

Breeding biology of Blyth's Reed Warbler *Acrocephalus dumetorum* in SE Finland

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A population study has been in progress in Lappeenranta, SE Finland, since 1978. So far, 66 nestings and 67 unpaired males have been observed in the study area of 3.4 km², where the density in 1979 was 25.3 territories per km². The proportion of the territorial males breeding was 68 %. Half-open, bushy and dry habitats with dense undergrowth were preferred.

On average the first singing males are heard on 28 May. Singing ceases completely after pairing. Egg-laying commenced between 3 June and 16 July (mean 15 June) and the average clutch size was 5.5. The incubation period lasted 12—14 days and the nestling period 10—12. The young leaving the nest are unable to fly and are fed by their parents for a further 10—22 days. Of all the eggs, 84 % hatched and 68 % produced young that fledged, the number of young fledging per clutch being 4.0.

Three mixed pairs formed by a male Blyth's Reed Warbler and a female Marsh Warbler were found in 1979. There is only one previous record of hybridization between two *Acrocephalus* species in the literature.

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Introduction

The breeding biology of Blyth's Reed Warbler *Acrocephalus dumetorum* is poorly known compared with that of the seven other *Acrocephalus* species breeding in Europe (Dement'ev & Gladkov 1968, Eriksson 1969a, 1969b, Sorjonen & Tasihi 1976, Koskimies 1978). The main reason for this seems to be that outside the Soviet Union *dumetorum* is not common enough to be studied systematically, except locally in SE Finland.

In the summer of 1978 I began to study the ecology and interspecific relations of the sympatric *Acrocephalus* species in Lappeenranta, where the breeding population of *dumetorum* seems to be the densest in the whole

of Finland (cf. Koskimies 1978, 1979). In this paper I present some preliminary observations on the breeding biology of *dumetorum*, comparing them with data on the Marsh Warbler *A. palustris*.

Study area and methods

The study was carried out south-east of the town of Lappeenranta (61°03'N, 28°11'E). In 1979 it was confined to an area of 3.4 km², where there are many suitable habitats for *dumetorum* and the density of the species is higher than elsewhere in the vicinity of Lappeenranta. No territories were found in a 1.5-km-broad zone around the study area in 1978—79. In 1979 I probably found all the *dumetorum* territories and nests in the study area, whereas in 1978 the census was less intensive and many territories may have remained undiscovered.

In 1979 I paid daily visits to all the potential and inhabited territories in the study area, both in the daytime and at night. The presence and pairing of the males was checked by playing *dumetorum* song with a tape recorder (cf. p. 28). I examined the nests almost every day to find out the date of egg-laying, the clutch size, incubation period, nestling period and nesting success. The growth rate of the nestlings was studied by determining the wing length and weight of 14 broods daily. In 1979, 90 % of the breeding adults and 36 % of the unpaired singing males were mist-netted and ringed with individual combinations of aluminium and colour-rings. All the nestlings and many males visiting the area occasionally were also ringed. Breeding adults were sexed on the basis of their behaviour and incubation patch.

The total records made by me so far in the study area comprise 58 nests (42 in 1979), 8 broods found after they had left the nest (2) and 67 unpaired males (41). During the two study years I ringed 126 adults and 249 young (92 and 177, respectively, in 1979).

Results and discussion

Expansion and population density. The first observations of *dumetorum* in Lappeenranta are from the summer of 1947, when one nest and two unpaired males were found (Toivari 1950). Since then the species has expanded rapidly in my study area and its immediate surroundings; according to highly comparable censuses, 4.5 times as many singing males were heard during 1974–76 as during 1962–64 (Koskimies 1979). Thus my material from South Karelia and other parts of Finland does not support Eriksson's (1969a) claim that the expansion of *dumetorum* in Finland is only apparent and that the increase in the records is due to intensified observation activity.

In 1979 there were 85 territories, or 25.3 territories per km², in the study area. The proportion of the singing males that bred was 52 %, but if passage migrants and occasional visit-

ors in July are excluded, this value rises to 68 %. Previous estimates of the proportion of breeding males range from 42 (Sorjonen & Tasihiin 1976) to 67 % (Koskimies 1978). The proportion varies from year to year and is probably higher in Lappeenranta than nearer the borders of the species' range.

Males singing at the same time often settle in groups leaving suitable habitats in intervening areas unoccupied. The females, which arrive later, may detect these clusters of males more easily than single individuals. The highest concentration observed in 1979 was 9 singing males (not all singing at the same time) in a meadow of 4 hectares (= 2.3 males per ha); 4 of them nested there. The minimum distances between two nests have been 10–15 m.

The ratio between the numbers of singing *dumetorum* and *palustris* males in the study area averaged 4:1 during the 1960s and 1970s (Koskimies 1979), but increased to 12:1 in 1979.

Habitat. Blyth's Reed Warbler nests in half-open, bushy and dry habitats with dense undergrowth. Suitable habitats are found most often in abandoned meadows and gardens, at the edges of fields and along roadsides. The species very occasionally nests in glades in park-like forests. Most often the undergrowth consists of *Rubus idaeus*, *Urtica dioica*, *Epilobium angustifolium*, *Filipendula ulmaria* and *Aegopodium podagraria*. By the beginning of the breeding season, in early June, the undergrowth is already dense and usually over half a metre high.

In the Soviet Union, in the central parts of the species' range, *dumetorum* is more eurytopic, breeding in a varie-

ty of habitats and even in coniferous forests (Dement'ev & Gladkov 1968).

The Marsh Warbler breeds in very similar habitats in Lappeenranta, but evidently tends to prefer moister habitats with luxuriant *Filipendula ulmaria* undergrowth (cf. Sorjonen & Tasihin 1976). Males of both species are frequently heard singing very close to each other, sometimes only a few metres apart, and normally without any signs of interspecific aggression. Their nests can be found within c. 10 m of each other (Eriksson 1969a, 1969b, own observations).

At present the *dumetorum* and *palustris* populations at Lappeenranta are not restricted by a shortage of suitable habitats.

Arrival. At Lappeenranta, *dumetorum* arrives in late May and early June. In 1970—79 the first singing males were heard between 20 May and 5 June (average 28 May). In 1979 I found 42 % of the males between 26 May and 4 June and 36 % between 5 and 15 June, i.e. 78 % had arrived by 15 June, the mean date of laying.

In the same area, *palustris* arrives 7 days later, on average (range in 1970—79: 20 May — 11 June).

Singing period. Migrating *dumetorum* males sometimes sing 1—2 days in the area and then disappear. The first to arrive, in late May, seem to sing only in the morning, and start their intensive night song after 2—5 days, whereas the males arriving in June seem to sing at night straight after their arrival.

An unpaired *dumetorum* male may sing many hours without interruption during the night and at times also in the day, most often in the morning. Immediately after the male has paired, the night song ceases completely, and

only short subdued bursts of song may be heard in the daytime, especially during the laying and incubation period. Thus, in the territories that are established first, night song is not heard at all if the female arrives soon after the male.

Because *dumetorum* males arrive and pair at different times, a conventional nocturnal census is not a reliable method. In such a census unpaired males are more likely to be found, which results in serious underestimates. To obtain a true picture of the population size one must visit every potential territory daily with a tape recorder.

In 1979 the mean singing period of the males lasted 8 days ($N=66$), range 1—47 days. In July 10 new males appeared in the study area, one of which was still singing on 21 July. These occasional visitors had probably nested or sung earlier elsewhere. In addition, I saw many silent unringed birds in July; e.g. on 16—26 July I mist-netted 8 new *dumetorum* individuals with the aid of playback song from the same bushes.

An unpaired male responds to playback of the species song by approaching the tape recorder and beginning to sing. Some males pay no attention to the site of the recorder but start to sing more vigorously with the "competitor".

A paired male responds very differently: it approaches the recorder, singing only in short excited bursts, if at all, but giving strong alarm calls. The aggression decreases as breeding proceeds. During the nestling period many males pay no attention to the playback song but respond to warning calls.

The function of the song in *dumetorum* is mainly sexual attraction, as in *palustris* (Dowsett-Lemaire 1979).

For that reason singing ceases completely after pairing, and a mated male does not begin to sing again even if a new singing male establishes a territory close by. The habitats of *dumetorum* seem to be so productive during the breeding season that there is no need to defend the territory fiercely; food for the young is collected by adjacent pairs from the same bushes and undergrowth without any aggression.

Nest and eggs. According to Eriksson (1969b), the female builds the nest alone. My observations show that the female builds the nest with her mate in attendance, but that the male may bring dry grasses, fibres and other material to the nest. It is hung on 3–5 plant stems in dense undergrowth dominated by *Rubus idaeus*, *Urtica dioica* and *Epilobium angustifolium*. The building most often lasted 3–4 days. The height of the upper edge of the nest from the ground ranged from 13 to 69 cm, averaging 38 cm ($N=55$). The highest nest (69 cm) was placed in a *Ribes rubrum* bush.

The nest of *palustris* tends to be built a little higher (cf. Sorjonen & Tasihiin 1976).

Egg-laying usually commenced 1–2 days after completion of the nest: in 1978 on 6–30 June (mean 15 June, $N=19$) and in 1979 on 3 June – 16 July (mean 15 June, $N=39$). Even the latest clutches in 1979, started on 8, 11 and 16 July, were evidently first ones, since the males were singing in their territories, and thus unmated, up to early July.

Dement'ev & Gladkov (1968) describe three colour-types of eggs. In Lappeenranta, too, the basic colour (from grey to somewhat reddish) and the dotting (colour, size, number) show much variation.

In 1978–79 the clutch size of *dumetorum* was 5 or 6, on average 5.5 ($N=31$). In *palustris* the usual number of eggs is 4 or 5 (Eriksson 1969a, Sorjonen & Tasihiin 1976, my own observations).

One of the parents may start sitting in the nest after the third egg, at least at night, but intensive incubation does not begin until the clutch is completed (cf. Wiprächtiger 1976). My observations indicate that the female incubates most of the time, but according to Eriksson (1969b) the parents take equal shares in incubation, as in *palustris* (Dowsett-Lemaire 1979). The incubation, from laying of the last egg to hatching of the last chick, took 12–14 days and averaged 13 days ($N=13$).

Nestlings. The young hatch within 1–2 days. A newly hatched chick weighs 1.5 g and has an average wing length of 6.5 mm ($N=60$). The growth rate is most rapid at the age of 4–8 days and the young leave the nest when they are 10–12 days old ($N=20$) and still unable to fly. At this time the mean weight is 11.4 g and the wing length 41 mm ($N=6$). The corresponding values in the adult population were 11.9 g and 63.7 mm ($N=126$; maximum flattened chord measurement, Svensson 1976).

The young are fed by both parents, on dipterans, spiders, phalangids and caterpillars. The food is collected within 0–30 m of the nest, both in the undergrowth and bushes and in the air. The nestlings are fed every 0.5–2 minutes. Until the young leave the nest, one of the parents sits on them during cold and rainy weather and at night. After leaving the young may sometimes return to the nest to spend the night there (J. Sorjonen, *in litt.*).

The female is able to raise a brood on its own: in a repeat brood observed

in 1979 the male disappeared on 31 July when the young (4) were 5—7 days old, but all of them fledged successfully. In many territories one of the parents disappeared during the nestling or fledgling period, as occurs commonly in *palustris*, too (Dowsett-Lemaire 1979). I did not find these birds later in the study area.

In a *palustris* population in Belgium, studied by Dowsett-Lemaire (1979), some of the males were bigamous and biterritorial. My preliminary observations suggest that this may also be true of *dumetorum*.

The young fledge at the age of c. 15—17 days. Before that they disperse in the undergrowth and both parents feed their own part of the brood, as in *palustris* (Dowsett-Lemaire 1979), usually continuing for 10—22 days after they leave the nest. The parents disappear from the territories and the whole study area after the young become independent. On 12 August 1979 a young bird ringed in Lappeenranta was recovered in Virolahti, 66 km southwest of its birth place, after 2 weeks' of independence.

Breeding success. Two nests (13 %) were destroyed in 1978, and five (11 %) in 1979. Two of these were deserted before the eggs hatched and in two others the nestlings died for some unknown reason. Three nests were probably robbed by a predator. Single eggs and young were lost because of the inclination of some nests after heavy rain.

In 1978—79, 83.7 % of all the eggs hatched and 68.0 % of them produced young that left the nest ($N=31$ clutches). These are high values for small passerines. On average, 4.0 young were produced per clutch commenced ($N=53$).

One nest was destroyed soon after

hatching on 4 July 1979. The parents built a replacement nest 15 m from the first one and egg-laying started on 9 July. The four young left the nest on 5 August. The other parents of destroyed nests disappeared from the territory and the whole study area within 1—2 days, and I found only one male later. The nest of this bird was abandoned early in the incubation period, and 8—12 days later the male was singing 1 km from the nest. Eriksson (1969b) did not observe repeat clutches in *dumetorum*, but Niemi (1968) found one successful repeat nesting.

Mixed dumetorum-palustris pairs. Blyth's Reed Warbler and the Marsh Warbler are very similar in appearance and behaviour, and seem to be very close relatives systematically as well. In 1979 I found three mixed breeding pairs formed by a *dumetorum* male and a *palustris* female. A brief description of my observations follows.

1. Lappeenranta, Mustola. A *dumetorum* male arrived on the night between 28 and 29 May (colour-ringed on 31 May) and moved 600 m to another territory on 31 May or 1 June. Here it paired on 7 June and the first egg was laid on 14 June. The form, colour and size of the eggs were like those of *palustris* (cf. Eriksson 1969b, Makatsch 1976). The incubation took 11.5 days and 3 of the 5 eggs hatched. The female was never seen properly because it slipped quietly into the shelter of the undergrowth every time I checked the nest. On 10 July I mist-netted both parents, and the female proved to be a *palustris*. On the same day the chicks left the nest. They were exactly like *dumetorum* young — there is a striking difference in the colour of the back and head between the young of *dumetorum* and *palustris*. Both parents fed the young up to 18 July and the female continued till at least 23 July.

2. Lappeenranta, Mustola (60 m from nest 1). A *dumetorum* male arrived on the night between 30 and 31 May and sang on his territory up to 14 June (colour-ringed on 11 June). At the singing site I found a completed nest on 17 June and laying commenced on

20 June. As in nest 1, the 5 eggs were exactly like those of *palustris*. On 21–23 June the *dumetorum* male sat on the eggs, but later only a silent female was seen incubating, except on 7 July, when both parents were at the nest. By mist-netting the female I confirmed that it was a *palustris*. The only nestling, hatched on 7 July, was raised by the female alone. The male was never seen during the nestling period, not even responding to play-back song. However, on 18 July, a day after the chick left the nest, the male incubated the 4 unhatched eggs and both parents gave alarm calls. The eggs were cold 5 hours later and on 20 and 21 July as well. On 21 July I took them away. The *palustris* female kept on scolding at the nest up to 26 July, when I mist-netted the nearly full-grown fledgling (wing 65, tail 43 mm). Its plumage was exactly as in *palustris* (back and head darker brown than in *dumetorum*). The notches in the primaries were also as in *palustris* (cf. Svensson 1976).

3. Lappeenranta, Partala (3 km from nest 1). A *dumetorum* male arrived on the night between 29 and 30 May and was colour-ringed on 30 May. It sang intensively up to 15 June, but between 15 and 19 June moved 150 m to the territory of another unpaired *dumetorum* male, which took over its former singing site. In this new territory the male kept on singing at least up to 21 June (not observed on 24 June). On 28 June it gave warning calls, but between 30 June and 11 July it failed to respond to blayback song. Surprisingly, it was again found giving warning calls on 24 July, and was seen together with a *palustris* female on 25 July. I mist-netted both birds and ringed the female. In dense *Epilobium angustifolium* I found the nest with four typical *dumetorum*-like nestlings, c. 10 days old. On 26 July the nest was empty. Each parent fed two young, and I saw the male up to 6 August and the female up to 9 August.

Previously there is only one confirmed record of pairing between two *Acrocephalus* species: in 1975 Lemaire (1977) observed a male Reed Warbler *A. scirpaceus* pairing with a *palustris* female, and later the birds nested together. This male had a mixed *scirpaceus-palustris* song. Pairing is presumably more probable between *dumetorum* and *palustris*, as their song and habitats are even more alike than those of *scirpaceus* and *palustris*.

In pairs 1 and 2, at least, breeding continued without interruption from pairing to the independence of the young. On my almost daily visits I saw no other *Acrocephalus* warblers in these territories, and the nearest *palustris* was 300 m away from nests 1 and 2 (an unmated male singing between 2 and 5 June and on 13 June) and 200 m from nest 3 (a breeding pair which commenced egg-laying on 19 June).

In the mixed pairs all the parents were ringed and measured and their identification was confirmed. In pair 1 hybridization between *dumetorum* and *palustris* was confirmed by the fact that the eggs were like those of *palustris* but the nestlings like those of *dumetorum*. Adoption of a fertilized *palustris* female by a *dumetorum* male seems extremely unlikely. F. Dowsett-Lemaire (*in litt.*) never established adoption in *palustris*.

The fact that three mixed *dumetorum-palustris* pairs were found near each other in the same summer raises the question, how commonly do such mixed pairs occur in SE Finland, where the expansion of both species has been rapid. Thorough future studies of *Acrocephalus* populations will be needed to answering this question.

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Selostus: Viitakerttusen pesimäbiologiaa Kaakkois-Suomessa

Viitakerttusen pesimäbiologiaa ja populaatiodynamiikkaa on tutkittu Lappeenrannassa 3,4 km²:n suuruisella tutkimusalueella vuodesta 1978 lähtien. Lajin ekspansio alueella on ollut nopea: esim. vuosina 1974–76 löydettiin vertailukelpoisissa laskennoissa 4,5 kertaa niin monta laulavaa koirasta kuin 1962–64. 1979 viitakerttusen tiheys tutkimusalueella oli keski-

määrin 25.3 reviiä/km² ja suurimmillaan 2.3 reviiä/ha. Vakituisilla revieireillä laulaneista koiraista 68 % oli pesiviä. Viita- ja luhtakerttusen lukumääräsuhde Lappeenrannassa on laulavien koiraiden perusteella ollut 1960- ja 1970-luvuilla keskimäärin 4:1.

Viitakerrtunen pesii puoliavoimilla, kuivilla pensaikkomailla, joilla on rehevä aluskasvillisuus. Varhaisimmat laulavat koiraat Lappeenrannassa kuullaan keskimäärin 28.5., viikko ennen ensimmäisiä luhtakerttusia. Toukokuun lopulla saapuvat koiraat laulavat 2—5 ensimmäistä vrk enimmäkseen tai yksinomaan päiväsaikaan, mutta kesäkuussa intensiivinen yölaulu alkanee heti saapumisen jälkeen. Heinäkuussa alueelle saapuu uusia parittomia koiraita.

Yölaulu loppuu täydellisesti heti pariutumisen jälkeen. Keskimääräinen laulukausi kesti 1979 8 vrk, mutta koiras ja naaras voivat saapua reviiirille samanakin yönä. Muninta alkoi 3.6.—16.7., keskimäärin 15.6. ($N=58$). Munaluku oli 5 tai 6, keskiarvo 5.5 ($N=31$). Haudonta kesti 12—14 ja pesäpoikasaika 10—12 vrk. Poikaset lähtivät pesästä lentokyvyttöminä ja emot ruokkivat niitä vielä n. 10—22 vrk. Munista 84 % kuoriutui ja 68 % tuotti pesästä lähtevän poikasen. Keskimäärin pesää kohti varttui 4.0 poikasta. Kaikkiaan 7 pesää tuhoutui, mutta vain yksi pari muni uusintapesyeseen.

V. 1979 tutkimusalueelta löytyi 44 pesivää viitakerrtuskoirasta, joista kolme oli pariutunut luhtakerrtusnaaraan kanssa. Pesintä onnistui kaikilla sekapareilla (3, 1 ja 4 poikasta). Hyvin lähisukuiset viita- ja luhtakerrtunen ovat levinneet nopeasti Kaakkois-Suomeen ja sekaparien yleisyyden selvittäminen edellyttää yksityiskohtaista *Acrocephalus*-populaatioiden tutkimista.

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