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A new genus for the Blue-and-yellow Tanager (Aves: Passeriformes): a suggested adjustment to the classification of the Thraupidae

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Abstract

Recent DNA-based studies have found that the genus *Thraupis*, as traditionally defined, is polyphyletic, with the Blue-and-yellow Tanager (historically treated as *Thraupis bonariensis*) being sister to the Fawn-breasted Tanager (*Pipraeidea melanonota*). As a result, most subsequent classifications lumped both species under a single genus, *Pipraeidea*. Here I show that both species differ markedly in plumage, morphology, voice, and behavior, each of them being more similar to a distantly related species than to each other. As such, I argue that the treatment of the Blue-and-yellow Tanager in *Pipraeidea* creates an undiagnosable genus contrasting greatly with the generic limits commonly applied to the tanagers. To avoid this situation, I propose the recognition of a new genus, *Remsenornis* gen. nov., for the Blue-and-yellow Tanager.

Key words: monotypic genus, Neotropical birds, *Pipraeidea*, taxonomy, *Thraupis*

Introduction

In recent years, DNA-based research on nine-primaried oscine birds have led to a revolution in the systematics and taxonomic classification of certain groups, leading to a new circumscription of the Thraupidae (tanagers) that made it the largest family of songbirds (Barker *et al.* 2013, 2015; Burns *et al.* 2014, 2016). A common finding of these studies is the polyphyletic nature of many genera, uncovering some unforeseen relationships among species. One of those unexpected findings was the sister relationship between the Fawn-breasted Tanager *Pipraeidea melanonota* (Vieillot), and the Blue-and-yellow Tanager, traditionally treated as *Thraupis bonariensis* (Gmelin) (Burns & Naoki 2004; Sedano & Burns 2010). To reconcile the classification of the tanagers with the molecular phylogenetic results, several authors, including some classification committees, adopted the proposal to merge both species into a single genus, thereby treating the Blue-and-yellow Tanager as *Pipraeidea bonariensis* (Dickinson & Christidis 2014; Piacentini *et al.* 2015; Clements *et al.* 2016; Remsen *et al.* 2016). This treatment was also adopted in the most recent broad classification proposal for the Thraupidae (Burns *et al.* 2016). Despite what seems to be widespread acceptance, and despite the subjectivity inherent to defining genera, merging both species into *Pipraeidea* creates an undiagnosable genus, greatly contrasting with generic limits in Thraupidae, both in traditional and recently proposed classifications. Thus, I here highlight the differences between both species and propose an adjustment to the classification of Burns *et al.* (2016).

Methods

The comparisons discussed here are mostly based on my personal experience with both species in the field (especially with *Pipraeidea melanonota*; over 15 years) and on a non-systematic revision of over 660 specimens housed at the following collections: Academy of Natural Sciences of Drexel University (ANSP), Philadelphia, USA; American Museum of Natural History (AMNH), New York, USA; Louisiana State University Museum of Natural Sciences (LSUMZ), Baton Rouge, USA; and Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo, Brazil. In total, I was able to visually inspect over 360 skins of "*Thraupis*" *bonariensis* and about 300 of *Pipraeidea melanonota*.

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Results

Even though it has been argued that both species have a similar color pattern (see online comments on Remsen *et al.* 2016, proposal 437E: http://www.museum.lsu.edu/~Remsen/SACCprop437.htm), they exhibit many more differences than similarities. Indeed, any similarity in plumage pattern/color is actually questionable.

The general "blue and yellowish" plumage color—which in fact appears in many genera and species across Thraupidae (e.g. *Cyanicterus*, *Buthraupis*, *Wetmorethraupis*, *Iridosornis*, etc.)—is only superficially similar in the two species. A close inspection of museum specimens (or even photographs) shows that both species have very different plumage colors (especially in the "yellow" component; Fig. 1). Even the blue patches differ between them: only one of the three main tones of blue found in *Pipraeidea* (the light blue of the crown) may be considered similar to the single one found in "*Thraupis*" *bonariensis*. Furthermore, "*T.*" *b. darwinii* has green in its plumage, a color completely absent in *Pipraeidea* (Figs. 1–2).

Other differences in plumage are also strong, with both species showing contrasting patterns. For example, the entire upperparts of *Pipraeidea* are blue, whereas *T. bonariensis* has three different color patches (blue head and nape, black back, and yellow rump; Fig. 1). Also, the blue on the head of *T. bonariensis* extends down to the throat and forms a complete hood, whereas it is restricted to the crown and nape in *Pipraeidea* (Fig. 2). Moreover, the entire underparts of *Pipraeidea* are "yellowish" (fawn-colored), including throat, underwing coverts, and thighs (all these parts being blue in *T. bonariensis*). The upperwing coverts are also differently patterned, with *Pipraeidea* showing mostly blackish feathers with a restricted (and darker) blue margin, whereas the (light) blue occupies most of the outer vane of the wing coverts in *T. bonariensis*. Lastly, *Pipraeidea* has a broad black facial mask extending from the forehead to the ear coverts, but lacks black on the chin and back, whereas in *T. bonariensis* the black mask is more restricted, extending from the lores to barely surround the eyes (the ear coverts are blue), but the chin and back are black (Fig. 2).

FIGURE 1. Ventral (left panel) and dorsal (right panel) view of variation in the male plumage of all taxa in *Pipraeidea melanonota* and "*Thraupis*" *bonariensis*. Upper row: *P. m. venezuelensis* (three specimens: AMNH 512622, 110138, and 512610) and *P. m. melanonota* (four specimens: AMNH 774284, 316184, 322066, 147177); lower row: *T. b. darwinii* (AMNH 820730), *T. b. composita* (AMNH 138349), *T. b. schulzei* (AMNH 142071) and *T. b. bonariensis* (two specimens: AMNH 322068 and 798091).

FIGURE 2. Details of the plumage color pattern of *Pipraeidea melanonota* and "*Thraupis*" *bonariensis* in ventral (left panel) and lateral (right panel) view. From left to right: *P. m. venezuelensis* (AMNH 512610), *P. m. melanonota* (AMNH 147177), *T. b. darwinii* (AMNH 820730), and *T. b. bonariensis* (AMNH 322068).

FIGURE 3. Lateral (left panel) and ventral (right panel) view of sexual dichromatism in *Pipraeidea melanonota* and "*Thraupis*" *bonariensis*. Upper row: *P. m. melanonota* (2 males: ANSP 170024 and 169087, 1 female: ANSP 170023) and *P. m. venezuelensis* (1 male: ANSP 133545; 2 females: ANSP 133354 and 109148); lower row: *T. b. bonariensis* (2 males: 133457 and 133456; 1 female: ANSP 133458), and *T. b. darwinii* (2 males: ANSP 59981 and 91492; 2 females: ANSP 59979 and 91494).

The fact that both species show well-marked sexual dichromatism has also been cited as a similarity between them (Remsen *et al.* 2016, proposal 437E). Nonetheless, here the differences are also greater than the similarities. Whereas the female *Pipraeidea* is a paler version of the male, with the same general color pattern, the female *T. bonariensis* is completely different from the male (even more striking in the *bonariensis* group of subspecies), being much plainer and less patterned than the male (Fig. 3).

Both species also differ markedly in other aspects of morphology and morphometrics. The tail is proportionately much shorter in *Pipraeidea* (about 65% of wing length; N=5) than in *T. bonariensis* (about 80%; N=5). The bill is flatter and more slender in *Pipraeidea*, being much stronger and stouter in *T. bonariensis* (Fig. 4).

FIGURE 4. Details on the bill morphology of *Pipraeidea melanonota* and "*Thraupis*" *bonariensis*. From top to bottom: *P. m. melanonota* (ANSP 169087), *T. b. darwinii* (ANSP 91492), *T. b. bonariensis* (ANSP 133456) and *P. m. venezuelensis* (ANSP 133545).

The differences in bill morphology partly reflect the differences in diet and behavior between both species. *Pipraeidea* seems to rely much more on insects than on fruits in comparison to *T. bonariensis*. In fact, *Pipraeidea* is commonly found searching for arthropods on leaves and thin branches of trees (it seems to be especially fond of caterpillars, which may even affect clutch size; Teixeira 2009), usually assuming an almost horizontal posture while constantly moving among the branches, and sometimes even hanging upside-down. It is also said to inspect bromeliads (see Isler & Isler 1987). Even though it also ingests fruits (mainly in the winter?), the species is uncommon to rare on birdfeeders and occasionally joins mixed-species flocks, including flocks composed mostly of insectivorous birds (Isler & Isler 1987; Machado 1999; Cavarzere & Tonetti 2015). On the other hand, *T. bonariensis* is primarily frugivorous, commonly seen perched still on a branch and in a more vertical posture. The species is very fond of large fruits (see also Isler & Isler 1987; Sick 1997) and is a regular visitor to birdfeeders (at least in southern Brazil). Although Athanas & Greenfield (2016) mention that *T. b. darwinii* does not visit feeders, photos on the internet show otherwise.

Nesting behavior also differs between the two species. *Pipraeidea melanonota* builds a nest concealed in clumps of epiphytes, and may even use artificial holes (Belton 1985; Teixeira 2009; Alquezar *et al.* 2010). In contrast, *T. bonariensis* makes a fairly visible cup-shaped nest on a horizontal fork, e.g. near the tips of large branches of the Mimosoideae tree *Prosopis ferox* (Dinelli 1924; Isler & Isler 1987; Salvador 2015).

FIGURE 5. Ventral, lateral and dorsal view on the plumage similarity between *Pipraeidea melanonota* (left specimen in each panel: AMNH 316184) and *Dubusia castaneoventris* (right specimen: AMNH 820617).

Finally, both species differ greatly in voice (pers. obs.; plus over 250 examples for *Pipraeidea* and 108 for *T. bonariensis* available online at www.xeno-canto.org, www.wikiaves.com.br, and Macaulay Library). The typical song of *Pipraeidea* can be described in general words as a repetition of a single high-pitched note with variable duration (usually 1–2 s), pace and number of notes (4–29). The species also has a second, rarely heard song that differs completely in structure from its regular song, being a long and complex sequence of highly variable notes, sometimes suggesting some imperfect imitations of other birds and thus similar to the song of some *Euphonia* species that mimic other species (e.g. *E. violacea*, *E. laniirostris*). Sick (1997:728) compared this second song of

Pipraeidea to the "half song" of some thrushes. Neither of these songs is reminiscent of the song of *T. bonariensis*, which typically is a melodious and short repetition of a sequence of 2–3 notes (usually 2, alternating high and low-pitched notes), lasting altogether for 2.5–3 seconds (similar descriptions of the song for both species appear in Isler & Isler 1987).

Remarkably, each species looks more similar to a more distantly related tanager than to its sister species. In plumage, *Pipraeidea* is much closer to *Dubusia castaneoventris* (formerly placed in *Delothraupis*) than it is to *T. bonariensis* (Fig. 5). In morphology, *T. bonariensis* resembles some *Thraupis*, which explains its historical treatment in that genus. In its diet and behaviour, *Pipraeidea* is quite similar to *Nemosia*, whereas *T. bonariensis* is again more similar to *Thraupis sayaca* and other congeners. Even in the popular nomenclature in Brazil *T. bonariensis* has been directly associated with *Thraupis*, all of which are collectively called *sanhaço*s (including also *Stephanophorus* and some *Piranga*; Sick 1997; Piacentini *et al.* 2015).

In sum, these species are very divergent from each other and I cannot see any phenotypic feature that unites them to the exclusion of other Thraupidae. They are much more divergent from each other, both phenotypically and genetically, than many other pairs of sister or closely related genera in the family (e.g. *Ramphocelus* vs. *Tachyphonus*; *Idiopsar* vs. *Chionodacryon*; *Spodiornis* vs *Acanthidops*; *Wetmorethraupis* vs. *Bangsia*; *Neothraupis* vs. *Diuca*; the five genera formerly treated collectively under *Tangara*; see Burns *et al.* 2016). Thus, I suggest *Pipraeidea melanonota* and the Blue-and-yellow Tanager be treated in distinct genera. Because no name is available for the latter species, I here propose the recognition of a new genus:

Remsenornis gen. nov.

Type species: *Loxia bonariensis* Gmelin, 1789 (traditionally treated as *Thraupis bonariensis* or, most recently, *Pipraiedea bonariensis*).

Included taxa: *Remsenornis bonariensis darwinii* (Bonaparte, 1838), *R. b. compositus* (Zimmer, 1944), *R. b. schulzei* (Brodkorb, 1938) and *R. b. bonariensis* (Gmelin, 1789).

Diagnosis. The adult male plumage of *Remsenornis* differs from all other genera of the Thraupidae by the combination of a well-defined blue hood with a bright yellow or orange-yellow rump. It further differs from *Pipraeidea*, its sister lineage, in all points highlighted above.

Etymology. I am happy to name this new genus after James V. "Van" Remsen, Jr., in recognition of his contribution to Neotropical and, especially, South American ornithology. Van has helped form the careers of many ornithologists over the years, but his influence has reached far beyond his formal students, which includes, for example, my views on the curation and care of bird collections. My ideas on generic limits of birds and the meaning and value of monospecific genera also overlap broadly with Van's, and such ideas are particularly relevant to this paper.

Gender: masculine.

Remarks. The establishment of a monospecific genus for the Blue-and-yellow Tanager may be questioned on the grounds that monospecific/monotypic genera do not convey information regarding systematic relationships when cited in a linear sequence (or when the species are presented in a book). One of the many flaws of such criticism stems from a misconception of the true goals of a linear sequence, coupled with a limited view of the reasons behind the existence of monospecific genera. It is worth keeping in mind the distinction between mono/polyspecific (i.e. single/many species) and mono/polytypic (i.e. single/many "forms" [taxa]).

First, it should be clear that a linear sequence of taxa is not intended to represent sistership of species (that is left to phylogenies, of course). Linear sequences are a simple and succinct way to present taxonomic diversity in a text. Second, a monospecific genus may result from different processes: (1) the existence of a very distinct lineage/species that may have undergone strong evolutionary pressures (unlike its sister lineage/species); (2) it may result from extinction(s) of closely related/sister lineages/species; (3) it may reflect our ignorance of the existence of other congeneric species, e.g. *Doliornis* was treated as a monotypic genus for over a century, until the discovery of a second *Doliornis* species; (4) it may reflect a temporal trend on the classification of the taxa included in it: for instance, *Remsenornis* is here defined as a monospecific but polytypic (i.e., with more than one "form"[taxon]) genus which may become polyspecific when any of the subspecies is elevated to species level—a likely fate for *R. b. darwinii* once adequate data becomes available, and a treatment already adopted by del Hoyo *et al.* (2016). Some of the points raised above on the significance of monospecific genera were also presented by Isler *et al.* (2013).

In any event, the treatment proposed here is far from being a novelty within the Thraupidae. Currently, there are at least nine other cases of two sister species being treated in two distinct, monospecific genera (following Burns *et al.* 2016): *Orchesticus* vs. *Parkerthraustes*; *Sericossypha* vs. *Compsothraupis*; *Chlorophanes* vs. *Iridophanes*; *Eucometis* vs. *Trichothraupis*; *Piezorina* vs. *Xenospingus*; *Urothraupis* vs. *Nephelornis*; *Spodiornis* vs. *Acanthidops*; *Idiopsar* vs. *Chionodacryon*; and *Diuca* vs. *Gubernatrix*. The latter pair is even known to hybridize in the wild, which is not the case for *Pipraeidea melanonota* and *Remsenornis bonariensis*.

Despite the subjectivity of generic limits, the recognition of *Remsenornis* brings more consistency to classification of the Thraupidae—either the traditional or the one proposed by Burns *et al.* (2016), which I strongly support. Additional minor adjustments may still be proposed, but I believe we are close to a robust and—hopefully—stable classification of the tanagers.

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