Collection of voucher specimens remains a scientific gold-standard for documenting notable populations of herpetofauna. This practice can also lead to advances in the fields of comparative morphology and genetics, and can improve understanding of diet, parasite assemblage, and reproductive timing as well.Illustrated here is a small sample of amphibians and squamates collected from the states of Veracruz and Puebla, Mexico.

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Identification uncertainty and proposed best-practices for documenting herpetofaunal geographic distributions, with applied examples from southern Mexico

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Abstract: The broad-scale geographic distribution of many amphibians and non-avian reptiles is incompletely known, which negatively affects a wide range of scientific disciplines. This knowledge deficiency, however, translates to opportunity. In regions where the geographic ranges of many species are poorly known, such as Mesoamerica, novel distributional data typically is more valuable compared to that from better-studied regions. Nevertheless, this opportunity for continued major discovery in poorly studied regions is tempered by several challenges. Chief among these is an uncertainty in species-level identifications resulting from the prevalence of cryptic species and species-rich yet morphologically conservative clades. This identification uncertainty constrains the scientific utility of novel geographic distribution data now and in the future, unless the material is well documented and reported. Here, we propose four best-practices to help address this challenge: (1) author transparency when identifications are uncertain; (2) routine collection of physical voucher specimens together with digital photo vouchers; (3) reporting of specific features with known diagnostic value when identifying difficult taxa; and (4) reliance on molecular verification, or DNA barcoding, for difficult taxa. Adherence to all or some of these best-practices might be impossible under certain circumstances, but we invite the global research community to consider adopting them whenever practical. We model these best-practices herein with a set of new distribution records from southern Mexico.

Key Words: Amphibians, cryptic species, DNA barcoding, identification, Mexico, new records, reptiles

Resumen La distribución geográfica a gran escala de muchos anfibios y reptiles no avianos no se conoce completamente, lo cual afecta negativamente a una amplia gama de disciplinas científicas. Esta deficiencia en el conocimiento representa, sin embargo, también una oportunidad. En regiones donde los rangos de distribución de un número considerable de especies son generalmente poco conocidos, como en Mesoamérica, los datos de distribución novedosos son típicamente de mayor valor que aquellos provenientes de regiones mejor estudiadas. No obstante, esta oportunidad para el continuo descubrimiento en regiones poco estudias afronta varios retos. Entre ellos, uno de los más relevantes es la incertidumbre en la identificación de las especies, resultado de la prevalencia de especies crípticas y clados específicamente diversos pero morfológicamente homogéneos. Esta incertidumbre en la identificación limita en el presente y futuro la utilidad científica de los datos novedosos de distribución geográfica, a no ser que el material sea adecuadamente documentado y reportado. Aquí proponemos cuatro prácticas idóneas auxiliares en el enfrentamiento de este reto: (1) el que los autores sean honestos cuando la identificación es incierta; (2) recolectar rutinariamente ejemplares de referencia físicos; (3) reportar características específicas con valor diagnóstico conocido para justificar la identificación en taxones de difícil determinación; y (4) acudir a la verificación molecular o al código de barras genético para la identificación en taxones de difícil determinación. El apego a todas o algunas de estas prácticas idóneas podría ser imposible en determinadas situaciones, pero invitamos a la comunidad mundial de investigación a considerar la posibilidad de adoptarlas cuando sea práctico. Ejemplificamos aquí las prácticas propuestas con un conjunto de nuevos registros de distribución del sur de México.

Palabras Claves: Anfibios, código de barras genético, especies crípticas, identificación, México, nuevos registros, reptiles

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"The very basis for the entire biodiversity system and the corresponding worldwide communication is unequivocal identification."

—Amorim et al. (2016: 126)

INTRODUCTION

Broad-scale scientific understanding of the distribution of many organisms is incomplete, and this reality has negative implications for a wide range of scientific disciplines. For example, biogeographers rely on extensive locality datasets to rigorously describe patterns in the distribution of species and biotic communities (Ladle et al., 2011). More specifically, species distribution models (also known as ecological niche models) require numerous occurrence data-points for spatially accurate outputs (Boitani et al., 2011; Hermoso et al., 2015). Furthermore, model inference can be negatively affected by inaccurate specimen identifications (Lozier et al., 2009), and these models increasingly are applied to conservation decision-making (Guisan et al., 2013). Thus, inaccurate distribution records and sampling artifacts can inhibit effective reserve design and on-the-ground conservation for imperiled species, actions that depend on robust distribution data to best prioritize limited resources (Rondinini et al., 2006). Indirectly, distribution records for little-known taxa also can provide valuable material for morphological, taxonomic, and phylogenetic studies (e.g., Scarpetta et al., 2014; Wallach 2016). Regardless of their application, the evidence-based scientific credibility of locality-level distribution data is imperative.

Geographic distributions often are poorly defined in species with cryptic life histories, because their secretive behavior can lead to few encounters by scientists. Amphibians and non-avian reptiles are exemplary among vertebrates for their high proportion of species with such life histories. The issue of limited occurrence data is especially pronounced in the herpetofauna of tropical regions such as much of Mesoamerica, where numerous enigmatic species remain known only from the type locality, or from just a handful of geographically proximate sites (e.g., Campbell and Frost, 1993; Wilson et al., 2007; Campbell et al., 2010; Rovito et al., 2012; Mendelson et al., 2015). Even for widespread Mesoamerican herpetofauna, the density of occurrence data often is limited (e.g., Mendoza-Hernández et al., 2011; Aguilar-López et al., 2014, 2016).

Inadequate knowledge of the distribution of many Mesoamerican herpetofauna is, in part, a function of the region's high species richness in a global context (Mittermeier et al., 2004; Johnson et al., 2015a), leading to a dilution of geographic distribution data across a larger pool of species. In areas with less gamma diversity, such as many parts of North America north of Mexico, the available information on the distribution of a particular species often is more comprehensive. This situation can be viewed as an opportunity. In the United States, for instance, high-value novel herpetofaunal distribution data is reported infrequently (non-native species introductions excepted [see Krysko et al., 2011]). In Mesoamerica, however, range extensions and new state- or country-level records are published regularly (e.g., Derry et al., 2015; Morales et al., 2015; Ramírez-González and Canseco-Márquez, 2015). Mesoamerica remains an area of great opportunity for unexpected biogeographic discoveries, many with immediate implications for the conservation and management of rare species (e.g., Luría-Manzano et al., 2014; Bouzid et al., 2015; Barrio-Amorós et al. 2016).

The Mexican herpetofauna epitomizes these broader patterns of diversity and discovery in the Americas. Mexico supports the richest assemblage of any country in Mesoamerica, with over 1,200 species of amphibians and non-avian reptiles (Flores-Villela and García-Vázquez, 2014; Parra-Olea et al., 2014). In contrast, North America north of Mexico supports only about one-half as many species (Crother et al., 2012), despite the continental United States alone being over four times the size of Mexico. Within this biodiverse setting, the topographically and climatically heterogeneous landscape of southern Mexico stands out for its exceptional species richness. Based on recent compendiums, the large southern states of Oaxaca and Chiapas support at least 442 and 330 herpetofaunal species, respectively (Johnson et al., 2015b; Mata-Silva et al., 2015). Recent clarification of the species assemblage in these states has revealed a number of surprising discoveries, and warrants additional attention (Canseco-Márquez and Ramírez-Gonzalez, 2015; Hernández-Ordóñez et al., 2015). These publications include new species descriptions (e.g., Campbell et al., 2016; Gray et al., 2016), catalogues of local or regional species composition (e.g., Colston et al., 2015; Hernández-Ordóñez et al., 2015), and multi- or single-species distribution records (e.g., Castañeda-Hernández et al., 2015; Scarpetta et al., 2015). In this contribution, we announce some additional novel records for the first time.

While researching these records, however, we encountered three important challenges that we believe exist for all students of the Mesoamerican herpetofauna. These challenges are especially relevant to those who pursue the publication of geographic distribution records. Our objective in this report is to: (1) define these three challenges, focusing on the especially problematic case of identification uncertainty; (2) present four situationally dependent best-practices for documenting and reporting novel herpetofaunal distribution records, which we hope will alleviate the effects of this latter challenge; (3) discuss possible issues associated with the implementation of these best-practices; and (4) model these best-practices using a set of novel distribution records from southern Mexico. Although the data we present here is regional in scope, the challenges we describe warrant attention by researchers of poorly studied tropical herpetofauna worldwide.

CURRENT CHALLENGES

The challenges we identified fall into two separate categories of taxonomic and distributional considerations, for the community and the individual. We differentiate these categories based on the ability of researchers to directly address them in their work.

Taxonomic and Distributional Considerations for the Community

The first category involves two challenges that, although worthy of increased recognition, cannot be "fixed" easily by the individual. We mention them here to boost awareness among the practitioner community.

One challenge is the often-misleading nature of range map polygons in regional and taxonomic treatments and field guides (e.g., Lee, 1996, 2000; Campbell and Lamar, 2004; Köhler, 2008, 2011). In many cases, these maps over-extrapolate from a handful of known records (e.g., *Typhlops* [*Amerotyphlops*] *tenuis* map in Köhler [2008]), or fail to account for biogeographic patterns that could improve range predictions (e.g., exclusion of western Selva Lacandona, Chiapas from many species maps in Lee [1996, 2000] and Köhler [2008, 2011]). Furthermore, these maps sometimes do not reflect primary literature data available at the time of their release, much less today. Such maps do allow the public to grasp the general distribution of a specific taxon, and we do not denigrate that value; however, we simply caution researchers against over-reliance on these maps when investigating new records. Placing greater emphasis on primary-source literature will improve research accuracy.

This brings us to the second challenge within this category: the vast recent increase in, and progressively diffuse nature of, the herpetofaunal distribution literature. Contemporary discoveries are spread across a large and growing number of journals. For Mesoamerica alone, these outlets include Alytes, Amphibian & Reptile Conservation, Check List, Herpetological Review, Herpetology Notes, Phyllomedusa, Poeyana, Revista Mexicana de Biodiversidad, Revista Mexicana de Herpetología, Salamandra, The Southwestern Naturalist, and of course this journal. Many of these journals now are open-access, with article PDFs available online, and with searchable text. Some of them, however, remain obscure, are not indexed, and are published across multiple languages. This leads to increasing difficulty by researchers in synthesizing all relevant literature when assembling novel findings. We emphasize that we support the publication of articles in languages other than English, because this practice is more inclusive and facilitates the democratization of knowledge production. Our point is that due diligence by researchers now requires extensive effort, and multilingual abilities.

Taxonomic and Distributional Considerations for the Individual

Of more relevance to the scientific community, and upon which we focus for the remainder of this contribution, is a pervasive challenge that individual researchers can counteract in their work: uncertainty in specimen identification (Fig. 1). The primary engines for this challenge within the Mesoamerican herpetofauna are: (1) a high frequency of species that are distinguished from congeners by subtle morphological features; (2) poor characterization of intra- and inter-specific variation; and (3) incomplete understanding of species limits, both taxonomically and geographically. When one or more of these issues pertains to a potential new geographic record, the specimen(s) in question might be misidentified or unverifiable, thus calling the very basis of the record into question. Transparency and alternative identifications should be addressed by authors in such cases, but failing this, additional best-practices become warranted.

Specimen identification of many members of the Mesoamerican herpetofauna requires cautious, highly detailed analysis of physical features. Numerous taxa are remarkably difficult to confidently identify morphologically (hereafter referred to as "difficult taxa") (e.g., Hillis and Wilcox, 2005; Rovito et al., 2013; Blair et al., 2015; Wallach et al, 2016). In part, this difficulty stems from the reliance of published keys on qualitative rather than discrete features, or reliance on subtle, inconspicuous features that are all but impossible to assess solely from photos in life (e.g., Campbell and Savage, 2000; Duellman, 2001). Publishing a distribution record of a difficult taxon based only on photographs not only limits the scientific value of that record (Reynolds and McDiarmid, 2012; Gotte et al., 2016), but also can lead to substantial misidentification rates (Austen et al., 2016). Furthermore, there is increasing recognition that morphologically conservative, cryptic species are widespread among the Mesoamerican herpetofauna (e.g., Jadin et al., 2012; Bryson Jr. et al., 2014; Camp and Wooten, 2016). What is considered one species today might be recognized as multiple, subtly differentiated species in the future.

Compounding these factors is a deficiency in our understanding of morphological variation within and between species of Mesoamerican herpetofauna. Limited comparative material exists for many taxa, and some are known to science from just a handful of specimens. For rarely-seen species of immediate conservation concern, this is particularly true (e.g., Campbell and Frost, 1993; Mendelson et al., 2015). A sustained surge in recent descriptive work involving the Mesoamerican herpetofauna (e.g., van der Heiden and Flores-Villela, 2013; Pavón-Vázquez et al., 2014; Kubicki and Salazar, 2015; Wallach, 2016) demonstrates the current severity of this knowledge gap. A novel distributional record may be represented by specimen(s) that do not exactly match topotypic material (Mendelson and Canseco-Márquez, 2002; Ramírez-Bautista et al., 2013), potentially complicating their identification to the species level. Similarly, new material may reveal that physical feature(s) formerly considered diagnostic for a species may, in fact, be diagnostically uninformative (Clause et al., 2016; Lara-Tufiño et al., 2016). Although it may be unsurprising that novel material for rare species often differs from type material, this reality has clear implications for accurate identification, and deserves close attention.

Selected Difficult Taxa

Causes of Identification Uncertainty

Prevalence of undescribed species
Chiropterotriton, *Phyllodactylus*, *Xenosaurus*

Cryptic species lumped within existing species
Micrurus, *Bothriechis schlegelii*, *Holcosus*

Species complexes requiring taxonomic revision
Bolitoglossa mexicana group, *Ptychohyla*, *Trachemys*

Range limits biogeographically ill-defined
Oedipina, *Anolis*, *Lampropeltis triangulum* group

Species diagnosed primarily using DNA
Chiropterotriton, *Thorius*, *Crotalus triseriatus* group

Subtle diagnostic external features
Bufo (*Incilius*), *Craugastor*, *Cerrophidion*

Few diagnostic external features
Cryptotriton, *Rana pipiens* group, Scolecophidia

Best-practice Solutions and Applied Examples

Author transparency when species-level identification of new material is uncertain
Craugastor laticeps, *Sibon nebulatus*, *Typhlops* (*Amerotyphlops*) *tenuis*

Collection of physical and photographic vouchers
Physical vouchers for all 28 modeled species and photographic vouchers for most

Description of diagnostic external features for morphologically challenging taxa
Craugastor laticeps, *Stenorrhina freminvillei*, *Micrurus diastema*, *M. ephippifer*, *Typhlops* (*Amerotyphlops*) *tenuis*

Reliance on molecular verification to support identification of morphologically challenging taxa
Bolitoglossa hartwegi, *B. stuarti*

Fig 1. Identification uncertainty examples, causes, and solutions. The left panel shows examples of difficult taxa, illustrating the broad taxonomic breadth of this problem. The center panel describes causes of identification uncertainty, with additional example taxa. The right panel lists best-practice solutions, and itemizes their application across the 28 model taxa we present in this contribution. Note that for several example taxa (e.g., *Craugastor*), multiple categories of identification uncertainty apply, even though each taxon is listed under only one cause.

Finally, many supraspecific taxa contain undescribed species with poorly defined geographic range limits, and are recognized as needing major taxonomic revisions to clarify their status (e.g., Campbell and Savage, 2000; García-París et al., 2002; Nieto-Montes de Oca et al., 2017). When publishing novel distribution data for members of such difficult groups, caution and transparency should prevail in attributing new material to an existing taxon. This is particularly true if new material originates from a geographic location intermediate between two morphologically similar taxa previously believed to be allopatric. Such cases warrant consideration of four possible outcomes for the identity of the new material (Fig. 2). Justification for any of these outcomes likely will necessitate careful comparison of external features, and possibly DNA markers, with type or topotypic material. Biogeography also can factor into the determination, particularly if the taxa in question occupy discontinuous habitats with known geographic barriers to dispersal (such as mountains, valleys, or bodies of water).

Problems of accuracy in specimen identification therefore arise on a regular basis, when new material is announced and attributed to a species with minimal rigor in reporting how the identification was reached. Frequent lack of physical material, attendant inability to rigorously justify species-level identification of that material, and subsequent lack of author transparency in reporting that uncertainty, represent what we feel are widespread contemporary problems in the geographic distribution literature for Mesoamerican herpetofauna. Here, we identify several potential solutions that are comparatively inexpensive and logistically feasible.

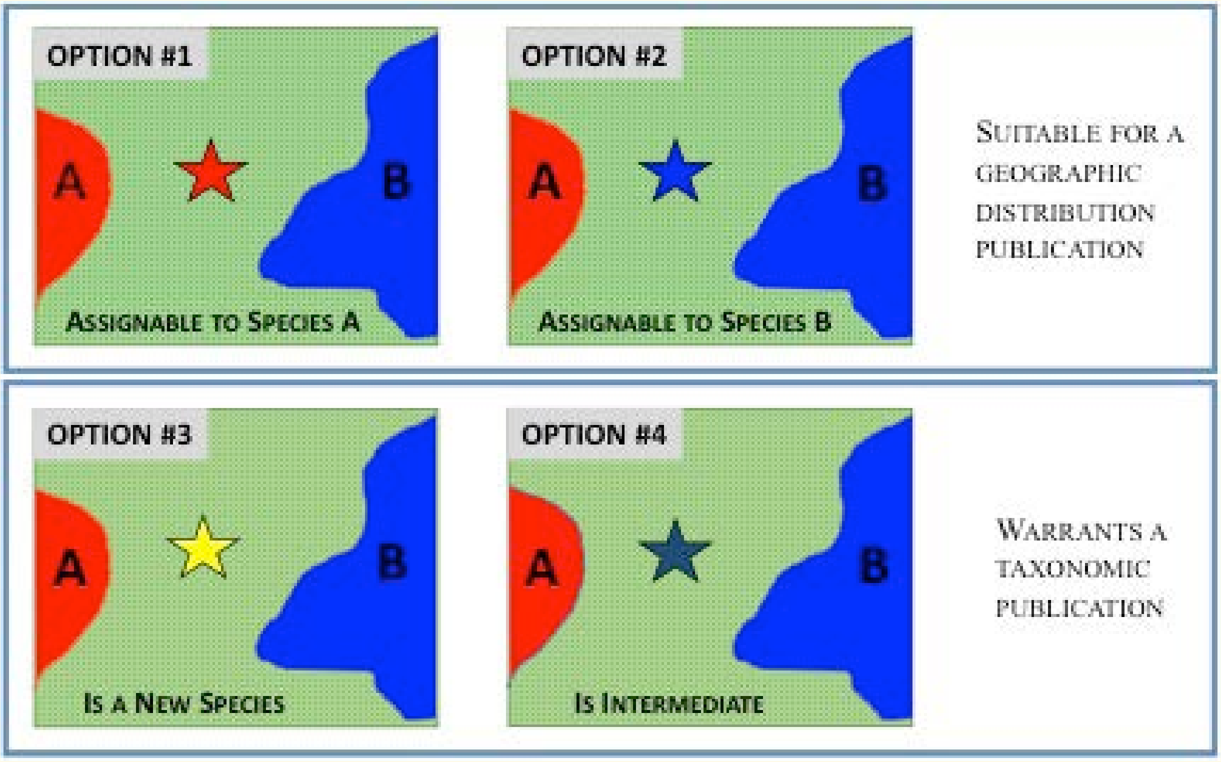

Fig 2. Four identification options for new material encountered outside the known range of closely-related species. The star in each panel represents the new material. Justifying the selection of any option will likely require detailed comparative study of external features and possibly DNA, within the context of biogeography.

POTENTIAL SOLUTIONS

To help researchers address this suite of problems associated with specimen identification, we propose four situationally dependent best-practices for scientific research and publication (Fig. 1).

First, we argue that when confidence in specimen identification is low or conflicted, authors simply should be transparent about that uncertainty. We advise a simple statement indicating that the identification is tentative. As needed, this statement can be supplemented with a brief discussion of possible alternative taxa that the specimen(s) may represent, and a short literature summary for species with unstable or controversial taxonomic histories. Consideration of biogeographic patterns, and how they might inform or complicate an identification, also is worthwhile. The importance of transparency in science has been discussed elsewhere (e.g., Parker et al., 2016). With respect to the current context of uncertain identifications, transparency also is promoted if physical specimens are vouchered (see below), because they may then inspire subsequent research or allow future researchers to use these specimens in taxonomic revisions (e.g., Wallach, 2016). Additionally, this academic honesty will help to ensure that records associated with potentially misidentified material are treated as provisional by the scientific community, and are not allowed to unduly influence conservation efforts (Jackson, 2006; Roberts et al., 2010).

Second, we argue that routine collection of both physical vouchers and digital photo vouchers, and their deposition in a reputable museum, is a valuable standard for field workers wishing to publish in peer-reviewed outlets. In our concept of physical vouchers, we include both whole-body specimens and genetic tissue samples. Physical vouchers are consistently upheld as the gold-standard of scientific documentation (McDiarmid, 1994; Simmons, 2002; Dubois and Nemésio, 2007; Gamble, 2014; Rocha et al., 2014; Amorim et al. 2016). In part, this is because other researchers can later re-examine the material to confirm or refute its identification, and can incorporate that material into future taxonomic revisions (Vonesh et al., 2010; Reynolds and McDiarmid, 2012; Gotte et al., 2016).

The numerous short- and long-term benefits of using specimens, instead of using only photographs, for improving accuracy and verifiability in documenting biodiversity have been discussed extensively elsewhere (e.g., Dubois, 2009; Amorim et al. 2016). Furthermore, controlled trials have revealed substantial misidentification rates associated with photographs, among expert and non-expert observers (Austen et al., 2016). Nonetheless, because colors in life rarely preserve well, photographs of living specimens remain strong complements to physical vouchers (Barry, 2012; Reynolds and McDiarmid, 2012; Simmons, 2015). We advocate the continued use of digital color photographs to support specimen identifications, but photographs should only replace physical vouchers in certain exceptional cases, such as when lack of appropriate permits or specimen size (e.g., large squamates, turtles, or crocodilians) prevents collection.

Third, we argue that for difficult taxa, explicit morphological support for identifications should be provided in the publication. This support can take the form of verbal descriptions, illustrations, or (ideally) both. In all cases, it is vitally important that the physical features presented are those deemed diagnostic by species authorities, as published in original species descriptions or in peer-reviewed dichotomous keys. This best-practice is particularly warranted for species easily confused with congeners and/or those known from minimal scientific material, which encompass a significant portion of the Mesoamerican herpetofauna. Nonetheless, we caution authors against the pitfall of diluting these truly important features with generalized descriptions of morphology. By emphasizing and relying upon diagnostically valid features, researchers not only can enhance scientific credibility for their identification, but also directly contribute to a better understanding of what is or is not a diagnostic feature for a given taxon. When enigmatic herpetofaunal species are documented from new localities in Mesoamerica, they often differ in key ways from type material (e.g., Bille, 2001; Cruz-Elizalde et al., 2015; Kubicki and Salazar, 2015; Scarpetta et al., 2015). Opportunities to simultaneously advance understanding of a species' geographic distribution and morphological variation are linked by the issue of identification, which is equally significant to both research fields.

Fourth, we argue that for some taxa, molecular verification of species easily confused with congeners is a critical element of species diagnosis. The last several decades have brought a growing recognition of the pervasiveness of cryptic species in Mesoamerica that are difficult to distinguish on morphological grounds (e.g., Jadin et al., 2012; Bryson Jr. et al., 2014; Camp and Wooten, 2016; Wallach, 2016). For such taxa, DNA barcoding and/or other more general DNA sequencing methods can be useful tools for specimen identification (Beebee, 2010; Schulte II, 2012). Molecular verification techniques are slowly gaining prominence in the geographic distribution literature (Hertz et al., 2013; Bouzid et al., 2015; Caviedes-Solis et al., 2015; Townsend et al., 2015; Hofmann et al., 2016), yet they remain underused and may warrant more widespread adoption (but see Collins and Cruickshank, 2013). Nonetheless, barcodes often are limited to single mtDNA fragments that may not represent the underlying evolutionary history of a population (Nichols, 2001). Additionally, barcoding is reliant upon both the prior availability of sequence data, and the correct identification of previously barcoded specimens. The latter may be difficult, however, if genetic samples from type or topotypic specimens are unavailable. Thus, although usually complementary to morphology-based specimen identifications, we caution that barcoding-based specimen identifications should be interpreted carefully. Ultimately, molecular verification is imperative for rigorous specimen identification in morphologically conservative clades, but is not necessary for the majority of Mesoamerican herpetofauna.

IMPLEMENTATION AND IMPLICATIONS OF PROPOSED SOLUTIONS

Implementation of these four proposed best-practices necessitates additional effort and training compared to less rigorous reporting techniques. As such, these methods have broader implications for the rate of knowledge production. We suggest, however, that they are not as time-intensive as sometimes perceived, nor do they necessarily prevent dissemination of scientific information.

Techniques for collecting and preserving whole-body specimens and tissues are not difficult to learn (Gotte et al. 2016), and several excellent instruction manuals exist (e.g., McDiarmid, 1994; Simmons, 2002; Barry, 2012; Gamble, 2014; Simmons, 2015; Gotte et al., 2016). Moreover, museum curators often provide support in the form of equipment (such as tags and preservatives) to collectors who donate to their institution. Many reputable natural history museums are available to accept and curate herpetological specimens, with enough staff and resources to make those specimens freely available to the broader scientific community. Sabaj (2016) lists over 40 institutional herpetological collections currently active in Mesoamerica, with at least one in each mainland country.

DNA barcoding and similar molecular verification techniques now can be done comparatively quickly and inexpensively, as demonstrated by the growing frequency of such data in geographic distribution records. These techniques are far simpler, cheaper, and less time consuming compared to genomic or multi-gene sequencing, or inference of phylogenetic trees. The mainstreaming of genetics within the field of herpetology, furthermore, has lowered access barriers for individual researchers who lack skills in genetics techniques (Gamble, 2014). We are aware of the social and economic circumstances that prevail in much of Mesoamerica, and which may hinder access to molecular techniques. Collaboration with scientists that possess genetics resources and expertise, however, is now easier than ever. We encourage such collaborations, by vocational and avocational herpetologists alike.

Obtaining scientific collecting permits for whole-body specimens and/or tissues rarely is easy, and generally is a time-consuming process—not only in Mesoamerica but worldwide (Duellman, 1999; Simmons, 2015; Fisher, 2016). Advance planning is crucial (Duellman, 1999; Das, 2016), but there are several valid reasons why researchers or environmental workers may not obtain collecting permits prior to planned fieldwork. In such cases, photographs may be the only legal method of documenting a novel distribution record. Nonetheless, we suggest that complications with obtaining permits should not excuse those interested in publishing novel distribution records from seeking permits to begin with. Collaborating with an established researcher who maintains active collecting permits is a simple, cost-effective way of ensuring the legality and integrity of collection-based field studies (Duellman, 1999; Schulte II, 2012).

A few authors continue to try and establish a link between lethal scientific collecting and declines of rare species (Donegan, 2008; Minteer et al., 2014; Henen, 2016). We maintain that it is widely accepted that limited scientific collecting does not appreciably increase the risk of species extinction or population extirpation (Dubois and Nemésio, 2007; Dubois, 2009; Nemésio, 2009a; Nemésio, 2009b; Krell and Wheeler, 2014; Poe and Armijo, 2014; Rocha et al., 2014; Marshall and Evenhuis, 2015). Explicit or implied claims that limited specimen collecting is at odds with conservation of imperiled herpetofauna (e.g., Gentile and Snell, 2009, Minteer et al., 2014; Henen, 2016) either lack supporting evidence, rely on examples that have been debunked, or invoke unrelated philosophical issues of morality (for discussion see Dubois and Nemésio, 2007; Dubois, 2009; Nemésio, 2009b; Rocha et al., 2014; Krell and Wheeler, 2014). The notion that a population can be threatened by collecting just one specimen to document a new locality, even for the rarest of Mesoamerican herpetofauna, is unsupported by existing data and thus should not dissuade its practice.

Although we advocate the routine collection of physical vouchers for difficult taxa, we recognize that a single clear photograph of the dorsal habitus, with no additional data, is sufficient for confident identification of many species of Mesoamerican herpetofauna. Numerous Mesoamerican taxa, however, warrant taxonomic updates and are considered by authorities to contain unrecognized or undescribed species-level lineages (e.g., Hedges, 2008; Campbell et al., 2010; Parham et al., 2015; Nieto-Montes de Oca et al., 2017). Taxonomic revisions may replace species-diagnostic external features with subtler features (Jadin, 2012; Bryson, 2014; Ruane et al., 2014; Arias et al., 2016; Lara-Tufiño et al., 2016), with features impossible to evaluate from digital images of live animals (Rovito et al. 2013; Rovito et al., 2015), or with genetic markers (Parra-Olea, 2003; Rovito et al., 2013; Blair et al., 2015). As such, a researcher who vouchers only photographs risks his or her records becoming un-attributable and scientifically uninformative in the future (Gotte et al., 2016). Managing that risk necessitates the routine collection of both specimens and photographs when documenting novel distribution records in Mesoamerica, regardless of the simplicity in identifying the taxa at the time of discovery.

The proposed best-practices we outline here are intended to start a discussion in our community and maximize the immediate and long-term value of our communities' efforts. We feel there is a strong parallel benefit, both socially and scientifically, offered by online citizen scientist initiatives such as NaturaLista and iNaturalist (O'Donnell and Durso, 2014), to which many of us also contribute. Although valuable and often incorporated into peer-reviewed scientific research (e.g., Condon et al., 2016; Pavón-Vázquez et al., 2016), these initiatives by design have different aims, methods, and standards. As such, the best-practices we advocate do not apply to citizen science projects, nor should citizen science documentation methods necessarily carry over to peer-reviewed journals.

In sum, we invite the diverse community of scientists and naturalists who publish peer-reviewed herpetofaunal distribution records in Mesoamerica to consider ascribing to the four best-practices we have outlined when warranted and practical. Given the typically high scientific value of these records on a per-unit basis across

Mesoamerica, we suggest that publication of new records from this region should reflect a similarly high standard of documentation and research. Adoption of these best-practices will minimize errors in identification, maximize the long-term identifiability of material, and maximize the scientific benefit of novel distribution records to researchers studying molecular and morphological diversity. Moreover, the issues we have raised are not unique to studies of Mesoamerican herpetofauna. We suggest that students of poorly known herpetofauna worldwide might benefit from considering the application of these best-practices to their own work.

APPLIED EXAMPLES OF PROPOSED BEST-PRACTICES

The remainder of this contribution models the best-practice techniques we advocate. None of the records that we present models all four of our recommendations (Fig. 1), and many records model just one: collection of both physical specimens and digital photographs. Once again, this emphasizes that our proposed best-practices are situationally dependent. Moreover, we purposely have withheld several especially difficult species records from this contribution. The amount of detail and discussion necessary to properly report each of them (i.e., application of all four best-practices, plus a detailed comparison of new material against historical specimens) requires a full article.

Herein, we announce 33 notable distributional records from eight species of amphibians and 18 species of squamate reptiles in southern Mexico. These include 21 records from the state of Chiapas, seven from Tabasco, and five from Oaxaca. Among these are 10 range extensions and two state records (one each from Chiapas and Tabasco). The IUCN Red List categorizes three of these species as threatened (*Eleutherodactylus leprus*, Vulnerable; *E. syristes*, Endangered; *M. ephippifer*, Vulnerable), indicating the potential value of these records for conservation work (IUCN, 2016).

Where appropriate, in the species accounts we include supplemental information on diagnostic physical traits, DNA barcoding, taxonomy, and brief summaries of existing regional distribution data. For particularly difficult-to-identify specimens, we obtained sequences of the mitochondrial loci encoding for the cytochrome *b* protein (*cyt-b*) using standard PCR protocols. Molecular-based identifications were made through BLAST© searching in GenBank©. We also include photographs for most taxa. Each of these photographs clearly illustrates one or more physical features important for specimen identification at the species level (Figs. 3, 4). For all records, we deposited a whole-body specimen and a tissue sample (typically liver) at the Museo de Zoología "Alfonso L. Herrera," Facultad de Ciencias, Universidad Nacional Autónoma de México, México, D.F., Mexico (MZFC-HE, formerly MZFC). Museum abbreviations for specimens from other collections, when cited in the species accounts, follow Sabaj (2016). Datum for all coordinates is WGS 84.

Order Caudata

Family Plethodontidae

***Bolitoglossa hartwegi* Wake & Brame, 1969.** CHIAPAS: Municipio de Las Margaritas, NNE of Comitan, 1.9 road km NE of Yashá (16.40294°N, 92.05644°W); elev. 1,870 m; 27 December 2014; Carlos J. Pavón-Vázquez, Chris M. Murphy, Adam G. Clause. A young adult (MZFC-HE 30389) found in mixed oak-pine forest, within the leaves of a rooted arboreal bromeliad. On 16 August 2015 at 1440 h, Justin K. Clause and Adam G. Clause collected a second adult (MZFC-HE 30390) under a rock at the same locality. Due to challenging diagnostic morphology and multiple *Bolitoglossa* species being possible in the region, we verified the identity of the first specimen using cyt-*b* sequence data (GenBank Accession No. KX399853; 98% similar [expect = 4e-85] to HQ009996.1), and morphologically the second specimen is indistinguishable from the first. This locality is the southeastern-most in Chiapas, and lies 25 km ESE from the nearest vouchered locality of "35 mi SE of San Cristóbal de las Casas," Municipio de Comitán de Dominguez, Chiapas (MVZ 66191). It partially fills a 98 km gap in the range between MVZ 66191 and "10.3 road km E of Yalambojoch," Huehuetenango, Guatemala (MVZ 265224–265226). A locality for *B. hartwegi* in this gap is reported from Parque Nacional Lagos de Montebello (Muñoz Alonso, 2010), but it is not supported by a vouchered specimen or photograph. The disjunct population cluster of *B. hartwegi* in the Sierra de los Cuchumatanes in Huehuetenango and Quiché, Guatemala, has been suggested to represent an undescribed species (Parra-Olea and García-París, 1998), further highlighting the importance of our easternmost Meseta Central record.

Fig 3. Amphibian species representing notable distribution records. Left to right, top to bottom: *Bolitoglossa hartwegi* (MZFC-HE 30390), *B. rufescens* (MZFC-HE 30391), *B. stuarti* (MZFC-HE 30393), *Craugastor laticeps* (MZFC-HE 30400), *Tlalocohyla picta* (MZFC-HE 30417), *Hyalinobatrachium fleischmanni* (MZFC-HE 30403), *Eleutherodactylus* (*Syrrhophus*) *leprus* (MZFC-HE 30401), and *E.* (*S.*) *syristes* (MZFC-HE 30402).
© Adam G. Clause

***Bolitoglossa rufescens* (Cope, 1869).** CHIAPAS: Municipio de Las Margaritas, southwestern outskirts of San Quintín west of Laguna Miramar (16.39316°N, 91.34147°W; elev. 210 m; 23 December 2014; Adam G. Clause, Chris M. Murphy, Carlos J. Pavón-Vázquez, Levi N. Gray, Eric W. Schaad. An adult (MZFC-HE 30391) found at 2200 h in disturbed forest, crawling at a height of 4 m on the outer leaves of a large tank bromeliad. This locality represents the first record for the municipality, and lies 50 km NW of the nearest vouchered locality of Ejido Loma Bonita, Municipio de Ocosingo, Chiapas (Hernández-Ordóñez et al., 2015). CHIAPAS: Municipio de Ocosingo, southwestern foothills of the Meseta Agua Escondida, 12 airline km NNW of San Quintín (16.49691°N, 91.39732°W); elev. 470 m; 24 December 2014; Levi N. Gray, Eric W. Schaad, Carlos J. Pavón-Vázquez, Chris M. Murphy, Adam G. Clause. A young adult (MZFC-HE 30392) found at 2210 h in intact lowland tropical rainforest, perched at a height of 1 m on herbaceous vegetation after an evening rainstorm. This locality lies 57 km SE of the nearest vouchered locality of Yaxoquintela, Municipio de Ocosingo, Chiapas (CM 88768–88769). Together these two localities near San Quintín partially fill a 119 km gap in the species' range between Yaxoquintela and Ejido Loma Bonita. Campbell et al. (2010) elevated former *B. rufescens* populations from the Sierra de Caral,

Fig 4. Squamate species representing notable distribution records. Left to right, top to bottom: *Anolis* (*Norops*) *capito* (MZFC-HE 30386), *A.* (*N.*) *compressicauda* (MZFC-HE 30388), *Lepidophyma flavimaculatum* (MZFC-HE 30407), *Corytophanes cristatus* (MZFC-HE 30399), *Manolepis putnami* (MZFC-HE 30410), *Leptodeira maculata* (MZFC-HE 30408), *L. polysticta* (MZFC-HE 30409), *Stenorrhina freminvillei* (MZFC-HE 30416), *Sibon nebulatus* (MZFC-HE 30414), *Tropidodipsas sartorii* (MZFC-HE 30418), *Micrurus diastema* (MZFC-HE 30411), *M. ephippifer* (MZFC-HE 30412), *Bothriechis bicolor* (MZFC-HE 30395), *B. schlegelii* (MZFC-HE 30396), and *Typhlops* (*Amerotyphlops*) *tenuis* (MZFC-HE 30419). © Peter A. Scott (*Sibon nebulatus* and *Micrurus ephippifer*), all others by Adam G. Clause

Izabal, Guatemala, to full species status, and suggested the presence of additional cryptic species diversity within *B. rufescens* from Mexico and Guatemala. Furthermore, Wake and Lynch (1976) questioned the validity of *B. occidentalis* with respect to *B. rufescens*, with the former presumably known from the Pacific versant of Mexico and Guatemala. We report on Atlantic versant specimens of presumed *B. rufescens* here to encourage additional taxonomic research into this complex.

Bolitoglossa stuarti **Wake & Brame, 1969.** CHIAPAS: Municipio de Las Margaritas, near Nueva Aurora 6.3 road km W of the Las Margaritas centro (16.30448°N, 92.03526°W); elev. 1,700 m; 22 December 2014; Levi N. Gray, Adam G. Clause, Eric W. Schaad, Chris M. Murphy, Carlos J. Pavón-Vázquez. An adult male (MZFC-HE 30393) found at 1445 h in mixed tropical forest, within a bromeliad on an oak tree. On 17 August 2015 at 2105 h, Justin K. Clause and Adam G. Clause also found a subadult conspecific (MZFC-HE 30394) a few dozen meters east of this locality in mixed tropical forest, crawling at a height of 1.5 m on a sapling during light rain. Due to challenging diagnostic morphology and multiple *Bolitoglossa* species being possible in the region, we verified the identity of the first specimen using cyt-*b* sequence data (GenBank Accession No. KX399852; 99% similar [expect 8e-83] to HQ010009.1), and morphologically the second specimen is indistinguishable from the first. These specimens represent the first records for the municipality, and extend the species' range 23 km N of the nearest vouchered locality of "1.4 mi S of La Trinitaria," Municipio de La Trinitaria, Chiapas (LACM 44210). Our specimens also represent a slight elevation record, 40 m higher than the previous maximum of 1,660 m (Campbell et al., 2010). This species is known from fewer than a dozen localities range-wide, adding to the significance of our discovery (Wake and Brame, 1969; Campbell et al., 2010).

Order Anura

Family Centrolenidae

Hyalinobatrachium fleischmanni **(Boettger, 1893).** TABASCO: Municipio de Huimanguillo, along the road to Ejido Francisco J. Mujica 7.2 road km WSW of the Mex-145 intersection (17.38561°N, 93.64211°W); elev. 280 m; 30 December 2014; Adam G. Clause, Carlos J. Pavón-Vázquez. Three adult frogs (an amplexing pair and a lone male; MZFC-HE 30403–30405) found at 0100 h along a small, rocky tributary of the Río Pedregal that flows out of the northern foothills of Cerro Las Flores. TABASCO: Municipio de Huimanguillo, along the road to Ejido Francisco J. Mujica 5.7 road km WSW of the Mex-145 intersection (17.38036°N, 93.63391°W); elev. 350 m; 24 August 2015; Adam G. Clause, Justin K. Clause. An adult male (MZFC-HE 30406) found at 2025 h along a second small, rocky tributary of the Río Pedregal. All of the frogs were perched on leaves at a height of 0.5–2 m, overhanging or near the flowing streams. Sánchez Soto et al. (2016) reported *H. fleischmanni* from approximately 7 km south of our sites in the same municipality, representing the only published record for the state of Tabasco. Sánchez Soto et al. (2016), however, did not voucher the single specimen they observed, and the photo included in their publication is difficult to interpret for identification purposes. With respect to vouchered records of *H. fleischmanni*, ours lie 56 km ESE of the nearest locality of Ejido Piedritas, Municipio de Las Choapas, Veracruz (Pavón-Vázquez et al., 2015), and partially fill a 117 km gap in the species' range between Ejido Piedritas and "Solusuchiapa" [=Solosuchiapa], Municipio de Solosuchiapa, Chiapas (UMMZ 122780).

Family Craugastoridae

Craugastor laticeps **(Duméril, 1853).** CHIAPAS: Municipio de Ocosingo, southwestern foothills of the Meseta Agua Escondida, 12 airline km NNW of San Quintín (16.49561°N, 91.39848°W); elev. 460 m; 24 December 2014; Levi N. Gray, Eric W. Schaad, Chris M. Murphy, Carlos J. Pavón-Vazquez, Adam G. Clause. An adult female (MZFC-HE 30400) found at 2050 h in intact lowland tropical rainforest, under a decaying log after an evening rainstorm. We confirmed this frog's identity on the basis of its large size (> 60 mm snout–vent length), a suprascapular (or transverse scapular) fold, a dark face mask, glandular dorsolateral ridges or folds, finely granular dorsal skin texture, and lack of toe webbing. Savage (1987) discussed the taxonomy of this species at length, and its known distribution consists of several disjunct populations (Savage, 1987; Lee, 1996). We suspect that additional sampling may reveal cryptic diversity in this taxon, and hope that the specimen we announce here will help stimulate this research. Our record lies 35 km SSE of the nearest vouchered locality of Lago Ocotal, Municipio de Ocosingo, Chiapas (MCZ 28225–28229), and partially fills a 90 km gap in the species' range between Lago Ocotal and Selva Loma, Ejido Loma Bonita, Municipio de Ocosingo (Hernández-Ordóñez et al., 2015).

Family Eleutherodactylidae

***Eleutherodactylus (Syrrhophus) leprus* (Cope, 1879).** CHIAPAS: Municipio de Maravilla Tenejapa, road to Amatitlán through Guadalupe Miramar, 10.8 road km N of Mex-307 intersection (16.21533°N, 91.31293°W); elev. 220 m; 28 December 2014; Levi N. Gray, Adam G. Clause, Carlos J. Pavón-Vázquez, Chris M. Murphy, Eric W. Schaad. An adult (MZFC-HE 30401) found at 2040 h in intact lowland tropical rainforest, under a rotten log in leaf litter atop porous limestone bedrock. This specimen represents the first record of this species from the municipality, and extends the species' range 34 km WNW of the nearest locality of Ruinas, Montes Azules Biosphere Reserve, Municipio de Ocosingo, Chiapas (Hernández-Ordóñez et al., 2015).

***Eleutherodactylus (Syrrhophus) syristes* (Hoyt, 1965).** OAXACA: Municipio de Candelaria Loxicha, Mex-175, 17.0 road km N of Candelaria Loxicha (15.97557°N, 96.50033°W); elev. 1,400 m; 15 December 2014; Peter A. Scott, Levi N. Gray, Adam G. Clause. An adult (MZFC-HE 30402) found at 0030 h, hopping among roadside leaf litter and organic debris. Although nearly totoptypic, this specimen represents the first record for the municipality, and lies 5 km SE of the nearest locality of "62.5 road km N of Pochutla" (Hoyt, 1965).

Family Hylidae

***Tlalocohyla picta* (Gunther, 1901).** CHIAPAS: Municipio de Las Margaritas, along the road to Las Margaritas (Mex-218), 29 road km WSW of San Quintín (16.33538°N, 91.48053°W); elev. 550 m; 26 December 2014; Adam G. Clause, Chris M. Murphy, Eric W. Schaad, Levi N. Gray, Carlos J. Pavón-Vázquez. An adult (MZFC-HE 30417) found at 0550 h in intact tropical rainforest, perched on a shrub above a dry stream channel. In Chiapas, *T. picta* previously was known from only three localities, all in the north-central part of the state: "19.0–20.8 mi N of Jitotol" (MVZ 138982–138983) and Palenque (Lee, 1996), Municipio de Palenque; and "4.4 road km NE of Ocosingo," Municipio de Ocosingo (UTEP 7698–7703). This specimen represents the fourth record for Chiapas, the first for the municipality, and lies 96 km SE of the nearest locality of Ocosingo. It partially fills a 220 km gap in the species' range between Ocosingo and Finca Chamá, Alta Verapaz, Guatemala (UMMZ 90918–90922).

Order Squamata

Family Corytophanidae

***Corytophanes cristatus* (Merrem, 1820).** CHIAPAS: Municipio de Ocosingo, southwestern foothills of the Meseta Agua Escondida, 12 airline km NNW of San Quintín (16.4973°N, 91.3975°W; elev. 470 m; 24 December 2014; Eric W. Schaad, Chris M. Murphy, Levi N. Gray, Carlos J. Pavón-Vázquez, Adam G. Clause. Two adult males (MZFC-HE 30397–30398) found in lowland tropical rainforest, sleeping on trunks of separate sapling trees after an evening rainstorm. CHIAPAS: Municipio de Maravilla Tenejapa, 8.5 airline km N of Maravilla Tenejapa (16.21619°N, 91.31245°W; elev. 230 m; 28 December 2014; Adam G. Clause, Levi N. Gray, Carlos J. Pavón-Vázquez, Chris M. Murphy, Eric W. Schaad. An adult male (MZFC-HE 30399) found in lowland tropical rainforest, sleeping at a height of 1.5 m in a shrub. The western and northern extent of *C. cristatus*' range lies in Tabasco and Chiapas, respectively (Lee, 1996; Triana-Ramírez et al., 2016). In Chiapas, this species previously was known from only seven localities: Lago Jalisco (INIREB 35), Zona Arqueológica "Yaxchilán" (MZFC-HE 12180), Campamento Yaxchilán (MZFC-HE 13152–13153), and Bonampak ruins (SDNHM 49920), Municipio de Ocosingo; across the river from Piedras Negras (USNM 113169.6084885) and vicinity of Palenque ruins (CAS 154150, AMNH 156187), Municipio de Palenque; and Héctor, Ejido Loma Bonito, Municipio de Maravilla Tenejapa (Hernández-Ordóñez et al., 2015). Unverified reports also exist for two additional, imprecise localities in the Municipio de Ocosingo: road between Lago Jalisco and Lacanjá-Chansayab (Lazcano-Barrero et al., 1992). Our specimens represent the tenth and eleventh localities for the state of Chiapas, as well as range extensions of 35 km SW and 59 km SSW, respectively, from the nearest locality of Lago Jalisco (INIREB 35).

Family Dactyloidae

***Anolis* (*Norops*) *biporcatus* (Wiegmann, 1834).** CHIAPAS: Municipio de Maravilla Tenejapa, 8.5 airline km N of Maravilla Tenejapa (16.21647°N, 91.31251°W); elev. 230 m; 28 December 2014; Eric W. Schaad, Levi N. Gray, Carlos J. Pavón-Vázquez, Chris M. Murphy, Adam G. Clause. An adult female (MZFC-HE 30385) found at 2150 h in intact lowland tropical rainforest, sleeping on vegetation. CHIAPAS: Municipio de Maravilla Tenejapa, along Mex-307, 1.2 road km NW of Maravilla Tenejapa (16.15253°N, 91.30286°W; elev. 410 m; 29 December 2014; Eric W. Schaad, Levi N. Gray, Carlos J. Pavón-Vázquez, Chris M. Murphy, Adam G. Clause. An adult female (MZFC-HE 30384) found at 0110 h in intact lowland tropical rainforest, sleeping on vegetation. These records represent the first for the municipality, and lie 41 and 39 km, respectively, WNW of the nearest vouchered locality of Chajul, Selva Lacandona, Municipio de Ocosingo, Chiapas (IHN 339). Our records also partially fill a 85 km gap in the species' range, between Chajul and "40 mi E [of] Comitan," Municipio de Ocosingo, Chiapas (Booth, 1959).

***Anolis* (*Norops*) *capito* Peters, 1863.** CHIAPAS: Municipio de Maravilla Tenejapa, along the road to San Mateo Zapotal/La Bella Ilusión, 1.7 road km NE of the Mex-307 intersection (16.14962°N, 91.25626°W); elev. 570 m; 29 December 2014; Eric W. Schaad, Levi N. Gray, Carlos J. Pavón-Vázquez, Chris M. Murphy, Adam G. Clause. An adult female (MZFC-HE 30386) found at 0030 h in intact lowland tropical forest, sleeping on vegetation. This locality represents the first from the municipality, and lies 24 km NNE of the nearest vouchered locality of Finca Yulaxac, 15 km N of Barillas, Huehuetenango, Guatemala (MVZ 134691). The record partially fills a 70 km gap in the species' range between Finca Yulaxac and Ibarro, 64 km ESE of "Altimirano" [=Altamirano], Municipio de Ocosingo, Chiapas (TCWC 19581).

***Anolis* (*Norops*) *compressicauda* Smith and Kerster, 1955.** TABASCO: Municipio de Teapa, northeast outskirts of Teapa near the Grutas de Coconá (17.56295°N, 92.93516°W); elev. 50 m; 1 January 2014; Carlos J. Pavón-Vázquez, Peter A. Scott, Levi N. Gray, Mariángel Arvizu-Meza. An adult male (MZFC-HE 30420) found at night in lowland tropical rainforest, in a crevice within a pile of boulders located in a rocky ladder. TABASCO: Municipio de Huimanguillo, along the road to Ejido Francisco J. Mujica, 4.9 road km WSW of the Mex-145 intersection (17.37985°N, 93.62801°W); elev. 360 m; 29 December 2014; Carlos J. Pavón-Vázquez, Adam G. Clause. An adult female (MZFC-HE 30387) found at 2340 h, sleeping along a small, rocky tributary of the Río Pedregal that flows out of the northern foothills of Cerro Las Flores. TABASCO: Municipio de Huimanguillo, along the road to Ejido Francisco J. Mujica, 5.7 road km WSW of the Mex-145 intersection (17.37985°N, 93.62801°W); elev. 350 m; 27 August 2015; Walter Schmidt-Ballardo, Adam G. Clause. An adult female (MZFC-HE 30388) found at 1720 h in lowland tropical rainforest, perched on a palm frond. These three specimens represent the first records for the state of Tabasco. The Teapa locality lies 70 km NNE of the nearest vouchered locality of 15 mi N of "Mal Paso" [=Malpaso], Municipio de Tecpatán, Chiapas (LACM 36233–34, 178141), while the Huimanguillo records are 9 km NW of the same Malpaso locality.

Family Xantusiidae

***Lepidophyma flavimaculatum* (Duméril, 1851).** TABASCO: Municipio de Huimanguillo, along the road to Ejido Francisco J. Mujica, 5.70 road km WSW of the Mex-145 intersection (17.38036°N, 93.63391°W); elev. 350 m; 27 August 2015; Adam G. Clause, Walter Schmidt-Ballardo. An adult male (MZFC-HE 30407) found at 1740 h in lowland tropical rainforest, at the mouth of a rock crevice in the northern foothills of Cerro Las Flores. This locality represents the first for the municipality, a slight northern range expansion into southwestern Tabasco, and lies 40 km NNW of the nearest vouchered locality of "25 mi NW of Ocozocoautla," Municipio de Ocozocoautla de Espinosa, Chiapas (UAZ 28805–28807). Aguilar-López and Canseco-Márquez (2006) report an unvouchered *L. flavimaculatum* from an undisclosed locality in the Municipio de Las Choapas, Veracruz, which would be even closer to our specimen—but more specific information is needed before we consider this a well-supported locality.

Family Colubridae

***Stenorrhina freminvillei* Duméril, Bibron & Duméril, 1854.** CHIAPAS: Municipio de Villaflores, road to Cerro Tres Picos, 3.7 road km NNW of the town of Tres Picos (16.25661°N, 93.59908°W); elev. 990 m; 18 December 2014; Levi N. Gray, Peter A. Scott, Carlos J. Pavón-Vazquez, Eric W. Schaad, Adam G. Clause. An adult female (MZFC-HE 30415), found dead-on-road in disturbed pine forest. We confirmed this snake's identity by the presence of 171 ventral scales; 29 subcaudal scales; a striped dorsum; and pale ventral scales with dark coloration limited to speckles in the lateral scale margins and, beginning at midbody, along the midline. This locality represents the first for the municipality, and lies 31 km E of the nearest vouchered locality of "5.3 mi N of Puerto Arista," Municipio de Arriaga, Chiapas (MZFC-HE 4195). CHIAPAS: Municipio de Las Margaritas, near Nueva Aurora, 6.0 road km WSW of the Las Margaritas centro on Mex-218 (16.30501°N, 92.03249°W); elev. 1,710 m; 17 August 2015; Adam G. Clause, Justin K. Clause. An adult female (MZFC-HE 30416) found at 1005 h at the edge of mixed tropical forest with some oak trees represented, under a roadside rock. We confirmed this snake's identity by the presence of 171 ventral scales; 28 subcaudal scales; a unicolor or faintly striped dorsum; and nearly immaculate, pale ventral scales with some dark spots along the lateral scale margins. This locality represents the first for the municipality, and lies 24 km N of the nearest vouchered locality of "1.2 mi S [of] La Trinitaria," Municipio de La Trinitaria, Chiapas (TCWC 30432).

Family Dipsadidae

***Leptodeira maculata* (Hallowell, 1861).** OAXACA: Municipio de San Pedro Huamelula, along the road to San Isidro Chacalapa, 5.6 road km N of the Mex-200 intersection (15.90706°N, 95.93719°W); elev. 190 m; 16 December 2014; Adam G. Clause, Peter A. Scott, Levi N. Gray. An adult male (MZFC-HE 30408) found at 2240 h in tropical dry forest, climbing at a height of 2 m in a roadside tree. This locality represents the first for the municipality, and lies 52 km SW of the nearest vouchered locality of "Río Guayabo, abajo del puente carretera a Santa María Ecatepec," Municipio de Santa María Ecatepec, Oaxaca. It partially fills a 125 km coastal gap in the species' range between Cerro Arenal, Municipio de Magdalena Tequisistlán, Oaxaca (AMNH 7990–7993) and "5 km S of Pochutla," Municipio de San Pedro Pochutla, Oaxaca (KU 58095). Duellman (1958) also mapped a point for *L. maculata* (as *L. annulata cussiliris*) some 50 km NNW of our specimen, but his gazetteer failed to identify the corresponding specimen for this point, which may be in error. Formerly considered a subspecies of *L. annulata* (Linnaeus, 1758), Mulcahy (2007) first provided molecular support for the recognition of *L. a. cussiliris* as a full species, and affirmed the taxon's monophyly while also showing *L. annulata* to be paraphyletic. Daza et al. (2009) reaffirmed these results with additional robust sequence data, and also synonymized *L. maculata* with *L. cussiliris*. *Leptodeira maculata*, however, has priority over *L. cussiliris* (Wilson et al., 2013).

***Leptodeira polysticta* Günther, 1895.** CHIAPAS: Municipio de Las Margaritas, along the road to Las Margaritas (Mex-218), 18 road km SW of San Quintín (16.34569°N, 91.42262°W); elev. 230 m; 26 December 2014; Eric W. Schaad, Levi N. Gray, Carlos J. Pavón-Vazquez, Chris M. Murphy, Adam G. Clause. An adult female (MZFC-HE 30409) found at night in lowland tropical rainforest, climbing in a shrub near the bank of the Río Euseba. This Atlantic versant locality represents the first record from the municipality, and lies 55 km NNW of the nearest vouchered locality of Finca Chiblac, Huehuetenango, Guatemala (MVZ 134710). Muñoz Alonso and March Mifsut (2003) also list an unvouchered sight record from the Estación Biologica Chajul, Municipio de Ocosingo, Chiapas, 57 km SE of our specimen. Formerly considered a subspecies of *L. septentrionalis* (Kennicott, 1859), recognition of *L. polysticta* as a full species was supported by two recent molecular studies demonstrating paraphyly in *L. septentrionalis* and resolving *L. polysticta* as a well-supported monophyletic clade (Mulcahy, 2007; Daza et al., 2009). Furthermore, the Pacific and Atlantic versant populations of *L. polysticta* may represent species-level lineages in their own right (Daza et al., 2009).

***Manolepis putnami* (Jan, 1863).** OAXACA: Municipio de San Pedro Huamelula, Mex-200, 2.3 road km W of Santiago Astata (15.99636°N, 95.69489°W; elev. 70 m; 17 December 2014; Adam G. Clause, Levi N. Gray, Peter A. Scott. An adult male (MZFC-HE 30410) found at 0155 h at the edge of intact tropical dry forest, among herbaceous roadside vegetation. This locality represents the first for the municipality, and extends the species' range 31 km SSW toward the coast from the nearest vouchered locality of Tenango, Municipio de San Miguel Tenango, Oaxaca (UIMNH 37176–37177).

***Ninia sebae* (Duméril, Bibron & Duméril, 1854).** CHIAPAS: Municipio de Las Margaritas, southwestern outskirts of San Quintín west of Laguna Miramar (16.39316°N, 91.34147°W); elev. 210 m; 23 December 2014; Adam G. Clause, Chris M. Murphy, Levi N. Gray, Carlos J. Pavón-Vázquez, Eric W. Schaad. A juvenile (MZFC-HE 30413) found at 2215 h in disturbed forest, under a small fallen log. Recent range maps (Lee, 1996; Köhler, 2008) show a large gap in the species' range spanning eastern and central Chiapas. This locality partially fills this gap, and lies 32 km NNE of the nearest vouchered locality of Amparo Agua Tinta, Municipio de Las Margaritas, Chiapas (MVZ 159002–159058).

***Sibon nebulatus* (Linnaeus, 1758).** OAXACA: Municipio de Candelaria Loxicha, Mex-175, 17.0 road km N of Candelaria Loxicha (15.97557°N, 96.50033°W); elev. 1,400 m; 15 December 2014; Peter A. Scott, Levi N. Gray, Adam G. Clause. An adult female (MZFC-HE 30414) found at 0030 h at the edge of intact tropical rainforest, crawling across leaf litter and organic debris on the road shoulder. Neither Casas-Andreu et al. (1996) nor Mata-Silva et al. (2015) included this species in their checklists of the Oaxacan herpetofauna. Smith and Taylor (1945) and Smith (1971), however, recognized the species in Oaxaca based on a record from "La Raya" reported by Gadow (1905) and a specimen collected in Progreso, Palomares, Municipality of Juchitán (UCM 40009), respectively. Additionally, at least four other museum specimens exist from Oaxaca that are assigned to *Sibon nebulatus*: three from the Atlantic versant (MVZ 196851, UCM 52652–52653) and one from the Pacific versant (UCM 49372). Our specimen represents the first record from the municipality, and was found 69 km WNW of the nearest vouchered locality of Santa Rosa, Municipio de San Juan Lachao, District of Juquila, Oaxaca (UCM 49372). The specimen reported herein exhibits one preocular on each side of the head, a condition found in less than 5% of the specimens examined by Peters (1960) in his monographic review of the Dipsadinae. The species is polytypic, however, and shows marked morphological variation over its wide range. Thus, the existence of several independent lineages within the taxon seems possible. Upon dissection, we found that the specimen contained four large eggs, with their major axes measuring 30.7, 38.5, 30.7, and 32.7 mm, and their minor axes measuring 7.5, 9.5, 8.2, and 8.4 mm, respectively.

***Tretanorhinus nigroluteus* Cope, 1861.** CHIAPAS: Municipio de Ocosingo, largest lake of Tres Lagunas, Selva Lacandona (16.84351°N, 91.14565°W); elev. 370 m; 10 August 2010; Levi N. Gray, Anthony J. Barley. A juvenile (MZFC-HE 30421) found in the evening when stirred up from the muddy bottom of the lake, near the shore in water 1 m deep. In Chiapas, *T. nigroluteus* previously was known from only four vouchered localities: "Rancho Alejandria, 6 km SE of Estación Juárez," Municipio de Juárez (IHN 1458); "0.8 mi S of Palenque," Municipio de Palenque (MPM 25949); Zona Arqueológica "Yaxchilán," Municipio de Ocosingo (MZFC-HE 11974); and Héctor, Ejido Loma Bonita, Municipio de Marquéz de Comillas (Hernández-Ordóñez et al., 2015). Our voucher represents the fifth for the state of Chiapas, and the second specimen-based record from the municipality. It also represents a slight westward expansion of the species' range, 20 km WSW of the Yaxchilán record.

***Tropidodipsas sartorii* Cope, 1863.** CHIAPAS: Municipio de Maravilla Tenejapa, along the road to Amatitlán through Guadalupe Miramar, 10.8 road km N of the Hwy 307 intersection (16.21551°N, 91.31345°W); elev. 210 m; 28 December 2014; Adam G. Clause, Levi N. Gray, Chris M. Murphy, Eric W. Schaad, Carlos J. Pavón-Vázquez. An adult (MZFC-HE 30418) found at 2020 h in lowland tropical rainforest, climbing at a height of 2 m in a roadside shrub. Our specimen is the first record from the municipality, and is 39 km NNW of the nearest known locality of Selva Gil, Ejido Loma Bonita, Municipio de Marquéz de Comillas (Hernández-Ordóñez et al., 2015).

Family Elapidae

***Micrurus diastema* (Duméril, Bibron & Duméril, 1854).** TABASCO: Municipio de Huimanguillo, along the road to Ejido Francisco J. Mujica, 4.9 road km WSW of the Mex-145 intersection (17.37979°N, 93.62713°W); elev. 360 m; 24 August 2015; Adam G. Clause, Justin K. Clause. An adult female (MZFC-HE 30411) found at 2025 h at the edge of intact lowland tropical rainforest, crawling among banana leaf litter and organic debris immediately after a heavy rainstorm. As reported by Campbell and Lamar (2004), *M. diastema* is a highly variable species across its wide geographic range. These authors noted, however, that the species can be distinguished from all congeners in areas of sympatry. Using their dichotomous key and species accounts, our specimen is attributable to *M. diastema* on the basis of geography and the following traits: pale spot on tip of snout, parietals entirely enclosed in pale yellow nuchal band, and distinct black tips present on scales in red body rings. In Tabasco, *M. diastema* previously was known from only four localities, all in the central or eastern parts of the state: "58 km E of Palenque," Municipio de Emiliano Zapata (SDSNH 44234); "40 mi N of Villahermosa," Municipio de Centla (USNM 192548.6311700); Teapa (LSUMZ 6924–6925) and "6.8 mi N of Teapa" (LACM 130099), Municipio de Teapa. Our record represents the fifth locality for Tabasco, the first from the municipality, and expands the species' range into the southwestern part of the state. It lies 50 km NNW from the nearest vouchered locality of "26 km N of Ocozocoautla," Municipio de Ocozocoautla de Espinosa, Chiapas (UTEP 6435).

***Micrurus ephippifer* (Cope, 1886).** OAXACA: Municipio de Santiago Astata, Mex-200, 1.8 road km W of Santiago Astata (15.99429°N, 95.69009°W); elev. 60 m; 17 December 2014; Peter A. Scott, Levi N. Gray, Adam G. Clause. An adult female (MZFC-HE 30412) found at 0120 h in intact tropical dry forest, crossing a paved road. This locality represents the first from the municipality, and extends the species' range 31 km SSW toward the coast from the nearest vouchered locality of Tenango, Municipio de San Miguel Tenango, Oaxaca (UIMNH 6250).

Family Typhlopidae

***Typhlops* (*Amerotyphlops*) *tenuis* (Salvin, 1860).** CHIAPAS: Municipio de Ocosingo, southwestern foothills of the Meseta Agua Escondida, 12 airline km NNW of San Quintín (16.49623°N, 91.39795°W); elev. 480 m; 24 December 2014; Adam G. Clause, Chris M. Murphy, Levi N. Gray, Carlos J. Pavón-Vázquez, Eric W. Schaad. An adult (MZFC-HE 30419) found at 2125 h in lowland tropical rainforest, under a log in a recent clearing. The distribution of this species is poorly defined, and extends from central Veracruz, Mexico, to northern Baja Verapaz, Guatemala (McCranie and Wilson, 2001). Our specimen exhibits dorsal spots as described for *T. tenuis* by Dixon and Hendricks (1979), but also possesses 367 dorsal scales. This dorsal scale count is intermediate between *T. stadelmani* of Honduras (range = 341–369, average = 357.0 ± 8.1 SD) and *T. tenuis* (361–441, 399.9 ± 18.8) (McCranie and Wilson, 2001; Townsend et al., 2008). Our specimen appears to reveal *T. stadelmani* as simply an extreme of clinal variation in this character—a significant finding given that *T. stadelmani* was re-elevated to species status largely on the basis of a lower dorsal scale count than *T. tenuis* (McCranie and Wilson, 2001). Additional collecting and genetic studies may demonstrate that these two species are, in fact, conspecific and justify the return of *T. stadelmani* to synonymy with *T. tenuis*. Our specimen represents a state record for Chiapas, and partially fills a 360 km gap in the species' range between Teapa, Tabasco, Mexico, and Cobán, Alta Verapaz, Guatemala (McCranie and Wilson, 2001).

Family Viperidae

***Bothriechis bicolor* (Bocourt, 1868)**. CHIAPAS: Municipio de Ángel Albino Corzo, along the road to Pablo Galeana (Mex-157), 50 road km SE of Ángel Albino Corzo (15.63162°N, 92.60365°W); elev. 1,430 m; 20 December 2014; Levi N. Gray, Carlos J. Pavón-Vázquez, Eric W. Schaad. A juvenile (MZFC-HE 30395) found at night in intact cloud forest, perched at a height of 4 m on a horizontal dead branch 0.5 m from a waterfall. In Mexico, *B. bicolor* previously was known from approximately a dozen localities, all in Chiapas (Campbell and Lamar, 2004; Meneses-Millán and García-Padilla, 2015). To our knowledge, however, only about six of these localities are supported by a museum specimen. Our locality represents the first for the municipality, and lies 20 km E of the nearest locality of El Triunfo, although to our knowledge El Triunfo is not a specimen-based locality. Ours also represents only the third record of *B. bicolor* from an interior slope of the Sierra Madre del Sur of Chiapas.

***Bothriechis schlegelii* (Berthold, 1846).** CHIAPAS: Municipio de Ocosingo, southwestern foothills of the Meseta Agua Escondida, 12 airline km NNW of San Quintín (16.49691°N, 91.39732°W; elev. 470 m; 24 December 2014; Chris M. Murphy, Levi N. Gray, Carlos J. Pavón-Vázquez, Eric W. Schaad, Adam G. Clause. An adult female (MZFC-HE 30396) found at 2215 h in intact lowland tropical rainforest, loosely coiled at a height of 2 m in a tree but 30 cm from an elevated block of limestone after an evening rainstorm. The western and northern extent of this species' broad distribution lies in Oaxaca and Chiapas, respectively (Campbell and Lamar, 2004; Wylie and Grünwald, *This Issue*). Formerly, *B. schlegelii* was known from only seven vouchered localities in Chiapas (Alvarez del Toro, 1952; Hernández-Ordóñez et al., 2015; Grünwald et al., 2016). These localities are: Jungle El Mercadito, Cintalapa, Municipio de Cintalapa (AMNH R-70540); Reserva El Ocote, Municipio de Ocozocoautla de Espinosa (IHN 1366); 2 km N of El Divisadero, Municipio de Berriozábal (UTA-DC 8123); 8 km S of Solosuchiapa, Municipio de Solosuchiapa, (UAZ 27095); Rayón, Municipio de Rayón; Ruinas, Montes Azules Biosphere Reserve, Municipio de Ocosingo (CNAR 26093); and Selva Rafa, Ejido Loma Bonita, Municipio de Marquéz de Comillas (CNAR 26082). Unverified reports also exist for two additional Chiapas localities (near Ocuilapa, and Rancho El Jordán near Ocosingo), but these are imprecise localities and lack vouchers (Alvarez del Toro, 1982). The record we report herein represents the eighth vouchered locality from Chiapas, and lies 54 km NW of the nearest vouchered locality of Ruinas, Montes Azules Biosphere Reserve (CNAR 26093). It partially fills a 144 km gap between the Ruinas and Rayón localities (Hernández-Ordóñez et al., 2015).

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