



Cataglyphis convexus sp.n., A New Ant Species (Hymenoptera: Formicidae) in Tunisia

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Abstract

A new Tunisian ant species, *Cataglyphis convexus* sp.n., is described based on the morphological traits of its workers. The species is endemic to Tunisia. The taxonomic position of *C. convexus* is not clear; it shares features of the *altisquamis*-, *emmae*- and *bicolor*-groups, but differs from all species of these genera by the presence of a V-shaped cavity at the level of the apical margin of the petiole.

Keywords: Taxonomy; New Species; Endemism; North Africa

Introduction

Cataglyphis is one of the keystone ant genera in arid zones of the Old World [1,2]. Currently, it includes 93 valid species and 18 valid. It is distributed mainly in Palaearctic, while several species dwell in deserts and semi-deserts of Afrotropical and Oriental Regions (India and Pakistan) [1,3,4]. Agosti defined this genus as one of the most typical insects of North Africa which so far has colonized the area with 36 species and 13 subspecies. Representatives of this genus are mainly large ants (up to 13 mm long), and all of this North African species are found from the seashore to 2800 m at the Hoggar in Algeria [5]. Null in the forest or dense matorrals, these ants nest in open places (large clearings, mountain pastures, steppes) [5]. They appear to be anthropogenic and their expansion has been favored by human activities [5]. Their role in the desert ecosystem is important as they have been reported pollinating flowering

plants [6] and contributing to the dispersal of seeds [7,8].

Starting with Santschi [9], the North African thermophilic desert-dwelling ants of the genus *Cataglyphis* have been the subject of intensive research in taxonomy, biogeography, ecology, neuroethology, physiology and biochemistry [10-12]. Various species within the genus *Cataglyphis* have drawn the attention of researchers as a result of their diverse and original reproductive strategies and their extraordinary adaptations to hot environments, including landmark navigation and foraging activity regulation [13-20].

Since 1990, this genus was separated into several 'species-group' and 'species-complex'. Based on the study of Wehner [12], four species groups (*bombycinus* group, *altisquamis* group, *bicolor* group and *albicans* group), including in total nine species of *Cataglyphis*, occur in Tunisia.

Material and Methods

Material was collected from arid area upstream of the Sidi Salem dam in northern Tunisia; governorate of Beja (36°37'21.5"N 9°15'39.7"E) (Figure 1) during two field trips in spring 2016. The area is part of the upper semiarid bioclimatic stage, marked by a hot summer and a mild winter.

The average annual rainfall varies between 400 and 450 mm with an irregular seasonal distribution. The region is characterized by a cold winter with an average temperature of 10.3°C, and a hot summer with an average temperature of 30°C and up to 47°C in July and August.

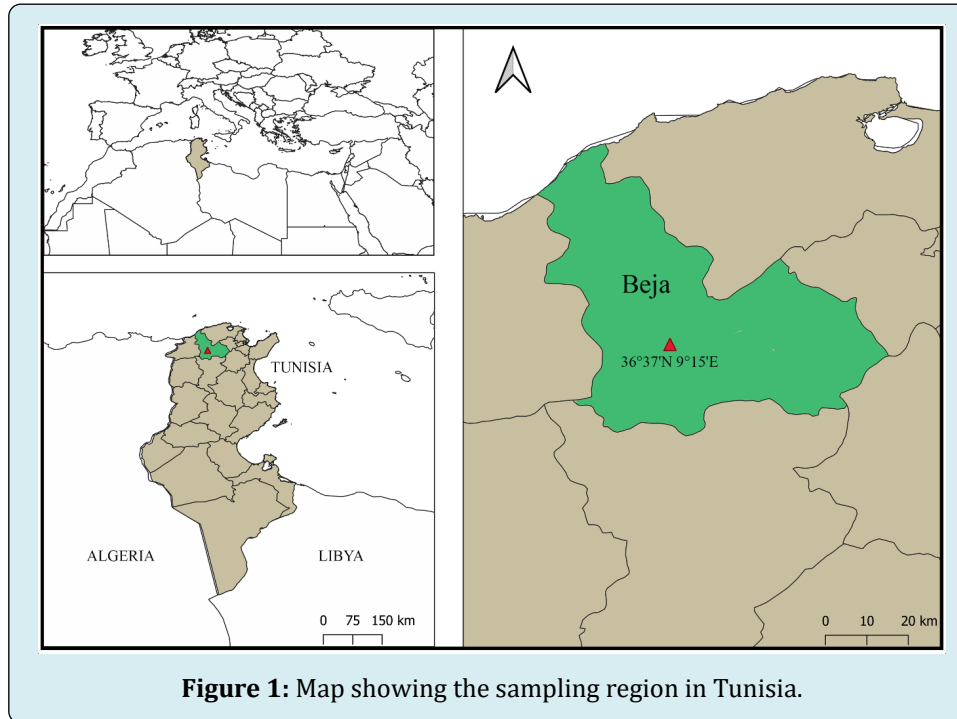


Figure 1: Map showing the sampling region in Tunisia.

Specimen images were taken using a Canon camera EOS 6D attached to a canon macro lens MP-E 65mm f/2.8, with a size scale then edited using Adobe Photoshop CS6 2012.

Measurements and Indices

All measurements are in millimeters and follow standard measurements of Agosti [21].

Measurements

Alitrunk length (AL): The diagonal length of the alitrunk in profile from the point at which the pronotum meets the cervical shield to the posterior base of the metapleuron.

Metanotum height (MH): The maximum distance from the line spanned between the anteriormost and posteriormost part of the alitrunk and the lowest part of the metanotum, measured at a right angle to this line.

Propodeum height (PH): The maximum distance from the line spanned between the anteriormost and posteriormost part of the alitrunk and the most raised part of the propodeum,

measured at a right angle to this line.

Eye length (EL): The maximum diameter of the eye.

Head length (HL): The length of the head proper, excluding the mandibles, measured from the mid-point of the anterior clypeal margin to the mid-point of the occipital margin, in full-face view.

Head width (HW): The maximum width of the head in full-face view, measured below the eyes.

Scape length (SL): The maximum straight line length of the antennal scape excluding the basal constriction or neck to the condylar bulb.

F1: Length of first funicular segment.

F2: Length of second funicular segment.

Indices

Cephalic index (CI): $HW \times 100/HL$.

Eye index (EI): $EL \times 100/HW$.

Funicular index (FI): $F1 \times 100/F2$.

Maxillary palp index (MPI): Length of fourth maxillary palp segment $\times 100$ /Length of fifth.

Propodeum index (PI): $PH \times 100/MH$.

Scape index (SI): $SL \times 100 / HW$.

Type Depositorie

The holotype is deposited in the entomological collection of the Biology Department, Faculty of Science Tunis El Manar.

A Paratype from the material studied in this paper will be deposited in the Natural History Museum, London, United Kingdom (NHM ex. BNHM) 2 workers (NHMUK 013806166; NHMUK 013806167); and another Paratype in the Muséum national d'Histoire naturelle, Paris, France (MNHN) 2 workers (MNHN-EY-EY XXXX; MNHN-EY-EY XXXX).

Results and Discussion

Taxonomy

Family FORMICIDAE Latreille, 1809

Subfamily FORMICINAE Latreille, 1809

Genus *Cataglyphis* Foerster 1850

Cataglyphis convexus sp.n.,

Etymology

The word “convexus” is derived from the Latin word “convexus”, to emphasize the presence of a convexity at the

apical end of the petiolar node.

Diagnosis

For the description of this new species of *Cataglyphis* we used the caste of workers, while the queens and males are still unknown (Figures 1-4). It's a bicoloured species with reddish head, alitrunk, petiolar node and black gaster. Workers are of variable size; their body length can reach 12 mm (Figures 2A & 2B). Their head has almost parallel sides (below the eyes) and gradually convex occipital margin (Figure 2C). The occipital corners are not marked. Their head length is longer than its width (CI 71–93) (Table 1). The anterior clypeal margin presents a convex form, without median notch. A light setae covers the clypeus; slightly longer than the length of clypeus and joined in near its posterior margin. The eyes are relatively small; 0.78 mm is their maximum diameter. The posterior ocelli; located at the level of the posterior margin of eyes; are relatively big, forming equilateral triangle.

The antennae are fragmented into 12 segments. Scapes are long; when laid back from their insertions, they surpass posterior margin of head by less than $\frac{1}{3}$ of its length. The first funicular segment is 1.66 time longer than second.

Measurements	Cataglyphis convexus (n=31)				
	holotype	min	max	mean	± SD
AL	3,590	1,880	4,460	3,281	0,720
MH	0,50	0,280	0,680	0,450	0,091
PH	0,730	0,360	0,930	0,649	0,149
PI	1,46,000	1,20,588	1,92,105	1,43,816	16,353
HL	2,150	1,170	2,860	1,993	0,472
HW	1,790	0,880	2,480	1,708	0,432
CI	83,255	71,910	95,348	85,456	6,604
EL	0,540	0,290	0,780	0,523	0,122
EI	30,167	26,130	34,259	30,917	2,017
SL	2,440	1,100	3,230	2,214	0,575
SI	1,36,312	1,08,108	1,51,000	1,29,821	9,434
F1	0,550	0,270	0,790	0,529	0,142
F2	0,310	0,150	0,490	0,325	0,102
FI	1,77,419	1,04,878	2,00,000	1,66,266	19,549
P3	0,470	0,240	0,690	0,490	0,111
P4	0,330	0,160	0,460	0,317	0,070
P5	0,200	0,100	0,290	0,209	0,047
P6	0,160	0,080	0,230	0,162	0,036
MPI	1,65,000	1,40,740	1,75,000	1,51,950	7,657

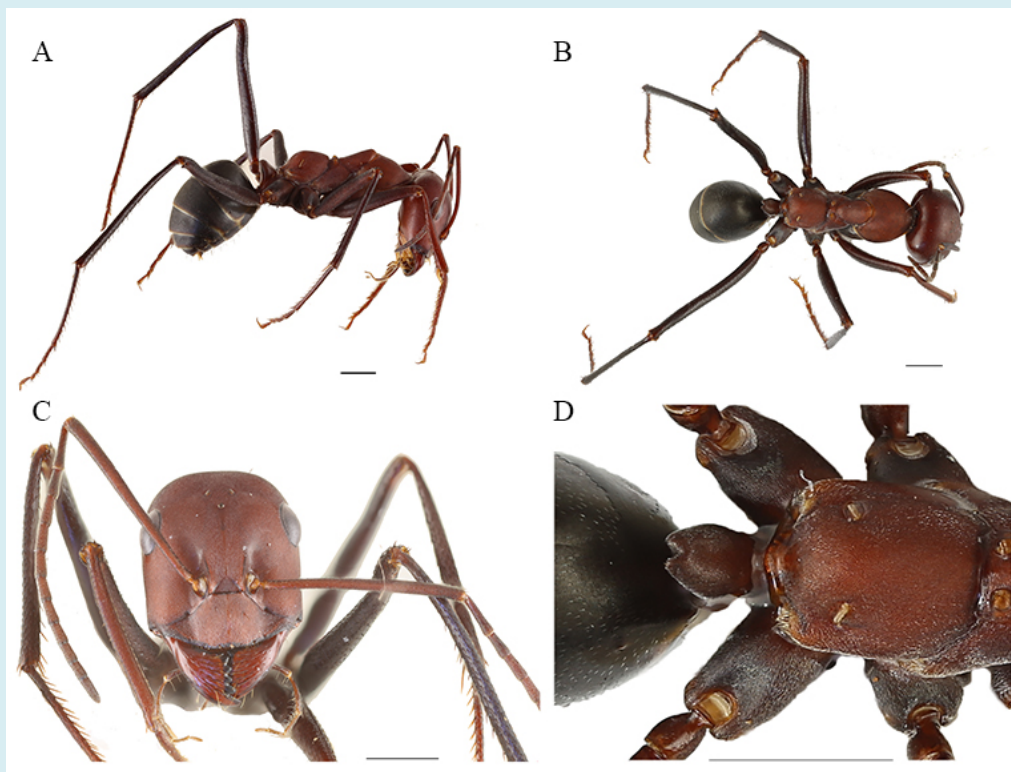
Table 1: Measurements (in mm) of *Cataglyphis convexus* sp. nov.

The first, second and sixth segments of maxillary palpes are the shortest with the same length almost; fifth segment 1.3 times longer than sixth ones while the fourth is 2 times longer and the third is 3 times longer than the sixth. The third segment is never flattened, with abundant erect hairs on inner margin. The length of the longest hairs that cover maxillary palpes is equal or only a little longer than the maximum diameter of the 4th segment. The two apical segments are covered with abundant shorter hairs. The robust mandibles contain six teeth: a long apical one, a slightly smaller periapical tooth, three small post-basal teeth and another smaller basal one.

The petiole in profile squamiform is reminiscent of the petiolar form of the species group *altisquamis* with an originality never encountered in the genus *Cataglyphis*: the presence of a V-shaped cavity at the level of apical margin of the petiole whose depth does not exceed 20% the petiolar height (Figure 2D). This character persists in all specimens

studied. The alitrunk is long and thick. The pronotum is elevated and followed by a mesonotum a little higher than the pronotal level. The propodeal dorsum is in profile distinctly low and little arched, nearly at same level as petiolar node.

The surface of the whole body has a dense micro-reticulation; appears dull although not strongly matt; which is more specific to the surface of the head giving a honeycomb effect. The body has sparse whitish short hairs. The Occiput has 1 or 2 quite long standing sallow hairs, frons haven't, clypeus have 1 or 2 similar hairs. The gaster and petiolar node are covered by a very sparse and short decumbent silver pilosity. Each gastric segment has a low density of long sallow hairs which are more abundant in the lower side. The coxae are upholstered with a dense silver pubescence with 3 to 4 long dark hairs in the lower side. The tibiae and femur are lined with dark short setae. The antennae are upholstered with fine, short whitish depressed pubescence, without semi-erect hairs.



Figures 2: Holotype worker: A – body in lateral view; B – body in dorsal view; C – head in full-face view D – petiolar node in dorsal view. Scale bar 1 mm.

Habitat

According to our observations, *C. convexus* has a preference for rocky areas (Figure 3). It has been found that the presence of this species is limited in space with a very

high density. During the sampling the workers are going to move overwhelmingly, some workers are carried by others between their mandibles (Figure 4: video: <https://www.youtube.com/watch?v=yK72AVJ6P7w>).



Figure 3: Typical habitat of *C. convexus* in rocky areas.



Figure 4: Anthill of *C. convexus*.

Comparative Diagnosis

C. convexus shares several features of the *altisquamis*-, *emmae*- and *bicolor* species-groups of *Cataglyphis*. This species presents a squamiform petiole with a general appearance cuneiform. Its mandible contains six or seven teeth by splitting off of the median and the premedian teeth into two denticles. The third maxillary palp is the longest segment never lattened and with erect hairs shorter than 1.5 maximum diameter of the segment. Its Gaster has a widely set pubescence. The head of *C. convexus* is reticulate and sometimes with a honeycombed appearance. The alitrunk length exceeds 4.2 mm. According to Agosti [21], all these last characteristics confirm that these ants belong to the group *altisquamis*.

On the other hand, caste worker of *C. convexus* has a high funicular index (FI) that may exceed 1990; distinct allometric growth with very dimorphic workers (these last are characteristics for the *emmae*-group species).

In general, workers of the species of all two groups above mentioned are unicolorous while ours is bicoloured; with reddish head, alitrunk and petiolar node and black gaster; reminiscent of *bicolor* species-groups. Moreover, members of this species have a high gaster in locomotion, propodeum arched with an index (PI) less than 200, cephalic index (CI) less than 97; which matches even more the members of the *bicolor* group.

The appropriate taxonomic position of this species can be definitively resolved when males are found. Despite this

slight taxonomic blur, *C. convexus* clearly differs from one of the species mentioned above by the presence of a V-shaped cavity at the level of apical margin of the petiole.

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