Brief reports

Breeding biology of the Golden Plover *Pluvialis apricaria* in eastern Finnish Lapland

Erkki Pulliainen & Lennart Saari

Pulliainen, E., Department of Zoology, University of Oulu, and Värriö Subarctic Research Station, University of Helsinki, Linnanmaa, SF-90570 Oulu, Finland
Saari, L., Värriö Subarctic Research Station, University of Helsinki, SF-00710 Helsinki, Finland

Received 3 December 1991, accepted 11 June 1992

Increasing attention has been paid in recent years to the breeding biology of the Golden Plover, *Pluvialis apricaria* (e.g. Ratcliffe 1976, Byrkjedal 1978, 1985, 1987, 1989, Parr 1979, 1980, Byrkjedal & Kålås 1985). Most of this research has been carried out in Great Britain and southern Norway, while the biology of northern populations is still largely unknown. We summarize here the basic traits of the breeding biology of the Golden Plover in Finnish Lapland and compare our results with those obtained elsewhere.

Material and methods

The data were collected in eastern Finnish Lapland in 1968–1987, mostly in the Värriötunturi fell area (67°44′N, 29°37′E) and its surroundings, with some additional data from the northwestern corner of the Lokka reservoir (68°02′N, 27°30′E). The study area has been described in detail by Pulliainen & Peiponen (1981). It consists mainly of lowland forests (70%; main tree species *Picea abies, Pinus sylvestris* and *Betula* spp.), subalpine birch forests (7%), bogs (13.5%), and alpine fell summits (9.5%). The nests were found during routine field surveys by the staff of the Värriö Subarctic Research Station and no special efforts were made to find as many Golden Plover nests as possible. A total of 28 nests were recorded, two of these at Lokka. Each year, 0–3 nests were found, but the data on some nests are limited.

Results

Arrival: On average, Golden Plovers arrive at Värriö on 15 May (± 4 days, range 7 May–23 May, n = 17), some 1.5 months later than on the southwestern coast of Finland (mean 31 March, Laine 1989). The birds immediately disperse into their territories and thus large flocks of Golden Plovers have not been recorded upon arrival. The birds are usually seen in pairs from the beginning, which indicates that pairing has taken place earlier.

Breeding biology: Only two nests completed later were found in the laying period, and the date of commencement for 13 nests had to be backdated from the hatching date (assuming a 30-day incubation period and a two-day laying interval, see Cramp & Simmons 1983). The clutches were commenced between 22 May and 23 June, mean 2 June ± 10.3 days, the latest date of commence-

ment being recorded in 1982, when the early summer was extremely cold and the onset of breeding was delayed for most species in the area (E. Pulliainen & L. Saari, unpubl.). In five cases laying was commenced 7–12 days after the first arrival in the area. In one nest the laying interval was two days between eggs 1–3, but only one day between eggs 3–4.

The nests were found on alpine heaths (8 cases), in subalpine birch forest (17 cases) and on bogs (3 cases, including both nests at Lokka) between 3 June and 9 July, mean 20 June, and thus were probably mostly well incubated (see above). The sizes of the completed clutches were 4 × 3 and 14 × 4 eggs (mean 3.8; omitting one c/2, the average for all the clutches recorded was the same, n = 27). Two nests failed completely: one c/2 was probably deserted at the laying stage and one c/3 was trampled by a reindeer *Rangifer tarandus*. The proportion of the eggs that hatched in the successful nests was 92% (49/53). In the 11 c/4 cases only one egg did not hatch (2%), whereas in the three c/3 1+2 eggs failed to hatch (33%).

An average of 3.1 young hatched in the 16 nests with a known outcome, and the average brood size in the 14 successful nests was 3.5. Calculated by the method of Mayfield (1975), the daily survival rate for nests during incubation was 0.996 (1 nest lost in 228 days). Assuming a 30-day incubation period, 88% survived that stage (the length of one incubation period in our material was only 28 days, however). Multiplication of this figure by the hatching success indicates that 81% (0.88 × 0.92) of the eggs seen at the beginning of incubation eventually hatched. The c/4 hatched between 27 June and 8 July (mean 3 July ± 4 days, n = 11), the c/3 between 13 and 27 July (mean 21 July ± 7 days, n = 3), the mean hatching date for all clutches being 7 July. The late clutches are thus smaller than the early ones ($t = 4.74$, $df = 12$, $P < 0.005$, two-tailed).

All eggs in a clutch hatched within 1–3 days. In five nests hatching was over in about one day, i.e. all eggs had hatched between two visits one day apart. In six cases hatching took 1–2 days, and in one nest about three days. In one nest the first cracks in the eggshell were noticed more than four days before the first chick hatched, and in another more than three days before. In both these nests chipping was heard from the eggs two days before the first chick hatched. Two newly hatched chicks in one nest weighed 22 and 23 g, and four newly hatched chicks in another weighed 21.5, 22.5, 22.5 and 23.5 g.

Flocking and departure: The Golden Plovers at Värriö started to flock in late June or early July. In 1970 at least 10 birds were seen passing over the study area on 2 July, and in 1971 7 exx. flew over the study area in the night between 20 and 21 June and 18 exx. on 27 June. In 1973 small flocks appeared from 21 June onwards. On 28 June 1974, 13 exx. were recorded at Lokka and about 40 *Pluvialis sp.* flew south on 29 June. In contrast to many other shore birds in the area, Golden Plovers are commonly seen in August, the latest record being dated 22 September 1971.

Discussion

Laying may start one week after the first arrival of the Golden Plovers at Värriö, and at least some of the birds have probably already paired by then, thus realizing the typical arctic breeding pattern (see Irving 1972). The clutches are commenced in late May and June, with a mean in the first few days of June, at about the same time as in the White Sea area (Cramp & Simmons 1983). In Great Britain laying usually takes place in April on the lower moors, and two or three weeks later for high-altitude pairs, and most nesting grounds are deserted by the end of July (Ratcliffe 1976). In southern Norway, laying takes place in late April–early May at Jaeren (300 m altitude), and did so around the middle of June in the exceptionally late 1974 season at Hardangervidda (1300 m altitude) (Byrkjedal 1978 and *in litt.*). Laying was about one month earlier at Jaeren than at Värriö. At Hardangervidda it was a little later even in more "normal" years: median laying date 11 June (n = 8 years, I. Byrkjedal *in litt.*). Due to the maritime climate along western Norway, Hardangervidda has high precipitation, resulting in extremely deep snow, which disappears late, and this explains the late start of breeding and the long pre-laying period there compared with the more continental Lapland (I. Byrkjedal *in litt.*).

Small flocks occur at Värriö in late June, even before the first eggs have hatched. Their behaviour indicates migration, but it is not known whether they really migrate. Flocking appears to start at about the same time as the moult starts in southern Norway (see Byrkjedal 1978). At Pori, autumn migration starts on average on 10 July (Lampolahti et al. 1984), but these birds may be of more southerly origin. The birds flocking in late June–early July at Värriö are probably largely off-duty birds.

The clutch sizes of Golden Plovers are remarkably similar in different areas (range 3.78–3.87, Table 1). At Värriö 7.6% of the 53 eggs incubated for the full time failed to hatch, a figure that is slightly higher than in two data sets from Great Britain: 4.4% (n = 135 clutches) and 3.8% (n = 105, excluding two infertile clutches, Ratcliffe 1976). At Hardangervidda 3.0% of the eggs were infertile (n = 67 clutches, Byrkjedal 1987).

No predation of nests was recorded at Värriö. Of the 66 nests studied by Parr (1980), 29 were completely and 2 partially destroyed, mainly by Crows *Corvus corone*. Ratcliffe (1976) reported that 38% of the studied clutches failed completely. As these authors did not use the method of Mayfield (1975) to estimate breeding success, their results are not directly comparable to ours, where 88% of the incubated nests survived. At Hardangervidda only 21.8% of the nests survived (27 nests out of 51 being robbed over 492 nest-days with a 27-day incubation period, Byrkjedal 1987). The low predation pressure on nests of ground-nesting birds at Värriö is a general phenomenon, probably reflecting the scarcity of avian and mammalian nest predators (E. Pulliainen & L. Saari, unpublished). The Gyrfalcon *Falco rusticolus*, is perhaps the most efficient hunter of the potential predators, but only one pair hunts in the area. Only the Raven *Corvus corax* is fairly common in the area, only one pair of Crows having bred there a few times and gulls *Larus* spp., being almost absent. The mammals in the area (mainly the red fox *Vulpes vulpes)* are probably not very efficient nest hunters owing to low population density. Golden Plovers and Whimbrels *Numenius phaeopus,* often nest near each other and thus the Golden Plover may benefit from the latter's aggressiveness towards predators.

The brood size for successful nests at Värriö was 3.5, the same as the estimate of Ratcliffe (1976) for Great Britain, while Parr (1980) recorded a brood size of 3.55 at hatching (n = 31). Owing to much greater complete losses, the number of young hatched per initial clutch is much smaller in Great Britain. Ratcliffe (1976) estimated 2.2 chicks per nest, but Mayfield's method (1975) might have given a lower figure. At Värriö we obtained 3.1 young hatched per nest started, a figure similar to that calculated from the mean clutch size and the nesting success ($3.8 \times 0.81 = 3.1$).

Acknowledgements: Thanks are due to Ingvar Byrkjedal, Hannu Pietiäinen, Paavo Tunkkari and Risto A. Väisänen for their critical reading of the manuscript. This paper constitutes Report No. 204 from the Värriö Subarctic Research Station, of the University of Helsinki.

Table 1. Clutch size of the Golden Plover in different parts of its range. The clutch size distribution in N Scotland was calculated from the percentages

	2	3	4	5	Mean	N	
Great Britain	9	15	207	–	3.86	231	Ratcliffe 1976
Great Britain, BTO	?	?	?	?	3.82	163	Ratcliffe 1976
N Scotland	(3)	(15)	(107)	(1)	3.85	126	Cramp & Simmons 1983
E Scotland	?	?	?	?	3.84	60	Parr 1980
Netherlands	–	5	18	–	3.78	23	Glutz von Blotzheim et al. 1975
S Norway	–	8	55	–	3.87	63	Byrkjedal 1987
Finland	–	4	14	–	3.78	18	von Haartman et al. 1963–72
N Finland	–	4	14	–	3.78	18	This study

Selostus: **Kapustarinnan pesimäbiologiasta Itä-Lapissa**

Kapustarinnan pesimäbiologiaa tutkittiin Itä-Lapissa, etupäässä Värriötunturin maastossa vuosina 1968–87. Kapustarinnat saapuivat alueelle keskimäärin 15.5. ja muninta alkoi 2.6. Täysilukuisten pesyeiden keskikoko oli 3.8 (n = 16) ja onnistuneista pesistä kuoriutui keskimäärin 3.5 (n = 14) poikasta. Muihin tutkimuksiin verrattuna kapustarintojen pesimämenestys oli varsin hyvä. Haudonta-ajan yli selvisi 88% pesistä (Mayfieldin menetelmä), pesärosvot eivät ryöstäneet yhtään pesää.

References

Byrkjedal, I. 1978: Altitudinal differences in breeding schedules of Golden Plovers Pluvialis apricaria (L.) in south Norway. — Sterna 17:1–20.

— 1985: Time-activity budget for breeding Greater Golden-plovers in Norwegian mountains. — Wilson Bull. 97:486–501.

— 1987: Antipredator behaviour and breeding success in Greater Golden-plover and Eurasian Dotterel. — Condor 89: 40–47.

— 1989: Habitat use and resource overlap by breeding Golden Plovers and Dotterels (Pluvialis apricaria, Charadrius morinellus). — J. Orn. 130: 197–206.

Byrkjedal, I. & Kålås, J. A. 1985: Seasonal variation in egg size in Golden Plover Pluvialis apricaria and Dotterel Charadrius morinellus populations. — Ornis Scand. 16: 108–112.

Cramp, S. & Simmons, K. E. L. (eds.) 1983: The birds of the Western Palearctic 3. — Oxford University Press, Oxford. 913 pp.

Glutz von Blotzheim, U. N., Bauer, K. M. & Bezzel, E. 1975: Handbuch der Vögel Mitteleuropas 6. — Akademische Verlagsgesellschaft, Wiesbaden. 840 pp.

von Haartman, L., Hildén, O., Linkola, P., Suomalainen, P. & Tenovuo, R. 1963–72: Pohjolan linnut värikuvin. — Otava, Helsinki. 1092 pp.

Irving, L. 1972: Arctic life of birds and mammals including man. — Springer-Verlag, Berlin-Heidelberg-New York. 192 pp.

Laine, R. 1989: Muuttolintujen saapuminen Varsinais-Suomeen 1965–1987. — Ukuli 20(2): 22–26.

Lampolahti, J., Nuotio, K., Peltomäki, J. & Pitkälä, A. 1984: Satakunnan lintujen lajiluettelo. — In: Soikkeli, M. (ed.), Satakunnan linnusto: 201–237. Porin lintutieteellinen yhdistys, Pori.

Mayfield, H. F. 1975: Suggestions for calculating nest success. — Wilson Bull. 87: 456–466.

Parr, R. 1979: Sequential breeding by Golden Plovers. — British Birds 72: 499–503.

— 1980: Population study of Golden Plovers Pluvialis apricaria, using marked birds. — Ornis Scand. 11:179–189.

Pulliainen, E. & Peiponen, V. 1981: On the breeding of the Redpoll Carduelis flammea in NE Finland. — Ornis Fennica 58:109–116.

Ratcliffe, D. A. 1976: Observations on the breeding of the Golden Plover in Great Britain. — Bird Study 23: 63–116.