COLOURFUL MISUNDERSTANDING

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Contents: The present paper has been based on the paper of Susan M. Smith and Alison M. Mostrom, "Coral Snake" Rings: Are they helpful in foraging?" from the journal Copeia 1985 (2), pp. 384-387.

INTRODUCTION

Smith and Mostrom studied the genera *Micrurus* (Coral Snakes) and *Lampropeltis* (King Snakes). Several species of these genera have a characteristic pattern of differently coloured rings, often in the colours red, yellow, white and black. In fact, quite conspicuous colours to the human eye. Several theories have been proposed which try to explain the evolution and the sense of this colour pattern.

CAMOUFLAGE VERSUS MIMICRY

According to one of these theories, the brightly coloured rings would provide camouflage to the snake. This would be particularly the case when the snake is immobile. The contrastingly coloured bands would disrupt the outer contours and thereby produce a sillhouette which does not resemble a snake. Thus, the snake might remain unnoticed by potential predators. Upon being noticed, the snake hurries away. By moving now, the snake changes into a differently coloured subject (the differently coloured rings appear to become lost and mingle to a new colour). This would evoke

some surprise in the predator and this might result in a delay in its reaction. The snake might benefit from the slightest hesitation and may be able to escape. Camouflage alone is not sufficient to explain the banded pattern in the genus *Lampropeltis*. With this genus, a relation has been shown to exist between the colour pattern and the proximity to the area in which coral snakes (*Micrurus*) live. The colour patterns of the *Lampropeltis* species become more varied with increasing distances. Close to and within the coral snake area the banded pattern prevails. Apparently, specimen that are sympatric (= occur within the same area) with coral snakes do have better chances of surviving if they have a ring pattern, as compared to specimen without such a ring pattern. This implies the mechanism of mimicry (= the imitation of another species in order to benefit oneself).
The question now is: who mimics who? Three groups of banded snakes exist: the very venomous coral snakes; the less venomous species of for instance the genus *Erythrolamprus* and the non-venomous species such as those of the genus *Lampropeltis*.
Several investigators state that the highly venomous snakes are being mimiced. This is unlikely, however. When a predator catches such a highly venomous snake and happens to be bitten, it is very likely to die. This makes the time of learning very short. It is more satisfactory if the predator undergoes an awful experience upon attacking a venomous snake. It should be so unpleasant that, whilst the predator stays alive, it will never again feel apetite for that kind of snake. Only in such a case does it become advantageous to be a similarly banded snake, because the chance of being attacked

than decreases. This is exactly what happens after consumption of the less venomous *Erythrolampus* species. These are venomous enough to be awful to the predator, but not so that the predator will die as a result. Such a predator will no longer eat banded snakes. This makes it likely that both the highly venomous and the non-venomous species mimic the weakly toxic species.

ADVANTAGE WHILE FORAGING

A third hypothesis has been studied by the authors of the original paper. This hypothesis does not postulate that the snake gets eaten, but instead that it is an active hunter itself, which, owing to its specific banded pattern, might be more successful while foraging, particularly while plundering birds nests.
This hypothesis proposes that the snakes react to the intensity of the alarm behaviour that the birds display when they notice a snake. The closer the snake approaches the nest, the more furiously the birds behave. The snake might deduce from this response, whether it is getting closer to the nest (increase of the alarm respone) or further away from the nest (decreasing alarm).
A snake that is very conspicuous will be noticed earlier by breeding birds. The birds will display their alarm sooner and the snake is guided by this.
Thus, a conspicuously coloured snake discovers birds nests more rapidly and this might constitute an advantage over less conspicuous snakes.

THE EXPERIMENT

The hypothesis has been tested in the field. In the breeding season, the investigators have studied the alarm response of breeding birds to the presence of snakes. They used plastic models of snakes; either brown unbanded or coloured banded models. They studied the alarm response of robins, which are known for their ability of colour discrimination. Not only was the effect of the two colour patterns was studied but also the effect of a snake's distance from the nest (up to 1.2 meters) as well as the effect of its movements.

RESULTS

In order that a snake should have a greater foraging success because of its bright colours, it should elicit an alarm response from the birds while it is further away than 1.2 meters. At a shorter distance the snake is able to discover the nest anyway by using its vision and smell. However, at this distance, there was hardly any alarm response. In addition, no difference in response was found to either the brown, unbanded or the brightly coloured, banded model of the snake.
The authors conclude that the banded colour pattern does not provide an advantage to the snake while foraging. The two other hypotheses (camouflage and mimicry) seem more likely.

Foto 1: *Lampropeltis triangulum elapsoides.*
Foto C.A.P. van Riel.

Foto 2: *Micrurus ibiboboca*, juvenile.
Foto A. Abuys.

LITERATURE

In case you wish to read more about mimicry among coral snakes, you may find the following survey of literature useful:

Brattstrom, B.H., 1955. The coral snake "mimic" problem and protective coloration.
Evolution 9: 217-219.

Greene, H.W. and R.W. McDiarmid, 1981. Coral snake mimicri: does it occur?
Science 213: 1207-1212.

Grobman, A.B., 1978. An alternative solution to the coral snake mimic problem.
J. Herpetol. 12: 1-12.

Hecht, M.K. and Marien, 1956. The coral snake mimic problem: a reinterpretation.
J. Morphol. 98: 335-336.

Smith, N.G., 1969. Avian predation of coral snakes.
Copeia 1969: 402-404.