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**Review of the habilitation application of dr. Sławomir Mitrus,
Samodzielna Katedra Biosystematyki , Uniwersytet Opolski**

General remarks

The recent scientific interests of Dr Mitrus are centred on the life history and ecology of ants. He finished his master studies in 1998 and achieved the PhD in 2003 with a thesis on the life history and conservation of the turtle *Emys orbicularis*. His supervisor was Prof. January Weiner from Jagiellonian University. Since 2005 he is a lecturer (adjunct) at the Chair of Biosystematics of Opole University. I have to say that I do not know Dr Mitrus personally. I did not contact the authorities of his University for additional background information. Therefore my opinion is solely based on the material sent to me and on common scientific data bases.

To date Dr Mitrus published 21 papers in international journals (Polish class A), 20 of them appeared after his PhD. His publications after PhD (joint impact = 19.7, 427 ministerial points) received a total of 70 citations (without self-citations, Scopus, retrieved 08.12.2017) resulting in a Hirsch index of five. Six international papers are part of the present application, in all of these papers Dr Mitrus is the first author. Apparent is the increase in scientific activity – and rising numbers of citations - during the last years. Unfortunately, publications in high ranking international journals are missing. This scientific output, the effective number of citations, and the H-index are within current standards for a Polish habilitation, although they are not outstanding but rather at the lower boundary. Importantly, his most cited paper from 2005 (24 citations) is linked to his PhD thesis.

Dr Mitrus achieved support by the German DAAD in 2009. He took part in Polish and international grants headed by German and Norwegian scientists. I was surprised that this internships and joint projects did not result in any international cooperation and respective publications. Dr Mitrus did also not head any grant financed by polish or international scientific agencies. Lack of heading a grant as principal investigator is a major drawback of this application.

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Scientific achievements

Papers associated with the application

A bundle of six papers on the ecology of ants, particularly *Temnothorax crassispinus*, forms the backbone of the present application. In all of them Dr Mitrus served as first and corresponding author, in five papers he is the single author. Two papers published in the Eur. J. Entomol. should be classified as short communications. The papers appeared between 2013 and 2017 in low and middle ranking impacted journals ($0.35 < IF < 1.77$) devoted to entomology. I missed higher ranking publications. Nevertheless the papers are interesting and surely contribute to our knowledge on ant social behaviour and evolutionary ecology. They form a cluster of thematically related studies clarifying elements of a coherent scientific problem. Such a form is required by the current legal regulations regarding scientific degrees and titles.

The application contains a typical professional summary that highlights the major achievements. It is not intended as a standalone publication or review. The structure of the professional summary is appropriate, has a clear logic, and shows the scientific development of dr. Mitrus. A major result of his studies regards the trade-off between high mortality due to surface hibernations and the gains associated to early resource acquisition. Possibly interspecific competition is a major driver in this system. The ability to find and to compare nesting sites according to physical characteristics points to a sufficiently developed level of perception and cognitive abilities.

It is not my task to review the papers again as this has already be done by the journal referees and the respective editors. Acceptance means that they are in line with the standards of international science. My duty is to assess whether the quality of these papers matches the current standards for a successful Polish habilitation application. I think they do, although the application covers a rather narrow field and is at most middle ranking. I have one point that I want to mention as I don't understand this. In Fig. 1 of Mitrus (2015, Entomol. Fennica) the number of ants after overwintering exceeds in many cases the initial number. How can this happen? The text is silent about this.

First of all the papers form a clearly defined package of thematically related publications centred around a common leitmotiv, the life history of the myrmicine ant *Temnothorax crassispinus*. Being common in Central Europe these ants are unusual under several aspects. Their colonies are very small, they hibernate near the soil and not underground, and they show nest emigration behaviour and uniting of different colonies before winter. Dr Mitrus identified several open questions regarding the social behaviour of these ants, particularly related to hibernation, survival rates, and nest choice. He showed that survival rates of larger (joint) colonies exceed those of smaller colonies by this explaining the unusual hibernation behaviour. He also showed that the high costs of hibernating near ground are counterbalanced by the opportunity for early colony development and possibly by the strong competition for nesting places. Possibly these ants are active drivers of plant seed distribution and thus might influence local plant community structure. Having also worked on hymenopteran sociobiology I was surprised by the finding that environmental stress was not linked to an excess of males. I think this line of study deserves further interest. Overall the achievements justify emphasis and might back a habilitation application.

A positive aspect of the present application regards the experimental approaches including the formation of an own lab with appropriate equipment and techniques. Lab building should ideally be associated with a habilitation as this shows that a scientist is becoming unassisted.

Other scientific achievements and activities

Beside the papers associated with the formal achievement, dr Mitrus published another 21 papers in international and national scientific journals. These contain work on various aspects of evolutionary ecology and life history, but also on molecular ecology. Additionally, he published one monograph on *Emys orbicularis* turtles (in Polish) and a number of articles in popular science. The spectrum of subjects demonstrates the wider interests of dr Mitrus within the general research direction centred on reproduction ecology and survival. Visible is also that he struggled to find an appropriate habilitation subject. A weak point again is the lack of international cooperation. A strong point is the well-filled methodological toolbox, including experimental, statistical, and molecular tools. These methods allow for further scientific development.

Dr Mitrus regularly attends national and international scientific conferences and is member of the *International Union for the Study of Social Insects*. 24 reviews for international journals (unfortunately he does not mention titles) is appropriate.

Interestingly, the professional summary contains an outlook. The idea to study nest individuality is really interesting. I think this is a new and promising research field triggered by a current paper in Science reporting on ant individuality and by a study on collective behaviour of *Temnothorax nylanderi* ants. This direction opens the door for higher ranking papers in evolutionary ecology.

Education and administration

The educational and administration activities of Dr Mitrus do not raise doubts. He provides a number of course and lectures, figures as a promotor in master theses and is member of a number of faculty commissions. He contributes to the popularization of science taking part in popular scientific events. These activities do not deviate from current standards. I wish to highlight his activity in nature conservation, testified by environmental assessments related to Natura 2000 habitats and by his membership in the regional conservation commission of the city of Opole.

Conclusion

My final conclusion has to weight the scientific, educational, and administrative activities of Dr Mitrus. The educational, and administrative activities do not raise doubts as they are within the normal duties of academic teachers. The habilitation is a scientific degree and thus the scientific activities and achievements are of major importance. In this respect the application of dr Mitrus fulfills current standards. Despite of deficits in scientific networking and grant acquisition, the results obtained by dr Mitrus deserve acknowledgment. He has a comparably strong methodological background. Within the narrow field of ant autecology and sociobiology he is a well recognised scientist. His bibliometric records are appropriate and the experimental approaches promising. I encourage him to widen his perspective towards evolutionary and molecular ecology.

Therefore, my final verdict is positive. In the light of my evaluation, I think that this is an application within current standards. Dr Mitrus fulfills the requirements defined by art. 2, 4, 21A, 25, and 26 on scientific degrees and titles of the Polish law from 2003 (changed by Dz. U. 2016, pos. 882, 1311). I support his application to obtain the habilitation degree in the field of Biology.

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Werner Ulrich