

Importance of color in dangerous prey recognition in great tits

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Introduction

The color is one of the most important parts of the warning signal of the aposematic insects. Yellow and red are colors usually considered as warning. We tried to observe the warning function of other colors (orange, white, blue, violet and green) connected to a black pattern of an aposematic insect - the red firebug (*Pyrrhocoris apterus*). We used black color without pattern as a control.

Aims of the study

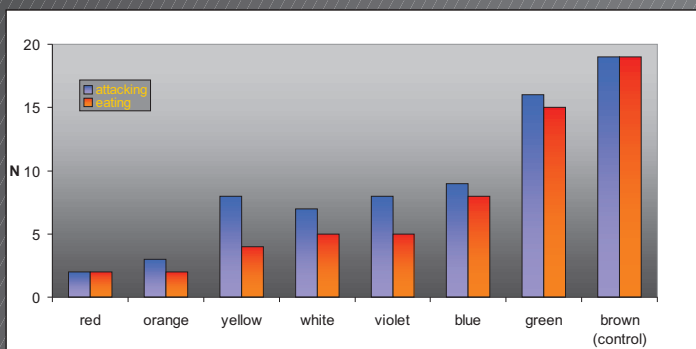
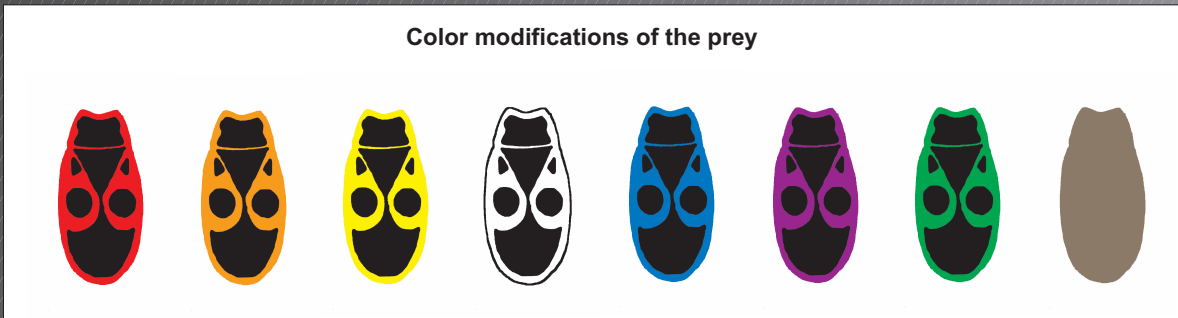
1. observe how the great tit (*Parus major*) senses colors which
 - a) are common as warning signal in the nature (yellow, red, orange)
 - b) are scarce in the nature (blue, violet)
 - c) are common as cryptic signal in the nature (green)
2. observe how is the reaction of great tits affected by the presence of the black pattern of the red firebug
3. observe potential importance of other optical signals like the body shape or way of moving

Methods

Predator species: great tit (*Parus major*), in the wild caught adult birds with presumed experience with the red firebug

Prey species: the second larval instar of the Guyana spotted roach (*Blaptica dubia*) carrying the paper sticker with colour pattern, this prey possesses no repellent chemical signals and is similar in size to the red firebug but differs a little in the general appearance and way of moving

Color modifications of the prey



Numbers of great tits attacking and eating roaches carrying particular sticker colors
Significantly affected by the color of the sticker (Analysis of Variance: attacking: $F_{160,7}=31.4$, $p=0.000052$; eating: $F_{160,7}=35.9$, $p=0.000008$)

Conclusions

- all color modifications except the green were considered warning by the great tit (they were attacked significantly less often than the brown control)
- therefore even the in the nature rare colors like blue or violet can suffice the aposematic signal
- the protective function is strongest in the case of red and orange, which are colors naturally occurring in the coloration of the red firebug
- no protective meaning of the green sticker shows relatively low warning significance of the firebug pattern *per se*
- as numbers of birds attacking red, orange, yellow and white colored roaches is practically equal as in the study with equally colored mutants of the red firebug (Exnerová et al. 2006, Biol J Lin Soc 88: 143-153), we may presume there is no other optical signal important in the protection of the red firebug. The warning coloration (the red color better than the black pattern) is the best working warning signal of the red firebug

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