

Background and Aims

SGARs:

- Second-generation anticoagulant rodenticides (SGARs) are an effective and cost-efficient tool for controlling rodent pests in the UK.
- However, use of ARs can cause an intoxication of non-target animals, particularly predators of rodent prey, such as foxes and owls.

Use of Thresholds:

- Ecotoxicological studies often use vertebrate animals' carcasses collected in the field.
- Liver residues of 100 and 200 ng/g wet weight (ww) have been widely considered as wild vertebrates' SGAR toxicity threshold values [1].
- However, these values were from experiments with barn owls (*Tyto alba*) and are not relevant to other species from field carcass collection.

New approach for the threshold:

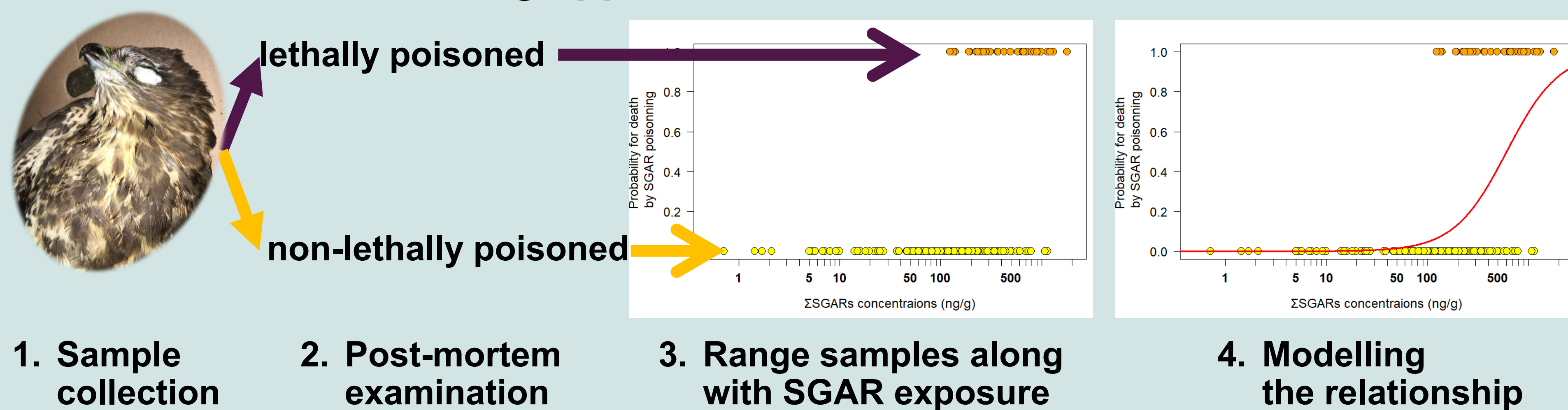
- There are also threshold values determined using statistical modelling (probabilistic modelling) with field-collected data.

Aims:

- We present the probabilistic modelling approach applied to field-collected data [2] and identify the discrepancy between the conventional and modelling approaches

Materials & Methods

Probabilistic modelling approach



Predatory birds used

- Probabilistic modelling was applied to 236 red kites (2015 – 2022) and 139 buzzards (2009 – 2021) collected from Great Britain (GB).
- All SGAR substances detected in the liver were summed (Σ SGARs)
- Samples with detectable signs of coagulopathy (traces of inner haemorrhage without external trauma) and a detectable SGAR concentration were diagnosed as 'lethally poisoned' samples.

Results

Probabilistic models

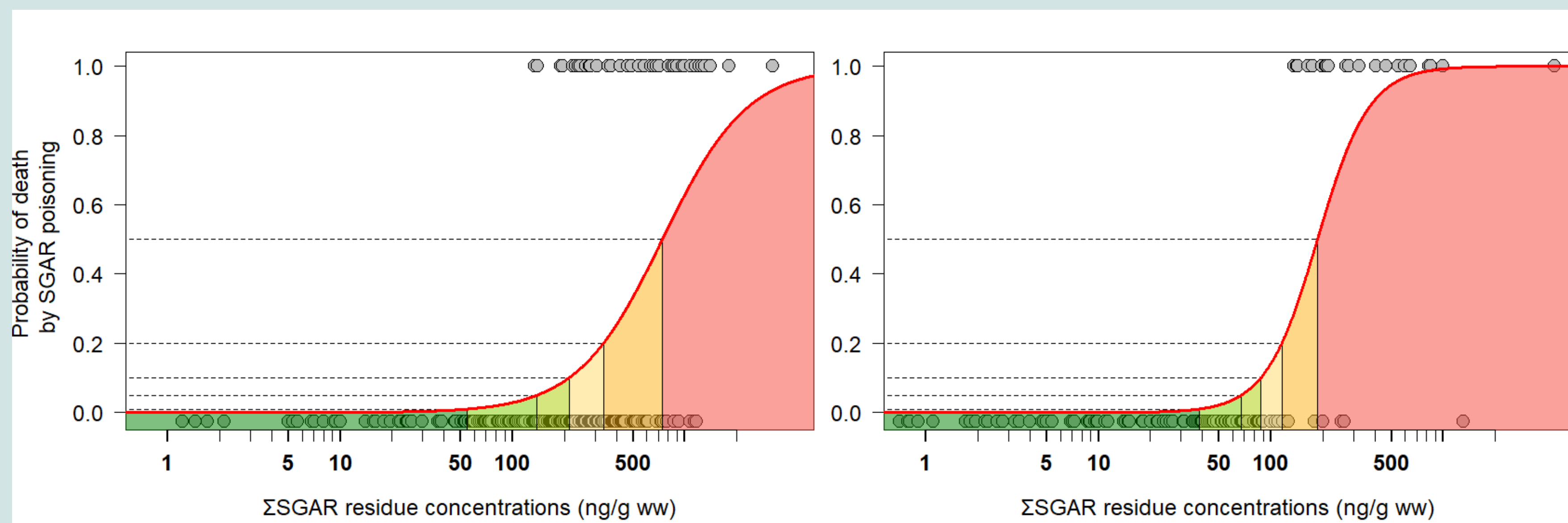


Figure 1. Probabilistic models demonstrating the probability of lethal SGAR poisoning and Σ SGAR concentrations in the liver for red kites (left) and buzzards (right) from GB.

SGAR threshold values

Probability of death by coagulopathy	Red kites (ng/g ww)	Buzzards (ng/g ww)
1%	54.2	38.2
5%	138.5	67.4
10%	211.9	87.2
20%	335.9	115.3
50%	738.7	185.8

Table. Σ SGAR concentrations in the liver of red kites and buzzards associated to the probability of lethal SGAR poisoning.

Discussion

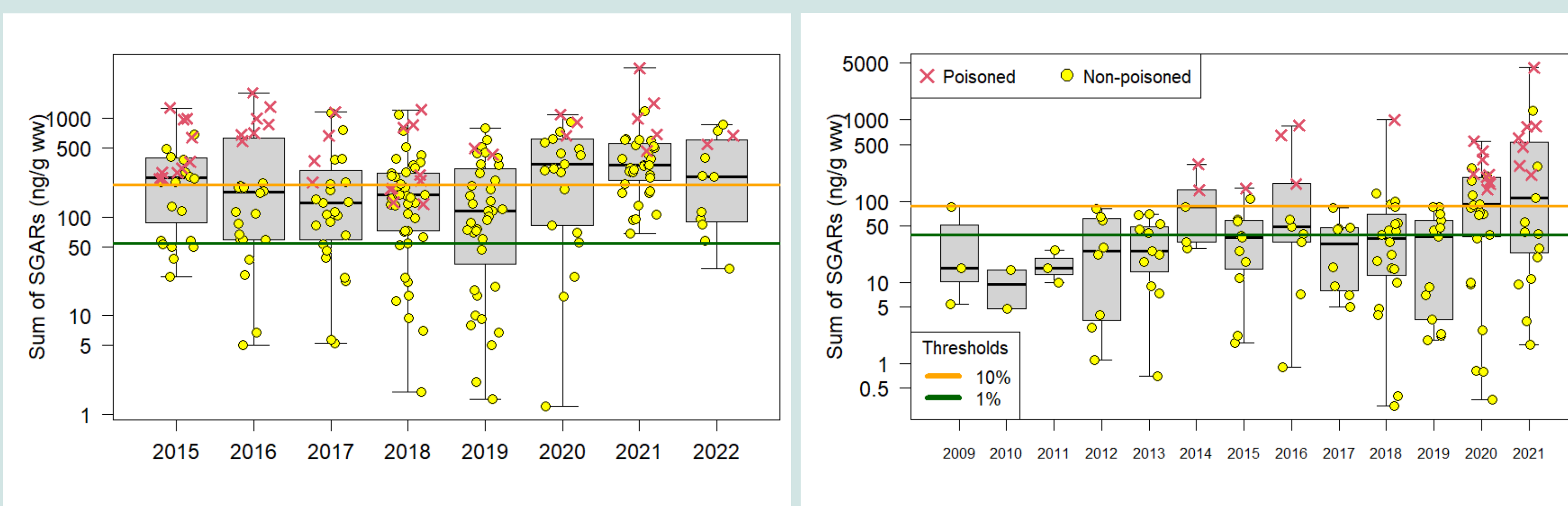


Figure 2. Σ SGAR concentrations in the liver of red kites (left) and buzzards (right) from GB and the thresholds for the 1% and 10% probabilities of lethal SGAR poisoning.

Threshold value between species

- Threshold values significantly differs between red kites and buzzards. Buzzards were more susceptible to SGAR toxicity than red kites.

Thresholds and poisoned birds

- **Red kites:** Birds with liver Σ SGARs of <100 ng/g ww were not lethally poisoned. Many birds with liver Σ SGARs >200 ng/g ww were also diagnosed as non-lethally poisoned.
- **Buzzards:** Birds with liver Σ SGAR of <100 ng/g ww were not lethally poisoned, but many birds with liver Σ SGAR >100 ng/g ww were lethally poisoned

Conclusion

There is an important discrepancy between the experiment-based threshold for a species and the field-observation-based threshold for another species. A large data-driven approach for each species, as demonstrated here, is therefore important for estimating the chemical effects and their thresholds.

References

- [1] R. F. Shore et al. (2005). Wildlife and Pollution: 2000/01 Annual Report. Centre for Ecology & Hydrology, JNCC Report 351.
- [2] S. Ozaki et al. (2026). Probabilistic approach reveals the toxicity threshold values of free-living raptors in Great Britain, United Kingdom, for the lethal effect of second-generation anticoagulant rodenticides. Environment International, vol. 208, p. 110099. doi: 10.1016/j.envint.2026.110099.