A novel species of *Euspondylus* (Squamata: Gymnophthalmidae) from the Andes Mountains of central Peru

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Abstract

The South American gymnophthalmid genus *Euspondylus* is distributed from Venezuela through Peru, with its highest diversity occurring in Peru. *Euspondylus paxcorpus* sp. nov. is a new species from Junín, Peru possessing prefrontal scales and represented by 60 specimens. The new species differs from all other species by the combination of four supraoculars with supraocular/supraciliary fusion, 5–7 occipitals, a single palpebral scale, five supralabials and infralabials, quadrangular dorsal scales with low keels arranged in transverse series only, 40–45 in a longitudinal count and 22–28 in a transverse count, 12 rows of ventrals in a transverse count and 23–25 in a longitudinal count, and no sexual dimorphism in coloration. The discovery of *E. paxcorpus* increases the known number of *Euspondylus* species to 13. Because the coloration patterns of the specimens were greatly different after preservation in alcohol, caution should be used when identifying *Euspondylus* species from museum specimens.

Key words: *Euspondylus paxcorpus*, Gymnophthalmidae, Junín, lizard, Peru, new species, Reptilia, South America, Squamata, taxonomy

Resumen

El género *Euspondylus* de la familia Gymnophthalmidae se distribuye en Sudamérica desde Venezuela hasta Perú, con la máxima diversidad en el Perú. *Euspondylus paxcorpus* sp. nov., procedente de Junín, Perú, posee escamas prefrontales y está representado por 60 especímenes. La nueva especie se distingue de las demás por poseer la combinación de cuatro supraoculares con la fusión de supraocular y supraciliar, 5–7 occipitales, una sola escama palpebral, cinco supralabiales e infralabiales, escamas dorsales cuadrangulares con quillas bajas y arregladas en filas transversales solamente, 40–45 por conteo longitudinal y 22–28 por conteo transversal, 12 filas de escamas ventrales en conteo longitudinal y 23–25 por conteo transversal, y sin dimorfismo sexual en coloración. El descubrimiento de *E. paxcorpus* aumenta el número de especies de *Euspondylus* conocidas a 13. Debido a que los patrones de coloración de los especímenes cambiaron tan drásticamente después de la conservación en alcohol, se debe tener precaución cuando se identifiquen las especies de *Euspondylus* de especímenes del museo.

Palabras claves: *Euspondylus paxcorpus*, Gymnophthalmidae, Junín, lagartija, Peru, nueva especie, Reptilia, Squamata, Sudamérica, taxonomía

Introduction

The gymnophthalmid genus *Euspondylus* Tschudi ranges from Venezuela to southern Peru from 800 to over 3400 masl (Mijares-Urrutia et al. 2000; Chavez et al. 2011). The genus has undergone recent revision when the first molecular phylogenetic study to include a *Euspondylus* species determined that *E. chasqui* Chávez, Siu-Ting,
Duran & Venegas was paraphyletic with respect to Proctoporus Tschudi, thus transferring that species to Proctoporus (Goicoechea et al. 2012). The genus Opipeuter Uzzell was additionally sunk into Proctoporus (Goicoechea et al. 2012). The definition of Euspondylus has always been vague (Uzzell 1973), but was generally considered to be similar to Proctoporus but possessing prefrontal scales (Doan 2003; Köhler & Lehr 2004), which Proctoporus species, until the recent new combinations, did not (Goicoechea et al. 2012). Now that this distinction between the two genera has been removed, unique diagnostic characters for Euspondylus do not exist and it is possible that all Euspondylus species may belong within Proctoporus (Goicoechea et al. 2012) or that some species are more closely allied to Anadia Gray (Kok & Rivas 2011). However, without concrete data to support such a transfer, the 12 species of Euspondylus will remain, with the highest diversity of the genus occurring in Peru (Chavez et al. 2011). A field expedition throughout the Ulcumayo district of the Junín region in the central Andes of Peru revealed a new species possessing prefrontal scales and belonging to Euspondylus, which we describe herein.

![FIGURE 1. Map of the northwestern Junín region, Peru with district boundaries in black. The localities where the specimens were collected are indicated by blue dots. The inset depicts the regions of Peru and the area of the larger map is contained in the red box.](image)

**Material and methods**

Specimens were collected in the Ulcumayo district of the Junín region of Peru (Fig. 1). Specimens were collected by hand, euthanized, fixed in 10% formalin, and later transferred to 70% ethanol for long-term museum storage. The specimens were deposited at the Museo de Historia Natural, Universidad Nacional de San Antonio Abad de Cusco (MHNC; formerly abbreviated UNSAAC) in Peru and the Amphibian and Reptile Diversity Research Center at the University of Texas at Arlington (UTA) in the USA. Museum numbers of MHNC retain the field ID codes. Information on other species of Euspondylus and Proctoporus was derived from Uzzell (1969, 1973), Mijares-Urrutia et al. (2000), Köhler (2003), Köhler & Lehr (2004), Myers et al. (2009), and Chávez et al. (2011).
Measurements were made with a digital caliper. All anatomical terms and methods of taking meristic counts follow Kizirian (1996), Doan (2003), and Doan & Schargel (2003).

Systematic account

**Euspondylus paxcorpus** new species

Figures 2–3.

**Holotype.** UTA R-62329, an adult male, from Ulcuran, district of Ulcumayo, province of Junín, region of Junín, Peru; 10° 57.954’ S, 75° 49.753’W; 3341 m (Fig. 1); collected on 8 November 2013 by Esther Ulloa Ribera.

**Paratypes.** Twelve paratypes (7 male, 2 female, 2 juvenile) are from the Ulcumayo district, province Junín, region Junín, Peru. UTA R-62308, an adult female, from Villac, 3741 m, collected by Franklin Jeferson Malpartida Ramos, 19 September 2013; UTA R-62309, an adult male, from Yapacmarka, 3754 m, by Frank Hever Malpartida Ramos, 20 September 2013; UTA R-62310, a subadult male, from Hachulan, 3581 m, by Herlis Malpartida Alderete, 5 November 2013; UTA R-62312, a subadult male, and UTA R-62313, a juvenile, from Huaylla, 3615 m, by Herlis Malpartida Alderete, 5 November 2013; UTA R-62315, a female, and UTA R-62317, a male, from La Libertad, 3523 m, by Heraclio Ulloa Condor, 6 November 2013; UTA R-62321, a male, from Matamayo, 3508 m, by Herlis Malpartida Alderete, 6 November 2013; UTA R-62325, a male, from Yananauwi, 3280 m, by Anibel Malpartida Arias, 7 November 2013; UTA R-62328, a juvenile male, from Ulcuran, 3341 m, by Esther Ulloa Ribera, 8 November 2013; UTA R-62330, a subadult male, from Ulcumayo, 3610 m, by Josben Chuco Carhuapoma, 9 November 2013.


**Diagnosis.** (1) prefrontals present with long suture (Doan & Cusi 2014); (2) supraoculors four, with first supraocular/first supraciliary fusion; (3) occipitals 5–7, usually irregularly shaped; (4) palpebral eye-disc made up of a single, undivided, transparent scale; (5) supralabials five; (6) infralabials five; (7) dorsal body scales rectangular with rounded edges and low rounded keel, in transverse rows only; (8) dorsal scale rows in a longitudinal count 40–45; (9) dorsal rows in a transverse count at midbody 22–28; (10) a continuous series of small lateral scales separating dorsals from ventrals, 2–6 scales wide; (11) gular scale rows eight; (12) ventral rows in a longitudinal count 23–25; (13) ventral rows in a transverse count 12; (14) femoral pores per leg in males 8–12, femoral pores per leg in females 5–9; (15) preanal pores absent; (16) subdigital lamellae on Toe IV 19–22; (17) in preservative, dorsal and lateral surfaces dark brown with no stripes or ocelli; (18) in life, three indistinct dorsal stripes and a continuous series of white spots (ocelli) present on the lateral surface of the body.

**Euspondylus paxcorpus** may be distinguished from all species of *Petracola* Doan & Castoe, *Proctoporus*, and *Riama* Gray (except *Proctoporus chasqui* and *P. xestus* (Uzzell)) by the presence of prefrontal scales. It may be distinguished from other species in the genus *Euspondylus* by the following character states (condition for *E. paxcorpus* in parentheses). *Euspondylus acutirostris* (Peters) and *E. monsfumus* Mijares-Urrutia, Señaris & Arens: longitudinal ventral count 26–33 (23–25). *Euspondylus auyanensis* Myers, Rivas & Jadin: palpebral eye disc divided (entire), dorsal scales smooth or wrinkled (usually keeled), and longitudinal dorsal count 23–25; (13) ventral rows in a transverse count 12; (14) femoral pores per leg in males 8–12, femoral pores per leg in females 5–9; (15) preanal pores absent; (16) subdigital lamellae on Toe IV 19–22; (17) in preservative, dorsal and lateral surfaces dark brown with no stripes or ocelli; (18) in life, three indistinct dorsal stripes and a continuous series of white spots (ocelli) present on the lateral surface of the body. *Euspondylus paxcorpus* may be distinguished from all species of *Petracola* Doan & Castoe, *Proctoporus*, and *Riama* Gray (except *Proctoporus chasqui* and *P. xestus* (Uzzell)) by the presence of prefrontal scales. It may be distinguished from other species in the genus *Euspondylus* by the following character states (condition for *E. paxcorpus* in parentheses). *Euspondylus acutirostris* (Peters) and *E. monsfumus* Mijares-Urrutia, Señaris & Arens: longitudinal ventral count 26–33 (23–25). *Euspondylus auyanensis* Myers, Rivas & Jadin: palpebral eye disc divided (entire), dorsal scales smooth or wrinkled (usually keeled), and longitudinal dorsal count 32–37 (40–45). *Euspondylus josyi* Köhler: longitudinal dorsal count 29–35 (40–45) and longitudinal ventral count 18 (23–25). *Euspondylus rahmi* (De Grijs): anteriormost supraocular not fused with anteriormost supraciliary (fused) and longitudinal dorsal count 49–54 (40–45). *Euspondylus simonsii* Boulenger: longitudinal dorsal count 33–39 (40–45) and no enlarged thenar scales (two enlarged thenar scales). *Euspondylus oreades* Chávez, Siu-Ting, Duran & Venegas: longitudinal ventral count 20–22 (23–25), sexual dimorphism in dorsal and ventral coloration (no sexual dimorphism in coloration), and in life males with...
black flecks on each dorsal scale and distinct black dorsolateral stripes separating lighter from darker regions (no black flecks on dorsal scales and dorsolateral stripes, if present, not distinct and located inside lighter scale region). *Proctoporus chasqui*: yellowish or reddish venter in life (white or bluish venter) and ventral scales in a longitudinal count 19–22 (23–25). *Proctoporus xestus*: a single large elongate subocular scale (several small subocular scales) and smooth dorsal scales (usually keeled).

**Description of holotype.** Adult male, snout-vent length (SVL) 51.24 mm, tail 85.11 mm, partially regenerated, length of regenerated portion 23.05 mm; axilla to groin distance 27.27 mm; head length 10.96 mm, head width 7.71 mm.

![Figure 2](image-url)  
**FIGURE 2.** Head and neck region of holotype of *Euspondylus paxcorpus* (UTA R-62329). Top left: dorsal view; top right: ventral view; bottom left: lateral view. Scale bar = 5 mm.
FIGURE 3. Comparison of body coloration of *Euspondylus paxcorpus*. Top two photographs: adult specimen in life (MHNC TMD1499) from the village of La Libertad, Peru. Bottom two photographs: holotype (UTA R-62329) preserved in ethanol (photographs taken by C. J. Franklin).

Head scales smooth, glossy, without striations or rugosities; rostral scale wider than tall, meeting supralabials on either side at above the height of supralabials, in contact with frontonasal, nasals, and first supralabials; frontonasal wider than long, pentagonal with all sutures rounded, in contact with nasals, loreals, prefrontals, approximately equal length as frontal; prefrontals paired, trapezoidal, in contact with frontal, fused supraciliary/ supraocular, second supraocular, and loreals; frontal longer than wide, hexagonal, in contact with first, second, and third pairs of supraoculars and frontoparietals; frontoparietals hexagonal, in contact with third and fourth pairs of supraoculars, parietals, and interparietals; supraoculbar four, first supraocular fused with first supraciliary, second supraocular in contact with supraciliaries 1, 2, and 3, third supraocular not in contact with supraciliaries, fourth supraocular in contact with fourth supraciliary, postocular, one temporal, and parietal; interparietal longer than wide, heptagonal, in contact with parietals and occipitals; parietals hexagonal, in contact on right side with one postocular, three temporals, and one occipital, on the left the parietal is fused with a temporal and contacts only two temporals, a postocular, and one occipital; occipitals seven, lateralmost occipitals pentagonal, next most lateral occipital polygonal, next most lateral polygonal, and triangular, median occipital quadrangular. Nasal triangular, longer than high, partially divided, nostril situated in anterior third of scale, in contact with first and second supralabials, and loreal; loreal quadrangular, on left side in contact with supralabial, frenocular, preocular, and first supraocular, loreal on right side not in contact with supralabials, in contact with frenocular and supraocular only; frenocular wedge-shaped, in contact with first two preoculars, first subocular, and supralabials 2 and 3, on right side also in contact with first supraciliary; three preoculars, first in contact with first and second supraciliaries, second in contact with first supraciliary, third in contact with first subocular; four supraciliaries, first expanded onto dorsal surface of head and fused with first supracocular; palpebral eye-disc made up of a single transparent scale; suboculars three; postoculars two; temporals smooth, glossy, polygonal; supratympanic temporals three, first largest; ear opening oblong, tympanum recessed; supralabial five, first four to angle of jaw; infralabials five. Mental wider than long, in contact with first infralabial and postmental posteriorly; postmental single, pentagonal,
posterior suture angular with point directed posteriorly, in contact with first and second infralabials and first pair of genials; two pairs of genials, anterior pair in contact with second and third infralabials, second genials in contact with third and fourth infralabials; two pairs of chin shields, separated by irregular pre gulars; gular scale rows eight; collar fold distinct; lateral neck scales round, smooth.

Dorsals rectangular, longer than wide, approximately twice the width as length at midbody, with anterior and posterior margins slightly rounded, juxtaposed, with single very low rounded keel, in transverse rows only, 44 in a longitudinal count at midbody, some paravertebral scales irregularly arranged; transverse dorsal count at fifth transverse ventral scale row 15, at tenth transverse ventral scale row 26, at fifteenth transverse ventral scale row 20, at twentieth transverse ventral scale row 15; dorsalmost lateral scales half the size of dorsals, rounded squarish, region approximately 3 scales wide, remaining lateral scales smaller, round, and forming a continuous series 2-4 scales wide, more numerous lateral scales at limb insertion regions, up to 11 scales wide; no lateral fold. Ventral scales smooth, in transverse and longitudinal rows, squarish, median scales wider than long, lateral ventral scales longer than wide, imbricate, 23 scales in a longitudinal count; transverse ventral count at midbody 12; scale row anterior to preanal plate three scales wide; anterior preanal plate scales 4; posterior preanal plate scales 6. Scales on tail like those on body; dorsal and dorsolateral caudal scales rectangular with low keel basally, more distal caudal scales lack keel; ventral and ventrolateral caudal scales square, smooth.

Limbs pentadactyl; digits clawed; dorsal brachial scales polygonal, subequal in size, imbricate, smooth; ventral brachial scales much smaller than dorsal scales, polygonal, subimbricate, smooth; dorsal and ventral anterobrachial scales polygonal, subequal in size, imbricate, smooth. Scales on dorsal surface of manus polygonal, smooth, imbricate; scales on palmar surface of manus small, rounded, subimbricate, domelike; thenar scales two, raised into triangular domes, subimbricate; finger length formula IV > III > II > V > I; scales on dorsal surfaces of fingers smooth, quadrangular, covering dorsal and lateral portion of digit, overhanging supradigital lamellae 3 on I, 6 on II, 8 on III, 8 on IV, 5 on V; subdigital lamellae 6 on I, 9/10 on II, 10/12 on III, 12/14 on IV, 9/10 on V. Scales on anterodorsal surface of thigh large, polygonal, smooth, imbricate; scales on posterior surface of thigh small, rounded, domelike, subimbricate; scales on ventral surface of thigh large, flat, smooth, polygonal, imbricate; femoral pores 9/8 in an arc, large, in center of scale, continuous series on right side, on left side scale lacking pore in between fifth and sixth pore and in between sixth and seventh pore; preanal pores absent; scales on anterior surface of crus polygonal, large, smooth, imbricate; scales on anterodorsal surface of crus rounded, domelike subimbricate; scales on ventral surface of crus large, polygonal, smooth, flat, imbricate. Scales on dorsal surface of pes polygonal, smooth, imbricate; scales on palmar surface of pes small, rounded, subimbricate, domelike; toe length formula IV > III > V > II > I; scales on dorsal surface of digits single, quadrangular, smooth, of varying sizes, overhanging supradigital lamellae 4 on I, 7 on II, 9/10 on III, 11/12 on IV, 9 on V; subdigital lamellae single distally, double proximally, 7/8 on I, 10/11 on II, 15 on III, 19/20 on IV, 12 on V; limbs not overlapping when adpressed against the body.

**Coloration in preservative.** Dorsal and lateral scales of head, body, tail, forelimbs, and hindlimbs uniform dark brown (Fig. 3). No lateral ocelli visible. Ventral surface of head, gular region, body, forelimbs, and hindlimbs uniform dark blue. Ventral surface of tail the same blue color of dorsal body transitioning to brown distally; regenerated portion of tail dark brown with light brown mottling.

**Coloration in life.** Base color of the dorsal region of the head, body, and tail brown, as in preservative. However, middorsal region of approximately 12 dorsals wide and the top of the head are light brown (Fig. 3). Lateralmost portion of the light region is even lighter, almost a beige color and slightly darker pigmentation separates the beige region from the light brown, creating indistinct darker stripes. In addition, a darker indistinct stripe appears paravertebrally. The light brown color does not extend laterally. The light brown head scales include the rostral, frontonasal, prefrontals, frontal, supraciliaries, supraoculars, first postocular, frontal, frontoparietals, interparietal, and occipitals. The light brown color continues onto the tail, but does not extend to the distal region. A series of lateral white spots begins at the neck region and continues to just before hindlimb insertion. The first two of these spots are surrounded by black and may be considered ocelli. More posterior spots are not surrounded by black. Ventral coloration in life is much lighter than in preservative, a pale whitish-blue. Femoral pores are a dark orangish-yellow.

**Variation.** Adult males SVL 45.34–54.78 mm (n = 7), adult females SVL 54.47–56.87 mm (n = 4), juveniles SVL 33.28–37.80 mm (n = 2); complete original tail of juvenile 74.80 mm, no adults with complete original tails known. The paratypes and referred specimens are similar to the holotype with the following minor exceptions. In
two males (UTA R-62309 and R-62321) the right frontoparietal is divided anomalously into two scales approximately midway through the scale. In a female (UTA R-62308) both frontoparietales are divided in the posterior third of the scales. In a male (UTA R-62330) the left third supraocular contacts the third supraciliary and in another male (UTA R-62321) the right third supraocular makes contact with the third supraciliary. In a subadult male (UTA R-62310) an extra tiny scale fills the space between the third supraocular and the third supraciliary on both sides. In a female (UTA R-62308) some of the dorsal scales lack keels. In two males (UTA R-62317 and R-62321) anterior/posterior preanal plate scale rows are 2/6; in a male (UTA R-62330) they are 4/4. In most specimens the femoral pores are small and indistinct, but in two males (UTA R-62317 and R-62321) the pores are much larger and fill one-third of the scale. In most the femoral pores are in a straight line along the leg, but in other specimens they proceed in an arc, as in the holotype.

Meristic variation in the paratypes and referred specimens is very minimal and includes: dorsal rows in a longitudinal count 40–45; dorsal rows in a transverse count at midbody 22–28; ventral rows in a longitudinal count 23–25; subdigital lamellae on Toe IV 19–22; femoral pores per leg in males 8–12, femoral pores per leg in females 5–9; occipitals 5–7, usually irregularly shaped. Sexual dimorphism is not apparent in any of the meristic characters, except for higher averages of femoral pores in males.

Coloration is quite similar among the specimens with no sexual dimorphism. In life the middorsal light region ranges from 10–12 dorsals wide. The dorsolateral and paravertebral “stripes” are more or less distinct in various specimens. The “stripes” are most distinct in all juveniles. In most specimens the femoral pores are grey. In some specimens, the lateral white spots are less distinct (but still visible upon close inspection); in other specimens they are very distinct and continue along the entire lateral surface of the body and tail. In preservative a minority of the adults and all of the juveniles and subadults have mottling on the ventral surface of the head and throat regions. The middorsal light region, stripes, and spots/ocelli are not visible in any preserved individuals.

**Distribution and natural history.** *Euspondylus paxcorpus* is endemic to the eastern slope of the Cordillera Oriental of the central Peruvian Andes. All specimens were collected by day associated with groups of rocks near small farms between 3500–3800 masl in the district of Ulcumayo, region of Junín, Peru. The terrain is montane and andenes (agricultural terraces) constructed by the local pre-hispanic culture dominate the area and have been maintained for the continued cultivation of potatoes (*Solanum spp.*), mashua (*Trapaeolum tuberosum*), olluco (*Ullucus tuberosus*), oca (*Oxalis tuberosa*), msha (*Trapaecolum tuberosum*), and fava beans (*Vicia faba*). The climate is defined as boreal (Dwb, Köppen–Geiger climate classification system) and is cold and dry with a marked difference between day and night (approximately 7 to 15 °C difference) stereotypical of the Suni and Quechua natural regions (Monge Miguel et al., 1996). An intense rainy season occurs between the months of December and March. The flora is mainly composed of small herbaceous plants and grasses including *Jarava ichu*. The only other reptile species found in the area was the dipsadid snake *Tachymenis peruviana* Wiegmann. Interestingly, in the district of Ulcumayo and surrounding areas, *E. paxcorpus* is used for traditional medicinal purposes; specimens are flayed and tied to extremities to heal broken bones. The use of reptiles for medicinal means is not limited to *E. paxcorpus* in Ulcumayo, as snakes are commonly left to steep in sugar cane alcohol called cañaso and considered a curative. In Quechua these lizards are referred to as *shakurhuay*.

**Etymology.** The specific epithet *paxcorpus* is a Latin noun that honors the Peace Corps, or Cuerpo de Paz in Spanish. The lizards were discovered and collected by a Peace Corps Volunteer during his service in Peru to promote community-based environmental management.

**Discussion**

The description of *Euspondylus paxcorpus* brings the current number of *Euspondylus* species to 13. In Peru nine or 10 species occur (it is questionable whether *E. guentheri* occurs in Peru), with three other species (*E. josyi, E. maculatus*, and *E. spinalis*) also occurring within the Junín region, though none of them is sympatric with *E. paxcorpus*. In fact, although *E. paxcorpus* was quite abundant in all areas where it was located, no other lizard species were found locally.

One striking finding during this study was the drastic difference in coloration of all specimens from life to after preservation in ethanol (Fig. 3). In ethanol, all specimens had a uniform dark brown dorsum, head, and dorsal surface of the tail, with no stripes, spots, or variations in color visible. However, the coloration in life showed visible spots, ocelli, stripes, and different regions of color. These differences do not bode well for the examination

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NEW EUSPONDYLUS FROM CENTRAL PERU

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of museum specimens of *Euspondylus* or other species whose coloration is so greatly altered. In our experience, though colors typically fade in alcohol, patterns are usually still visible in other species. The fact that no patterning is visible indicates that the examination of color patterns of museum specimens may give misleading information about the coloration of living specimens and conclusions about coloration based solely on museum specimens should be treated with caution.

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