Barbastella 7 (1)
ISSN: 1576-9720 SECEMU
www.secemu.org

Open Access

Pedración de murciélagos por la jineta *Genetta genetta* (Linnaeus, 1758): revisión

Predation on bats by genets *Genetta genetta* (Linnaeus, 1758): a review

Maria Mas[1], Adrià López-Baucells[1] & Antoni Arrizabalaga[1]

[1] Granollers Natural History Museum, Chiroptera Research Department
Av. Francesc Macià 61, 08402 Granollers, Catalonia.

Corresponding author e-mail: maria.masnavarro@gmail.com

Abstract: Bats have partially evolved in response of predation pressure and have developed several strategies to cope with these threats. Nevertheless, the role played by many predators and their true impact on bat populations is poorly known and to date have only ever been considered superficially in studies. In this manuscript we review the role of genet as potential bat predator. We herein present an in-depth literature review of bats as prey of genets and also provide 6 new reports from scat analysis and 1 opportunistic event in a mist net placed next to a cave entrance. While the fact that only few reports of genet predation on bats have been reported seems to suggest that they only hunt bats occasionally, other repeated reports from South Portugal inside hibernating roosts (Palmeirim & Rodrigues 1991) and our new predation event next to a cave entrance suggests that genets could also repeatedly hunt bats in some caves (not as occasionally as usually considered).

Keywords: Genet, *Genetta genetta*, diet composition, predation, mammal carnivore.

Citation: Mas, M., López-Baucells, A., Arrizabalaga, A. 2014. Predation on bats by genets *Genetta genetta* (Linneaus, 1758): a review. Barbastella 7, pp XX ISSN: 1576-9720

accepted: February 07, 2014

Bats have long coexisted with their predators and have developed several strategies to cope with the threats they pose (Rydell & Speakman 1995). However, predation rates are generally difficult to quantify (Findley 1993) and thus are rarely taken into account in studies of population dynamics (David 1966, Sendor & Simon 2003). Despite the extensive review of bat predation by Allen (1939), the role played by many predators and their true impact on bat populations is poorly known and to date have only ever been considered superficially in studies (Gillette and Kimbroug 1970, Speakman 1991, Nyffeler & Knörnschild 2013, Ancillotto et al. 2013). It is widely assumed that most predators commonly capture bats in the evening or by daylight (Speakman & Lumsden 1994), either when bats emerge from their roosts or while they are roosting or hibernating (Baker 1962, Palmeirim & Rodrigues 1991, Speakman et al. 1995). Literature examples of predation upon bats include hibernating common pipistrelle, *Pipistrellus pipistrellus* (Schreber 1774) by Great tit *Parus major* (Linnaeus 1758) cited by Estók (2010) and *Myotis* sp. by raccoons (Munson & Keith 1984, McAlpine et al. 2011) for instance. Several taxa including invertebrates (Molinari et al 2005, Nyffeler & Knörnschild 2013), birds (Clay 1959; Elwell 1962, Krzanowski 1973, Ruprecht 1979, Speakman 1991, Lefevre 2005, Lesinski et al. 2009a, 2009b), fish (Baker 1962), amphibians (Kinsey 1961), reptiles (Hopkins & Hopkins 1982; Hammer & Arlettaz 1998) and mammals (Munson & Keith 1984, McAlpine et al. 2011), have been recorded as preying occasionally on bats.

Aerial predators such as the Red-tailed Hawk (*Buteo jamaicensis* Gmelin 1788) and the Great Horned Owl (*Bubo virginianus* Gmelin 1788) are generally assumed to be typical bat predators because of their great manoeuvrability (Baker 1962) and fast flight (Rydell & Speakman 1995, Speakman 1991). Nonetheless, some avian predators have greater difficulties than expected when hunting bats and therefore lower efficiencies, mainly due to their particular hunting techniques (Baker 1962) (e.g. bats usually constitute less than 5% of the vertebrate preys of Neotropical owls (Escarlate-Tavares & Pessôa 2005, Motta-Junior 2006)).

According to Rydell & Speakman (1995), the most important night predators on bats are Barn (*Tyto alba* Scopoli, 1769) and Tawny (*Strix aluco* Linnaeus 1758) owls, while the most common daylight predators are hawks (Speakman 1991) and crows (Lefevre 2005, Hernández et al. 2007). Actually, most studies regarding the impact of predation upon bats has been devoted to bird-bat interactions and only few studies (and most of them anecdotal) have address the issue regarding terrestrial predators.

In Europe, only the mammals carnivores Beech marten (*Martes foina* Erxleben 1777), European pine marten (*Martes martes* Linneaus 1758), Genet (*Genetta genetta* Linneaus 1758) and non-wild carnivores as cats, have been reported as occasional bat predators (Romanowski & Lesinski 1991, Palmeirim & Rodrigues 1991, Clevenger 1993, Arrizabalaga 1984, Freixas et al. 2010, Ancillotto et al 2013). According to Baker (1962) these mesopredator are more likely to take advantage of congested caves or roosts rather than prey on solitary individuals (also in Palmeirim & Rodrigues 1991). Nevertheless, most available literature reports the occurrence of single bats, rather than multiple individuals: e.g. a single *Vespertilio murinus* (Linnaeus 1758) was identified from a skull found in a Beech marten's faecal sample in Romania (Romanowski & Lesinski 1991).

In this manuscript we aimed to review the role of genet as potential bat predator. Thus, a thorough revision was carried out using online databases (Google Scholar & Web of Knowledge) with the following keywords: 'chiroptera', 'bats', 'diet', 'dietary composition', 'mortality', 'predator', 'predation' and '*Genetta genetta'* in English, Spanish, Portuguese and French. As a result, a wide range of studies were retrieved for Genet diet description considering its whole distribution (Portugal, France, Spain and North Africa), but only few revealing bats on those diets.

Genetta genetta (Viverridae) is a medium-sized opportunistic carnivore with a euryphagous diet (Larivière & Calzada 2001) found only in the Iberian Peninsula, southern France, North Africa and the Balearic Islands (Clevenger 1993; Virgos & Casanovas 1997; Larivière & Calzada 2001; Fig. 1). It is commonly classified between the specialist European Otter (*Lutra lutra*, Linnaeus 1758) and the generalist European Badger (*Meles meles*, Linnaeus 1758). In fact, several studies have investigated the species' diet throughout its distribution by the analysis of scats (Arrizabalaga & Montagud 1984, Cugnasse & Riols 1984, Ariagno 1985, Delibes et al. 1989, Lodé et al. 1991, Amdine et al. 1993, Ruiz-Olmo & López-Martín 1993, Clevenger 1995, Gil Sánchez 1998, Rosalino & Santos-Reis 2002, Virgós et al. 1999, Carvalho & Gomes 2003, Mostefai et al. 2003, Torre et al. 2003, Amroun et al. 2007, Sánchez et al. 2008, Le Jacques & Lode 2009, Freixas et al. 2010, Palazón & Rafart 2010, Camps 2012, Torre et al. 2013). Small mammals (mostly *Apodemus* sp., Torre et al. 2013) represent more than 90% of the species' diet and the remaining is usually composed in equal proportions by invertebrates, reptiles, amphibians and birds depending on resource availability (Virgós et al. 1999, Arrizabalaga et al. 2002, Rosalino and Santos-Reis 2002). However, despite the species' preference for small mammals, bats have only rarely been detected in the diet of this mammal (Arrizabalaga 1984, Freixas et al. 2010) We herein present an in-depth literature review of bats as prey of genets and also provide six new reports (Table 1).

Fig. 1 – *Genetta genetta* near the cave entrance (pictures: Ignasi Torre).

Only three incidents of bat predation by genets are currently available in the literature, namely: a serotine bat *(Eptesicus serotinus,* Schreber 1774*)* and a greater mouse-eared bat (*Myotis myotis,* Borkhausen 1797) identified in genet scats from the Iberian Peninsula (Arrizabalaga & Montagud 1984, Freixas et al. 2010, respectively; Table 1) and several Schreiber's Bent-winged Bat (*Miniopterus schreibersii* Kuhl 1817), partially consumed inside some caves in South Portugal (Palmeirim & Rodrigues 1991). We add two new serotine bats (*Eptesicus serotinus*) in scat samples collected in 1981 and 2000, and three unidentified bats in scats from 1983 and 1999 (Table 1).

We also report one opportunistic predation event of a *G. genetta* upon an individual of *Miniopterus schreibersii* (Kuhl 1817) entangled in a mist net. This 3m mist net was placed at the emergence point of a *M. schreibersii* equinoctial cave roost in a periurban natural park near Barcelona (Collserola Park: UTM ED50 418385, 4586771). The individual of *M. schreibersii* was found dead close to the ground in the first bag of the mist net. When the presence of the genet was detected near the mist net (another conspecific individual was also sighted simultaneously in the same area near the cave entrance), the bat was already dead and had numerous bite marks. As the bat could not be properly extracted from the mist net by the genet, we removed it and it is now deposited in the mammal collection of the Granollers Natural History

Table 1. Literature review and new reports of bats as prey of genets.

Species	% in diet	Source	Location	Other items in the faeces
Eptesicus serotinus		(Unpublished 1981, own data)	El Corredor Natural Park, Catalonia.	Unavailable
Bat #1 #2 (unidentified)	0.3%	(Unpublished 1983, own data)	Guilleries Natural Park, Sant Llorenç de Folgueroles, Catalonia.	*Talpa europaea* (4); *Sorex minutus* (9); *Neomys anomalus* (1); *Suncus etruscus* (5); *Crocidura russula* (2); *Rattus rattus* (1); *Elyomis quercinus* (6); *Sciurus vulgaris* (6); *Mus spretus* (15); *Apodemus* sp. (250); *Apodemus sylvaticus* (238); *Apodemus flavicollis* (51); Ofidi (1); Sauria (1); *Clethrionomys glareolus* (45); *Microtus agrestis* (4); *Arvicola sapidus* (3); *Microtus duodecimcostatus.*
Eptesicus serotinus		(Arrizabalaga & Montagud 1984)	Valles Oriental, Barcelona, Catalonia.	Unavailable.
Bat #3 (unidentified)	0.14%	(Unpublished 1999, own data)	Montseny, Viladrau, Arimells, Catalonia.	*Rattus rattus* (1); *Glis glis* (1); *Crocidura russula* (4); *Clethrionomys glareolus* (9); *Apodemus sylvaticus* (109); *Apodemus flavicollis* (58); *Apodemus* sp. (48); *Mus spretus* (3); Gramineae; *Rubus* sp. (445); *Anguis fragilis* (2); Reptile ind. (1); birds (3); Coleoptera, *Prunus dulcis*
Eptesicus serotinus	0.21%	(Unpublished 2000, own data)	Montseny, Sant Marçal, Barraca el Sot de les Illes, Catalonia.	*Glis glis* (2); *Clethrionomys glareolus* (5); *Sciurus vulgaris* (1); *Elyomis quercinus* (1); *Crocidura russula* (1); *Apodemus* sp. (50); *Apodemus sylvaticus* (85); *Apodemus flavicollis* (44); *Rubus* sp. (272); Ortoptera; Gramineae; *Anguis fragilis*
Myotis myotis		(Freixas et al. 2010)	Poblet Area of Natural Interest (Prades), Catalonia	*Sorex minutus* (6); *Crocidura russula* (32); *Suncus etruscus* (9); *Microtus duodecimcostatus* (1); S*ciurus vulgaris* (4); *Apodemus sylvaticus* (394); *Apodemus sp.* (79); *Mus spretus* (10); *Myotis myotis* (1): Sauria (7); Snake (2); birds (9)
Miniopterus schreibersii		Current work	Collserola Park. Can Rabella. Barcelona, Catalonia.	Unavailable

Museum. Due to our presence, both genets left the area and were not detected again during any other field surveys of this cave.

This predation event represents the first report of a *M. schreibersii* being predated by a genet in Spain and it corresponds to similar predation events than previously cited in Portugal (Palmeirim & Rodrigues 1991). Nevertheless, although some bats have been detected in genet faecal samples (collected by the Granollers Natural History Museum), they always represent less than 0.3% of their diets. This is probably due to the fact that is more difficult to hunt flying animals than small terrestrial mammals.

Fig. 2 – *Genetta genetta* distribution in South France, Spain, Portugal and North Africa.

As stated previously, it is hard to extrapolate and quantify genet predation rates upon bats as there are few reports and capture events are probably underestimated (Tuttle & Stevenson 1982). Indeed, as a result of this predation pressure, bats have adopted several defensive strategies to avoid aerial predators and, for example, some bat species habitually evade predators by emerging from roosts in groups (Erkert 1982, Speakman 1991, Speakman et al. 1995). Thus, assuming that aerial hunters pose the greatest threat, it still remains to be seen what effect predation by terrestrial predators has on bats.

We consider essential to report all witnessed predation events – even opportunistic ones – to provide more information on the diet of this secretive species. According to scat analysis and previous cited reports, conclusive answers to these questions remain unknown. While the few reports of genet predation on bats (detected though scat analysis) seem to suggest that genets only hunt bats occasionally, other reports from South Portugal (Palmeirim & Rodrigues 1991) affirm that genets repeatedly hunt bats in some caves (not opportunistically) taking advantage of bat roosting behaviour. This predation pressure caused relevant disturbance to these bat populations, being the cause of the uncompleted bat occupation in what would be the best hibernating cave in Portugal. Regarding our opportunistic predation report, and considering the behaviour of the two genets (which seemed to perfectly know the territory and the entrance of the cave), it could be another case of repeated hunting attempts in cave roosting bat colonies, leading us to consider often these genets could use this colony as an available food resource. Due to lack of information, many questions still remain unanswered. Does this occur all year round or is it a more common practice during hibernation? Are there more non reported cases of genets visiting caves time and time again to hunt bats?

Aknowledgments

We would like to thank Dr. Carles Flaquer, Xavier Puig, Lídia Freixas, Oriol Massana and Arnau Sardà for helping us during the fieldwork, Dr. Ignasi Torre for the pictures of the Genet, and Michael Lockwood for the manuscript corrections and revision. These fieldwork could not be accomplished without the support of the Collserola Natural Park and all his workers.

Referencias

Allen, G. M. 1939 (Reprinted. 1962). Bats. Dover (eds) New York.

Amdine, W. H., Thévenot, M., Sellami, M. & DE Smet, K. 1993. Régime alimentaire de la Genette *(Genetta genetta* Linné, 1758) dans le Parc national du Djurdjura, Algérie. Mammalia 57 (1): 9-18. http://dx.doi.org/10.1515/mamm.1993.57.1.9

Amroun, M., Giraudoux, P. & Delattre, P. 2007. Etude comparative des régimes alimentaires de deux carnivores sympatriques le chacal doré (*Canis aureus*) et la genette commune (*Genetta genetta*) en Kabylie, Algérie. Mammalia 70(3-4): 247-254. http://dx.doi.org/10.1515/MAMM.2006.040

Ancillotto, Leonardo, Maria Tiziana Serangeli, & Danilo Russo. 2013. Curiosity killed the bat: Domestic cats as bat predators." Mammalian Biology-Zeitschrift für Säugetierkunde.

Ariagno, D. 1985. Régime alimentaire de la Genette *Genetta genetta* dans le département du Rhône (France). Le Bièvre 7 (2): 115-126.

Arrizabalaga, A. & Montagud, E. 1984. Notes sobre la fauna de Quiròpters del Vallès Oriental (Barcelona, Catalunya). Una nova espècie per a la fauna espanyola. Miscel·lània Zoològica 8: 307-310.

Arrizabalaga, A., C. Flaquer, E. Montagud, A. Ribas & I. Torre 2002. Noves dades sobre la dieta del gat mesquer (*Genetta genetta*) al Montseny. V Trobades d'Estudiosos del Montseny. Monografies 33: 85-88.

Baker, J. K. 1962. The manner and efficiency of raptor depredations on bats. The Condor 64(6): 500-504. http://dx.doi.org/10.2307/1365473

Camps, D. 2012. Jineta - Genetta genetta. En: Enciclopedia Virtual de los Vertebrados Españoles. Salvador, A., Cassinello, J. (Eds.). Museo Nacional de Ciencias Naturales, Madrid.

Carvalho, J. C. & Gomes, P. 2001. Food habits and trophic niche overlap of the red fox, European Wild Cat and Common Genet in the Peneda-Gerês National Park. Galemys 13 (2): 39-48.

Clay, W. M. 1959. Blue jays attack a Red Bat. The Auk 76(4): 532.

Clevenger, A. 1993. Pine marten (*Martes martes* Linné, 1758) comparative feeding ecology in an island and mainland population of Spain. Zeitschrift für Säugetierkunde 58(4): 212-224.

Clevenger, A. 1995. Seasonality and relationships of food resource use of *Martes martes*, *Genetta genetta* and *Felis catus* in the Balearic Islands. Revue d'écologie 50(2): 109-131.

Cugnasse, J. M. & Riols, C. 1984. Contribution à la connaissance de l'écologie de la genette (*Genetta genetta* L.) dans quelques départements du sud de la France. Gibier faune sauvage 1, 25-55.

Davis, W. H. 1966. Population Dynamics of the Bat Pipistrellus subflavus. Journal of Mammalogy 47(3): 383-396.

Delibes, M., Alejandro Rodríguez & F. F. Parreno. 1989. Food of the common genet (Genetta genetta) in northern Africa. Journal of Zoology 218(2): 321-326.

Elwell, A. S. 1962. Blue jay preys on young bats. Journal of Mammalogy 43(3): 434-434.

Erkert, H. 1982. Ecological aspects of bat activity rhythms. In Kunz, T.H. Plenum Press (eds) Ecology of bats (201-236) New York.

Escarlate-Tavares, Fabricio and Leila M. Pessôa. 2005. Bats (Chiroptera, Mammalia) in barn owl (Tyto alba) pellets in northern pantanal, Mato Grosso, Brazil. Mastozoología neotropical 12(1): 61-67.

Estók, P., Zsebők, S. & Siemers B. M. 2010. Great tits search for, capture, kill and eat hibernating bats. Biology Letters 6(1): 59-62. http://dx.doi.org/10.1098/rsbl.2009.0611

Fenton, M. B., Rautenbach, I. L., Smith, S.E., Swanepoel, J., Grosell, J. & vann Jaarsveld, J. 1994. Raptors and bats: threats and opportunities. Animal Behaviour 48(1): 9-18. http://dx.doi.org/10.1006/anbe.1994.1207

Findley, J. S. 1993. Bats: a community perspective. CUP Archive. University of New Mexico (eds). 179p

Freixas, L., Torre, I. & Arrizabalaga, A. 2010. Inventari dels petits mamífers al Paratge Natural d'Interès Nacional de Poblet. Natural History Museum of Granollers (eds).

Gil Sánchez, J. M.1998. Dieta comparada del gato montés (*Felis silvestris*) y la jineta (*Genetta genetta*) en una área de simpatría de las Sierras Subbéticas (SE España) Miscel.lania Zooloaica 21 (2) 57-64.

Gillette, D. D., & Kimbrough, J. D. 1970. Chiropteran mortality. About Bats. Southern Methodist University Press, Dallas, Texas, 262-283.

Hammer, M. & R. Arlettaz 1998. A case of snake predation upon bats in northern Morocco: some implications for designing bat grilles. Journal of Zoology 245(2): 211-212. http://dx.doi.org/10.1111/j.1469-7998.1998.tb00090.x

Hernández D.L., Mell, J. J. & Eaton, M.D. 2007. Aerial predation of a bat by an American Crow. The Wilson Journal of Ornithology 119(4): 763-764. http://dx.doi.org/10.1676/06-049.1

Hopkins, H. & Hopkins, M. G. 1982. Predation by a snake of a flower-visiting bat at *Parkia nitida* (Leguminosae: Mimosoideae). Brittonia 34(2): 225-227. http://dx.doi.org/10.2307/2806382

Kinsey, C. 1961. Leopard frog attacks bat. Journal of Mammalogy 42(3): 408.

Krzanowski, A. 1973. Numerical comparison of Vespertilionidae and Rhinolophidae (Chiroptera: Mammalia) in the owl pellets. Acta zoologica Cracoviensia. 18: 133-140.

Le Jacques, D. & Lode, T. 2009. L'alimentation de la Genette d'Europe, Genetta genetta L., 1758, dans un bocage de l'ouest de la France. Mammalia 58 (3) 383–390. http://dx.doi.org/10.1515/mamm.1994.58.3.383

Larivière, S. & Calzada, J. 2001. *Genetta genetta*. Mammalian Species: 1-6. http://dx.doi.org/10.1644/1545-1410(2001)680<0001:GG>2.0.CO;2

Lefevre, K. L. 2005. Predation of a bat by American Crows, *Corvus brachyrhynchos*. The Canadian Field-Naturalist 119(3): 443-444.

Lesinski, G., Ignaczak, M. & Manias, J. 2009a. Opportunistic predation on bats by the tawny owl *Strix aluco*. Animal Biology 59(3): 283-288. http://dx.doi.org/10.1163/157075609X454917

Lesinski, G., J. Gryz, & Kowalski, M. 2009b. Bat predation by tawny owls *Strix aluco* in differently human□transformed habitats. Italian Journal of Zoology 76(4): 415-421. http://dx.doi.org/10.1080/11250000802589535

Lodé, T., Lechat, I. & Le Jacques, D. 1991. Le régime alimentaire de la genette en limite nord-ouest de son aire de répartition. Revue d'écologie 46 (4): 339-348.

McAlpine, D. F., Vanderwolf, K. J., Forbes, G. J. & Malloch, D. 2011 Consumption of Bats (*Myotis* spp.) by Raccoons (*Procyon lotor*) during an outbreak of white-nose syndrome in New Brunswick, Canada: Implications for Estimates of Bat Mortality. The Canadian Field-Naturalist 125(1):257-260

Molinari, J., Gutiérrez, E. E., Ascenção, A. A., Nassar, J. M., Arends, A., & Márquez, R. J. 2005. Predation by giant centipedes, Scolopendra gigantea, on three species of bats in a Venezuelan cave. Caribbean Journal of Science, 41(2), 340-346.

Mostefai, N., Sellami, M. & Grenot, C. 2003. Contribution à la connaissance du régime alimentaire de la Genette commune (*Genetta genetta*) dans la réserve cynégétique de Moutas, Tlemcen (Algerie). Bulletin de la Société zoologique de France 128 (3): 227-237.

Motta-Junior & José Carlos. 2006. Relações tróficas entre cinco Strigiformes simpátricas na região central do Estado de São Paulo, Brasil. Revista Brasileira de Ornitologia 14(4): 359-377.

Munson, P. J. & Keith, J. H. 1984. Prehistoric Raccoon Predation on Hibernating Myotis, Wyandotte Cave, Indiana. Journal of Mammalogy 65(1): 152-155.

Nyffeler, Martin & Mirjam Knörnschild. 2013. Bat Predation by Spiders. PloS one 8 (3): e58120. http://dx.doi.org /10.1371/journal.pone.0058120

Palazón, S. & Rafart, E. 2010. Dieta de la gineta común *Genetta genetta* (Linnaeus, 1758) en los hábitats riparios de Navarra. Galemys 22(2): 3-18.

Palmeirim, J. M. & Rodrigues, L. 1991. Estatus y conservación de los murciélagos en Portugal. Pp. 98-110. En: Benzal, J., De Paz, O. (Eds.). Los murciélagos de España y Portugal. Colección técnica. Ministerio de Agricultura, Pesca y Alimentación, Instituto Nacional para la Conservación de la Naturaleza, Madrid.

Romanowski, J. & Lesinski, G. 1991. A note on the diet of stone marten in southeastern Romania. Acta Theriologica 36(1-2): 201-204.

Rosalino, L. M. & Santos-Reis, M. 2002. Feeding habits of the common genet *Genetta genetta* (Carnivora: Viverridae) in a semi-natural landscape of central Portugal. Mammalia, 66 (2) 795-205.

Ruiz-Olmo, J. & López-Martín, J. M. 1993. Note on the diet of the common genet (*Genetta genetta* L.) in Mediterranean riparian habitats of NE Spain. Mammalia 57: 607-607. http://dx.doi.org/10.1515/mamm.1993.57.4.607

Ruprecht, A. L. 1979. Bats (Chiroptera) as constituents of the food of barn owls *Tyto alba* in Poland. Ibis 1214(1): 489-494. http://dx.doi.org/10.1111/j.1474-919X.1979.tb06690.x

Rydell, J. & Speakman, J. R. 1995. Evolution of nocturnality in bats: Potential competitors and predators during their early history. Biological Journal of the Linnean Society. 542: 183-191. http://dx.doi.org/10.1111/j.1095-8312.1995.tb01031.x

Sánchez, M., Rodrigues, P. Ortuño, V. & Herrero, J. 2008. Feeding habits of the *Genetta genetta* in an Iberian continental wetland. Hystrix 19 (2) 133-142.

Sendor, T. & M. Simon. 2003. Population dynamics of the pipistrelle bat: effects of sex, age and winter weather on seasonal survival. Journal of Animal Ecology 72(2): 308-320. http://dx.doi.org/10.1046/j.1365-2656.2003.00702.x

Speakman, J. R. 1991. The impact of predation by birds on bat populations in the British Isles. Mammal Review 213: 123-142. http://dx.doi.org/10.1111/j.1365-2907.1991.tb00114.x

Speakman, J., Lumsden, L. & Hays. G. 1994. Predation rates on bats released to fly during daylight in south□eastern Australia. Journal of Zoology 2332: 318-321. http://dx.doi.org/10.1111/j.1469-7998.1994.tb08593.x

Speakman, J., Stone, R. & Kerslake, J. 1995. Temporal patterns in the emergence behaviour of pipistrelle bats, *Pipistrellus pipistrellus*, from maternity colonies are consistent with an anti-predator response. Animal Behaviour 505: 1147-1156. http://dx.doi.org/10.1016/0003-3472(95)80030-1

Torre, I., Ballesteros, T. & Degollada, A. 2003. Cambios en la dieta de la gineta (*Genetta genetta* Linnaeus, 1758) con relación a la disponibilidad de micromamíferos: ¿posible preferencia por el topillo rojo? Galemys (15): 25-36.

Torre, I., Arrizabalaga, A., Freixas, L., Ribas, A., Flaquer, C., Díaz, M. (2013). Using scats of a generalist carnivore as a tool to monitor small mammal communities in Mediterranean habitats. Basic and Applied Ecology 14: 155-164.

Tuttle, M. & Stevenson, D. 1982. Growth and survival of bats. in Kunz, T.H. ed. Ecology of bats. Plenum Press, New York: 105-150.

Virgós, E. & Casanovas, J. G. 1997. Habitat selection of Genet *Genetta genetta* in the mountains of central Spain. Acta Theriologica 42: 169-178.

Virgós, E., Llorente, M. & Cortésá, Y. 1999. Geographical variation in Genet (*Genetta genetta* L.) diet: a literature review. Mammal Review (292): 117-126. http://dx.doi.org/10.1046/j.1365-2907.1999.00041.x