



A new genus for the American Tree Sparrow (Aves: Passeriformes: Passerellidae)

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The genus *Spizella* (Bonaparte) contains seven species of North American sparrows in the recently resurrected family Passerellidae (Bock 1994; Barker *et al.* 2013), formerly placed in the Emberizidae, and includes a few of the region's most common and familiar bird species. *Spizella* sparrows occupy more or less open habitats; most species are at least partially migratory and form small flocks when not breeding. On the basis of their similar morphology and behavior, they have long been treated as a natural group (Ridgway 1901; American Ornithologists' Union 1998).

Mayr and Short (1970) suggested that the American Tree Sparrow *Spizella arborea* (Wilson) had no close relatives but did not provide a rationale for their assertion. Two early molecular studies found *S. arborea* to be divergent from the other species of *Spizella*, on the basis of mtDNA restriction fragment length polymorphisms (Zink & Dittmann 1993) and cytochrome b mitochondrial (mtDNA) sequences (Dodge *et al.* 1995), although taxon sampling in both studies was limited. Zink and Dittman observed that the mean genetic distance between *S. arborea* and other species of *Spizella* was greater than that between *S. arborea* and *Junco hyemalis* (Linnaeus), and recommended that *Spizella* be tested for monophyly. Dodge *et al.* (1995) observed polyphyly of *Spizella* involving *S. arborea*, depending on which non-*Spizella* outgroups they included in their analysis. However, they stopped short of concluding that *Spizella* is polyphyletic in light of limited taxon sampling and possible long-branch attraction issues (Felsenstein 1978) in their phylogeny.

More recent molecular phylogenies corroborate patterns from those earlier studies. Using much denser species sampling and three mtDNA loci, Carson and Spicer (2003) resolved a polyphyletic *Spizella*, with *S. arborea* sister to *Passerella iliaca* (Merrem). In a multilocus phylogeny with complete sampling of New World sparrows, Klicka *et al.* (2014) also found *Spizella* to be polyphyletic: *S. arborea* formed a monophyletic group with *Passerella*, *Zonotrichia*, and *Junco*, while the rest of *Spizella* formed a monophyletic group distant from *S. arborea*. The mtDNA tree (based on ND2 sequences) of Klicka *et al.* (2014) strongly supported a sister relationship between *S. arborea* and *Passerella iliaca*, with long branches separating the two (also see Barker *et al.* 2013). The less resolved nuclear DNA tree of Klicka *et al.* (2014) strongly supported the placement of *S. arborea* within the *Passerella-Zonotrichia-Junco* clade, although it failed to support the sister relationship between *Passerella iliaca* and *S. arborea*. Using species tree inference, Klicka *et al.* (2014) found *S. arborea*, *Passerella*, *Zonotrichia*, and *Junco* to form a four-way polytomy, distant from other species of *Spizella*.

Multiple studies now corroborate that the genus *Spizella* is polyphyletic; hence, *S. arborea* and the rest of *Spizella* belong in separate genera. The type species of *Spizella*, by original designation, is *Fringilla pusilla* (Wilson). *Spizella pusilla* is part of a monophyletic group that includes all other *Spizella* species except *S. arborea* (Klicka *et al.* 2014). Thus, the genus *Spizella* should be restricted to this group, and *S. arborea* should be placed in a different genus.

Given the phylogenetic relationships described above, three options exist for the generic placement of *S. arborea*: 1) place *S. arborea* in a monotypic genus, 2) merge *S. arborea* into *Passerella*, or 3) merge *S. arborea*, *Passerella*, *Zonotrichia*, and *Junco* into a single genus. The long branches subtending *S. arborea* and *Passerella iliaca* on the mtDNA tree indicate that these two lineages are relatively ancient. Merging both into *Passerella* (see Rising 2011) overlooks the morphological and genetic distinctiveness and long independent histories of these two taxa. Although the merger of *Passerella* and *Zonotrichia* with (Short & Simon 1965) and without (Paynter 1964) *Junco* has been proposed, such notions have never included *S. arborea*, but instead have proposed that *Melospiza*, now known to be only distantly related (Klicka *et al.* 2014), forms part of this group (Dickerman 1961). Given that the strong phenotypic differences and deep phylogenetic divergence among these four groups are on par with divisions between other sparrow genera (Klicka *et al.* 2014), we feel that *Passerella*, *Zonotrichia*, and *Junco* should be retained and that placing *S. arborea* in a monotypic genus is warranted. *Spizella arborea* has been previously placed in seven other genera: *Emberiza*, *Fringilla*,

Passer, *Passerella*, *Passerina*, *Spinetes*, and *Zonotrichia* (Baird *et al.* 1901; Ridgway 1901; Hellmayr 1938; Rising 2011). However, *S. arborea* is not the type species of any of these genera (Baird *et al.* 1901; Ridgway 1901; American Ornithologists' Union 1998). Because no generic name is currently available for the American Tree Sparrow, we describe a new genus:

***Spizelloides*, gen. nov.**

Type species. *Fringilla arborea* Wilson, currently *Spizella arborea*.

Included species. *Spizelloides arborea* (Wilson) *comb. nov.*, American Tree Sparrow.

Diagnosis. Distinguished from all extant species of *Spizella*, *Passerella*, *Junco*, and *Zonotrichia* by (1) a yellow lower mandible contrasting with a black upper mandible and (2) strongly divergent molecular characters (Klicka *et al.* 2014). Further distinguished from the six species of *Spizella*—*atrogularis* (Cabanis), *breweri* (Cassin), *pallida* (Swainson), *passerina* (Bechstein), *pusilla* (Wilson), and *wortheni* (Ridgway)—by (1) distinctive plumage features including rufous crown, rufous postocular stripe, and pale gray underparts with a dark central breast spot; (2) larger size on average (wing chord 67–82 mm, tail 60–74 mm; Pyle 1997); and (3) lateroventral process (LP) of the laterosphenoid 0.8–1.3 times the length of the zygomatic process (ZP) and with a wide, flat tip (vs. LP short (0.1–0.4 times the length of the ZP) in five species of *Spizella*; *S. wortheni* not examined; Patten & Fugate 1998). Further told from *Passerella iliaca*, its sister taxon according to the most complete molecular phylogeny (Klicka *et al.* 2014), by plumage characters, including a conspicuous lack of dense, dark streaking or spotting on the underparts. Separated from all extant species of *Zonotrichia*—*atricapilla* (Gmelin), *albicollis* (Gmelin), *capensis* (Müller), *leucophrys* (Forster), and *querula* (Nuttall)—and *Junco*—*hyemalis*, *phaeonorotus* (Wagler), and *vulcani* (Boucard)—species by rufous crown and, in adults, a combination of dark iris and dorsal plumage streaking.

Description. *Spizelloides arborea* is well known and many descriptions have been published elsewhere (e.g. Ridgway 1901; Naugler 1993; Pyle 1997).

Etymology. The generic epithet *Spizelloides* is formed from the sparrow genus *Spizella* and the Greek suffix *-oidēs* (resembling; Brown 1956). The name alludes to the evolutionary convergence in plumage, morphology, and behavior that led to *Spizelloides arborea* being considered a *Spizella* sparrow for many years. The gender of *Spizelloides* is feminine.

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