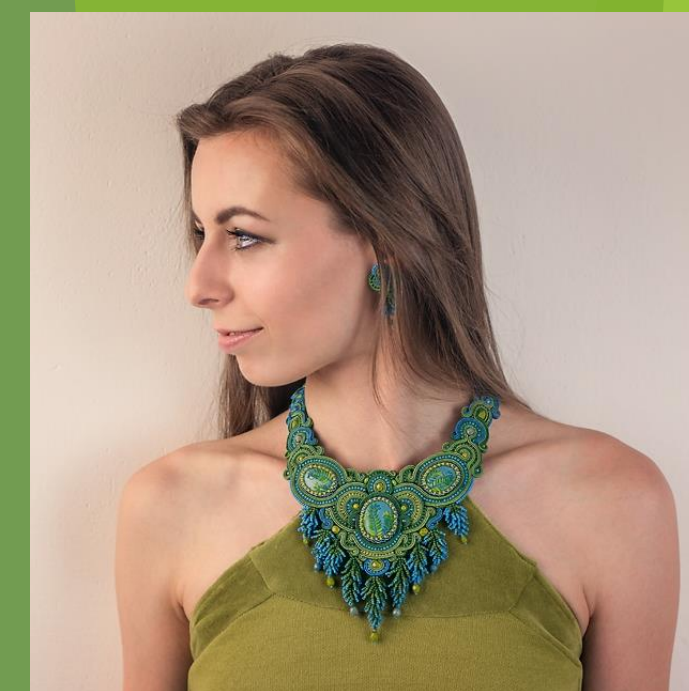




Colour pattern does not play a key role in forming a mimetic complex of red-and-black insects. Experiments with naive and adult great tits

Tereza Drábková, Petr Veselý, Roman Fuchs



Introduction

- Aposematic animals use multimodal warning signals to advertise their unprofitability to predators. A colour pattern together with chemical signals seems to be the most important clues.
- Adult great tits (*Parus major*) avoid red-and-black insects (Dolenská et al. 2009; Hotová et al. 2010). Birds differ in the innateness of aversion towards different prey (Exnerová et al. 2007).
- To erase other possible clues for visual identification of a real insect individual like its body posture and shape of legs and antennae (Veselý and Fuchs 2008; Dolenská et al. 2009), colour patterns were transferred on Guyana spotted roach using paper stickers.
- Are there differences in reactions of adult and naive birds to individual patterns of red-and-black insects?

Methods

- Seven colour patterns representing these species: seven-spotted ladybird *Coccinella septempunctata*¹, froghopper *Cercopis vulnerata*², striated shield bug *Graphosoma lineatum*³, *Corizus hyoscyami*⁴, black-and-red-bug *Lygaeus equestris*⁵, red firebug *Pyrrhocoris apterus*⁶, and *Tropidothorax leucopterus*⁷, were tested.



- Patterns were printed on paper stickers and then placed on palatable prey (Guyana spotted roach *Blaptica dubia*) to test and compare reactions of wild-caught and naive great tits that were used as predators in this study.

Conclusion

- The attack rate of wild-caught great tits was in general lower than the attack rate of naive birds. Naive birds without any former experience with the prey mostly attacked in all five trials with no difference amongst the patterns. Their latency to attack was lower as well.
- Concerning the wild-caught tits, colour pattern *Pyrrhocoris* was the most protected, and also the latency to attack this pattern was the highest. Colour pattern *Corizus* was the second best protected. Partially protected colour patterns were patterns *Tropidothorax*, *Coccinella*, and *Graphosoma*.
- Great tits showed no innate aversion to any of our colour patterns. Innate aversion of great tits to the real insect individuals of the seven-spotted ladybird is known (Dolenská et al. 2009), nevertheless, the colour pattern *Coccinella* itself does not protect the palatable prey from attacks of naive great tits.
- Wild-caught great tits show partial aversion to some colour patterns, but the reactions among individuals differ greatly. In general, the importance of bird's individual experience and the ability to generalise matter the most, since the best protected pattern belongs to the most common species *Pyrrhocoris apterus*, while the second best protected pattern *Corizus* is very similar to the pattern *Pyrrhocoris*.
- The rest of patterns was not recognised by birds at first sight which led to closer examination where birds were able to find the edible roach underneath the sticker. This could be caused by the lack of other visual clues like the typical body shape.

References

- Dolenská et al. 2009: What constitutes optical warning signals of ladybirds (Coleoptera: Coccinellidae) towards bird predators: colour, pattern or general look?, *Biological Journal of the Linnean Society*, 98, 234–242.
- Exnerová et al. 2007: Avoidance of aposematic prey in European tits (Paridae): learned or innate?, *BEHAVIORAL ECOLOGY*, 18, 148–156.
- Hotová et al. 2010: Predator dependent mimetic complexes: Do passerine birds avoid Central European red-and-black Heteroptera?, *Eur. J. Entomol.*, 107, 349–355.
- Veselý and Fuchs 2008: Newly emerged Batesian mimicry protects only unfamiliar prey, *EVOLUTIONARY ECOLOGY*, 23, 919–929.

Financial support: Studentská Grantová Agentura PŘF JU.

Results

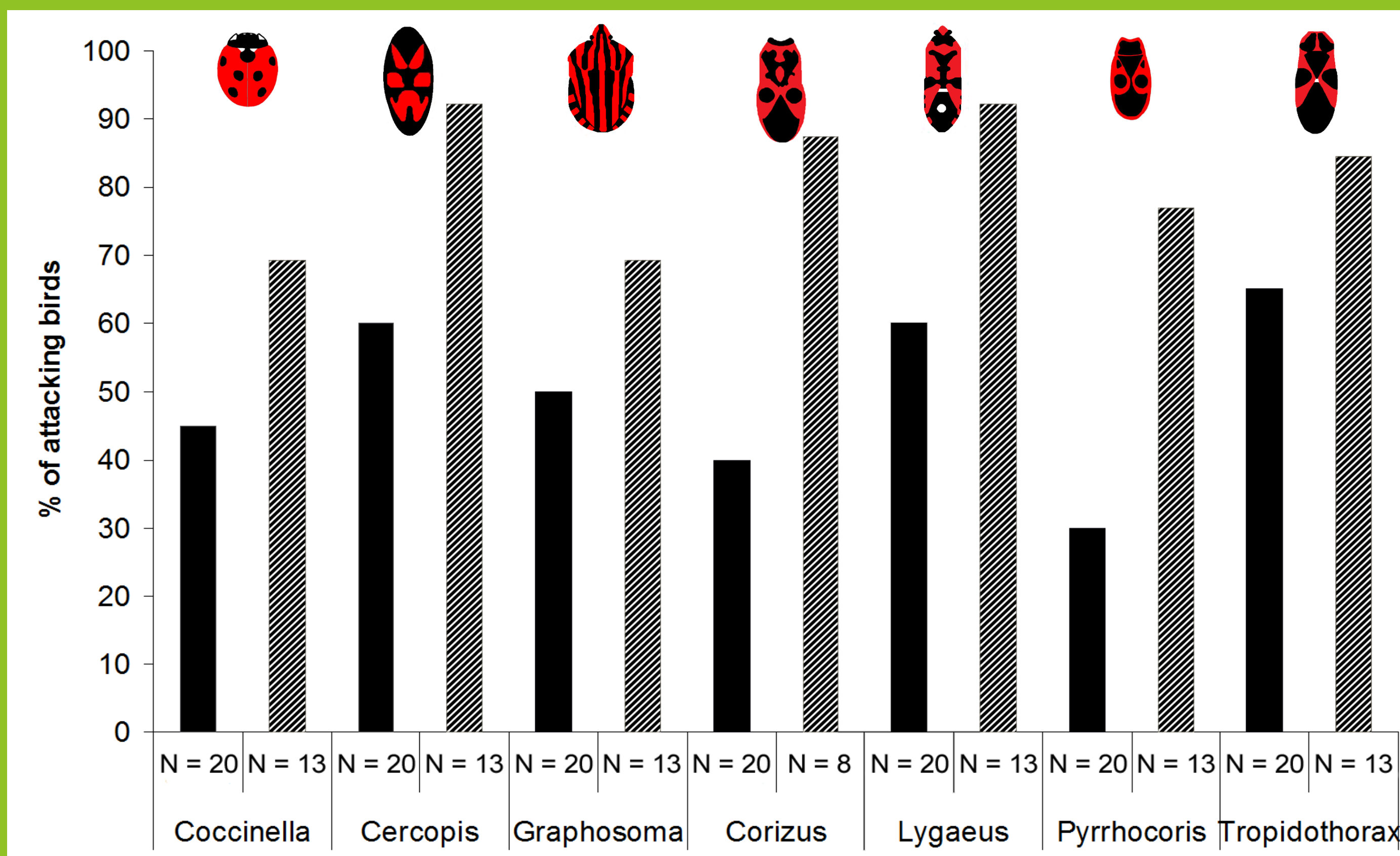


Figure 1: Comparison of attack rates to individual patterns within wild-caught (adult, N = 20) and hand-reared (naive) birds in the first trial.

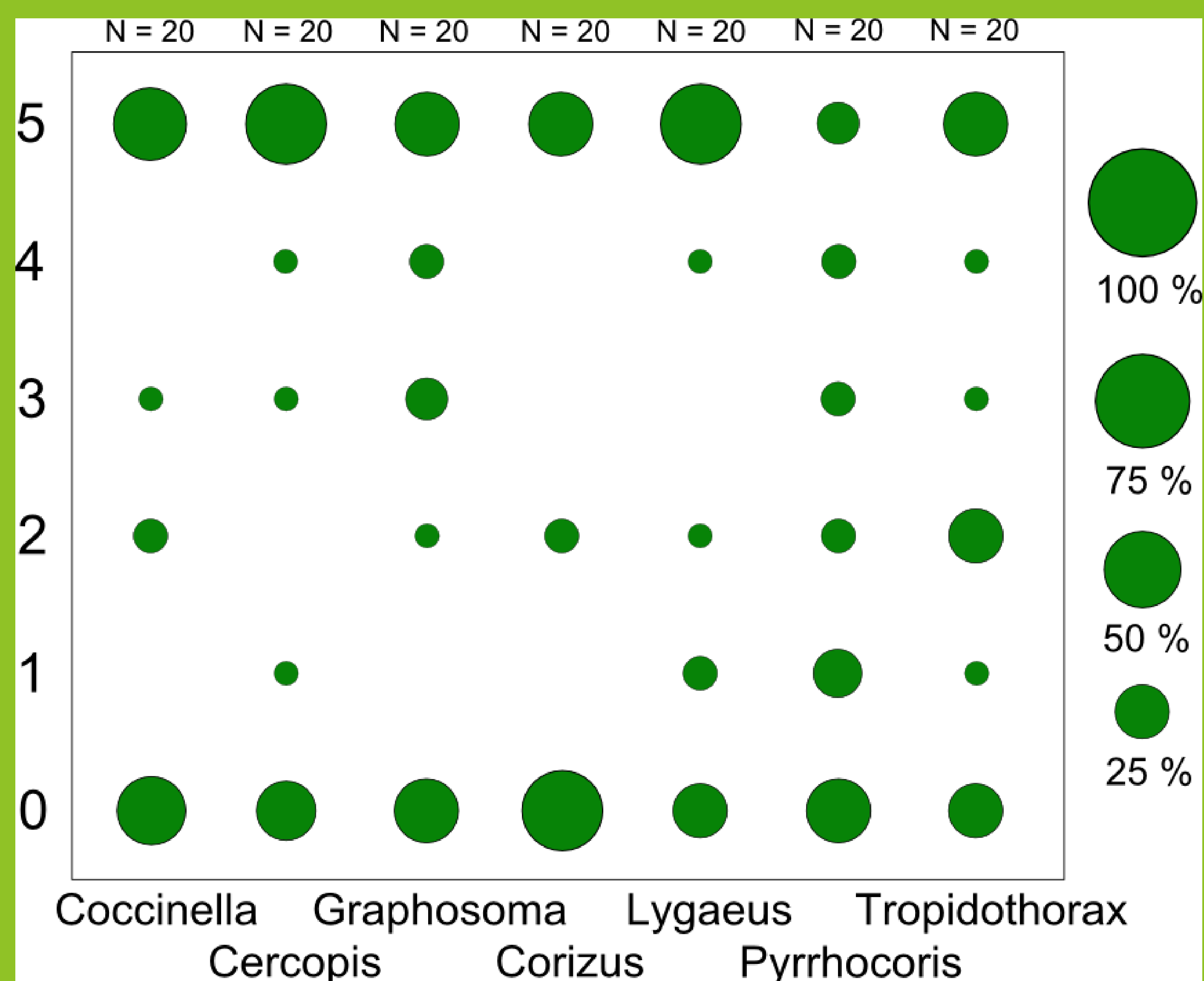


Figure 2: Number of prey attacked by wild-caught birds (0 – no attack, minimum; 5 – five attacks, maximum). Size of a circle indicates how many birds attacked that number of prey; the bigger the circle, the more birds attacked the particular number of prey.

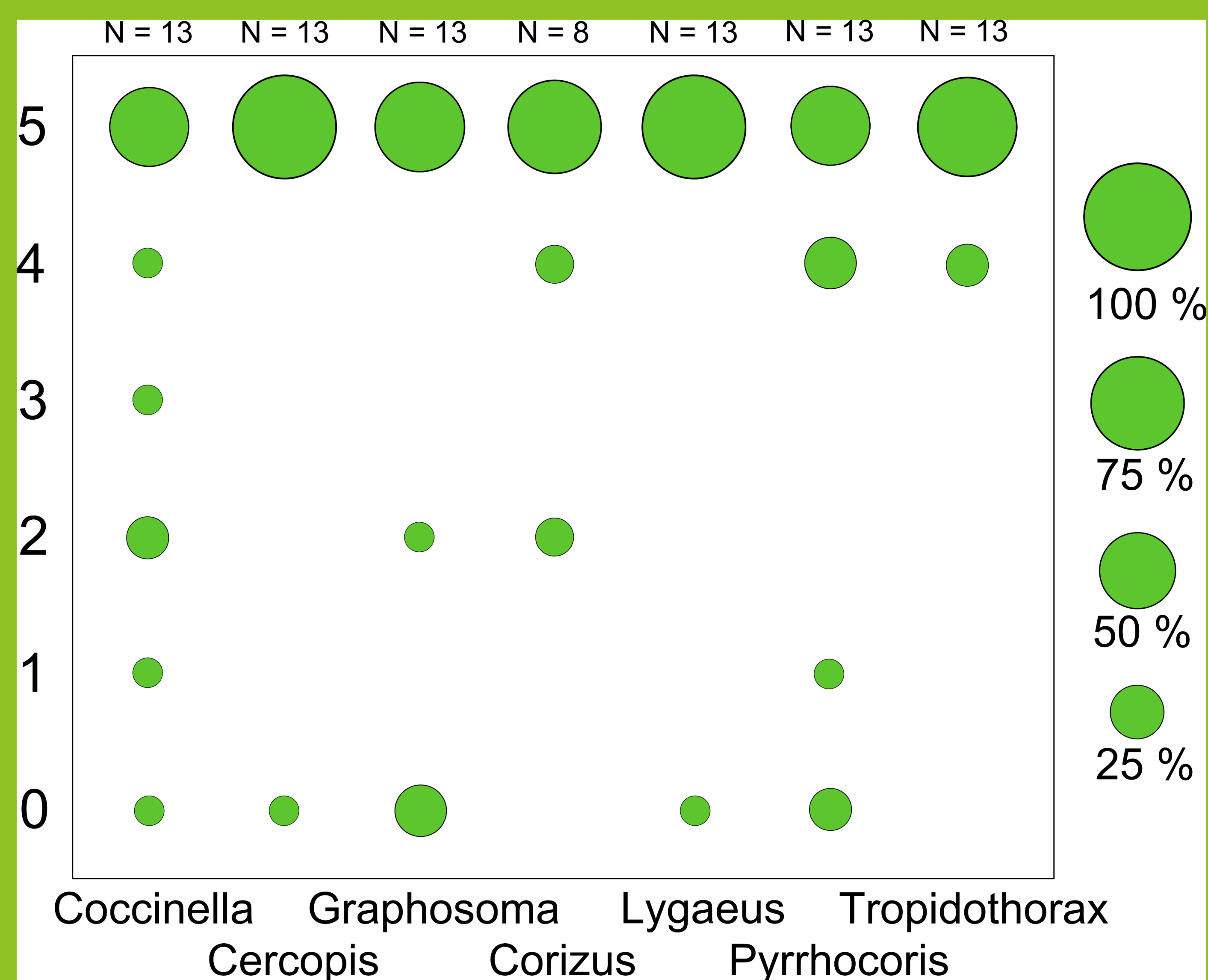


Figure 3: Number of prey attacked by naive birds (0 – no attack, minimum; 5 – five attacks, maximum). Size of the circle indicates how many birds attacked that number of prey; the bigger the circle, the more birds attacked the particular number of prey.