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The Palaearctic members of the *Myrmica schencki* group with description of a new species

(Hymenoptera: Formicidae)

with 15 figures and 1 table

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Summary

A taxonomic synopsis of the 6 Palaearctic species of the *Myrmica schencki* group is given based upon worker morphology. All species are well-separable by morphometry and structural characters. *Myrmica pelops* **sp. n.**, an endemic species of S Greece, is described. The radiation centre of the group is in the W Palaearctic. Only one species, *Myrmica koreana* ELMES et al. 2001, is of E Palaearctic distribution, but reaches SE Kazakhstan in the west. Previously established synonymy of *Myrmica lacustris* RUZSKY 1905 with *Myrmica deplanata* EMERY 1921 (RADCHENKO 1994b) is considered as most likely. *Myrmica caucasicola* ARNOLDI 1934, an endemic of SE Azerbaijdshan, is redescribed and confirmed as valid species.

Zusammenfassung

Eine taxonomische Synopsis der 6 paläarktischen Arten der *Myrmica-schencki*-Gruppe, basierend auf der Arbeiter-Morphologie, wird vorgestellt. Alle Arten können mittels Morphometrie und Strukturmerkmalen deutlich unterschieden werden. *Myrmica pelops* sp. n., ein Endemit des südlichen Griechenland, wird erstmals beschrieben. Das Radiationszentrum der Gruppe ist die Westpaläarktis. Nur eine Art, *Myrmica koreana* ELMES et al. 2001, hat eine ostpaläarktische Verbreitung, welche aber westwärts bis SE Kasachstan reicht. Die schon von RADCHENKO (1994a) angenommene Synonymie von *Myrmica lacustris* RUZSKY 1905 und *Myrmica deplanata* EMERY 1921 wird als sehr wahrscheinlich angesehen. *Myrmica caucasicola* ARNOLDI 1934, ein Endemit aus SE Aserbaidschan, wird wieder beschrieben und als gute Art bestätigt.

Key words

Palaeartic region, taxonomic revision, *Myrmica schencki* group, morphometry

Introduction

The species of the Palaearctic *Myrmica schencki* group are, in terms of the genus, thermophilic ants living in either open steppe or light xerothermous woodland. 10 taxa of specific or subspecific rank have been allocated to this group by recent authors. Three taxa, the varieties *kutteri* FINZI 1926, *obscura* FINZI 1926, and *subopaca* ARNOLDI 1934, have been synonymised with *Myrmica schencki* VIERECK 1903 (SEIFERT 1988,

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RADCHENKO 1994b). These synonymisations seem reasonably clear either by investigation of type material or by considering descriptions in connection with zoogeographical knowledge and are not discussed here. This paper provides an argumentation for the species status of *Myrmica caucasicola* ARNOLDI 1934 separate from *schencki* VIERECK 1903. This heterospecifity was already suggested by RADCHENKO (1994b) who, however, did not present data to give evidence for his idea. Furthermore a new species of probably endemic distribution is described here: *Myrmica pelops* sp. n. from S Greece. Because gynes are unknown in 3 species, the scope of this paper is reduced to the worker caste.

A note on a taxonomic procedure dictated by the ICZN is necessary here. § 45.5 of ICZN requires a retrospective use of this quadrinomen paragraph. However, from the juridic point of view, it is untenable if § 45.5 is considered to take effect retrospective from the date of its inactment. In other words, there is no juridic reasoning to penalise an author for a taxonomic act performed in 1895 which has been prohibited as late as 1961. Furthermore, it is difficult to understand from the practical point of view, why a person can be declared to be the author of a taxonomic species name - simply because of being the first to use it as a tri- or binomen - while the description and the types of the suppressed author remain the valid references to recognise this species. This temporal and spatial disruption of the authorship-defining process from the descriptory and type-defining process causes accessory and confusing taxonomic procedures. Retrospective use of § 45.5 may also produce the paradoxy of unvoluntary authorship that may even change to persons active in other fields of science. If, for instance, the ornithologist X, in a publication of the year 1902, would have written "...I found the ant *Myrmica rubra* var. *schencki* EMERY (1895) in big numbers within the stomach of a wryneck..." he would become the involuntary author of an ant species name and would replace the unconscious author Viereck (1903). As a consequence, it is strongly indicated to generally prohibit a retrospective application of the quadrinomen article by a change of the ICZN.

Material and Methods

74 samples of 6 species including 169 worker specimens were investigated morphometrically for 17 standard measurements. The sampling localites are given in detail within the species sections.

Measurements were made on mounted and dried specimens using a goniometer-type pin-holding device, permitting endless rotations around X, Y, and Z axes. A Technival 2 (Zeiss Jena) or a M10 (Wild) stereomicroscope were used at magnifications of 100-225x. The maximum possible magnification to keep a structure within the range of the ocular micrometer was used. A mean measuring error of 2 µm was calculated for smaller structures such as FR, but one of ±3 µm for larger structures such as cephalic length. To avoid rounding errors, all measurements were recorded in µm even for characters for which a precision of ± 1 µm is impossible.

17 standard morphometric characters were investigated:

CL – maximum cephalic length in median line; the head must be carefully tilted to the position with the true maximum. Excavations of occiput and/or clypeus reduce CL. Longitudinal carinae or rugae on anterior clypeus are included into the measurement - if exactly median, in their full height and, if of doubtful position, in their half height.

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CS – cephalic size; the arithmetic mean of CL and CW, used as a less variable indicator of body size.

CW – maximum cephalic width; this is in *Myrmica* always across eyes

EYE – eye-size index: the arithmetic mean of the large (EL) and small diameter (EW) of the elliptic compound eye is divided by CS, i.e. EYE=(EL+EW)/(CL+CW).

FL – maximum anterior divergence of frontal carinae (=maximum frontal lobe width, Fig. 5).

FR – minimum distance between frontal carinae (Fig. 5)

MetL – the height of metapleuron including the propodeal lobe measured in lateral view perpendicular to the straight section of metapleuro-coxal border(heavy dashed line in Fig. 1). The lower endpoint of measuring line is the metapleuro-coxal border and the upper one the upper margin of propodeal lobe. The level of the measuring line is positioned in the middle between the frontalmost point of subspinal excavation and the caudalmost point of propodeal lobe (fine dashed lines in Fig. 1).

MetSp – the height of subspinal excavation from upper margin of propodeal lobe to lower spine margin measured along the dorsal continuation of the measuring line for MetL (Fig. 1).

PEW – maximum width of petiole.

PEH – maximum petiole height measurable perpendicular to a reference line defined as follows: the frontal endpoint of the reference line is marked by the centre of the petiole-propodeal junction and the caudal endpoint by the centre of petiole-postpetiolar junction (dark spots in Fig. 2).

PEL – maximum measurable diagonal petiole length from the tip of subpetiolar process to the dorsocaudal corner of the caudal cylinder (Fig. 2).

PoOc – postocular distance. Use a cross-scaled ocular micrometer and adjust the head to the measuring position of CL. Caudal measuring point: median occipital margin; frontal measuring point: median head at the level of the posterior eye margin. Note that many heads are asymmetric and average the left and right postocular distance (Fig. 3).

PPHL – length of longest hair on dorsal postpetiole.

PPW – maximum width of postpetiole.

ScLH – scape lobe height measured perpendicular to a reference line at SVPS ***f*** or ***c***. Maximum height at which cuticular projections such as lobes or carinae protrude above the upper profile of scape base. The reference line is the cord of the curved dorsal scape profile stretching from midpoint of scape length to the point just before the projections at scape bent begin to raise.

SL – maximum straight line scape length excluding the articular condyle and lobes at the scape bent.

SP – maximum length of propodeal spines. Arithmetic mean of both spines measured in dorsofrontal view from spine tip to the bottom of the meniscus formed between the spines. This mode of measuring is less ambiguous than other methods but results in some spine length in species with reduced spines (Fig. 4).

SVPS – standard viewing positions of scape defined by their position relative to the moving plane of the hinge joint between scape and first funiculus segment (Fig. 6). Dorsal view ***d*** is directed perpendicular to this moving plane (in this position the anterior margins of upper and lower lobe of the distal scape end are congruent and the basal curvature of scape is not or only weakly visible). Frontal view ***f*** and caudal view ***c*** are within the moving plane and perpendicular to the longitudinal scape axis - i.e. when the scape is immagined to be directed strictly laterad from head, viewing position ***f*** is the frontal and viewing position ***c*** the caudal aspect of scape. SVPS's such as ***cd*** and ***df*** describe intermediate viewing positions.

Size-dependent variance of body ratios (=allometry) was removed by correction functions describing the average situation in 28 West Palaearctic *Myrmica* species. These overall corrections are less precise than corrections calculated for particular species pairs but are advantageous in synoptic comparisons of all the species. Allometric corrections can either detect pseudo-differences or reveal differences hidden in primary body ratios. The size-corrected characters CL/CW(1150)...to SP/CS(1150) describe ratios for the assumption of each specimen having the same size (CS=1150 µm). Factors with negative/positive signs refer to negative/positive allometries. The corrections are given by the following functions (functions given in *italics* were calculated from only 11 species and a reduced sample size)

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CL/CW(1150)	=	CL/CW	+	(1150-CS)	*	(-0.000046144)
SL/CS(1150)	=	SL/CS	+	(1150-CS)	*	(-0.000052496)
ScLH/CS(1150)	=	*ScLH/CS*	+	*(1150-CS)*	*	*(-0.000048315)*
FL/CS(1150)	=	FL/CS	+	(1150-CS)	*	(+0.000026667)
FR/CS(1150)	=	FR/CS	+	(1150-CS)	*	(+0.000010806)
FL/FR(1150)	=	FL/FR	+	(1150-CS)	*	(+0.000013687)
MetL/CS(1150)	=	MetL/CS	+	(1150-CS)	*	(+0.000018285)
MetSp/(1150)	=	*MetSp/CS*	+	*(1150-CS)*	*	*(-0.000001457)*
SP/CS(1150)	=	SP/CS	+	(1150-CS)	*	(+0.000116325)
PEH/CS(1150)	=	PEH/CS	+	(1150-CS)	*	(+0.000016925)
PEL/CS(1150)	=	*PEL/CS*	+	*(1150-CS)*	*	*(-0.000030276)*
PEW/CS(1150)	=	PEW/CS	+	(1150-CS)	*	(+0.000020187)
PPW/CS(1150)	=	PPW/CS	+	(1150-CS)	*	(+0.000008500)
PPHL/CS(1150)	=	PPHL/CS	+	(1150-CS)	*	(-0.000066340)

Source collections of the investigated material have the following acronyms:

MCZ Cambridge	-	Museum of Comparative Zoology of the Harvard University Cambridge Massachusetts/USA
NHM Basel	-	Naturhistorisches Museum Basel/Switzerland
coll.Elmes	-	collection of Graham Elmes/Wareham/Dorset
MHN Genève	-	Muséum d'Histoire Naturelle Genève/Switzerland
MCSN Genova	-	Museo Civico di Storia Naturale Genova/Italy
SMN Goerlitz	-	Staatliches Museum für Naturkunde Goerlitz/Germany
MZ Lausanne	-	Musée de Zoologie Lausanne/Switzerland
ZMLSU Moskva	-	Zoological Museum of the Lomonossov State University Moskva

Definition of the *schencki* group

The species of the *Myrmica schencki* group have the following character combination

(a) males with very short antennal scapes (SL/CL 0.28-0.55)

(b) a dent or semicircular flange protruding dorsad at scape bent in the female castes.

(c) the workers have a rather large body size: population means of cephalic size (CS) vary between the species from 1186 to 1344 µm.

(d) anterior clypeal margin excavated in median region which is always visible in dorsofrontal view.

Species of the *Myrmica lobicornis* group are superficially similar to members of the *schencki* group by scape morphology of the female castes but definitely form a separate group because of having longer-scaped males (SL/CL 0.66-0.90) and smaller species means of CS in the workers, ranging 1056-1116 µm. Furthermore, zoogeography suggests different radiation centres of both groups. The more thermophilic species of the *schencki* group developed in the southern part of the W Palaearctic and only two species reached the E Palaearctic (ELMES et al. 2001). The radiation centre of the *lobicornis* group, that includes less thermophilic species and several boreoalpine elements, is obviously much farther east. RADCHENKO (1994a) assumes S and E Siberia as the main centre of the *lobicornis* group.

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Myrmica schencki VIERECK 1903

Myrmica rubra var. *schencki* VIERECK 1903: first available use of *Myrmica rubra scabrinodis* var. *schencki* EMERY, 1895; Europe [types in MCSN Genova, investigated]
Myrmica schencki var. *kutteri* FINZI 1926; Switzerland: Zermatt [type MCZ Cambridge, investigated]
Myrmica schencki var. *obscura* FINZI 1926; Venezia Guilia: Mt. Nanos, Mt. Castellaro [description, zoogeography]
Myrmica schencki var. *subopaca* ARNOLDI 1934; SE Ukraine [RADCHENKO, 1994b; type: ZMLSU Moskva, not seen]

Type material

Lectotype worker (top specimen, by present designation) and paralectotype worker (bottom specimen on the same pin), labelled by Emery himself "Graten" (?, poorly legible) and "*Myrmica scabrinodis* var. *schencki* Emery", MCSN Genova.

Material studied

39 samples with 74 workers were morphometrically investigated:

Europe: without locality, type of *schencki*. **Sweden**: Blekinge: Aryd 3 km E, 1992.06.15 (leg. Seifert); Öland: Borgholms Slot Ruin, 1992.06.13 (leg. Seifert); Öland: Glömminge 3 km SSW, 1992.06.13 (leg. Seifert). **Danmark**: Jutland: Mols Laboratory, 1974.09. **Spain**: Pyrenees: Espot 1 km W, 1991.05.16 (No.32, No.R, leg. Seifert). **France**: Hautes Alpes, 1983.07.12 (leg. Collingwood). **Switzerland**: Zermatt (leg. Kutter), type *kutteri*. **Germany**: Baden-Württemberg: Tübingen, 1990.07.09 (leg. Seifert); Brandenburg: Kreblitz 3 km E, 1984.08.22 (leg. Seifert); Brandenburg: Stöbritz, 1984.08.22 (leg. Seifert); Brandenburg: Wildau-Wentdorf, 1986.08.09 (leg. Seifert); Sachsen-Anhalt: Quenstedt, 1979.08.05 (leg. Seifert); Thüringen: Leutra-19860824 (leg. Seifert); Thüringen: Günserode-1981.09.09 (leg. Seifert); Thüringen: Schwarza, 1986 (leg. Sander); Sachsen: Leipzig vic., FND Wyhrahang, 1981.06.05 (leg. Delling); Sachsen: Meißen, 1967 (leg. Braune); Sachsen: Guttau, 1963.06.06 (leg. Jordan); Sachsen: Großsaubernitz, 1964.06.23 (leg. Jordan); Sachsen: Milkeler Moor, 1964.06.03 (leg. Jordan); Sachsen: Großschönau, 1977 (leg. Sieber); Sachsen: Görlitz-Rengersdorf, 1981.09.26 (leg. Seifert). **Czechia**: Moravia: Hranice (leg. Braune); Bohemia: Usti nad Labem, 1988.10.11 (leg. Seifert). **Hungary**: Visegrad, 1989.06 (leg. Sieber). **Bulgaria**: Pirin Mts.: Rozen 7 km NE, 1982.08.26 (leg. Seifert). **Turkey**: Kastamonu 40 km N, 1989.07.08 (leg. Schulz). **Georgia**: Caucasus: 44.56 E, 42.32 N, 1500 m, 1985.08.11 (leg. Seifert); Caucasus: Omalo (45.37 E, 42.23 N), 1500 m, 1985.07.31 (samples No. 653o,653u, leg. Seifert); Caucasus: Shatili (45.10 E, 42.40 N), 1450 m 1985.08.14 (leg. Seifert). **Kyrghysistan**: Karakol 12 km SE (42.25 N, 78.27 E), 2000.07.27 (No.56, leg. Seifert). **Kazakhstan**: Tarbagatai Mts. (47.47 N, 81.46 E), 2001.08.01 (No. 83, leg. Seifert); Manrak Mts. (47.03 N, 84.55 E), 2001.07.29; (No. 322, leg. Seifert); Manrak Mts. (47.19 N, 84.37 E), 2001.07.27 (No.244, leg. Seifert); Saur Mts.(47.42 N, 85.18 E), 2001.07.25 (No.212, 262, leg. Seifert).

Diagnostic characters

The combination of morphometric characters given in Tab. 1 provides a powerful discrimination from related species. In particular the following structural characters are diagnostic:

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Scape with a broad and high flange at the dorsoproximal bend site (Fig. 7) and in SVPS f and c without excavation below the flange [difference to *pelops* sp. n.]. Frons narrow, FR/CS(1150) 0.213 [difference to *caucasicola*]. Spines long, SP/CS(1150) 0.324 [difference to *lacustris*]. Petiole rather low, PEH/PEL 0.676 [difference to *pelops* sp. n.] and with a straight or slightly concave anterior profile that meets the dorsal profile at a blunt, rounded angle. For further differences to its sister species *Myrmica caucasicola* see there.

Comments

According to the juridically doubtful retrospective application of § 45.5 of the 4th edition of ICZN, *Myrmica rubra scabrinodis* var. *schencki* EMERY 1895 is an unavailable name. VIERECK (1903), who used the name in the combination "*Myrmica rubra* var. *schencki* EMERY" for a N American species of unknown identity, is given the authorship of the name *Myrmica schencki* by a futher regulation of ICZN. Remains the question of types. According to the provisions of § 72.4.4 "...The type series of a nominal species-group taxon of which the name is made available by a bibliographic reference to a description associated with an unavailable name [Arts. 12.2.2, 13.1.2] consists of or includes the specimen or specimens denoted by that unavailable name...". Hence, the type series of EMERY (1895) is also the type series of *Myrmica schencki* VIERECK 1903. EMERY mentioned material from Maine/USA (leg. Pergande) and "europäisches Material" in his original description. Two fully intact worker specimens with a type label in MCSN Genova, mounted on the same pin and labelled by Emery himself as "*Myrmica scabrinodis* var. *schencki* Emery", have a locality label not fully legible (may be "Graten"). Emery usually wrote very brief and poorly legible locality labels but a North American origin of any material he surely would have stated. Hence, these specimens must originate from the Palaearctic and most probably from Europe. Their characters fully match the W Palaearctic species which has been generally named as *Myrmica schencki* during the last 50 years. The primary morphometric characters of these 2 type specimens are CS 1233.0, 1266.5; CL/CW 1.003, 1.012; SL/CS 0.761, 0.778; FL/CS 0.354, 0.350; FR/CS 0.217, 0.219; FL/FR 1.631, 1.597; PEW/CS 0.243, 0.262; PPW/CS 0.398, 0.410; SP/CS 0.348, 0.343; PPHL/CS 0.194, 0.191. The means of the size-corrected characters of lectotype and paralectotype are fully within the range of the European *schencki* population, exclude each of the other five species, and minimise doubts on their geographic origin (compare with Tab. 1): CL/CW(1150) 1.003, SL/CS(1150) 0.761, FL/CS(1150) 0.354, FR/CS(1150) 0.217, PEW/CS(1150) 0.243, PPW/CS(1150) 0.398, SP/CS(1150) 0.348, PPHL/CS(1150)0.194.

The smaller top specimen was fixed by present designation as lectotype of *Myrmica schencki*.

Emery's material from North America is not available in MCZ Cambridge nor in MCSN Genova and is deemed to be lost. However, if the North American specimens should be discovered one day, they will most probably turn out as species different from our Palaearctic *schencki*.

M. schencki is very constant throughout its range from Spain to E Kazakhstan. This refers also to the size of scape bent lamellae that can show much variation in related species. According to ELMES et al., 2001, *M. schencki* has also reached Pacific Russia (Primorskij Kraij) which would represent the rare case of a submediterranean W Palaearctic species to have crossed the zoogeographical barriers in S Central Siberia.

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Myrmica caucasicola ARNOLDI 1934

Myrmica schencki var. *caucasicola* ARNOLDI 1934; Azerbaijdshan: Talysh Mountains; [types investigated]

Type material seen

One specimen from a syntype series of Arnoldi was washed off, cleaned, remounted, and designated as lectotype (by present designation); it is labelled "*AZERBAIJDSHAN: Talysh Mountains, Nodus-galasi, 14.07.1929, leg. K.Arnoldi No A 4286*"; depository SMN Goerlitz. 8 worker paralectotypes collected by K.Arnoldi in the Talysh mountains in July 1929, sample numbers A4237, A4286, A4294, A4282; ZMLSU Moskva. 2 paralectotype workers from Talysh, July 1929, leg K.Arnoldi, MZ Lausanne.

Material morphometrically evaluated:

5 type samples with 11 workers were morphometrically investigated:

Azerbaijdzan: Talysh Mountains, 1929.07, leg. Arnoldi (samples No. A4237, A4282, A4294); Talysh Mountains, 1929.07.14, leg. Arnoldi (sample No. A4286); Talysh Mountains, 1929.07, leg. Arnoldi (without sample No.)

Redescription of worker (Fig. 8)

Head as long as broad. Clypeus on entire surface longitudinally rugulose-carinate. Frontal triangle longitudinally carinulate. Frontal carinae less narrowing than in *schenki*. Longitudinal macrorugae on vertex ± linear, weakly wrinkled; on central vertex, their interspaces are perfectly smooth. On lateral and posterior vertex, the macrorugae are connected by few macroanastomosae, giving a semi-reticulate macrosculpture; their interspaces reflecting but with a weak microreticulum. Scape in principal architecture similar to *lobicornis*; its flange much smaller than in *schencki* (Fig. 8). Propodeal spines shorter and thinner than in *schencki*; their axis in lateral view deviating by 25-40° from the mesosomal longitudinal axis. Mesopropodeal depression absent or weak. Mesosomal macrorugae clearly wrinkled and moderately strong (the strongest on pronotum are 15-16 µm high); their dorsal interspaces smooth. Dorsal centre of postpetiolar node ± smooth, very weakly microreticulate. Petiolar and postpetiolar shape similar to *schencki* but petiolar profile more angulate. Setae on whole body relatively longer than in average *schencki*.

Diagnostic characters

The combination of morphometric characters given in Tab. 1 provides a powerful discrimination from related species. In particular the following structural characters are diagnostic:

Scape with a low and small transversal carina at dorsoproximal bend (Fig. 8) [difference to *schencki*]. In SVPS f and c without excavation below the flange [difference to *pelops* sp. n.]. Frons wider, FR/CS(1150) 0.245 [difference to *schencki*]. Spines rather long, SP/CS(1150) 0.298 [difference to *lacustris*]. Petiole with a straight or slightly concave anterior profile that meets the dorsal profile at a blunt angle; rather low, PEH/PEL 0.675 [difference to *pelops* sp. n.].

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Comments

RADCHENKO (1994a) has raised *caucasicola* to species rank without, however, presenting evidence for his suggestion. This lacking argumentation will be presented below and confirms his view. *M. caucasicola* is most probably an endemic sister species of *schencki* distributed in dry forests of lower mountain ranges of E Azerbaijdshan. As lectotype was selected a worker from the characteristic Talysh series that matches the original description. The different samples from Talysh and Armenia, stored in ZMSLU Moskva, which all were included by Arnoldi into his type series, contain two species at least. A gyne labelled "4684 Armenia Karaulis IX 30 A.Avetisjan" fully shows the typical morphometry of the Caucasian *Myrmica schencki* population and is well-different from the Talysh *Myrmica caucasicola* population. Two males labelled "*4680 Armenia Karaulis IX 30 A.Avetisjan*" and "*Typi Myrmica schencki caucasicola K.Arn* " undoubtedly belong to the *schencki* group. However, considering the most difficult separation of males of related species and the fact that almost nothing is known on the characters of the local male populations, it must remain open if they belong to *schencki*, *ravasinii*, or *caucasicola*.

M. caucasicola differs from Palaearctic *schencki* in particular by the larger FR. Accessory differences are the smaller scape lobe, longer postpetiolar setae, and shorter spines. The nest sample means of FR/CS(1150) are 0.245 ± 0.003 [0.241,0.248] in five samples of *caucasicola* and 0.213 ± 0.011 [0.180,0.228] in 38 samples of *schencki*. In view of the low geographic variability of *schencki*, *caucasicola* is most probably a separate species and no geographic variant of *schencki*. Individual workers can be separated by a discriminant

$$D(4) = 10\ FR/CS + 7.5\ PPHL/CS - 25\ ScLH/CS - 0.6\ SP/CS$$

with D(4) 2.434 ± 0.299 [1.408,2.899] in 74 workers of *schencki* and D(4) 3.316 ± 0.204 [3.085,3.706] in 11 workers of *caucasicola*.

Myrmica pelops sp. n.

Type material

7 samples from the Peloponissos peninsula in Greece:

Holotype and 2 paratypes, labelled "*Greece, Peloponessos Taigetos Mts. \ Laganda Pass(20 km E Kalamata) 1.6.1994 1100-1400 m Schulz lgt.*", SMN Goerlitz; 9 paratypes, labelled "*GREECE - Peloponnisos* 1347 *Taigetos Oros, Laganda Pass, 20 km E. Kalamata, 1100-1400 mH, leg. Schulz, Vock 01.6.1994*", SMN Goerlitz; 5 paratypes, labelled "*GREECE - Peloponnisos* 1420 *Killini, Nordseite, 42 km W Korinthos, 1200-1400 mH, leg. Schulz, Vock 05.6.1994*", SMN Goerlitz. Further worker paratypes with the following labelling are in the private collection of Andreas Schulz: "*GREECE - Peloponnisos* 1394 *Chelmos, 30 km SSE Egion, 1800-2200 mH, leg. Schulz, Vock 04.6.1994*", "*GREECE - Peloponnisos* 1368 *Taigetos Oros, unterhalb des Profitis Ilias, 1800-2000 m, leg. Schulz, Vock 02.06.1994*", and "*GREECE - Peloponnisos* 1404 *Killini, Nordseite, 45 km W Korinthos, 1600-1800 m, leg. Schulz, Vock 05.6.1994*".

Material morphometrically investigated

4 type samples with 17 workers were morphometrically investigated:

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Greece: Peloponissos: Egion 30 km SSE, Chelmos, 1800-2000 m, 1994.06.04 (leg. Schulz); Kalamata 20 km E, Laganda pass, 1100-1400 m, 1994.06.01 (leg. Schulz); Korinth 42 km W, Killini, N side, 1200-1400 m, 1994.06.05 (leg. Schulz); Taigetos Oros, below the Profitis Ilias, 1800-2000 m, 1994.06.02 (leg. Schulz).

Description

Worker (Figs. 9, 12, 14, 15): Head shorter than broad, CL/CW 0.987. Clypeus strongly longitudinally rugose-carinate. Frontal triangle longitudinally carinulate. Frons narrow, FR/CS 0.218. Frontal carinae strongly diverging into frontal lobes, which are more prominent in posterior view than in *schencki* (Figs. 12, 13). Longitudinal rugae on dorsum of head (vertex) strong and weakly wrinkled; on posterior vertex they are connected by few anastomosae, giving a semi-reticulate macrosculpture, the interspaces of macrorugae with a reflecting surface but with very fine microreticulum. Scape rather long, in principal architecture derived from the *ravasinii* type, but with a much smaller basal flange (Fig. 9). The very regular, semicircular flange seen when dorsally viewing on the scape base of *schencki* is not found in *pelops*. Instead, there emerges a smaller flange as continuation of a longitudinal, frontodorsal carina, curves round the dorsal scape angle, and slopes down to the posterior scape base. Mesosoma with rather long and acute spines; in lateral view their axis deviates by 33-40° from longitudinal mesosomal axis. Mesopropodeal depression varying from deep to shallow. Sculpture on mesosoma, petiole and postpetiole strong. The strongest rugae on pronotum are 30-40 μm high, in the majority of specimens weakly wrinkled, and only rarely with anastomosae. Lateral metapleuropropodeal lobe at least as high as the concavity below the spines (Fig. 15). Petiole strongly rugulose-carinulate, block-shaped, with a short anterior peduncle; in profile normally as in Fig. 15. For morphometric data see Tab. 1.

Diagnostic characters

Myrmica pelops differs from *ravasinii* in particular by a much wider frons (FR/CS ranges 0.207-0.237 in 17 *pelops* workers but 0.119-0.158 in 18 *ravasinii* workers) and the much smaller diameter of the circular dorsal plane at scape base which is extraordinary huge in *ravasinii* (Fig. 11).

The scape shows in frontal and caudal view a strong excavation below the flange which is still more pronounced in frontolateral view. *M. schencki* and *caucasicola*, in contrast show no trace of such an excavation (Figs. 7-9). Further differences to the latter species are the high (PEH/PEL 0.741), block-shaped, and much stronger rugose petiole with a short anterior peduncle. The longitudinal rugae on mesosoma are much coarser with a height of 30-40 μm (in *schencki* and *caucasicola* 15-20 μm). *Myrmica caucasicola* can be separated from *pelops* on the individual level by a discriminant function

$$D(6) = 0.003\ CS - 4\ CL/CW + 3\ SL/CS + 9\ FL/CS - 69\ FR/CS + 30\ SP/CS + 5$$

with D(6) 6.73 ± 0.90 [5.36,8.89] in 17 workers of *pelops* and 2.17 ± 0.75 [0.22,3.12] in 11 syntype workers of *caucasicola*.

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Comments

Myrmica pelops is a sister species of *ravasinii* as indicated by basic scape architecture, the block-shaped petiole profile with a short peduncle, long spines, big size, and strong petiolar rugosity. There are no detailed records on the habitat of *M. pelops*. However, Andreas Schulz stated the *M. pelops* sites to be distributed in a zone of very light, degraded, and extensively used coniferous forests. Nowhere in this region he found dense woodland.

Myrmica ravasinii FINZI 1923

Myrmica ravasinii FINZI 1923; Albania: Tomor [type investigated]

Material studied

8 samples with 18 workers were morphometrically investigated:

Albania: Lona, Tomor, 1600 m, 1922, type *ravasinii*. **Greece**: Metsovo 25 km ENE, 1600 m, 1996.05.24 (leg. Schulz). **Turkey**: Kirka, Sivrihasir, 1250 m, 1986.06.25 (leg. Collingwood); Kure, 1300 m, 1985.06 (leg. Collingwood); Refahiye 20 km E, 1800 m, 1990.05.19 (leg. Schulz); Tepeleci, 1986.06.23 (leg. Collingwood); district Bolu: Abant Gölü, 1994.07.07 (leg. Schulz). **Georgia**: Borshomi, Zagveri, 1200 m (leg. Zhizhilashvili).

Diagnostic characters

Myrmica ravasinii is not to confuse with any Palaearctic *Myrmica* species by its extremely narrow frons and the huge, plate-shaped flange at scape (Fig. 11).

Accessory characters are a block-shaped petiole profile with a short peduncle, long spines, big size, and strong petiolar rugosity.

Comments

M. ravasinii is closely related to *pelops* sp. n. The geographic range seems to be restricted to the Balkans and Asia Minor between 38...42° N and 20...43° E. The main habitat is light forest, usually with *Pinus,* rarely dense pine forest. The elevation of the sites ranged from 800 to 1800 m, with the majority between 1200 and 1800 m.

Myrmica lacustris RUZSKY 1905

Myrmica scabrinodis var. *lacustris* RUZSKY 1905; Russia: Guberniya Tobolsk [description; description of neotype by RADCHENKO (1994b]

Myrmica lobicornis var. *deplanata* EMERY 1921 [First available use of *Myrmica scabrinodis lobicornis* var. *deplanata* RUZSKY 1905]; Russia: Orenburgskaya Guberniya, Crimea, Caucasus [description]

Myrmica moravica SOUDEK 1922; S Moravia:Pavlovske Kopce [description]

Myrmica lobicornis var. *plana* KARAVAJEV 1926; Ukraine: Askania Nova [types ZMSLU Moskva, investigated]

Myrmica deplanata RUZSKY, ARNOLDI (1934)

Myrmica deplanata RUZSKY, KARAVAJEV (1934)

Myrmica deplanata RUZSKY, STITZ (1939)

Myrmica deplanata RUZSKY, NOVAK & SADIL (1939)

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Myrmica deplanata RUZSKY, NOVAK & SADIL (1941)
Myrmica deplanata RUZSKY, KRATOCHVIL (1944)
Myrmica deplanata RUZSKY, SADIL (1952)
Myrmica deplanata RUZSKY, SADIL (1953)
Myrmica deplanata RUZSKY, MALICKY (1968)
Myrmica deplanata RUZSKY, ARNOLDI (1970)
Myrmica deplanata RUZSKY, ARNOLDI (1976)
Myrmica deplanata RUZSKY, TARBINSKY (1976)
Myrmica deplanata RUZSKY, ARNOLDI & DLUSSKY (1978)
Myrmica deplanata RUZSKY, ASSING (1987)
Myrmica deplanata RUZSKY, AGOSTI & COLLINGWOOD (1987a)
Myrmica deplanata RUZSKY, AGOSTI & COLLINGWOOD (1987b)
Myrmica deplanata RUZSKY, SEIFERT (1988)
Myrmica deplanata RUZSKY, WERNER (1989)
Myrmica deplanata RUZSKY, DLUSSKY, SOYUNOV, and ZABELIN (1990)
Myrmica lacustris RUZSKY, RADCHENKO (1994)
Myrmica deplanata RUZSKY, STUMMER (1995)
Myrmica deplanata RUZSKY, SEIFERT (1996)
Myrmica deplanata RUZSKY, KLEIN et al. (1998).

Material studied

10 samples with 34 workers were morphometrically investigated:

Czechia: Bohemia: Praha, Prokop Valley, 1958.07 (leg. Tkalcu); Bohemia: Praha, Prokop Valley, 1980.07.08 (leg. Werner); Bohemia: Praha, Prokop Valley, 1983.09.03 (leg. Seifert). **Austria**: Burgenland: Winden 1.5 km SE, 2000.06.16 (leg. Seifert). **Ukraine**: Askaniya Nova (33.52 E, 46.26 N), 1983. **Turkmenistan**: Kopet Dagh, 1935.09.18 (leg. Arnoldi). **Kazakhstan**: Tarbagatai Mts. (41.16 N, 80.49 E), 2001.07.19 (samples No. 151, 253, leg. Seifert); S-Ural: Ekaterinoslavka, 1935.07.15 (leg. Arnoldi, sample No 5940); Lower course of river Chorny Irtysh (Black Irtysh), near Buran (85.12 E, 48.01 N), 1976 (leg. Reznikova).

Diagnostic characters

Myrmica lacustris differs from any species of the *schencki* group by its short and thin propodeal spines - a character already mentioned in the original description of RUZSKY. Nest sample means of SP/CS(1150) range in *lacustris* from 0.188 to 0.250 and in the five other species from 0.266 to 0.380. Further most discriminative characters to any species with exception of its sister species *koreana* are a long scape, wide frontal lobes, and a broad frons (Tab. 1). The anterior petiolar peduncle of *lacustris* is a little longer than usual in the group. The petiole shows in lateral aspect a clearly concave frontal and a convex dorsocaudal profile and no angular structures. For differences to *koreana* see there.

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Comments

The assumption of RADCHENKO (1994b) that the description of *Myrmica scabrinodis* var. *lacustris* RUZSKY 1905 is in agreement with the species conception of *deplanata* as it was used from ARNOLDI (1934) to SEIFERT (1988) is most probably true. The full text of Ruzsky's description of the *lacustris* worker in direct translation is as follows:

" Worker. Clypeus with a small excavation in the middle of its anterior margin. Spines short, equal 1/2 or in the maximum 2/3 of their basal area. Frontal triangle striate in its posterior part. Scape at bend with a small, skewed, dent-like lobe. Constriction (i.e. transversal depression) between meso-metanotum weak, not deep, as a consequence middle-back and basal surface of the hind-back more shallow (in the typical *scabrinodis* they are more vaulted). Rugosity of head weaker. Colour as in the type [*Ruzsky means with this expression the situation in ants he considers as normal scabrinodis, B.S.*], but gaster, with exception of its tip, entirely dark brown...This *Myrmica* is typical for the solonchaks of the Guberniya Tobolsk..."

The character combination of underlined terms should exclude *salina*, *lobicornis*, *schenki*, *koreana*, and *caucasicola* but indicates a synonymy with *deplanata*. The complete and direct translation of Ruzsky's description of the *deplanata* worker, which is by bibliographic reference of EMERY (1921) the description valid for *Myrmica lobicornis* var. *deplanata* EMERY 1921, is as follows [statements pointing to *deplanata* sensu SEIFERT, 1988 are underlined, other statements do not contradict]:

"Worker. Differs from the typical *lobicornis* by the almost absent constriction between meso-metanotum, of which exist only traces, because the profile of back is more vaulted and almost even [*Ruzsky exactly wrote: "pochemu spinnoij profil yavlyaetsya boleye vypuklym i pochti rovnym", B.S.*]. Spines shorter, thin, acute. At the bend of antennal scape an acute dent, or small acute lobe. Second waist segment almost smooth above, weakly shining, with a thin and minor net-like rugosity. Setae on the body very rare, sometimes almost absent from thorax and dorsum of gaster."

To interpret what *deplanata* sensu Ruzsky might be, we must consider all species found in the terra typica showing scape base lobes positioned similar to the situation in *lobicornis*. *Myrmica lobicornis* can be excluded because it has a coarser rugosity on dorsal postpetiole and usually a well-expressed metanotal depression. *Myrmica schencki* VIERECK 1903, *koreana* ELMES et al. 2001, and *caucasicola* ARNOLDI 1934 have longer and stronger spines and the latter does not occur at the given type localities. The only species known from SW Siberia fitting uncontradictory to this character combination is *Myrmica lacustris* in the understanding of RUZSKY (1905) and RADCHENKO (1994b) and *deplanata* in the understanding of all the 19 authors from EMERY (1921) to KLEIN (1998) which are mentioned in the heading synonymic list. The retrospective application of § 45.5 of ICZN dictated by the code automatically withdraws the authorship of *deplanata* from RUZSKY (1905) and tranferes it to EMERY (1921). As a consequence, *deplanata* becomes a junior synonym of *lacustris* RUZSKY 1905.

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Myrmica lacustris is a Euro-Siberian steppe species occurring in Central Europe only very locally on certain spots of natural steppe. Its unique character combination caused the rare situation that it has not been misidentified by 18 European authors since ARNOLDI (1934) elevated it to species rank, but all these authors named the species *deplanata*. RADCHENKO (1994b), who was the first after RUZSKY (1905) to use the name *lacustris*, fixed a neotype for *lacustris* and considered it a senior synonym of *Myrmica salina* RUZSKY 1905, *deplanata*, and four other taxa. His synonymisation with *salina* that belongs to another species group is definitely a mistake (SEIFERT 2002).

Myrmica koreana ELMES et al. 2001

Myrmica koreana ELMES, RADCHENKO & KIM 2001; Korea [types investigated]

Material studied

8 samples with 18 workers were morphometrically investigated:

Kazakhstan: N Tarbagatai Mts. (47.30.55 N, 82.43.23 E), 962 m, 2001.07.22 (leg. Seifert, sample No. 166); N Tarbagatai Mts. (47.21.47 N, 83.31.51 E), 970 m, 2001.07.30 (leg. Seifert, sample No. 232); N Tarbagatai Mts. (47.21.47 N, 83.31.51 E), 970 m, 2001.07.31 (leg. Seifert); Zaur Mts. (47.18.15 N, 85.27.48 E), 1419 m, 2001.07.24 (leg. Seifert, samples No. 58,177). **Korea**: S Korea, no site given, 1970 (leg. B.J.Kim, sample No. K-100), paratypes from the holotype sample; S Korea, mountains, (leg. B.J.Kim, sample No. K-115), w; S Korea: Sunchon City, 1982.07.02 (leg. B.J.Kim, sample No. K-118)

Diagnostic characters

Several most discriminatory morphometric characters of *M. koreana* are given in Tab. 1. Postocular index, head-length index, eye size, and scape length are outside the values usually observed in other species of the *schencki* group. A further unique character of *koreana* is a protrusion on ventrolateral perioccipital flange forming a blunt corner on ventrocaudal head profile.

Comments

I agree with ELMES et al., 2001 in considering *M.koreana* as a member of the *schencki* group, but zoogeography and the morphological deviations mentioned above indicate a slightly remote position. The sites from which samples were available for this study probably represent the westernmost and easternmost populations within an E Palaearctic range extending over 4000 km. Despite of the large geographical distance, no significant differences were detectable between the SE Kazakhian and Korean populations. According to Radchenko (pers. comm. 2002), *koreana* is frequently found in Mongolia which indicates a continuous distribution and no disjunctive occurrence. According to head morphometry, the next related species should be *deplanata*. As habitats in Kazakhstan were recorded a poor *Artemisia* steppe, *Artemisia-Stipa* steppe, and a more fresh-dry situation with closed field layer on an alluvial soil.

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	ravasinii (n=8;18)	*pelops* (n=4;17)	*schencki* (n=39;74)	*caucasicola* (n=5;11)	*lacustris* (n=10;34)	*koreana* (n=8;15)
CS	1363 ± 73 [1253,1452]	1321 ± 66 [1227,1372]	1185 ± 65 [991,1294]	1189 ± 80 [1058,1256]	1282 ± 43 [1214,1339]	1206 ± 78 [1088,1291]
CL/CW (1150)	1.008 ± 0.008 [0.992,1.017]	0.991 ± 0.012 [0.979,1.006]	1.008 ± 0.013 [0.981,1.035]	1.012 ± 0.007 [1.005,1.023]	1.002 ± 0.006 *** [0.992,1.010]	0.972 ± 0.009 [0.956,0.989]
SL/CS (1150)	0.799 ± 0.011 [0.788,0, 0.818]	0.811 ± 0.017 [0.795,0.835]	0.787 ± 0.015 [0.759,0.820]	0.795 ± 0.007 [0.789,0.804]	0.830 ± 0.007 *** [0.815,0.842]	0.855 ± 0.007 [0.845,0.868]
FL/CS (1150)	0.356 ± 0.009 [0.347, 0.372]	0.369 ± 0.013 [0.353,0.384]	0.350 ± 0.007 [0.339,0.368]	0.353 ± 0.007 [0.344,0.361]	0.398 ± 0.009 [0.388,0.417]	0.423 ± 0.006 [0.413,0.431]
FR/CS (1150)	0.138 ± 0.009 *** [0.128,0.155]	0.215 ± 0.008 [0.209,0.226]	0.213 ± 0.011 *** [0.180,0.228]	0.245 ± 0.003 [0.241,0.248]	0.280 ± 0.008 [0.267,0.293]	0.266 ± 0.015 [0.243,0.282]
PEW/CS (1150)	0.266 ± 0.016 [0.251,0300]	0.256 ± 0.011 [0.243,0.266]	0.261 ± 0.012 [0.239,0.301]	0.262 ± 0.010 [o.248,0.274]	0.268 ± 0.012 [0.245,0.285]	0.252 ± 0.006 [0.243,0.260]
PPW/CS (1150)	0.388 ± 0.019 [0.356,0.408]	0.390 ± 0.015 [0.375,0.409]	0.408 ± 0.013 [0.379,0.451]	0.399 ± 0.008 [0.386,0.406]	0.418 ± 0.021 [0.385,0.448]	0.394 ± 0.011 [0.374,0.403]
PEH/CS (1150)	0.342 ± 0.008 [0.335,0.352]	0.346 ± 0.007 [0.341,0.351]	0.316 ± 0.010 [0.301,0.330]	0.308 ± 0.008 [0.297,0.317]	0.340 ± 0.006 *** [0.330,0.347]	0.316 ± 0.006 [0.308,0.324]
PPHL/CS (1150)	0.196 ± 0.008 [0.186,0.202]	0.195 ± 0.000 [0.195,0.195]	0.189 ± 0.009 * [0.171,0.208]	0.204 ± 0.010 [0.190,0.217]	0.187 ± 0.006 [0.181,0.198]	0.183 ± 0.010 [0.174,0.202]
ScLH/CS (1150)	0.051 ± 0.008 *** [0.042,0.066]	0.021 ± 0.011 [0.013,0.029]	0.038 ± 0.009 ** [0.019,0.060]	0.017 ± 0.003 [0.013,0.020]	0.029 ± 0.006 ** [0.019,0.037]	0.048 ± 0.017 [0.030,0.085]
SP/CS (1150)	0.349 ± 0.014 [0.329, 0.375]	0.348 ± 0.015 [0.331,0.364]	0.324 ± 0.025 * [0.266,0.380]	0.298 ± 0.008 [0.288,0.310]	0.218 ± 0.017 *** [0.188,0.250]	0.294 ± 0.016 [0.269,0.316]
FL/FR (1150)	2.583 ± 0.213 [2.236,2.853]	1.721 ± 0.026 [1.693,1.744]	1.650 ± 0.083 [1.506,1.914]	1.445 ± 0.035 [1.408,1.489]	1.426 ± 0.040 *** [1.365,1.505]	1.592 ± 0.076 [1.501,1.707]
PEH/PEL	0.720 ± 0.016 [0.701,0.746]	0.741 ± 0.011 [0.733,0.748]	0.676 ± 0.020 [0.638,0.697]	0.675 ± 0.017 [0.654,0.694]	0.702 ± 0.017 [0.675,0.723]	0.666 ± 0.019 [0.631,0.692]
MetL/MetSp	1.098 ± 0.102 [0.945,1.231]	1.132 ± 0.067 [1.084,1.179]	1.267 ± 0.037 [1.223,1.316]	1.304 ± 0.066 [1.206,1.344]	1.271 ± 0.129 ** [1.141,1.420]	1.124 ± 0.083 [1.014,1.277]
PoOc/CL	0.429 ± 0.006 [0.420,0.439]	0.429 ± 0.002 [0.426,0.432]	0.451 ± 0.006 [0.441,0.466]	0.455	0.426 ± 0.010 ** [0.410,0.443]	0.410 ± 0.004 [0.404,0.416]
EYE	0.180 ± 0.007 [0.170,0.186]	0.183 ± 0.003 [0.197,0.186]	0.186 ± 0.004 [0.179,0.194]	0.177	0.193 ± 0.006 [0.180,0.200]	0.203 ± 0.006 [0.194,0.209]

Tab. 1: sample means of morphometric data in workers of the *schencki* group. In brackets are given the number of samples before and of individuals after the semicolon. Characters with the designation «(1150)» are allometrically corrected for the assumption of each specimen having CS=1150 µm, characters without «(1150)» are primary data. The best discriminators within pairs of related species are marked with a string of asterisks.

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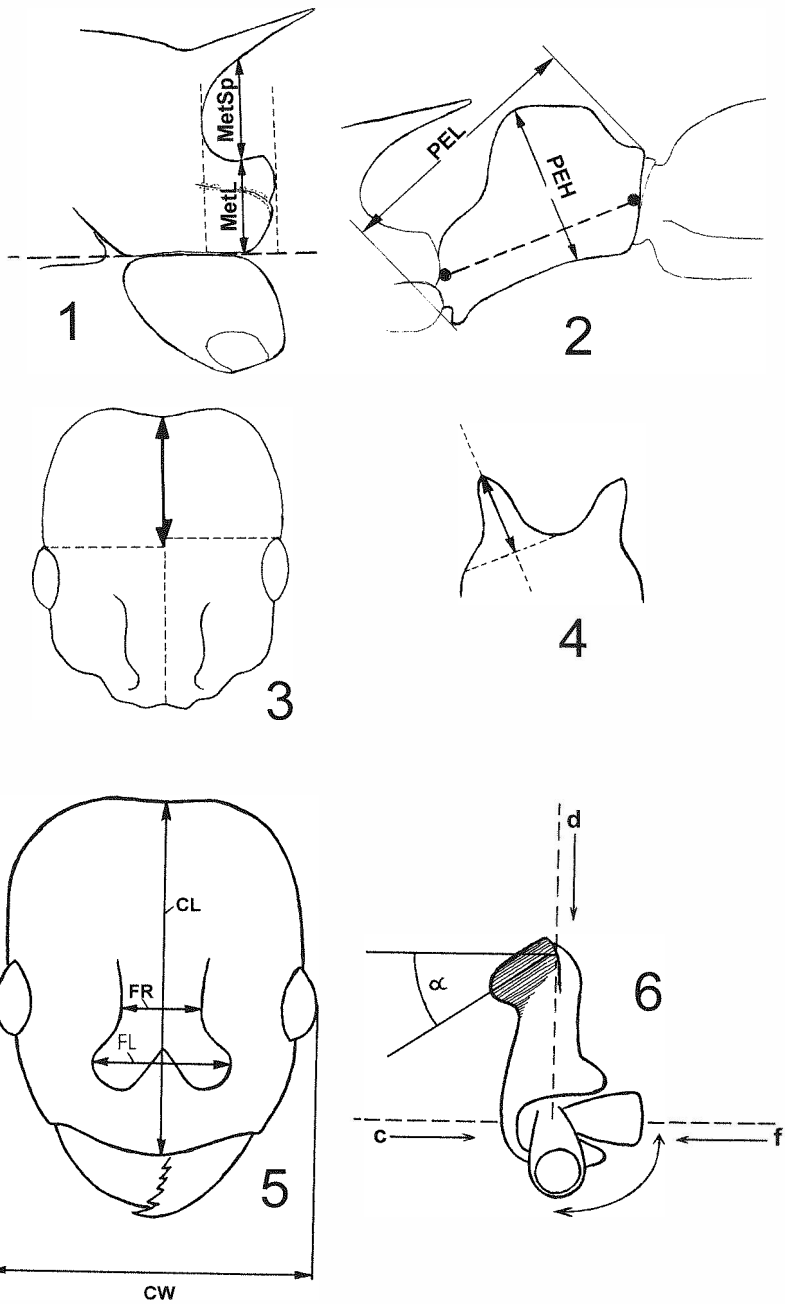

Figs. 1-6. Fig. 1: Mode of measuring MetSp and MetL. **Fig. 2:** Mode of measuring petiolar height and length. **Fig. 3:** Mode of measuring the postocular distance PoOc. **Fig. 4:** Mode of measuring spine length in dorsofrontal view. **Fig. 5:** Mode of measuring cephalic length, cephalic width, minimum frons width, and maximum frontal lobe width. **Fig. 6:** Standard viewing positions c, d, and f of scape relative to the plane of movement of the hinge joint formed by distal scape and pedicellus. The angle α describes the caudal slope of scape lobe.

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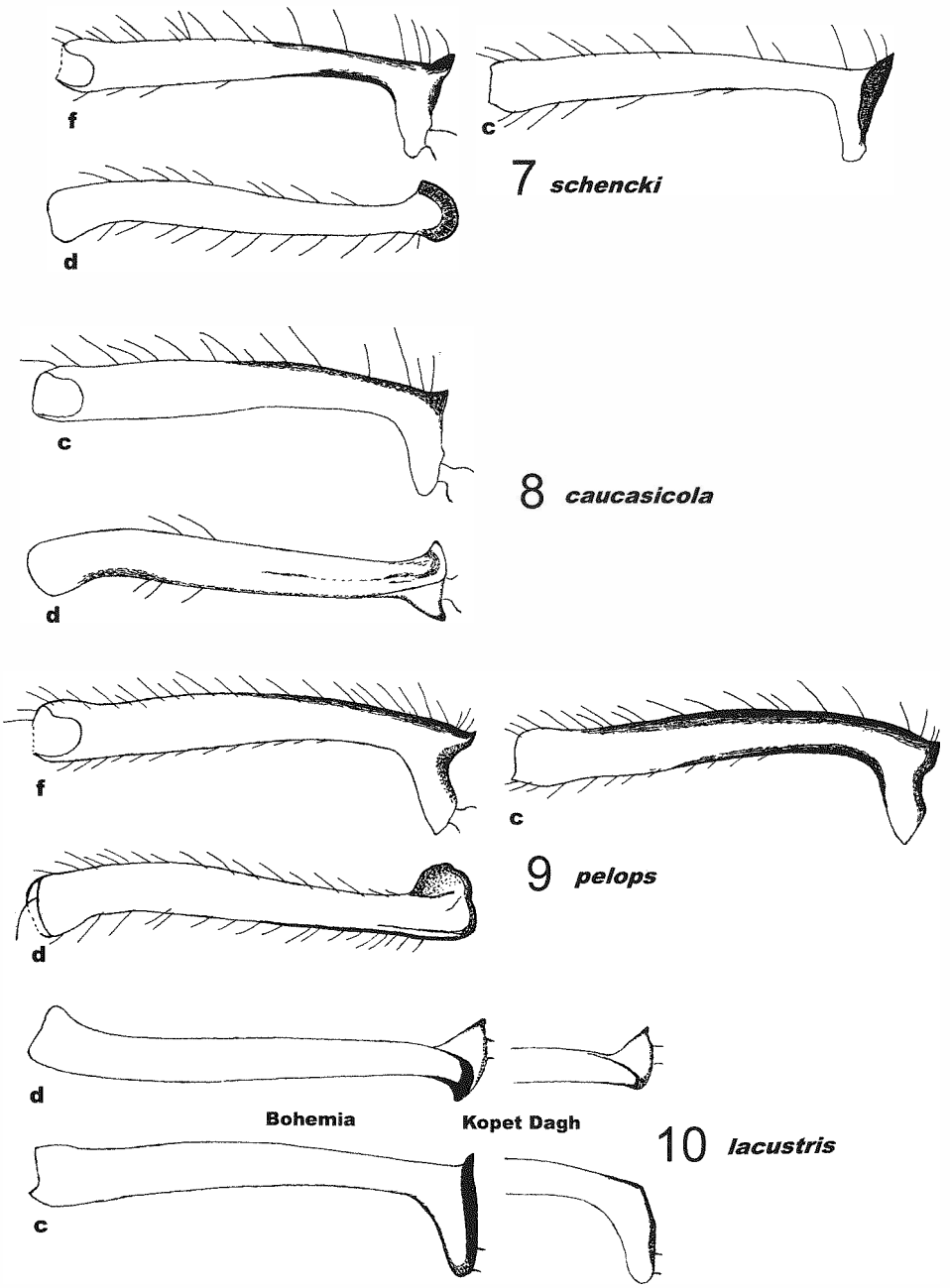

Figs. 7-11: scapes of *Myrmica schencki, caucasicola, pelops, lacustris,* and *ravasinii* in the dorsal, caudal, and frontal standard viewing positions. Pilosity is not depicted in case of *lacustris.*

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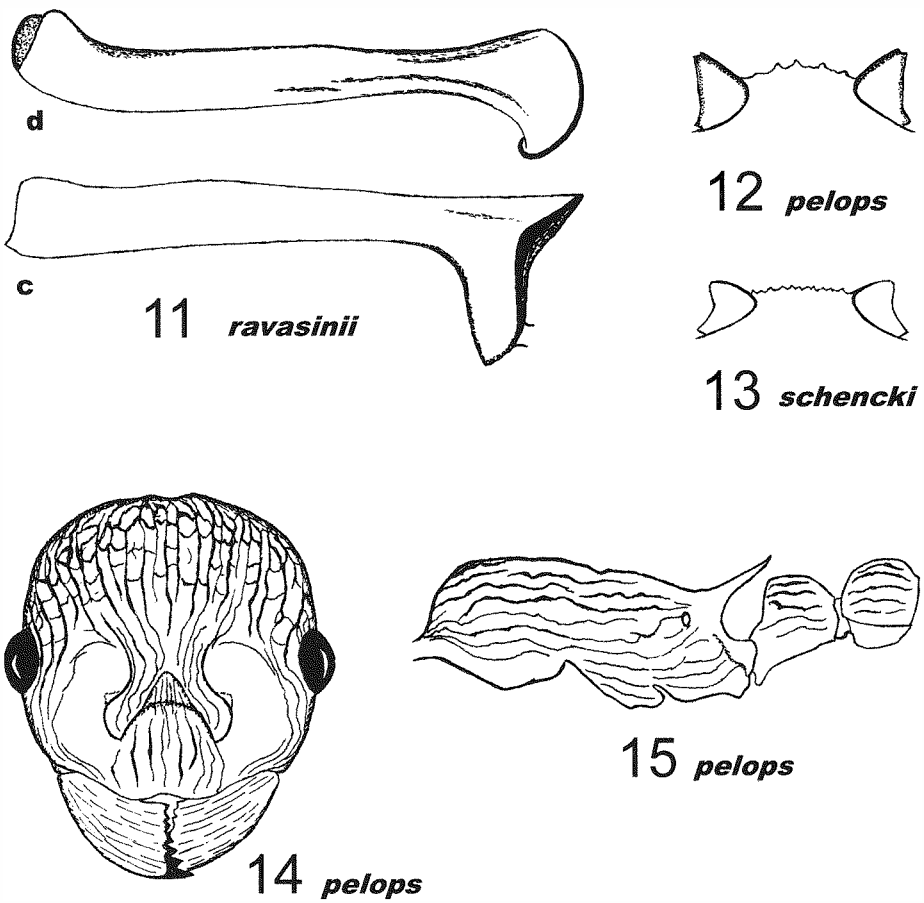

Figs. 12-13: frontal lobes of *Myrmica pelops* and schenki in dorsocaudal view.
Fig. 14: head of Myrmica pelops in dorsal aspect. **Fig. 15:** mesosoma and waist of *Myrmica pelops* in profile.

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Besprechungen

HINTERMEIER, H. & HINTERMEIER, M.: **Bienen, Hummeln, Wespen im Garten und in der Landschaft**. - München: Obst- und Gartenbauverlag, 2002: 140 S., 163 Farbfotos, 7 Farbtafeln, 38 Zeichnungen. - ISBN 3-87596-098-X

Diese Broschüre wendet sich hauptsächlich an Kinder und Jugendliche, Naturschützer und Gartenbesitzer. Auch Freizeitentomologen und Imker werden in diesem Buch sicher noch Neues und Wissenswertes entdecken können. In übersichtlicher Form wird ein Abriss der Biologie und Ökologie heimischer aculeater Hautflügler gegeben. Bei den dargestellten Arten handelt es sich hauptsächlich um jene, die auch in der Nähe von bzw. in menschlichen Siedlungen anzutreffen sind. Ein besonderes Kapitel behandelt die Honigbiene. Ein Schwerpunkt der Schrift liegt auf der Darstellung der Bedeutung der verschiedenen Hautflüglerarten für verschiedene Pflanzenarten. „Bienenweiden" sind vielen Menschen bekannt, hier wird jedoch auch herausgearbeitet, dass z. B. Hummeln und andere Wildbienen ein anderes, oft stark spezialisiertes Blütenbesuchsspektrum haben, und viele Wildpflanzen - darunter natürlich auch seltene bzw. gefährdete Arten - überhaupt nicht durch die Honigbiene bestäubt werden können.

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Die Fotos sind gut gelungen, so macht es Spaß, in diesem Heft zu blättern und zu lesen. Vielleicht hätte man bei der Darstellung der Trachtpflanzen der Honigbiene und den „Hummelpflanzen" statt Strichzeichnungen auch Fotos wählen sollen, für Laien wären diese sicher etwas instruktiver gewesen. Dies und die Tatsache, dass statt einer Braconide („Apanteles glomeratus") eine kleine Schlupfwespe abgebildet wurde, schaden dem guten Gesamteindruck des Werkes jedoch nicht. Die Broschüre ist - auch auf Grund seines moderaten Preises - dem genannten Personenkreis durchaus zur Lektüre bzw. „Benutzung" zu empfehlen.

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