

REPLACEMENT OF MATES IN A PERSECUTED POPULATION OF GOSHAWKS *Accipiter gentilis*

Rob G. Bijlsma

INTRODUCTION

Raptor populations in the northern provinces of The Netherlands have been studied closely since 1982. After it turned out that persecution of birds of prey was widespread in the provinces of Friesland, Groningen and Drenthe, a working group on birds of prey was founded in order to pinpoint specific areas of notorious persecution, and to take legal action wherever possible (Bijlsma & van Manen 1989).

METHODS

Large parts of the province of Drenthe were covered during 1985-89, varying from 12,000 to 20,500 ha per year (total area 75,732 ha, of which 13.4% is woodland; the rest is mainly farmland). All birds of prey were mapped according to standardized mapping rules. Each study plot was surveyed 4-7 times during the breeding season. Locating nests was given priority. In each territory, the age (adult or yearling) of its occupants was noted by visual observation and by using moulted feathers (Opdam & Muskens 1976). Clutch and brood size, as well as the number of fledglings, were determined for each nesting pair. All nests were visited at least twice to score the above-mentioned parameters. The majority of nests was checked more often. Replacements were usually discovered after comparing the age of territory holders with data obtained earlier in the breeding cycle, or after comparison of moulted feathers (for striking differences in colouration and pattern of pigmentation) found during consecutive visits to the nest.

RESULTS

The area of 75,732 ha held 97 territories of Goshawks *Accipiter gentilis*, viz 0.1/100 ha or 1.0/100 ha of woodland.

In 12 out of 97 territories (12%), a change in mate was detected during the breeding cycle (March-July). All twelve cases involved the female birds; only once were both members of a pair replaced. This latter case is particularly interesting, because an adult female disappeared after clutch completion (5 eggs, start of laying March 31). She was replaced within a few days by an immature female, after which the adult male disappeared, to be replaced by an immature male within a week. All eggs hatched, and all young fledged. The immature female commenced breeding where its predecessor left off.

Ten adult females were replaced by immature females; the two remaining females were immature, and were replaced by adult birds. All replacements occurred during the egg stage. In ten pairs, breeding was resumed where the previous birds left off. This usually meant (9 out of 10) that the new female incubated eggs not laid by herself. Only once, an immature female added three eggs to an incomplete clutch of two eggs; all five eggs hatched and four young fledged. A new clutch was started by two pairs.

Precise data on the time lapse between loss of a mate and attraction of a new one are lacking. Several cases suggest an extremely rapid replacement within only a few days (see above).

Breeding success of pairs with replacements (unstable pairs) differed slightly from that of pairs in the same area where no change of mate composition (stable pairs) was detected (Table 1). Number of fledglings per pair was almost the same in both categories ($r^2=0.0086$, $p=0.45$), as was nesting success ($\text{chi-square} = .0$, $df=1$, $p=1$).

Table 1: Breeding success of Goshawk pairs with a change in mate composition during the breeding season (unstable pairs) and of pairs with no such change (stable pairs), province of Drenthe, The Netherlands, 1985-89. One stable pair has been omitted because the outcome of its breeding attempt was not quantified.

	Number of fledglings per pair						n	\bar{x}	sd
	0	1	2	3	4	5			
Unstable pairs	5	3	1	0	2	1	12	1.5	1.83
Stable pairs	37	5	10	19	12	1	84	1.6	1.61

DISCUSSION

Replacement of lost mates during the breeding cycle is known in a number of raptors, among which Goshawk, Cooper's Hawk *Accipiter cooperi* and Sparrowhawk *A. nisus* (review in Newton 1979). Most instances date back to the era in which raptor persecution was common practice. The present cases were also detected in an area where raptors, especially Goshawks, are relentlessly persecuted. In the Forestry of Norg, for example, only 9 out of 44 (20%) breeding attempts of Goshawks in 1984-89 were successful (van Manen 1990). This compares unfavourably with the 57% in 1984-89 in the province of Drenthe as a whole ($n=209$), or the 72% ($n=387$) on the Veluwe, a woodland area in the central part of The Netherlands (Bijlsma 1989).

It is thought that death rather than displacement by another bird was responsible for replacements in the study area, although the fate of the vanished territory holders was never known. All areas where replacements were witnessed are notorious for their raptor persecution. Poisoned Goshawks and Common Buzzards *Buteo buteo* were frequently found, mainly in spring. Female birds are particularly vulnerable, tied as they are to the nest during incubation and the nestling period. The number of breeding females in immature plumage was high in areas with known persecution, up to 67% ($n=9$ in 1988) in the Forestry of Norg (van Manen 1990). In areas without persecution, this percentage is much lower, such as 10% ($n=291$) on the Veluwe in 1979-88 (Bijlsma 1989).

A change of mate during the breeding season was apparently not disadvantageous to the success of the breeding attempt. This result came as a surprise, not least because most replacements were immature birds, of which it is known that their breeding success is less than in adult birds (Newton 1979). However, the data from the province of Drenthe show that the age of the male bird is more important for the outcome of the nest than the age of the female (unpublished information, Werkgroep Roofvogels Noord- en Oost-Nederland), and most replacements involved female birds.

The rapid replacements suggest the existence of a large number of non-breeding birds. This is not surprising, because the Dutch population of Goshawks reached a high and stable level of 1500-1800 pairs in the late 1980s, without showing any reduction in the output of young. On the Veluwe, for example, Goshawks reached their saturation level in the early 1980s, but the number of young produced per territorial pair (including unsuccessful pairs) remained more or less constant throughout 1974-88 (Bijlsma 1989). The surplus population must therefore be substantial. Actually, the rapid replacements and the stable population density in the study area - despite low reproduction in the persecuted population of Goshawks in the province of Drenthe - are indicative of a strong influx of non-breeding individuals from elsewhere.

SUMMARY

Replacement of mates during the breeding season was found in 12 out of 97 territories of Goshawks: 11x a female and 1x female and male. Most new females (10 out of 12) resumed breeding where the previous birds left off. *Breeding success was similar to that of pairs without replacements. The high frequency of replacement was caused by systematic persecution by man.*

ACKNOWLEDGEMENTS

Willem van Manen commented on an earlier draft of the manuscript. Anne-Marie Blomert handled the statistics.

REFERENCES

- BIJLSMA, R.G. 1989. Goshawk *Accipiter gentilis* and Sparrowhawk *A. nisus* in the Netherlands during the 20th century. In: J.T. Lumeij, W.P.F. Huyskens & Croin Michelsen (eds.), *Valkerij in perspectief*, p. 67-89. Nederlands Valkeniersverbond "Adriaan Mollen"/Stichting Behoud Valkerij, Monnickendam.
- BIJLSMA, R.G. & W. VAN MANEN 1989. Roofvogelvervolgning in Noord-Nederland. *Limosa* 62: 95-96.
- VAN MANEN, W. 1990. Roofvogelinventarisatie in Boswachterij Norg 1989. Report, Assen.
- NEWTON, I. 1979. *Population Ecology of Raptors*. Poyser, Calton.
- OPDAM, P. & G. MUSKENS 1976. Use of shed feathers in population studies of Accipiter hawks (*Aves, Accipitriformes, Accipitridae*). *Beaufortia* 24: 55-62

Rob G. Bijlsma
Doldersummerweg 5
7983 LD Wapse
The Netherlands