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coverts. When ageing birds in the autumn and spring there are some characters which can be useful, especially the occurrence of moulted and unmoulted greater coverts (Glutz & Bauer 1988).

The majority of the young males achieves a grey brown, female-like plumage during this moult after which sexing usually is very difficult (Glutz & Bauer 1988).

While colour-ringing Black Redstarts in West Sweden in 1983-1990, new sex and age criteria were developed: (1) The size and shape of the cloaca were recorded in 98 males and 15 females and was found to be a reliable sex criterion (the method is previously described for some other species by Busse (1984) and Svensson (1984)). (2) Markings on the tail-feathers as a way to certify the age has been suggested earlier but has not been studied carefully (Menzel 1983, Cramp 1988). The extension of dark on the outer webs and shaft of outer rectrices were measured with a ruler (estimated in some cases) from the tip of the feathers and inwards. The number of birds measured consisted of 51 yearlings with juvenile rectrices, 39 birds in their third calendar year or older, and finally 88 birds in their second calendar year captured during the spring season.

In yearlings with juvenile rectrices, the dark parts on outer webs culminated in the interval 15-19 mm, with a variation between 0-26 mm (Fig.1). Only 4% fell within 0-4 mm. The variation of adults (third calendar year or older) was 0-12 mm, with 85% within 0-4 mm. Most of the old birds lacked dark parts totally.

The occurrence of dark shafts generally followed the pattern as shown by the outer webs of rectrices. It seems, however, as if the shafts get their red colour a bit later than the outer webs. Variation in width shown by yearlings, was 5-33 mm with a peak at 15-19 mm (Fig.2). Birds in their third calendar year or older fell between 0-10 mm, with 61% in the interval 0-4 mm. Most of the adults had a red colour without any dark. Both outer webs and shafts showed a zone of overlap between 5-10 mm.

Fig. 3 shows that a portion of the second-year birds captured in spring showed considerably less dark markings on the outer webs as compared with yearlings. As moult during winter is not known to take place in the Black Redstart the diagram rather shows that the rectrices to some extent are moulted during late summer. This is verified by 3 out of 18 yearlings which were in active moult, and were found to have symmetrically growing feathers at this time of the year.

The cloaca of the males protruded clearly during the breeding season and was more tap-shaped as compared with the cloaca of females (Busse 1984, Svensson 1984). Also non-breeding birds showed this character. On the other hand, no such clear pattern was observed after the breeding season.

With the facts given, a majority of Black Redstarts can be sexed and aged with great certainty. If consideration is taken to the occurrence of overlap and renewal of rectrices the following guidance is proposed for practical use:

Yearlings (autumn), 2nd calendar year (spring): >10 mm dark on outer web or shaft.

Adults: < 5 mm dark on both outer web and shaft.

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Wing length criteria for sex determination of Robins *Erithacus rubecula* wintering in southern Spain

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In many studies on bird behaviour, for example those on foraging efficiency and time allocation in relation to social rank and territorial conflicts, it is essential to be able to sex individuals in the field. In monomorphic species it may be difficult to do so without first trapping the bird for sexing and marking. The European Robin *Erithacus rubecula* is one of these monomorphic species where to sex birds, even when having them in the hand, is extremely difficult. In this species, the wing length may be the only useful criterion for sexing individuals.

Wings of European Robins are longer in males than in females. The range of variation is 66-78 mm in males and 65-76 mm in females (Cramp 1988, pp. 614-615). Fenno-Scandian breeding populations of Robins ringed on migration at Ottenby Bird Observatory (Öland, Baltic Sea, Pettersson & Lindholm 1983) also showed the same sexual dimorphism. The wings were longer in males (>74 mm in juveniles and >75 mm in adults) than in females (<71 mm in juveniles and <72 mm in adults); Pettersson (1984). Approximately 60% of the birds could be adequately sexed with this method (J. Pettersson pers. comm.).

In southern Spain, a notable concentration of wintering migrant Robins is observed every winter (Cramp 1988). The Spanish Bird Ringing Reports (1980-1988) show five recaptures of wintering Robins in Andalusia (southern Spain): two from Scandinavia and three from Central Europe. Six Robins ringed as breeders in Fenno-Scandia have also been recaptured in southern Spain in winter (1961-1970), Pettersson & Lindholm 1983.

In order to determine if wing length can be used for sexing Robins also in the winter, I measured the wing length of 18 males and 24 females gathered by the Doñaña Biological Station. The birds were sexed by gonadal inspection by the Doñaña's staff when they prepared them for conservation. All the individuals considered in the analysis were captured while wintering in Andalusia from 15 October to 15 March. Wing length was measured to the nearest 0.1 mm according to method 3 of Svensson (1984). Robins were also aged according to: 1) tips of central rectrices (Pettersson 1983, Svensson 1984) and 2) presence of yellow tips on the great coverts (Benvenuti & Ioalé 1983, Svensson 1984). Unfortunately, the inside of the upper mandible could not be checked (Pettersson 1983, Svensson 1984, Karlsson et al. 1986). The

Table 1. Wing length distribution of European Robins *Erithacus rubecula*, wintering in Andalusia, southern Spain.

Vinglängd hos rödhakar övervintrande i Andalusien, södra Spanien.

Wing length *Vinglängd*	Females *Honor*	Males *Hanar*
67.5 - 68.5	2	0
68.5 - 69.5	1	0
69.5 - 70.5	2	2
70.5 - 71.5	5	2
71.5 - 72.5	3	11
72.5 - 73.5	2	6
73.5 - 74.5	3	1
> 74.5	0	2
Total *Summa*	18	24
Range *Spridning*	68-74.1	70-75.6
Mean *Medeltal*	71.3	72.4
Standard dev.	1.8	1.4

statistical procedures used were according to Sokal & Rohlf 1981).

The results are shown in Table 1. Males had longer wings (72.4 ± 1.4 mm, mean ± s.d. hereafter) than females (71.3 ±1.8). The difference was statistically significant ($t = 2.23$, $d.f. = 40$, $p < 0.05$). The coefficient of variation was similar in both (corrected C.V. for males = 1.95 and females = 2.63). The difference was not significant (G-test = 0.09, d.f. = 1, $p > 0.10$). Unfortunately differences between age groups could not be checked because few adult Robins were gathered.

These results show that the sexes differ in wing length also in winter. Only males had wings longer than 74.1 mm and only females had wings shorter than 70 mm. Assuming a normal distribution of wing lengths for both sexes, the probability of making an erroneous sex determination using these figures is 0.04 in males and 0.06 in females. Finally, the application of this criterium to a sample of 40 field ringed wintering Robins meant that 35% of them ough to have been adequately sexed.

This figure is smaller than the 60% of Robins sexed at Ottenby on migration because the Robins wintering in southern Spain is a mixture of populations from different breeding areas with presumably different morphological features.

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Sammanfattning

Vinglängdskriterier för könsbestämning av rödhakar Erithacus rubecula övervintrande i södra Spanien

För många studier av fåglars beteende, t ex rörande födo–sökseffektivitet och tidsbudgetering i förhållande till social status och revirkonflikter är det väsentligt att kunna könsbestämma individerna i fält. Hos monomorfa arter, t ex rödhaken, är könsbestämningen svår även när man har fågeln i handen. För rödhaken kan vinglängden vara det enda användbara kriteriet.

Enligt Cramp (1988) är vinglängden hos hanar 66-78 mm och hos honor 65-76 mm. Fennoskandiska rödhakar fångade vid Ottenby visade liknande skillnader (Pettersson & Lindholm 1983): hanarnas vingar var längre än 74 mm (unga) och 75 mm (gamla); honornas vingar var kortare än 71 mm (unga) och 72 mm (gamla),

Betydande mängder rödhakar övervintrar i södra Spanien och ringfynd visar att en del av dessa kommer från Fennoskandien (tre av fem fynd). Vidare har sex fåglar märkta som häckande i Fennoskandien återfunnits i södra Spanien.

För att fastställa om vinglängden kan användas som könskriterium även vintertid i Spanien mättes vinglängden på 18 hanar och 24 honor som insamlats och könsbestämts i samband med konserveringen på Doñaña Biological Station. De insamlades mellan 15 oktober och 15 mars. Vinglängden mättes enligt metod 3 i Svensson (1984).

Resultaten visas i Tabell 1. Hanarna hade signifikant längre vingar än honorna (72,4 mm resp 71,3 mm). Bara

hanar hade vingar längre än 74,1 mm och bara honor hade vingar kortare än 70 mm. Om man antar att vinglängden är normalfördelad följer att sannolikheten att göra en felaktig könsbestämning är 0,04 för hanar och 0,06 för honor.

Med användning av detta kriterium kan 35% av rödhakarna könsbestämmas vintertid. Denna siffra är lägre än vid Ottenby (60%), vilket torde bero på att flera olika geografiska bestånd med olika genomsnittliga mått blandas i vinterområdet.

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Notes on the breeding biology of the Barred Warbler *Sylvia nisoria* at Ottenby, Sweden

ANDERS HEDENSTRÖM & SUSANNE ÅKESSON

The Barred Warbler *Sylvia nisoria* breeds from the Baltic and France eastwards to Mongolia (Moreau 1972, Harrison 1982). In Sweden it is a scarce breeder mainly in the southeastern part of the mainland (SOF 1990), but it is rather common on Öland (Waldenström 1976). The breeding biology of Swedish Barred Warblers is very poorly known; the only studies are from Ottenby (Aulén 1976) and from central and northern Öland (Pettersson 1976). Here we present some information on clutch size, hatchability, nesting success, and nest sites extracted from nest cards from our ongoing study of Barred Warblers at Ottenby, Öland.

Study site and methods

Barred Warblers were studied in 1984-1990 at Ottenby (56° 12'N, 16° 24'E) on the southernmost point of the island of Öland, SE Sweden. The study area is characterized by an old deciduous forest surrounded by shrubby grassland. The main breeding area of the Barred Warbler is the forest edge, an area dominated by shrubs of the genera *Prunus*, *Crataegus*, *Rubus* and *Juniperus*. We searched for nests mainly in June and early July. Adult birds were mist-netted near their nests, aged and sexed according to criteria in Williamson (1968), Schmidt (1981), Busse (1984), Svensson (1984) and own observations. Breeding birds were sexed according to the incubation patch (see Hasselquist et al. 1988). Each nest was given a number in a year and information about the nest site, parent birds and nest content was filed on a nest card after each visit. In this study we use information from 63 nest cards obtained in 1984 (8), 1985 (15), 1986 (23), 1987 (8), 1988 (3), 1989 (3) and 1990 (3). As the information contents varied on different nest cards only subsets of the cards could be used in different analyses.

Results and discussion

Nests were mostly placed in dense scrub close to the forest edge (cf. Aulén 1976). Their distribution among bush species is presented in Table 1 together with information on their height above the ground. Aulén (1976) did not find any Barred Warblers nesting in *Juniperus communis* during his study (1971-1975) at Ottenby. In contrast we found *J. communis* to be the most common nest site (Table 1). This can be due to either a change in the birds' preference or a sampling bias between the two studies. *J. communis* has probably not become significantly more abundant since 1971-1975 so we think a sampling bias is the most likely explanation. In northern Germany most Barred Warblers nests were found in *Rubus* spp. (Neuschulz 1981). If *J. communis* was preferred as nest site we would expect a lower predation rate among nests in *J. communis* compared to nests in other bush species. However, the predation tended to be higher for nests in *J. communis* compared to nests in other bushes, although it was not significantly different (G-test, $p>0.05$). Nest site distribution among bush species probably reflects availability rather than preference. The mean height of nests in our study (0.78m, Table 1) does not differ significantly from what Neuschulz (1981) found in Germany (0.65 m). Nests tended to be placed higher up in *J. communis* than in other bush species, probably because of the latter's architecture.

The first birds arrive in the breeding area about 20 May (Aulén 1976, Enquist & Pettersson 1986, own

Table 1. Nest sites of Barred Warblers *Sylvia nisoria* at Ottenby in 1984-1990.

Boplatser för höksångare Sylvia nisoria vid Ottenby under 1984-1990.

Species of shrub *Art av buske*	No. of nests *Antal bon*	% of nests *% bon*	Mean height of nests (m) *Bonas medelhöjd (m)*
Juniperus communis	18	35	1.05
Crataegus sp.	14	27	0.72
Rubus fruticosus	10	19	0.57
Potentilla fruticosa	4	8	0.65
Rosa sp.	3	6	0.63
Prunus spinosa	2	4	0.45
Rubus idaeus	1	2	0.50
Total	52		0.78