Hatching- and Fledging Success of Some 'Meadow Birds' on Parcels of Land Cultivated with Different Intensity

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From 1986 until 1988 hatching and fledging success of Black-tailed Godwit *Limosa limosa* and Curlew *Numenius arquata* was controlled in 6 areas in Schleswig-Holstein (FRG). The intensity of farming was lowered in some parcels of land due to special contracts. The reproduction rate of both species is not sufficient to give a stable population level. Meadows seem to be unsuitable for these 'meadow birds'. Why a bird species may breed in unsuitable areas is discussed. Some proposals are made about how to change the suitability of farmland for meadow birds. These cannot be universal because the different species of meadow bird have different needs. It is also noted that meadow bird species also have - or at least have had - natural biotopes which might have been protected.

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Most of the species called 'meadow-birds' nowadays normally breed in meadows and pastures. Of course these birds do not breed there 'naturally', since their natural breeding areas are different: some breed in swamps, others in marshes, beaches, river banks, dunes, heaths, and other natural biotopes.

Cultivating an area always means disturbing the ecosystem. Many species will decrease in numbers or even vanish. On the other hand some species will have advantages from this change. Their populations will increase because their competitors or enemies decrease or because the food supply improves. Other species will immigrate and very often unexpected associations of species occur in such an artificial area which under natural conditions never, or very rarely, meet.

Figure 1 shows the distribution of some meadow birds in relation to the intensity of agricultural activities. Increasing intensity does not lead to a decrease in birds in general; it is rather that some vanish and others appear. This figure does not consider the breeding success, it shows simply the presence of breeding pairs during the breeding season.

Earlier investigations in many countries (*e.g.* Beintema & Müskens 1981, Beintema *et al.* 1982, Blaszyk 1960, Doornbos 1981, Matter 1982, O'Connor 1986, Ranftl 1981) and also in Schleswig-Holstein (Jonas 1979, Schultz 1987, Witt 1986, 1988) have shown that the breeding success of many meadow birds is very low even if the density of breeding pairs is still high.

Obviously there is a difference between the attractiveness of meadows and pastures for meadow birds and their suitability for reproduction. An area can remain attractive even when its suitability is already lost. If there are no suitable breeding areas left, the population must decrease if it is not supplemented by immigration. Most of the meadow bird populations nowadays are decreasing more or less rapidly.

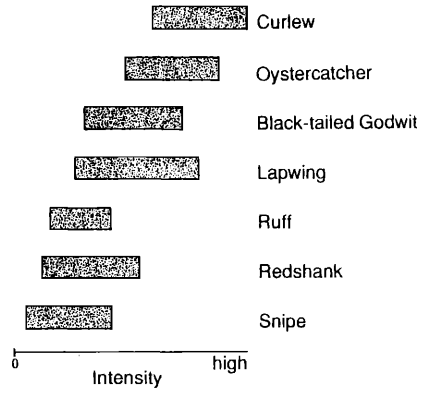


Figure 1. Preference and tolerance of meadow birds for intensity levels (arbitrary) of agricultural management (from Beintema 1986).

Facing the destruction of the natural environment and the over-production of agricultural products, the Ministry of Food, Agriculture, and Forestry in Schleswig-Holstein developed a set-aside programme in agriculture, which aims to lower the intensity or maintain a more traditional way of farming. It is now possible for farmers to enter into a contract with the government, committing themselves to abstain from some of their injurious activities.

The obligations on the contractor are:

- no new ditches or drains can be built;
- from the 5 April or 20 April until the 5 June or 20 June (depending on the area) the farmer is not allowed to roll, harrow, fertilize, or mow the parcel of land; and
- no more than 3 head of cattle per hectare can be grazed before 20 June.

It is important to keep in mind that:

- the parcels of land must still be cultivated;
- the existing drainage system can be used as before; and
- the amount of fertilizer is not limited in general.

In our investigation we concentrated on the consequences of these contracts on two species of meadow birds: the Black-tailed Godwit *Limosa limosa* and the Curlew *Numenius arquata*. The question was: are the contracts suitable for increasing the breeding success of these two species? We compared the hatching success on parcels of land under contract with the success on normally cultivated fields. After chicks hatched we tried to follow the movements of the families to get some information about the choice of the rearing areas and the losses of chicks.

From 1986 until 1988 we worked in 6 areas in Schleswig-Holstein. Each area was controlled almost daily from March until July by at least one ornithologist, mostly students of the University of Kiel.

There are differences in hatching and fledging success between the areas and between the years. Here I will only outline the results in general. In this paper hatching success and fledging success are defined as follows. A breeding pair has:

- hatching success, if within one breeding season at least one chick hatches; and
- fledging success, if within one breeding season at least one chick fledges.

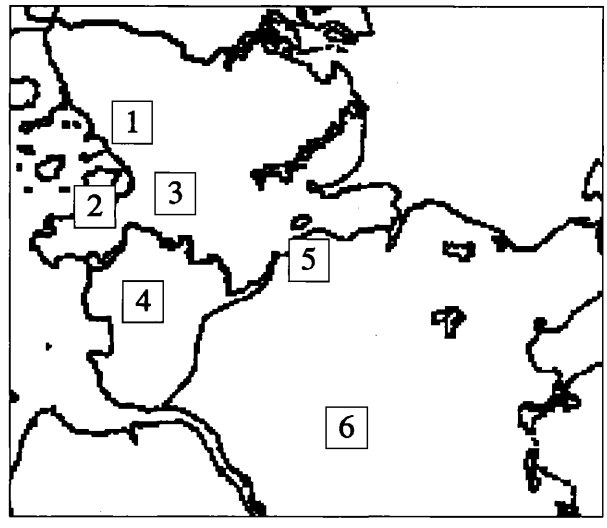


Figure 2. The locations of the investigation areas in Schleswig-Holstein, West Germany.

In the Black-tailed Godwit 49 % of the breeding pairs had hatching success. The percentage of successful pairs (the dark section in Figure 3) is much higher on meadows than on pastures. There is hardly any difference between parcels of land under contract and normally cultivated fields.

54% of the breeding pairs of the Curlew had hatching success. Figure 4 appears to be quite similar to Figure 3, with a very low success on pastures. The contracts, however seem to double the success of Curlews on meadows.

If we look at the fledging success - which is no longer fixed to a definite parcel of land because of the mobility of the families - we see that about half of the breeding pairs have hatching success, and that of these pairs about half rear their chicks until fledging (Figure 5). However these successful pairs have lost half of the hatched chicks by that time, and so on average each successful pair rears 1.8 chicks. This means, that for both species 0.4 fledged young are produced on average per breeding pair per annum.

To assess if this is a good or bad result, *i.e.* if the productivity is sufficient to give a stable

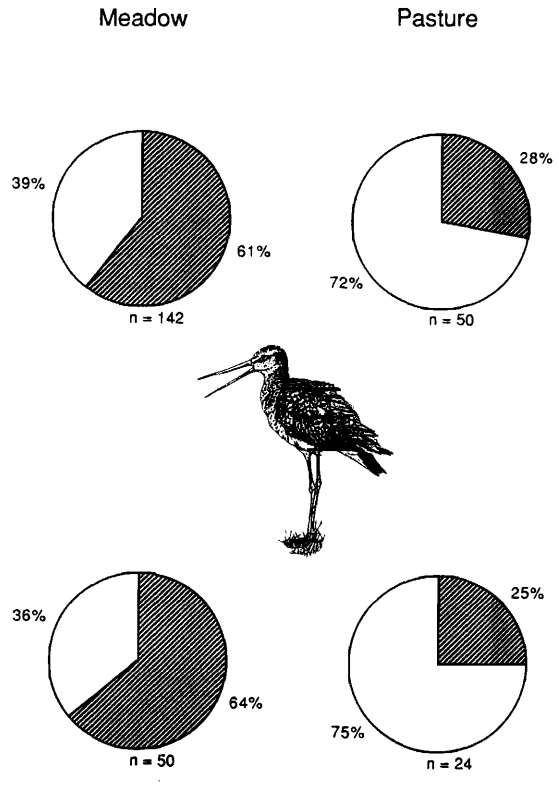


Figure 3. Hatching success of the Black-tailed Godwit 1986-1988. Above: normally cultivated fields; below: land under contract. The percentage of successful pairs is shown shaded.

population level, we need some further information, which I have taken from the literature.

In the Black-tailed Godwit, mortality from fledging until breeding is more than 50 % (Beintema & Drost 1986, Glutz *et al.* 1977). So our 0.4 young birds will be reduced to no more than 0.2 adults. This means that an average breeding pair would need more than 10 years for reproduction. This is valid if every adult breeds every year, which is not the case. In some areas and in some years the proportion of non-breeders in the population may exceed 50 %.

The average duration of life of an adult Black-tailed Godwit is only 2.3 years (Glutz *et al.* 1977).

The mortality of Curlew from fledging until maturity is about 70% (Glutz *et al.* 1977). So from 0.4 fledged birds only 0.1 will become adult. This means, that with the breeding success observed in Schleswig-Holstein an average duration of life of 20 years (plus 3 years until maturity) would be necessary to stabilize the population, provided that every mature bird breeds every year. But in some years and in some areas in Schleswig-Holstein just a small part of the potential breeding population actually breeds, so average life-spans would need to be even longer. But from 137 young Curlew ringed in the Netherlands only one became older than 14 years (Glutz *et al.* 1977).

The life-span calculation for Curlew is speculative since mortality may be overestimated (*e.g.* by ring losses) and reproduction may be underestimated (*e.g.* because chicks escaped our notice).The difference between observed and required reproduction rate is, however, so large that the errors in calculation can be considered minimal.

The reproduction rates calculated here must lead to extinction where an isolated population is concerned. Both the Black-tailed Godwit and the Curlew population are not, however, isolated in Schleswig-Holstein, so immigration is possible. Indeed it is essential if the population is to continue to breed.

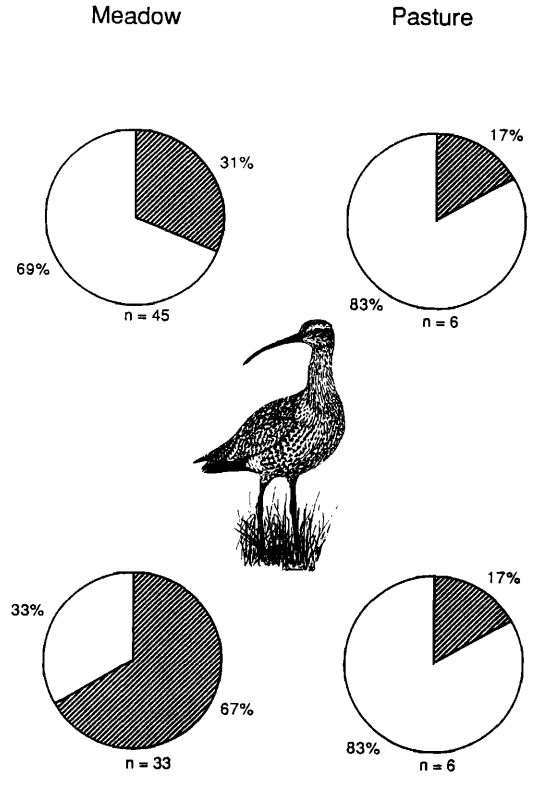
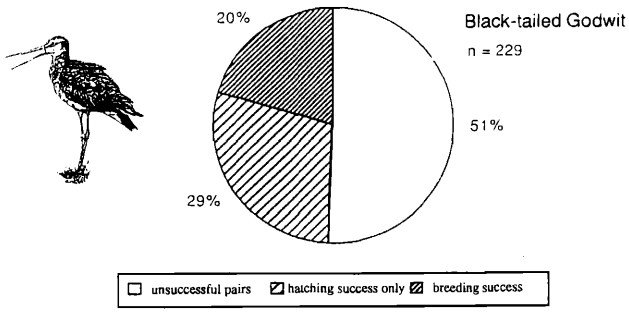


Figure 4. Hatching success of the Curlew 1986-1988. Above: normally cultivated fields; below: land under contract. The percentage of successful pairs is shown shaded.



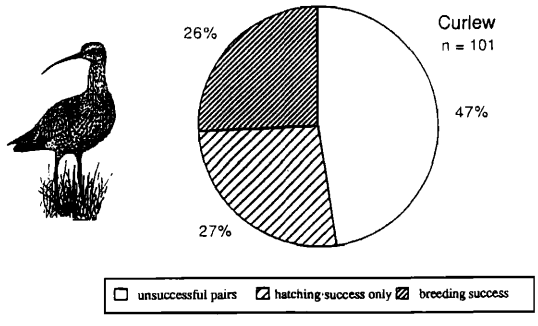


Figure 5. Hatching success and fledging success 1986-1988.

The breeding areas of Snipe *Gallinago gallinago*, Ruff *Philomachus pugnax*, Redshank *Tringa totanus*, and Black-tailed Godwit in Schleswig-Holstein have decreased in number and size within the last decades and their breeding populations have declined (Ziesemer 1986). The Curlew population in Schleswig-Holstein has decreased in fens but increased on meadows (Berndt 1986, Knief & Busche 1982).

Normally, if a biotope is unsuitable for breeding, a bird will not breed there. Meadows and pastures cultivated with normal intensity are unsuitable for breeding birds. In a former publication (Witt 1986) I tried to explain the phenomenon of the ineffective breeding of meadow birds as follows.

Birds must be able to detect present and future suitability of a breeding area at the beginning of the breeding season. In my opinion they react to structural characteristics of the biotope, structures which in nature represent a suitable breeding area - suitable now for nesting and suitable in future for rearing the chicks. It is not the breeding area in its entirety which the bird takes into consideration, it is just the presence or absence of (maybe very few) key-stimuli within the area, which release mating and breeding behaviour. In a natural environment structures working as a key-stimulus characterize suitable biotopes unmistakably - suitable for the species at least. Of course some breeding pairs will breed unsuccessfully also in their natural breeding areas, but the species will survive.

Artificial areas, *i.e.* areas such as farmland or cities, changed by man, will show incoherent structures, of which some features also exist in nature. But in many cases they no longer represent suitability. In that case they work like a bait in a trap: they induce ineffective breeding just as a worm on a fish-hook induces ineffective feeding.

It is possible to explain the choice of a breeding area by innate releasing mechanisms. In ethology the supernormal stimulus by artificial or natural (but in nature non-normal) structures is well known. Some structures on farmland may act on bird species as supernormal stimuli. Birds then give preference to these artificial areas and sometimes they breed there in supernormal densities.

Artificial combinations of structures will lead to artificial combinations of breeding species. This is why 'meadow bird' species, which in nature never breed together, do so on farmland.

The Oystercatcher *Haematopus ostralegus*, which looks a little out of place on grassland, is nowadays a very successful meadow bird with regard to the number of breeding pairs, but not however in producing chicks (Witt 1986). In contrast, the Great Snipe *Gallinago media*, which seems a more typical 'meadow bird', became extinct in Schleswig-Holstein in about 1930. The structures releasing breeding behaviour of this species seem to have been lost in this part of its potential breeding area.

We can draw some conclusions about species breeding in artificial breeding areas:

- in contrast to nature every combination of attractiveness and suitability is possible, also attractive - unsuitable (and perhaps unattractive - suitable);

- in artificial areas the density of breeding pairs (or even their presence) should not be seen as an indicator for the suitability of the area;

- if the attractiveness of unsuitable artificial areas (intensively cultivated farmland) is higher than the attractiveness of suitable natural areas (fens, heaths, swamps etc.) small nature reserves surrounded by farmland would not save the species;

- a species which breeds unsuccessfully not only lets down itself but also (by competition) other species. Energy comsumption of unsuccessful breeding birds is higher than that of non-breeders. Destruction of clutches prolong the breeding period: the more clutches of the early breeding species are destroyed the more they will compete with the late breeding species;

- the reason for the presence of a bird in a natural environment is also an ecological one: every individual bird of every species is a functional part within the ecosystem. In artificial biotopes this reason often does not exist, it is not a system of species but just an accumulation: one should use the word 'ecosystem' very cautiously when speaking about cultivated areas.

From these general considerations we can return to the more specific conclusions concerning the protection of meadow birds. The aims of this study were to find out if the set-aside programme improves conditions for Curlew and Black-tailed Godwit. I do not think it does, or at least that it is not sufficient.

There are two reasons for the poor breeding success of Curlews and Black-tailed Godwits:

- the loss of clutches and chicks is high; and

- the attractiveness of the area decreases during the breeding season mostly due to changing vegetation structure and drainage. This means that only very few birds start a second clutch after the first one is lost - losses are not compensated.

How can we make the set-aside contracts more efficient? The breeding success on pastures is very low, so three head of cattle per hectare is still too many. Maybe one animal could be accepted, however none would be best. On meadows, the period where farming activities are restricted is too short. From March until the end of July the parcels of land should be totally undisturbed.

The ground water level is too low and drops too fast. It is not enough to forbid the digging of new ditches or drains - the existing drainage system should be filled in or at least partially blocked.

Due to the sowing of fast growing grasses and due to the spreading of manure the vegetation grows quickly and densely in spring. The birds, especially the chicks, can hardly move in this 'jungle' and after rainfall they often perish due to the cold. On the other hand on the short cut or grazed parcels of land there is no shelter against predators. Structure and growth of vegetation should therefore be less unnatural. 'Ameliorations' of the ground should be reversed.

Of course there are many more factors impairing the quality of these artificial breeding areas such as farmsteads, villages, roads, overhead power lines and disturbances by farmers, hunters, tourists, and even scientists. It would, however, still be possible to change the conditions on farmland to the advantage of meadow birds if farmers could be persuaded to manage the land differently. If the profit from the land is at least maintained then maybe some farmers will keep meadow birds instead of cattle. It is, however, important that decisions are first made as to which species of meadows birds are to profit from the management because, as we have seen in Figure 1, not all species can be catered for at the same time.

Most of the scientists working on the protection of meadow birds want to change the conditions on farmland without stopping the cultivation. There will not be meadows birds without farming. However maybe Snipe, Ruffs, Redshanks, Black-tailed Godwits, and Curlews would breed successfully if their natural breeding areas were protected. In that case the decrease of meadow birds would be of less relevance to the populations.