



“Regional-scale multi-analyses of Argentine ant populations in Southern Europe ”

Olivier Blight, Laurence Berville, V Vogel, Abraham Hefetz, Marielle Renucci,
J Orgeas, Laurent Keller, Erick Provost

► To cite this version:

Olivier Blight, Laurence Berville, V Vogel, Abraham Hefetz, Marielle Renucci, et al.. “Regional-scale multi-analyses of Argentine ant populations in Southern Europe ”. XVI Congress of the International Union for the Study of Social Insects Copenhagen, Aug 2010, Copenhagen, Denmark. hal-04212398

HAL Id: hal-04212398

<https://hal.science/hal-04212398>

Submitted on 20 Sep 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Objectives

Here we performed a regional multi-analyses to identify the expansion range of the Corsican supercolony, a new European supercolony (Blight et al. 2010) and to characterize its structure more explicitly. This is the first multi-analysis study conducted on Argentine ant populations in southern Europe. In view of the role of hydrocarbons and genetics in ant recognition, conducting joint behavioral, chemical and genetic analyses appeared to us a promising approach to understanding patterns of Argentine ant supercolony organization. This multidisciplinary approach was intended to allow us to formulate assumptions on the historical processes that may have produced this pattern, and its evolution.

Results

Members of this new supercolony were aggressive towards ants from the other two supercolony studied, i.e. the main European and the Catalanian supercolonies described by Giraud et al. (2002). Aggression between workers from the Corsican and the main European supercolonies varied from moderate to high (3.85 ± 0.06 , $n = 165$), but was systematically high when workers from the Catalanian supercolony were involved (5 ± 0 , $n = 55$). This behavioral demarcation was confirmed by chemical data (Fig. 1, 2; Table 1). Chemical proximity of members of the Corsican supercolony to members of the main supercolony was greater than to those of the Catalanian supercolony. Surprisingly, despite the concordance between chemical and behavioral groups, the main and the Corsican supercolonies were genetically undiscriminated. The central position of the nesting sites sampled here suggests that, from a genetic point of view, these nesting sites are related in some manner to the global supercolony described worldwide (van Wilgenburg 2010) (Fig. 3).

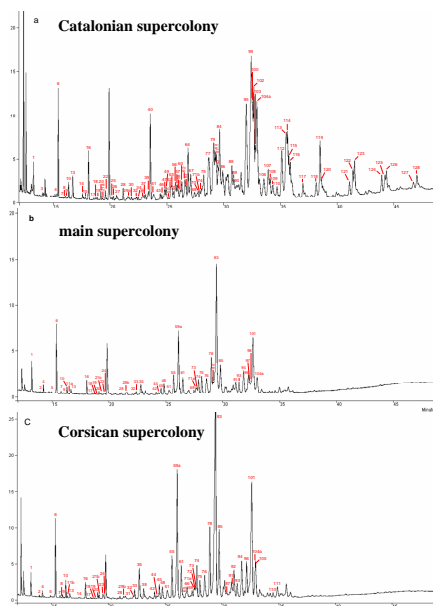
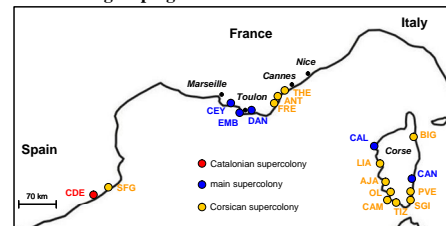


Fig. 1 Gas Chromatograms of total body wash of 30 workers of *Linepithema humile* from (a) Caldes d'Estrac (Catalan supercolony), (b) Ceyreste (main European supercolony), (c) Fréjus (Corsican supercolony) and Giens (peace colony). Peak numbers correspond to the list of the identified cuticular hydrocarbons in Table 1.

Table 1. List of the identified cuticular hydrocarbons of workers from Caldes d'Estrac (Catalan supercolony), Ceyreste (main European supercolony) and Fréjus (Corsican supercolony).

Site	Compound	Retention time (min)	Peak number
Caldes d'Estrac	1	11.12	1
	2	11.12	2
	3	11.12	3
	4	11.12	4
	5	11.12	5
	6	11.12	6
	7	11.12	7
	8	11.12	8
	9	11.12	9
	10	11.12	10
Ceyreste	1	11.12	1
	2	11.12	2
	3	11.12	3
	4	11.12	4
	5	11.12	5
	6	11.12	6
	7	11.12	7
	8	11.12	8
	9	11.12	9
	10	11.12	10
Fréjus	1	11.12	1
	2	11.12	2
	3	11.12	3
	4	11.12	4
	5	11.12	5
	6	11.12	6
	7	11.12	7
	8	11.12	8
	9	11.12	9
	10	11.12	10

Behavioral grouping



Chemical grouping

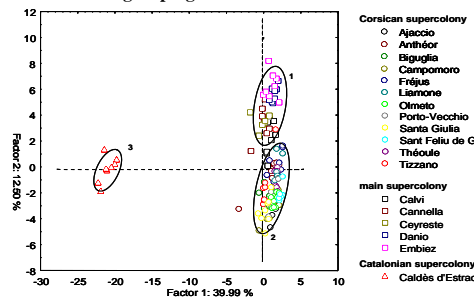


Fig. 2 Principal Component Analysis based on cuticular profiles of *Linepithema humile* workers from the 18 nesting sites ($n = 153$). The projection was performed on factorial plane 1-2. Axis 1 accounts for 39.99 % of total variance and axis 2 for 12.50 %. Results of K-means cluster analyses, group 1: the main supercolony (CAL, CAN, CEY, DAN, EMB), group 2: the Corsican supercolony (ANT, AJA, BIG, CAM, FRE, LIA, PVE, SFG, SGI, TIZ, THE) and group 3: the Catalan supercolony (CDE). Nesting sites are assigned different symbols following results of behavioral tests.

Genetics

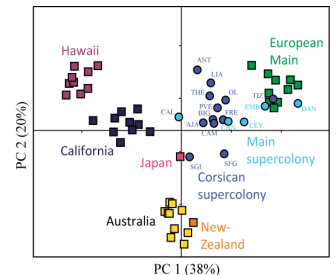


Fig. 3 Principal Component Analysis based on microsatellite allele frequencies calculated on nests that may have a common history. We included in the analysis all the nesting sites of the main and the Corsican supercolonies of the present study (represented by dots) as well as all the nests of the world wide supercolonies studied in Vogel et al. (2010) sharing the same haplotype (squares). Note that the sampling was performed at different scale depending of the supercolonies (see Vogel et al 2010 for more details) which may explain the differences in the extend in the graph of the supercolonies. The percentage of variance explained is given in brackets.

Conclusions

- This study confirms the existence of a distinct Corsican supercolony with a distribution range of at least Corsica, southeastern France and one location in Spain.
- What we report here is, to our knowledge, the first recorded aggression between supercolonies that are genetically undiscriminated, at least for the Argentine ant.
- We demonstrate that genetically similar nests at microsatellite markers do not necessarily belong to the same supercolony.
- In the light of our results, the recent identification of a global supercolony formed by the largest intercontinental supercolonies, which are viewed as genetically and chemically similar, needs to be considered with caution.
- The process of nestmate recognition that behaviorally segregate the Corsican supercolony from the main supercolonies remains unclear.
- Genetic data also raise questions on the origin and evolution of this regional pattern.