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## Pre- and non-breeding biology of Dotterel *Charadrius morinellus* on Värriötunturi fell area, NE Finland

Erkki Pulliainen & Lennart Saari

Pulliainen, E. & Saari, L. 1996. Pre- and non-breeding biology of Dotterel *Charadrius morinellus* on Värriötunturi fell area, NE Finland. *Wader Study Group Bull.* 81: 54-58.

The pre- and non-breeding biology of the Dotterel *Charadrius morinellus* was studied mainly in 1969-1973 in the Värriötunturi fell area (67°44' N, 29°37' E), NE Finland. Dotterel arrived in late May apparently already paired and copulations were concentrated into a short period in late May-early June. No "mating areas" were observed and fights recorded were mostly between neighbouring pairs meeting on the alpine heath. Territoriality was weak, the function of the fights was probably spacing out of nests. Females usually seemed to leave the study area after the completion of clutches and consequently few display flights were recorded.

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## INTRODUCTION

The pre-breeding biology of Dotterel *Charadrius morinellus* is not well known. We define the pre-breeding season as the time between arrival and the start of egg-laying. Summaries of pre-breeding behaviour are given by Nethersole-Thompson (1973), Glutz von Blotzheim *et al.* (1975), Cramp & Simmons (1983) and Owens *et al.* (1994, 1995). Accounts of Dotterel territoriality differ. Even less well known is the non-breeding biology that we here apply to everything done by the Dotterel on the breeding grounds after the pre-breeding period that is not laying, incubation or chick rearing. The existence of non-breeders, prospecting for new mates, summer flocking *etc.* fall under this heading, as does autumn flocking and

departure. Of necessity this is a mainly descriptive account describing some basic behavioural traits in order to facilitate future, more detailed studies.

## METHODS

Most of the data was collected on the Värriötunturi fell (67°44' N, 29°37' E) during an intensive Dotterel study period in 1969-1973, with further data for the whole study period 1968-1990 (see Pulliainen & Saari 1992). In 1969-1973 the study area was visited daily from the arrival of Dotterel throughout the breeding season.

## RESULTS

### *Timing of arrival*

For the Värriö area we have Dotterel arrival dates for 18 seasons (between 1969-1990). The mean arrival date was 25 May  $\pm$  5 days (including all the available data north of the Arctic Circle in Finland during the same period gave 24 May  $\pm$  5 days, range 16 May-1 June,  $n = 19$ ). The first arrival dates do not necessarily clearly reflect the timing of peak migration. Therefore we briefly summarize the Dotterel numbers on Värriö I in the best studied years of 1969-1973. The dates of first arrival are given in Table 1.

Table 1. First arrival, first and last copulations recorded and the dates of clutch initiation in Värriö I between 1969-1973. In 1973 two clutches were completed when found and failed before hatching so that date of clutch initiation could not be established. In one of these, the commencement of egg-laying was no later than 27 May.

Year	First arrival	First copulation	Last copulation	Clutch initiation (range)
1969	30 May	5 June	10 June	9 June $\pm$ 2 days (n=6, 6-13 June)
1970	25 May	2 June	16 June	7 June $\pm$ 6 days (n=7, 1-19 June)
1971	26 May	28 May	4 June	4 June $\pm$ 3 days (n=5, 2-8 June)
1972	21 May*	26 May	4 June	2 June $\pm$ 4 days (n=5, 29 May-7 June)
1973	18 May	19 May	31 May	31 May $\pm$ 2 days (n=3, 29 May-1 June)

\* at the nearby Nuorttitunturi, arrival was on 16 May.

Peak numbers were recorded shortly after first arrival. In 1969 on 5 June (16-20 birds), and in 1970-1973 between 26 and 30 May (11-28 birds, maximum in 1972). After the peak the numbers of Dotterel seen fell rapidly, as the birds dispersed in pairs over the alpine heath. It is probable that a few birds on their way north stopped for a while on Värriötunturi, at the southernmost edge of the Finnish range, since the number of pairs recorded on Värriö I were usually less than the peak spring counts.

There also seemed to be some latecomers to the population, although it was more difficult to record the arrival of these birds. This was best illustrated in 1970 when an intensive study program on the pre-breeding behaviour was carried out. Between 3 - 9 June at least three "new" ringed birds were recorded. Some other observations in the same year also indicated late arrival. On 4 June probably three new pairs had arrived, which were very shy and kept on moving within the study area. The resident birds kept quite well together in pairs, copulated and eagerly made nest scrapes. On 9 June one female was seen arriving at 17.40 hrs from the direction of the Sautunturi fell flying high and calling. At 18.15 hrs an unringed pair descended from very high to land on the

alpine heath, and at 19.00 hrs one Dotterel migrated north over the Research Station.

### *Behaviour after arrival*

Immediately upon arrival the birds fled when the observer approached within c. 30 m. A couple of days later the distance had dropped to c. 20 m and with established pairs it was c. 5-10 m.

The birds probably arrived already paired, and fights and displays were recorded very soon after the first ones were observed. For example, in the morning of 26 May 1970 the males in a trio of two males and one female behaved aggressively towards each other chasing, calling, jumping in the air, and even fighting while the female appeared to watch. In the evening two pairs met and the females fought each other, usually 0.5 m (sometimes only 0.2 m) apart calling vigorously and chasing and retreating alternately. Later two pairs met, at first only one bird of both pairs participating in the fight but the others joining in later. The fights were usually female-female or male-male fights. Between fights the birds pecked the ground. When the pair was alone the male made nest-scrapes with backward kicks, wagging its body laterally, shivering its tail, side-throwing small objects and calling while the female watched closely. The pair then preened, moved, fought neighbouring pairs, ground-pecked, raised the wings, before the male started to scrape again.

On the day of arrival in 1971 (26 May) c. 35% of the alpine heath of Värriö I (58 ha) was snowfree. On 29 May a group of eight fighting Dotterel were seen, only two fighting at a time, however. All the birds then dispersed within an area of 150 x 150 m in a loose flock. Later the birds gradually reunited as pairs and finally the group disintegrated.

On 30 May 1971 between 24.00 and 00.40 hrs flocks of three and two Dotterel, respectively, were feeding peacefully within a radius of c. 150 m. At 00.40 hrs one bird of the flock of three started to call a series of fast "pitt" notes and to move nervously for c. 2-3 min. All five then flew to an area of 5 x 5 m and attacked each other in a crouched position with feathers raised, tails spread and calling intensively. It was impossible to see which birds initiated attacks or won. Five minutes later a coherent flock of four Dotterel (probably two pairs) flew away. The fifth bird was not seen. On the next night at 22.30 hrs three birds were recorded as probably roosting as they were 2-3 m apart seemingly asleep with their bills into the wind.

By 1 June 1971 nest making had become seemingly purposeful and one female appeared close to laying. It was usually the male that made nest scrapes, but when the female moved away scraping was discontinued.

A female about to lay soon appears reluctant to move. The pair may feed passively for long times and the female may sit down as if incubating (once for 25 min.) the male staying a few metres apart, the birds allowing the observer to approach within c. 5 m.

On 28 May 1973 all the Dotterel on Värriö I were still together in one flock of 20 birds although at least one pair had started laying. Two days later flocks were still recorded although the birds in flocks were clearly paired and single pairs were also seen foraging on the alpine heath.

Dotterel rarely associated with other species. For example, on 26 May 1971 four Dotterel and three Golden Plovers *Pluvialis apricaria* migrated east. On 25 and 26 May 1972 one Golden Plover was seen twice with a flock of six Dotterel and once with a pair of Dotterel. On 2 June 1972 one Dotterel out of a flock of four and one Golden Plover migrated together north, and one Dotterel flew east towards the Russia. On 5 June one Dotterel pair was seen on two occasions with 2-3 Golden Plovers and a Whimbrel *Numenius phaeopus* pair. On 9 June 1972 four and one Dotterel, respectively, and two Whimbrels were seen together.

Interspecific conflicts were few. On 3 June 1971 one ringed Dotterel male tried to chase a Whimbrel away but it was defeated and retreated with its tail spread. On 1 June 1971 a Short-eared Owl *Asio flammeus* flew over a Dotterel pair under observation. Both Dotterel became extremely alarmed and flew off in different directions.

### Copulations

The first copulations were recorded soon upon the arrival (Table 1), although some of the earliest ones were certainly missed since at least in 1969-1970 the first eggs appeared very early in relation to (or even before) the first copulations observed. Most of the copulations were recorded in a short period in late May-early June. Usually copulations were preceded by a flight. Some late copulations were probably missed since once nests were found, these were monitored intensively and the search for new pairs became less intensive.

On 2 June 1970 the behaviour of a pair was recorded for several hours. Copulation was attempted at 12.38 hrs. The male climbed on the back of the female, both wagging their tails laterally, but without cloacal contact. Both then ground-pecked, departed 10 m from each other, one of the birds calling. The male began nest-scraping the female apparently watching only; later both birds scraped and called 0.1-0.2 m apart. During the next c. 1 h 50 min. the birds moved c. 400 m on the alpine heath scraping, calling, ground-pecking, side-throwing, preening and sleeping. At 15.20 hrs both made the same nest scrape alternately, copulated three times, called vigorously and resumed nest-scraping. They moved together with the female leading, occasionally fighting with the neighbouring pairs. At 17.19 hrs the male stopped, the female circled around him and they copulated. Both members of the pair now vigorously formed many nest scrapes, fought the neighbouring pairs, peeped loudly, parted for a while and then reunited. At 18.00 hrs this pair flew away and could not be found.

On 3 June 1970 between 08.40 and 14.20 hrs one pair copulated three times successfully and once

unsuccessfully. Another pair copulated once and at the end of the observation period the female laid an egg. At 15.30 hrs an additional pair copulated three times and another pair once, for 30 sec. At least six copulations were recorded on 4 June and five on 5 June.

In 1971 a few copulations were recorded between 28 and 30 May (one on each day) and many (at least seven) on 31 May when the females were squatting very often. The males, however, did not mount of many of these occasions. Five copulations lasted c. 5 sec. During the next night there were at least four copulations, one with a female who seemed to be carrying an egg. One of the copulations lasted c. 8 sec. (cloacal contact for c. 3 sec.) and another c. 3 sec. Later during the day "several" (at least four) copulations were recorded as also between 2 - 4 June (four, one and three seen, respectively). At one of these the male remained mounted for c. 5 sec. with a cloacal contact of 2 sec. The first copulation in 1973 was recorded on 19 May, the next one on 26 May, three on 29 May and the last one on 31 May.

Copulations may first take place within flocks, as on 19 May 1973 in a flock of eight Dotterel (four pairs). Usually, however, the pair is alone during copulation. The birds seem to be loosely paired upon arrival, but within a few days the birds seem to have formed stable pairs even if staying in flocks (as on 27 May 1973). The pairs may also spend part of the day alone, gather in flocks and then depart again. As the spring progresses pairs seem to spend more time alone although even during the egg-laying period the breeding pairs may form flocks. That the pair bonds can be unstable was seen on 27 May 1972 when a calling Dotterel flew north over the study area and was joined by a male from a pair on the fell, both disappearing towards the nearby Nuorttitunturi fell.

A few cases where the females apparently competed for males were recorded. On 26 May 1972 a trio of one male and two females was followed. There was much calling and the male was seen chasing both females and the females each other. Whenever the male was close to one of the females the other tried to chase him away. The male occasionally jumped on the back of one of the females but did not really try to copulate. After 20 min. the male chose one of the females, copulated, and the male started walking away from the female who followed c. 2 m apart. The other female tried to join, but even mild threats of the paired female were enough to keep her away. On the next day one pair was just about to copulate (the female was already squatting) when a strange female approached. The male interrupted the procedure and chased the strange female away. When the female was not yet squatting she herself chased the trespasser away.

### Display flights and midsummer flocking

Display flights were relatively uncommonly observed and most were in late June-early July. Usually the female displayed alone, but on 18 June 1970 one male flew calling and a female joined him. The male flew normally, the female with slow and very high wing beats like a

Golden Plover (this may have been the late pair that commenced its clutch on 19 June).

No indisputable case of non-breeders was recorded, but a few observations suggest one. It is possible, however, that the apparent non-breeders were failed breeders, or breeders whose nests had not been found. In 1969 one unringed pair was observed quite regularly in late June-early July. In 1973 an unringed probable pair was recorded from early June to early July and on 2 July there were probably two non-breeding males and one female in the area. On 29 June 1969 the behaviour of a presumably non-breeding female was recorded between 09.50 and 11.25 hrs using binoculars at a distance of more than 15 m. During the observation period it moved on the alpine heath in a zig-zag pattern. It moved within the home ranges of at least males I and II without coming into contact with either. It moved in short bursts of 1-2 m, much more slowly than feeding incubating males, pecking occasionally on the move. It spent much time preening, especially at the beginning of the observation period and preened at almost every pause. It rested often sitting in a sheltered depression or near a tussock and when moving it kept very low between stones and in depressions.

Summer flocking was observed most intensively in 1971. The birds appeared in flocks from the night of 20-21 June onwards, during visits to the other hills of the Värriötunturi fell chain. These flocks consisted mainly of females. On 21 June during the day the birds were displaying within the group. Up to 12 July a total of 16 such flocks were observed. The mean flock size was  $4.3 \pm 2.7$  (range 2-10). On some occasions calling Dotterel flew over head so high that they could not be seen.

#### Autumn migration

The number of Dotterel recorded increased in August with a peak on Värriö I in the middle of the month (15 August 1969 8 birds, 12-13 August 1970 20 birds and 17 August 1971 a flock of 30 Dotterel and possibly an additional flock of 13 birds). However, a flock of 16 Dotterel was seen on Värriö I as early as 29 July 1970. In 1973 a brood of one adult and two unringed unfledged chicks was recorded on 28 August, but three days later these birds were seen flying. The last Dotterel were recorded in 1968-1971 and 1973-1974 on 14, 22, 22, 17, 31 and 24 August respectively (mean 22 August  $\pm$  6 days,  $n = 6$ ). The birds in these migratory flocks were shyer than the broods still present on the fell.

## DISCUSSION

Dotterel arrive in Värriötunturi in late May. This is later than in Cairngorms, Scotland, where they usually return in the first week of May (range 2-12 May, Nethersole-Thompson 1973). In Hardangervidda, southern Norway, Dotterel arrive in mid-May, but disperse onto nesting sites from late May to early June, when 75% of the ground is still covered by snow (Kålås & Byrkjedal 1984). Thus despite earlier arrival in Hardangervidda the birds occupy

the breeding grounds at the same time at both Hardangervidda and Värriö.

Despite different arrival times the commencement of clutches is about the same in all the above areas. In Scotland the mean date of earliest clutch commencement was 27 May ( $n = 36$  years, Nethersole-Thompson 1973), in southern Norway laying usually started in the last week of May (Kålås & Byrkjedal 1984), and at Värriö the median date of commencement of all clutches was 7 June, with the earliest one started not later than 27 May (Pulliainen & Saari 1992).

Thus the pre-breeding period is longer in Scotland than in both Norway and Finland. In Scotland pairs seem to form out of flocks (Nethersole-Thompson 1973), or on mating arenas (Owens *et al.* 1994). However, at other sites in Scotland some Dotterel arrive apparently already paired (D.P. Whitfield in Owens *et al.* 1994). In Norway with a shorter pre-breeding season Dotterel arrive apparently already paired (Kålås & Byrkjedal 1984), as at Värriö where the pre-breeding season is compressed as is breeding season in the arctic in general (see Irving 1972). Copulation at Värriö was concentrated into a short period in late May-early June.

According to Owens *et al.* (1994) upon arrival in spring, Dotterel formed aggregations at the highest points of their breeding plateaux. Frequently these aggregations acted as mating arenas: males tended to move as a group in the centre of the arena, while feeding and females were usually around the periphery of the arena where courtship and fighting took place. Fighting usually occurred when a female attempted to isolate one male from the mating arena. Females typically pursued a single male on the arena, and successful courtship consisted of a female fending off all other females for a sufficiently long period to be able to isolate the male from the flock and move away.

This behaviour differs greatly from that observed in Finland. Nothing like the mating arenas as described by Owens *et al.* (1994) have been observed in our studies. The Dotterel are usually seen in pairs already upon arrival, although the pair bond may not yet be strong. Fights usually occur when neighbouring pairs meet on the alpine heath and often copulation follows these fights. These fights are usually female-female fights, although males sometimes participate. These early combats between the pairs cause dispersal and may help to prevent competition for food close to the nest. Territoriality at Värriö seems weak, as in Norway (see Kålås & Byrkjedal 1984), but in Scotland according to Nethersole-Thompson (1973) the Dotterel is territorial.

In Scotland the mating arenas are a feature of Dotterel during the early part of the breeding season. Later in the season female Dotterel perform song flights in search of males (Owens *et al.* 1994). In Norway, Dotterel arrived already paired, and display flights drastically increased after the completion of first clutches (Kålås & Byrkjedal 1984). At Värriö Dotterel also arrive already paired, but after the

completion of clutches females seem to disappear and courtship flights are seldomly observed.

The difference in the frequency of display flights between Norway and Finland may be related to the number of males not attending to eggs after first clutches have been laid. As many nests were robbed during the incubation period in Norway (see Kålås & Byrkjedal 1984), some "free" males will always be available, whereas the Dotterel nests at Värriö survived well (see Pulliainen & Saari 1992) and almost all the local males were sitting on eggs after completion of first clutches. Thus prospecting for new mates at Värriö is probably highly unprofitable and females move elsewhere.

Midsummer flocking was not very common at Värriötunturi either, such flocks were observed most regularly in 1971, the year with peak Dotterel numbers (see Pulliainen & Saari 1992), and when much field research on the whole Värriötunturi fell chain was done. These female flocks rarely visited Värriö I, the main study area. These flocks were recorded at the same time both at Värriö and Hardangervidda, but seemingly much more regularly in the latter (see Kålås & Byrkjedal 1984). As most females seem to leave Värriötunturi after the onset of incubation, formation of such female flocks is naturally difficult.

According to 'the sexual conflict theory of copulation behaviour' the males of the sex-role reversed Dotterel (who usually provide all the parental care) should copulate both frequently and throughout the prelaying period (Owens *et al.* 1995). This prediction was, however, neither fulfilled in Scotland (Owens *et al.* 1995), nor in Finland. Despite continuous observations in the prelaying period both day and night at Värriö (where the sun is then continuously above the horizon) only few copulations were seen. Because the semi-quantitative nature of the data, no exact figures of the copulation frequency can be given, but the impression obtained was that it was probably

below the figure of 0.22 copulations per hour given by Owens *et al.* (1995).

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## Are you a wader species expert? (continued from p. 3)

wetlands and other wader sites under, for example, the Ramsar Convention and EC Birds Directive.

As many members will know, the wader populations workshop held at the WSG 1996 Conference in Belgium made important steps in making a new assessment of Western Palearctic wader population sizes - a report will appear in the April 1997 *Bulletin*. To ensure that the best available expertise is brought to bear on validating these, and future, population estimates I am developing a 'wader species expert network', and am seeking to identify members who have expertise, knowledge or interest in particular wader species. Ideally this knowledge is of the population size, trends and dynamics of your favourite species. But I would also like to hear from you if you are keen to start developing this type of expertise - at the Conference workshop it proved quite hard to identify those who might have such expertise, even for the most well-known wintering waders of coastal western Europe!

Most urgently I am looking for help with wader that overwinter in western Europe, especially coastal species, but since we will be

extending population reviews progressively to other categories of waders in the Africa/Europe/Middle East region any offers of help will be welcome. Another developing focus of WSG attention (watch future *Bulletins* for more about this development) is likely to become globally-threatened wader species. If you have expertise in any such species I would be very pleased to hear from you.

As part of our Specialist Group role through Wetlands International all those appointed to the species expert network will also become members of IUCN's Species Survival Commission and will receive regular species information from IUCN.

I will be writing to all those so far volunteering (or whose names have been suggested to me) to begin establishing the network. So if you think you can help, now is a perfect time to tell me. Contact me at: c/o JNCC, Monkstone House, City Road, Peterborough PE1 1JY, UK; tel. +44-1733-86904; fax +44-1733-555948; e-mail [davids\\_n@jncc.gov.uk](mailto:davids_n@jncc.gov.uk).

Nick Davidson, WSG/Wetlands International Liaison Officer