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Editorial

Abiotic Factors and Insect Abundance

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Insect abundance and distribution are regulated by several biotic and abiotic factors and their interactions. Survival and thriving at extreme physical conditions require peculiar adaptations and plastic responses. Among abiotic factors, temperature and humidity stand out as the most important ones constraining abundance and distribution of insect. Furthermore, it is well documented that abiotic factors, especially temperature, regulate the ecology of insect communities.

The current issue explores part of the effects of abiotic factors on insect abundance and provides remarkable insights on the influence and the direction of the impact that abiotic factors have on insect populations. There is a great diversity of studies included that goes across several insect taxa and ecosystems reflecting the magnitude of the effects of the physical environment on insect populations.

Although effects of temperature on survival, development, and reproduction of insects have been exhaustively explored over several decades, there is still a lot of interest on how temperature and other abiotic factors set the limits of distribution and define abundance of insect species. The present special issue includes two studies reporting on the influence of temperature on species specific population dynamics and phenology. In their study regarding the impact of climatic factors on population dynamics of *Diaphania pulverulentalis*, a devastating leafroller for mulberry, V. K. Rahmathulla and colleagues demonstrate that the interaction of low temperatures with increased rainfall and subsequent humidity is correlated with increased infestation levels. Additionally, C. P. Bonsignore studied the effect of temperature on the phenology of the buprestid beetle *Capnodis tenebrionis* that poses a serious threat especially to organic cultivation of various *Prunus* species and develops a temperature driven model that explains the activity of *C. tenebrionis* in the field. Both studies provide important tools for understanding seasonal population dynamics and making pest management decisions.

There are two more studies that explore the influence of temperature on the development and survival of insects on marginal environmental conditions. E. Müller and E. Obermaier examined the effect of daily exposure to temperatures above the developmental threshold on *Galeruca tanaceti*. Average temperatures close to or below the developmental threshold retard development and in many cases increase mortality. Nevertheless, E. Müller and E. Obermaier showed that larvae of *G. tanaceti* are capable of exploiting the daily increase of temperature in early spring above the developmental threshold and exhibit increased developmental rates and survival. This enables them to take advantage of the nutritional rich food that is only available at that time ensuring the completion of development and successful pupation. On the other hand E. Penarrubia-Maria and colleagues explore the persistence of the Mediterranean fruit fly (medfly), *Ceratitis capitata*, in north-east (NE) Spain, in an area lying within the northern limits of its distribution. The study focuses on adult survival during the winter and demonstrates that both males and females were unable to withstand the freezing temperatures of the area and, therefore, to overwinter in NE Spain.

Modelling effects of temperature on insect development is another thoroughly explored and longstanding topic in insect biology. In this issue, P. Damos and M. Savopoulou-Soultani present an extended review on temperature-driven models for insect development, describing the strengths and weakness of the most commonly used ones. In recent years, there is an increasing emphasis on modelling that based on sophisticated software tools allows projections and predictions of potential distributions for insect species based on climatic suitability. The ecoclimatic matching model CLIMEX seems to be the most commonly used tool over the last few years. Olfert and colleagues using CLIMEX provide interesting data regarding the potential distribution of the invasive species *Sitona lineatus* in North America.

Abiotic factors, as it is pointed out above, regulate insect communities and are connected with several physiological and other peculiar adaptations and plastic responses. U. Irmler studied the Staphylinidae fauna in six different habitats of the Baltic Sea coast of Schleswig-Holstein (northern Germany). Vegetation and soil moisture were the most important factors affecting species composition. Results showed that such studies provide an important tool to assess the impact of anthropogenic activities on ecosystems. Accordingly, the abundance of selected species could be used as a bioindicator to monitor pollution in tropical freshwater ponds, as shown by A. Pal and colleagues. Another study by C. J. Bidau and colleagues reported on the influence of latitude and altitude on the body size in two grasshopper species. The contribution of arboreal ants in relation to the surrounding habitat to soil fertility was examined in tropical-derived savannah ecosystems by B. C. Echezona and colleagues.

Finally, M. Eizaquirre and A. A. Fantinou reviewed dormancy responses and voltinism of *Sesamia nonagrioides* in the Mediterranean region. Facultative diapause in response to daylength has been reported in populations of the cooler Mediterranean areas; however, no such response (diapause) is reported in African populations. Voltinism depends on diapause termination, while early emergence allows the accumulation of heat units before the prevailance of the critical photoperiod for diapause induction.

Overall the current special issue contains a diverse number of papers (both original research and review papers) that contribute towards a better understanding of the effects the "abiotic factors" have on "insect abundance" and it definitely adds an asset to the growing literature on the specific subject.

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