

## Exotic ants (Hymenoptera: Formicidae) in the Balearic Islands

Kiko GÓMEZ & Xavier ESPADALER

### Abstract

Fourteen exotic ant species are reported from the Balearic Islands (almost a quarter of the Balearic ant fauna). We confirm the rapid expansion of the Argentine ant, *Linepithema humile*, and, to a lesser extent, *Cardiocondyla mauritanica* on the islands, in what seems to be one of the few cases of a surface foraging ant species in coexistence with the Argentine ant in its expansion. Six species are new to the Balearic fauna (*Cardiocondyla mauritanica*, *Paratrechina vividula*, *P. jaegerskioeldi*, *P. longicornis*, *Pyramica membranifera*, and *Tetramorium caldarium*) and another one is new to the Mediterranean area (*Monomorium exiguum*). The unknown male of *Pheidole teneriffana* is here described. In the Balearic Islands, exotics are usually limited to sites under anthropogenic influence.

**Key words:** Ants, exotics, Balearic Islands, *Monomorium exiguum*, *Pheidole teneriffana*, male.

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### Introduction

The worldwide transfer of plants and animals is an established fact. Although there is a general consensus that the process will have wide ranging effects (VITOUSEK & al. 1997), its ultimate ecological consequences are still debated in some aspects (LODGE 1993, MCNEELY 2001, ROSENZWEIG 2001, COLLINS & al. 2002). There are a plethora of names to designate the species that are found outside their original geographical areas (DAVIS & THOMPSON 2000, RICHARDSON & al. 2000). In the context of this paper we use the term "exotics" to designate the species we interpret as having being transported into the Balearic Islands by human movement and commerce. It is important and useful to focus on the ecological consequences these species may have when they are established. Some species may simply establish themselves for a short time and then disappear, while others may integrate wholly with the local biota without many apparent effects. A very small fraction of those that establish themselves are of concern because they can become invasive (WILLIAMSON & FITTER 1996). That is, they develop constantly, increasing in density and / or spatial extent and their populations grow to such an enormous size as to interfere in variable, sometimes dramatic, degrees with local biota. These are the invasive species, some of which may impose a heavy, economic toll (PIMENTEL & al. 2000). They are especially unsettling when they manage to invade local natural habitats. Thus, it must be stressed that not all exotic species are, or will become, invasive. We provide here a preliminary summary of exotic ants detected in the Balearic Islands.

### Materials and methods

If not specified otherwise, the Ibiza and Formentera samples have been collected and identified by X. Espadaler & K. Gómez, and the Mallorca and Menorca material by K. Gómez. The reference in brackets refers to the voucher samples in the following collections, KG: Kiko Gómez; MNIB: Pascual Comín; XE: Xavier Espadaler. Literature

records, but for *Hypoconer punctatissima* (ROGER, 1859), have been accepted as correct identifications since they concern clearly identifiable (*Aphaenogaster iberica* EMERY, 1908, *Linepithema humile* MAYR, 1868, and *Pheidole teneriffana* FOREL, 1893) or recently revised (*Cardiocondyla batesii* FOREL, 1894) species. Species were identified using keys to Iberian species (COLLINGWOOD, 1978) and recent revisions (BOLTON 1987, 2000, SEIFERT 2003a, b).

### Morphometrics:

- CI Cephalic Index (HL / HW).
- HL Maximum head length, in median line, from occiput to front clypeal border.
- HW Maximum head width, eyes included.
- SI Scape Index (SL / HL).
- SL Maximum scape length, excluding basal condyle.
- EL Maximum length of the eye.
- EW Maximum width in the orthogonal axis to EL.
- ML Maximum length of mesosoma measured in lateral view from the caudalmost portion of the propodeum to the most distant point of the mesonotum (see Fig. 9).
- MW Maximum width of mesosoma in dorsal view, measured before the tegulae (see Fig. 10).
- WL Maximum wing length measured from the insertion under the tegula to the distalmost point.

Palp formula: the number of segments in the maxillary palp and labial palp, in this order. Measurements were done with a Leica MZ16 binocular microscope and at 25 - 100 × magnification, depending on the structure concerned.

### Results

#### *Aphaenogaster gemella* (ROGER, 1862)

This species was described by ROGER (1862) using samples from Mallorca. It has been mentioned in the Balearics only from cities and disturbed places, and has never been found in the wild. This probably points to an exotic

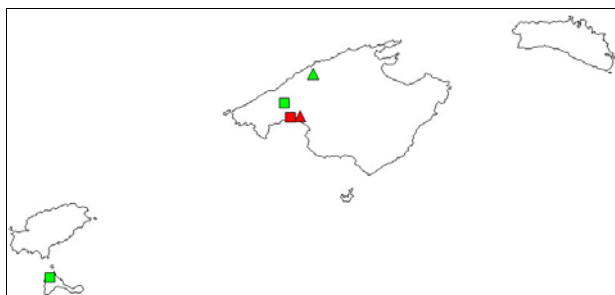


Fig. 1: Distribution of *Aphaenogaster iberica* in the Balearic Islands [literature data (■), new data (■)] and *Hypoponera punctatissima* (literature data (▲), new and / or revised data (▲); literature data for *H. punctatissima* could belong in *H. schauinslandi* as separation from *H. punctatissima* was not possible in the past].

opportunistic species introduced many decades or centuries ago but unable to colonize the arid natural environment of the islands. The last sample was collected in 1983 (Inca; COMÍN 1988) and we have been unable to find it despite our intensive samplings in the area. Before the 1980ies its distribution was restricted to parks and sidewalks in Inca, in the centre of the island, where the Argentine ant, *Linepithema humile*, was not well established by then. Our sampling in recent years shows that the Argentine ant is abundant throughout the city, especially in parks and gardens and on irrigated lawns, and we have not found a recent *A. gemella* sample. Due to its size and conspicuous feeding habits and the intensive sampling we undertook in the zone, we think that its presence is very improbable. COMÍN (1988) states that his collections of *A. gemella* at Inca were "initially as isolate individuals [December 1978] and five years later [September 1983], amid trails of *Iridomyrmex humilis*". This ant species should probably be deleted from the list of actually existing ants in the Balearic fauna (details at GÓMEZ & ESPADALER 2005). Its present distribution is restricted to Morocco (CAGNIANT 1990).

#### *Aphaenogaster iberica* EMERY, 1908

The species is widely distributed in the Iberian Peninsula (ESPADALER & RIASOL 1983) and all too scarce in the Balearics. It may be debatable if this species is indeed an exotic in the Balearic Islands, as the term is used in this paper. We have two arguments for treating *A. iberica* as such. First, queens are micropterous, unable to fly and colony reproduction is by budding; second, the relatively large size of workers (up to 7.2 mm) and their highly visible nest openings, usually surrounded by plant material, makes it hard to miss the species in routine myrmecological surveys. This is an example of the inherent difficulty of using a sharp definition of "exotic". Formerly cited from Establiments (Mallorca) (COMÍN 1988) and Estany Pudent-La Savina (Formentera) (DE HARO & al. 1986), it has now been found in a restricted area at the south of the Paseo Marítimo in Palma City, foraging on the lawn and sidewalks. It seems to have displaced the much more common *Aphaenogaster senilis* MAYR, 1853 from this zone (Fig. 1).

**Mallorca:** [KG1335A (04.IX.2004), KG1351B, KG1357A, KG1359] Palma, Paseo Marítimo (39° 33' N, 2° 39' E), 26.IX.2004, 5 m a.s.l., lawn.

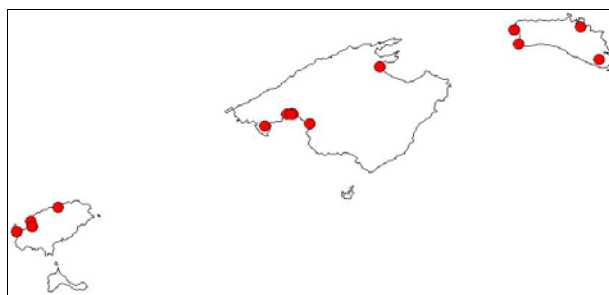


Fig. 2: Distribution of *Cardiocondyla mauritanica* in the Balearic Islands.

#### *Cardiocondyla batesii* FOREL, 1894

All of the material formerly cited as *C. batesii* for the islands by COMÍN (1988) has been now identified by us as *C. mauritanica* FOREL, 1890. Remark the fact that both localities given by Dr. Comín (S'Albufera and Sa Porrassa) were infested with *Linepithema humile* in 1976. As a result of this, the known distribution of *C. batesii* in the Balearic Islands is restricted to Puerto de Andraitx (Mallorca) (SEIFERT 2003a) and our new record from Ibiza. The fact that it has never been collected outside gardens suggests that it has been recently introduced into the Islands, from nearby mainland Spain (Fig. 7).

**Ibiza:** Punta Galera (39° 0' N, 1° 18' E), 30.IX.2004, leg. X. Espadaler, gardens.

#### *Cardiocondyla mauritanica* FOREL, 1890

This ant seems to be rapidly extending its range from North Africa and southern Spain to the north along the West Mediterranean coast (K. Gómez & X. Espadaler, unpubl.) and the Balearic Islands, where it is not rare on the lawn of housing estates and hotels. We have found it on several irrigated housing estates in Ibiza, Mallorca and Menorca, usually in coexistence with the Argentine ant, *Linepithema humile*. This species seems to be the first case to join the Argentine ant in its invasion, with no apparent problems in gardens infested by *Linepithema*. This seemingly "peaceful" survival has been recently described in urban habitats in California (WARD 2005). This fact apart, both species are highly aggressive to each other. In encounters between foraging ants of the two species, the *C. mauritanica* worker initially crouches down to the floor and remains quiet while the Argentine worker antennates it. If pulled, the *Cardiocondyla* worker repeatedly fiercely stings the Argentine ant until it retreats (we have seen, or noticed, this behaviour five times with various workers, always with the same result). Thereafter, recruitment by the Argentine ant is not triggered and its vast numeric prevalence has no local effect. All of the *C. batesii* data belonging to Dr. Comín's collection have been revised and identified as *C. mauritanica* (this material was cited in COMÍN 1988: 130 - 131, 351) (Fig. 2).

**Ibiza:** [KG1379] Port de Sant Miquel (39° 4' N, 1° 26' E), 28.IX.2004, 1 m a.s.l., gardens; [KG1399] Punta Galera (39° 0' N, 1° 17' E), 30.IX.2004; [KG1403, KG1407D] Sant Antoni de Portmany (38° 58' N, 1° 18' E), 30.IX.2004, 5 m a.s.l., gardens; [KG1416, KG1417A, KG1418B] Playa del Delfin (38° 57' N, 1° 13' E), 30.IX.2004, 30 m a.s.l., lawn; [KG1419] Cala Tarida (38° 57' N, 1° 13' E),

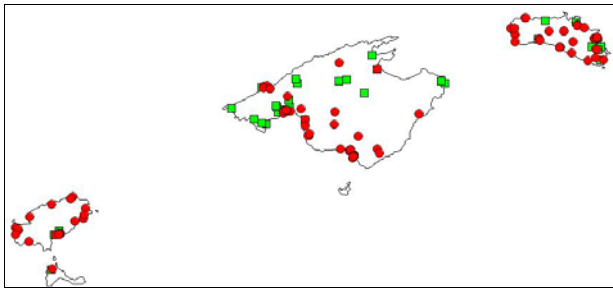


Fig. 3: Distribution of *Linepithema humile* in the Balearic Islands. [literature records (■), new data (●)].

30.IX.2004, 30 m a.s.l., lawn. **Mallorca:** [KG 1203] El Arenal (Llucmajor) (39° 30' N, 2° 44' E), 6.VII. 2004, 1 m a.s.l., gardens; [KG1330A (uncultivated land), KG1333A (gardens); KG1339 KG1340, KG1357C (26.IX. 2004)] Palma, Paseo Marítimo (39° 33' N, 2° 39'E), 5.IX. 2004, 1 - 10 m a.s.l., lawn; [KG1703] Palma, Paseo Marítimo (39° 33' N, 2° 37' E), 1 m a.s.l., gardens; [MNIB 1650] Hotel Las Gaviotas (S'Albufera Alcudia) (39° 48' N, 3° 6' E), leg. P. Comín, 17.VII.1976, det. K. Gómez; [MNIB 1651] La Porrassa (Magalluf) (39° 30' N, 2° 30' E), leg. P. Comín, 7.X.1976, det. K. Gómez; [MNIB1652] Hotel Las Gaviotas (S'albufera Alcudia), (39° 48' N, 3° 6' E), leg. P. Comín, 15.XII.1976, det. K. Gómez; **Menorca:** [KG 1426B] Golf "Son Parc" (Fornells) (40° 1' N, 4° 9' E), 4. X.2004, 10 m a.s.l., lawn; [KG1435, KG1436] Cala'n Blanes, Menorca (40° 0' N, 3° 48' E), 5.X.2004, 15 m a.s.l., lawn; [KG1438] Cala'n Bosch (39° 55' N, 3° 50' E), 5.X. 2004, 5 m a.s.l., lawn; [KG1439] Sant Lluís (39° 50' N, 4° 15' E), 5.X. 2004, 55 m a.s.l.

#### *Hypoponera punctatissima* (ROGER, 1859)

Cited in Mallorca in the cave of Sa Figuera (Porto Cristo) and Turixant de Baix (COMÍN 1988). We have not been able to find the first sample in the MNIB collection, but the second one is identified now as *Ponera testacea* EMERY, 1895 [MNIB1838, K. Gómez det.]. We have found an isolated winged queen at Bahía Azul, and another queen in the MNIB collection previously identified as *Hypoconerops eduardi* (FOREL, 1894). Both records have been determined using head morphometry as in SEIFERT (2003b). It may be debatable if this species is an indigenous in the Balearics. Here we tentatively treat *H. punctatissima* – as we would do with *H. schauinslandi* (EMERY, 1899) – as exotic in the Balearic islands because of its consideration as a tramp species (TAYLOR 1967) and its present very wide distribution throughout Europe and, especially, the tropics and subtropics (COLLINGWOOD 1979). SEIFERT (2003b) characterizes *H. punctatissima* as "tropical to south temperate, cosmopolitan".

**Mallorca:** [KG524] Bahía Azul (Llucmajor), Mallorca, (39° 26' N, 2° 45' E), 24.VI.2003, 140 m a.s.l. [MNIB 1421] Palma, (39° 35' N, 2° 35' E), 26.VI.1987, P. Comín leg., K. Gómez det. (Fig. 1).

#### *Linepithema humile* (MAYR, 1868)

This is one of the five species of ants listed by the IUCN in the "100 of the World's Worst Invasive Alien Species" (LOWE & al. 2004) and the damage to the local faunas and ecosystems is beyond any doubt. The current distribution

and main consequences of its invasion on the Balearic Islands have been recently updated (GÓMEZ & ESPADALER 2005). This ant is rapidly spreading in the islands, much more easily the more humid the environment is, and it is a common pest in houses in Ibiza, Mallorca, and Menorca. In Menorca the infestation is considered very important, especially in the vicinity of housing states, golf courses, and wetlands. We have visited several wetlands on the island (S'Albufera d'Es Grao, Son Bou, Cala Galdana, Cala'n Porter, Torrent d'Algendar), and the findings are dismaying. It is the only ant species found in all of the transects done, except for one nest of *Plagiolepis pygmaea* (LATREILLE, 1798) at Es Grao. The ecological consequences should be studied, especially after the finding that it may have negative consequences on brood rearing for some bird species (ROCA 2005). In Mallorca the Argentine ant can be found in all of the villages and housing estates in vast numbers. Wetlands are the most affected environments. In the Parque de S'albufera it is the only ant species found at present (although 22 species were known to exist in the past; COMÍN 1988) and its numbers are really spectacular with equally spectacular consequences (i.e., according to the Park Service, phone cables were cut during an infestation at the offices). Some zones of the Sierra de Tramuntana as Port d'Es Canonge are seriously damaged, as it is the only terrestrial ant found. The south of the island is becoming increasingly affected, with established populations in the irrigated parks and gardens, hotels and housing estates, and it is slowly spreading from there to the natural environment. Non-wet uplands seem to impose a distribution limit to this species.

In Ibiza the first findings date from 1976 (COMÍN & ESPADALER 1984), and in 30 years it has become widely distributed, always associated with urban developments. From there it is beginning to spread to natural habitats such as pinewood forests. We have found populations of the two supercolonies ("main" and "Catalan") known to inhabit the West Mediterranean European coast (GIRAUD & al. 2002), indicating that a minimum of two different introductions to the island have occurred. At Mallorca and Menorca, all of the analysed populations by now belong to the "main" supercolony. A detailed map of the small-scale distribution of both supercolonies in Mallorca is pending. In Formentera we have found a single, not very populous, colony within La Sabina harbour. The spread of the Argentine ant on this arid island may well be very slow, and restricted to irrigated places or humid lands. Its presence was not detected at the pond of Estany Pudent, quite close to La Sabina harbour (Fig. 3).

#### *Monomorium andrei* SAUNDERS, 1890

Cited from Castillo de Bellver in Mallorca (REYES & LUQUE 2003). This is a very rare species, formerly known from a few Iberian localities. A recent introduction into Mallorca is not to be dismissed. Alternatively, this could be a case of a native, formerly overlooked because of its very small size and cryptic habits.

#### *Monomorium exiguum* FOREL, 1894

This small yellow ant belongs in the *M. monomorium*-group and has its possible origin in Sub-Saharan Africa, as it is cited from a diversity of countries in that region (BOLTON 1987). To our knowledge this is the first report



Fig. 4: *Monomorium exiguum* worker; head frontal view.



Fig. 5: *Monomorium exiguum* worker; lateral view.

for the European fauna. We have found a single worker (Figs. 4, 5) at Sant Antoni de Portmany (Ibiza) (Fig. 7), in an irrigated garden. Colouration corresponds to the var. *flavescens* FOREL, 1916.

**Ibiza:** [KG1455] Sant Antoni de Portmany (38° 58' N, 1° 18' E), 30.IX.2004, 5 m a.s.l.

#### *Monomorium pharaonis* (LINNAEUS, 1758)

Known only from Jesús (Ibiza) (COMÍN & ESPADALER 1984).

#### *Paratrechina jaegerskioeldi* (MAYR, 1904)

This species has its probable origin in the Middle East, and is considered a common pest in the houses in the Arab Emirates (COLLINGWOOD & al. 1997), where it seems to seek out damp and humid places (baths and kitchens). It is known from several locations around the Mediterranean region, including Egypt (ALFIERI 1931), Lybia (BERNARD 1948), Greece (COLLINGWOOD 1993), Israel (KUGLER 1988), Spain (ESPADALER & COLLINGWOOD 2001); and in the Macaronesian region in the Canary Islands (ESPADALER & BERNAL 2003) and Madeira (X. Espadaler, unpubl.). Several workers were collected in the gardens and on the sidewalks near the harbour of Sant Antoni de Portmany, at Ibiza, where it is not an uncommon species all around the gardens. On the Paseo Marítimo of Palma de Mallorca, it can be found inhabiting the base of a palm tree and hunting on a lawn one metre away. It seems to compete with

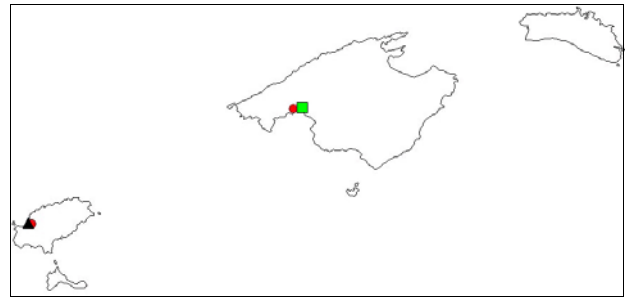


Fig. 6: Distribution of *Paratrechina vividula* (■), *Paratrechina longicornis* (▲) and *Paratrechina jaegerskioeldi* (●) in the Balearic Islands.



Fig. 7: Distribution of *Cardiocondyla batesii* [literature records (●), new data (●)] and *Monomorium exiguum* (▲) in the Balearic Islands.

the native *Tetramorium* cf. *caespitum* (LINNAEUS, 1758) as several corpses of this species were found at the entrance of a mound nest. For Distribution see Fig. 6.

**Ibiza:** [KG1401, KG1407B] Sant Antoni de Portmany (38° 58' N, 1° 18' E), 30.IX.2004, 5 m a.s.l., garden. **Mal-lorca:** [KG696A] Palma, Paseo Marítimo (39° 34' N, 2° 38' E), 25.VIII.2005, 1 m a.s.l., lawn, base of palm trees.

#### *Paratrechina longicornis* (LATREILLE, 1802)

This ant is "probably the most widely distributed tramp ant" (COLLINGWOOD & al 1997) and has been recently reported from the Iberian Peninsula (TINAUT & AÑO 2000) and the Canary Islands (ESPADALER & BERNAL 2003). We have found this species close to the main fountain in the centre of the gardens at Sant Antoni de Portmany, although it does not seem to be as abundant as *P. jaegerskioeldi*. Its movements, which are very fast and jerky, together with its medium size and foraging trails make it a very notorious ant in gardens and on sidewalks. This is the northernmost locality of an established population for this species (Fig. 6).

**Ibiza:** [KG1407A] Sant Antoni de Portmany (38° 58' N, 1° 18' E), 30.IX.2004, 5 m a.s.l., gardens.

#### *Paratrechina vividula* (NYLANDER, 1846)

(= *P. flavipes* in ESPADALER & COLLINGWOOD 2001; ESPADALER & BERNAL 2003; misidentification)

The area occupied by this species is small at present and it seems to have been detected in the first stages of expansion. It inhabits a small area in the Parque de la Catedral, in Palma and extends South and North along the lawns of the Paseo Marítimo, where it coexists with at least three native ant species (*Lasius grandis* FOREL, 1909, *Plagiolepis pygmaea*, *Tetramorium* cf. *caespitum*). A single reproduc-





Fig. 8: *Pheidole teneriffana*, male A, lateral view.



Fig. 9: *Pheidole teneriffana*, male A, close up view of mesosoma.

tive queen with brood was found in 2004 in a small tumulus (5 cm high, 15 cm length) half a metre away from a popular tree, in a chamber above soil level, but the colony seems to have moved and is now (VIII.2005) nesting in the stone walls of the park, one metre away from the tree, which remains the main feeding source. A colony with sexuals was found nesting among the roots of the grass on the grass verge of the sidewalk, and other colonies have established themselves in the gardens close to La Lonja (Fig. 6).

**Mallorca:** [KG1336, KG1342] Palma, Paseo Marítimo (39° 33' N, 2° 39' E), 4.IX.2004, 1 m a.s.l., isolated workers on lawn and sidewalks; [KG1649] Palma, Paseo Marítimo (39° 33' N, 2° 39' E), 22.VI.2005, 1 m a.s.l., nest with sexuals among lawn roots; [KG1349A, KG1354, KG1356D, KG1446] Palma, Parque Catedral (39° 34' N, 2° 39' E), 4.IX.2004, 1 m a.s.l., on *Populus* sp. [KG1700A] Palma, La Lonja (39° 34' N, 2° 38' E), 25.VIII.2005, 1 m a.s.l.

### *Pheidole teneriffana* FOREL, 1893

Although described from the Canary Islands (FOREL 1893), its origin is unknown (COLLINGWOOD & al. 1997) and it has a worldwide distribution. This species seems to be expanding its distribution range throughout the South coast of Mallorca, and it is well established in zones of the islands of Ibiza and Formentera. Our samples confirm the formerly cited presence in Ibiza city (DE HARO & al. 1986) where it has become a common species in the gardens and trees and on sidewalks near the harbour. It seems to be expanding its range in Mallorca from El Arenal gardens – where it may become very abundant – to Son Verí to the East and La Lonja (Palma city) in the West, always in disturbed habitats (roots of isolated trees in the street, gar-

dens, housing estates) (GÓMEZ 2004, and new data). The presence in Formentera seems to be restricted to the vicinity of a beach at La Sabina harbour. In addition to the observations of COLLINGWOOD & al. (1997) that major workers "appear to act as guards", we note that major workers are often found among the minor workers in the foraging columns, and that in artificial nests they spend most of the time inside the nest, nursing the pupae. It is a very aggressive species and fights with the very abundant *Tetramorium* cf. *caespitum* are very common. The nests can become very populous, and a nest close to La Lonja in Palma extended 5 - 7 meters length along the lawn border, monopolizing three palm trees bases, with columns of hundreds of workers foraging all over their territory.

**First description of male** (Figs. 8 - 12). Measurements in mm (n = 2).

Head in full-face view narrowed behind eyes, in profile vertex strongly convex, forming a lump at insertion of three big ocelli. Diameter of median ocellus approximately as large as distance between lateral ocelli. Big eyes (EL / HL 0.59 - 0.63), elliptically shaped, without hairs among ommatidia. Clypeus in profile strongly convex anterodorsally, its anterior margin convex and entire; median portion with longitudinal carina. Distance between antennal insertions almost as long as maximum diameter of median ocellus. Antennae 13-segmented. Scape cylindrical, not swollen apically, 2 - 2.2 times as long as broad. Pedicel swollen, 0.5 times as long as scape. Antennal segment 3 slightly narrower apically than basally, segments 4 - 13 cylindrical. Segments 3 - 13 gradually increasing in length, from 0.5 times to nearly as long as scape. Mandible narrow, with long apical tooth followed by 2 - 3 smaller denticles. Palp formula 2, 2.

Mesosoma weakly sclerotized, becoming easily deformed in dried specimens. Pronotum in dorsal view without humeri. Mesoscutum with parapsidal furrows long and clearly demarcated. Scuto-scutellar furrow broader than deep, with 14 longitudinal rugae. Mesoscutellum rounded posteriorly and slightly swollen. Propodeum in lateral view with its dorsal and declivitous faces meeting each other at angle of 120 - 125°. No propodeal spines present. Propodeal spiracle located at midlength and just above mid-height of propodeum, directed posteriorly.

Forewing with radial (open), discoidal and two cubital cells. Hind wing with 13 - 14 hamuli. Legs very long. Hind femur 1.4 - 1.5 times as long as hind tibia. Hind basitarsus 1.1 - 1.2 times as long as hind tibia. Petiole in dorsal view long, weakly widened in posterior half, in lateral view weakly convex, posterodorsally node-like. Postpetiole clearly (1.6 times) broader than long; in lateral view weakly convex dorsally and almost straight ventrally. Without petiolar and postpetiolar process.

Frons smooth and shiny. Clypeus with median and two lateral carinae. Frontal triangle weak, with two carinae continuing lateral carinae on clypeus. Other sculpture of head very variable among males, from smooth to strongly carinate between eyes, antennal insertions and nuchal carinae. Transversally carinate between ocelli. Mesoscutum in dorsal view with convergent striae forming V-shaped structures, formed by weak carinae which become stronger towards rearmost part. Mesoscutellum smooth and shiny dorsally, and horizontally carinate laterally. Dorsal face of propodeum longitudinally carinate, lateral face hori-

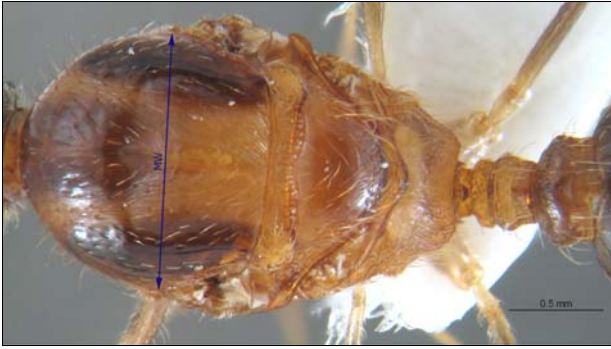


Fig. 10: *Pheidole teneriffana*, male A, dorsal view of mesosoma.



Fig. 11: *Pheidole teneriffana*, male A, head.



Fig. 12: *Pheidole teneriffana*, male B, head and antennae.

zonally carinulate. Petiole and postpetiole smooth and shining.

Clypeus and frons yellowish brown, remaining head brownish, antennae yellow. Mesonotum in dorsal view with anterior central part slightly infuscated and two lateral bands brownish with space between yellowish. Scutellum yellowish with rearmost part infuscated. Propodeum and petiole yellowish. Postpetiole infuscated, gaster brown.

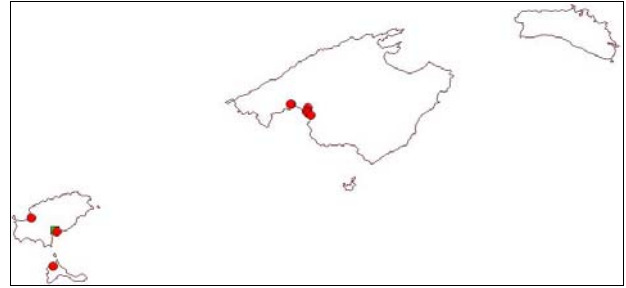


Fig. 13: Distribution of *Pheidole teneriffana* in the Balearic Islands [literature records (■), new data (●)].



Fig. 14: Distribution of *Pyramica membranifera* (●) and *Tetramorium caldarium* (▲) in the Balearic Islands.

Whole body covered with sparse yellow pilosity, consisting of adpressed to erect, slightly curved, apically pointed hairs. Scape and legs covered with short, decumbent hairs.

The male of this species can be easily distinguished from males of *Pheidole pallidula* (NYLANDER, 1849), the other species present in the Iberian Peninsula and the Balearic Islands, as *P. pallidula* male has a relatively shorter petiole, the ocelli smaller than the separation between the antennal insertions, the eyes with pilosity among the ommatidia and the second funicular segment subequal to the third (smaller in *P. teneriffana*) (Fig. 13).

**Formentera:** [KG1383] La Sabina (38° 43' N, 1° 25' E), 29.IX.2004, 5 m a.s.l., beach. **Ibiza:** [KG1421] Parque central (38° 54' N, 1° 26' E), 30.IX.2004, 10 m a.s.l., garden; [KG1408] Sant Antoni de Portmany (38° 58' N, 1° 18' E), 30.IX.2004, 5 m a.s.l., sidewalk. **Mallorca:** [KG1346] Palma, La Lonja (39° 34' N, 2° 38' E), 21.IX.2004, 5 m a.s.l., sidewalk; [KG1132A] Aeropuerto Son Sant Joan (39° 33' N, 2° 43' E), 7.V.2004, 40 m a.s.l., garden.

#### *Pyramica membranifera* (EMERY, 1869)

This species has a worldwide distribution (BOLTON 2000) and is becoming increasingly cited in all of the Southern and Western Iberian Peninsula: Barcelona (ESPADALER 1979, ESPADALER & LOPEZ 1991), Córdoba (REYES & LUQUE 2001), Huelva (REYES & LUQUE 2001) and Murcia (MARTÍNEZ & al. 2002). We have collected one queen being carried as a prey by a worker of *Lepisiota frauenfeldi* (MAYR, 1855) in the gardens near Palma Cathedral (Mallorca), two queens in pitfall traps in the same location, two workers in the gardens in front of the port in pitfall traps, and a single worker in Sant Antoni de Portmany gardens in Ibiza. Our impression is that it is not a rare species, but its cryptic habits make it not such an easy find (Fig. 14).

Tab. 1: Measurements (mm) of two *Pheidole teneriffana* males.

	HL	HW	SL	CI	SI	EL	EW	ML	MW	WL
Male A	0.66	0.55	0.18	1.11	0.27	0.39	0.25	1.83	1.12	4.42
Male B	0.74	0.64	0.20	1.19	0.27	0.47	0.30	2.34	1.35	–

**Ibiza:** [KG1404] Sant Antoni de Portmany (38° 58' N, 1° 18' E), 30.IX.2004, 5 m a.s.l., garden. **Mallorca:** [KG 1337, KG1702G (VIII.2005)] Palma, Paseo Marítimo (39° 33' N, 2° 39' E), 5.IX.2004, 1 m a.s.l., lawn; [KG1703C] Palma, Paseo Marítimo (39° 33' N, 2° 37' E), 28.VIII. 2005, 1 m a.s.l., gardens.

### *Tetramorium caldarium* (ROGER, 1857)

This small bicoloured species has been found in several locations on the Islands, always associated with irrigated gardens and lawns and seems to be well established at these habitats, where it is the commonest species on the lawn verges close to buildings in La Lonja. Foraging is individual but tandem teams are not unusual. We have occasionally detected queens among the foraging workers: These could be either migrating or foraging queens. It has recently been reported in the Iberian Peninsula from Córdoba (Spain) (REYES & ESPADALER 2005) (Fig. 14).

**Ibiza:** [KG1400, KG1402, KG1406 KG1407C] Sant Antoni de Portmany (38° 58' N, 1° 18' E), 30.IX.2004, 5 m, gardens. **Mallorca:** [KG1352C, KG1697 & KG1700B (25.VIII.2005)] Palma, Paseo Marítimo (39° 34' N, 2° 38' E), 26.IX.2004, 5 m a.s.l., lawn. **Menorca:** [KG1437C] Ciutadella, Plaza des Born (39° 59' N, 3° 50' E), 5.X. 2004, 15 m a.s.l., one male drowned in a fountain.

### Discussion

Fifty-six ant species (GÓMEZ & ESPADALER 2005) are known for the Balearic Islands. We suggest that two groups of exotics are somewhat dissimilar in geographical origin: (1) species that we interpret as introductions coming from nearby mainlands, the Iberian Peninsula or Northern Africa (*Aphaenogaster iberica*, *Cardiocondyla mauritanica*, *C. batesii* and, perhaps, *Monomorium andreii*); and (2) the remaining exotic species, whose present distribution is predominantly tropical or subtropical and are usually regarded as tramp species (PASSERA 1994, MCGLYNN 1999). Fourteen (*A. gemella* excluded) of these 56 ant species we consider as exotics. This relatively small number (25 %) compares favourably with the exotic complement of several islands from Macaronesia in the Atlantic: Azores: 57 % (WETTERER & al. 2004); Madeira: 37 % (J. Wetterer & al., unpubl.); El Hierro: 30 % (ESPADALER in press); La Gomera: 30 % (unpubl.); Fuerteventura: 35 % (unpubl.); Lanzarote: 42 % (unpubl.); Gran Canaria: 40 % (unpubl.); Tenerife: 37 % (unpubl.). The exotic complement seems to be of lesser importance in the Balearics. This may indicate either comparatively better-preserved biotopes in the Mediterranean islands or a higher resistance to establishment of exotic species, probably because of the dry, harsher summer climate. This is not to say that we should blandly accept the present state of affairs in the Balearics: the occurrence of the Argentine ant is the most dis-

turbing of the exotic species and is a true matter of concern. Apart from this highly invasive species, the other ant exotics are probably nothing more than extraneous additions to urban fauna. The irrigated private and public gardens and parks, lawns and golf courses are artificial habitats maintained as "ant hospitable" only because of regular watering, especially during the hot, dry Mediterranean summer. These artificial, nearly tropical, island habitats provide the perfect conditions for the exotic ant species. In a sense, they act as small inadvertent zoos for small insects that may arrive in a garden, last for a given number of generations and then disappear without anybody noticing them, unless detected and perceived as indoor pests. The possibility exists, however, that a long period of latency for some of those exotics species (CROOKS 2005) is followed by an explosive expansion and true invasiveness.

Disturbed habitats are much more prone to invasion than undisturbed habitats (ELTON 1958) and many invasives may benefit from various elements of global change (DUKES & MOONEY 1999), with much help from anthropogenic disturbances (BYERS 2002). The Argentine ant is, up to now, the single truly exotic and invasive ant in the Balearics (GÓMEZ & ESPADALER 2005). This highlights the relevance of maintaining a judicious degree of alertness over prospective invaders. A clever approach would imply reducing the risk of alien species introductions through (1) generalized quarantine procedures – which are amazingly lacking in the EU; (2) enforcement of current legislation about animal and pet trade; and (3) with wide-ranging campaigns of popular (LOWE & al. 2004) and formal science programmes (BYERS & al. 2002).

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### Zusammenfassung

Vierzehn exotische Ameisenarten werden von den Balearischen Inseln gemeldet (ein knappes Viertel der balearischen Ameisenfauna). Wir bestätigen die rasche Ausbreitung der Argentinischen Ameise, *Linepithema humile*,



und – in geringerem Ausmaß – von *Cardiocondyla mauritanica* auf den Inseln. Es handelt sich bei letzterer offenbar um einen der wenigen Fälle, in denen eine auf der Bodenoberfläche fouragierende Ameisenart sich in der Anwesenheit der Argentinischen Ameise ausbreitet. Sechs Ameisenarten sind neu für die balearische Fauna (*Cardiocondyla mauritanica*, *Paratrechina vividula*, *P. jaeger-skioeldi*, *P. longicornis*, *Pyramica membranifera* und *Tetramorium caldarium*) und eine weitere ist neu für den gesamten Mittelmeerraum (*Monomorium exiguum*). Das bisher unbekannte Männchen von *Pheidole teneriffana* wird hier beschrieben. Auf den Balearischen Inseln sind exotische Ameisen meist auf anthropogen stark überprägte Lebensräume beschränkt.

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