

## Viewpoint

# Taxonomic pitfalls in tits – comments on the Paridae chapter of the Handbook of the Birds of the World

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In the last two decades, parid systematics and taxonomy have greatly benefited from the consistent application of detailed morphological, bioacoustic and molecular genetic methods. Continuously enlarged character sets, particularly in the latter field, helped to resolve a considerable number of taxonomic controversies, and in some cases a clear grouping of molecular markers (mitochondrial DNA) and vocalizations has enabled unambiguous assignment to taxonomic category. However, in our opinion some of these assignments were inadequately reflected in the species accounts of *Handbook of the Birds of the World*, vol. 12 (Gosler & Clement 2007). Here we point out what we consider to be major flaws in order to prevent further misunderstandings. Most taxonomic pitfalls addressed here refer to those examples where a polytypic species in former treatment was split into one species A and a second paraphyletic species B which includes the sister taxon to species A as a subspecies (or subspecies group). The authors were aware of the current state of the taxonomic debate in all the cases addressed below. They briefly discussed most arguments for an alternative taxonomy but finally rejected the new findings and risked perpetuating an 'old' and increasingly obsolete taxonomy. However, we accept that some of the work we cite below was unavailable to the authors.

### GREAT TITS AND TURKESTAN TITS – SPECIES STATUS OF *PARUS BOKHARENSIS*

Gosler and Clement (2007) continue to rank the Turkestan Tit *P. bokharensis* as a species opposite a sister species that comprises all remaining taxa of the Great Tit *Parus major*. Contrary to this traditional point of view, phylogeographic

studies (mitochondrial DNA) showed that the central Asian *bokharensis* populations are most closely related specifically to the north Palaearctic subspecies *Parus m. major* s. str. These two taxa form a monophyletic lineage which is strongly diverged from an East Palaearctic/Indomalayan cluster of populations of *P. major*, namely the subspecies sectors *P. m. minor* and *Parus m. cinereus* (Kvist *et al.* 2003a, 2003b, 2007, Päckert *et al.* 2005). Two discrete clusters resulting from discriminant analysis of song parameters confirmed this bifurcation of the molecular Great Tit tree. In contrast, the members of the *major/bokharensis* clade exhibit no significant and hardly measurable acoustic differentiation (Päckert *et al.* 2005).

The *major* s. str. and the *bokharensis* populations also are not reproductively isolated biological species, despite the authors' claim that 'the two interbreed only rarely and locally' and 'genetic evidence indicates that they are better considered separate species'. As to the first argument, scantiness of local hybridization is certainly due to the patchy distribution of the artificially introduced *major* form in Kazakhstan and Kyrgyzstan. Mitochondrial gene flow has been detected in a small sample size from the Kazakh contact area of *bokharensis* and the *major* sectors (Päckert *et al.* 2005). In still another natural contact zone between these two subspecies sectors in south-west Mongolia, all collected specimens were found to be hybrids (Eck 1980, 1988). In contrast, in the well-studied Far East Siberian hybrid zone two apparently separate mitochondrial gene pools of each *major* and *minor* birds coexist despite striking and presumably unilateral nuclear gene flow (Kvist *et al.* 2003a, Kvist & Rytönen 2006).

Consequently, a consistent split between well-diagnosable phylogenetic species of this group should first be considered between Palaearctic *P. major* (including *bokharensis*) and south-east Asian *P. minor* (including *cinereus*) reflecting the marked discontinuity of both genetic and acoustic markers (Fig. 1). Applying a narrow biospecies concept might favour the same split (limited gene flow in Far East Russia) or alternatively in a wide biological species approach all Great Tit populations might be united under *P. major* (Fig. 1).

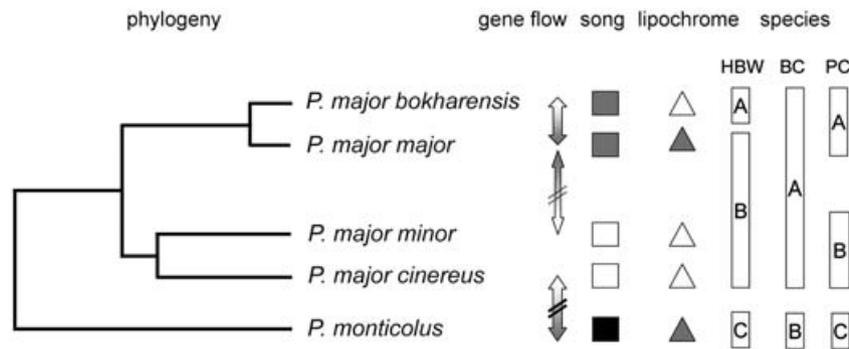
In any case, the *bokharensis* metapopulation is undoubtedly one least-inclusive taxonomic unit of the Great Tit assemblage. It should not be opposed to a paraphyletic species taxon, *P. major*, which includes three equally diagnosable and reproductively compatible subspecies blocks.

### COAL TITS AND SPOT-WINGED TITS – SPECIES STATUS OF *PERIPARUS MELANOLOPHUS*

Another least-inclusive tit taxon, *Periparus melanolophus* of the northwestern Himalayas, is currently almost unanimously treated as a species on its own. Genetic data now surprisingly revealed that this taxon is embedded in a monophyletic clade of *Periparus ater* (Gill *et al.* 2005). Among five distinct mitochondrial lineages, the east

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**Figure 1.** Paraphyletic phylogenies in the *Parus major* group. Simplified mitochondrial phylogeny of traditional Great Tit subspecies sectors (only nominate subspecies given for each sector; outgroup: *Parus monticolus*); gene flow, arrows. Without bars = unrestricted, even mitochondrial; dotted bars = no mitochondrial but nuclear gene flow; bold bars = no hybrids occur; song, squares: black = very narrow-banded, whistles, white = broad-banded, modulated notes, grey = narrow-banded, whistles; lipochrome, triangles: dark grey = belly and mantle, light grey = mantle only, white = no lipochromes; species: HBW: species taxa distinguished by Gosler and Clement (2007), BC: species set according to a wide approach of the biological species concept; PC: species set according to the phylogenetic species concept, respectively.

Himalayan *aemodius* and *martensi* populations are the closest relatives of the west Himalayan *melanolophus* clade (Martens *et al.* 2006). Geographic differentiation of songs is subtle in Coal Tits and as yet not fully investigated with respect to Chinese populations. However, songs from west Europe and from the Himalayas differ with respect to frequency range and element repertoire. In playback experiments Nepal birds (*aemodius*) showed reduced territorial response to unknown dialects from *ater* and *melanolophus* populations (Martens 1975). Despite these acoustic differences, local hybridization between *aemodius*, *martensi* and *melanolophus* is common in secondary contact (Martens 1975, Eck & Martens 2006, Martens *et al.* 2006).

We note also that another Coal Tit subspecies, *Periparus ater fokiensis* of south-east China, is similarly dark and greyish like Himalayan *melanolophus*. Generally, colour pattern does not seem to be a reliable diagnostic marker for species level taxa in the *P. ater* complex. Until further evidence, we suggest the west Himalayan *melanolophus* populations be treated as a subspecies of *P. ater* in accordance with Collar and Pilgrim (2007).

Further, Gosler and Clement (2007) mention two additional genetically and morphologically distinct taxa but do not list them in the subspecies accounts. These missing subspecies are: *Periparus ater eckodedicatus* Martens, Tietze & Sun 2006 and the concurrently revalidated southwestern European *Periparus ater abietum* Brehm 1831 (Martens *et al.* 2006). The marked genetic differentiation of the latter populations strikingly parallels the situation between northern and southern European Blue Tits (see below). We question why these distinctive populations (*abietum* and *eckodedicatus*) of Coal Tits did not merit formal subspecies status, while the genetically least-distinctive Himalayan *melanolophus* populations that hybridize regularly with the *aemodius* sister clade rank as a separate species.

### RUFOUS-VENTED TITS (*PERIPARUS RUBIDIVENTRIS*)

As in the *P. ater* group, genetic clusters of Rufous-vented Tit populations do not correspond with the pronounced differentiation of plumage coloration, for example between ssp. *rubidiventris* and ssp. *beavani*. In particular, the well-marked Chinese populations (*whistleri*) are morphologically and genetically distinguishable from at least two of the other three listed subspecies, including *beavani* (Martens *et al.* 2006). Yet they are included in *Periparus r. beavani* with token acknowledgment that they are 'probably better separated as race *whistleri*' (Gosler & Clement 2007).

### EUROPEAN AND CANARIAN BLUE TITS - NORTH AFRICAN CYANISTES TENERIFFAE ULTRAMARINUS

Inclusion of the North African populations in the European Blue Tit *Cyanistes caeruleus* as done by Gosler and Clement (2007) is not a matter of perspective or taxonomic concepts, it is a simple misplacement. The authors acknowledge the alternative taxonomic affiliation of subspecies *ultramarinus* and *cyrenaicae* with *C. teneriffae* and point out that further studies would be required. However, North African *Cyanistes* populations undoubtedly belong to the genetic cluster of Canarian *C. teneriffae*, i.e. to one mitochondrial haplotype clade with the populations from Lanzarote and Fuerteventura, *C. teneriffae degener* (Salzburger *et al.* 2002, Kvist *et al.* 2005, Dietzen *et al.* 2008). Bioacoustic analysis of *Cyanistes* song pattern indicated a close relationship between North African and Canarian populations long before the first genetic studies were published (Becker *et al.* 1980, Schottler 1993, 1995). Morphological differentiation suggests an affiliation of *ultramarinus* to the

Canarian population group as well (Eck 1988, 2006). To be fair, the newly described subspecies *Cyanistes teneriffae hedwigii* Dietzen, Garcia-del-Rey, Delgado-Castro & Wink 2008 could understandably not have been included by Gosler and Clement (2007).

## AZURE TITS – CYANISTES CYANUS

We support the treatment of the central Asian *flavipectus* populations as a subspecies of the Azure Tit (Gosler & Clement 2007). The subspecific rank of *Cyanistes cyanus flavipectus* is in accordance with a lack of genetic and acoustic differentiation of these populations (Martens 1996, Salzburger *et al.* 2002); nevertheless these have been repeatedly treated as a separate species to date (Harrap & Quinn 1996, Dickinson 2003).

With this exception, the cases discussed here represent a missed opportunity to move past traditional taxonomic perspectives in favour of a comprehensive systematic approach that applies current knowledge to consistent taxonomic treatments.

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