



# TAPINOMA NIGERRIMUM AS “SAFEGUARD” FOR ITALIAN MYRMECOFAUNA AGAINST ARGENTINE ANT



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## TOPICS and...

- The invasive Argentine ant, *Linepithema humile*, occurs mainly in Mediterranean regions outcompeting and displacing native ant species (Lach et al., 2010).
- Some authors investigated on local resistance by the native ants. *Tapinoma* species have been proposed as a factor limiting Argentine ant invasion: *T. simrothi* in North Africa (Bernard, 1976); *T. sessile* in California (Buczukowski & Bennett, 2008); *T. nigerrimum* in France (Blight et al., 2010).
- Literature lacks of topics concerning *L. humile* and *T. nigerrimum* in Italy, the most common *Tapinoma* species occurring in our Country.

## ...AIMS!

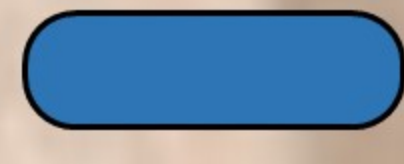
- 1) We first verified co-occurrence and local distribution of *L. humile* and *T. nigerrimum* in some Italian suitable habitats (GPS SURVEY).
- 2) We investigated the impact of *L. humile* on native ant species compared with presence/absence of *T. nigerrimum* (PITFALL TRAPS).
- 3) We evaluated their ability to discover and monopolize food resources (BAITS).

## TARGET SPECIES

*Linepithema humile*  
(Mayr, 1868)



*Tapinoma nigerrimum*  
(Nylander, 1856)



|   |                       |  |
|---|-----------------------|--|
| Dolichoderinae  | SUBFAMILY             | Dolichoderinae                                     |
| 3 mm, Brown   | SIZE & COLOR (WORKER) | 3 – 6 mm, Black                                    |
| NO  | SIZE POLYMORPHISM     | YES  |
| YES (invasive populations)                                  | UNICOLONALITY         | YES (niche optimum)                                |
| Iridomyrmecine  | CHEMICAL ARM          | Iridodial  |
| «Dominant Dolichoderinae»                                   | ECOLOGICAL NOTE       | «Dominant Dolichoderinae»                          |
| one valid species   | TAXONOMIC NOTE        | species complex (our data)                         |
| IUCN's 100 World's Worst Pest                               | CONSERVATION NOTE     | introduced in Germany                              |
| Global, Mediterranean regions                               | DISTRIBUTION AREA     | South Europe, North Africa                         |
| Tirrenic & Ionian coast                                     | ITALY DISTRIBUTION    | Widespread (Islands included)                      |
| Dune, anthropized open areas, wetland, anthropic structures | ITALIAN HABITAT       | Dune, warm open areas (semi-natural & anthropized) |

## 1 - PRELIMINARY INVESTIGATION

We verified occurrence and distribution of the two species in some Mediterranean coastline segments of Tuscany, Latium, Campania, Sicily and Sardinia. Two-four operators collected GPS data of nesting sites, along 20 meters width linear transects covering the whole selected segments (Ward & Stanley, 2012).

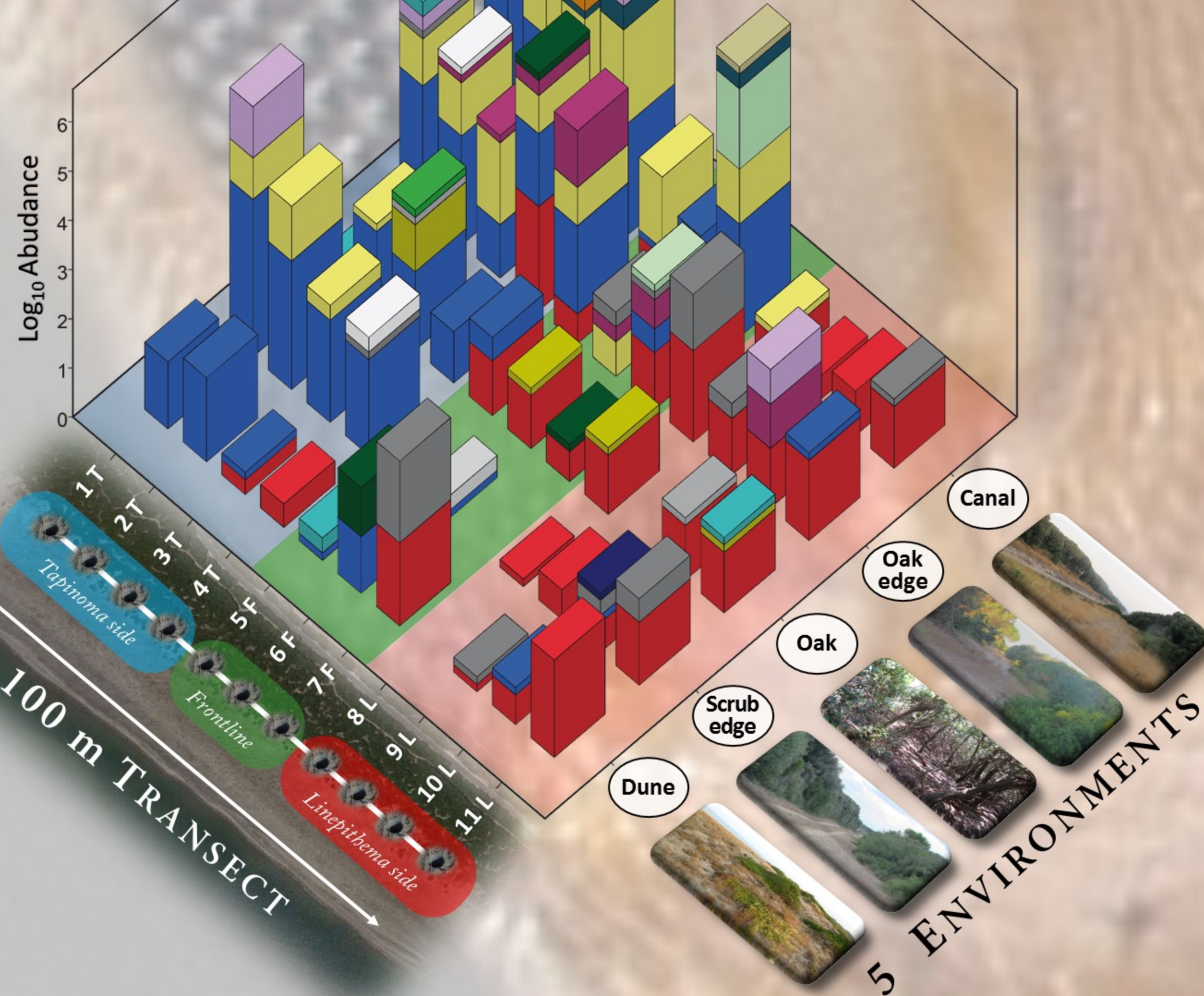


The two species showed a local abundant and patchy distribution, with several frontline areas reflecting a systematic exclusion.

## 2 - PITFALL TRAPS

We placed 11 pitfalls / transect along «Tap side» (1-4 T), «Frontline» (5-7 F) and «Lin side» (8-11 L), left out for 48h (Agosti et al., 2000). We replicated the 6 transects in June, July and August.

198 Pitfalls  
1.060 ants  
19 species



## STUDY AREA

We selected Castelporziano Reserve as model area for the following reasons:

- 1) high colony density of both species
- 2) several frontline areas
- 3) high myrmecological diversity.

## PITFALL TRAPS & BAITS

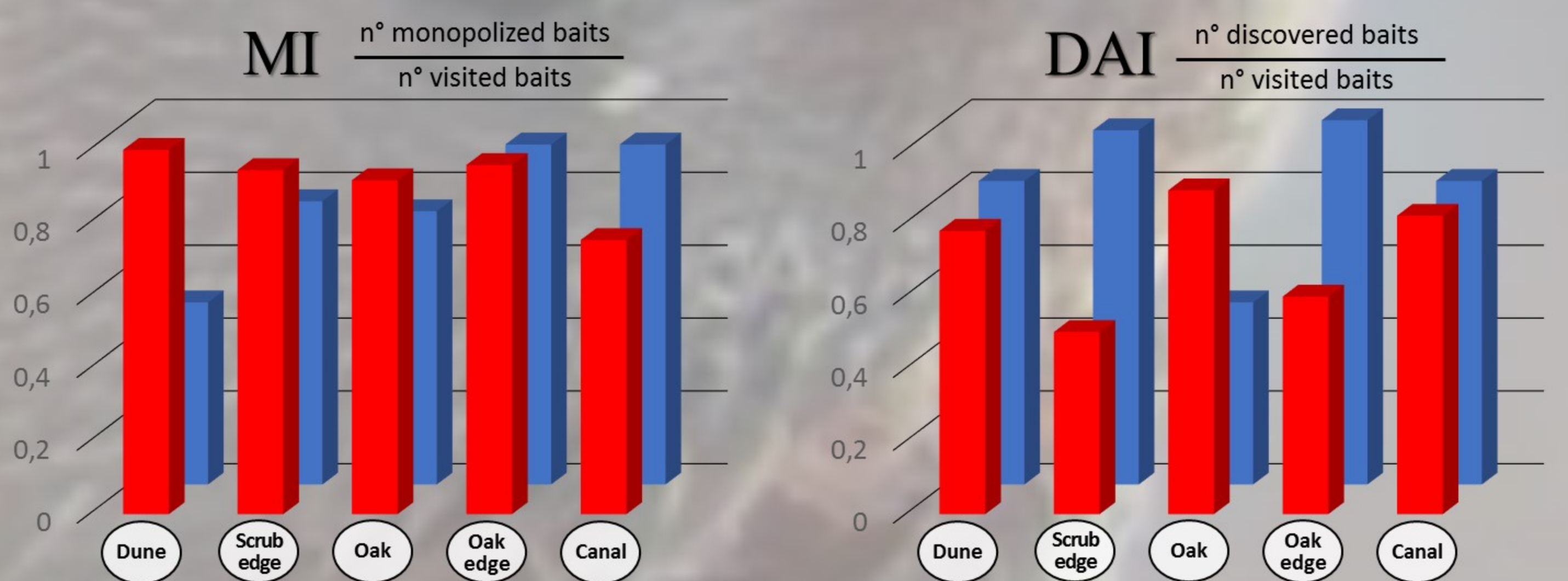
were placed along 6 transects across the frontline “hot-spots” representing 5 environments.



## 3 - BAITS

We calculated **Monopolized Index** & **Discovery Ability Index** (Solida et al., 2014) by:

- 22 baits (11 tuna + 11 honey) / transect + 4 additional (2 + 2) in frontline
- 7 observations / bait at temporal steps: 5-15-30-60-90-120-180 minutes
- 3 replicates in June, July and August, in the morning (6:30 to 9:30).



468 baits - 3.234 observations - 16 species  
visited baits → 42% *L. humile* 28% *T. nigerrimum* 4% other species

## PITFALLS HIGHLIGHT :

- Ant diversity differs significantly between the two species patchy (Kruskal-Wallis Test -  $\chi^2 = 13.5, p = 0.000$ ).
- Such differences were marked in disturbed sites, where the greatest diversity was found: “Scrub edge”, “Oak edge” & “Canal”. (Linear Regression Model -  $p = 0.007, p = 0.052, p = 0.000$ ).
- The associations *T. nigerrimum*-*M. minor* & *L. humile*-*P. pygmaea* - 2 known dominant species (*M. monomorium* & *T. caespitum*) occurred just in “Frontline”.

## BAITS HIGHLIGHT :

- DAI did not differ significantly between *L. humile* and *T. nigerrimum* species (Kruskal-Wallis Test -  $\chi^2 = 0.13, p = 0.716$ ).
- MI differences were slightly significant (Kruskal-Wallis Test -  $\chi^2 = 5.75, p = 0.016$ ).
- 16 recorded species, just 1 more than pitfall (*Camponotus fallax*).

## DISCUSSION

First results highlight a clear reduced ant diversity in the *L. humile* patchy in respect to the adjacent *T. nigerrimum* patchy. Moreover, concerning the access to food resources, the two species do not seem to differ in competitive ability. Our preliminary results suggest that *T. nigerrimum*, limiting the spread and impact of the Argentine ant invasion, may act as an efficient “safeguard” for the local myrmecofauna.

## References

References - Agosti et al., 2000. *Ants: standard methods for measuring and monitoring biodiversity*. Smithsonian Institution Press: 1-280. - Bernard, 1976. Contribution to knowledge of *Tapinoma simrothi* the most serious ant pest on crops of the Maghreb North Africa. *Bulletin de la Société d'Histoire Naturelle de l'Afrique du Nord* 67: 87-102. - Blight et al., 2010. A native ant armed to limit the spread of the Argentine ant. *Biological Invasions* 12: 3785-3793. - Buczukowski & Bennett, 2008. Aggressive interactions between the introduced Argentine ant, *Linepithema humile* and the native odorous house ant, *Tapinoma sessile*. *Biological Invasions* 9: 73-85. - Solida L. et al., 2014. Spatio-temporal Foraging Dynamics in Two Coexisting Harvester Ants (Hymenoptera: Formicidae). *Journal of Insect Behavior* 27: 429-438. - Ward & Stanley, 2012. Site occupancy and detection probability of Argentine ant populations. *Journal of Applied Entomology* 137: 197-203.



| SPECIES                          | TAP SIDE | FRONT | LIN SIDE |
|----------------------------------|----------|-------|----------|
| <i>Aphaenogaster subterranea</i> | ✓        | ✓     | ✓        |
| <i>Cardiocondyla elegans</i>     | ✓        | ✓     | ✓        |
| <i>Plagiolepus pygmaea</i>       | ✓        | ✓     | ✓        |
| <i>Tetramorium moravicum</i>     | ✓        | ✓     | ✓        |
| <i>Temnothorax unifasciatus</i>  | ✓        | ✓     | ✓        |
| <i>Temnothorax flavicornis</i>   | ✓        | ✓     | ✓        |
| <i>Camponotus aethiops</i>       | ✓        | ✓     | ✓        |
| <i>Messor minor</i>              | ✓        | ✓     | ✓        |
| <i>Crematogaster scutellaris</i> | ✓        | ✓     | ✓        |
| <i>Formica cunicularia</i>       | ✓        | ✓     | ✓        |
| <i>Pheidole pallidula</i>        | ✓        | ✓     | ✓        |
| <i>Solenopsis fugax</i>          | ✓        | ✓     | ✓        |
| <i>Temnothorax recedens</i>      | ✓        | ✓     | ✓        |
| <i>Camponotus lateralis</i>      | ✓        | ✓     | ✓        |
| <i>Temnothorax lichtensteini</i> | ✓        | ✓     | ✓        |
| <i>Monomorium monomorium</i>     | ✓        | ✓     | ✓        |
| <i>Tetramorium caespitum</i>     | ✓        | ✓     | ✓        |
| TOTAL                            | 14       | 9     | 7        |