

## Ants of the genus *Myrmica* (Hymenoptera: Formicidae) from Vietnam, with a description of a new species

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### Abstract

*Myrmica schoedli* sp.n. is described from workers and a single queen collected on the mountains of northern Vietnam, and its taxonomic position is discussed. A first record of *M. angulata* in Vietnam is reported and a first description of its queen is given. A short review of the *Myrmica* species known from Vietnam and a key for their identification are provided. It is proposed that *M. draco*, *M. yamanei* and *M. schoedli* sp.n. should be placed in the *M. draco* complex (a new complex in the *M. ritaе* species group) based on their unusual combination of morphological features.

**Key words:** Ants, Formicidae, *Myrmica schoedli*, taxonomy, new species, key, Vietnam.

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### Introduction

The majority of *Myrmica* species live in the Temperate Zone of the Holarctic Region, but some also live on high mountains in the northern parts of the Oriental Region. The latter mostly belong to the *M. ritaе* species group that ranges from Taiwan to the Himalayas, including southern China, northern Burma, Thailand, and Vietnam (RADCHENKO & ELMES 1998, 1999, 2001b, ELMES & RADCHENKO 1998, RADCHENKO & al. 2001). The *M. ritaе* group contains unusual *Myrmica* species represented by the specimens found in Baltic Amber from the late Eocene (RADCHENKO & al. in press). The female castes differ from other Palaearctic *Myrmica* in a variety of morphological features, particularly in the very long propodeal spines, long and low petiole, fig-shaped postpetiole and long antennal scape, which is weakly curved at the base and is usually longer than the head. Only a few males of *M. ritaе* group species are in the different World ant collections, and males of most species are unknown.

We think some species of the *M. ritaе* group have been fairly well conserved since the Eocene, surviving in the mountains of Southeast Asia where they have given rise to many local endemics (RADCHENKO & al. in press). Therefore when Katsuyuki Eguchi (Kagoshima University, Japan) and one of us (BTV) investigated the ant fauna of the mountains of North Vietnam, it was no surprise that they collected specimens of species belonging to the *M. ritaе* group (RADCHENKO & ELMES 2001a). More recently they made further collections of *Myrmica* in these mountains and took specimens of a new species, *Myrmica schoedli* sp.n., and a queen of *M. angulata* RADCHENKO & al., 2001 for the first time. Here we describe the new

species and the queen, review the *Myrmica* fauna of Vietnam and provide a key to the Vietnamese species.

### Materials and methods

This review is based on examination of the types of previously known Vietnamese *Myrmica* species and on additional material collected by B.T. Viet and K. Eguchi. The type material examined is deposited in the following Museums and collections: The Natural History Museum, London, UK (BMNH); Museum of Comparative Zoology at Harvard University, USA (MCZ); Institute of Zoology of the Ukrainian National Academy of Sciences, Kiev, Ukraine (IZK); collections of Seiki Yamane, Kagoshima University, Japan (YAMANE), Graham W. Elmes, Centre for Ecology and Hydrology, UK (ELMES), and B.T. Viet, Institute of Ecology and Biological Resources, Vietnam (VIET).

Measurements of specimens were made for each caste (accurate to 0.01 mm) and these were used to calculate various indices:

#### Morphometrics:

- HL Maximum length of head in dorsal view, measured in a straight line from the anteriormost point of clypeus (including any carinae or rugae, if they protrude over the anterior margin) to the mid-point of the occipital margin.
- HW Maximum width of head in dorsal view behind (above) the eyes.
- FW Minimum width of frons between the frontal carinae.

- FLW Maximum width between outer borders of the frontal lobes.
- SL Maximum straight-line length of antennal scape from its articulation with condylar bulb to the proximal edge of scape.
- AL Diagonal length of the alitrunk seen in profile, from the neck shield to the posterior margin of metapleural lobes (workers) and from the anterodorsal point of alitrunk to posterior margin of metapleural lobes (queens and males).
- HTL Maximal length of hind tibia, measured from the junction with the femur to the junction with the first tarsal joint.
- PNW Maximum width of pronotum from above (workers).
- PL Maximum length of petiole from above, measured from the posterodorsal margin of petiole to its anterior edge at the articulation with propodeum; petiole should be positioned so that measured points lay on the same plane.
- PW Maximum width of petiole from above.
- PH Maximum height of petiole in profile, measured from the uppermost point of the petiolar node perpendicularly to the imaginary line between the anteroventral (just behind the subpetiolar process) and posteroventral points of petiole.
- PPL Maximum length of postpetiole, measured from above from its anterior to posterior margins.
- PPW Maximum width of postpetiole from above.
- PPH Maximum height of postpetiole in profile from its uppermost to lowermost points, measured perpendicularly to the linear component of the lateral postpetiolar suture.
- ESL Maximum length of propodeal spine in profile, measured along the spine from its tip to the deepest point of the propodeal constriction at the base of spines.
- ESD Distance between the tips of propodeal spine from above.
- SCW Maximum width of scutum from above (queens and males).
- SCL Length of scutum + scutellum from above (queens and males).
- AH Height of alitrunk, measured from upper level of mesonotum perpendicularly to the level of lower margin of mesopleura (queens and males).

Indices:

CI	HL / HW	PPI <sub>2</sub>	PPH / PPW
FI	FW / HW	PPI <sub>3</sub>	PPW / PW
FLI	FLW / FW	PPI <sub>4</sub>	PPW / HW
SI <sub>1</sub>	SL / HL	ESLI	ESL / HW
SI <sub>2</sub>	SL / HW	ESDI	ESD / ESL
PI <sub>1</sub>	PL / PH	AI	AL / AH
PI <sub>2</sub>	PL / HW	SCI	SCL / SCW
PPI <sub>1</sub>	PPL / PPH		

*Myrmica schoedli* sp.n.

**Material examined:** holotype (worker), northern Cong Troi, Sa Pa district, Lao Cai province, 2000 - 2200 m a.s.l., 28.IV.2002, No. Eg02-VN-152 (GWE No. VN-3), leg. K. Eguchi (BMNH); paratypes: 3 workers and 1 queen

from the nest of the holotype; same locality, 2100 - 2200 m a.s.l., 5.V.2001, GWE No. VN-4, leg. K. Eguchi, 1 worker (ELMES, IZK, VIET).

**Workers** (Figs. 1 - 5): Head distinctly longer than broad, with convex sides and occipital margin and very broadly rounded occipital corners, so that head appears sub-oval, its upper latero-ventral corners pointed; anterior clypeal margin very feebly convex, shallowly but distinctly notched medially. Mandibles with 9 - 10 teeth. Frontal carinae feebly curved, frons wide, frontal lobes somewhat raised vertically (i.e., perpendicular to the head dorsum); antennal sockets surrounded by a single ruga and fine additional striae. Antennal scape extremely long, the longest among all known *Myrmica* species, gradually and weakly curved at the base.

Alitrunk long and low, with feebly convex promesonotal dorsum (seen in profile), promesonotal suture indistinct (seen from above); metanotal groove distinct but shallow; metapleural lobes projecting apically to form sharp teeth. Propodeal spines very long, broad at the base, sharp, straight, projecting backwards at  $< 45^\circ$  (seen in profile) and divergent (seen from above). Petiole very long, low and narrow, with long node; its anterior surface concave, node dorsum very feebly convex; postpetiole fig-shaped (seen from above), high, somewhat higher than long, its anterior surface quite steep, slightly convex, node dorsum narrowly rounded (seen in profile). Spurs on middle and hind tibiae well developed and pectinate.

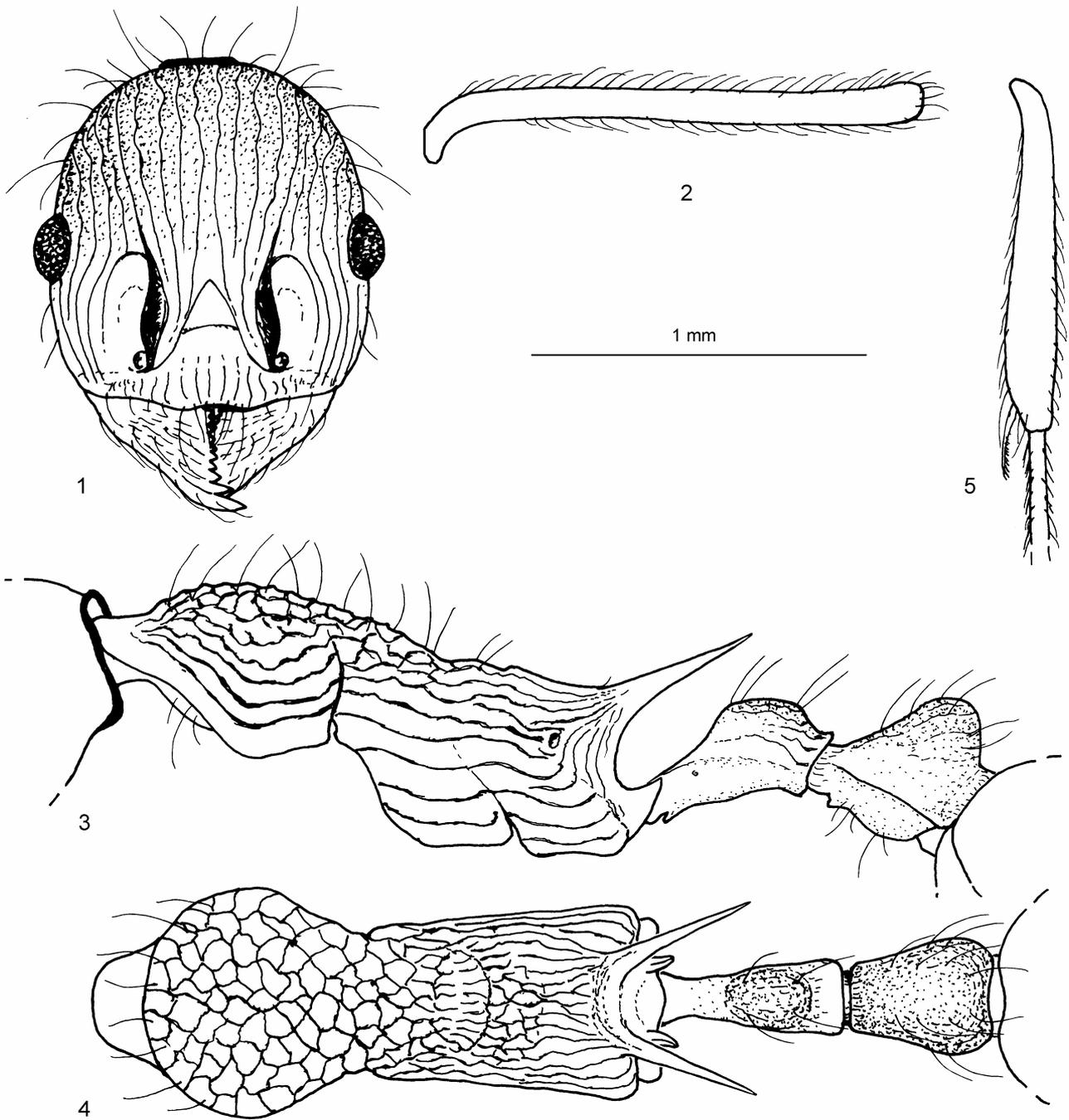
Head dorsum with fine, slightly sinuous longitudinal rugae, without reticulation. Frons between frontal carinae level with the eyes, with no less than eight rugae. Clypeus with fine longitudinal rugulae, mandibles striato-rugulose. Surface of head dorsum between rugae finely though obviously punctated, but appears more or less shiny, while frontal triangle, antennal sockets and clypeus smooth and shiny.

Alitrunk in contrast to head much more coarsely sculptured. Its sides with very coarse longitudinal, more or less straight or slightly sinuous rugae. Promesonotal dorsum with coarse reticulation, propodeal dorsum with longitudinal sinuous rugosity. Surface between rugae smooth and shiny, not punctated. Petiole and postpetiole without rugae, only partly finely striated and punctated, appearing somewhat dull. Gaster smooth and shiny.

Head margins, alitrunk dorsum and waist with sparse, very long outstanding hairs. Antennal scape and tibiae with much shorter hairs. Alitrunk and head brownish-red, gaster brownish-yellow, antennae reddish, legs reddish-yellow.

Measurements (mm) and indices of workers (n = 5) in order minimum - maximum, arithmetic means in parentheses, data of the holotype in brackets: HL 1.08 - 1.24 (1.12) [1.10], HW 0.89 - 1.04 (0.94) [0.94], FW 0.33 - 0.39 (0.35) [0.34], FLW 0.38 - 0.45 (0.40) [0.39], SL 1.40 - 1.54 (1.45) [1.44], AL 1.76 - 1.98 (1.84) [1.82], HTL 1.12 - 1.24 (1.15) [1.14], PNW 0.66 - 0.76 (0.70) [0.70], PL 0.55 - 0.60 (0.57) [0.57], PW 0.23 - 0.26 (0.24) [0.23], PH 0.26 - 0.30 (0.27) [0.27], PPL 0.42 - 0.45 (0.43) [0.43], PPW 0.36 - 0.42 (0.38) [0.38], PPH 0.44 - 0.50 (0.45) [0.44], ESL 0.60 - 0.72 (0.63) [0.61], ESD 0.45 - 0.54 (0.51) [0.52].

CI 1.17 - 1.21 (1.19) [1.17], FI 0.36 - 0.38 (0.37) [0.36], FLI 1.14 - 1.15 (1.15) [1.15], SI<sub>1</sub> 1.24 - 1.31 (1.29) [1.31], SI<sub>2</sub> 1.48 - 1.57 (1.54) [1.53], PI<sub>1</sub> 2.00 - 2.15 (2.08) [2.11],



Figs. 1 - 5: Details of structure of *Myrmica schoedli* sp.n. (holotype, worker). (1) Head, dorsal view; (2) scape, lateral view; (3) alitrunk and waist in profile; (4) alitrunk and waist from above; (5) tibia and base of first tarsal joint of hind leg.

PI<sub>2</sub> 0.58 - 0.62 (0.61) [0.61], PPI<sub>1</sub> 0.90 - 0.98 (0.95) [0.98], PPI<sub>2</sub> 1.16 - 1.21 (1.18) [1.16], PPI<sub>3</sub> 1.57 - 1.65 (1.60) [1.65], PPL<sub>4</sub> 0.40 - 0.42 (0.40) [0.40], ESLI 0.64 - 0.63 (0.65) [0.66], ESDI 0.75 - 0.88 (0.82) [0.85].

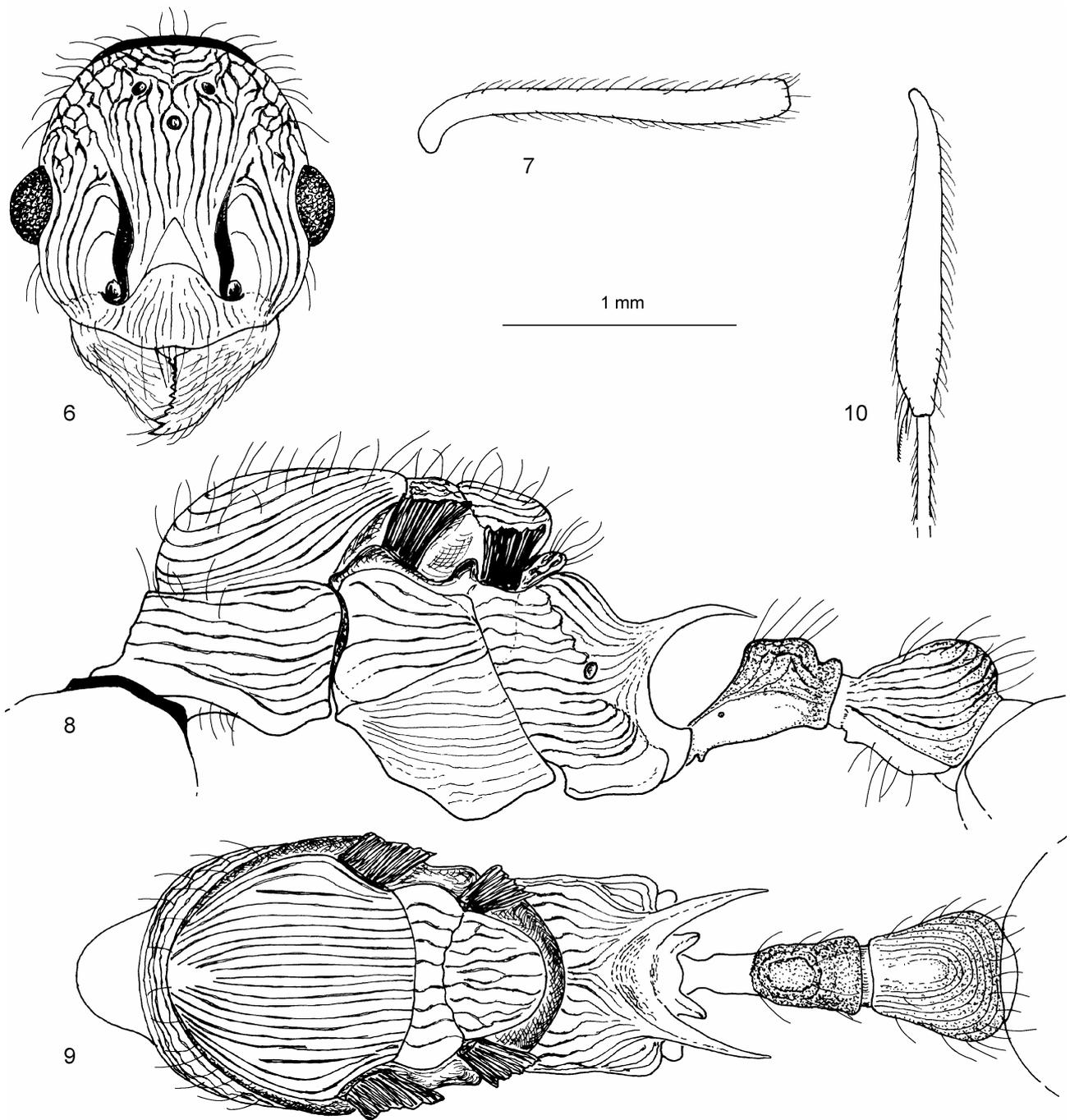
**Queen** (Figs. 6 - 10): Despite its general resemblance to the workers, the queen differs from them in the following points: head appears less sub-oval, with more distinct though broadly rounded occipital corners, frontal lobes less extended. Scape relatively shorter than that of the workers, but still very long. Propodeal spines distinctly curved downwards, only slightly divergent; petiole relatively shorter and higher, its anterior surface strongly convex, not concave.

Head, alitrunk and waist have a uniformly coarse rugosity, that of the entire alitrunk being longitudinal, more or less straight, and that of petiole and postpetiole being longitudinally-concentric. Head and waist not punctated.

Measurements (mm) and indices of queen (n = 1): HL 1.30, HW 1.14, FW 0.44, FLW 0.49, SL 1.56, AL 2.46, AH 1.50, SCW 1.10, SCL 1.66, HTL 1.44, PL 0.75, PW 0.35, PH 0.41, PPL 0.58, PPW 0.56, PPH 0.62, ESL 0.63, ESD 0.62.

CI 1.14, FI 0.39, FLI 1.11, SI<sub>1</sub> 1.20, SI<sub>2</sub> 1.37, PI<sub>1</sub> 1.83, PI<sub>2</sub> 0.66, PPI<sub>1</sub> 0.94, PPI<sub>2</sub> 1.11, PPI<sub>3</sub> 1.60, PPL<sub>4</sub> 0.49, ESLI 0.55, ESDI 0.98, AI 1.64, SCI 1.50.

**Bionomics.** Little is known about the bionomics of this species except that it was found in secondary forests at



Figs. 6 - 10: Details of structure of *Myrmica schoedli* sp.n. (paratype, queen). (6) Head, dorsal view; (7) scape, lateral view; (8) alitrunk and waist in profile; (9) alitrunk and waist from above; (10) tibia and base of first tarsal joint of hind leg.

altitudes between 2000 and 2200 m and a nest was located under vegetation on a rock, by a stream.

**Etymology.** This species is dedicated to the memory of Dr. Stefan Schödl, famous Austrian myrmecologist.

**Discussion.** While *M. schoedli* sp.n. clearly belongs to the *M. ritae* group, it has features of both the *M. ritae* and *M. boltoni* complexes (RADCHENKO & ELMES 1998). In this respect it resembles two recently described species from Vietnam and Southern China: *M. yamanei* RADCHENKO & ELMES, 2001, and *M. draco* RADCHENKO & al., 2001. The species of the *M. ritae* complex have a very coarsely rugose head, alitrunk and waist with the

surface between the rugae being smooth, not punctated. In contrast, species of the *M. boltoni* complex have a much more finely rugulose or even striated head and alitrunk, with the surface between the rugae of head dorsum being distinctly punctated, while the waist is punctated, not rugose. *Myrmica schoedli* sp.n. has a rugose head and alitrunk (like the *M. ritae* complex), but surface of head between rugae is punctated, and waist finely striated and punctated. In these respects it resembles *M. yamanei* and *M. draco*.

Now that a third species has been discovered having characters intermediate between the two known complexes

in the *M. ritae* group, it seems reasonable to establish a new complex within the *M. ritae* species group – the ***M. draco*-complex** – to include *M. draco*, *M. yamanei* and *M. schoedli* sp.n. In the character of body sculpture outlined above, the *M. draco* complex well differs from all known species of the *M. ritae* group. Furthermore, all known males in the *M. ritae* group, with the exception of *M. draco*, have short antennal scape; if males of *M. yamanei* and *M. schoedli* sp.n. prove to have long antennal scape, our view will be further supported.

*Myrmica schoedli* sp.n. well differs from the other *M. draco* complex species (*M. draco* and *M. yamanei*) in its much longer scape:  $SI_1 > 1.23$  vs.  $< 1.18$ ,  $SI_2 > 1.45$  vs.  $< 1.40$ . Additionally, the head dorsum of *M. yamanei* has coarse reticulation (vs. longitudinal rugosity in *M. schoedli* sp.n.), and the propodeum is punctated, not smooth. *Myrmica draco* has a distinctly shorter, not sub-oval head (CI  $< 1.10$  vs.  $> 1.15$ ), less developed reticulation on the mesonotal dorsum, deeper metanotal groove, shorter petiole, etc. (see also RADCHENKO & al. 2001).

### ***Myrmica serica* WHEELER, 1928**

*Myrmica margaritae* var. *serica*: WHEELER (1928: 8): worker, China, holotype in MCZ, examined; CHAPMAN & CAPCO (1951: 127).

*Myrmica ritae* subsp. *serica*: WEBER (1950: 222): workers, queens.

*Myrmica serica*: RADCHENKO (1994: 44); BOLTON (1995: 283); RADCHENKO & ELMES (1998: 7): males; RADCHENKO & ELMES (2001a: 221); ELMES & RADCHENKO (1998: 222); RADCHENKO & al. (2001: 217).

**Material examined:** holotype (worker), China, Yunnanfu, leg. Silvestri (MCZ); non-type material: Southern Taiwan, Arisan, 2450 m a.s.l., 20.X.1977, leg. K. Yamachi, 5 workers; Central Taiwan, Hou-hoa-shan, 22.VIII.1995, leg. K. Onoyama, 4 workers, 5 males; Taiwan, Tanta, Nantou, Hsien, 12.VII.1994 and 14.VIII.1996, leg. C. Lin, 2 workers; Taiwan, Fenchitu, 8.VIII.1969, leg. M. Kubota, 5 workers; Taiwan, Nantou Hsien, Jeiyeng, 9.VIII.2002, leg. J. Elmes, 70 workers, 3 queens, 9 gynes, 3 males (from several nests); Taiwan, Chiayi Hsien, Alishan Forest Recreation Centre, 11.VIII.2002, leg. G. W. Elmes, 56 workers, 5 gynes (from several nests); Shanxi, 34° 27' N, 110° 06' E, Qin Ling Shan, Hua Shan, 118 km E. Xian, 1200 - 1400 m a.s.l., No 958, 18.-20.VIII.1996, leg. Wrase, 2 workers, 1 queen; Guangxi, Damin Shan, 14.VI.1997, DMS-139, leg. J. Fellowes, 1 worker; Guangxi, Hua Ping, 840 m a.s.l., 16.VIII.1998, leg. J. Fellowes, 1 worker; Guangxi, Hua Ping, 6.VII.1995, No. 1, leg. S. Zhou, 1 worker; Guangxi, Da Yao Shan, 1300 m a.s.l., 21.IX.1998, leg. J. Fellowes, 2 workers; Guangxi, Da Yao Shan, 21.IX.1998, No. 5, leg. S. Zhou, 1 worker; Guangxi, Mao Er Shan, 29.VIII.1997, leg. S. Zhou, 1 worker; northern Vietnam, Xeo Mi Ti, Sa Pa district, Lao Cai province, 1680 m a.s.l., 29.-30.VII.1998, leg. B. T. Viet, 2 workers; northern Vietnam, Cong Troi, Sa Pa district, Lao Cai province, 2000 - 2200 m a.s.l., 26.IV.-2.V.2002, leg. K. Eguchi, 47 workers (from several nests).

**Taxonomic notes.** For the details of taxonomy and morphometrics see RADCHENKO & ELMES (1998).

**Bionomics.** This species inhabits the high altitude mixed forests that grow on mountains throughout SE Asia. In mainland China it was recorded at about 1300 m a.s.l., in

Vietnam between 1680 m - 2200 m a.s.l., and in Taiwan between 1400 - 2450 m a.s.l.. In Vietnam nests were located in rotten wood, or sometimes natural cavities in fallen and standing dead wood, and in dead bamboo. In Taiwan one of us (GWE) found nests under stones by the side of a forest track; sometimes these stones were quite large and deeply embedded. Other nests were found in rotting tree-stumps and branches, in fairly open forests. An earlier sample was recorded as living under a stone in grassland. The choice of nest site may be determined simply by the availability of different types of cavity / substratum for nesting, or deeply embedded stones may be favoured in more sunny, exposed places (grass and forest edge), while rotten wood and/or natural cavities may be favoured within forests. In Taiwan nests could be quite large ( $> 1000$  workers). Despite their unusual morphology and presumed ancient origins this *M. ritae* group species appears to forage and behave like many other forest species of *Myrmica* (e.g., *M. ruginodis* NYLANDER, 1846, *M. kotokui* FOREL, 1911). Workers were not particularly aggressive, less aggressive than in *M. arisana* WHEELER, 1930 from nearby locations in Taiwan. Their sting was no more painful than that of any other *Myrmica* species. Sexualls from nuptial flights were found on the ground in Taiwan on 9 - 11 August 2002; the mating sites were not located, they were probably at the top of tall trees. In short, nothing in their ecology as far as it is known, other than an inclination to use natural cavities in wood, stands out as being remarkably different from other, possibly more recently derived, forest-living species of *Myrmica*.

**Distribution.** *Myrmica serica* is one of the commonest and widespread species of the *M. ritae* group, ranging from southern China and Taiwan to northern Vietnam.

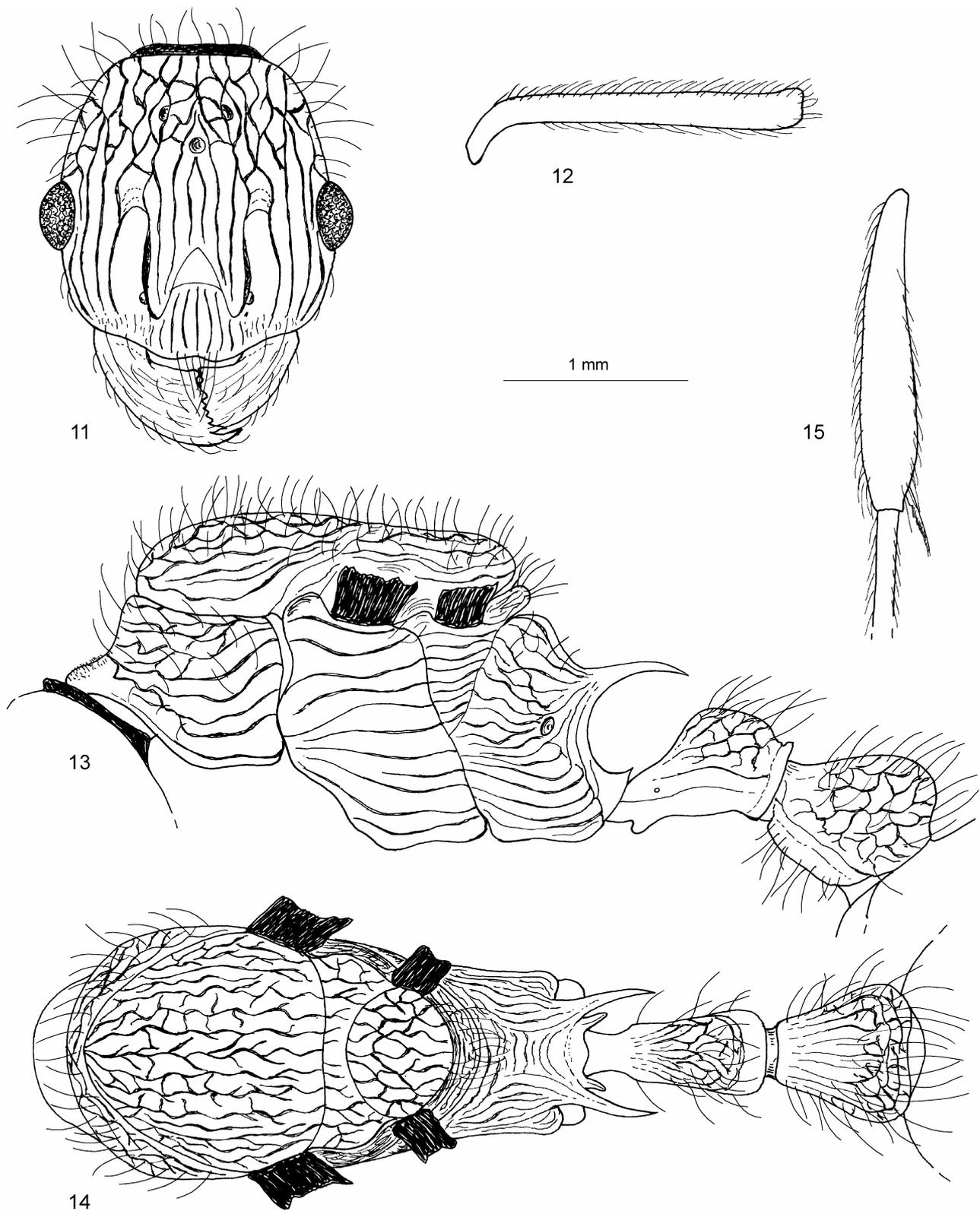
### ***Myrmica titanica* RADCHENKO & ELMES, 2001**

*Myrmica titanica*: RADCHENKO & ELMES (2001 a: 222): workers.

**Material examined:** holotype (worker), northern Vietnam, Fan Si Pan, Sa Pa district, Lao Cai province, alt. 2020 m a.s.l., April 1998, leg. B. T. Viet (YAMANE); paratype worker with the same label (ELMES); non-type material: northern Vietnam: Lao Chau province, western slopes of Mt. Fan Si Pan (W. Cong Troi), 2100 - 2200 m a.s.l., 6.V.2002, leg. K. Eguchi, 1 worker; Cong Troi, Sa Pa district, Lao Cai province, 2000 - 2200 m a.s.l., 28.IV. - 2.V.2002, leg. K. Eguchi, 11 workers.

**Taxonomic notes.** For the details of taxonomy and morphometrics see RADCHENKO & ELMES (2001a). It is worth noting that this species is the biggest *Myrmica* known worldwide with HL  $> 2.1$  mm and AL  $> 3.3$  mm. Nevertheless, *M. titanica* clearly belongs to the *M. ritae* complex of the *M. ritae* group and differs from all other species from this complex (except for *M. angulata*) in the punctures present between rugae on the petiole and postpetiole.

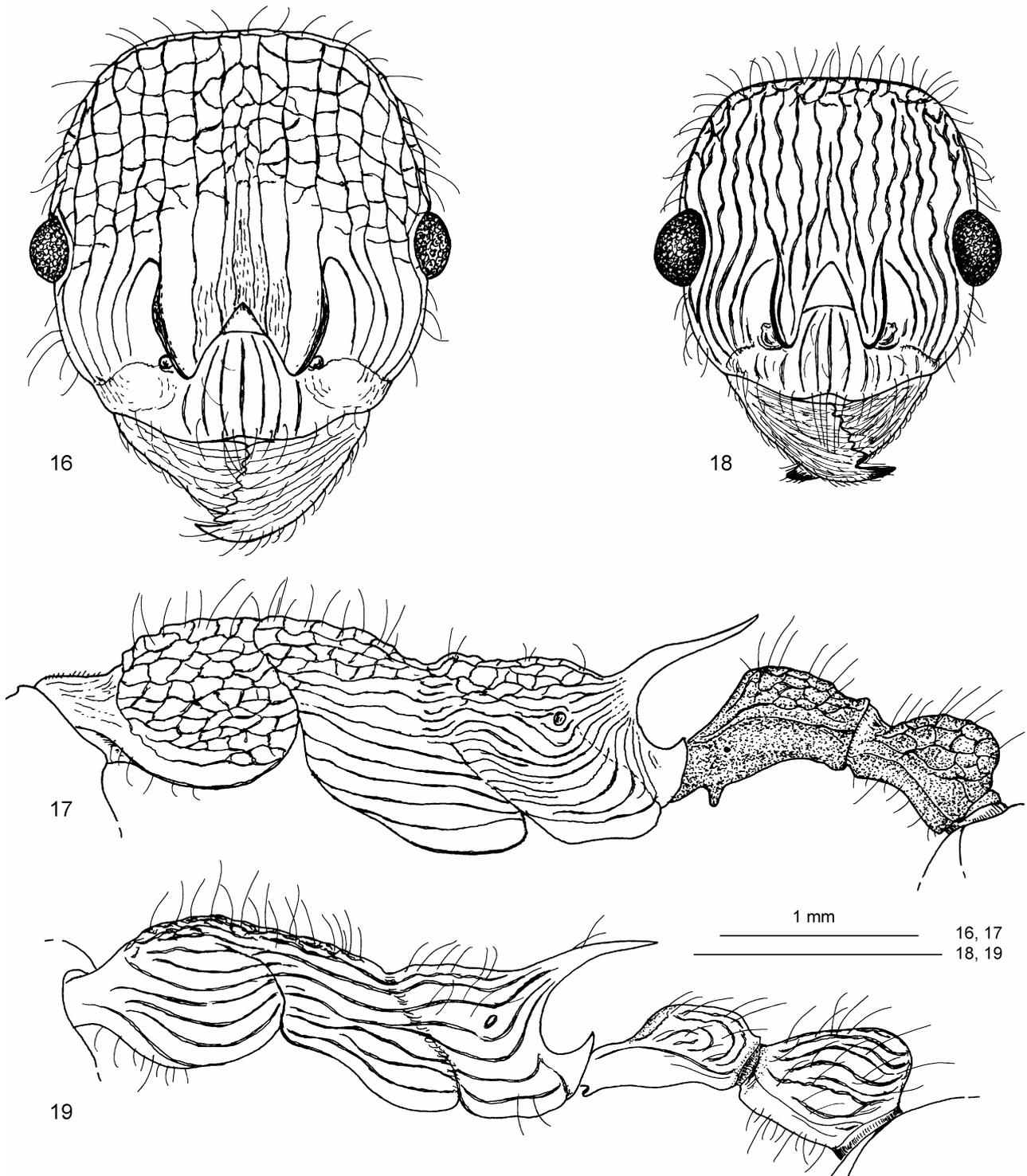
**Bionomics.** Little is known about this species. Almost all specimens have been collected foraging on the ground or on fallen trees in well-developed forests. Katsuyuki Eguchi collected workers coming out from a natural cavity in a tree cut down for timber; unfortunately he had no tools to cut into the wood to "excavate" the colony. This led us to speculate that *M. titanica* might be a truly



Figs. 11 - 15: Details of structure of *Myrmica angulata* (queen). (11) Head, dorsal view; (12) scape, lateral view; (13) alitrunk and waist in profile; (14) alitrunk and waist from above; (15) tibia and base of first tarsal joint of hind leg.

arboreal species living and foraging mainly in the canopy, in which case it might be endangered by excessive

logging activities. Specimens were found at altitudes of 2000 - 2200 m a.s.l.



Figs. 16 - 19: Details of structure of *Myrmica titanica* (holotype, worker; 16, 17) and *M. serica* (lectotype, worker; 18, 19). (16, 18) Head, dorsal view; (17, 19) alitrunk and waist in profile.

**Distribution.** The species is known only from the northern Vietnam and could be endemic to that region.

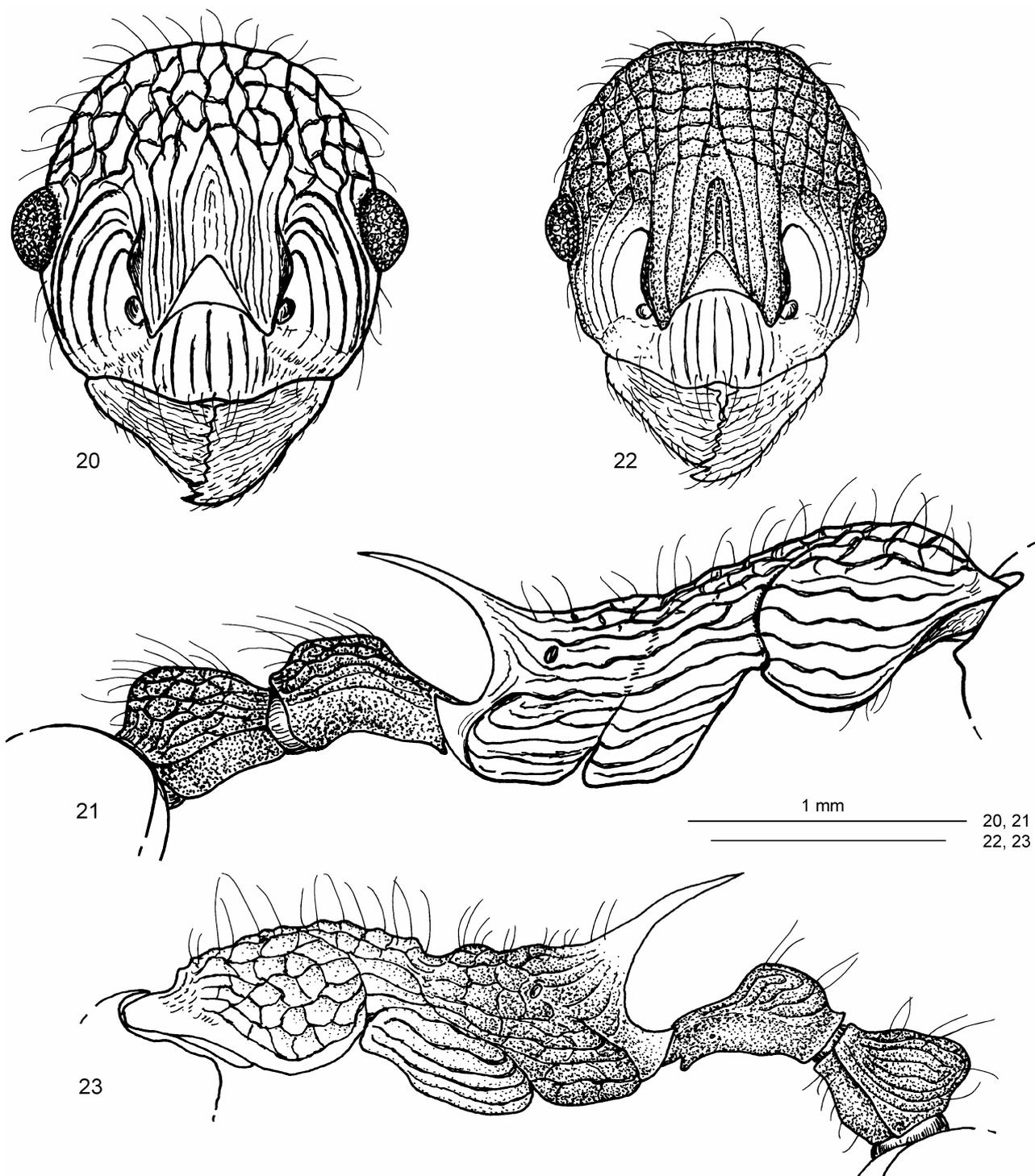
***Myrmica yamanei* RADCHENKO & ELMES, 2001**

*Myrmica yamanei*: RADCHENKO & ELMES (2001a: 223): worker.

**Material examined:** holotype (worker), northern Vietnam, Xeo Mi Ti, Sa Pa district, Lao Cai province, 1680 m

a.s.l., 29. - 30.VII.1998, leg. B.T. Viet (YAMANE); non-type material: northern Vietnam, Lai Chau province, western slopes of Mt. Fan Si Pan (W. Cong Troi), 2100 - 2200 m a.s.l., 6.V.2002, leg. K. Eguchi, 1 worker.

**Taxonomic notes.** We have transferred *M. yamanei* to the newly established *M. draco* complex of the *M. ritae* group based on body sculpture intermediate between that of the *M. ritae* - and *M. boltoni* complexes.



Figs. 20 - 23: Details of structure of *Myrmica angulata* (holotype, worker; 20, 21) and *M. yamanei* (holotype, worker; 22, 23). (20, 22) head, dorsal view; (21, 23) alitrunk and waist in profile.

For the differences between *M. yamanei* and *M. schoedli* sp.n. see above. It clearly differs from *M. draco* in its well-developed, coarse reticulation on the head dorsum and the punctated surfaces between the rugae of the alitrunk.

**Bionomics.** Nothing is known about this species except that it lives in forests at altitudes between 1680 and 2200 m a.s.l.

**Distribution.** Known only from northern Vietnam.

***Myrmica angulata* RADCHENKO, ZHOU & ELMES, 2001**

*Myrmica angulata*: RADCHENKO & al. (2001: 213): workers.

**Material examined:** holotype (worker), southern China, Guangxi, Xing An, 500 m a.s.l., 7.VII.1994, No. 2, leg. S. Zhou (BMNH); paratypes: 4 workers from the same nest; NE Guangxi, Hua Ping, 840 m a.s.l., 16.VIII.1998, HP-25, leg. J. Fellowes, 1 worker; Guangxi, Da Yao

Shan, 1020 m a.s.l., 19.IX.1998, DYS-108, leg. J. Fel-  
lowes, 2 workers; non-type material: northern Vietnam,  
Lai Chau province, western slopes Mt. Fan Si Pan, (W.  
Cong Troi), 2100 - 2200 m a.s.l., 29.IV. - 6.V.2002, Nos.  
Eg02-VN-179, 313, 315, leg. K. Eguchi, 45 workers (from  
several nests); northern Vietnam, Cong Troi, Sa Pa dis-  
trict, Lao Cai province, 28.IV. - 5.V.2002, 2000 - 2200 m  
a.s.l., Nos. Eg02-VN-159, 183, 253, 308, 311, leg. K.  
Eguchi, 103 workers, 1 queen (from several nests).

**Queen** (first description, Figs. 11 - 15). Head longer  
than broad, with slightly convex sides and almost straight  
posterior margin, and rounded occipital corners; its upper  
latero-ventral corners pointed. Anterior clypeal margin  
slightly convex, notched medially. Frontal carinae very  
feebly curved, frons wide. Antennal sockets surrounded  
by rugae. Antennal scape longer than head, sharply curved  
at the base. Mandibles with 7 - 8 teeth.

Alitrunk relatively long, scutum and scutellum very  
weakly convex. Metapleural lobes projecting apically and  
forming sharp tooth. Propodeal spines very long, acute,  
strongly curved downwards in its apical third. Petiole rela-  
tively short and quite high (distinctly shorter than in  
workers). Postpetiole quite high, subequal to its length,  
with more or less straight anterior surface and rounded node  
dorsum, fig-shaped seen from above. Spurs on middle and  
hind tibiae well developed and distinctly pectinate.

Whole body with coarse sculpture. Frons between  
frontal carinae level with the eyes, with no less than six  
rugae. Upper (rear) third of head dorsum with coarse  
reticulation. Clypeus with coarse longitudinal rugae, man-  
dibles coarsely striated while frontal triangle smooth and  
shiny. Scutum and scutellum with coarse sinuous rugae  
and reticulation. Sides of alitrunk with sinuous rugae.  
Petiolar and postpetiolar nodes with coarse sinuous rugae  
and reticulation. Surface of head, alitrunk and waist be-  
tween rugae not punctated, smooth and shiny. Gaster  
smooth and shiny.

Occipital and lateral margins of head with very long  
outstanding hairs; alitrunk with similar hairs. Antennal  
scape and tibiae with numerous long subdecumbent hairs;  
upper margin of scape with suberect hairs. Body dark  
brown, with antennae and legs somewhat lighter.

Measurements (mm) and indices of queen (n = 1): HL  
1.64, HW 1.44, FW 0.57, FLW 0.60, SL 1.79, AL 2.81,  
AH 1.71, SCW 1.40, SCL 1.97, HTL 1.65, PL 0.87, PW  
0.46, PH 0.53, PPL 0.71, PPW 0.73, PPH 0.78, ESL  
0.70, ESD 0.73.

CI 1.14, FI 0.39, FLI 1.06, SI<sub>1</sub> 1.09, SI<sub>2</sub> 1.24, PI<sub>1</sub>  
1.63, PI<sub>2</sub> 0.60, PPI<sub>1</sub> 0.91, PPI<sub>2</sub> 1.06, PPI<sub>3</sub> 1.58, PPI<sub>4</sub> 0.50,  
ESLI 0.49, ESDI 1.04, AI 1.65, SCI 1.41.

**Taxonomic notes.** *Myrmica angulata* differs from  
other Vietnamese *Myrmica* species first of all in a scape  
that is strongly angled at the base. Additionally, it differs  
from *M. titanica* in a much smaller size (HL < 1.50, AL  
< 2.45 vs. HL > 2.10 AL > 3.30 mm). From *M. serica* it  
differs in well developed coarse reticulation on the head  
dorsum and in the sculpture of waist, which surface be-  
tween rugae densely punctated; from *M. yamanei* and *M.*  
*draco* it differs in the absence of punctures on the head  
dorsum (for differences from *M. schoedli* sp.n. see above;  
for other details see RADCHENKO & al. 2001).

**Bionomics.** In southern China nests of *M. angulata*  
were found in rotten wood in forests at altitudes of 500 -

1000 m a.s.l. In northern Vietnam it also lives in mixed  
forests between 1700 and 2200 m a.s.l., nests being  
found in rotten wood, in soil under logs and barks, or  
under stones. In this respect it resembles *M. serica* and we  
might speculate that it occupies a similar niche. The alti-  
tude difference between China and Vietnam is undoubt-  
edly due to regional climatic differences (note that *M.*  
*serica* also lives at somewhat lower altitudes in China).

**Key for identification of *Myrmica* species from Vietnam  
(workers)**

- 1 Body extremely large, HL > 2.10 mm, AL >  
3.30 mm. Posterior (rear) half of head dorsum  
with coarse reticulation, remainder parts of  
head with coarse longitudinal rugae (Fig. 16).  
Alitrunk and waist with coarse reticulation, sur-  
face between reticules on waist densely punc-  
tated (Fig. 17). ..... *M. titanica*
- Body much smaller, HL < 1.60 mm, AL <  
2.50 mm. Body with other combinations of  
type of sculpture (Figs. 1, 18, 20, 22). ..... 2
- 2 Head dorsum coarsely rugose and surface be-  
tween rugae smooth, not punctated (Figs. 18,  
20). ..... 3
- Head dorsum rugose or rugulose and surface  
between rugae distinctly punctated (Figs. 1, 22). ..... 4
- 3 Head dorsum with coarse sinuous longitudinal  
rugae, reticulation may be present, but only on  
the occiput (Fig. 18). Petiole and postpetiole  
coarsely rugose and surfaces between the ru-  
gae smooth and shiny (Fig. 19). ..... *M. serica*
- Frons with coarse sinuous longitudinal rugae  
and posterior (rear) third of head dorsum with  
coarse reticulation (Fig. 20). Petiole and post-  
petiole coarsely rugose and reticulate and sur-  
face between rugae densely punctated (Fig.  
23). ..... *M. angulata*
- 4 Head dorsum with fine, slightly sinuous longi-  
tudinal rugae, without reticulation, surface  
between rugae finely though obviously, super-  
ficially punctated, appearing more or less shiny  
(Fig. 1). Petiole and postpetiole without rugae,  
only partly finely striated and finely punc-  
tated, appearing somewhat dull (Figs. 3, 4).  
Scape very long, SI<sub>1</sub> > 1.23, SI<sub>2</sub> > 1.45. ....  
. .... *M. schoedli* sp.n.
- Only frons with coarse longitudinal rugae, post-  
erior (rear) part of head dorsum with coarse re-  
ticulation, surface between rugae densely punc-  
tated, appearing dull (Fig. 22). Petiole and post-  
petiole with coarse rugae and densely punctat-  
ed, appearing dull (Fig. 23). Scape shorter, SI<sub>1</sub>  
< 1.18, SI<sub>2</sub> < 1.38. .... *M. yamanei*

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### Zusammenfassung

*Myrmica schoedli* sp.n. aus den Bergen Nord-Vietnams wird anhand von Arbeiterinnen und einer Königin beschrieben. Ihre taxonomische Stellung wird diskutiert. Für *M. angulata* wird der Erstdnachweis aus Vietnam erbracht und die Königin der Art erstmals beschrieben. Es wird ein kurzer Überblick über die aus Vietnam bekannten *Myrmica*-Arten gegeben und ein Schlüssel zu ihrer Bestimmung präsentiert. Es wird vorgeschlagen, *M. draco*, *M. yamanei* und *M. schoedli* sp.n. im *M. draco*-Komplex, einem neuen Komplex innerhalb der *M. ritae*-Artengruppe, zusammenzufassen, basierend auf ihrer ungewöhnlichen Kombination morphologischer Merkmale.

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