

PhD Thesis Acceptance Report
Institute of Environmental Sciences
Jagiellonian University

Candidate's name and surname: **Agnieszka Gudowska**

PhD Thesis Title: "Metabolic rate and respiratory patterns in ground beetles (Carabidae): the effect of feeding, temperature and parasites."

Thesis Supervisor: prof. dr hab. Jan Kozłowski

Assistant Supervisor / ~~Second Supervisor~~ / ~~Co-supervisor~~ (if applicable):.....

Dr Ulf Bauchinger

Reviewer: Dr Eran Gefen

THESIS EVALUATION

1. Scientific merit of the thesis

a. Originality of the research (25-200 words):

This study is original in its use of insect metabolic rates and respiratory patterns for addressing key topics in evolutionary physiology. The nature of temperature-dependence of metabolic rates, phylogenetic and statistical components of variation in mass scaling of metabolic rates, the adaptive value of intermittent gas exchange in insects, where a decades-old hypothesis is tested experimentally for the first time. The concluding chapter contributes to the currently limited available data concerning the metabolic cost of feeding in insects, and offers implications for foraging strategies.

b. Scientific merit of the chapters / articles (25-200 words):

I find the various hypothesis-driven chapters in this dissertation well-thought, planned, executed and generally thoroughly-discussed. A testimony for the sound scientific approaches used in this study is the publication of three chapters in international peer-reviewed journals, two of which in high-profile journals in the field of evolutionary and comparative physiology. The major contribution of the respective chapters is as follows:

- I. This chapter highlights the need for caution in interpreting mass-scaling of metabolic rates irrespective of confounding methodological effects, and supports the notion that there is no universal scaling exponent of metabolic rates.
- II. Challenging the theory of universal thermal dependence of metabolic rates, the candidate demonstrates that temperature effects on metabolic rate in insects depend on body size.
- III. This is the first ever experimental test of the strolling arthropod hypothesis for the evolution of discontinuous gas exchange in insects.
- IV. Very little is known on specific dynamic action in terrestrial arthropods, and this chapter presents valuable information on the cost of feeding and its consequences in terms of foraging strategies in unique environmental conditions.

2. Substantial merit of the thesis

The hypotheses and rationale for the suggested experimentation are well described in all four chapters. The statistical analysis of the data is sound, as is the discussion of the experimental data and its

possible implications. The methods employed and experimental setup are appropriate, but one caveat I found concerns the definition and ability to determine what constitutes a postabsorptive state in the research organisms. Could food withdrawal for 60% longer than the typical time interval between feeding events (chapter four) result in reduced metabolic rates, and thus overestimation of SDA? Moreover, In the first three chapters food withdrawal of >17h is employed (+12h where both night and day measurements are carried out) for interspecific comparison among species varying in an order of magnitude in body size. This uniform protocol for insects varying in body energy stores and rates of their use could have an effect on their nutritional state at time of measurements, and thus on measured MRs and in turn the employed gas exchange pattern. Determination of what would be a "postabsorptive state" across species is not trivial, and beyond the scope of this study, but a reference to this complexity would improve the discussion.

3. Layout and register

*(layout, register and the clarity of the language, the quality of the visual material etc.)
(25-200 words):*

The quality of the text and its visual presentation are satisfactory and up to standards of peer-reviewed journals. Naturally, the fourth chapter would require some editing before being accepted for publication. For example, there is redundancy in presenting the same data in both a table (without a heading; p. 49) and a figure (Fig. 2; p. 51). Moreover, the "time to SDA peak" data does not match between the two.

4. Critical notes

5. Final grade (justification 25-200 words):

I, hereby, declare that the reviewed PhD thesis by **Agnieszka Gudowska** meets the criteria pursuant to art. 13.1 of Act of 14 March 2003 on Academic Degrees and Academic Title and Title in the Arts (O.J. no 65 item 595 as amended) and request that the Council of the Institute of Environmental of Sciences of the Jagiellonian University accepts **Agnieszka Gudowska** for further stages of doctoral proceedings.

YES

I, hereby, request that the thesis is accepted with distinctions. Justification (25-200 words)

NO



17/1/2018

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date

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Reviewer's signature