Tapinoma nigerrimum (Formicidae) : Last shield against the spread of the Argentine ant in south of France ?

BERVILLE Laurence, O. BLIGHT, M. RENUCCI, A. TIRARD & E. PROVOST

* Institut Méditerranéen d'Ecologie et Paléoécologie UMR CNRS 6116 Université Paul Cézanne, Europôle méditerranéen de l'Arbois BP 80. F -13545 Aix-en-Provence

Background :

Global biodiversity is currently threatened by invasive species most of which have been redistributed throught expansion of international trade.

The Argentine ant (*Linepithema humile,* Mayr) native to South America is one of the most important invasive species as it is currently found in many parts of the world. Since a century it spread across a Meditterraneen coast of France.

The interspecific interactions between Argentine ants and native ants often result in the displacement or/and elimination of native ants species, creating eradication.

L. humile

Study context :

Blight et al. (2010) demonstrated the abilities of *Tapinoma nigerrimum* to fight and kill the Argentine ants. Both species are present in Provence-Côte d'Azur coasts. They share remarkably similar biology and ecological behaviour.
This study seeked to investigate if *Tapinoma* is able to slow down or to block the spread of this invasive species ?

Objective :

In the laboratory, we examined the ability of *T. nigerrimum* to resist or to kill the Argentine ant when:

- ✓ the number of Argentine ants is far more numerous than *T. nigerrimum.*
- ✓ *T. nigerrimum* or *L. humile* are resident.

T. nigerrimum

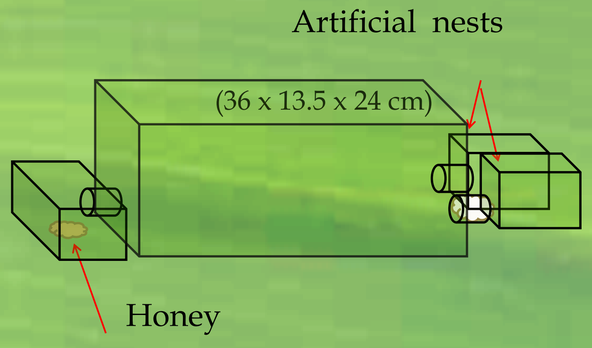
Methods :

Two behavioural assays were conducted in laboratory to assess the resistance potential of *T. nigerrimum.*

• Resource and territorial competition in large arena with the notion of resident :

450 workers were placed in an artifial nest called : resident colony. The same number of the other species was introduced after 48h. The second colony was allowed to access foraging arena after 2 h.

This bioassay allowed examination of the defense ability of a resident colony against intruding workers of the other species (*n*= 11 replicates).

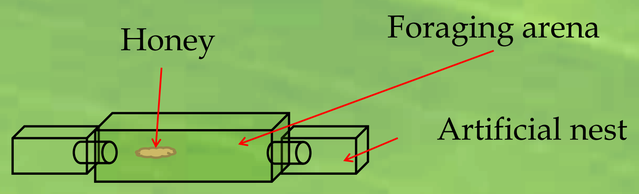


• Asymetrical group interaction:

For each trial assay worker from each of the two species were placed in closed artificial nests where they were kept for two hours to acclimatize. Aritificial nest were connected with plastic tubes to a common foraging arena with honey in the center.

Artificial nests were opened allowing workers to access the foraging arena (*n*= 50 replicates with different rate).

When it still only one species alive we counted the number of survivor.



Results :

•Resource and territorial competition in large arena with the notion of resident:

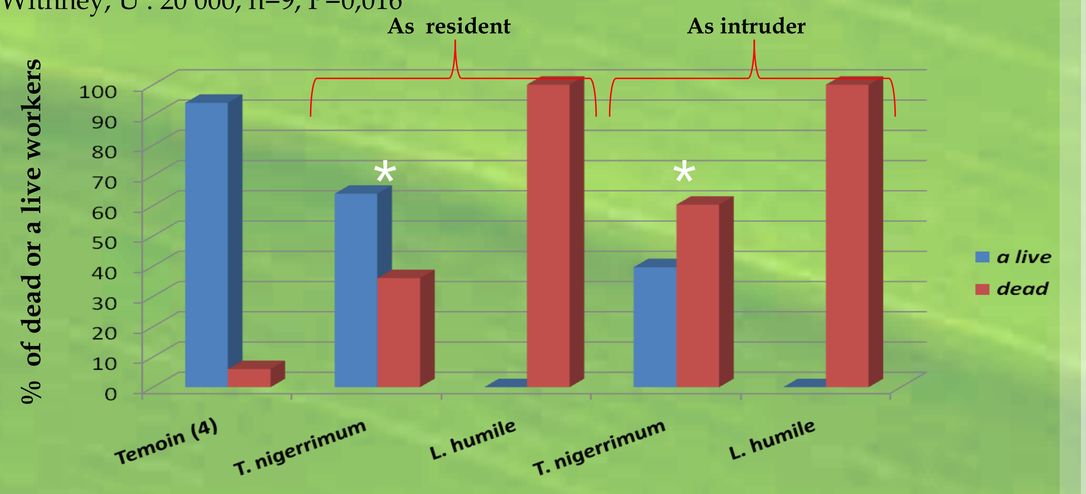
- *T. nigerrimum* as resident :

✓ *L. humile* never invaded *T. nigerrimum* nest
✓ The average mortality was 100% for *L. humile* and 39% for *T. nigerrimum* by the end of the experiements.
✓*Tapinoma* always dominated over the food.

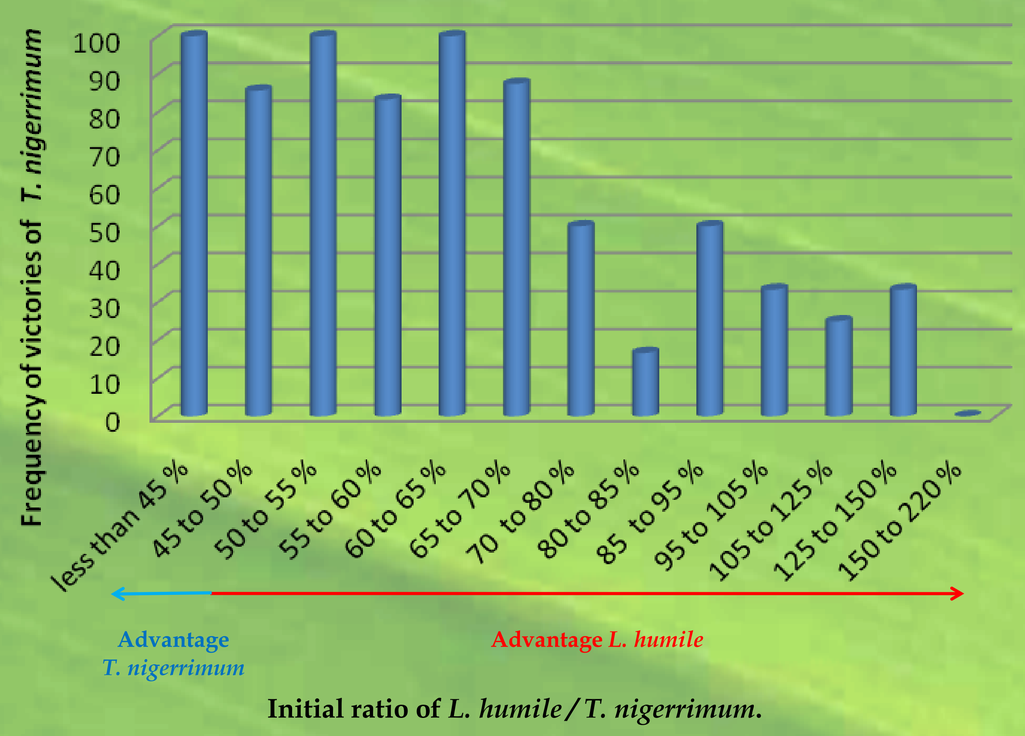
- *L. humile* as resident

✓ *Tapinoma* always invaded *L. humile* nest.
✓ The average mortality was 100% for *L. humile* and *63%* for *T. nigerrimum* by the end of the experiments.
✓ *Tapinoma* always took the control of the food area.
✓*L. humile* were forced back to their nest while *T. nigerrimum* obstructed their entrance with sand during the fight.

* Effect of the resident in the % mortality of the *T. nigerrimum* workers : Mann-Withney, U : 20 000; n=9; P=0,016



•Asymetrical group interaction :



Victories of *T. nigerrimum* depended on the initial ratio of *L. humile/ T. nigerrimum*. Mann-Whitney (n = 50; U : 103 000; *P*=< 0.001)

Conclusions:

Our results demonstrate :

- The ability of *T. nigerrimum* to resist and defend a resource and a territory from *L. humile*.
- The ability of *T. nigerrimum* to compete, establish a colony and exterminate *L. humile* in its own territory.
- *T. nigerrimum* is able to exterminate *L. humile* until its population reach a ratio 1:1.6 beyond which *T. nigerrimum* become less effective.

This result will be used to create and test a management plan of the argentine ant in the field.

T. nigerrimum