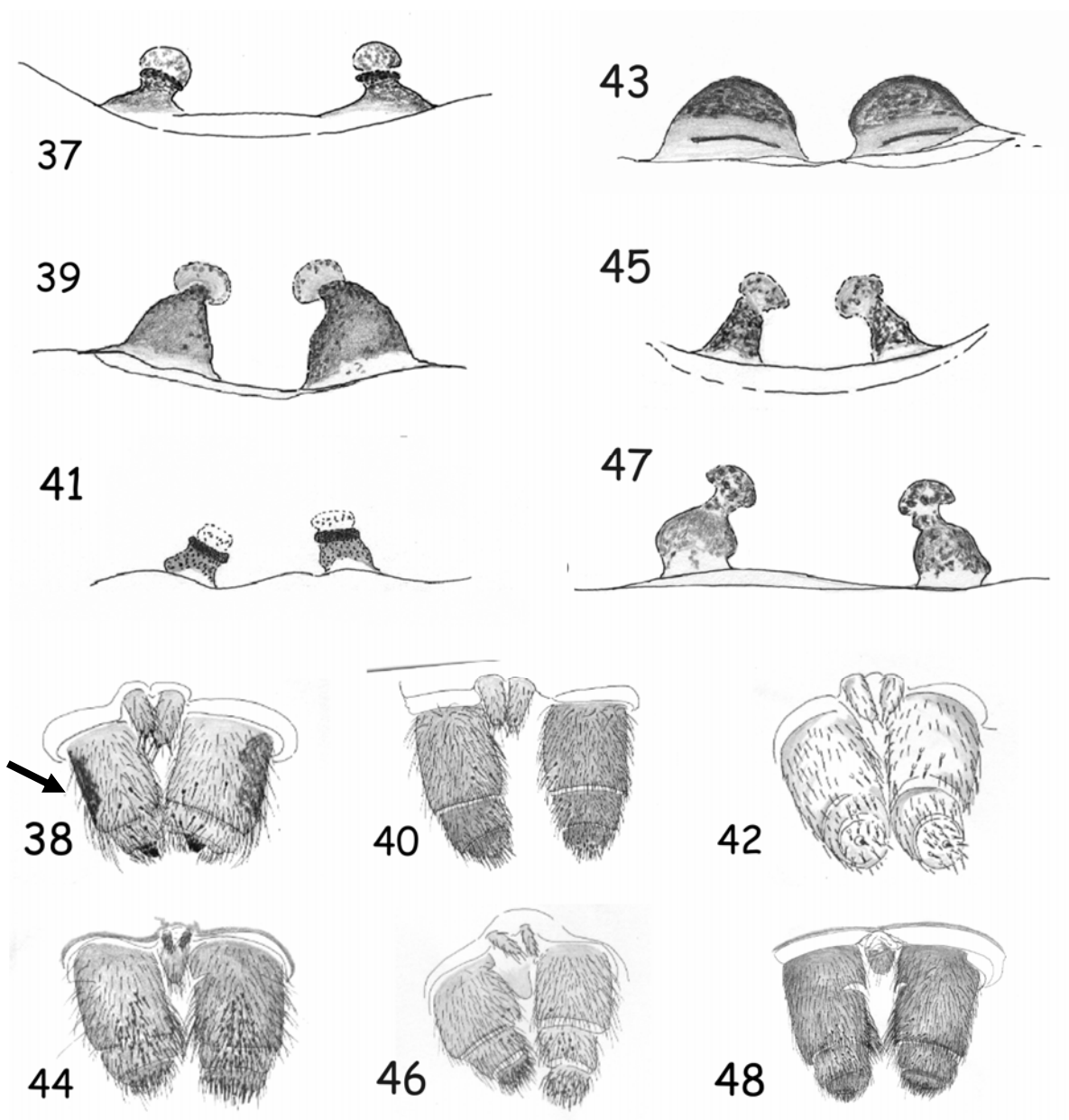
Figs 1-12 Nemesiidae from Portugal, comparative sizes and dorsal habitus. Top row males, bottom row females. 1-2 *Nemesia athiasi*; 3-4 *N. bacelarae*; 5-6 *N. fagei*; 7-8 *N. uncinata*; 9-10 *N. N. ungoliant*; 11-12 *Iberesia machadoi*. Scale-line = 10mm



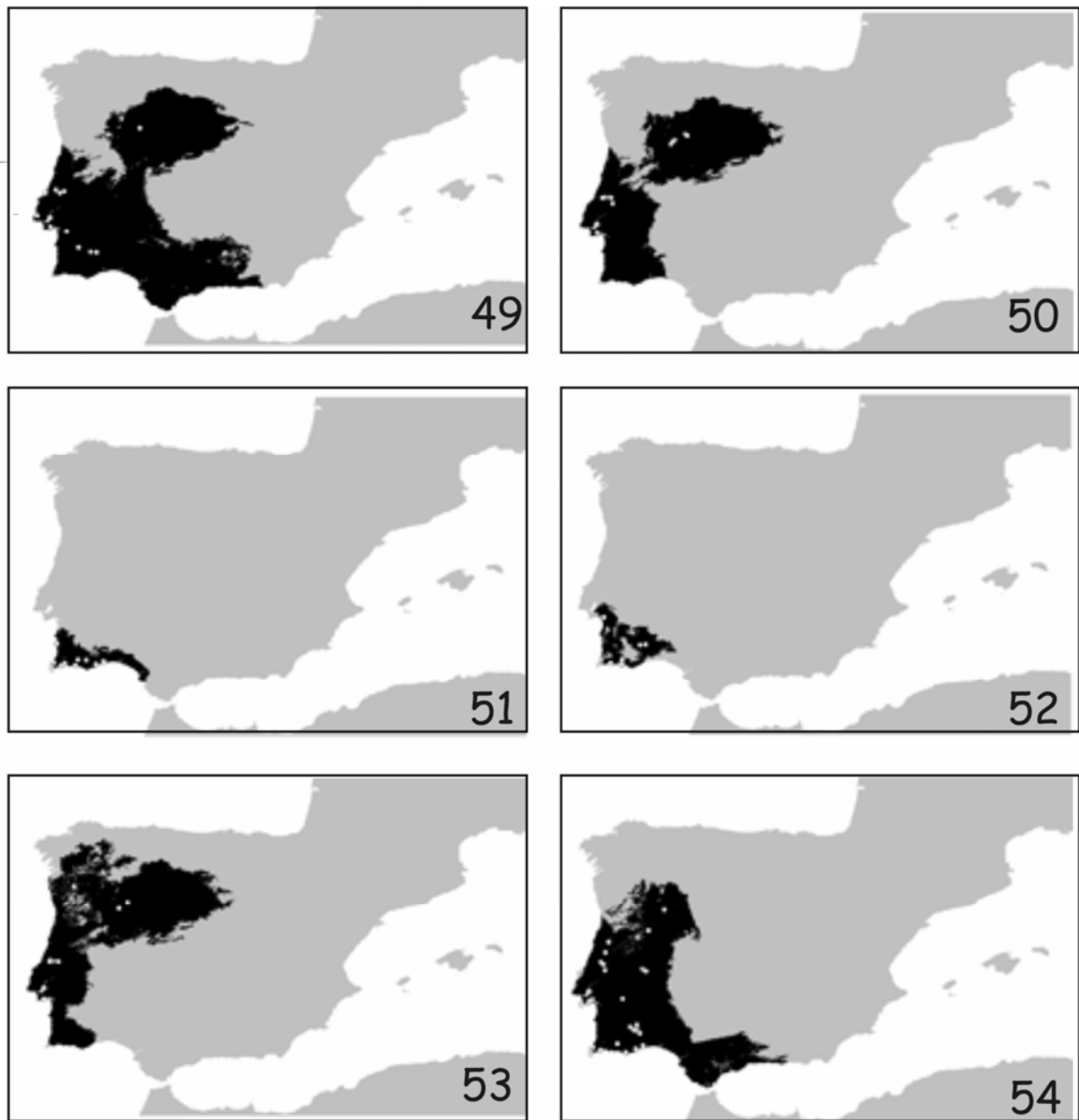
Figs 13-24 Nemesiidae from Portugal lateral prosoma comparative sizes and shape. *Nemesia athiasi* 13 male, 14 female; *N. bacelarae* 15 male, 16 female; *N. fagei* 17 male, 18 female; *N. uncinata* 19 male, 20 female; *N. ungoliant* 21 male, 22 female; *Iberesia machadoi* 23 male, 24 female. Scale-line = 10mm



Figs 25-36 Bulb structure, general bulb shapes, and close-ups of diagnostic structures on embolus tip. **25-26** *Nemesia athiasi*; **27-28** *N. bacelarae* (arrow indicates fish hook); **29-30** *N. fagei*; **31-32** *N. uncinata*; **33-34** *N. ungoliant*; **35-36** *Iberesia machadoi*.



Figs 37-48 Diagnostic characters in females (not to scale). Spermathecae (above), spinnerets (below). **37-38** *Nemesia athiasi* (arrow indicates maculae); **39-40** *N. bacelarae*; **41-42** *N. fagei*; **43-44** *N. uncinata*; **45-46** *N. ungoliant*; **47-48** *Iberesia machadoi*.



Figs 49-54 Estimated areas of distribution (black zones) and collection sites (white dots) of Portuguese Nemesiids. **49** *Nemesia athiasi*; **50** *N. bacelarae*; **51** *N. fagei*; **52** *N. uncinata*; **53** *N. ungoliant*; **54** *Iberesia machadoi*.

Table 1
Summary of localities (X) where Nemesiid species have thus far been found in Portugal

Site	Latitude	Longitude	<i>Iberesia machadoi</i>	<i>Nemesia athiasi</i>	<i>Nemesia bacelarae</i>	<i>Nemesia fagei</i>	<i>Nemesia uncinata</i>	<i>Nemesia ungoliant</i>
Albergaria	N41°47.718	W008°08.180						X
Albufeira	N37°05.274	W008°15.115				X		
Alcácer do Sal	N38°22.347	W008°30.773		X				
Algodôr	N37°44.956	W007°48.027	X	X				
Aljustrel	N37°52.830	W008°09.898		X				
Alte	N37°14.000	W008°11.000	X			X	X	
Bairro	N39°34.087	W008°37.022			X			X
Barrenta	N39°34.316	W008°45.686			X			X
Braciais	N37°37.948	W007°34.199	X					
Bruçó	N41°15.253	W006°43.542			X			
Cabo Espichel	N38°24.936	W009°12.988	X					
Castelo de Vide	N39°24.958	W007°27.339	X					
Castro Marim	N37°13.110	W007°26.516	X			X		
Coimbra	N40°12.428	W008°25.770	X					
Corredoura	N37°44.774	W007°38.530	X	X				
Corte da Velha	N37°41.239	W007°43.716	X					
Escusa	N39°23.544	W007°24.580	X					
Faro	N37°00.909	W007°56.056	X					
Fátima	N39°37.072	W008°39.161	X					
Fonte d'Aldeia	N41°25.372	W006°24.251			X			
Foz do Mira	N37°43.281	W008°47.305				X		
Guadalupe	N38°34.234	W008°01.272	X					
Guarda	N40°32.314	W007°16.036	X					
Herdade do Pinheiro	N38°27.689	W008°43.199					X	
Lagos	N37°05.965	W008°40.264	X			X		
Mata do Solitário	N38°27.711	W009°00.117						X
Mata do Vidal	N38°29.198	W008°59.552		X	X			
Mazouco	N41°10.131	W006°47.855			X			
Mértola	N37°38.576	W007°39.673	X				X	
Palão	N41°07.655	W006°49.225	X		X			X
Palmela	N38°33.946	W008°54.132	X					
Paúl do Boquilobo	N39°23.385	W008°32.478	X		X			
Penina	N37°09.712	W008°33.918				X		
Picote	N41°22.900	W006°20.700			X			
Picotino	N41°12.410	W006°45.646			X			
Planalto de St António	N39°30.469	W008°42.239		X				
Pomarão	N37°34.500	W007°32.100	X					
Porto de Espada	N39°21.308	W007°21.024	X					
Porto de Mós	N39°36.140	W008°49.046		X				X
Portugal	-	-		X				
Praia da Falésia	N37°05.328	W008°10.130					X	
Praia da Oura	N37°05.273	W008°13.477					X	
Praia da Rocha	N37°07.031	W008°32.134					X	
Ramalhais	N39°53.949	W008°31.490	X					
Relva do Lobo	N37°09.118	W008°53.081	X			X		
Ribeira de Limas	N37°49.233	W007°37.065	X					
Sagres	N37°00.193	W008°56.678	X			X		
São Domingos	N37°39.676	W007°29.289					X	
São Martinho do Porto	N39°30.684	W009°08.114		X				
Serra do Caldeirão	N37°14.341	W007°56.232				X		
Serro Ventoso	N39°33.372	W008°50.293			X			X
Setúbal	N38°31.435	W008°53.535	X					
Sintra	N38°48.062	W009°23.008		X				
Tavira	N37°07.585	W007°39.000	X			X		
Terras do Risco	N38°27.765	W009°02.038	X					
Tó	N41°18.950	W006°34.442						X
Vale da Rasca	N38°30.680	W008°58.837	X	X	X			
Vale Garcia	N39°32.989	W008°35.272	X	X	X			X
Vila Chã da Braciosa	N41°24.940	W006°21.395		X				
Vila Real de St António	N37°11.671	W007°24.926				X		
Site	Latitude	Longitude	<i>Iberesia machadoi</i>	<i>Nemesia athiasi</i>	<i>Nemesia bacelarae</i>	<i>Nemesia fagei</i>	<i>Nemesia uncinata</i>	<i>Nemesia ungoliant</i>