

## Are serpentine biota free from biological invasions ? An example of an ant community from southern New Caledonia

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### Introduction

The edaphic conditions of ultramafic regions act as an effective barrier against biological invasions for plants: no natural establishment of exotic species without human intervention. Observations on the low productivity and weak trophic structure of ultramafic vegetation communities often represented by toxic species, has led to the notion that ultramafic areas might also offer an effective resistance to fauna invasions.

### The ultramafic ant fauna of New Caledonia

Knowledge of the ant fauna of ultramafics in New Caledonia is incomplete and poorly represented in the taxonomic literature. It is estimated that there are at least 80 ant species, but there is possibly twice this number (Ward, unpublished). On the basis of literature (Emery 1914 ; Taylor 1987) and personal observations, 4 of the 9 known genera of Ponerinae, 4 species of Cerapachyinae and the only species of Myrmeciinae appear to be restricted to ultramafics. All these species exhibit primitive social structures and morphology, and appear to represent a relictual fauna protected by the insularity of ultramafic conditions. Moreover, the local endemism (69%) exceeds the theoretical endemism rate (32%) if there was only a position endemism (i.e. rate calculated in regard to the 1/3 surface area contribution of ultramafics to the total island) and suggests that these habitats are a sanctuary for endemic ants.

### Introduced ant species

Humans have assisted in the expansion of many invasive species in New Caledonia, especially ants. According to the literature, 21 species of ant have been introduced to New Caledonia of which 16 of these are true «tramp species» (ants with great invasive powers, spread by human activity). Among these, *Wasmannia auropunctata* «electric ant» clearly illustrates the threat

exotic species have on native fauna. Research conducted in the Galapagos Islands and currently in New Caledonia shows that this ant excludes or eliminates part of the native fauna. This species has a tendency to saturate a biome and monopolise the food resources. In the canopy of sclerophyll forest invaded by «electric ants», 60% of the fauna collected consists of this species (Jourdan *et al.* in press).

### Threats to ultramafic areas : first results

A screening of the ultramafic ant population was conducted in southern New Caledonia from May to June 1994 to identify areas invaded by *Wasmannia auropunctata*. Ant fauna was collected from 100 sites along roads and tracks. The traps consisted of a plastic vial (6.5 cm in diameter) filled with ethylene glycol (a substance which is not known to attract or repel ants) placed in the soil so that the lip of the container was level with the soil surface. Each trap was emptied once a week. Three kinds of biota were selected : secondary rain forest, ultramafic maquis and land subject to human influences (cultivation, savannah, disturbed vegetation).

Twenty-one species of ant have been collected from this preliminary study. Figure 1 describes the distribution of ants captured in relation to the different biota. Endemic and native ant species occur solely in natural habitats. Several of the «tramp species» appear to be restricted to areas of human settlement (*Pheidole megacephala*, *Solenopsis geminata*), while others are entering natural habitats : *Wasmannia auropunctata*, *Paratrechina longicornis*, and to a lesser extent *Anoplolepis longipes*, *Cardiocondyla emeryi*, *Monomorium floricola*. The invasive pressure of these exotic species in southern New Caledonia threatens the future survival of the ultramafic fauna and further studies are necessary to increase information on this matter.

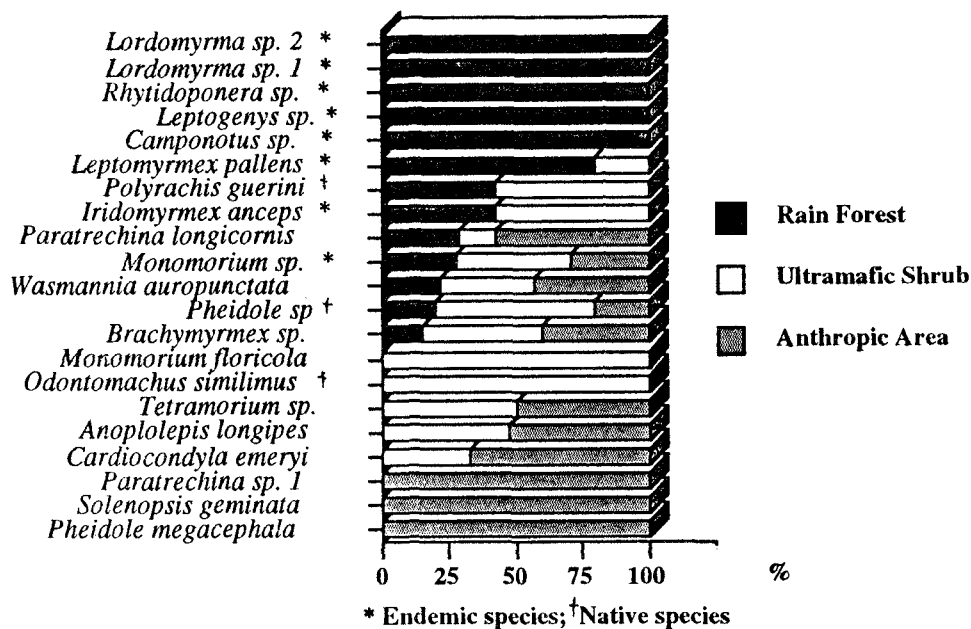


Fig. 1 Ant frequencies in each surveyed biota.

### Ants : a tool for conservation management in ultramafic areas

Ants have often been used as bio-indicators especially in Australia (Majer 1983 ; Andersen 1990, 1995). Ant communities have been used in : natural reserve design, mine site rehabilitation, habitat disturbance, evaluation of pollution contamination, edaphic condition, fire management. Ants have been used because they are readily obtainable with minimum effort and they can be placed even at the generic level into functional groups which correspond to a particular habitat (Andersen 1990, 1995).

Endemic ant species which are restricted to undisturbed ultramafic biota of New Caledonia represent an effective bio-indicator of habitat qualities. In addition, these ant communities may act as a valuable tool in conservation management of ultramafics.

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