

The breeding habitat of Broad-billed Sandpipers *Limicola falcinellus* in northern Norway, with notes on breeding ecology and biometrics

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The breeding habitat of Broad-billed Sandpipers *Limicola falcinellus* in northern Norway is described, with detailed information given on vegetation. The birds nest in extensive wet sedge and moss-dominated fens, with nests placed on shallow hummocks close to transition zones between different fen vegetation types. After hatching, broods are moved to wetter fen areas close by. Breeding behaviour and site fidelity are described, and information given on egg, chick and adult biometrics.

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INTRODUCTION

The Broad-billed Sandpiper *Limicola falcinellus* is a poorly-known and secretive breeder in inaccessible wet fens of northern Fennoscandia and eastern Europe (Koskimies 1994). Its ecological requirements are poorly understood; indeed in terms of nesting habitat both Koskimies (1994) and Cramp & Simmons (1983) repeat ecological information presented over 20 years earlier in Bannerman (1961) and Dementiev & Gladkov (1951). Birds nest in loose colonies of up to 20 pairs km⁻² (Koskimies 1994) in extensive wet fens. The Norwegian population is estimated to be 200 -1,000 pairs, with no evidence of change (Koskimies 1994). However, the Finnish population may have declined and, on account of this, the Broad-billed Sandpiper is classed as a Species of European Conservation Concern, Category 3 (SPEC 3), indicating an Unfavourable Conservation Status in Europe (Koskimies 1994). This study provides further details of habitat and nest sites from a site in northern Norway, together with some additional breeding and biometric information.

STUDY AREA AND DATES

The study site, known from our visit in July 1993 to hold Broad-billed Sandpipers, was close to Kautokeino, Finnmark, northern Norway (68°55'N; 23°10'E, altitude 350-400 m) and was searched on 5-6 July 1995. Some data are also presented from observations in the same area in 1994 and in a nearby area from 24-29 June 1996 (which was also visited more casually in previous years). The main study area consisted of a very extensive mosaic of large fens within a landscape of scattered birch woodland and drier ridges dominated by heath.

METHODS

Several large fen complexes, each of the order of 10-50 ha in size, separated by drier areas, were searched systematically for Broad-billed Sandpipers and other waders. Observers walked through most areas, aiming to find nests through flushing or by the behaviour of breeding birds. Nests were found through searching after flushing or by watching for returning birds. Incubating adults were caught subsequently by flushing into mist nets or using nest traps. Great care was taken to minimise disturbance during all these operations.

All measurements were taken according to Baker (1993). Wing lengths were maximum chord measurements. Bill, total head and tarsus and toe (including claw) measurements were made with dial calipers by one observer.

BREEDING HABITAT

Broad-billed Sandpipers were found in wet fens within very extensive 'aapa' mire complexes (extensive watery sedge mires of northern Scandinavia), also containing 'palsas' (ice-cored peat mounds), with heath and birch woodland (sometimes quite tall, up to 4 m, and extensive) close by. Typical breeding areas were wet quaking mesotrophic fens with *ca.* 40% shallow standing water (depth 0.3 - 1 m over soft substrate) with extensive floating vegetated edges. Each fen expanse (or flark) was of the order of 30-300 x 100-700 m in area, surrounded by more oligotrophic drier peaty ridges (string hummocks) with dwarf birch *Betula nana*, downy birch *B. pubescens* and willows *Salix* spp. growing over *Vaccinium vitis-idaea*, *Rubus chamaemorus* and *Ledum palustre*.

Fen habitats could be divided into three distinct types (see Figure 1).

Habitat A: Around the edges of each fen expanse, there was slightly drier fen with shorter, denser vegetation dominated by cotton grass *Eriophorum angustifolium*, *E. vaginatum* and almost 100% cover of hummocks of *Sphagnum* sp. with frequent bog rosemary *Andromeda polifolia*. This graded into Habitat B: much wetter fen, dominated by generally taller sedges *Carex* spp. including *C. nigra*, *C. limosa*, *C. ?serotina* and *C. chordorrhiza*, with the horsetail *Equisetum fluviatile*, marsh cinquefoil *Potentilla palustris* and bog bean *Menyanthes trifoliata*. Around 20% of the surface was dominated by dark brown bryophytes, primarily *Sphagnum lindbergi* lawns, *Drepanocladus* sp. and *Scorpidium scorpioides* with *Sphagnum capillifolium* in hummocks. Often found in the centre of each fen expanse was Habitat C: open water, with very scattered horsetails, bog bean and sedges. All fen habitats were underlain by permafrost which slowly melted during the season, so increasing water depths; at point of lay, permafrost is thought usually to be just below the fen surface (5-10 cm).



NEST SITES

Most nest sites found were on very shallow hummocks, concealed by sedge and usually adjacent to bog rosemary. These hummocks were close to the wetter fen areas with open water, either on the edge of slightly drier peripheral fen (Habitat A, above, and Figure 1) or on small islands of raised sedge vegetation in the wet fen. Nests were located in slightly wetter zones with less vegetation than those used by Red-necked Phalarope *Phalaropus lobatus*. Detailed descriptions of three nest sites are given below. These were made in the field by one observer and confirmed later with photographs. Detailed notes on vegetation were not taken for other nests.

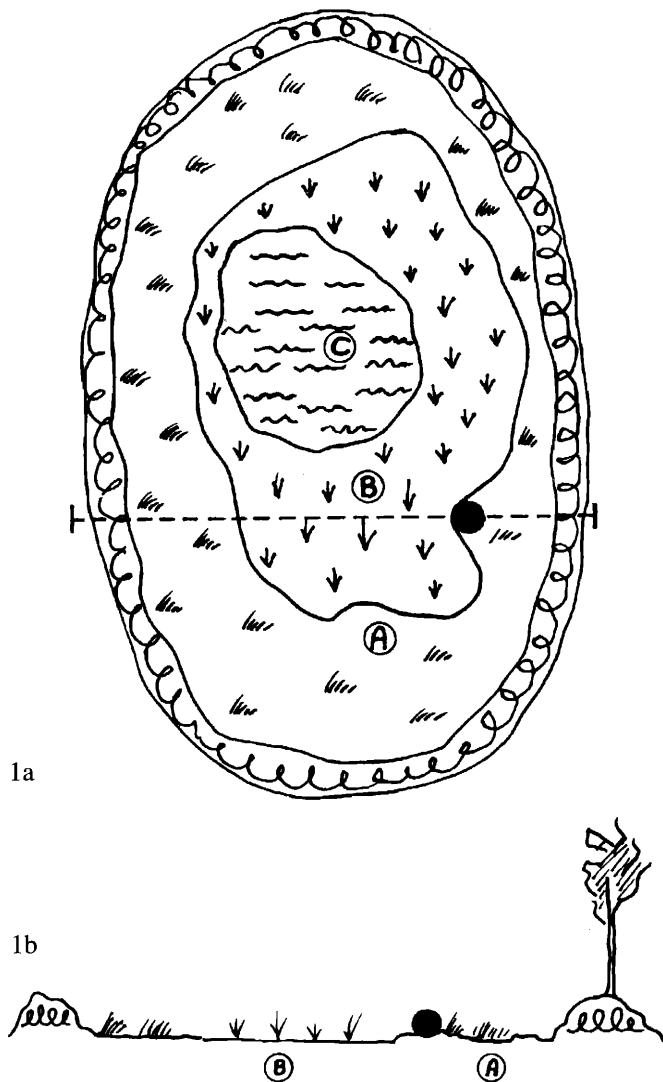


Figure 1. Simplified illustration of Broad-billed Sandpiper breeding habitat. a) diagram of fen expanse or flark, showing three fen habitat types (A,B and C) referred to in text. b) cross-section of flark along dashed line shown in a), from peripheral string hummocks across two fen types. In a) and b) location of typical nest is indicated by black circle.

Nest A: well concealed, located on a slightly raised vegetation platform (ca. 4 cm above wet surface) between two very small bryophyte hummocks; one *Aulacomnium* sp., the other *Sphagnum ?capillifolium*. Growing through the hummocks were stems of *Carex nigra* forming a concealing roof to 20 cm. Growing on the bryophyte hummocks were *Equisetum fluviatile*, dwarf *Salix* sp. and thin *Betula nana*, and close to the nest were *Carex lasiocarpa* and *C. aquatilis* in wetter

Table 1. Egg dimensions from six Broad-billed Sandpiper clutches

Dimensions (mm)

| Clutch | Dimensions (mm) | Clutch | Dimensions (mm) |
|----------|-----------------|----------|-----------------|
| Clutch 1 | 31.4 x 22.4 | Clutch 2 | 30.3 x 21.5 |
| | 30.9 x 22.9 | | 30.3 x 21.5 |
| | 32.2 x 22.4 | | 33.0 x 21.2 |
| | 32.0 x 22.0 | | 31.7 x 21.5 |
| Clutch 3 | 32.0 x 22.3 | Clutch 4 | 31.1 x 22.8 |
| | 31.4 x 22.1 | | 31.1 x 22.8 |
| | 31.7 x 21.3 | | 31.5 x 22.6 |
| | 33.3 x 22.2 | | 31.9 x 23.2 |
| Clutch 5 | 33.3 x 22.6 | Clutch 6 | 32.4 x 22.5 |
| | 32.6 x 23.3 | | 31.6 x 22.1 |
| | 33.7 x 23.0 | | 32.2 x 22.8 |
| | 33.0 x 22.3 | | 31.6 x 22.3 |

areas. The nest cup was lined with dead *Carex* and *Salix* leaves. A 1 x 1 m quadrat centred on the nest had 60% cover of dark brown *Sphagnum lindbergi* lawn, 30% *Carex nigra* tussocks and 10% other dark bryophytes including *Drepanocladus ?vernicosus* and hummocks mentioned above, with scattered *Andromeda polifolia*, *Equisetum fluviatile*, dwarf *Salix* sp. and occasional *Salix glauca*. 1 m from the nest was a drier fen area of *Eriophorum angustifolium* and *Sphagnum* sp. The nest was in a 50 x 30 m area of wet aapa fen, as described above, ca. 6 m from a drier ridge at the edge of the fen.

Nest B: in a *Carex* tussock, ca. 3 m from a drier peripheral peaty ridge dominated by heath/birch as for nest A. The *Carex* tussock lay in wet fen and was surrounded (within 1 x 1 m) by ca. 60% water, 30% *Drepanocladus ?vernicosus* and 10% *Carex ?lasiocarpa*. *Carex chordorrhiza* and *C. curta* were also present. Very wet *Equisetum* dominated fen lay ca. 8 m away. The whole immediate wet fen area was ca. 20 x 10 m in extent, but part of a large diffuse aapa complex.

Table 2. Biometrics of eight Broad-billed Sandpiper chicks (two broods)

| | Tarsus & toe (mm) | Bill (mm) | Wt.(g) |
|---------|-------------------|-----------|--------|
| Brood 1 | 42.0 | 13.0 | 8.0 |
| | 41.0 | 12.3 | 8.0 |
| | 41.0 | 12.3 | 7.6 |
| | 40.0 | 13.2 | 8.6 |
| Brood 2 | 40.0 | 11.4 | 5.8 |
| | 41.0 | 11.2 | 6.0 |
| | 42.0 | 11.6 | 6.1 |
| | 38.0 | 10.0 | 5.0 |

Nest C: on a *Sphagnum ?capillifolium* hummock with 25 cm tall *Carex nigra* interwoven around and over to conceal the nest. The hummock was ca. 10 cm higher than the surrounding wetter fen of similar botanical composition to that surrounding nest B. The hummock also had low cover of *Rubus chamaemorus*, *Betula nana*, *Andromeda polifolia* and was ca. 10 m from a peripheral peaty ridge dominated by birch (> 3 m height) and heath, and 15 m (height > 3 m) from an open *Sphagnum* fringed pool with scattered *Eriophorum angustifolium*.



BROOD HABITAT

Four broods of four chicks were found with single adults in attendance. The broods were located in the wetter and more quaking parts of the fens described above (Habitat B, above); *i.e.* close to but several metres away from the areas in which the nest was located.

BREEDING BEHAVIOUR

Observations suggested that birds may arrive and display in previous breeding areas but move away to nest if conditions are unsuitable, due to late thawing. At our 1995 study site, no birds bred in 1996, but displaying birds were present. Flight lines of these were followed to an area 5 km away, where two nests were found. No nests were present there in previous years. Both adults were found to incubate, from catching males and females on the same nest. The birds sit very tight on the nest once incubation is underway and are hard to flush; some walk off the nest. Once incubation has commenced, very little singing or display takes place. After hatching, only the male appears to stay with the brood; the females apparently desert the area, as none were seen after broods hatched.

SITE FIDELITY AND FLYWAY LINK

In 1995, we retrapped a male with a brood, which had been

Mean egg length was 32.01 mm (± 0.84 , range 30.3 - 33.7, $n = 24$), mean width was 22.31 mm (± 0.58 , range 21.2 - 23.3, $n = 24$). Mean mass was 7.43 g (± 0.50 , range 7.0 - 8.5, $n = 21$).

Chicks

See Table 2. Eight chicks were weighed and measured, from two broods of four, on 6 July 1995. All were very small (estimated 2-3 days old), although the exact age was unknown. Their mass varied from 5.0 - 8.0 g (mean = 6.13 g) and within this range, tarsus and toe length ranged from 40.0 - 42.0 mm (brood 1) and 38.0 - 42.0 mm (brood 2) and bill length ranged from 12.3 - 13.2 mm (brood 1) and 10.0 - 11.6 mm (brood 2).

Adults

See Table 3. Ten breeding adults were caught near nests or broods. From measurements or behaviour, three were considered to be males, two were females; the remainder were intermediate or unsexed and due, to this, biometric data have not been separated by sex. Only one known pair was caught, and the biometric differences between these two birds were clear. Overall, wing lengths ranged from 106 - 112 mm and weights from 35.5 - 40.5 g. No means of these measurements have been calculated due to the differing sexes of the birds involved. All wing and weight data, together with other measurements, are shown in Table 3.

Table 3. Biometrics of ten adult Broad-billed Sandpipers.

| <i>EURING code 4 = hatched before current calendar year. 6 = hatched before previous year. m = male, f = female.</i> | | | | | | |
|--|-----------|-------------------|-----------|-----------------|--------|----------------|
| Age/Sex | Wing (mm) | Tarsus & toe (mm) | Bill (mm) | Total head (mm) | Weight | Notes |
| 4 m | 109 | 41.0 | 30.9 | 53.1 | - | With brood |
| 4 m | 109 | 41.5 | 31.0 | 53.5 | 36.0 | With brood |
| 4 f | 112 | 44.0 | 35.0 | 56.5 | 40.5 | Pair. Off nest |
| 4 m | 107 | 42.5 | 30.9 | 51.8 | 37.5 | Pair. Off nest |
| ? | 108 | 43.0 | 27.9 | 49.9 | 35.5 | Off nest |
| 6 | 108 | 42.0 | 26.1 | 47.3 | 36.0 | Off nest |
| ? | 106 | 39.5 | 27.4 | 49.5 | 36.0 | Off nest |
| 4 f | 111 | 44.5 | 32.2 | 56.9 | 37.0 | Off nest |
| ? | 110 | 43.0 | 33.9 | 55.6 | 36.5 | Off nest |
| 4 | 107 | 41.5 | 30.2 | 52.7 | 36.0 | Off nest |

ringed at the same site in 1994, and a female bird was caught at the nest and colour-ringed. It had already been ringed on staging grounds in the Sivash, Ukraine in 1993, thus establishing a link between passage and breeding areas. In 1996, the same bird was seen again, at a fen 5 km to the north, although breeding was not proved. Nests found near those of previous years suggest annual use of the same very small areas, possibly by the same birds.

CLUTCH SIZES AND BIOMETRICS

Clutch sizes

In total, 13 nests were found, all with four eggs except one with seven eggs. This was undoubtedly due to two females laying in the same nest (E. Duthie, pers.comm.).

Biometrics

Eggs

Measurements from six clutches of four are given in Table 1.

DISCUSSION

Our descriptions of nesting habitat and nest sites indicate that most previous accounts of habitat do not describe adequately the areas we studied in northern Norway. Merikallio (1958) described the Broad-billed Sandpiper as breeding in colonies on the very wettest and least vegetated bogs. Nisbet (1961) reported that the species breeds in quaking bogs, with nest tussocks surrounded by treacherous semi-liquid mud. The most substantive account appeared in Bannerman (1961), which describes nests being made on a treacherous slough of thin peat mud lightly overgrown with sedge and dotted with half-floating tufts of cotton-grass and andromeda. The quagmire is generally fringed with hummocks and tongues of sphagnum, and surrounded by an expanse of waterlogged sedge and grass, rooted in a slightly firmer peat.

While some of these points accurately describe the habitat in our study area, mud was never present at our sites; the substrate



was entirely dense bryophyte cover, water or loose organic material (very wet peat). The fen surface was very waterlogged and quaking, but no vegetation tufts were floating; instead the whole vegetation mat over large areas floated. Another feature of the study area was the extensive stands of birch trees and scrub on raised peat ridges between individual fen areas.

Nesting in tussocks or hummocks has been described by Hayman *et al.* (1986) and earlier by Nisbet (1961) and Bannerman (1961) who noted that nests were usually in one of the smaller tussocks out on the quagmire, with eggs quite often open to view; less frequently they were made in a firmer tussock on the edge of the marsh, with some concealment. Nests were said to be usually raised well above the surrounding water or ooze, although sometimes low. Nest cups were described as lined with fallen leaves of dwarf birch, willow or dry grass. At our study sites, nests were usually on small tussocks or on the edge of a larger tussock, but very low (4-10 cm above surrounding fen surface), and usually moderately or well concealed by strands of sedge pulled over the cup. Nests were frequently situated in areas with a high percentage cover of dark brown bryophytes, and this may be one reason why both eggs and chicks are dark chocolate brown in colour.

Although other nesting habitats are likely to be used by Broad-billed Sandpipers, the bird appears to occupy a distinct niche within the 'aapa' mire and 'palsa' mire complexes which are widespread in many parts of northern Norway. This abundance of apparently suitable habitat suggests that the current

population estimate for Norway of 200-1,000 pairs is probably too low.

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