

MULTIVAR STATS IN ECOL AND GENETICS — EXERCISES, SHEET 3

1. Once more the RIKZ data: In the same data where ShannonW is given you also find a column “Richness” which is just the number of species found at each sample site. How does Richness depend on week, angle1, angle2, exposure, salinity, temperature, NAP, penetrability, grain-size, humus, chalk, sorting1 and Beach? Fit Poisson and quasipoisson models.

2. Collet¹ and Venables and Ripley² report an experiment to investigate the toxicity of trans-cyphemethrin to the tobacco budworm *Heliothis virescens*. Batches of 20 male and 20 female moths were exposed to different doses of trans-cyphemethrin for three days. The following table shows the numbers of dead or knocked down moths.

dose [μg]	1	2	4	8	16	32
male	1	4	9	13	18	20
female	0	2	6	10	12	16

How does the probability of a moth to be killed or knocked out depend on the dose and on the moth’s sex? Fit a logistic regression model. Check whether the model fit can be improved by rescaling the dose in an appropriate way. Present your final results graphically with 95% confidence bands.

3. The data file `TbDeerAndBoar.txt` contains data from a survey of Vicente et al.³, see also Zuur et al.⁴. Boars and deers on 32 farms in Spain were tested for tuberculosis (Tb) and for the parasite *Elaphostrongylus cervi*. The table contains the numbers of sampled individuals and the numbers of positively tested individuals on each farm. The other variables in the table describe the habitat: the percentage of open land, pine and scrubs plantation, density of quercus plants, density of quercus trees, a wild boar abundance index, a red deer abundance index, the size of the habitat in ha, and whether the habitat was fenced (1) or not (0).

How does the risk of a red deer / wild boar to be infected with tuberculosis / *Elaphostrongylus cervi* depend on the other variables?

¹Collet, D. (1991) *Modelling Binary Data*. Chapman & Hall, London.

²Venables, W.N., Ripley, B.D (2002) *Modern Applied Statistics with S, 4th ed.* Springer, New York.

³Vicente, J., Höfle, U., Garrido, J.M., Fernandez-de-Mera, I.G., Juste, R., Barralb, M., Gortazar, C. (2006) Wild boar and red deer display high prevalences of tuberculosis-like lesions in Spain. *Veterinary Research* **37**: 107–119

⁴Zuur, A.F., Ieno, E.N., Walker, N.J., Saveliev, A.A., Smith, G.M. (2009) *Mixed Effects Models and Extensions in Ecology with R*. Springer, New York.