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Conserving the Mesoamerican herpetofauna: The most critical case of the priority level one endemic species

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Abronia fuscolabialis (Tihen 1944). The Mount Zempoaltepec Arboreal Alligator Lizard has an EVS of 18 (Johnson et al. 2017) and its distribution is restricted to the Sierra Madre de Oaxaca of Oaxaca, Mexico (Mata-Silva et al. 2015). This species is poorly known since it is represented by only five museum specimens from two different localities in the Sierra Madre de Oaxaca (Cerro Pelón and Cerro Zempoaltepetl). This individual was observed and photographed in a third (new) locality in the Sierra Juárez of Oaxaca, Mexico. *Photo by César Mayoral Halla*.

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Perspective

Conserving the Mesoamerican herpetofauna: the most critical case of the priority level one endemic species

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***Abstract.*—Of significant biodiversity importance, the Mesoamerican herpetofauna now increases at a rate of approximately 35 species annually. As its size increases, however, the global problem of biodiversity decline continues to worsen with time. Recently, a set of conservation priority levels was established for individual species based on a combination of physiographic distribution and Environmental Vulnerability Score (EVS). The 18 such levels identified range from level one, encompassing species that occupy a single physiographic region and with a high EVS, to level 18, including species that inhabit six physiographic regions and have a low EVS. For the Mesoamerican herpetofauna, the greatest number of species is placed in level one, amounting to 970 taxa with documentable distributions. From one to 149 priority level one species are found in 20 of the 21 physiographic regions recognized in Mesoamerica. Slightly more than three-quarters of the priority level one species of anurans, salamanders, and squamates are found in the Baja California Peninsula and six montane regions in Mexico and Central America. Conservation biology, thus far, has not been successful at reversing the steady loss of biodiversity nor at placing biodiversity decline on the global agenda. In addition, humans are becoming increasingly divorced from contact with the natural world and, thus, less aware of the life-threatening impact they are having on the planet's life-support systems. Given this situation, the authors of this paper have become increasingly devoted to trying to understand why humans in general exhibit the highly dangerous anthropocentric worldview. As have other biologists, the authors ascribe this behavior to what is known as "the mismanagement of the human mind." This mismanagement of the human mind is believed to result from a cascade of psychological ailments giving rise to increasingly restrictive forms of centristic thinking. In the final analysis, these types of thinking appear likely to doom to failure any efforts to establish for perpetuity protected areas that can harbor the priority level one species identified in this and earlier papers. Until and unless the anthropocentric worldview can be transformed into a worldview consonant with the realities of how life operates on planet Earth, we humans are not only endangering ourselves but also all other life. This article discusses the implications of this worldview for the potential conservation of the priority level one endemic species of the Mesoamerica herpetofauna.**

Keywords. Amphibia, biodiversity decline, Central America, conservation priority levels, Mexico, Reptilia

***Resumen.*—De gran significancia en materia de biodiversidad, la herpetofauna Mesoamericana aumenta a una tasa aproximada de 35 especies anualmente. Sin embargo, así como aumenta su importancia, el problema de la disminución global de la biodiversidad continúa empeorando con el tiempo. El trabajo reciente por algunos de nosotros estableció un número de niveles de conservación prioritarios que están basados en la combinación de la distribución geográfica y el Índice de Vulnerabilidad Ambiental (Environmental Vulnerability Score = EVS, por sus siglas en inglés). Dieciocho niveles han sido identificados, que van desde el nivel uno, que incluye las especies que se encuentran en una sola región fisiográfica y con un EVS alto, al nivel 18, que incluye especies que habitan en seis regiones fisiográficas y con un EVS bajo. El mayor número de especies se encuentra en el nivel uno, con 970 taxones. De una a 149 especies en el nivel de prioridad uno, se encuentran en 20 de las 21 regiones fisiográficas reconocidas en Mesoamérica. Ligeramente más de tres cuartos de los anuros, salamandras, y escamosos en el nivel de prioridad uno, se encuentran en la Península de Baja California y en seis regiones montañosas de México y Centroamérica. A la fecha, la conservación biológica no ha sido exitosa en revertir la pérdida consistente de biodiversidad, ni en establecer la disminución de la biodiversidad en la agenda global. Adicionalmente, los humanos cada vez están más divorciados del contacto con el mundo natural, y así, menos conscientes del impacto mortal que estamos ejerciendo en los sistemas que sostienen**

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la vida del planeta. Dada la situación actual, los autores de este artículo se han dedicado seriamente a intentar entender por qué los humanos en general demuestran una visión antropocéntrica del mundo muy peligrosa. En concordancia con otros biólogos, estos autores atribuyen esta conducta a lo que se conoce como "la mala conducta de la mente humana". Esta conducta mental es el resultado de una cascada de problemas psicológicos que dan origen a una creciente variedad de pensamientos centristas. En el análisis final, son los tipos de pensamientos centristas los que probablemente aseguran el fallo de los esfuerzos para establecer áreas naturales protegidas perpetuas que pueden albergar a las especies en el nivel uno de prioridad que hemos identificado en este y otros artículos anteriores. Mientras no sea posible transformar la visión antropocéntrica del mundo en una que vaya acorde con la realidad de cómo funciona la vida en el planeta Tierra, hasta entonces los humanos no solo estaremos poniendo en riesgo nuestras propias vidas, si no la de todos los seres vivos. Este artículo discute las implicaciones de esta cosmovisión para la conservación potencial de las especies endémicas de primer nivel de la herpetofauna de Mesoamérica.

Palabras Claves. Anfibia, América Central, disminución de la biodiversidad, México, niveles prioritarios de conservación, Reptilia

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> *"Oxymorons, such as "*sustainable development,*" are strung together by politicians and developers in any attempt to make all this destruction and homogenization seem less offensive."*
>
> Eric R. Pianka (1994)

Introduction

The Mesoamerican herpetofauna is of tremendous biodiversity significance (Wilson and Johnson 2010; Wilson et al. 2013a,b; Johnson et al. 2015; Johnson et al. 2017; Mata-Silva et al. 2019), and that significance only increases with time due to the continuing discovery of new taxa within the region (see below). Wilson and Johnson (2010) comprehensively documented a herpetofauna for the region of 1,879 species. The current figure for Mesoamerica is 2,156 species, or an increase of 277 species over approximately eight years, i.e., 34.6 species per year (http://mesoamericanherpetology.com; accessed 9 November 2019). If this rate of discovery were to hold until mid-century, then the total figure for Mesoamerica could be expected to rise to ~3,229 species. While this increase in our knowledge of the Mesoamerican herpetofauna is occurring, the factors that exacerbate the overall global problem of biodiversity decline are worsening at an exponential rate, in concert with the rise in human population numbers (Johnson et al. 2017; Jarvis 2018). Unfortunately, we know much more about the growth of our knowledge of the Mesoamerican herpetofauna than we do about its decline. The rate at which our knowledge of this herpetofauna increases (as indicated above), undoubtedly pales into virtual insignificance when compared to the probable (but essentially unknown) rate of herpetofaunal species decline over time. What data we do have, however, points to a decline in herpetofaunal diversity that is increasing ever more rapidly with time. If we have any hope to limit this decline, we must rapidly accumulate the baseline data needed to document its nature and extent in order to transform the search for ultimate solutions from its current position on "herpetological wish lists" to rapid enactment over the long term.

Johnson et al. (2017) and Mata-Silva et al. (2019) examined the endemic herpetofaunas of Mexico and Central America, respectively, in an attempt to establish a set of conservation priority levels based on physiographic distribution and Environmental Vulnerability Score (EVS; Wilson et al. 2013a,b; Johnson et al. 2015). Calculations in Johnson et al. (2017) and Mata-Silva et al. (2019) led to the recognition of a series of 18 priority levels ranging from level one (species occupying a single physiographic region and having a high category EVS) to level 18 (species occurring in six physiographic regions and having a low category EVS).

Johnson et al. (2017) and Mata-Silva et al. (2019) considered the priority level one species to be the most in need of conservation attention, due to their limited distribution and high environmental vulnerability. Johnson et al. (2017) listed 490 such species in Mexico, and Mata-Silva et al. (2019) listed 429 species in Central America, for a total of 919 species. In the interim beyond the appearance of these two papers, a number of additional species have been described that also qualify as conservation priority level one species, and we have incorporated them into our analysis below. In addition, several corrections to the categorizations that were assigned in these two papers have been necessitated by new information, and these re-classifications are reflected as necessary in the tables accompanying the text of this paper.

The purpose of this paper is to examine in detail the future prospects for the preservation of the conservation priority level one species identified by Johnson et al. (2017) and Mata-Silva et al. (2019) in Mexico and Central

America, respectively. The approach we have taken is to examine the distribution of these species in greater detail than was undertaken in these two previous papers, with a view to focusing on the relative significance of the various Mesoamerican physiographic areas.

The "Conservation Priority Level" Concept

The concept of conservation priority levels was developed for application to the Mesoamerican herpetofauna by Johnson et al. (2017) and Mata-Silva et al. (2019). These priority levels are based on a combination of environmental vulnerability scores (EVS) and occurrence in physiographic regions. Since these two papers were published, additional herpetofaunal taxa have been described, primarily in Mexico. These new taxa are discussed immediately below.

Recent Changes to the Mesoamerican Herpetofauna

In the relatively short time since the publication of Johnson et al. (2017) and Mata-Silva et al. (2019), a number of significant additions to the herpetofauna of Mexico and Central America have appeared. These additional taxa are listed in Table 1, along with citations of their place of publication, distribution among physiographic regions, EVS calculations, and conservation priority levels. Those that occupy priority level one are incorporated into the sections below.

The 71 species included in Table 1 comprise 19 anurans, three salamanders, 20 lizards, 27 snakes, and two turtles. Forty-eight of the 71 species were described as new and the remainder involved elevations from subspecies to species level or reports as new for the herpetofauna of Mesoamerica. Thirty-five of the 48 new species were described in 2018, one in 2016, four in 2017, and eight in 2019. Twenty-nine of the 48 species were described from Mexico, and the other 15 from Central America; and only nine of the 71 species are known to occupy more than a single physiographic region (see Table 1). The physiographic regions (as recognized by Wilson and Johnson [2010]) involved for all 71 species are as follows: BC (9 species), CG (1), CP (1), CRP (6), EP (2), GCR (5), GH (5), HN (8), MC (6), NB (2), NP (2), OC (4), OR (7), SC (13), SD (1), SU (11), TT (4), and YP (1). All but six species are placed in the high EVS category of vulnerability, with scores ranging from 14 to 19; with six exceptions having EVS of 13 (4), 12 (1), and 9 (1). As a consequence, 59 of the 71 species in Table 1 qualify as priority level one taxa and, thus, need to be included in the following tables.

Priority Levels among the Members of the Mesoamerican Herpetofauna

As noted in the introduction, Johnson et al. (2017) and Mata-Silva et al. (2019) developed and utilized a scheme for assigning conservation priority levels to the members of the Mexican and Central American herpetofauna. Given that the herpetofauna of these two regions has increased considerably in size since these papers were published, it is necessary to comprehensively summarize the current data on the diversity and endemicity of this herpetofauna for all of Mesoamerica.

Thus, Table 2 indicates the diversity of all the Mesoamerican herpetofauna to the present day, amounting to a total of 70 families (21 amphibian and 49 reptile), 294 genera (92 amphibian and 202 reptile), and 2,156 species (834 amphibians and 1,322 reptiles). The number of families was recently augmented by Goicoechea et al. (2016), which accomplished the erection of the family Alopoglossidae to include the genera *Alopoglossus* and *Ptychoglossus*, the latter of which contains, among others in South America, three species that occupy Lower Central America. The greatest numbers of these taxa at all levels belong to the Order Anura among the amphibians and the Order Squamata among the reptiles.

The level of endemicity of the Mesoamerican herpetofauna is startling and strongly indicative of a global stature for this group of animals in this region. The species-level endemicity is documented in Table 3. The total level of herpetofaunal endemism is at 79.0%, meaning that more than three of every four species in the region are found nowhere else in the world. Amphibian endemicity in Mesoamerica is higher, at 84.2%, than that for reptiles, at 75.8%. The amphibian level indicates more than eight of every 10 species are endemic to the region; while slightly more than three of every four reptile species are endemic. Finally, at the ordinal level, the figure for salamanders is simply incredible, at 96.0%, indicating that for every 100 salamander species, only four are not endemic. In addition, the levels of endemicity for both anurans and squamates include more than three out of every four species (77.9% and 76.8%, respectively).

As noted above, Johnson et al. (2017) and Mata-Silva et al. (2019) constructed a set of conservation priority levels for the herpetofaunas of Mexico and Central America, respectively. The results of the categorizations of these authors, updated to the present time (Table 4), indicate that of the 18 recognized priority levels, six are allocated to the high EVS priority levels, eight to the medium EVS priority levels, and four to the low EVS priority levels. In general, the total numbers of species allocated to each level decrease precipitously from levels one to six among the high EVS levels, and from seven to 14 among the medium EVS levels, but this pattern is not seen with the few species (eight in total) placed in the low EVS levels. This same general pattern is seen for both Mexico and Central America, when considered individually (although there is but one low EVS species in Central America). The total counts for the three EVS levels decrease markedly from high (1,253) to medium (216) to low (eight). Thus, the high EVS level species make up 84.8% (1,253 of 1,477) of the total number

Craugastor daryi (Ford and Savage 1984). Ford's Robber Frog has an EVS of 17 (Mata-Silva et al. 2019) and inhabits cloud forest at elevations of 1,500–2,290 m in the Sierra Xucaneb and Sierra de las Minas in central Guatemala (Frost 2019). This individual was found at Purulhá, Baja Verapaz, Guatemala. *Photo by Andres Novales*.

Eleutherodactylus syristes Hoyt 1965. The Piping Peeping Frog has an EVS of 16 (Johnson et al. 2017) and occupies the "pine-oak woodland on the Pacific slopes of the Sierra de Miahuatlán and Mixteca Alta, Oaxaca, east into the Sierra Madre del Sur of Guerrero, Mexico" (Frost 2019). This individual was located in the Municipality of San Juan Lachao, Oaxaca, Mexico. *Photo by Vicente Mata-Silva*.

Bromeliohyla melacaena (McCranie and Castañeda 2006). The Omoa Bromeliad Frog has an EVS of 20 (Mata-Silva et al. 2019), which lies at the upper limit of the range of values for this conservation measure. It was described from the visitors' center in Parque Nacional El Cusuco in northwestern Honduras, one of the most significant areas of herpetofaunal endemicity in the country (Townsend and Wilson 2008). This individual came from Parque Nacional Cusuco, Honduras. *Photo by Andres Novales*.

Charadrahyla sakbah Jiménez-Arcos, Calzada-Arciniega, Alfaro-Juantorena, Vázquez-Reyes, Blair, and Parra-Olea 2019. This recently-described hylid frog has an EVS of 15 (Table 1) and is restricted to cloud forest in the western portion of the Sierra Madre del Sur of Oaxaca, Mexico, an area of high herpetofaunal endemicity (Mata-Silva et al. 2015b). This individual is from Río Chite ku'e (Río de las Mil Cascadas), San Isidro Paz y Progreso, Santa Maria Yucuhiti, Oaxaca. *Photo by Víctor H. Jiménez-Arcos*.

Dendropsophus sartori (Smith 1951). Taylor's Yellow Treefrog has an EVS of 14 (Johnson et al. 2017) and a distribution encompassing the "Pacific slopes of southwestern Mexico (Jalisco to Oaxaca)" (Frost 2019). These individuals were found in the Municipality of San Juan Lachao, Oaxaca, Mexico. *Photo by Vicente Mata-Silva*.

Plectrohyla dasypus McCranie and Wilson 1981. The Cusuco Spotted Treefrog has an EVS of 14 (Mata-Silva et al. 2019) and occurs in cloud forest at elevations of 1,300–1,990 m in the Sierra de Omoa of northwestern Honduras (Townsend and Wilson 2008). This individual was encountered at Parque Nacional Cusuco, Honduras. *Photo by Andres Novales*.

Table 1. Mesoamerican herpetofaunal species described or elevated to species level since Johnson et al. (2017) and Mata-Silva et al. (2019), along with their places of publication, physiographic region(s), EVS calculations, and conservation priority levels. The abbreviations for regions involved are as follows: BC = Baja California and adjacent islands; NB = Northern Plateau Basin and Ranges; SD = Sonoran Desert basins and ranges; MC = Mesa Central; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; YP = Yucatan Platform; SU = Sierra Madre del Sur; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras; CRP = Isthmian Central American highlands; CG = western nuclear Central American highlands; HN = eastern nuclear Central American highlands; CP = Pacific lowlands from central Costa Rica through Panama; NP = Caribbean lowlands from Nicaragua to Panama; and EP = eastern Panamanian highlands.

Species	References	Physiographic region(s)	EVS calculations	Conservation priority level
Craugastor aenigmaticus	Arias et al. 2018	CRP	5+8+4=17	One
Craugastor blairi	Arias et al. 2019	CRP	5+8+4=17	One
Craugastor castanedai	McCranie 2018	HN	6+8+4=18	One
Craugastor gutschei	McCranie 2018	HN	5+7+4=17	One
Craugastor sagui	Arias et al. 2019	CRP	5+8+4=17	One
Craugastor zunigai	Arias et al. 2019	CRP	5+8+4=17	One
Eleutherodactylus colimotl	Grünwald et al. 2018	SC	5+8+4=17	One
Eleutherodactylus erendirae	Grünwald et al. 2018	MC	5+8+4=17	One
Eleutherodactylus floresvillelai	Grünwald et al. 2018	MC	6+8+4=18	One
Eleutherodactylus jaliscoensis	Grünwald et al. 2018	MC	5+8+4=17	One
Eleutherodactylus manantlanensis	Grünwald et al. 2018	MC	6+8+4=18	One
Eleutherodactylus nietoi	Grünwald et al. 2018	SU	5+7+4=16	One
Hemiphractus elioti	Hill et al. 2018	CRP	5+7+5=17	One
Hemiphractus kaylockae	Hill et al. 2018	EP	6+8+5=19	One
Hemiphractus panamensis	Hill et al. 2018	EP	5+8+5=18	One
Charadrahyla esperancensis	Canseco-Márquez et al. 2017a	OR	6+8+1=15	One
Charadrahyla sakbah	Jiménez-Arcos et al. 2019	SU	6+8+1=15	One
Quilticohyla zoque	Canseco-Márquez et al. 2017b	TT	5+8+1=14	One
Sarcohyla hapsa	Campbell et al. 2018a	OC, MC	5+8+1=14	Two
Chiropterotriton aureus	García-Castillo et al. 2018	OR	6+8+4=18	One
Chiropterotriton chico	García-Castillo et al. 2017	MC	6+8+4=18	One
Chiropterotriton nubilus	García-Castillo et al. 2018	OR	5+8+4=17	One
Gerrhonotus mccoyi	García-Vázquez et al. 2018	NB	6+8+3=17	One
Laemanctus julioi	McCranie 2018	GCR	6+8+3=17	One
Laemanctus waltersi	McCranie 2018	GH	5+8+3=16	One
Norops arenal	Köhler and Vargas 2019	CRP	6+8+3=17	One
Norops brianjuliani	Köhler et al. 2019	SU	6+8+3=17	One
Norops caceresae	Hofmann and Townsend 2018	HN	5+7+3=15	One
Ctenosaura brachylopha	Zarza et al. 2019	SC, OC	5+6+6=17	Two
Sceloporus esperanzae	McCranie 2018	HN	5+8+3=16	One
Sceloporus hondurensis	McCranie 2018	HN, GCR	5+5+3=13	Ten
Sceloporus olloporus	Solis-Zurita et al. 2019	CG, HN, GH, GCR, NP	5+1+3=9	Occupies level between 17 and 18
Sceloporus schmidti	McCranie 2018	HN	5+7+3=15	One

Table 1 (continued). Mesoamerican herpetofaunal species described or elevated to species level since Johnson et al. (2017) and Mata-Silva et al. (2019), along with their places of publication, physiographic region(s), EVS calculations, and conservation priority levels. The abbreviations for regions involved are as follows: BC = Baja California and adjacent islands; NB = Northern Plateau Basin and Ranges; SD = Sonoran Desert basins and ranges; MC = Mesa Central; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; YP = Yucatan Platform; SU = Sierra Madre del Sur; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras; CRP = Isthmian Central American highlands; CG = western nuclear Central American highlands; HN = eastern nuclear Central American highlands; CP = Pacific lowlands from central Costa Rica through Panama; NP = Caribbean lowlands from Nicaragua to Panama; and EP = eastern Panamanian highlands.

Species	References	Physiographic region(s)	EVS calculations	Conservation priority level
Phyllodactylus benedetti	Ramírez-Reyes and Flores-Villela 2018	SC	6+8+3=17	One
Phyllodactylus isabelae	Ramírez-Reyes and Flores-Villela 2018	SC	6+8+3=17	One
Phyllodactylus kropotkini	Ramírez-Reyes and Flores-Villela 2018	SC	6+8+3=17	One
Phyllodactylus lupitae	Ramírez-Reyes and Flores-Villela 2018	SC	6+8+3=17	One
Phyllodactylus rupinus	Ramírez-Reyes and Flores-Villela 2018	SC	6+8+3=17	One
Plestiodon lotus	Pavon-Vazquez et al. 2017	SC	5+7+3=15	One
Aristelliger nelsoni	McCranie 2018	GH	6+8+3=17	One
Lepidophyma inagoi	Palacios-Aguilar et al. 2018	SC	6+8+2=16	One
Xenosaurus fractus	Nieto-Montes de Oca et al. 2018	OR	5+8+3=16	One
Lampropeltis greeri	Hansen and Salmon 2017	OC	5+8+3=16	One
Lampropeltis leonis	Hansen and Salmon 2017	OR	5+6+3=14	One
Masticophis lineatus	Oconnell and Smith 2018	SC, OC, SU	5+5+4=14	Three
Masticophis piceus	Oconnell and Smith 2018	SC	3+6+4=13	Seven
Salvadora gymnorhachis	Hernández-Jiménez et al. 2019	SU	5+8+4=17	One
Sonora annulata	Cox et al. 2018	BC, SD	3+7+5=15	Two
Sonora cincta	Cox et al. 2018	BC, SC	2+7+5=14	Two
Sonora episcopa	Cox et al. 2018	NB	3+7+3=13	Seven
Sonora fasciata	Cox et al. 2018	BC	5+8+5=18	One
Sonora mosaueri	Cox et al. 2018	BC	5+8+3=16	One
Sonora palarostris	Cox et al. 2018	SC	2+8+5=15	One
Sonora punctatisima	Cox et al. 2018	BC	2+8+3=13	Seven
Sonora savagei	Cox et al. 2018	BC	6+8+3=17	One
Sonora straminea	Cox et al. 2018	BC	5+8+3=16	One
Sonora taylori	Cox et al. 2018	TT	3+8+3=14	One
Cenaspis aenigma	Campbell et al. 2018b	TT	6+8+2=16	One
Chersodromus australis	Canseco-Márquez et al. 2018	TT	6+8+2=16	One
Chersodromus nigrum	Canseco-Márquez et al. 2018	OR	6+8+2=16	One
Rhadinaea eduardoi	Mata-Silva et al. 2018	SU	6+8+2=16	One
Rhadinaea nuchalis	García-Vázquez et al. 2018	SU	6+8+2=16	One
Rhadinella dysmica	Campillo et al. 2016	SU	6+8+2=16	One

Plectrohyla exquisita McCranie and Wilson 1998. The Cusuco Giant Treefrog has an EVS of 15 (Mata-Silva et al. 2019) and is distributed from 1,430–1,780 m in cloud forest in the Sierra de Omoa in northwestern Honduras (Townsend and Wilson 2008). This individual was found at Parque Nacional Cusuco, Honduras. *Photo by Andres Novales*.

Bolitoglossa chinanteca Rovito, Parra-Olea, Lee, and Wake 2012. The Chinanteca Salamander has an EVS of 18 (Johnson et al. 2017) and a distribution within the Sierra Juárez of Oaxaca, Mexico (Frost 2019). This individual was encountered in the Municipality of San Felipe Usila, Oaxaca, Mexico. *Photo by Vicente Mata-Silva*.

Bolitoglossa oaxacensis Parra-Olea, García-París, and Wake 2004. The Atoyac Salamander has an EVS of 17 (Johnson et al. 2017) and is distributed in "humid oak-pine forest in the Sierra Madre del Sur, specifically from the mountains south of Sola de Vega, to immediately south of the Atoyac River Basin, in the vicinity of Puerto Portillo, Oaxaca, Mexico" (Frost 2019). This individual was encountered in the Municipality of Santa Catarina Juquila, Oaxaca, Mexico. *Photo by Vicente Mata-Silva*.

Quilticohyla acrochorda (Campbell and Duellman 2000). The Warty Mountain Stream Frog has an EVS of 14 (Johnson et al. 2017) and ranges "at elevations from 594–900 m on the Atlantic slopes of the Sierra Juárez [sic], Oaxaca, Mexico" (Frost 2019). This individual was found in the Municipality of San Felipe Usila, Oaxaca, Mexico. *Photo by Vicente Mata-Silva*.

Bolitoglossa conanti McCranie and Wilson 1993. Conant's Mushroomtongue Salamander has an EVS of 16 (Mata-Silva et al. 2019) and is found at moderate and intermediate elevations of 1,370–2,000 m in cloud forest on both versants from northwestern Honduras to extreme northwestern El Salvador, as well as adjacent eastern Guatemala (Townsend and Wilson 2008; Frost 2019). This individual was encountered at La Unión, Zacapa, Guatemala. *Photo by Andres Novales*.

Bolitoglossa helmrichi (Schmidt 1936). The Coban Mushroomtongue Salamander has an EVS of 16 (Mata-Silva et al. 2019) and ranges in southwestern Alta Verapaz and Baja Verapaz, Guatemala, at elevations of 1,000–2,000 m (Frost 2019). This individual was found at Purulhá, Baja Verapaz, Guatemala. *Photo by Andres Novales*.

Table 1 (continued). Mesoamerican herpetofaunal species described or elevated to species level since Johnson et al. (2017) and Mata-Silva et al. (2019), along with their places of publication, physiographic region(s), EVS calculations, and conservation priority levels. The abbreviations for regions involved are as follows: BC = Baja California and adjacent islands; NB = Northern Plateau Basin and Ranges; SD = Sonoran Desert basins and ranges; MC = Mesa Central; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; YP = Yucatan Platform; SU = Sierra Madre del Sur; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras; CRP = Isthmian Central American highlands; CG = western nuclear Central American highlands; HN = eastern nuclear Central American highlands; CP = Pacific lowlands from central Costa Rica through Panama; NP = Caribbean lowlands from Nicaragua to Panama; and EP = eastern Panamanian highlands.

Species	References	Physiographic region(s)	EVS calculations	Conservation priority level
Rhadinella xerofila	Ariano-Sánchez and Campbell 2018	GH	6+8+2=16	One
Epictia rioignis	Koch et al. 2019	GCR	6+8+1=15	One
Crotalus brunneus	Blair et al. 2018	SU, OR	5+7+5=17	Two
Crotalus exiguus	Blair et al. 2018	SU	6+8+5=19	One
Crotalus polisi	Meik et al. 2018	BC	6+8+5=19	One
Crotalus thalassoporus	Meik et al. 2018	BC	6+8+5=19	One
Kinosternon albogulare	McCranie 2018	GCR, GH, HN, CP, YP, NP	5+4+3=12	Twelve
Kinosternon vogti	López-Luna et al. 2018	SC	6+8+3=17	One

of Mesoamerican endemic species, the medium EVS species comprise 14.6%, and the low EVS species 0.5%. Therefore, it is abundantly clear that an impressive proportion of the Mesoamerican endemic species are allocated to the high EVS category of conservation priority levels. Beyond this simple observation, it is additionally evident that the conservation priority level one species, amounting to 971 species, constitute by far the most numerous and most sizable proportion (65.7%) category of all the 18 levels recognized by Johnson et al. (2017) and Mata-Silva et al. (2019). This trend is continuing with the species described since these two papers were published (Table 1), and is expected to continue into the foreseeable future.

Priority Level One Species: the Most Challenging to Protect

In our opinion, the priority level one species identified by Johnson et al. (2017), Mata-Silva et al. (2019), and in Table 1 of this paper, as discussed above, will prove the most challenging to protect in perpetuity, especially as they make up 65.7% of the Mesoamerican endemic species. This challenge will become increasingly daunting, inasmuch as most species described as new to science will require placement in the priority level one category due to their limited distribution as initially understood, as well as perhaps thereafter, and their expectedly high EVS levels. The data in Table 1 support this contention.

As an initial step in the analysis in this paper, lists of the priority level one species for Mexico (Table 5) and for Central America (Table 6) were compiled. Slight corrections in the data provided by Johnson et al. (2017) and Mata-Silva et al. (2019) were necessary, due to some initial errors and information resulting from new taxa descriptions and resurrections (as documented in Table 1). The resulting lists include 526 priority level one species known from Mexico and 445 known from Central America (with one species in the latter group having an

Table 2. Diversity of the Mesoamerican herpetofauna at familial, generic, and specific levels (based on Taxonomic List at http://mesoamericanherpetology.com; accessed 15 November 2019).

Orders	Families	Genera	Species
Anura	15	68	517
Caudata	4	20	301
Gymnophiona	2	4	16
Amphibian totals	**21**	**92**	**834**
Crocodylia	2	2	3
Squamata	37	181	1,261
Testudines	10	19	58
Reptile totals	**49**	**202**	**1,322**
Sum totals	**70**	**294**	**2,156**

Bolitoglossa subpalmata (Boulenger 1896). The La Palma Salamander has an EVS of 15 (Mata-Silva et al. 2019) and occurs at elevations of 1,245–2,900 m in "humid lower montane and montane zones and marginally into the premontane belt on both slopes of the Cordillera de Guanacaste, Cordillera de Tilarán, Cordillera Central, and their outliers in central to northern Costa Rica" (Frost 2019). This individual was observed at Cerro de la Muerte, Provincia de Cartago, Costa Rica. *Photo by Louis W. Porras*.

Pseudoeurycea cochranae (Taylor 1943). Cochran's False Brook Salamander has an EVS of 17 (Johnson et al. 2017) and is distributed in pine and pine-oak forest at elevations of 2,200–2,700 m in the mountains of central and western Oaxaca, Mexico (Frost 2019). This individual was found at Santiago Tenango, Oaxaca, Mexico. *Photo by César Mayoral Halla*.

Pseudoeurycea mixteca Canseco-Márquez and Gutiérrez-Mayén 2005. This salamander has an EVS of 17 (Johnson et al. 2017) and is distributed in "the Mixteca Alta region of northwestern Oaxaca"…and at an "isolated relict cave locality in the arid Tehuancan Valley, Puebla" (Frost 2019). This individual was photographed at Teposcoulula, in the municipality of the same name, Oaxaca, Mexico. *Photo by Bruno Téllez Baños*.

Cryptotriton veraepacis Lynch and Wake 1978. The Baja Verapaz Salamander has an EVS of 17 (Mata-Silva et al. 2019) and is found at elevations of 1,610–2,290 m in the Sierra de las Minas and nearby mountains of eastern Guatemala (Frost 2019). This individual was encountered at Purulhá, Baja Verapaz, Guatemala. *Photo by Andres Novales*.

Pseudoeurycea conanti Bogert 1967. Conant's Salamander has an EVS of 16 (Johnson et al. 2017) and is known only from a few localities in southern Oaxaca, Mexico (Bogert 1967; Parra-Olea et al. 1999; Mata-Silva et al. 2015a, 2017). This individual was observed in the Municipality of Villa Sola de Vega, Oaxaca, Mexico. *Photo by Vicente Mata-Silva*.

Thorius boreas Hanken and Wake 1994. The Boreal Thorius has an EVS of 18 (Johnson et al. 2017) and is known only from the vicinity of the type locality at elevations of 2,800–3,000 m in pine-oak forest both north and south of the summit of Cerro Pelón in the Sierra Juárez of Oaxaca, Mexico (Frost 2019). This individual was located at Llano de las Flores, municipality of San Juan Atepec (Sierra de Juárez), Oaxaca, Mexico. *Photo by Vicente Mata-Silva*.

Table 3. Degree of endemism of the Mesoamerican herpetofauna at the ordinal level and above. The figures represent the combination of those for distributional categories 1, 2, and 4 of Wilson et al. (2017), as updated with data from the Mesoamerican Herpetology Taxonomic List (http://mesoamericanherpetology.com; accessed 15 November 2019).

Ordinal levels and above	Total number of species	Number of endemic species	Percentage of endemism
Anura	517	403	77.9
Caudata	301	289	96.0
Gymnophiona	16	10	62.5
Amphibian totals	**834**	**702**	**84.2**
Crocodylia	3	1	33.3
Squamata	1,261	968	76.8
Testudines	58	33	56.9
Reptile totals	**1,322**	**1,002**	**75.8**
Sum totals	**2,156**	**1,704**	**79.0**

imprecisely known distribution). Thus, the total number of such species for Mesoamerica is 971.

The 971 priority level one species represent 45.0% of the 2,156 species currently reported from Mesoamerica (http://mesoamericanherpetology.com; accessed 9 November 2019). Of the 835 endemic species in Mexico (Johnson et al. 2017; http://mesoamericanherpetology.com; Table 4), the 526 priority level one species for this country is 63.0% of the total; and for Central America, the comparable figures are 642, 445, and 69.3% (Mata-Silva et al. 2019; http://mesoamericanherpetology.com; Table 4). The total of the species endemic to Mexico and Central America is 1,477, so the 971 priority level one species constitute 65.7% of that total (Table 4).

The data in Tables 5 and 6 are summarized by physiographic region in Table 7. Three regions (WGN, CGU, and YP) that overlap Mexico and Central America represent the combined data for these regions from Tables 5 and 6. There are priority level one species present in 20 of the 21 physiographic regions recognized in Mesoamerica (see Tables 5–7), with none occurring in the EL region (i.e., the subhumid extratropical lowlands of northeastern Mexico). The number of such species in each of the 20 regions ranges from one to 149 (mean = 48.5). The number of species in seven of these 20 regions lies above this mean figure, i.e., the BC (70), MC (60), OR (141), SU (107), WN (105), HN (107), and CRP (149) regions; while they lie below the mean value range, from one to 41, in the remaining 13 regions (Table 7). The seven high-value regions comprise the peninsula of Baja California (BC) and six montane regions in the major portion of Mexico (i.e., the Sierra Madre Oriental, Mesa Central, and Sierra Madre del Sur) and in Central America (the western nuclear Central American highlands, eastern nuclear Central American highlands, and the Isthmian Central American highlands).

Table 4. Conservation priortiy list of endemic herpetofaunal species in Mesoamerica based on the EVS categorization and the range of physiographic occurrence (data from Johnson et al. 2017 and Mata-Silva et al. 2019, as updated with data from http://mesoamericanherpetology.com; accessed 11 June 2019).

Priority levels	Mexico	Central America	Totals
One (High EVS in One Region)	526	445	971
Two (High EVS in Two Regions)	105	73	178
Three (High EVS in Three Regions)	32	27	59
Four (High EVS in Four Regions)	9	21	30
Five (High EVS in Five Regions)	1	9	10
Six (High EVS in Six Regions)	2	3	5
High EVS species totals	**675**	**578**	**1,253**
Seven (Medium EVS in One Region)	57	23	80
Eight (Medium EVS in Two Regions)	38	21	59
Nine (Medium EVS in Three Regions)	28	5	33
Ten (Medium EVS in Four Regions)	18	5	23
Eleven (Medium EVS in Five Regions)	5	4	9
Twelve (Medium EVS in Six Regions)	5	3	8
Thirteen (Medium EVS in Seven Regions)	1	1	2
Fourteen (Medium EVS in Eight Regions)	1	1	2
Medium EVS species totals	**153**	**63**	**216**
Fifteen (Low EVS in One Region)	1	—	1
Sixteen (Low EVS in Three Regions)	2	—	2
Seventeen (Low EVS in Four Regions)	3	—	3
Eighteen (Low EVS in Six Regions)	1	1	2
Low EVS species totals	**7**	**1**	**8**
Sum totals	**835**	**642**	**1,477**

Table 5. Distribution of the 529 priority level one herpetofaunal species in Mexico, among 14 physiographic regions. The abbreviations for regions are as follows: BC = Baja California and adjacent islands; SD = Sonoran Desert basins and ranges; NB = Northern Plateau basins and ranges; MC = Mesa Central; EL = subhumid extratropical Lowlands of northeastern Mexico; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; LT = Sierra de Los Tuxtlas; SU = Sierra Madre del Sur; YP = Mexican portion of Yucatan Platform; WN = Mexican portion of western Nuclear Central American highlands; and CGU = Mexican portion of Pacific lowlands from eastern Chiapas to south-central Guatemala.

Taxa	Physiographic regions of Mexico													
	BC	SD	NB	MC	EL	SC	OC	OR	TT	LT	SU	YP	WN	CGU
Anura (92 species)														
Bufonidae (6 species)														
Anaxyrus kelloggi						+								
Incilius cristatus								+						
Incilius cycladen											+			
Incilius gemmifer						+								
Incilius mccoyi							+							
Incilius pisinnus						+								
Craugastoridae (20 species)														
Craugastor batrachylus								+						
Craugastor decoratus								+						
Craugastor galacticorhinus								+						
Craugastor glaucus													+	
Craugastor guerreroensis											+			
Craugastor megalotympanum										+				
Craugastor montanus													+	
Craugastor omiltemanus											+			
Craugastor pelorus													+	
Craugastor polymniae								+						
Craugastor pozo													+	
Craugastor rhodopis								+						
Craugastor saltator											+			
Craugastor silvicola													+	
Craugastor spatulatus								+						
Craugastor tarahumaraensis							+							
Craugastor taylori													+	
Craugastor uno											+			
Craugastor vulcani										+				
Craugastor yucatanensis												+		
Eleutherodactylidae (22 species)														
Eleutherodactylus albolabris											+			
Eleutherodactylus angustidigitorum				+										
Eleutherodactylus colimotl						+								
Eleutherodactylus dennisi								+						
Eleutherodactylus dilatus											+			
Eleutherodactylus erendirae				+										
Eleutherodactylus floresvillelai				+										
Eleutherodactylus grandis				+										

Table 5 (continued). Distribution of the 529 priority level one herpetofaunal species in Mexico, among 14 physiographic regions. The abbreviations for regions are as follows: BC = Baja California and adjacent islands; SD = Sonoran Desert basins and ranges; NB = Northern Plateau basins and ranges; MC = Mesa Central; EL = subhumid extratropical Lowlands of northeastern Mexico; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; LT = Sierra de Los Tuxtlas; SU = Sierra Madre del Sur; YP = Mexican portion of Yucatan Platform; WN = Mexican portion of western Nuclear Central American highlands; and CGU = Mexican portion of Pacific lowlands from eastern Chiapas to south-central Guatemala.

Taxa	Physiographic regions of Mexico													
	BC	SD	NB	MC	EL	SC	OC	OR	TT	LT	SU	YP	WN	CGU
Eleutherodactylus grunwaldi				+										
Eleutherodactylus jaliscoensis				+										
Eleutherodactylus longipes								+						
Eleutherodactylus manantlanensis				+										
Eleutherodactylus maurus				+										
Eleutherodactylus modestus						+								
Eleutherodactylus nietoi				+										
Eleutherodactylus pallidus						+								
Eleutherodactylus rufescens				+										
Eleutherodactylus saxatilis							+							
Eleutherodactylus syristes											+			
Eleutherodactylus teretistes							+							
Eleutherodactylus verruculatus								+						
Eleutherodactylus wixarika							+							
Hylidae (38 species)														
Charadrahyla esperancensis								+						
Charadrahyla sakbah											+			
Charadrahyla tecuani											+			
Charadrahyla trux											+			
Dendropsophus sartori						+								
Duellmanohyla ignicolor								+						
Ecnomiohyla echinata								+						
Ecnomiohyla valancifer										+				
Exerodonta abdivita								+						
Exerodonta bivocata													+	
Exerodonta juanitae											+			
Exerodonta xera								+						
Megastomatohyla mixe								+						
Megastomatohyla mixomaculata								+						
Megastomatohyla nubicola								+						
Megastomatohyla pellita											+			
Plectrohyla lacertosa													+	
Plectrohyla pycnochila													+	
Ptychohyla acrochorda								+						
Ptychohyla erythromma											+			
Quilticohyla zoque									+					
Sarcohyla ameibothalame											+			
Sarcohyla calthula								+						

Table 5 (continued). Distribution of the 529 priority level one herpetofaunal species in Mexico, among 14 physiographic regions. The abbreviations for regions are as follows: BC = Baja California and adjacent islands; SD = Sonoran Desert basins and ranges; NB = Northern Plateau basins and ranges; MC = Mesa Central; EL = subhumid extratropical Lowlands of northeastern Mexico; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; LT = Sierra de Los Tuxtlas; SU = Sierra Madre del Sur; YP = Mexican portion of Yucatan Platform; WN = Mexican portion of western Nuclear Central American highlands; and CGU = Mexican portion of Pacific lowlands from eastern Chiapas to south-central Guatemala.

Taxa	**Physiographic regions of Mexico**													
	BC	**SD**	**NB**	**MC**	**EL**	**SC**	**OC**	**OR**	**TT**	**LT**	**SU**	**YP**	**WN**	**CGU**
Sarcohyla calvicollina								+						
Sarcohyla celata								+						
Sarcohyla cembra											+			
Sarcohyla charadricola								+						
Sarcohyla chryses											+			
Sarcohyla cyanomma								+						
Sarcohyla cyclada								+						
Sarcohyla ephemera								+						
Sarcohyla labedactyla											+			
Sarcohyla miahuatlanensis											+			
Sarcohyla pachyderma								+						
Sarcohyla psarosema								+						
Sarcohyla sabrina								+						
Sarcohyla siopela								+						
Smilisca dentata				+										
Ranidae (6 species)														
Lithobates chichicuahutla				+										
Lithobates dunni				+										
Lithobates lemosespinali							+							
Lithobates megapoda				+										
Lithobates pueblae								+						
Lithobates tlaloci				+										
Anuran totals	**—**	**—**	**—**	**15**	**—**	**7**	**6**	**31**	**1**	**3**	**19**	**1**	**9**	**—**
Caudata (111 species)														
Ambystomatidae (10 species)														
Ambystoma andersoni				+										
Ambystoma bombypellum				+										
Ambystoma dumerilii				+										
Ambystoma flavipiperatum				+										
Ambystoma granulosum				+										
Ambystoma leorae				+										
Ambystoma lermaense				+										
Ambystoma mexicanum				+										
Ambystoma silvense							+							
Ambystoma taylori				+										
Plethodontidae (101 species)														
Aquiloeurycea cafetalera								+						
Aquiloeurycea galaenae								+						

Table 5 (continued). Distribution of the 529 priority level one herpetofaunal species in Mexico, among 14 physiographic regions. The abbreviations for regions are as follows: BC = Baja California and adjacent islands; SD = Sonoran Desert basins and ranges; NB = Northern Plateau basins and ranges; MC = Mesa Central; EL = subhumid extratropical Lowlands of northeastern Mexico; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; LT = Sierra de Los Tuxtlas; SU = Sierra Madre del Sur; YP = Mexican portion of Yucatan Platform; WN = Mexican portion of western Nuclear Central American highlands; and CGU = Mexican portion of Pacific lowlands from eastern Chiapas to south-central Guatemala.

Taxa	Physiographic regions of Mexico													
	BC	SD	NB	MC	EL	SC	OC	OR	TT	LT	SU	YP	WN	CGU
Aquiloeurycea praecellens								+						
Aquiloeurycea quetzalanensis								+						
Aquiloeurycea scandens								+						
Bolitoglossa chinanteca								+						
Bolitoglossa hermosa											+			
Bolitoglossa macrinii											+			
Bolitoglossa oaxacensis											+			
Bolitoglossa riletti											+			
Bolitoglossa zapoteca											+			
Chiropterotriton arboreus								+						
Chiropterotriton aureus								+						
Chiropterotriton chico				+										
Chiropterotriton chiropterus								+						
Chiropterotriton chondrostega								+						
Chiropterotriton cieloensis								+						
Chiropterotriton cracens								+						
Chiropterotriton dimidiatus								+						
Chiropterotriton infernalis								+						
Chiropterotriton lavae								+						
Chiropterotriton magnipes								+						
Chiropterotriton miquihuanus								+						
Chiropterotriton mosaueri								+						
Chiropterotriton multidentatus								+						
Chiropterotriton nubilus								+						
Chiropterotriton orculus								+						
Chiropterotriton priscus								+						
Chiropterotriton terrestris								+						
Cryptotriton alvarezdeltoroi													+	
Dendrotriton megarhinus													+	
Dendrotriton xolocalcae													+	
Isthmura corrugata								+						
Isthmura gigantea								+						
Isthmura maxima											+			
Isthmura sierraoccidentalis							+							
Ixalotriton niger													+	
Ixalotriton parvus													+	
Parvimolge townsendi								+						
Pseudoeurycea ahuitzotl											+			

Table 5 (continued). Distribution of the 529 priority level one herpetofaunal species in Mexico, among 14 physiographic regions. The abbreviations for regions are as follows: BC = Baja California and adjacent islands; SD = Sonoran Desert basins and ranges; NB = Northern Plateau basins and ranges; MC = Mesa Central; EL = subhumid extratropical Lowlands of northeastern Mexico; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; LT = Sierra de Los Tuxtlas; SU = Sierra Madre del Sur; YP = Mexican portion of Yucatan Platform; WN = Mexican portion of western Nuclear Central American highlands; and CGU = Mexican portion of Pacific lowlands from eastern Chiapas to south-central Guatemala.

Taxa	Physiographic regions of Mexico													
	BC	SD	NB	MC	EL	SC	OC	OR	TT	LT	SU	YP	WN	CGU
Pseudoeurycea altamontana				+										
Pseudoeurycea amuzga											+			
Pseudoeurycea anitae											+			
Pseudoeurycea aquatica								+						
Pseudoeurycea aurantia								+						
Pseudoeurycea cochranae											+			
Pseudoeurycea conanti											+			
Pseudoeurycea firscheini								+						
Pseudoeurycea juarezi								+						
Pseudoeurycea kuautli											+			
Pseudoeurycea lineola								+						
Pseudoeurycea longicauda				+										
Pseudoeurycea lynchi								+						
Pseudoeurycea melanomolga								+						
Pseudoeurycea mixcoatl											+			
Pseudoeurycea mixteca											+			
Pseudoeurycea mystax											+			
Pseudoeurycea naucampatepetl								+						
Pseudoeurycea nigromaculata								+						
Pseudoeurycea obesa								+						
Pseudoeurycea orchileucos								+						
Pseudoeurycea orchimelas										+				
Pseudoeurycea papenfussi								+						
Pseudoeurycea robertsi				+										
Pseudoeurycea ruficauda								+						
Pseudoeurycea saltator								+						
Pseudoeurycea tenchalli											+			
Pseudoeurycea teotepec											+			
Pseudoeurycea tlahcuiloh											+			
Pseudoeurycea tlilicxitl				+										
Pseudoeurycea unguidentis											+			
Pseudoeurycea werleri										+				
Thorius adelos								+						
Thorius arboreus								+						
Thorius aureus								+						
Thorius boreas								+						
Thorius dubitus								+						
Thorius grandis											+			

Table 5 (continued). Distribution of the 529 priority level one herpetofaunal species in Mexico, among 14 physiographic regions. The abbreviations for regions are as follows: BC = Baja California and adjacent islands; SD = Sonoran Desert basins and ranges; NB = Northern Plateau basins and ranges; MC = Mesa Central; EL = subhumid extratropical Lowlands of northeastern Mexico; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; LT = Sierra de Los Tuxtlas; SU = Sierra Madre del Sur; YP = Mexican portion of Yucatan Platform; WN = Mexican portion of western Nuclear Central American highlands; and CGU = Mexican portion of Pacific lowlands from eastern Chiapas to south-central Guatemala.

Taxa	**Physiographic regions of Mexico**													
	BC	**SD**	**NB**	**MC**	**EL**	**SC**	**OC**	**OR**	**TT**	**LT**	**SU**	**YP**	**WN**	**CGU**
Thorius hankeni											+			
Thorius infernalis											+			
Thorius insperatus								+						
Thorius longicaudus											+			
Thorius lunaris								+						
Thorius macdougalli								+						
Thorius magnipes								+						
Thorius maxillabrochus								+						
Thorius minutissimus											+			
Thorius minydemus								+						
Thorius munificus								+						
Thorius narismagnus										+				
Thorius narisovalis											+			
Thorius omiltemi											+			
Thorius papaloae								+						
Thorius pennatulus								+						
Thorius pinicola											+			
Thorius pulmonaris								+						
Thorius schmidti								+						
Thorius smithi								+						
Thorius spilogaster								+						
Thorius tlaxiacus											+			
Thorius troglodytes								+						
Salamander totals	**—**	**—**	**—**	**14**	**—**	**—**	**2**	**59**	**—**	**3**	**28**	**—**	**5**	**—**
Amphibian totals	**—**	**—**	**—**	**29**	**—**	**7**	**8**	**90**	**1**	**6**	**47**	**1**	**14**	**—**
Squamata (315 species)														
Bipedidae (2 species)														
Bipes biporus	+													
Bipes tridactylus						+								
Anguidae (30 species)														
Abronia bogerti													+	
Abronia chiszari										+				
Abronia cuetzpali											+			
Abronia deppii				+										
Abronia graminea								+						
Abronia leurolepis													+	
Abronia martindelcampoi											+			
Abronia mitchelli								+						

Table 5 (continued). Distribution of the 529 priority level one herpetofaunal species in Mexico, among 14 physiographic regions. The abbreviations for regions are as follows: BC = Baja California and adjacent islands; SD = Sonoran Desert basins and ranges; NB = Northern Plateau basins and ranges; MC = Mesa Central; EL = subhumid extratropical Lowlands of northeastern Mexico; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; LT = Sierra de Los Tuxtlas; SU = Sierra Madre del Sur; YP = Mexican portion of Yucatan Platform; WN = Mexican portion of western Nuclear Central American highlands; and CGU = Mexican portion of Pacific lowlands from eastern Chiapas to south-central Guatemala.

Taxa	**Physiographic regions of Mexico**													
	BC	**SD**	**NB**	**MC**	**EL**	**SC**	**OC**	**OR**	**TT**	**LT**	**SU**	**YP**	**WN**	**CGU**
Abronia mixteca											+			
Abronia ornelasi													+	
Abronia ramirezi													+	
Abronia reidi										+				
Abronia smithi													+	
Barisia herrerae				+										
Barisia levicollis							+							
Barisia rudicollis				+										
Celestus ingridae										+				
Celestus legnotus								+						
Elgaria cedrosensis	+													
Elgaria nana	+													
Elgaria velazquezi	+													
Gerrhonotus farri								+						
Gerrhonotus lazcanoi								+						
Gerrhonotus lugoi			+											
Gerrhonotus mccoyi			+											
Gerrhonotus parvus								+						
Mesaspis antauges				+										
Mesaspis gadovii											+			
Mesaspis juarezi								+						
Mesaspis viridiflava								+						
Crotaphytidae (3 species)														
Crotaphytus antiquus			+											
Crotaphytus grismeri	+													
Crotaphytus insularis	+													
Dactyloidae (25 species)														
Norops anisolepis													+	
Norops boulengerianus						+								
Norops brianjuliani											+			
Norops compressicauda													+	
Norops cuprinus													+	
Norops cymbops								+						
Norops duellmani										+				
Norops dunni											+			
Norops gadovi											+			
Norops hobartsmithi													+	
Norops immaculogularis						+								

Table 5 (continued). Distribution of the 529 priority level one herpetofaunal species in Mexico, among 14 physiographic regions. The abbreviations for regions are as follows: BC = Baja California and adjacent islands; SD = Sonoran Desert basins and ranges; NB = Northern Plateau basins and ranges; MC = Mesa Central; EL = subhumid extratropical Lowlands of northeastern Mexico; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; LT = Sierra de Los Tuxtlas; SU = Sierra Madre del Sur; YP = Mexican portion of Yucatan Platform; WN = Mexican portion of western Nuclear Central American highlands; and CGU = Mexican portion of Pacific lowlands from eastern Chiapas to south-central Guatemala.

Taxa	**Physiographic regions of Mexico**													
	BC	**SD**	**NB**	**MC**	**EL**	**SC**	**OC**	**OR**	**TT**	**LT**	**SU**	**YP**	**WN**	**CGU**
Norops liogaster											+			
Norops megapholidotus											+			
Norops milleri								+						
Norops nietoi											+			
Norops omiltemanus											+			
Norops parvicirculatus													+	
Norops peucephilus											+			
Norops pygmaeus													+	
Norops rubiginosus								+						
Norops sacamecatensis											+			
Norops schiedii								+						
Norops stevepoei											+			
Norops taylori						+								
Norops zapotecorum											+			
Eublepharidae (1 species)														
Coleonyx gypsicolus	+													
Iguanidae (9 species)														
Ctenosaura clarki						+								
Ctenosaura conspicuosa	+													
Ctenosaura hemilopha	+													
Ctenosaura nolascensis	+													
Ctenosaura oaxacana						+								
Dipsosaurus catalinensis	+													
Sauromalus klauberi	+													
Sauromalus slevini	+													
Sauromalus varius	+													
Phrynosomatidae (50 species)														
Petrosaurus slevini	+													
Phrynosoma cerroense	+													
Phrynosoma ditmarsi							+							
Phrynosoma sherbrookei											+			
Phrynosoma wigginsi	+													
Sceloporus adleri											+			
Sceloporus anahuacus				+										
Sceloporus angustus	+													
Sceloporus aurantius							+							
Sceloporus aureolus											+			
Sceloporus caeruleus			+											

Table 5 (continued). Distribution of the 529 priority level one herpetofaunal species in Mexico, among 14 physiographic regions. The abbreviations for regions are as follows: BC = Baja California and adjacent islands; SD = Sonoran Desert basins and ranges; NB = Northern Plateau basins and ranges; MC = Mesa Central; EL = subhumid extratropical Lowlands of northeastern Mexico; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; LT = Sierra de Los Tuxtlas; SU = Sierra Madre del Sur; YP = Mexican portion of Yucatan Platform; WN = Mexican portion of western Nuclear Central American highlands; and CGU = Mexican portion of Pacific lowlands from eastern Chiapas to south-central Guatemala.

Taxa	Physiographic regions of Mexico													
	BC	SD	NB	MC	EL	SC	OC	OR	TT	LT	SU	YP	WN	CGU
Sceloporus chaneyi								+						
Sceloporus cozumelae												+		
Sceloporus cryptus								+						
Sceloporus cupreus											+			
Sceloporus cyanostictus								+						
Sceloporus druckercolini											+			
Sceloporus exsul								+						
Sceloporus gadsdeni			+											
Sceloporus goldmani								+						
Sceloporus grandaevus	+													
Sceloporus halli											+			
Sceloporus hunsakeri	+													
Sceloporus insignis				+										
Sceloporus lemosespinali							+							
Sceloporus lineatulus	+													
Sceloporus macdougalli						+								
Sceloporus maculosus			+											
Sceloporus omiltemanus				+										
Sceloporus ornatus			+											
Sceloporus palaciosi				+										
Sceloporus samcolemani								+						
Sceloporus shannonorum							+							
Sceloporus subniger				+										
Sceloporus subpictus											+			
Sceloporus sugillatus				+										
Sceloporus tanneri											+			
Sceloporus unicanthalis							+							
Uma exsul			+											
Uma paraphygas			+											
Uma rufopunctata		+												
Urosaurus auriculatus	+													
Urosaurus clarionensis	+													
Urosaurus lahtelai	+													
Uta encantadae	+													
Uta lowei	+													
Uta nolascensis	+													
Uta palmeri	+													
Uta squamata	+													

Table 5 (continued). Distribution of the 529 priority level one herpetofaunal species in Mexico, among 14 physiographic regions. The abbreviations for regions are as follows: BC = Baja California and adjacent islands; SD = Sonoran Desert basins and ranges; NB = Northern Plateau basins and ranges; MC = Mesa Central; EL = subhumid extratropical Lowlands of northeastern Mexico; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; LT = Sierra de Los Tuxtlas; SU = Sierra Madre del Sur; YP = Mexican portion of Yucatan Platform; WN = Mexican portion of western Nuclear Central American highlands; and CGU = Mexican portion of Pacific lowlands from eastern Chiapas to south-central Guatemala.

Taxa	**Physiographic regions of Mexico**													
	BC	**SD**	**NB**	**MC**	**EL**	**SC**	**OC**	**OR**	**TT**	**LT**	**SU**	**YP**	**WN**	**CGU**
Uta tumidarostra	+													
Phyllodactylidae (14 species)														
Phyllodactylus benedetti						+								
Phyllodactylus bugastrolepis	+													
Phyllodactylus davisi						+								
Phyllodactylus delcampoi						+								
Phyllodactylus duellmani						+								
Phyllodactylus isabelae						+								
Phyllodactylus kropotkini						+								
Phyllodactylus lupitae						+								
Phyllodactylus papenfussi											+			
Phyllodactylus partidus	+													
Phyllodactylus paucituberculatus						+								
Phyllodactylus rupinus						+								
Phyllodactylus unctus	+													
Phyllodactylus xanti	+													
Scincidae (6 species)														
Plestiodon indubitus				+										
Plestiodon lagunensis	+													
Plestiodon lotus						+								
Plestiodon multilineatus							+							
Plestiodon nietoi											+			
Plestiodon parviauriculatus							+							
Sphenomorphidae (1 species)														
Scincella kikaapoa			+											
Teiidae (18 species)														
Aspidoscelis bacata	+													
Aspidoscelis calidipes						+								
Aspidoscelis cana	+													
Aspidoscelis carmenensis	+													
Aspidoscelis catalinensis	+													
Aspidoscelis celeripes	+													
Aspidoscelis ceralbensis	+													
Aspidoscelis cozumela												+		
Aspidoscelis danheimae	+													
Aspidoscelis espiritensis	+													
Aspidoscelis franciscensis	+													
Aspidoscelis labialis	+													

Table 5 (continued). Distribution of the 529 priority level one herpetofaunal species in Mexico, among 14 physiographic regions. The abbreviations for regions are as follows: BC = Baja California and adjacent islands; SD = Sonoran Desert basins and ranges; NB = Northern Plateau basins and ranges; MC = Mesa Central; EL = subhumid extratropical Lowlands of northeastern Mexico; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; LT = Sierra de Los Tuxtlas; SU = Sierra Madre del Sur; YP = Mexican portion of Yucatan Platform; WN = Mexican portion of western Nuclear Central American highlands; and CGU = Mexican portion of Pacific lowlands from eastern Chiapas to south-central Guatemala.

Taxa	**Physiographic regions of Mexico**													
	BC	**SD**	**NB**	**MC**	**EL**	**SC**	**OC**	**OR**	**TT**	**LT**	**SU**	**YP**	**WN**	**CGU**
Aspidoscelis martyris	+													
Aspidoscelis mexicana											+			
Aspidoscelis opatae							+							
Aspidoscelis picta	+													
Aspidoscelis rodecki												+		
Holcosus gaigeae												+		
Xantusiidae (15 species)														
Lepidophyma chicoasense													+	
Lepidophyma cuicateca											+			
Lepidophyma dontomasi											+			
Lepidophyma inagoi						+								
Lepidophyma lipetzi													+	
Lepidophyma lowei											+			
Lepidophyma micropholis								+						
Lepidophyma occulor								+						
Lepidophyma zongolica								+						
Xantusia bolsonae			+											
Xantusia extorris			+											
Xantusia gilberti	+													
Xantusia jaycolei		+												
Xantusia sanchezi				+										
Xantusia sherbrookei	+													
Xenosauridae (9 species)														
Xenosaurus arboreus													+	
Xenosaurus fractus								+						
Xenosaurus mendozai								+						
Xenosaurus newmanorum								+						
Xenosaurus penai											+			
Xenosaurus phalaroanthereon											+			
Xenosaurus platyceps								+						
Xenosaurus sanmartinensis										+				
Xenosaurus tzacualtipantecus								+						
Charinidae (1 species)														
Exiliboa placata								+						
Colubridae (38 species)														
Arizona pacata	+													
Conopsis megalodon											+			
Ficimia ramirezi													+	

Table 5 (continued). Distribution of the 529 priority level one herpetofaunal species in Mexico, among 14 physiographic regions. The abbreviations for regions are as follows: BC = Baja California and adjacent islands; SD = Sonoran Desert basins and ranges; NB = Northern Plateau basins and ranges; MC = Mesa Central; EL = subhumid extratropical Lowlands of northeastern Mexico; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; LT = Sierra de Los Tuxtlas; SU = Sierra Madre del Sur; YP = Mexican portion of Yucatan Platform; WN = Mexican portion of western Nuclear Central American highlands; and CGU = Mexican portion of Pacific lowlands from eastern Chiapas to south-central Guatemala.

Taxa	**Physiographic regions of Mexico**													
	BC	**SD**	**NB**	**MC**	**EL**	**SC**	**OC**	**OR**	**TT**	**LT**	**SU**	**YP**	**WN**	**CGU**
Ficimia ruspator											+			
Geagras redimitus						+								
Lampropeltis catalinensis	+													
Lampropeltis greeri							+							
Lampropeltis herrerae	+													
Lampropeltis leonis								+						
Lampropeltis ruthveni				+										
Lampropeltis webbi							+							
Masticophis anthonyi	+													
Masticophis barbouri	+													
Masticophis slevini	+													
Mastigodryas cliftoni							+							
Pituophis insulanus	+													
Pseudelaphe phaescens												+		
Rhinocheilus etheridgei	+													
Salvadora gymnorhachis											+			
Salvadora intermedia											+			
Sonora fasciata	+													
Sonora mosaueri	+													
Sonora palarostris						+								
Sonora savagei	+													
Sonora straminea	+													
Sonora taylori									+					
Tantilla briggsi									+					
Tantilla cascadae				+										
Tantilla ceboruca							+							
Tantilla coronadoi											+			
Tantilla flavilineata											+			
Tantilla johnsoni													+	
Tantilla oaxacae											+			
Tantilla robusta								+						
Tantilla sertula						+								
Tantilla shawi								+						
Tantilla slavensi										+				
Tantilla tayrae													+	
Dipsadidae (52 species)														
Adelphicos latifasciatum													+	
Adelphicos nigrilatum													+	

Table 5 (continued). Distribution of the 529 priority level one herpetofaunal species in Mexico, among 14 physiographic regions. The abbreviations for regions are as follows: BC = Baja California and adjacent islands; SD = Sonoran Desert basins and ranges; NB = Northern Plateau basins and ranges; MC = Mesa Central; EL = subhumid extratropical Lowlands of northeastern Mexico; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; LT = Sierra de Los Tuxtlas; SU = Sierra Madre del Sur; YP = Mexican portion of Yucatan Platform; WN = Mexican portion of western Nuclear Central American highlands; and CGU = Mexican portion of Pacific lowlands from eastern Chiapas to south-central Guatemala.

Taxa	Physiographic regions of Mexico													
	BC	SD	NB	MC	EL	SC	OC	OR	TT	LT	SU	YP	WN	CGU
Cenaspis aenigma									+					
Chersodromus australis									+					
Chersodromus nigrum								+						
Coniophanes alvarezi													+	
Coniophanes melanocephalus						+								
Coniophanes meridanus												+		
Coniophanes michoacanensis						+								
Coniophanes sarae				+										
Conophis morai										+				
Cryophis hallbergi								+						
Dipsas gaigeae						+								
Geophis anocularis								+						
Geophis bicolor				+										
Geophis blanchardi								+						
Geophis chalybeus								+						
Geophis duellmani								+						
Geophis incomptus				+										
Geophis isthmicus						+								
Geophis juarezi								+						
Geophis laticollaris											+			
Geophis latifrontalis								+						
Geophis lorancai								+						
Geophis maculiferus				+										
Geophis nigrocinctus				+										
Geophis occabus											+			
Geophis omiltemanus											+			
Geophis pyburni				+										
Geophis russatus											+			
Geophis sallei											+			
Geophis tarascae				+										
Geophis turbidus								+						
Hypsiglena affinis				+										
Hypsiglena catalinae	+													
Hypsiglena tanzeri								+						
Hypsiglena unalocularis	+													
Leptodeira uribei						+								
Rhadinaea bogertorum											+			
Rhadinaea cuneata								+						

Table 5 (continued). Distribution of the 529 priority level one herpetofaunal species in Mexico, among 14 physiographic regions. The abbreviations for regions are as follows: BC = Baja California and adjacent islands; SD = Sonoran Desert basins and ranges; NB = Northern Plateau basins and ranges; MC = Mesa Central; EL = subhumid extratropical Lowlands of northeastern Mexico; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; LT = Sierra de Los Tuxtlas; SU = Sierra Madre del Sur; YP = Mexican portion of Yucatan Platform; WN = Mexican portion of western Nuclear Central American highlands; and CGU = Mexican portion of Pacific lowlands from eastern Chiapas to south-central Guatemala.

Taxa	**Physiographic regions of Mexico**													
	BC	**SD**	**NB**	**MC**	**EL**	**SC**	**OC**	**OR**	**TT**	**LT**	**SU**	**YP**	**WN**	**CGU**
Rhadinaea eduardoi											+			
Rhadinaea forbesi								+						
Rhadinaea nuchalis											+			
Rhadinaea omiltemana											+			
Rhadinaea quinquelineata								+						
Rhadinella donaji											+			
Rhadinella dysmica											+			
Rhadinella kanalchutchan													+	
Rhadinophanes monticola											+			
Sibon linearis										+				
Tantalophis discolor											+			
Tropidodipsas repleta							+							
Elapidae (3 species)														
Micrurus nebularis											+			
Micrurus pachecogili				+										
Micrurus proximans						+								
Leptotyphlopidae (3 species)														
Epictia vindumi												+		
Rena boettgeri	+													
Rena bressoni				+										
Natricidae (10 species)														
Adelophis copei				+										
Adelophis foxi							+							
Thamnophis bogerti											+			
Thamnophis exsul								+						
Thamnophis godmani											+			
Thamnophis lineri								+						
Thamnophis mendax								+						
Thamnophis postremus						+								
Thamnophis rossmani				+										
Thamnophis sumichrasti								+						
Viperidae (25 species)														
Bothriechis rowleyi													+	
Cerrophidion petlalcalensis								+						
Cerrophidion tzotzilorum														+
Crotalus angelensis	+													
Crotalus brunneus											+			
Crotalus campbelli				+										

Table 5 (continued). Distribution of the 529 priority level one herpetofaunal species in Mexico, among 14 physiographic regions. The abbreviations for regions are as follows: BC = Baja California and adjacent islands; SD = Sonoran Desert basins and ranges; NB = Northern Plateau basins and ranges; MC = Mesa Central; EL = subhumid extratropical Lowlands of northeastern Mexico; SC = Pacific lowlands from Sonora to western Chiapas, including the Balsas Basin and Central Depression of Chiapas; OC = Sierra Madre Occidental; OR = Sierra Madre Oriental; TT = Atlantic lowlands from Tamaulipas to Tabasco; LT = Sierra de Los Tuxtlas; SU = Sierra Madre del Sur; YP = Mexican portion of Yucatan Platform; WN = Mexican portion of western Nuclear Central American highlands; and CGU = Mexican portion of Pacific lowlands from eastern Chiapas to south-central Guatemala.

Taxa	**Physiographic regions of Mexico**													
	BC	**SD**	**NB**	**MC**	**EL**	**SC**	**OC**	**OR**	**TT**	**LT**	**SU**	**YP**	**WN**	**CGU**
Crotalus catalinensis	+													
Crotalus ericsmithi											+			
Crotalus estebanensis	+													
Crotalus exiguus											+			
Crotalus lannomi				+										
Crotalus lorenzoensis	+													
Crotalus morulus								+						
Crotalus polisi	+													
Crotalus stejnegeri							+							
Crotalus tancitarensis				+										
Crotalus thalassoporus	+													
Crotalus tlaloci				+										
Crotalus transversus				+										
Mixcoatlus barbouri											+			
Mixcoatlus browni											+			
Ophryacus smaragdinus								+						
Ophryacus sphenophrys											+			
Porthidium hespere						+								
Porthidium yucatanicum												+		
Squamate totals	**70**	**2**	**12**	**31**	**—**	**30**	**16**	**51**	**4**	**8**	**60**	**8**	**22**	**1**
Testudines (11 species)														
Emydidae (4 species)														
Terrapene coahuila			+											
Terrapene yucatana												+		
Trachemys ornata						+								
Trachemys taylori			+											
Kinosternidae (5 species)														
Kinosternon chimalhuaca						+								
Kinosternon creaseri												+		
Kinosternon durangoense			+											
Kinosternon oaxacae						+								
Kinosternon vogti						+								
Testudinidae (1 species)														
Gopherus flavomarginatus			+											
Trionychidae (1 species)														
Apalone atra			+											
Turtle totals	**—**	**—**	**5**	**—**	**—**	**4**	**—**	**—**	**—**	**—**	**—**	**2**	**—**	**—**
Reptile totals	**70**	**2**	**17**	**31**	**—**	**34**	**16**	**51**	**4**	**8**	**60**	**10**	**22**	**1**
Herpetofaunal totals	**70**	**2**	**17**	**60**	**—**	**41**	**24**	**141**	**5**	**14**	**107**	**11**	**36**	**1**

Evidently, the majority of the priority level one species in Mesoamerica are distributed in the montane regions. Although the entire peninsula of Baja California is included in our analysis, this long, thin extension of the North American continent encompasses a "dramatically sculpted topography [consisting of] a series of mountain ranges, known collectively as the Peninsular Ranges, that run nearly uninterrupted from its northern border to the Isthmus of La Paz" (Grismer 2002). In total, of the 970 priority level one species in Mesoamerica (excluding *Amereega maculata*, known from an imprecise type locality, located somewhere in Panama; Köhler 2011), 739 or 76.2% occur in seven of the 20 total regions. The other 13 regions are occupied by the remaining 231 (23.8%) priority level one species. Based on these figures, the protection of the priority level one species in Mesoamerica obviously has to be centered in the montane regions, as opposed to lowland regions on either the Atlantic or Pacific versants. This conclusion, however, does not discount the importance of protecting lowland priority level one species, especially as these are the areas in which the majority of the human population lives, and one of the seven high-value regions comprises the Baja California Peninsula and its associated islands.

Physiographic Distribution of the Priority Level One Species: a Closer Look

The data summarized in Table 7 can be examined in more detail at the familial and ordinal levels. Most priority level one Mesoamerican anurans (194 of 221 total species, or 87.8%) are in families Bufonidae (18 species), Craugastoridae (76), Eleutherodactylidae (31), and Hylidae (69). One-half of the bufonid species (nine of 18) and both of the two centrolenid species are found in the CRP region. The craugastorid priority level one species are most often (63 of 76 species, or 82.9%) distributed in montane regions in Mesoamerica, including the OR, SU, WN, HN, and CRP. The dendrobatid species are limited to the four Lower Central American regions (CRP, EP, NP, and CP) and more or less evenly distributed between the highland and lowland regions therein (four in the CRP and EP regions vs. five in the NP and CP regions; as noted elsewhere the dendrobatid *Amereega maculata* is unknown from any specific locality). The eleutherodactylid anurans are almost all (30 of 31 species, 96.8%) distributed in highland regions, with one exception in the NP region. Most of the hylid taxa (60 of 69 species, 87.0%) are found in highland regions in Mesoamerica. Three families with single species represented are found in one highland (HN) and two lowland (NP and CP) regions. Finally, all but one of the ranid frogs are distributed in montane physiographic regions. Of the 221 priority level one anurans, 188 (85.1%) are distributed in the nine montane regions in Mesoamerica. Most of the salamanders in Mesoamerica (228 of 238 species, 95.8%) belong to family Plethodontidae. Nonetheless, considered as a whole, this group of amphibians has the greatest representation in the nine Mesoamerican montane regions, i.e., 224 of 238 species (94.1%). Interestingly, the few priority level one caecilians are represented in both highland (two in CRP) and lowland regions (three in CP). Considering amphibians as a whole, of the 464 priority level one species, 414 (89.2%) are restricted to the nine montane regions; in contrast, 50 priority level one species (10.8%) are found in the 11 lowland regions.

Among the Mesoamerican priority level one squamates, most taxa are in the families Anguidae (53 species), Dactyloidae (73), Phrynosomatidae (52), Teiidae (20), Colubridae (53), Dipsadidae (101), and Viperidae (36), or 388 of 494 total species (78.5%). The two species of priority level one bipedid amphisbaenians occupy one in each of the BC and SC regions in western Mexico (note, the entire family Bipedidae comprises only three species, all of which are endemic to Mexico). Of the 53 priority level one species in family Anguidae, most (46 or 86.8%) are distributed among all nine of the Mesoamerican highland regions, with the highest number (14) occupying the WN region; in addition to three species in the BC region, two in the NB region, and one each in the NP and CP regions. Three priority level one species belong to the family Crotaphytidae, all of which are confined to non-montane regions in Mexico. Of 73 species of priority level one in family Dactyloidae, 62 (84.9%) are found in six of the nine Mesoamerican highland regions. The single priority level one eublepharid gecko is in the BC region. The single priority level one gymnophthalmid lizard is in the lowland CP region. The priority level one lizards of family Iguanidae almost all depart from the typical pattern of majority representation in highland regions, in that 11 of 12 (91.7%) species are found in the lowland regions of Mesoamerica (BC, SC, and GH); only one species is found in the WN region; however, it is within the interior dry Motagua Valley. Similarly, the three species of mabuyid skinks are found in two lowland regions (GH and NP). The 52 priority level one phrynosomatid species are limited primarily in their distributions to Mexico (with two exceptions in the HN region) with broad distribution in both lowland (25 species in BC, SD, NB, SC, and YP) and highland regions (27 in MC, OC, OR, SU, and HN). The geckos of family Phyllodactylidae also depart from the usual pattern of high representation in the Mesoamerican highlands, in that 16 of the 17 priority level one species (94.1%) are located in the BC, SC, and GH lowland regions. Most (four) of the six species of priority level one scincid lizards are distributed in three highland regions (MC, OC, and SU). The sphaerodactylid geckos are also poorly represented in highland regions, with nine of 11 species (81.8%) found in the GH, NP, and CP regions in Central America. The sphenomorphid skinks are poorly represented among the priority level one species, with one species found in each of the NB and

Thorius narisovalis Taylor 1940. The Upper Cerro Pigmy Salamander has an EVS of 17 (Johnson et al. 2017) and is known only from three areas in Oaxaca, Mexico, including the vicinity of the type locality on Cerro San Felipe, the vicinity of Zaachila in central Oaxaca, and the vicinity of Tlaxiaco (Frost 2019). This individual was observed at La Cumbre de Ixtepeji, Oaxaca, Mexico. *Photo by César Mayoral Halla.*

Abronia mixteca Bogert and Porter 1967. The Mixtecan Arboreal Alligator Lizard has an EVS of 18 (Johnson et al. 2017) and is limited in distribution to the Montañas y Valles del Occidente region of western Oaxaca, as well as in central Guerrero, Mexico. This individual was observed at the type locality (El Tejocote, Etla) in the Mixteca region of Oaxaca, México. *Photo by Elí García Padilla.*

Abronia montecristoi Hidalgo 1983. The Cerro Montecristo Arboreal Alligator Lizard has an EVS of 17 (Mata-Silva et al. 2019) and is found at moderate and intermediate elevations of the Pacific versant of northwestern El Salvador and on the Atlantic versant of western Honduras (McCranie 2018). This individual was encountered at Zacate Blanco, Departamento de Intibucá, Honduras. *Photo by Louis Porras.*

Celestus bivittatus (Boulenger 1895). This terrestrial anguid lizard has an EVS of 15 (Mata-Silva et al. 2019) and is found at moderate and intermediate elevations on the Atlantic versant of eastern Guatemala and on both versants from southwestern Honduras to northwestern Nicaragua (McCranie 2018). This individual was located at 13.3 km WNW of La Esperanza, Departamento de Intibucá, Honduras. *Photo by Louis Porras.*

Celestus montanus Schmidt 1933. The Mountain Lesser Galliwasp has an EVS of 15 (Mata-Silva et al. 2019) and occurs at moderate and intermediate elevations of the Atlantic versant in northwestern Honduras and in adjacent eastern Guatemala (McCranie 2018). This individual was observed at Santa Elena, Departamento de Cortés, Honduras. *Photo by Louis Porras.*

Gerrhonotus mccoyi García-Vázquez, Contreras-Arquieta, Trujano-Ortega, and Nieto-Montes de Oca 2018. This alligator lizard has an EVS of 17 (Table 1) and is limited in distribution to the Cuatrociénegas Basin in Coahuila, México (Reptile Database, http://reptile-database.org; accessed 26 May 2019). This individual was photographed at Poza Churince, municipality of Cuatrocienegas, Coahuila, Mexico. *Photo by Uri Omar García-Vázquez.*

Table 6. Distribution of the 444 priority level one herpetofaunal species in Central America among 10 physiographic regions. The abbreviations for regions are as follows: CGU = Central American portion of Pacific lowlands from eastern Chiapas to south-central Guatemala; CP = Pacific lowlands from central Costa Rica through Panama (area includes associated Pacific islands); CRP = Isthmian Central American highlands; EP = highlands of eastern Panama; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras (area includes associated Caribbean islands); HN = eastern nuclear Central American highlands; NP = Caribbean lowlands from Nicaragua to Panama (area includes associated Caribbean islands); WN = Central American portion of western nuclear Central American highlands; and YP = Central American portion of Yucatan Platform. ? = species known only from indeterminate type locality.

Taxa	Physiographic regions of Central America									
	WN	HN	CRP	EP	YP	GH	NP	CGU	GCR	CP
Anura (130 species)										
Bufonidae (12 species)										
Atelopus chiriquiensis			+							
Atelopus chirripoensis			+							
Atelopus limosus							+			
Incilius aucoinae										+
Incilius epioticus			+							
Incilius guanacaste			+							
Incilius holdridgei			+							
Incilius karenlipsae			+							
Incilius majordomus			+							
Incilius periglenes			+							
Incilius peripatetes			+							
Incilius porteri		+								
Centrolenidae (2 species)										
Hyalinobatrachium talamancae			+							
Hyalinobatrachium vireovittatum			+							
Craugastoridae (56 species)										
Craugastor adamastus	+									
Craugastor aenigmaticus			+							
Craugastor anciano		+								
Craugastor andi			+							
Craugastor angelicus			+							
Craugastor aphanus	+									
Craugastor azueroensis										+
Craugastor blairi			+							
Craugastor bocourti	+									
Craugastor castanedai		+								
Craugastor catalinae			+							
Craugastor chingopetaca							+			
Craugastor chrysozetetes		+								
Craugastor coffeus		+								
Craugastor cruzi		+								
Craugastor cuaquero			+							
Craugastor cyanochthebius		+								
Craugastor daryi	+									
Craugastor emcelae			+							
Craugastor emleni		+								
Craugastor escoces			+							

Table 6 (continued). Distribution of the 444 priority level one herpetofaunal species in Central America among 10 physiographic regions. The abbreviations for regions are as follows: CGU = Central American portion of Pacific lowlands from eastern Chiapas to south-central Guatemala; CP = Pacific lowlands from central Costa Rica through Panama (area includes associated Pacific islands); CRP = Isthmian Central American highlands; EP = highlands of eastern Panama; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras (area includes associated Caribbean islands); HN = eastern nuclear Central American highlands; NP = Caribbean lowlands from Nicaragua to Panama (area includes associated Caribbean islands); WN = Central American portion of western nuclear Central American highlands; and YP = Central American portion of Yucatan Platform. ? = species known only from indeterminate type locality.

Taxa	Physiographic regions of Central America									
	WN	HN	CRP	EP	YP	GH	NP	CGU	GCR	CP
Craugastor fleischmanni			+							
Craugastor gabbi			+							
Craugastor gulosus			+							
Craugastor gutschei		+								
Craugastor inachus	+									
Craugastor jota			+							
Craugastor melanostictus			+							
Craugastor merendonensis						+				
Craugastor milesi		+								
Craugastor monnichorum			+							
Craugastor myllomyllon	+									
Craugastor nefrens		+								
Craugastor olanchano		+								
Craugastor omoaensis		+								
Craugastor phasma			+							
Craugastor podiciferus			+							
Craugastor polyptychus							+			
Craugastor punctariolus			+							
Craugastor rayo			+							
Craugastor rhyacobatrachus			+							
Craugastor rivulus	+									
Craugastor sagui			+							
Craugastor saltuarius		+								
Craugastor stadelmani		+								
Craugastor tabasarae			+							
Craugastor talamancae							+			
Craugastor taurus										+
Craugastor trachydermus	+									
Craugastor underwoodi			+							
Craugastor xucanebi	+									
Craugastor zunigai			+							
Pristimantis adnus				+						
Pristimantis museosus			+							
Pristimantis pirrensis				+						
Strabomantis laticorpus				+						
Dendrobatidae (11 species)										
Ameerega maculata?										
Andinobates claudiae							+			
Andinobates geminisae							+			

Table 6 (continued). Distribution of the 444 priority level one herpetofaunal species in Central America among 10 physiographic regions. The abbreviations for regions are as follows: CGU = Central American portion of Pacific lowlands from eastern Chiapas to south-central Guatemala; CP = Pacific lowlands from central Costa Rica through Panama (area includes associated Pacific islands); CRP = Isthmian Central American highlands; EP = highlands of eastern Panama; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras (area includes associated Caribbean islands); HN = eastern nuclear Central American highlands; NP = Caribbean lowlands from Nicaragua to Panama (area includes associated Caribbean islands); WN = Central American portion of western nuclear Central American highlands; and YP = Central American portion of Yucatan Platform. ? = species known only from indeterminate type locality.

Taxa	Physiographic regions of Central America									
	WN	HN	CRP	EP	YP	GH	NP	CGU	GCR	CP
Colostethus latinasus				+						
Ectopoglossus astralogaster				+						
Ectopoglossus isthminus				+						
Oophaga arborea			+							
Oophaga pumilio							+			
Oophaga speciosa			+							
Phyllobates lugubris							+			
Phyllobates vittatus										+
Eleutherodactylidae (9 species)										
Diasporus citrinobapheus			+							
Diasporus darienensis				+						
Diasporus hylaeformis			+							
Diasporus igneus			+							
Diasporus majeensis				+						
Diasporus pequeno				+						
Diasporus sapo				+						
Diasporus tigrillo							+			
Diasporus ventrimaculatus			+							
Hemiphractidae (3 species)										
Hemiphractus elioti			+							
Hemiphractus kaylochae				+						
Hemiphractus panamensis				+						
Hylidae (31 species)										
Bromeliohyla melacaena		+								
Dryophytes bocourti	+									
Duellmanohyla legleri			+							
Duellmanohyla lythrodes							+			
Duellmanohyla rufioculis			+							
Ecnomiohyla minera	+									
Ecnomiohyla rabborum			+							
Ecnomiohyla salvaje		+								
Ecnomiohyla thysanota				+						
Ecnomiohyla veraguensis			+							
Exerodonta catracha		+								
Exerodonta perkinsi	+									
Isthmohyla calypso			+							
Isthmohyla debilis			+							
Isthmohyla infucata			+							
Isthmohyla insolita		+								

Table 6 (continued). Distribution of the 444 priority level one herpetofaunal species in Central America among 10 physiographic regions. The abbreviations for regions are as follows: CGU = Central American portion of Pacific lowlands from eastern Chiapas to south-central Guatemala; CP = Pacific lowlands from central Costa Rica through Panama (area includes associated Pacific islands); CRP = Isthmian Central American highlands; EP = highlands of eastern Panama; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras (area includes associated Caribbean islands); HN = eastern nuclear Central American highlands; NP = Caribbean lowlands from Nicaragua to Panama (area includes associated Caribbean islands); WN = Central American portion of western nuclear Central American highlands; and YP = Central American portion of Yucatan Platform. ? = species known only from indeterminate type locality.

Taxa	Physiographic regions of Central America									
	WN	**HN**	**CRP**	**EP**	**YP**	**GH**	**NP**	**CGU**	**GCR**	**CP**
Isthmohyla picadoi			+							
Isthmohyla pictipes			+							
Isthmohyla xanthosticta			+							
Isthmohyla zeteki			+							
Plectrohyla calvata		+								
Plectrohyla dasypus		+								
Plectrohyla exquisite		+								
Plectrohyla psiloderma		+								
Plectrohyla tecunumani	+									
Plectrohyla teuchestes	+									
Ptychohyla dendrophasma	+									
Quilticohyla sanctaecrucis	+									
Scinax altae										+
Smilisca manisorum							+			
Smilisca puma							+			
Leptodactylidae (1 species)										
Leptodactylus silvanimbus		+								
Microhylidae (1 species)										
Hypopachus pictiventris							+			
Pipidae (1 species)										
Pipa myersi										+
Ranidae (3 species)										
Lithobates lenca		+								
Lithobates miadis							+			
Lithobates vibicarius			+							
Anuran totals	**16**	**25**	**54**	**13**	**—**	**1**	**14**	**—**	**—**	**6**
Caudata (127 species)										
Plethodontidae (127 species)										
Bolitoglossa anthracina			+							
Bolitoglossa aurae			+							
Bolitoglossa aureogularis			+							
Bolitoglossa bramei			+							
Bolitoglossa carri		+								
Bolitoglossa cataguana		+								
Bolitoglossa celaque		+								
Bolitoglossa centenorum	+									
Bolitoglossa cerroensis			+							
Bolitoglossa chucantiensis				+						
Bolitoglossa compacta			+							

Table 6 (continued). Distribution of the 444 priority level one herpetofaunal species in Central America among 10 physiographic regions. The abbreviations for regions are as follows: CGU = Central American portion of Pacific lowlands from eastern Chiapas to south-central Guatemala; CP = Pacific lowlands from central Costa Rica through Panama (area includes associated Pacific islands); CRP = Isthmian Central American highlands; EP = highlands of eastern Panama; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras (area includes associated Caribbean islands); HN = eastern nuclear Central American highlands; NP = Caribbean lowlands from Nicaragua to Panama (area includes associated Caribbean islands); WN = Central American portion of western nuclear Central American highlands; and YP = Central American portion of Yucatan Platform. ? = species known only from indeterminate type locality.

Taxa	Physiographic regions of Central America									
	WN	**HN**	**CRP**	**EP**	**YP**	**GH**	**NP**	**CGU**	**GCR**	**CP**
Bolitoglossa conanti		+								
Bolitoglossa copia			+							
Bolitoglossa cuchumatana	+									
Bolitoglossa cuna							+			
Bolitoglossa daryorum	+									
Bolitoglossa decora		+								
Bolitoglossa diaphora		+								
Bolitoglossa diminuta			+							
Bolitoglossa dunni		+								
Bolitoglossa epimela			+							
Bolitoglossa eremia	+									
Bolitoglossa gomezi			+							
Bolitoglossa gracilis			+							
Bolitoglossa heiroreias		+								
Bolitoglossa helmrichi	+									
Bolitoglossa huehuetenanguensis	+									
Bolitoglossa indio							+			
Bolitoglossa insularis		+								
Bolitoglossa jacksoni	+									
Bolitoglossa jugivagans			+							
Bolitoglossa kamuk			+							
Bolitoglossa kaqchikelorum	+									
Bolitoglossa la	+									
Bolitoglossa longissima		+								
Bolitoglossa magnifica			+							
Bolitoglossa marmorea			+							
Bolitoglossa meliana	+									
Bolitoglossa minutula			+							
Bolitoglossa mombachoensis		+								
Bolitoglossa nigrescens			+							
Bolitoglossa ninadormida	+									
Bolitoglossa nussbaumi	+									
Bolitoglossa obscura			+							
Bolitoglossa omniumsanctorum	+									
Bolitoglossa oresbia		+								
Bolitoglossa pacaya	+									
Bolitoglossa pesrubra			+							
Bolitoglossa porrasorum		+								
Bolitoglossa psephena	+									

Table 6 (continued). Distribution of the 444 priority level one herpetofaunal species in Central America among 10 physiographic regions. The abbreviations for regions are as follows: CGU = Central American portion of Pacific lowlands from eastern Chiapas to south-central Guatemala; CP = Pacific lowlands from central Costa Rica through Panama (area includes associated Pacific islands); CRP = Isthmian Central American highlands; EP = highlands of eastern Panama; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras (area includes associated Caribbean islands); HN = eastern nuclear Central American highlands; NP = Caribbean lowlands from Nicaragua to Panama (area includes associated Caribbean islands); WN = Central American portion of western nuclear Central American highlands; and YP = Central American portion of Yucatan Platform. ? = species known only from indeterminate type locality.

Taxa	Physiographic regions of Central America									
	WN	**HN**	**CRP**	**EP**	**YP**	**GH**	**NP**	**CGU**	**GCR**	**CP**
Bolitoglossa pygmaea			+							
Bolitoglossa robinsoni			+							
Bolitoglossa robusta			+							
Bolitoglossa sombra			+							
Bolitoglossa sooyorum			+							
Bolitoglossa splendida			+							
Bolitoglossa subpalmata			+							
Bolitoglossa suchitanensis	+									
Bolitoglossa synoria		+								
Bolitoglossa taylori				+						
Bolitoglossa tenebrosa	+									
Bolitoglossa tica			+							
Bolitoglossa tzultacaj	+									
Bolitoglossa xibalba	+									
Bolitoglossa zacapensis	+									
Cryptotriton monzoni	+									
Cryptotriton necopinus		+								
Cryptotriton sierraminensis	+									
Cryptotriton veraepacis	+									
Cryptotriton xucaneborum	+									
Dendrotriton bromeliacius	+									
Dendrotriton chujorum	+									
Dendrotriton cuchumatanus	+									
Dendrotriton kekchiorum	+									
Dendrotriton rabbi	+									
Dendrotriton sanctibarbarus		+								
Nototriton abscondens			+							
Nototriton barbouri		+								
Nototriton brodiei	+									
Nototriton costaricense			+							
Nototriton gamezi			+							
Nototriton guanacaste			+							
Nototriton lignicola		+								
Nototriton limnospectator		+								
Nototriton major			+							
Nototriton matama			+							
Nototriton mime		+								
Nototriton nelsoni		+								
Nototriton oreadorum		+								

Table 6 (continued). Distribution of the 444 priority level one herpetofaunal species in Central America among 10 physiographic regions. The abbreviations for regions are as follows: CGU = Central American portion of Pacific lowlands from eastern Chiapas to south-central Guatemala; CP = Pacific lowlands from central Costa Rica through Panama (area includes associated Pacific islands); CRP = Isthmian Central American highlands; EP = highlands of eastern Panama; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras (area includes associated Caribbean islands); HN = eastern nuclear Central American highlands; NP = Caribbean lowlands from Nicaragua to Panama (area includes associated Caribbean islands); WN = Central American portion of western nuclear Central American highlands; and YP = Central American portion of Yucatan Platform. ? = species known only from indeterminate type locality.

Taxa	Physiographic regions of Central America									
	WN	HN	CRP	EP	YP	GH	NP	CGU	GCR	CP
Nototriton picadoi			+							
Nototriton picucha		+								
Nototriton richardi			+							
Nototriton saslaya		+								
Nototriton stuarti	+									
Nototriton tapanti			+							
Nototriton tomamorum		+								
Oedipina altura			+							
Oedipina berlini			+							
Oedipina capitalina		+								
Oedipina carablanca							+			
Oedipina chortiorum		+								
Oedipina collaris							+			
Oedipina cyclocauda							+			
Oedipina fortunensis			+							
Oedipina gephyra		+								
Oedipina gracilis							+			
Oedipina grandis			+							
Oedipina kasios		+								
Oedipina koehleri		+								
Oedipina leptopoda		+								
Oedipina maritima							+			
Oedipina motaguae						+				
Oedipina nica		+								
Oedipina nimaso			+							
Oedipina pacificensis										+
Oedipina paucidentata			+							
Oedipina petiola		+								
Oedipina poelzi			+							
Oedipina quadra						+				
Oedipina salvadorensis									+	
Oedipina savagei			+							
Oedipina stenopodia	+									
Oedipina taylori		+								
Oedipina tomasi		+								
Oedipina tzutujilorum	+									
Oedipina uniformis			+							
Pseudoeurycea exspectata	+									
Salamander totals	**34**	**35**	**45**	**2**	**—**	**2**	**7**	**—**	**1**	**1**

Table 6 (continued). Distribution of the 444 priority level one herpetofaunal species in Central America among 10 physiographic regions. The abbreviations for regions are as follows: CGU = Central American portion of Pacific lowlands from eastern Chiapas to south-central Guatemala; CP = Pacific lowlands from central Costa Rica through Panama (area includes associated Pacific islands); CRP = Isthmian Central American highlands; EP = highlands of eastern Panama; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras (area includes associated Caribbean islands); HN = eastern nuclear Central American highlands; NP = Caribbean lowlands from Nicaragua to Panama (area includes associated Caribbean islands); WN = Central American portion of western nuclear Central American highlands; and YP = Central American portion of Yucatan Platform. ? = species known only from indeterminate type locality.

Taxa	Physiographic regions of Central America									
	WN	**HN**	**CRP**	**EP**	**YP**	**GH**	**NP**	**CGU**	**GCR**	**CP**
Gymnophiona (5 species)										
Caecilidae (3 species)										
Caecilia volcani										+
Oscaecilia elongata										+
Oscaecilia osae										+
Dermophiidae (2 species)										
Dermophis costaricensis			+							
Dermophis gracilior			+							
Caecilian totals	**—**	**—**	**2**	**—**	**—**	**—**	**—**	**—**	**—**	**3**
Amphibian totals	**50**	**58**	**100**	**13**	**—**	**3**	**21**	**—**	**1**	**10**
Squamata (181 Species)										
Anguidae (23 species)										
Abronia anzuetoi	+									
Abronia aurita	+									
Abronia campbelli	+									
Abronia fimbriata	+									
Abronia frosti	+									
Abronia gaiophantasma	+									
Abronia meledona	+									
Abronia montecristoi		+								
Abronia salvadorensis		+								
Abronia vasconcelosii	+									
Celestus adercus			+							
Celestus bivittatus		+								
Celestus cyanochloris			+							
Celestus hylaius							+			
Celestus laf			+							
Celestus montanus		+								
Celestus orobius			+							
Celestus scansorius		+								
Coloptychon rhombifer										+
Diploglossus montisilvestris				+						
Mesaspis cuchumatanus	+									
Mesaspis monticola			+							
Mesaspis salvadorensis		+								
Corytophanidae (2 species)										
Laemanctus julioi									+	
Laemanctus waltersi						+				
Dactyloidae (48 species)										

Table 6 (continued). Distribution of the 444 priority level one herpetofaunal species in Central America among 10 physiographic regions. The abbreviations for regions are as follows: CGU = Central American portion of Pacific lowlands from eastern Chiapas to south-central Guatemala; CP = Pacific lowlands from central Costa Rica through Panama (area includes associated Pacific islands); CRP = Isthmian Central American highlands; EP = highlands of eastern Panama; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras (area includes associated Caribbean islands); HN = eastern nuclear Central American highlands; NP = Caribbean lowlands from Nicaragua to Panama (area includes associated Caribbean islands); WN = Central American portion of western nuclear Central American highlands; and YP = Central American portion of Yucatan Platform. ? = species known only from indeterminate type locality.

Taxa	Physiographic regions of Central America									
	WN	HN	CRP	EP	YP	GH	NP	CGU	GCR	CP
Dactyloa casildae			+							
Dactyloa kathydayae			+							
Dactyloa microtus			+							
Norops alocomyos			+							
Norops altae			+							
Norops amplisquamosus		+								
Norops arenal			+							
Norops benedikti			+							
Norops bicaorum						+				
Norops caceresae		+								
Norops campbelli	+									
Norops cusuco		+								
Norops datzorum			+							
Norops fortunensis			+							
Norops fungosus			+							
Norops gruuo			+							
Norops haguei	+									
Norops heteropholidotus		+								
Norops intermedius			+							
Norops johnmeyeri		+								
Norops kemptoni			+							
Norops kreutzi		+								
Norops leditzigorum			+							
Norops magnaphallus			+							
Norops monteverde			+							
Norops morazani		+								
Norops muralla		+								
Norops ocelloscapularis		+								
Norops osa										+
Norops pachypus			+							
Norops pijolensis		+								
Norops pseudokemptoni			+							
Norops pseudopachypus			+							
Norops purpurgularis		+								
Norops roatanensis						+				
Norops rubribarbaris		+								
Norops salvini			+							
Norops sminthus		+								
Norops tenorioensis			+							

Table 6 (continued). Distribution of the 444 priority level one herpetofaunal species in Central America among 10 physiographic regions. The abbreviations for regions are as follows: CGU = Central American portion of Pacific lowlands from eastern Chiapas to south-central Guatemala; CP = Pacific lowlands from central Costa Rica through Panama (area includes associated Pacific islands); CRP = Isthmian Central American highlands; EP = highlands of eastern Panama; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras (area includes associated Caribbean islands); HN = eastern nuclear Central American highlands; NP = Caribbean lowlands from Nicaragua to Panama (area includes associated Caribbean islands); WN = Central American portion of western nuclear Central American highlands; and YP = Central American portion of Yucatan Platform. ? = species known only from indeterminate type locality.

Taxa	Physiographic regions of Central America									
	WN	**HN**	**CRP**	**EP**	**YP**	**GH**	**NP**	**CGU**	**GCR**	**CP**
Norops townsendi										+
Norops triumphalis										+
Norops tropidolepis			+							
Norops utilensis						+				
Norops villai							+			
Norops wampuensis						+				
Norops wermuthi		+								
Norops woodi			+							
Norops yoroensis		+								
Gymnophthalmidae (1 species)										
Bachia blairi										+
Iguanidae (3 species)										
Ctenosaura bakeri						+				
Ctenosaura oedirhina						+				
Ctenosaura palearis	+									
Mabuyidae (3 species)										
Marisora alliacea							+			
Marisora magnacornae							+			
Marisora roatanae						+				
Phrynosomatidae (2 species)										
Sceloporus esperanzae		+								
Sceloporus schmidti		+								
Phyllodactylidae (3 species)										
Phyllodactylus insularis						+				
Phyllodactylus palmeus						+				
Phyllodactylus paralepis						+				
Sphaerodactylidae (11 species)										
Lepidoblepharis emberawoundule				+						
Lepidoblepharis rufigularis				+						
Sphaerodactylus alphus						+				
Sphaerodactylus dunni						+				
Sphaerodactylus graptolaemus										+
Sphaerodactylus guanaje						+				
Sphaerodactylus homolepis							+			
Sphaerodactylus leonardovaldesi						+				
Sphaerodactylus pacificus										+
Sphaerodactylus poindexteri						+				
Sphaerodactylus rosaurae						+				
Sphenomorphidae (1 species)										

Table 6 (continued). Distribution of the 444 priority level one herpetofaunal species in Central America among 10 physiographic regions. The abbreviations for regions are as follows: CGU = Central American portion of Pacific lowlands from eastern Chiapas to south-central Guatemala; CP = Pacific lowlands from central Costa Rica through Panama (area includes associated Pacific islands); CRP = Isthmian Central American highlands; EP = highlands of eastern Panama; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras (area includes associated Caribbean islands); HN = eastern nuclear Central American highlands; NP = Caribbean lowlands from Nicaragua to Panama (area includes associated Caribbean islands); WN = Central American portion of western nuclear Central American highlands; and YP = Central American portion of Yucatan Platform. ? = species known only from indeterminate type locality.

Taxa	**Physiographic regions of Central America**									
	WN	**HN**	**CRP**	**EP**	**YP**	**GH**	**NP**	**CGU**	**GCR**	**CP**
Scincella rara							+			
Teiidae (2 species)										
Cnemidophorus duellmani										+
Holcosus miadis							+			
Colubridae (15 species)										
Dendrophidion crybelum			+							
Dendrophidion paucicarinatum			+							
Oxybelis wilsoni						+				
Tantilla albiceps							+			
Tantilla bairdi	+									
Tantilla berguidoi				+						
Tantilla gottei		+								
Tantilla hendersoni	+									
Tantilla lempira		+								
Tantilla olympia		+								
Tantilla psittaca						+				
Tantilla stenigrammi		+								
Tantilla tecta					+					
Tantilla tritaeniata						+				
Tantilla vermiformis									+	
Dipsadidae (49 species)										
Adelphicos daryi	+									
Adelphicos ibarrorum	+									
Adelphicos veraepacis	+									
Atractus darienensis										+
Atractus depressiocellus										+
Atractus hostilitractus							+			
Atractus imperfectus				+						
Chapinophis xanthocheilus	+									
Coniophanes joanae				+						
Cubophis brooksi						+				
Dipsas nicholsi										+
Dipsas tenuissima										+
Enulius bifoveatus						+				
Enulius roatanensis						+				
Geophis bellus				+						
Geophis championi			+							
Geophis damiani		+								
Geophis downsi			+							

Table 6 (continued). Distribution of the 444 priority level one herpetofaunal species in Central America among 10 physiographic regions. The abbreviations for regions are as follows: CGU = Central American portion of Pacific lowlands from eastern Chiapas to south-central Guatemala; CP = Pacific lowlands from central Costa Rica through Panama (area includes associated Pacific islands); CRP = Isthmian Central American highlands; EP = highlands of eastern Panama; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras (area includes associated Caribbean islands); HN = eastern nuclear Central American highlands; NP = Caribbean lowlands from Nicaragua to Panama (area includes associated Caribbean islands); WN = Central American portion of western nuclear Central American highlands; and YP = Central American portion of Yucatan Platform. ? = species known only from indeterminate type locality.

Taxa	Physiographic regions of Central America									
	WN	**HN**	**CRP**	**EP**	**YP**	**GH**	**NP**	**CGU**	**GCR**	**CP**
Geophis dunni		+								
Geophis fulvoguttatus		+								
Geophis godmani			+							
Geophis nephodrymus		+								
Geophis talamancae			+							
Geophis zeledoni			+							
Hydromorphus dunni			+							
Imantodes phantasma				+						
Leptodeira rubricata										+
Ninia celata			+							
Ninia espinali		+								
Omoadiphas aurula		+								
Omoadiphas cannula		+								
Omoadiphas texiguatensis		+								
Rhadinaea calligaster			+							
Rhadinaea pulveriventris			+							
Rhadinella lisyae		+								
Rhadinella pegosalyta		+								
Rhadinella rogerromani		+								
Rhadinella tolpanorum		+								
Rhadinella xerofila						+				
Sibon lamari							+			
Sibon manzanaresi						+				
Sibon merendonensis		+								
Sibon miskitus						+				
Sibon noalamina			+							
Sibon perissostichon			+							
Trimetopon gracile			+							
Trimetopon slevini			+							
Trimetopon viquezi							+			
Urotheca myersi			+							
Elapidae (3 species)										
Micrurus mosquitensis							+			
Micrurus ruatanus						+				
Micrurus stuarti	+									
Leptotyphlopidae (3 species)										
Epictia martinezi		+								
Epictia pauldwyeri										+
Epictia rioignis									+	

Table 6 (continued). Distribution of the 444 priority level one herpetofaunal species in Central America among 10 physiographic regions. The abbreviations for regions are as follows: CGU = Central American portion of Pacific lowlands from eastern Chiapas to south-central Guatemala; CP = Pacific lowlands from central Costa Rica through Panama (area includes associated Pacific islands); CRP = Isthmian Central American highlands; EP = highlands of eastern Panama; GCR = Pacific lowlands from southeastern Guatemala to northwestern Costa Rica; GH = Caribbean lowlands of eastern Guatemala and northern Honduras (area includes associated Caribbean islands); HN = eastern nuclear Central American highlands; NP = Caribbean lowlands from Nicaragua to Panama (area includes associated Caribbean islands); WN = Central American portion of western nuclear Central American highlands; and YP = Central American portion of Yucatan Platform. ? = species known only from indeterminate type locality.

Taxa	Physiographic regions of Central America									
	WN	**HN**	**CRP**	**EP**	**YP**	**GH**	**NP**	**CGU**	**GCR**	**CP**
Typhlopidae (1 species)										
Typhlops tycherus		+								
Viperidae (11 species)										
Atropoides indomitus		+								
Bothriechis guifarroi		+								
Bothriechis lateralis			+							
Bothriechis marchi		+								
Bothriechis nigroviridis			+							
Bothriechis nubestris			+							
Bothriechis thalassinus		+								
Cerrophidion sasai			+							
Cerrophidion wilsoni		+								
Porthidium porrasi									+	
Porthidium volcanicum										+
Squamate totals	**19**	**47**	**48**	**8**	**1**	**27**	**12**	**—**	**4**	**15**
Testudines (1 species)										
Kinosternidae (1 species)										
Kinosternon angustipons							+			
Turtle totals	**—**	**—**	**—**	**—**	**—**	**—**	**1**	**—**	**—**	**—**
Reptile totals	**19**	**45**	**48**	**8**	**1**	**25**	**13**	**—**	**2**	**15**
Herpetofaunal totals	**69**	**103**	**148**	**21**	**1**	**28**	**34**	**—**	**3**	**25**

NP regions in Mexico and Central America, respectively. The priority level one teiid lizards are another group of largely lowland-occurring species, with 18 of 20 species (90.0%) occupying the BC, SC, YP, NP, and CP regions. The xantusiid lizards are distributed in both lowland (six species in BC, SD, NB, and SC) and highland regions (nine species in MC, OR, SU, and WN). The priority level one xenosaurid lizards are found only in highland regions (OR, LT, SU, and WN), primarily in Mexico. The single charinid boa is found in OR, a highland region in Mexico. The 53 priority level one colubrid snakes have significant representation in both highland (29 species or 54.7% in MC, OC, OR, LT, SU, WN, HN, CRP, and EP) and lowland regions (24 species or 45.3% in BC, SC, TT, YP, GH, NP, and GCR). The squamate family with the largest representation is the Dipsadidae, with 101 species; 77 of which (76.2%) are found in the nine highland regions (MC, OC, OR, LT, SU, WN, HN, CRP, and EP); the remaining 24 species (23.8%) occur in lowland regions (BC, SC, TT, YP, GH, NP, and CP). The six priority level one elapid species are distributed in both lowland (three species in SC, GH, and NP) and highland regions (three species in MC, SU, and WN). A similar pattern is seen among the leptotyphlopids; with four of the six priority level one species in lowland regions (BC, YP, GCR, and CP) and two in highland regions (MC and HN). The 10 priority level one natricid snake species are limited to Mexico, where nine are distributed in highland regions (MC, OC, OR, and SU). The single priority level one typhlopid snake is found in the HN region. The 36 priority level one viperid snake species are largely represented in highland regions (25 species or 69.4% in MC, OC, OR, SU, WN, HN, and CRP), but are also fairly well represented in lowland regions (11 species or 30.6% in BC, SC, YP, CGU, GCR, and CP). Considering the squamates as a whole, of the 506 priority level one species, 310 (61.3%) are confined to the nine montane regions (Table 7).

Relatively few turtles are included among the priority level one species in Mesoamerica. Twelve species are represented among four families, the Emydidae (four species), Kinosternidae (six), Testudinidae (one), and

Mesaspis monticola (Cope 1877). This anguid lizard has an EVS of 14 (Mata-Silva et al. 2019) and occurs in "humid areas of the upper portions of the lower montane and montane and subalpine belits of the cordilleras of Costa Rica and western Panama" (Savage 2002: 534). This individual was seen on Cerro de la Muerte, Provincia de Cartago, Costa Rica. *Photo by Louis Porras.*

Norops compressicauda (Smith and Kerster 1955). The Malposo Scaly Anole has an EVS of 15 (Johnson et al. 2017) and is found in "disjunct populations in eastern Oaxaca and western Chiapas, Mexico" (Köhler 2008). This individual was photographed in the Zona Sujeta a Conservación Ecológica La Pera, in the municipality of Berriozabal, Chiapas, Mexico. *Photo by Bruno Téllez Baños.*

Ctenosaura oaxacana Köhler and Hasbun 2001. The Oaxaca Spiny-tailed Iguana has an EVS of 19 (Johnson et al. 2017) and is restricted in distribution to the Pacific slopes of the Isthmus of Tehuantepec, Oaxaca, Mexico (Köhler and Hasbun 2001). This individual was located at Guiengola, Tehuantepec, Oaxaca, Mexico. *Photo by César Mayoral Halla.*

Mesaspis viridiflava (Bocourt 1873). The Dwarf Alligator Lizard has an EVS of 16 (Johnson et al. 2017) and is distributed Sierra de Juárez. This individual was encountered at La Cumbre de Ixtepeji, Oaxaca, Mexico. *Photo by César Mayoral Halla.*

Ctenosaura hemilopha (Cope 1863). The Baja California Spiny-tailed Iguana has an EVS of 18 (Johnson et al. 2017) and "ranges from near Loreto south along the Sierra la Giganta to the west coast near Arroyo Seco and throughout the Cape Region. In the Gulf of California, *C. hemilopha* is known only from Isla Cerralvo" (Grismer 2002: 117). This individual was found in the Municipality of Los Cabos, Baja California Sur, Mexico. *Photo by Vicente Mata-Silva.*

Ctenosaura palearis Stejneger 1899. The Motagua Spiny-tailed Iguana has an EVS of 19 (Mata-Silva et al. 2019) and is restricted in distribution to the Motagua Valley of eastern Guatemala (Köhler 2003). This individual was encountered at El Arenal, Zacapa, Guatemala. *Photo by Andres Novales.*

Trionychidae (one). Unlike the typical pattern among most of the other members of the herpetofauna, these 12 species are all found in lowland regions (NB, SC, YP, and NP).

The overall pattern for the Mesoamerican herpetofauna (970 species total) is one of major representation in the nine highland regions (730 species, 75.3%) versus lesser representation in the lowland regions (240 species, 24.7%). As expected, our closer look at the physiographic regional distribution of the priority level one herpetofaunal species shows that slightly more than three-quarters of them are limited to the highland regions in Mesoamerica, whereas slightly less than one-quarter are found in lowland regions.

Taxonomic Representation of the Priority Level One Species: a Closer Look

The numbers of priority level one species per family in Mexico and Central America, as well as all of Mesoamerica (from Table 7) are summarized in Table 8, in order to demonstrate the taxonomic representation at this level in these regions. The priority level one species in Mesoamerica are allocated to 42 of the 69 families (60.9%) represented in the endemic Mesoamerican herpetofauna as a whole (Tables 2 and 8). Interestingly, more than twice as many anuran families are represented in Central America than in Mexico (11 vs. five) among the 11 families of priority one species occurring in Mesoamerica. Nonetheless, the five families occurring in Central America that have no priority level one representatives in Mexico include only relatively small numbers (one to 10, usually only one or two). They comprise families with only a few species occurring in Mexico (Centrolenidae, Leptodactylidae, and Microhylidae) or none at all (Dendrobatidae and Pipidae).

Two families of salamanders with priority level one representatives in Mexico compare to only one in Central America; the family Ambystomatidae is distributed no farther south than the Mesa Central, where the majority of the Mexican diversity in this family is centered (Table 5). The other salamander family distributed in Mesoamerica is the Plethodontidae, the priority level one portion of which is tremendously diverse in both Mexico and Central America, although more so in the latter region (Table 8).

No priority level one caecilian species occur in Mexico, and this group has only a single endemic species (Johnson et al. 2017). In Central America, there are five such species representing two families, Caeciliidae and Dermophidae (Table 8).

Among Mesoamerican amphibians, a total of 464 species is allocated to conservation priority level one, including 203 from Mexico (43.8%) and 261 from Central America (56.3%).

Relatively few Mesoamerican turtles qualify as priority one species (Johnson et al. 2017; Mata-Silva et al. 2019). Most of these turtles are endemic to Mexico (11 of 12; 91.7%), and most belong to families Emydidae and Kinosternidae (10 of 12; 83.3%). The other families represented by one species each are the Testudinidae and Trionychidae.

The other priority level one species of reptiles are all squamates, which comprise 506 of 970 total herpetofaunal species (52.2%). These species are allocated to 24 of the 36 families with endemic representatives in Mesoamerica (66.7%). Of these 24 families, 16 comprise the amphisbaenians and lizards and eight encompass snakes. Of the 16 amphisbaenian/lizard families, the largest numbers of priority level one species in Mesoamerica are in Anguidae (53 species), Dactyloidae (73), Phrynosomatidae (52), Teiidae (20), and Xantusiidae (15), for a total of 213 out of 280 species (76.1%). Of the eight snake families, the greatest numbers of such species belong to the Colubridae (53 species), Dipsadidae (101), and Viperidae (36), for a total of 190 out of 214 species (88.8%).

Can Well-designed Systems of Protected Areas Be the Salvation of the Mesoamerican Priority Level One Species?

As noted by Vitt and Caldwell (2009: 379) in their superb textbook on herpetology, “conservation biology is no longer a fledgling subject.” They pointed out that the premier journal in the field, *Conservation Biology*, issued its 101st issue in June 2006. After 33 volumes (as of December 2019) this journal’s publication history now consists of 182 issues, with six new issues published per year by the Society for Conservation Biology. ConBio, as it is affectionately known, is a successful journal with a relatively high impact factor (the 2019 figure is 6.194). Vitt and Caldwell (2009) also noted that a number of other conservation journals are specific to the field of herpetology. They highlighted *Amphibian & Reptile Conservation*, a journal that originated in 1996, which now has an Impact Factor of 1.160 (2017 value; http://amphibian-reptile-conservation.org; accessed 19 February 2019). This journal publishes both single papers and special issues which focus specifically on conservation issues, such as the first paper published in 2019 on the endemic herpetofauna of Central America (Mata-Silva et al. 2019) and a special issue on the amphibians of Venezuela. Vitt and Caldwell (2009) also discussed a number of other sources of information on the conservation of amphibians and reptiles. *Herpetological Conservation and Biology*, now in its 15th year of existence, is another prominent conservation journal.

So, with the plethora of journals focused specifically on conservation (and even on herpetological conservation), it would appear that there is no shortage of interest in addressing the conservation needs of these organisms. Nonetheless, Vitt and Caldwell (2009: 379) stated:

Tables 7. Distributional summary of herpetofaunal families containing conservation priority level one species in Mesoamerica, among 21 physiographic regions. The first 14 regions are in Mexico, with the remainder in Central America, and WN, CGU, and YP are represented in both regions. One dendrobatid species has an uncertain type locality (see Table 6). See Tables 5 and 6 for explanations of abbreviations.

Families	**Numbers of species**	**Physiographic regions**																				
		BC	**SD**	**NB**	**MC**	**EL**	**SC**	**OC**	**OR**	**TT**	**LT**	**SU**	**YP**	**WN**	**CGU**	**HN**	**CRP**	**EP**	**GH**	**NP**	**GCR**	**CP**
Bufonidae	18	—	—	—	—	—	3	1	1	—	—	1	—	—	—	1	9	—	—	1	—	1
Centrolenidae	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—
Craugastoridae	76	—	—	—	—	—	—	1	6	—	2	4	1	15	—	14	24	3	1	3	—	2
Dendrobatidae	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	3	—	4	—	1
Eleutherodactylidae	31	—	—	—	10	—	3	3	3	—	—	3	—	—	—	—	4	4	—	1	—	—
Hemiphractidae	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2	—	—	—	—
Hylidae	69	—	—	—	1	—	1	—	20	1	1	11	—	10	—	8	11	1	—	3	—	1
Leptodactylidae	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
Microhylidae	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
Pipidae	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Ranidae	9	—	—	—	4	—	—	1	1	—	—	—	—	—	—	1	1	—	—	1	—	—
Anuran totals	**221**	—	—	—	**15**	—	**7**	**6**	**31**	**1**	**3**	**19**	**1**	**25**	—	**25**	**54**	**13**	**1**	**14**	—	**6**
Ambystomatidae	10	—	—	—	9	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Plethodontidae	228	—	—	—	5	—	—	1	59	—	3	28	—	39	—	35	45	2	2	7	1	1
Salamander totals	**238**	—	—	—	**14**	—	—	**2**	**59**	—	**3**	**28**	—	**39**	—	**35**	**45**	**2**	**2**	**7**	**1**	**1**
Caeciliidae	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
Dermophidae	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—
Caecilian totals	**5**	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	**2**	—	—	—	—	**3**
Amphibian totals	**464**	—	—	—	**29**	—	**7**	**8**	**90**	**1**	**6**	**47**	**1**	**64**	—	**60**	**101**	**15**	**3**	**21**	**1**	**10**
Bipedidae	2	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Anguidae	53	3	—	2	4	—	—	1	8	—	3	4	—	14	—	6	5	1	—	1	—	1
Crotaphytidae	3	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Dactyloidae	73	—	—	—	—	—	3	—	4	—	1	11	—	8	—	15	23	—	4	1	—	3
Eublepharidae	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Gymnophthalmidae	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Iguanidae	12	7	—	—	—	—	2	—	—	—	—	—	—	1	—	—	—	—	2	—	—	—
Mabuyidae	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2	—	—
Phrynosomatidae	52	16	1	6	6	—	1	5	6	—	—	8	1	—	—	2	—	—	—	—	—	—
Phyllodactylidae	17	4	—	—	—	—	9	—	—	—	—	1	—	—	—	—	—	—	3	—	—	—
Scincidae	6	1	—	—	1	—	1	2	—	—	—	1	—	—	—	—	—	—	—	—	—	—
Sphaerodactylidae	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	6	1	—	2
Sphenomorphidae	2	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
Teiidae	20	12	—	—	—	—	1	1	—	—	—	1	3	—	—	—	—	—	—	1	—	1
Xantusiidae	15	2	1	2	1	—	1	—	3	—	—	3	—	2	—	—	—	—	—	—	—	—

Tables 7 (continued). Distributional summary of herpetofaunal families containing conservation priority level one species in Mesoamerica, among 21 physiographic regions. The first 14 regions are in Mexico, with the remainder in Central America, and WN, CGU, and YP are represented in both regions. One dendrobatid species has an uncertain type locality (see Table 6). See Tables 5 and 6 for explanations of abbreviations.

Xenosauridae	9	—	—	—	—	—	—	—	5	—	1	2	—	1	—	—	—	—	—	—	—	—
Charinidae	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
Colubridae	53	12	—	—	2	—	3	4	3	2	1	7	1	5	—	4	2	1	3	2	1	—
Dipsadidae	101	2	—	—	8	—	5	1	14	2	2	13	1	8	—	13	14	4	6	3	—	5
Elapidae	6	—	—	—	1	—	1	—	—	—	—	1	—	1	—	—	—	—	1	1	—	—
Leptotyphlopidae	6	1	—	—	1	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	1	1
Natricidae	10	—	—	—	2	—	1	1	4	—	—	2	—	—	—	—	—	—	—	—	—	—
Typhlopidae	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
Viperidae	36	6	—	—	5	—	1	1	3	—	—	6	1	1	1	5	4	—	—	—	1	1
Squamate totals	**494**	**70**	**2**	**12**	**31**	—	**30**	**16**	**51**	**4**	**8**	**60**	**8**	**41**	**1**	**47**	**48**	**8**	**26**	**13**	**3**	**15**
Emydidae	4	—	—	2	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Kinosternidae	6	—	—	1	—	—	3	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—
Testudinidae	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Trionychidae	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Turtle totals	**12**	—	—	**5**	—	—	**4**	—	—	—	—	—	**2**	—	—	—	—	—	—	**1**	—	—
Reptile totals	**506**	**70**	**2**	**17**	**31**	—	**34**	**16**	**51**	**4**	**8**	**60**	**10**	**41**	**1**	**47**	**48**	**8**	**26**	**14**	**3**	**15**
Herpetofaunal totals	**970**	**70**	**2**	**17**	**60**	—	**41**	**24**	**141**	**5**	**14**	**107**	**11**	**105**	**1**	**107**	**149**	**23**	**29**	**35**	**4**	**25**

> "Yet, in spite of all the successes, conservation biology has not achieved what its practitioners hold most dearly: the reversal of the tremendous loss of biodiversity, natural habitats, and even ecosystems that is occurring unabated throughout the world. Although we can find local success stories, and these should be applauded, the overall picture for most groups of plants and animals is a steady decline in number of individuals and populations and, ultimately, species. Thus, the future of conservation biology, and whether we are to succeed in reversing the depressing trends we see every day, lies in coming to terms with why the excellent scientific framework has not translated into real-world change and how new paths can be forged that will make a real difference."

Vitt and Caldwell (2009) followed these straightforward statements with an excellent discussion and summary of the principles of conservation biology, the human impact on amphibian and reptile communities, and the ideals and problems associated with preservation and management of amphibian and reptile populations. In the afterword attached to that chapter in their textbook, these authors (p. 408) indicated that "evidence is mounting that humans are spending less and less time engaged in nature-based recreation" and that this "disconnect between humans and nature may well be the world's greatest environmental threat."

Commonly considered fundamental to the conservation of biodiversity is the erection and maintenance of protected areas, presumably in a state as close to pristine as is possible at any given point in time. A recent paper by García-Bañuelos et al. (2019) explored the extent to which existing protected areas in Mexico provide for protection of the plethodontid salamanders in the country. As noted above, Mexico is the second most important region in the world for salamanders, being surpassed only by the United States. In the final section of their paper, García-Bañuelos et al. (2019: 11) concluded that

> "In a highly biodiverse and environmentally heterogeneous country like Mexico, the number, extent, and current location of protected areas *are not sufficient for harboring all threatened plethodontid salamander species* [emphasis ours]. Despite [that] the proportion of protected space is close to international suggestions, almost 40% of threatened species do not occur in protected areas. The design of a reserve system should consider as a priority criterion to include the occurrence of all those species that need immediate attention for their protection, specifically those species threatened by habitat transformation. Areas that contain threatened gap species [those species not known to occur within any protected area], not only of salamander species but of other threatened species, could serve as a guide for the creation of new

Salvadora intermedia Hartweg 1940. The Oaxacan Patch-nosed Snake has an EVS of 16 (Johnson et al. 2017) and "occurs south of the Transverse Volcanic Cordillera, ranging at 500 to 2,700 m elevation from the Sierra Madre del Sur of Guerrero through the highlands of Oaxaca and adjacent southern Puebla" (Heimes 2016: 150). This individual was located at Santiago Tenango, Oaxaca, Mexico. *Photo by César Mayoral Halla.*

Tantilla sertula Wilson and Campbell 2000. The Garland Centipede Snake has an EVS of 16 (Johnson et al. 2017) and occupies the Pacific coastal plain of southwestern Mexico from northern Guerrero to southwestern Oaxaca (Heimes 2016; Rocha et al. 2016). This individual was found in the Municipality of Santa Catarina Juquila, Oaxaca, Mexico. *Photo by Vicente Mata-Silva.*

Thamnophis lineri Rossman and Burbrink 2005. Liner's Gartersnake has an EVS of 17 (Johnson et al. 2017) and "is known only from high elevations (2,670–3,048 m) in the Sierra Juárez in north-central Oaxaca" (Heimes 2016: 369) in Mexico. This individual was photographed in the Municipality of San Juan Atepec, Oaxaca, Mexico. *Photo by Vicente Mata-Silva.*

Sceloporus tanneri Smith and Larsen 1975. Tanner's Spiny Lizard has an EVS of 16 (Johnson et al. 2017) and is restricted in distribution to the southern slopes of the Sierra de Miahuatlán in Oaxaca, Mexico (Köhler and Heimes 2002). This individual was located near the type locality in the vicinity of San Juan Lachao, in the municipality of the same name, Oaxaca, Mexico. *Photo by Elí García Padilla.*

Phyllodactylus delcampoi Mosauer 1936. Del Campo's Leaf-toed Gecko has an EVS of 16 and is distributed in the Pacific coastal region of Guerrero, Mexico (Palacios-Aguilar and Flores-Villela 2018). This individual was photographed at Tierra Colorada, in the municipality of the same name, Guerrero, Mexico. *Photo by Bruno Téllez Baños.*

Table 8. Summary of numbers of priority level one species in Mexico, Central America, and Mesoamerica, arranged by families.

Families	Mexico	Central America	Mesoamerica
Bufonidae	6	12	18
Centrolenidae	—	2	2
Craugastoridae	20	56	76
Dendrobatidae	—	10	10
Eleutherodactylidae	22	9	31
Hemiphractidae	—	3	3
Hylidae	38	31	69
Leptodactylidae	—	1	1
Microhylidae	—	1	1
Pipidae	—	1	1
Ranidae	6	3	9
Anuran totals	**92**	**129**	**221**
Ambystomatidae	10	—	10
Plethodontidae	101	127	228
Salamander totals	**111**	**127**	**238**
Caeciliidae	—	3	3
Dermophiidae	—	2	2
Caecilian totals	**—**	**5**	**5**
Amphibian totals	**203**	**261**	**464**
Anguidae	30	23	53
Bipedidae	2	—	2
Crotaphytidae	3	—	3
Dactyloidae	25	48	73
Eublepharidae	1	—	1
Gymnophthalmidae	—	1	1
Iguanidae	9	3	12
Mabuyidae	—	3	3
Phrynosomatidae	50	2	52
Phyllodactylidae	14	3	17
Scincidae	6	—	5
Sphaerodactylidae	—	11	11
Sphenomorphidae	1	1	2
Teiidae	18	2	20
Xantusiidae	15	—	15
Xenosauridae	9	—	9
Charinidae	1	—	1
Colubridae	38	15	53
Dipsadidae	52	49	101
Elapidae	3	3	6
Leptotyphlopidae	3	3	6
Natricidae	10	—	10
Typhlopidae	—	1	1
Viperidae	25	11	36
Squamate totals	**315**	**179**	**494**
Emydidae	4	—	4
Kinosternidae	5	1	6
Testudinidae	1	—	1
Trionychidae	1	—	1
Turtle totals	**11**	**1**	**12**
Reptile totals	**326**	**180**	**506**
Herpetofaunal totals	**529**	**441**	**970**

> protected areas and strengthen the existing reserve system. The set of new areas that would help to protect threatened species can be a combination of different types of governance, where federal, state, and municipal governments, as well as community and private sectors can be involved in the protection of threatened biodiversity."

The current study shows a good example of the problems that arise when protected areas are established before the necessary biotic surveys are completed. Thus, the authors noted that 40% (actually 38%) of the threatened species (i.e., those placed in the IUCN CR, EN, and VU categories) are not found in any of the currently-existing protected areas.

An additional problem related to the formal conservation model of Natural Protected Areas in Mexico is that a recent tally of 1,609 mining concessions have been documented inside their mapping polygons (Armendariz-Villegas and Ortíz-Rubio 2015). Thus, the credibility or efficiency of this system is highly questionable, and they are very possibly ineffective in protecting the threatened species of amphibians and reptiles and their natural habitats. The current authors have been observing and documenting the herpetofauna of the most biodiverse Mexican state (Oaxaca), where the social tenure of the land consists of ca. 80% of the state's territory, in which the local communities (especially the native indigenous ones) have shown resistance to the imposition of the formal model of conservation of the biodiversity based on NPAs. They see the NPA system as a loss of their autonomy over their legal and ancestral territories (which are recognized constitutionally) that they have been occupying, in some cases, for more than 3,000 years (e.g., in the Los Chimalapas region). The "Chima" (Zoque) people, whose ancestors are the ancient Olmecs, have legally defeated the decree of NPAs inside their communal territory. So, they were pioneers in the first attempts at developing an alternative community conservation program known as "Reserva Ecológica Campesina de los Chimalapas" back in 1990 (García-Aguirre 2013). In a more recent introspective look at the community conservation areas in the mega-diverse state of Oaxaca, Galindo-Leal (2010) documented a total of more than 192 (2,512 km^2) of these initiatives within the Mexican territory and 74 (931.2 km^2) inside the Oaxacan territory.

In a more recent study, Ochoa-Ochoa et al. (2009) found that most of the amphibian species of Mexico have some portion of their potential ecological niche distribution protected, but 20% are not protected at all within governmental Natural Protected Areas. Seventy-three percent of endemic and 26% of micro-endemic amphibians are represented within Social Conservation Initiatives (e.g., Community Conservation Areas and others); however, 30 micro-endemic species are not represented within either governmental NPAs or Social Conservation Initiatives. Therefore, this study shows how the role of land conservation through social initiatives is becoming a crucial element for an important number of species that are not protected by governmental NPAs.

Based on our experiences in the field, we also highly support the Community Conservation Areas as a real and effective ally for the conservation of amphibian and reptile biodiversity. The communities (especially the indigenous ones) are doing effective work in protecting their territories and natural resources. These social initiatives and practices date back many centuries and have as their sole purpose the conservation of their ecosystems and the protection of biodiversity. The statutes of all these communities include conservation of the plant cover and their aquiferous mantles, and the prohibition of hunting the great majority of animal species which inhabit their territory. For these reasons, we suspect that the indigenous or native communities represent the most effective protectors and guardians of the biodiversity, including threatened amphibians and reptiles. The members of these communities also have a major responsibility to maintain the irreplaceable cultural diversity they encompass.

In addition, we have examined these questions in various ways in a number of publications authored by one or more of us, beginning with the paper that introduced the EVS measure and first used it to assess the conservation status of the herpetofauna of Honduras (Wilson and McCranie 2004). These authors developed this measure to categorize species in the highly diverse Honduran herpetofauna (Townsend and Wilson 2010) as to their vulnerability to environmental pressures based on information available at that time. Basically, this measure recognized that the rate of exacerbation of environmental damage in Honduras, especially due to habitat modification and destruction, far outpaced the efforts being undertaken to preserve the herpetofauna of the country. Moreover, in that paper the authors stressed an easily understood, but seldom implemented, maxim of problem solving that "a problem *cannot* be solved by simply treating its symptoms" and further opined that "biodiversity decline is a symptom of habitat loss and degradation, in turn a symptom of runaway human population growth. Uncontrolled population growth is, in turn, a symptom of the mismanaged human mind." (Wilson and McCranie 2004: 31).

If the goal is to curb biodiversity decline, the above paragraph thus indicates that this can only be accomplished by treating the problems that give rise to the decline, which means ultimately that humans will have to confront the fundamental problem of the mismanagement of the human mind. What this term signifies, and how it came to exist as a problem for humanity, is not likely to be understood in even its most basic parameters, since most humans operate on the assumption that our species occupies the pinnacle of existence, believing that it is our mind that places us in this position. So, a term like "mismanagement of the human mind" would be counterintuitive to the understanding of most humans.

Over the years since the publication of Wilson and McCranie (2004), one or more of us (along with additional co-authors) have returned to the concept of the "mismanagement of the human mind" in an attempt to expose its underpinnings. We have excavated these underpinnings in an initial fashion in a pair of recent papers on the endemic herpetofaunas of Mexico (Johnson et al. 2017) and Central America (Mata-Silva et al. 2019). The title of the former paper encapsulated our opinion that the endemic herpetofauna of Mexico is composed of "organisms of global significance in severe peril." Johnson et al. (2017: 608) opined that:

> "…efforts to conserve the endemic elements of the Mexican herpetofauna have to be pursued within the framework of a set of cascading environmental problems of global extent and anthropogenic origin, if they are to have a long-lasting impact…What makes these problems so intransigent and difficult to approach is their widespread connectivity in the natural world (i.e., all of its components are interrelated by energy flow and the cycling of materials), and [that] the linear approach often taken by humans to resolve these issues can be relatively ineffective, if not counterproductive."

Johnson et al. (2017: 609) further indicated that:

> "Fundamentally, humans have created and maintain these environmental problems because of their capacity for rational thought, i.e., their ability to connect cause to effect through the passing of time, and adopting an anthropocentric worldview that stresses the exploitation of the world's resources to support the burgeoning human population. Such a worldview contrasts markedly with that of environmentalists, who have adopted 'a worldview that helps us make sense of how the environment works, our place in the environment, and right and wrong environmental behaviors' (Raven and Berg, 2004: G-6). Obviously, the present anthropocentric worldview held by most people represents the fundamental reason why these environmental problems exist, and continued human population growth allows them to worsen over time."

In the last section of the Johnson et al. (2017: 612) paper, these authors conclude that:

> "...[their] opinion is that humans have the rational capacity to design a sustainable world through cooperative action, but our species' attitudes and actions will have to change. Our preparedness will have to improve as well. Such change will have to be based on realistic, fact-based appraisals of where we are now and where we want to be in the future. Biologists will have to commit to helping the rest of us understand why the protection of biodiversity is critical to enjoying a sustainable world. Cultural anthropologists also will have to assist humanity at large understand why the maintenance of cultural diversity also is essential to living sustainably. Educational reform will have to be central to such efforts, to help people learn how to think and act critically and base decisions on the way things really are, and not how we might wish them to be by denying reality. The devotion humans have for structuring beliefs on little or no evidence, essentially reversing the benefit of rationality, will have to surrender to critical-thinking education established by top-to-bottom educational reform."

Mata-Silva et al. (2019) offered a subsequent installment of their view of why biodiversity decline is continuing to be exacerbated, specifically while considering the endemic herpetofauna of Central America. In the title of their paper, Mata-Silva et al. (2019: 3) indicated that this herpetofauna will become "a casualty of anthropocentrism." These authors picked up on the conclusions of Johnson et al. (2017: 613), who stated that "the devotion humans have for structuring beliefs on the basis of little or no evidence will have to surrender to critical-thinking education established by top-to-bottom educational reform." Mata-Silva et al. (2019: 47) went on to note that "critical-thinking educational reform, however, is much easier to conceive than to bring into reality. A fundamental question is why such reform has not been undertaken. This question is not easy to answer, but perhaps the most fundamental reason is that the educational systems currently in existence are products of the anthropocentric worldview and reflect its mindsets. These educational systems also have developed within the current economic systems responsible for the huge disparities between the rich and poor, and act to reinforce these disparities."

These authors concluded that:

> "…ultimate solutions will emerge only from a clear understanding of the evolution of human psychology, as confronted with the problems we face. If not, then the endemic herpetofauna of Central America, as well as the remainder of life on Earth, will become casualties of the biodiversity crisis that eventually will envelop all humanity."

Moreover, Mata-Silva et al. (2019: 58) posited that:

> "If there is any merit to [their] hypothesis that anthropocentrism is part of a cascade of psychological ailments, which extend through ethnocentrism and culminate in the narcissistic personality disorder, it might predict that the critical-thinking educational reform called for by Johnson et al. (2017) will have to be recognized as requiring species-wide psychotherapy to treat a species-wide mental disease. If so, addressing this disease will be the largest problem undertaken by humanity during its existence on planet Earth."

If humanity as a whole is beset with a plethora of psychological ailments that are manifested as a cascade of centristic forms of thinking, the treatment of which will require the creation of an educational system essentially constituting species-wide psychotherapy, then that therapy will have to be based on a clear understanding of why such centristic types of thinking have come into existence in the first place and why they characterize, in a variety of ways, our entire species. The truth of this statement is obvious. Just as the therapy for physical ailments has to be based on an understanding of the cause(s) of these type of ailments, and the same is true of mental ailments, then it is clear that therapy for a species-wide psychological ailment will have to depend on a full understanding of the parameters of this ailment and their origin(s) throughout the chapters of the entire evolutionary history of our species on the planet.

Wilson and Lazcano (2019) recently published an essay that attempted to lay out the steps in the historical development of the prevailing worldview that is responsible for positioning us on the threshold of the extinction of our species and much of the rest of life on Earth by conscious design. This essay consists essentially of a lengthy argument that attempts to outline the steps that have led to the evolution of anthropocentrism and the other more restricted forms of centristic thinking which exist in a cascade extending from ethnocentrism to egocentrism. Given the lengthiness of this argument, we have to limit our discussion of it to the exposition of a series of steps that Wilson and Lazcano (2019) posited as a set of hypotheses which require testing by psychobiological methods. These authors exposed these interconnected steps as follows: (a) the evolution of rationality; (b) the origin of self-awareness and the awareness of space-time positioning; (c) the creation of a fear of the inevitable; (d) the development of a vicious cycle of addiction and denial; (e) the manifestation of violence of all types and at all levels; and (f) the spread of destructive worldviews reinforcing the violence. Wilson

Geophis sallei Boulenger 1894. Salle's Earthsnake has an EVS of 15 (Johnson et al. 2017) and "is known only from a few localities in the Sierra Madre del Sur of southern Oaxaca" (Heimes 2016: 250) in Mexico. This individual was found in the vicinity of San Juan Lachao, in the municipality of the same name, Oaxaca, México. *Photo by Vicente Mata-Silva.*

Bothriechis guifarroi Townsend, Medina-Flores, Wilson, Jadin, and Austin 2013. Guifarro's Palm-Pitviper has an EVS of 19 (Mata-Silva et al. 2019) and is restricted in distribution to the Refugio de Vida Silvestre of northern Honduras (Townsend et al. 2013). This individual was photographed in Refugio de Vida Silvestre Texíguat, Departamento de Atlántida, Honduras. *Photo by Josiah H. Towsend.*

Bothriechis lateralis Peters 1863. The Side-striped Palm-piviper has an EVS of 16 (Mata-Silva et al. 2019) and is found at elevations from 700–1,950 m in premontane and lower montane zones of the cordilleras of Costa Rica and western Panama (Savage 2002). This individual was located at Caragral de Acosta, Provincia de San José, Costa Rica. *Photo by Louis Porras.*

Bothriechis nigroviridis Peters 1859. The Black-speckled Palm-pitviper has an EVS of 17 (Mata-Silva et al. 2019) and is found in "premontane and lower montane zones of the cordilleras of Costa Rica and western Panama" (Savage 2002: 725). This individual was seen at San Gerardo de Dota, Provincia de San José, Costa Rica. *Photo by Louis Porras.*

Bothriechis thalassinus Campbell and Smith 2000. The Blue-green Palm-pitviper has an EVS of 17 (Mata-Silva et al. 2019) and "occurs in disjunct populations at moderate and intermediate elevations on the Atlantic versant from extreme eastern Guatemala to western Honduras" (McCranie 2011: 495). This individual was located at Sierra del Merendon, Guatemala. *Photo by Andres Novales*.

Crotalus brunneus Harris and Simmons 1978. The Oaxacan Pygmy Rattlesnake has an EVS of 17 and it is endemic to the Mexican state of Oaxaca, occurring in Montañas y Valles de Occidente, Montañas y Valles del Centro, Sierra Madre de Oaxaca, and Sierra Madre del Sur physiographic regions (Mata-Silva et al. 2015b). This individual was found in the vicinity of Capulálpam de Méndez, in the municipality of the same name, Oaxaca, México. *Photo by Elí García-Padilla.*

Kinosternon oaxacae Berry and Iverson 1980. The Oaxaca Mud Turtle has an EVS of 15 (Johnson et al. 2017) and is distributed at low elevations on the Pacific slope of Guerrero and Oaxaca, Mexico (Mata-Silva et al. 2015b; Palacios-Aguilar and Flores-Villela 2018). This individual was found in the Municipality of Villa de Tututepec de Melchor Ocampo, Oaxaca, Mexico. *Photo by Vicente Mata-Silva.*

and Lazcano (2019), thus, maintain that ultimately it was the evolution of rationality as it is manifested in the human species (i.e., the ability to connect cause to effect through the passage of time) that has allowed the development and virtually universal acceptance of the anthropocentric worldview that has given rise to the species-wide violence directed toward all components of the life-support systems of planet Earth. Addressing this monumental paradox will require the redesign of the paradigm underlying human existence, a task the likes of which humanity has never faced in its history on Earth.

So, to return to the question that forms this section's title: Can protected areas be a salvation for the Mesoamerican priority level one species? The short answer is no, they cannot. The next question to be asked, of course, is: Why not? The answer to that question is that the establishment and maintenance of such protected areas requires them to be set aside for perpetuity from the destructive actions of a species dedicated to two overarching guidelines. One is the continual unregulated growth of its own global population, in ignorance of the basic principle of population biology which states that no species can enjoy unlimited population growth in the face of dependence on a limited resource base. The other guideline is that the planetary resource base is to be used and abused by humans to whatever extent is necessary to support to whatever extent is possible an unregulated global population of its own species. Ultimately, the efforts some humans undertake to "do the right thing" (e.g., devise a means to respond effectively to the problem of biodiversity decline) will ultimately fail in the face of the devotion of the larger population of humans to "do the wrong thing" (i.e., continue to practice unlimited population growth and thus steadily increase the impact on the limited planetary resource base).

Biodiversity decline is an environmental problem of global dimensions, equivalent in that sense to other global environmental problems impacting the atmosphere (e.g., climate change), the hydrosphere (e.g., ocean pollution), and the lithosphere (e.g., land pollution and soil loss).

So, Is There a Future for the Mesoamerican Priority Level One Species?

In attempting to answer this question, we must understand that the answer has to be sought within the context of addressing the psychological problems posed by the maintenance of the anthropocentric worldview and the cascade of other forms of centristic thinking that flow from it (Wilson and Lazcano 2019). In our view, centristic thinking in all of its forms constitutes a chain of psychological ailments that lead to violence in all of its manifestations—ranging from the violence of all humans toward the environment that supports all populations of all organisms that now exist, as well as those that have ever existed or will ever exist, to the violence that single individuals can visit upon others and themselves.

In our opinion, the fate of the Mesoamerican priority level one species will only become of concern to the humans now occupying the Earth if such concern emerges as a consequence of the transition of present-day humans to a new paradigm that replaces the counterproductive anthropocentric worldview based on a misunderstanding of the provisions of the "biological contract" discussed by Wilson and Lazcano (2019). Since everything else with which humans are faced will only become workable in the context of a sustainable society, the necessary paradigm shift will need to occur in the shortest time possible. The short time-line that now remains is a consequence of the two most destructive actions promulgated by humans which were mentioned in the previous section, i.e., unregulated population growth and unlimited exploitation of the limited planetary resource base. There is nothing particularly original about our conclusions, inasmuch as far more extended discussions of these symptoms of anthropocentrism can be found in any college and university level environmental science textbook.

A number of metrics have been developed to attempt to measure the amount and degree of the human impact on the environment. One metric is the so-called IPAT equation (expressed as $I = PAT$), where:

I is the environmental impact
P is the population growth
A is the level of affluence
T is the level of technology

This metric was developed originally by P.R. Ehrlich and J.P. Holdren (1971) in order to demonstrate "the mathematical relationship between environmental impacts and the forces that drive them" (Raven and Berg 2004: 6–7). As noted by Raven and Berg (2004: 7) "the three factors in the *IPAT* equation are always changing in relation to each other. For example, consumption of a particular resource may increase, but technological advance may decrease the environmental impact of the increased consumption." Thus, these authors noted (p. 7) that "the *IPAT* equation, while useful, must be interpreted with care, in part because we often do not understand all of the environmental impacts of a particular technology." Nonetheless, in a broad sense, this formula informs us that the amount of environmental impact registered by humans on the planetary resources that support them is dependent upon the interplay of the number of people multiplied by the level of affluence per person (i.e., "a measure of the consumption or amount of resources used per person;" Raven and Berg 2004: 6) multiplied by the level of technology (i.e., the resources needed and wastes produced by the technologies used to obtain and consume the resources; Raven and Berg 2004).

Another metric of value is that of the "ecological footprint." The ecological footprint measures human demand on nature, i.e., the quantity of nature it takes to support people or an economy. It tracks this demand through an ecological accounting system. The accounts contrast the biologically productive area people use for their consumption to the biologically productive area available within a region of the world (biocapacity, the productive areas that can regenerate what people demand from nature). In short, it is a measure of human impact on Earth's ecosystem and reveals the dependence of the human economy on natural capital. The organization Global Footprint Network estimates that, as of 2014, humanity has been using natural capital 1.7 times as fast as the Earth can renew it. This means humanity's ecological footprint corresponds to 1.7 planet Earths (http://data.footprintnetwork.org; accessed 10 June 2019). The implications of this calculation are that "the average world citizen has an eco-footprint of about 2.7 global average hectares while there are only 2.1 global hectare of bioproductive land and water per capita on earth. This means that humanity has already overshot global biocapacity by 30% and now lives unsustainability by depleting stocks of 'natural capital'" (http://wikipedia.org; accessed 17 March 2019). If we underwrite a goal of sustainability for all humanity, then it is necessary to have a footprint that is smaller than the planet's biocapacity. Sustainability is defined as "the ability to meet humanity's current needs without compromising the ability of future generations to meet their needs; sustainability implies that the environment can function indefinitely without going into a decline from the stresses imposed by human society on natural systems such as fertile soil, water, and air" (Raven and Berg 2004: G-15). Thus, a lack of sustainability, the current state of humanity, implies that the current human population is attempting to meet its needs by sacrificing the ability of future generations to meet their needs. In other words, we who are here now will be handing to our offspring a world in which it will be increasingly more difficult for them to meet their needs than it is for us now.

A third metric of interest is termed Earth Overshoot Day (EOD), which is the calculated calendar date when humanity's resource consumption for the year exceeds the Earth's capacity to regenerate those resources during that year. EOD is calculated by dividing the year's global biocapacity (the amount of natural resources generated), by the global ecological footprint (humanity's consumption of Earth's natural resources), and multiplying by 365. According to data presented in the Wikipedia article on Earth Overshoot Day, the EOD has been occurring consistently earlier each year since 1987, when it was 23 October. At the beginning of the new millennium, it had shifted to 23 September, by 2010 it was 8 August, and by 2015 it was down to 6 August. The current EOD (i.e., that for 2018) is 1 August. Therefore, the question arises, naturally, as to whether this metric will recede into July by the current year (2020). Interestingly, the EOD graph for the period of 1969–2018 in the Wikipedia article indicates that the EOD in 1969 was 1 January, the point at which the world human population was dependent on one Earth's worth of natural capital. Over the intervening half a century, the EOD has fluctuated somewhat but in general has steadily receded to earlier in the year until reaching its current day of 1 August, which requires the expenditure of 1.7 Earths of natural capital per year. Obviously, this approach to human subsistence on Earth is the equivalent of the well-known economic concept of deficit spending, which is "the amount by which spending exceeds revenue over a particular period of time" (http://wikipedia.org; accessed 17 March 2019). Such spending results in a budget deficit, which can be applied to the budget of a government, private company, or individual. The practice of deficit spending, especially at the governmental level is controversial, but in light of the reality that human economies are all based on the availability of earth capital, it would appear to be risky business to practice deficit spending over the long term. Certainly, such practices would have to be abandoned if humanity were ever able to achieve a sustainable economy.

Given the understanding, as indicated by the ecological footprint and Earth Overshoot Day metrics, that humanity is living an increasingly unsustainable existence, we can return to the question framed by the title of this section of our paper, i.e., Is there a future for the Mesoamerican priority level one species? The short answer is that no, there is not; not any more than there is a future for the remainder of the biodiversity currently inhabiting our planet. In fact, humanity is responsible for the creation and maintenance of the worldwide problem called "biodiversity decline" or "the biodiversity crisis." This problem is the major environmental problem facing the biosphere, the entire compendium of life on Earth. Biodiversity decline can be viewed as a tripartite problem, inasmuch as biodiversity encompasses three levels, i.e., genetic diversity, species diversity, and ecosystem diversity (Campbell et al. 2008). Losses, therefore, can and do occur at all three levels of organismic diversity. Generally speaking, biodiversity loss is usually measured in the number of species lost to extinction. We are at a loss, however, to provide a precise measure of the loss of species across the planet. As noted by Campbell et al. (2008), "Because we can only estimate the number of species currently existing, we cannot determine the exact rate of species loss. However, we do know for certain that the extinction rate is high and that human activities threaten Earth's biodiversity at all levels." The most important point made in this statement is that "we can only estimate the number of species currently existing," meaning that we have nothing more available to us than rough guesses as to what might exist out there in the world that remains to be discovered. Wilson (2014: 47) noted that:

> "…at the time of this writing (in 2013) there are 273,000 known species of plants in the living flora of Earth, a number expected to rise to 300,000 as more expeditions take to the field. The number of all known species of organisms on Earth, plants, animals, fungi, and microbes, is about 2 million. The actual number, combining known and unknown, is estimated to be at least three times that number, or more. The roster of newly described species is about 20,000 a year. The rate will certainly grow, as a multitude of still poorly explored tropical forest fragments, coral reefs, seamounts, and uncharted ridges and canyons of the deep ocean floor become better known. The number of described species will accelerate even faster with exploration of the largely unknown microbial world, now that the technology needed for the study of extremely small organisms has become routine. There will come to light strange new bacteria, archaeans, viruses, and picozoans that still swarm unseen everywhere on the surface of the planet."

To draw from what Wilson (2014) wrote above, we have only a vague guess about what we have yet to discover in the living world. Even more vague is our understanding of how biodiversity loss is proceeding. At best, we might have a somewhat less vague idea of how much of what we do know about is being lost, but we otherwise have no idea of how rapidly what we don't know about is disappearing. What we don't know about the life that remains to be discovered is an indeterminate quantity, simply as measured in terms of how many taxa remain to be described. The formal description, however, is simply the first step in opening up the biology of that particular organism. If our own work in herpetology is any indication, we can say that we still know relatively little about the totality of the "biology" of any of these creatures. To use just one example from our own field, we can mention the work done by the last author, Larry David Wilson, over the previous 50± years. In that period of time, he has described 12 of the 66 currently recognized species of the genus *Tantilla*. *Tantilla* is the third most speciose snake genus in the world (Reptile Database; accessed 26 November 2019), after *Atractus* in Lower Central America and South America (with 147 species) and *Oligodon* in southern and eastern Asia (with 79 species). To date, most of the *Tantilla* species are still not known beyond what was presented in their respective original descriptions (Wilson and Mata-Silva 2015). That information has been summarized by Wilson (1999), and Wilson and Mata-Silva (2014, 2015). This case of the work Wilson and colleagues have accomplished over the many years of working with this interesting genus of snakes is exemplary of what we biologists are faced with as we continue with our efforts to understand the diversity of life we enjoy on planet Earth. Numerous similar examples could be mentioned to demonstrate how little we know at this time about even relatively easy-to-encounter organisms such as snakes and other members of the herpetofauna. After all, most of these organisms are terrestrial just as we humans are.

Another major point needs to be made at this point in the discussion. Since the world's biologists still have discovered and named but a fraction of the life that exists today on our planet, and we have only a vague idea of how much of what the biologists have catalogued to date has disappeared already, then a major two-part question facing humanity is what remains of the life on Earth to be discovered, and how much of that life will disappear before we have a chance to discover it. Inasmuch as we still know so little about how the majority of the world's known species of organisms contribute to the maintenance of the life support systems on the planet, how are we to judge the true extent of the damage we are wreaking on those systems that allow life to occur on Earth? What is the likelihood that, at some point, we will render extinct that one species of organism whose disappearance will represent the tipping point beyond which life will cascade into the ultimate mass extinction episode? Is any person or group of people now alive in a position to answer this question? Does anyone have any idea of what sort of organism such a keystone creature might be? Would it be a macroscopic creature, i.e., large enough to be seen with the unaided eye? Or, on the contrary, would it be microscopic and visible only with the most sophisticated and modern equipment? Would it perhaps only be recognizable by the application of modern molecular biological technology? In fact, might such a creature be beyond our ability to visualize it by any means we currently possess? The sad answer to all of these questions is that we simply do not know any of their answers and are likely to never know them.

To return to the question that forms the title of this section of our paper, "Is there a future for the

Mesoamerican priority level one herpetofaunal species?" Our answer is that until and unless humanity manages to transition to a new paradigm for our existence, to move from anthropocentrism as the guiding, overarching worldview to one that lies within the provisions of the "biological contract" discussed by Wilson and Lazcano (2019), then this component of the hugely important Mesoamerican herpetofauna will become just another casualty of the actions of a centristically-oriented species devoted to itself without regard for the illogical application of such an approach to living on planet Earth. Ultimately, we will be forced to conclude that "now you see them … and now you don't."

Conclusions, Realities, Recommendations, and Predictions

Conclusions

A. The Mesoamerican herpetofauna is of tremendous biodiversity significance, and its significance increases markedly with time, due to the continuing discovery of new taxa at the approximate rate of 35 species per year.

B. At the same time that our knowledge of the composition of the Mesoamerican herpetofauna is increasing, the global problem of biodiversity decline continues apace.

C. In order to identify the Mesoamerican herpetofaunal species in most critical need of conservation attention, Johnson et al. (2017) and Mata-Silva et al. (2019) established a set of conservation priority levels based on a combination of physiographic distribution and Environmental Vulnerability Score (EVS), and applied those levels to the endemic component of the Mesoamerican herpetofauna.

D. Eighteen priority levels were identified, ranging from level one, comprising those species limited to a single physiographic region and assessed to have a high category EVS, to level 18, which includes those species occurring in six physiographic regions and judged to have a low category EVS.

E. The greatest number of species, by far, is allocated to conservation priority level one (971 of 1,477 species, or 65.7%). This is the group of species considered to be the most challenging to protect for perpetuity.

F. From one to 149 priority level one species are distributed in 20 of the 21 physiographic regions recognized in Mesoamerica.

G. The greatest proportion of the priority level one species (739 of 970, or 76.2%) are distributed in the Baja California Peninsula and six montane regions in Mexico (Sierra Madre Oriental, Mesa Central, and Sierra Madre del Sur) and Central America (western nuclear Central American highlands, eastern nuclear Central American highlands, and Isthmian Central American highlands).

H. The preponderance of priority level species in montane regions in Mesoamerica is evident among anurans (194 of 221 species, or 87.8%), salamanders (228 of 238 species, or 95.8%), and squamates (310 of 506 species, or 61.3%), but not among caecilians (the few species represented in both highland and lowland regions) nor turtles (all found in lowland regions).

I. The priority level one Mesoamerican endemic species are allocated to 43 of the 50 families (84.0%) represented in the endemic Mesoamerican herpetofauna as a whole, including 11 of 11 anuran families, two of two salamander families, two of two caecilian families, 24 of 30 squamate families, and four of five turtle families.

J. The science of conservation biology has not been successful in reversing the steady loss of biodiversity. This science has not even been successful in placing biodiversity decline on the global agenda to be recognized as a threat to life on Earth as serious as climate change.

K. Humans are becoming increasingly disconnected from the natural world as they become more and more urbanized and technologized. As such, they are growing less and less attuned to the life-threatening impact they are having on the life-support systems of the planet. They are increasingly losing sight of the larger picture and their own role in that larger picture.

L. The most fundamental approach conservation biologists have taken to the problem of the perpetual protection of biodiversity is to support the recognition of natural protected areas. Two major approaches to the creation of such areas have involved government-supported systems and those erected by local communities, especially indigenous ones. Neither of these approaches is sufficiently effective to address the problem of biodiversity decline, but the governmental approach is usually only partially successful, especially as it is inherently susceptible to the vagaries of the political climate and economic pressure. Thus, the local community approach has definite advantages and is the one we think holds the most promise for the future.

M. Much of the work the authors of this paper have undertaken in the last decade has been directed toward attempting to answer the immensely important question of how humans have come to embrace highly destructive worldviews that support a cascade of increasingly limited and centristic forms of thinking. These forms of thinking have been characterized as exemplary of the "mismanagement of the human mind."

N. The "mismanagement of the human mind" has been manifested as a misuse of human rational capacity that has given rise to the anthropocentric worldview and other forms of centristic thinking connected to and flowing from it, ranging from ethnocentrism to egocentrism. These centristic forms of human thought can be viewed as a cascading series of psychological ailments that have their origin in the very feature that is most definitive in humans, i.e., their rational capacity.

O. No feature evolved by any creature guarantees the success of that creature over the long term. Contrariwise, every creature is guaranteed eventual extinction. Rationality, the ability to link cause to effect through the passage of time, is no exception to this general rule. This feature became derailed as it led to the development of self-awareness and the positioning of the self within a space-time continuum, which gave rise to a fear of the inevitable (e.g., the eventual death of every human) that embroiled the members of our species in a vicious cycle of addiction and denial giving rise to violence of all types and at all levels, which led to the development of destructive worldviews reinforcing that violence.

P. In the final analysis, we do not expect that systems of protected areas will act as a salvation for the Mesoamerican priority one species for several reasons. The most important one of these is that the majority of humanity harbors worldviews that stress an unrelenting ravaging of the planetary resource base in order to fuel a global population dedicated to continual unregulated growth and continual unabated "improvement" of human lifestyles based on maximizing the rate at which resources are turned into garbage.

Q. Finally, we ask whether there is a future for the Mesoamerican priority level one species. Given that measures such as the "ecological footprint" and "Earth Overshoot Day" indicate that the human impact on the life support systems of our planet continues to increase apace leading to an increasingly unsustainable existence for our species, then our realistic appraisal is that, if measured over the long term, this highly significant component of the Mesoamerican herpetofauna does not have a future; at least not until and unless humanity transitions away from the anthropocentric worldview that increasingly worsens the impact our species has on the rest of life on the planet to adopt a new paradigm that stresses operating within the limits imposed by the provisions of the "biological contract."

Realities, Recommendations, and Predictions

A. Several anthropogenic environmental problems have achieved global dimensions as they have become increasingly ignored or simply been given lip service by people throughout the world. These problems have impacted all of the great spheres of the planet, including the atmosphere, hydrosphere, lithosphere, and, of most direct importance to this paper, the biosphere. These problems have had their impacts by utilizing the same pathways in reverse as those used by the flow of energy and the cycling of resources through planetary systems.

B. Humans have misused their rational capacity so as to adopt worldviews or ideas about the workings of the real world that depart from that reality and reinforce mindsets that operate counter to the provision of the "biological contract." In so doing, humans are not only endangering their own sustainable existence but that of the remainder of life on Earth.

C. Humans have reached a point in their history as a species on planet Earth at which the misuse of their rational capacity has given rise to problems that are being exacerbated at a rate commensurate with the exponential increase of this species' global population, so as to rise to the level of consciousness of even the most inattentive among them. The time with which to respond effectively to these problems is rapidly shortening, so that it threatens to escape the grasp of the members of our species, the one responsible for the emergence of these problems on the world stage.

D. We support the conclusions of the recently-published paper (Wilson and Lazcano 2019) entitled "Biology and society: exposing the vital linkages," that the anthropocentric worldview and its cascade of descendent forms of centristic thinking have proven to be countermandatory to the continued survival of life on Earth and have to be viewed as a set of nested psychological ailments that culminate in narcissistic personality disorder, as characterized in the *Diagnostic and Statistical Manual of Mental Disorders* (DMS-5). We recommend that several initiatives be undertaken as rapidly as possible to accomplish several ends, as outlined below.

E. Given our hypothesis that humanity has progressively reversed the survival value of rationality over the course of its history as a species of organism on planet Earth, so as to create and enmesh itself in a cascade of nested psychological disorders of increasing scope, all contributing to the advancing endangerment of all life, then the world community of environmental psychologists has to undertake a study of global dimensions in order to identify the stages of what might be identified as the *centristic personality disorder*, encompassing all levels from the species-wide anthropocentric disorder to the individualistic narcissistic personality disorder and the linkages that exist among them. Such a study would have to be underwritten and supported by a global-level consortium, such as the United Nations or the Sustainable Development Solutions Network (http://unsdsn.org), and the results presented as rapidly as conceivable at the most proximate dedicated World Government Summit. Such a study might be entitled something like: *Report of the Global Summit on the Causes and Consequences of the Anthropocentric Worldview and its Descendent Psychological Ailments on the Survival of Life on Planet Earth*.

F. Such a global level response to the psycho-ailment cascade also must be intrinsically linked to a collateral effort to reform the global systems of education with the ultimate goal of transforming the paradigm of the prevailing anthropocentric worldview to one that is based on the provisions of the "biological contract" outlined in Wilson and Lazcano (2019), that is, to a biocentric worldview that acknowledges that human life has to be restructured to exist within the limits of the parameters that allow for the continued existence of life in its totality on our planet.

G. We predict that if these initiatives are not undertaken with all dispatch that humankind will officiate over the headlong race toward the tipping points of the interlaced global environmental problems beyond which no retreat from the mass extinction abyss will be possible.

> *"We must move quickly to preserve as much as possible and to* read *the disappearing pages before they are gone forever."*
>
> Eric R. Pianka (1994)

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Addendum

We chose a cut-off date of 10 December 2019 for revising the many calculations involved in this paper. However, in the interest of completeness, we continued to include additions to the list of Mesoamerican herpetofaunal species described or elevated to the species level since Johnson et al. (2017) and Mata-Silva et al. (2019). These additions are placed below:

1. *Eleutherodactylus erythrochomus* Palacios-Aguilar and Santos-Bibiano, 2020. This frog species was described by Palacios-Aguilar and Santos-Bibiano (2020). This anuran is limited to the Pacific lowlands from Sinaloa to western Chiapas and has an EVS of 18; therefore, it qualifies as a priority level one species.
2. *Sarcohyla floresi* Kaplan, Heimes, and Aguilar, 2020. This treefrog species was described by Kaplan et al. (2020). This species is limited to the Sierra Madre del Sur and has an EVS of 13, thus placing it in priority level seven.
3. *Sarcohyla toyota* Grünwald, Franz-Chávez, Morales-Flores, Ahumada-Carrillo, and Jones, 2019. This frog species was described by Grünwald et al. (2019). This species is limited to the Sierra Madre del Sur and has an EVS of 15, therefore qualifying as a priority level one species.
4. *Bolitoglossa coaxtlahuacana* Palacios-Aguilar, Cisneros-Bernal, Arias-Montiel, and Parra-Olea, 2020. This salamander species was described by Palacios-Aguilar et al. (2020). This species is restricted to the Sierra Madre del Sur and has an EVS of 18; therefore, it qualifies as a priority level one species.
5. *Chiropterotriton casasi* Parra-Olea, García-Castillo, Rovito, Maisano, Hanken, and Wake, 2020. This salamander species was described by Parra-Olea et al. (2020). This species occurs on the southern slopes of Pico Orizaba in the Sierra Madre Oriental and has an EVS of 18; therefore, it qualifies as a priority level one species.
6. *Chiropterotriton ceonorum* Parra-Olea, García-Castillo, Rovito, Maisano, Hanken, and Wake, 2020. This salamander species was described by Parra-Olea et al. (2020). This species occurs on the southern slopes of Pico Orizaba in the Trans-Mexican Volcanic Belt and has an EVS of 18; therefore, it qualifies as a priority level one species.
7. *Chiropterotriton melipona* Parra-Olea, García-Castillo, Rovito, Maisano, Hanken, and Wake,

2020. This salamander species was described by Parra-Olea et al. (2020). This species occurs in the Sierra Madre Oriental and has an EVS of 17; therefore, it qualifies as a priority level one species

8. *Chiropterotriton perotensis* Parra-Olea, García-Castillo, Rovito, Maisano, Hanken, and Wake, 2020. This salamander species was described by Parra-Olea et al. (2020). This species occurs on Cofre de Perote in the Trans-Mexican Volcanic Belt and has an EVS of 18; therefore, it qualifies as a priority level one species.
9. *Chiropterotriton totonacus* Parra-Olea, García-Castillo, Rovito, Maisano, Hanken, and Wake, 2020. This salamander species was described by Parra-Olea et al. (2020). This species occurs on the southern slopes of Pico Orizaba in the Trans-Mexican Volcanic Belt and has an EVS of 18; therefore, it qualifies as a priority level one species
10. *Sceloporus scitulus* Smith, 1942. This taxon was described originally as a subspecies of *Sceloporus formosus* by Smith (1942), but was elevated to species level by Pérez-Ramos and Saldaña de La Riva (2008), a position accepted by Palacios-Aguilar and Flores-Villela (2018). This taxon is limited to the Sierra Madre del Sur and has an EVS of 15 (Palacios-Aguilar and Flores-Villela 2018), thus it qualifies as as a priority level one species.
11. *Crotalus ehecatl* Carbajal-Márquez, Cedeño-Vázquez, Martínez-Arce, Neri-Castro, and Machkour-M'Rabet, 2020. This rattlesnake species was described by Carbajal-Márquez et al. (2020). This snake is resident in the Pacific lowlands from Sinaloa to western Chiapas, the Sierra Madre del Sur, and the western Nuclear Central American highlands and has an EVS of 15; therefore, it qualifies as a priority level three species.

Elí García-Padilla is a herpetologist with a primary focus on the ecology and natural history of the Mexican herpetofauna, particularly the Mexican states of Baja California, Tamaulipas, Chiapas, and Oaxaca. His first experience in the field was researching the ecology of the insular endemic populations of the rattlesnakes in the Gulf of California, and his Bachelor's degree thesis was on the ecology of *Crotalus muertensis* (*C. pyrrhus*) on Isla El Muerto, Baja California, Mexico. To date, he has authored or co-authored over 100 peer-reviewed scientific publications. Elí is currently the formal Curator of Amphibians and Reptiles from Mexico in the electronic platform "Naturalista" of the Comisión Nacional para el Uso y Conocimiento de la Biodiversidad (CONABIO; http://www.naturalista.mx). One of his main passions is environmental education, and for several years he has been using audiovisual media to reach large audiences in promoting the importance of the knowledge, protection, and conservation of Mexican biodiversity. Elí's interests include wildlife and conservation photography, and his art has been published in several recognized scientific, artistic, and educational books, magazines, and websites. His present research project involves an evaluation of the Jaguar (*Panthera onca*) as an umbrella species for the conservation of the herpetofauna of Nuclear Central America.

Dominic L. DeSantis is an Assistant Professor of Biology at Georgia College and State University, Milledgeville, Georgia, USA, in the Department of Biological and Environmental Sciences. Dominic's research interests broadly include the behavioral ecology, conservation biology, and natural history of herpetofauna. Much of his current research focuses on integrating multiple longitudinal monitoring technologies to study the proximate and ultimate drivers of spatial strategies and activity patterns in snakes. Dominic accompanied Vicente Mata-Silva, Elí García-Padilla, and Larry David Wilson on survey and collecting expeditions to Oaxaca in 2015, 2016, and 2017, and is a co-author on numerous natural history publications produced from those visits, along with an invited book chapter on the conservation outlook for herpetofauna in the Sierra Madre del Sur of Oaxaca. Overall, Dominic has authored or co-authored over 50 peer-reviewed scientific publications.

Arturo Rocha is a herpetologist from El Paso, Texas, USA, whose interests include the biogeography and ecology of amphibians and reptiles in the southwestern United States and Mexico. A graduate of the University of Texas at El Paso, Arturo's thesis focused on the spatial ecology of the Trans-Pecos Rat Snake (*Bogertophis subocularis*) in the northern Chihuahuan Desert. To date, he has authored or co-authored over 10 peer-reviewed scientific publications.

Vicente Mata-Silva is a herpetologist originally from Río Grande, Oaxaca, Mexico, whose interests include ecology, conservation, natural history, and biogeography of the herpetofaunas of Mexico, Central America, and the southwestern United States. Vicente received his B.S. degree from the Universidad Nacional Autónoma de México (UNAM), and his M.S. and Ph.D. degrees from the University of Texas at El Paso, USA (UTEP). Vicente is an Assistant Professor of Biological Sciences at UTEP in the Ecology and Evolutionary Biology Program, and Co-Director of UTEP's 40,000-acre Indio Mountains Research Station, located in the Chihuahuan Desert of Trans-Pecos, Texas. To date, Vicente has authored or co-authored over 100 peer-reviewed scientific publications. He also was the Distribution Notes Section Editor for the journal *Mesoamerican Herpetology*.

Jerry D. Johnson is Professor of Biological Sciences at The University of Texas at El Paso, USA, and he has extensive experience studying the herpetofauna of Mesoamerica, especially southern Mexico. Jerry is the Director of the 40,000-acre Indio Mountains Research Station, and was a co-editor of *Conservation of Mesoamerican Amphibians and Reptiles* and co-author of four of its chapters. Jerry has authored or co-authored over 100 peer-reviewed papers and is the Mesoamerica/Caribbean editor for the Geographic Distribution section of *Herpetological Review*. One species, *Tantilla johnsoni*, has been named in his honor. Presently, he is an Associate Editor and Co-chair of the Taxonomic Board for the journal *Mesoamerican Herpetology*.

Larry David Wilson is a herpetologist with extensive experience in Mesoamerica. He was born in Taylorville, Illinois, USA, and received his university education at the University of Illinois at Champaign-Urbana (B.S. degree) and at Louisiana State University in Baton Rouge (M.S. and Ph.D. degrees). Larry has authored or co-authored more than 425 peer-reviewed papers and books on herpetology, including 18 papers from 2013–2019 on the EVS measure and the Mexican Conservation Series surveys of the composition, distribution, and conservation status of the herpetofauna of different states in Mexico and other regions in Central America. Larry is the senior editor of *Conservation of Mesoamerican Amphibians and Reptiles* and a co-author of seven of its chapters. His other major books include *The Snakes of Honduras, Middle American Herpetology, The Amphibians of Honduras, Amphibians & Reptiles of the Bay Islands and Cayos Cochinos, Honduras, The Amphibians and Reptiles of the Honduran Mosquitia*, and *Guide to the Amphibians & Reptiles of Cusuco National Park, Honduras*. To date, he has authored or co-authored the descriptions of 74 currently recognized herpetofaunal species, and seven species have been named in his honor, including the anuran *Craugastor lauraster*, the lizard *Norops wilsoni*, and the snakes *Oxybelis wilsoni*, *Myriopholis wilsoni*, and *Cerrophidion wilsoni*. In 2005, he was designated a Distinguished Scholar in the Field of Herpetology at the Kendall Campus of Miami-Dade College. Currently, Larry is a Co-chair of the Taxonomic Board for the journal *Mesoamerican Herpetology*.