Age, Sex and Size of Dead Tawny Owls Strix aluco Found During Winter Famine 2006

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Age, sex and size of dead Tawny Owls *Strix aluco* found during winter famine 2006

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From January to May 2006, 130 Tawny Owls were reported dead along the coastal areas of southern Norway. Of these, 79 were collected for a museum collection, most from the counties Vest-Agder (27), Aust-Agder (37), Telemark (9) and Vestfold (4). One owl was found starving, and was nurtured back to life. Of 67 sexable specimens, there were 34 males and 33 females. Nine of the birds were ringed, 5 females, 3 males and one unsexed bird. Five ringed owls were juveniles (in their second calendar year), while four ringed were old adults (calendar year 6–12). Of 79 aged owls, 51 (64.6%) were juveniles, while 28 (35.4%) were adults (third calendar year or older). Weight and body measurements were taken from all individuals as far as the carcasses allowed. The famine followed a very good breeding year of Tawny Owls along the southern coast of Norway in 2005, with high numbers of wood mice *Apodemus sylvaticus* until frost and snowfall in November. The following winter was cold, followed by heavy snowfall on 20–21 January 2006. Snow depth increased steadily through February and March, reaching about 1 m in the coastal areas of Agder around 10 March. Tawny Owls started dying in February (n = 7), but most owls were found in March (n = 52). Many owls found in April (n = 17) were more or less decomposed, many probably having died in March. Young and old birds seemed to die at a similar rate through spring. Neither was there any sex difference in mortality rates.

Key words: winter famine, natural selection, Tawny Owl, *Strix aluco*, Norway

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INTRODUCTION

Natural selection is the driving force in the evolution of species, culling of individuals and letting others survive and prosper. Selection may be studied by viewing properties of the survivors, while the individuals that do not make it usually disappear in the wild before they can be examined. They are either eaten by predators or scavengers, or lost to decomposition. Any situation that presents large numbers of dead animals may thus represent a unique opportunity to compare the two groups; those selected to live, and those selected not to. Starvation is a prime cause of death for many predators in their first year of life, and especially during winter. In raptors, where reversed sexual dimorphism is strong, juvenile males have been shown to have higher mortality than females (Newton *et al.* 1983, Sunde 2002). This is explained by the females' higher capacity to store fat on their larger bodies than the males. Relative fat deposition is in general correlated with body size of both raptors and owls, and is highest during winter and in females (Overskaug *et al.* 1997). In Tawny Owls *Strix aluco* females are in general considerably larger and heavier than males (Mikkola 1983). Although both male and female Tawny Owls may accumulate a thick layer of fat during autumn and winter (Fig. 1; Overskaug *et al.* 1997), males could be expected to die before females during a period of starvation. Because Tawny Owls are year-round residents in their breeding territories, one may also expect juvenile birds to be at higher risk than older birds during a famine, and be the first to die.

The Tawny Owl's distribution in Norway is restricted to the southern half of the country, with the highest densities in broadleaf and mixed forests along the coast (Sonerud 1994). The species is a very common nest-box breeder (Mikkola 1983), and many ornithologists have provided nest boxes for Tawny Owls over large areas. Although the Tawny Owl is a food generalist (Mikkola 1983), it also clearly responds to peak rodent years with higher breeding frequencies and larger clutch-sizes.

In Norway the Tawny Owl is more likely to be found as roadkills than any other owl species, mainly because of its habit of flying low to the ground and thereby exposing itself to be hit by cars. These individuals are however often partly destroyed by the traffic, thus reducing the possibility for weighing and measuring the birds.

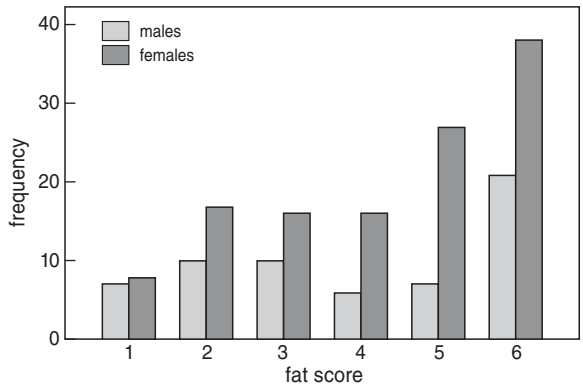

Figure 1. Body fat scores for Norwegian male (n = 61) and female (n = 122) Tawny Owls found dead by other causes than starvation during September–February. Based on figures in Overskaug *et al.* (1997). Fat scores range from 1 (no) to 6 (very much).

METHODS

From January to May 2006, 130 Tawny Owls were found dead along the coastal areas of southern Norway. In January and February, some dead owls were brought to Agder Museum of Natural History in Kristiansand. On 15 February reports of avian influenza from Rügen off the north coast of Germany hit the media. This immediately created a situation which benefitted the collecting of dead Tawny Owls. Norwegian Food Authorities told the public to report all dead birds, and very soon people started to report sightings of dead Tawny Owls. The Food Authorities kept lists of names and telephone numbers from all people that reported dead owls. By the use of these lists I was able to trace a substantial number of dead Tawny Owls, asking the finders to freeze or otherwise take care of the birds. Some of the owls were reported or brought directly to the museum by the public. Some Tawny Owls were found along roads, with flattened specimens obviously killed by cars.

A total of 79 Tawny Owls were collected. The birds were weighed and measured as far as the carcasses allowed. They were then skinned for the museum collections. Skins were made with one wing loose from the body, fanned out to make all primaries and secondaries fully visible. Some individuals were totally flattened by cars, or nearly decomposed, and could not be made into whole skins. Outfanned wings could however be made from all of the owls, thus allowing all individuals to be properly aged. The body of each owl was opened and visually sexed, and a tissue sample from each individual was placed in alcohol. The bodies were frozen for potential later use. One Tawny Owl was caught outside the museum, starving and unable to fly. This bird was nurtured back to a healthy state and later released. For some of the owls the exact date of death was known by the people who found the birds. For birds where this was unknown, I estimated an approximate date of death based on the state of the carcass.

During spring 2007 I caught 26 female Tawny Owls in the Agder Counties, breeding in nest boxes (n = 25) or natural nest sites (n = 1). Only one of these females was a yearling, the rest (n = 25) were at least 3 years or older. The females were weighed and measured, and blood samples were taken, before they were released.

RESULTS

The first dead Tawny Owl was found on 15 January, and the last on 15 May. Two owls found in May were however so decomposed that they both must have died before the end of April. The mortality was concentrated during 6 March – 2 April, with a peak 13–19 March (Fig. 2). Dead Tawny Owls were collected from five counties, with Vest-Agder, Aust-Agder and Telemark as the most important counties (Table 1). Of the 79 carcasses, 67 could be sexed visually, resulting in 34 males and 33 females (Table 2). There were 51 yearlings (hatched in 2005) and 28 older birds (35.4%). Sexes were evenly distributed to age-class (Table 2). Nine of the owls were ringed birds (Table 3); of these, four were adult birds of 5, 7, 8 and 11 years of age, respectively.

There was no tendency for either sex to die earlier or later than the other (Fig. 3). The same applied for

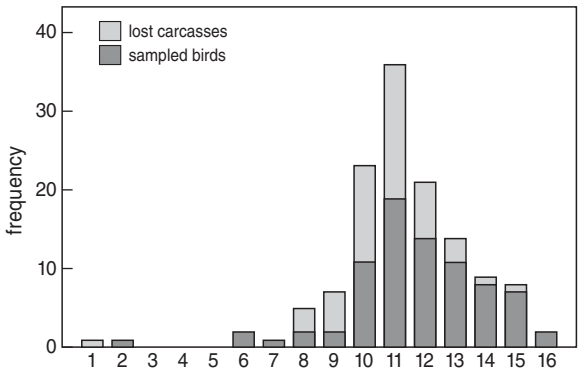

Figure 2. Number of Tawny Owls found dead during week 1–16 in January–May 2006.

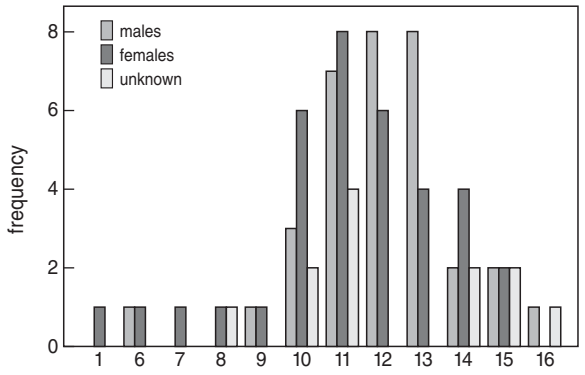

Figure 3. Recoveries of dead male and female Tawny Owls by week 1–16, January–May 2006.

Table 1. Number of Tawny Owls found in different counties of Norway during the famine in January–April 2006.

County	Number found
Hordaland	1
Vest-Agder	28 [a]
Aust-Agder	37
Telemark	9
Vestfold	4
Akershus	1

[a]Includes one ringed bird found alive and rescued.

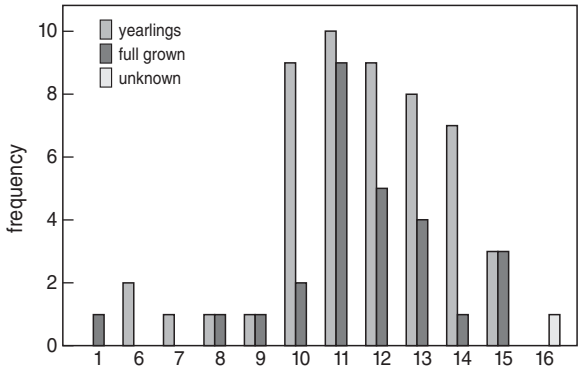

Figure 4. Recoveries of dead yearlings and full-grown Tawny Owls by week 1–16, January–May 2006.

Table 2. Sex and age of 80 Tawny Owls found in Norway, January–April 2006.

Sex	Yearling	Full grown[c]	Unknown	Total
Male	21	13		34
Female	22	11		33
Unknown	8 [a]	4	1[b]	13
Total	**51**	**28**	**1**	

[a]One ringed, starved owl found alive and rescued.
[b]One dead owl was destroyed by burning before it could be retrieved, only body feathers remained. [c]In third calendar year or older.

Table 3. Sex and age of nine ringed Tawny Owls found dead in Norway, January–April 2006.

Sex	Yearling	Full grown[b]	Total
Male	2	3	5
Female	2	1	3
Unknown	1 [a]		1
Total	**5**	**4**	**9**

[a]One ringed, starved owl found alive and rescued.
[b]In third calendar year or older.

the two age groups (Fig. 4). Females were heavier than males, but there was no apparent tendency for body weight changes through March and April (Fig. 5). When birds obviously killed by cars are left out from the material, there are 31 males and 29 females that undoubtedly died by starvation. When testing weight against time for these samples (linear regression) there is no correlation for males ($R^2 < 0.01$, $P = 0.862$) or females ($R^2 = 0.08$, $P = 0.151$). The same applies for wing length against time (males: $R^2 = 0.02$, $P = 0.497$, females: $R^2 = 0.03$, $P = 0.335$). When testing condition index (weight/wing length^3) against time, the result is similarly non-significant for both males ($R^2 = 0.01$, $P = 0.657$) and females ($R^2 = 0.02$, $P = 0.657$). Condition index was however higher for females than for males ($R^2 = 0.10$, $P = 0.016$). When wing length of the adult dead females ($n = 9$) is compared with wing length of the adult breeding birds from 2007 ($n = 25$), the mean is 28.87 cm for the dead birds and 29.17 for the survivors. Although not significant ($F_{1,32} = 2.00$,

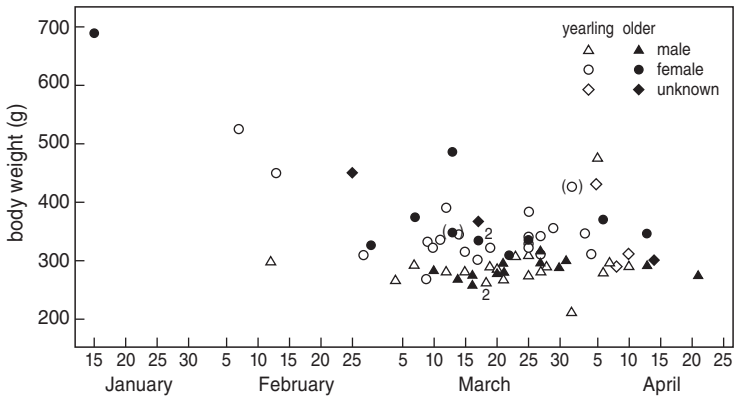

Figure 5. Body weight for different age and sex classes of Tawny Owls when found during January–May 2006. Birds heavier than 400 g were mainly roadkills. ( ) Two birds found in Hordaland and Akershus counties. Excluding birds that could not be weighed.

$P = 0.167$), it indicates a tendency for larger birds among the survivors.

Of the 79 dead Tawny Owls, 11 (13.9%) were found along roads in a state clearly indicating that they were roadkills. One other owl had collided with an unknown object (window or car), and is not included among the roadkills. There was no tendency for young birds to be more susceptible to traffic than older birds, as roadkills and non-traffic deaths are exactly evenly distributed among the two age classes (7 roadkills out of 51 yearlings, 4 roadkills out of 28 full-grown).

DISCUSSION

In the first days after 15 February, Tawny Owls were collected and sent to the Norwegian Veterinary Center in Oslo. When they soon learned that the Tawny Owls were irrelevant to the avian flu situation, people were told to discard the dead owls. Unfortunately it was not until 29 March that I became aware of the role that the Food Authorities played concerning the dead birds. If bird influenza had not been found in northern Europe, the number of reported owls would probably have been much lower.

The high number of dead Tawny Owls found in 2006 was probably caused by a combination of high reproduction in 2005, followed by cold weather, deep snow and lack of food. One of the main prey species along coastal south Norway is the wood mouse *Apodemus sylvaticus*. This species had a population high during spring, summer and autumn of 2005, and seemed to crash with the first frost and snow at the end of November 2005. A heavy snowfall on 20 January 2006, followed by low temperatures and more snow until the end of March (Fig. 6) may have triggered the concentration of owl deaths in March. Snow depth for

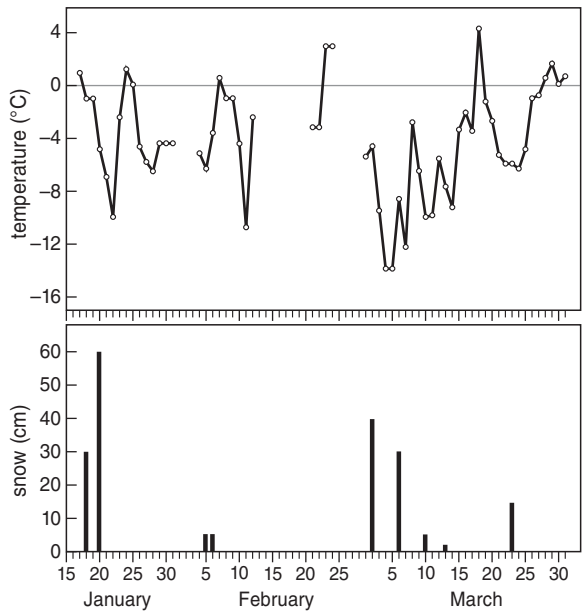

Figure 6. Temperature (upper panel) and snowfall (lower panel) in Arendal, Aust-Agder 17 January – 31 March. Based on data provided by Arne Flor, Arendal, and own notes.

the areas where the owls were found was 50–150 cm on 10 March. The extremity of the snow depth is underlined by the fact that snow depth in March 2006 for the coastal areas of Agder and Telemark Counties was 300% more than median snow depth for March during the 30 year period 1971–2000 (Data provided by NVE, Norwegian Meteorological Institute and Statens Kartverk; http://www.senorge.no/mapPage.aspx).

Following the good reproduction year of 2005, one would expect that the dead owls would be dominated by yearlings. The high proportion (35.4%) of old birds (up to 11 years for a ringed individual) emphasizes that

the Tawny Owl population must have experienced a really hard time. The fact that 67 (84.8%) were found not being killed by traffic is in strong contrast with 41 dead Tawny Owls brought to the Museum in 1995–2007 (excluding 2006), where 24 (58.5%) were road-kills. Saurola (1979, quoted in Mikkola 1983) analysed ringing material from Finland, and also found traffic to be the most common cause of death for ringed Tawny Owls reported by the public. Saurola also found that owls dead by starvation were almost non-existent in the recovery material, probably because these birds are usually eaten by other animals (Mikkola 1983). The equal proportions of young and old Tawny Owls killed by traffic or non-traffic (13.7% of 51 yearlings, 14.3% of 28 adults) indicate that Tawny Owls do not learn to avoid traffic as they age. This is quite understandable, considering their usual hunting mode of flying low to the ground.

The evidence does not support the prediction that males should die of starvation before females. The same applies for the prediction that yearlings should be more prone to starvation than older birds. One would expect larger birds to be better off at the start of a famine, and that these birds should be the last to die. The result that there is no significant change in weight for either males or females through the starvation period may only be caused by the birds dying when their body mass dips below a certain threshold. The lack of correlation between size measured by wing length and time of death is more striking, indicating that starvation and time of death was not slowed with increasing body size. The higher condition index for females however indicates that the condition of the male Tawny Owls that died were worse than that of the females. This may further indicate that males may be better at withstanding starvation than females.

The Tawny Owl varies in colour from grey to reddish brown, usually described as two distinct colour morphs (Mikkola 1983). Colours however vary on a more continuous scale. Although colour may be scored on a continuous scale for several parts of the plumage, the categorization into colour morphs grey and brown seems to prevail (Brommer *et al.* 2005). Several studies have shown that these colour morphs differ in respect to parasitic load (Galeotti & Sacchi 2003), breeding frequency and weight of offspring (Roulin *et al.* 2003), or lifetime production of young (Brommer *et al.* 2005). In this study colour morphs have not yet been taken into account. The museum skins with one fanned out wing are however perfect for such an approach, and the question of mortality and colour morphs will be analysed in a separate paper.

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SAMENVATTING

In de periode van januari tot mei 2006 werden 130 verhongerde Bosuilen *Strix aluco* gevonden in de kuststreek van Zuid-Noorwegen. Van deze uilen werden er 79 verzameld voor een museumcollectie. De meeste waren afkomstig uit de provincies Vest-Agder (27), Aust-Agder (37), Telemark (9) en Vestfold (4). Eén uil was sterk vermagerd, maar kon worden opgelapt. Onder de vogels waarvan het geslacht was vast te stellen waren 34 mannetjes en 33 vrouwtjes. Negen van de vogels waren geringd, vijf ervan waren jongen van het vorige broedseizoen en vier waren 4–10 jaar oud (zesde tot twaalfde kalenderjaar). Van de 79 verzamelde uilen was 65% jong en 35% ouder dan 1 jaar. Het voedseltekort volgde op een goed broedjaar van de Bosuil in 2005 met een hoge dichtheid van de Bosmuis *Apodemus sylvaticus*. Vanaf november begon het te vriezen en viel er veel sneeuw, waarbij zelfs in de kuststreken een pak sneeuw van 1 m bleef liggen. De eerste dode Bosuilen werden in februari gevonden (n = 7), maar de meeste uilen werden gevonden in maart (n = 52) en april (n = 17). Tussen jonge en oude vogels bestond geen verschil in het moment waarop ze werden gevonden, en evenmin bestond er verschil tussen de seksen.

ARDEA

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