Bats, birds & shrews in environmental risk assessment

Meet us at booth 25

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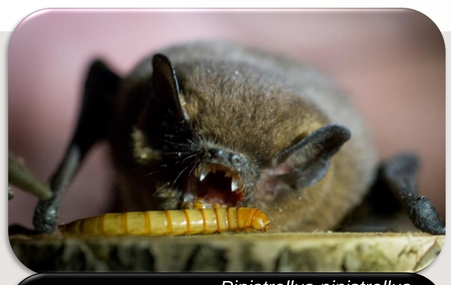
Introduction



Pipistrellus pipistrellus

photos: Jonas Penndorf

Bats are not specifically considered in pesticide risk assessments. The implicit assumption is that bats are covered by the current avian or mammalian risk assessment scheme according to EFSA (2009), which focusses on birds and mammals, such as rodents, shrews and lagomorphs. However, bats differ considerably in various aspects compared to rodents, shrews, lagomorphs or birds. It is therefore reasonable to question, whether bats should potentially be considered as an additional species group in terrestrial vertebrate risk assessments.

Based on a review of publically available literature we compiled a list of relevant European bat species, that potentially are present in the agricultural landscape (cf. for reptiles: Körner et al. 2012a, b & Lutzmann et al. 2012 a, b). Food intake is considered being the main route of bat exposure to pesticides. Information on daily energy expenditure and food intake has also been gathered from literature to determine appropriate food intake rates. With this information, environmental risk assessments based on the same prerequisites following the main concepts of EFSA (2009) were conducted for insectivorous birds, shrews and three bat species assuming pesticide applications in orchards as an example.

Bat diet composition and food intake rate

Considering its occurrence in farmland, its body weight and its diet composition, the common pipistrelle seems to be a representative species for an insectivorous bat risk assessment. However, as predominantly aerial hunters, the assumed residue uptake of common pipistrelles is rather low. Therefore, risk assessments for two additional bat species representing predominantly ground foraging and leaf gleaning foraging techniques are also presented.

Species	Body weight [g]	Assumed proportion of foraging strata
Common pipistrelle (*Pipistrellus pipistrellus*)	4 - 6	95% flying and 5% ground arthropods
Geoffroy's bat (*Myotis emarginatus*)	7 - 15	90% foliage and 10% flying arthropods
Greater mouse-eared bat (*Myotis myotis*)	26 - 45	85% ground and 15% flying arthropods

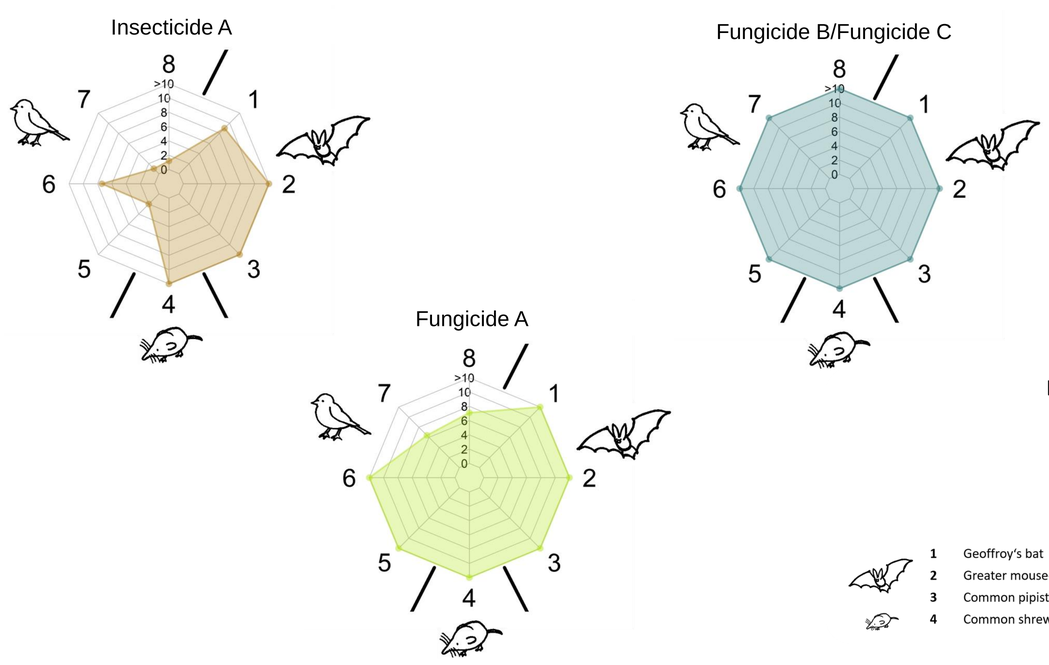
FIR/b.w. of insectivorous mammals, birds and bats are in the same range, and insectivorous birds cover minimum, maximum and mean FIR/b.w. of bats.

FIR/b.w.	Common shrew (EFSA 2009)	Insectivore bird species (EFSA 2009)	Bats (based on our review)
Mean	0.55	0.79	0.57
Geometric mean		0.75	0.53
90th percentile		0.99	0.84
Minimum		0.31	0.28
Maximum		1.06	0.92

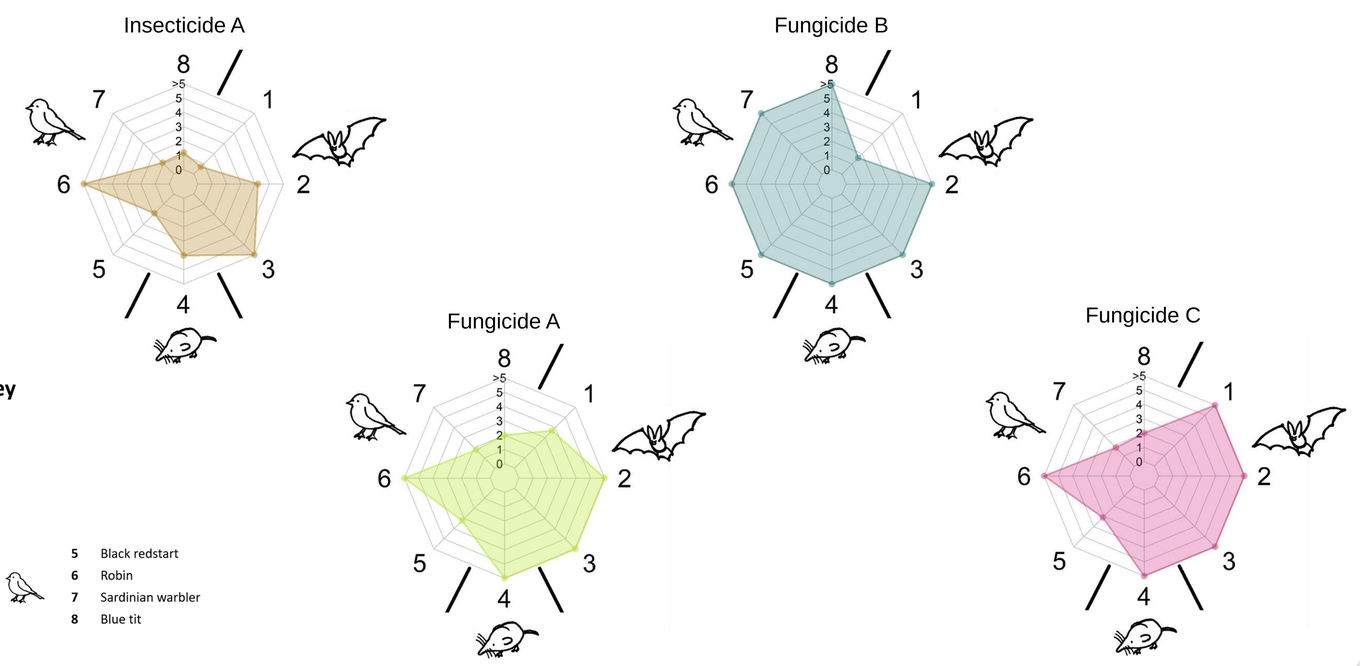
Results from acute and reproductive TER calculations

Given the lack of suitable and reliable pesticide toxicity data for bats in the EU, risk assessments were carried out using four randomly selected active substances currently approved for use in orchards in the EU. The mean FIR/b.w. of bats was used for the TER calculations, and the respective EU-agreed acute and reproductive toxicity endpoints for rats were assumed. The results from the TER calculations are presented as radar plots, where TER values are shown up to the relevant acute and long-term triggers. TER values greater than the relevant trigger values are also shown.

TER values from acute risk assessments



TER values from reproductive risk assessments



Regulatory conclusion

Due to the limited availability of toxicity endpoints for bats, it is difficult to derive a general conclusion on whether they are covered by EFSA (2009) or not. In fact, a literature review from Carravieri & Scheifler (2012) contained only LD_{50} values. They found partially higher toxicity values for certain bat species (e.g. for *Eptesicus fuscus* (Parathion-methyl)), while toxicity values for other bat species were lower (e.g. for *Pipistrellus pipistrellus* (DDT)), when compared to standard test rodents. However, comparing rat-endpoint based risk assessments (as done for all other mammal species according to EFSA (2009)) for several active substances used nowadays as pesticides in orchards, the acute risk for bats seems to be covered by current insectivorous scenarios. The reproductive risk for bats still shows some uncertainties. Future work could investigate the actual habitat use of bats in farmland, which is unfortunately not of great interest for science, and appropriate registration relevant data is missing. In addition other relevant exposure routes than via diet and bats' migration and hibernation strategies need further consideration.

Orchard: spray application photo: Martin Grimm

REFERENCES: Carravieri, A. & Scheifler, R. (2012). Effets des substances chimiques sur les Chiroptères : état des connaissances. Rapport bibliographique. http://ww w.plan-actions-chiropteres.fr/IMG/pdf_Effets_SubstancesChimiques_Chiropteres_Version_FINALE.pdf. - EFSA (2009). Guidance Document on Risk Assessment for Birds & Mammals EFSA Journal 7: 1438. - Körner, O., Lutzmann, N., Vogel, G., Dietzen, C. & Ludwigs, J.-D. (2012a). Relevant Lizard Species for the Risk Assessment of Plant Protection Products in Northern and Central Europe. Poster SETAC World Conference Berlin 2012. - Körner, O., Lutzmann, N., Vogel, G., Dietzen, C. & Ludwigs, J.-D. (2012b). Relevant snakes and turtle species for the risk assessment of plant protection products in Northern and Central Europe. Poster SETAC World Conference Berlin 2012. - Lutzmann, N., Dietzen, C., Gerlach, J., Körner, O. & Vogel, G. (2012a). Relevant Lizard Species for the Risk Assessment of Plant Protection Products in Southern Europe. Poster SETAC World Conference Berlin 2012. - Lutzmann, N., Dietzen, C., Gerlach, J., Körner, O. & Vogel, G. (2012b). Relevant Snake Species for the Risk Assessment of Plant Protection Products in Southern Europe. Poster SETAC World Conference Berlin 2012. **CREDITS:** European Crop Protection Association (AISBL) for funding parts of previous work on the project.