Age determination of Willow and Crested Tits *Parus montanus* and *P. cristatus*

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In Willow and Crested Tits adults have rounded and fresh rectrices, while immature birds (first winter) have rather pointed and more or less worn rectrices. Rectrices of adult birds are also, on the average, broader than those of immature birds. These criteria can be used for aging from the autumnal moult period (August — September) until the end of winter, at least. The method has been tested in two winters in populations where the age of adult birds was known from ringing.

Introduction

Information about how to age Willow and Crested Tits is lacking in ringers' manuals (DROST 1951, SVENSSON 1970, 1975) and handbooks (e.g. WITHERBY et al. 1958, VON HAARTMAN et al. 1969). This makes population studies more difficult with these species than with Great and Blue Tits, which, in addition, are much easier to attract into nest-boxes.

During a study of the winter ecology of Great and Blue Tits begun by the authors in 1970, Willow and Crested Tits were caught in the nets in small numbers. From the start, we were interested in the reliability of methods for determining the age and sex of tits (concerning Great and Blue Tits, see LAAKSONEN et al. 1972, MYRSKY 1974), and in winter 1972/73 we tried to find out if there were any differences in the wing coverts of Willow and Crested Tits similar to those in Great, Blue and Coal Tits (see SVENSSON 1970, 1975). We could not find any useful criteria, though small differences apparently exist in the form and wear of primary coverts. In the following winter we began to look for differences in the rectrices and this time we were successful.

Form and degree of wear of rectrices

In passerines adult and first winter birds fairly commonly differ in the form and/or degree of wear of the rectrices. This criterion holds in, e.g., the Goldcrest, some thrushes and other Muscicapidae and in almost all Fringillidae and Emberizidae (e.g. SVENSSON 1970, 1975). In Blue Tits the difference is fairly clear, but in Great Tits, whose post-juvenal moult is more extensive, it is not useful during wintertime (see p. 12). The cause of the difference in the degree of wear is that immature birds (first winter) in these species retain their juvenile rectrices, or at least some of the outermost

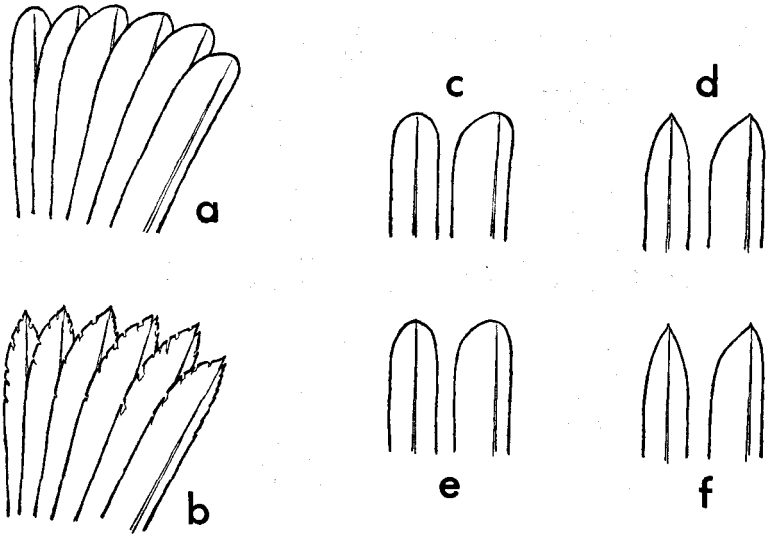

FIG. 1. Typical examples of tail feathers of Willow and Crested Tits. a. Half of the tail of an adult Crested Tit in mid-winter. b. Half of the tail of an immature Crested Tit in mid-winter. c—f. Central and 2nd outermost tail feathers: c. adult Crested Tit. d. immature Crested Tit. e. adult Willow Tit. f. immature Willow Tit.

ones, throughout the postjuvenal moult. Thus, these feathers are older and more worn in the winter. The difference is increased by the fact that juvenile feathers are often weaker and more easily worn. Why juvenile and adult rectrices have a different form even when fresh is unknown to us, but what matters here is that a difference exists.

Adults. In both species the rectrices are fresh with rounded tips. Marked wear is not apparent until February — March (first in the central pair). In many individuals the rectrices are still fairly fresh in spring. They are generally slightly broader than in immature birds.

Immature birds. In both species the rectrices are worn from November on (quite or relatively fresh in September — early October). The rectrices are more worn than those of adults throughout the winter. They are narrower than those of adults and their tips are clearly pointed.

Typical examples of the rectrices are presented in Fig. 1. The drawings are based on photographs and field sketches by the authors.

Tests

Willow and Crested Tits were ringed in the study area from winter 1970/71

TABLE 1. Tail-feather types of ringed and unringed Willow and Crested Tits in 1973—1975.

	Type adult	intermediate	immature
P. cristatus			
ringed	15	—	—
unringed	2	2	9
P. montanus			
ringed	10	—	—
unringed	5	1	19

on. Although the efficiency of netting varied, it was estimated that most adult individuals caught in winters 1973/74 and 1974/75 carried rings from earlier winters. Thus, it was expected that the individuals already carrying rings when caught for the first time in 1973/74 and 1974/75 would have fresh, rounded tail-feathers and most of the unringed birds would have worn, pointed tail-feathers. The results presented in Table 1 are in good accordance with this prediction. The fact that we caught proportionally more unringed Willow than Crested Tits with tails of the adult type is, according to our opinion, just what might be expected, in view of the differences in the biology of the two species. The Willow Tit moves over more extensive areas than the Crested Tit during autumn and winter (PALMGREN 1927, LINKOLA 1961). Three birds classified as intermediates were caught towards the end of the winter.

It is possible to reinforce this test. We may assume that the variation in wing and tail length in these species is similar to that in other tits and virtually all European passerines whose postnuptial moult is complete (including wings and tail) but whose postjuvenal moult is partial (not including wings and tail). We may expect then, that, on the average, immature birds will have shorter wings and tails than adults (see e.g. LAAKSONEN et al. 1974).

In both species four groups of birds can be compared with each other: (A) adults ringed in some previous winter, (B) unringed birds (usually, but not exclusively, immature), (C) adults, according to the rectrices, and (D) immature birds, according to the rectrices. The mean wing and tail lengths in groups A and C should be the same, and greather than in groups B and D. The mean wing and tail lengths in group B may be expected to be slightly greater than in D, or the same, if all the adult birds in the population were ringed in earlier winters. All measurements given apply to different individuals; most individuals were measured several times, and in such cases the mean was used.

Wings were measured by the method of the minimum or unflattened chord (SVENSSON 1970, LAAKSONEN et al. 1974). The maximum chords were also taken in the same set of birds; on the average, they gave 2.3 mm longer measurements, but the two methods provided comparable results. The method of measuring tail length was that used in Operation Baltic. As can be seen in Tables 2 and 3, the comparisons of the wing and tail lengths fit the expectations nicely in both species.

TABLE 2. Wing lengths of Willow and Crested Tits in winter (November—March). Method: minimum chord.

A. *Parus montanus*	Group A	t-test	Group B
$\bar{x}\pm$S.E., n	63.1±0.77, 13	1.266, N.S.	62.2±0.34, 35
t-test	0.183, N.S.		0.221, N.S.
	Group C		Group D
$\bar{x}\pm$S.E., n	63.3±0.64, 13	1.731°	62.1±0.39, 21
B. *Parus cristatus*	Group A	t-test	Group B
$\bar{x}\pm$S.E., n	63.8±0.48, 12	2.602**	62.1±0.47, 14
t-test	0.042, N.S.		0.200, N.S.
	Group C		Group D
$\bar{x}\pm$S.E., n	63.9±0.49, 13	2.838**	61.9±0.40, 9

TABLE 3. Tail lengths of adult and immature Willow and Crested Tits in winter (November—March). Method: Operation Baltic method (see BUSSE & KANIA 1970, LAAKSONEN et al. 1974). Age determined by the method presented in this paper. x ± S.E., n.

	Adult	t-test	Immature
Parus montanus	60.8 ± 0.68, 7	2.472**	58.1 ± 0.58, 20
P. cristatus	53.4 ± 0.62, 11	2.015°	52.0 ± 0.87, 6

It is possible to make one more prediction as to wing lengths. As immature birds have shorter wings than adults, the wing length of an immature indivvdual may be expected to grow significantly between one winter and the next, whereas that of an adult changes only slightly and more or less randomly. In six Crested Tits of unknown age (measured for the first time when unringed in 1971—73) the increase in wing length from one winter to the next averaged 1.7 mm; in two immature birds (aged according to the rectrices), it was 0.5 and 1.5 mm, and in seven adults (aged according to the rectrices) on the average only 0.3 mm. In six Willow Tits of unknown age (measured for the first time when unringed in 1971—73) the increase in wing length averaged 1.0 mm, in one immature (according to the rectrices) it was 1.8 mm, and in four adults (according to the rectrices) only 0.4 mm on the average. The growth rates of the wing length of immature birds are roughly those that may be expected from the mean wing lengths of adults and immature birds in the population studied (Table 2). This is further proof of the reliability of the ageing method.

Discussion

All evidence so far available is in favour of the ageing method presented. In autumn 1975 we checked the age of a few individuals with skull ossification and found no discrepancies between age determinations made by these two methods.

The most evident gap in the tests is the scarcity of knowledge about the moult patterns of juvenile Willow and Crested Tits. SVENSSON (1975) reports that juveniles of both species undergo partial postjuvenal moult, but he does not give a full description of the extent of the moult. In Palearctic passerines postjuvenal moult does not generally include the rectrices, or includes only one or a few of the central pairs. FLEGG & COX (1969) studied the moult of juvenile Great and Blue Tits in Great Britain, and according to them only 15 % of the Blue Tits moulted the central pair and none the whole tail, but as many as 80 % of the Great Tits moulted the entire tail. Our own data on Great and Blue Tits from SW Finland (1971—75) and Poland (autumn 1975) give roughly the same percentages.

Finnish moult card data on Willow and Crested Tits (collected by Dr. Erkki Haukioja) are few. The cards on adult Willow Tits indicate that the post-nuptial moult begins in mid-June and is finished by the end of August. The moult is thus almost a fortnight earlier than in both Great and Blue Tits (authors, unpublished). The three cards on adult Crested Tits showing the moult of primaries are from the same period as those of the Willow Tits.

The following data are available on

the postjuvenal moult: The only card on the Crested Tit shows no moult of the rectrices, though the body feathers were moulting. Of ten Willow Tits, seven did not moult the tail, though the body feathers were moulting; one bird had dropped the central pair of rectrices, one four inner pairs, and one the third pair (accident?, from one side only?). Thus, so far there is no evidence of the moult of the entire tail in Willow and Crested Tits. The moult cards indicate that it may be wise to use only two to four outer pairs of rectrices for ageing. Of course, when an immature bird has not moulted the central pair of rectrices, it is easily identified with the aid of these feathers as well.

Closing comment

In a visit to Poland in September 1975 we were told by Mr. Andrzej Petryna that the same criteria for ageing Willow and Crested Tits were recently adopted in Operation Baltic, and are also suitable for ageing the Marsh Tit *Parus palustris*. The few Marsh Tits investigated by us at Mierzeja Wislana were easily aged according to this character.

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Selostus: Hömö- ja töyhtötiaisen iänmääritys

Hömö- ja töyhtötiaisen ikä voidaan määrittää syksyllä ja talvella (jopa keväällä) pyrstösulkien muodon ja kuluneisuuden perusteella, ks. kuva 1. Vanhoilla linnuilla ovat pyrstösulkien kärjet pyöristyneet ja lähes kulumattomat. Nuorilla linnuilla pyrstösulkien kärjet ovat melko terävät ja kuluneemmat kuin vanhoilla.

Menetelmää on testattu kahtena talvena populaatiossa, joiden vanhat linnut tunnettiin aikaisempien rengastusten perusteella. Taulukossa 1. nähdään renkaallisten (vanhat) ja renkaattomien (nuoriksi oletetut) pyrstötyypit. Taulukossa 2. verrataan pyrstösulkien mukaan nuoriksi (ryhmä D) ja vanhoiksi (ryhmä C) määritettyjen sekä renkaitten perusteella vanhoiksi tunnettujen (ryhmä A) ja renkaattomien (oletettavasti nuoria,

ryhmä B) lintujen siivenpituuksia. Taulukossa 3. verrataan pyrstösulkien mukaan iälleen määritettyjen lintujen pyrstön pituuksia.

Eri ryhmien lintujen siivenpituudet ovat kahden peräkkäisen talven välillä muuttuneet odotetulla tavalla ts. nuoriksi määritettyjen lintujen siivenpituus on kasvanut selvästi enemmän kuin vanhoiksi määritettyjen. Muutamien yksilöiden iänmääritys on tarkistettu syksyllä 1975 myös kallon luutumisen perusteella.

Saatavilla olevien sulkasatotietojen perusteella näyttää siltä, etteivät kummankaan lajin nuoret linnut vaihda ensimmäisessä sulkasadossa koko pyrstöään.

Operation Baltic on ottanut saman menetelmän käyttöön äskettäin ja menetelmä pätee myös viitatiaiselle.