

Cryptic diversity in the widespread European earwig, *Forficula auricularia* (Insecta, Dermaptera)

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Introduction

The European earwig, *Forficula auricularia* is considered as a beneficial predator of several pests in pip fruit. The species is widespread in Europe and population dynamics are characterized by single- (SBP) and double-brood populations (DBP), each with specific biological characteristics. Breeding experiments revealed differences in reproductive features between these population types, viz. SBP-females lay a single brood a year and eggs need a diapause after oviposition for optimal reproductive success whereas DBP-females can lay two broods a year and eggs do not need a diapause. Previously it was thought that both groups represented two biological species (based on molecular data) but a recent study (based on breeding experiments) claimed that *F. auricularia* comprises a single biological species since SBP and DBP individuals are able to interbreed.



Aim of the study

Because of the conflicting results of the above mentioned studies (i.e. molecular data versus breeding experiments) we sequenced >500 specimens of *F. auricularia* from Europe and North America and determined whether the earwigs originated from SBP or DBP. Sequences were obtained from two mitochondrial region: the 16S rDNA gene and the COI-COII intergenic region.

Concurrently, we conducted a breeding experiment by and crossed all possible combinations of males and females from SBP and DBP individuals. These individuals were also characterised for both mitochondrial regions.

Results

- the 16S rDNA fragment revealed two major lineages within *F. auricularia*
- the COI-COII intergenic region revealed less structure with only one supported clade
- each of the two major 16S rDNA lineages comprised males and females of SBP and DBP.
- crossings between males and females of SBP and DBP were succesful, but only if both originated from the same molecular 16S rDNA lineage
- crossings between individuals from both 16S rDNA lineages were unsuccessful

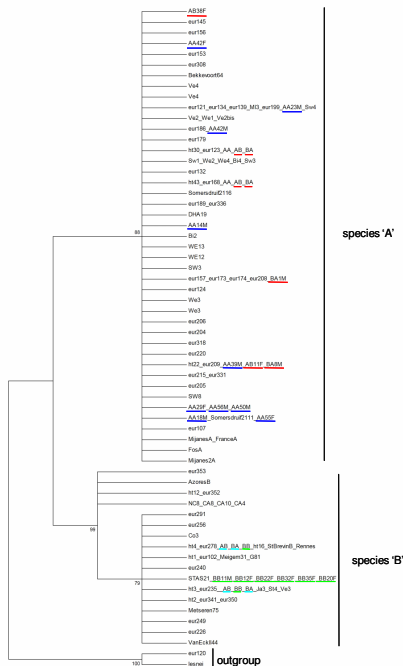
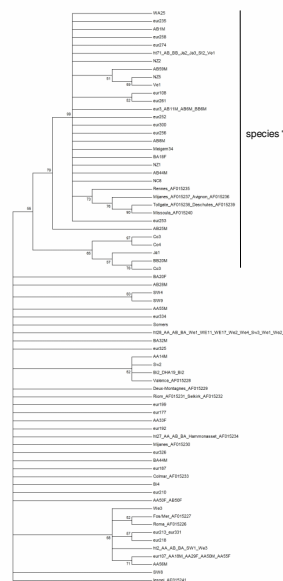


Fig. left NJ-tree of the 16S rDNA gene: AA: crossing between male and female from SBP; BB: crossing between male and female from DBP; AB: crossing between male from SBP and female from DBP; BA: crossing between male from DBP and female from SBP.

Fig. below: NJ-tree of the COI-COII intergenic region.



Conclusions

The European earwig, *F. auricularia*, appears to consist of at least two biological species that do not interbreed. Yet, each species shows variation in life history strategies, i.e. they both have females that produce one or two broods a year.

The use of the mitochondrial 16S rDNA and COI-COII intergenic region, and of the COI barcode fragment, allows a quick and accurate characterisation of earwig populations and this may enhance the optimization of the use of these taxa as biological control agents in orchards.