

ings or building projects are named 'De Witte Raaf', including a well-known hotel at Noordwijkerhout, Zuid-Holland. Other examples include a special brand of 'white' beer, brewed in Limburg, and one of the numerous series of popular cheap pocket books ('Witte Raven'). It seems obvious that there is a semantic link between this meaning and the eagerness with which the White Raven was collected at the end of the 19th century and the presumed high prices paid for specimens. In the past, 'White Raven' had the same meaning in Danish, as can be seen in old proverbs. It is, however, not used anymore in everyday language (Søren Sørensen in litt).

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Trends in systematics

Species limits in the Blue Tit complex: new evidence from play-back studies

Islands are famous for their high levels of endemism. On the Canary Islands, the Blue Tit *Parus caeruleus* is represented by no less than four endemic subspecies, which are largely based on plumage differences. An early study by Becker et al (1980) showed that the vocalizations of Tenerife Blue Tits *P c teneriffae* differ from those of mainland populations (European *P c caeruleus* and northern African *P c ultramarinus*) and that these subspecies only rarely responded to play-back of each other's songs. In view of the importance of vocalizations in species level taxonomy in tits (Snow 1956, Martens & Nazarenko 1993), such results have taxonomic relevance. Martin (1991), for instance, used these vocal data to support his proposal to recognize a second species in the Blue Tit complex, *Parus teneriffae*, comprising all four Canarian and two northern African subspecies. Other than those of *teneriffae* and *ultramarinus*, the vocalizations of these subspecies were not known, and in the absence of further play-back tests the taxonomic status and relationships of these subspecies remained uncertain.

In a new study by Brigitte Schottler, aimed at testing hypotheses about the evolution of vocal differences among island populations (Schottler 1995), the vocalizations of all seven populations

of Blue Tit on the Canary Islands, as well as two populations in Europe and northern Africa, were analyzed and most populations were subjected to play-back tests. This study, one of the largest of its kind, shows that the six analyzed taxa (four on the Canary Islands, and one each in Europe and northern Africa), rarely responded to play-back of each other's songs. Although she did not intend to address the taxonomic implications of her findings, the data represent the most significant contribution to our understanding of blue tit relationships and compel us to re-examine the specific status of the six analyzed taxa. The taxonomic interpretation given here is, therefore, entirely my own.

Schottler analyzed over 2000 songs of 270 males of populations on Tenerife, Gran Canaria and Gomera (*P c teneriffae*), Fuerteventura and Lanzarote (*P c degeneri*), Hierro (*P c ombriosus*), La Palma (*P c palmensis*), central Europe (*P c caeruleus*) and Tunisia (*P c ultramarinus*). No less than 1359 play-back experiments were conducted to test the ability of these populations to recognize each other's songs. Her results, and those of Becker et al (1980), can be summarized as follows: songs of *teneriffae* did not elicit territorial behaviour from *caeruleus* and only rarely from *palmensis*; *ombriosus* apparently does react to songs of *teneriffae* from Tenerife (Schottler & Martens 1991), although no further details of these tests have been published; songs of *pal-*

mensis did not evoke any reaction from *teneriffae*, *ombriosus*, *ultramarinus* or *caeruleus*; songs of *ombriosus* did not elicit any reaction from *palmensis*; songs of *ultramarinus* elicited only very few reactions from *caeruleus*; songs of *caeruleus* elicited a positive reaction from some, but not all *teneriffae* and did not elicit any reaction from *palmensis*; songs of *degener* elicited a positive reaction from about 50% of the tested individuals of *palmensis*, the other 50% did not respond, or only weakly so. To separate lack of motivation from absence of recognition, each play-back test was followed by play-back of the population's original song; all individuals responded vigorously to vocalizations of their own population.

Under the Biological Species Concept, which delimits species on the basis of reproductive isolation, it is difficult to evaluate the status of allopatric populations since there is, obviously, no direct method to test their reproductive compatibility. All we can do at the present time is to infer their status by indirect methods. In many species, a territory is an essential prerequisite for the attraction of a partner and successful reproduction. Songs often act as an effective territorial proclamation, and the males of most species will defend a breeding territory against any invading competitor (Catchpole & Slater 1995). In play-back experiments, in which the territory of a male is invaded by a loudspeaker broadcasting recordings of songs, the territorial response towards the song indicates to what extent the male identifies the song as that of a competitor. Since most competitors are males that belong to the same species, the level of response in a play-back test is of taxonomic significance. Play-back tests, therefore, can be used by taxonomists as a tool for the assessment of species recognition in the birds themselves (eg, Alström & Olsson 1992). However, males sometimes respond to the songs of other (sympatric) species. Such manifestations of interspecific territoriality are known for several species (Payne 1986, Catchpole & Slater 1995). In the blue tits, however, it is the general lack of response that needs to be explained. Under certain circumstances, males may not respond to the songs of conspecific males, so for a taxonomic interpretation of Schotter's results it is essential to investigate this possibility.

Alström & Olsson (1992) identified several reasons why males may not respond to the play-back of songs of conspecific individuals: 1 the individual is in a stage in the breeding cycle where competition is less harmful to its breeding



76 Tenerife Blue Tit / Tenerifepimpelmees
Parus (caeruleus) teneriffae, Tenerife, Canary Islands,
July 1988 (Oscar V Endtz)

success; 2 the individual may not have established a firm territory; 3 if the song that is played was recorded near the territory of the tested bird, the individual may recognize the song and react less vigorously to it than to a song from a strange individual; 4 the speaker may have been placed at the periphery of the territory, which might be less vigorously defended; 5 visual signals may be more important in proclaiming territory ownership; and 6 visual signals may be necessary in combination with song to elicit a response.

In the blue tits, these pitfalls can be excluded because the tested males all responded vigorously to play-back of the song of their own population. The general lack of response to the songs of other members of the Blue Tit complex therefore indicates that they did not consider each other as competitors. It seems unlikely that they would interact if they were in contact and are therefore better regarded as separate species.

In addition to European Blue Tit *P caeruleus*, I propose to recognize five species: North African Blue Tit *P ultramarinus*, Fuerteventura Blue Tit *P degener*, Tenerife Blue Tit *P teneriffae*, Hierro Blue Tit *P ombriosus* and Palma Blue Tit *P pal-*

menis. Previously, these forms were regarded as members of a 'teneriffae group' of subspecies (eg, Cramp & Perrins 1993, Harrap & Quinn 1996) which Martin (1991) raised to specific status. The members of this group share several features which distinguish them from European Blue Tit, such as a blackish crown, blue-grey to slate-grey upperparts (except for Hierro Blue Tit) and territorial songs characterized by quick frequency changes (Schottler 1995). These five species, however, differ in several other parameters of the territorial song (Schottler 1993, 1995), alarm calls (Schottler & Martens 1992), contact calls (Schottler 1995), plumage (Cramp & Perrins 1993) and size and proportions (Grant 1979). These differences are consistent with the view that these taxa are separate species and suggest a long history of separation.

North African Blue Tit inhabits broad-leaved woodlands in northern Africa and Pantelleria Island, Italy. It differs from all other species by its dark blue upperparts. In the absence of vocal data, the isolated *P u cyrenaicae*, which is confined to juniper woodland on the Barka Plateau, Lybia, can be tentatively regarded as conspecific with North African Blue Tit. The rare Fuerteventura Blue Tit inhabits semi-arid habitats with few trees on Fuerteventura and Lanzarote and is characterized by relatively pale greyish upperparts, broad white wing-bars and a small white patch on the central belly. Its total population is almost certainly less than 200 individuals (Schottler 1995). Populations on Fuerteventura and Lanzarote apparently do not respond to play-back of each other's songs (Schottler & Martens 1991), although no details have been published. Tenerife Blue Tit occurs commonly in laurel woods and pine forests on Tenerife, Gran Canaria and Gomera and is characterized by a combination of greyish-blue upperparts, the absence of wing-bars and a yellow belly. Although the three populations differ in territorial song, they apparently do respond to play-back of each other's songs (Schottler & Martens 1991). Hierro Blue Tit inhabits pine woods on Hierro and differs from all other Canarian blue tits by its olive-green upperparts. It differs from Fuerteventura Blue Tit by its much smaller greyish-white or nearly absent wing-bars and from Palma Blue Tit by its yellow belly. Palma Blue Tit is fairly common in pine forests on La Palma. It differs from all other species by its extensive white belly and from Tenerife and Hierro Blue Tits by its narrow white wing-bars and its dull and relatively dark grey upperparts. See also Harrap & Quinn (1996).

The announcement that a Western Palearctic species represents a complex of no less than six species may provoke incredulity. However, compared with some currently recognized species, such as Songar Tit *P songarus* and Turkestan Tit *P bokharensis* (see Harrap & Quinn 1996), which are mainly based on plumage and biometric differences from Willow Tit *P montanus* and Great Tit *P major*, respectively, and are not supported by play-back tests, the proposal to recognize six species in the Blue Tit complex seems relatively well-supported.

Either implicitly or explicitly, taxonomists often shift the burden of proof onto those who favour a 'split', and many taxonomists feel that in cases of 'doubt' a taxon is better lumped (eg, Mayr & Ashlock 1991). However, whatever one's viewpoint on the number of species in the Blue Tit complex, each viewpoint involves a hypothesis about relationships, and all hypotheses should be tested with equal care. In those cases where there are several lines of evidence about the existence of isolating mechanisms, taxonomists should evaluate which evidence supports a specific distinction and which evidence indicates conspecificity, instead of judging whether there is 'doubt'.

The case for conspecificity probably rests on the existence of some morphological similarities and perhaps the fact that some Palma Blue Tits respond to the songs of Fuerteventura Blue Tit. However, these species are separated by species which do not or only rarely respond to each other's songs. Furthermore, the level of response in Palma Blue Tit to songs of Fuerteventura Blue Tit is comparable with that of European Blue Tit to songs of Azure Tit *P cyaneus* (Martens & Schottler 1991). Based on some morphological and vocal characteristics (see above), an argument could be made that the taxa in the 'teneriffae group' should be treated together as a separate species, *P teneriffae*. However, that would deny the lack of vocal recognition among its members. The vocal, behavioral and morphological data, taken together, are more consistent with the view that the Blue Tit complex comprises six biological species.

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Recensies

N J COLLAR, M J CROSBY & A J STATTERSFIELD 1994. *Birds to watch 2 - the world list of threatened birds*. BirdLife Conservation Series 4. BirdLife International, Wellbrook Court, Girton Road, Cambridge CB3 0NA, UK. 407 pp. ISBN 0-946888-30-2. GBP 18.50.

DAVID C WEGE & ADRIAN J LONG 1995. *Key areas for threatened birds in the Neotropics*. BirdLife Conservation Series 5. BirdLife International, Wellbrook Court, Girton Road, Cambridge CB3 0NA, UK. 311 pp. ISBN 0-946888-31-0. GBP 22.50.

In 1988, the first edition of *Birds to watch* was hailed as a milestone in avian conservation. Those accolades were rightly deserved. The new publication is a totally rewritten version of the first one. With the fast accumulation of new information the first edition had become out-of-date. The new edition, however, is more than just an update. For each species, threat status has been re-evaluated according to new IUCN criteria. There are basically three categories of threat: Vulnerable, Endangered and Critical, each of which is characterized by a different probability of extinction.

The results of the new investigation reinforce the impression that the global avifauna is rapidly deteriorating. The species accounts constitute the bulk of the book and list no fewer than 1111 globally threatened species (c 11% of all species). Of these, four are extinct in the wild, 168 are critically endangered, which means they could have a 50% chance of extinction in

the next five years, 235 are endangered, characterized by a 20% chance of extinction in the next 20 years and 704 species are vulnerable, having a 10% chance of extinction in the next 100 years. For each species, there are details about distribution, habitat requirements, population trends and threats.

Compared to the previous edition the number of threatened species has increased by 81 species. The authors point out that the new list does not consist of the old list with 81 additions. In fact, there are 295 threatened species in the new edition that were not considered to be at risk in the old edition, while 214 species are downgraded from threatened status. Most of these changes are due to improved information; only few changes are due to a genuinely deteriorated situation. For example, of the 16 species that are now considered to be extinct, it is likely that only one (Ivory-billed Woodpecker *Campephilus principalis*) became extinct after the publication of the first edition. In the Western Palearctic, species now considered to be at risk include Ferruginous Duck *Aythya nyroca*, Steller's Eider *Polysticta stelleri*, Spotted Eagle *Aquila clanga*, Sociable Lapwing *Chettusia gregaria* and White-eyed Gull *Larus leucophthalmus*.

Key areas documents the 600 most important sites for the conservation of the 290 threatened species in Mexico, Middle and South America. These sites, which were identified using the information in *Threatened birds of the Americas* (Collar et al 1992, Cambridge),