A New Species of Extinct Barn Owl (Aves: *Tyto*) from Barbuda, Lesser Antilles

David W. Steadman and William B. Hilgartner

ABSTRACT

A new species of extinct barn owl, *Tyto neddi,* is described from six bones discovered in a late Quaternary cave deposit on Barbuda, Lesser Antilles, West Indies. *Tyto neddi* is the first extinct species of barn owl known from the Lesser Antilles. It appears to be most closely related to the several large, extinct species of *Tyto* known from late Quaternary cave deposits in the Greater Antilles and Bahamas. By far, the most abundantly represented species of vertebrate at the type locality of *T. neddi* is a large, extinct oryzomyine rodent (genus and species undescribed) that probably was the primary prey item of *T. neddi.* A single pedal phalanx from the type locality of *T. neddi* represents a much smaller species of *Tyto* that is the size of the extant *T. alba* (Scopoli). Bones of the Burrowing Owl, *Athene* (*Speotyto*) *cunicularia* (Molina), also occur commonly in Barbudan caves. Thus Barbuda, where no species of owl occurs today, once supported at least three species.

Introduction

During 16–24 January 1983, DWS was part of a team (see Acknowledgments) that surveyed modern and prehistoric vertebrates on Barbuda, Leeward Islands, Lesser Antilles (Figure 1). Although no deep, stratified bone deposits were found, we did collect hundreds of vertebrate fossils from several small, shallow, sediment accumulations in a limestone cave system at Gun Shop Cliff on Barbuda's northeastern coast. At least 42 indigenous species of reptiles, birds, and mammals are known from these and other prehistoric sites on Barbuda, which has a fossil vertebrate fauna exceeded in the Lesser Antilles only on nearby Antigua (Pregill et al., 1994).

The most common species in the Barbudan sites by far is a large, undescribed, extinct cricetid rodent (Oryzomyini, genus and species undescribed), which would suggest that a large owl was responsible for the bone deposits in these caves. Bones of owls, however, are often scarce in Quaternary fossil deposits on islands, even in deposits that the owls helped to create (Steadman, 1986). In spite of the abundance of cricetid rodent bones in prehistoric sites from both Barbuda and Antigua (Ray, 1962; Steadman et al., 1984; Watters et al., 1984), evidence of any large species of owl was lacking on these islands and elsewhere in the Lesser Antilles until we found six bones of a large species of *Tyto* in a small solution cavity at Gun Shop Cliff known as "Rat Pocket."

Five extinct species of barn owls (Tytonidae: *Tyto*) are known from bone deposits in the Greater Antilles and Bahamas. Four of these are larger than any extant West Indian spe-

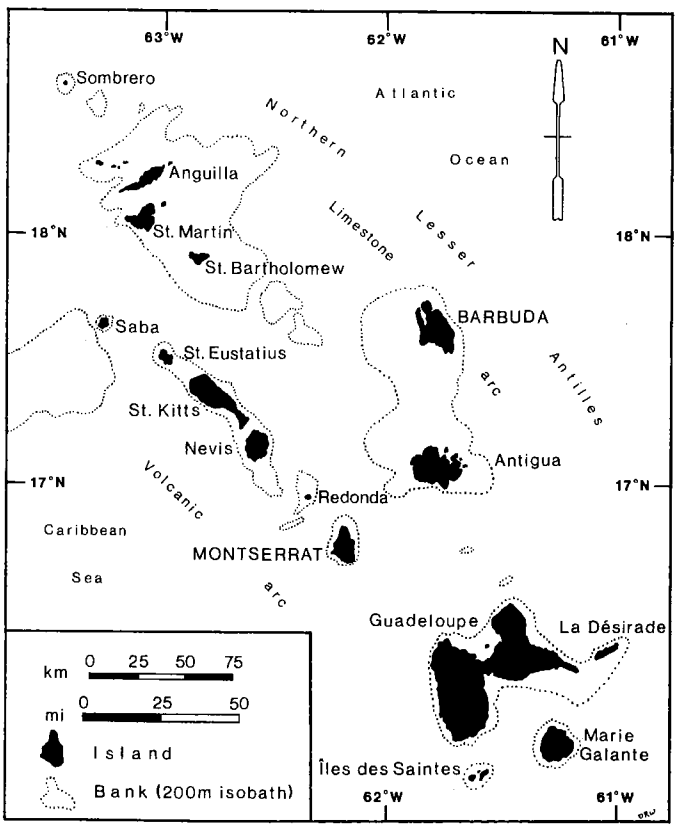

FIGURE 1.—The Leeward Islands of the Lesser Antilles, West Indies.

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cies of *Tyto* (see "Discussion"). In this paper we describe from Barbuda a fifth large West Indian species of *Tyto*. We note as well the bones of two other species of owls from Barbuda, an island that lacks owls today.

MATERIALS AND METHODS.—The partially mineralized bones of *Tyto* from Barbuda are housed in the Vertebrate Paleontology Collection of the National Museum of Natural History, Smithsonian Institution (housing the collections of the former United States National Museum (USNM)). Modern comparative skeletons are from the USNM, the Florida Museum of Natural History (UF), and the New York State Museum. Prehistoric bones of *T. ostologa* Wetmore (1922b) from Hispaniola are from the USNM (especially St. Michel, Cave 1, Haiti, collected in 1928 by A.J. Poole; see Wetmore, 1922b, 1959; Miller, 1926, 1929; Wetmore and Swales, 1931) and the UF (sorted by DWS from various sites excavated from 1978 to 1984 by C.A. Woods and colleagues; see Woods et al., 1985). Specimens of *T. punctatissima* (G.R. Gray) from Holocene cave deposits in the Galápagos Islands are housed at the USNM (Steadman, 1986; Steadman and Zousmer, 1988). Certain osteological nomenclature follows Baumel et al. (1993).

ACKNOWLEDGMENTS.—We thank the government and people of Barbuda, especially Hillborn Frank, Morris Nedd, and Johnny DiSouza for their generous cooperation during our visit. Able field associates on Barbuda were R.I. Crombie, J.P. Dean, G.K. Pregill, C.L. Watters, and D.R. Watters. Field work was sponsored by the National Science Foundation (grant DEB-8207347 to G.K. Pregill), the Smithsonian Institution (Scholarly Studies Program, Alexander Wetmore Fund), and the Carnegie Museum of Natural History. Museum research was supported in part by the National Science Foundation (grant BSR-8607535 to DWS). S.L. Olson (USNM) and C.A. Woods (UF) kindly provided access to collections. L.J. Justice and E.S. Wootan helped to prepare the manuscript. For comments on the manuscript, we thank M.R. Browning, S.L. Olson, G.K. Pregill, D.R. Watters, and C.A. Woods. The photographs are by V.E. Krantz (USNM).

Systematics

Class AVES

Order STRIGIFORMES

Family TYTONIDAE

The bones are referred to the Tytonidae and the genus *Tyto* rather than to the Strigidae because of the following characters.

Femur with proximal portion of crus condylus lateralis rather pointed (not squared) in posterior aspect; condylus lateralis extends farther posteriorly beyond trochlea fibularis in lateral aspect. Coracoid with foramen nervus supracoracoidei relatively small; processus procoracoideus sterno-humerally elongate; facies articularis clavicularis nonpneumatic and confined to humeralmost portion of bone. Pedal phalanges with condyles (distal articulations) narrow relative to overall size of bones.

Tyto neddi, new species

HOLOTYPE.—Right femur, USNM 359240 (Figure 2), collected on 19–20 January 1983 by D.W. Steadman, G.K. Pregill, D.R. Watters, R.I. Crombie, and J.P. Dean.

TYPE LOCALITY.—Rat Pocket, Gun Shop Cliff, Two Foot Bay, Barbuda.

HORIZON AND AGE.—Unstratified; late Quaternary, probably late Pleistocene or early Holocene.

Because the deposit lacked organic materials, such as charcoal or unmineralized bone for radiocarbon dating, we were unable to refine the chronology of this site beyond being late Quaternary.

PARATYPES.—Left coracoid, USNM 359245 (Figure 3); left pedal digit I, phalanx 1, USNM 359242 (Figure 4); left pedal digit II, phalanx 1, USNM 359243 (Figure 5); left pedal digit III, phalanx 2, USNM 359241 (Figure 6); juvenile pedal phalanx (either digit II, phalanx 1; digit III, phalanx 3; or digit IV, phalanx 4), USNM 359244 (not figured).

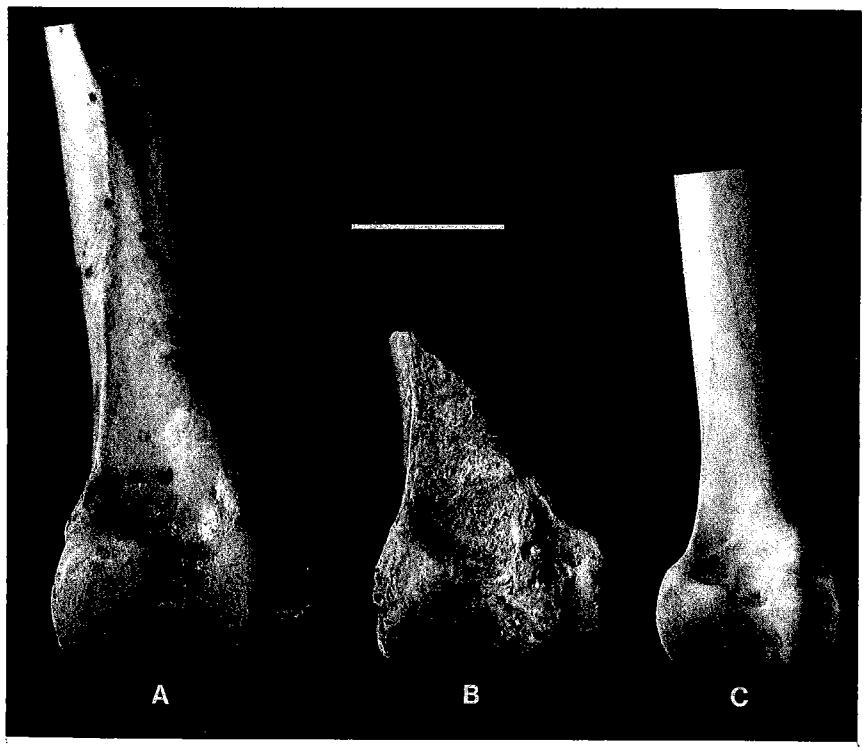

FIGURE 2.—Right femur of *Tyto* in caudal aspect: A, *T. ostologa*, St. Michel (Cave 1), Haiti, USNM uncataloged; B, *T. neddi*, holotype, Barbuda, USNM 359240; C, *T. alba furcata*, male, Jamaica, USNM 553575. (Scale=10 mm.)

All material collected 19–20 January 1983 by D.W. Steadman, G.K. Pregill, D.R. Watters, R.I. Crombie, and J.P. Dean.

ETYMOLOGY.—We name this species after Mr. Morris Nedd, a resident of Barbuda generally known by his nickname "Tomac." Barbuda's premier naturalist, Tomac guided us to many caves in 1983, including the type locality of *Tyto neddi.*

DIAGNOSIS.—A large species of *Tyto* that is slightly smaller than *T. ostologa,* slightly larger than *T. noeli* Arredondo (1972a), and either much larger or much smaller than all other New World insular species of *Tyto* (Tables 1–5).

Compared to *Tyto ostologa,* femur with larger and deeper impressio ansae musculo iliofibularis, deeper depression on medial side of condylus medialis, and tuberculum musculo gastrocnemius lateralis placed more proximally; coracoid with larger foramen nervus supracoracoidei; and pedal phalanges proportionately more robust.

Discussion

BIOGEOGRAPHY.—*Tyto neddi* is part of a late Quaternary Barbudan avifauna that included 15 species of birds that no longer occur on the island (Pregill et al., 1994). Antigua and Barbuda were coalesced into a single, large island during Quaternary glacial intervals (Pregill et al., 1988). Thus it is likely that *T. neddi* also occurred on Antigua. *Tyto neddi* also is the sixth extinct species of barn owl to be described from West Indian Quaternary fossil deposits and is the first described from the Lesser Antilles. Arredondo (1976) reviewed the large extinct tytonids in the Greater Antilles and Bahamas, particularly those from Cuba, where two large species once existed (*T. noeli* and the extremely large *T. riveroi* Arredondo, 1972b). Single large species of *Tyto* are known from Hispaniola (*T. ostologa,* which is geographically the closest to *T. neddi* of all large congeners (see Figure 8)) and the Bahamas (*T. pollens* Wetmore, 1937). A smaller extinct species (*T. cavatica* Wetmore, 1920) inhabited Puerto Rico (see also Wetmore, 1922a). Although no extinct species of *Tyto* are known from Jamaica (Olson and Steadman, 1977; Pregill et al., 1991), this may be an artifact reflecting how few avian fossils have been recovered and studied from Jamaica.

From the same bone deposit as the type material of *Tyto neddi* is an ungual phalanx (digit II, phalanx 3), USNM 453559 (Figure 7), that we cannot distinguish quantitatively (Table 6) or qualitatively from digit II, phalanx 3, of modern specimens of *T. alba* (Scopoli). We assign the specimen to digit II, phalanx 3, based on the uniform roundness of the dorsal surface, the relatively flattened ventral surface, and the relatively rounded (less oblong) articular surface. USNM 453559, which represents an adult bird, is not an adequate basis for species-level identification. Its similarity in size to the same phalanx in *T. alba* means that USNM 453559 is smaller than in *T. neddi,* even though digit II, phalanx 3, is not available for *T. neddi.*

The taxa of *Tyto* that reside today in the Greater Antilles are

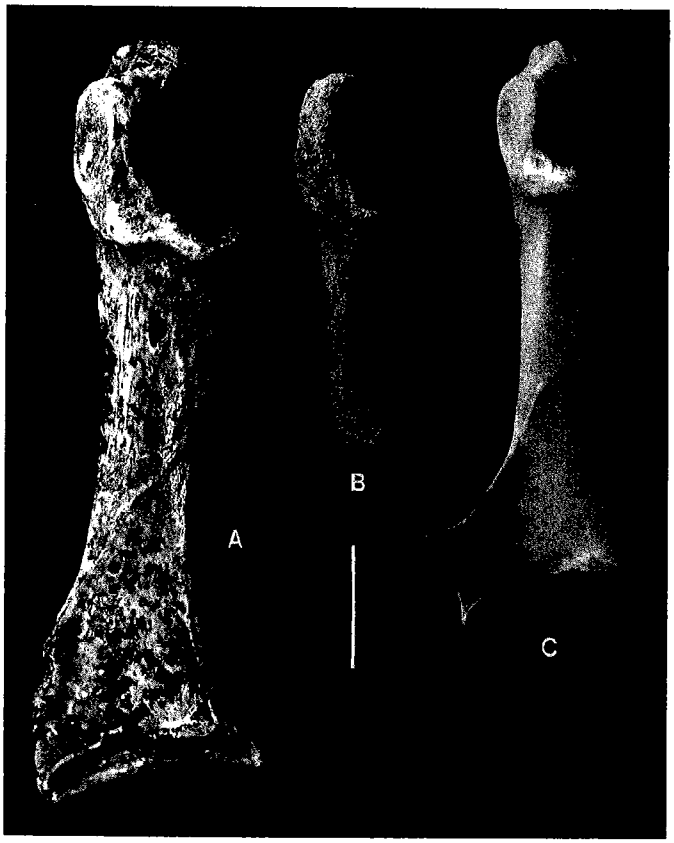

FIGURE 3.—Left coracoid of *Tyto* in dorsal aspect: A, *T. ostologa,* St. Michel (Cave 1), Haiti, USNM uncataloged; B, *T. neddi,* paratype, Barbuda, USNM 359245; C, *T. alba furcata,* male, Jamaica, USNM 553575. (Scale=10 mm.)

TABLE 1.—Measurements (mm) of the coracoid in New World species of *Tyto,* with mean ($\bar{x}$), range, and sample size (n). (Glenoid facet=facies articularis humeralis; coracoidal foramen=foramen nervus supracoracoidei.)

Species	Locality	Length of glenoid facet			Width at coracoidal foramen			Depth at coracoidal foramen		
		$\bar{x}$	range	n	$\bar{x}$	range	n	$\bar{x}$	range	n
T. neddi	Barbuda	9.4		1	7.4		1	3.9		1
T. ostologa	Hispaniola	10.7	10.6–10.7	4	8.9	8.7–9.3	3	5.2	4.6–5.7	6
T. alba pratincola	North America	7.3	6.7–8.2	11	6.2	5.5–6.6	11	3.7	3.1–4.0	11
T. alba furcata	Jamaica, Haiti, Cuba	7.8	7.0–8.8	8	6.4	5.9–7.0	8	4.1	3.7–4.4	8
T. glaucops	Hispaniola	6.2	5.6–6.8	2	6.1	6.0–6.2	2	3.4	3.3–3.5	2
T. punctatissima	Galápagos Islands	5.2	4.9–5.4	4	4.9	4.8–5.0	2	2.9	2.8–3.0	4

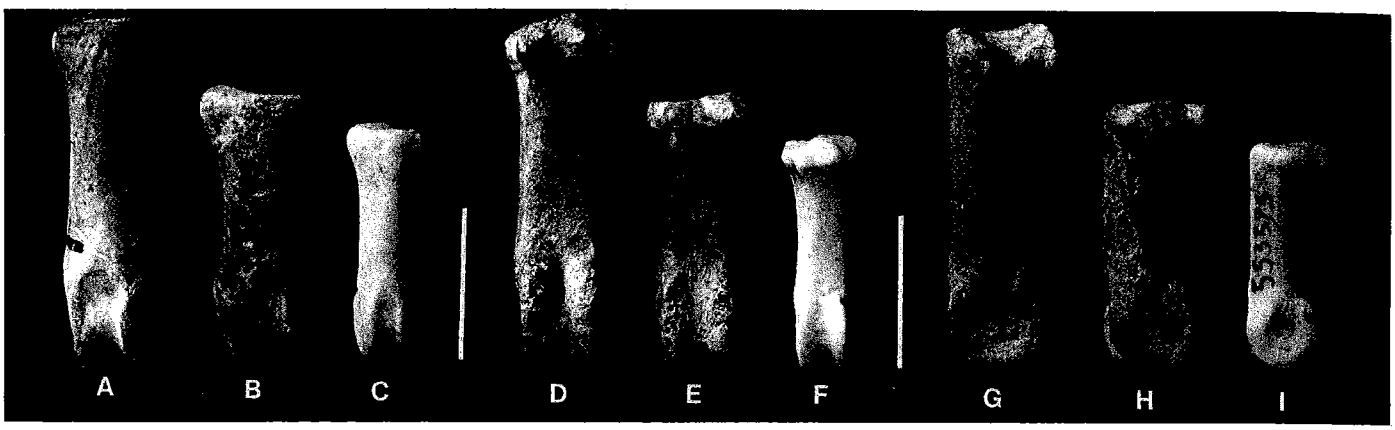

FIGURE 4.—Left pedal digit I, phalanx 1, of *Tyto* in dorsal (A–C), plantar (D–F), and lateral (G–I) aspects: A,D,G, *T. ostologa*, St. Michel (Cave 1), Haiti, USNM uncataloged; B,E,H, *T. neddi*, paratype, Barbuda, USNM 359242; C,F,I, *T. alba furcata*, male, Jamaica, USNM 553575. (Each scale=10 mm.)

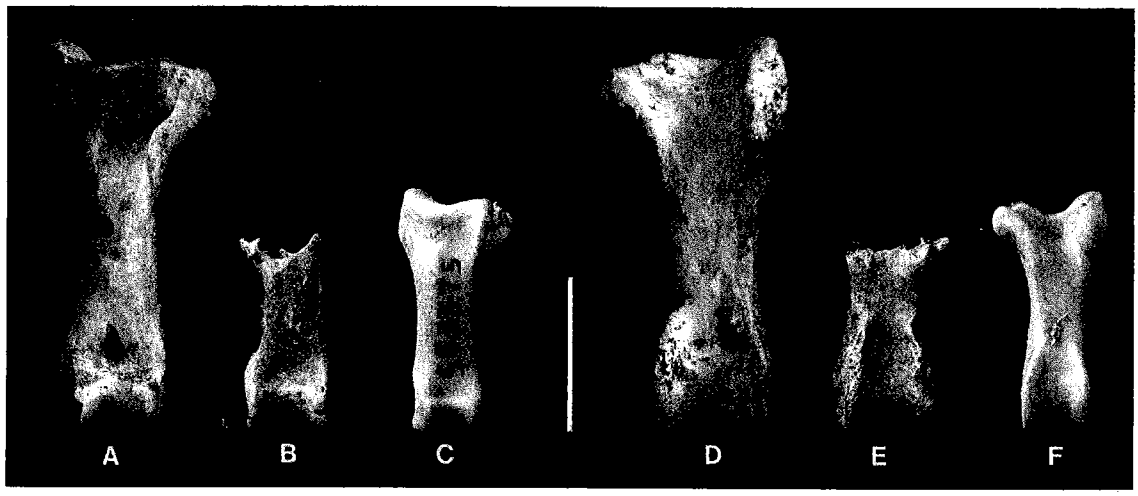

FIGURE 5.—Left pedal digit II, phalanx 1, of *Tyto* in dorsal (A–C) and plantar (D–F) aspects: A,D, *T. ostologa*, St. Michel (Cave 1), Haiti, USNM uncataloged; B,E, *T. neddi*, paratype, Barbuda, USNM 359243; C,F, *T. alba furcata*, male, Jamaica, USNM 553575. (Scale=10 mm.)

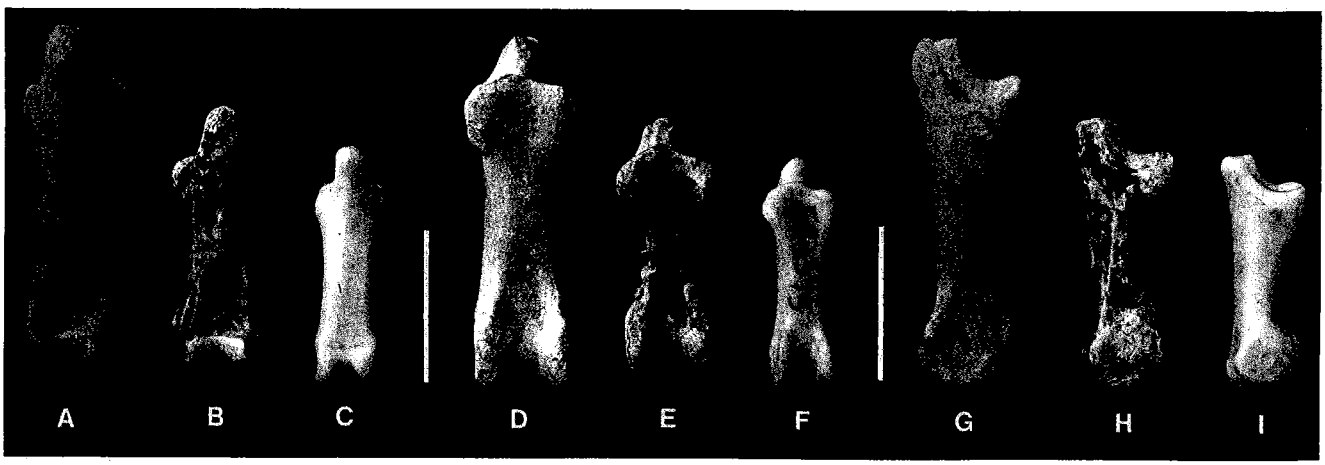

FIGURE 6.—Left pedal digit III, phalanx 2, of *Tyto* in dorsal (A–C), plantar (D–F), and lateral (G–I) aspects: A,D,G, *T. ostologa*, St. Michel (Cave 1), Haiti, USNM uncataloged; B,E,H, *T. neddi*, paratype, Barbuda, USNM 359241; C,F,I, *T. alba furcata*, male, Jamaica, USNM 553575. (Each scale=10 mm.)

T. alba furcata (Temminck) in the Bahamas, Cuba, Jamaica, and Cayman Islands, *T. alba niveicauda* Parkes and Phillips (1978) on Isle of Pines, and *T. glaucops* (Kaup), endemic to Hispaniola (Ridgway, 1914:612–613; Wetmore and Swales, 1931; Parkes and Phillips, 1978). The only race of *T. alba* currently recognized for North American populations, *T. a. pratincola* (Bonaparte), has been recorded in the nonbreeding season on Cuba (Garrido, 1978) and Hispaniola (Schwartz and Klinikowski, 1965). In the Lesser Antilles, *T. alba* may be represented by *T. "a." nigrescens* (Lawrence) on Dominica and *T. "a." insularis* (Pelzeln) on St. Lucia, St. Vincent, Bequia, Carriacou, Union, and Grenada (Peters, 1940; Bond, 1956, 1980; Evans, 1990). These two forms are smaller and darker than other Antillean subspecies of *T. alba* and, like *T. glaucops,* may deserve recognition as a single distinct species (Ridgway, 1914:613–615). The current absence of *Tyto* on the northern (leeward) islands of the Lesser Antilles (including Barbuda) is without obvious ecological or biogeographic explanation. Thus it is not surprising that a smaller species of *Tyto* (but larger than *T. "a." nigrescens* or *T. "a." insularis*) once occurred on Barbuda.

The West Indian species of *Tyto* can be arranged into a size progression (see references above and Tables 1–6, herein) from smallest to largest, as follows (*=extinct): (1) *T. glaucops;* (2) **T. cavatica;* (3) *T. [alba?] nigrescens, T. [alba?] insularis;* (4) *T. alba furcata, T. alba pratincola, T.* sp. (Barbuda); (5) **T. noeli;* (6) **T. neddi;* (7) **T. ostologa;* (8) **T. pollens;* and (9) **T. riveroi.* We have not seen skeletons of *T. nigrescens* or *T. insularis,* although skins of these taxa are consistently smaller than those of *T. alba furcata* or *T. a. pratincola* in all external measurements (Ridgway, 1914:601–615). Also, whereas measurements of the skeletal elements in Tables 1–6 are not available for *T. riveroi,* the measurements and photographs of other elements of *T. riveroi* reveal a size about 10% larger than that of *T. ostologa* and 30%–40% larger than that of *T. noeli* (Arredondo, 1972a, 1972b, 1976, 1982). The only other New World species of tytonid is *T. punctatissima,* which is endemic to the Galápagos Islands (Steadman, 1986) and is smaller than any of the West Indian species (Tables 1, 2).

Large extinct species of *Tyto* are not confined to the West Indies. *Tyto balearica* Mourer-Chauviré, Alcover, Moya, and Pons (1980) and *T. melitensis* (Lydekker, 1891) were described from middle and late Pleistocene deposits on the Mediterranean islands of Mallorca and Menorca and of Malta, respectively (Alcover et al., 1992). The geochronologic and geographic range of *T. balearica* has been extended to the late Miocene and Pliocene of mainland Spain (Mourer-Chauviré and Sánchez, 1988; Cheneval and Adrover, 1995). From the Miocene of the Gargano Peninsula in Italy are two species of *Tyto* (*robusta* Ballmann, 1973, *gigantea* Ballmann, 1976) that are each larger than any living congeners (Ballmann, 1973, 1976; Olson, 1978; Mourer-Chauviré et al., 1980). In spite of a

TABLE 2.—Measurements (mm) of the femur in New World species of *Tyto*, with mean ($\bar{x}$), range, and sample size (n). Values for *T. noeli* are from Arredondo (1976).

Species	Locality	Distal width			Depth of inner condyle			Least depth between condyles		
		$\bar{x}$	range	n	$\bar{x}$	range	n	$\bar{x}$	range	n
T. neddi	Barbuda	15.4		1	11.1		1	5.1		1
T. ostologa	Hispaniola	17.3	16.5–18.3	9	12.9	12.5–13.6	5	6.4	6.0–6.7	5
T. noeli	Cuba	14.4	14.0–14.8	2	–	–	–	–	–	–
T. pollens	Bahamas	18.1		1	–	–	–	–	–	–
T. alba pratincola	North America	11.8	10.9–12.9	11	8.4	7.8–9.4	11	4.0	3.6–4.7	11
T. alba furcata	Jamaica, Haiti, Cuba	11.9	11.4–12.8	8	7.7	7.1–8.9	8	4.7	4.4–5.1	8
T. glaucops	Hispaniola	11.0	10.8–11.1	2	6.6	6.5–6.7	2	4.2	4.1–4.4	2
T. punctatissima	Galápagos Islands	8.5	8.4–8.6	4	5.4	5.2–5.6	4	3.6	3.5–3.8	5

TABLE 3.—Measurements (mm) of pedal digit I, phalanx 1, in New World species of *Tyto,* with mean ($\bar{x}$), range, and sample size (n).

Species	Locality	Statistic	Total length	Proximal width	Proximal depth	Least width shaft	Least depth shaft	Distal width	Distal depth
T. neddi	Barbuda	$\bar{x}$	18.3	7.3	7.6	4.6	3.7	5.5	6.1
		range							
		n	1	1	1	1	1	1	1
T. ostologa	Hispaniola	$\bar{x}$	23.5	7.7	9.1	5.3	4.5	6.1	6.0
		range	23.1–24.3	7.5–7.9	8.7–9.6	5.2–5.3	4.4–4.9	6.0–6.3	6.8–7.1
		n	5	5	5	5	5	5	5
T. alba pratincola	North America	$\bar{x}$	14.0	4.9	5.4	3.0	2.5	3.6	4.4
		range	13.4–14.9	4.6–5.2	4.9–5.9	2.8–3.3	2.2–2.8	3.1–4.1	4.1–4.8
		n	11	11	11	11	11	11	11
T. alba furcata	Jamaica, Cuba	$\bar{x}$	15.1	5.2	5.8	3.3	2.7	3.7	4.7
		range	14.0–15.8	4.9–5.3	5.5–6.0	3.1–3.4	2.4–2.9	3.6–3.8	4.4–4.9
		n	4	4	4	4	4	4	4
T. glaucops	Hispaniola	$\bar{x}$	12.0	4.6	4.5	2.7	2.1	3.2	3.8
		range							
		n	1	1	1	1	1	1	1

TABLE 4.—Measurements (mm) of pedal digit II, phalanx 1, in New World species of *Tyto*, with mean ($\bar{x}$), range, and sample size (n).

Species	Locality	Least shaft width			Least shaft depth			Distal width		
		$\bar{x}$	range	n	$\bar{x}$	range	n	$\bar{x}$	range	n
T. neddi	Barbuda	5.1		1	4.3		1	6.2		1
T. ostologa	Hispaniola	6.0	5.9–6.0	3	5.4	5.3–5.4	3	7.0	6.9–7.1	3
T. alba pratincola	North America	3.5	3.3–3.8	11	3.1	2.6–3.6	11	4.1	3.8–4.5	11
T. alba furcata	Jamaica, Cuba	3.7	3.6–3.8	4	3.3	3.2–3.4	4	4.5	4.3–4.7	4
T. glaucops	Hispaniola	3.2		1	2.6		1	3.7		1

TABLE 5.—Measurements (mm) of pedal digit III, phalanx 2, in New World species of *Tyto*, with mean ($\bar{x}$), range, and sample size (n).

Species	Locality	Statistic	Total length	Proximal width	Proximal depth	Least shaft width	Least shaft depth	Distal width	Distal depth
T. neddi	Barbuda	$\bar{x}$	18.0	7.0	6.5	4.4	3.8	6.1	5.6
		range							
		n	1	1	1	1	1	1	1
T. ostologa	Hispaniola	$\bar{x}$	23.8	7.5	7.9	5.0	4.6	6.4	7.3
		range	22.8–24.4	7.2–8.0	7.5–8.5	4.7–5.5	4.4–4.8	5.9–6.7	7.0–7.6
		n	11	13	11	13	13	13	11
T. alba pratincola	North America	$\bar{x}$	14.6	4.5	5.0	3.0	2.7	3.8	4.4
		range	14.2–15.6	4.3–5.1	4.9–5.3	2.7–3.3	2.5–3.0	3.6–4.2	4.1–4.7
		n	11	11	11	11	11	11	11
T. alba furcata	Jamaica, Cuba	$\bar{x}$	15.6	4.9	5.4	3.2	2.8	4.0	4.6
		range	14.9–16.3	4.7–5.1	5.2–5.5	3.1–3.3	2.7–2.9	3.7–4.3	4.5–4.7
		n	4	4	4	4	4	4	4
T. glaucops	Hispaniola	$\bar{x}$	12.4	4.1	4.2	2.8	2.3	3.2	3.4
		range							
		n	1	1	1	1	1	1	1

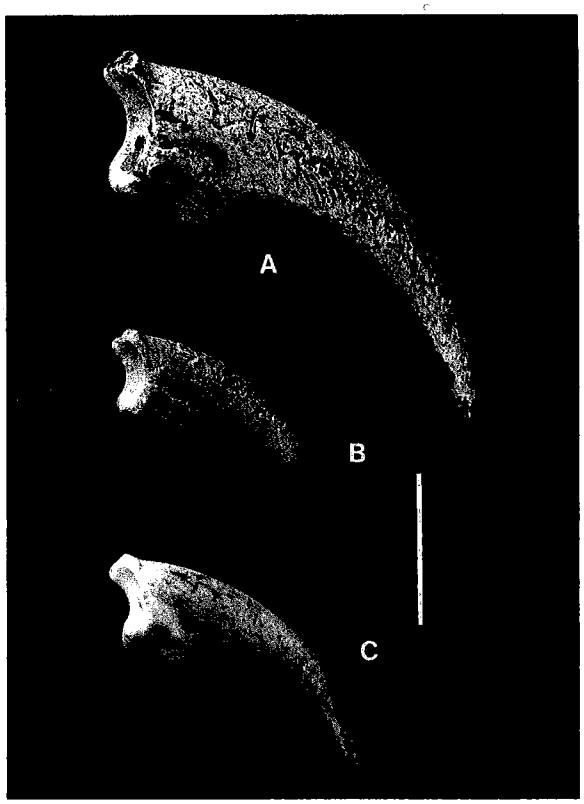

FIGURE 7.—Ungual phalanx (digit II, phalanx 3) of *Tyto* in lateral aspect: A, *T. ostologa*, St. Michel (Cave 1), Haiti, USNM uncataloged; B, *Tyto* sp., Barbuda, USNM 453559; C, *T. alba furcata*, male, Jamaica, USNM 553575. (Scale=10 mm.)

TABLE 6.—Measurements (mm) of the ungual phalanx (digit II, phalanx 3) in New World species of *Tyto*, with mean ($\bar{x}$), range, and sample size (n).

Species	Locality	Articulation width			Articulation depth		
		$\bar{x}$	range	n	$\bar{x}$	range	n
T. ostologa	Hispaniola	7.6	7.2–8.1	6	9.6	9.4–9.8	6
T. alba pratincola	North America	4.7	4.4–5.0	8	5.6	5.2–5.9	8
T. alba furcata	Jamaica, Cuba	4.8	4.5–5.0	4	5.7	5.2–6.1	4
Tyto sp.	Barbuda	5.3		1	5.9		1
T. glaucops	Haiti	4.4		1	5.0		1

fairly rich fossil record of birds, no large extinct species of *Tyto* have been reported from the Canary or other island groups in the North Atlantic (Báez, 1992; Alcover and McMinn, 1995).

No species of owls live on Barbuda today, where the prehistoric bones now reveal the former occurrence of at least three owl species (two tytonids and one strigid). Nowhere in the West Indies today does more than a single resident species of tytonid owl survive. Prehistorically, however, three species of *Tyto* are known from Cuba (Arredondo, 1976, 1982) and two from Hispaniola (Wetmore and Swales, 1931). The single species of strigid owl from the Barbudan caves, *Athene cunicularia* (Molina), is the only species of strigid recorded anywhere in the Lesser Antilles, whereas individual major islands in the Greater Antilles once sustained at least three to seven species of strigid owls in the genera *Otus, Gymnoglaux, Bubo, Ornimegalonyx, Glaucidium, Athene, Pulsatrix, Asio,* and *Pseudoscops* (Arredondo, 1976, 1982; Arredondo and Olson, 1994).

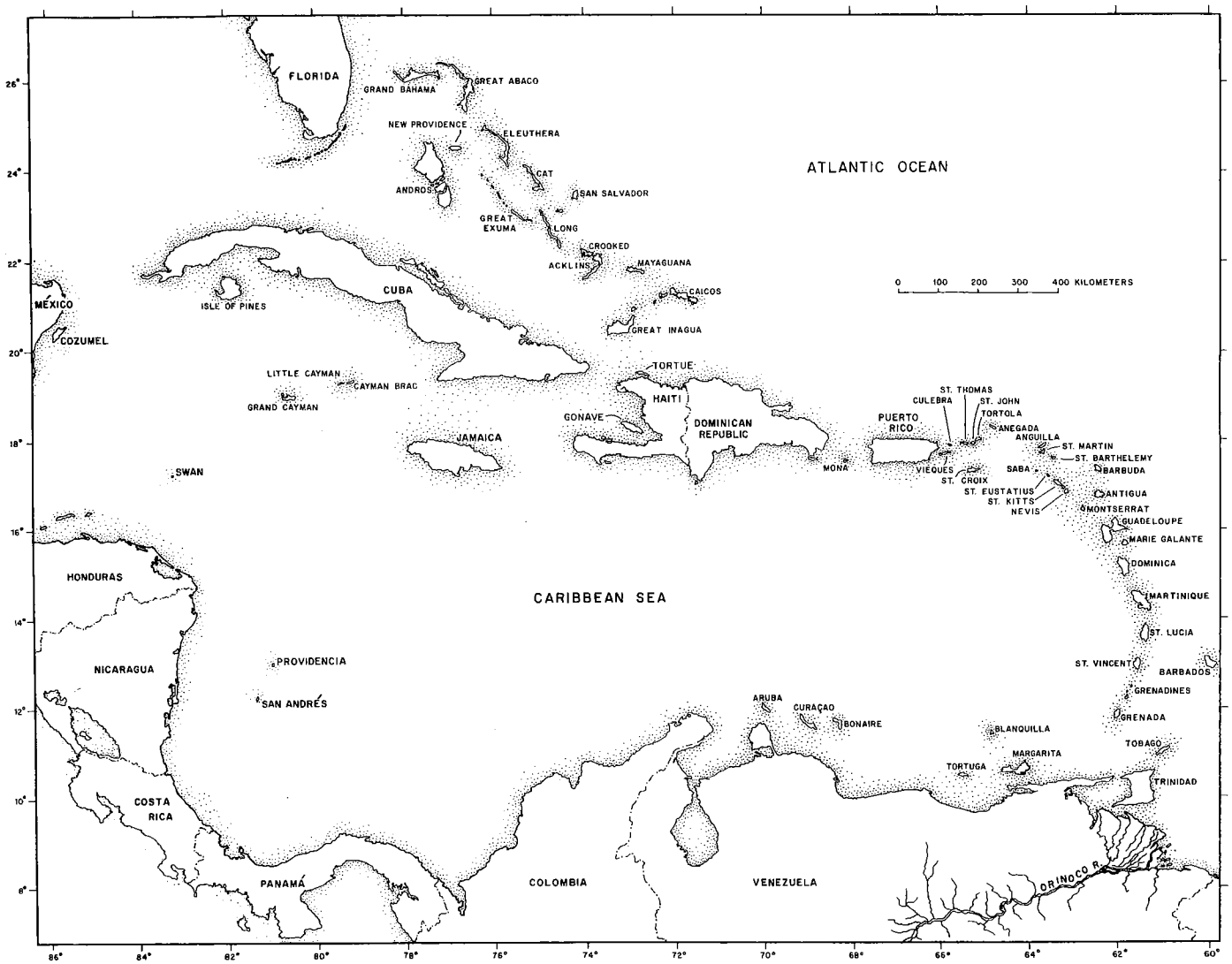

FIGURE 8.—The West Indies.

EVOLUTION AND PALEOECOLOGY.—The available specimens of *T. neddi* are not adequate to evaluate whether it is derived from a Greater Antillean large species of *Tyto* or whether it evolved autochthonously from a smaller Lesser Antillean species. The evolution of tytonid owls in the West Indies may be linked to their prey (primarily rodents and insectivores, to a lesser extent ground sloths, primates, bats, amphibians, reptiles, and birds) and perhaps as well to interactions with strigid owls. This can be evaluated only through the fossil record because most indigenous species of West Indian barn owls and nonvolant mammals became extinct in the late Quaternary.

West Indian insectivores, primates, and ground sloths were confined to the Greater Antilles (Morgan and Woods, 1986; MacPhee and Iturralde-Vinent, 1994, 1995). The short toes of *T. neddi* (relative to those of *T. ostologa*) may reflect a diet focused more exclusively on rodents. The longer toes of the Hispaniolan *T. ostologa* may have been advantageous when hunting arboreal primates or thick-skinned edentates.

Two great radiations of rodents occurred in the West Indies: caviomorphs, mainly in the Greater Antilles and Bahamas (Woods, 1989), and oryzomyines, primarily in the Lesser Antilles (Ray, 1962; Woods, 1989; Pregill et al., 1994). Nearly all of the species in the former radiation and every species in the latter one are now extinct. All of the extinct caviomorph rodents and many of the extinct oryzomyine rodents are larger than the typical prey of *Tyto alba* today. Thus an approximate correlation with size of prey, especially of rodents, might account for the large size of most of the extinct West Indian species of *Tyto*. The undescribed, extinct oryzomyine from Barbuda (and Antigua) was larger than a large packrat (*Neotoma* spp.) but smaller than a muskrat (*Ondatra zibethicus* (Linnaeus)). Considering age-related size variation, adults of this ro-

dent seem well suited as prey for *T. neddi,* whereas the juveniles would be appropriate for the smaller species of *Tyto* that lived on Barbuda.

The extinction of the various large species of *Tyto* was probably related to loss of their preferred prey species. Because the stratigraphy and/or chronology of West Indian fossil *Tyto* are so poorly documented, it is uncertain whether most of the extinct tytonids survived into the Holocene or became extinct in the late Pleistocene. Extensive anthropogenic change has occurred in the terrestrial habitats of Barbuda and Antigua, both in prehistoric and in historic times (Harris, 1965; Steadman et al., 1984; Pregill et al., 1988). On both Barbuda and Antigua, the extinct oryzomyine rodent survived into the late Holocene, being recorded commonly in archaeological sites (Watters et al., 1984, 1992; Pregill et al., 1994). This would suggest that *Tyto neddi* also may have survived into the last millennium or two.

The Burrowing Owl is too small to have fed upon the large extinct cricetid rodent that dominates the Barbudan fossil assemblages. In the West Indies, *Athene cunicularia* seems to have eaten mainly insects, amphibians, and reptiles (Steadman et al., 1984). Conversely, predation from the much larger *Tyto neddi* and *Tyto* sp. may explain why bones of *A. cunicularia* occur commonly in the bone deposits on Barbuda and Antigua.

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