

EUROPEAN EXPERTISE IN RESEARCH ON THERMAL ADAPTATION

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General scope of the group's research: We are trying to understand the evolution of the thermal reaction norms for development in insects, mainly in the context of seasonal adaptations. Another general topic is the evolution of seasonal life cycles, diapause, colony and body size, mainly in social insects.

Topics & Questions: Inter- and intraspecific variation of thermal requirements for growth and development, seasonal life cycles, phenotypic plasticity, trade-offs, body size and temperature, proximate and ultimate causes of latitudinal patterns, influence of temperature on physiology, ecology, behaviour and distribution of insects.

Organisms: Primarily insects, particularly ants (e.g. *Myrmica*, *Lasius*, *Leptothorax*), the linden-bug *Pyrrhocoris apterus*, the blow-flies of the genus *Calliphora*, various carabid beetles and Lepidoptera.

Methods & Expertise we use: ecological and behavioural field and lab experiments, all-the-year-round recording of temperature in natural microhabitats, computerized temperature control in the lab, artificial selection and experimental evolution, statistical methods.

Methods & Expertise sought:

Methods for measuring metabolic energetics (e.g. respirometry) of small insects; comparative data on intraspecific (especially latitudinal) variation of thermal reaction norms for development in various ectotherms; data on the influence of body size on the development time.

3-5 Sample publications:

- Kipyatkov, V., E. Lopatina and A. Imamgaliev, 2005. Duration and thermal reaction norms of development are significantly different in winter and summer brood pupae of the ants *Myrmica rubra* Linnaeus, 1758 and *M. ruginodis* Nylander, 1846 (Hymenoptera, Formicidae). *Myrmecologische Nachrichten*, 7: 69-76.
- Kipyatkov, V.E. and E.B. Lopatina, 2002. Reaction norm in response to temperature may change to adapt rapid brood development to boreal and subarctic climates in *Myrmica* ants (Hymenoptera: Formicidae). *Eur. J. Entomol.*, 99: 197-208.
- Kipyatkov, V.E., E.B. Lopatina, A.A. Imamgaliev and L.A. Shirokova, 2004. Influence of temperature on the rearing of the first brood by founding queens of the ant *Lasius niger* L. (Hymenoptera, Formicidae): latitudinal variation of the reaction norm. [In Russian with English summary]. *Zhurn. Evol. Biokhim. Fisiol.*, 40: 134-141.
- Lopatina, E.B., S.V. Balashov and V.E. Kipyatkov, 2007. First demonstration of the influence of photoperiod on the thermal requirements for development in insects and in particular the linden-bug, *Pyrrhocoris apterus* (Heteroptera, Pyrrhocoridae). *Eur. J. Entomol.*, 104: 23-31.
- Lopatina, E.B., A.A. Imamgaliev and V.E. Kipyatkov, 2002. Latitudinal variation of duration and thermal lability of pupal development in three ant species of the genus *Myrmica* Latr. (Hymenoptera, Formicidae). [In Russian with English summary]. *Entomol. Obozr.*, 81: 265-275.