

The jack-of-all-trades raptor: versatile foraging and wide trophic role of the Southern Caracara (*Caracara plancus*) in Brazil, with comments on feeding habits of the Caracarini

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RESUMO: O raptor pau-para-toda-obra: forrageio versátil e ampla função trófica do caracará (*Caracara plancus*) no Brasil, com comentários sobre hábitos alimentares de Caracarini. O caracará (*Caracara plancus*) é uma das espécies de Falconiformes com dieta particularmente ampla, acompanhada de variadas táticas alimentares. Apresento aqui uma visão geral dos hábitos alimentares deste falconídeo, com cerca de uma dezena de tipos principais de alimento e um número semelhante de táticas de forrageio. Adicionalmente, comento sobre os hábitos alimentares de Caracarini e noto que a versatilidade trófica de *C. plancus* é uma característica compartilhada com outras espécies do grupo que habitam áreas abertas. Estudos filogenéticos classificam *C. plancus* como uma das espécies mais basais do grupo, o que poderia indicar que dieta variada e versatilidade comportamental em Caracarini sejam características ancestrais. As duas espécies de *Milvago* e *Daptrius ater* parecem ser mais especializadas em alguns aspectos (e.g., catação habitual de carrapatos), porém *Phalcoboenus* apresenta um padrão trófico semelhante ao de *Caracara*, embora cace cooperativamente.

PALAVRAS-CHAVE: Táticas alimentares, versatilidade comportamental, dieta ampla, áreas abertas, Caracarini, características ancestrais.

ABSTRACT: The Southern Caracara (*Caracara plancus*) has one of the most diversified diets and versatile foraging tactics among the Falconiformes. I present here a general view of the feeding habits of this falconid in Brazil, with about 10 main food types and a similar number of foraging tactics. Additionally, I comment on the feeding habits of the Caracarini and note that the trophic versatility of *C. plancus* is a feature shared with other species of this group that dwell in open areas. Phylogenetic studies place *C. plancus* as one of the basalmost species within the group, which may indicate that wide diet and behavioural versatility of the Caracarini are ancestral traits. The two *Milvago* species and *Daptrius ater* seem to be more specialised in some features (e.g., habitual tick-cleaning), but *Phalcoboenus* has a trophic pattern similar to that of *Caracara* though it forages cooperatively.

KEY-WORDS: Foraging tactics, behavioural versatility, wide diet, open areas, Caracarini, ancestral traits.

The two crested caracara species (*Caracara plancus* and *C. cheriway*, Falconidae) are renowned for their omnivorous feeding habits and varied foraging tactics (Yosef and Yosef 1992, White *et al.* 1994, Morrison 1996, Sick 1997; Travaini *et al.* 2001, Morrison and Kyle 2006, and references therein). *Caracara plancus* is less studied than its northern counterpart *C. cheriway* and, besides general statements and a few brief descriptions (e.g., White *et al.* 1994, Sick 1997, Olmos and Silva e Silva 2003, Tomazzoni *et al.* 2005), no study attempts to synthesize its wide behavioural foraging repertoire and the type of foods the diverse foraging tactics are aimed at. The versatile foraging and wide trophic roles of this southern species seem shared by most of the Caracarini falcons (White *et al.* 1994, Sick 1997), despite some instances of distinctive (and sometimes local) foraging specialisations, *viz.* tick-picking, fishing, and social foraging (e.g., White *et al.* 1994, Monteiro-Filho 1995, Peres 1996, Sick 1997, Tomazzoni *et al.* 2005).

I summarise here the versatile foraging tactics and the wide trophic role of the Southern Caracara (*Caracara plancus*) in southwestern and southeastern Brazil. Additionally, I comment on the feeding habits of the Caracarini and note that wide foraging roles and versatile foraging may be regarded as ancestral traits of this falconid group.

METHODS

Foraging Southern Caracara individuals were recorded whenever found during field trips during the last 15 years at several localities in southwestern and southeastern Brazil. “Ad libitum” and “behaviour” sampling rules (Martin and Bateson 1986) were used throughout the observations, on occasions documented with photographs. I summarise the results in a table, as most tactics I recorded are already described and/or illustrated, however briefly (see Discussion) and describe two previously unrecorded feeding techniques. No attempt to quantify or compare the relative occurrence of each foraging tactic was made, due both to my haphazardly collected data and the general lack of suitable data in the literature (the tactics used by *C. plancus* in Brazil are mostly mentioned en passant and/or illustrated in more general texts). However, quantified data are available for food items consumed by *C. plancus* during the breeding season in Andean Patagonia (Travaini *et al.* 2001).

RESULTS

The wide trophic role and versatile foraging tactics of the Southern Caracara in Brazil are here summarised (Table 1) and

some of them illustrated (Figures 1-6 and 11-14). Two previously unrecorded foraging tactics are described with some detail below.

Foraging on swarming leafcutter ants – Recorded once at the Fazenda Santa Genebra in Campinas (~22°48'S, 47°11'W), São Paulo state, southeastern Brazil, on 12 October 1995 at about 1700 h. An adult caracara was standing near a shrub in a corn field and repeatedly pecked at a spot on the ground. Large winged insects were distinguishable in its bill on occasions. It proceeded with the pecking for about 15 min after which it flew off. The spot the bird was pecking at contained openings to an underground nest of the large leafcutter ant (*Atta laevigata*, Formicidae), which was swarming with winged males and females. A similar foraging was recorded by Flávio H. G. Rodrigues at the Parque Nacional de Emas, Goiás state, western Brazil (pers. comm.), where an adult caracara was standing near a terrestrial termite nest partly dismantled by a giant anteater (*Myrmecophaga tridactyla*, Myrmecophagidae) and catching the swarming insects (Figure 2).

Waiting for organic human refuse – Recorded on five occasions on stream banks crossing the Transpantaneira road in Poconé (~16°30'S, 56°45'W), Mato Grosso state, southwestern Brazil. One instance is here chosen as illustrative of this foraging tactic. On 17 May 1997 at about 1500 h, two adult and two immature caracaras perched on shrubs on the bank of a stream near the road, where fishermen were packing their belongings and loading a car. The fishermen left on the bank a small pile of litter usually associated with this type of activity in the area (fish remains, food leftovers, plastic bags). As soon

TABLE 1. Food types and foraging tactics used by the Southern Caracara (*Caracara plancus*). Main sources (including references therein): Sazima and Zamprogno (1993), White *et al.* (1994), Sick (1997), Olmos and Silva e Silva (2003), Tomazzoni *et al.* (2005), IS pers. obs. Order of food types roughly reflects the tactics used to forage on these foods.

Food types	Foraging tactics
Vertebrate carcasses (large)	Searches on wing; patrols roads; joins vultures
Vertebrate carcasses (small)	Searches on wing; patrols roads; searches on foot; steals
Organic human refuse	Searches on wing; waits on perch
Carnivore feces	Searches on foot
Bird eggs and nestlings	Raids nests on wing
Fruits	Searches on foot under trees
Vertebrates (medium-sized)	Searches on wing; waits on perch; raids nests
Vertebrates (small)	Searches on foot; waits on perch; follows ploughs, steals
Vertebrates (afterbirth, newborn large)	Searches on wing, searches on foot
Invertebrates (general)	Searches on foot; follows ploughs; turns wood pieces
Mangrove crabs	Searches on foot; waits near burrows
Freshwater crabs	Searches wading in the shallows
Termites and ants (swarming)	Waits near nests' openings
Sore tissue and ticks (on mammals)	Inspects on or near hosts (cleaning behaviour)

as the people entered the car and the driver started the engine, the four birds landed near the 'refuse dump' and began to peck at the visible food. Then they proceeded to dismantle the litter pile scratching at it with their feet and pecking here and there on presumably edible items. The birds were recorded to eat the fish remains and the food leftovers (mostly fried chicken).

The food types consumed by the Caracarini may be summarised in a few wide categories (Table 2). Their foraging tactic likely are similar to those presented for the Southern Caracara (Table 1), with a few distinctive behaviours such as cooperative killing of larger prey by species of *Phalcoboenus* (Figure 7). On the other hand, foraging on carrion is the most conspicuous and widespread feeding mode among the Caracarini (Table 2, Figure 8). Picking off ticks from and pecking at sores of large herbivorous mammals is a widespread feeding habit as well, being most conspicuous in the genus *Milvago* (Figures 9 and 10).

DISCUSSION

The Southern Caracara has one of the most varied diets and accompanying foraging tactics among the falconids and even among the Caracarini (White *et al.* 1994, Sick 1997, present paper). Except for the foraging on social insects swarming at nest, as well as the waiting for organic human refuse reported herein, the remainder foraging tactics summarised here are already recorded for *Caracara plancus*, however briefly (Sick 1997, Travaini *et al.*

TABLE 2. Food types consumed by falcons of the Caracarini. Main sources, including references therein: Haverschmidt 1947, Schubart *et al.* (1965), Yosef and Yosef (1992), White *et al.* (1994), Monteiro-Filho (1995), Morrison (1996), Peres (1996), Strange (1996), Rodríguez-Estrella and Rodríguez (1997), Sick (1997), Travaini *et al.* (2001), Jaksić *et al.* (2002), Galetti and Guimarães Jr. (2004), Tomazzoni *et al.* (2005), Morrison and Pias (2006), Sazima (2007), F. Olmos (pers. comm.), this paper.

Food types	Caracarini genera
Carrion (large to small)	All five genera
Organic human refuse (in dumps)	<i>Caracara</i> , <i>Milvago</i> , <i>Phalcoboenus</i>
Carnivore or other animal's feces	<i>Caracara</i> , <i>Milvago</i> , <i>Phalcoboenus</i>
Bird or turtle eggs (the latter mostly as laid)	All five genera
Fruits (large to small)	All five genera
Terrestrial vertebrates (small to medium)	<i>Caracara</i> , <i>Daptrius</i> , <i>Milvago</i> , <i>Phalcoboenus</i>
Terrestrial vertebrates (afterbirth, large newborn)	<i>Caracara</i> , <i>Milvago</i> , <i>Phalcoboenus</i>
Aquatic vertebrates (small)	<i>Caracara</i> , <i>Daptrius</i> , <i>Milvago</i>
Bird nestlings (small to large)	<i>Caracara</i> , <i>Daptrius</i> , <i>Milvago</i> , <i>Phalcoboenus</i>
Arthropods (terrestrial)	All five genera
Arthropods (aquatic)	<i>Caracara</i> , <i>Milvago</i>
Wasps (on nests)	<i>Ibycter</i>
Termites or ants (swarming)	<i>Caracara</i> , <i>Milvago</i>
Earthworms (at ploughing; after rains)	<i>Caracara</i> , <i>Milvago</i> , <i>Phalcoboenus</i>
Maggots (on carrion)	<i>Caracara</i> , <i>Milvago</i> , <i>Phalcoboenus</i>
Ticks and sore tissue (on mammals)	<i>Caracara</i> , <i>Daptrius</i> , <i>Milvago</i>

1998, Olmos and Silva e Silva 2003, Galetti and Guimarães Jr. 2004, Tomazzoni *et al.* 2005), or its northern counterpart *Caracara cheriway* (reviews in Morrison 1996, Rodríguez-Estrella and Rodríguez 1992, 1997, Morrison and Pias 2006).

Swarming social insects, mostly winged termites are a rich, ephemeral, and unpredictable food source readily used by several birds including passerines, owls, and parrots (brief review

in Olson and Alvarenga 2006). On the other hand, waiting for human refuse may be compared to the “anticipating” behaviour recorded by Strange (1996) for the Striated Caracara (*Phalcoboenus australis*). Several individuals of this latter species positioned themselves ahead of the observer’s route and waited for Southern Giant Petrels (*Macronectes giganteus*, Procelariidae) to desert their nests upon the observer’s



FIGURES 1-6. (1) An adult Southern Caracara (*Caracara plancus*) on a hunting perch near a soybean field, where it preyed on a small lizard – Fazenda Santa Genebra in Campinas, São Paulo, SE Brazil; (2) an adult caracara near a partly dismantled terrestrial termite nest catches the swarming insects – Parque Nacional de Emas, Goiás, W Brazil; (3) a postjuvenile caracara about to displace a Black Vulture (*Coragyps atratus*) from a road-killed caiman – note crest and neck feathers erected and wings lowered during the falcon’s lunge forwards – Transpantaneira road in Poconé, Mato Grosso, SW Brazil; (4) a postjuvenile caracara wades tarsus-deep water searching for crabs – same area as precedent figure; (5) a juvenile caracara on a mangrove flat at low tide holds a fiddler crabs (*Uca* sp.) with its foot – Cubatão, São Paulo, SE Brazil; (6) an adult caracara pursues an Osprey (*Pandion haliaetus*) that holds a fish in its talons – same area as precedent figure. Photographs by Ivan Sazima (1, 3, 4), Flávio H. G. Rodrigues (2) and Robson Silva e Silva (5, 6).

approach, at which moment the caracaras immediately took and ate the eggs (Strange 1996). In the two described situations, both *C. plancus* and *P. australis* demonstrated that they are able to “predict” the outcome of human activities to their own profit. Other instances of foraging by Caracarina falcons, such as following ploughs, waiting for turtles to lay eggs, or waiting for large mammals to give birth (White *et al.* 1994, Morrison 1996, Sick 1997, R. Silva e Silva pers. comm.) attest to these birds’ ability to recognise foraging opportunities that will take place under certain circumstances.

Due to its carrion-feeding, the crested caracaras are frequently compared with vultures in the past and present literature. However, this foraging mode is overrated since caracaras feeding on carcasses, especially at road kills, are easily seen (Morrison 1996). Carrion-feeding apart, caracaras and vultures, especially the Turkey Vulture (*Cathartes aura*) have some traits in common, such as flying low while foraging over open areas they favour, killing small vertebrates, feeding on fruits, pecking at ticks and sores on mammals (Haverschmidt 1947, Sazima and Zamprogno 1993, Houston 1994, White *et al.* 1994, Sick 1997, Sazima 2007) and such comparisons are not entirely out of place.

The Northern Caracara (*C. cheriway*) is among the best studied Caracarina (Yosef and Yosef 1992, White *et al.* 1994, Morrison 1996, Morrison and Kyle 2006, and references therein), although there is less data published for the Southern Caracara, *C. plancus* (*e.g.*, Travaini *et al.* 2001, Sick 1997). However, taken together, the amount of data available for these two species may explain their apparently wider trophic role and greater diversity of foraging tactics as compared to the other species within this falconid group (see White *et al.* 1994). Even if the studies on the caracaras of the genus *Phalcoboenus* are fewer (see Strange 1996 for a detailed account on *P. striatus*), their trophic role and foraging tactics seem very close to that of the crested caracaras except for their cooperative hunting, which remain unrecorded in other Caracarina species but the Red-throated Caracara (*Ibycter americanus*) (White *et al.* 1994, Peres 1996, Sick 1997). However, what appears to be an initial stage of cooperative foraging is recorded for pairs (couples) of *C. cheriway* (Morrison 1996). Cooperative foraging was possibly present in the ancestral Caracarina (see phylogeny in Griffiths 1999, Griffiths *et al.* 2004), and was perhaps attenuated in the genus *Caracara* and secondarily lost in *Daptrius* and *Milvago* due to ecological and other constraints.



FIGURES 7-8. (7) Two Striated Caracaras (*Phalcoboenus australis*) dismantle a Flying Steamer Duck (*Tachyeres patachonicus*) killed by three individuals during cooperative hunting; (8) a Chimango Caracara (*Milvago chimango*) pulls the carcass of a Magellanic Penguin (*Spheniscus magellanicus*) chick from within the nesting burrow – both records in Argentinean Patagonia; (9) a postjuvinal Yellow-headed Caracara (*Milvago chimachima*) picks off a tick from the throat of capybara (*Hydrochoerus hydrochaeris*) male that poses laid down on its side; (10) an adult of the same caracara species pecks at an open sore on the back of a capybara male – both records in São Paulo, SE Brazil. Photographs by Fabio Olmos (7, 8) and Ivan Sazima (9, 10).

The trophic roles and foraging tactics of the two species of *Milvago* (*M. chimachima* and *M. chimango*) are very similar to each other, the Chimango Caracara perhaps being more specialised in tick-removing from herbivorous mammals (White *et al.* 1994, but see Sazima 2007). From the trophic viewpoint, the Black Caracara (*Daptrius ater*) seems close to these two species due especially for its foraging on ticks and sores of mammals (White *et al.* 1994, Peres 1996, Sick 1997).

The least studied species, the Red-throated Caracara (*Ibycter americanus*) stands out as the only Caracarina that cooperatively hunts wasps in their nests (White *et al.* 1994, Peres 1996, Sick 1997). Further studies may disclose that this forest falcon has a wider trophic role and varied foraging tactics, although the forest habitat may put a constraint on a great versatility such as that displayed by the open-dwelling Caracarina.

A glance at the two tables and the literature here briefly reviewed reveals that most Caracarina species display a great foraging versatility, a fact already noted by several authors (see White *et al.* 1994, Sick 1997), this versatility possibly being an ancestral trait of this monophyletic falconid group (see Griffiths 1999, Griffiths *et al.* 2004 for phylogeny). It may be foreseen that further field studies on the natural history of the Caracarina (see Strange 1996 for an example) would fill at least some of the apparent gaps between the foraging tactics of the genera and/or species, especially those dwelling in open areas, likely a key ecological factor for the great behavioural versatility displayed by these falcons.

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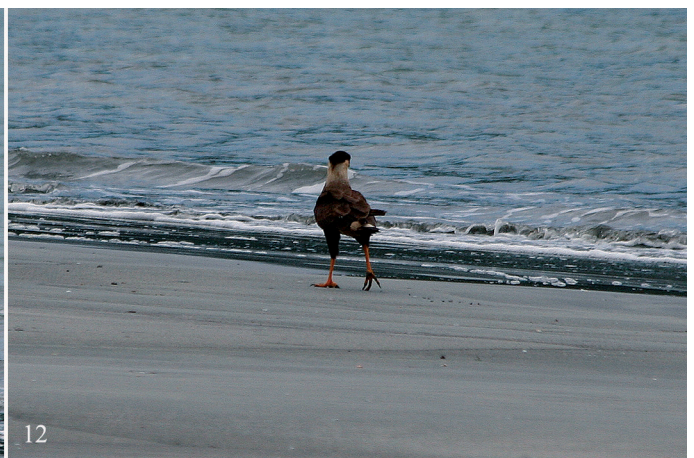
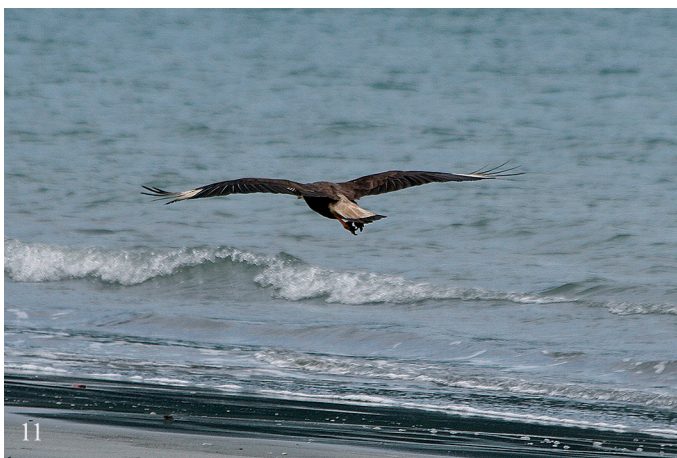
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ADDENDUM

After the completion of this paper I had the opportunity to observe and photographically record a few additional foraging tactics of the Southern Caracara (*Caracara plancus*) not illustrated previously. To clarify further the versatility of this raptor, I present here some of the pictures obtained at two localities in São Paulo, Southeastern Brazil (Figures 11-14).



FIGURES 11-14. (11) A Southern Caracara (*Caracara plancus*) flies low while patrolling a sandy beach at low tide; (12) the same individual patrols the shoreline on foot – note its head oriented towards the coming waves; (13) a caracara on a lawn dismantles a Rock Pigeon (*Columba livia*) that was sick or disabled when the raptor caught it; (14) a couple of caracaras at a pond edge, the individual on the left feeding on a small carcass (about 25 cm total length) of the fish *Tilapia rendalli* – the other bird had fed on the same carcass moments earlier. The two beach records from Ubatuba; the remainder ones from Campinas.