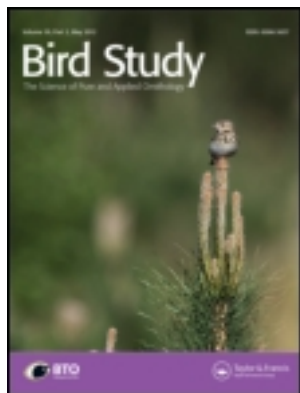


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SHORT REPORT

The occurrence of reptiles in Barn Owl diet in Europe

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Capsule We present a review of the propensity to eat reptiles in the Barn Owl *Tyto alba* in Europe. Based on the analysis of 591 published studies reporting 3.07 million prey items identified in pellets, only 2402 reptiles (0.08%) were found. Reptiles were most often captured in southern parts of the European continent and on islands. A large proportion of the 1304 identified reptiles to the species level were nocturnal Gekkonidae (77.1%).

The Barn owl *Tyto alba* is a model species for the study of predator–prey interactions. Many studies have been published on its diet using pellet analysis showing that small mammals form the bulk of the diet. It remains unclear under which circumstances other groups of vertebrates such as reptiles can become an important food source. Our aim in the present article is therefore to review the frequency that reptiles are captured by the Barn Owl in Europe. This is necessary to identify the extent to which reptiles are ecologically relevant to this owl. We expect that reptiles are more often captured in southern than northern regions and on islands compared to mainland where prey diversity is usually reduced compared to continents (Crowell 1962, Grant 1998) but where reptiles are often abundant (see Pérez-Mellado *et al.* 2008 and references therein).

The present review is based on an extensive collection of studies on the Barn Owl gathered for the last 20 years and looking for citations in all these papers. We visited several libraries, particularly the one located at the Swiss Ornithological Institute in Sempach (Switzerland), as well as searching for papers on the internet and contacting ornithologists who published papers in local journals that are otherwise difficult to obtain. We did not preferentially search some journals over others and we did not select studies based on any criterion such as sample size: all Barn Owl studies in Europe that we could find were used here. This method allowed us to collect 2927 papers on the Barn Owl of which 591 reported quantitative data on its diet in Europe (Table 1). The number of prey items identified in each study varied between 9 and 234,991 (median

1207) between 1860 and 2010 (median date 1977). Among these 591 studies only 31 identified reptiles to the species level (Table 2). For the sake of comparison, we report the data by country and in Table 1 we indicate the number of reptilian species found in each country based on a ‘Reptile Database’ (Uetz *et al.* 2007).

Table 1 gives the number of studies performed on Barn Owl diet in Europe for which the authors reported whether or not reptiles had been found as prey. Out of 591 studies, 3,065,967 prey items were identified of which only 2402 (0.08%) were reptiles. In only 70 (11.8%) of the studies, researchers found at least one reptile in Barn Owl pellets. As predicted, reptiles were more often captured in countries located in southern regions of the European continent and on islands (Table 1). This is further shown by the significant negative relationship between the percentage of reptiles in diet and latitude (generalized linear mixed models with binomial distribution; latitude: $F_{1,587} = 6763.2$, $P < 0.0001$; island/mainland: $F_{1,587} = 172.28$, $P < 0.0001$). Thus, although reptiles are rarely captured, in some places they can become an important prey for Barn Owls. An anecdotal study in Spain reported up to 123 reptiles captured out of 708 prey items (17.4%) (Orti & Gonzales 2001). A large proportion of reptiles in the diet is however relatively rare in Europe (Figure 1).

According to the nocturnal habits of the Barn Owl, most captured reptiles are nocturnal (i.e. Gekkonidae, 77.1%). In contrast, the diurnal Lacertidae, Scincidae, Anguillidae and Colubridae species are captured in much lower numbers probably at sundown, in the early morning or near human habitations where reptiles are attracted by light (Carretero *et al.* 2012). Given that nocturnal reptiles are found only in southern parts of

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Table 1. Proportion of Barn Owl diet composed of reptiles in different European countries and islands. Number of reptilian species is based on the Reptile Database (<http://www.reptile-database.org/>; Uetz *et al.* 2007). The references used to compile these tables can be found as supplementary material on the article's web page at <http://dx.doi.org/10.1080/00063657.2012.731035>.

Country	No. of reptilian species present in the country/islands	No. of studies	No. of prey identified	No. of reptiles as prey	% of reptiles in the diet
Albania	33	1	68	0	0
Austria	14	8	11,298	0	0
Balearic Islands	8	3	9,180	677	7.37
Belgium	9	10	155,883	0	0
Bosnia	17	1	1,782	0	0
Bulgaria	36	5	41,787	3	0.007
Corfu	27	1	3,097	34	1.10
Corsica	11	3	11,295	13	0.12
Crete	14	2	1,284	4	0.31
Croatia	36	3	8,633	0	0
Czech Republic	10	22	103,037	0	0
Denmark	5	1	36,173	0	0
France	37	89	680,353	26	0.0038
Germany	14	148	661,943	3	0.0005
Greece	65	11	9,583	11	0.11
Hungary	16	20	68,721	0	0
Ireland	1	16	25,481	0	0
Italy	41	60	95,212	155	0.16
Cos	21	1	2,277	0	0
Luxemburg	5	6	9,678	0	0
Malta	9	2	424	0	0
Netherlands	8	10	126,070	1	0.0008
Poland	11	15	112,769	0	0
Portugal	32	8	20,343	4	0.02
Roumania	24	3	3,283	12	0.37
Sardinia	17	5	2,415	5	0.21
Serbia	19	2	8,576	0	0
Sicily	11	2	997	5	0.50
Slovakia	12	8	23,431	0	0
Slovenia	19	6	6,179	2	0.03
Spain	47	43	166,017	1,336	0.80
Sweden	6	1	1,661	0	0
Switzerland	15	16	291,168	0	0
Tenerife	5	1	2,058	94	4.56
UK	6	58	363,811	17	0.005
Total		591	3,065,967	2,402	0.08

Table 2. Reptiles identified in Barn Owl pellets collected in different European countries and islands. Papers used to generate this table are reported in the reference list.

	E	T	BI	Cor	F	R	GR	I	Si	Cre	Bu	P	Sa	Co	D	UK	Total
Gekkonidae																	
Kotschy's Gecko <i>Cyrtodactylus (Mediodactylus) kotschy</i>	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	7
Mediterranean House Gecko <i>Hemidactylus turcicus</i>	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47
Moorish Gecko <i>Tarentola mauritanica</i>	801	89	47	0	2	0	4	0	4	0	0	0	1	0	0	0	951
Scincidae																	
Canaryan Cylindrical Skink <i>Chalcides viridanus</i>	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Lacertidae																	
Ocellated Lizard <i>Timon lepidus</i>	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Balkan Emerald Lizard <i>Lacerta trilineata</i>	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	12
European Green Lizard <i>Lacerta viridis</i>	0	0	0	22	0	0	0	0	0	0	0	0	0	0	0	0	22
<i>Lacerta viridis</i> or <i>trilineata</i>	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
Western Green Lizard <i>Lacerta bilineata</i>	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	4
<i>Lacerta</i> sp.	70	0	0	0	3	0	0	0	0	0	0	0	0	1	1	1	76
Iberian Wall Lizard <i>Podarcis hispanica</i>	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Common Wall Lizard <i>Podarcis muralis</i>	0	0	0	0	5	0	0	5	0	0	0	0	0	0	0	0	10
Ibiza Wall Lizard <i>Podarcis pityusensis</i>	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	25
Crimean Wall Lizard <i>Podarcis tauricus</i>	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	7
Algerian Psammodromus <i>Psammodromus algirus</i>	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59
<i>Psammodromus</i> sp.	58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58
Gallot's Lizard <i>Gallotia galloti</i>	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
<i>Lacertidae</i> sp.	0	0	0	0	1	5	0	3	0	4	0	1	0	0	0	0	14
Anguidae																	
Slow Worm <i>Anguis fragilis</i>	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
Colubridae																	
Caspian Whipsnake <i>Dolichophis caspius</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Aesculapean Snake <i>Zamenis longissimus</i>	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
European Grass Snake <i>Natrix natrix</i>	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
<i>Colubridae</i> sp.	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3
Total	1045	94	61	34	23	12	11	8	4	4	3	1	1	1	1	1	1304

E: Spain; T: Tenerife; BI: Balearic Islands; Cor: Corfu; F: France; R: Rumania; GR: Greece; I: Italy; Si: Sicily; Cre: Crete; Bu: Bulgaria; P: Portugal; Sa: Sardinia; Co: Corsica; D: Germany; UK: United Kingdom.

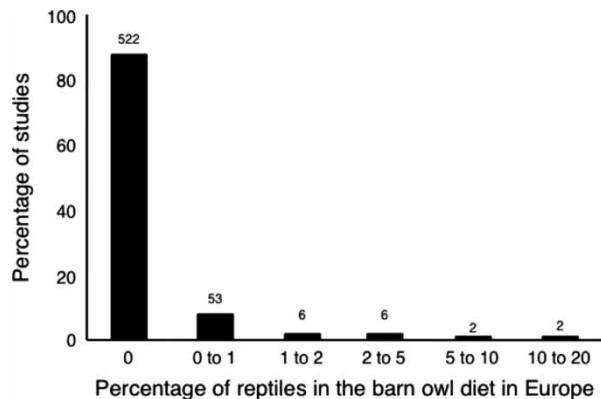


Figure 1. Frequency distribution of studies reporting various percentages of reptiles in Barn Owl diet in Europe. Number above bars indicates the absolute number of studies.

the continent where ambient temperatures are sufficiently high at night for reptiles to be active (Carretero 2008), this group of animals may sometimes be ecologically relevant to Barn Owls. Finally, it is interesting to note that no venomous snakes have been found in Barn Owl pellets in Europe. It would be interesting to review the literature on continents such as Australia and Africa where venomous snakes are common in order to evaluate whether Barn Owls actively avoid such prey.

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