Motorway Mortality of Birds of Prey and Owls in the East of France

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INTRODUCTION

In the proceedings of the last two World Conferences (Berlin and Johannesburg) and among some 200 papers, problems caused by powerlines, shooting and organochlorines have been discussed but none has been devoted to road or motorway mortality. For the conservation of some raptor and owl species, this is a major problem since in the main part of our study area it accounts for 1 Barn Owl/km/ year and 0.5 Long-eared Owl/km/year.

Being aware of its share of responsibility in roadway-caused mortality of wildlife, the SAPRR (Société des Autoroutes Paris Rhin Rhône) signed an agreement with the society La Choue (for the study and the protection of owls in Burgundy) in September 1991. The purpose of this agreement was to define which species were victims of the traffic (where and why) and to propose measures to limit or compensate for roadway-caused mortality. The results of a ten year study answer these questions. Results from the past help one to see ahead. We here study these results and detail the main points.

STUDY AREA

The study area (Fig. 1) is located in the northeast of France, over the regions of Burgundy, Champagne and Lorraine. It concerns the section of roadway A31 between Dijon and Toul, the section of roadway A5 from its junction with A31 to Vulaines and 20 km of A26, making more than 300 km of motorway crossing three major biotopes --25% forests, 50% cereal fields and 25% meadows. The altitude is rather low (from 150 to 300 m) and the climate is continental.

Figure 1. Study Area.



METHODS

Dead animals are collected systematically along the motorway three times daily by SAPRR employees who are in charge of collecting everything that could impede the traffic. The animals are placed in plastic bags and frozen for positive identification. Detailed notes are taken recording the date, species and precise location along the motorway where the animals are found. About once every two months the five freezers situated along the motorway are emptied, the plastic bags are opened, the notes are checked or corrected, and measurements are taken of the length and weight of each animal, as well as its sex, age and stomach contents. The species are classified in three categories according to their abundance.

common : more than 1000 pairs present in the study area not common : between 50 and 1000 pairs rare or absent : between 0 and 50 pairs

RESULTS

Firstly, all species are taken together: number of animals killed by motorway traffic, abundance of species and mortality. Then the five most represented species are studied according to the factors involving traffic-caused mortality and possible solutions identified, especially for the most endangered species.

1. Different species

Table 1 shows the different species killed by motorway traffic from 1992 to 2001 according to their importance.

Among diurnal birds of prey, the Buzzard *Buteo buteo* is in the lead with a rate of 79.6% of the birds identified, in front of the Kestrel (15.4%). None of the other nine species reaches 2%.

Among owls, the Barn Owl *Tyto alba* lies in first place (64.9 %) in front of the Long-eared Owl *Asio otus* (30.4%) and the Tawny Owl *Strix aluco* (4.6%). Two other species are here presented with a non-significant rate.

Table.1 Diurnal birds of prey and owls killed on the motorway (1992-2001)

Buteo buteo	539							
Falco tinnunculus	104							
Milvus milvus	11							
Milvus mierans	9							
Accipiter nisus	7							
Acciniter gentilis	2							
Pernis apivorus	1							
Circus cvaneus	1							
Circus pygargus	1							
Buteo lagonus	1							
Falco columbarius	1							
TOTAL	677							

DIURNAL BIRDS OF PREY

OWLS

Tyto alba	1731
Asio otus	811
Strix aluco	123
Athene noctua	1
Asio flammeus	1
TOTAL	2667

2. Abundance and mortality

The two considerations can be compared in Tables 2 and 3. The species are divided into three categories according to their abundance (during the breeding and wintering periods) and also in function of the quantity of dead animals: common, not common, rare or absent species.

Among the 18 diurnal birds of prey species during the year, for 12 there are no differences between their number and the roadway mortality linked to them. There is an annual difference (Goshawk Accipiter gentilis, Sparrowhawk A.nisus) or a summer one (Honey Buzzard Pernis apivorus, Montagu's and Hen Harriers Circus pygargus, C. cyaneus and Hobby Falco subbuteo) for six species. These show less roadway-caused mortality that we would imagine according to their number.

Among the eight owl species, there is a difference only for the Little Owl: not present in a strong number but exceptionally victim of the roadway traffic.

а (нам.), он на наст, онон е е .		BREEDING							W	'INT	ERI	NG				
Birds Of Prey		ç	N	(C	R	/A			C NC		IC	R/A				
	P	M	Р	M	P	M	<u>P?</u>	M	P	M	P	M	Р	M	P?	M
Pernis apivorus			+			+	?									
Milvus migrans			+	+			=	:								
Milvus milvus			+	+				:					+	+	=	:
Circaetus gallicus					+	+	=	:								
Circus aeruginosus	_				+	+	=	1								
Circus cyaneus			+			+	?						+	+	=	:
Circus pygargus			+			+	?									
Accipiter gentilis			+			+	?				+			+	?	
Accipiter nisus	+			+			?		+			+			?	
Buteo buteo	+	+					=		+	+					=	=
Buteo lagopus													+	+	=	=
Hieraaetus pennatus					+	+	=									
Pandion haliaetus													+	+	=	:
Falco tinnunculus	+	+					=	:	+	+					=	=
Falco vespertinus													+	+	=	:
Falco columbarius													+	+	=	2
Falco subbuteo			+			+	?									
Falco peregrinus					+	+							+	+	=	:
	C =	cor	nmc	m					P =	pre	send	ce			-	
NC = not common						M = mortality										
	R / A = rare or absent															

Table 2. Diurnal birds of prey: abundance and mortality

Table 3. Owls: abundance and mortality

	BREEDING					WINTERING										
OWLS		C		NC		/A	P? M		C		NC		R/A		P ?	Μ
	P	M	Р	M	Р	M			Р	M	Р	M	Р	Μ		
Tyto alba	+	+					Ξ		+	+					=	
Otus scops					+	+	Ξ									
Bubo bubo					+	+	=						+	+	=	
Athene noctua			+			+	?				+			+	?	
Strix aluco	+	+					=		+	+					=	
Asio otus	+	+				Γ	=		+	+					=	
Asio flammeus					+	+	=						+	+	=	
Aegolius funereus					+	+	=						+	+	=	

C = commonNC = not common

R / A = rare or absent

P = presenceM = mortality

3. Factors influencing roadway-caused mortality

3.1. Biotopes

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The percentages representing distance and mortality of the five species (Table 4) show a significant difference for four of them (test G). For the Buzzard, there is a significant difference only where meadows are concerned.

 Table 4. Influence of biotops (%)

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Biotops	Distance	B.buteo	F.tinnunculus,	T.alba	A.otus	S.aluco
forests	24,4	26,7	7,9	17,2	12,8	53,8
cereal fields	49,6	54,8	89,2	67,7	74,8	36,1
meadows	26	18,5	2,9	15,1	12,4	10,1
n	687,2 km	520	102	1686	782	1,19
<u></u>	5.7	5		le conc	en na na na Redda ar na	utstead

3.2 Road elevation

In Table 5, "favourable" means that the motorway is lower than the surroundings, "not favourable" that it is at the same level or higher.

The engineering of the roadway is of no influence on diurnal birds of prey mortality. However, it is a major factor contributing to the mortality of the three species of owls (test chi 2).

Table 5. Influence of elevation of the motorway (%) on Antoph Homen's second

Road elevation	Distance	B.buteo	F.tinnunculus"	T.alba	A.brus	Saluco
favourable	46	44,2	43,1	36,5	36,8	,
not favourable	54	55,8	56,9 1001	63,5	63,2	⇒73,1
n	687,2 km	520	102 	1686	782 ⁻	119

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3.3. Common Voles Microtus arvalis

In Table 6, "poor" means that the biotope is not very suitable for voles (bushes, stones...); "rich" that it is suitable (rich grass).

This factor alone can nearly account for diurnal birds of prey and owls roadway-caused mortality, except for the Tawny Owl (test chi 2).

Table 6. Influence of voles (%)

Voles	Distance	B.buteo	F.tinnunculus	T.alba	A.otus	S.aluco
poor	47	40,6	11,8 07 0	iii 23,8 ∛	23,1	47,9
rich	53	59,4	88,2	76,2	76,9	52,1
n	687,2 km	520	an ga 102 , angga	1686	- 782	119

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1 & 2. Abundance and mortality

The few studies carried out in France and Switzerland also show that diurnal birds of prey and owls are the birds most killed by motorway traffic and that the Barn Owl lies in first place (Bourquin 1983; Joveniaux 1996; Massemin 1996).

In Burgundy, this mortality cause is largely ahead of all others: 65% of the identified mortality among young Barn Owls (Baudvin 1986).

If species are victims of motorways, misfortune has little to do with it. Thus, in the study area, the population of Sparrowhawks is as important as the Kestrel's and the Sparrowhawk has been 15 times less victim of the motorway than the Kestrel. As for owls, the Tawny Owl is about three times more present than the Barn Owl and 14 times less victim of the traffic. So?

Five diurnal bird of prey and owl species out of seven whose motorway mortality is inferior to what is expected are not significant predators of the Common Vole (Goshawk, Sparrowhawk, Honey Buzzard, Hobby, Little Owl *Athene noctua*). Thus they have no good reason to fly near places rich in voles such as roadway verges. There is a different explanation concerning the last two species (Hen Harrier and Montagu's Harrier), derived from their hunting technique: on the wing and not from perches along the motorway.

As for mammals, those with voles in their diets are easily in the lead too. Among 4,299 classified mammals, the Fox *Vulpes vulpes* lies in first place with 34.6%, in front of the Wild Cat *Felis sylvestris* with 20.2 %, Pine Marten and Stone Marten *Martes martes*, *M. foina* 15.3 %.

3. Factors influencing mortality

3.1 Biotopes

The differences correspond to the way of life of the species: the Kestrel, Barn Owl and Long-eared Owl prefer cereal fields, avoiding forests and large areas of meadows. The results on the Tawny Owl confirm its forest way of life. Traditionally present everywhere, the Buzzard is slightly under-represented in meadows.

3.2 Road elevation

Could the difference between diurnal birds of prey and owls be linked to sight? This would allow a quicker reaction when facing the danger from vehicles as they cross motorways. The results on the Barn Owl and the Longeared Owl are here totally similar.

3.3 Common Voles

The results strictly correspond to the diet of the species:

• the Kestrel, a specialist on this vole, is easily in first position. Its movements, which are very often above 5m over the ground, help it to avoid collisions when crossing motorways; so does its hunting technique (hovering). On the other hand, its weakness for the vole, whose population it hunts along, and sometimes in the middle of the motorway very often leads to its death.

- the Barn Owl and the Long-eared Owl once again show similar results. They too greatly appreciate Common Voles, a little less than the Kestrel but surely more than the Buzzard and Tawny Owl.
- The general diet of the Buzzard helps it better to survive. For the Tawny Owl, the Common Vole represents less than 2 % of its prey in the study area.

The Buzzard and Kestrel are spared by the influence of the road elevation and the Tawny Owl is not affected by the presence of voles. On the contrary, the Barn Owl and Long-eared Owl combine the two negative effects in similar proportions. We should then try to limit the roadway-caused mortality of these two species.

CONCLUSION

In order to reduce this mortality, solutions have been proposed to the SAPRR. Areas showing a high rate of mortality will no longer be systematically mown so that vegetation will grow naturally (brambles, thorns, broom...). Low bushes will also be planted which would decrease common vole availability and thus the number of its predators. These measures are being realised.

Along with these attempts aimed at reducing mortality, others are being tried to help the birth rate: erection of nestboxes, making breeding sites safe from predators or weather conditions. When there is no lack of food, Barn Owls and Long-eared Owls need breeding sites. Helping the birth rate to increase seems then to be a way to counterbalance the excessive roadway-caused mortality. The first results on the Barn Owl appear to be very positive.

ACKNOWLEDGEMENTS

We are very grateful to the SAPRR, without which this study would never have been made. It also assumes the results and financing of the measures proposed for the protection of the Barn Owl and Long-eared Owl. It is undoubtedly an example to follow for other road or motorway people in charge.

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REFERENCES

BAUDVIN, H. 1986.La reproduction de la Chouette effraie, *Tyto alba. Le Jean le Blanc* XXV: 1 – 125 BOURQUIN, J.D. 1983.Mortalité des rapaces le long de l'autoroute Genêve – Lausanne. *Nos Oiseaux* 37: 149–169

JOVENIAUX, A. 1996. La mortalité de la Chouette effraie sur l'autoroute A36 en Bourgogne Franche-Comté. Bilan de quinze années d'observation. Actes du colloque international sur la Chouette effraie, Dijon, 5 et 6 Octobre 1996:18 – 35

MASSEMIN, S., Y. LE MAHO, T. ZORN & Y. HANDRICH 1996. Mortalité autoroutière de la Chouette effraie, *Tyto alba*, dans le Nord -Est de la France. Actes du colloque international sur la Chouette effraie, Dijon, 5 et 6 Octobre 1996:12 - 16

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