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The Defensive Reaction of Rheas (*Rhea americana*) to a Rattlesnake Signal

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Behavioral categories (avoidance, indifference, curiosity and no reaction) of five captive rheas (*Rhea americana*) - at the Sabiá's Zoo in Uberlândia, Minas Gerais, Brazil - were recorded during the playback of the sound of a rattlesnake (*Crotalus durissus collineatus*) and during the playing of countrol sounds. Rheas displayed significantly more avoidant responses to the rattlesnake sound than to the control ones. Results suggest that rheas can identify rattles as danger signals and that this recognition may be unlearned.

Index terms: Defensive behavior. Rattlesnakes. Rheas. *Rhea americana.*

Resposta defensiva de emas (*Rhea americana*) ao som do guizo da cascavel. Respostas (esquiva, indiferença, curiosidade e sem reação) de cinco emas (*Rhea americana*) cativas – no Zoológico do Parque do Sabiá em Uberlândia, Minas Gerais – foram registradas durante a apresentação do som do guizo de uma cascavel (*Crotalus durissus collineatus*) e de sons de controle. As emas emitiram significativamente mais respostas de esquiva diante do som do guizo do que diante dos sons de controle. Os resultados sugerem que emas indentificam o som do guizo da cascavel como sinal de perigo e que este reconhecimento pode ser inato.

Descritores: Comportamento defensivo. Cascavéis. Emas. *Rhea americana.*

Our interest in this study was to observe captive rheas' defensive reactions to rattlesnake sounds and to ascertain if such reactions might occur without previous experience. Rheas co-evolved with rattlesnakes in Brazilian savannas and it might be inferred that there are species-specific, unlearned, defensive reactions of rheas to the rattlesnake sounds. Rattlesnakes are a monophyletic group characterized by rattles, which are epidermal derived caudal structures associated with specialized shakes muscles (Greene, 1988; Martin & Bagby, 1972, 1973 cited by Fenton & Licht, 1990). These poisonous reptiles shake their rattle whenever they are intimidated, as an warning signal. The rattling of a snake quickly attracts attention and has been identified as a "deimatic" display, designed to frighten the signal receiver (Edmunds, 1974 cited by Fenton & Licht, 1990) and as an aposematic one to avoid that big animals stepping on it (Fenton & Licht, 1990). This sign is so relevant that it is mimicked by the field owl (*Speotyto cunicularia*) to drive away enemies (Rowe, Coss, & Owings, 1986).

We recorded the sound emitted by a rattlesnake *Crotalus durissus collineatus* with a Panasonic RQ-L30, at the Reptiles Management Sector of the Federal University of Uberlândia (UFU). Two loudspeakers distant 20 m from each other were placed on the ground, hidden by natural shrubs, inside the cage of rheas (20 x 60 m) at the Sabiá's Zoo of Uberlândia – MG. One of such loudspeakers played the tape recording of the rattle sound and the other played a recording of telephone ring. Observers

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and sound apparatus controls remained twenty meters away from the cage.

The behavior of 5 rheas was observed from 9 am to 5 pm, during 5 days. Whenever one of them approached and entered a virtual circle, two meters diameter, around the site of one of the loudspeakers, we played the artificial rattle sound (or the controle sound) and recorded the rhea's reaction. Reactions observed were: *avoidance* (the rhea reacted to the sound leaving immediately the virtual circle without getting closer to the loudspeaker); *indifference* (the rhea gave signs of noticing the sound but didn't modify its foraging behavior); *curiosity* (the rhea looked for the source of the sound without leaving the virtual circle); *no reaction* (the rhea did not reacts to sound onset). Acoustic signals (rattlesnake or control) were not played again if an animal approached the same loudspeaker shortly after a stimulation. Each rhea was tested approximately 4 time a day.

Rheas were exposed 55 times to the rattle sound and 40 times to the control sound. Rheas avoided significantly more the rattle (n = 28; 50,1%) than the sound (n = 9; 21,9%; Fisher Test, $p < 0,01$). Relative frequency of indifference (rattle: 25.4%; control: 30%), curiosity (rattle: 12.7%; control: 27.7%) and no-reaction (rattle: 10.9%; control: 20%) was somewhat higher in the control condition but the difference was not significant ($c^2 = 1.05$, $p > 0.05$).

Rheas defensive behavior (they defend their nests by stretching their neck on the floor, and hissing like a snake, in a frightening attitude, Sick, 1984) may well have evolved, in part, in response to snakes signals. Rheas response to rattles is not an exception in birds behavior. Other species which co-evolved with rattlesnakes or other dangerous snakes also show defensive adaptations. Hand-raised great kiskadees and turquoise-browed motmots are, for instance, frightened by sticks painted with black, red, and yellow bands to look like coral snakes (Smith, 1975, 1977). The same kind of evolution of sign-stimuli predator perception may have occurred in the case of rheas and rattlesnakes sounds.

Rheas' defensive behavior may be interpreted as a learned, associative reaction dependent on previous pairings of sound and contact with snakes. This interpretation does not seem to be valid since the rheas we observed were born in captivity and had no previous contacts with rattlesnakes. Association of defensive behavior with other sounds, present in the zoo, may of course have generalized to the rattle sound, but this hypothesis is difficult to test. It seems more likely that rheas have an unlearned discrimination of the specific features of rattlesnakes sounds - as honest signals – and that defensive tendencies to such signals are somewhat stronger than avoidance simply elicited by novel sounds (there are indications that novel, non-warning stimuli may generate aversions in predators, Jetz, Rowe, & Guilford, 2001).

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