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ITALIAN SOCIETY FOR EVOLUTIONARY BIOLOGY

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EVOLUTIONARY APPLICATIONS FOR BIOSYSTEMS AND AGRICULTURE

This symposium aims at providing a general view of the impact that both man-made and natural selection had and still have on plant and animal species of agricultural relevance. The themes tackled by the symposium will range from the evolution of invasive species, the traits that human being have been selecting during plant and animal domestication, the relationship between biodiversity and the occurrence of the centers of domestication, the co-evolution of crops and the pests affecting them, the relationships between social behavior and the evolution of communication mechanisms in insects and many more topics.

Chairs: Gianfranco Anfora and Claudio Varotto (Fondazione Edmund Mach)

Linking the evolution of brain asymmetries and social behaviour in honeybees

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The honeybee (*Apis mellifera* L.) has been shown to be an excellent model to investigate cognitive abilities such as learning and memory. Studying the mechanisms of learning, storage and recall of memory in bees is very important because these mechanisms are of vital importance for honeybees to be able to forage for nectar, learn and remember where flowers are located, as well as to find their way home to the hive. In fact, the failure of bees to return to the hive after foraging has been shown to be the primary symptom of the colony collapse disorder which has devastated honey bee populations world-wide since about 2006. Here a series of studies are presented to understand the cognitive abilities of honeybee foragers in learning, discriminating, memorizing and recalling different odours. A population-level asymmetry in the use of the antennae has been found: bees use their right antenna to learn and recall short-term memory, whereas the left antenna allows recall of long-term memory. Recently, it has been suggested that the alignment of lateralization at the population level may have evolved as an evolutionary stable strategy (ESS) when individually-asymmetrical organisms must coordinate their behaviour with that of other asymmetrical organisms. Game-theoretical models based on ESS suggest that population-level lateralization is more likely to evolve in social than in non-social species. This hypothesis has been tested by comparing olfactory responses of the right and the left antenna using behavioural (conditioning of the Proboscis Extension Reflex, PER), physiological (ElectroAntennoGraphy, EAG) and morphological (Scanning Electron Microscopy, SEM) measurements in three species of Hymenoptera Apoidea that show different levels of sociality: eusocial honeybees (*Apis mellifera L.*), solitary mason bees (*Osmia cornuta* L.) and bumble bees (*Bombus terrestris* L.), an annual eusocial species. The connection between the evolution of population-level asymmetries and the evolution of social behaviour is discussed on the basis of communication mechanisms in honeybees.

Insects social networks: from pure to applied ethology

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Social interactions are crucial for the life of thousands of species worldwide. The most famous peaks in social organization have been reached inside the complex societies of social insects, where hundreds to thousands of individuals continuously