



CLIMOS project – perspective of a medical entomologist

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The CLIMOS project (Climate Monitoring and Decision Support Framework for Sand Fly-borne Diseases Detection and Mitigation) puts under a spotlight phlebotomine sand flies – small, hairy dipterans that may seem like an unlikely candidate to attract a focused effort of a research consortium comprised of 29 partners that will pursue the project aims for next three years in many European and adjacent countries. However, we shall not be mistaken by their humble size and rather a modest appearance. Sand fly females are avid blood feeders many species do not hesitate to bite humans. Despite a small volume of blood taken, the transmission of pathogens may occur during the feeding. Diverse sand fly-borne pathogens include parasitic protozoans, bacteria and viruses and all these can be causative agents of diseases in their human or animal hosts. Sand fly vectors are thus of importance for both human and veterinary medicine.

With their small size and rather an unimpressive colouring, they attract far less attention than other insects and often remain overseen compared to even some of their hematophagous fellows like mosquitoes. The establishment of several invasive mosquito species, some visually distinct and easy to spot, in countries of southern Europe and their gradual northward spread is witnessed not only by medical entomologists but also by amateur naturalists or people who just notice a peculiar mosquito in their backyard or garden; in fact, many records that document the emergence of *Aedes albopictus* and his fellows come from citizen science. This is unlikely to be happening for sand flies, even though they are expected to follow the suit of their mosquito relatives. Models based on environmental and climatic variables suggest future scenarios that anticipate more and more European regions becoming suitable for them.

This trend that reflects ongoing climatic and environmental changes is supported also by first field data. However, to understand the dynamics and epidemiological significance of these processes, we need focused and sustained sand fly monitoring and research. And we still see many gaps in knowledge that need to be filled. On the other hand, sand flies are an ideal insect model for understanding the impact of climatic changes: their larvae develop in the soil and organic litter and as an overwintering stage, they are a good biological indicator of how the climatic variables affect the epidemiology of sand fly-borne diseases. In this respect, the CLIMOS project certainly chose the correct target organisms.

Despite the first sand fly species being described by Italian researcher Scopoli as early as 1786, the biodiversity of species occurring in Europe is still not fully understood – a region that may be regarded as thoroughly studied revealed four newly recognized and described species only in the last decade!

With each such finding, a natural question arises: is this new species a competent vector that can transmit a disease-causing *Leishmania* or virus? And what is the actual role of those species that are well known for years but were never tested? Such questions cannot be answered without experimental infections – and this is where field entomology meets with laboratory research. CLIMOS covers both legs. It aims to perform two extensive field trapping campaigns for two consecutive seasons in ten different European and adjacent countries that include regions where sand flies are well established (Mediterranean region) as well as those where they emerged only recently (Austria, Germany) or were not recorded yet, despite the proximity of populations in neighbouring countries (Czech Republic). But it will also utilize established laboratory colonies of two project partners (Istituto Superiore di Sanita and Charles University) to pursue the “white coat approach” – testing of vector competence of several sand fly

species reared in captivity to Leishmania and phleboviruses.

And most importantly, this will not end where many often stop: the acquired data will provide important input for modelling and risk assessment of sand fly-borne pathogens, development of scenarios of how these pathogens may affect human health under ongoing climate and environmental change and also an early warning system that shall pass the important message to those at potential risk. The aims of CLIMOS are ambitious but they match the significance of what seems to be a tiny insect at a first look.

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