



USE OF MILLIPEDES AS FOOD AND FOR SELF-ANOINTING BY THE PUERTO RICAN GRACKLE (*QUISCALUS NIGER BRACHYPTERUS*)

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Abstract · Although rarely observed in nature, anting is widespread and has been reported in more than 200 species of birds. The concept was used to describe birds allowing ants to climb on their body or the behavior of capturing and rubbing the ants against the plumage. However, the nomenclature of this behavior has been broadened and now is called self-anointing, and includes the use of other animals, such as millipedes (Diplopoda), and even liquids. Here, I describe the Antillean Grackle (*Quiscalus niger brachypterus*) using millipedes (*Trigoniulus coralinus* and *Anadenobolus monilicornis*) for self-anointing and as food. The genus *Anadenobolus* is reported for self-anointing for the first time. I also observed five grackles, feeding upon the millipede *Asiomorpha coarctata*, after washing it in water. Possibly, grackles rub the millipedes on their plumage because their secretions may work as ectoparasite repellent or may decrease irritation during molting. The birds ingest these myriapods when food is scarce or because these may help against intestinal parasites.

Resumen · Uso de milpiés como alimento y para “auto-unción” por el Mozambique de Puerto Rico (*Quiscalus niger brachypterus*)

Aunque raras veces observado, el “hormigarse” ha sido reportado para más de 200 especies de aves. El concepto fue utilizado para explicar la conducta de aves que dejan que hormigas se suban sobre estas o las capturan, para restregárselas en su plumaje. Sin embargo, la nomenclatura de esta conducta se ha ampliado y actualmente se le llama “auto-unción” e incluye el uso de untarse líquidos y otros animales como milpiés (Diplopoda). En este trabajo describo el uso de milpiés (*Trigoniulus coralinus* y *Anadenobolus monilicornis*), por parte del Mozambique de Puerto Rico (*Quiscalus niger brachypterus*), para untárselos en su plumaje y luego ingerirlos. El género *Anadenobolus* es informado, por primera vez, para este tipo de uso. Además, observé cinco individuos del Mozambique de Puerto Rico ingerir individuos del milpiés *Asiomorpha coarctata*, luego de lavarlos en agua. Probablemente, el Mozambique frota los milpiés en su plumaje como repelente de ectoparásitos o para aliviar la irritación que produce la muda. El ave ingiere a estos miriápodos como fuente de alimento, cuando este escasea, y posiblemente, para combatir parásitos intestinales.

Key words: Anting · Dunking · Feeding · Millipede · *Quiscalus niger* · Puerto Rico · Self-anointing

Anting is a behavior during which birds may crouch or lie prostrated, in an area or substrate with ants, and allow these to climb into its body, particularly on their feathers (passive anting). Birds also capture ants and rub them against their body (active anting). The term “anting” was first ascribed to this behavior since ants were the first animals observed to be used for such a purpose (Stresemann 1935, Ali 1936). More recently, the nomenclature of this behavior has been broadened and is now known as “self-anointing.” The term includes the use of other animals such as millipedes (Diplopoda), parts of plants (walnut juice, onions, tobacco, mustard), and even chemical substances, as mothballs (Groff & Brackbill 1946, Brackbill 1948, Whitaker 1957, Simmons 1966, Clark et al. 1990, Parkes et al. 2003, Sazima 2003, Peckre et al. 2018). The function of anting and self-anointing has been debated for years, and presently there are several hypotheses to explain this behavior. It has been suggested that anting and self-anointing act as way of: (1) ridding of ectoparasites, (2) improving feather grooming, (3) decreasing skin irritation during molt, (4) food preparation (e.g., removing pungent effluents from ant bodies before eating them), and (5) sensory self-stimulation (Potter 1970, Morozov 2015).

Although, rarely observed in nature, anting is widespread and has been reported in more than 200 species of birds, most of these passerines (Morozov 2015). With the exceptions of the Puerto Rican Tanager (*Nesospingus speculiferus* - King & Kepler 1970), Yellow-shouldered Blackbird (*Agelaius xanthomus* - Post & Browne 1982), and Smooth-billed Ani (*Crotophaga ani* - Quinn & Startek-Foote 2000), to my knowledge, there are no other published reports for avian anting and self-anointing

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from the West Indies. Within the genus *Quiscalus*, only the Common Grackle (*Quiscalus quiscula*) has been reported to practice anting (Groff & Brackbill 1946, Johnson 1971, Nero & Hatch 1984, Clark et al. 1990, Clayton & Vernon 1993). My objectives are to report the consumption of three species of millipedes by the Puerto Rican Grackle (*Quiscalus niger brachypterus*) and to document the use of two of these for self-anointing.

I observed Puerto Rican Grackle foraging and conducting anting behavior at the Campus of the University of Puerto Rico at Humacao (UPRH, 18°8'57.59"N; 65°50'18.29"W, 30 m a.s.l.), and Bairoa Park urbanization, in Caguas (Bairoa, 18°14'2.83"N; 66°02'54.68"W, 120 m a.s.l.). Sites descriptions are provided in Pérez-Rivera (2000, 2018). At both localities, the grackles were observed at a distance of 3–4 m. At Bairoa, following the anting observations, millipedes were collected from sites at which grackles were observed handling them. At UPRH, parts of the millipedes, not consumed, were also collected for identification. Joglar et al. (2014) was used as an invertebrate taxonomic reference.

On 9 January 2017 at 10:05 h EST, on the lawn of the Natural Science building at the UPRH, I observed a male grackle capturing a rusty millipede (*Trigoniulus corallinus* - Spirobolida: Trigoniulidae) of about 4 cm in length. The grackle began rubbing the millipede on its back, wings, and ventral parts until the myriapod was broken in two sections. The grackle first ingested the part that it was grasping in its beak, followed by the other section that had fallen on the ground. At that time, millipedes were quite common on the campus, and the bird was able to find five additional individuals. With each one of these, the grackle repeated the same procedure, except for the last one, in which the bird struck the millipede against the substrate several times, and only consumed the piece carried in its beak. Each "anting" episode lasted about 10 sec.

On 22 September 2017 near noon, in my backyard located in Bairoa, Caguas (which was partially flooded at the time, owing to hurricane María), I observed five grackles feeding on annelids (Oligochaeta) and arthropods (Euarthropoda) including small "worms" that subsequently were identified as millipedes. Small black millipedes (about 2 cm in length) that rolled after being captured, were either dropped or forcibly immersed (from two to five times), in small water pools by the birds before being ingested completely. Grackles of both sexes participated in this activity having eaten possibly nearly a dozen millipedes in total. Small singsing pari millipedes *Asiomorpha coarctata* (Polydesmida: Paradoxosomatidae), which have diagnostic pointier paranota (lateral keels), were collected at the site. Although this species of millipede is apparently seasonal, it is usually found under the fallen leaves of banana plants (*Musa paradisiaca*), growing in my backyard.

On 14 November 2018, ca. 10:35 h, I observed a male grackle turning up leaves under a hedge of burning love (*Ixora coccinea*), located at the UPRH. The grackle was able to capture a bumble bee millipede *Anadenobolus monilicornis* (Spirobolida: Rhinocricidae; approx. 4 cm long). Immediately the grackle began rubbing the millipede against its wings, back, and belly. While anting, the grackle fluffed its belly feathers and inserted its bill deeper into his plumage. A few seconds later the exoskeleton of the millipede began breaking into segments and the grackle retained the larger

segment, in its bill, and kept rubbing it against its body. This process took about 30 sec. Afterwards, the grackle began consuming the various parts of the millipede. However, I interrupted it, to collect some of these, to verify the identity of the myriapod.

In urban areas, Puerto Rican Grackles have learned to recognize the sounds of machines, such as mowers and trimmers (Pérez-Rivera in prep.). The opportunistic, omnivorous grackles take advantage of the invertebrates and small vertebrates (e.g., frogs and lizards), exposed, injured, or otherwise compromised by the machines, to feed on these. On the morning of 14 December 2018, after mowing my lawn at Bairoa, I began to observe the grackles as they fed within the freshly cut grass. One male took part of a bumble bee millipede in its bill and, after beating it against the grassy substrate, and breaking it into smaller segments, consumed it.

The first published report of birds using millipedes for "anting" was from Australia (Sedgwick 1946). Since then, nearly one dozen avian species have been reported using millipedes for self-anointing (Parkes et al. 2003). Parkes et al. (2003) reports the following millipedes used for self-anointing by birds: *Iulus* sp., *Glomeris* sp., *Tachypodoiulus niger*, and *Trigoniulus lombricus* (presently *corallinus*). However, *Anadenobolus monilicornis*, is reported here for the first time.

Different forms of anting have been documented in *Quiscalus quiscula* (Johnson 1971, Nero & Hatch 1984, Clark et al. 1990, Clayton & Vernon 1993). However, for the genus *Quiscalus* the use of millipedes for self-anointing, apparently, have been overlooked. Use of millipedes for self-anointing by the Puerto Rican Grackle seems to be the first published record of this behavior from the West Indies.

Trigoniulus is among the Spirobolida or quinone millipedes, so named because their defensive secretion consists mainly of benzoquinones (Eisner et al. 1978). Anting in this case may have arisen from what has been called a food-preparatory function, in which the bird removes pungent effluents, from the arthropod body, before eating it (Eisner & Aneshansley 2008). This could also explain the observations of millipede washing. Food dunking is practice by the Puerto Rican Grackle to soften pieces of hard bread, pizza, and, particularly, dog-food pellets (Pérez-Rivera 2000). Captured individuals of *Asiomorpha* may have been "washed" by the grackle, before ingesting them, to purge the millipedes of secondary toxic compounds. Some Diplopoda are known to secrete hydrogen cyanide, benzaldehyde, and, in some cases, benzoyl cyanide, which are highly toxic (Eisner et al. 1978, Judson & Bennett 1992, Shear 2015).

The grackle that fluffed its feathers while self-anointing with an individual of *Anadenobolus monilicornis*, probably did it to introduce the millipede more deeply into its plumage or rub it directly to its skin. When the observation was made (in mid-November), most birds, including icterids, are still molting (Post & Browne 1982, RAPR unpubl. data). Thus, the hypothesis, that anting may decrease skin irritation during molting, is plausible in this instance.

Self-anointing with millipedes may have other functions. The toxic compounds found in the secretory glands of millipedes may provide a defense against insects such as mosquitoes (Valderrama et al. 2000, Weldon et al. 2003), or other ectoparasites. Antillean Grackles suffer from malaria (Fallon et al. 2004), and avian pox (Mckenzie 1990), which are trans-

mitted by mosquitoes. Consequently, self-anointing with millipedes may protect grackles, and other avian hosts, from these insects, particularly during the rainy season. Peckre et al. (2018) suggested that the ingestion of the millipedes' benzoquinone secretions may act in a complementary fashion against gastrointestinal parasite infections, which appear common in *Quiscalus niger* (Barus 1968, RAPR unpubl. data).

Anting and its ancillary self-anointing behaviors appear to be widespread and common but easily overlooked. Possibly, because these behaviors take just a few seconds to execute, potential observers may simply fail to notice them. Also, when self-anointing is performed using ants, even experienced observers may confuse the behavior with preening, sunning, or dust (sand) bathing (Potter 1970, Ehrlich et al. 1998). For example, I have made hundreds of observations of Puerto Rican Grackles feeding and possibly have overlooked this behavior for many years. It was not until January of 2017 that I noticed the behavior, because it was repeated several times by a single individual. Nevertheless, without a much larger sample size, I cannot conclude that self-anointing by the Puerto Rican Grackle, using millipedes, is by any means a common behavior. Apparently, millipedes are used for self-anointing and consumed when other food is scarce (Pérez-Rivera 2000).

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