University of Hradec Kralove, Faculty of Science, Department of Biology

OPPOSER STATEMENT TO THE DOCTORAL THESIS

Spatial and temporal variation of UV reflectance in relation to environmental factors in genus *Pieris* and *Colias*

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Insect vision is very specific in many aspects. First, the compound eye allows the insects to see the objects and movements in a different way than the chamber eye of arthropods, and many groups of insects can detect UV light. The detection of UV light is important for insects, both in intraspecific and interspecific communication.

This thesis is focused into all aspects of UV light detection and importance of UV light among animals. The first part is compiled as a review on this topic. On 70 pages, the topics as UV reflectance, UV visual systems in organisms and methodology of studies of UV reflectance are discussed. This part is very well written and brings a comprehensive overview on the topic.

The author studied especially the variation of UV reflectance within one species of butterfly (mainly species of the genera *Pieris*, *Colias* and *Gonepteryx* of the family Pieridae and also in *Araschnia levana* of the family Nymphalidae) in relation to the environmental factors. Second part is compiled from six published papers. David Stella is the first author of three of them. Four of the papers are in quite high-ranked journals with IF, two other in journals without IF. One of these two papers is the abstract of the poster, which was awarded by the student's award in the conference Zoologické dny. The papers were reviewed by experienced reviewers and thus it is not necessary to evaluate their scientific quality. Publishing in journals of high quality is the best evaluation.

Here are some questions and suggestions:

1) All papers evaluate the environmental factors connected with UV reflectance intraspecifically - only within one species. Especially in third paper (Stella et al. 2018: Environmental Entomology) would be good to evaluate the species one another. Have the authors found and analysed changes in UV reflectance in connection with longitude or altitude, habitat type or other environmental factors? Can we say, e.g., that species occurring near the equator show larger parts of wings with UV reflectance?

2) In most cases, lighter parts of wings show higher UV reflectance than the darker. Do you know any example of the opposite situation?

3) Most species of bees cannot see red colour. In bees and wasps, red and black colouration is behind yellow and black colouration the most-used aposematic pattern. However, some cuckoo bees (nest parasites of other solitary bees) are aposematic by reddish parts of the body, but if we put their photos into the grayscale, their colouration is very similar to the colouration of their hosts. This fact is usually explained in that way that the parasite resembles its host in the general appearance but uses red colour for its potential predators as an aposematic pattern. Would it be possible to test it and have you ever read something about the UV reflectance in bees and wasps?

4) What about the metallic colouration of scarabaeid or carabid beetles, or of blue butterflies (Lycaenidae) or *Apatura*? Do the metallic body parts of these insects also reflect the UV?

Final evaluation: The Ph.D. thesis of David Stella is very good both in language and in scientific value. The author is able to do scientific research, work as the main leader of a research topic and also as a member of scientific team. His publications are of high scientific quality. Last but not least, he has chosen a very interesting topic, where is a lot of to study. After successful defence of his doctoral thesis, I agree that he can get the scientific title Ph.D., and wish him all the best in the following scientific career.

Hradec Králové, 14th October 2020 Assoc. Prof. Petr Bogusch, Ph.D.