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Classification of a clade of New World doves (Columbidae: Zenaidini)

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To evaluate the role of the formation of the Central American land bridge in diversification of the American avifauna, Johnson and Weckstein (2011) reconstructed a phylogeny, using DNA sequence data from four gene regions, of 24 nominal species in three putative genera of New World doves. Although a systematic revision of these doves was not a primary purpose of their study, Johnson and Weckstein (2011) provided information that helps to re-evaluate the presumed relationships among the taxa included. Their analysis supported a hypothesis of monophyly for a group containing seven species currently (American Ornithologists' Union [AOU] 1998, Gibbs *et al.* 2001, Dickinson 2003, Remsen *et al.* 2012) placed in the genus *Zenaida* Bonaparte, 1838, and for a group of 12 taxa in 6 species (of as many as 11 currently recognized species) in the genus *Leptotila* Swainson, 1837 (Gibbs *et al.* 2001, Dickinson 2003). However, the 11 species (of up to 16 [Dickinson 2003] or 18 [Gill and Wright 2006]) of the genus *Geotrygon* Gosse, 1847, occurred in three separate lineages (Johnson and Weckstein 2011: fig. 1), revealing that the genus is polyphyletic. Unfortunately, the type species of *Geotrygon*, *G. versicolor* (Lafresnaye), was excluded from their analysis because of the incomplete sequence data available for that species. The purposes of the current study are to provide molecular phylogenetic data for that species and for *G. chrysis* Bonaparte to determine which lineage includes *G. versicolor*, and to provide a taxonomic revision of the group. For the few species of the genus for which genetic data are not yet available, only tentative placement based on inference is possible.

Using the same protocols, we sequenced three (mitochondrial genes ND2 and COI and nuclear beta fibrinogen intron 7) of the four genes used by Johnson and Weckstein (2011) for captive individuals of *G. versicolor* (LSU B28878) and *G. chrysis* (LSU B20785) (GenBank Accession numbers KC881101-KC881106). Sequences for the cytochrome *b* gene could not be obtained for these species because of difficulties in PCR amplification and apparent nuclear pseudogenes. PartitionFinder (Lanfear *et al.* 2012) was used to test for the best-fit partitioning scheme and likelihood models, and indicated that the best fit resulted from partitioning into nuclear versus mitochondrial genes with a GTR+I+G model for mitochondrial genes and HKY+G model for the nuclear gene. We performed Bayesian phylogenetic analyses using MrBayes (v. 3.2.1, Ronquist and Huelsenbeck 2003). Two simultaneous runs of 10 million generations each, sampling every 500 generations, were conducted, and the first 250,000 generations were discarded as burn-in. To assess nodal support, we calculated posterior probabilities from the remaining trees.

Phylogenetic analysis of these sequences (Fig. 1) indicated that the species of *Geotrygon* comprise three distinct clades (cf. Johnson and Weckstein 2011). *Geotrygon veraguensis* was recovered as the sister species to members of the genus *Leptotila*. A clade of primarily montane *Geotrygon* species was recovered as the sister group to the genus *Zenaida*, and a third clade consisting of mainly lowland *Geotrygon* taxa was sister to the clade comprising all other taxa currently in *Geotrygon*, *Leptotila*, and *Zenaida*. Support values for most clades were similar to those in Johnson and Weckstein (2011), although support for monophyly of the clade of lowland *Geotrygon* taxa was higher (posterior probability 95%).

Three generic names are available for the species in the clade of lowland taxa. One lineage in this clade (Fig. 1) consists of two South American taxa (*saphirina* and *purpurata*) often considered conspecific (Peters 1934, Dickinson 2003) and long separated as the genus *Osculatia* Bonaparte, 1855 (type species *G. saphirina* Bonaparte, 1855). Goodwin (1958) merged *Osculatia* into *Geotrygon*, and this merger has been followed in all subsequent classifications. The other lineage consists of the Central and South American species *violacea* Temminck and the widespread continental and Caribbean species *montana* Linnaeus, the type species of *Oreopelia* Reichenbach, as well as *G. versicolor* and *G. chrysis*. The divergence between *G. purpurata* + *G. saphirina* and the other lineage of lowland *Geotrygon* is high, although support is now stronger for a sister relationship between these two sub-clades. Until further information about