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The Black Grouse in the Netherlands : Monitoring the last (?) surviving Population (*)

by

P.G.A. TEN DEN and F.J.J. NIEWOLD

Key words : *Tetrao tetrix*, Black Grouse, Netherlands, Sallandse Heuvelrug, long term monitoring, decline, reproductive success, isolated population

SUMMARY

There has been a dramatic decline in numbers of the black grouse in the Netherlands during the last 60 years. From the original spring population of 5 to 8 thousand cocks before 1940, no more than 30 cocks divided over less than 10 populations survived around 1990. Of these, only the population of the Sallandse Heuvelrug still exists. The male population of this totally isolated population has been monitored yearly since 1974, and studied thoroughly in 1982-1986. The presented figures show large fluctuations (12 to 32 males), but an overall population size that does not seem to have changed much in the last 25 years. A decline during the last 3 years resulted in a spring count of only 15 males this year. From 1995 onwards, a survey of territorial males has been included in the yearly spring counts, as was done in 1974-1986. Herewith yearly reproductive success and yearly losses amongst males were estimated. These estimates indicated fluctuating reproductive successes of 14 to 41%, and yearly losses of 25 to 48% during the last six years. Recent reproductive successes were moderate to poor compared to figures from 1982-1985, when the population was on the same level but increasing. Yearly losses were of the same magnitude. Only last year's losses were a little high. The availability of arthropods in relation to weather conditions may have played a role in the recent low reproduction. On the short term, we expect the population to survive. But at this moment we have not enough insight in the effects of the total isolation to give a reasonable prediction for the long term.

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1 *ALTERRA P.O. Box 23, 6700 AA Wageningen, The Netherlands Email : F.J.J.Niewold@wag-ur.nl*

Introduction

At the conference on «The Future of the Wild Galliformes in the Netherlands» a dramatic decline in numbers of the black grouse *Tetrao tetrix britannicus* in the Netherlands during the second half of the last century was reported (BIJLSMA, 1990; NIEWOLD, 1990). Until 1930/40 numbers had increased to a maximum of 5 to 8 thousand cocks in spring. This was due to a decline in sheep rearing and a simultaneous small scale cultivation and afforestation of heathlands and peatmoors, which resulted in an improved supply of food and cover. Hereafter numbers began decreasing again **(fig. 1)** as a consequence of

Fig. 1. Development of black grouse male numbers in spring and black grouse populations in the Netherlands, 1940-1989 (after Niewold, 1990).
Evolution des effectifs des Tétras lyres mâles au printemps et des populations de l'espèce aux Pays-Bas, de 1940 à 1989 (d'après Niewold, 1990).

the progressing cultivation and afforestation, the maturing of conifer plantations, and temporarily of large scale heather mowing during World War II (for camouflage). A small recovery after 1945, due to regeneration of heather, was followed by a continuous decline in the 1950^{S} and 1960^{S}. In 1970 no more than 800 cocks divided over a 100 areas had remained. By that time the reclamation of heatlands and peatmoors for agriculture and afforestation had merely stopped, but the remaining black grouse habitats continued to change dramatically in quantity and quality, resulting in an even faster decline in numbers. The most important changes were (NIEWOLD, 1990, 1996):

Encroachment of trees, which further reduced the amount of open heathlands, and isolated them from surrounding agricultural fields.
Increased levels of nitrogen deposition and lowered groundwater tables, which

changed heathlands into uniform grasslands.
Disturbed heather growth caused by catastrophes as frosts, fires and plaques of the heather beetle.
Large scale heather management and grazing by sheep and cattle.
A progressing habitat isolation and fragmentation caused by the construction of roads, paths and ditches in and around the heathlands and by increased levels of outdoor recreation and military training.
A rapid change of the agricultural landscape due to re-allotments (PEAK 1970-1975), including drainage and the use of fertilisers and pesticides, which made surrounding agricultural fields less suitable for foraging and chick rearing.
An increase in numbers or range of the main predators.

Around 1990 no more than 30 cocks in less than 10 populations survived. All of these populations except one, contained 5 or less cocks. A critical point was reached (NIEWOLD, 1990). Only the largest population was considered to be viable if proper measurements were taken soon. In the National Black Grouse Conservation Scheme (DEN HOLLANDER, 1990), high priority was therefore given to this population. Since then, the small populations indeed all have disappeared. Only the largest one, the population of the Sallandse Heuvelrug, still exists **(fig. 2)**.

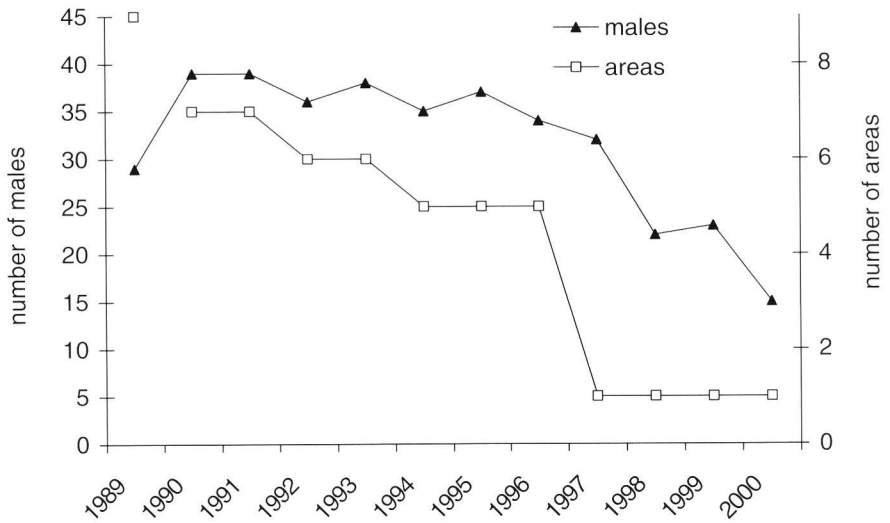

Fig. 2. Development of black grouse male numbers in spring and black grouse populations in the Netherlands, 1989-2000 (SOVON).
Evolution des effectifs des Tétras lyres mâles au printemps et des populations de l'espèce aux Pays-Bas, de 1989 à 2000 (SOVON).

The black grouse population of the Sallandse Heuvelrug has been monitored yearly since 1974 and studied thoroughly in the period 1982-1986

(NIEWOLD, 1990, 1996; NIEWOLD & NIJLAND, 1987, 1988). From 1974 until 1986 territorial and non-territorial cocks were distinghuised. Hereafter only monitoring of total male numbers in spring was continued. This however gave insufficient insight in the effects of the measurements taken on population dynamics. Especially an estimation of yearly reproduction seemed necessary. Because of a low budget and a very vulnerable population, a simple method with a minimum of disturbance was chosen. So, from 1995 onwards we re-introduced a survey of territorial males in addition to the regular spring counts of all males. Herewith juvenile and adult males could be distinguished, assuming that all males become territorial in their second year (DE VOS, 1983; NIEWOLD & NIJLAND, 1988; KLAUS *et al.*, 1990). Several studies have shown no real difference in winter mortality between juvenile and adult males and a similar percentage juveniles in spring as in the previous fall. Therefore, the percentage juveniles in the male population in spring is regarded as a representative estimate of reproductive success of the previous year (ANGELSTAM, 1983; WILLEBRAND, 1988; NIEWOLD & TEN DEN, 1998). In a similar way yearly losses amongst males could be estimated, because territorial birds (the adults) are the survivors of all the males present in the previous spring.

Study area and methods

Study area

The Sallandse Heuvelrug is an afforested sandy glacial ridge of 50 km^2 (elevation up to 75 m) in the eastern part of the Netherlands. The black grouse population occupies the open heathlands and the surrounding woodland edges, but do not frequent agricultural fields. The heathlands are dominated by *Calluna*, mixed with *Vaccinium* and surrounded by mainly conifer woodlands with a *Vaccinium* undergrowth. During the last 10 years the amount of open heathland increased from approximately 700 ha to 1100 ha due to the conservation scheme. The first goal herein was to create suitable habitat for a population of at least 50 males, by enlarging and linking the fragmented heathlands through clear cutting of woodlands and by creating more natural woodland edges. At present most of the woodlands are felled and slowly turning into suitable habitat (HERINGA, 2000). In a second stage agricultural fields and a peat-moor nearby may be included. The population is totally isolated for over 10 years, but in fact much longer. At present, the nearest populations are at a distance of about 200 km (Lüneburger Heide, Germany; Hautes-Fagnes, Belgium).

Spring counts of males

Since 1974 males were counted each spring by more or less the same method. For this purpose the area was divided into several sub-areas which could be surveyed from one point each. Between 6.30 and 8.30 AM, every 15

minutes all birds observed in each sub-area were counted at the same time. Temporarily not seen birds were taken into account. Movements between sub-areas were registered to avoid double counts. At the end of each morning the maximum counts of all sub-areas were added up, which gave a fairly good estimate of all males present that day. To minimise weather effects these counts were done during three different mornings in late April and early May (one week apart). The maximum count of these three days was regarded as the number of males present that spring. Females were counted in the same way since 1982, but because females are less conspicuous, female numbers are very likely to be underestimated.

Survey of territorial males

From 1995 onwards we distinguished between territorial (adult) and non-territorial (juvenile) males as was done in the period 1975-1986. On different mornings between 15 April and 15 May, when territorial cocks are most likely to be present at their territories and often displaying, the study area was traversed by bike or car in search of leks or solitary display sites. Visits were made separately, but occasionally simultaneously. Each lek or display site was visited on at least three different occasions and observed for 15 to 60 minutes. Location, number of males and behaviour were recorded. Birds were regarded as territorial when seen displaying regularly at more or less the same site and for long periods. Boundary disputes, fighting, chasing, fleeing, mating behaviour and physical appearance were used as additional criteria. Data from the simultaneous counts of all males were also taken into account.

Calculation of yearly reproductive success and yearly losses

By combining both counts reproductive success (S) and losses (L) amongst males were calculated as follows :

$$S_n = \frac{A_{n+1} - T_{n+1}}{A_{n+1}} * 100\% \quad \text{and} \quad L_n = \frac{A_n - T_{n+1}}{A_n} * 100\%$$

in which A_n = number of all males present in year n and T_n = number of territorial males in year n.

Results

Total numbers in spring

Since the early 1960s male numbers in spring on the Sallandse Heuvelrug declined from over 100 to about 50 in 1970 (**fig. 3**). From 1974 onwards, numbers fluctuated between 12 and 32 cocks. Until the early 1980s numbers were fairly low for several years, with a minimum of only 12 males in 1977. This probably was an underestimation because of very bad weather during the spring counts of 1977. In the midst 1980s an increase took place to a maximum of 32 cocks in 1986. After a short but sharp decrease, the male population recovered to the same level in the midst 1990s. In the last 3 years numbers decreased again to a count of only15 males in 2000.

Numbers of females developed more or less similar and were positively correlated with male numbers (R^2= 0.3393, n=20, p<0.01). But during years with fewer males, relatively more females were seen (**figure 3**). Last spring even more females than males were observed.

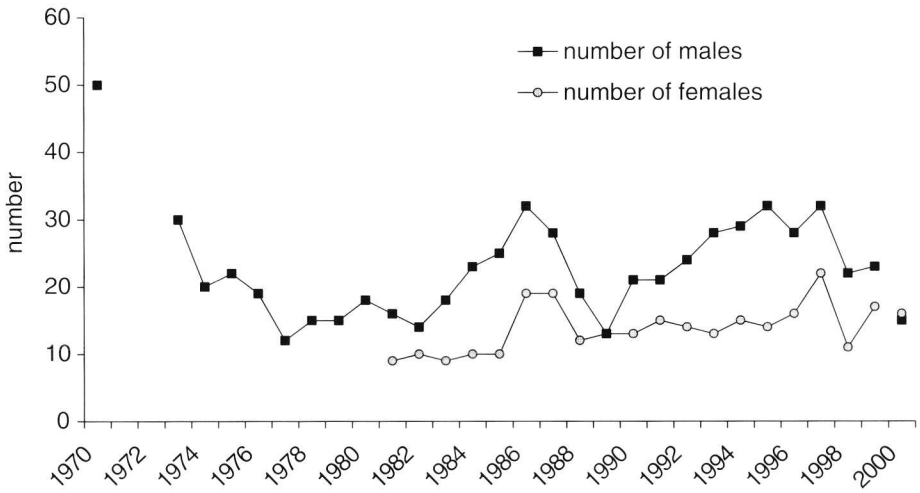

Fig. 3. Black grouse spring numbers on the Sallandse Heuvelrug, 1970-2000 (rough estimates from 1970 and 1973 included).
Effectifs printaniers des Tétras lyres au Sallandse Heuvelrug, de 19970 à 2000 (estimations grossières de 1970 et 1973 inclues).

Yearly reproductive success and losses

Yearly reproductive success fluctuated between 6% and 52% with a mean of 28%, while losses fluctuated between 7% and 58% with a mean of 29% (**fig. 4**). The calculated high losses of 1976 (58%) probably were caused by the underestimated number of (territorial) males in 1977, and therefore not very reliable. Reproductive success was highest in 1982-1985 (around 50%), when the population was growing fast. During the last 5 years and especially in 1997 and1999 reproduction was relatively poor compared to this, while losses were not out of order. Only last years losses were a little high.

Losses correlated positively with male numbers in the same spring (**fig. 5**), which is indicative for a density dependency of yearly losses. No such correlation was found between reproductive success and male numbers (**fig. 6**).

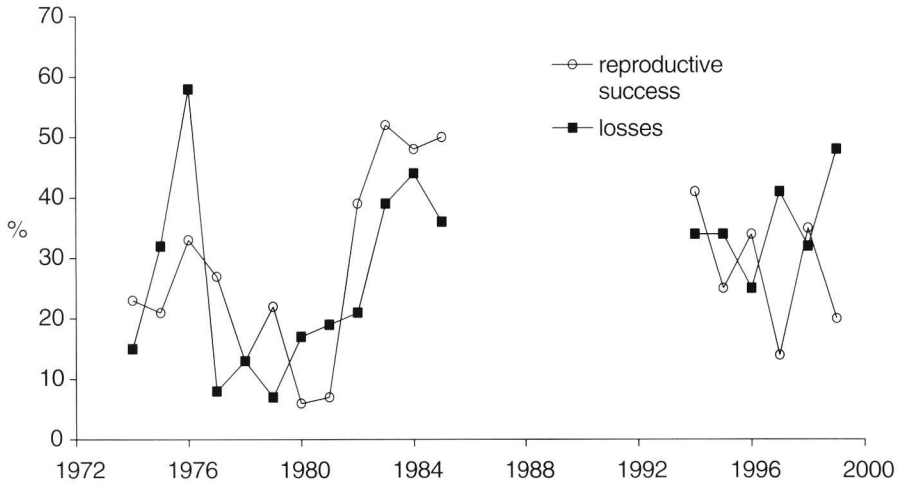

Fig. 4. Black grouse reproductive success and losses amongst males on the Sallandse Heuvelrug, 1974-1985 and 1994-1999.
Succès reproducteur des Tétras lyres et pertes annuelles pami les mâles au Sallandse Heuvelrug, 1974-1985 et 1994-1999.

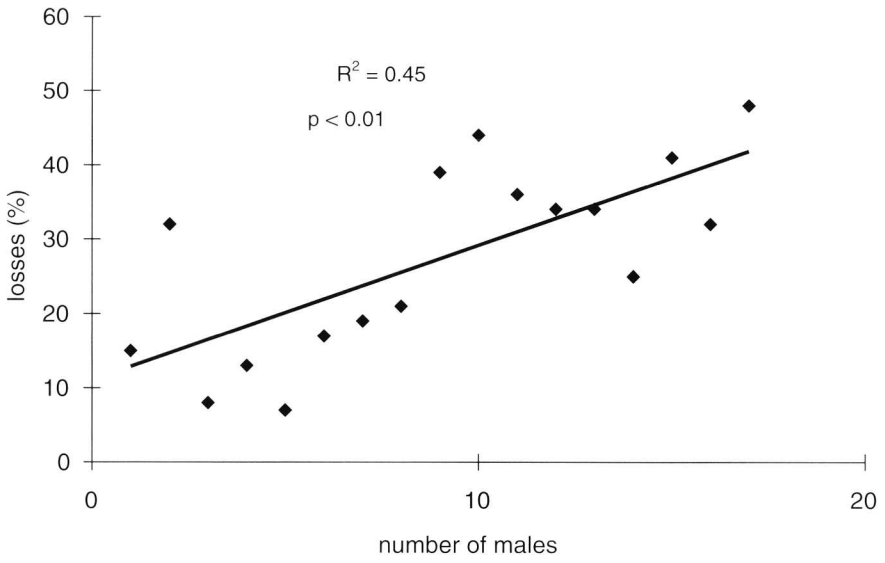

Fig. 5. Relationship between number of males of black grouse in spring and losses on the Sallandse Heuvelrug, 1974-1999 (without 1976, see text).
Relation entre les effectifs des Tétras lyres mâles au printemps et les pertes au Sallandse heuvelrug, 1974-1999 (sans l'année 1976, voir texte).

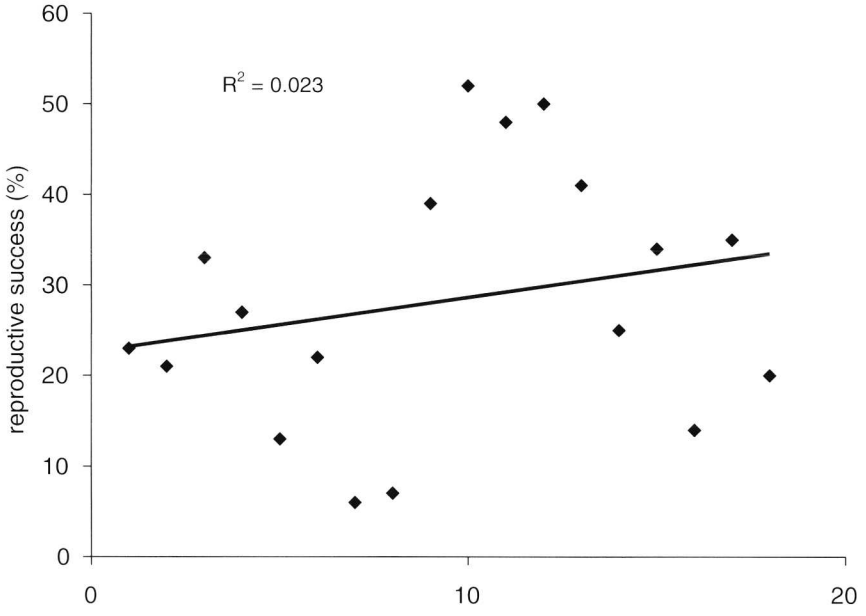

Fig. 6. Relationship between number of males of black grouse in spring and reproductive success on the Sallandse Heuvelrug, 1974-1999
Relation entre les effectifs des Tétras lyres mâles au printemps et le succès reproducteur au Sallandse Heuvelrug, 1974-1999.

Conclusions and discussion

Numbers of cocks in spring on the Sallandse Heuvelrug indicate a fluctuating population size that, at first sight, does not seem to have changed much during the last 25 years. Before, in the 1950^{S} and early 1960^{S}, the population was considerably larger, but then the plantations were much younger, the heathlands less fragmented and the birds made use of surrounding agricultural fields. A sharp decline in numbers ended around 1975, shortly after the minimum amount of open heathland (400-500 ha) was reached. Hereafter a stabilisation took place, followed by an increase in the midst 1980^{S}. This was probably associated with a increase in suitable heathland, due to storms in the 1970s, a forest fire in 1984 and some clearance of woodlands, and also with outbreaks of some larger arthropod species. The latter resulted in high chick survival rates (NIEWOLD, 1990, 1996), and consequently in the high reproductive successes of 1982-1985. A temporarily decrease hereafter was followed by a recovery in the midst 1990^{S} to the same relatively high level as before. So on the whole, there seem to have been two different periods associated with habitat changes : a period of decline until the midst 1970^{S}, as a result of a diminishing amount of suitable habitat, followed by a period of stabilisation and increase, associated with an enlarging amount of habitat. However, recently numbers dropped again, despite the growing amount of open area due to the conservation scheme.

Our finding that losses probably are density dependent and therefore at least partly regulating numbers, agrees with other studies on grouse species (see ELLISON,1991). No clear relationship between reproductive success and male numbers in spring was found, but a longer period of low population size coincided with relatively low reproductive successes, whereas a period of marked population growth followed high reproductive successes. Temporarily population decreases, as the recent decrease, also seem to be related to low reproductive successes, more than to high losses. Last year's high losses might be explained by an ageing male population. The number of predators have not increased much lately. During the last few years there may have been a few more red foxes in the area, but numbers of goshawks, the main predators of females in spring (NIEWOLD and NIJLAND, 1988), have been stable or even decreasing.

These findings agree with earlier research, which indicated that reproductive success is the main factor determining fluctuations in numbers, and that a long term decrease in reproductive success is most likely the cause of the general decline or near extinction in the Netherlands and elsewhere in Europe (NIEWOLD, 1990, 1996; BAINES, 1991). These studies also indicated that reproductive success, through chick survival, strongly depends on the availability of arthropods, wherein weather conditions may play a role. A strong influence of weather conditions on yearly fluctuations in black grouse numbers was found in the Netherlands and elsewhere (NIEWOLD, 1993; LONEUX *et al.*,1998). During

the last 3 to 5 years weather conditions seem to have been unfavourable. The relatively higher numbers of females on our study area during periods with low population sizes may support this assumption. Because of lower growth rates and therefore lower nutrient demands, female chicks may have higher survival rates than male chicks when food availability or weather conditions are unfavourable. This has been suggested for other grouse species as well (MOSS, 1986).

The population has not yet responded on the recent enlargement of open heathland. This is not very surprising, because most of the woodlands have been cleared after 1994 and it takes about 6 years or more before clearings have developed into suitable habitat for nesting and brood rearing (NIEWOLD & NIJLAND, 1988). So a clear response may only be expected in the coming years.

Black grouse numbers have been low before on our study area, even for a fairly long period, and so far the population has always arisen. Because the newly created areas are becoming more and more suitable as breeding areas, a population growth to a level of more than 30 males is possible within 5 to 10 years. But on the long term, effects of the total isolation on genetic variation within the population, or on extinction by chance may prevail. Though we are working on this by modelling, there is not yet enough insight herein to give a reasonable prediction. Survival may also depend on establishing new populations at a distance that allows exchange. More attention could be given to this.

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RESUME : Gestion de la dernière population survivante (?) aux Pays-Bas

A la fin des années soixante, le nombre de Tétras lyres a décliné de façon assez spectaculaire aux Pays-Bas. De la population originelle d'avant 1940 (5 à 8 mille coqs au printemps), il ne restait qu'environ 800 coqs éparpillés sur une centaine de zones. Au début des années nonante, pas plus de 5 à 6 populations ont survécu. De celles-ci, seule la population de Sallandse Heuvelrug existe encore. Celle-ci, aujourd'hui totalement isolée, a été suivie assidûment de 1982 à 1986. Plus tard, on a recensé uniquement les coqs au printemps. Leurs nombres ont beaucoup varié au cours des années (13-33 coqs), mais dans l'ensemble, la population n'indique pas de déclin constant depuis 1975. Cependant la population n'a cessé de diminuer au cours des trois dernières années, et comprend 15 coqs seulement cette année.

En 1991, le gouvernement hollandais traita le projet de conservation du Tétras lyre en priorité. Le premier but était de créer un espace pour une population future d'environ 50 mâles, en élargissant la proportion des landes ouvertes disponibles par l'éclaircissement des zones boisées. Les comptages annuels printaniers étaient loin d'être suffisants pour étudier les effets et mieux comprendre la dynamique de population. Donc à partir de 1995, nous avons recensé les mâles territoriaux. Par la distinction des adultes (territoriaux) et des juvéniles (non territoriaux), nous avons pu estimer les pertes et le succès annuel de reproduction.

De 1994 à l'an passé, celui-ci a beaucoup varié (14-41%), tandis que les pertes annuelles étaient plus stables (25-48%). Le succès de reproduction était modéré à faible comparé à celui des années 1983 à 1986 (40-50%), lorsque la population était similaire à celle de maintenant mais en augmentation et les pertes annuelles quasi similaires. Les pertes de l'an passé sont cependant légèrement plus importantes. La disponibilité d'arthropodes suivant les conditions climatiques, apparemment peu favorables, peut avoir joué un rôle au niveau de la faible reproduction. Une zone à bruyère a brûlé en 1994, rendant ainsi une grande partie de la zone temporairement inappropriée (à la reproduction), peut aussi avoir influencé négativement la reproduction. Les pertes assez importantes l'an passé peuvent s'expliquer par le fait d'une population plus âgée.

Le nombre de coqs est bas, il a même été plus bas auparavant, et jusqu'ici la population s'est rétablie à chaque fois. Il est probable que cette fois encore elle se rétablisse, parce que les zones brûlées et nouvellement créées sont devenues de plus en plus appropriées à la reproduction. Mais en ce moment, nous n'avons pas suffisamment d'éclaircissement quant aux effets d'un total isolement de la population pour juger de son avenir à plus long terme. Cependant, l'isolement à long terme de cette population relique pourrait mettre en péril sa pérennité ultérieure.

Mots-Clés : *Tetrao tetrix*, Tetras lyre, Pays-Bas, Sallandse Heuvelrug, population isolée, recensements, déclin, arènes.