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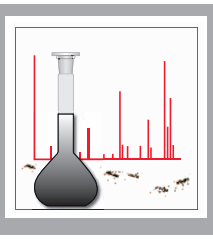

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A New Function of Hydrocarbons in Insect Communication: Maternal Care and Offspring Signalling in the European Earwig

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An earwig mother tending her clutch of 1st instar nymphs.

Hydrocarbons are a ubiquitous component of the insect exoskeleton (cuticle). Their primary function is to provide an effective hydrophobic barrier against water loss and desiccation. But cuticular hydrocarbons (CHCs) are also species-specific, vary with the biotic and abiotic environment, and they have been shown to often have evolved a secondary function as signals in insect communication. For instance, a sex difference in CHCs is used as sex pheromone in the fruitfly, and ants use CHCs to recognize intruders in their colony. In the context of parental care, where young insects (nymphs or larvae) interact with their parents to receive protection and/or food, we explored whether CHCs of young could have evolved to influence parental behaviour, similar to the begging calls of nestling birds or the crying of human babies.

European earwig (*Forficula auricularia:* Dermaptera) mothers care for their nymphs by defending them against predators and providing food *via* individual mouth to mouth food regurgitation. Chemical extract from CHCs of nymphs reared under different nutritional conditions (high-food versus low-food) were obtained and tested on mothers. Mothers exposed to extract from high-food nymphs foraged significantly more food and provided food to more nymphs than mothers that were exposed to extract from low-food nymphs. The identification and quantification of nymph CHCs by GC-MS revealed that the profile of CHCs is composed of 20 compounds, that the total quantity of CHCs did not differ between high- and low-food nymphs, but that there was significant variation in the relative quantities of four compounds (three alkanes: n-C25, n-C27, n-C31 and one alkene: x-C29:1). These results demonstrate that CHCs contain information about the nutritional condition of offspring to which earwig mothers respond by adjusting care behaviour. **The effect of condition-dependent CHCs of nymphs on maternal behaviour supports a new secondary function of hydrocarbons in insect communication**.

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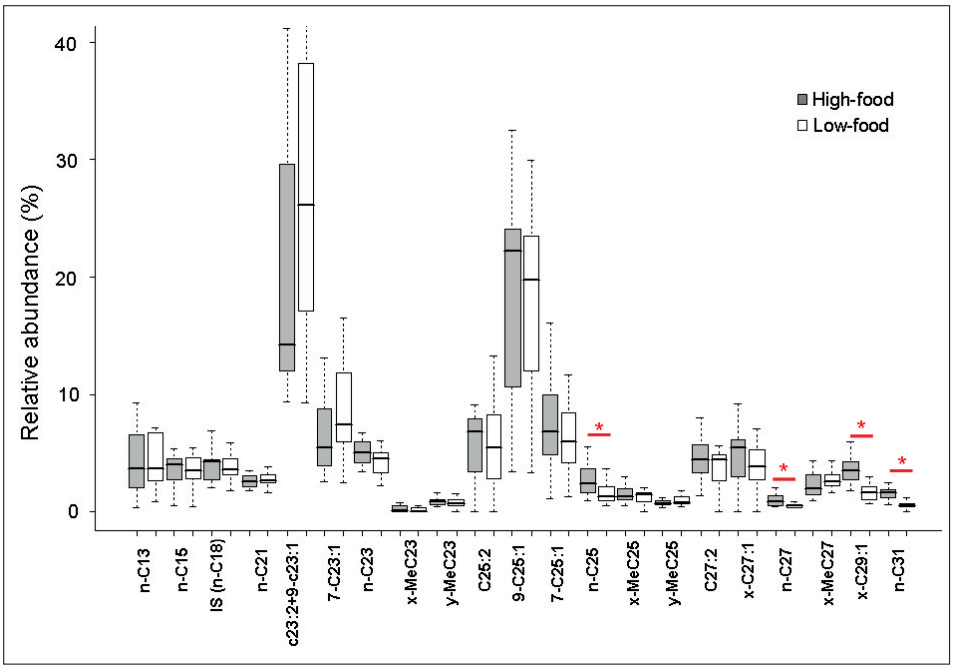

Box plots (medians and interquartile ranges) of relative quantities of the 20 hydrocarbons found on the earwig nymph cuticle, and for nymphs reared under high-food (grey) and low-food (white) conditions. IS is an internal standard. Red asterisks indicate statistically significant differences between treatments.

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