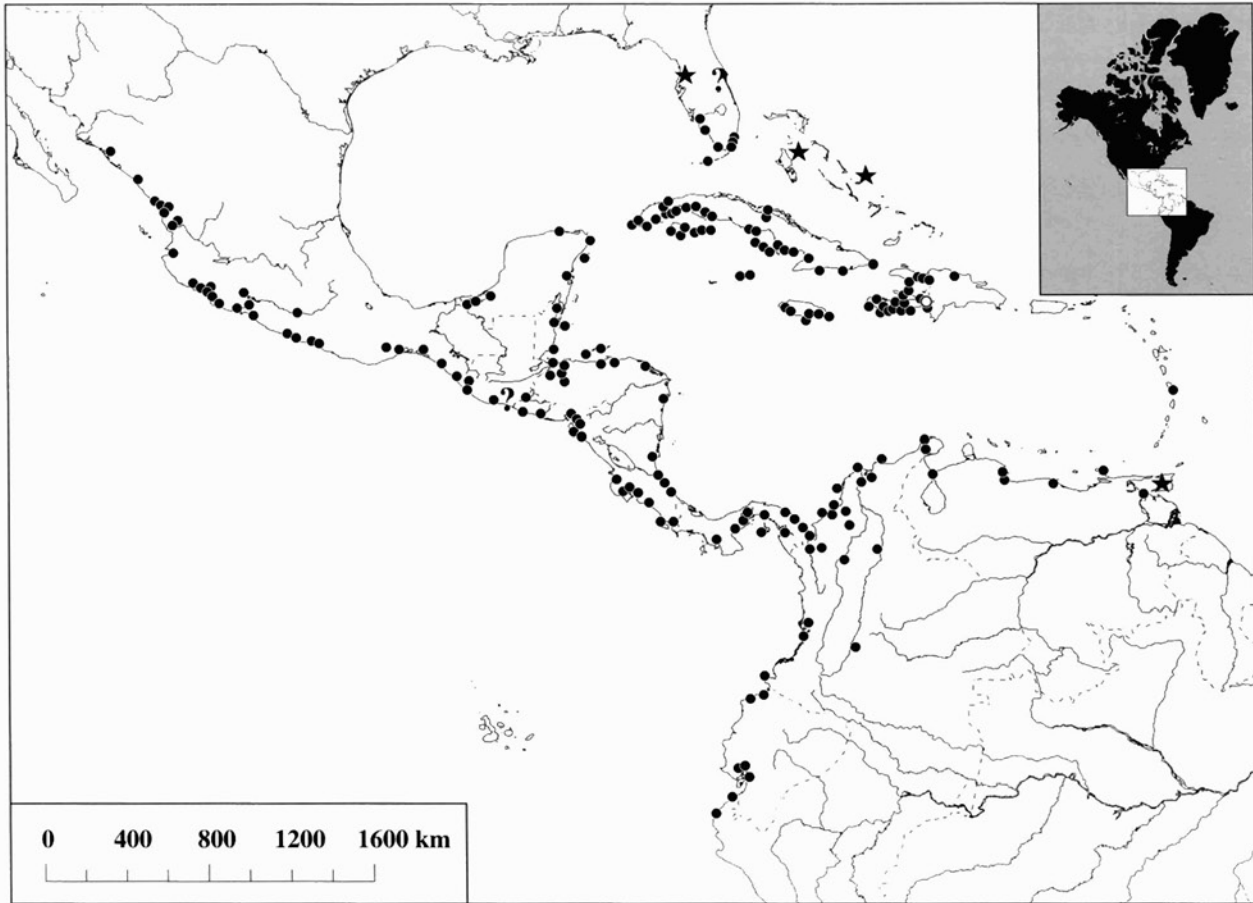
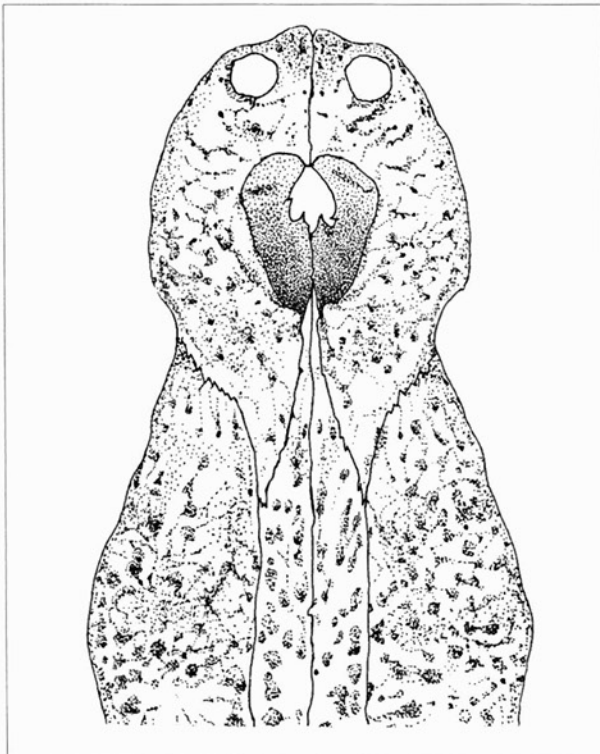


## Catalogue of American Amphibians and Reptiles.

Ernst, C.H., F.D. Ross, and C.A. Ross. 1999. *Crocodylus acutus*.***Crocodylus acutus* (Cuvier)**  
American Crocodile*Crocodylus Americanus Plumerii* Schneider 1801:37. Type locality, "isle Saint Domingue." Holotype, undesignated. *Nomen oblitum*; see Comments.*Crocodylus acutus* Cuvier 1807:55. Type locality, "la grande Île de Saint-Dominique [Hispaniola]," restricted to "L'Etang Saumatre, Haiti" by Schmidt (1953). Syntypes, the species was presumably based on six specimens originally in the Laboratoire d'Anatomie Comparée, Muséum National d'Histoire Naturelle, Paris (MNHN); all are now missing (*vide* R. Bour, in litt., 4.XI.97).*Crocodylus biscutatus* Cuvier 1807:53. Type locality, not designated; restricted to "Tampico," México by Smith and Taylor (1950a), but this is an obvious error because the species does not range this far north along the eastern coast of México. Syntypes, one alcoholic and one mounted (Duméril and Bibron 1836), probably originally in the MNHN, but now missing (*vide* R. Bour, in litt., 4.XI.97).*Crocodylus (Champse) biscutatus*: Merrem 1820:34.*Crocodylus (Champse) acutus*: Merrem 1820:34.*Champsia acutus*: Merrem 1822:691.*Crocodylus scutatus*: Gray 1829:188. *Ex errore*.*Crocodylus (Champses) acutus*: Cocteau, in Cocteau and Bibron 1838:45.*Crocodylus americanus*: Gray 1844:60.*Crocodylus Americanus (acutus, Cuv.)*: Huxley 1860:11.*Molinia americana*: Gray 1862:272.*Halcrosia frontata*: Gray 1862:273 (part).*Mecistops cataphractus*: Gray 1869:157 (part).*Alligator lacordairei* Preudhomme de Borre 1869:110. Type locality, "Bélize, Honduras britannique [Belize]." Syntypes, Academie Royal de Belgique, Brussels, 2.001A and 2.001B, hatchlings, sent by Bernard Lévy in 1866 (examined by authors). See Comments.*Crocodylus pacificus* Duméril, in Duméril and Bocourt 1870:31. Type locality, "l'embouchure du Nagualate, côte occidentale de la république de Guatemala;" restricted to "Río Nagualate," Guatemala by Smith and Taylor (1950a). Syntypes, MNHN, two juveniles and an adult skull, now missing (*vide* R. Bour, in litt., 4.XI.97).*Crocodylus lewyanus* Duméril, in Duméril and Bocourt 1870:33. Type locality, "la rivière de la Magdelaine [Magdalena] (Colombie) [Colombia]." Syntypes, MNHN, sent alive by Bernard Lévy in 1851 and later kept in captivity in Paris, now missing (*vide* R. Bour, in litt., 4.XI.97).*Crocodylus acurus*: Maynard 1873:162. *Ex errore*.*Molinia acuta*: Gray 1874:145.*Crocodylus floridanus* Hornaday 1875:504. Type locality, "Arch Creek, flowing from the Everglades into the head of Biscayne Bay [Florida, USA]." Syntypes, National Museum of Natural History (USNM) 211273, mounted skeleton of an 3.25 m adult female collected by W.T. Hornaday on 22 January 1875. The location of five other syntypes is unknown; see Comments.*Crocodylus acutus*: Beneden 1882:555. *Ex errore*.*Crocodylus americanus* var. *acutus*: Günther 1885:20.FIGURE 1. *Crocodylus acutus* from Lago Enriquillo, República Dominicana (photograph courtesy of José A. Ottenwalder).FIGURE 2. *Crocodylus acutus* from Provincia de Puntarenas, Costa Rica (photograph by Roy W. McDiarmid).



**MAP.** Distribution of *Crocodylus acutus*. The circle marks the restricted type locality, dots indicate other selected localities, and stars denote localities of probable fossils or subfossils.



**FIGURE 2.** Anterior dorsal view of the skull of an adult *Crocodylus acutus* from Hispaniola (Museum of Comparative Zoology 5051, drawing by Aleta Karstad).

- Crocodylus americanus pacificus*: Cope 1887:20 (part).  
*Crocodylus moreletii*: Cope 1887:20 (part).  
*Crocodylus americanus*: Boulenger 1889:281.  
*Crocodylus acutus floridanus*: Hornaday 1904:317.  
*Crocodylus acutus*: Stejneger 1917:289. First use of present combination.  
*Crocodylus americanus*: Müller 1924a:319.  
*Champsia acuta*: Werner 1933:4. *Ex errore*.  
*Crocodylus acutus acutus*: Müller and Hellmich 1940:128.  
*Crocodylus acutus lewyanus*: Müller and Hellmich 1940:130.  
*Crocodylus acuatus*: Tamayo 1962:323. *Ex errore*.  
*Crocodylus actus*: Gordon et al. 1968:213. *Ex errore*.  
*Crocodylus acuttus*: Beltrán 1969:181. *Ex errore*.  
*Crocodylus acutes*: Rodríguez Schettino 1993:1. *Ex errore*.

• **CONTENT.** *Crocodylus acutus* is a monotypic species. Although no subspecies are recognized, differences between geographic populations do exist (see Comments).

• **DEFINITION.** *Crocodylus acutus* is a large species of crocodile, reaching a total length of 6.25 m (Alvarez del Toro 1974) and maximum adult skull length of about 70 cm. Size and age at attainment of maturity are 2.10–2.74 m and 13 years (Le Buff 1957a); hatchling length is 20–35 cm.

The snout is long and pointed, up to seven times longer than the greatest width, but snout shape varies clinally. *Crocodylus acutus* from Florida and Cuba have broader snouts than those from Hispaniola; and from México southwards through Central America, the Atlantic populations have broader snouts than those from the Pacific. The cline from broadest to narrowest continues through Panamá and Colombia, with the most pointed snouts

found in crocodiles from coastal Venezuela and Perú. In northern localities, juveniles have more pointed snouts than medium-sized individuals from the same population, but small juveniles from southern populations have broader snouts than medium-sized individuals (F.D. Ross, pers. obs.).

In the skull, the wavy (W-shaped), transverse premaxillary-maxillary suture on the palate is always directed at least partly posterior to the level of the first maxillary tooth, although it can extend as far posteriorly as the third maxillary tooth. A transverse palatine-ptyergoid suture is present. The anterior mandibular symphysis extends posteriorly from the jaw tip to the transverse level of either mandibular tooth 4, 5, or 6, depending on the age and origin of the individual. The enlarged fourth tooth on the lower jaw is visible when the mouth is closed. Teeth are thecodont and of irregular lengths. Five premaxillary teeth lie on each side of the anteriormost bulge of the snout, and 13–14 maxillary teeth are present behind the notch for the fourth mandibular tooth. Maxillary tooth 5 is the largest of the 18–19 upper teeth. Fifteen teeth are on each side of the mandible, and the tip of tooth 1 often pierces the premaxillary bone, creating one or two small holes anterior to the external nares. On the dorsal surface of the head, the nasal bones are not elevated above the height of the fifth tooth humps on the maxillary bones. A midline bulge of the nasal and lacrymal bones often is present just anterior to the orbit, and, in some individuals, bony ridges occur on the lateral edges of the preorbital bulge (usually no lacrymal ridges are present). The relative size of the orbit varies with age and reflecting the number of maxillary teeth beneath it, i.e., teeth 8–14 on a young juvenile, teeth 11–14 on a

medium sized individual or 12–13 if slightly larger, to only tooth 13 in very large, old crocodiles. Behind the orbits, the dorsal surface of the skull has a cranial table that tends to be broadly concave (though flat in very young juveniles and slightly convex in some hatchlings and embryos). Shape at the edges of this table is variable, but the squamosal horns and overall triangular shape found in *Crocodylus rhombifer* never develop. Posterior squamosal elevations are poorly developed or absent.

Adults are gray, brownish-gray, or yellowish-gray with some darker gray mottlings. Several dark dorsal transverse bands usually are present on the back and sides. The tail bears dark bands. The venter is cream-colored or white. Juveniles are gray or yellowish-gray with narrow black crossbands, particularly on the tail; some individuals may have rows of transverse dark spots. The iris is silver, and the pupil is a vertical ellipse. Both the fore and hind toes are webbed (the hind toes are especially heavily webbed when compared with those of either *C. moreletii* or *C. rhombifer*). The hindlimbs are longer than the forelimbs. The long tail has a prominent medial keel.

*Crocodylus acutus* can be distinguished by the following combination of scale characteristics: often fewer, rarely more, than six scales in the cervical shield and four postoccipital scales in the nape region; dorsal armor normally with 16 (14–17) continuous precaudal rows that are highly variable in number and size of scales per row with at least some rows asymmetrical, and 2–6, usually four, contiguous scales per row at midbody; detached dorsolateral scutes with noticeably raised keels, higher than those of the middorsal scales; usually no ventrolateral intercalary irregularity of the anterior caudal whorls, although

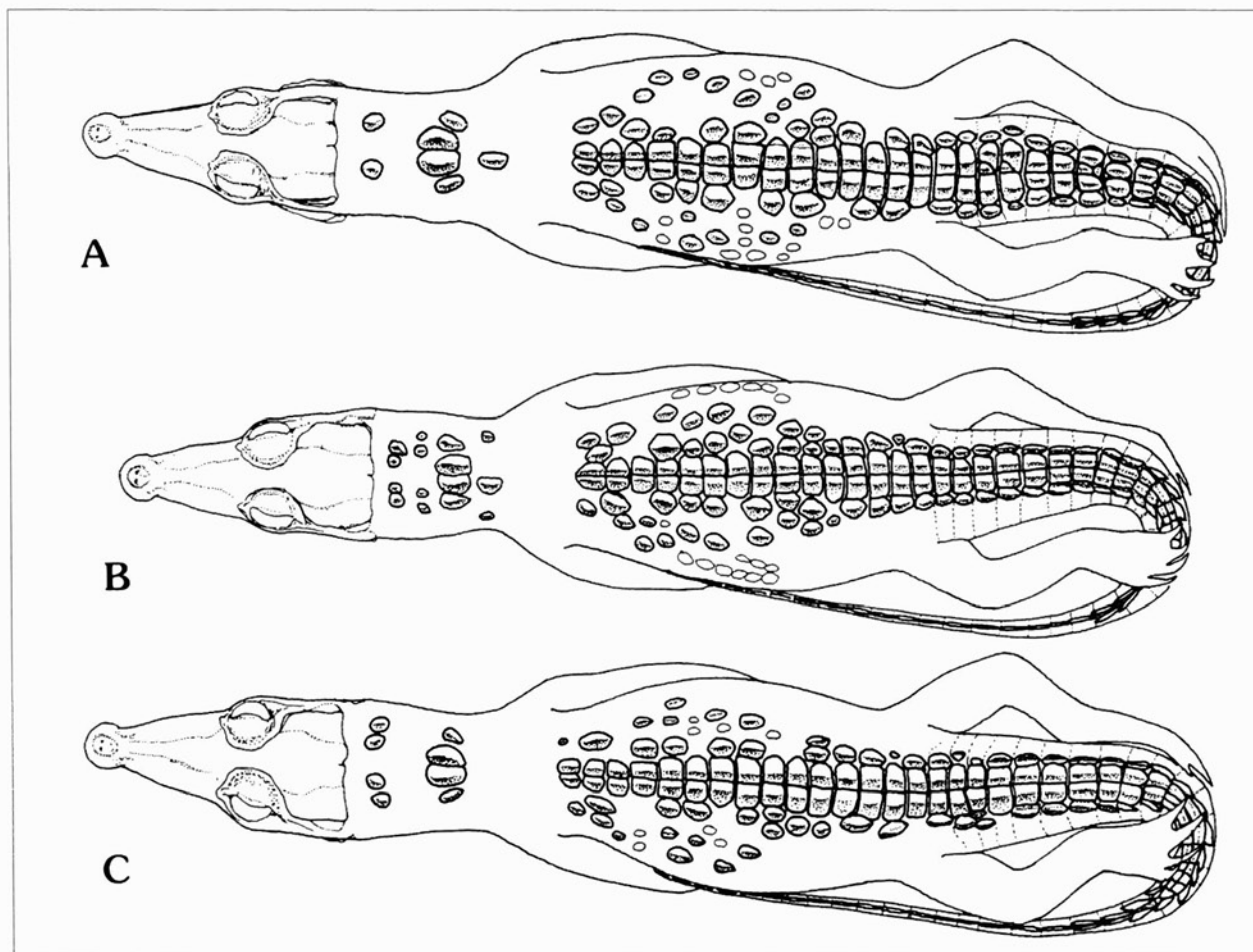


FIGURE 3. Dorsal scalation of three juvenile *Crocodylus acutus* from Florida (Museum of Comparative Zoology 13428–30, respectively, drawings by Aleta Karstad).

some individuals do have single, or multiple scale and lateral intercalary anterior caudal irregularities; 26–34 transverse ventral scale rows; and collar scales composing the cervical shield distinctly larger than surrounding scales.

• **DIAGNOSIS.** *Crocodylus acutus* is a brackish water, New World species that can be best separated from other crocodylians by a series of characters. Body color varies from gray or yellowish-gray to grayish-brown with darker mottling, several dark bands across the back and sides, and dark tail bands. The pointed-snout is up to seven times longer than its greatest width. A medial hump develops on the snout anterior to the orbits, but no preorbital ridge is present. Posterior to the orbits is a cranial table that is broadly concave in adults, but lacks squamosal horns at its edge. The cervical shield is larger than the surrounding scales and is normally composed of six (often less, seldom more) scales. The nape has four occipital scales. Dorsal body armour usually has 16 (14–17) continuous precaudal rows that vary in both number and size of scales per row; at least some of the scales are asymmetrical. Midbody scale rows normally have 4 (2–6) contiguous scales per row. Ventral scales are in 26–34 transverse rows. The premaxillary bears five teeth on each side of the anteriormost bulge of the snout, and 13–14 maxillary teeth are present behind the notch for the fourth mandibular tooth, which is visible when the jaws are closed. Maxillary tooth 5 is the largest of the 18–19 upper teeth. Each mandible has 15 teeth, and the mandibular symphysis extends posteriorly to the level of teeth 4–5.

• **DESCRIPTIONS.** **General descriptions** are in Strauch (1866), Gundlach (1880), Boulenger (1889), DeSola (1930), Grant (1940), Müller and Hellmich (1940), Cochran (1941), Smith and Taylor (1950b), Wermuth (1953), Ahrenfeldt (1954), Medem and Marx (1955), Alvarez del Toro (1960, 1982), Wermuth and Mertens (1961), Cochran and Goin (1970), Stevenson (1976), Smith and Smith (1977), Behler and King (1979), Medem (1981, 1983), Henderson and Schwartz (1984), Henderson et al. (1984), Steel (1989), Conant and Collins (1991, 1998), Grenard (1991a), Ramirez-Bautista (1994), Murphy (1997), and Bartlett and Bartlett (1999). Other descriptions are as follows: **color** (DeSola 1930, 1940; Pope 1955; Ross and Magnusson 1989), **eye color** (Varona 1966, Alvarez del Toro 1974), **comparative anatomy** (Ahrenfeldt 1953), **skull** (Baur 1886b; Mook 1921a, 1921c; Müller 1924b; Kälin 1933; Varona 1966; Iordansky 1973), **skeleton** (Baur 1886a, Cope 1898, Mook 1921b, Gadow 1933, Hoffstetter and Gasc 1969, Langston 1965), **hyoid muscles** (Shumacher 1973), **other muscles** (Fürbringer 1876, Camp 1923), **larynx** (Owen 1831), **lungs** (Milani 1897), **urogenital system** (Davis and Schmidt-Nielsen 1967), **copulatory organ** (Gadow 1888), **digestive tract** (Parsons and Cameron 1977), **teeth** (Cope 1898; Edmund 1960, 1962, 1969; Varona 1966; Brazaitis 1974), **ear** (Wever 1978), **eustachian tube** (Colbert 1946), **skin histology** (Lwoff 1884), **scale patterns** (Cope 1898; Varona 1966; King and Brazaitis 1971; Brazaitis 1973; Fuchs 1975; Ross and Ross 1974, 1987; Ross and Mayer 1983), **eggs** (Grant 1940, Breder 1946), **karyotype** (Cohen and Gans 1970a, 1970b), **hybrids** (Varona 1966), and **habitat** (Medem 1981, 1983; Brandt et al. 1995).

• **ILLUSTRATIONS.** Illustrations include: **color photographs of adults** (Ditmars 1949; Behler and King 1979; Medem 1981; Ashton and Ashton 1985; Ross 1989; Steel 1989; Penny 1991; Moler 1992b, front cover; Trutnau 1994; Murphy 1997; Bartlett and Bartlett 1999; Powell 1999a), **black and white photographs or drawings of adults** (DeSola 1933; Cochran 1944; Schmidt 1944, 1952; Medem 1953; Oliver 1955; Pope 1955; Alvarez del Toro 1960, 1982; Cochran and Goin 1970; Neill 1971; Freiberg

1972; Grenard 1991a; Moler 1992b; Thorbjarnarson et al. 1992; Frick 1999), **color or black and white illustrations of juveniles** (Allen 1938, Breder 1946, Pope 1955, Neill 1971, Freiberg 1972, Alvarez del Toro 1974, Behler and King 1979, Smith and Brode 1982, Lander et al. 1994, Garlock 1994b, Schubert and Santana 1996), **heads of either adults or juveniles** (Stejneger 1917; Cochran 1941; Schmidt 1944; Breder 1946; Wermuth 1953; Oliver 1955; Wermuth and Mertens 1961; Leviton 1971; Alvarez del Toro 1974; Gore 1978; Ogden 1978a; Medem 1981; Smith and Brode 1982; Ashton and Ashton 1985; Steel 1989; Alderton 1991; Grenard 1991a; Conant and Collins 1991, 1998; Bartlett 1994; Garlock 1994b; Powell et al. 1998; Powell 1999a), and **eggs, embryos, or nests** (Hochstetter 1902, Breder 1946, Alvarez del Toro 1974, Mazzotti et al. 1988, Trutnau 1994).

Other illustrations are as follows: **skull** (Brühl 1862; Mook 1921a, 1921c; Müller and Hellmich 1940; Wermuth 1953; Wermuth and Mertens 1961; Varona 1966; Iordansky 1973; Smith and Smith 1977; Medem 1981; Grillitsch et al. 1996), **vertebrae and other skeletal elements** (Schimkewitsch 1910, Mook 1921b, Hoffstetter and Gasc 1969, Grasse 1970, Brochu 1996), **musculature** (Killian 1890, Camp 1923), **skin** (Cope 1900, Stejneger 1917, Barbour and Ramsden 1919, Varona 1966, Brazaitis 1973, Fuchs 1975, Medem 1981, Ross and Mayer 1983), **carcass** (Schubert and Santana 1996, Powell 1999b), **teeth** (Edmund 1960, Murphy 1997), **intestinal cells** (Duges 1896), **brachial plexus** (Grasse 1970), **telencephalon** (Minnelli 1966, 1967, 1968), **ear** (Wever 1978), **eustachian tube** (Colbert 1946), **retina** (Heinemann 1877), **choanae** (Kuhn 1968), **lungs** (Milani 1897, Trutnau 1994), **gastroliths** (Alvarez del Toro 1974), **hybrids** (Varona 1966), **dominance behavior** (Lang 1987, 1989), **feeding behavior** (Alvarez del Toro 1974), **habitat** (Neill 1971, Alvarez del Toro 1974, Medem 1981, Alcalá and Dy-Liacco 1989, Garlock 1994b), **chemical structure of bile salt** (Tammam 1974), and **parasites** (Elkan 1974).

• **DISTRIBUTION.** *Crocodylus acutus* usually is a brackish water crocodile that formerly occurred along the southern coast of Florida from Palm Beach County on the Atlantic Coast (a questionable record is from Lake Harney, Volusia County by Maynard 1873) to at least Lee County on the Gulf of Mexico; Ashton and Ashton (1985) mapped a locality in Charlotte County. The species now is restricted to the Everglades and Keys in Dade and Monroe counties. The American Crocodile also is known from the islands of Little Cayman, Cayman Brac, Cuba, Isle of Pines, Jamaica, Hispaniola, Martinique, and Margarita (although Censky and Kaiser [1999] omitted mention of the purported population on Martinique). Populations are found along both the Atlantic and Pacific coasts of México, Central America, and northern South America from Tabasco, México southward to Colombia and Venezuela in the east, and from Sinaloa, México south to Ecuador and Río Chira, Perú. Due to confusion of *C. acutus* with the primarily freshwater species *C. moreletii* along the eastern coast of México, where the latter species also enters brackish waters, reports of *C. acutus* north of Tabasco are questionable. Several records for *C. acutus* from coastal localities in mainland Quintana Roo, and one from Yucatán may also be of *C. moreletii* (Lee 1996).

Publications discussing distribution include Stejneger (1899), Barbour (1910, 1916, 1920, 1922, 1930, 1935, 1937), Morfín (1918), DeSola (1935), Gaige et al. (1937), Oliver (1937), Carr (1940), Mertens (1952a,b), Schmidt (1952), Sutcliffe (1952), Neill (1954), Peters (1954), Carr and Goin (1955), Le Buff (1957b), Duellman (1958, 1961), Duellman and Schwartz (1958), Medem (1958, 1961, 1962, 1964, 1981, 1983), Zweifel (1959, 1960), Neill and Allen (1961), Garrido and Schwartz (1969), Hardy and McDiarmid (1969), King (1973), Mertens (1972b), Meyer and Wilson (1973), Wilson and Hahn (1973),

Henderson and Hoovers (1975), Schwartz and Thomas (1975), Stevenson (1976), Ogden (1978a), Garrido (1980), Lee (1980, 1996), Paolillo (1981), King et al. (1982), Jacobsen (1983), Alvarez (1984), Hendrickx et al. (1983), Ashton and Ashton (1985), Varona (1985), Seijas (1986a, 1986b), Garrido et al. (1986), Savage and Villa (1986), Wilson et al. (1986), Schwartz and Henderson (1988, 1991), Lazell (1989), Thorbjarnarson (1986), Kushlan and Mazzotti (1989a), King et al. (1990), Casas-Andreu (1990, 1994), Casas-Andreu and Mendez-de la Cruz (1991), Mendez-de la Cruz and Casas-Andreu (1992), Sasa (1992), Chaves Cordero (1993), Estrada (1993), Rodríguez Schettino (1993), Mitchell (1994), Casas-Andreu (1995), Castillo (1996), Cerdano Vazquez et al. (1996), Powell et al. (1996, 1999), Schubert and Santana (1996), Vazquez et al. (1996), Bolaños et al. (1997a,b), Muñoz-Canales and Argon Morales (1997), Platt and Thorbjarnarson (1997), Bartlett and Bartlett (1999), Crombie (1999), and Estrada and Ruibal (1999).

The relationship between climate and distribution are discussed in Cope (1900) and Casas-Andreu and Reyna Trujillo (1994).

Various distribution maps are in Brazaitis (1974), Smith and Smith (1977), Ogden (1978a), Lee (1980, 1996), King et al. (1982), Maness (1982), Ashton and Ashton (1985) Torbjarnarson (1986), Gorzula (1987), Ross (1989), Steel (1989), Conant and Collins (1991, 1998), Grenard (1991a), Schwartz and Henderson (1991), Mendez-de la Cruz and Casas-Andreu (1992), Moler (1992b), Casas-Andreu and Reyna Trujillo (1994), Schubert and Santana (1996), and Bartlett and Bartlett (1999). Maps of Turkey Point Nuclear Power Plant, Florida are presented in Garlock (1994a) and Brandt et al. (1995).

• **FOSSIL RECORD.** No fossil attributable to this species has been found on the mainland of Latin America (Langston 1965, Báez and de Gasparini 1979), but two fossil crocodiles from the Bahamas probably are *Crocodylus acutus*. Pregill (1982) reported a portion of a juvenile vertebra from a limestone sink on New Providence Island, Bahamas. The material at this site probably is late Pleistocene (Rancholabrean). Olson et al. (1990) reported a partial left jugal and one body scute from San Salvador (Watling's) Island; this material is either late Pleistocene (Rancholabrean) or Holocene. Because juvenile *C. acutus* are intolerant of sea water and probably cannot survive an oceanic migration, the juvenile fossil suggests a resident population occurred in the Bahamas at one time. The ponds and the mangrove swamps of the Bahamas are too saline today, but they might have been less so in the past during periods of lower sea levels. Neill (1971) reported finding presumed *C. acutus* teeth in a fossil bed at an elevation of 7.6 m on the Gulf Coast of Citrus County, Florida that possibly dated from a Pleistocene interglacial stage. The American Crocodile is only occasionally found on Trinidad (Steel 1989), but an archeological subfossil has been recorded from St. John's Province (Wing and Reitz 1982).

• **PERTINENT LITERATURE.** The three most important regional references are for Florida (Neill 1971), México (Alvarez del Toro 1974, Chiapas), and Colombia (Medem 1981). **General accounts** are in Wyman (1869, 1870), Hornaday (1875), Gundlach (1880), West (1900), Reese (1915), Dimock (1918), Barbour and Ramsden (1919), Barbour (1923), DeSola (1930, 1940), Allen (1938, 1942), Carr (1940), Grant (1940), Cochran (1946), Ditmars (1949), Lewis (1949), Allen and Neill (1952a,b), Moore (1953b); Moore (1954), Carr and Goin (1955), Pope (1955), Smith (1956), Le Buff (1957a), Schmidt and Inger (1957), Duellman and Schwartz (1958), Alvarez del Toro (1960, 1974, 1982), Bothwell (1962), Croulet (1963), Donoso Barros (1965a,b, 1966a,b), Medem (1968, 1981), Fernandez (1971),

Leviton (1971), Neill (1971), Freiberg (1972), Guggisberg (1972), Brazaitis (1973), Fuchs (1975), Perrero (1975), Pritchard (1977), Smith and Smith (1977), Ogden (1978a), Harris (1980), Townsend and Byers (1980), Campbell and Winterbotham (1981), Varona (1981), Groombridge (1982, 1987), Mudde and van Dijk (1984), Ashton and Ashton (1985), Hirschorn (1986), Lambert (1986), Rivero Blanco and D'Andria (1986), Van Meter (1987), Martin (1989), Ross (1989), Ross and Magnusson (1989), Steel (1989), Campbell (1990), Caras et al. (1990), Alderton (1991), Grenard (1991a,b), Penny (1991), Moler (1992b), Thorbjarnarson et al. (1992), Flores-Villela (1993), Bartlett (1994), Garlock (1994a), Trutnau (1994), Lee (1996), Murphy (1997), and Bartlett and Bartlett (1999).

Other papers, listed by topics, include: **literature review** (Villa et al. 1988, Enge and Dodd 1992, Vanzolini 1993); **evolution and genetics** (Aggarwal et al. 1994, Dessauer and Fox 1956, Dessauer 1970, Campbell 1972, Medem 1971b, Brooks and O'Grady 1989, Frey et al. 1989, Densmore and Owen 1989, Steel 1989, Densmore and White 1991, Menzies and Kushlan 1991, Hass et al. 1992, Mindell et al. 1996, Poe 1996); **karyotype** (Cohen and Gans 1970); **systematics and taxonomy** (Gray 1831; Stejneger 1933; Mook and Mook 1940; Müller and Hellmich 1940; Wermuth 1953, 1964; Mertens and Wermuth 1955; Wermuth and Mertens 1961; Rider and Bartel 1967; Ross and Ross 1974, 1987; Smith and Smith 1977; Wermuth and Fuchs 1978; Harris 1980; Densmore 1983; Varona 1986; Densmore and Owen 1989; King and Burke 1989; Poe 1996; Crother 1999); **zoogeography** (Medem 1953; Sill 1968; Brooks and O'Grady 1989; Taplin and Griggs 1989; Hedges 1996a, b; Murphy 1996); **morphology** (Sloane 1725, Ahrenfeldt 1953); **vertebrae** (Brochu 1996); **teeth** (Edmund 1960, 1962, 1969; Varona 1966); **growth, size, or morphometrics** (Schmidt 1944; Wermuth 1964; Minton and Minton 1973; Dodson 1978; Carney 1979; Blahout 1979; Mazzotti 1982, 1984; Perez-Higareda et al. 1991; Arteaga and Herrera 1997; Piedra et al. 1997); **development** (Broman 1939, Rathke 1866, Neill 1971); **sexing technique** (Brazaitis 1969b); **metabolism** (Buchanan 1909; Dill and Edwards 1931a,b; Bennett and Dawson 1976; Wood and Lenfant 1976); **acid-base balance** (Howell and Rahn 1976); **heart beat** (Buchanan 1909); **blood vessels or hematology** (Hochstetter 1902, Dill and Edwards 1931b, Dessauer and Fox 1956, Dessauer et al. 1962, Rider and Bartel 1967, Thorson 1968, Dessauer 1970, Minnich 1982, Menzies 1991); **kidneys and osmoregulation** (Hernandez and Coulson 1959; Davis and Schmidt-Nielsen 1967; Dunson and Taub 1967; Schmidt-Nielsen and Skadhauge 1967; Schmidt-Nielsen and Davis 1968; Thorson 1968; Dunson 1970, 1976, 1982; Dantzler and Holmes 1974; Bentley 1976; Dantzler 1976; Evans and Ellis 1977; Carney 1979; Davis et al. 1980; Zucker 1980; Ellis 1981; Lillywhite and Maderson 1982; Mazzotti 1982; Minnich 1982; Mazzotti and Dunson 1984, 1989; Mazzotti et al. 1986; Dunson and Mazzotti 1989); **extrarenal salt glands** (Taplin et al. 1982); **evaporative water loss** (Zucker 1980, Lillywhite and Maderson 1982); **pharynx** (Beneden 1882); **larynx and swallowing** (Owen 1831); **trachea, lungs, and ventilation** (Gadow 1901, Dill and Edwards 1931a); **diving** (Parker 1925); **thymus gland** (Stannius 1846); **ear and hearing** (Beneden 1882; Wever 1971, 1978); **ear muscles and ligaments** (Bland-Sutton 1885, Killian 1890); **eye and vision** (Heinemann 1877, Allen and Neill 1950, Fleishman et al. 1988); **jaw, hyolaryngeal, and shoulder muscles** (Fürbringer 1876, 1922; Iordansky 1964; Schumacher 1973); **tail muscles** (Frey et al. 1989); **digestive tract** (Meckel 1817, Duges 1896, Jacobshagen 1920, Petzold 1959, Haslewood 1967, Brazaitis 1969a, Parsons and Cameron 1977); **learning behavior** (Gossette and Hombach 1969, Burghardt 1977); **burrowing behavior** (Alcala and Dy-Liaco 1989, Ross and Magnusson 1989); **social behavior** (Garrick and Lang 1977;

Lang 1987, 1989; Thorbjarnarson 1991); **aggressive behavior** (Cope 1900, Cochran 1944, Dugan et al. 1981, Seijas et al. 1985, Lazcano-Barrero 1996); **vocalizations** (Neill 1971, Campbell 1973, Carpenter and Ferguson 1977, Lang 1989, Ross 1995b); **chemical signals** (Polo et al. 1988a, 1988b; Rasmussen and Schmidt 1992); **courtship** (Lang 1989); **eggs** (Breder 1946, Rand 1968a, Folinsee et al. 1970, Neill 1971, Ogden 1971a, Greer 1975, Lutz et al. 1980, Dunbar-Cooper and Lutz 1981, Lutz and Dunbar-Cooper 1982, Fitch 1985, Seijas et al. 1990, Aguilar and Casas-Andreu 1991, Perez and Villa 1991, Shwedick 1991, Sigler 1994, Bolaños 1996b, Thorbjarnarson 1996, Platt and Thorbjarnarson 1997); **nesting** (Schmidt 1924; Werner 1933; Breder 1946; Bean 1953; Moore 1953a, Rand 1968a,b; Casas-Andreu and Guzmán-Arroyo 1970; Greer 1971; Neill 1971; Campbell 1972; Porter 1972; Ogden 1976, 1978b; Duval 1977; Garrick and Lang 1977; Lutz and Dunbar-Cooper 1982, 1984; Ferguson 1985; Mazzotti et al. 1988; Paez and Bock 1988; Mazzotti 1989; Rodriguez and Rodriguez 1989; Ross and Magnusson 1989; Thorbjarnarson 1989; Moler 1991; Brandt et al. 1995; Schubert 1995, 1997; Anon. 1996; Bolaños 1996a; Tabet and Soberón 1998); **hatchlings** (Dutt 1951, Rau 1959, Greer 1975, Lang 1989, Seijas et al. 1990, Brandt et al. 1995, Schubert 1995, Sánchez et al. 1997, Tabet and Soberón 1998); **sex determination** (Aguilar et al. 1993); **hatchling sex ratio** (Brandt et al. 1995), **parental care** (Descourtiz 1809, Brehm 1865, Campbell 1973, Ogden and Singletary 1973, Ogden 1978b, Dugan et al. 1981, Shine 1988, Ross and Magnusson 1989); **hybridization** (Varona 1966; Mertens 1968, 1972a; Groombridge 1987; Steel 1989; Penny 1991; Rue 1994); **movement** (DeSola 1930, Rodda 1984, Moler 1991); **habitat** (Schmidt 1951, Neill 1958, Barbour 1976, Ogden 1976, Compton 1979, Wilcox 1979, Gaby et al. 1985, Gaby 1987, Alcalá and Dy-Liacco 1989, Dunson and Mazzotti 1989, Rodríguez Schettino 1993, Garlock 1994b, Sigler 1995, Arteaga and Herrera 1997); **general ecology** (Medem 1962; Ogden 1971a, 1976; Mazzotti 1984; Gaby et al. 1985; Thorbjarnarson 1988, 1989; Kushlan and Mazzotti 1989b; Seijas 1990; Brandt et al. 1995); **populations** (Turner 1977; Kushlan 1982; Schomer and Drew 1982; Gaby et al. 1985; Seijas 1986a; Kushlan and Mazzotti 1986; Thorbjarnarson 1986, 1988; Casas-Andreu 1990, 1994, 1995; Menzies and Kushlan 1991; Moler 1992a; Sasa 1992; Sasa and Chaves 1992; Arteaga 1993, 1994; Chaves Cordero 1993; Platt 1994; Schubert 1994, 1995; Brandt et al. 1995; Bolaños et al. 1996, 1997a, 1997b; Sánchez et al. 1996; Schubert and Santana 1996; Martínez-Ibarra et al. 1997; Muñoz-Canales et al. 1997; Arteaga et al. 1998); **sex ratio** (Thorbjarnarson 1997); **longevity** (Oliver 1955, Comfort 1961, Snider and Bowler 1992); **survival status and exploitation** (Dickinson 1953; Brazaitis 1967; Medem 1971a, 1971b; Ogden 1971a, 1971b; Powell 1971, 1973a, 1973b; Mittermeier 1972; Lang 1975; Horan 1977; Townsend 1978; Compton 1979; Anon. 1980; Varona 1980, 1987; Maness 1982; Mielcarek 1983; Rivero Blanco and D'Andria 1986; Seijas 1986a, 1986b, 1990; Thorbjarnarson 1986; Steel 1989; King et al. 1990; Mendez-de la Cruz and Casas-Andreu 1992; Ottenwalder and Ross 1992; Thorbjarnarson et al. 1992; Rodríguez Schettino 1993; Garlock 1994a, 1994b; Mairson 1994; Pritchard 1994; Brandt et al. 1995; Casas-Andreu 1995; Ponce-Campos et al. 1996; Schubert 1995; Ross 1996; Schubert and Santana 1996; Arteaga and Herrera 1997; Muñoz-Canales et al. 1997; Pough et al. 1998; Henderson and Powell 1999); **management** (Beltrán 1968, 1969; Ogden 1971b, 1976, 1978b; Alvarez del Toro 1972, 1974; Ogden and Singletary 1973; Behler 1978; Dodd 1978; Compton 1979; Klukas et al. 1979; Shapiro 1980; Varona 1980; Jacobsen 1982, 1983; King et al. 1982; Kushlan 1982; Tryon and Behler 1982; Horan 1984; Gaby 1987; Gorzula 1987; Clagett 1988; Kushlan 1988; Moler 1989; Palis 1989; Seijas et al. 1990; Grenard 1991;

Menzies 1991; Moler 1992a; Ross 1992; Arteaga 1993; Baquero de Pedret et al. 1993; Seijas 1993; Quero de Peña 1993; Felix 1994; Forestieri 1994; Garlock 1994b; Lander et al. 1994; Schubert 1994; Brown 1995; Ross and David 1995; Acuna 1996; Bolaños 1996a; Velasco 1996; Bolaños et al. 1997a; Klinge 1997; Soberón 1997; Larriera et al. 1997); **trapping method** (Mazzotti and Brandt 1988); **predation** (Charnock-Wilson 1970, Fitch 1985, Rasmussen and Schmidt 1992, Schubert 1997), **competition with other crocodylians or iguanas** (Rand 1968b, Rand and Robinson 1969, Neill 1971, Dugan et al. 1981, Gaby et al. 1985, Steel 1989, Penny 1991), **thermal relationships** (Cope 1900; Dittmars 1910; Duellman 1965; Guggisberg 1972; Lang 1978, 1979; Gregory 1982; Mazzotti et al. 1986; Mazzotti 1989; Penny 1991; Casas-Andreu and Reyna Trujillo 1994; Mindell et al. 1996), **feeding habits** (Noble 1921, Langston 1965, Hernández 1977, Lang 1979, Caldwell 1986, Ross and Magnusson 1989, Rodriguez and Rodriguez 1991, Casas-Andreu and Mendez de la Cruz 1993, April 1994, Plotkin and Zanella 1994, Ortiz et al. 1997), **cannibalism** (Casas-Andreu and Mendez de la Cruz 1993), **nuisance behavior and attacks on humans** (Allen 1938, Allen and Neill 1952a, Neill 1971, Pooley et al. 1989, Ross 1995, Lazcano-Barrero 1996), **mutualistic cleaning by fish** (Kühlmann 1966, Guggisberg 1972), **contamination** (Hall et al. 1979; Kushlan 1982, 1988; Stoneburner and Kushlan 1984; Eisler 1990), **diseases and parasites** (Pérez Viguera 1936, 1957; Hughes et al. 1940, 1942; Peláez and Cruz 1953; Caballero and Brenes 1958; Jasmin and Baucom 1967; Lainson 1968; Groschaft and Barús 1970; Elkan 1974; Sprent 1977; Coy Otero and Barús 1979; Perez Benitez et al. 1980; Sardiñas et al. 1980; Frank 1981; Coy Otero and Lorenzo-Hernandez 1982; Telford 1984; Brooks and O'Grady 1989; Obaldia et al. 1990; Baquero de Pedret and Boede 1993; Boede et al. 1995; Sigler 1996), **chemical immobilization** (Klide and Klein 1973), **scale patterns** (Cope 1900, Varona 1966, King and Brazaitis 1971, Brazaitis 1973, Ross and Ross 1974), **folk tales and anthropology** (Moore 1954, Trompf 1989, Ross 1995), **common names** (Liner 1994, Collins 1997), and **use as food** (Klemens and Thorbjarnarson 1995).

• **ETYMOLOGY.** The specific name *acutus* derives from the Latin *acuere*, meaning to sharpen or to end in a sharp point, and undoubtedly refers to the pointed snout of this species.

• **COMMENTS.** Andersson (1900) reported two eggs had full grown embryos, one of which had its head protruding, among the specimens (syntypes?) examined by Linnaeus (1758) in composing his description of *Lacerta crocodilus*. Andersson (1900) identified these embryos as *Crocodylus americanus* Laurenti 1768 (= *Crocodylus acutus*). However, Lönnberg (1896) reported that the type specimen of *L. crocodilus* is a *Caiman sclerops* Schneider 1801 (= *Caiman crocodilus*), thus the name *crocodilus* is not available for *Crocodylus acutus*.

The name *Crocodylus Americanus Plumerii* Schneider 1801 predates *Crocodylus acutus* Cuvier 1807, and appears to be legitimate. A description is provided and was based on anatomical notes sent to Schneider by Plumer, for whom Schneider named the species. As was the custom of the day, no holotype was designated and a rather general type locality was given. The name *Plumerii* has been ignored in the literature, but meets the criteria of a *nomen oblitum* as described in the International Code of Zoological Nomenclature.

Three other names predate *Crocodylus acutus* Cuvier 1807, but these usually are considered *nomen dubia*. The earliest taxonomic reference to *C. acutus* may have been *Crocodylus americanus* Laurenti 1768, based on a plate (no. 106) of a crocodylian in the first volume of Seba's (1734) Thesaurus. However, the drawing is not diagnostic, and it could represent any

New World crocodylian. The type locality, "America," provides no clue to the illustrated individual's identification. Smith and Smith (1977) proposed that, because the drawing can represent any crocodylian, the name *Crocodylus americanus* Laurenti 1768 be fixed as a junior synonym of Linnaeus' (1758) *Lacerta crocodilus* (= *Caiman crocodilus*, see above). Bory de Saint-Vincent (1824) considered *C. americanus* Laurenti to be synonymous with *Crocodylus sclerops* Schneider 1801 (also *Caiman crocodilus*, see above). This uncertainty reinforces the name *Crocodylus americanus* Laurenti 1768 as a *nomen dubium*. The second questionable name, *Lacerta alligator* Blumenbach 1779, also was proposed for a crocodylian in the Seba (1734) plate. Although Smith and Smith (1977) proposed the name as a "*nomen clarum*" (?), with the same identity as *Crocodylus americanus* Laurenti 1768, the same argument exists that *C. americanus* is a *nomen dubium*. The third *nomen dubium* is *Crocodylus caudiverbera* Bonnaterre 1789, which is equally unidentifiable. Smith and Smith (1977) also designated it a "*nomen clarum*" (?) with the same identity as *Crocodylus americanus* Laurenti 1768.

The earliest name that can be properly identified with the taxon *Crocodylus acutus* is *Crocodylus biscutatus* Cuvier 1807. The latter appeared on page 53 and the former on page 55 of the same publication. The first revisors, Duméril and Bibron (1836), chose *acutus* as the species name. They noted that one of the syntypes of *biscutatus* was a mutilated specimen of *acutus*. Unfortunately, the syntypes of both *acutus* and *biscutatus* apparently were kept in the Laboratoire d'Anatomie Comparée where Cuvier worked, and not in the collection of the Muséum National d'Histoire Naturelle, Paris; they eventually were lost (*vide* Roger Bour, in litt., 4.XI.97). Cuvier (1807) considered the collection data associated with one of the syntypes of *biscutatus* to be untrustworthy, and the general area of distribution was unknown until Duméril and Bibron (1836) examined one syntype and identified it as *acutus*. *Crocodylus biscutatus* occasionally has had its origin listed as Africa, but this locality apparently derived from the label on one of the missing syntypes upon which supposedly was written that "Adanson" called it "Gavial de Sénégal."

The syntypes of *Alligator lacordairei* Preudhomme de Borre 1869 probably are hatchlings, and they often have been confused with the other true crocodylian present in Belize, *Crocodylus moreletii*. Günther (1885) regarded *A. lacordairei* as a synonym of *C. moreletii*, but Schmidt (1924) showed Preudhomme de Borre's original figures of *lacordairei* to be identical with *C. acutus*, an opinion previously expressed by Werner (1909), although not universally followed. Wermuth and Mertens (1961) first formally assigned *A. lacordairei* to the synonymy of *C. acutus*, but not until Ross and Ross (1974) examined the caudal scalation of the syntypes of *lacordairei* was their identity as young *C. acutus* finally confirmed.

The missing syntypes of *Crocodylus floridanus* were originally placed in the private museum of Professor Ward, Rochester, New York, they consisted of a 4.27 m adult male collected at Arch Creek by Hornaday on 21 January 1875, a 38 cm skull salvaged by Hornaday at Arch Creek, a 19 cm skull collected at Indian River, Florida by Hornaday, a 37 cm stuffed juvenile collected at the mouth of the Miami River, 26 September 1874, and the skin and skeleton of a 6.37 m specimen killed at Lake Worth.

Müller and Hellmich (1940) partitioned *Crocodylus acutus* into two subspecies, *C. a. acutus* Cuvier 1807 and *C. a. lewyanus* Duméril, in Duméril and Bocourt 1870. However, their discussion was not at the depth required to make such a taxonomic designation, and their work usually has been disregarded.

*Crocodylus acutus* is protected under both Florida and U.S. regulations. The species is now federally listed as endangered.

Over the rest of its range in the Americas the species is vulnerable, as most populations are small and declining. Farming and international trade are monitored by CITES.

The overall quality of survey data is poor. In many areas populations are severely depleted or extirpated. Substantial populations are thought to remain in Belize and Cuba. Small, but relatively secure populations exist in southern Florida and Jamaica.

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