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Recently discovered populations of the Honduran endemic salamanders *Oedipina kasios* and *Oedipina quadra* (Caudata: Plethodontidae)

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Manuscript received: 5 April 2011

MCCRANIE et al. (2008) described three new species of plethodontid salamanders of the genus *Oedipina* from Honduras, based on combined molecular and morphological data. Molecular analyses demonstrated that two of those new species (*O. kasios* and *O. quadra*) represented a previously unknown divergent lineage that was proposed as the new subgenus *Oeditriton*. The third new species (*O. leptopoda*) described by MCCRANIE et al. (2008) belongs to a previously known lineage (and subgenus *Oedipina*) as recognized by GARCÍA-PARÍS & WAKE (2000). MCCRANIE et al. (2008) reported *O. leptopoda* from two localities in Yoro and MCCRANIE et al. (2011) reported that species from a third locality to the west of the two Yoro localities. Herein, we provide additional distributional records, habitat information, and molecular analyses for the two Honduran species of *Oedipina* of the subgenus *Oeditriton*.

Sequences for the molecular analyses were aligned with the on-line version of MAFFT (KATO H et al. 2002) available at <http://mafft.cbrc.jp/alignment/server/> by using the ‘E-INS-I’ strategy and default parameters. The aligned sequence data set comprised 55 sequences and was trimmed to a total length of 628 bp. A Maximum Likelihood Phylogeny was reconstructed by using Treefinder (JOB B et al. 2004) with speculations for a general time-reversible model of sequence evolution (GTR+I+G) as revealed by the hierarchical likelihood test. Expected-likelihood weights of local rearrangements of tree topology (LR-ELW) were calculated as estimator of confidence in the configuration of branches (STRIMMER & RAMBAUT 2002).

MCCRANIE et al. (2008) described *Oedipina kasios* based on six specimens taken between 950 m and 1780 m altitude in the Parque Nacional La Muralla in northwestern Olancho. All of those specimens were found either under or inside rotten logs in the Premontane Wet Forest and Lower Montane Wet Forest formations of HOLD-RIDGE (1967). TOWNSEND et al. (2011) reported *O. kasios* from a single specimen collected at 1920 m altitude in the

Parque Nacional Montaña de Yoro in Francisco Morazán. That second locality lies about 45 km WSW of the Parque Nacional La Muralla. TOWNSEND et al. (2011:53) stated only that their specimen was found “in a small mesic ravine” that was bordered on two sides by “regularly burned pine-oak forest.”

On 3–4 July 2010, two adults (Fig. 1) of *Oedipina kasios* (USNM 565898–99) were collected at 1920 m altitude on a trail (14°56’46.20”N, 85°54’45.36”W) leading to Pico La Picucha from an area known as Quebrada de Agua in the Sierra de Agalta in central Olancho. This new locality is about 80 km SE of the Parque Nacional La Muralla (Fig. 2). The species identification was confirmed by analysis of mtDNA sequence data for the gene 16S (Fig. 3). Both USNM 565898–99, and several others that could not be collected, were in a habitat that differed greatly from the previously known habitats of this species.



Figure 1. Adult female of *Oedipina kasios* (USNM 565898; total length 123 mm). Photo: A. GUTSCHE.

The steep mountain slopes in the area of the new locality are dominated by a closed canopy broadleaf forest. However, the small area (ca. 10 m²) where *Oedipina kasios* was collected was dominated by large pine trees (*Pinus oocarpa*) of ca. 20 m in height, which formed a nearly closed canopy that allowed only a few shifting, intermittent, sunny patches to reach the ground (Fig. 4). The pine trees carried a moderate amount of epiphytic mosses, orchids, and bromeliads. Main understorey components were scattered tree ferns of 2 to 5 m in height, and a few lower shrubs

and herbs. The ground was covered by a thick layer of pine needles, beneath which was a mattress-like network of ca. 20–50 cm in depth, consisting of soil, decaying conifer needles and other vegetation, and root systems. Beneath that substrate was highly eroded limestone with numerous holes, cracks, and crevices (Fig. 5). All specimens of *Oedipina kasios* were found by raking or digging through this substrate layer to depths of up to 30 cm. The substrate was lightly moist, and because of its porous structure, rainwater passed quickly through it.

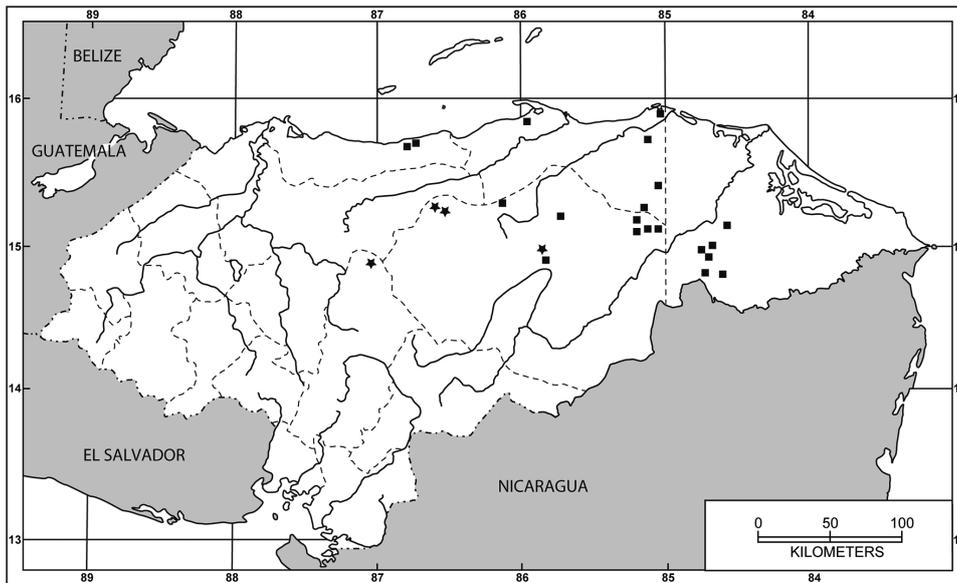


Figure 2. Map showing known localities for *Oedipina kasios* (stars) and *O. quadra* (squares).

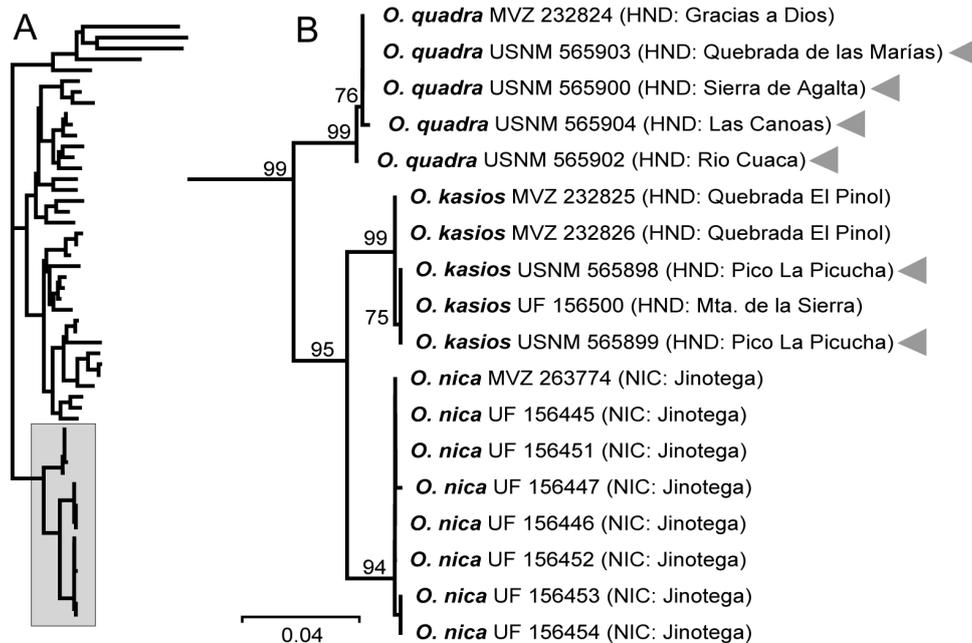


Figure 3. Maximum likelihood phylogram based on the analysis of partial sequences of the mitochondrial 16S rRNA gene. A. Topology of ML tree based on the analysis of all available *Oedipina* sequences plus plethodontid outgroup sequences. B. Magnification showing clade of *Oedipina* as shaded in A. New sequences reported here are marked with arrows. Numbers on branches show support by Expected-Likelihood Weights of Local Rearrangements of the tree topology.

Table 1. New specimens of *Oedipina kasios* and *Oedipina quadra* used in the phylogenetic analyses, museum numbers, locality information, and GenBank accession numbers. The same information for the remaining species and other *Oedipina kasios* and *Oedipina quadra* can be found in GARCÍA-PARÍS & WAKE (2000), MCCRANIE et al. (2008), and SUNYER et al. (2010).

Museum number	Species	Locality	GenBank 16S
USNM 565898	<i>O. kasios</i>	Sierra de Agalta, Olancho	JF499891
USNM 565899	<i>O. kasios</i>	Sierra de Agalta, Olancho	JF499892
USNM 565903	<i>O. quadra</i>	Quebrada de Las Marías, Olancho	JF499894
USNM 565900	<i>O. quadra</i>	Sierra de Agalta, Olancho	JF499893
USNM 565904	<i>O. quadra</i>	Las Canoas, Olancho	JF499896
USNM 565902	<i>O. quadra</i>	Río Cuaca, Olancho	JF499895



Figure 4. Habitat of *Oedipina kasios* in the Sierra de Agalta. Photo: A. GUTSCHE.



Figure 6. Adult female of *Oedipina quadra* (USNM 565900; total length 95 mm). Photo: A. GUTSCHE.

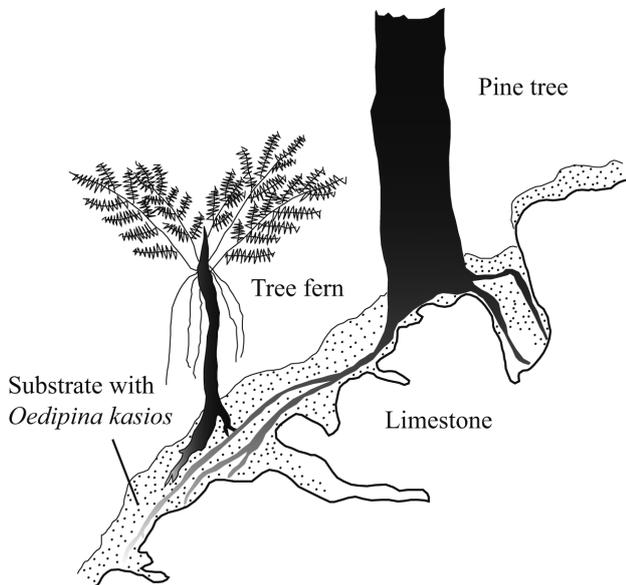


Figure 5. Cross-section of the *Oedipina kasios* habitat, showing the structure of the ground substrate. Drawing: A. GUTSCHE.

MCCRANIE et al. (2008) described *Oedipina quadra* based on 34 specimens found between 70 and 540 m altitude from north-central to eastern Honduras. All of those specimens were taken by raking through leaf litter in broadleaf rainforest (Lowland Moist Forest formation

of HOLDRIDGE 1967). MCCRANIE et al. (2008) also mentioned four specimens that, based on colour in alcohol and foot morphology, appeared most similar to *O. quadra*. Those four specimens were found between 1100 and 1250 m altitude (Premontane Wet Forest formation of HOLDRIDGE 1967) at a locality (Sierra de Agalta, Olancho) that is isolated from the remaining known *O. quadra* localities. MCCRANIE et al. (2008) mentioned the need for molecular analysis of that population. Subsequently, tissues from a specimen (Fig. 6) of that population and several other intervening moderate altitude localities are now available (Table 1). Molecular analyses of these new samples demonstrate that they are conspecific with *O. quadra* (Fig. 3), but extend the known vertical distribution of the species to 1250 m. A map (Fig. 2) showing all known localities for *O. quadra* is included herein. Most of these new specimens were also found in leaf litter, but one (USNM 565902; Río Cuaca, Olancho) was under a log and another (USNM 565901; Cueva de Leimus, Gracias a Dios) was active at night on a fallen, dead branch of a tree about 0.5 m above the ground. *Oedipina quadra* is now known from both primary and secondary broadleaf rainforest in the Lowland Moist Forest formation and secondary broadleaf rainforest and coffee farms in the Premontane Wet Forest formation (formations from HOLDRIDGE 1967).

Because of its numerous known localities, *Oedipina quadra* is a species of Least Concern according to the criteria developed by the IUCN. In addition, much forest remains in good condition in parts of its known range. On

the other hand, *O. kasios* would be classified as Endangered under the same criteria (B2ab[111]). Most montane species of *Oedipina* are limited in distribution (GARCIA-PARÍS & WAKE 2000). However, *O. kasios* is unusual among montane species of *Oedipina* in that it is now known from three separate mountain ranges. The pristine state of the forest in the vicinity of the new locality reported herein is encouraging for the future of this species. Although deforestation for agricultural purposes is taking place below the new locality for *O. kasios* (presently up to ca. 1400 m altitude), the extreme steepness of the slopes at the new locality speaks well for the continued existence of *O. kasios* in the Sierra de Agalta.

Acknowledgements

We thank IRIS ACOSTA and CARLA CÁRCAMO of the Instituto Nacional de Conservación y Desarrollo Forestal, Tegucigalpa, for issuing the collecting (DVS-ICF-016-2009) and export (009-2010-DVS-ICF) permits. KRAIG ADLER and TIM PERRY of the Society for the Study of Amphibians and Reptiles (SSAR) provided permission to use the base map in Fig. 2. We also thank STEVE W. GOTTE for quickly supplying the USNM numbers for the specimens. Fieldwork of A. GUTSCHE was supported by the Adolf and Hildegard Isler Foundation.

References

- GARCÍA-PARÍS, M. & D. B. WAKE (2000): Molecular phylogenetic analysis of relationships of the tropical salamander genera *Oedipina* and *Nototriton*, with descriptions of a new genus and three new species. – *Copeia*, **2000**: 42–70.
- HOLDRIDGE, L. R. (1967): *Life Zone Ecology*. Revised Edition. – Tropical Science Center, San José, Costa Rica.
- JOBBS, G., V. HAESELER & K. STRIMMER (2004): TREEFINDER: a powerful graphical analysis environment for molecular phylogenetics. – *BMC Evolutionary Biology*, **4**: 18.
- KATO, K., K. MISAWA, K. I. KUMA & T. MIYATA (2002): MAFFT: a novel method for rapid multiple sequence alignment based on fast Fourier transform. – *Nucleic Acids Research*, **30**: 3059–3066.
- MCCRANIE, J. R., D. R. VIETES & D. B. WAKE (2008): Description of a new divergent lineage and three new species of Honduran salamanders of the genus *Oedipina* (Caudata: Plethodontidae). – *Zootaxa*, **1930**: 1–17.
- MCCRANIE, J. R., S. M. ROVITO, J. M. SOLÍS & J. R. COLLART (2011): Geographic distribution. *Oedipina leptopoda* (Narrow-footed Worm Salamander). – *Herpetological Review* **42**: 235–236.
- STRIMMER, K. & A. RAMBAUT (2002): Inferring confidence sets of possibly misspecified gene trees. – *Proceedings of the Royal Society of London B, Biological Sciences*, **269**: 137–142.
- SUNYER, J., D. B. WAKE, J. H. TOWNSEND, S. L. TRAVERS, S. M. ROVITO, T. J. PAPENFUSS, L. A. OBANDO & G. KÖHLER (2010): A new species of worm salamander (Caudata: Plethodontidae: *Oedipina*) in the subgenus *Oeditriton* from the highlands of northern Nicaragua. – *Zootaxa*, **2613**: 29–39.
- TOWNSEND, J. H., I. R. LUQUE-MONTES & L. D. WILSON. (2011): Newly-discovered populations of four threatened endemic salamanders (Caudata: Plethodontidae) from the highlands of central Honduras. – *Salamandra*, **47**: 50–54.