

Phylogenetic relationships within Philodromidae, with a taxonomic revision of *Philodromus* subgenus *Artanes* in the western Palearctic (Arachnida : Araneae)

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Abstract. The first quantitative phylogenetic analysis within the spider family Philodromidae (using 65 morphological characters from 40 ingroup taxa) does not corroborate Schick's division into the tribes Thanatini (*Apollophanes* O. P.-Cambridge, 1898, *Pelloctanes* Schick, 1965, *Thanatus* C. L. Koch, 1837; *Tibellus*, Simon, 1875) and Philodromini (*Ebo* Keyserling, 1884, *Philodromus* Walckenaer, 1826; *Rhysodromus* Schick, 1965). Instead, *Ebo* is sister to all other genera in the family, and a fraction of *Philodromus* (the *histrion* species-group = *Rhysodromus* Schick) are contained with the Thanatini. The forgotten genus *Artanes* Thorell, 1870 constitutes a well-defined distal taxon in a clade that contains the majority of *Philodromus* species. Here *Artanes* is considered a subgenus of *Philodromus*, and includes the *margaritatus* and the *poecilus* species-groups. The western Palearctic species of the subgenus are revised. Twelve species are (re-)described, keyed and illustrated: *Philodromus blanckei* (Wunderlich, 1995) (first description of ♀); *P. calidus* Lucas, 1846; *P. femurostriatus*, sp. nov. from the eastern Mediterranean; *P. fuscomarginatus* (De Geer, 1778); *P. johani*, sp. nov. from Crete; *P. laricum* Simon, 1875, removed from synonymy with *P. corticinus* (C. L. Koch); *P. maghrebi*, sp. nov. from northern Africa (♀ only); *P. margaritatus* (Clerck, 1757); *P. parietalis* Simon, 1875; *P. pentheri*, sp. nov. from the Caspian region and Albania (♀ only); *P. pinetorum*, sp. nov. from the Mediterranean; and *P. poecilus* (Thorell, 1872).

Introduction

The spider family Philodromidae comprises 522 species or subspecies considered as valid in 29 genera, 10 of them being monotypic (Platnick 2008). For a long time, philodromid spiders were regarded as a derived taxon of crab spiders, and were allocated to subfamily rank within the Thomisidae (e.g. Petrunkevitch 1928; Simon 1932; Locket and Millidge 1951; Schick 1965). Detailed studies of embryological characters (Holm 1940), chromosomes (Hackmann 1948) and eye structure (Homann 1975) later suggested that Philodromidae and Thomisidae are not closely related to each other. This view has been corroborated by a recent study of molecular phylogeny (Benjamin *et al.* 2008), which indicated that philodromids may fall at the root of Dionycha. While the family status of Philodromidae is generally accepted today (but see Roberts 1995), relationships within the family have not been thoroughly investigated within a modern phylogenetic framework. As a consequence, almost half of the world's species (247) and two-thirds (105) of the Palearctic species are presently included in the collective genus *Philodromus* Walckenaer, 1826. According to current taxonomic concepts, all extra-Mediterranean species in the western Palearctic would fall into one of three genera, *Philodromus*, *Thanatus* C. L. Koch, 1837 and *Tibellus* Simon, 1875. This view differs from earlier concepts of the group by Simon (1864), Prach (1866), Thorell (1870), Menge (1875), Hansen (1882) and Bösenberg (1902). These authors consistently recognised an additional genus of

philodromid spiders, *Artanes* Thorell, 1870 (nom. nov. pro *Artamus* C. L. Koch, 1837 [praeocc.]). However, Simon (1875) soon changed his opinion and henceforth considered *Artanes* a synonym of *Philodromus*. In 'post-Simon' times the status of *Artanes* remained controversial. While most arachnologists followed Simon's authority, Gertsch (1933) erected the genus *Horodromoides* for the single Nearctic species, *H. validus* Gertsch, 1933. Dondale and Redner (1975) did not accept this new genus and referred to diagnostic characters that overlapped with *Philodromus*. More recently Wunderlich (1995) and Logunov (1997) pleaded for a revalidation of *Artanes*, but this proposal was not followed in Platnick's catalogue (2008) due to a lack of information. Here I present the first comprehensive phylogenetic study within Philodromidae, including representatives of all western Palearctic groups, in order to unravel the status of *Artanes* and the limits of *Philodromus*. The need for a revision of Simon's (1932) intrageneric classification has already been demonstrated in a previous study (Muster *et al.* 2007).

At the species level, knowledge of *Artanes* has also remained patchy and inconsistent. Besides the two frequently found species *Philodromus margaritatus* (Clerck, 1757) and *P. fuscomarginatus* (De Geer, 1778), all other representatives are poorly characterised and were regularly misidentified even by experienced arachnologists. This may be due to the rarity of material for comparison, especially in contemporary collections. Specimens of this taxon might not be sampled by

using standard methods such as pitfall trapping or sweeping. They exclusively live on vertical structures, mostly on or under the bark of trees. Their effective camouflage makes them difficult to detect even for experienced collectors. Menge (1875: 415) characterised their habits with apt words: ‘The animals live under loose bark of trees where they build their cocoons and silky shelters for the winter. At warm, sunny days one can spot them out on the trunks, especially in the evening, waiting for prey. At risk they quickly move sideways around the trunk, hide or let themselves fall to the ground without producing a thread. They are very skilful and efficient in catching their prey’ [translated from German]. Despite possibly different sampling strategies applied by earlier and modern arachnologists, the comparison of historical and contemporary records suggests that *Artanes* species have declined in central Europe during the last century. Negative abundance trends are documented for only very few spider species. Thus, several species of *Artanes* are of conservation importance and are listed in high categories of national and regional red data books. A basic prerequisite for effective conservation efforts is a better knowledge of their taxonomy, distribution and ecology. The second aim of this study is therefore a critical taxonomic revision of the western Palearctic species of the subgenus and the biogeographic interpretation of the data.

Material and methods

Specimens and morphological examination

Specimens were examined and measured using a STEMI 2000 stereoscopic microscope (Carl Zeiss, Jena, Germany) with micrometer eyepiece. All measurements are in millimetres. For leg measurements, the variation is given for the entire leg followed by average values for the leg segments (femur, patella, tibia, metatarsus and tarsus) in square brackets. A clock-face terminology is used to describe the position of tegular appendages and structures of the left pedipalpus. For example, if the embolus originates at 9:00 o'clock position, its base is situated at the outmost prolateral point of a round tegulum. Male and female genitalia were dissected and studied as temporary mounts in Hoyer's solution (Kraus 1984) under an Eclipse E600 microscope (Nikon Instruments, Melville, NY) with adrawing tube. SEM images were taken with a XL20 electron microscope (Philips Electronic Instruments, Mahwah, NY) at the University of Vienna (Dept of Cell Imaging and Ultrastructure Research), after ethanol-acetone dehydration, HMDS drying and sputter-coating with gold using an Arga Sputtercoater 108. A total of 350 specimens from the following institutions and private collections were examined (institutional abbreviations follow Evenhuis 2007):

AMNH	American Museum of Natural History, New York
BMNH	The Natural History Museum, London
CB	Coll. Robert Bosmans, Gent
CTh	Coll. Konrad Thaler & Barbara Knoflach, Innsbruck
CJK	Coll. Johan van Keer, Kapelle-Op-Den-Bos
CJW	Coll. Jörg Wunderlich, Hirschberg-Leutershausen
IRSNB	Institut Royal des Sciences Naturelles de Belgique, Brussels

MNHN	Muséum National d'Histoire Naturelle, Paris
MTD	Museum für Tierkunde, Dresden
NMW	Naturhistorisches Museum, Wien
SMF	Forschungsinstitut Senckenberg, Frankfurt a. M.
NHRS	Naturhistoriska riksmuseet, Stockholm
ZMHB	Museum für Naturkunde der Humboldt-Universität, Berlin
ZMUM	Zoological Museum of the Moscow State University, Moscow

Abbreviations used in text and figures

AE	anterior eyes
ALE	anterior lateral eyes
AME	anterior median eyes
BC	bursa copulatrix
CD	copulatory duct
CL	cephalothorax length
ClyH	clypeus height
CoI	sclerotised part of conductor
CoII	membranous part of conductor
CoP	conductor process
CW	cephalothorax width
CyL	cymbium length
CyW	cymbium width
DTA	dorsal tibial apophysis
E	embolus
EG	epigynal groove
EGL	length of epigynal grooves
EGW	width of epigynal grooves
FD	fertilisation duct
Fem	femur
GH	glandular head
GM	glandular mound
ITA	intermediate tibial apophysis
MS	median septum
Mt	metatarsus
OL	opisthosoma length
OW	opisthosoma width
Pat	patella
PE	posterior eyes
PEP	paraembolar projection of the embolus
PFem	length of palpal femur
PLE	posterior lateral eyes
PME	posterior median eyes
PPat	length of palpal patella
PTib	length of palpal tibia
R	receptaculum
R-EG	distance between anterior margins of epigynal grooves and receptacula (Fig. 24a)
RL	receptacula length
RTA	retrolateral tibial apophysis
RW	receptacula width
SD	sperm duct loop
Tar	tarsus
Teg	tegulum
Tib	tibia
VTA	ventral tibial apophysis

Cladistic analysis

Sixty five morphological characters were scored in 40 species of Philodromidae and three outgroup taxa. The ingroup sampling comprised representatives of all philodromid genera and *Philodromus* species-groups occurring in the Holarctic. With exception of the subgenus *Artanes* – the focal taxon of this study – only one to three species were included from the well-defined species-groups. It is reasonable to assume that the addition of more species from these taxa would not significantly affect the phylogenetic reconstructions among supraspecific categories. The *Philodromus aureolus*, *fuscmarginatus* (=subgenus *Artanes*), *histrion*, *infuscatus*, *pulchellus* and *rufus* species-groups constitute more than 50% of the global *Philodromus* species diversity and some 20% of the currently valid species of the family. On the other hand, I purposefully included a number of Mediterranean species whose affinities remained completely unclear (i.e. *Philodromus bigibbus* (O. P.-Cambridge, 1876), *P. insularis* Kulczynski, 1905, *Thanatus fornicatus* Simon, 1897). The choice of outgroups was based on a recent study by Benjamin *et al.* (2008), which indicated that Philodromidae are close to basal groups of the Dionycha rather than closely related to Thomisidae. Characters concern leg spination (9), other leg features (3), prosoma (3), eyes (4), chelicerae (1), opisthosoma (2), male genitalia (27) and female genitalia (16). Thirty nine characters were multistate, all characters were treated as unordered.

The data matrix (Table 1; also available as an Accessory Publication on the *Invertebrate Systematics* website) was analysed with TNT (Goloboff *et al.* 2008b). I applied two different weighting schemes. First, in an equal weights analysis, heuristic searches were performed using 1000 replications of random taxon addition with the TBR swapping algorithm and up to 10 starting trees per replicate. Resampling frequencies were calculated from 1000 replicates of jackknifing and symmetric resampling (the latter is not affected by uninformative characters and transformation costs, Goloboff *et al.* 2003) with the probability of character removal in pseudoreplicates set to 0.36. Characters were optimised on one of the shortest trees using the ‘unambiguous changes only’ function in WinClada (Nixon 2002). Second, the data matrix was subjected to implied weighting against homoplasy. Goloboff (1993) has argued and demonstrated (Goloboff *et al.* 2008a) that differential downweighting of characters that show high degrees of homoplasy on the tree is not ‘unparsimonious’ and can improve the phylogenetic analysis of morphological data sets. For the analysis I followed a slightly modified approach from Benjamin *et al.* (2008). Traditional searches with the value of the concavity constant k varying from 4 (strong weighting regime) to 25 (weak weighting) were performed in TNT as described above. Topological congruence of the trees resulting from different weighting strength was assessed by node frequencies in a 50% majority rule consensus tree. Characters used in the phylogenetic analysis are shown in Table 2.

Results

Parsimony analysis under equal weights resulted in seven shortest trees of 465 steps ($CI=0.32$, $RI=0.65$). These trees

differ slightly in the position of four species. *Philodromus glaucinus* Simon, 1870 is either grouped with *P. pulchellus* Lucas, 1848 or basal to all Philodromidae distal to *Paratibellus oblongiusculus* (Lucas, 1846). *Philodromus fallax* Sundevall, 1833 is either sister to a clade containing the *Philodromus histrion*-group and the Old World species of ‘Ebo’, or to this clade including the Thanatini. *Thanatus fornicatus* is either sister to the remaining Thanatini, or sister to *Tibellus*, or included in *Thanatus*. *Thanatus vulgaris* Simon, 1870 is either sister to *T. arenarius* L. Koch, 1872/*T. formicinus* (Clerck, 1757) or to *Tibellus*, or to all Thanatini excluding *T. fornicatus*. The tree with the best fit to the current system (i.e. monophyly of the *Philodromus pulchellus*-group and *Thanatus* (concerning *T. fornicatus* see discussion)) was chosen as the best phylogenetic hypothesis (Fig. 1a).

Whenever more than two representatives of well-defined species-groups were included, they group together in supported clades with one exception, *P. glaucinus/pulchellus*. However, *Philodromus* as currently defined is clearly polyphyletic with respect to *Ebo*, *Thanatus* and *Tibellus*. In all reconstructions the Nearctic *Ebo* species (excluding subgenus *Titanebo*) were established as the most basal Philodromidae. Also the *Philodromus infuscatus*-group and *Paratibellus* may represent basal lineages within the family. The position of the *Philodromus pulchellus*-group appears ambiguous (see below). The remaining Philodromidae group in two large clades. Clade I comprises the tribe Thanatini *sensu* Schick (1965), the *Philodromus histrion*-group and related species (for which the name *Rhysodromus* Schick is available), the subgenus *Titanebo* and some Palearctic species currently included in *Ebo*. Clade II comprises several *Philodromus* species-groups and *Artanes* as a derived distal clade. While the more basal clades are not well supported, showing only few putative synapomorphies, the subgenera and species-groups usually are. Also the Thanatini *sensu* Schick are moderately supported. *Artanes* emerged as a strongly supported taxon, all included species share a high number of synapomorphies. The taxon consists of two subclades, the *margaritatus* and the *poecilus* species-groups. A unique feature of the *margaritatus*-group is the presence of four pairs of ventral spines on metatarsus I (character 1). The *poecilus*-group is characterised by five or six pairs of ventral spines on tibia I (character 0) and the existence of spines on some female tarsi (character 8), a trait that escaped the attention of former arachnologists.

The implied weights analysis (Fig. 1b) results principally in the same pattern of relationships, but with some important modifications. Even by application of weak weighting ($k=25$) the *P. pulchellus*-group and *P. insularis* move from clade I to clade II. By increasing the weighting strength ($k<11$) *P. infuscatus* Keyserling, 1880 is also shifted to this large *Philodromus* clade. Then, to make *Philodromus* monophyletic, only the *P. histrion*-group (including *P. histrion* (Latreille, 1819), *P. lepidus* Blackwall, 1870, *P. fallax*) and *P. bigibbus* need to be transferred to other genera. Significantly, *Artanes* and the proposed species-groups within the subgenus are monophyletic across the whole range of k values.

Table 1. Character matrix for 65 morphological characters

See text for explanations. ‘-’ = inapplicable characters, ‘?’ = unavailable data. Polymorphisms: A=0,1; B=0,2; C=0,3; D=1,2; E=1,3; F=2,3; G=4,5; H=7,8; I=0,1,2,3; J=0,1,2; K=1,2,3; L=1,2,3,4; M=1,2,3,4,5

Taxa	Characters							
	0000000000	1111111111	2222222222	3333333333	4444444444	5555555555	66666	
	0123456789	0123456789	0123456789	0123456789	0123456789	0123456789	0123456789	01234
<i>Cheiracanthium mildei</i>	M100000000	1300200252	0102113131	2103001101	0011----01	0232111123	1210-	
<i>Clubiona trivialis</i>	21F0000000	4000202152	01010??000	0112120000	000-000011	0031111150	1210-	
<i>Salticus zebraneus</i>	0000000000	4000232102	01010??000	000530110?	0011----11	40200-10--	0210-	
<i>Ebo andreaannae</i>	2220130300	0310021105	0102022101	1113030101	000-002011	01100-10--	0010-	
<i>Ebo</i> , sp. nov.	3220110301	101011110?	0110----01	1010201000	0011002001	0132130114	0010-	
<i>Ebo evansae</i>	0E51500000	1020221102	01010--001	0101310001	000-013011	01311100--	0010-	
<i>Ebo latithorax</i>	BCA00A0000	1020221102	01010--001	1101310001	000-003011	01311100--	0210-	
<i>Ebo mexicanus</i>	2220120300	0310001105	0102022101	0113030101	000-002011	01100-10--	0010-	
<i>Ebo patellidens</i>	3220110301	101001110?	01110--001	0010101000	0011012201	320-0-1112	0210-	
<i>Ebo pepinensis</i>	2211000000	1020221102	01010--001	2101310001	000-003011	01311100--	0210-	
<i>Paratibellus oblongiusculus</i>	4430D10200	1300122113	0202124001	2012222000	000-002211	3130130113	0010-	
<i>Philodromus albidus</i>	4FF1221300	1011121141	0102003201	1003012011	0011000011	0131112100	00010	
<i>Philodromus aureolus</i>	4441221300	1011022142	0103016121	0002212001	010-003201	010-1000--	00110	
<i>Philodromus bigibbus</i>	3221120201	1002221123	1102024201	100010000?	0010003000	110-0-00--	0210-	
<i>Philodromus blankei</i>	7431I21310	1221121111	1103211210	0203230101	100-113200	10100-1130	01011	
<i>Philodromus calidus</i>	7431020210	1221021111	1103013310	0303130101	100-112200	110-0-1101	00011	
<i>Philodromus collinus</i>	4431221300	1020022133	0102015121	0002112001	010-003201	010-1300--	02110	
<i>Philodromus dispar</i>	6431231300	1012021111	0101125-10	0003030101	100-000201	00321200--	0010-	
<i>Philodromus emarginatus</i>	4231120300	1011121113	0102115020	0003112100	100-010201	010-1400--	1210-	
<i>Philodromus fallax</i>	3220110F01	1310121101	1102022201	1010101000	0011002011	31100-00--	0010-	
<i>Philodromus femurostriatus</i>	7431LK1310	1221221111	1103021210	0003030101	100-111200	21200-0100	0000-	
<i>Philodromus fuscomarginatus</i>	HG31LF1300	1221021113	0103021110	0103130101	100-112200	11400-1101	0100-	
<i>Philodromus glaucinus</i>	4221120300	1011121111	0102106201	1010210011	100-003111	01301100--	00110	
<i>Philodromus histrio</i>	3220110301	1000022151	0102124001	1010101001	0010002011	0231110104	00010	
<i>Philodromus infuscatus</i>	5420020300	1002222111	1103122001	1002210001	000-013211	10211200--	0010-	
<i>Philodromus insulanus</i>	3420120300	1311221141	01010--200	10021011??	?0??112201	01121400--	12110	
<i>Philodromus johani</i>	7431DK0310	1221021111	1103211310	0203130101	100-113200	11400-2101	00011	
<i>Philodromus laricum</i>	8431020310	1221021113	1103221110	?03130101	100-112200	11400-0100	00011	
<i>Philodromus lepidus</i>	32F0110301	1310021104	0100----01	1010301000	0011012201	1211130110	0210-	
<i>Philodromus maghrebi</i>	4531221300	1212021143	11????????	??????????	??????????	20200-1110	0210-	
<i>Philodromus margaritatus</i>	4531F21300	1212021143	1103221110	0103130101	100-112200	20200-0110	0210-	
<i>Philodromus parietalis</i>	7431JF1310	1221121111	1103221310	0103030101	100-111200	20400-2101	00011	
<i>Philodromus penterii</i>	7431A21310	122122111?	11????????	??????????	??????????	20400-0100	0000-	
<i>Philodromus pinetorum</i>	7431JDA310	1221021113	1103213310	0203230101	100-112200	11000-1141	1200-	
<i>Philodromus poecilus</i>	7431DF1310	1221021113	1103211110	0103130101	100-112200	1A100-1100	0100-	
<i>Philodromus pulchellus</i>	4221120300	1001121141	0102124200	1012211101	100-103111	01311100--	01110	
<i>Philodromus rufus</i>	4FF1221300	1001121141	0102003201	1003012011	0011000211	0131112100	00010	
<i>Thanatus arenarius</i>	42F1020001	4101131212	01010--301	1010210100	0010013110	40100-0023	0010-	
<i>Thanatus formicinus</i>	42K0000001	4101031112	01010--201	1012210100	0010013200	40100-0123	0010-	
<i>Thanatus fornicatus</i>	4231120201	4111132112	0102121201	1010301000	0010013210	40200-00--	0210-	
<i>Thanatus vulgaris</i>	42F1120A01	4111031212	0102020001	1011320000	0010003100	40100-0123	0000-	
<i>Tibellus macellus</i>	4231120201	4101131042	02010--300	0010301000	000-002211	500-0-1113	0000-	
<i>Tibellus oblongus</i>	4231120201	4101131042	0200----01	1014311000	000-002011	500-0-0113	0000-	

Discussion

Phylogenetic relationships within Philodromidae

To date, neither the monophyly of Philodromidae nor phylogenetic relationships within the family have been subject to cladistic analyses. As a consequence, which genera and species-groups are basal philodromids and which constitute the most derived taxa has remained unclear. All phylogenetic reconstructions performed in this study indicate monophyly of the Holarctic philodromid spiders, but the taxon is not

strongly supported. Noteworthy is the lack of unambiguous autapomorphies for Philodromidae. Characters 15 (recurvature of the posterior eye row) and 56 (structure of bursa copulatrix) appear highly homoplastic within Dionycha. Whether the autapomorphies cited in Homann (1975) (cheliceral fang with four long, slender hairs and last larval instar with well-formed serrula and teeth on prolateral claw) will bear comparison with comprehensive sampling needs to be explored in the future. With respect to intra-familial relationships, substantial progress has been achieved although a full generic revision

Table 2. Characters used in the phylogenetic analysis*Somatic characters*

(0) *Tib I*, number of ventral spine pairs: (0) absent; (1) one; (2) two; (3) three; (4) three + apicals; (5) four; (6) four + apicals; (7) five; (8) six.

(1) *Mt I*, number of ventral spine pairs: (0) absent; (1) one; (2) two; (3) two + apicals; (4) three; (5) > three.

(2) *Femur I*, number of dorsal spines: (0) absent; (1) one; (2) two; (3) three; (4) four.

(3) *Pat I*, spines: (0) absent; (1) present.

(4) *Tib I*, number of dorsal spines: (0) absent; (1) one; (2) two; (3) three; (4) four.

(5) *Tib I*, number of pro- and retrolateral spines: (0) absent; (1) one; (2) two; (3) three.

(6) *Mt I*, dorsal spines: (0) absent; (1) present.

(7) *Mt I*, number of pro- and retrolateral spines: (0) absent; (1) one; (2) two; (3) three.

Simon (1932) used tibial spination as a character for intrageneric classification in *Philodromus*. Most subsequent authors regarded leg spination as highly variable and of little value for the clarification of relationships within Philodromidae; for example, Dondale and Redner (1976) pay little attention to spination patterns in their review of American *Philodromus* species-groups. The current study revealed that, despite frequent variation in individual characters, leg spination patterns as a whole are highly characteristic for superspecific taxa within the Philodromidae and often the most reliable character for the classification of species with highly derived genitalia in the system. The coding of spination characters in Philodromidae bears two major sources of inconsistencies. First, the most distal pair of ventral spines is often shifted dorsally to a rather lateral position. As continuous transitions between taxa occur, this distal pair was ascribed to the ventral pairs of spines up to a lateral shift of 90°. Second, the 'apicals' can be either defined by position or size. Here I defined apicals as vestigial spines on the very tip of the segment.

(8) *Spines on female tarsi*: (0) absent; (1) present.

Females of the *Philodromus poecilus*-group bear a pro- and/or retrolateral macroseta on tarsi I–III (species-specific). To my knowledge, this character does not occur in any other taxon of the Philodromidae; it is regarded as an autapomorphy of the group.

(9) *Pilosity on Mt and Tar I*: (0) not densely covered with long, pinnate hairs; (1) densely covered with thin hairs that are longer than the diameter of the segment (Fig. 7).

(10) *Longest leg*: (0) I; (1) II [Fig. 2]; (2) IV.

(11) *Second longest leg*: (0) I; (1) II; (2) III [Fig. 2]; (3) IV.

Most superspecific taxa of Philodromidae have a characteristic leg formula. Due to the high number of combinations and the fact that the order of the shorter legs seems less strongly associated with phylogeny, I decided on the above coding scheme.

(12) *Cephalothorax, shape*: (0) longer than wide; (1) as long as wide; (2) wider than long [Fig. 2].

(13) *Clypeus, orientation*: (0) steep, angle >80° (fig. 97c in Jocqué and Dippenaar-Schoeman 2007); (1) slightly oblique, angle 60°–80° (fig. 84d in in Jocqué and Dippenaar-Schoeman 2007); (2) oblique, angle <60° (fig. 106d in in Jocqué and Dippenaar-Schoeman 2007).

(14) *Clypeus, length*: (0) >AME–PME; (1) = AME–PME; (2) <AME–PME.

(15) *PE row, shape*: (0) procurve [fig. 20.21 in Ubick *et al.* 2005]; (1) straight; (2) slightly recurve, recurvature index <1.5 [fig. 46.5 in Ubick *et al.* 2005]; (3) strongly recurve, recurvature index >1.5 [fig. 46.6 in Ubick *et al.* 2005].

The PE recurvature index was defined by Schick (1965: 8) as the distance (in terms of PME diameters) between the anterior margins of the PME and PLE divided by the diameter of the PME.

(16) *AE, distance*: (0) AME–AME < AME–ALE; (1) AME–AME > AME–ALE; (2) identical.

(17) *PE, distance*: (0) PME–PME < PME–PLE; (1) PME–PME > PME–PLE; (2) identical.

(18) *Largest eyes*: (0) AME; (1) PLE; (2) AME + PLE; (3) ALE; (4) ALE + PLE; (5) all equal; (6) ALE + AME.

Eye sizes and patterns were included in this analysis because in the past much emphasis has been placed on these characters, even in genus delineation.

However, it is hard to find discrete differences and to establish apomorphic states for any supraspecific taxon.

(19) *Cheliceral furrow, number of promarginal teeth*: (0) none; (1) one; (2) two; (3) one + one vestigial; (4) one vestigial; (5) two vestigial.

(20) *Opisthosoma, shape*: (0) ovoid [fig. 14 in Dondale and Redner 1975]; (1) pentagonal [Fig. 2].

(21) *Opisthosoma, length*: (0) ~ width; (1) 1–2 × width; (2) > 2 × width.

Male palpus

(22) *Patella, number of apophyses*: (0) none; (1) one [fig. 36 in Levy 1977].

(23) *Tibia, number of apophyses*: (0) none [figs 32, 33 in Levy 1977]; (1) one [figs 36, 37 in Levy 1977]; (2) two [figs 10, 11 in Levy 1977]; (3) three [figs 4, 5 in Levy 1977; Fig. 13].

Homology of tibial apophyses among and within families and genera of the RTA clade is poorly understood, especially with respect to ITA (Schick 1965).

Currently one can only rely on the criterion of topology. A special problem is whether a lateral outgrowth of VTA or RTA should be regarded as a separate apophysis (ITA) or not. It is incomprehensible why Dondale and Redner (1975) refer to two tibial apophyses in the *Philodromus*

fuscomarginatus-group. They distinguish VTA and RTA, although they are 'partly united', but unify RTA and DTA to a '2-pronged retrolateral apophysis'.

In all known species of the subgenus *Artanes*, however, RTA and DTA are less strongly associated with each other than RTA with VTA. Accordingly,

I consider the DTA of *Artanes*, which rests in a proximal-dorsal depression of the cymbium, as a unique character that is not homologous to the RTA

in other Philodromidae.

(24) *Longest tibial apophysis*: (0) RTA [Fig. 11]; (1) VTA [fig. 7 in Muster *et al.* 2007]; (2) DTA [Figs 18, 19].

(25) *VTA, structure*: (0) soft, transparent [fig. 51 in Muster *et al.* 2007]; (1) heavily sclerotised [Fig. 15a]; (2) weakly sclerotised [Fig. 10a].

(26) *VTA, shape in ventral view*: (0) ridge [fig. 43 in Levy 1977]; (1) thin, straight projection [Figs 10a–14a]; (2) flat, broad [fig. 44c in Roberts 1985]; (3) thin, bent projection [Fig. 15a]; (4) triangular [fig. 7 in Muster *et al.* 2007]; (5) irregular [fig. 44e in Roberts 1985]; (6) quadrangular [fig. 18 in Muster *et al.* 2007].

(27) *Tip of RTA, shape in lateral view*: (0) broadly rounded [fig. 44 in Levy 1977]; (1) tapering, rounded [Figs 10b, 11b]; (2) pointed [Fig. 12b]; (3) with straight ridge [Figs 16b, 19b].

(28) *Bulbus, shape*: (0) droplike [figs 44d, 45d in Roberts 1985]; (1) flat, disc-like [figs 43b, 45b in Roberts 1985; Figs 10–19a]; (2) flattened, bulged [figs 43c, 44e in Roberts 1985]; (3) elongated with long process [fig. 1032 in Heimer and Nentwig 1991].

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Table 2. (continued)

- (29) *Cymbium tip, shape*: (0) broadly rounded [Fig. 12a]; (1) tapering, rounded [fig. 18 in Muster *et al.* 2007].
- (30) *Cymbium tip, length*: (0) <1/4 CyL; (1) 1/4–1/3 CyL; (2) >1/3 CyL.
- (31) *Dorsal cymbium bulges, number*: (0) none; (1) one [Fig. 6, arrow]; (2) two [Fig. 15c]; (3) three [Fig. 16c].
- (32) *Embolus, structure*: (0) not divided [Fig. 12a]; (1) divided in basal and distal embolus [fig. 15 in Muster *et al.* 2007].
- (33) *Distal embolus, condition*: (0) stiff and thorn-like [fig. 18 in Muster *et al.* 2007]; (1) falciform, inflexible [fig. 43 in Levy 1977]; (2) whip-like, flexible [fig. 54 in Muster *et al.* 2007]; (3) filiform, flexible [Fig. 4]; (4) special structure [fig. 46b in Roberts 1985]; (5) blade [fig. 1379 in Heimer and Nentwig 1991].
- (34) *Embolus, origin*: (0) 3:00–7:30 o'clock [Fig. 19a]; (1) 7:31–9:00 o'clock [Fig. 17a]; (2) 9:01–10:30 o'clock [Fig. 15a]; (3) 10:31–12:00 o'clock [fig. 43 in Levy 1977].
- (35) *Embolus, position of tip*: (0) 12:00–12:59 o'clock [fig. 44d in Roberts 1985]; (1) 13:00–13:59 o'clock [fig. 43c in Roberts 1985]; (2) 14:00–14:59 o'clock [fig. 43 in Levy 1977]; (3) 15:00–15:59 o'clock [Fig. 18a].
- (36) *Embolus tip*: (0) not exceeding tegulum [Fig. 18a]; (1) exceeding tegulum distally [fig. 44d in Roberts 1985]; (2) exceeding tegulum laterally [fig. 43c in Roberts 1985].
- (37) *Embolus, visibility in ventral view*: (0) freely visible [fig. 43c in Roberts 1985]; (1) (partially) hidden [Fig. 11a].
- (38) *Paraembolar projection (PEP)*: (0) absent; (1) present [fig. 13 in Muster *et al.* 2007].
- For a definition of this character, see Muster *et al.* (2007: 49).
- (39) *Conductor, size*: (0) small [fig. 36 in Levy 1977; figs 45c, 46b in Roberts 1985]; (1) medium to large [Fig. 13a; fig. 7 in Muster *et al.* 2007].
- Palpal homologies in the *Dionycha* are less understood than in other spiders, e.g. the *Orbiculariae* for which a vast number of studies exist (see Agnarsson *et al.* 2007; and references therein). A special problem is the conductor, which, in contrast to most palpal structures recognised by topology, was traditionally defined by function (Comstock 1910). According to Schick (1965), the philodromid conductor is highly diverse, constituting a large membranous lobe, a broad sclerite bearing a membranous groove, a lobe-like process, or a retrolateral shallow groove. It is obvious that some of these structures refer to nonhomologous sclerites. Logunov (1996) suggested that the membranous philodromid conductor would not be homologous to that of other spider groups, but instead be a homologue of the distal haematodocha. In the current matrix, all membranous structures conducting the embolus were encoded as conductor. In *Artanes*, the conductor appears divided in a large sclerotised part between the distal margin of tegulum and the embolar course (CoI) and a membranous semicircle with a ventral groove in which the embolus is embedded (CoII).
- (40) *Conductor process*: (0) absent [fig. 43c in Roberts 1985]; (1) present [Figs 4, 5, 10a, 13a; fig. 15 in Muster *et al.* 2007].
- As with the conductor, the homology of regular apophyses is difficult to establish in philodromid spiders. Some supraspecific taxa of *Philodromus* (*dispar-*, *emarginatus-*, *pulchellus-*, *rufus* species-groups and subgenus *Artanes*) bear a small sclerotised lobe or hook arising from the conductor membrane near the tip of the embolus (Figs 4, 5). According to Muster *et al.* (2007) and used here, this structure is named conductor process (CoP). Other philodromid spiders, e.g. representatives of *Thanatus* or the *histrion*-group of *Philodromus*, have a more expanded regular apophysis that arises more directly from the tegulum (called PTA, philodromid regular apophysis in Szita and Logunov 2008). Finally, the species of the *P. aureolus*-group have a stout, curved seta on the tegulum, the retinaculum (Braun 1965). All these structures were subsumed as 'paraconductor bulbar apophysis' (PCA) by Schick (1965). Although topology and structure suggest that they are not homologous, they occur mutually exclusively in these taxa. However, regarding them as independent structures or encoding the different position and structure of a single character is without influence on the output of cladistic analyses.
- (41) *Retinaculum*: (0) absent; (1) present [fig. 1 in Braun 1965].
- See comment on previous character.
- (42) *Tegular apophysis*: (0) absent [Fig. 12a]; (1) present [figs 1, 2 in Logunov 1996].
- See comment on character 40.
- (43) *Tegular apophysis, size*: (0) small [fig. 2 in Logunov 1996]; (1) large, exceeding tegulum [fig. 36 in Levy 1977].
- (44) *Sperm duct loop, shape*: (0) symmetric [fig. 15 in Muster *et al.* 2007]; (1) asymmetric [Fig. 12a].
- According to Schick (1965), the sperm reservoir forms three loops along the spiral course through the tegulum, a basal, middle and apical loop (= 'embolar loop of SD' in Szita and Logunov 2008). For taxonomic purpose within Philodromidae, only the middle loop is of relevance and is simply called the sperm duct loop (SD) here.
- (45) *Sperm duct loop, course*: (0) without parallel run [fig. 7 in Muster *et al.* 2007]; (1) with parallel run [Fig. 16a].
- (46) *Sperm duct loop, opening*: (0) 5:00–5:59 o'clock [fig. 43b in Roberts 1985]; (1) 6:00–6:59 o'clock [Figs 12a, 19a]; (2) 7:00–7:59 o'clock [Fig. 16a]; (3) 8:00–8:59 o'clock [Fig. 18a].
- (47) *Sperm duct loop*: (0) in basal half of tegulum [fig. 44c in Roberts 1985]; (1) in distal half of tegulum [fig. 7 in Muster *et al.* 2007]; (2) in both halves of tegulum [Fig. 13a].
- (48) *Subtegulum*: (0) not visible in ventral view [Fig. 10a]; (1) visible in ventral view [fig. 1 in Logunov 1996].
- Female genitalia**
- (49) *Receptacula, size*: (0) large, voluminous, RSI < 7; (1) small, RSI ≥ 7.
- Here I define the receptacula size index (RSI) as the ratio CW/RL. For the different usage of the terms 'receptaculum', 'receptaculum seminis' and 'spermathecae' see Jäger (2002) and Muster and Thaler (2003).
- (50) *Receptacula, shape*: (0) round [fig. 37 in Muster *et al.* 2007]; (1) ellipsoid [Fig. 22b]; (2) kidney-shaped [Fig. 30b]; (3) bagpipe-shaped [fig. 39 in Levy 1977]; (4) irregular, with seams [figs 6–8 in Logunov 1996]; (5) pear-shaped [fig. 65 in Levy 1977].
- (51) *Receptacula, distance*: (0) touching each other [Fig. 31b]; (1) < diameter apart [Fig. 22b]; (2) ≥ diameter apart [fig. 39 in Levy 1977].
- (52) *Glandular heads*: (0) not appreciable [Fig. 25b]; (1) sitting distally [Figs 23b, 24b]; (2) sitting laterally [Figs 21b, 29b]; (3) on copulatory ducts [fig. 36 in Muster *et al.* 2007]; (4) hidden dorsally [Fig. 22b].
- The receptacula of most philodromid spiders have prominent appendages with glandular function, that are either present on the receptacula walls or on ducts of variable length. However, different terminologies have been proposed as follows: 'gland of spermatheca' (Comstock 1910; Ono 1988), 'spermathecal organs' (Schick 1965; Dondale and Redner 1976; and previous papers; Szita and Samu 2000; Muster and Thaler 2003; Szita and Logunov 2008), 'receptacula' (Logunov 1996), and 'glandular heads' (Muster *et al.* 2007).

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Table 2. (continued)

- (53) *Glandular heads, distance from receptacula*: (0) < diameter [Fig. 24b]; (1) 1–2× diameter [fig. 32 in Muster *et al.* 2007]; (2) >2× diameter [fig. 80 in Dondale and Redner 1969].
- (54) *Copulatory ducts*: (0) absent [Fig. 20b]; (1) present [fig. 36 in Muster *et al.* 2007].
- The use of the terms ‘copulatory ducts’ and ‘bursa copulatrix’ has been particularly controversial. Schick (1965) defined bursa copulatrix as ‘the intromittent division [that] is developed as a simple, tubular, membranous canal’. Later Logunov (1996) adopted this term for the ducts of the glandular heads, which may be independent of the intromittent orifice (Jäger 2002; Muster and Thaler 2003). Other related terms are ‘copulatory tubes’ (Dondale and Redner 1976; and previous papers), ‘copulatory ducts’ (Foelix 1982; Muster and Thaler 2004; Muster *et al.* 2007), ‘intromittent canal’ (Ono 1988), ‘insemination duct’ (Szita and Logunov 2008). In my opinion, the confusion is caused by the fact that the insemination duct and the duct from the glandular heads can be incorporated in a single canal in some taxa, but they can be independent in others. For clarity in the future, I propose the following definitions. ‘Bursa copulatrix’ is a canal or three-dimensional region (Figs 21b, 23b, 24b, 28b) of the vulva that is passed by the embolus during copulation before it enters the receptacula and that is NOT connected with the duct leading to the glandular heads. Usually the bursa copulatrix is less strongly sclerotised than the receptacula. If the intromittent canal is merged with the ducts of the glandular heads, this structure is called ‘copulatory duct’. Copulatory ducts are often strongly sclerotised. Note that the exact position of the intromittent orifice is often unknown.
- (55) *Copulatory ducts, shape*: (0) straight [fig. 16b in Muster and Thaler 2004]; (1) bent [fig. 32 in Muster *et al.* 2007]; (2) curled [fig. 80 in Dondale and Redner 1969]; (3) tubes [fig. 23b in Muster and Thaler 2004]; (4) S-shaped [fig. 1210 in Heimer and Nentwig 1991].
- (56) *Bursa copulatrix*: (0) not appreciable [Figs 20b, 22b, 26b]; (1) heavily sclerotised [Figs 21b, 23b]; (2) weakly sclerotised [Figs 27b, 31b]. See comment on character 54.
- (57) *Epigynal grooves*: (0) absent [fig. 37 in Muster *et al.* 2007]; (1) present [Figs 20–31a].
- Synonym terms in use are ‘atrium’ or ‘bilateral atria’ (Schick 1965; Dondale and Redner 1976; and previous papers) or ‘vestibulum’ (Ono 1988).
- (58) *Epigynal grooves, shape*: (0) ellipsoid [Fig. 24a]; (1) ear-like [Fig. 20a]; (2) half-circles [Fig. 45 in Levy 1977]; (3) sigmoid [Fig. 23a]; (4) 1/4 circles [Fig. 25a]; (5) cordiform [fig. 1060 in Heimer and Nentwig 1991].
- (59) *Epigynal grooves, margins*: (0) sclerotised around [fig. 26a]; (1) sclerotised in caudal half [Fig. 28a]; (2) sclerotised in distal half [Fig. 38 in Levy 1977]; (3) laterally sclerotised [Fig. 45 in Levy 1977]; (4) sclerotised on inner margins [fig. 16 in Szita and Logunov 2008].
- (60) *Median septum*: (0) continuous [Figs 20a, 26–31a]; (1) interrupted [Fig. 25a].
- (61) *Median septum, surface*: (0) flat [Figs 26–31a]; (1) elevated with keel [Figs 22a, 23a, 24a]; (2) with depression [Fig. 25a].
- (62) *Median septum, width*: (0) < epigynal grooves [Figs 22a, 28–31a]; (1) > epigynal grooves [Fig. 21a].
- (63) *Glandular mounds*: (0) not appreciable [Figs 20–22b, 24–25b, 29–30b]; (1) present [Figs 23b, 26–28b, 31b].
- Glandular mounds are glandular regions on the wall of the receptacula that occur in some philodromid taxa in addition to the glandular heads.
- (64) *Glandular mounds, position*: (0) anterior [fig. 25b in Muster and Thaler 2004]; (1) lateral [Figs 23b, 26–28b, 31b].

of the family on a worldwide scale was beyond the scope of the current study.

The analysis revealed more complex relationships within Philodromidae than reflected in the present nomenclatorial system. Previously proposed supra- and infrageneric classifications require major modifications to fulfil the criterion of monophyly. The poor match of Simon’s (1932) species-groups with evolutionary entities has already been demonstrated (Muster *et al.* 2007). But also Schick’s (1965) division of philodromid spiders into the tribes Thanatini (*Apollophanes*, *Pelloctanes*, *Thanatus*, *Tibellus*) and Philodromini (*Philodromus*, *Rhysodromus*, *Ebo*) is not corroborated, because Philodromini is paraphyletic with respect to Thanatini. Schick (1965) accurately recognised the distinctiveness of the *Philodromus histrio*-group and established the new genus *Rhysodromus*. However, he failed to detect the affiliation of *Rhysodromus* to the Thanatini rather than to *Philodromus* or *Ebo*. Furthermore, it has not been predicted that *Ebo* could be sister to all the remaining Holarctic Philodromidae, but this was consistently found in all reconstructions in this study. Note that the analysis suggests that the subgenus *Titanebo* deserves re-elevation as a separate genus and that the Palearctic ‘*Ebo*’ species seem to be more closely related to *Rhysodromus* than to Nearctic *Ebo*.

The delineation of *Philodromus* remains a major challenge. The subgenus *Artanes* as defined in this study is clearly a distinct lineage characterised by numerous synapomorphies (Fig. 1a), including somatic traits (e.g. the leg

formula with leg III being longer than leg I or IV, character 11), male genitalic traits (e.g. the presence of three tibial apophyses with DTA being longer than RTA and VTA, character 24) and female genitalic traits (e.g. kidney-shaped receptacula, character 50). The sister taxon of *Artanes* is probably *P. dispar*, placed in a separate species-group of *Philodromus* by Simon (1932) and Dondale and Redner (1969). It shares the flat, disc-like cymbium and the circular course of the filiform embolus, but is clearly distinct in the configuration of tibial apophyses and especially in female genitalia. Thus, from the view of evolutionary systematics, assigning generic rank to *Artanes* would be justified, as proposed by Koch (1837b; sub *Artamus*) or Gertsch (1933; sub *Horodromoides*). However, because *Artanes* is a distal taxon within a large clade containing several *Philodromus* species-groups, such a conclusion would render a great proportion of *Philodromus* paraphyletic. For the reasons of nomenclatorial stability and to avoid the establishment of many new (partially monotypic) genera I here consider it as a subgenus of *Philodromus*. To assure monophyletic genera and yet proposing a minimum of nomenclatorial changes, regarding *Philodromus* as coextensive with clade II (Fig. 1) would be a reasonable compromise. Weighting against homoplasy has shown that the *infuscatus* and *pulchellus* species-groups and *Philodromus insularis* may as well belong to this clade. Inevitable changes could be restricted to the re-establishment of *Rhysodromus* and transfer of *P. bigibbus*, which is most probably a senior synonym of *P. latrophagus* Levy, 1999. But it must be noted

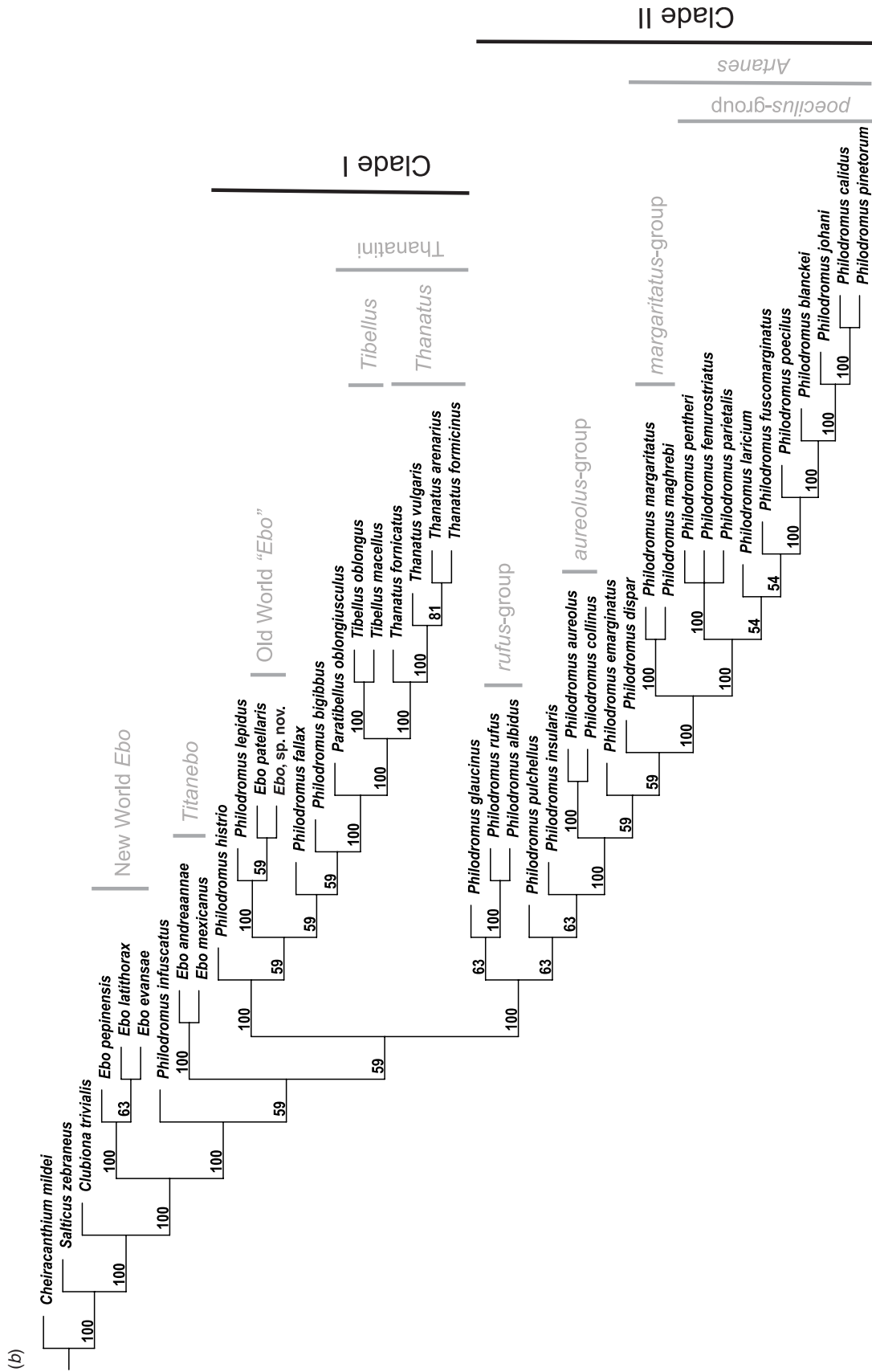


Fig. 1. (continued)

that *Philodromus* with these limits remains a weakly supported taxon. Schick (1965) pointed out that even the subset of Californian *Philodromus* species (excluding *Rhysodromus*) were united by not more than two weak characters, the widely spaced PME and the presence of a paraconductor bulbar apophysis (PCA). Further studies may result in the eventual contraction of *Philodromus* to the *aureolus* species-group.

The reason for the failure of earlier authors to reveal phylogenetic relationships within Philodromidae may lie in the exclusive focus on either eye or genitalic characters. This study has shown that, without doubt, genitalia provide the best characters for species diagnoses, but they may be misleading at the supraspecific level due to difficulties in establishing homologies and detecting homoplasies. On the other hand, leg spination turned out to be very useful for the discrimination of genera and species-groups. Although the number of spines is variable among species and specimens, and sometimes even within individuals, each supraspecific taxon is well characterised by its spination pattern. Besides the ventral spines on the tibiae, the hitherto neglected spines on the metatarsi appear to be rather constant and highly informative characters which may help to place poorly known taxa. This is illustrated by *Thanatus fornicatus* Simon, 1897 (= *Philodromus sitiens* Fage, 1929, syn. nov., types of both species examined at MNHN), whose difficult placement is also evident from the proposed transfer to *Apollophanes* by Logunov (1996). Examination of its spination pattern revealed its unequivocal affiliation with the Thanatini.

Taxonomic progress in the subgenus Artanes

Given the findings in other studies on Mediterranean Philodromidae (Levy 1977, 1999; Muster and Thaler 2004; Muster *et al.* 2007) it was not surprising that this group required intensive efforts at the level of basic alpha-taxonomy. *Philodromus margaritatus* and *P. fuscomarginatus* were the only species adequately characterised when this study was started (but see synonymy list of *P. fuscomarginatus* for the problems with east-Asian records). Two other species, *P. calidus* and *P. parietalis*, were only known from their poor original descriptions, while in *P. blanckei* the female remained unknown. Although *P. laricum* has been well characterised, its synonymy and nomenclature was subject to controversy. *Philodromus poecilus* is the most frequently misidentified species of the genus, strongly influenced by Simon's (1932) confusion. At a rough estimate, only about 50% of the specimens of this taxon from museum collections were correctly identified. One can easily anticipate the uncertainty associated with faunistic records where there has been no proper deposition of voucher specimens. Some specimens of the five species newly described here were also accommodated under incorrect names in collections.

Conservation considerations

The apparent population decline in some species of the subgenus is mysterious, particularly in *P. poecilus*. Probably

this species has always been rare, but arachnological collections that originate from the end of the 19th century comprise some larger series (Coll. Zimmermann, Reimoser, see also Bösenberg 1902). On the other hand, the last record from Germany dates back more than 25 years (20 May 1980, Baden-Württemberg, Kißlegg, Gründlenried, from bark of *Pinus* in peat bog, leg. B. Gerken, Coll. K.-H. Harms), despite the fact that the number of faunistic surveys using stem electors and other methods for the inventory of corticolous animals have rapidly increased since then. In Austria, Thaler (1997) noted a decline in the number of records of *P. fuscomarginatus* since the 1950s. The situation in the Mediterranean seems to be similar. In this respect, a comparison with the recently revised *pulchellus*-group (Muster *et al.* 2007) is illustrative. Although the same institutional and private collections were screened for specimens of both taxa, in the *pulchellus*-group only 29% of the material studied was collected before 1930, whereas this percentage was 73% in *Artanes*. More specifically, the comprehensive collection of R. Bosmans (Gent) from this region contained only four specimens of *Artanes*, compared with 203 in the *Philodromus pulchellus*-group. Admittedly, this unbalanced sampling is not strong evidence for population decline, but can neither be explained by methodological preferences of collectors alone. The reasons remain unclear, but intensification of forest management, pollution, pathogens, biotic interactions or climatic change, may be impacting populations of these species.

Biogeography

The subgenus *Artanes* is probably restricted to the Palearctic region, with the exception of one Nearctic species. Species diversity is highest in Mediterranean climates and declines towards polar and subtropical latitudes. A clear longitudinal gradient in species richness across Eurasia is not discernible. Mediterranean endemics include: *P. calidus*, *P. femurostriatus*, *P. maghrebi*, *P. parietalis*, *P. pinetorum*, and the more restricted narrow range endemics, *P. blanckei* (Tyrrhenian Islands and southern Italy) and *P. johani* (Crete). *Philodromus pentheri* seems to be primarily a Caspian species, and *P. laricum* is the only species strictly associated with mountainous ecosystems. The remaining species, *P. fuscomarginatus*, *P. poecilus* and *P. margaritatus* are widespread across the western Palearctic, with the latter extending to Japan. The localisation of a centre of origin is complicated by the insufficiently known situation in eastern Asia (see remarks on *P. poecilus*). Significantly, available data suggest that the number of (undescribed) species from this region could exceed that from the western Palearctic, and so an east-Palearctic origin for the taxon is possible. Biogeographic reconstructions are further hampered by unresolved phylogenetic relationships within the genus. Unfortunately, there is little hope for any rapid improvement of this situation. Morphological characters have been extensively scored in this study without achieving reasonable resolution, and molecular studies are obstructed by the extreme rarity of fresh specimens.

Taxonomy

Family PHILODROMIDAE

Genus *Philodromus* Walckenaer

Subgenus *Artanes* Thorell

Artamus C. L. Koch, 1837b: 27 (nom. preocc.). – Prach, 1866: 623.

Artama Simon, 1864: 415–416.

Artanes Thorell, 1870: 180 (replacement name). – Menge, 1875: 414–415; Hansen, 1882: 63–64; Bösenberg, 1902: 324.

Horodromoides Gertsch, 1933: 9–10.

Type species. *Artanes margaritatus* (Clerck, 1757) by subsequent designation (Thorell 1870).

Diagnosis

Philodromid spiders with a flat prosoma that is as wide (*margaritatus*-group) or markedly wider than long (*poecilus*-group, Fig. 2); opisthosoma pentagonal (character 20); third leg longer than legs I and IV (character 11), tibia I with at least four pairs of ventral spines. Males with three separate tibial apophyses of which DTA is longest (character 24); cymbium with dorsal bulges (character 31); bulb flattened, in distal half with semicircular course of embolus; conductor with large sclerotised part, sperm duct loop asymmetric (character 44). Females with two separated grooves (character 57) in a heavily sclerotised epigyne (Figs 8, 9); receptacula voluminous (character 49), vulva lacking copulatory ducts (character 54) or ducts from the glandular heads.

Description

Somatic features

Moderately sized to large philodromid spiders, total length (♂/♀, $n=21/40$) 3.4–6.9/3.9–8.2, cephalothorax width 1.80–3.20/2.05–3.50. Prosoma flattened, dorsal shield as wide or wider than long, densely covered with hairs, colour brownish, usually darker at the sides and brighter in the middle, but without distinct median band or V-shaped sign (Fig. 2). Eyes in two recurved rows, the second row almost straight, lateral eyes larger than medians. Clypeus narrow, oblique. Leg formula 2341 (*margaritatus*-group) or 2314 (*poecilus*-group), femur II 1.17–1.35/1.15–1.42 × longer than femur I (length femur I 2.05–3.5/2.2–4.3, length femur II 2.7–4.2/2.85–5.1). Leg spination, femora with three dorsal macrosetae (four in some ♀ of *P. margaritatus*), 2–3 prolaterals, 0–5 retrolaterals, patellae with one dorsal macroseta (none in *P. laricum*), 0–2 prolaterals, 0–1 retrolaterals, tibiae with 0–4 dorsal macrosetae, 0–3 prolaterals, 1–4 retrolaterals, four (*margaritatus*-group), five (*poecilus*-group except *P. laricum*) or six (*P. laricum*) pairs of ventrals (including apicals), metatarsi with 0–2 dorsal macrosetae, 2–3 prolaterals, 2–3 retrolaterals, three (*poecilus*-group) or four (*margaritatus*-group) pairs of ventrals (including apicals), tarsi I–III in most females of the *poecilus*-group with one pro- and one retrolateral macroseta. Legs yellowish to brown, with twofold dark annulation on tibiae and metatarsi, femora with a characteristic prolateral-ventral patch (Fig. 3) and diverse

spots. Opisthosoma pentagonal (Fig. 2), dorsally with a square of muscle spots, the posterior pair sometimes divided and comma-shaped, dorsum covered with recumbent setae and hairs, basic colour whitish to grey, with tessellated pattern of angular lines in posterior half and dark flanks, venter beige.

Pedipalp

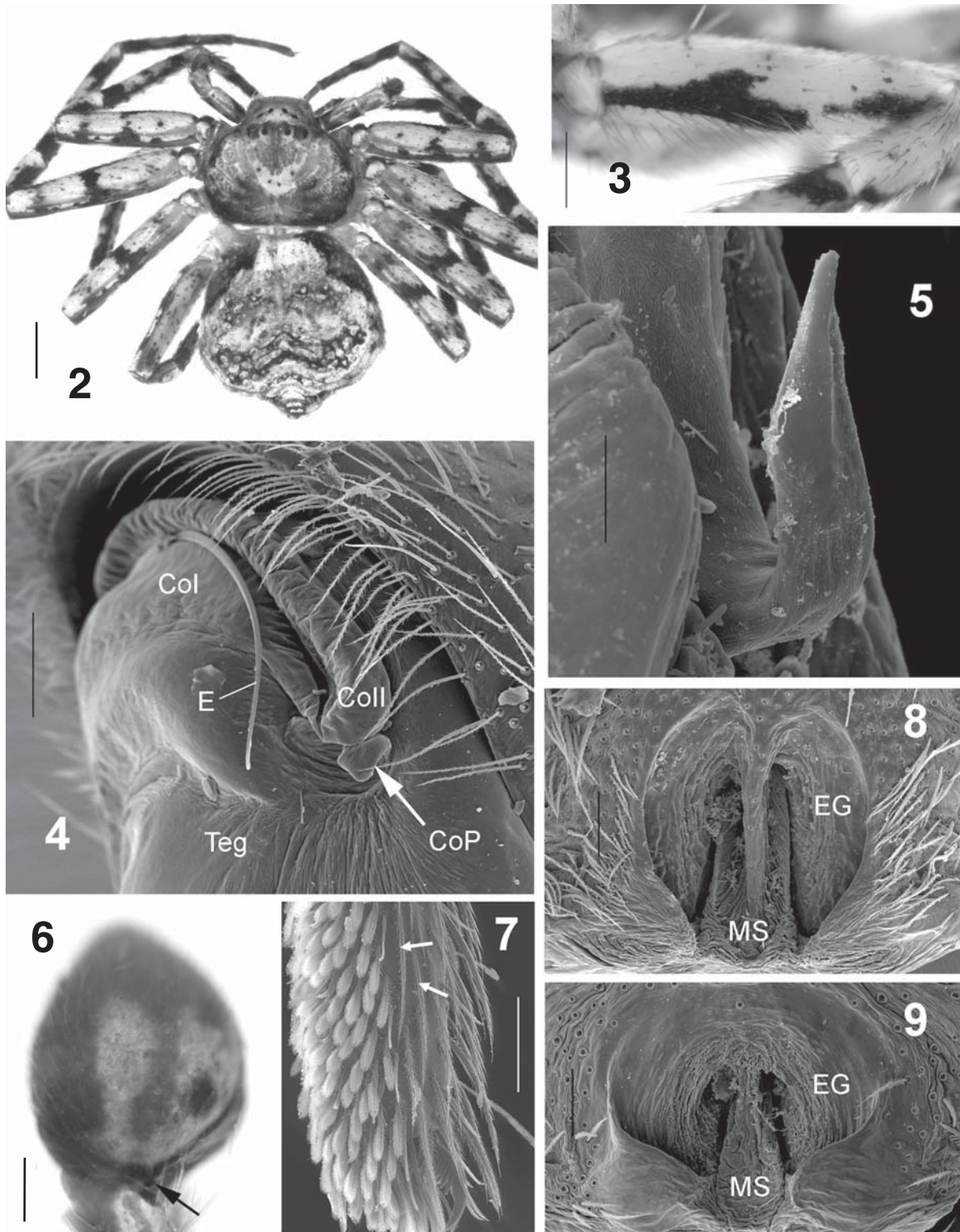
Tibia with three separated apophyses, ventral tibial apophysis (VTA) bladed, often acute, retrolateral tibial apophysis (RTA) of specific shape, dorsal tibial apophysis (DTA) broadly triangular (Fig. 10c) or elongated (Fig. 18c), resting in an excavation of the cymbium, usually not visible in ventral view. Cymbium and bulb flattened, almost circular, cymbial tip short, broadly rounded, with chemosensitive hairs. Cymbium length (CyL) 0.76–1.24, width (CyW) 0.54–1.02, ratio CyL/cephalothorax width 0.38–0.46. Tegulum with tegular suture leading to 6:30 to 8 o'clock position, without apophyses except a bulge near the origin of embolus in some species. Sperm duct takes course obliquely on tegulum, asymmetric, R-shaped. Conductor divided into a broad sclerite (CoI) and a shallow membranous groove accommodating the embolus (CoII), with a lobe-like conductor process (CoP) near the tip of the embolus (Figs 4, 5). Embolus long, arising from 7:30 to 9 o'clock position, following a semicircular course in the distal half of the alveolus. Surface of basal embolus with fine grooves, distal embolus filiform and flexible.

Epigyne/vulva

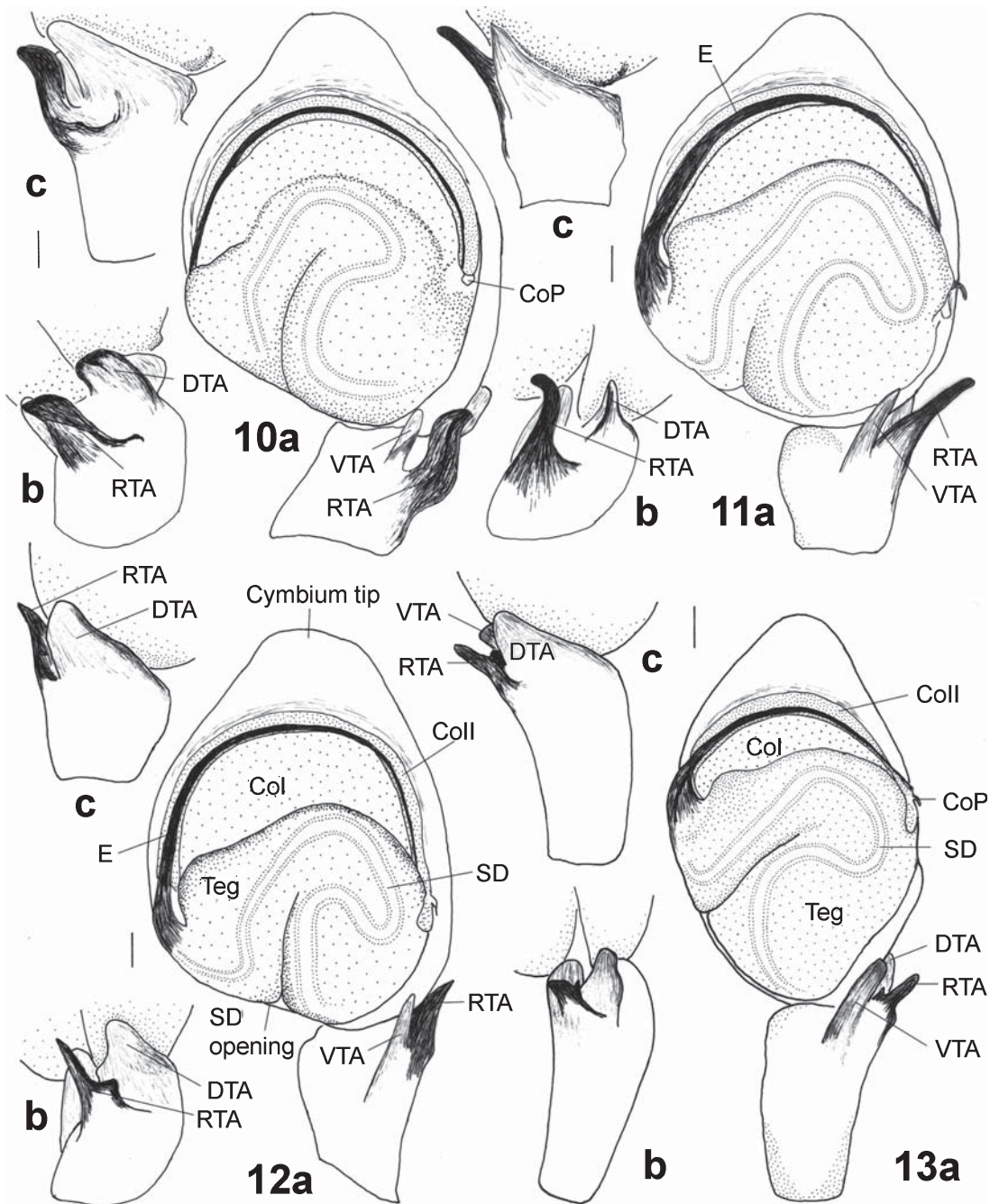
Epigyne heavily sclerotised, with a median septum (MS) dividing the atrium into two separated epigynal grooves (EG), median septum in some species with elevated keel (Fig. 8). Epigynal grooves covered by a transparent membrane, the lateral margins may form 'lateral guide pockets' for the embolus during copulation (Schick 1965), the intromittent orifice is probably situated near the anterior arches of the grooves. Intromittent division of the vulva in some species developed as three-dimensional membraneous or sclerotised structure, called 'bursa copulatrix' (BC) in this paper (Fig. 23b). Receptacula (R) voluminous with heavily sclerotised walls, often kidney-shaped (Fig. 30b), length 0.27–0.56, width 0.14–0.28. Glandular heads (GH), if visible, sitting in anterior, dorso-anterior or lateral position on receptacula (Figs 20b, 22b, 24b), without duct, independent from intromittent canal. Receptacula with up to two glandular mounds (GM) laterally (Fig. 23b). Spermathecal cock (Ono 1988) and fertilisation ducts near the epigastric furrow (Figs 20b, 23b).

Remarks

The presence of DTA is regarded as an autapomorphy for *Artanes*. In species of the *P. aureolus* and *infuscatus* species-groups with three tibial apophyses, the intermediate tibial apophysis appears to be rather a lateral outgrowth of either VTA or RTA (see Schick 1965).



Figs 2–9. 2, *Philodromus pinetorum*, Turkey: Namrun, female habitus; 3, *P. blanchei*, France: Sardinia, characteristic patch on femur I of female; 4, *P. margaritatus*, Austria: Stubaital, distal embolus and conductor process (arrow); 5, *P. fuscomarginatus*, Germany: Bremen, conductor process; 6, *P. poecilus*, unknown locality, dorsal view of cymbium with cymbial bulge (arrow); 7, *P. lepidus*, Tunisia: Zaafrane, tarsus of leg I, arrows pointing to long pinnate hairs; 8, *P. poecilus*, unknown locality, epigyne; 9, *P. pinetorum*, unknown locality, epigyne. Scale bars = 1 mm (2), 0.5 mm (3), 100 μ m (4, 7, 8, 9), 20 μ m (5).



Figs 10–13. *a*, left male palp, ventral view; *b*, tibial apophyses, retrolateral view; *c*, ditto, dorsal view; 10, *Philodromus margaritatus*, Austria: Stubaital; 11, *P. fuscomarginatus*, Germany: Nuremberg; 12, *P. femurostriatus*, Turkey: Fethiye; 13, *P. laricum*, Austria: Innsbruck. Scale bars = 0.1 mm.

Composition and distribution

In the western Palearctic, the subgenus contains 12 species as characterised and described in this paper. Other species include: *Philodromus validus* (Gertsch, 1933) (type species of *Horodromoides* Gertsch, 1933) and the single representative of the *Philodromus fuscomarginatus*-group from North America (Dondale and Redner 1975), *Philodromus spinitarsis*

Simon, 1895 from eastern Asia (transferred to *Artanes* by Logunov 1997), *Philodromus utotchkini* Marusik, 1991 from eastern Siberia, and *Philodromus marusiki* (Logunov, 1997) from central Asia. The true diversity of the taxon in the eastern Palearctic is unknown.

Artanes as defined here differs from the generic concepts of Koch (1837b), Prach (1866) and Bösenberg (1902), and

from Simon's (1932) 3rd species-group as it does not include *P. emarginatus*. This taxon, however, is strikingly distinct in the genital organs of both sexes: males show strongly modified tibial apophyses, an oval cymbium and they lack the sclerotised part of the conductor, while females have globular receptacula with long sclerotised copulatory ducts, and they lack paired epigynal grooves. Furthermore, *P. emarginatus* bears only two pairs of ventral spines on the metatarsi.

Key to species of the subgenus *Artanes* in the western Palearctic

1. Tibia I with four pairs of ventral spines (including the apicals, see comment on characters 1–7); chelicerae with light transversal band (*margaritatus*-group).....2
Tibia I with five or six pairs of ventral spines (including apicals); chelicerae without transversal band (*poecilus*-group).....3
2. Vulva with bubble-shaped bursa copulatrix (Fig. 21*b*); glandular heads in distal third of receptacula; specimens from northern Africa.....*Philodromus maghrebi*, sp. nov.
Bursa copulatrix not visible in dorsal view; glandular heads near the middle of receptacula (Fig. 20*b*); widely distributed in the Palearctic*Philodromus margaritatus*
3. Tibia I with six pairs of ventral spines (including the apicals).....*Philodromus laricum*
Tibia I with five pairs of ventral spines (including the apicals).....4
4. Coloration uniform: dorsal shield of prosoma reddish-brown, dorsum of opisthosoma grey, legs without distinct annulation5
Dorsal shield of prosoma and opisthosoma with colourful pattern, legs with distinct dark spots and annulation (Fig. 2).....6
5. Femora with parallel black stripe on prolateral-ventral side; CoI large (Fig. 12*a*); receptacula embryo-shaped (Fig. 29*b*).....*Philodromus femurostriatus*, sp. nov.
Femora without dark pattern; CoI of normal size (Fig. 11*a*); receptacula bean-shaped (Fig. 22*b*).....*Philodromus fuscomarginatus*
6. Males.....7
Females12
7. DTA strongly elongated (Figs 18*c*, 19*c*)8
DTA of similar length as other tibial apophyses9
8. RTA tapering (Fig. 18*a–c*); embolus originating at 9 o'clock position.....*Philodromus blanckei*
RTA with a broad edge (Fig. 19*a–c*); embolus originating at 7:30 o'clock position.....*Philodromus parietalis*
9. RTA an extended blade with straight anterior margin (Fig. 16*b*).....*Philodromus calidus*
RTA not so.....10
10. RTA with a single rounded tip (Fig. 14*a–c*).....*Philodromus poecilus*
RTA bifid (Figs 15*a–c*, 17*a–c*).....11
11. Embolus irregularly curved with a sharp bend and sudden narrowing at 12 o'clock position (Fig. 15*a*); RTA in lateral view tower-shaped (Fig. 15*b*).....*Philodromus pinetorum*, sp. nov.
Embolus evenly curved and narrowing (Fig. 17*a*); RTA in lateral view shrew-shaped (Fig. 17*b*).....*Philodromus johani*, sp. nov.
12. Receptacula kidney-shaped (Figs 30*b*, 31*b*).....13
Receptacula ovoid.....14
13. Anterior part of receptacula more voluminous than posterior; bursa copulatrix not visible (Fig. 30*b*).....*Philodromus pentheri*, sp. nov.
Anterior and posterior part of receptacula of similar size; weakly sclerotised bursa copulatrix anterior to the receptacula (Fig. 31*b*).....*Philodromus parietalis*
14. Epigyne with distinct slit-shaped orifices along the median septum (Figs 9, 25*a*).....*Philodromus pinetorum*, sp. nov.
Epigyne without distinct slit-shaped orifices (e.g. Fig. 8).....15

15. Median septum with elevated keel; receptacula with glandular heads sitting anteriorly.....16
Median septum without elevated keel; glandular heads not17
appreciable
16. Lateral margins of epigynal grooves concave (Fig. 23*a*); bursa copulatrix voluminous, extending beyond receptacula anteriorly (Fig. 23*b*).....*Philodromus blanckei*
Lateral margins of epigynal grooves convex (Fig. 24*a*); bursa copulatrix small, between the receptacula (Fig. 24*b*).....*Philodromus poecilus*
17. Median septum parallel; receptacula with lateral notch (Fig. 28*b*).....*Philodromus calidus*
Median septum diverging anteriorly; receptacula without lateral notch (Fig. 27*b*).....*Philodromus johani*, sp. nov.

The *P. margaritatus* species-group

Diagnosis

Within *Artanes*, the *margaritatus*-group is characterised by the presence of four pairs of ventral spines (three plus apicals) on tibia I, the existence of apical spines on the metatarsi in addition to the three standard pairs (character 1), the leg formula 2341, a prosoma of equal length and width, and a bright transversal band along the chelicerae. Epigynal grooves relatively small, i.e. less than half the length of the receptacula. Only two species are included. Distribution: Palearctic.

Philodromus maghrebi, sp. nov.

(Fig. 21)

Material examined

Holotype. Algeria: Tizi Ouzou: ♀, 'Kabylie', ~36°40'N, 4°31'E (MNHN ES-19826).

Paratype. 1 ♀, same data as holotype.

Other material examined. **Algeria**: 1 juv., 'Teniet' (MNHN ES-5990).

Diagnosis

The most striking difference from *P. margaritatus* is the presence of a moderately sclerotised, spherical bursa copulatrix, embedded in the lateral curvatures of the receptacula (Fig. 21*b*). The receptacula are more elongated than in *P. margaritatus*, the glandular head situated more distally (in the anterior third).

Description

Measurements

Species of intermediate size. Female ($n=2$): total length 6.2–6.5, CL 3, CW 3, ClyH 0.44–0.46, OL 3.3–3.6, OW 2.7–3.1. Leg I 9.5–10 [2.9, 1.15, 2.5, 2.05, 1.15]. Eye distances: AME–AME 0.33, AME–AML 0.21, PME–PME 0.54, PME–PML 0.42, ALE–PME 0.38. Epigyne/Vulva: EGL 0.18–0.24, EGW 0.1–0.11, RL 0.46, RW 0.2, R–EG 0.2–0.28.

Epigyne/vulva (Fig. 21*a*, *b*)

Epigynal grooves oval, lateral margins heavily sclerotised, ventrally protruding, median septum relatively

wide. Receptacula in the shape of a long cudgel, glandular heads laterally in the anterior third, a sclerotised bursa copulatrix is visible in dorsal view.

Colour

Dorsal shield of prosoma greyish-brown, the sides, eye area and clypeus whitish-grey, between PME and PLE dark brown, front margin of clypeus covered with white hairs. Chelicerae brown with light transverse band. Sternum whitish-grey with tiny spots. Legs yellowish grey with numerous black spots, tibiae and metatarsi basally and distally darkened, characteristic patch on femur I a straight black line that is interrupted at 4/5th of its length, femora ventrally with conspicuous long white pilosity. Dorsum of opisthosoma whitish-grey, the first pair of muscle spots indistinct, the posterior pair deeply depressed, giving the impression of two orange eyes, with a thin black line leading to the lateral margins, in posterior half with two chevrons. Flanks of opisthosoma almost black, venter and spinnerets pale orange.

Remarks

In contrast to low variation in genitalic characters across the vast range of *P. margaritatus*, females from northern Africa exhibit discrete structural vulvae differences. Thus, assigning specific rank to these specimens seems warranted despite the lack of males.

Distribution and habitat

Only known from northern Algeria (Fig. 33). The type series is labelled 'Kabylie', the name of several mountain ranges between Alger and Constantine. I assume that the type material comes from Grande Kabylie in the province Tizi Ouzou. It is not clear to which exact locality 'Teniet' refers, as there are many places bearing this name in Algeria.

Etymology

The distribution of this species is probably restricted to the Maghreb region (Morocco, Algeria, Tunisia). Noun in apposition.

Philodromus margaritatus (Clerck)

(Figs 4, 10, 20)

Araneus margaritatus Clerck, 1757: 130, pl. 6, fig. 3.

Aranea levipes Linnaeus, 1758: 624.

?*Aranea wilkii* Scopoli, 1763: 400.

Aranea ornata Sulzer, 1776: 254, pl. 30, fig. 5.

?*Aranea tetra* Martini & Götze in Lister, 1778: 290–291.

?*Aranea decem-oblique punctata* Martini & Götze in Lister, 1778: 294.

Aranea tigrina De Geer, 1778: 302, pl. 18, fig. 25.

Aranea ieiuna Panzer, 1801: 83, pl. 21.

Thomisus laevipes (Linnaeus). – Hahn, 1826: 2, pl. 14, fig. B; Hahn, 1833: 120–121, fig. 90.

Philodromus jejunos (Panzer) – Walckenaer, 1830: 97; Walckenaer, 1837: 551–552, pl. 14, fig. 1; Simon, 1864: 416–417, fig. 196.

Philodromus tigrinus (De Geer). – Sundevall, 1833: 225–226.

Artamus laevipes (Linnaeus). – C. L. Koch, 1837b: 27; Prach, 1866: 624–625, pl. 11, figs 13–15.

Artamus jejunos (Panzer). – C. L. Koch, 1845: 83–85, figs 1015, 1016. *Thomisus leopardinus* Gistel, 1848: 156.

Artamus margaritatus (Clerck). – Thorell, 1856: 73.

Artama jejuna Simon, 1864: 415.

Artanes margaritatus (Clerck). – Thorell, 1872: 262–264; Hansen, 1882: 64, pl. 4, fig. 10; Bösenberg, 1902: 327, p. 31, fig. 485.

Philodromus margaritatus (Clerck). – Westring, 1861: 454–457; Simon, 1875: 271; Becker, 1882: 221–223, pl. 23, fig. 3; Chyzer & Kulczyński, 1891: 106, pl. 4, fig. 14; Simon, 1895: 1057, fig. 1097; Reimoser, 1930: 54, fig. 8; Simon, 1932: 846, 882, figs 1280, 1281; Palmgren, 1950: 33, figs 12, 14, 15; Lockett & Millidge, 1951: 200–201, figs 99D, 100F; Vilbaste, 1969: 107–108, figs 89, 90; Miller, 1971: 127, pl. 17, fig. 11; Tyschchenko, 1971: 108, fig. 248; Brændegaard, 1972: 30–34, figs 14–16; Punda, 1975: 81, figs 174, 186; Roberts, 1985: 112, fig. 45B; Matsuda, 1986: 86, figs 23, 24; Yaginuma, 1986: 218, fig. 121.10; Chikuni, 1989: 136, fig. 11; Heimer & Nentwig, 1991: 460, fig. 1221; Roberts, 1995: 175; Mcheidze, 1997: 127, fig. 185; Roberts, 1998: 186; Namkung, 2002: 511, figs 41, 9A; Almquist, 2006: 463, 464, fig. 396.

Philodromus margaritatus tigrinus (De Geer). – Chyzer & Kulczyński, 1891: 107; de Lessert, 1910: 382.

Philodromus laevipes (Linnaeus). – Tullgren, 1944: 108–110, figs 40, 41A, pl. 15, figs 205–208.

References in the Platnick catalogue (2008) not referring to this species:

Philodromus pallidus Walckenaer. – Blackwall, 1861: 93–94, pl. 5, fig. 56 [= *Philodromus emarginatus* (Schrank, 1803)].

Philodromus ambiguus Blackwall, 1867: 208 [= replacement name for *P. pallidus* Blackwall, 1861].

Artanes margaritatus (Clerck). – Menge, 1875: 417–419, pl. 70, fig. 236 [= *P. poecilus* Thorell, 1870 (see remarks to this species)].

Philodromus elegans Blackwall. – Canestrini, 1876: 215, pl. 9, fig. 3 [= *Philodromus spec. aureolus*-group].

Philodromus margaritatus (Clerck). – Bellmann, 1997: 182 [epigyne = *P. aureolus* (Clerck, 1757)].

Material examined

Austria: Lower Austria: 2 ♀, 18 juv., Mödling (NMW Coll. Reimoser). **Northern Tyrol:** 2 ♀, Halltal-Ausgang (CTh A–137); 1 ♂, Hochzirl (CTh A–140); 1 ♂, 1 ♀, Ötztal-Eingang (CTh A–141); 1 ♂, Innsbruck-Heiligwasser (CTh); 1 ♂, Stubai Alpen, Kirchrachspitze (CM 0956). **Vienna:** 9 juv. (NMW). **France:** 10 ♂, 3 ♀, 5 juv., 'Gallia' (MNHN ES 660). **Languedoc-Roussillon:** 2 ♀, Banyuls sur Mer (MNHN Coll. Berland); 1 juv., Pyrénées-Orientales, Vallegirin (MNHN). **Germany: Bavaria:** 1 ♂, 2 ♀, Nürnberg (NMW 1882 I. 379). **Hesse:** 8 ♂, 1 ♀, Frankfurt am Main, Stadtforst (Coll. T. Blick). **Saxony:** 1 ♂, Hintere Sächsische Schweiz (MTD); 1 ♂, Tharandter Wald (MTD Coll. Hiebsch 612); 1 ♀, 2 juv., Dresdner Heide (MTD). **Italy: Calabria:** 2 ♀, 4 juv., Aspromonte (NMW). **Sardegna:** 1 juv., Sorgono (NMW). **Sicilia:** 1 juv., Castelbuono (MNHN ES–11957). **Trentino-Alto Adige:** 1 ♂, Jenesien (CTh). **Poland: Podlaskie:** 1 ♂, Bialowieza National Park (Coll. S. Otto, Leipzig, VS 69). **Spain: Aragón:** 1 ♀, Ainsa (CB). **Turkey:** 1 ♂, 'Ressl 81/44' without exact locality (CJW).

Diagnosis

The best diagnostic characters of *P. margaritatus* are the unique combination of tibial apophyses of the male palp, in particular the S-shaped RTA (Fig. 10), and the specific shape of the female receptacula (Fig. 20).

Description

Measurements

Male ($n=5$): total length 6.38 (5.7–6.9), CL 2.86 (2.6–3.2), CW 2.82 (2.6–3.0), ClyH 0.39, OL 3.53 (3.25–3.9), OW 2.55 (2.15–2.7). Leg I 15.4 (13.2–17.1) [4.16, 1.43, 4.1, 3.8, 1.9]. Eye distances: AME–AME 0.31, AME–AML 0.23, PME–PME 0.47, PME–PML 0.3, ALE–PME 0.32. Pedipalp: PFem 1.02 (0.94–1.1), PPat 0.48 (0.44–0.5), PTib 0.39 (0.34–0.42), CyL 1.1 (1.0–1.22), CyW 0.86 (0.82–0.92). Female ($n=5$): total length 7.7 (7.0–9.5), CL 3.13 (2.5–3.5), CW 3.19 (2.55–3.6), ClyH 0.56, OL 4.82 (4.4–5.5), OW 3.66 (3.4–3.9). Leg I 11.14 (8.7–12.9) [3.9, 1.5, 3.2, 2.75, 1.55]. Eye distances: AME–AME 0.36, AME–AML 0.24, PME–PME 0.51, PME–PML 0.39, ALE–PME 0.35. Epigyne/Vulva: EGL 0.2 (0.18–0.21), EGW 0.18 (0.14–0.22), RL 0.46 (0.38–0.54), RW 0.23 (0.2–0.25), R–EG 0.3 (0.19–0.36).

Pedipalp (Figs 4, 10)

Tibia with two very long bristles on prolateral side (not shown in Fig. 10a); VTA narrow, transparent, with rounded tip; RTA S-shaped, with sharp tip, longer than VTA and almost as long as DTA; DTA triangular (Fig. 10c), its anterior border resting in a matching depression of the cymbium. Dorsal side of cymbium either uniformly yellowish-brown or dark brown with whitish pattern, with one small cymbial bulge near prolateral edge of DTA. Tegulum without modifications, sperm duct loop weakly asymmetric, tegular suture leading to 7 o'clock position. CoI strongly sclerotised, CoP a rather broad lobe (Fig. 4). Embolus originating at 9 o'clock position, abruptly narrowing near the embolic base, taking a semicircular course as filiform structure to 3 o'clock position.

Epigyne/vulva (Fig. 20)

Epigynal grooves oval, orientation oblique, small (less than half the length of receptacula), lateral margins heavily sclerotised, ventrally protruding, median septum narrower than epigynal grooves. Receptacula in shape of a compressed cudgel, glandular heads laterally halfway of receptacula length, lateral concavities distinctly smaller than in *A. maghrebi*, without visible bursa copulatrix.

Colour

Typically variable, two colour variants have been described, the more uniform greyish-brown *laevipes*, and the contrasty black-and-white *tigrinus*. Dorsal shield of prosoma uniformly brown to brown with whitish lateral patches above coxae and black eye area (*laevipes*), or marbled brown with two large blackish patches in posterior half and small whitish margin (*tigrinus*). Clypeus in both forms pale yellowish brown, chelicerae dark brown with light transversal band, sternum pale yellowish brown. Legs yellowish-brown, femora, tibiae and metatarsi with threefold dark annulation (not ventrally), characteristic patch on femur I a dark stripe, sometimes interrupted at 3/4th of its length and/or fusing with the dorsal annulation, legs in females and some males intensely mottled, leg coloration generally more contrasting in forma *tigrinus*. Opisthosoma dorsally with two pairs of

orange-brown spots, the second pair divided, deeply depressed or not, colour uniformly grey to blackish with white marbled pattern (*laevipes* males), grey with dark flanks and dark angular lines in posterior half (*laevipes* females), or whitish grey with blackish cardiac mark, dark flanks and three pairs of black patches of decreasing size in posterior half (forma *tigrinus*). Venter and spinnerets in both forms beige-brown. Both colour variants are figured, for example, in Becker (1882: pl. 23, fig. 3), Tullgren (1944: fig. 40) and Brændegaard (1972: fig. 14).

Remarks

The synonymy list may not be exhaustive with respect to the many names applied to this species before 1900. I list only those references that allow an identification with reasonable confidence either by the written details, the quality of the figures, or for biogeographic reasons.

Platnick (2008) lists *Philodromus m. tigrinus* (De Geer, 1778) as a valid subspecies, despite a very clear statement on synonymy by Thorell (1872: 263): '*Aran. margaritatus* Clerck, *Ar. levipes* Linn. and *Ar. tigrina* De Geer all beyond doubt indicate one and the same, here in Upland very common species, the last name however expressing a variety, which is identical with *Ar. jejunos* (Panz.), C. Koch'. Later authors dealing with the Swedish spider fauna accepted this view (Tullgren 1944; Almquist 2006), and I fully agree with this opinion. Although there is some variation within the colour morphs, two discrete forms are distinguishable, and this must have led earlier authors, relying chiefly on colour and somatic characters, to describe several species. However, there are no differences in genitalic characters, and both colour variants co-occur in vast areas of the range, with the *laevipes* form being approximately 10× more frequent than *tigrinus*.

Distribution and habitat

Philodromus margaritatus has the widest distribution of all species in the subgenus, covering temperate regions of the Palearctic from Spain to Japan. It is also the most abundant *Artanes* species in vast areas of the western Palearctic, but it is rare in Mediterranean climates (verified European records in Fig. 32). The preferred habitat is coniferous forest. Most records come from spruce and pines, but some individuals were collected from walls and wooden partitions.

The *P. poecilus* species-group

Diagnosis

Species of the *poecilus*-group bear five or more pairs of ventral spines (including apicals) on tibia I (character 0), the leg formula is 2314, the prosoma is markedly wider than long (character 12). In the western Palearctic species, the sperm duct loop is strongly asymmetric, R-shaped (this seems not to hold true for species from eastern Asia). The paired epigynal grooves are large, at least half as long as the receptacula. An important synapomorphy is the presence of pro- and/or retrolateral macrosetae near the middle of the tarsi of the first two or three legs in females (character 8), which have become

secondarily lost in *P. fuscomarginatus* according to the parsimony analysis (Fig. 1).

The great majority of all *Artanes* species belong to this group. The *poecilus*-group was erected by Simon (1932); it is coextensive with the *fuscomarginatus*-group of Dondale and Redner (1975). The distribution of the taxon is Holarctic, but with only one species reaching North America. Many more species may exist in the eastern Palearctic.

Philodromus blanckei (Wunderlich)

(Figs 3, 18, 23)

Artanes blanckei Wunderlich, 1995: 374–375, figs 48, 49.

Philodromus blanckei (Wunderlich). – Platnick, 2008: The world spider catalogue, version 8.5.

Material examined

France: Corse: 1 ♀, Vescovato (SMF 9270); 4 ♀, between Zonza and Quenza (CJK 1906); 1 ♀, Gorges de la Restonica (CJK 1916); 2 ♂, 1 ♀ Col de la Serra near Vivario (CJK 1919). **Italy: Campagna:** 1 ♂, Napoli (MNHN ES–6343). **Sardegna:** 1 juv., Sorgono (NMW Coll. Reimoser); 2 juv., Baunei (CJK 1752); 1 ♀, Calangianus (CJK 1765); 2 ♂, 2 ♀, Seneghe (CJK 1772).

Diagnosis

The species is easily recognisable by the shape of the elongated tibial apophyses (Fig. 18c) and by the long epigynal grooves with concave lateral margins (Fig. 23a).

Description

Measurements

Male ($n = 5$): total length 4.8 (4.4–5.0), CL 2.26 (2.2–2.35), CW 2.46 (2.4–2.5), ClyH 0.3, OL 2.55 (2.3–2.8), OW 2.05 (1.85–2.2). Leg I 10.06 (9.65–10.45) [2.83, 1.04, 2.5, 2.33, 1.38]. Eye distances: AME–AME 0.24, AME–AML 0.18, PME–PME 0.36, PME–PML 0.3, ALE–PME 0.28. Pedipalp: PFem 0.82 (0.79–0.86), PPat 0.37 (0.34–0.4), PTib 0.32 (0.29–0.34), CyL 1.03 (1.02–1.04), CyW 0.85 (0.82–0.88). Female ($n = 7$): total length 5.99 (5.4–7.1), CL 2.36 (2.2–2.7), CW 2.71 (2.5–3.05), ClyH 0.3, OL 3.31 (2.9–4.2), OW 3.2 (2.5–4.0). Leg I 8.49 (7.65–10.25) [2.6, 1.07, 2.1, 1.65, 1.06]. Eye distances: AME–AME 0.29, AME–AML 0.18, PME–PME 0.42, PME–PML 0.38, ALE–PME 0.4. Epigyne/Vulva: EGL 0.42 (0.4–0.44), EGW 0.15 (0.13–0.17), RL 0.47 (0.46–0.48), RW 0.22 (0.2–0.24), R–EG 0.07 (0.06–0.07).

Specific features of leg spination

Female tarsi with one pro- and one retrolateral spine on legs I–II, variable on tarsus III.

Pedipalp (Fig. 18)

All tibial apophyses elongated; VTA a narrow spine, RTA two-pointed, the ventral branch lengthened, DTA a very long spine, resting in a matching depression of the cymbium. Cymbium dorsally brindled, with bulges at the base and tip of DTA. Anterior border of tegulum with small but distinct bulge near embolic base, sperm duct loop strongly

asymmetric, tegular suture leading to 8 o'clock position. Sclerotised part of conductor (CoI) gradually merging with membranous conductor (CoII), CoP a small hook. Embolus originating at 9 o'clock position, gradually tapering to a filiform appendix, irregularly curved with a sharp bend at 12 o'clock position, terminating at 4 o'clock position.

Epigyne/vulva (Fig. 23)

Epigynal grooves long, the lateral margins concave, median septum narrow, with elevated keel. Receptacula bent outwardly, glandular heads sitting distally, two pairs of glandular mounds at lateral margins, bursa copulatrix voluminous, moderately sclerotised, towering above receptacula anteriorly.

Colour

A colourful species. Dorsal shield of prosoma yellowish to whitish brown with dark brown posterior edges, especially in females densely covered with whitish hairs and black bristles, males from Sardegna with uniformly dark brown cephalothorax. Clypeus of same colour as anterior prosoma, chelicerae dark brown, sternum yellowish brown, sometimes with darker heart-shaped patch in the middle. Legs yellowish-brown, vividly mottled, characteristic prolateral-ventral patch on femur I bifurcated, reaching 2/3rd of the length of the segment (Fig. 3). Opisthosoma whitish to dark grey with black flanks and chevrons in posterior half, the two pairs of muscle spots inconspicuous, but some specimens show an additional pair of distinct satyrid patches in the anterior half. Venter and spinnerets light grey to yellowish.

Remarks

The female of this species was previously unknown. The suspicion of Wunderlich (1995) that a female from Corse in the SMF collection (mentioned by Kraus 1955: 384) might belong to this species is confirmed.

Distribution and habitat

Sardinia, Corsica and continental Italy (Fig. 33). Wunderlich (1995) regarded this species as endemic to the Tyrrhenian Islands. The detection of a specimen from Napoli in the MNHN collection makes clear that this view can not be maintained. The distribution on the Apenninean peninsula requires further investigation. Specimens of *P. blanckei* have been collected from bark of *Pinus*, olive trees and *Quercus suber*.

Philodromus calidus Lucas

(Figs 16, 28)

Philodromus calidus Lucas, 1846: 195, pl. 11, fig. 3.

Artama callida (Lucas). – Simon, 1864: 416.

Material examined

Syntypes. Algeria: 1 ♂, 3 ♀, 5 juv., 'Algerie Lucas *Philodromus calidus*' (MNHN).

Other material examined. **Algeria:** Sétif: 1 ♂, Mont Babor (CB). **Tizi Ouzou:** 1 ♀, 'Kabylie' (MNHN). **Morocco:** Meknès-Tafilalet: 1 ♀, Moyen Atlas S El Ksiba (CTH).

Diagnosis

The best diagnostic character in males is the large, blade-like RTA (Fig. 16b). A similar apophysis is only found in *P. parietalis*, but in this species the DTA is much longer. Females can be recognised by details of the vulva (Fig. 28b).

Description

Measurements

Male ($n=2$): total length 4.1–4.4, CL 2.1–2.15, CW 2.3–2.4, ClyH 0.34, OL 2.1–2.2, OW 1.5–1.9. Leg I 8.9 [2.7, 0.9, 2.3, 2.2, 0.8]. Eye distances: AME–AME 0.23, AME–AML 0.18, PME–PME 0.36, PME–PML 0.28, ALE–PME 0.34. Pedipalp: PFem 0.9, PPat 0.34, PTib 0.32, CyL 0.94–1.04, CyW 0.64–0.68. Female ($n=3$): total length 5.4 (4.4–6.3), CL 2.32 (2.2–2.5), CW 2.63 (2.4–2.8), ClyH 0.3, OL 3.0 (2.1–3.8), OW 2.67 (2.5–3.0). Leg I 8.49 (7.65–10.25) [2.6, 1.07, 2.1, 1.65, 1.06]. Eye distances: AME–AME 0.28, AME–AML 0.19, PME–PME 0.46, PME–PML 0.40, ALE–PME 0.33. Epigyne/Vulva: EGL 0.24, EGW 0.15, RL 0.42, RW 0.22, R–EG 0.11.

Specific features of leg spination

Female tarsi with one pro- and one retrolateral spine on legs I–II, variable on tarsus III.

Pedipalp (Fig. 16)

VTA a slightly bent spine, RTA an outspread blade of characteristic shape (Fig. 16b), DTA a small triangle with rounded tip (Fig. 16c). Cymbium dorsally two-toned, light brown towards the tip and darker at the base, here with a deep depression accommodating DTA, with three marked bulges at the base, the tip and above the tip of DTA. Anterior border of tegulum with small but distinct bulge near embolic base, sperm duct loop strongly asymmetric, tegular suture leading to 7:30 o'clock position. Sclerotised part of conductor (CoI) smaller than membranous part (CoII), CoP indistinct. Embolus originating at 9 o'clock position, thickened at its base, almost straight in the basal third, then smoothly curved up to 3 o'clock position.

Epigyne/vulva (Fig. 28)

Epigynal grooves oval, wider than median septum. Receptacula with very thick inner walls, laterally with marked notch flanked by two pairs of granular mounds, glandular heads not visible in ventral view, apparently they lay directly in the wall at the anterior tip of the receptacula, bursa copulatrix strongly sclerotised, located between the receptacula.

Colour (inferred from ♂ from Mont Babor and ♀ from El Ksiba)

Similar to *P. blanckei*. Dorsal shield of prosoma uniformly brown (male) or pale yellowish with dark brown margins and posterior edges and white spots above coxae (female). Clypeus uniformly brown (male) or two-toned: whitish below the eyes and brown above the margin (female), chelicerae dark brown, sternum orange-brown with darker central patch. Legs orange-brown, femora with dark spots around dorsal spines and dark median transverse band, characteristic prolateral-ventral

patch Y-shaped, tibiae, metatarsi and tarsi with the usual twofold annulation. Opisthosoma whitish-grey with dark marbling, blackish flanks and chevrons in posterior half, second pair of muscle spots divided and deep. Venter beige with rows of dark spots.

Distribution and habitat

The single species of the *poecilus*-group in northern Africa is apparently widespread but rare, with reliable records ranging from Libya to Morocco (Fig. 33). Despite tremendous sampling efforts of Robert Bosmans and others in Algeria, Morocco and Tunisia, only very few specimens were collected in the last decades. All are from mountainous areas in 1830 m (Mont Babor in Petit Kabylie, northern Algeria) and 1600 m (El Ksiba, Moyen Atlas, Morocco).

Philodromus femurostriatus, sp. nov.

(Figs 12, 29)

Material examined

Holotype. Turkey: Muğla: ♂, Fethiye [Telmessos], *Pinus* forest, 36°37'N, 29°07'E, 12.v.–5.vi.1964, F. Ressler (NMW Ressler 403).

Other material examined. Greece: **Dytiki Makedonia**: 1 ♀, NNE Kastoria (CTh). Turkey: **Adana**: 1 ♂, Uskiyen mountain pass S Feke (CTh Aspöck & Rausch 1983/48). **Mersin**: 1 subad. ♀, Namrun (NMW Ressler 418).

Diagnosis

Diagnostic characters are the conspicuous longitudinal stripes in prolateral-ventral position on the femora. Male palp resembles *P. fuscomarginatus*, but sclerotised conductor much more extensive (Fig. 12a); embolus originating in a more prolateral-basal position in *femurostriatus*. Configuration of embryo-shaped receptacula unique (Fig. 29b).

Description

Measurements

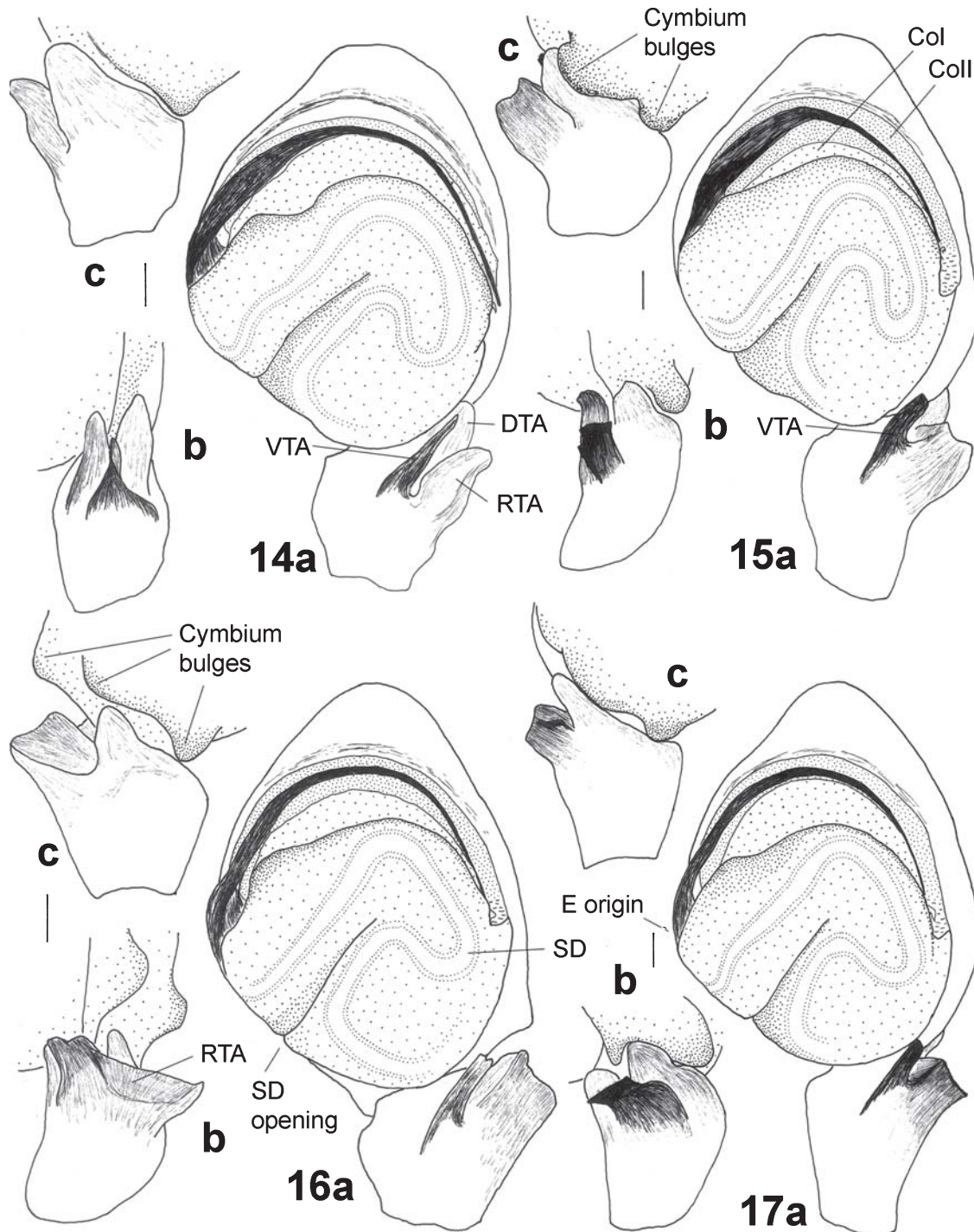
Male ($n=2$): total length 5.4–5.5, CL 2.5–2.6, CW 2.8, ClyH 0.24, OL 3.0–3.1, OW 2.4–2.5. Leg I 11.6–11.8 [3.3, 1.2, 3.1, 2.6, 1.5]. Eye distances: AME–AME 0.26, AME–AML 0.19, PME–PME 0.4, PME–PML 0.34, ALE–PME 0.3. Pedipalp: PFem 0.8–0.97, PPat 0.26–0.4, PTib 0.32–0.36, CyL 1.09–1.18, CyW 0.82–0.84. Female ($n=1$): total length 8.1, CL 3.1, CW 3.35, ClyH 0.3, OL 5.0, OW 4.2. Leg I 10.6 [3.4, 1.2, 2.8, 2.1, 1.1]. Eye distances: AME–AME 0.3, AME–AML 0.26, PME–PME 0.54, PME–PML 0.42, ALE–PME 0.38. Epigyne/Vulva: EGL 0.4, EGW 0.18, RL 0.5, RW 0.2, R–EG 0.24.

Specific features of leg spination

Female tarsi with one pro- and one retrolateral spine on legs I–III.

Pedipalp (Fig. 12)

VTA and RTA basally fused, VTA a straight arrowhead, RTA in lateral view two-pointed, the ventral branch thin and sharp, DTA broadly triangular with rounded tip. Cymbium dorsally



Figs 14–17. *a*, left male palp, ventral view; *b*, tibial apophyses, retrolateral view; *c*, ditto, dorsal view; 14, *Philodromus poecilus*, 'Preußisch Neubad'; 15, *P. pinetorum*, Turkey: Fethiye; 16, *P. calidus*, Algeria (Coll. Lucas); 17, *P. johani*, Greece: Crete. Scale bars = 0.1 mm.

light brown towards the tip, dark brown at its base, with DTA depression, but without distinct bulges around. Tegulum small, anterior border near embolic base with small but distinct bulge, sperm duct loop strongly asymmetric, tegular suture

leading to 6:30 o'clock position. Sclerotised part of conductor (CoI) very large, almost occupying half of the bulb, CoP a small hook. Among known species of the *poecilus*-group, *femurostriatus* has the longest embolus, originating at

8 o'clock position, taking the course of an inverted U and terminating in a 3:30 o'clock position.

Epigyne/vulva (Fig. 29)

Epigynal grooves oval, their sclerotised margins coinciding distally, grooves distinctly shorter than translucent receptacula. Receptacula embryo-shaped, glandular heads sitting in the nose position, inner walls relatively thin, granular mounds and bursa copulatrix not appreciable.

Colour

Dorsal shield of prosoma uniformly reddish brown with a small dark V-sign in front of fovea. Clypeus of same colour as cephalothorax, chelicerae light brown, sternum yellowish brown without spots. Legs yellowish brown, femora along their length with conspicuous parallel black stripes, with weak median transversal annulation and mottled with inconspicuous spots, the remaining leg segments without markings. Opisthosoma dorsally dark grey with numerous whitish spots, posterior part almost black. Venter grey with rows of whitish spots, spinnerets yellowish brown.

Remarks

Males and females have not yet been found together, but body shape and the specific leg coloration allow an unequivocal matching of sexes.

Distribution and habitat

Apparently a Pontomediterranean element (Fig. 32), but the distribution limits towards the east remain unexplored. The holotype male was collected from *Pinus* bark.

Etymology

The specific epithet refers to the striking coloration of the femora, adjective.

Philodromus fuscomarginatus (De Geer)

(Figs 5, 11, 22)

Aranea fusco-marginata De Geer, 1778: 301, pl. 18, figs 23, 24.

Philodromus fusco-marginatus (De Geer). – ?Sundevall, 1833: 224; Simon, 1875: 279–280; Simon, 1932: 882; Izmailova, 1989: 129, fig. 119.

Philodromus cinereus Westring, 1851: 50–51. – Westring, 1861: 448–450.

Artamus corticinus (C. L. Koch). – Prach, 1866: 626–627.

Artanes fusco-marginatus (De Geer). – Thorell, 1872: 259–260; Menge, 1875: 415–416, pl. 70, fig. 235; Bösenberg, 1902: 326, pl. 31, fig. 483.

Philodromus fuscomarginatus (De Geer). – Dahl, 1883: 71; Chyzer & Kulczyński, 1891: 102, 105; Pereleschina, 1928: 37–38, fig. 6; Simon, 1932: 843, figs 1273–1274; Tullgren, 1944: 106–107, fig. 30A, pl. 14, figs 200–202; Palmgren, 1950: 32, figs 12, 14, 15; Vilbaste, 1969: 108–110, figs 78A–B, 91A–B, 92A–B; Miller, 1971: 126, pl. 16, fig. 21, pl. 17, fig. 12; Dondale & Redner, 1975: figs 5, 7–9; Punda, 1975: 78, figs 175, 184; Heimer & Nentwig, 1991: 460, fig. 1222; Roberts, 1998: 188; Aakra, 2000: 82–83, fig. 4; Almquist, 2006: 462, fig. 395.

References in the Platnick catalogue (2008) not referring to this species:

Philodromus limbatus Sundevall. – Prach, 1866: 629–630 [= *P. dispar* Walckenaer, 1826].

Philodromus auronitens Ausserer. – Simon, 1875: 303–305; Becker, 1882: 235–236, fig. 2 [= *P. collinus* C. L. Koch, 1835].

Philodromus fusco-marginatus (De Geer). – Nakatsudi, 1942: 14, fig. 5a, b [= *P. cf. spinitarsis* Simon, 1895].

Philodromus fuscomarginatus (De Geer). – Kim & Jung, 2001: 195, figs 21–25 [= *P. cf. spinitarsis* Simon, 1895].

Philodromus fuscomarginatus (De Geer). – Tyschchenko, 1971: 110, fig. 244 [=?].

Material examined

Mixed sample (Germany, Alps and Russia): 2 ♂, 1 ♀, 'Nbg. (L. K.) Alpes Ross^m (Wagner)' [= Nürnberg (L. Koch), Alps, Russia Meridionale] (MNH ES-638). **Austria: Lower Austria:** 1 ♀, 1 juv., Mödling (NMW Coll. Reimoser). **Germany: Bavaria:** 2 ♂, 2 ♀, Nürnberg (NMW 1882.1.377). **Bremen:** 3 ♂, 3 ♀, 1 juv., Bremen, Park (SMF 3130). **Baden-Württemberg:** 1 ♀, Rottweil (SMF 33393). **Hesse:** 6 ♂, 1 ♀, Frankfurt am Main, Stadtfurst (Coll. T. Blick). **Rhineland-Palatinate:** 1 ♀, Mainz-Gonsenheim (SMF 15146); 1 ♂, 1 ♀, 'Rheinprovinz' (Bertkau) (SMF 4338). **Saxony-Anhalt:** 3 ♀, Dessau-Wörlitz, Großkühnauer See (SMF 21681). **Saxony:** 1 ♂, 11 juv., Leipzig (SMF 4339, 4340). **Italy: Friuli Venezia Giulia:** 1 ♀, Görz (NMW 1890 II.74). **Sweden: Halland:** 1 ♀, Endslöv, Årnilt (NHRS). **Norrbottnen:** 1 ♀, Messaure (CTh A3711). **Switzerland: Graubünden:** 2 ♂, Ramosch (CTh).

Diagnosis

Species characterised by uniform coloration, particularly lack of a distinct prolateral-ventral patch on the femora. Tibial apophyses of male palp all tapering. Females with characteristic bean-shaped receptacula, without clearly visible glandular heads or bursa copulatrix (Fig. 22b).

Description

Measurements

Male ($n=4$): total length 6.05 (5.6–6.7), CL 2.83 (2.65–3.1), CW 2.95 (2.8–3.2), ClyH 0.48, OL 3.6 (3.2–3.9), OW 2.25 (2.0–2.5). Leg I 11.03 (10.5–12.3) [3.18, 1.2, 2.5, 2.6, 1.55]. Eye distances: AME–AME 0.28, AME–AML 0.2, PME–PME 0.4, PME–PML 0.34, ALE–PME 0.36. Pedipalp: PFem 0.96 (0.9–1.0), PPat 0.31 (0.28–0.35), PTib 0.3 (0.25–0.32), CyL 1.21 (1.16–1.24), CyW 0.93 (0.9–0.96). Female ($n=7$): total length 7.68 (6.7–9.8), CL 2.88 (2.7–3.0), CW 3.09 (2.9–3.25), ClyH 0.38, OL 4.73 (3.9–6.7), OW 3.48 (2.8–5.0). Leg I 11.98 (11.03–12.3) [3.2, 1.3, 2.6, 2.2, 1.2]. Eye distances: AME–AME 0.3, AME–AML 0.2, PME–PME 0.44, PME–PML 0.34, ALE–PME 0.34. Epigyne/Vulva: EGL 0.3, EGW 0.16, RL 0.45, RW 0.23, R–EG 0.26.

Specific features of leg spination

The number of ventral spine pairs on FemI can vary between five and seven, some rare specimens have four pairs of ventral spines on Mtl instead of three. Among the western Palearctic species, this is the only one without spines on the female tarsi.

Pedipalp (Fig. 11)

VTA and RTA thorn-like, in close contact at their base, RTA bent ventrally, DTA a narrow triangle in a groove of the cymbium. Cymbium dorsally light brown, without distinct bulges. Anterior border of tegulum conspicuously blackish, with distinct bulge near embolic base, sperm duct loop strongly asymmetric, tegular suture leading to 7 o'clock position. Sclerotised part of conductor (CoI) smaller than in *P. femurostriatus*, CoP a comparatively large hook (Fig. 5). Embolus originating at 8:30 o'clock position, evenly curved, terminating at 3 o'clock position.

Epigyne/vulva (Fig. 22)

Epigynal grooves oval with strongly sclerotised posteriolateral guide pockets, distinctly shorter than the receptacula, but size relation variable, median septum with elevated keel. Receptacula bean-shaped, fixed to the epigastric furrow by sclerotised structures; glandular heads, bursa copulatrix and glandular mounds not visible in dorsal view.

Colour

Dorsal shield of prosoma, clypeus and chelicerae uniformly reddish brown. Sternum yellowish brown without pattern. Legs uniformly yellowish brown, sometimes mottled, but without distinct patches or annulations, densely covered with tightly fitting black hairs in males and more erected greyish hairs in females. Opisthosoma dorsally grey with four indistinct muscle spots in a square, the second pair divided, venter whitish grey, in some males with two longitudinal grey stripes. Some specimens show a more contrasting pattern with dark flanks and white dorsal speckling on the opisthosoma, and annulation and patches on the legs (cf. Thorell 1872: 260 and fig. 3 in Bryja *et al.* 2005).

Distribution and habitat

Philodromus fuscomarginatus is a temperate to northern Palearctic species (Fig. 32), and in Scandinavia occurs up to the Finnmark (Aakra 2000). In the true Mediterranean, the species seems to be absent, as well as on the British Isles. The eastern distribution limits remain insufficiently known, with previous records from the Far East being referred to other species. In temperate Europe, this is one of the more frequently collected species of the group. It is associated with coniferous forest, most specimens were found under bark of pine trees.

Philodromus johani, sp. nov.

(Figs 17, 27)

Material examined

Holotype. Greece: Kriti: ♂, Kalamafka NE Ierapetra, 550–600 m, bark of *Platanus* trees, 35°04'23"N, 25°39'23"E, 13.v.2003, J. van Keer (IRSNB).

Other material examined. 2 ♀, same data as holotype (CJK 2261); 1 ♂, same data as holotype (CB).

Diagnosis

Recognisable by details of the male and female genital organs, especially the unique shape of RTA (Fig. 17b).

*Description**Measurements*

Male ($n = 2$): total length 5.3–5.5, CL 2.3–2.55, CW 2.6–2.9, ClyH 0.42, OL 2.7–2.8, OW 2.5. Leg I 12.4 [3.5, 1.3, 3.0, 2.8, 1.8]. Eye distances: AME–AME 0.24, AME–AML 0.2, PME–PME 0.37, PME–PML 0.32, ALE–PME 0.26. Pedipalp: PFem 0.88–0.98, PPat 0.4, PTib 0.36–0.4, CyL 1.2–1.24, CyW 0.84–0.96. Female ($n = 2$): total length 6.3–7.4, CL 2.2–2.6, CW 2.5–3.0, ClyH 0.4, OL 3.8–4.3, OW 3.6–4.2. Leg I 7.6–9.2 [2.65, 1.05, 2.1, 1.6, 1.0]. Eye distances: AME–AME 0.26, AME–AML 0.2, PME–PME 0.5, PME–PML 0.38, ALE–PME 0.36. Epigyne/Vulva: EGL 0.32–0.38, EGW 0.18–0.2, RL 0.46, RW 0.24, R–EG 0.14–0.22.

Specific features of leg spination

Female tarsi with one pro- and one retrolateral spine on legs I–II.

Pedipalp (Fig. 17)

VTA a truncated thorn, RTA tapering, bent ventrally, in lateral view resembling the silhouette of a shrew (Fig. 17b), DTA transparent, triangular with rounded tip (Fig. 17c). Cymbium dark brown with yellowish tip and whitish patches dorsally, with a small bulge at the prolateral base of DTA and a huge bulge close to anterior border of DTA. Tegulum without specific modifications, sperm duct loop strongly asymmetric, tegular suture leading to 7:30 o'clock position. Sclerotised part of conductor (CoI) of equal size as membranous part (CoII), CoP indistinct. Embolus originating at 9 o'clock position, evenly narrowing and smoothly curved, terminating at 3 o'clock position.

Epigyne/vulva (Fig. 27)

Epigynal grooves with strongly sclerotised guide pockets posteriorly and weakly sclerotised margins in anterior half, median septum not elevated. Receptacula ovoid, diverging anteriorly, with weakly sclerotised bursa copulatrix and two pairs of lateral glandular mounds. Glandular heads not visible in dorsal view (apparently shifted to antero-ventral position).

Colour

Dorsal shield of prosoma dark brown (male) or greyish brown with dark sides (female), with pattern of stripes and yellowish V-sign containing two stamped black dots behind the eyes, area between posterior eyes dark grey, between anterior eyes pale yellowish. Clypeus brown with whitish anterior margin, chelicerae dark brown, sternum yellowish brown, covered with conspicuous long hairs. Legs yellowish brown, intensely mottled, with bifurcated femur patches and double-annulation on tibiae and metatarsi. Opisthosoma almost as wide as long, dorsum dark grey with contrasty whitish pattern, most prominent in females is a central mustard-shaped patch, anterior pair of muscle spots divided in two, posterior pair

divided in up to six speckles, covered with fine, tightly fitting white hairs and erect bristle-like black hairs. Venter grey with two ellipses of whitish spots.

Distribution and habitat

Apparently endemic to Crete (Fig. 33). Only known from the type locality, where it was collected from bark of *Platanus* trees.

Etymology

The species is named in honour of Johan van Keer, an ambitious Belgian spider hunter and arachnologist.

***Philodromus laricum* Simon**

(Figs 13, 26)

Philodromus laricum Simon, 1875: 273–274. – de Lessert, 1910: 383.
Philodromus corticinus (C. L. Koch). – Simon, 1918: 52; Schenkel, 1927: 230, 253–255, fig. 14; Simon, 1932: 843–844, 882, fig. 1275; Thaler, 1981: 121–122, figs 43, 44; Heimer & Nentwig, 1991: 460, fig. 1219.

Material examined

Syntypes. 4 ♀, 5 juv. France: ‘Alpes!’ (MNHN ES–657).

Other material examined. **Austria: Northern Tyrol:** 1 ♂, 1 ♀, Innsbruck, Kranebitter Klamm (CTh); 1 ♀, Innsbruck, Martinswand (CTh A145); 3 ♀ Ötztal Längenfeld (CTh); 1 ♂, 1 ♀, Ötztal, Espan bei Längenfeld (CTh); 1 ♀, Vennatal (CTh). **France: Languedoc-Roussillon:** 1 ♀, Cevennen, Lozère, Le Malzieu (MNHN ES 756). **Italy: Piedmont:** Alpe Veglia (MNHN Coll. Dresco). **Spain: Andalusia:** 1 ♀, Sierra Nevada, ‘Peñón de San Francisco’ (MNHN). **Switzerland: Graubünden:** 2 ♂, Ramosch (CTh A3341).

Diagnosis

Philodromus laricum shows some unique features among west-Palaearctic species of the group: more than five pairs of ventral spines on tibia I, long tibia of the male palp (half as long as cymbium, Fig. 13a), sperm duct loop only moderately asymmetric; females bearing only retrolateral spines on tarsi I and II.

Description

Measurements

Male ($n = 1$): total length 5.3, CL 2.2, CW 2.45, ClyH 0.25, OL 3.0, OW 2.1. Leg I 14.1 [3.9, 1.4, 3.6, 3.4, 1.8]. Eye distances: AME–AME 0.2, AME–AML 0.18, PME–PME 0.44, PME–PML 0.38, ALE–PME 0.36. Pedipalp: PFem 1.1, PPat 0.48, PTib 0.46, CyL 0.94, CyW 0.62. Female ($n = 3$): total length 7.47 (7.1–7.8), CL 3.08 (2.85–3.3), CW 3.3 (3.1–3.5), ClyH 0.4, OL 4.4 (4.1–4.8), OW 3.3 (3–3.5). Leg I 12.82 (12.35–13.1) [4.02, 1.33, 3.47, 2.6, 1.4]. Eye distances: AME–AME 0.28, AME–AML 0.23, PME–PME 0.44, PME–PML 0.38, ALE–PME 0.36. Epigyne/Vulva: EGL 0.34 (0.32–0.35), EGW 0.13 (0.12–0.15), RL 0.34, RW 0.21, R–EG 0.04.

Specific features of leg spination

Tibia I regularly with six pairs of ventral spines (but Schenkel 1927 mentions seven pairs), female tarsi only with one retrolateral spine on legs I–II.

Pedipalp (Fig. 13)

Tibia long (half as long as cymbium, in other species of the genus it is only one-third of CyL). All tibial apophyses short, VTA and RTA grown together, VTA a straight spine, RTA thorn-like with a short secondary inner tip, DTA broadly triangular with rounded tip. Cymbium dorsally light brown without dorsal bulges or a groove for DTA. Tegulum without modifications, sperm duct loop moderately asymmetric, tegular suture leading to 8 o'clock position. CoI and CoII not well separated, CoP hook-like. Embolus relatively short, originating at 8 o'clock position, gradually narrowing, almost straight in distal third, terminating at 2:30 o'clock position.

Epigyne/vulva (Fig. 26)

Epigynal grooves long-oval, almost of same length as receptacula, median septum with almost parallel margins. Receptacula ovoid with thick walls, glandular heads and bursa copulatrix not appreciable, glandular mounds well visible in lateral notches.

Colour

Colourful species. Dorsal shield of prosoma yellowish brown in anterior half and dark brown in posterior half, with dark lateral spots above coxae I–II and II–III and with pale central V-sign with several black dots. Eye area and clypeus whitish, chelicerae orange-brown. Sternum yellowish brown with thin dark border. Legs yellowish brown, prolateral-ventral femur patch small, comma- or V-shaped, femora with numerous black spots, imitating three-fold annulation, tibia with dark patches basally and distally, metatarsi only basally darker. Opisthosoma oval to pentagonal, dorsum whitish with black pattern of cardiac mark in anterior and four chevrons in posterior half, orange brown muscle spots divided in two (anterior pair) to three (posterior pair) individual speckles.

Remarks

Simon did not designate types, but tube 657 from his collection most probably contains the female from the type locality, Briançon in Hautes-Alpes. Biogeographic evidence necessitates its withdrawal from synonymy (Simon 1918) with *Artamus corticinus* C. L. Koch, a species described from Regensburg (see nomina dubia).

Distribution and habitat

Philodromus laricum is an endemic species of (south-)western-European mountain ranges. It is apparently widespread in the southwestern Alps and reaches the northern calcareous Alps in Tyrol. The verified records from the Cevennen and Sierra Nevada (Denis 1957) suggest that older records from Jura (Simon 1932) and the Pyrenees (Denis 1938; Bosmans and De Keer 1985) are presumably correct (all sub *P. corticinus*). It does not occur in central Europe north of the Alps. Adults of this rare species have been collected in July and August from branches of trees (Simon 1875), from surface and crevices of limestone rocks (Schenkel 1927; Simon 1932; Thaler 1981, 1997) and from scree slopes (Schenkel 1927; Thaler 1981).

***Philodromus parietalis* Simon**

(Figs 19, 31)

Philodromus parietalis Simon, 1875: 276–277. – Simon, 1932: 845, 882, figs 1278, 1279.**Material examined***Syntypes*. 3 ♂, 4 ♀. France: Languedoc-Roussillon: Pyrénées-Orientales, Vernet-les-Bains (MNHN ES 654). Spain: Madrid: Casa de Campo (MNHN ES 24454). Labels with both collection numbers were found in a single vial. The samples were probably merged by Simon himself.*Other material examined*. Spain: Madrid: 1 ♀, Casa de Campo (MNHN ES 24472).**Diagnosis**Unique character combinations of *P. parietalis* are: elongated spatula-shaped DTA together with the bulb twisted anti-clockwise in males; kidney-shaped receptacula with a distinct bursa copulatrix in females.**Description***Measurements*Male ($n=3$): total length 5.13 (5.0–5.4), CL 2.58 (2.5–2.75), CW 2.85 (2.8–2.9), ClyH 0.4, OL 2.77 (2.5–3.0), OW 2.05 (1.8–2.25). Leg I 12.07 (12.0–12.1) [3.4, 1.17, 2.97, 2.9, 1.63]. Eye distances: AME–AME 0.28, AME–AML 0.19, PME–PME 0.41, PME–PML 0.36, ALE–PME 0.38. Pedipalp: PFem 1.03 (1.0–1.04), PPat 0.4 (0.37–0.44), PTib 0.34 (0.31–0.36), CyL 1.19 (1.16–1.22), CyW 0.91 (0.86–1.02). Female ($n=3$): total length 6.3 (5.8–7.1), CL 2.6 (2.3–2.8),

CW 2.8 (2.5–3.0), ClyH 0.24, OL 3.57 (3.3–4.0), OW 3.0 (2.5–3.5). Leg I 9.33 (7.6–10.7) [3.1, 1.13, 2.07, 1.87, 1.17]. Eye distances: AME–AME 0.3, AME–AML 0.2, PME–PME 0.46, PME–PML 0.38, ALE–PME 0.37. Epigyne/Vulva: EGL 0.34, EGW 0.18, RL 0.48, RW 0.24, R–EG 0.16.

Specific features of leg spination

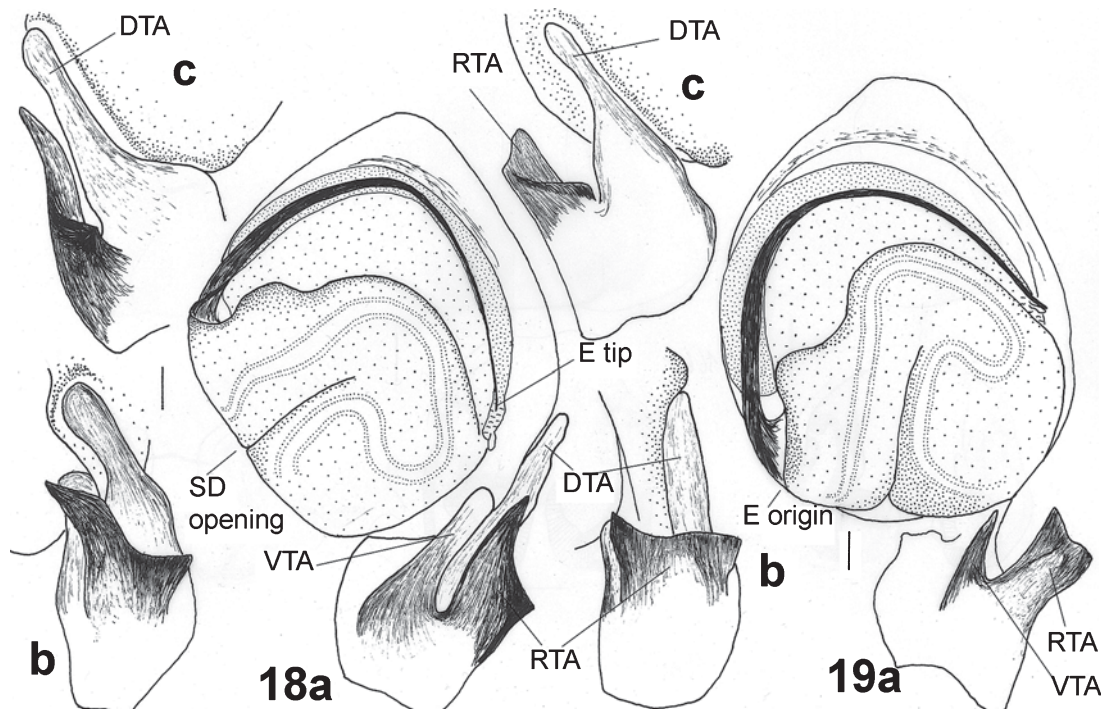
Female tarsi with one pro- and one retrolateral spine on legs I–II, on leg III apparently variable.

Pedipalp (Fig. 19)

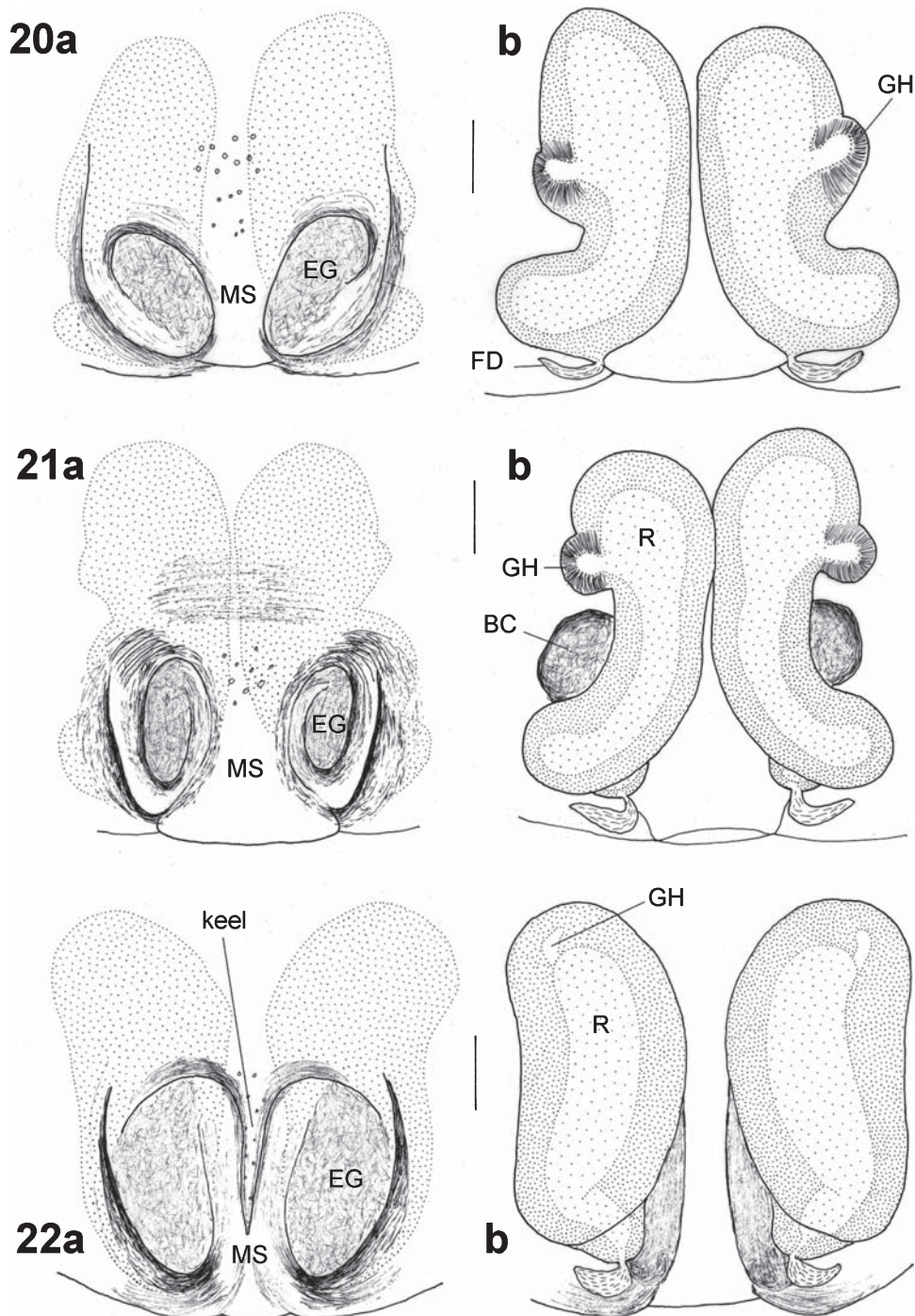
VTA a straight spine, RTA an extended blade with a long anterior edge and an inner board, DTA long, spatula-shaped, resting in a groove of the cymbium. Cymbium brown with a small bulge near base of DTA. Bulb appears twisted anti-clockwise as compared with other species of the group. Tegulum with strong bulge near embolar base, sperm duct loop strongly asymmetric, tegular suture leading to 6:30 o'clock position. Embolus originating at 7:30 o'clock position, almost straight in basal and distal third, evenly curved in medial third, terminating at 3 o'clock position.

Epigyne/vulva (Fig. 26)

Epigyne square-shaped, inner and outer margins of epigynal grooves almost parallel. Receptacula kidney-shaped, touching each other, with moderately sclerotised bursa copulatrix anteriorly and a pair of lateral glandular mounds, glandular heads not appreciable.



Figs 18, 19. a, left male palp, ventral view; b, tibial apophyses, retrolateral view; c, ditto, dorsal view; 18, *Philodromus blankei*, Italy: Sardinia, 19, *P. parietalis*, Spain: Madrid. Scale bars = 0.1 mm.



Figs 20–22. *a*, epigyne, ventral view; *b*, vulva, dorsal view; 20, *Philodromus margaritatus*, Austria: Mödling; 21, *P. maghrebi*, Algeria: 'Kabylie'; 22, *P. fuscomarginatus*, Germany: Nuremberg. Scale bars = 0.1 mm.

Colour (inferred from historical material)

Dorsal shield of prosoma reddish brown (male) to yellowish brown (female) with dark posterolateral edges, area behind the eyes light-coloured, often with two black dots in the V-sign. Clypeus laterally brown, in the middle pale yellowish, chelicerae basally brown, distally yellowish. Sternum uniformly yellowish.

Legs yellowish brown, femur I on prolateral-ventral side with black longitudinal stripe, in some females bifurcated, femora with two- to threefold pseudoannulation, tibia with dark patches basally and distally, metatarsi only basally darker. Opisthosoma weakly pentagonal, dorsum whitish grey with black mosaic pattern, posterior pair of orange-brown muscle spots divided in three individual speckles.

Distribution and habitat

The type locality of *P. parietalis* is Vernet in the Pyrénées-Orientales (France, Fig. 33). Later Simon (1932) adds a second locality in the Pyrenees, and he states 'commun dans le nord et le centre de l'Espagne' and 'sur les troncs de Conifères'. Nevertheless there are only few specimens of this taxon in his collection (all examined), and Urones (1995) lists only a single new record from Spain (Aldarrubia in Salamanca, from *Pinus pinea* in 820 m, Jerardino *et al.* 1991).

***Philodromus pentheri*, sp. nov.**

(Fig. 30)

Material examined

Holotype. Azerbaijan: Lankaran: 1 ♀, Apo Village, 38°38'N, 48°47'E, 28.v.2003, N. Snegovaya (ZMUM).

Paratypes. Albania: 1 ♀, 'Nord-Albanien', A. Penther 1903 (NMW). Azerbaijan: Lankaran: 1 ♀, 'Lenkoran' (MNHN ES-10981).

Diagnosis

Species characterised by the distinctive shape of the kidney-like receptacula (Fig. 30b).

*Description**Measurements*

Species of intermediate size. Female ($n=2$): total length 6.5, CL 2.05–2.8, CW 2.3–2.9, ClyH 0.24, OL 3.5–4.1, OW 3.1–4.0. Leg I 7.8–10.2 [2.65, 1.1, 2.25, 1.8, 1.2]. Eye distances: AME–AME 0.26, AME–AML 0.2, PME–PME 0.44, PME–PML 0.36, ALE–PME 0.36. Epigyne/Vulva: EGL 0.4–0.5, EGW 0.2, RL 0.4–0.56, RW 0.2–0.35, R–EG 0.11–0.14.

Epigyne/vulva (Fig. 30)

Epigynal grooves almost as long as receptacula, margins equally sclerotised all around. Receptacula of characteristic kidney-shape, more voluminous in anterior half than posteriorly, without clearly visible bursa copulatrix, glandular heads and glandular mounds.

Colour

Dorsal shield of prosoma whitish-grey, with brown lines radiating from fovea, margins and posterior edges dark brown, indistinct V-sign with two dark dots sitting apart at the tips of its shanks and two tiny spots at their base, area between PME and PLE blackish. Clypeus yellowish and brown, chelicerae dark brown, sternum yellowish brown with fine brown margin. Legs yellowish-brown, femur I at prolateral-ventral side with black bifurcated patch in basal thirds and a separate patch distally, other femora with transversal prolateral chevron in the middle of the segment, tibiae and metatarsi with basal and distal annulation, all segments intensely spotted. Dorsum of opisthosoma whitish-grey, with conspicuous dark flanks, a central grey area and two chevrons in posterior half, muscle spots not conspicuous. Venter orange-brown.

Distribution and habitat

Known localities in Albania and on the coast of the Caspian Sea are widely separated, with the species not yet being found in the Pontomediterranean region between these two disjunct localities (Fig. 32). This raises the question as to whether the Albanian material could originate from the ancient kingdom of Caucasian Albania, which was situated exactly in the Lenkoran region on the western coast of the Caspian Sea. However, nothing is known about excursions of Penther to this region, whereas his field trips to the border area of Makedonia-Albania are well documented (e.g. Penther 1914). DeLattin (1967: 370) lists other examples of primarily Caspian elements with disjunct areas on the Balkans.

Etymology

This species is named in honour of Arnold Penther (1865–1931), an Austrian zoologist who collected the first preserved specimen of this taxon.

***Philodromus pinetorum*, sp. nov.**

(Figs 2, 9, 15, 25)

Philodromus poecilus (Thorell). – Simon, 1875: 274–276; Simon, 1932: 845, 882, figs 1276, 1277 (misidentifications).

Philodromus poecillus [sic] (Thorell). – Miller, 1971: 126–127, pl. 16, fig. 17, pl. 17, fig. 14 (misidentification).

Material examined

Holotype. Turkey: Muğla: ♂, Fethiye [Telmessos], *Pinus* forest, 36°37'N, 29°07'E, 19.iv.1964, F. Ressler (NMW Ressler 403).

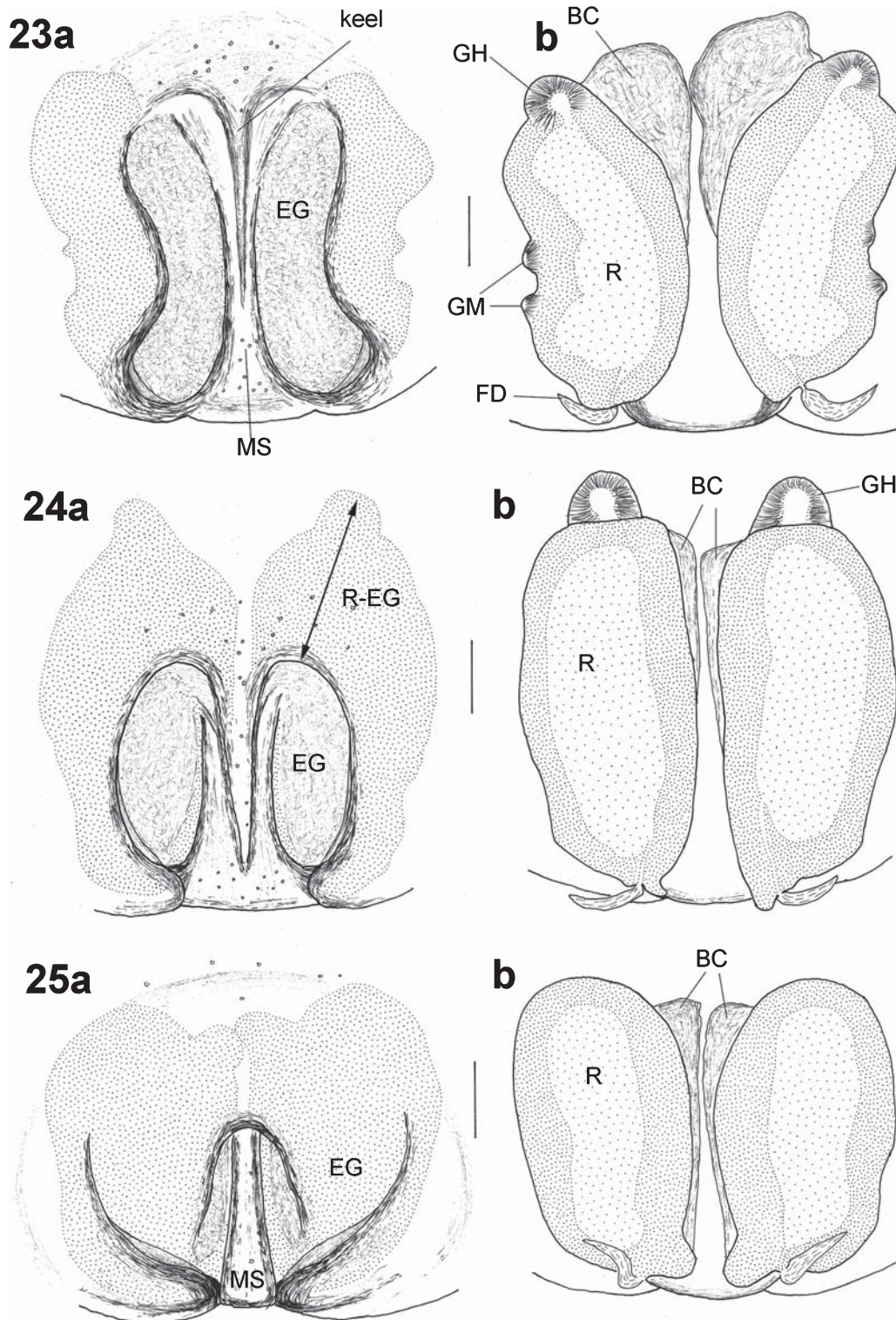
Other material examined. **France**: 8 ♂, 19 ♀, 5 juv., 'Suecia (Th.) Rossia (Wagner) Gallia' (MNHN ES 662; see remarks). **Languedoc-Roussillon**: 1 ♂, Camargue, estuary of Petit Rhône (CTh). **Greece**: **Ipiros**: 1 ♀, Katarrakti (NMW). **Kentriki Makedonia**: 1 ♀, Chalkidiki, Gomati (CTh 386). **Peloponnisos**: 1 ♂, Zachlorou (CJK 1971). **Turkey**: 1 ♂, 'Asia Minor' (MNHN ES 14751). **Ankara**: 1 ♀, Kizilcahamam (NMW Coll. Radda). **Antalya**: 1 ♂, Termessos (NMW Coll. Radda). **Bursa**: 1 ♂, Sadağ Kanyonu (Uludağ University Bursa). **Izmir**: 1 juv. ♀, 'Smyrne' (MNHN ES 12359). **Mersin**: 1 ♀, Namrun (CTh Aspöck & Rausch 1983/50); 2 ♀, Namrun (NMW Ressler 418). 1 ♀, Taurus Mts. between Gülnar and Ermenek (CTh Aspöck & Rausch 1983/59); 1 ♀ SW Yeniüyruk [Ayolincik-Gülnar] (CTh Aspöck & Rausch 1983/27). **Muğla**: 1 ♀, Dodurga (NMW Ressler 413).

Diagnosis

Epigyne unique, with anteriorly diverging margins of the grooves and slit-like orifices next to the median septum (Figs 9, 25a). The discrimination of males is more subtle: the wide flattened basal embolus is also found in *P. poecilus*, but this species does not have a bifid RTA.

*Description**Measurements*

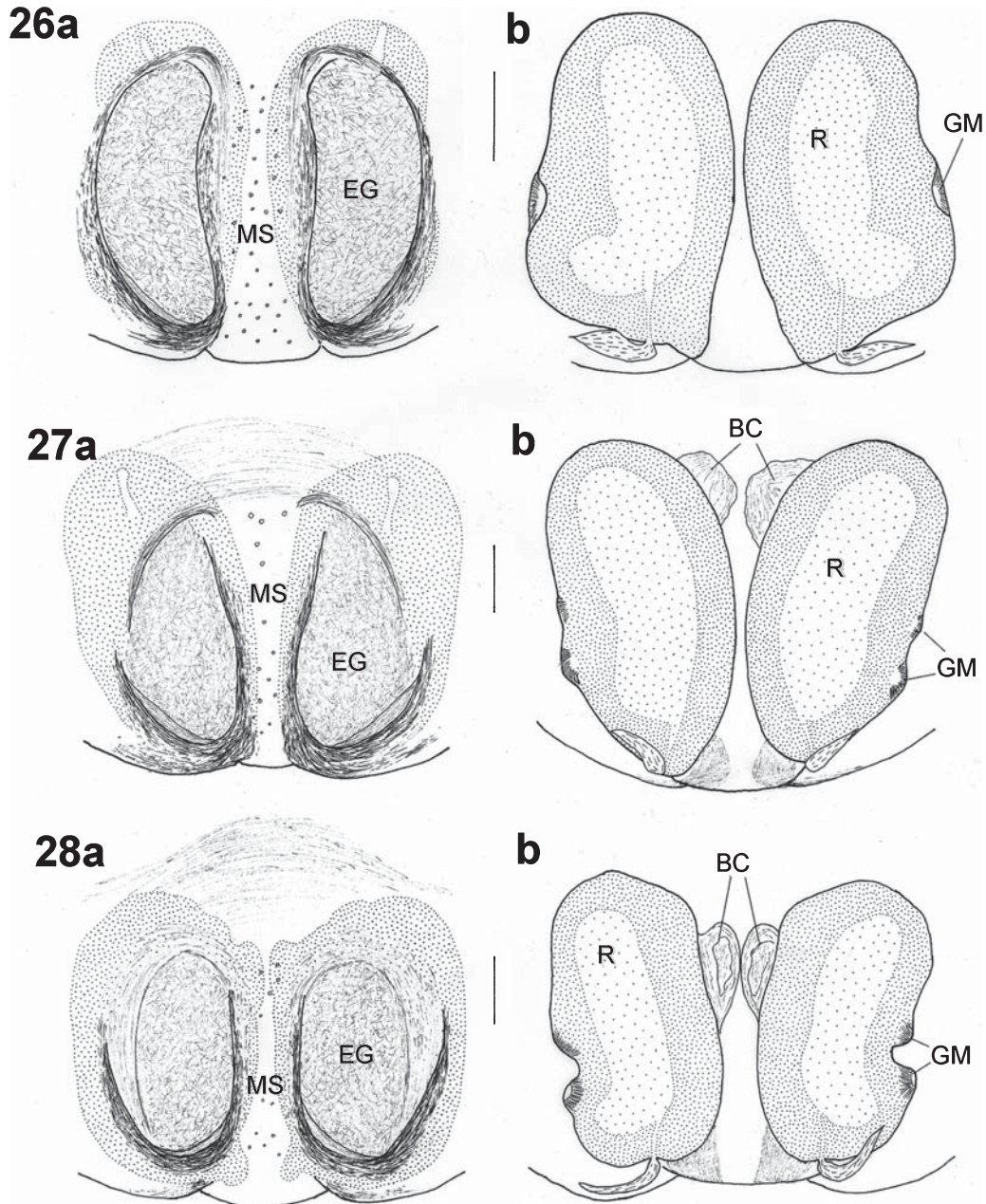
Male ($n=3$): total length 4.3 (4.0–4.5), CL 2.17 (2.1–2.2), CW 2.23 (1.9–2.45), ClyH 0.34, OL 2.18 (2.05–2.3), OW 2.15 (2.05–2.3). Leg I 8.1 (7.8–8.25) [2.28, 0.9, 1.97, 1.78, 1.12]. Eye distances: AME–AME 0.24, AME–AML 0.18, PME–PME



Figs 23–25. *a*, epigyne, ventral view; *b*, vulva, dorsal view; 23, *Philodromus blanchei*, Italy: Sardinia; 24, *P. poecilus*, Germany: Limburg; 25, *P. pinetorum*, Turkey: Namrun. Scale bars = 0.1 mm.

0.37, PME–PML 0.28, ALE–PME 0.36. Pedipalp: PFem 0.79 (0.7–0.84), PPat 0.29 (0.26–0.36), PTib 0.33 (0.3–0.36), CyL 0.99 (0.94–1.04), CyW 0.69 (0.66–0.7). Female ($n=4$):

total length 5.95 (5.3–6.5), CL 2.28 (2.1–2.7), CW 2.7 (2.5–3.0), ClyH 0.36, OL 3.68 (3.2–4.2), OW 3.55 (3.3–3.8). Leg I 8.29 (7.95–8.8) [2.63, 1.03, 2.06, 1.6, 0.98]. Eye distances:



Figs 26–28. *a*, epigyne, ventral view; *b*, vulva, dorsal view; 26, *Philodromus laricum*, Austria, Ötztal; 27, *P. johani*, Greece: Crete; 28, *P. calidus*, Algeria (Coll. Lucas). Scale bars = 0.1 mm.

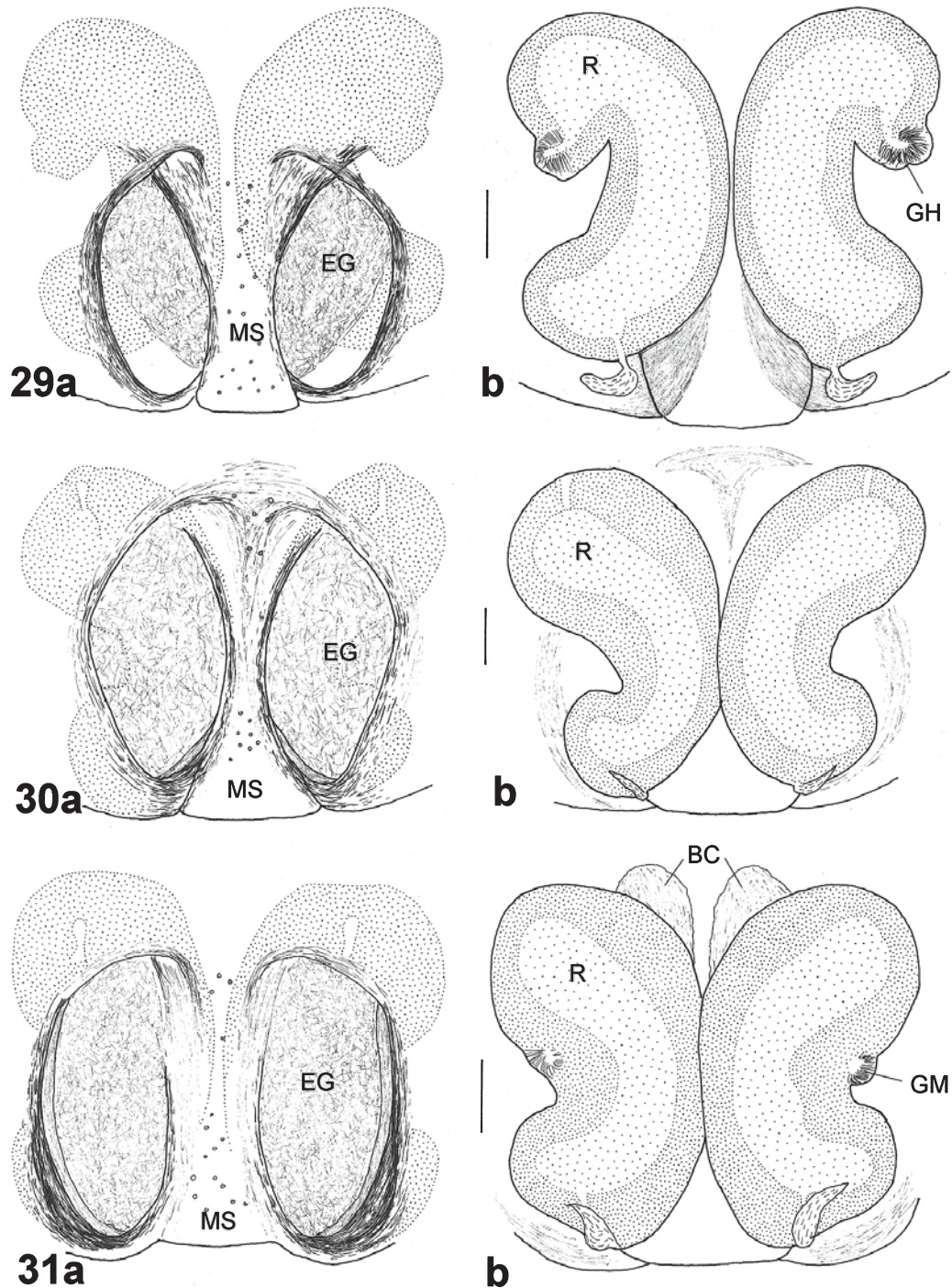
AME–AME 0.25, AME–AML 0.18, PME–PME 0.4, PME–PML 0.32, ALE–PME 0.29. Epigyne/Vulva: EGL 0.19 (0.16–0.21), EGW 0.06 (0.04–0.08), RL 0.4 (0.38–0.44), RW 0.24 (0.23–0.24), R–EG 0.24 (0.21–0.28).

Specific features of leg spination

Female tarsi with one pro- and one retrolateral spine on legs I–II, some individuals also with one prolateral spine on tarsus III.

Pedipalp (Fig. 15)

VTA a curved spine, RTA bifid, DTA triangular with dorsal hump, resting in a deep groove of the cymbium. Cymbium brown with grey dorsal pattern, a small bulge near the base of DTA and a large bulge along anterior border of DTA. Tegulum without modifications, sperm duct loop extremely asymmetric, tegular suture leading to 7:30 o'clock position. CoI reduced in size, less extended than CoII, CoP small, inconspicuous. Embolus relatively short, originating at 10 o'clock position, conspicuously flat and widened in basal half, at 12 o'clock



Figs 29–31. *a*, epigyne, ventral view; *b*, vulva, dorsal view; 29, *Philodromus femurostriatus*, Greece: Makedonia; 30, *P. pentheri*, Albania; 31, *P. parietalis*, Spain: Madrid. Scale bars = 0.1 mm.

position sharply bent and abruptly narrowing to a filiform structure, terminating at 3 o'clock position.

Epigyne/vulva (Figs 9, 25)

The epigyne is unique in having slit-shaped orifices on both sides of the median septum, while the epigynal grooves are not clearly demarcated anteriorly, the strongly sclerotised

posterior margins distinctly diverging. Receptacula ovoid with thick walls and moderately sclerotised bursa copulatrix in between; glandular heads and glandular mounds not distinct.

Colour

Dorsal shield of prosoma uniformly dark brown with some yellowish shades in males and colourful in females: basic colour

yellowish brown, margins, posterior edges and area between posterior eyes blackish, brown lines radiating from fovea, V-shaped sign pale yellowish with usually four black dots. Clypeus yellowish to brown, chelicerae uniformly dark brown, sternum orange-brown with light median stripe. Legs with high-contrast pattern: basic colour yellowish brown, femora with prolateral-ventral bifurcated black patch, with strong medio-dorsal annulation and dark patch distally, patellae with prolateral-ventral black stripe, tibia with basal and subdistal dark annulation, metatarsi with basal annulation, in addition all leg segments may be mottled. Opisthosoma pentagonal, almost as wide as long, dorsum whitish-grey with conspicuous dark flanks and contrasting pattern: anterior area whitish, followed by grey marbled area between the muscle spots (that are divided in several individual speckles) and two blackish chevrons in posterior half. Venter pale yellowish to grey.

Remarks

The identity of this species has repeatedly been mistaken. Tube 662 from the Simon collection labelled 'Ph. poecilus Th. Suecia (Th.) Rossia (Wagner) Gallia' contained 27 adult specimens of *P. pinetorum* and five juveniles. Also the figures of *P. poecilus* in Simon (1932) undoubtedly belong to this new species. On the other hand, I could not trace adult specimens of the true *P. poecilus* in the Simon collection. Although he should have seen *P. poecilus* (Simon 1875: 274 wrote 'M. T. Thorell qui a bien voulu me communiquer un exemplaire typique de son *Artanes poecilus*') he apparently did not recognise the distinctiveness of both species, which are otherwise rather similar in size and colour. Since all material examined in this study suggests that this new species does not occur in temperate and northern regions of central and eastern Europe, the locality information on the label in tube 662 is probably incorrect. I assume that the specimens originate from Mediterranean France. A remaining mystery is the illustration of this species by Miller (1971; sub *P. poecillus*). Without doubt he characterised *P. pinetorum*, but he states in the text that this species has not been found in Czechoslovakia, nor does the inventory of his collection identify this material (Kúrka 1997). The most likely scenario is that he borrowed material of *P. poecilus* from MNHN Paris and simply followed the authority of Simon in its identification.

Distribution and habitat

Due to the rarity of material and the above mentioned misinterpretations, it is hard to outline the area occupied by this species. Probably it is restricted to the Mediterranean. The verified records (Fig. 33) suggest a disjunct distribution in the Pontomediterranean subcentre and in southern France, but Italy is poorly studied. In Turkey, *P. pinetorum* appears to be the most common species of the genus. Extra-Mediterranean records from France (Simon 1932) need to be verified as they could refer to *P. poecilus*. If indicated, specimens were collected from bark of pine, spruce and plane trees.

Etymology

The specific epithet is derived from 'Pinetum', which refers to the association with these dry coniferous plant communities.

Philodromus poecilus (Thorell)

(Figs 6, 8, 14, 24)

- Philodromus tigrinus* (Walckenaer). – Westring, 1861: 452–454.
Artanes poecilus Thorell, 1872: 261–262. – Bösenberg, 1902: 326–327, pl. 31, fig. 484.
Artanes margaritatus (Clerck). – Menge, 1875: 417–419, pl. 70, fig. 236 (misidentification).
Philodromus poecilus (Thorell). – ? Becker, 1882: 223–225, pl. 24, fig. 1; Tullgren, 1944: 107, fig. 39B, pl. 15, figs 203–205; Palmgren, 1950: 32, figs 12, 14; Azheganova, 1968: 111, figs 248, 249; Izmailova, 1989: 130, fig. 121; Vilbaste, 1969: 110–112, figs 93, 94; Heimer & Nentwig, 1991: 460, fig. 1218; Logunov, 1992: 58, figs 3B-r; Roberts, 1998: 187–188; Bryja *et al.*, 2005: 187–188, fig. 1B; Almquist, 2006: 464–465, fig. 397A–E.
Philodromus corticinus (C. L. Koch). – Miller, 1971: 126, pl. 17, figs 4, 5 (misidentification).

References in the Platnick catalogue (2008) not referring to this species:

- Thomisus laevipes* (Linnaeus). – Hahn, 1833: 120–121, fig. 90 [= *Philodromus margaritatus* (Clerck, 1757)].
Thomisus leopardinus Gistel, 1848: 156 [= *Philodromus margaritatus* (Clerck, 1757)].
Philodromus poecilus (Thorell). – Simon, 1875: 274–276; Simon, 1932: 845, 882, figs 1276, 1277 [= *Philodromus pinetorum*, sp. nov.].
Philodromus poecilus Thorell. – Saito, 1939: 87, fig. 10–6; Paik, 1979: 435–436, figs 82–80; Kim & Jung, 2001: 198, figs 36–40; Namkung, 2002: 509, figs 41–7 [= *Philodromus spec.*].
Philodromus poecillus [sic] (Thorell). – Miller, 1971: 126–127, pl. 16, fig. 17, pl. 17, fig. 14 [= *Philodromus pinetorum*, sp. nov.].

Material examined

1 ♂, 8 ♀, 1 juv. (NMW 1896 VIII.169, 'Koelbels Nachlass', without locality information). **Austria: Burgenland:** 1 ♀, Parndorfer Platte (CTh). **Lower Austria:** 7 ♀, 14 juv., Mödling (NMW Coll. Reimoser). **Vienna:** 1 ♀, 6 juv. (BMNH 1897-5-24-42, 1897-5-43-46); 2 juv. (NMW). **Croatia: Istria:** 3 subad. ♀, 'Istrien' (NMW). **France:** 2 ♀ 'Galizien' (NMW 1882 L380). **Germany: Baden-Württemberg:** 1 ♀, Kiblegg, Gründlenried (Coll. K.-H. Harms). **Hesse:** 2 ♀, 2 juv., Limburg (ZMHB 4504 Coll. Zimmermann). **Saxony:** 1 ♂ palp, 1 ♀, Niesky (NHRS Coll. Thorell). 1 ♀, 1 juv. 'Lausitz' (ZMHB 5702). **Kazakhstan: Shyghys Qazaqstan:** 1 ♂, 1 ♀, Kyzylbulak river canyon (ZMUM Coll. A. V. Gromov). **Latvia: Rigas Rajons:** 2 ♂, 2 ♀, 6 juv., Saulkrasti ['Preußisch Neubad'] (ZMHB 6355). **Poland: Śląskie:** 1 ♂, 1 juv. 'Silesia' (ZMHB Coll. Schott). **Romania:** 1 ♀, 1 juv., 'Rumenien' (ZMHB 20550). **Russia: Belgorod:** 1 ♀, 3 juv., Valuiki (NMW). **Orenburg:** 3 ♀, 2 juv., Kargala (ZMHB 20551). **Sweden: Östergötland:** 1 ♀, Kvarsebo (NHRS Coll. Tullgren). **Stockholm:** 1 ♀, 'Stockholm' (NHRS Coll. Holm). **Turkey: Burdur:** 1 ♀, N Ugurlu (CTh Aspöck & Rausch 1983/20); 1 ♀, Burdur (NMW Ressler 412). **Konya:** 2 ♂, Akşehir (NMW Ressler R1). **Manisa:** 1 ♀, Üşümüş-Tepe (CTh Aspöck & Rausch 1983/15). **Niğde:** 1 ♂, 1 ♀, Niğde (NMW). **Ukraine: Dnipropetrovsk:** 1 ♀, Nicopol (NHRS Coll. Thorell). **Uzbekistan: Fergana:** 2 ♀, Besharyk (ZMUM Coll. A. V. Gromov). **Surxondaryo:** 8 juv., Margelan (MNHN ES-6502).

Diagnosis

Distinction from *P. pinetorum* requires consideration of genitalic structures. Males can be readily recognised by the curved, blunt RTA (Fig. 14). Females are characterised by the oval epigynal grooves separated by a prominent keel (Figs 8, 24a) in combination with anteriorly sitting glandular heads on receptacula (Fig. 24b).

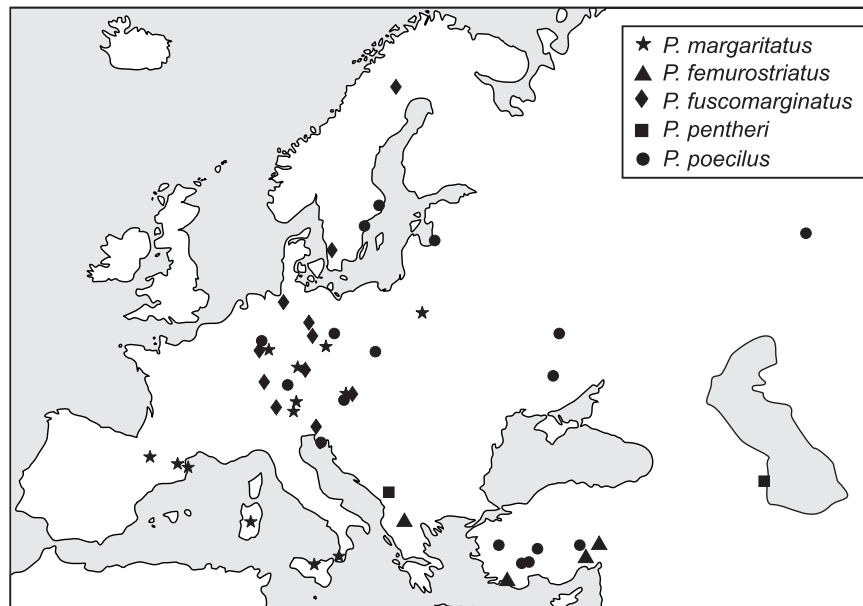


Fig. 32. Verified records of *Philodromus femurostriatus*, sp. nov., *P. fuscomarginatus*, *P. margaritatus*, *P. penteri*, sp. nov., and *P. poecilus* in Europe. Not included are records of *P. poecilus* from Central Asia.

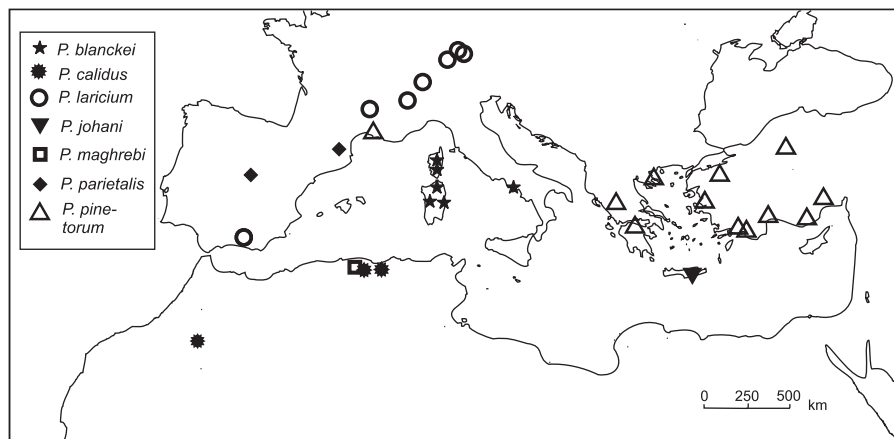


Fig. 33. Verified records of *Philodromus blanckei*, *P. calidus*, *P. johani*, sp. nov., *P. laricum*, *P. maghrebi*, sp. nov., *P. parietalis*, and *P. pinetorum*, sp. nov. from the broader Mediterranean.

Description

Measurements

Male ($n=3$): total length 4.3 (4.0–4.5), CL 2.17 (2.1–2.2), CW 2.23 (1.9–2.45), ClyH 0.34, OL 2.18 (2.05–2.3), OW 2.15 (2.05–2.3). Leg I 8.1 (7.8–8.25) [2.28, 0.9, 1.97, 1.78, 1.12]. Eye distances: AME–AME 0.24, AME–AML 0.18, PME–PME 0.37, PME–PML 0.28, ALE–PME 0.36. Pedipalp: PFem 0.79 (0.7–0.84), PPat 0.29 (0.26–0.36), PTib 0.33 (0.3–0.36), CyL 0.99 (0.94–1.04), CyW 0.69 (0.66–0.7). Female ($n=4$): total length 5.95 (5.3–6.5), CL 2.28 (2.1–2.7), CW 2.7 (2.5–3.0), ClyH

0.36, OL 3.68 (3.2–4.2), OW 3.55 (3.3–3.8). Leg I 8.29 (7.95–8.8) [2.63, 1.03, 2.06, 1.6, 0.98]. Eye distances: AME–AME 0.25, AME–AML 0.18, PME–PME 0.4, PME–PML 0.32, ALE–PME 0.29. Epigyne/Vulva: EGL 0.19 (0.16–0.21), EGW 0.06 (0.04–0.08), RL 0.4 (0.38–0.44), RW 0.24 (0.23–0.24), R–EG 0.24 (0.21–0.28).

Specific features of leg spination

Female tarsi with one pro- and one retrolateral spine on legs I–II, apparently variable on leg III.

Pedipalp (Fig. 14)

VTA a straight, pointed spine, RTA a curved process, not bifid, DTA triangular with rounded tip, resting in a shallow cymbial groove. Cymbium brown, dorsally with distinct grey and blackish pattern (Fig. 6), only one small bulge near the base of DTA. Tegulum wide, sperm duct strongly asymmetric, tegular suture leading to 7:30 o'clock position. Col more extended than CoII, CoP inconspicuous, in a small lateral tegulum depression. Embolus originating at 9 o'clock position, flat and widened in basal half, smoothly curved without sharp bend, terminating at 3:30 o'clock position.

Epigyne/vulva (Fig. 24)

Epigynal grooves oval, equally sclerotised all around, median septum with distinct elevated keel. Receptacula ovoid with anteriorly sitting glandular heads and sclerotised bursa copulatrix of variable size (see remarks), glandular mounds not appreciable.

Colour

Very similar to *P. pinetorum*. Dorsal shield of prosoma brown with dark radiating lines and beige V-sign (males), yellowish brown with dark brown margins and posterior edges, dark lines radiating from fovea, V-sign pale yellowish, with inconspicuous dots only (female). Space between posterior eyes blackish in both sexes. Clypeus with a broad yellowish vertical band, the sides brown. Chelicerae colourful blackish and brown with a pair of white mediobasal patches. Sternum either uniformly orange-brown or with brown cardiac-mark. Legs colourful (more pronounced in females): basic colour yellowish brown, femora with prolateral-ventral bifurcated black patch, with medio-dorsal annulation and retrodorsal-distal dark patch, patellae with prolateral-ventral black stripe, tibia with basal and subdistal dark annulation, metatarsi with basal annulation, at least in females all leg segments intensely mottled. Opisthosoma pentagonal, almost as wide as long, dorsum whitish-grey with conspicuous dark flanks and contrasting pattern: anterior area whitish, grey marbling in area between the muscle spots lighter than in *P. pinetorum*, posterior pair of muscle spots usually divided in two individual speckles, in posterior half two distinct chevron lines, the posterior one more prominent. Venter pale yellowish to grey.

Remarks

As for other species of the group, *P. poecilus* has repeatedly been misidentified. Particularly the misinterpretation of this species by Simon (see *P. pinetorum*) resulted in numerous erroneous records. Of the 22 taxonomic citations given for *P. poecilus* in Platnick (2008) only 12 refer to this species. This concerns all records from the Far East. Paik (1979), Kim and Jung (2001) and Namkung (2002) figure a species with a broad VTA and a narrow, spine-like RTA whereas the conformation is reversed in *P. poecilus*. The female characterised by Saito (1939) most probably belongs to yet another species. Menge's (1875) figures of '*Artanes*

margaritatus' are not easy to interpret, but several details of the description indicate that he in fact characterised *P. poecilus*: (i) the mention of five pairs of ventral spines on tibia I; (ii) the leg formula 2314; (iii) the measurements given; (iv) PLE being the largest eyes; (v) opisthosoma with distinct chevrons; (vi) the asymmetric run of the sperm duct seen in fig. 236E; (vii) the large, oval epigynal grooves shown in fig. 236H; and (viii) the habitat (bark of willows and poplars).

The tube with the female from Niesky (Thorell collection at NHRS) also contained a microvial with a palp of *P. poecilus*. According to T. Kronstedt (personal communication), this material was on loan to M. Roberts in 1997 and was probably used for the illustration of this species in 'Spinnengids' (Roberts 1998).

Philodromus poecilus is the only species of the genus in which I observed a noteworthy degree of intraspecific variation in genitalic characters. In particular, this concerns dimensions and position of vulva structures. The receptacula can be in close contact or separated, parallel or diverging; and the relative size of receptacula with respect to epigynal grooves varies from being twice as long to almost equal. Most distinct are specimens from Asia Minor. Here, the receptacula do not exceed the anterior margin of the grooves, while the bursa copulatrix is extending anteriorly beyond the glandular heads, resembling the situation in *P. blanckei*. In males from Turkey, the sperm duct loop is less strongly asymmetric, the cymbial tip more pointed, and there are also minute differences in the shape of the tibial apophyses. However, the differences do not include important structural changes, and there is also variation among specimens from single localities. Accordingly I propose that these differences are due to intraspecific variation.

Distribution and habitat

The range of *P. poecilus* comprises vast areas of the temperate and boreal Palearctic, but records from the Far East need to be revised. It is very rare in central Europe and does not occur in western Europe, Great Britain and on the Appeninean peninsula (Fig. 32). It reaches middle Scandinavia in the north. The habitat and natural history of the species are poorly known. Most specimens were collected from bark of willows, birches and poplars, but records from pines also exist. Apparently the species prefers wet habitats.

Nomina dubia***Philodromus beskida*** (Fickert)

Artanes beskida Fickert, 1876: 74.

As five pairs of ventral spines on tibia I were mentioned, the affiliation to the *poecilus*-group is beyond doubt. The description fits generally well to *P. poecilus*, except for the quadrangle of the median eyes that is longer than wide, in contrast to *P. beskida*. Fickert may have described an individual aberration.

Philodromus corticinus (C. L. Koch)

Artamus corticinus C. L. Koch, 1837a: 85–86, fig. 306. – C. L. Koch, 1837b: 27, fig. 48.

This name has been applied in the past to at least three different taxa. Most recently it was used for *P. laricum* from the Alps and west-European mountains, but as the locus typicus is Regensburg this synonymy must be withdrawn for biogeographic reasons. Judging from fig. 306 in Koch (1837a) it could either be *P. poecilus*, but also a colour variant of *P. margaritatus*. As the type could not be located in the Koch collections at ZMHB and BMNH, an unequivocal identification is not possible.

Philodromus gigas (C. L. Koch)

Artamus gigas C. L. Koch, 1837b: 27.

The inadequacy of the description and absence of type material excludes any statement on the identity of this species from Greece.

Philodromus tigrinus (Walckenaer)

Aranea tigrina Walckenaer, 1802: 230.

Thomisus tigrinus Walckenaer, 1805: 34–35.

Philodromus tigrinus Walckenaer, 1826: 87–89. – Walckenaer, 1837: 551.

The question whether Walckenaers *tigrinus* is identical with *P. margaritatus* or *P. poecilus* has been disputed between Thorell (1872) and Westring (1874). I follow the arguments of the latter author and do not consider it a synonym of *P. margaritatus*. However, since *P. pinetorum* also occurs in France, which is very similar to *P. poecilus* in somatic characters, the identity cannot be clarified in the absence of type material.

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