

Meadow birds, field management and nest protection in a Dutch peat soil area

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From 1982 onwards, the colonization and breeding success of meadow birds, species of waders and ducks that breed in agricultural grassland, was studied in Waterland, a peat area in The Netherlands. Farmers and volunteers cooperated in searching for and protecting nests. Differences in colonization between grazed and mown fields were assessed. The proportion of clutches that hatch before mowing depends on the bird species and the mowing date, and is highest (89%) for the Lapwing *Vanellus vanellus* and lowest (23%) for the Mallard *Anas platyrhynchos*. Nest protection, i.e. the marking of nests and the use of nest protectors to prevent trampling of clutches by cattle, was successful in 71% of the cases. It is concluded that in peat soil areas, some meadow birds may have high hatching success on mown fields, and that a good organized nest protection scheme will increase breeding success.

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INTRODUCTION

Meadow birds are a typically Dutch phenomenon comparable to clogs, windmills, tulip fields and Van Gogh. In the moist areas in the west and north of The Netherlands especially, a vast number of these birds breed at high densities on agricultural land, particularly meadows (Piersma 1986; Beintema 1986, 1991a). Here, Lapwing *Vanellus vanellus*, Black-tailed Godwit *Limosa limosa*, Oystercatcher *Haematopus ostralegus*, Redshank *Tringa totanus*, Mallard *Anas platyrhynchos* and Shoveler *Anas clypeata* constitute typical bird communities, in combination with smaller numbers of Ruff *Philomachus pugnax*, Snipe *Gallinago gallinago*, Garganey *Anas querquedula* and several passerines such as Skylark *Alauda arvensis*, Meadow Pipit *Anthus pratensis* and Yellow Wagtail *Montacilla flava flava* (Verstraël 1987). Consequently, The Netherlands is an important area for many meadow birds, for example holding 85-90% of the northwest European population of the nominate race of Black-tailed Godwit (Mulder 1972; Piersma 1986; Van Dijk *et al.* 1989; Beintema 1991b). Most breeding waders inhabit normal agricultural fields, instead of nature reserves, which covers only 9% of the total agricultural area of the Noord-Holland province (WWNN 1982).

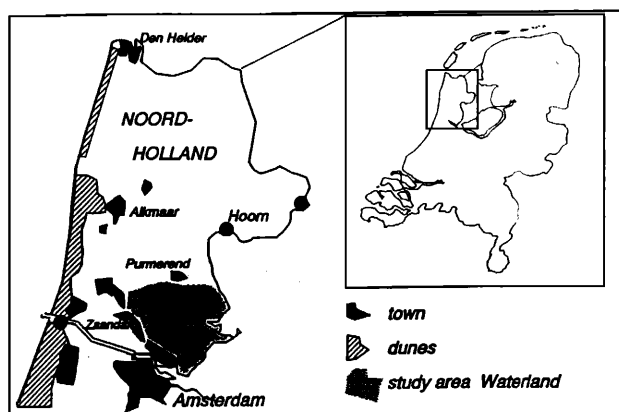


Figure 1. Location of Waterland the study area

In many areas, the numbers of breeding waders has declined, thought to be caused by the result of field drainage and increased fertilizer application (e.g. Beintema *et al.* 1985). These agricultural changes have led to an advance in the average first mowing date from the second week in June, early this century, to mid-May in 1975. This shortens the time available for the various meadow birds to safely hatch their clutch and raise their chicks. Such strong selection on early breeding has shifted the breeding periods of several



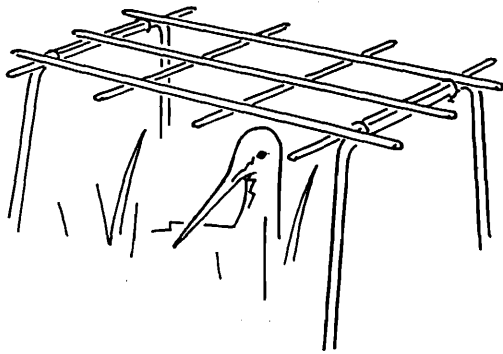


Figure 2. Nest protector.

wader species by one or two weeks (Beintema *et al.* 1985). Since the 1970s the mowing date has continued to advance and in some areas the start of the mowing season begins at the end of April. A similar story is true for the advance of the grazing period.

Peat soil areas are particularly rich in meadow birds. Because these soils are not drained as rigorously as other soils, dairy farming is less intensive. This has resulted in relatively high densities of breeding meadow birds (WWNN 1982; Ruitenbeek *et al.* 1990). Densities are particularly high in Waterland which is located near Amsterdam in Noord-Holland (Figure 1). However, there is concern among local farmers, conservationists and government about the future of agriculture in Waterland, and these bird populations.

Without farmers there will be no meadow birds!

Hence in 1982 the cooperative group Waterland (Samenwerkingsverband Waterland) was founded, being an organization of farmers (Werkgroep Jonge Boeren Waterland), the county conservation body (Milieufederatie Noord-Holland) and the research centre of agriculture and environment (Centrum voor Landbouw en Milieu). One of the goals was to investigate the possibilities of combining good agricultural practice with sustaining high densities of meadow birds.

A way of increasing the breeding success of meadow birds is to protect their nests. This involves locating and marking nests, so enabling farmers to avoid them during operations such as fertilizing and mowing; and placing a nest protector (Figure 2) over the nest before cattle are released in the field, to prevent trampling of the nest. This practice has been developed in the province of Friesland since the 1940s and was applied there on c. 74,000 ha in 1991 (Hoekstra 1992). In Noord-Holland this method was introduced in the 1980s and, in 1991, was applied on 3,700 ha.

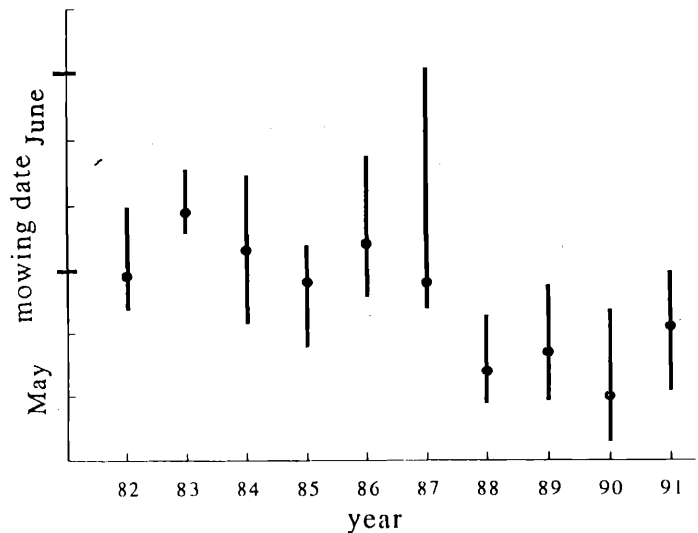


Figure 3. Mowing periods 10, 50, and 90% of area mown) in Waterland on unrestricted fields in Waterland in 1985-1991.

In Waterland we have collected data on the breeding success of meadow birds and, simultaneously, protected their nests (Guldermond & Tanger 1986). Our aim was to answer the following questions:

1. what are density and hatching success on mown and grazed fields?
- 2) what is the proportion of clutches that hatch before mowing? and
- 3) what is the hatching success of clutches in nest protection programmes?

STUDY SITE AND METHODS

Waterland (ca. 7,000 ha) is located just north of Amsterdam and consists of meadows, small elongated lakes reflecting inundations of the former Zuider Sea (the present IJsselmeer), natural canals and marshy areas with reedbeds. Every field is enclosed by ditches which are usually 2 m wide, sometimes up to 5 m. Small villages are scattered around, and the farms are located along the roads. In some areas the fields can only be reached by boat, and these have the most extensive form of agricultural management. Compared to other areas in The Netherlands dairy farm management in Waterland is less intensive.

Waterland has predominantly peat soils or a thin layer of clay on peat; some small polders have a clay soil. Water tables are high, only 20-40 cm below field surface in summer, and even higher in winter. An increasing proportion of fields are drained (water table to ca. 50-100 cm below the surface) by individual farmers, and in the near future specific assigned areas will be drained under a governmental scheme of land 'improvement'. Grazing takes place from April and mowing from May onwards, but there is considerable



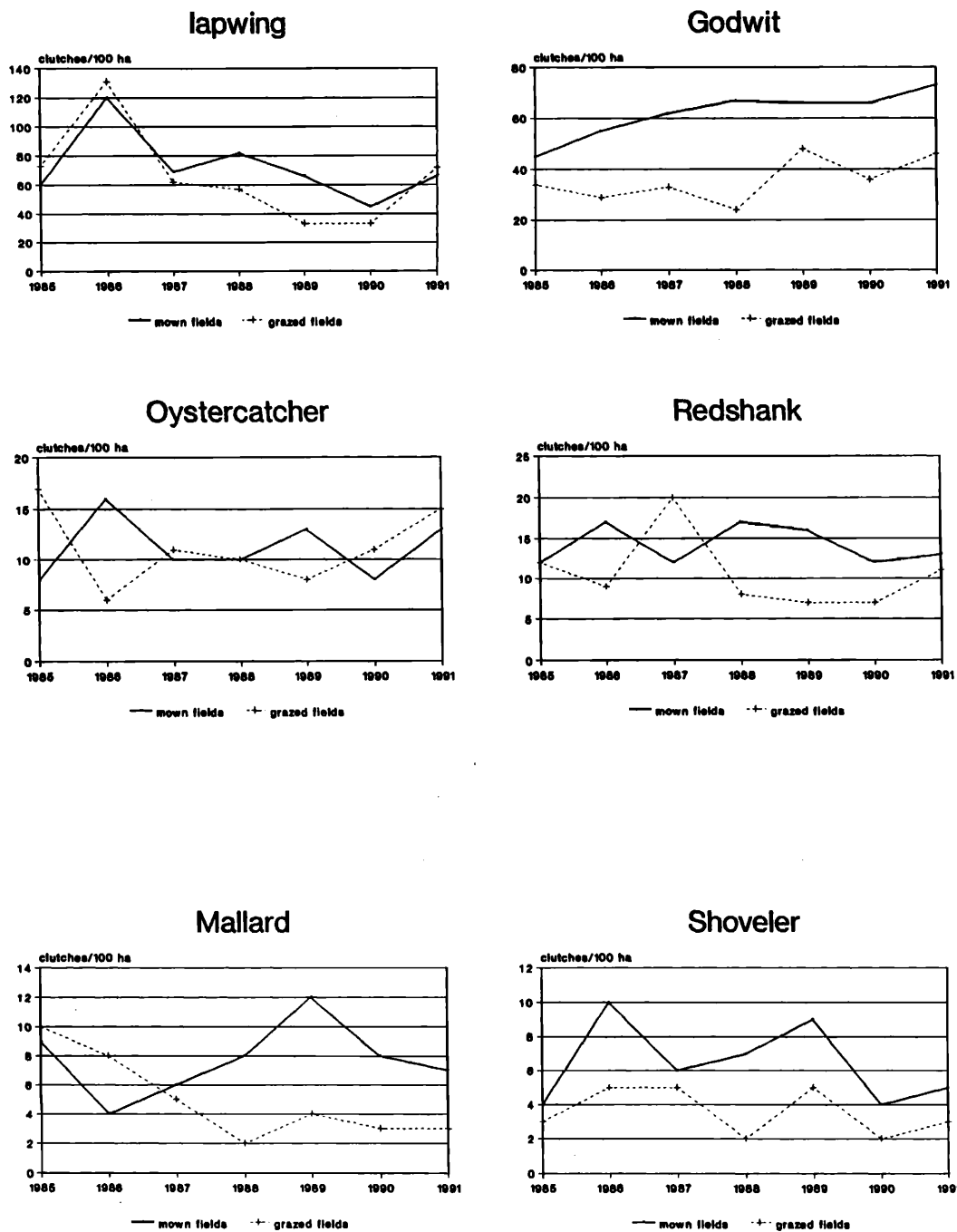


Figure 4. Densities of clutches found/100 ha. on unrestricted mown and grazed fields in Waterland in 1985-1991.

variation between years, as well as between different areas in Waterland. Fieldwork started in 1982 and continues. It is undertaken by volunteers (bird watchers) and farmers. Since 1985 the number of farmers and bird watchers involved in the project has increased from ca. 10 and 25 respectively, to 64 farmers and more than 100 volunteers in

1991. From 1989 co-ordinators were contracted for the field season to organize the field work and to attract more bird watchers, which have been the limiting factor. This has resulted in an increase in the area covered from 200 ha to over 1300 ha with ca. 2,200 clutches detected in 1991. Fieldwork takes place from late March / early April to June, when most of the clutches



Table 1. Densities of breeding birds in meadow bird communities in Noord-Holland per 100 ha (after Ruitenbeek *et al.* 1990), and on 5 farms studied in Waterland.

	all meadow bird communities*	best meadow bird communities*	farms in Waterland**
Lapwing	18	35	45-75
Black-tailed Godwit	10	27	34-48
Redshank	4	7	8-14
Oystercatcher	14	19	8-15
Ruff	0.1	0.7	0.5-1
Snipe	0.2	1.4	<0.5
Shoveler	2.1	7.9	3-5
Gargany	0.2	1.4	<0.5

* Estimation of number of breeding pairs by territory mapping technique.

** 5 farms, 180 ha, minimum and maximum densities of **hatched** nests in 1985-1991, which is a minimal measure of the density of breeding pairs.

hatch. Most of the fields on a farm are systematically searched for nests each week.

The fields and farms are not selected for the occurrence of high numbers of birds, so the densities are representative for the area. Usually, farms were included in the research when the farmer had asked for nest protection. Each nest is indicated on a map of the field and marked with a bamboo pole which is positioned ca. 2 m away to allow the farmer to avoid it during work on the field and to aid relocation during subsequent visits. The number of eggs is recorded as well as their outcome: hatched, predated, disappeared, trampled, or lost during agricultural operations, e.g. mowing. When a full clutch of Oystercatcher, Lapwing or Black-tailed Godwit is found, the developmental stage is assessed by immersing an egg in water (Van Paassen *et al.* 1984); the degree of floating allowing us to estimate the date of egg laying and hatching. Parameters of all relevant agricultural practices, including mowing date, grazing periods and numbers of cattle or sheep, are recorded.

In this paper we focus on the more common meadow birds Lapwing, Oystercatcher, Black-tailed Godwit, Redshank, Mallard and Shoveler, and the rare Ruff.

RESULTS

Mowing

A great variability in the date of mowing was found in Waterland on those fields without any mowing restriction, i.e. fields on which the farmer alone determines when mowing takes place (unrestricted fields; Figure 3). In contrast, many fields owned by or under management agreement of conservation bodies have an earliest mowing date ranging from 1 to 25 June. Low

temperature and high rainfall in April and May are important factors delaying the mowing date. In 1983, 1986 and 1987 mowing was relatively late, and in 1988, 1989 and 1990 it was early (Figure 3). The lowering of water tables on many farms leads to an earlier growth of grass so enabling the cattle to start grazing earlier and of earlier mowing.

Density of nests in mown and grazed fields

A conservative estimate of the number of breeding birds is given by the density of hatched clutches. This has been assessed on five farms in Waterland where all the fields have been investigated annually from 1985. For most of the meadow bird species, densities were higher on these five farms than in those areas in Noord-Holland which are typified as meadow bird communities (Ruitenbeek *et al.* 1990 and Table 1).

Is there a difference in the density of clutches found in mown and grazed fields? A pairwise comparison between the years 1985-1991 shows that the overall density is higher on mown fields in 6 of the 7 years, with mean densities of 173 and 132 nests per 100 ha on mown and grazed fields, respectively. Densities of Oystercatcher and Lapwing are rather similar between mown and grazed fields, but Black-tailed Godwit, Redshank, and duck species are more frequently found on mown than on grazed fields (Figure 4). Comparison of the percentage of hatched eggs is less relevant, because nest protection took place on all fields. However, in 6 of the 7 years this percentage is higher on mown fields, 68%, than on grazed fields, 60%.

How many clutches hatch before mowing?

An important decision, in areas which are managed by conservation bodies but leased and used by farmers, is



Table 2. The percentage of clutches (%) that hatched before mowing in Waterland. n= number of clutches.

	1982		1984		1985		1986		1987		1988		1989		1990		1991		1982-1991	
	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	S.D
Oystercatcher	55	11	75	16	38	8	41	17	50	12	7	14	8	25	6	35	29	56	34	24
Lapwing	95	64	92	77	91	66	85	78	97	76	85	93	87	94	84	174	89	234	89	5
Black-tailed godwit	90	69	92	62	92	50	81	48	89	54	57	83	58	120	59	222	79	250	77	15
Redshank	77	13	80	10	77	13	67	12	75	12	57	30	54	28	24	42	51	49	62	18
Ruff	100	2	100	1	50	4	50	2	50	2	0	1	50	2	0	1	0	1	(50)	-
Mallard	30	10	50	12	25	4	0	9	29	7	20	10	7	27	23	30	23	26	23	14
Shoveler	56	9	67	9	40	5	25	4	20	5	11	9	8	24	17	18	35	20	31	20
area (ha)	97.5		144.5		144		120.8		154		161		269		513		518			

Table 3

Percentage of hatched, predated, abandoned and trampled meadow birds clutches under nest protectors or mown around in Waterland, in 1985-1991. N = number of clutches. Because not all causes of loss are mentioned most figures do not total 100%.

percentage:	nest protector				N	mown around			
	hatch	pred	aband	tramp		hatch	pred	aband	N
Oystercatcher	76	15	5	3	106	81	14	2	103
Lapwing	73	12	9	5	396	83	6	1	102
Black-t Godwit	70	16	9	5	243	64	14	17	229
Redshank	61	13	14	10	79	69	18	8	72
Ruff	50	0	50	0	4	80	20	0	10
Mallard	67	8	17	0	12	57	15	23	60
Shoveler	56	6	19	19	16	80	9	4	46
All species	71	13	9	5		71	13	10	

the earliest mowing date allowed, often set at June 15. For farmers this date is not ideal for their field management plans. Therefore we have determined the proportion of clutches that hatch before mowing, on those fields without any mowing restriction.

Table 2 shows that the percentages of clutches that hatched before mowing in the period 1982-1991 differed within and between species. A high proportion of the clutches of the early breeding Lapwing hatch before mowing (89%, mean over the period). However, this cannot be said of Mallard (23%), Shoveler (31%) and Oystercatcher (34%). Black-tailed Godwit (77%) and Redshank (62%) have an intermediate position. It is surprising that half the clutches of the Ruff, an endangered species in The Netherlands (Osieck 1986), hatch before mowing, although the number of clutches (16) is too low for more definitive conclusions. For Oystercatcher, Black-tailed Godwit and Redshank, a negative relationship existed between date of mowing and hatching success (Figure 5), which indicate that their clutches hatch close to the mowing date and is little adaptable to year-to-year differences in mowing period. Ducks and Lapwing do not show such correlation

(Figure 5). This is because ducks colonize fields with high grass and, therefore, will often be found breeding at time of mowing; the Lapwing is an early breeding species which usually hatches well before mowing.

Nest protection

Annual hatching success, calculated for all clutches under a nest protector in 1985-1991, varied from 58 to 88%. Hatching success increases from Shoveler (56%), Redshank, Mallard, Black-tailed Godwit, Lapwing to Oystercatcher (76%). In some years predation can be a major cause of the clutch loss, but the average yearly predation is between 6% (Shoveler) and 16% (Black-tailed Godwit). Predation is highest among the waders (Table 3). Abandonment of a clutch covered by a nest protector seems highest for ducks and Redshank, but lower for other waders. Nest protectors do not give full protection against trampling by cattle and sheep: Redshank and Shoveler seem to have a rather high proportion of lost clutches due to trampling, however, the other waders appear to be well protected (Table 3).

Annual hatching success of those clutches around



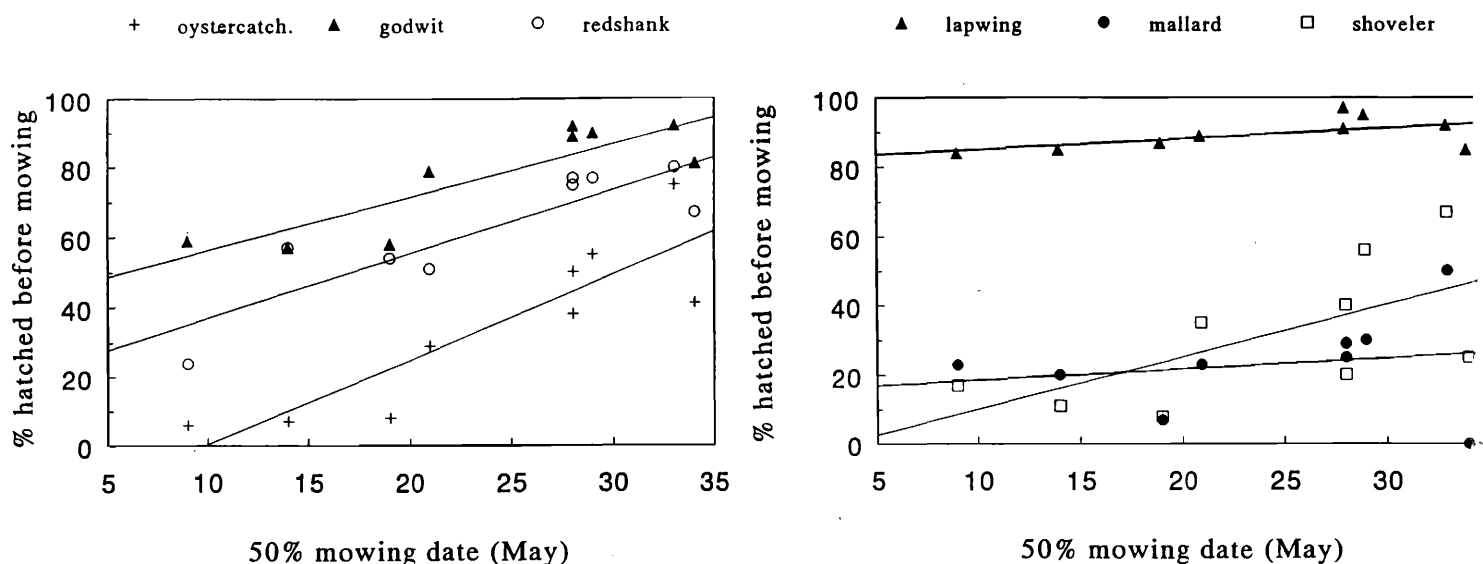


Figure 5. Relationship between timing of mowing (date by which 50% of the fields has been mown) and breeding success (percentage of clutches that has hatched before mowing).

which the farmer has mown was between 67-80%. Hatching success increases from Mallard (57%), Black-tailed Godwit, Redshank, Shoveler, Oystercatcher to Lapwing (83%). In some years predation can be a major cause of clutch loss, but the average predation is between 18% (Redshank) and 6% (Lapwing) (Table 3). Mallard and Black-tailed Godwit appear to be the most easily disturbed species, while Lapwing, Oystercatcher and also Shoveler rarely abandon their nests. Predation and nest abandonment are the most important factors in causing breeding failure for nests that have been mown around.

DISCUSSION

The main aim of our study is to determine the optimal conditions for both good agricultural practice and a high population and diversity of meadow birds, which we try to achieve by co-operation between farmers and conservationists. We have focused on factors of agricultural management because those can be influenced by farmers.

Differences in densities of breeding meadow birds between mown and grazed fields might be attributed to factors other than the use of the fields, such as soil type, water table or levels of disturbance from sources such as farms and roads (Veen 1973; Van der Zande *et al.* 1980). For example, grazed fields are often closer to the farm, where disturbance is higher, than mown fields. If we accept that these differences are inherent to the use of the fields we may conclude that some birds show a preference for mown fields, but none have a preference for grazed fields. The Black-tailed Godwit (Cramp & Simmons 1983; Buker & Groen 1989) and ducks preferentially colonize grass tussocks or higher stands of grass, which ties in with their preference for mown fields. On the other hand, Lapwing (Klomp 1954)

and Oystercatcher often breed in low vegetation, which may explain their relatively high frequency in grazed fields.

A high proportion of Lapwing clutches and, to a certain extent those of Black-tailed Godwit and Redshank, hatch before mowing. This indicates that, even without special protective measures, mown fields offer good opportunities for several meadow birds. Moreover, in years when mowing is relatively late in the season, hatching success of Black-tailed Godwits and Redshanks is also high. However, in years with early mowing, hatching success drops, as demonstrated by the negative relationship between mowing date and hatching success of these species (Figure 5).

Because the research always included nest protection it was not possible to measure hatching success on grazed fields without nest protection. The data shows that survival of clutches on grazed fields is rather poor (Beintema *et al.* 1982; Beintema & Müskens 1987). The chance of trampling increases from Lapwing, Oystercatcher, Black-tailed Godwit to Redshank. At a dairy cattle density of 20 cows/ha, a commonly occurring density, the chance of trampling of a clutch during a week ranges from 73% to 98% in the aforementioned species (Beintema *et al.* 1982). Also, compared with dairy cows, trampling effects are higher with calves and lower with sheep at equal stocking densities. It is likely that the majority of the clutches will not survive grazing under the current cattle densities.

Therefore, nest protection on grazed fields is of great importance, and is also successful, since half to three quarters of the clutches under a nest protector hatch. The main causes of clutch losses under protectors are predation and abandonment. Other studies found that in Friesland 82.5% (n=19,664), and in Zuid-Holland



84% (n=322), of all clutches under a nest protector hatched (Hoekstra 1990; Van Paassen 1992); predation is a major mortality factor accounting for 43% of the lost clutches (Hoekstra 1992).

The hatching success of clutches which have been mown around is slightly higher for most of the species compared with clutches under nest protectors. It is obvious that the chance of survival for a clutch in a field that is mown is small, although miraculous escapes have been recorded when the nest lies in a little depression. Hence, hatching success increases with this rather simple protective measure, especially for the ducks and the Oystercatcher, and also for Black-tailed Godwit and Redshank in years when mowing is early.

This study recommends grazing those fields which have a low or zero density of meadow birds, and the mowing of richer ones. The richest fields in particular should eventually be mown (Joosten *et al.* 1986). This measure can often fit well into agricultural practice. Nest protection, in the form of nest marking in order to use nest protectors or to be able to save the nests during mowing, increases the hatching success despite some predation and nest abandonment.

Nest protection is only possible if enough well trained volunteers are available to look after the nests, if co-ordination and support of nest protectors is organized, and, most importantly, if farmers and conservationists (birds watchers) cooperate. Also, farmers search for nests if they feel capable and have enough time. This will enable meadow bird communities to survive in efficiently used agricultural fields, where most of the breeding populations of these species still occur.

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