

DO RUFOUS-TAILED JACAMARS (*GALBULA RUFICAUDA*) PLAY WITH APOSEMATIC BUTTERFLIES?

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Arirambas-da-mata (*Galbula ruficauda*) brincam com borboletas aposemáticas?

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The Rufous-tailed Jacamar (*Galbula ruficauda*, Galbulidae) is an insectivorous bird commonly found in primary and secondary forests of Central and South America (Sick 1985). In central and western Brazil, adult individuals feed mostly on wasps (Fry 1970), but also attack many moths and butterflies, which they capture on tree trunks and in the air, respectively, and a few other insects (Pinheiro *et al.* 2003). From time to time, they attack and capture aposematic (i.e., warning-colored and chemically defended; Poulton 1890) butterflies, which are usually released alive and apparently unharmed after being captured, handled, smelled and/or tasted by birds (see Chai 1986 and Pinheiro 2004 for examples of aposematic butterflies attacked and released alive by these jacamars in nature). In some cases, however, birds seem to play with aposematic butterflies before letting them go. After capturing them in the air and returning to the perch, the birds throw the butterflies into the air so as to make them turn around two or three times before catching them again with their long, slender, forceps-like bill, and such behavior may be

repeated once or twice. Interestingly, only some Heliconiinae (Nymphalidae) butterflies, such as the yellow, black, orange, and white *Heliconius ethilla narcea* and *Eneides isabella dianasa*, and the blue and yellow *Heliconius sara thamar* were observed to elicit such behavior in wild birds on three different occasions in central Brazil. The Rufous-tailed Jacamar has been used in several palatability and mimicry experiments with butterflies in both laboratory and field conditions (reviewed in Pinheiro 2011), but to date such behavior has remained unnoticed. Here we propose two alternative explanations for the “throw-catch” behavior of this jacamar.

The first explanation is that birds are just checking the butterflies for defensive chemicals and/or other traits, such as their body mass or wing toughness that could be also used to classify the butterfly as “palatable” or “unpalatable,” or even as “models” or “Batesian mimics” (species without chemical defenses that mimic the aposematic ones, or models to deceit predators) (Bates 1862; see also Brown 1988; Pinheiro 2003, 2007 for examples of Batesian mimicry among

Neotropical butterflies). In contrast to palatable species (including Batesian mimics), which usually exhibit soft wings, aposematic butterflies have tough wings that help them to resist sampling by birds (DeVries 2002). One problem with this view, however, is that birds could check these traits without the need of throwing the butterflies into the air and making them turn around, as observed in most other attacks by these jacamars on aposematic and mimetic butterflies (Chai 1986; Pinheiro 2004, pers. observ.).

An alternative explanation for such behavior is that birds play with butterflies before releasing them. Playing with potential prey is relatively well documented in mammals, but only rarely observed and described in birds (see examples in Gamble & Cristol 2002, Diamond & Bond 2003, Sazima 2008). Moreover, defining playing is difficult as it covers many behavioral categories, varies considerably between and within species, and its functional significance is still being debated (Held & Spinka 2011). In the absence of a widely accepted definition, most authors utilize a list of shared characteristics, such as an activity without an obvious purpose or adaptive function, utilizing species typical motor programs exaggerated in intensity or number of repetitions, differing in structure and/or timing from the adult “serious” form of the behavior, and others (Gould & Gould 1994, Burghardt 2005). Most of these traits, however, apply only to mammals. In fact, all birds ($n =$ three individuals) observed to “play” with *Heliconius* butterflies in nature were males (easily distinguished from females by the white collar) and apparently adult individuals. In addition, throwing the butterflies into the air and making them turn around themselves did not seem to be exaggerated in intensity or in the number of repetitions, as it may be repeated (once or twice) or not. In spite of these differences, the jacamars’ throw-catch behavior shows some similarities to the

“drop-catch” behavior of the Herring Gull and other birds that play with food items (Gamble & Cristol 2002).

Whether or not throw-catch by jacamars constitutes true playing behavior or is a way to evaluate butterfly traits remains obviously an open question. We claim that future observations of such behavior in both captive and wild individuals should be reported in the literature as they could reveal unknown/novel and important behavioral traits of this Neotropical bird.

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