Parasitized Collared Aracari (*Pteroglossus torquatus*) killed by conspecific

Pichí Collarejo (*Pteroglossus torquatus*) parasitado, muerto por conespecífico

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Abstract

We report an incident of intraspecific aggression behavior in Collared Aracari (*Pteroglossus torquatus*) in the municipality of San Rafael, Antioquia. The record was made on Saturday 21 may 2022 in the afternoon, with the help of binoculars and a photographic camera. This is the first report of this behavior in which the attacked individual was found to be visibly parasitized by larvae of dipterans (myiasis). The aggression observed could have occurred in the context of intraspecific within-group dominance hierarchy, for competition of resources including mates, food and nesting cavities. However, it is also possible that it could have an importance in preventing or reducing parasite infection in the group. This observation opens the door to further questions related to the prevalence of dipteran parasitism in *Pteroglossus torquatus* and to its relevance to group behavior and parasitism avoidance.

Key words: behavior, intraspecific, toucans, aggression, myiasis, parasites

Resumen

Reportamos un caso de agresión intraespecífica en el Pichí Collarejo (*Pteroglossus torquatus*) en el municipio de San Rafael, Antioquia. El registro se hizo el sábado 21 may 2022 en horas de la tarde, con ayuda de binoculares y cámara fotográfica. Este es el primer reporte de este comportamiento en el que el individuo agredido se encontró severamente parasitado por larvas de dípteros (miasis). La agresión observada puede haber ocurrido en un contexto de jerarquía y dominancia al interior del grupo, por competencia por recursos, entre los que se encuentran: pareja, alimento y cavidades para anidación. Sin embargo, es posible que tenga importancia en prevenir o reducir la infección de parásitos en el grupo. Esta observación abre las puertas hacia más preguntas relacionadas con la incidencia del parasitismo por moscas en *Pteroglossus torquatus* y su importancia para las interacciones sociales y la prevención del parasitismo en tucanes.

Palabras clave: comportamiento, intraespecífico, tucanes, agresión, miasis, parásitos

Intraspecific aggressions have been recorded in at least nine toucan species: *Ramphastos sulphuratus brevicarinatus* (Van Tyne 1929), *Pteroglossus aracari* (Pernalete 1989), *Pteroglossus torquatus* (Brydon 1995, Ritterson & Stein 2011), *Ramphastos ambiguus swainsonii* (Ehrlich *et al.* 2001), *Rhamphastos dicolorus*, *Pteroglossus castanotis*, *Rhamphastos toco*, *Ramphastos vitellinus* and *Selenidera maculirostris* (de Guaraldo *et al.* 2019); mainly attributed to disputes over territory and resources, including access to nesting cavities, food and mates (de Guaraldo *et al.* 2019). These interactions can involve everything from dueling with their beaks, pecking, intertwining of beaks, to holding by legs and neck (de Guaraldo *et al.* 2019) and in two species it has been observed that they can end with the death of one of the individuals (*P. aracari* and *P. torquatus*) (Pernalete 1989, Ritterson & Stein 2011). In this note we report the first incident of such aggression for *Pteroglossus torquatus* which resulted in the death of a severely

Figure 1. Intraspecific aggression in *Pteroglossus torquatus* in Antioquia, Colombia. One individual can be seen holding the other by the neck (Photo: Christian Walter).

parasitized individual.

On Saturday 21 may 2022 at 16:15, during a birdwatching tour, a search was initiated for a group of *Pteroglossus torquatus* of at least five individuals that were emitting alarm calls in the dense vegetation of the Arenal River, municipality of San Rafael, Antioquia (6.252784 N, -75.014558 W). The area where the observation took place is located in the very humid premontane forest life zone (bmh PM; Holdridge 1987), and it is covered by secondary vegetation in different successional stages, as well as by agricultural and livestock areas.

Using binoculars and a camera with an 800 mm lens, at 16:30 we were able to locate the source of the vocalizations and noticed one individual firmly holding another by the neck on the riverbank, approximately 50 cm from the water's edge (Fig. 1). At this time a third individual of the same species was observing the pair from approximately 2 m distance, but quickly moved away from the field of view (Fig. 3). The aggressor appeared to squeeze the other individual's neck at three-second intervals or whenever the other individual made any movement. Throughout the struggle, the aggressor held on to a tree root with its talons, presumably, to have sufficient leverage. During the first 30 minutes of observation the attacked individual made alarm calls and flapped its wings, however, thereafter until 17:09 only faint movements were observed, presumably associated with its restraint breathing. At 17:23 the aggressor left the site and it was not visible whether it joined the flock or not. The body of the

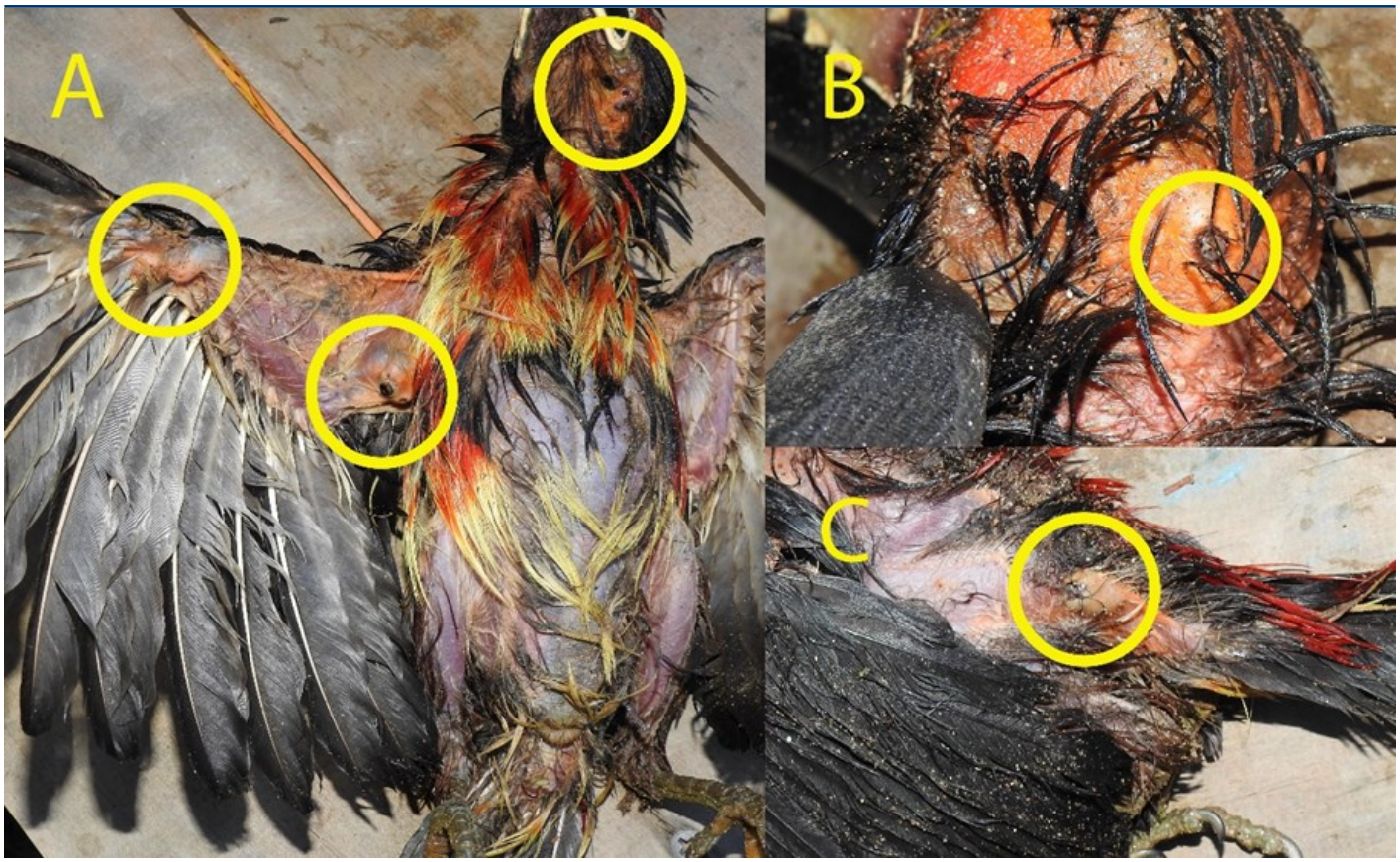

Figure 2. Lesions of myiasis on mandible, humerus (A) head (B) and rump (C) in an individual of *Pteroglossus torquatus* killed by conspecific. (Photos: Laura Rubio-Rocha)

lifeless individual was recovered immediately and inspected superficially by moving the feathers of the head, back, rump, wings and venter by hand. At this point, at least eleven lesions were observed and photographed (Fig. 2), which by their morphology (enlarged subcutaneous cysts with a respiratory pore) were found consistent with those produced by diptera, and commonly referred to as myiasis (Spalding *et al.* 2002, Little 2008). No further examination of the corpse or of the lesions was performed, so the taxonomic identity of the parasite remains unknown.

The aggression observed took place during the breeding season of the species, which has been reported from January through May in most of its range (Green & Kannan 2020). So, it is possible that this intraspecific killing happened in the context of competition for territory and resources, or intraspecific within-group dominance hierarchy, which has been recorded not only in toucans but in other groups of animals (Hof & Hazlett 2012, de Guaraldo *et al.* 2019). However, since this species lacks sexual dimorphism, it was impossible to determine if the fight was sexually related. A similar observation of extreme aggression in this species, which resulted in the death of an individual was attributed to an adult fending off a juvenile seeking to join a group (Ritterson & Stein 2011). In this case, the authors suggest that this event of extreme aggression may be more energetically beneficial to the group than several less aggressive encounters to meet their objective. In our case, additionally, it is possible that the health status of the attacked individual was the driving factor in explaining the observed behavior.

In birds, myiasis or the infestation of healthy or necrotic tissue by dipteran larvae is very common,

Figure 3. Third individual of *Pteroglossus torquatus*, observing the aggressive behaviour from approximately 2 m distance (Photo: Christian Walter).

particularly in nestlings (Little 2008). Three genera of flies are responsible for most avian parasitism: *Protocalliphora* (Calliphoridae), *Passeromyia* and *Philornis* (Muscidae), from which only the latter occurs in the neotropics (Common *et al.* 2019); thus, it is very likely that the parasite affecting the Collared Aracari in our observation belongs to the genus *Philornis*. Although, regarded as almost exclusive parasites of nestlings, the parasitism of adults by these flies has been very likely underestimated and is more prevalent than currently known (Quiroga *et al.* 2020). The effects of dipteran parasitic larvae on birds can vary depending on the species and the environmental context (habitat loss, extreme weather, food availability), but in general they comprehend delayed physical and behavioral development of nestlings, increased mortality of nestlings, and decreased fitness and survival for parents in future years (Dudaniec & Kleindorfer 2006, Little 2008). They can have such a negative effect in some population's reproductive success, that they are threatening the extinction of many neotropical bird species (Quiroga *et al.* 2020). So, considering the negative effects parasitism can have in a population, any behavior that could minimize or avoid exposure to parasites could result advantageous (avoidance hypothesis) (Loehle 1995).

Behavior can be the first line of defense against infection, preventing or reducing the parasite encounter (Curtis 2014), and there are a variety of behavioral strategies identified in the animal world as adaptive for this purpose. Some of these include conspecific killings in the form of

cannibalism and infanticide, a disease control mechanism in which sick individuals are removed when they could become a risk for the litter, as has been noticed in rodents and carnivores (Hart 1990). In social animals such as primates, lions and wolves, restriction of the group size also reduces the risk of infection, therefore strange conspecifics are peripheralized and rejected when they show any symptoms of sickness (Hart & Hart 2021). In Collared Aracaris, also social animals, it could be expected that by removing a parasitized individual from the flock, or one who might be attempting to join, the group could reduce the probability of infection by dipteran flies. This could be of more importance considering that their groups, of up to six individuals, share cavities of trees as roosting sites even during the breeding season (Skutch 1958, 1989), which could facilitate the transmission of subdermal parasitic flies, like the ones observed in our victim. If allowed to remain in the group, the dipteran larvae could exit the parasitized individual, finish its development in the nest (or roosting cavity), mate and infect other members (Little 2008). At present, information on the reproductive biology of dipteran subcutaneous parasites is limited and studies on *Philornis* and other dipteran life cycles are crucial to increase the knowledge about their interaction with hosts.

Despite the costs of aggression, that include the risk of injury or predation, an extreme agonistic aggression such as the one observed, could be more cost-effective than allowing a parasitized individual to enter or remain in the group. More questions related to social interactions in Collared Aracaris arise and its potential implications for parasite avoidance will need to be explored in the future: Is this type of aggression present or more prevalent in other roosting-sharing toucans? Are aggressors dominant member of the flock? Are victims current members of the flock or potential ones? Can Collared Aracaris and other toucans recognize sick/parasitized individuals? Our observation opens the door to further questions related to social interactions in toucans, the prevalence of diptera parasitism in *Pteroglossus torquatus* and to its relevance to group behavior and parasitism avoidance.

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Literature cited

Brydon, A. 1995. Intra-specific aggression in Pale-mandibled Aracari *Pteroglossus erythropygius*. Cotinga 3: 55. http://www.neotropicalbirdclub.org/wp-content/uploads/2014/12/Cotinga-03-1995-55.pdf

Common, L.K., Dudaniec, R. Y., Colombelli-Négrel, D., & Kleindorfer, S. 2019. Taxonomic shifts in *Philornis* larval behavior and rapid changes in *Philornis downsi* Dodge & Aitken (Diptera: Muscidae): An invasive avian parasite on the Galápagos Islands. In: M. Sarwar (ed.). Life cycle and development of Diptera. IntechOpen. https://doi.org/10.5772/intechopen.88854

Curtis, V. 2014. Infection-avoidance behavior in humans and other animals. Trends in immunology 35 (10), 457–464. https://doi.org/10.1016/j.it.2014.08.006

Dudaniec, R. Y., & S. Kleindorfer. 2006. Effects of the parasitic flies of the genus *Philornis* (Diptera: Muscidae) on birds. Emu - Austral Ornithology 106 (1): 13-20. https://doi.org/10.1071/MU04040

Ehrlich, P.R., S. Bailey., E. Bush., T. Davis., & S. Girshick. 2001. Dominance behavior in toucans. Cotinga 16: 64–66.

Green, C. & R. Kannan. 2020. Collared Aracari (*Pteroglossus torquatus*), version 1.0. In: T. S. Schulenberg (ed.). Birds of the World. Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.colara1.01

De Guaraldo, A.C., L.M.C. Antqueves., & L. T. Manica. 2019. Beyond a feeding and thermoregulatory structure: toucan's bill as a sword and pincer. Revista Brasileira de Ornitologia 27: 145–148. https://doi.org/10.1007/BF03544462

Hart B. L. 1990. Behavioral adaptations to pathogens and parasites: five strategies. Neuroscience and Biobehavioral Reviews, 14(3), 273–294. https://doi.org/10.1016/s0149-7634(05)80038-7

Hart, L.A, & B.L. Hart. 2021. How does the social grouping of animals in nature protect against sickness? A Perspective. Frontiers in Behavioral Neuroscience

15:672097. https://doi.org/10.3389/fnbeh.2021.672097
Hof, D., & N. Hazlett. 2012. Mortal combat: an apparent intraspecific killing by a male Black-capped Chickadee. Journal of Field Ornithology 83(3), 290–294. http://www.jstor.org/stable/23255521
Holdridge, L. 1987. Ecología basada en zonas de vida. Instituto Interamericano de Cooperación para la Agricultura, San José, Costa Rica
Little, S.E. 2008. Myiasis in Wild Birds. Chapter 32. Pages 546-560. In: Atkinson, CT., Thomas, N.J., & Hunter, B.D. (eds.). Parasitic Diseases of Wild Birds. Wiley-Blackwell, Iowa, USA. https://doi.org/10.1002/9780813804620.ch32
Loehle, C. 1995. Social barriers to pathogen transmission in wild animal populations. Ecology, 76 (2), 326–335. https://doi.org/10.2307/1941192
Pernalete, J.M. 1989. Breeding the Black-necked aracari *Pteroglossus aracari* at Barquisimeto Zoo. International Zoo Yearbook 28: 244–246. Wiley Online Library.
Ritterson, J.D., & A.C. Stein. 2011. Deadly intra-specific aggression in Collared Aracari *Pteroglossus torquatus*. Cotinga 33: 80. https://www.neotropicalbirdclub.org/wp-content/uploads/2016/10/C33-Ritterson-Stein.pdf
Skutch, A.F. 1958. Roosting and nesting of araçari toucans. Condor. 60(4): 201-219. https://sora.unm.edu/sites/default/files/journals/condor/v060n04/p0201-p0219.pdf
Skutch, A.F. 1989. Birds Asleep. University of Texas Press, Austin, Texas.
Spalding, M.G., J.W. Mertins., P.B. Walsh., K.C. Morin., D.E. Dunmore., & D.J. Forrester. 2008. Burrowing fly larvae (*Philornis porteri*) associated with mortality of eastern bluebirds in Florida. Journal of Wildlife Diseases 38(4):776-783. https://doi.org/10.7589/0090-3558-38.4.776
Quiroga, M.A., Hayes, T.I., Hayes, C.D., Garrod, H., Soares, L., Knutie, S.A, Latta, S.C., & D.L. Anderson. 2020. More than just nestlings: incidence of subcutaneous *Philornis* (Diptera: Muscidae) nest flies in adult birds. Parasitology Research 119, 2337–2342. https://doi.org/10.1007/s00436-020-06696-2
Van Tyne, J. 1929. The Life History of the Toucan *Ramphastos brevicarinatus*. University of Michigan Museum of Zoology.

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