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Table 1. Relation between vole density and egg and nestling predation on the Meadow Pipit^a

Year	Vole density (No. per ha)	Total eggs found <i>n</i>	Un-hatched eggs <i>n</i>	Total egg predation		Egg predation by voles		Hatched nestlings <i>n</i>	Total nestling predation		Nestling predation by voles		Total predation by voles	
				<i>n</i>	%	<i>n</i>	%		<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
1993	40	132	10	22	17	18	14	100	16	16	12	12	30	22.7
1994	15	133	9	27	20	13	10	97	18	19	9	9	22	16.5
1995	4	134	6	11	8	7	5	117	20	17	5	4	12	9.0

^a Predation by voles detected by a video camera and by other signs as described in the text.

each (trodden by Chamois *Rupicapra rupicapra* and bitten by Carabid beetles) were placed 30–100 cm from vole burrows. The nestlings were 3 days and 7 days old and weighed 3.5–9 g. A video camera was focused on the nest (in one instance a 500-mm lens was used to photograph from a hide). The study was carried out in June 1995.

In each case the Common Voles took both the eggs and the nestlings into their burrows. The nestlings were bitten on the head and immediately pulled into the burrows. None of the nests were disturbed by the voles. The removal of the prey from these nests which were less well concealed than natural nests, into burrows was probably influenced by the vole's antipredator behaviour. In addition, pieces of eggshells, egg contents soaked into the nest and vole droppings were found in about half of the natural pipit nests, which were mainly well hidden, examined. Partially devoured nestlings were sporadically found in nests, and they were sometimes found in the grass near the nests. Parts of their bodies, often the head and legs, were partly devoured. In most cases, the nestlings had been killed by a bite through the skull.

The predation on Meadow Pipit eggs and nestlings changed with the density of the voles during their cycle of numbers. The voles were the most important predators during the vole outbreak (Table 1). The approximate spring density of voles was estimated from the number of observed occupied burrows found on a strip transect (300 × 2 m). Verbeek (1970) recorded similar signs of Deer Mouse predation on Water Pipit eggs and nestlings. Again, the predation on eggs was much higher when the Deer Mice were plentiful.

The results confirm the suggestion of Piatt *et al.* (1990) that the disappearance of eggs and nestlings could have been caused by voles. Based on the results above, egg and nestling predation by voles could be usual throughout their range.

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Adoption of young in the Blackbird *Turdus merula*

The term "adoption" is defined as the provision of care to young by unrelated adults. Of the bird species studied with biparental care, adoptive behaviour has been recorded in 17 species, and only by replacement males (Meek & Robertson 1991). Rohwer's (1986) hypothesis is that adoption may facilitate the replacement male acquiring the female for reneating (either within or between breeding seasons). It is expected that adoption will be favoured within breeding seasons in double-brooded species that break the pair bond and disperse following nest failure but maintain pair bonds following

successful nesting. Only nine studies have quantified the amount of care provided when replacement males feed young, and there are no documented examples of full adoption by a replacement breeding pair (Meek & Robertson 1991). We record a rare case of adoption of young by a breeding pair in the Blackbird *Turdus merula*, observed in The Netherlands.

Blackbirds are territorial, sexually dimorphic birds. Observations on the breeding ecology of colour-ringed birds showed that only the female incubate, but both parents feed the nestlings until they fledge 13–14 days after hatching (Snow 1958, Reise 1990, Magrath 1992, Schnack 1991). In the Netherlands, clutches are usually laid from mid-March to late June, during which time a pair can raise two broods, sometimes more (Snow 1958, Glutz & Bauer 1988). Adoptions in the Blackbird have not been reported previously (Reise 1990, Magrath 1992, Meek & Robertson 1991, Schnack 1991).

In May 1995 a breeding pair (male 1 and female 1) built a nest at a height of 4 m in a spruce tree, 3 m from a window, which offered good opportunities for observation. Soon after the female started incubating, the male was injured by a cat. Due to damaged flight feathers in one wing and the loss of all tail feathers he was unable to fly and after 1 week he was found dead. The female, which was also identifiable by the absence of tail feathers, remained incubating. During the first 2 days after hatching, the female stayed on the nest for 80% of the day and fed the young infrequently (mean feedings per hour \pm s.e. = 0.51 ± 0.05 ; the nest was observed for 8 h). Two days after hatching, another pair (male 2 and female 2), with undamaged plumage and therefore distinguishable from pair 1, entered the territory. When the male approached the nest, female 1 immediately flew off and did not defend her nestlings. However, after a brief inspection, the male started foraging and soon afterward returned to the nest with food and fed the young. During the nestling phase, he took a 50% share of all feedings (mean feeding rate per hour, female 1 = 1.62 ± 0.20 ; male 2 = 1.86 ± 0.16 ; $n = 6$ h). Female 1 did not show any aggressive behaviour toward male 2 or female 2. Instead, she avoided them, leaving the nest immediately when one of the others landed in the nest tree, but she continued feeding her young. Female 2 did not show overt aggression toward female 1 or the young, but she followed her persistently wherever she went. Two days after the arrival of pair 2, female 2 started building her own nest 1 m above the nest built by pair 1. The male did not assist her but only fed the young in the first nest. Female 2 laid eggs, but her clutch was lost c. 3 days after she started incubation. After the clutch loss, she also adopted the young in nest 1 by feeding them, though the feeding rate was low (mean feeding rate per hour = 0.32 ± 0.11 ; $n = 8$ h). At least one nestling fledged and was fed by male 2 away from the nest.

The interpretation of the observed adoption behaviour remains speculative, as the degree of genetic relatedness between these individuals is unknown. Obviously for female 1, receiving help at the nest is advantageous for offspring survival. Without this help she would probably have lost her entire brood, since she would not have been able to both brood and feed the newly hatched young properly. Adoption by the new male would be adaptive from his point of view when he had fathered (some of) the young by extra-pair fertilization. If the new male was related to female 1, his adoptive behaviour could be explained in terms of gaining indirect fitness benefits

through the production of related young (Emlen 1995). If unrelated to female 1, he would gain no clear fitness benefits, unless adoption served as a way of establishing a new pair bond with a high-quality partner. For female 2, adoption was not associated with obtaining breeding status; she adopted the young of female 1 after failure of her own clutch. Again, this could be adaptive for her if she was related to female 1. However, being a breeder is generally the most productive, and one might wonder why female 2 did not destroy the brood of female 1 (who seemed to be submissive) and expel her from the territory. By this action she might have gained better brood care from her partner, resulting in surviving offspring of her own.

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Habitat selection by marine birds in relation to water depth

A recent analysis of seabird abundance in relation to water depth (Stone *et al.* 1995) showed that some species (auks and Manx Shearwaters *Puffinus puffinus*) were restricted largely to continental shelf waters less than 100 m in depth, while other species (Fulmars