

Passerine birds' ability to recognize warning signal and Batesian mimicry



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Introduction

Batesian mimicry is well known phenomenon where harmless organism looks like a venomous or unpalatable organism usually by producing a similar warning colouration and pattern. Batesian mimic is protected against predators as the result of such similarity. It has been already discovered that predator's answer to warning signal of red firebug (*Pyrhocoris apterus*) differs according to bird species (Exnerová *et al.* 2003) and its previous food experience also (Vesely and Fuchs 2009).

In present study: Firstly, reactions of four passerine predators to artificial Batesian mimic of the red firebug were studied in laboratory tests. Secondly, effect of previous food experience on protection level of Batesian mimic was tested in context of birds' prior diet containing/not containing non-conspicuous form of that Batesian mimic.



Material and methods

Experimental predators: great tit (*Parus major*), blue tit (*Cyanistes caeruleus*), robin (*Erithacus rubecula*), and black redstart (*Phoenicurus phoenicurus*), all adults caught with a mist net

Aposematic model of prey: red firebug (*Pyrhocoris apterus*)

Experimental prey – Batesian mimic: second larval instar of Guyana spotted roach (*Blattella dubia*) carrying a paper sticker with pattern of red firebug on its back

Control prey: second larval instar of Guyana spotted roach carrying a paper sticker with pattern of Guyana spotted roach on its back

Previous food experience of predators: mealworms x Guyana spotted roaches



We presumed all tested birds had encountered red firebug before. One half of the birds of each species was fed by Guyana spotted roaches before the experiment. The second half of the birds was fed only by mealworms. Thus, we got two different types of food experience, which were later combined with two types of experimental prey offered (Fig. 1). Ten birds of each species were tested in every category.

Statistics: GLM (logit-link function, binomial data), Tukey HSD post hoc test







Birds' food experience	Sticker of prey
mealworm 	roach 
	firebug 
Guyana spotted roach 	roach 
	firebug 

Figure 1. Types of experiments according to food experience of bird and sticker of prey.

Results

- Great tits and robins attacked the prey with firebug-sticker more often than the prey with roach-sticker (great tit $p = 0,0530$, robin $p = 0,0033$; Fig. 2). Blue tits and black redstarts attacked the prey with firebug-sticker as often as the prey with roach-sticker (blue tit $p = 0,9880$, black redstart $p = 0,9999$; Fig. 2).
- Birds which had previous food experience with mealworms attacked the prey with firebug-sticker less frequently than the prey with roach-sticker ($p < 0,0001$; Fig. 3). Birds which had previous food experience with roaches attacked both the prey with firebug-sticker and the prey with roach-sticker at the same frequency ($p = 0,9265$; Fig. 3).

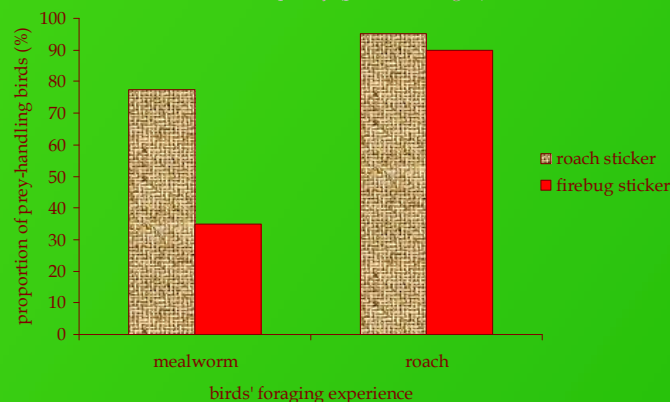


Figure 3. Proportion of birds that handled at least one out of five prey offered - previous food experience - sticker type relation (N = 40).

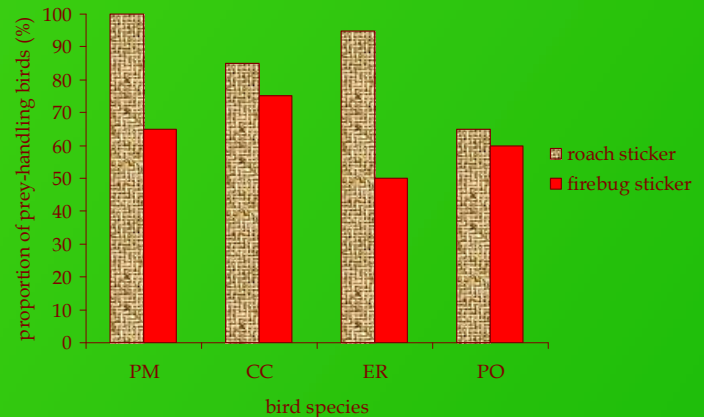


Figure 2. Proportion of birds that handled at least one out of five prey offered - bird species - sticker type relation (PM - great tit, CC - blue tit, ER - robin, PO - black redstart; N = 20).

Conclusions

Passerine birds differed in their reactions to the warning signal of artificial Batesian mimic. Great tits and robins recognized firebug pattern as warning signal and refused it, whereas blue tits and black redstarts did not distinguish between Batesian mimic and its non-conspicuous form. Two explanations are possible for blue tits and black redstarts: red firebug's pattern is not such a strong warning signal for them (case of black redstart, we suppose), or the birds are able to reveal the truth about Batesian mimic's nature (case of blue tit).

All tested species attacked Batesian mimic more willingly, when they had experienced its non-conspicuous form previously. We presume that birds, thanks to the experience with roaches, created "search-image" of prey (Bond and Kamil 2002). Experimental Batesian mimic was then compared with that "search-image" and attacked on the basis of sufficient similarity.



Literature cited

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