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Mimicry of *Crematogaster ionia* by "dark morph" chameleon ants: First Lebanese record of *Colobopsis imitans* (Hymenoptera, Formicidae)

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Keywords: acrobat ants, Levant, trail-following behaviour.

SUMMARY

Ant mimicry is a key defensive strategy of *Colobopsis* ants in the West Palaearctic. The chameleon ant *Colobopsis imitans* was initially described as a Western Mediterranean species, differing from the widespread sister species *Co. truncata* by showing morphological and behavioural adaptations to mimic *Crematogaster scutellaris* instead of *Dolichoderus quadripunctatus*. Recently, it was discovered to extend its geographic range to the Eastern Mediterranean and to mimic additional species of ants, including *D. quadripunctatus* and *Cr. ionia*. Here, we report the presence of *Co. imitans* in Lebanon for the first time. Lebanese *Co. imitans* workers were observed living in close association and following the trails of *Cr. ionia* and belonged to the *Cr. ionia*-mimicking "dark" colour morph. The Lebanese record represents the first of the species from the Levant, while old *Co. truncata* records from the region should be considered dubious.

INTRODUCTION

West Palaearctic *Colobopsis* ants have developed morphological and behavioural adaptations to mimic more abundant ant species with better defensive capabilities (Schifani et al. 2022; Wagner and Csősz 2025). For a long time, they were all classified into a single species, *Colobopsis truncata* (Spinola, 1808). Scattered accounts of mimicry of different model ant species existed but had not been comprehensively addressed, until Schifani et al. (2022) attempted to test for the existence of multiple species within the region and described *Co. imitans* Schifani et al. 2022. *Colobopsis imitans* was recognized as a south-western Mediterranean species occurring in the Maghreb, southern Iberia, and Sicily, and characterized by mimicry adaptations related to *Crematogaster scutellaris* (Olivier, 1792) as its

model, comprising both colour mimicry and the trail-following behaviour (Schifani et al. 2022; 2024). In contrast, *Co. truncata* appeared to be a mimic of *Dolichoderus quadripunctatus* (Linnaeus, 1771) occurring widely across Europe and east to the Caucasus but lacking the same level of behavioural specialization (Schifani et al. 2022).

The set of adaptations of *Co. imitans* resembles those developed by other West Palaearctic Camponotini. The Mediterranean *Camponotus lateralis* (Olivier, 1792) mimics *Crematogaster* spp. in colour and frequently follows their trails avoiding detection or capture by the resident ants (Kraker and Wagner 2025; Wagner et al. 2025). Interestingly, *Ca. lateralis* has been documented to mimic at least three different *Crematogaster* species across its range: *Cr. scutellaris* in the Western Mediterranean, and *Cr. schmidti* (Mayr, 1853) and *Cr. ionia* Forel, 1911 in the Eastern Mediterranean (Wagner et al. 2025). Another very similar case is that of *Ca. guanchus* Santschi, 1908 which does the same with *Cr. alluaudi* Emery, 1893 on the Canary Islands (Pérez-Delgado and Wagner 2024). Other related *Camponotus* species in the Mediterranean are suspected to have looser but similar mimicry and/or behavioural connections with *Crematogaster* spp. (e.g., *Ca. rebeccae* Forel, 1913 or *Ca. ruber* Emery, 1925, see Wagner et al. 2025).

Wagner and Csősz (2025) discovered other forms of mimicry by *Co. imitans* and a much wider distribution range. In central Iberia, southern Greece, Crimea, and Caucasus (east to Azerbaijan) they documented a "*D. quadripunctatus*-like" colour morph of *Co. imitans* that mimics *D. quadripunctatus* like *Co. truncata* does. In Anatolia, Crete, and Cyprus, they described a "*Cr. ionia*-like" colour morph, acting as a mimic of *Cr. ionia* and following its trails. These two different colour morphs, in addition to the "*Cr. scutellaris*-like" earlier described from southern Iberia, the Maghreb, and Sicily, all testify to an exceptionally high mimicry plasticity of *Co. imitans* and redefine the biogeographical picture that was initially hypothesized by Schifani et al. (2022). *Colobopsis imitans* has therefore received the name "chameleon ant" (Wagner and Csősz 2025).

Here, we report a further contribution to this picture with the first Levantine record of *Co. imitans* based on a sample from Lebanon that belongs to the "*Cr. ionia*-like" colour morph (although with some chromatic differences compared to specimens from Crete). The species was observed using the foraging trails of *Cr. ionia*, in the same way described by Wagner and Csősz (2025) for the populations of Crete.

MATERIALS AND METHODS

Ants were sampled opportunistically during August 2025 and preserved in 95% ethanol (see Schifani and Massaad 2026). A single *Colobopsis* worker was collected from a *Cr. ionia* trail on a *Quercus libani* tree near Saghbine, in the Beqaa region of Lebanon (33.61305, 35.68862, error range 5 m), on 23 Aug 2025. Identification was carried out under a stereoscopic microscope using the key and descriptions provided by Wagner and Csősz (2025). The D_{Colo} discriminant function relies on seven morphometric characters, namely the cephalic width including compound eyes (CW), the length of the hind tibiae (HTL), the depth of the metanotal groove (MGr), the petiole length measured from the centre of the spiracle (NOL), the depth of the dorsal propodeal groove (PrGr), the petiole height measured from the centre of the spiracle (PeSH), and the length of the mesosoma (ML) (see Wagner and Csősz 2025 for further details on their measurement). Scores > 0 indicate *Co. imitans* (with an estimated error rate of 5.6% in individual workers), while values < 0 indicate *Co. truncata* (error rate in individual workers of 2.0%): $D_{Colo} = 0.1184 * MGr + 0.0536 * PrGr - 0.0418 * PeSH + 0.0408 * NOL + 0.0339 * HTL - 0.0378 * CW + 0.0105 * ML - 9.1534$.

Focus-stacked images were taken using a Canon MP-E 65mm f/2.8 1–5x macro lens. A series of images was captured at successive focal planes by incrementally shifting the focus, and the resulting image stack was combined into a single extended-depth-of-field image using the software Helicon Focus. Scale bars were added using the software ImageJ (Schneider et al. 2012).

RESULTS

We recorded the following morphometric values for the specimen (values in µm): CW 794, HTL 873, MGr 16, NOL 64, PrGr 22, PeSH 190, ML 1268. The corresponding D_{Colo} score is 1.485. Any $D_{Colo} > 0$ score already suggests an identification as *Co. imitans*, and the 1.485 score is safely outside the overlap range for the D_{Colo} scores associated with the two species (Fig. 1).

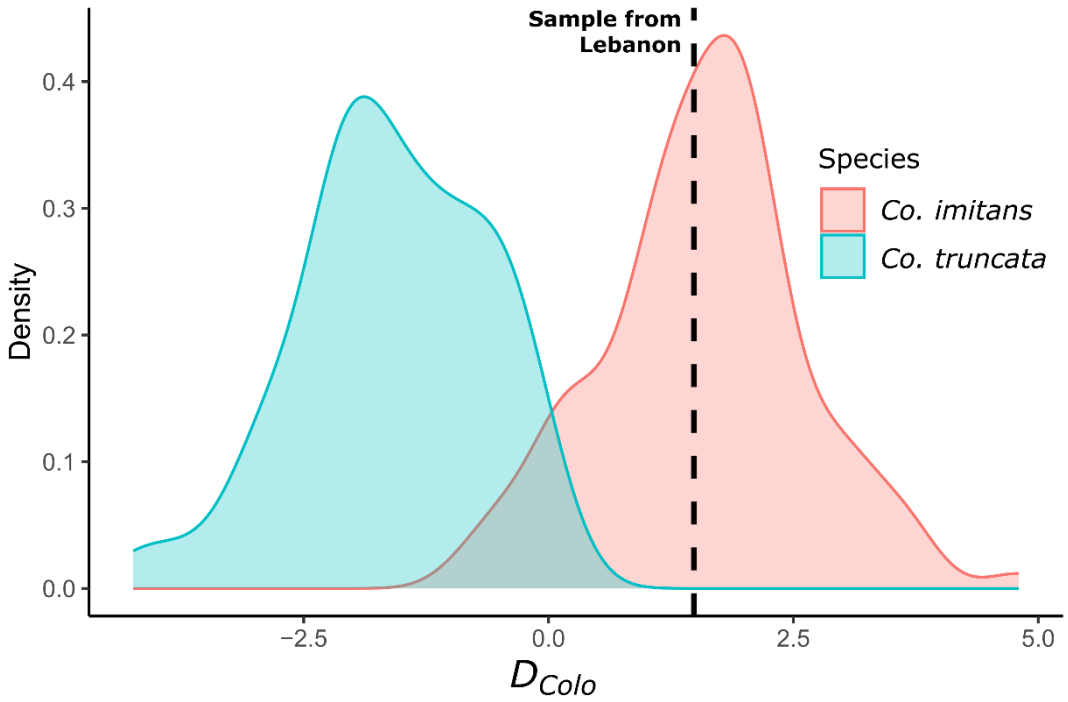


Figure 1. Position of the Lebanese sample of *Colobopsis imitans* (dotted vertical line) compared to the D_{Colo} discriminant function scores for *Co. imitans* and *Co. truncata* (data from Wagner and Csősz 2025).

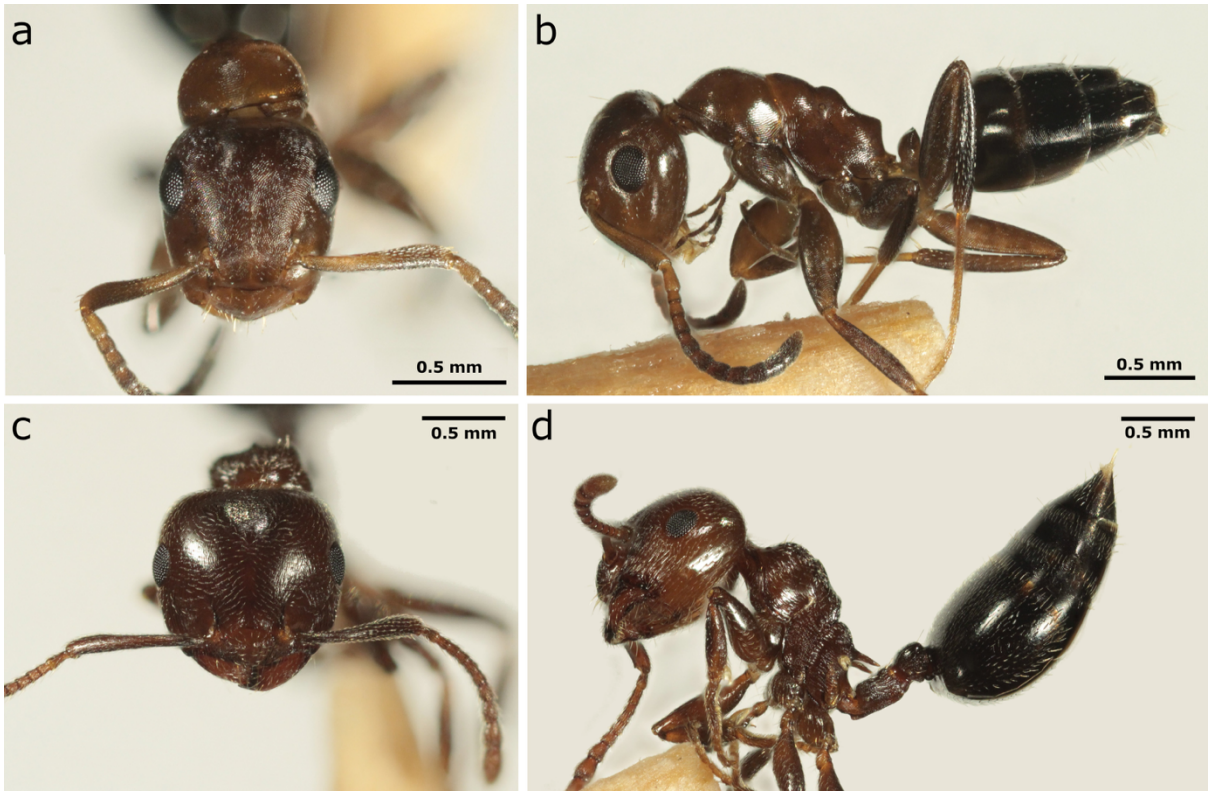


Figure 2. Worker samples of *Colobopsis imitans* (a, b) collected from a trail of *Crematogaster ionia* (c, d) from a *Quercus libani* oak tree in Saghbine, Beqaa, Lebanon.

Pigmentation in our sample was dark brown across the whole body and appendages, except for the black gaster (Fig. 2a, b). The first antennomeres were somewhat lighter, while the rest and the head dorsum were slightly darker. No white stripes on the gaster occurred. This colour pattern resembles the "blackish morph" of *Co. imitans* described by Wagner and Csősz (2025) although it is overall much lighter in colour than the one depicted in the photograph they published, with dark brown tones prevailing over the widespread blackish pigmentation characterizing the latter. It closely adheres to that of the *Cr. ionia* workers collected from the same tree (Fig. 2c, d) – in contrast to the blackish *Cr. ionia* workers from Crete depicted by Salata et al. (2020) and Wagner and Csősz (2025). A similarly lighter, brownish rather than properly blackish pigmentation also characterized the samples from Anatolia and Samos examined by Wagner and Csősz (2025) (H.C. Wagner, pers. comm.).

The new record is the southernmost record in the distribution of *Co. imitans* and is the first in the Levant region for this species. It is geographically closest to *Co. imitans* records from Cyprus and Türkiye (at a distance of 300-365 km), while the closest confirmed *Co. truncata* records are in Greece (roughly 1200-1425 km away) (Fig. 3).

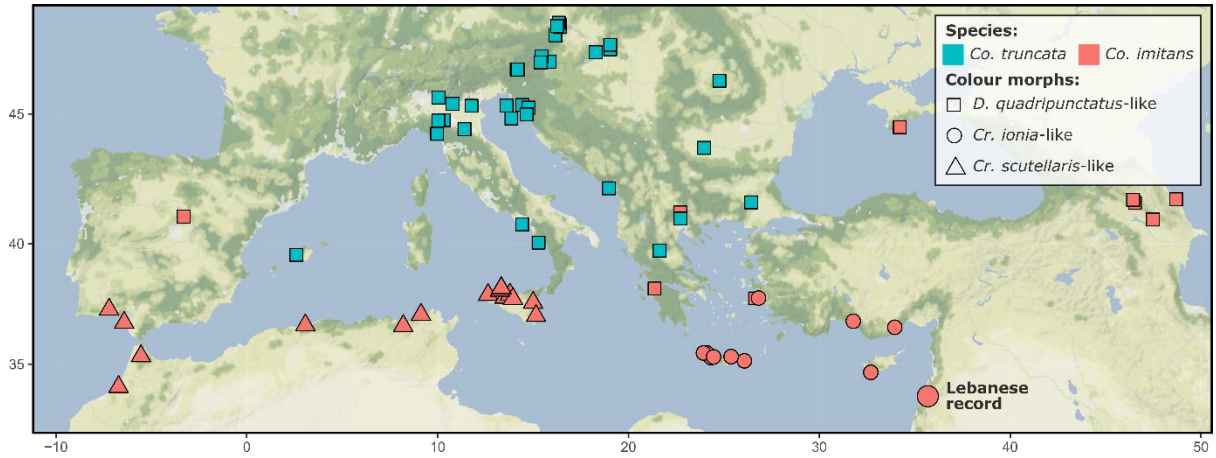


Figure 3. Distribution of *Colobopsis imitans* and *Co. truncata* and their colour morphs. Data comprise the new record from Lebanon published in this paper plus all the *Cr. scutellaris*-like Co. *imitans* data from Schifani et al. (2022; 2024) and all the *Co. imitans* and *Co. truncata* data from Wagner and Csősz (2025). Map from Stadia Maps (stadiamaps.com and Stamen Design – stamen.com).

DISCUSSION

Lebanon is expected to host a high ant diversity even within the context of the Mediterranean global ant hotspot (Kass et al. 2022; Oberski et al. 2025). However, research efforts have been scarce during the last few decades, whereas ant taxonomy in the region took several important steps forward (Oberski et al. 2025). In a recent contribution, we reported on the addition of seven native and non-native species to the Lebanese ant checklist based on the same one-week sampling campaign during which we collected *Co. imitans* (Schifani and Massaad 2026). The proper identification of *Co. imitans* became possible only later, thanks to the recent discoveries published by Wagner and Csősz (2025). Access to a significant portion of Lebanon was at the time of our sampling restricted due to constant Israeli attacks, also causing a worrying degree of environmental destruction, especially to southern regions (Kallab and Mouawad 2023; Hassoun et al. 2025; Schifani and Massaad 2026); these have since continued and greatly escalated into an even greater human tragedy.

Most records of *Colobopsis* in the West Palaearctic have been published under the hypothesis that *Co. truncata* was the only species of the region. Records of *Co. truncata* by Schifani et al. (2022) and Menchetti et al. (2026) were produced under the hypothesis that the only possible colour morph of *Co. imitans* was the "*Cr. scutellaris*-like". The discovery of a "*Cr. ionia*-like" morph, and especially of a "*D. quadripunctatus*-like" morph that is chromatically very similar to *Co. truncata* (Wagner and Csősz 2025), makes its identification more difficult and many of the *Co. truncata* records by Schifani et al. (2022) doubtful. Given the new distribution information on the genus in the area, past *Co. truncata* records from Jordan, Lebanon, and Palestine (see Menozzi 1933; Ionescu-Hirsch 2009;

Tohmé and Tohmé 2014; Borowiec and Salata 2020) appear likely to represent *Co. imitans*.

It is worth noting that the taxonomy of *Cr. ionia* itself may not remain stable, as some authors have suggested the existence of multiple species under this name (Salata et al. 2020). The lighter colour of both Lebanese *Cr. ionia* and associated *Co. imitans* workers can suggest further intraspecific plasticity of *Co. imitans*.

Our discovery encourages further checking for the presence of *Co. imitans* along the range of *Cr. ionia*. However, similar efforts are more broadly needed in regions such as Corsica, mainland France, Iberia, Sardinia, and Ukraine, to fill major knowledge gaps in the distribution of both *Co. imitans* and *Co. truncata*.

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