A test for rapid assessment of saproxylic beetle biodiversity using subsets of "monitoring species"

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Saproxylic beetle richness reflects conservation value of forests[1]

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Identification of species is expensive and time-consuming

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A need for simple and rapid biodiversity assessment techniques (RBA)

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Use of species subsets as surrogates for total species richness

Subsets used

We built a large scale compiled dataset on saproxylic beetle richness (total of 856 species). It was based on 67 elementary datasets from France and Belgium, counting together 642 forest plots with total of 1521 traps. We defined 41 species subsets which could serve as potential surrogates. Here we present results for four of these subsets:

1. **identifiable** - subset made by eliminating species difficult to identify (615 species)
2. **german** – species present on German list of saproxylic monitoring species[2] (499 species)
3. **common** – common and widely distributed species (256 species)
4. **easy-to-identify** – species easy to identify (203 species).

Criteria

A good surrogate for total richness:

- should well reflect the variation in species richness (high correlation value)
- should not be sensitive to environment or sampling
- should not be sensitive to spatial scale
- should be easily applicable in practice

Correlation, environmental and methodological effects

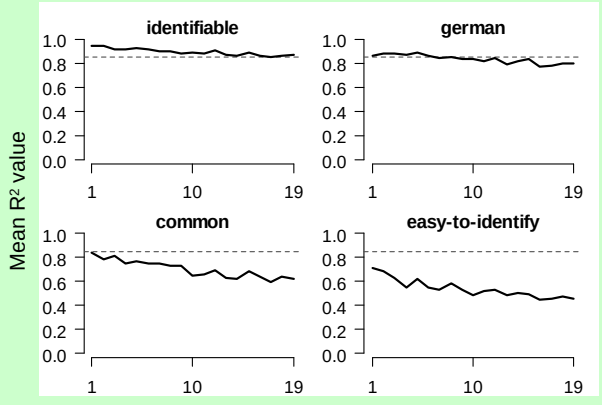
Correlation between total richness and richness of subset on the trap level based on R^2. The effects were tested by Poisson mixed-effects model. Dash sign (-) = prediction of subset is not affected; asterisks (*) = prediction is affected by the factor.

Subset	R^2	Environmental effects				Sampling
		Forest type	Altitude	Latitude	Clima	Bait
identifiable	**0.96**	*	-	-	-	**
german	**0.89**	***	-	-	-	-
common	**0.90**	-	-	***	***	-
easy-to-identify	**0.76**	-	-	-	-	*

Forest type = deciduous, mixed, coniferous; Altitude = higland, lowland; Latitude = north, south; Clima = alpine, atlantic, continental, mediterranean; Bait = baited trap, not baited trap

Scale effect

The R^2 value vs. increasing number of aggregated plots. Computed by randomization. Dashed line represents level of 85% of explained variation.



Evaluation

Evaluation of subset performance in different aspects: 1 = good (suitable in the aspect), 2 = average (but still sufficient), 3 = bad (not suitable in the aspect).

Proportion to identify refers to mean proportion of species being part of the subset in each trap, thus proportion of species to be identified in each trap (the lower the better), ***% easy-to-identify*** is percentage of species in subset that are easy to identify (the higher the better).

good / average / bad	identifiable	german	common	easy-to-identify
Correlation value	1	1	1	2
Sensitivity to environment	2	3	3	1
Sensitivity to sampling	2	1	1	2
Sensitivity to scale	1	2	3	3
Proportion to identify	3	3	3	1
% of easy-to-identify	2	3	3	1
Ranking	**2**	**3**	**4**	**1**

References:
[1] Grove 2002 – Saproxylic insect ecology and the sustainable management of forests. Annual Review of Ecology and Systematics 33: 1-23.
[2] Schmidl & Bussler 2004 – Ökologische Gilden xylobionter Käfer Deutschlands und ihr Einsatz in der landschaftsökologischen Praxis – ein Bearbeitungsstandard. Naturschutz und Landschaftsplanung 36: 202-218.

Conclusions: Despite the high sensitivity to spatial scale, the subset consisting of easy-to-identify species was the best performing subset. It gives high correlation value on per trap level, it's not sensitive to environmental gradients and it can be easily applicable in practice. However, attention has to be paid when assessing the true usefulness of subsets. Each of the aspect may play different role in different kinds of studies.

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