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Source: Journal of Raptor Research, 42(4) : 265-272

Published By: Raptor Research Foundation

URL: https://doi.org/10.3356/JRR-08-18.1

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J. Raptor Res. 42(4):265–272
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A NEW SPECIES OF LARGE, TERRESTRIAL CARACARA FROM HOLOCENE DEPOSITS IN SOUTHERN JAMAICA (AVES: FALCONIDAE)

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ABSTRACT.—A new species of caracara, *Caracara tellustris*, is described from cave deposits in the arid Portland Ridge area of southern Jamaica. It is characterized by great size and much reduced wings, and was probably almost completely terrestrial in habits if not even flightless. It was thus probably confined to the more arid southern areas of the island where open country would be compatible with a terrestrial mode of life.

KEY WORDS: Caracara tellustris; *caracara*; *extinction*; *Falconidae*; *fossil birds*; *Holocene*; *Jamaica*; *West Indies*.

NUEVA ESPECIE GRANDE Y TERRESTRE DE *CARACARA* DE DEPÓSITOS DEL HOLOCENO EN EL SUR DE JAMAICA (AVES: FALCONIDAE)

RESUMEN.—Se describe una nueva especie, *Caracara tellustris*, proveniente de los depósitos de una cueva del área árida de Portland Ridge en el sur de Jamaica. Se caracteriza por su gran tamaño y la marcada reducción de las alas, y probablemente fue de hábitos casi completamente terrestres sino incluso no voladora. Estuvo por ende probablemente confinada a las áreas más áridas del sur de la isla, donde los espacios abiertos podrían ser más compatibles con un modo de vida terrestre.

[Traducción del equipo editorial]

In the modern avifauna of the West Indies, the falconid subfamily Caracarinae is represented only by the Crested Caracara (*Caracara cheriway*) found in Cuba and the Island of Pines. The Cuban birds do not differ from those of Florida and the species is believed to be a recent colonist from the mainland (Suárez and Olson 2001). Caracaras of the genera *Caracara* and *Milvago* were once much more widespread in the Antilles, however, as indicated in the fossil record (Olson 1976, Morgan 1994, Suárez and Olson 2001, 2003).

The crested caracaras, genus *Caracara* (formerly *Polyborus*, but see Banks and Dove 1992) are represented as fossils by two named species: *C. creightoni* Brodkorb (1959) from Pleistocene and probable Holocene deposits in Cuba and the Bahamas (Olson and Hilgartner 1982, Suárez and Olson 2001, 2003) and *C. latebrosus* Wetmore (1920) known only from two fragmentary wing bones from cave deposits in central Puerto Rico. Both species were about the size of the living *C. cheriway*, although *C. creightoni* was slightly smaller. A hitherto unpublished caracara of this size is indicated on Mona Island, between Puerto Rico and Hispaniola, by a single well preserved notarium (USNM uncataloged) from an underwater cave deposit. Whether this was the same as *P. latebrosus* of Puerto Rico can only be determined with the collection of additional material. So far there has been no fossil record of *Caracara* from Hispaniola but this may be simply an artifact of collecting.

Another possibly distinct species of *Caracara* is indicated by the distal end of a right tarsometatarsus from a cave deposit on Grand Cayman (Morgan 1994). This specimen (UF 172841) was from a large species, the size (Table 1) of large individuals of the Southern Caracara (*C. plancus*; for the separation of *C. plancus* from *C. cheriway* see Dove and Banks 1999). It may be anticipated that this species will be found in Cuba as well.

The diversity of West Indian caracaras was further increased by the discovery of an exceptional new species of even larger *Caracara* from the arid parts of southern Jamaica, an island whose modern raptor fauna is notably depauperate (Olson 2006). This species is certain to have been endemic to Jamaica, as its pectoral elements indicate that it had very weak powers of flight at best (Table 2).

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Table 1. Measurements (mm) of hindlimb elements of *Caracara*. Sequence in modern taxa is: range (mean). Data taken partly from Suárez and Olson (2001). Measurements in boldface are from the holotype of *C. tellustris* n. sp.

	SPECIES				
ELEMENT AND MEASUREMENT	*C. CREIGHTONI*	*C. CHERIWAY* $N = 11$	*C. PLANCUS* $N = 6$	*CARACARA* SP. (GRAND CAYMAN)	*C. TELLUSTRIS* N. SP.
TIBIOTARSUS					
Shaft width at midpoint	6.2	6.0–6.6 (6.3)	5.7–7.9 (7.1)	—	ca. 9.4
TARSOMETATARSUS	—			—	
Length	82.1	85.8–97.3 (91.6)	87.5–108.0 (98.0)	—	**112.5**, 115.4
Proximal width	12.4	12.3–13.6 (13.0)	12.4–16.0 (15.6)	—	**18.6**, 17.6
Shaft width at midpoint	5.4	5.1–5.7 (5.4)	4.8–6.7 (5.9)	—	**8.3**, 8.6
Distal width	13.8	12.6–16.2 (15.0)	14.2–19.9 (16.9)	17.6	**20.2**, 20.1
PHALANX 1, DIGIT I	—				
Length	—	17.7–21.0 (19.5)[a]	19.1–22.6 (20.8)	—	24.2
Proximal width	—	8.3–10.7 (9.3)[a]	8.7–10.9 (10.0)	—	12.0

[a] $N = 12$.

MATERIALS AND METHODS

Complete recent skeletons, unless otherwise noted, from the collections of the National Museum of Natural History, Smithsonian Institution (USNM): *Phalcobaenus australis* 490979, *Caracara cheriway* USNM 11679 (partial postcranial), 19670-71, 321805, 322338, 343845-46, 346402, 428041, 431612, 553229-30, *Caracara plancus* 18478, 345779-80, 490931, 614583-84, 630187. Fossil specimens: *Caracara latebrosa* AMNH 4921, holotypical proximal end of right carpometacarpus; AMNH 4987, paratypical proximal end of right ulna. *Caracara* sp. UF 172841, distal end of right tarsometatarsus, Grand Cayman. Measurements were taken with digital calipers to the nearest 0.1 mm. In the photographs, the new fossil species is compared with large individuals of *C. plancus*, which is larger than *C. cheriway*, in order to emphasize the larger size of the Jamaican bird.

Systematics

Class Aves

Family Falconidae

Genus *Caracara* Merrem, 1826

The Jamaican bird agrees in all general aspects with *Caracara*. The tarsometatarsus is much more slender and elongate than in *Phalcobaenus* (Figs. 1–3) or in the much smaller *Ibycter* in which the tarsometatarsus is likewise short and robust. The tarsometatarsus of *Daptrius* and *Milvago*, which are probably best considered congeneric, may be difficult to separate on qual-

Table 2. Measurements (mm) of pectoral elements of *Caracara*. Sequence in modern taxa is: range (mean).

	SPECIES				
ELEMENT AND MEASUREMENT	*C. CREIGHTONI*	*C. CHERIWAY* $N = 11$	*C. PLANCUS* $N = 6$	*CARACARA* SP. (GRAND CAYMAN)	*C. TELLUSTRIS* N. SP.
CORACOID					
Length from head to internal distal angle	—	45.2–52.6 (49.4)	47.2–58.1 (54.5)	55.6	—
Least width of shaft	—	6.3–8.5 (6.9)	6.8–9.8 (8.2)	5.9	—
HUMERUS					
Length	101.2	102.1–114.5 (109.4)	105.1–133.9 (122.0)	114.2	—
Proximal width	8.5	18.6–23.2 (20.0)[a]	22.2–27.5 (25.3)	23.0	—
Shaft width at midpoint	5.0	7.6–8.8 (8.1)	8.1–10.3 (9.3)	9.1, 9.0	—
Distal width	9.1	16.8–18.5 (17.7)[a]	18.2–22.4 (20.5)	18.7	—

[a] $N = 12$

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Figure 1. Right tarsometatarsi of caracaras in anterior view. A, *Phalcobaenus australis* USNM 490979; B, *Caracara tellustris*, new species, holotype USNM 535727; C, *C. plancus* USNM 490931. Scale = 2 cm.

itative characters, as those previously thought to distinguish the two (Campbell 1979, Suárez and Olson 2003) appear to have been compromised by certain fossil material from Peru (W. Suárez and S. Olson unpubl. data). Nonetheless, the Jamaican bird is so large that it is unlikely to have been derived from any of the small, delicate species of *Daptrius/Milvago*.

Caracara tellustris, **new species**
Figs. 1–5

Holotype. Complete right tarsometatarsus USNM 535727 (Figs. 1–3). Collected in 1995 by R.D.E. MacPhee and D.A. McFarlane.

Type Locality. Jamaica, Clarendon Parish, south coast of Portland Ridge, Jackson's Bay cave system, Skeleton Cave, Pit 1 down to 70 cm (see McFarlane et al. 2002).

Age. Radiocarbon ages from various depths and parts of Skeleton Cave were all Holocene in age ranging from 1870 ± 50 before present to 6410 ± 110 BP at the deepest level (McFarlane et al. 2002).

Measurements (mm) of Holotype. See Table 1. Additional measurements, with paratype USNM 535728 in parentheses: length of calcaneal ridge of hypotarsus 17.9 (19.4); width and depth of middle trochlea 7.4 × 9.4 (damaged in paratype).

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Figure 2. Right tarsometatarsi of caracaras in posterior view. A, *Phalcobaenus australis* USNM 490979; B, *Caracara tellustris*, new species, USNM 535727; C, *C. plancus* USNM 490931. Scale = 2 cm.

Paratypes. Skeleton Cave, Map Room: left humerus USNM 535726. Lloyd's Cave, Pit #1, Mantrap Entrance: right coracoid USNM 535725. Drum Cave, surface contents: proximal third of left humerus USNM 535723; shaft of right tibiotarsus. Jackson's Bay cave system, exact cave uncertain: distal half of right humerus USNM 535730; right tarsometatarsus USNM 535728; left pedal phalanx 1 of digit I USNM 535729.

Measurements (mm) of Paratypes. See Table 1.

Etymology. L. *tellustris*, of the earth, from *tellus*, *telluris*, earth, land; in reference to the terrestrial habits and poor, or nonexistent, flying ability of the species.

Diagnosis. A species of *Caracara* with hindlimb elements larger than in any other member of the genus or of the rest of the subfamily Caracarinae, whereas the pectoral elements are small in relation to body size and weakly developed, indicating extremely weak powers of flight or even flightlessness.

Description. Except for larger size and more robust shaft, the tarsometatarsus resembles that of *C. plancus* although the scar for M. tibialis anticus is notably shorter and wider and has a flat rather than rounded surface, the scar for the hallux faces medially rather than posteriorly, and the wing of the inner trochlea is decidedly longer, narrower, and

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Figure 3. Right tarsometatarsi of caracaras in medial view. A, *Phalcobaenus australis* USNM 490979; B, *Caracara tellustris*, new species, USNM 535727; C, *C. plancus* USNM 490931. Scale = 2 cm.

more distinctly set off from the rest of the trochlea. The large size of phalanx 1 of the hind toe (Fig. 5E) indicates that the foot was correspondingly large as well.

Although the coracoid falls within the range of *C. plancus* in length, the shaft is much narrower and the overall aspect is weak and feeble by comparison (Fig. 5B, D). Given the large size of the hindlimb, the humerus is small (Fig. 4B, D, E). The pectoral crest appears to have been greatly reduced and was rotated toward the palmar surface of the shaft, both of which are characters associated with flightlessness (Olson and Steadman 1979). The crest also extends farther distally than in *C. plancus*. The distal end of the humerus is less expanded than in *C. plancus* but the brachial depression is larger and much deeper, which is also associated with flightlessness. It may seem counterintuitive that M. brachialis almost always appears to be better developed in flightless birds but this can be explained by the fact that this muscle is important in keeping the wing folded, which is of much greater importance to a bird that does not use the wing for flight. The small size of the humerus in *C. tellustris* is demonstrated by the ratio of its length to the length of the tarsometatarsus, the mean ratios being: *C. creightoni*, 1.23; *C. cheriway*, 1.19; *C. plancus*, 1.24; and *C. tellustris*, 1.00. Thus, the humerus in typical caracaras is about 20% longer than the tarsometarsus, whereas in *C. tellustris* these elements are the same length.

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Figure 4. Left humeri of *Caracara* (A, B, E, F, anconal view; C, D, palmar view). A, C, F, *C. plancus* USNM 490931; B, D, *C. tellustris*, new species, USNM 535726; E, *C. telluris*, new species, USNM 535730. Scale = 2 cm.

DISCUSSION

Even with nearly complete skeletal material it is often difficult to predict from morphology whether a bird with reduced pectoral girdle and appendages would have been completely flightless. *Caracara tellustris* would have had at best very reduced powers of flight and probably led a nearly completely terrestrial existence, both foraging and dispersing on foot.

The habitat of *C. tellustris* was likely very restricted because such a large terrestrial avian predator could probably only function effectively in relatively open habitats. The vegetation of most of Jamaica prior to human settlement would have been closed forest or dense scrub (Asprey and Robbins 1953). Open habitats could probably have developed only in the drier southern parts of the island, and the caves in which the bones of *C. tellustris* were found are situated nearly at the southern tip of the island (McFarlane et al. 2002, Olson 2006). The most suitable habitat type would probably have been what Asprey and Robbins (1953) defined as thorn scrub, which is dominated by mimosoids such as *Acacia* and *Prosopis*. Thorn scrub is developed on alluvial sediments, which predominate in the southern part of the island. A littoral manifestation of thorn scrub is cactus scrub, in which cacti such as *Stenocereus*, *Pilosocereus*, and *Opuntia* are conspicuous. The region where this type of open scrub adjoins coastal flats and mangroves would probably have been ideal habitat for the caracara, but this habitat would have been of very limited extent, so that the population of *C. tellustris* was probably always quite small.

Prey of *Caracara tellustris* may have consisted of the wide variety of vertebrates, invertebrates, and carrion characteristic of the crested caracaras (e.g., Morrison 1996). Reptiles may have been an important component, as some 17 species of snakes and lizards occur on the Portland Peninsula (Schwartz and Henderson 1991), of which such ground-dwelling species as the skink (*Mabuya* spp.), teiids (*Ameiva* spp. and *Celestus* spp.), and young iguanas (*Cyclura* spp.), would have been paramount. In coastal areas, fiddler crabs (*Uca* spp.), of which

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Figure 5. Right coracoids (A, B, ventral view; C, D, dorsal view) and pedal phalanx 1 of digit I in dorsal view (E, F) of *Caracara*. A, C, F, *C. plancus* USNM 490931; B, D, *C. telluris*, new species, USNM 535725; E, *C. tellustris*, new species, USNM 535729. Scale = 2 cm.

there are six species in Jamaica, all occurring on the southern coast (Barnwell 1986), may have been a ready source of food.

As on most oceanic islands, extinction of the Jamaican caracara may have been a result of human interference of some kind. The small population of caracaras in the inhospitable hot, arid Portland Peninsula may have survived into the historic period only to be exterminated by introduced predatory mammals before its presence could be noted by naturalists. Also, the greatest changes in vegetation cover appear to have been effected following European settlement and agricultural expansion in the 1600s (Asprey and Robbins 1953).

ACKNOWLEDGMENTS

I am first of all most grateful to Ross D.E. MacPhee and Donald A. McFarlane for collecting the fossil material of the new species and making it available and for their comments on the manuscript and much other shared information. Gary Graves also provided helpful comments. For lending holotypes of fossil caracaras I am indebted to the authorities of the American Museum of Natural History, New York (AMNH), and the Florida Museum of Natural History, Gainesville (UF). The photographs are by John Steiner, Smithsonian Photographic Services and the plates were composed by Brian Schmidt, Division of Birds.

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Received 25 March 2008; accepted 8 August 2008
Associate Editor: Carol L. McIntyre

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