

REPTILIA: SQUAMATA: GEKKONIDAE

THECADACTYLUS, *T. RAPICAUDA*

Catalogue of American Amphibians and Reptiles.

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Thecadactylus Goldfuss

Thecadactylus Goldfuss 1820:157. Type species, *Gecko laevis* Daudin 1802:112 (= *Thecadactylus rapicauda* [Houttuyn 1782]), by monotypy.

Thecadactylus: Wagler 1830:142. *Nomen substitutum*.

Thecadacrylus: Amaral 1948 (1949):109. *Error typographicus*.

Tecadactylus: Medina 1973:318. *Lapsus*.

• **CONTENT.** A single species, *Thecadactylus rapicauda*, is recognized (Kluge 1991, 1993; Rösler 2000).

• **DEFINITION, DIAGNOSIS, DESCRIPTIONS, ILLUSTRATIONS, DISTRIBUTION, FOSSIL RECORD, PERTINENT LITERATURE.** See species account.



FIGURE 1. Adult *Thecadactylus rapicauda* from the northside watertank near Brimegin, Anguilla, near the northern extent of the range of the species in the West Indies (photograph by R. Powell).



FIGURE 2. Adult *Thecadactylus rapicauda* with original tail from Cuyabeno, Sucumbios Province, Ecuador (photograph by L.J. Vitt).

• **ETYMOLOGY.** *Thecadactylus* is derived from the Latin *theca*, meaning sheath, and *dactylus*, from the Greek *daktylos* meaning finger. The name refers to the sheathed claws that are diagnostic for this genus.

• **REMARKS.** Cuvier (1817 [1816]) used the vernacular term "thecadactyles" in reference to several species of geckos, but did not use a Latinized generic name. Goldfuss (1820), whose citation of the name *Thecadactylus* in conjunction with the species *laevis* made the name available, attributed the name to Cuvier. Avila-Pires (1995) attributed the name *Thecadactylus* to Oken (1817), but this usage, in a summary of Cuvier's (1817 [1816]) classification system, has been regarded as a *nomen nudum* (e.g., Kluge 1993). Vanzolini (1968a) reviewed the history of the generic name and incorrectly attributed it to Gray (1825).



FIGURE 3. Adult *Thecadactylus rapicauda* with regenerated tail from Rio Ituxí, Amazonas, Brazil (photograph by L.J. Vitt).



FIGURE 4. Adult *Thecadactylus rapicauda* from Rio Formoso, Rodônia, Brazil, illustrating the golden colored iris and a dark dorsal pattern (photograph by L.J. Vitt).



FIGURE 5. Juvenile *Thecadactylus rapicauda* from Santarém, Pará, Brazil (photograph by L.J. Vitt).

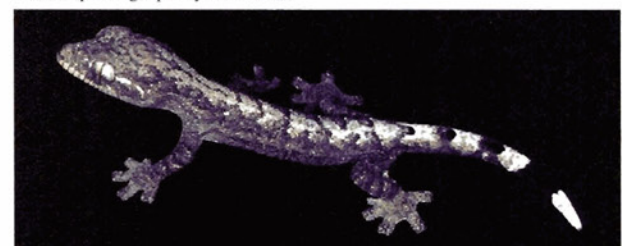
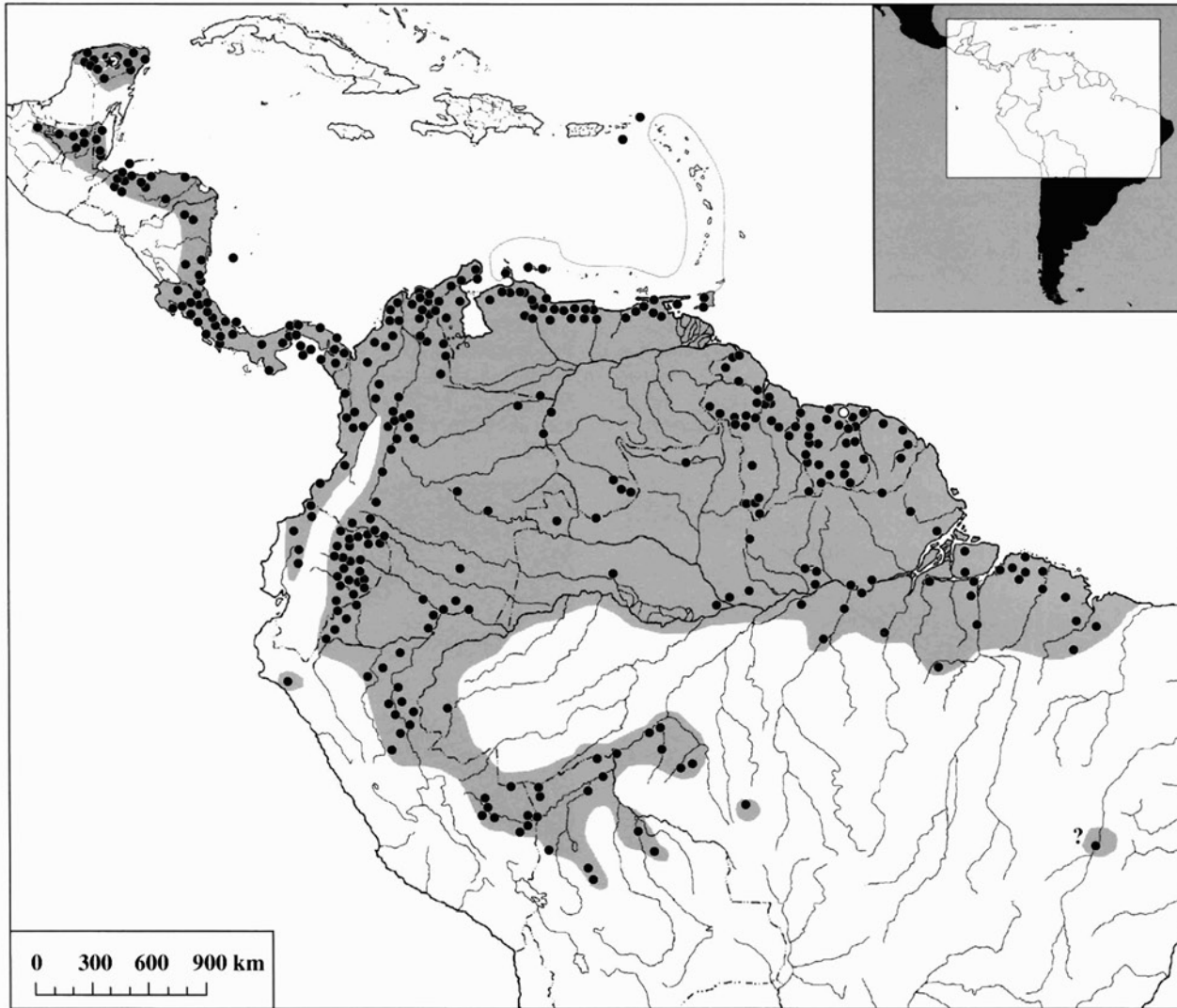


FIGURE 6. Juvenile *Thecadactylus rapicauda* from 101 km S Santarém, Pará, Brazil (photograph by L.J. Vitt).



MAP 1. Distribution of *Thecadactylus rapicauda* in Central and South America and adjacent islands based on museum records and localities reported by Mechler (1968), Hoogmoed (1973), Avila-Pires (1985), Lee (1996), and Murphy (1997). The restricted type localities of Smith and Taylor (1950a,b: "Chichen Itzá, Yucatán, Mexico") and Hoogmoed (1973: "Paramaribo, Surinam") are indicated by circles. The star indicates a subfossil locality from cave sites in the Yucatán (see **Fossil Record**). Dots mark other records; some dots denote two or more geographically proximate localities. The question mark indicates a doubtful extralimital locality.

Brongersma (1934) provided morphological evidence for the removal of the Australian species *T. australis* Günther 1877 (now *Pseudothecadactylus australis*) from the genus, leaving it monotypic. *Thecadactylus* belongs to the subfamily Gekkoninae (Kluge 1967, 1987) and has been referred to the tribe Gekkonini on the basis of the absence of the second ceratobranchial arch of the hyoid apparatus (Kluge 1983). Russell and Bauer (1988) and Abdala and Moro (1996) found some morphological similarities with *Briha* on the basis of digital structure and cranial musculature, respectively. Kluge (in Duellman and Pianka 1990) suggested that *Thecadactylus* had an (unspecified) African sister taxon. Vanzolini (1968a), Duellman and Pianka (1990), and Bauer (1993) discussed the biogeography of the genus.

***Thecadactylus rapicauda* (Houttuyn)**
Turnip-tailed Gecko

Gekko Rapicauda Houttuyn 1782:323, pl., fig. 1. Type locality, West Indies (as implied by Houttuyn's reference to this species as a "Westindische Gekko"). Smith and Taylor (1950b), Taylor (1956), and J.A. Peters (1967) gave the original type

locality as "American Islands." Subsequent restrictions of the type locality have been made by Smith and Taylor (1950a, b; "Chichen Itzá, Yucatán, Mexico") and Hoogmoed (1973; "Paramaribo, Surinam"); see **Remarks**. Holotype unknown (Smith and Taylor 1950a, Stuart 1963), probably lost (Hoogmoed 1973; Schwartz and Thomas 1975).

Lacerta rapicauda: Gmelin 1789:1068.

Stellio perfoliatus Schneider 1792:26. *Nomen substitutum*.
Synonymized *fide* Cuvier (1817 [1816]).

Gekko rapicauda: Meyer 1795:26.

Gekko laevis Daudin 1802:112. Type locality, "Amérique méridionale," listed incorrectly as *Gekko laevis* in synonymy by Taylor (1956). According to Brygoo (1990), this name is based on two specimens collected by Bosc and Brongniart and not present in the Paris Museum. Synonymized *fide* Wagler (1830).

Gekko surinamensis Daudin 1802:126. Type locality, "Surinam," listed incorrectly as *Gekko surinamensis* in synonymy by Taylor (1956). Holotype, apparently once in the Paris Museum, but missing since at least 1851 (Brygoo 1990); collected by Levaillant. Synonymized with *Gekko laevis fide*



MAP 2. Distribution of *Thecadactylus rapicauda* in the Lesser Antilles based on museum records. Dots mark localities. Stars indicate late Quaternary fossil sites on Anguilla, Barbuda, Antigua, and Guadeloupe (see Fossil Record).

- Cuvier (1817 [1816]); synonymized with *Platydactylus theconyx* fide Duméril and Bibron (1836); synonymized with *Thecadactylus rapicaudus* fide Gray 1845.
- Lacerta Perfoliata*: Shaw 1802:268.
- Gekko laevis*: Merrem 1820:42. *Lapsus*.
- Greco levis*: Gray 1825:198. *Error typographicus*.
- Thecadactylus laevis*: Fitzinger 1826:47.
- [*Thecodactylus*] *laevis*: Wagler 1830:142.
- Gekko Levis*: Griffith and Pigeon 1831:229. *Lapsus*.
- [*Thecodactylus*] *perfoliatus*: Oken 1836:638.
- [*Thecodactylus*] *rapicaudus*: Oken 1836:638.
- Platydactylus Theconyx* Duméril and Bibron 1836:306, pl. 33, fig. 2. *Nomen substitutum*.
- Thecodactylus perfoliatus*: Oken 1843: caption pl. 68, fig. 2.
- Thecodactylus laevis*: Fitzinger 1843:98.
- Thecadactylus rapicaudus*: Gray 1845:146.
- Platydactylus theconyx*: Duméril in Duméril and Duméril 1851: 34.
- Pachydactylus tristis* Hallowell 1854: 98. Type locality (in error), "Liberia, west coast of Africa." Holotype, Academy of Natural Sciences of Philadelphia (now lost, fide Dunn in Loveridge 1947), presented by Dr. Goheen. Synonymized fide Hallowell (1857).
- Platydactylus pheconyx*: Court 1858:440. *Lapsus*.
- Hemidactylus rapicauda*: Schlegel 1858:543
- Thecadactylus rapicauda*: Günther 1859:211. First use of combination.
- Platydactylus rapicauda*: Reinhardt and Lütken 1863:123.
- Thecadactylus rapicaudatus*: Kappler 1881:166. *Lapsus*.
- Thecadactylus rapicauda*: Vanzolini 1968a:66. *Error typo-*

graphicus, in synonymy.

Tecadactylus rapicauda: Medina 1973:318. *Lapsus*.

Thecodactylus rapicaudus: Lainson and Naiff 1999:209. *Lapsus*.

• **CONTENT.** Burt and Myers (1942) thought that this species would probably be taxonomically subdivided, but no comprehensive analysis of variation within the species has been undertaken and no subspecies are currently recognized (Wermuth 1965; Kluge 1991, 1993; Rösler 2000). Karyological differences across the range of *T. rapicauda*, however, suggest that more than one species exists (Mijares-Urrutia and Arends R. 2000).

• **DEFINITION.** Males attain 125 mm SVL and females 126 mm (maximum weight 40.3 g) (Vitt and Zani 1997), although claims of up to 140–150 mm SVL exist (Roze 1964; Henkel and Schmidt 1991, 1995). The head is large, 26–31% SVL in females, 25–29% in males, 32% in juveniles; head 1.3–1.6 times as long as wide, 1.5–1.8 times as wide as deep in females, 1.6–1.8 times in males, 1.5 times in juveniles. The snout is pointed with rounded tip, concave in profile; frontal and intraorbital region concave. The tongue is lanceolate, tip broadly rounded, slightly divided. The rostral is large, rectangular, 2.0 times as wide as deep, with a short median cleft extending from the posterior border. The nostrils are bordered by the rostral and by the first supralabials, 3–5 small postnasals, and a postrostral on each side. Rectangular supralabials number 9–16 (usually 9–12), decrease in size posteriorly, and number 7–10 to below the center of the eye. The ear opening is moderately large, smaller than the eye, obliquely to horizontally oval, and with smooth margins. The external auditory meatus is long and the tympanum is barely visible. Scales on the dorsal and lateral surfaces of head are subequal, small, and granular. The canthus rostralis is distinct and rounded. Margins of upper eyelids feature a row of slightly enlarged conical scales; up to 13 of these are enlarged posteriorly into spikes, which are not developed in juveniles. The eyes are large and pupils are vertical with lobed margins. The mental is small, triangular, usually wider than long, and bordered posteriorly by two (rarely one) postmentals. Square infralabials number 9–14 (usually 9–11), decrease in size posteriorly, and are bordered by a row of sublabials. Scales on the chin and throat are small and granular. Scales on the nape and sides of the neck are identical with dorsals.

Dorsal and lateral scales are small, granular, and disposed in indistinct oblique rows. Ventrals are larger than dorsals, round

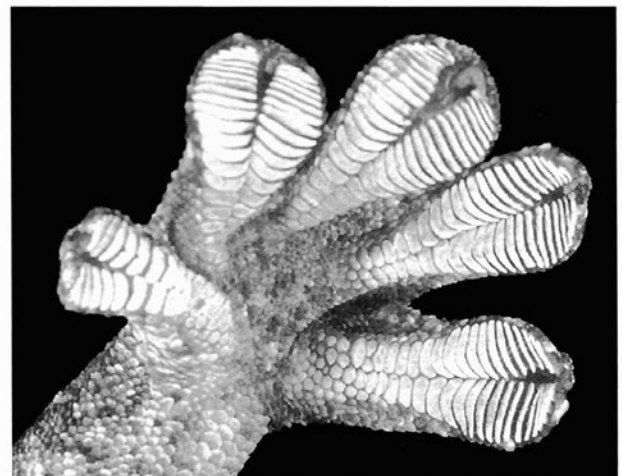


FIGURE 7. Ventral view of the foot of *Thecadactylus rapicauda* from 101 km south of Santarém, Pará, Brazil, illustrating the extensive digital webbing, broad, divided lamellae, and claws recessed in a median sulcus (photograph by L.J. Vitt).

to oval, smooth, imbricate, in oblique rows, 95–129 between the insertion of the forelimbs and the vent. The total number of scales around midbody is 140–177. The transition between laterals and ventrals is gradual. A few rows of scales immediately anterior to the vent are smaller than ventrals and more or less granular. No femoral or preanal pores are present.

Limbs are short and stout and digits are strongly dilated and connected by a basal web. Subdigital lamellae are in two rows, separated by a median sulcus that widens and deepens distally; subdigital lamellae beneath digit IV of the manus number 16–25 (usually 19–22) and those on digit IV of the pes number 18–25 (usually 20–23). Scales on the upper, anterior, and lower surfaces of the forelimbs, and on the anterior and lower surfaces of the thighs are round to rhomboid, flat, and slightly imbricate; those on the lower surfaces of the hindlimbs are large, lanceolate, flat, and strongly imbricating; and those on the posterior surfaces of the forelimbs, posterior and upper surfaces of the thighs, and posterior, upper, and anterior surfaces of the antibrachium are small and granular.

Scales on the proximal part of the tail are like dorsals, whereas those on the distal portion are slightly larger, flat, slightly imbricate, and arranged in transverse rows. Scales beneath the tail are larger than ventrals, square, flat, imbricate, and arranged in transverse rows. The tail is divided into indistinct verticils, each with 5 scale rows. Regenerated parts of tails bear small, round to oval, convex, juxtaposed, and irregularly arranged scales. Most individuals exhibit a regenerated tail, which has a turnip-shaped form, the proximal part being fleshy and much wider than the base of the tail, and the distal part tapering to a blunt tip. Enlarged postanal scales number 1–3.

Dorsal color in alcohol is pale brown to grey. The head and dorsum may or may not have black markings but, when present, these are V-shaped, with the apex directed caudad, and arranged in transverse series. The middorsal region is often lighter than the remainder of the back. Distinct white to orange stripes extend from the eyes to the insertions of the forelimbs and onto the flank, where they fade. Lips are greyish-white, with or without black borders on labials. An original tail bears dark wide brown or black transverse bands; a regenerated tail sometimes retains this pattern but usually has many short, irregular, longitudinal dark brown streaks. The venter is white to dark brown, either immaculate or with small spots.

Color in life changes as induced by environmental or physiological factors, and these changes may be pronounced (Beebe 1944). The greatest color change is from diurnal to nocturnal, especially in younger animals. The dorsum ranges from pale pinkish-white with ivory dorsal markings to dark to light grey or brown with black and white or violet to brown chevrons and spots. The venter is pale beige. Pale whitish to olive brown stripes extend from the eye to the shoulder, and are bounded above and below by dark brown bands of equal width. Labials are usually olive buff, frequently with black margins. The tongue is blue and the oral cavity is lined with orange. The iris is reddish tan to golden in males and silver in females and juveniles (Hoffmann 1993).

• **DIAGNOSIS.** Among Neotropical geckos *Thecadactylus rapicauda* differs from *Coleonyx*, *Gymnodactylus*, *Homonota*, *Lygodactylus*, *Phyllodactylus*, *Coleodactylus*, *Gonatodes*, *Lepidoblepharis*, *Pseudogonatodes*, and *Sphaerodactylus* in the possession of expanded scansorial pads under the bases of all digits. This species may be distinguished from *Aristelliger*, *Tarentola*, *Bogertia*, *Briba*, *Phyllopezus*, and *Hemidactylus* by the presence under each toe of a deep subdigital sulcus that houses the claw and extends proximally for the entire length of the scansorial row, segregating the scansors into a double series. The presence of cloacal sacs (and internal cloacal bones) fur-

ther distinguishes *T. rapicauda* from *Aristelliger*, *Lygodactylus*, and the sphaerodactyl geckos *Coleodactylus*, *Gonatodes*, *Lepidoblepharis*, *Pseudogonatodes*, and *Sphaerodactylus*.

• **DESCRIPTIONS.** In addition to the descriptions cited in the synonymy, Daudin (1802), Schneider (1812), Guichenot (1855), Boulenger (1885), Beebe (1944), Taylor (1956), da Cunha (1961), Underwood (1962), Maslin (1963), Vanzolini (1968a), Hoogmoed (1973), Duellman (1978), Schwartz and Henderson (1991), Avila-Pires (1995), Lee (1996, 2000), Murphy (1997), and Campbell (1998) provided detailed descriptions of *T. rapicauda*. Werner (1925) described juveniles.

• **ILLUSTRATIONS.** Early line drawings of *Thecadactylus rapicauda* were provided by Houuttuyn (1782, whole animal with regenerated tail), Daudin (1802, whole animal with regenerated tail), Schneider (1812, whole animal with original tail and underside of head and forebody), Schinz (1833, whole animal with original tail), and Oken (1843, whole animal with original tail). **Color photographs** of the entire animal are in Alvarez del Toro (1982), Gasc (1990), Bianchi (1991), Henkel and Schmidt (1991, 1995), Seuffer (1991, 1995), Klátil (1994), Kozmik (1994, adult and juvenile), Avila-Pires (1995), Bartlett and Bartlett (1995), Rösler (1995), Powell et al. (1996), Lee (1996, 2000), Murphy (1997), Vitt and de la Torre (1996), Campbell (1998), Malhotra and Thorpe (1999, adult and juvenile), Stafford and Meyer (2000), Köhler (2000), van Buurt (2001), and Leenders (2001). Color photographs of particular views or features are in MacLean (1982, head showing tongue wiping spectacle), Seuffer (1991, top of the head and underside of pes), Murphy (1997, individual with a partly autotomized tail), and Renjifo and Lundberg (1999, head and forebody). **Black and white photographs** are in Ribeiro (1937, dorsal view of an adult with original tail), Beebe (1944, juvenile with original tail, ventral view of pes), Marcuzzi (1954, specimen with original tail), Pope (1955, whole body in lateral view), Taylor (1956, preserved specimen), Vanzolini (1968a, preserved specimen), Hoogmoed (1973, dorsal, lateral, and ventral views of the whole animal and head only of a male specimen from Suriname; 1974, head and body), Duellman (1978, juvenile), da Rocha (1994, lateral view of head and body), Sherriff et al. (1995, three-quarter view), Vitt and de la Torre (1996, head and body), and Vitt and Zani (1997, adult male and female, juvenile, and ventral view of pes). **Black and white photomicrographs** are in Hamilton (1960, section through inner ear), Wever (1973, section through meatal closure muscles of ear), Schleich and Kästle (1986, SEM of toe pads), and Russell and Bauer (1988, cleared and stained skeleton of the toes, dissection of toes, and histological section through the paraphalanges). **Halftone drawings** are in Beebe (1944, diurnal and nocturnal color patterns, head and forebody of adult, view of the digits of the manus being hyperextended) and Almendáriz (1987). **Line drawings** are in Duméril and Bibron (1836, ventral view of toe), Duméril (1856, ventral view of toe), Cartier (1872, surface of toe lamellae and view of individual setae), Hoffmann (1890, surface of toe lamellae and view of individual setae), Cope (1892, hyoid apparatus), Versluys (1898, lateral view of dissection of head and neck illustrating neck musculature and the ear region), Camp (1923, vertebrae), Brongersma (1934, lateral view of a single digit), Beebe (1944, hyoid apparatus), Underwood (1954a, ventral view of toe), Hamilton (1960, inner ear), Solano (1964, ventral view of manus), Mechler (1968, lateral view of head), Bellairs (1969, ventral view of toe), Currat (1980, dorsal and lateral view of whole animal and incorrectly drawn dorsal and ventral views of foot), MacLean (1982, head and body), Seuffer (1985, 1991, ventral view of toe), Avila-Pires (1995, rostrum, orbit, mental region, and ventral view of pes), Vitt and de la Torre (1996,

head and body), Lee (1996, 2000, ventral view of toe), Abdala and Moro (1996, pterygoid and associated musculature), and Murphy (1997, diagrammatic view of venter of foot).

• **DISTRIBUTION.** *Thecadactylus rapicauda* has the most extensive range of any naturally distributed lizard in the Western Hemisphere (Parker 1935), and one of the widest distributions of any gecko in the world (Mattison 1989). The species occurs more or less continuously from the Virgin Islands and northern Middle America to northcentral South America. General statements of its distribution and selected records from throughout the range of the species have been given by Fitzinger (1843), Flower (1929), Marcuzzi (1950, 1954), Wermuth (1965), and Peters and Donoso-Barros (1970, 1986).

Its range in **Central America** extends from the Yucatán Peninsula, where an apparent disjunction occurs, through Panamá. In México, Belize, Guatemala, and Honduras, it occurs on the Atlantic versant only, but, farther south, it is present on the Pacific versant as well. *Thecadactylus rapicauda* also has been recorded from the Corn Islands (Nicaragua; Barbour and Loveridge 1929) and Utila Island (Honduras; Köhler 1996, 1998). Elevational records in Middle America range from sea level to at least 750 m (Stafford and Meyer 2000, Wilson et al. 2000).

Checklists, faunal surveys, field guides, and notes mentioning **Mexican localities** have been presented by Cope (1866), Barbour and Cole (1906), Gaige (1936), Smith (1938), Smith and Taylor (1950b), Peters (1953), Barrera (1962 [1963]), Duellman (1965), Smith and Smith (1976), Casas Andreu and McCoy (1979), Sanchez-Herrera and Alvarez del Toro (1980), Lee (1980, 1996, 2000), Alvarez del Toro (1982), Flores-Villela (1993) and Campbell (1998). Other **Middle American localities** for *T. rapicauda* have been listed by Günther (1893), Villa et al. (1988), and Johnson (1989). Records from individual countries have been given in a diversity of publications: **Guatemala** (Cope 1887; Stuart 1934, 1935, 1948, 1950, 1958, 1963; Duellman 1963; Campbell and Vannini 1989; Campbell 1998, 2000), **Belize** (Neill and Allen 1959, 1961, 1962; Neill 1965; Henderson and Hoevers 1975; Campbell and Vannini 1989; Campbell 1998; Stafford and Meyer 2000; Turvey and Cooper 1999), **Honduras** (Smith 1950, Meyer 1966, Meyer and Wilson 1973, Köhler 1996, Nicholson et al. 2000, Wilson et al. 2000), **Nicaragua** (Barbour and Loveridge 1929, Villa 1983, Köhler and Seipp 1998, Köhler 1999), **Costa Rica** (Cope 1875a [1876], 1887; Taylor 1956; Fitch 1973; Savage 1980; Savage and Villa 1986; Burger 2001), **Panamá** (Peracca 1896; Barbour 1906; Schmidt 1933; Swanson 1945; Cochran 1946; Sexton et al. 1964; Ortleb and Heatwole 1965; Myers and Rand 1969; Ibañez et al. 1994, 2000; Auth 1994). Point localities have been mapped for México, Belize, and northern Guatemala by Lee (1980, 1996) and for Nicaragua by Köhler (1999).

General discussions of the distribution in **South America** and reviews of material from across the South American range include Griffin (1917), Burt and Burt (1930, 1931, 1933), Burt and Myers (1942), Vanzolini (1968a,b), Avila-Pires (1995), and da Silva and Sites (1995). In Ecuador and Colombia, the species occurs on both sides of the Andes, whereas in Perú and Bolivia, it is known only from the eastern side (except for a single record from extreme northwestern Perú). The southeastern border of its distribution in Brazil probably coincides with the border between the Amazonian rain forest and cerrado (Hoogmoed 1973, Censky and Kaiser 1999). Records extend from sea level to about 750 m in Venezuela (Péfaur and Díaz de Pascual 1982, Durant and Díaz 1996) and Brazil (Ribeiro 1937), but Dunn (1945) reported its occurrence from sea level to 1500 m in Colombia. In addition to mainland localities, it has also been found on Isla de Patos (Lancini 1963) and Isla de Margarita

(Roze 1964), off the Venezuelan coast. The species also is known from Tobago, Trinidad, Nelson Island, Monos Island, Chacachacare Island, Little Tobago Island, Gaspar Grande Island, Caledonia Island (Trinidad and Tobago), Curaçao and Bonaire (Netherlands Antilles), and Aruba (Netherlands).

Checklists, regional faunas, and notes from particular South American countries include: **Colombia** (Boulenger 1914, Ruthven 1922, Dunn 1945, Medem 1969, Valdivieso and Tamsitt 1963, Mechler 1968, Ayala (1986), **Venezuela** (Stejneger 1901, Shreve 1947, Aleman 1953, Marcuzzi 1954, Lancini 1963, Roze 1964, Test et al. 1966, Donoso-Barros 1968, Péfaur and Díaz de Pascual 1982, Bisbal 1990, Péfaur 1992, Durant and Díaz 1996, Gorzula and Senaris 1998, Mijares-Urrutia and Arends R. 2000), **Guyana** (Beebe 1919, 1944; Crawford 1931; Smith 1956), **Suriname** (van Lidth de Jeude 1904, Hoogmoed 1973), **French Guiana** (Hoogmoed and Lescure 1975; Gasc 1981, 1990; Hoogmoed and Avila-Pires 1991), **Brazil** (Goeldi 1902; Hagmann 1909; Proctor 1923; Cott 1926; Amaral 1937 [1938], 1948 [1949]; da Cunha 1961, 1981; Vanzolini 1972, 1974; O'Shea 1990; Nascimento et al. 1991; Avila-Pires 1995), **Ecuador** (O'Shaughnessy 1881; J.A. Peters 1967; Duellman 1978; Miyata 1982; Almedáriz 1987, 1991; Vitt and de la Torre 1996), **Perú** (Cope 1868, 1869 [1871], 1875b [1876]; Dixon and Soini 1975, 1986; Duellman and Salas 1991; Rodriguez and Cadle 1990; Duellman and Mendelson 1995; Carrillo de Espinoza and Icochea 1995; Morales and McDiarmid 1996; Lamar 1997; Franklin 2001), **Bolivia** (Schmidt and Inger 1951; Fugler 1983, 1986, 1989), **Trinidad and Tobago** (Mole and Urich 1894a; Beebe 1952; Brongersma 1956; Boos and Quesnel 1969; Dinsmore [1969]1970; Mertens 1972 [1973]; Boos 1977, 1983a,b, 1985; Moonen 1977; Hardy 1982; Krintler 1982; Murphy 1997), and **Aruba, Curaçao and Bonaire** (Meek 1910, Ruthven 1923, Werner 1925, Menne 1954b, van Buurt 2001). Point locality maps have been published for Suriname (Hoogmoed 1973), Colombia (Mechler 1968), Amazonian South America (Avila-Pires 1995), and Trinidad and Tobago (Murphy 1997). Marcuzzi (1954) mapped the distribution of the species in Venezuela, and Ribeiro (1937) mapped the southern distributional limit of *Thecadactylus* in South America.

In the **West Indies**, *Thecadactylus rapicauda* is absent from the Greater Antilles and from the smaller islands of the Puerto Rico Bank (except Necker Island), but is present on all of the major islands of the Lesser Antilles except Barbados. It has been recorded from St. Croix (U.S. Virgin Islands); Necker Island (British Virgin Islands); Sombrero (St. Kitts and Nevis); Anguilla; Sint Maarten/St. Martin (Netherlands Antilles/French Antilles); St. Barthélemy (French Antilles); Saba, Sint Eustatius (Netherlands Antilles); St. Christopher; Nevis (St. Kitts and Nevis); Antigua, Barbuda (Antigua and Barbuda); Montserrat; Guadeloupe; La Désirade; Terre-de-Haut, Terre-de-Bas, Marie-Galante (French Antilles); Dominica; Martinique; Diamant; Chancel (French Antilles); St. Lucia, Maria Major (St. Lucia); St. Vincent, Bequia Island (St. Vincent and the Grenadines); and Carriacoa Island, Grenada, Green Island, Ilet Hardy (Grenada).

The general distribution of *T. rapicauda* in the West Indies was reviewed by Barbour (1914, 1930, 1935, 1937), Schwartz and Thomas (1975), MacLean et al. (1977), Schwartz and Henderson (1985, 1988, 1991), and Powell et al. (1996). Lesser Antillean records have been presented in checklists, guides, keys, and regional faunal treatments by Garman (1887), Boulenger (1891), Barbour (1915), Parker (1933), Cochran (1938), Underwood (1962), Pinchon (1967), Long (1974), Corke (1987, 1992), Pregill et al. (1994), Sherriff et al. (1995), Censky and Kaiser (1999), and Malhotra and Thorpe (1999). A range map for the West Indies and a separate one for the Virgin Islands was published by Schwartz and Henderson (1991). Its occurrence in

the Virgin Islands has been noted by Günther (1859), Grant (1932b, 1937), Philobosian and Yntema (1976, 1977), MacLean (1982), and Lazell (1995).

The species had been recorded from St. Thomas, U.S. Virgin Islands by Reinhardt and Lütken (1863), Cope (1868), Boulenger (1885), Schmidt (1928), and Grant (1932b), at least in part on the basis of a specimen in the Muséum National d'Histoire Naturelle, Paris (MNHN 2440), but this record was repudiated by Grant (1937). A record from "Gaudalaxara" [= Guadalajara, Jalisco, México] from the J.J. Major collection in the United States National Museum was published by Cope (1887), but was called into question by Gadow (1905). Subsequent authors (Zweifel 1959, Sanchez-Herrera and Alvarez del Torro 1980, Smith and Pérez-Higareda 1989) also have dismissed the record as erroneous.

• **FOSSIL RECORD.** Non-cultural Late Quaternary fossil remains have been found on Anguilla, Barbuda, Antigua, and Guadeloupe (Auffenberg [1958]1959; Etheridge 1965; Estes 1983; Pregill et al. 1988, 1994). Subfossil cave deposits also have been recovered from the Yucatán Peninsula (Langebartel 1953).

• **PERTINENT LITERATURE.** The **phylogenetic affinities and geographic origins** of *T. rapicauda* have been considered indeterminate (Vanzolini 1968b), although Savage (1966, 1982) and Duellman (1979, 1990) considered it a South American element that had subsequently entered Central America, and Hedges (1996) believed that it had dispersed from South America to the West Indies in the Quaternary. The phylogeny of *Thecadactylus*, in light of other South American geckos, was discussed by Abdala (1996). Other comparative or phylogenetic studies that included *T. rapicauda* were Taylor and Leonard (1956), Jullien and Renous-Lecuru (1972), Kluge (1982), and Grismer (1988).

Although both sexes can reach **snout vent lengths** over 120 mm, Vitt and Zani (1998a) recorded a mean of 99 mm and 20.8 g for specimens from Roraima, Brazil. Eastern Amazonian adults have a larger average SVL than those in western Amazonia (Vitt and Zani 1997). Sexual dimorphism was discussed by Taylor (1956) and Fitch (1981). Sherriff et al. (1995) provided morphometric data for specimens from Maria Major Island, St. Lucia.

The **skin** is delicate and tears if roughly handled (Barbour 1921; Beebe 1944; Johnson 1946; MacLean 1982; Bauer and Russell 1992; Bauer et al. 1989, 1992; Lazell 1995; Lee 1996; Murphy 1997). Bauer et al. (1989) tested skin mechanical parameters and compared them to those of other weak-skinned geckos. Loose skin forms digital webbing and limb fringes that are spread and used in parachuting, as well as crypsis (Vitt and de la Torre 1996, Vitt and Zani 1997). Beebe (1944) described the color of living specimens and diel variations thereof. Stejneger (1901), Roze (1964), and Obst et al. (1984, 1988) also noted the ability of individuals to change color. Geographic variation in color was mentioned by Garman (1887). The source of lamellar coloration was discussed by Neill and Allen (1961).

Many workers (Griffith and Pidgeon 1831, Oken 1836, Taylor 1956, G. Peters 1967, Mertens 1969, Grzimek 1971) have discussed the strange "turnip like" shape of the **regenerated tail**. Tails are autotomized readily (76.4% of adults >100mm SVL) in association with predation attempts and in intense social encounters (Vitt and Zani 1997). Tails average 12.4% of body mass (Vitt and Zani 1997) and can be used as fat storage organs (Malhotra and Thorpe 1999). The original tail is prehensile (Beebe 1944, da Cunha 1961, Mertens 1969).

A variety of additional **morphological characters**, including the condition of the hyoid and scleral ossicles have been

summarized by Kluge (1967, 1983, 1987). Other anatomical structures considered are **dentition** (Etheridge 1964, 1965; Estes 1983), **cranial osteology** (Abdala 1996), **hyoid structure** (Cope 1892, Beebe 1944, Jollie 1960), **ear morphology and function** (Cope 1892; Versluys 1898; Hamilton 1960, 1964; Miller 1966; Wever 1974, 1978), **meatal closure musculature** (Versluys 1898, Wever 1973), **lack of parietal eye** (Gundy and Wurst 1976), **microstructure of glandular scales** (Taylor and Leonard 1956), **cranial musculature** (Abdala and Moro 1996), **arteries of the head** (Versluys 1898), **vertebral morphology** (Camp 1923, Remane 1936), **digital structure** (Brongersma 1934; Underwood 1954a,b; Solano 1964; Schleich and Kästle 1986; Russell and Bauer 1990), **paraphalangeal structure** (Russell and Bauer 1988), **postanal (cloacal) sacs and bones** (Hoogmoed 1973, Hoogmoed and Lescure 1975), **cloacal spurs** (Neill and Allen 1962, incorrectly described as cloacal bones), **hemipenial structure** (Dowling et al. 1971), **preanal pores** (Camp 1923), **lung morphology** (Milani 1894, Camp 1923), **fine structure of the epidermis** (Cartier 1872), and **nerve structure and arrangement** (Renous-Lecuru and Jullien 1972). The **karyotype** of *T. rapicauda* was presented by McBee et al. (1984) and Soma et al. (1975), and Olmo (1984) considered genome size in this species. **Tail autotomy** in this species was compared to other lizards by Zani (1996), and aspects of scansorial morphology were similarly compared by Zani (2000).

The **natural history** of *Thecadactylus rapicauda* has been outlined in some detail by Beebe (1944, Guyana), Hoogmoed (1973, Suriname), Duellman (1978, Ecuador), Lazell (1995, Necker Island, British Virgin Islands), and Vitt and Zani (1997, Amazonia; 1998b, Nicaragua). General **habitats** have been described by Günther (1859), Stejneger (1901), Beebe (1925, 1944), Stuart (1935, 1950), Breder (1946), Marcuzzi (1954), Neill and Allen (1959), Sexton et al. (1964), Donoso-Barros (1968), Crump (1971), Vanzolini (1968a, 1972, 1986), Meyer and Wilson (1973), Dixon and Soini (1975, 1986), Duellman (1978), Gasc (1981, 1990), Bartlett (1987), Corke (1987, 1992), Hoogmoed and Avila-Pires (1991), Martins (1991), Schwartz and Henderson (1991), Ibañez et al. (1994), Sherriff et al. (1995), Morales and McDiarmid (1996), Murphy (1997), Malhotra and Thorpe (1999), Campbell (2000), Stafford and Meyer (2000), and Wilson et al. (2000). Vitt and Zani (1997) recorded it from five habitat types in Amazonia: grassy areas, edge of forest, within primary forest, within secondary forest, and along stream edges. In eastern Amazonia, the species is found chiefly in forest habitats, whereas in western Amazonia it is more frequently encountered in clearings (Vitt and de la Torre 1996, Vitt and Zani 1997). It occupies xerophytic and other diverse habitat types in Venezuela and elsewhere in northern South America (Marcuzzi 1954, Donoso-Barros 1968, Rivero-Blanco and Dixon 1979). Bullock and Evans (1990) found it most abundant in coastal woodlands on Dominica.

Thecadactylus rapicauda is primarily arboreal (Menne 1954a; Duellman 1966, 1987, 1990; Vanzolini 1986; Martins 1991; Rodriguez and Cadle 1990) and has been recorded at heights of up to 30 m in trees (Vitt and Zani 1997), although mean perch height in Ecuador was only 3.75 m (Vitt and Zani 1996). It is found on tree trunks (Ruthven 1922, Rand and Myers 1990, Vitt and de la Torre 1996, Vitt and Zani 1997, Gorzula and Senaris 1998), on branches and bromeliad leaves (Lazell 1995, Vitt and de la Torre 1996, Vitt and Zani 1997), in decayed logs, hollow trees, and palm leaf axils (Beebe 1944), and under bark by day (Ruthven 1922; Barbour 1930, 1935, 1937). It may also be found on the ground (Vitt and de la Torre 1996, Vitt and Zani 1997), in rock crevices or under vegetable trash (Barbour 1930, 1935, 1937), or even below ground (Lazell 1995). Occupancy of man-made structures has been reported by Kappler (1887), Barbour (1930, 1935, 1937), Smith (1938), Beebe (1944),

Swanson (1945), Maslin (1963), Roze (1964), Bullock and Evans (1990), Lazell (1995), Vitt and Zani (1996, 1997, 1998a), and Howard et al. (2001). Vitt and Zani (1997) noted that it may be common in buildings, especially when *Hemidactylus* spp. are absent, but that it is chiefly limited to structures near forest edges or the periphery of towns. Howard et al. (2001) found individuals cohabiting buildings with *H. mabouia* on Anguilla, recorded cloacal temperatures below those of the substrate, and recorded perch heights averaging 6.6 m, although only one individual was found below 4.5 m. Occupation of caves has been noted by Gaige (1938), Duellman (1965), and Turvey and Cooper (1999).

The **activity period** of *Thecadactylus rapicauda* has been discussed by Park and Williams (1940), Vanzolini (1972, 1986), Dixon and Soini (1975, 1986), Obst et al. (1984, 1988); Lazell (1995), and Powell et al. (1996). Although chiefly nocturnal (Beebe 1944; Roze 1964; Rand and Humphrey 1968; Vanzolini 1968a; Medem 1969; Duellman 1987, 1990; Rand and Myers 1990; Rodriguez and Cadle 1990; Vitt 1996; Gorzula and Senaris 1998), diurnal activity has been noted by Valdivieso and Tamsitt (1963), Hoogmoed (1973), Hoogmoed and Avila-Pires (1989), and Campbell (1998). It is the only primarily nocturnal lizard in the Amazon (Duellman 1987) and most lowland Neotropical forests (Vitt and Zani 1997). Vitt and Zani (1996) found it active generally after 2000 h, with peak activity within three hours of sundown. *Thecadactylus rapicauda* is not heliothermic (Vitt et al. 1998) and mean body temperatures measured in Amazonia (26.4°C) were highly correlated with substrate and air temperatures (Vitt and de la Torre 1996, Vitt and Zani 1997).

The **predators** of *T. rapicauda* have been reviewed by Avila-Pires (1995). Numerous snakes, including *Leptophis ahaetulla* (Hero and Magnusson 1987), *Siphlophis cervinus* (da Cunha and Nascimento 1994), *Leptophis mexicanus* (Campbell 1998), *Liophis cobella* (Mole and Ulrich 1894b, Boos 2001), and *Corallus caninus* (Henderson 1993), as well as phyllostomid bats (Goodwin and Greenhall 1961, Tuttle 1967, Greene 1988) and centipedes (Olson 1993) are known predators. Beebe (1944) reported that one was eaten by a captive cebus monkey.

Thecadactylus rapicauda has been considered a sit and wait predator (Vitt and Zani 1996, 1997, 1998a) and is capable of chemical discrimination of prey (Cooper 1995a,b, 1997). **Diet** of specimens from Suriname has been considered by Hoogmoed (1973, 1974) and that of specimens from Guyana by Beebe (1944). The diet is nearly exclusively insectivorous (Beebe 1925, 1944; Parker 1935; Gaige 1938; Roze 1964; Duellman 1978, 1990; Martins 1991; Lazell 1995). Duellman (1978) reported that roaches made up 70% of stomach volume in specimens from Ecuador, and that one gecko had eaten a scorpion. The diet also incorporates molluscs and other lizards (Roze 1964, Medem 1969, Maclean 1982), including *Anolis* spp. and *Sphaerodactylus molei* (Beebe 1944, Duellman 1978, Malhotra and Thorpe 1999). Large prey items are especially important in the diet (Vitt 1996; Vitt and Zani 1996, 1997). Vitt and Zani (1997) found dietary breadth to be greater in eastern Amazonian samples, but mean prey size greater in western Amazonia.

Parasites have been discussed by Bianchi (1991) and De Marmels (1994). Parasitic worms were considered by Chitwood (1938), Skryabin et al. (1960, 1974), and Baker (1987), and blood parasites by Telford (1970, 1971a,b, 1978, 1988, 1998), Guerrero and Ayala (1977), Ayala (1978), and Lainson and Naiff (1999). Christensen and Telford (1972) described a new species of trypanosome in lizards of this species from Panamá. Experimental infection of this species with *Leishmania donovani* was described by Medina (1973).

Reproduction, oviposition and clutch size was discussed by Beebe (1944), Sexton et al. (1964), Meyer (1966), Fitch (1970, 1982), Telford (1971c), Hoogmoed (1973, 1974), Dixon and Soini (1975, 1986), Duellman (1978), Bianchi (1991), and

Lee (1996, 2000). Clutch size has been cited as either one with a short interval between clutches (Lee 1996, Vitt and Zani 1997), or two, with a significant delay between oviposition of first and second egg (Hoogmoed 1973, Campbell 1998). A report of 2–3 eggs in *T. rapicauda* from the French Antilles (Curat 1980) is almost certainly in error. Eggs usually are laid under bark (Vitt and de la Torre 1996, Campbell 1998). Egg size was discussed by Beebe (1944), Duellman (1978), and Almedáriz (1987). Kozmik (1994) reported on eggs and hatchlings in captivity. **Captive husbandry** and care were discussed by Miller (1979, 1982), Seuffer (1985, 1991, 1995), and Bianchi (1991). Captive longevity records are given by Snider and Bowler (1992) and Slavens and Slavens (1998).

Intraspecific interactions, including **territorial behavior** were described by Beebe (1944) and Kaiser and Diaz (2001), **aggressive behavior** by Duellman (1978), and **antipredator defenses** by Greene (1988). The role of this species in a community of Amazonian lizards was discussed by Vitt et al. (1999), and the influence of body size on community structure by Vitt (2000). Juveniles are cryptically colored and have conspicuously banded tails that they wave when threatened (Vitt and Zani 1997). Lazell (1995) reported that specimens on Necker Island showed varying degrees of nocturnal movement, but that some travelled great distances at night before returning to a fixed daytime retreat. **Vocalizations** are frequently produced in a variety of social contexts and have been described by Kappler (1887), West (*in* Grant 1932a), Beebe (1944), Johnson (1946), da Cunha (1961), Geijskes (1970), Avila-Pires (1995), Campbell (1998), Turvey and Cooper (1999), and Malhotra and Thorpe (1999). **Scansorial locomotion** was discussed by Beebe (1944) and **parachuting** from a height of 30 m was described by Vitt and Zani (1997). **Local abundances and densities** were commented upon by Rand and Myers (1990, Barro Colorado Island, Panamá) and Lazell (1995, Necker Island, British Virgin Islands). Duellman (1987) considered the contribution of the species to biomass.

Because of its wide distribution, *Thecadactylus rapicauda* is known by a diversity of **vernacular names**: gecko patudo (Alvarez del Toro 1982, Liner 1994, Campbell 1998, México), cuiga cola de nabo, escorpión (Campbell 1998, Guatemala), escorpión, turnip-tailed gecko, gecko patudo (Henderson and Hoovers 1975, Stafford and Meyer 2000, Belize), talconete (Nicholson et al. 2000, Honduras); salamanqueja (Dunn 1945, Valdivieso and Tamsitt 1963, Renjifo and Lundberg 1999, Colombia), canchacha, salamanqueja, tuteque, tuqueque (Roze 1964, van Buurt 2001, Venezuela), kwakwasnekie (van Lidth de Jeude 1904, Hoogmoed 1973, Suriname), large house gecko, cat-eyed gecko, gongasacka, cang-gah-sah or kinggasah [= "one who calls in the house," Akawai Indian] (Beebe 1944, Guyana), lagartixa, lagarto, osga, sepópéua (da Cunha 1961, O'Shea 1990, Brazil), woodslave (Günther 1859, St. Croix), mabouia des bananiers, mabouya collant, mabouya des cocotiers (Guichenot 1855, Curat 1980, French Antilles), mabouya hazyé (Bullock and Evans 1990, Dominica), wood slave (Barbour 1914, Grenada), plantain mabuia, mabuia de bananiers, house gecko, woodslave, mabuia, mabou-yahn, twenty-four hours (Parker 1935, Boos 1985, Murphy 1997, Trinidad and Tobago), pegapega, kèkè, knolstaartgekkko (van Buurt 2001, Aruba, Curaçao and Bonaire).

Local superstitions (Groome 1970, Mattison 1989), including that the species is venomous, have been recorded from much of the range, including the Yucatán (Maslin 1963), Honduras (Schmidt and Inger 1957), Colombia (Dunn 1945), Venezuela (Roze 1964), and Suriname (Hoogmoed 1973). In parts of Honduras and Venezuela, some locals believe the species capable of killing by stinging with the tail (Roze 1964, Nicholson et al. 2000). In many parts of the West Indies, contact with the

scansorial pads is believed to be deadly (Boos 1985, Trinidad), and Günther (1859) noted the belief in St. Croix that the part of the body to which the gecko was attached had to be cut off to prevent death. The common name "twenty-four hours" refers to the time it is believed one has to live after contact with the geckos. Mole (1926) mentioned two species of twenty-four hours in Trinidad, one is certainly *T. rapicauda*, and *Hemidactylus mabouia* is probably the other (Powell et al. 1998).

Other listings of the species in **general catalogues, lists, or short species accounts** include Sonnini and Latreille (1802), Daudin (1803), Tilesius von Tilenau (1821), Bory de Saint-Vincent (1828), Gray (1827, 1831, 1845), Bonaparte (1832), Wiegmann (1834a,b), Duméril and Duméril (1851), Duméril et al. (1854), Lichtenstein and von Martens (1856), Jan (1857), Müller (1878), Boulenger (1885, 1887, 1894), Strauch (1887), Boettger (1893a,b), Peracca (1897), Stejneger (1904), Penard and Penard (1906), Grant (1932b), da Cunha (1961), Dixon (1979), Hoogmoed (1979), Elter (1981), Lazell (1983), Banks et al. (1987), Frank and Ramus (1995), Smith and David (1999), and Lewis (2001). **Bibliographies** of *Thecadactylus rapicauda* have been provided by Smith and Smith (1973, 1976, 1993) and Villa et al. (1988).

• **ETYMOLOGY.** The specific epithet is from the Latin *rapum* (= turnip) and *cauda* (= tail), in reference to the peculiar shape of the regenerated tail in this species. The epithet is treated as a noun in apposition and thus is not formed with a masculine ending to match the generic name (Neill and Allen 1962).

• **REMARKS.** Although not formally described until 1782, *Thecadactylus rapicauda* had been known to European workers at least several decades earlier. According to Lönnberg (1896), Linnaeus' (1749) concept of *Lacerta Gecko* was, in part, based on the species. This species may have been recognized and described simply as "*Gekko*" by Hartsinck (1770: 102) (Hoogmoed, 1973), although Powell et al. (1998) believed that the animal described was more likely *Hemidactylus mabouia*.

The type locality of *Thecadactylus rapicauda* has been a source of confusion. Smith and Taylor (1950a,b) restricted the type locality of this species to Chichen Itzá, Yucatán, México without comment. Vanzolini (1968a) doubted the validity of this restriction. Because Houttuyn (1782) reported the species from a specimen in his possession (Stuart 1963), Hoogmoed (1973) felt that it could only have come from one of the Dutch possessions. As such, Houttuyn's use of the term "Westindische" in discussing this species could have referred only to Suriname (as well as Demerara, Essequibo, and Berbice, now parts of Guyana) and the Dutch West Indian islands of Aruba, Bonaire, Curaçao, Saba, St. Eustatius, and St. Maarten. Hoogmoed (1973) argued that circumstantial evidence points to Suriname as the place of origin of the type and, because only coastal Suriname had been colonized by Europeans at that time, that the specimen probably came from Paramaribo, a place where it still occurs. Hence, Hoogmoed (1973) restricted the type locality to this spot.

Cuvier (1817 [1816], 1829, 1836) suggested that *Gecko squalidus* Herrmann, might be conspecific with this species, and it was listed in synonymy by several subsequent authors (Wagler 1830, Fitzinger 1843). Although this name was not listed in any context by most subsequent reviewers (e.g., Boulenger 1885, Wermuth 1965), Kluge (1993) tentatively allocated it to the synonymy of *Tarentola mauritanica* without comment. Some confusion exists in the early systematic literature with respect to the use of the specific epithet *rapicauda* versus *perfoliatus*, *laevis*, *surinamensis*, and *theconyx*, with some authors using more than one name despite their apparent recognition of their synonymy relative to one another. This stems from the fact that

some workers regarded the name *rapicauda* as appropriate only to "mutilated" specimens, those with regenerated tails (Wagler 1830, Fitzinger 1843). This confusion has been exacerbated by the lack of extant type material for any of the taxa proposed as new.

Brygoo (1990) recognized MNHN 2265, collected in Martinique by Auguste Plée, and MNHN 2266, collected in Martinique by Justin Goudot, as syntypes of *Platydictylus theconyx* Duméril and Bibron 1836. Another supposed syntype specimen, MNHN 2267, collected in Martinique by Alexandre Moreau de Jonnès could not be located by Brygoo in 1990. Additional material from Suriname, Guadeloupe, and Cartagena was present in 1851 (Duméril in Duméril and Duméril 1851). The status of any of this material as types, however, is incorrect, as the name was clearly erected as a substitute for *T. rapicauda*; Duméril and Bibron (1836) considered both *Gecko laevis* and *Lacerta rapicauda* as synonyms of their new name.

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