

Catalogue of American Amphibians and Reptiles.

Flores-Villela, O., H.M. Smith, E.A. Liner, and D. Chiszar. 2010. *Sceloporus carinatus*.

***Sceloporus carinatus* Smith**
Keeled Spiny Lizard
Lagartija escamosa aquillada

Sceloporus carinatus Smith 1936:89. Type-locality, "near Tuxtla Gutiérrez, Chiapas, Mexico". Holotype, Field Museum of Natural History (FMNH) 32005, adult male, collected 4 September 1935 by E.H. Taylor and H.M. Smith.

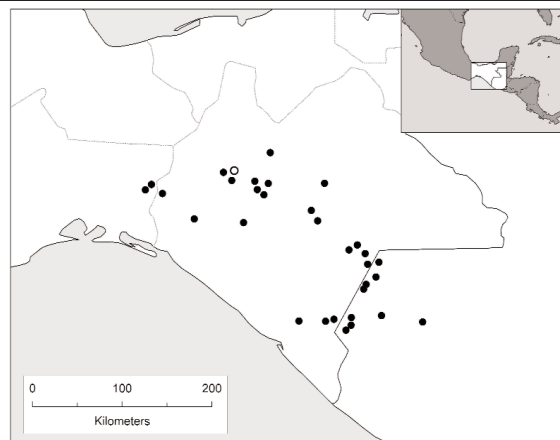
• **CONTENT.** No subspecies are currently recognized.

• **DEFINITION.** A small species, maximum known SVL ca. 80 mm (*vide* Alvarez del Toro, 1960, 1973, 1982) with the following characteristics: head scales strongly keeled; frontal ridges prominent; 2 postrostrals; 1 canthal; 2 pairs of internasals; 3 frontonasals, subequal in size, contiguous; 2 prefrontals; frontal divided, posterior part much smaller than anterior part, which is split longitudinally; 2 frontoparietals, broadly in contact; a single row of large supraoculars, only partially separated from median head scales by a single interrupted row of circumorbitals; 1 parietal on each side; dorsal scale rows 38–44; dorsal scales about twice size of the lateral scales, which are arranged in oblique rows; 8 rows of dorsals on rump; males without enlarged postanals; gular and abdominal semeions absent. The color pattern consists of indistinct dorsolateral and lateral light lines, a vertebral row of chevron-shaped dark marks on the dorsum, ground color brownish dorsally, suffused with reddish, and a pair of round, orange spots on the rear of the thigh.

• **DIAGNOSIS.** *Sceloporus carinatus* is a member of the *siniferus* species group, nearly unique in the presence of keeled preanals in females; outside of this group, only *S. ochoterena* has that character. The species differs from all others of the genus except *S.*



FIGURE 1. *Sceloporus carinatus* male from Huehuetenago, Guatemala (JAC 18929, UTA Slide Collection 21062). Photograph by J.A. Campbell.



MAP. The circle represents the type-locality of *Sceloporus carinatus*, and the dots represent other locality records.

squamosus in the combination of two postrostrals, a single canthal, and lateral scales in oblique rows. It differs from the closely allopatric *S. squamosus* by having more femoral pores on each side (11–12 vs. 3–6) and more dorsal scale rows (38–44 vs. 28–37) from the occiput to the rear margins of the thighs.

• **DESCRIPTIONS.** Significant descriptions are in Smith (1936, 1939) and Köhler and Heimes (2002). The species is compared in detail with *S. squamosus* and *S. siniferus* by Smith (1991).

• **ILLUSTRATIONS.** A color photograph appeared in Köhler and Heimes (2002), black-and-white photographs in Smith (1936) and Alvarez del Toro (1960, 1973, 1982).

• **DISTRIBUTION.** Terrestrial habitats in the upper valley and headwater valleys of the Río Grijalva from extreme eastern Oaxaca and the central plateau of Chiapas to the headwater valleys of the Río Negro, Guatemala (Stuart 1963).

• **FOSSIL RECORD.** None.

• **PERTINENT LITERATURE.** General accounts are provided by Köhler (2000), Köhler and Heimes (2002), and Smith (1936, 1939). Additional literature is arranged by topic: **anatomy and morphology** (Burstein et al. 1974; Larsen and Tanner 1974; Olson et al. 1986, 1987), **biogeography and distribution** (Alvarez del Toro 1960, 1973, 1982; Alvarez del Toro and Smith 1956; Campbell and Vannini 1989; Flores-Villela 1993; Flores-Villela and Gérez 1988, 1994; Flores-Villela et al. 1991; Freiberg 1972; García 2006; Johnson 1989, 1990; Maldonado Koerdell 1953; Manrique and Manrique 1988; Savage 1966; Smith 1991; Stuart 1954a,b; Villa et al. 1988; Wilson and McCranie 1998), **phylogeny and systematics** (Etheridge 1964; Flores-Villela et al. 2000; Hall 1973; Harmon et al. 2003; Larsen and Tanner 1975; Leaché and Mulcahy 2007; Reeder and Wiens 1996; Schulte and Moreno-Roark 2010; Sites et al. 1992; Wiens 1993, 1999; Wiens and Reeder 1995, 1997; Wiens et

al. 2010; Wills 1977), **reproduction** (Fitch 1970; Guillette et al. 1980; Méndez de la Cruz et al. 1998). The species occurs in the following **checklists and similar compendia**: Bell et al. (2003), Etheridge (1960), Flores Villela et al. (1995), Frank and Ramus (1995), Hutchins et al. (2003), Limer (1994, 2007), Limer and Casas-Andreu (2008), Marx (1956), Peters and Donoso-Barros (1970), Smith and Smith (1976, 1993), Smith and Taylor (1950a,b), Smith et al. (2000), Sokolov (1988), Stuart (1963), and Taylor 1944.

• **ETYMOLOGY.** The adjectival Latin word *carinatus* means keeled, and was applied in reference to the strongly keeled scales on the dorsum.

• **ACKNOWLEDGMENTS.** We are indebted to the curators of CAS, CM, FMN, KU, LACM, MCZ, TCWC, TNHC, UAZ, UCM, UIMNH, UMM, USNM, and UTEP for information on their holdings of this species (acronyms follow Leviton et al. 1985).

LITERATURE CITED

- Alvarez del Toro, M. 1960. Los reptiles de Chiapas. Tuxtla Gutiérrez, Chiapas, Mexico, Gobierno del Estado.
- . 1973. Los Reptiles de Chiapas. Segunda edición. Gobierno del Estado.
- . 1982. Los Reptiles de Chiapas. Tercera Edición, Corregida y Aumentada. Publ. Inst. Hist. Nat., Tuxtla Gutiérrez, Chiapas, Mexico.
- and H.M. Smith. 1956. Notulae herpetologicae Chiapasiae I. *Herpetologica* 12:3–17.
- Bell, E.L., H.M. Smith, and D. Chiszar. 2003. An annotated list of the species-group names applied to the lizard genus *Sceloporus*. *Acta Zool. Mex.* (n.s.) 90:103–174.
- Burstein, N., K.R. Larsen, and H.M. Smith. 1974. A preliminary survey of dermatoglyphic variation in the lizard genus *Sceloporus*. *J. Herpetol.* 8:359–369.
- Campbell, J.A. and J.P. Vannini. 1989. Distribution of amphibians and reptiles in Guatemala and Belize. *Proc. West. Found. Vert. Zool.*(4):1–21.
- Etheridge, R. 1960. The Relationships of the Anoles (Reptilia: Sauria: Iguanidae): An Interpretation based on Skeletal Morphology. Ph.D. Diss., Univ. Michigan, Ann Arbor.
- . 1964. The skeletal morphology and systematic relationships of sceloporine lizards. *Copeia* 1964: 610–631.
- Fitch, H.S. 1970. Reproductive cycles in lizards and snakes. *Misc. Publ. Mus. Nat. Hist. Univ. Kansas* (52):1–247.
- Flores-Villela, O. 1993. Herpetofauna Mexicana: Annotated list of the species of amphibians and reptiles of Mexico, recent taxonomic changes, and new species. *Carnegie Mus. Nat. Hist. Spec. Publ.* (17):iv + 73 p.
- and P. Gérez. 1988. Conservación en México: Síntesis sobre vertebrados terrestres, vegetación y el uso del suelo. *Inst. Nac. Investigaciones Recur-*
- sos Nat., Xalapa, México.
- and –. 1994. Biodiversidad y conservación en México: Vertebrados, vegetación y uso del suelo. Univ. Nac. Autón. México - UBIPRO, México, D.F.
- , E. Hernández García, and A. Nieto-Montes de Oca. 1991. Catálogo de anfibios y reptiles del Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autónoma de México. *Ser. Catálogos Mus. Zool. “Alfonso L. Herrera”* (3):xii + 222 p.
- , K.M. Kjer, M. Benabib, and J.W. Sites, Jr. 2000. Multiple data sets, congruence, and hypothesis testing for the phylogeny of basal groups of the lizard genus *Sceloporus* (Squamata, Phrynosomatidae). *Syst. Biol.* 49:713–739.
- , F. Mendoza Quijano, and G. Gonzalez Porter (compl.). 1995. Recopilación de claves para la determinación de anfibios y reptiles de México. *Publ. esp. Mus. Zool.* (10):iv + 285 p.
- Frank, N. and E. Ramus. 1995. A Complete Guide to Scientific and Common Names of Reptiles and Amphibians of the World. N G Publ., Inc., Pottsville, Pennsylvania.
- Freiberg, M.A. 1972. Los reptiles, p. 447–634. *In* L. Cendrero, *Zoología Hispanoamericana. Vertebrados*. Porrúa, Mexico, D.F.
- García, A. 2006. Using ecological niche modelling to identify diversity hotspots for the herpetofauna of Pacific lowlands and adjacent interior valleys of Mexico. *Biol. Conserv.* 130:25–46.
- Guillette, L.J., Jr., R.E. Jones, K.T. Fitzgerald, and H.M. Smith. 1980. Evolution of viviparity in the lizard genus *Sceloporus*. *Herpetologica* 36:201–215.
- Hall, W.P. 1973. Comparative Population Cytogenetics, Speciation, and Evolution of the Iguanid Lizard Genus *Sceloporus*. Ph.D. Diss., Harvard Univ., Cambridge, Massachusetts.
- Harmon, L.J., J.A. Schulte, II, A. Larson, and J.B. Losos. 2003. Tempo and mode of evolutionary radiation in iguanian lizards. *Science* 301:961–964.
- Hutchins, M., J.B. Murphy, and N. Schlager (eds.). 2003. *Grzimek’s Animal Life Encyclopedia*. 2nd ed., Vol.7. Reptiles. Gale Group, Inc., Farmington Hills, Michigan.
- Johnson, J.D. 1989. A biogeographic analysis of the herpetofauna of northwestern nuclear Central America. *Milwaukee Pub. Mus. Contrib. Biol. Geol.* (76):1–66.
- . 1990. Biogeographic aspects of the herpetofauna of the central depression of Chiapas, Mexico, with comments on surrounding areas. *Southwest. Nat.* 35:268–278.
- Köhler, G. 2000. *Reptilien und Amphibien Mittelamerikas, Band 1: Krokodile • Schildkröten • Echsen*. Herpeton, Offenbach, Germany.
- and P. Heimes. 2002. *Stachelleguane: Lebensweise • Pflege • Zucht*. Herpeton, Offenbach, Germany.
- Larsen, K.R. and W.W. Tanner. 1974. Numeric analysis of the lizard genus *Sceloporus* with special reference to cranial osteology. *Great Basin Nat.* 34: 1–41.

- and –. 1975. Evolution of sceloporine lizards (Iguanidae). *Great Basin Nat.* 35:1–20.
- Leaché, A.D. and D.G. Mulcahy. 2007. Phylogeny, divergence times and species limits of spiny lizards (*Sceloporus magister* species group) in western North American deserts and Baja California. *Mol. Ecol.* 16:5216–5233.
- Leviton, A.E., R.H. Gibbs, Jr., E. Heal, and C.E. Dawson. 1985. Standards in herpetology and ichthyology: Part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. *Copeia* 1985:802–821.
- Liner, E.A. 1994. Scientific and common names for the amphibians and reptiles of Mexico in English and Spanish. *Nombres científicos y comunes en Inglés y Español de los anfibios y reptiles de México.* SSAR Herpetol. Circ. (23):v + 113 p.
- . 2007. A checklist of the amphibians and reptiles of México. *Occas. Pap. Mus. Nat. Sci. Louisiana St. Univ.* (80):1–60.
- and G. Casas-Andreu. 2008. Standard Spanish, English and scientific names of the amphibians and reptiles of Mexico, 2do Edic (bilingual English Spanish). *SSAR Herpetol. Circ.* (38):iv + 162 p.
- Maldonado Koerdell, M. 1953. Reptiles, p. 121–133. *In* E. Beltrán (ed.), *Vida silvestre y recursos naturales a lo largo de la carretera Panamericana.* Instituto Mexicana de Recursos Naturales Renovables, México, D.F.
- Manrique, L. and J. Manrique. 1988. *Flora y Fauna de México.* Editorial Everest Mex., México, D.F.
- Marx, H. 1958. Catalogue of type specimens of reptiles and amphibians in Chicago Natural History Museum. *Fieldiana Zool.* 36:409–496.
- Méndez-de la Cruz, F.R., M. Villagrán-Santa Cruz, and R. Andrews. 1998. Evolution of viviparity in the lizard genus *Sceloporus*. *Herpetologica* 54: 521–532.
- Olson, R.E., B. Marx, and R. Rome. 1986. Descriptive dentition morphology of lizards of Middle and North America, I. Scincidae, Teiidae, and Helodermatidae. *Bull. Maryland Herpetol. Soc.* 22:97–124.
- , –, and –. 1987. Descriptive dentition morphology of lizards of Middle and North America II: Iguanidae. *Bull. Maryland Herpetol. Soc.* 23:12–34.
- Peters, J.A. and R. Donoso-Barros. 1970. Catalogue of the Neotropical Squamata: Part II. Lizards and Amphisbaenians. *Bull. U.S. Natl. Mus.* (297):v–viii + 293 p.
- Reeder, T.W. and J.J. Wiens. 1996. Evolution of the lizard family Phrynosomatidae as inferred from diverse types of data. *Herpetol. Monogr.* (10):43–84.
- Savage, J.M. 1966. The origins and history of the Central American herpetofauna. *Copeia* 1966: 719–766.
- Schulte, J.A., II and F. Moreno-Roark. 2010. Live birth among iguanian lizards predates Pliocene-Pleistocene glaciations. *Biol. Lett.*, in press.
- Sites, J.W., Jr., J.W. Archie, C.J. Cole, and O. Flores Vilella. 1992. A review of phylogenetic hypotheses for lizards of the genus *Sceloporus* (Phrynosomatidae): implications for ecological and evolutionary studies. *Bull. Amer. Mus. Nat. Hist.* (213): 1–110.
- Smith, H.M. 1936. Descriptions of new species of lizards of the genus *Sceloporus* from Mexico. *Proc. Biol. Soc. Washington* 49:87–96.
- . 1939. The Mexican and Central American lizards of the genus *Sceloporus*. *Zool. Ser. Field Mus. Nat. Hist.* (26):1–397.
- . 1991. The status of the southern Mexican lizard *Sceloporus carinatus*. *Bull. Maryland Herpetol. Soc.* 27:195–200.
- , D.L. Auth, D. Chiszar, D. Lintz, and B.C. Brown. 2000. The distribution of *Sceloporus megalepidurus* and of abdominal semeions in its genus (Reptilia: Sauria). *Bull. Maryland Herpetol. Soc.* 36:15–19.
- and R.B. Smith. 1976. Synopsis of the Herpetofauna of Mexico. Source Analysis and Index for Mexican Reptiles. Vol. III. John Johnson, North Bennington, Vermont.
- and –. 1993. Synopsis of the Herpetofauna of Mexico. Vol. VII. Bibliographic Addendum IV and Index, Bibliographic Addenda II–IV. Univ. Press Colorado, Niwot.
- and E.H. Taylor. 1950a. Type localities of Mexican reptiles and amphibians. *Univ. Kansas Sci. Bull.* 33:313–380.
- and –. 1950b. An annotated checklist and key to the reptiles of Mexico exclusive of the snakes. *Bull. U.S. Natl. Mus.* (199):v + 253 p.
- Sokolov, V.E. (ed.). 1988. *Dictionary of Animal Names in Five Languages. Amphibians and Reptiles.* Russky Yazyk Publ., Moscow.
- Stuart, L.C. 1954a. A description of a subhumid corridor across northern Central America, with comments on its herpetofaunal indicators. *Contrib. Lab. Vert. Biol. Univ. Michigan* (65):1–26.
- . 1954b. Descriptions of some new amphibians and reptiles from Guatemala. *Proc. Biol. Soc. Washington* 67:159–178.
- . 1963. A checklist of the herpetofauna of Guatemala. *Misc. Publ. Mus. Zool. Univ. Michigan* (122):1–150.
- Taylor, E.H. 1944. Present location of certain herpetological and other types specimens. *Univ. Kansas Sci. Bull.* 30:117–187.
- Villa, J., L.D. Wilson, and J.D. Johnson. 1988. *Middle American Herpetology: a Bibliographic Checklist.* Univ. Missouri Press, Columbia.
- Wiens, J.J. 1993. Phylogenetic relationships of phrynosomatid lizards and monophyly of the *Sceloporus* group. *Copeia* 1993:287–299.
- . 1999. Phylogenetic evidence for multiple losses of a sexually selected character in phrynosomatid lizards. *Proc. R. Soc. Lond. B* 266:1529–1535.
- , C.A. Kuczynski, S. Arif, and T.W. Reeder. 2010. Phylogenetic relationships of phrynosomatid lizards based on nuclear and mitochondrial data, and a revised phylogeny for *Sceloporus*. *Mol. Phylo. Evol.* 54:150–161.
- and T.W. Reeder. 1995. Combining data sets with different numbers of taxa for phylogenetic analysis.

- sis. Syst. Biol. 44:548–558.
- and –. 1997. Phylogeny of the spiny lizards (*Sceloporus*) based on molecular and morphological evidence. Herpetol. Monogr. (11):1–101.
- Wills, F.H. 1977. Distribution, Geographic Variation and Natural History of *Sceloporus parvus* Smith (Sauria: Iguanidae). M.S. Thesis, Texas A&M Univ., College Station.
- Wilson, L.D. and J.R. McCranie. 1998. The biogeography of the herpetofauna of the subhumid forests of Middle America (Isthmus of Tehuantepec to northwestern Costa Rica). Contrib. Royal Ontario Mus. Life Sci. (103):1–50.

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