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Source: Journal of Herpetology, 42(2) : 386-396

Published By: Society for the Study of Amphibians and Reptiles

URL: <https://doi.org/10.1670/07-1341.1>

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Two New Sympatric Species of Leaf-Toed Geckos (Gekkonidae: *Phyllodactylus*) from the Balsas Region of the Upper Marañon Valley, Peru

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ABSTRACT.—Two new species of the genus *Phyllodactylus* are described based on material collected in the southern portion of Departamento de Amazonas, Peru. Both species are well differentiated from all other South American *Phyllodactylus* based on characteristics of their morphology. In the case of one species, its large adult size and lack of well-defined rows of strongly keeled scales differentiate it from other *Phyllodactylus*, whereas in the second species, the presence of an enlarged postanal scale is diagnostic. Both species were collected in the xeric Balsas region of the upper Marañon Valley, and exhibit some similarities to other assemblages of sympatric *Phyllodactylus* in South America. The Balsas region is an area of endemism that warrants further attention from systematists and conservation biologists.

RESUMEN.—Dos nuevas especies del genero *Phyllodactylus* son descritas basándose en material colectado en la porción sur del Departamento de Amazonas, Perú. Ambas especies poseen caracteres morfológicos bien definidos que los diferencian de las demás especies de *Phyllodactylus* de Sudamérica. Para el caso de la primera especie, esta se diferencia por su talla adulta y carecer de filas bien definidas de escamas fuertemente killadas, en comparación a otros *Phyllodactylus*, y en la segunda especie, el carácter diagnostico es la presencia de una escama postanal alargada. Ambas especies fueron colectadas en la árida área de Balsas en la cuenca alta del Marañón, y exhiben cierta similitud a otros grupos de *Phyllodactylus* simpátricos de Sudamérica. El área de Balsas, es una zona de endemismos con gran potencial en el estudio de la sistemática y biología de la conservación.

The New World Leaf-Toed Geckos, genus *Phyllodactylus* Gray 1828, occur along the Pacific coast from southern California, USA, through Mexico and Central America to western Panama and from southern Ecuador to northern Chile, including the Galapagos Islands (Dixon and Huey, 1970; Bauer et al., 1997). The genus also has representatives along the Caribbean coast of the Yucatán Peninsula, the Islas de la Bahía of Honduras, the Caribbean coasts of Colombia and Venezuela, the Orinoco Basin, the Caribbean islands of Aruba, Barbados, Bonaire, Curacao, Puerto Rico, and Hispaniola, and Isla Malpelo off the Pacific coast of Colombia (Dixon, 1964; Dixon and Huey, 1970; Huey, 1975; Bauer et al., 1997). Because of the form of the terminal lamellae of their toes, characterized by having the distal phalanges symmetrically dilated with two ventral terminal plates (Peters and Donoso-Barros, 1970; Rösler, 1995), these

reptiles are commonly referred to as the Leaf-Toed Geckos.

In Peru, there are 11 recognized species of *Phyllodactylus*: *P. angustidigitus*, *P. clinatus*, *P. gerrhopygus*, *P. inaequalis*, *P. interandinus*, *P. johnwrighti*, *P. kofordi*, *P. lepidopygus*, *P. microphyllus*, *P. reissi*, and *P. sentosus* (Dixon and Huey, 1970). The majority of these species are distributed along the arid Pacific coastal plain, although *P. interandinus*, *P. johnwrighti*, and *P. reissi* inhabit dry inter-Andean valleys in north-western Peru (Dixon and Huey, 1970). In the interval since Dixon and Huey (1970) provided the only major treatment of the South American *Phyllodactylus*, no new species have been described in this genus from mainland South America. Moreover, the complex physiography of the Andes in northern Peru has limited herpetological collecting in many potentially diverse regions (Duellman and Pramuk, 1999), and some regions have not been explored at all (Lehr, 2002; Campbell and Lamar, 2004).

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TABLE 1. Comparison of diagnostic characteristics in species of *Phyllodactylus* from Peru.

	Max SVL (mm)	Dorsal tubercles	Rows of dorsal tubercles	Number of 4th toe lamellae	Terminal digital pads	Abdominal plaque
<i>P. detsolari</i>	81	small, round, smooth	≤ 10, irregular	13–16	large	no
<i>P. thompsoni</i>	42	large, trihedral	> 10	11–13	small	no
<i>P. angustidigitus</i>	57	Dorsal scales subequal	None	15–20	small	yes
<i>P. clinatus</i>	46	large, trihedral	> 10	13–15	large	no
<i>P. gerrhopygus</i>	56	Dorsal scales subequal	None	12–15	small	yes
<i>P. inaequalis</i>	42	small, round, smooth	< 10, irregular	10–12	large	no
<i>P. interandinus</i>	47	large, trihedral	> 10	10–12	large	no
<i>P. johmwrighti</i>	44	large, trihedral	> 10	10–12	large	no

To contribute to the knowledge of the Andean herpetofauna, two of the authors (PJV and CK) surveyed the inter-Andean valleys of the upper Marañón basin in July 2005, and one author (PJV) returned for a second survey in June 2006 to collect additional information on the amphibians and reptiles of this region. The investigations resulted in the discovery of a comparatively huge new species of *Phyllopezus* (Koch et al., 2006) and two apparently new species of *Phyllodactylus*. Simultaneously, JHT was working in the Herpetology Collection at the Florida Museum of Natural History (UF), Gainesville, Florida, and became aware of material possibly representing two species of undescribed *Phyllodactylus* from the upper Marañón basin. These geckos were collected in 1972 by F. G. Thompson, Curator of Malacology at the Florida Museum of Natural History and, together with the material recently collected by PJV and CK, represent two distinctive new species of *Phyllodactylus*, which are described below.

MATERIALS AND METHODS

All measurements were taken to the nearest 0.1 mm using dial calipers and a stereomicroscope with an optical micrometer; some tail measurements were taken with a tape measure. Terminology in the diagnoses and descriptions follows that used by Dixon and Huey (1970) and Bauer et al. (1997), with the term “cloacal spurs” used in favor of “postanal tubercles.” Comparative data for other South American species of *Phyllodactylus* were taken from Dixon and Huey (1970); in addition, we examined specimens of South American *Phyllodactylus* housed in the Museo de Historia Natural San Marcos, Peru (MUSM), Florida Museum of Natural History, USA (UF), and Zoologisches Forschungsmuseum Alexander Koenig, Germany (ZFMK).

Diagnostic characteristics for Peruvian *Phyllodactylus* are compared in Table 1. Measurements and morphological classifications generally follow that used by Dixon (1964). Measurements of type specimens are always in millimeters unless otherwise specified, and measurements are abbreviated as follows: snout–vent length (SVL), axilla–groin length (AGL), length of leg (LLE), length of arm (LAR), length of tail (LTA), length of head (LHE), depth of head (DHE), width of head (WHE), length of snout (LSN), diameter of eye (DEY), diameter of ear (DEA), distance from eye to ear (DEE). Sex was determined by the presence of enlarged cloacal spurs and by probing the base of the tail. For additional specimens examined, see Appendix 1.

DESCRIPTIONS OF NEW SPECIES

Phyllodactylus thompsoni sp. nov.

Figures 1, 2, 3

Holotype.—Florida Museum of Natural History (UF) 126943, a female from 7 km east of Balsas, 1,400 m elevation, Departamento de Amazonas, Peru (6.847°S, 77.986°W), collected 29 April 1972 by F. G. Thompson, original field number FGT 1511.

Paratypes.—Six; two adult males (ZFMK 84998, 85000) and four adult females (MUSM 19561, 19563 [Fig. 1], 19564, ZFMK 84999) from Quebrada Honda in the vicinity of Balsas, approximately 900–1,000 m above sea level, Provincia de Chachapoyas, Departamento de Amazonas, Peru (6.817°S, 78.00°W); collected by P. J. Venegas and C. Koch on 10 July 2005.

Diagnosis.—Of the species of *Phyllodactylus* found in mainland South America, *P. thompsoni* is the only species with an enlarged postanal scale; this species can be further differentiated from *P. angustidigitus*, *P. gerrhopygus*, and *P.*



FIG. 1. Female paratype of *Phyllodactylus thompsoni* sp. nov. (MUSM 19563).

heterurus by lacking an abdominal plaque anterior to the cloaca (abdominal plaque present in aforementioned species), from *P. inaequalis* and *P. microphyllus* by having well-defined rows of enlarged, trihedral tubercles (dorsal tubercles small, rounded, not arranged in regular rows), from *P. dixonii*, *P. reissi*, *P. delsolari*, and *P. ventralis* by not exceeding 42 mm SVL (those four species regularly exceed 70 mm SVL), from *P. johnwrighti* by having internasals in contact along the medial suture (internasals usually separated in *P. johnwrighti*), from *P. sentosus* by having enlarged medial subcaudals (medial subcaudals not enlarged in *P. sentosus*), from *P. clinatus*, *P. interandinus*, and *P. lepidopygus* by having enlarged trihedral tubercles on the dorsal surface of tibia (dorsal surface of tibia with very small granular scales in *P. clinatus* or with rounded, elevated scales in *P. interandinus* and *P. lepidopygus*), from *P. pumilis* by having homogenous scales on the proximal one-fourth of the tail (scales heterogeneous on the proximal one-fourth of the tail in *P. pumilis*), and from *P. kofordi* by lacking rows of enlarged tubercles on the tail (enlarged tubercles on the tail present in *P. kofordi*).

Description of Holotype.—A small female gecko (33.8 mm SVL) with a broad, depressed head, 1.75 times as long as it is wide; head distinct from neck; snout with concave granular scales

slightly larger than granular dorsal scales; temporal and posterior dorsal surface of head with granular scales interspersed with enlarged, round, smooth scales; snout length 3.5 mm; 19 scales across the snout at the level of the third supralabial; rostral twice as wide as it is high, with a medial groove extending from the dorsal edge approximately halfway down the rostral; two internasals; 9/9 supralabials, with supralabials 5–9 entirely below the orbit; six supralabials to a point below the center of eye; eye large, pupil vertical, orbit width 2.8 mm, 3–4 denticulate scales bordering posterior-dorsal one-third of orbit; 11 scales from anterior edge of orbit to nostril; seven granules between orbits, interorbital distance 0.9 mm; eye to ear distance 3.0 mm; ear opening oval shaped, diagonally compressed, inside of ear opening strongly denticulate on the anterior and posterior edges; ear diameter about one-third the diameter of the eye; mental larger than infralabials, bell-shaped, 2.0 mm long, 1.1 and 1.7 mm wide at its narrowest and widest points; infralabials 7/7, with the first pair largest and each subsequent pair smaller than the last; five infralabials to a point below the center of eye; three irregular, enlarged medial chinshields contact the mental; scales on chin largest anteriorly, becoming smaller, almost granular toward the gular region. Body essentially

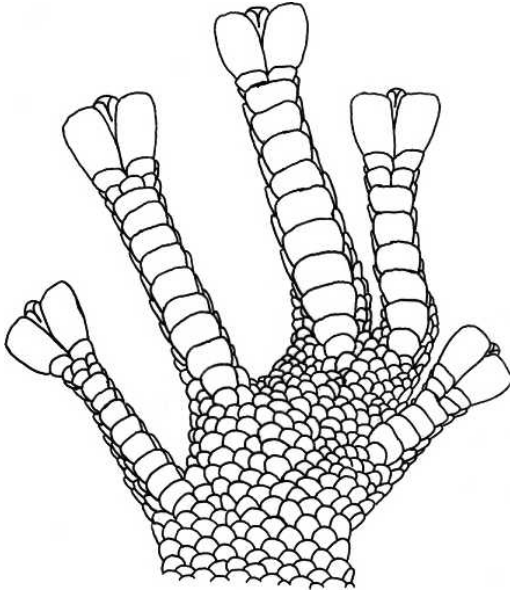


FIG. 2. Ventral view of left hind foot of a paratype of *Phyllodactylus thompsoni* sp. nov. (ZFMK 85000).

cylindrical; dorsum covered with small granules, with eight complete rows of greatly enlarged, trihedral, posteriorly projecting keeled dorsal tubercles and at least four more partial rows of same scales on lateral surfaces between forelimbs and hind limbs; maximum of 39 enlarged tubercles per row between the head and level of the vent; about 108 dorsal granules between level of the axilla and level of the vent; about 86 scales around the midbody; lateral scales enlarged, imbricate, keeled or "pointed," projecting outward, becoming smaller and grading into ventral scales; ventral scales larger than laterals, smooth, imbricate, becoming larger posteriorly, 44 ventral scales along midventral line between axilla and cloaca; abdominal plaque anterior to cloaca absent; enlarged plate present posterior to cloaca and anterior to base of tail, 1 mm long by 2.2 mm wide, with the anterior edge continuous with the posterior interior surface of the cloaca; enlarged, narrow scale present bordering anterior edge of cloaca; leading edges of fore and hind limbs covered with enlarged, imbricate scales, largest on the forearms and thighs; dorsal surfaces of tibia with enlarged trihedral tubercles; fourth toe with 11 subdigital lamellae, terminal lamellae enlarged, longer than wide, with the tip of the claw primarily concealed. Tail complete, 0.82 times the length of the body, stout, tapering distally; dorsal and lateral surfaces covered with keeled, imbricate scales that are largest at the base and becoming gradually smaller distally; medial subcaudals

enlarged, somewhat irregular, platelike, imbricate, more than twice as wide as long.

Measurements of Holotype.—Snout–vent length, 33.8 mm; tail length, 28.1 mm; head length, 10.9 mm; and head width, 6.2 mm.

Color (in Preservative).—Coloration of the holotype, after 35 yr preserved in formalin and stored in ethanol, is as follows: dorsal ground color of head and body pale brown; head and snout with faint pale brown mottling; brown line visible from posterior edge of orbit running along lateral surface of body, breaking up and becoming diffuse posteriorly; dorsal surfaces with irregular, brown mottling; exceeding small dark brown spots are scattered across most scales of the body, most profuse laterally; ventral scales on head and body immaculate or marked with one or two microscopic dark brown spots; tail pale brown with three pairs of brown spots, becoming paler and closer together distally.

Color in Life.—Coloration in life of an adult female paratype (Fig. 1; MUSM 19563) is as follows: ground color pinkish-tan with brown indistinct thin bars reaching to the middle of dorsum, tail with seven brownish bands and yellowish-brown interspaces, bands a bit smaller than interspaces, head dirty yellowish-brown, dark brown line from nostril through eye to above arm insertion, venter white, ventral surface of tail dirty whitish.

Variation.—Male paratypes range from 40–42 mm SVL, and female paratypes range from 36–41 mm SVL. Tail length ranges from 42–54% of total length. Postmentals vary from two to three, always contacting first infralabial, often contacting second infralabial; number of scales immediately following postmentals varies from 5–7. Interorbital scales range from 20–26, scales across snout at level of third labials from 17–21. Usually two internasals bordered by five scales, only one specimen with four internasals bordered by four scales; internasals always in contact. Scales from nostril to eye number from 10–13. Twenty-five to 29 scales across venter, from gular region to vent from 57–68; dorsal tubercular rows always 10; paravertebral tubercles from head to base of tail vary from 36–40, with 20–24 between axilla and groin; enlarged rows of tubercles reaching base of tail number 6 in five specimens and 4 in one specimen. Tubercles absent from tail. Lamellae beneath fourth toe 12 or 13 in all paratypes. Dorsal color pattern with double row of indistinct 8–10 spots or transverse bars or lines, dorsal surface of tail usually banded with 4–9 brownish bands, with ground color interspaces of almost equal width; bands not present on regenerated tails and only very weak developed in some individuals. Ventral coloration dirty white in all specimens.

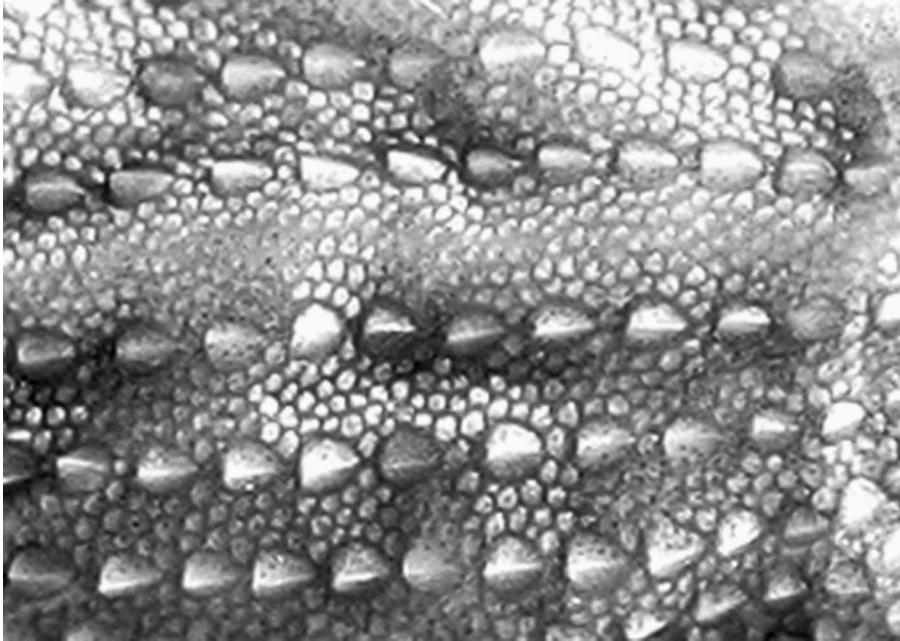


FIG. 3. Close-up of dorsal sculation in a paratype of *Phyllodactylus thompsoni* sp. nov. (UF 126943).

Etymology.—The specific name *thompsoni* is a patronym honoring F. G. Thompson, collector of the holotype of this new species. Thompson has served as a curator of Malacology at the Florida Museum of Natural History since 1966, during which time he has conducted biological surveys in 18 countries worldwide that have led him to describe two subfamilies, 35 genera, and over 200 species of mollusks, as well as new species of *Thamnophis*, *Xenosaurus*, and *Leptotyphlops*. Thompson's collections have also led to the description of many other amphibian and reptile taxa, including *Eleutherodactylus araiodactylus* Duellman and Pramuk 1999 and *Phrynopus thompsoni* Duellman 2000, which are only known from material collected by F. G. Thompson in Peru in May 1972.

Distribution and Natural History.—*Phyllodactylus thompsoni* is known only from the mountains east of Balsas and the Río Marañón in vicinity of the type locality, from 900–1,400 m elevation on the western slope of the northern portion of the Cordillera Central (see Duellman and Pramuk, 1999). The vicinity of the type locality receives less than 500 mm of rain annually (Duellman and Pramuk, 1999), and the vegetation is characterized as dry deciduous tropical forest and thorn scrub forest with a short, sparse overstory that includes the plants *Acacia macracantha*, *Aeschynomene scoparia*, *Caesalpinia* sp. nov., *Capparis* sp., *Coursetia cajamarcana*, *Croton* sp., *Dalea exilis*, *Dalea carthagenensis* var. *brevis*, *Eriotheca* sp., *Leucaena trichodes*, *Maraniona lavi-*

nii, *Mimosa incarum*, *Mimosa ctenodes*, *Parkinsonia praecox*, *Pithecellobium excelsum*, and *Tecoma rosifolia* (Hughes et al., 2004). This habitat is within the Ecuatorial Dry Forest ecoregion (Brack, 1986).

Paratypes collected in 2005 and 2006 were also found at night, either perched on low rocks or actively moving on the ground. Air temperature during these nights averaged 27.3°C; substrate temperature of the rocks averaged 28.8°C.

Phyllodactylus delsolari sp. nov.

Figures 4, 5, 6

Holotype.—Florida Museum of Natural History (UF) 50059, an adult female from 7 km east of Balsas, 1,400 m elevation, Departamento de Amazonas, Peru (6.847°S, 77.986°W), collected 29 April 1972 by F. G. Thompson, original field number FGT 1508.

Paratypes.—UF 50060, 50062 adult males, UF 50061 juvenile male, collected with the holotype on 29 April 1972, by F. G. Thompson; MUSM 26327, adult male and MUSM 26328–26330, adult females, from Quebrada Honda in the vicinity of Balsas (06°49'S, 78°00'W, approximately 900–1,000 m above sea level), Provincia de Chachapoyas, Departamento de Amazonas, Peru, collected by P. J. Venegas on 18 June 2006; MUSM 19566, 26410 and ZFMK 85002 adult males, MUSM 26411, ZFMK 85001, 85003 adult females from Quebrada Honda; collected by P. J. Venegas and C. Koch on 10 July 2005.



FIG. 4. Male paratype of *Phyllodactylus delsolari* sp. nov. (MUSM 26410).

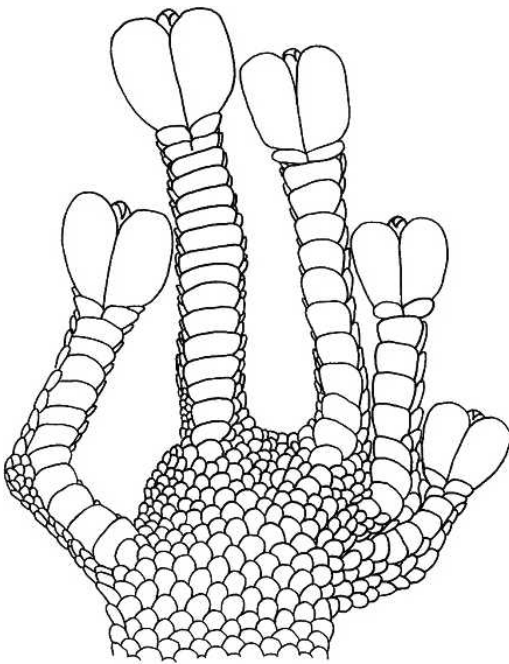


FIG. 5. Ventral view of left hind foot of a paratype of *Phyllodactylus delsolari* sp. nov. (ZFMK 85001).

Diagnosis.—Of the *Phyllodactylus* found in western South America, *P. delsolari* is one of two “giant” species, the other being *P. reissi*. Both *P. delsolari* and *P. reissi* exceed 70 mm SVL, with no other species from the region exceeding 60 mm SVL. *Phyllodactylus delsolari* can be readily distinguished from *P. reissi* by having fewer than 10 poorly defined rows of small, smooth, round tubercles (12–18 well-defined rows of enlarged, trihedral, strongly keeled tubercles in *P. reissi*), and by having broad, well-defined dark dorsal cross-bands (no cross-bands or sometimes incomplete, dark, irregular, narrow cross-bands in *P. reissi*). There are two other species of “giant” *Phyllodactylus* recorded from mainland South America: *P. dixonii* and *P. ventralis*. Both of these species may exceed 70 mm SVL and are found in central Venezuela and along the Caribbean coast of Colombia and Venezuela, respectively. *Phyllodactylus delsolari* can be distinguished from *P. dixonii* and *P. ventralis* by having poorly defined, irregular rows of small, smooth, round tubercles (well-defined, regular rows of enlarged, trihedral, strongly keeled tubercles in *P. dixonii* and *P. ventralis*). This species can be further differentiated from all other *Phyllodactylus* found in South



FIG. 6. Close-up of dorsal scalation of the holotype of *Phyllodactylus delsolari* sp. nov. (UF 50059).

America as follows (Table 1): from *P. angustidigitus*, *P. gerrhopygus*, and *P. heterurus* by lacking an abdominal plaque (abdominal plaque present in aforementioned species); from *P. clinatus*, *P. interandinus*, *P. johnwrighti*, *P. kofordi*, *P. lepidopygus*, *P. pumilis*, and *P. sentosus* by having fewer than 10 poorly defined rows of enlarged, smooth, round tubercles (14–22 rows of enlarged trihedral tubercles in *P. interandinus*, 10–16 rows of enlarged keeled or trihedral tubercles in the other aforementioned species); from *P. microphyllus* by having large terminal lamellae (small terminal lamellae in *P. microphyllus*); and from *P. inaequalis* by having ear denticulation on the anterior and posterior edges (ear denticulation absent in *P. inaequalis*). There is one other species of South American *Phyllodactylus* that has broad, dark dorsal cross-bands, *P. transversalis*, which is endemic to Isla de Malpelo, but it lacks ear denticulation (inside of ear strongly denticulate on the anterior and posterior edges in *P. delsolari*) and is not reported to exceed 57 mm SVL.

Description of Holotype.—A large female gecko (73.2 mm SVL) with a broad, depressed head, 1.3 times longer than it is wide; head distinct from neck, covered in small granules that are largest on snout and smallest on back of head; snout granules concave, larger than dorsal granules, snout length 7.6 mm; 22 scales across the snout at the level of the third supralabial; rostral broad, rectangular, lacking a medial groove; two internasals; supralabials 10/10, with supralabials 6–10 entirely below the orbit; seven supralabials to a point below the center of eye; eyes large, pupil vertical, orbital width

5.3 mm, three rows of small, somewhat trihedral supraciliary scales bordering the anterior edge; one row of enlarged platelike scales bordering the eye, and 2–3 rows of small granules between platelike scales and upper edge of orbit; 13 scales from anterior edge of orbit to nostril; 18 granules between orbits, interorbital distance 2.6 mm; eye to ear distance 6.7 mm; ear opening oval shaped, vertically compressed, 1.5 mm high by 1 mm wide, inside of ear opening strongly denticulate on anterior and posterior edges; mental larger than infralabials, bell-shaped, 3.7 mm long, 1.7 and 3.4 mm wide and its narrowest and widest points; infralabials 9/9, first pair largest and each subsequent pair smaller; six infralabials to a point below the center of eye; one pair of enlarged medial chinshields contacts the mental; scales on chin largest where they contact infralabials and chinshields, becoming smaller, almost granular toward the midventral line. Body depressed; dorsal surface of neck with small granules that are somewhat smaller than those on the head; dorsum covered with small granules, with about nine poorly defined longitudinal rows of enlarged, smooth scales that are 2–3 dorsal granules in width (Fig. 2); a maximum of 28 enlarged scales per row between level of the axilla and level of the vent; enlarged rows most evident on posterior one-third of the dorsum, where enlarged scales are also interspersed with granules; about 134 dorsal granules between level of the axilla and level of the vent; about 115 scales around the midbody; ventral surface with smooth, plate-like, subimbricate scales that gradually become

larger posteriorly; 51 ventral scales along midventral line between axilla and vent; pre-anal plate absent; leading edges of fore and hind limbs covered with enlarged, platelike scales that are largest on the forearms and shins; fourth toe with 13 subdigital lamellae, terminal lamellae greatly enlarged, truncate, with the tip of the claw exposed. Tail complete, 1.26 times the length of the body; dorsal surface of tail covered with squarish, platelike scales, without whorls of enlarged scales; medial subcaudal scales broadly expanded, two or more times as wide as they are long, larger than any other scales found on the body.

Measurements of Holotype.—Snout-vent length, 73.2 mm; tail length, 92.4 mm; head length, 21.4 mm; and head width, 16.5 mm.

Color (in Preservative).—Coloration of holotype after 35 yr preserved in formalin and stored in ethanol, is as follows: dorsal ground color of head and body pale brown, with the snout and supralabials heavily mottled brown and irregular brown flecks and blotches on the dorsal surface of the head; dorsum with broad brown bands, which are 1–2 times as wide as the pale intervening areas; dorsal bands interrupted by a narrow pale brown middorsal stripe; lateral surfaces of the body yellowish-cream with pale brown mottling, lateral scales marked with minute dark brown spots; dorsal surfaces of limbs tan with brown flecks and mottling; ventral surface of head and body immaculate cream; dorsal surface of tail with about five poorly defined brown bands, subcaudal surface immaculate cream.

Color in Life.—Coloration of an adult male paratype (MUSM 26327) is as follows: ground color grayish-white, dorsal surface from rear of head to vent with 5–6 broad brown transversal bands, which are cut vertically by a slender grayish vertebral stripe with the margin of each band undulated (Fig. 4). Head is grayish-brown, limbs with brown flecks and blotches (Fig. 4), and the venter white.

Variation.—Male paratypes range from 54.5–80 mm SVL, and female paratypes range from 47.5–81 mm SVL. In two adult male paratypes, UF 50062 possesses 3/3 cloacal spurs, and UF 50060 has 4/4 cloacal spurs. All paratypes have a single pair of postmental chinshields, and usually a single pair of internasals in broad contact. Supralabials 11/10 in UF 50660 (7/8 to a point below the center of eye), 10/11 in UF 50062 (8/8 to a point below the center of eye), and 11/10 in UF 50061 (8/8 to a point below the center of eye). Infralabials 7/9 in UF 50060 (6/7 to a point below the center of eye), 8/8 in UF 50061 (6/6 to a point below the center of eye), and 9/9 in UF 50062 (6/6 to a point below the center of eye). Among all paratypes, there are

11–14 scales between anterior edge of orbit and nostril; dorsal tubercles intermixed between granules, only sometimes forming short indistinct rows ranging from 6–12. All male and female paratypes lack precloacal or femoral pores. The color pattern exhibited in the paratypes is very similar to that of the holotype, with broad transversal bands from rear of head to vent numbering five or six, with 6–8 dark bands on tail. One juvenile male (UF 50061) differs from all other specimens in lacking a thin, pale middorsal stripe interrupting the transverse dorsal bands.

Etymology.—The specific name is a patronym honoring Gustavo del Solar, in recognition of his continued and unattenuated work in the conservation of the White Winged Guan, *Penelope albipennis*, a critically endangered species of Cracid bird that is endemic to northwestern Peru.

Distribution and Natural History.—The known geographic and ecological distribution of *P. delsolari* mirrors that of *P. thompsoni* (see species account above). The holotype and paratypes of *P. delsolari* collected in 1972 were found between 2100 and 2230 h on a damp, west-facing exposed limestone wall from 3–5 m above the ground. Paratypes collected in 2005 and 2006 were also found at night, usually perched between 30 cm and 3 m above the ground on tall, nearly vertical boulders in Quebrada Honda, a tributary of Río Marañón. Air temperature during these nights averaged 27.3°C; substrate temperature of the rocks averaged 28.8°C. Two individuals of *P. delsolari* were observed running on the ground a few meters away from verticals rock walls. This new species appeared abundant, along with the sympatric giant gecko *Phyllopezus maranjonensis* (Koch et al., 2006), in the zones where the ravine is very narrow and forms a small canyon surrounded by completely vertical rocky walls. Along with *P. maranjonensis*, the congener *Phyllodactylus reissi* is also sympatric with *P. delsolari* and *P. thompsoni* in the Balsas region, giving that area a unique assemblage of sympatric geckos (especially giant geckos) notable among Neotropical herpetofaunas.

Three female paratypes of *P. delsolari* were gravid. Two of these females (MUSM 26328, 26330) contained two oviductal eggs with the following sizes: 3.8 × 3 mm and 3.6 × 2.7 mm; 8.5 × 6.9 mm and 8.6 × 7.3 mm, respectively; the other female (MUSM 26328) contained a single oviductal egg measuring 5.5 × 5 mm.

DISCUSSION

The New World *Phyllodactylus* remains a relatively little studied yet significant group of

gekkonids, and virtually no systematic work has appeared since Dixon and Huey (1970) presented their exhaustive review of the South American taxa. In that work, all revisionary systematics were based on comparative morphological data, and no attempt was made to resolve higher-level relationships within the South American taxa. Bauer et al. (1997) restricted the genus *Phyllodactylus* to New World taxa, naming five new genera and retrieving a sixth from synonymy to represent monophyletic clades of geckos from Africa, Asia, and Europe that were previously referred to as *Phyllodactylus*. As indicated by Bauer et al. (1997), the monophyly of the New World *Phyllodactylus* has not been tested, and phylogenetic relationships among species of *Phyllodactylus* remain unknown.

The *P. gerrhopygus* group is defined by the presence of abdominal plaques in the group's three constituent species: *P. angustidigitus*, *P. gerrhopygus*, and *P. heterurus*. An abdominal plaque (referred to as "preanal plate" by Dixon and Huey, 1970) is a novel sensory organ resembling an enlarged, roundly triangular plate or scale located anterior to the cloacal opening on the ventral surface and is most likely a heat sensing organ used to actively sample substrate temperature (Kroll and Dixon, 1972). Members of the *P. gerrhopygus* group inhabit some of the driest and coldest habitats of any South American species of *Phyllodactylus*, making the evolution of the heat-sensing abdominal plaque potentially advantageous (Kroll and Dixon, 1972). *Phyllodactylus thompsoni* possesses an enlarged scalelike plate or pad extending from the posterior inside edge of the cloacal lip posteriorly onto the body. The extremely dry habitat in the upper Marañón Valley, not unlike that of the arid Andean foothills inhabited by *P. gerrhopygus*, may have fueled evolution in *P. thompsoni* of an organ homologous to the abdominal plate in the *P. gerrhopygus* group. External examination of the postcloacal plate does not allow for determination of whether this plate is a sensory plaque like those found in the *P. gerrhopygus* group, some other sort of sensory organ, or perhaps simply cloacal ornamentation.

After being overlooked by biologists until relatively recently, the upper Marañón Valley in the area of Balsas is beginning to be recognized as an important center for endemism within the Marañón Valley, particularly among plants (Bregman, 1996; Bridgewater et al., 2003; Hughes et al., 2004; Pendry, 2004; Hughes, 2005). The vicinity of the type locality for *P. delsolari* and *P. thompsoni* also encompasses the distribution of the endemic legume (Leguminosae) species *Coursetia cajamarcana*, *Mimosa cte-*

nodes, *Parkinsonia peruviana*, two undescribed species of *Caesalpinia*, and the endemic genus and species *Maraniona lavinii* (Hughes et al., 2003, 2004; Hughes, 2005). Many of these taxa, as well as endemic species from other plant families, exhibit highly localized distributions in the Balsas area, some of which (like *Maraniona*) are restricted to a narrow elevational belt that also encompasses the known distribution of the two new *Phyllodactylus*.

The Marañón Valley is also an area of bird endemism, with 22 species restricted to the valley, and Balsas and its immediate surroundings up to 2,900 m elevation is considered an area of importance for endemic bird conservation (Franke et al., 2005). This region and the surrounding highlands is potentially a center for land snail endemism, with some endemics already described (Thompson, 1982) and over 70 new species awaiting description (F. G. Thompson, pers. comm.), all of which were collected on the same trip that produced the type material of *Phyllodactylus delsolari* and *Phyllodactylus thompsoni*, as well as that of *E. araiodactylus* (Duellman and Pramuk, 1999), *Phrynopus spectabilis* (Duellman, 2000; later synonymized with *Pleurodema marmorata* by Lehr, 2006), and *Phyllodactylus thompsoni* (Duellman, 2000).

Eleven of the 15 species of *Phyllodactylus* reviewed or described by Dixon and Huey (1970) are sympatric with at least one other member of the genus. There are four species of sympatric geckos in the Balsas region: *Phyllodactylus delsolari*, *Phyllodactylus thompsoni*, *Phyllodactylus reissi*, and *Phyllopezus marañonensis* (Koch et al., 2006). In their discussion of sympatry in *Phyllodactylus*, Dixon and Huey (1970) noted two general commonalities among sympatric sets of *Phyllodactylus*: first, sympatric species typically exhibit a wide divergence in body size, often typified by the presence of one relatively large and one relatively small species; second, sympatric species usually demonstrate clear differences in their respective degrees of arboreality. Although *P. delsolari* and *P. thompsoni* obviously conform to the first of Dixon and Huey's (1970) characterizations, the ecological relationships among the two giant species of *Phyllodactylus* (*P. delsolari* and *P. reissi*) and the even larger sympatric gecko *Phyllopezus marañonensis* remains unclear. Clearly, focused examination of the unique gekkonid assemblage in the Balsas region is warranted, particularly given the apparent ecological overlap among the three species of giant geckos.

In lower parts of the Marañón basin around 120–150 km north of Balsas, in the Huanca-bamba Depression near Bagua and the confluence of the Marañón and ríos Chinchipe and

Utcubamba, the giant species *P. reissi* is sympatric with the small species *P. interandinus*, an endemic to the Bagua region. The Huanca-bamba Depression is both an important hotspot for endemism across a variety of taxonomic groups (Cadle, 1991; Duellman and Wild, 1993; Reeder, 1996; Duellman and Pramuk, 1999; Sancho, 2004) and one of the most significant biogeographic barriers in the entire Andes, separating the northern and southern cordilleras of the Andes and forming the southern edge of the distribution for taxa found to the north and the northern edge for species found in the southern cordilleras (Duellman, 1979; Weigend, 2002). Suites of plant genera found in both the Bagua and Balsas regions of the Marañon Valley, such as the legumes *Mimosa* and *Coursetia*, each contain species endemic to that respective region (Weigend, 2002; Hughes, 2005), a pattern not unlike that seen in *Phyllodactylus*. Evidence from the fossil record indicates that some dry forest-inhabiting plant species in northwestern Peru have remained remarkably conserved in terms of morphology for at least 10 million years, indicating that dry forests in this region have been present continuously for the intervening period and became gradually more fragmented, shaping the current phytogeography of the region (Burnham, 1995; Burnham and Barranco, 2004; Hughes, 2005).

Despite the identification of a number of locally endemic species in the Balsas area, this region remains poorly known and under-sampled biologically. Even taxonomic groups that are relatively well studied in this region, such as plants, have thus far only received limited attention from systematists, and *P. detsolari* and *P. thompsoni* are the second and third endemic reptile species to be described from the immediate vicinity of Balsas (Koch et al., 2006). The potential for discovery of additional endemic, undescribed species in the Balsas region is high, and a concerted effort to characterize the composition and conservation status of the herpetofauna of the upper Marañon Valley should be undertaken at the earliest possible opportunity.

Acknowledgments.—JHT is grateful to F. G. Thompson for bringing his attention to the type series of *P. detsolari*, for supporting efforts to describe these taxa, and for providing comments on an earlier version of this manuscript. J. D. Austin and L. D. Wilson also provided helpful comments on a draft of this manuscript. J. Cordova and C. Aguilar granted access to the collections of the Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos, Lima, Peru, and facilitated the loan of material. M. A. Nickerson, F. W. King, and K. Krysko

provided access to the UF herpetology collection and database. While preparing this manuscript, JHT was supported by a Tropical Conservation and Development Graduate Fellowship, a University of Florida Foundation Grinter Fellowship, and grants from the Reptile and Amphibian Conservation Corps (RACC). PV is indebted to C. Elera for allowing access to the laboratory of the Museo de Sican. CK thanks the Deutscher Akademischer Austauschdienst (DAAD) for financial support and A. Schlüter, Staatliches Museum für Naturkunde, Stuttgart, for sharing his experience with Peruvian authorities.

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Accepted: 16 December 2007.

APPENDIX 1

Additional Specimens Examined

- Phyllodactylus kofordi*.—PERU: Piura: UF 34719, 34722–34733, 34745–34749.
- Phyllodactylus microphyllus*.—PERU: Piura: UF 34718, 34720–34721, 34738, 34743, 126944–126956.
- Phyllodactylus reissi*.—ECUADOR: Esmeraldas: UF 71934, Guayas: UF 39458–39459, 71502–71503, 90620–90631, 99334, 126957–126958, PERU: Cajamarca: UF 39454–39457, Piura: UF 34717, 34734–34737, 34739–34742, 34744, 126959–126967.
- Phyllodactylus ventralis*.—VENEZUELA: Falcon: UF 40739–40741, Guarico: UF 40709–40710, 40729–40737, 60946, Portuguesa: UF 40671–40708, 40742–40743.