

A NEW SPECIES OF THE GENUS *ROSSOMYRMEX* ARNOLDI, 1928 FROM TURKEY(HYMENOPTERA, FORMICIDAE)

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ABSTRACT

A new species, *Rossomyrmex anatolicus*, is described from the Anatolian plains (Turkey). Although it is very similar to *R. proformicarum* because of the abundant pilosity, it can be distinguished by the petiole, which gradually narrows towards the apex. This character, together with the high number of hairs, can be used, also, to differentiate it from *R. minuchae*. The geographical distribution of the genus *Rossomyrmex* is discussed and compared with other taxa that also show disjointed distributions.

Key words: *Rossomyrmex anatolicus*, new species, slave-making ants, Hymenoptera, Formicidae.

RESUMEN

Una nueva especie del género *Rossomyrmex* Arnoldi, 1928 de Turquía (Hymenoptera, Formicidae)

Se describe *Rossomyrmex anatolicus*, nueva especie encontrada en las llanuras de Anatolia (Turquía). Muy parecida a *R. proformicarum* por la abundante pilosidad, se diferencia de ésta por el peciolo, que se estrecha gradualmente hasta el ápice. Este mismo carácter, junto con la pilosidad permiten diferenciarla de *R. minuchae*. Se discute la distribución geográfica del género *Rossomyrmex* y se compara con la de otros taxones que muestran también distribución disjunta.

Palabras clave: *Rossomyrmex anatolicus*, nueva especie, hormigas esclavistas, Hymenoptera, Formicidae.

Introduction

Ants of the genus *Rossomyrmex* Arnoldi, 1928 are slave-makers that invade nests of genus *Proformica* Ruszky, 1903 to steal brood that will grow-up as slaves (Marikovsky, 1974; Ruano &

Tinaut, 1999). This genus was first described from the Caucasian steppes by Arnoldi in 1928 (Arnoldi, 1928, 1932) with the species *R. proformicarum*. No further information on this genus appeared for 40 years, until 1974, when the biology of this species was studied by Marikovsky (Marikovsky, 1974) in

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the Tian-Shan slopes, near Almaty (Kazakhstan). In 1981 (Tinaut, 1981) workers and females of a new species of this genus were described: *R. minuchae*, found in Sierra Nevada (Granada, Spain) many kilometers away from the Central Asian steppes, the only place where the genus was known until then. The third species of the genus, *R. quadratinodum* Xia and Zheng 1995, was described in the Chinese region of Urumchi (Xinjiang) (Xia & Zheng, 1995), located in the western part of China and corresponding to a small region between Mongolia, Kazakhstan and Kyrgyzstan.

Since the discovery of *R. minuchae* and given the rarity of the genus due to its distribution and biology, we increased our field work in order to find new nests and populations. To do so, we have searched not only in many localities within the Iberian Peninsula but also in other countries where the presence of genus *Proformica* has been documented, because finding the host represents a first clue to finding *Rossomyrmex*. Outside of Spain we have searched in Mongolia (2005) and Turkey (2001 and 2006). Our efforts finally bore fruit: in the nineties new nests in Sierra Nevada were discovered, the male of *R. minuchae* was described (Tinaut *et al.*, 1994), and many studies were started on its behaviour (Zamora-Muñoz *et al.*, 2003; Ruano & Tinaut, 2004, 2005; Ruano *et al.*, 2005; Errard *et al.*, 2006) and phylogeny (Hasegawa *et al.*, 2002). New populations in Sierra Nevada and nearby mountains (Gádor and Filabres) have been found (unpublished data). In this article a new species for the genus: *Rossomyrmex anatolicus* nov. sp., found in the eastern part of the Anatolian plains, near the region of Konya (Turkey), is described.

Material studied

Many series of *Rossomyrmex minuchae* have been studied, including the type series, coming from Sierra Nevada and Sierra de Gádor (Granada and Almería, Spain). For *R. proformicarum*, notes and drawings made on the holotype from the British Museum that were used for the description of *R. minuchae* (see Tinaut, 1981) have been taken into account. For the third species, *R. quadratinodum*, no specimen has been available and thus we have used only the original description (Xia & Zheng, 1995). A single nest of *R. anatolicus* has been found near Belebasy Bebi's harbour, and a total of 20 workers of this nest are used for this description.

Rossomyrmex anatolicus nov. sp.

TYPE MATERIAL: Holotype and type series (19 workers) come from Belebasy Bebi's harbour (Konya, Turkey), collected the 7 June 2006 at 1340 m altitude, A. Tinaut leg. The holotype and 24 paratype workers are stored in the author's collection. Two specimens of the paratype series are stored in the collection of the Museo Nacional de Ciencias Naturales of Madrid (Spain) and the Museum of Geneva (Switzerland) besides two other specimens stored in Dra. Dolores Martínez (Univ. Complutense, Madrid, Spain) and Dr. Aktac (Anatolia, Turkey) private collections.

DESCRIPTION

Head length: 1.19-1.41 mm; Head width: 1.05-1.22 mm; Occipital width: 0.84-1.00 mm; Scape length: 0.84-0.93 mm; Thorax length: 1.41-1.62 mm. General colour is black or dark brown. The tegument is bright with some ridges in the mesopleuron and metapleuron (Fig. 1). There are two types of whitish hairs: very small (about 50 µm) adpressed hairs, and long hairs (about 200 µm) which are abundant on the thorax, petiole and gaster and less abundant on the head.

Long head with sides slightly bowed and with occipital region slightly excised (Fig. 2). Slightly marked keel in the front region, the edge of the clypeus is convex and complete, with a small lump on its upper part. Well-developed reddish mandibles with eight teeth, the apical and pre-apical sharper and more developed than the others. Drumstick-like scapes, funiculus with eleven articles, the first being four times longer than its average width and as long as the second and third.

The tegument of the thorax is bright and polished, striated in the pleuron of mesothorax and metathorax only. The entire surface is covered with adpressed hairs and long hairs (around 200 µm), with thirty appearing on the pronotum, a dozen on the mesonotum and epinotum (Figs. 1 and 3).

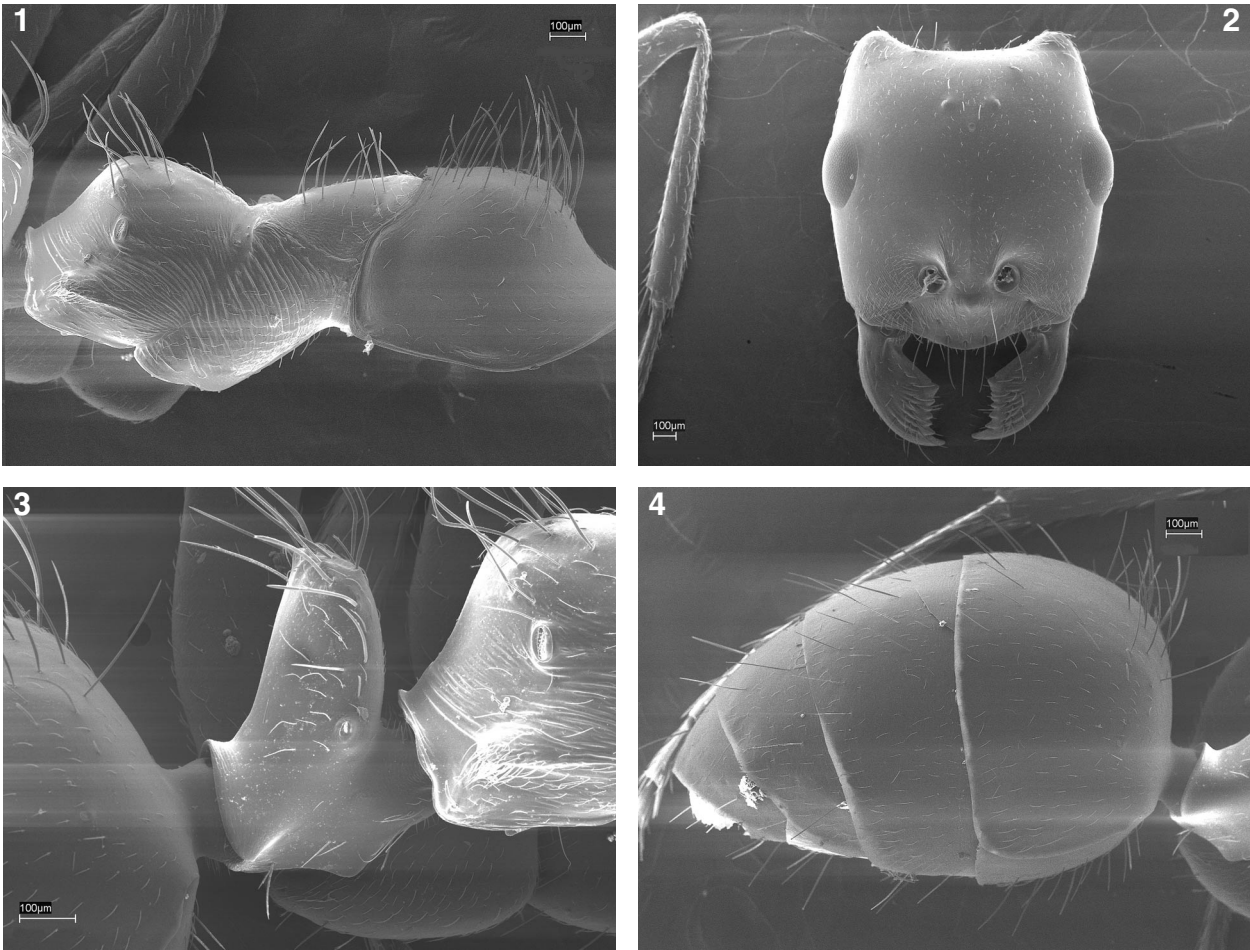
High petiole scale (Fig. 3) narrowing to the apex, where a dozen long hairs appear as well as on both side margins. Oval gaster with numerous hairs all over the dorsal and ventral surfaces (Fig. 4).

ETYMOLOGY

The name is dedicated to the region of Anatolia (Turkey).

Discussion

Because this new species is very hairy, it seems more closely related to *Rossomyrmex proformicarum* than suggested by its petiole profile, which is scale-shaped and narrowing to the apex in the case of *R. anatolicus* nov. sp. but cylindrical and trun-



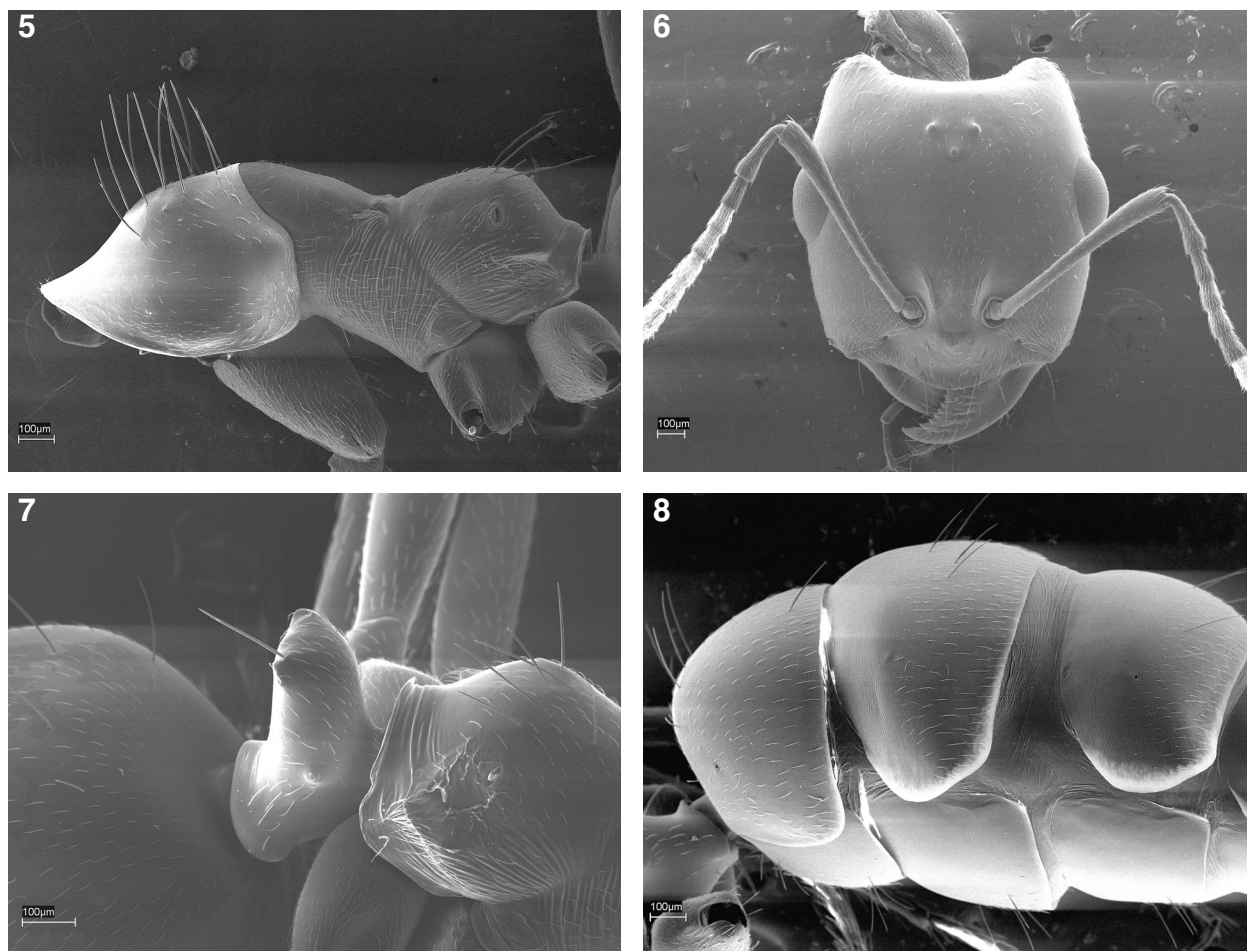
Figs. 1-4.— *Rossomyrmex anatolicus* nov. sp.: 1) Thorax, showing the striation of the meso- and metapleuron. 2) Frontal view of the head. 3) Epinotum and petiole. 4) Gaster.

Figs. 1-4.— *Rossomyrmex anatolicus* nov. sp.: 1) Tórax en el que puede apreciarse la estriación de las meso y metapleuras. 2) Vista frontal de la cabeza. 3) Epinoto y peciolo. 4) Gastro.

cated in *R. proformicarum* (Fig. 9) as can be seen also in Bolton (1994, p. 59). It clearly differs from *R. minuchae* in number of hairs, which are scarcer in the Spanish species (Figs. 5 to 8), and also in petiole profile, which is more cylindrical in *R. minuchae* and not progressively narrowing to the apex as occurs in *R. anatolicus* nov. sp. Other more subtle details differ in the two species, like the occipital excision which is deeper and more convex in *R. minuchae* (Figs. 2 and 6). A problem may occur when comparing it to *R. quadratinodum* because the original description (Xia & Zheng, 1995) gives few details. These authors consider it is similar to *R. proformicarum*, based

mainly on the differences in: “petiole in profile quadrante, head almost rectangular and mesonotum without convex in front”. Drawings provided do not offer clear differences from *R. proformicarum* but they do from *R. anatolicus* nov. sp., because of the petiole and the previously mentioned characteristics so that *R. quadratinodum*’s petiole would be wider and more cylindrical than that of *R. anatolicus* nov. sp.

The genus clearly shows a disjointed distribution: Central Asia-Iberian Peninsula (Fig. 10). This remarkable distribution is shared with other phylogenetically very distant taxa (Figs. 11 and 12), of which we can highlight the Ropalocerae butterfly:



Figs. 5-8.— *Rossomyrmex minuchae*: 5) Thorax. 6) Frontal view of the head. 7) Epinotum and petiole. 8) Gaster.

Figs. 5-8.— *Rossomyrmex minuchae*: 5) Tórax. 6) Vista frontal de la cabeza. 7) Epinoto y peciolo. 8) Gastro.

Pseudochazara hippolyte (Esper, 1784) (Olivares, 2002) or such beetles as Escarabeidae of the subgenus *Parentius* Zunino, 1979, with three species (one in France, another in the Iberian Peninsula and Morocco, and a third in Korea, China, and Mongolia) (Martín-Piera & López-Colón, 2000) and even a Vertebrate, the azure-winged magpie *Cyanopica cyanus* (Pallas, 1776), with a very similar distribution to the former (Fok *et al.*, 2002) (Fig. 12). The coincidence in distribution of different taxonomical groups with different evolutionary histories, migration capability and natural history, points to the existence of an extrinsic cause that has favoured this kind of situation. The presence of some of these taxa (*Pseudochazara* and *Parentius*) also in North Africa allows us to attribute these dis-

tributions to a pre-Quaternary Age, probably in the second half of the Tertiary, when some invasions of temperate species coming from Asia (Behrensme-*et al.*, 1992) occurred on both Mediterranean coasts, colonising southern Europe and North Africa. Progressive global cooling and the following Quaternary glaciations probably caused the extinction of intermediate populations and originated the current distribution, clearly disjointed for many of the species that initially could have been uniformly distributed across the Iberian-Turanian-Asiatic band. In birds, it has been demonstrated that although most of the speciation processes probably happened over the Pliocene (Klicka & Zink, 1997), the Pleistocene climatic fluctuations have played an important role both in initiating major phyloge-

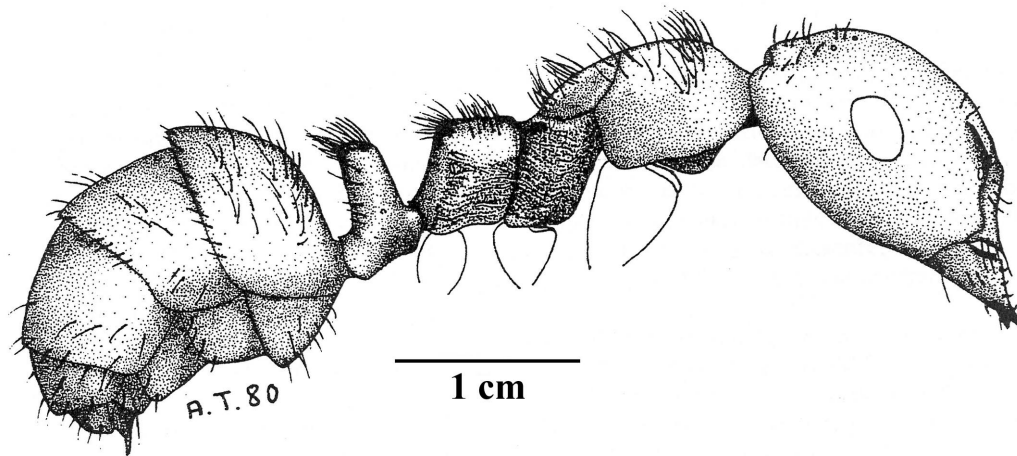


Fig. 9.— Lateral view of *Rossomyrmex proformicarum*.

Fig. 9.— Vista lateral de *Rossomyrmex proformicarum*.

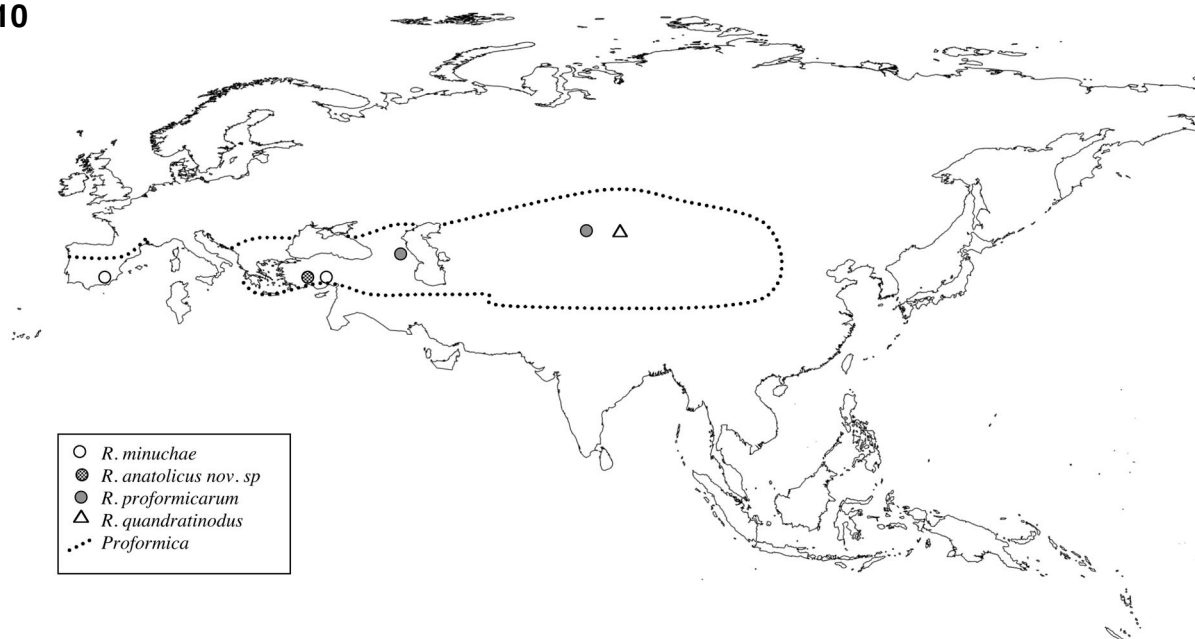
graphical separations within species and in completing speciations that had begun earlier (Avisé & Walker, 1998). This explanation has been successfully applied for the azure-winged magpie (Fok *et al.*, 2002) and it is also very likely to be the cause for the discontinuous distribution of the different species of the genus *Rossomyrmex*.

The existence of disjointed species can thus be explained by historical factors, but we cannot dismiss the possibility of an insufficient knowledge. In any case, the presence of disjointed species in a bird and a Ropalocera, groups which are very well known and easily recognizable, gives strong support to the acceptance of this kind of distribution. For this reason, the distribution of *Rossomyrmex* was not initially considered unusual, nor was the existence of other species in intermediate regions between Kazakhstan and the Iberian Peninsula deemed necessary. However, as stated in the Introduction, our interest in the genus *Rossomyrmex* has led us to look for it in any suitable area where the presence of genus *Proformica* had been demonstrated. *Proformica* includes 26 species (Bolton, 1995), and, contrary to *Rossomyrmex*, has an almost continuous distribution from Turkey to Mongolia. Apparently it does not occur in North Africa but a closely related genus does (*Bajcaridris* Agosti, 1994) (Agosti, 1994), which had been previously considered as *Proformica*. Other cited species in North Africa remain to be confirmed as to whether they belong to *Proformica* or to *Bajca-*

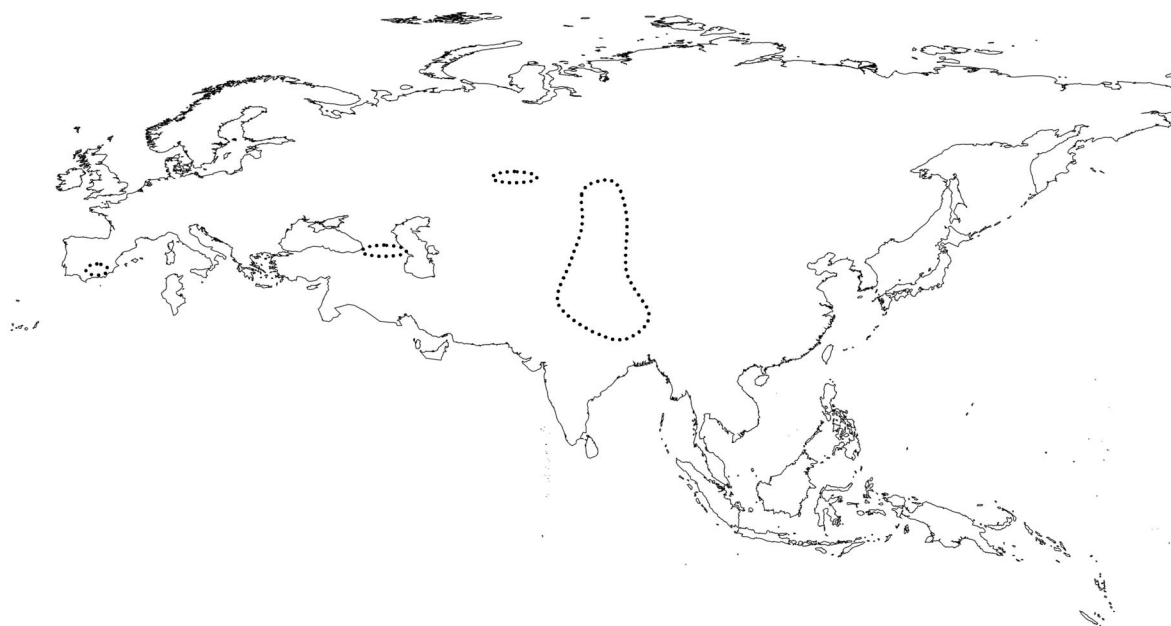
ridris. In Southern Europe, the distribution of *Proformica* is more irregular and reduced to the Iberian Peninsula, occupying most of the territory and reaching the French Mediterranean shore and Balkans to Greece (Agosti & Collingwood, 1987) (Fig. 10).

As stated above, we have taken this distribution into account in our research and looked into most of the Iberian Peninsula, Morocco, Turkey, and Mongolia, having new and positive results only in the Turkish locality mentioned above for this new species. However, genus *Rossomyrmex* was found for the first time in Turkey by Schulz & Sanetra (2002). These authors mentioned the presence of *R. minuchae*, in the province of Kayseri. This locality is around 350 km northeast from the locality where *R. anatolicus* nov. sp. was found. I have not been able to see the material of *R. minuchae* from Turkey and therefore it was not possible to confirm whether there are two species of *Rossomyrmex* in Turkey. In any case, the presence of the genus *Rossomyrmex* in Turkey fills the gap between Kazakhstan and Spain. The *R. quadratinodum* finding broadens the distribution area to the east and suggests the possibility that this genus may be found in the Gobi desert, too, although it has not been documented in our previous samplings. Therefore we propose a more widespread distribution than expected for the genus and attribute the rarity of its citations mostly to its parasitic lifestyle that makes it very difficult to find.

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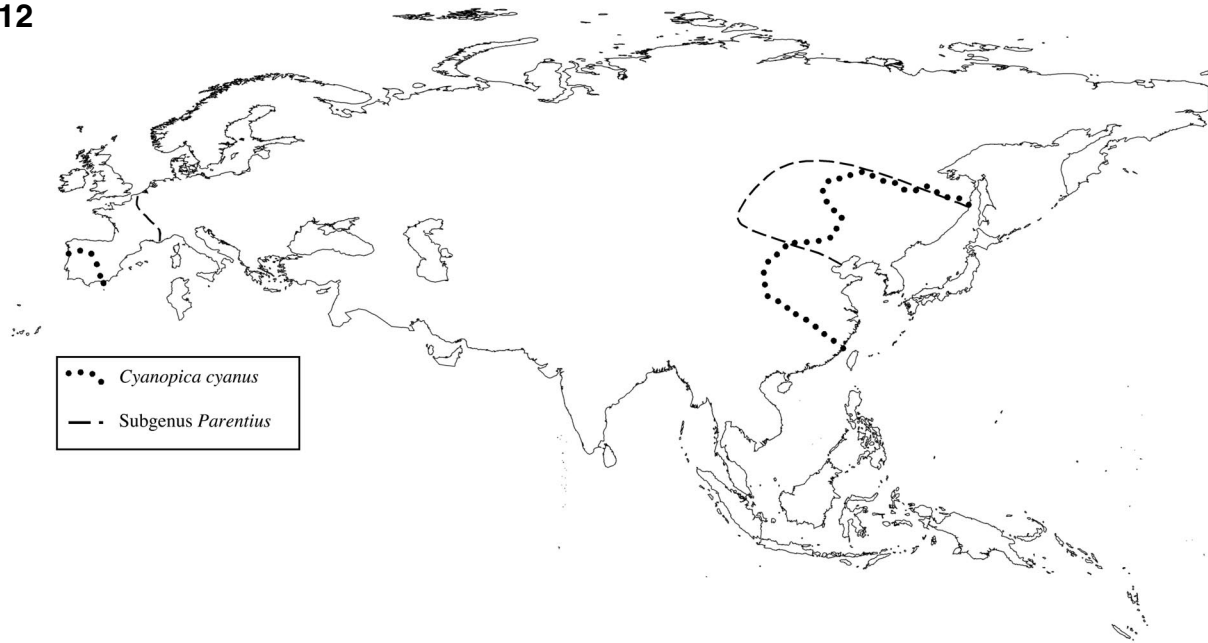
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Figs. 10-12.— 10) Distribution of genus *Proformica* and the different species of *Rossomyrmex*. 11) Distribution of *Pseudochazara hippolyte* (Lepidoptera). 12) Distribution of subgenus *Parentius* (Coleoptera) and *Cyanopica cyanus* (Aves).

Figs. 10-12.— 10) Distribución del género *Proformica* y de las diferentes especies del género *Rossomyrmex*. 11) Distribución de *Pseudochazara hippolyte* (Lepidoptera). 12) Distribución del subgénero *Parentius* (Coleoptera) y de *Cyanopica cyanus* (Aves).

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References

- AGOSTI, D., 1994. The phylogeny of the ant tribe Formicini (Hymenoptera: Formicidae), with the description of a new genus. *Systematic Entomology*, 19: 93-117.
- AGOSTI, D. & COLLINGWOOD, C. A., 1987. A provisional list of the Balkan ants (Hym. Formicidae) and a key to the worker caste. I. Synonymic List. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft*, 60: 51-62.
- ARNOLDI, K. W., 1928. Studien über die systematik der Ameisen, III. *Rossomyrmex* Neue gattung der Ameisen and ihre bezie-hungen zu der anderen Gattungen der Formicidae. *Zoologischer Anzeiger*, 75: 299-310.
- ARNOLDI, K. W., 1932. Biologische Beobachtungen an der neuen palaäarktischen Sklavenhalteranreise *Rossomyrmex proformicarum* K. Arnoldi, nebst einigen Bemerkungen über die Beforderungsweite Der Ameisen. *Zeitschrift für Morphologie und Ökologie der Tiere*, 24: 319-326.
- AVISE, J. C. & WALKER, D., 1998. Pleistocene phylogeographic effects on avian populations and the speciation process. *Proceedings of the Royal Society of London, Series B Biological Sciences*, 265: 457-463.
- BEHRENSMEYER, A. K., DAMUTH, J. D., DIMICHELE, W. A., POTTS, R., SUES, H. & WING, S. L., 1992. *Terrestrial ecosystems through time. Evolutionary paleoecology of terrestrial plants and animals*. University Chicago Press. Chicago. 568 pp.
- BOLTON, B., 1994. *Identification guide to the ant genera of the world*. Harvard University Press. Cambridge. 222 pp.
- BOLTON, B., 1995. *A new general catalogue of the ants of the world*. Harvard University Press. Cambridge. 504 pp.
- ERRARD, C., RUANO, F., RICHARD, F.-J., LENOIR, A., TINAUT, A. & HEFETZ, A., 2006. Coevolution-driven cuticular hydrocarbon variation between the slave-making ant *Rossomyrmex minuchae* and its host *Proformica longiseta* (Hymenoptera: Formicidae). *Chemoecology*, 16: 235-240.
- FOK, K. W., WADE, C. M. & PARKIN, D. T., 2002. Inferring the phylogeny of disjunct populations of the azure-winged magpie *Cyanopica cyanus* from mitochondrial control region sequences. *Proceedings of the Royal Society, Biological Sciences Series B*, 269: 1671-1679.

- HASEGAWA, E., TINAUT, A. & RUANO, F., 2002. Molecular phylogeny of two slave-making ants: *Rossomyrmex* and *Polyergus*. *Annales Zoologici Fennici*, 39: 267-271.
- KLICKA, J. & ZINK, R. M., 1997. The importance of recent Ice Age in speciation: a failed paradigm. *Science*, 277: 1666-1668.
- MARIKOVSKY, P. I., 1974. The biology of the ant *Rossomyrmex proformicarum* Arnoldi (1928). *Insectes Sociaux*, 21(3): 301-308.
- MARTÍN-PIERA, F. & LÓPEZ-COLÓN, J. I., 2000. *Coleoptera, Scarabaeoidea I*. In: Ramos, M. A. et al. (eds.). Fauna Ibérica, Vol. 14. Museo Nacional de Ciencias Naturales, CSIC. Madrid. 526 pp.
- OLIVARES, J., 2002. Analyse des populations connues de *Pseudochazara hippolyte* (Esper, 1784) dans le sud-est ibérique (Lepidoptera: Nymphalidae, Satyrinae). *Linneana Belgica*, 17: 361-369
- RUANO, F., HEFETZ, A., LENOIR, A., FRANCKE, W. & TINAUT, A., 2005. Dufour gland secretion as a repellent used during usurpation in the slave-maker ant *Rossomyrmex minuchae*. *Journal of Insect Physiology*, 51: 1158-1164.
- RUANO, F. & TINAUT, A., 1999. Raid process, activity pattern and influence of abiotic conditions in *Rossomyrmex minuchae* (Hymenoptera: Formicidae), a slave-maker ant species. *Insectes Sociaux*, 46: 341-347.
- RUANO, F. & TINAUT, A., 2004. The assault process of the slave-making ant *Rossomyrmex minuchae* (Hymenoptera, Formicidae). *Sociobiology*, 43: 201-209.
- RUANO, F. & TINAUT, A., 2005. Mating system in a slave-making ant, *Rossomyrmex minuchae* (Hymenoptera, Formicidae). *Naturwissenschaften*, on line.
- SCHULZ, A. & SANETRA, M., 2002. Notes on the socially parasitic ants of Turkey and the synonymy of *Epimyrmica*. *Entomofauna*, 23(14): 157-172.
- TINAUT, A., 1981. *Rossomyrmex minuchae* nov. sp., (Hym. Formicidae) encontrada en Sierra Nevada, España. *Boletín de la Asociación española de Entomología*, 4: 195-203.
- TINAUT, A., RUANO, F. & FERNÁNDEZ ESCUDERO, I., 1994. Descripción del macho del género *Rossomyrmex* Arnoldi, 1928 (Hymenoptera, Formicidae). *Nouvelle Revue d'Entomologie*, 4: 347-351.
- XIA, Y. & ZHENG, Z., 1995. A new record genus and a new species of Formicidae (Hymenoptera) from China (In Chinese). *Entomotaxonomia*, 17: 219-221.
- ZAMORA-MUÑOZ, C., RUANO, F., ERRARD, C., LENOIR, A., HEFETZ, A. & TINAUT, A., 2003. Coevolution in the slave-parasite system *Proformica longiseta*-*Rossomyrmex minuchae* (Hymenoptera: Formicidae): arms race or evolutionary equilibrium? *Sociobiology*, 42(2): 299-317.

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