

Insect cornucopia: various bird types prey on the season's first giant cicadas in an urban park in southeastern Brazil

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Abstract: Some species of large cicadas (Hemiptera) emerge in huge numbers during particular periods, and thus become an abundant food source for several vertebrate species that dwell in the same areas. I record here a small assemblage of six bird species that preyed on the season's first giant cicadas (*Quesada gigas*) from early September to mid November 2007 in an urban park of Campinas, São Paulo, southeastern Brazil. The Plumbeous Kite (*Ictinia plumbea*) was the most ubiquitous cicada predator. It waited high on perches or patrolled on wing and hunted adult cicadas only. Three cuckoo species (*Crotophaga ani*, *Guira guira*, and *Piaya cayana*) foraged on cicadas both on vegetation and on the ground, the first one also taking nymphs that emerged from a pond bank. The Common Moorhen (*Gallinula chloropus*) preyed mostly on nymphs on the pond bank, although it also preyed on adult cicadas that fell in the water, which was the case of the Green Heron (*Butorides striata*) as well. With the exception of the Plumbeous Kite, which may specialize on cicadas during the breeding season, the remainder birds behaved as opportunistic predators on this seasonal and abundant food source.

Keywords: *aves, Ictinia plumbea, cicada prey, Quesada gigas, mass emergence, seasonality, abundant food source, urban area.*

SAZIMA, I. **Cornucópia de insetos: diversos tipos de aves apressam as primeiras cigarras gigantes da temporada em parque urbano no sudeste do Brasil.** *Biota Neotrop.* 9(1): <http://www.biotaneotropica.org.br/v9n1/pt/abstract?short-communication+bn02009012009>.

Resumo: Algumas espécies de cigarras (Hemiptera) emergem em grande número durante certos períodos, assim constituindo um recurso alimentar abundante para diversas espécies de vertebrados que ocorrem nas mesmas áreas. Registro aqui um pequeno conjunto de seis espécies de aves que apressaram as primeiras cigarras gigantes (*Quesada gigas*) da temporada, entre início de setembro a meados de novembro de 2007 em um parque urbano de Campinas, São Paulo. O gavião-sovi (*Ictinia plumbea*) foi o predador mais ubíquo, espreitando em ramos ou patrulhando em vôo e apressando apenas cigarras adultas. Três espécies de Cuculidae (*Crotophaga ani*, *Guira guira* e *Piaya cayana*) caçaram cigarras adultas na vegetação ou no chão, o primeiro também apressando ninfas emergentes na margem de um lago. O frango-d'água (*Gallinula chloropus*) apressou principalmente ninfas que emergiam na margem do lago, embora também apanhasse adultos caídos na água, caso também do socozinho (*Butorides striata*). Com exceção do gavião-sovi, que pode se especializar em cigarras durante a temporada de reprodução, as demais aves comportaram-se como predadores oportunistas deste abundante recurso sazonal.

Palavras-chave: *aves, Ictinia plumbea, cigarras, Quesada gigas, emergência em massa, sazonalidade, recurso alimentar abundante, área urbana.*

Introduction

Some species of cicadas (Hemiptera) emerge in huge numbers during particular periods (e.g. Williams & Simon 1995, Motta 2003) and thus become an abundant food source for several vertebrate species that occur in the same areas, most of them birds (Forbush 1924, Steward et al. 1988, Hahus & Smith 1990, Williams & Simon 1995, Seavy et al. 1997, Sick 1997, Yang, 2004 and references therein), the mass emergence being regarded as a predator satiation strategy (Williams & Simon 1995).

In central and southeastern Brazil several cicada species, including the giant cicada *Quesada gigas*, habitually begin to appear en masse during the austral spring in September-October, sometimes a little sooner or later (Motta 2003), usually after the first rains soften the soil.

I report here on a small assemblage of non-passeriform bird species that preyed on the season's first giant cicadas, *Quesada gigas* (Olivier), from early September to mid November 2007 in an urban park of Campinas, São Paulo, southeastern Brazil. Additionally, I comment on which bird species specialise on cicadas during the massive appearance of this prey type, and which ones take cicadas opportunistically during foraging on a more varied array of preys or food types.

Material and Methods

Observations and records were made at the urban reserve "Parque Ecológico Prof. Hermógenes F. Leitão Filho" (22° 48.62' S and 47° 04.50' W), Campinas, São Paulo state, southeastern Brazil. This public park has a pond bordered by a sandy path about 1.500 m long used by people for walking, running, and promenading (Sazima 2007). The path is bordered by trees and shrubs along most of its extension. I recorded instances of birds that preyed on cicadas over 29 non-consecutive days from 07 September to 20 November 2007. The birds were observed with naked eye, through binoculars, and a 70-300 mm photographic autofocus camera lens at a distance of 1.5-12 m. Observational sessions lasted 5-45 minutes, totalling 3.995 minutes between 7:12 AM-5:15 PM. "Ad libitum" and "behaviour" sampling rules (Martin & Bateson 1986) were used throughout. A large series of digital photographs was taken as vouchers, besides being used for analyses, description and illustration of the feeding behaviours, a few of the most representative presented here.

Results

The Plumbeous Kite, *Ictinia plumbea* (Gmelin), was the most ubiquitous cicada predator; up to six individuals hunted this prey type at a given time in the park. The kite sat in wait perched on high branches of isolated trees (hawking) or patrolled on wing (soaring) for flying cicadas. When a cicada moved or flew while changing perch or flushed by a foliage-gleaning bird, the kite quickly took off (while hawking) or dived (while soaring) and caught the cicada on the wing. The prey was pursued both in the open and among the trees, sometimes causing the kite to collide with the foliage during its efforts to catch a cicada. The prey was deftly snatched with one extended foot, transferred to the bill and carried to a perch. Once there, the kite grabbed the cicada with its talons and moved its foot towards the bill, its head bending to approach the raised foot (Figure 1a). The bird tore off the wings, which were discarded under the perch and took pieces from the cicada's body (the prey's feet were discarded as well). Upon finishing the meal the kite closely examined the foot that held the cicada and picked up any remains stuck there. The whole feeding process lasted about 1 minute (N = 7) to 2 minutes (N = 2), the two latter records for birds harassed on their perches (see below). Afterwards, the bird rubbed briefly its bill against the branch. Hunting success varied from 25 to 50% (mean \pm SD = 38.6 \pm 11.82,

N = 24 chases by five birds). Agonistic encounters were recorded 11 times, in which one individual displaced another from hunting or feeding perches, or chased it while on the wing.

On 2 October I found a nest of the Plumbeous Kite with a brooding adult at about 10 m above the ground on a large tree (*Jacaranda* sp.) about 15 m tall. On 9 October a nestling still covered by natal white down was seen for the first time, and adult perching nearby (Figure 1b). The nestling was raised mostly on cicadas for about 20 days, at which time it had flight feathers and pale buffy, streaked brown feathers on the body (still with some white down) and began to exercise wings occasionally. From this phase on it was also fed pieces from small birds, but cicadas were still caught and fed to the nestling. On 5 November, after two days of heavy rain, wind, and cold, the nestling was found dead within the nest.

Three cuckoo species, the Smooth-billed Ani, *Crotophaga ani* L., the Guira Cuckoo, *Guira guira* (Gmelin), and the Squirrel Cuckoo, *Piaya cayana* (L.), foraged for cicadas and other insects mostly on vegetation but occasionally on the ground as well. They mainly caught resting cicadas during colder days or in early morning. Both the guira and squirrel cuckoos also flushed the cicadas from the vegetation in warmer periods, chased them for a short distance, and occasionally caught one, especially when the insect tumbled to the ground while flushed. The cicada was held in the bill (Figure 1c), beaten against a branch and the pieces that resulted from this manipulation were swallowed on the perch. Occasionally the prey got loose and tumbled to the ground, from where it was immediately retrieved (Figure 2a). The Smooth-billed Anis also foraged for cicada nymphs on the pond bank during their late emergence from the ground early morning, or caught nymphs that failed to metamorphose (Figure 2b). The nymph was beaten against the ground and its pieces swallowed in a way similar to the manipulation of other large insect prey.

The Common Moorhen, *Gallinula chloropus* (L.), preyed mostly on last instar nymphs that emerged from the pond bank early morning or those that failed to shed completely or partially their nymphal skin, sometimes offering them to its chicks (Figure 2c), although it also caught a few cicadas that hit the water surface during a chase by the Plumbeous Kite. The Green Heron, *Butorides striata* (L.), similarly preyed on late emerging last instar nymphs or non-metamorphosed ones, and adults that swirled on water surface.

Discussion

As cicadas are plentiful during their emergence periods and some species emerge in huge numbers (e.g. Williams & Simon 1995, Motta 2003, Yang, 2004), they are a predictable food resource for a few to several weeks. With the exception of the Plumbeous Kite, which may specialize on cicadas during its breeding season (Seavy et al. 1997) the remainder birds behaved as opportunistic predators on this seasonal and abundant food source. Specialization on large cicadas similar to here reported for the plumbeous kite is recorded for the Mississippi Kite, *Ictinia mississippiensis* (Wilson), during its breeding season in North America (Glinksy & Ohmart 1983). It is evident that these two kite species are able to adjust their breeding cycle to coincide with the massive appearance of large cicadas, at least in some parts of their ranges and/or over particular periods. Breeding patterns timed by food abundance and climate are known for several species of insectivorous birds in the Neotropics (e.g. Skutch 1950, Stutchbury & Morton 2001 and references therein for other factors). I regard the death of the plumbeous kite nestling to a very short but critical period with low prey availability and, very probably, the consequent long absence of the female and/or the male on the nest. As cicadas in southeastern Brazil emerge in the same season as alate termites (Isoptera) and leaf-cutting ants (Hymenoptera), the latter two

Birds prey on giant cicadas in an urban park



Figure 1. A Plumbeous Kite (*Ictinia plumbea*) on a feeding perch dismembers a giant cicada (*Quesada gigas*) held in the talons of right foot (a); a nest of the Plumbeous Kite on the right with a nestling within – in the centre of the nest – and a perching adult to the left (b); a Guira Cuckoo (*Guira guira*) holds a giant cicada in the bill (c).

Figura 1. Um gavião-sovi (*Ictinia plumbea*) em poleiro de alimentação desmembra uma cigarrã gigante (*Quesada gigas*), que segura com as garras do pé direito (a); um ninho de gavião-sovi à direita, com um ninhego – no centro do ninho – e um adulto empoleirado à esquerda (b); um anu-branco (*Guira guira*) segura uma cigarrã gigante no bico (c).

Figure 2. A Squirrel Cuckoo (*Piaya cayana*) holds a giant cicada (*Quesada gigas*) in the bill after chasing it from the branches to the ground (a); a Smooth-billed Ani (*Crotophaga ani*) holds a last instar nymph of the giant cicada in the bill after catching it on the pond bank (b); a Common Moorhen (*Gallinula chloropus*) female holds a nymph of the giant cicada in the bill to offer the prey to its chicks (c).

Figura 2. Uma alma-de-gato (*Piaya cayana*) segura uma cigarrã gigante (*Quesada gigas*) no bico, após persegui-la da vegetação ao chão (a); um anu-preto (*Crotophaga ani*) segura, no bico, uma ninfa de último estágio da cigarrã gigante após apanhá-la na margem do lago (b); uma fêmea de frango-d'água (*Gallinula chloropus*) segura, no bico, uma ninfa da cigarrã gigante para oferecer a seus filhotes (c).

known food sources for the Plumbeous Kite (Seavy et al. 1997, Sick 1997), it is possible that this hawk specialize on these abundant, but short-lived insect bursts during its breeding season.

The hunting behaviour and nesting data here reported for the Plumbeous Kite are mostly similar to reports on this hawk and the Mississippi Kite over their ranges (Skutch 1947, Seavy et al. 1997, Parker 1999, Loures-Ribeiro et al. 2003). However, the hunting success I recorded is lower than that reported for the Plumbeous Kite in Guatemala (about 60%) (Seavy et al. 1997). This discrepancy may be due to my small sample compared to the very large sample of the latter authors (about 400), but more likely this is due to the fact that in my observations the kites hunted cicadas only, whereas in the study of Seavy et al. (1997) various insects were hunted by the hawks. An additional difference is that I recorded several agonistic interactions among individuals while hunting or feeding, behaviour I found no mention to in the literature about the Plumbeous Kite. As the aggressive encounters occurred on hunting grounds and not near the nest, I suggest that this behaviour was directly related to competition for hunting and feeding perches and/or food, however abundant the cicadas were at the time. Aggressive behaviour towards conspecifics of any age is reported as very infrequent for the related Mississippi Kite, regarded as gregarious and social even in the nest vicinity (Parker 1999, Thiollay 1994).

The remainder of the small bird assemblage preyed occasionally on the abundant cicadas during their habitual foraging on other food types. None of the cuckoo species is deft enough to pursue a flying cicada, and their hunting success probably was very low (even if this aspect was not quantified in my observations). I strongly suspect that most of the caught cicadas were not much active and probably less able to flee. The Squirrel Cuckoo is a specialist in caterpillars, particularly the hairy and bristled ones, besides being a generalized predator (Payne 1997, Sick, 1997), whereas the Guira Cuckoo and the Smooth-billed Ani are insect generalists that occasionally catch small vertebrates (e.g. Payne 1997, Sick, 1997). On the other hand, the nymphs caught by the Smooth-billed Ani conform well to its foraging on the ground including water edges (Sick 1997, Quinn & Startek-Foote 2000).

The cicadas caught by the Green Heron and the Common Moorhen also were instances of opportunistic foraging on an abundant resource, both the nymphs and the adults, when the latter felt to water surface. This small heron preys mostly on arthropods and fishes, the latter lured to bait provided by some individuals (Sazima 2007). Although at least one of the few individuals that dwell in the park is a deft bait-fisher (Sazima 2007), these herons also forage on insects (IS pers. obs.). On the other hand, the moorhen is an omnivore that feeds both on plants and small invertebrates, and even scavenges on small dead fish washed ashore or floating on water surface (Taylor 1996, Sick 1997).

In conclusion, large cicadas are an abundant and seasonal, thus predictable food source for several birds worldwide (see Introduction), and no doubt the list of bird species that habitually or opportunistically prey on these insects in Brazil will increase with further studies during the periods of giant cicadas' massive appearance. Curiously, I recorded no passerine birds preying on giant cicadas in the park (possibly due to their large size), although thrushes of the genus *Turdus* are probable candidates due to their ground-foraging and litter-tossing habit (Sick 1997), which would create the conditions to prey at least on late emerging or incompletely metamorphosed nymphs. Another potential cicada-hunter would be the Great Kiskadee, *Pitangus sulphuratus* (L.), as this large and very opportunistic tyrannid is able to catch large prey (Sick 1997).

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