UNIVERSITY OF OXFORD
DEPARTMENT OF ZOOLOGY
Tinbergen Building, South Parks Road, Oxford OX1 3PS

Direct line: (01865) 281194
Facsimile: (01865) 271168
e-mail: tobias.uller@zoo.ox.ac.uk

Soil Temperature, Female Nest Site Choice and Establishment Success in Introduced Lizards

Applicant: Terézia Horváthová, Department of Zoology, Faculty of Natural Sciences, Comenius University in Bratislava

Host: Dr. Tobias Uller**,** Edward Grey Institute, Department of Zoology, University of Oxford

The purpose of the visit was to examine the role of nest temperature and population origin effect on different aspects of offspring fitness in wall lizards (*Podarcis muralis*) which might have important consequences for establishment success of this introduced species. The aims of this project were:

1. to examine the role of incubation temperature for developmental rate, hatching success and hatchling morphology
2. to quantify actual nest temperature in introduced populations using thermal loggers and assess to what extant female nest site choice may reduce the direct impact of climate on hatching success
3. to examine whether hybridization between different subspecies affect developmental rate, hatching success, and hatching morphology.

Part I. Consequences of incubation temperature for developmental rate, hatching success and hatchling morphology

We captured gravid females from eight populations in UK (20-30 females per population) approximately 10 days before egg laying and brought them to the laboratory in Oxford. Females were housed under standard conditions until oviposition. After female laid a first clutch, eggs were weighed immediately and clutch was split and assigned to two thermal regimes, constant 24°C and 19°C, representing high and low temperatures in natural nests in introduced populations (based on

data from 2010). The incubation period takes approximately 100-120 days for low temperature treatment and 50-60 days for high temperature treatment (based on data from 2010).

To link the rate of embryonic development with actual physiological process, we measured heart rates of embryos using infrared heart rate monitor (Buddy system, Avian Biotech; http://www.avianbiotech.com/buddy.htm). All eggs from 19°C treatment were measured approximately half-way through the total incubation length (50-60 days). The Buddy system works by shining an infrared beam onto the surface of the egg, detecting minute distortions cause by embryonic heart beats (detailed procedures in Du et al. 2009). Finally when offspring started to hatch, they were measured, weighed, sexed and scored for malformations.

Part II. Females nest site choice in introduced populations

To estimate actual nest temperatures we placed thermal loggers in soil at depth of 10cm in two populations (Jurassic coast and Somerset). Thermal loggers will be retrieved at the end of September and data will be used to compare it with available soil and air temperatures (data provided by the UK MetOffice).

Part III. Crosses between populations

Hybridization between genetically distinct lineages is common in introduced wall lizard populations. To examine the role of hybridization on developmental rate and hatching success, we conducted mating experiments using females from Part I. soon after they laid first clutch. Using a standardized method, each female was mated with either of two males; one male from the same subspecies or one male from the different subspecies. After laying second clutch, eggs were weighed and incubated as above. Offspring will be measured, sexed and scored for malformations upon hatching by Dr. Tobias Uller.

Because eggs will hatch after my research visit, data for completion of this project will be collected by Dr. Tobias Uller and analysed during my second visit in November. The data will be used to parameterise a mechanistic model to address the extent to which soil temperatures limit establishment success in introduced wall lizards and to what extent female nest site choice can buffer embryos from cool temperatures, thereby facilitating colonization of thermally challenging environments. Furthermore, we hope to be able to address whether admixture between different subspecies facilitate or reduce establishment success via its effects on embryonic development and survival.

Note: I did not include the expected travel expense for the second visit in the final report (170 €)