Experimental methodology for testing effects of variation in naturally structured fine fuel loads on fire intensity

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Write your abstract here.

Keywords: experiment, fire intensity, fuel load, fuel characteristics, Fire Aboveground Biomass Incineration Organizer

INTRODUCTION

1. Fuel characteristics - load (mass), structure, type, moisture, particle size - drive fire intensity and severity.

2. Studies in fire ecology that experimentally manipulate fuel characteristics often only change the fuel load and/or type of fuel, sacrificing some realism in fuel structure.

3. We present a methodology for maintaining realism in fuel structure in experiments where fine fuels with typical vertical structure, e.g. grasses, are manipulated.

4. We demonstrate how the Fire Aboveground Biomass Incineration Organizer (FABIO) maintains realistic fuel structure while experimentally manipulating other fuel characteristics.

Compare Temperature Metrics to Bowman et al. 2017

(Bowman 2017) *Differential demographic filtering by surface fires: How fuel type and fuel load affect sapling mortality of an obligate seeder savanna tree.*

In this study, “Grass fuels had to be laid horizontally rather than standing vertically.” The context provided is that the native sorghum flattens easily after it dries and does not remain vertical throughout the dry season.

```
- This reads like a response to a reviewer comment, which might indicate a gap that the FABIO
```

```
- Average flame height was measured "when the fire was within 15cm of the tree stem using a me
```

Additional references given where fuels have been laid flat when testing flammability:

1. (JAUREGUIBERRY et al. 2011)
2. (Simpson 2016)
3. (Conard et al. 2016)

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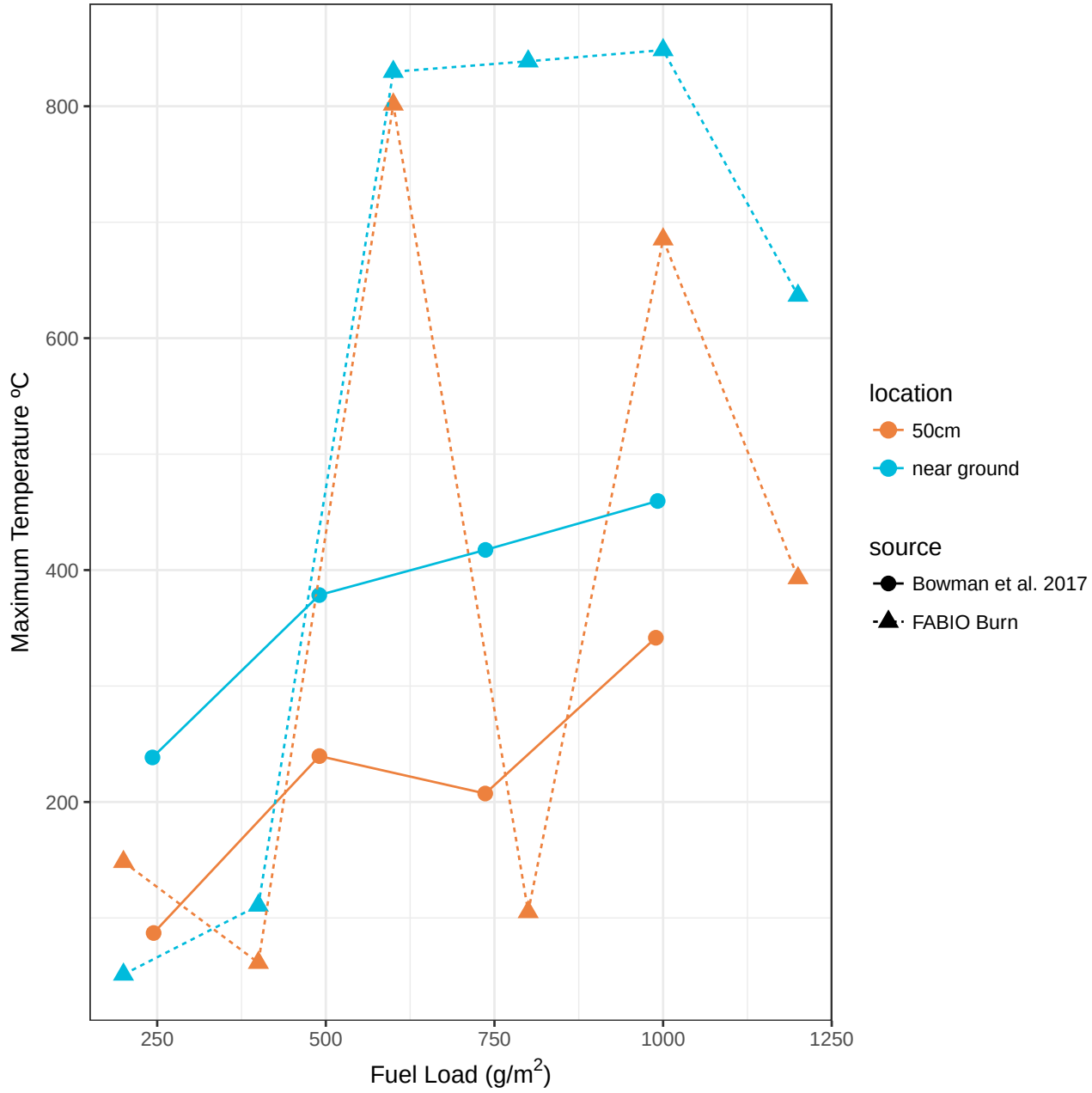


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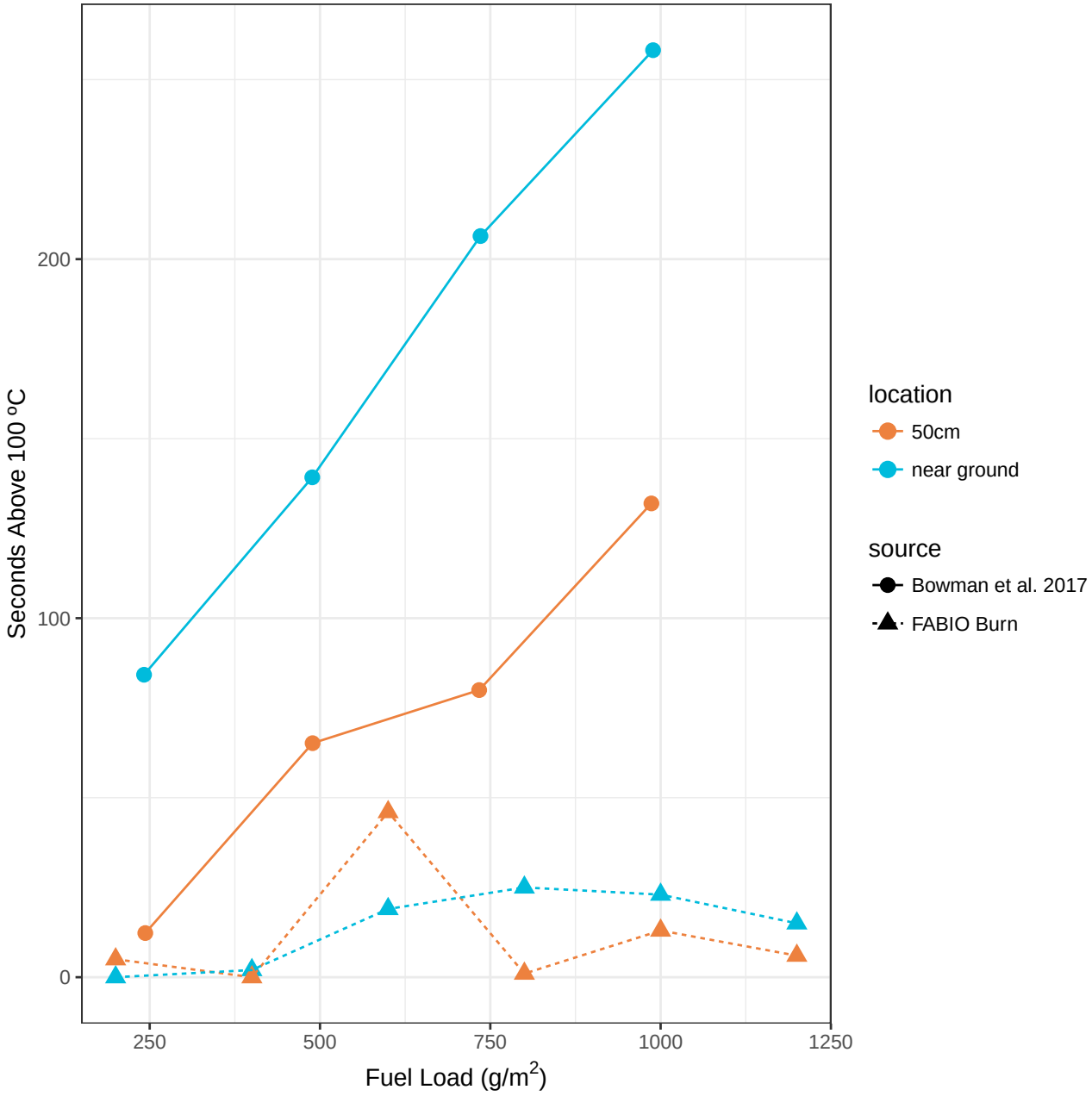

Write your introduction here. You can cite bibliography like this (Yan and Gerstein 2011, Sutherland et al. 2011), if you provide a `BibTeX` file with references. See http://rmarkdown.rstudio.com/authoring_bibliographies_and_citations.html for more information. Or you could also use knitcitations or RefManageR to fetch bibliographic metadata automatically from the web. For example, citing a paper can be as easy as providing its DOI (Clark and Gelfand 2006) or even just a few keywords (Ricklefs 2008). They will then automagically appear in the list of cited

references.

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METHODS

Study Area

We worked in a **beautiful** place with lots of trees, like *Quercus suber* and *Laurus nobilis*.

Data collection and analysis

We applied a linear model where

$$y_i = \alpha + \beta * x_i$$

We used the statistical language `R` (R Core Team 2017) for all our analyses. These were implemented in dynamic rmarkdown documents using `knitr` (Xie 2014, 2015, 2017) and `rmarkdown` (Allaire et al. 2017) packages. All the multilevel models were fitted with `lme4` (Bates et al. 2015).

RESULTS

Trees in forest A grew taller than those in forest B (mean height: 25 versus 13 m). And many more cool results that get updated dynamically.

DISCUSSION

Discuss.

CONCLUSIONS

ACKNOWLEDGEMENTS

REFERENCES

Allaire, J., J. Cheng, Y. Xie, J. McPherson, W. Chang, J. Allen, H. Wickham, A. Atkins, R. Hyndman, and R. Arslan. 2017. Rmarkdown: Dynamic documents for r.

Bates, D., M. Mächler, B. Bolker, and S. Walker. 2015. Fitting linear mixed-effects models using lme4. Journal of Statistical Software 67:1–48.

Bowman, J. P. 2017. Contributions to microbial systematics and ecology. PhD thesis, University of Queensland Library.

Clark, J. S., and A. E. Gelfand. 2006. A future for models and data in environmental science. Trends in Ecology & Evolution 21:375–380.

Conard, S. G., S. Doerr, and J. Foster. 2016. Twenty-five years of international journal of wildland fire. International Journal of Wildland Fire 25:i.

JAUREGUIBERRY, P., G. BERTONE, and S. DÍAZ. 2011. Device for the standard measurement of shoot flammability in the field. Austral Ecology 36:821–829.

R Core Team. 2017. R: A language and environment for statistical computing. R Foundation for

Statistical Computing, Vienna, Austria.

Ricklefs, R. E. 2008. Disintegration of the ecological community. The American Naturalist 172:741–750.

Simpson, C. 2016. Understanding macroevolution through the origin of higher taxa. Ecology 97:3246–3248.

Sutherland, W. J., D. Goulson, S. G. Potts, and L. V. Dicks. 2011. Quantifying the impact and relevance of scientific research. PLoS ONE 6:e27537.

Xie, Y. 2014. Knitr: A comprehensive tool for reproducible research in R. *in* V. Stodden, F. Leisch, and R. D. Peng, editors. Implementing reproducible computational research. Chapman; Hall/CRC.

Xie, Y. 2015. Dynamic documents with R and knitr. 2nd editions. Chapman; Hall/CRC, Boca Raton, Florida.

Xie, Y. 2017. Knitr: A general-purpose package for dynamic report generation in r.

Yan, K.-K., and M. Gerstein. 2011. The spread of scientific information: Insights from the web usage statistics in plos article-level metrics. PLoS ONE 6:e19917.

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Table 1: A glimpse of the famous *Iris* dataset.

Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
5.1	3.5	1.4	0.2	setosa
4.9	3.0	1.4	0.2	setosa
4.7	3.2	1.3	0.2	setosa
4.6	3.1	1.5	0.2	setosa
5.0	3.6	1.4	0.2	setosa
5.4	3.9	1.7	0.4	setosa

Table 2: Now a subset of mtcars dataset.

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Merc 280	19.2	6	167.6	123	3.92	3.440	18.30	1	0	4	4
Merc 280C	17.8	6	167.6	123	3.92	3.440	18.90	1	0	4	4
Merc 450SE	16.4	8	275.8	180	3.07	4.070	17.40	0	0	3	3
Merc 450SL	17.3	8	275.8	180	3.07	3.730	17.60	0	0	3	3
Merc 450SLC	15.2	8	275.8	180	3.07	3.780	18.00	0	0	3	3
Cadillac Fleetwood	10.4	8	472.0	205	2.93	5.250	17.98	0	0	3	4
Lincoln Continental	10.4	8	460.0	215	3.00	5.424	17.82	0	0	3	4

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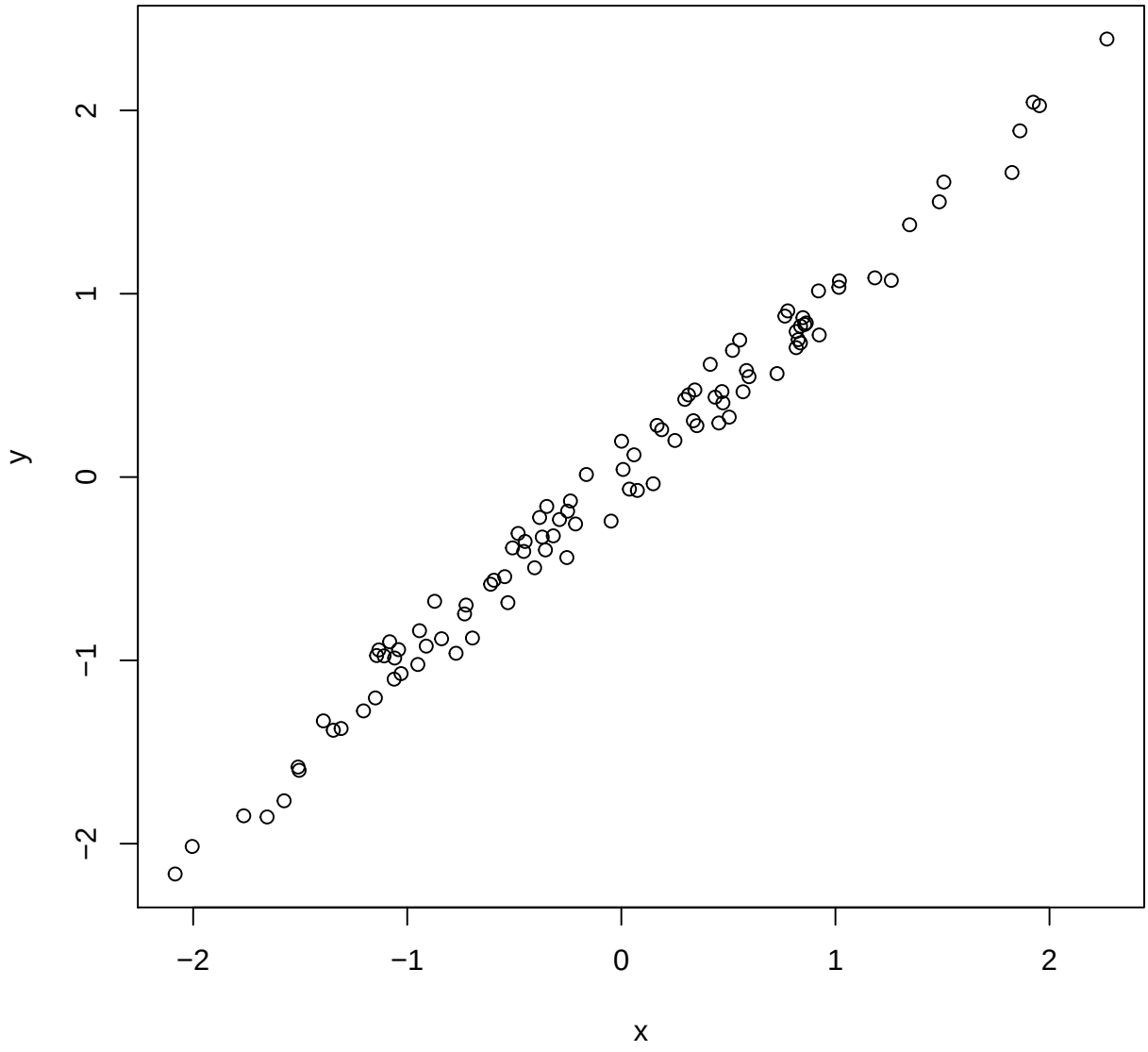

Figure 1: Just my first figure with a very fantastic caption.

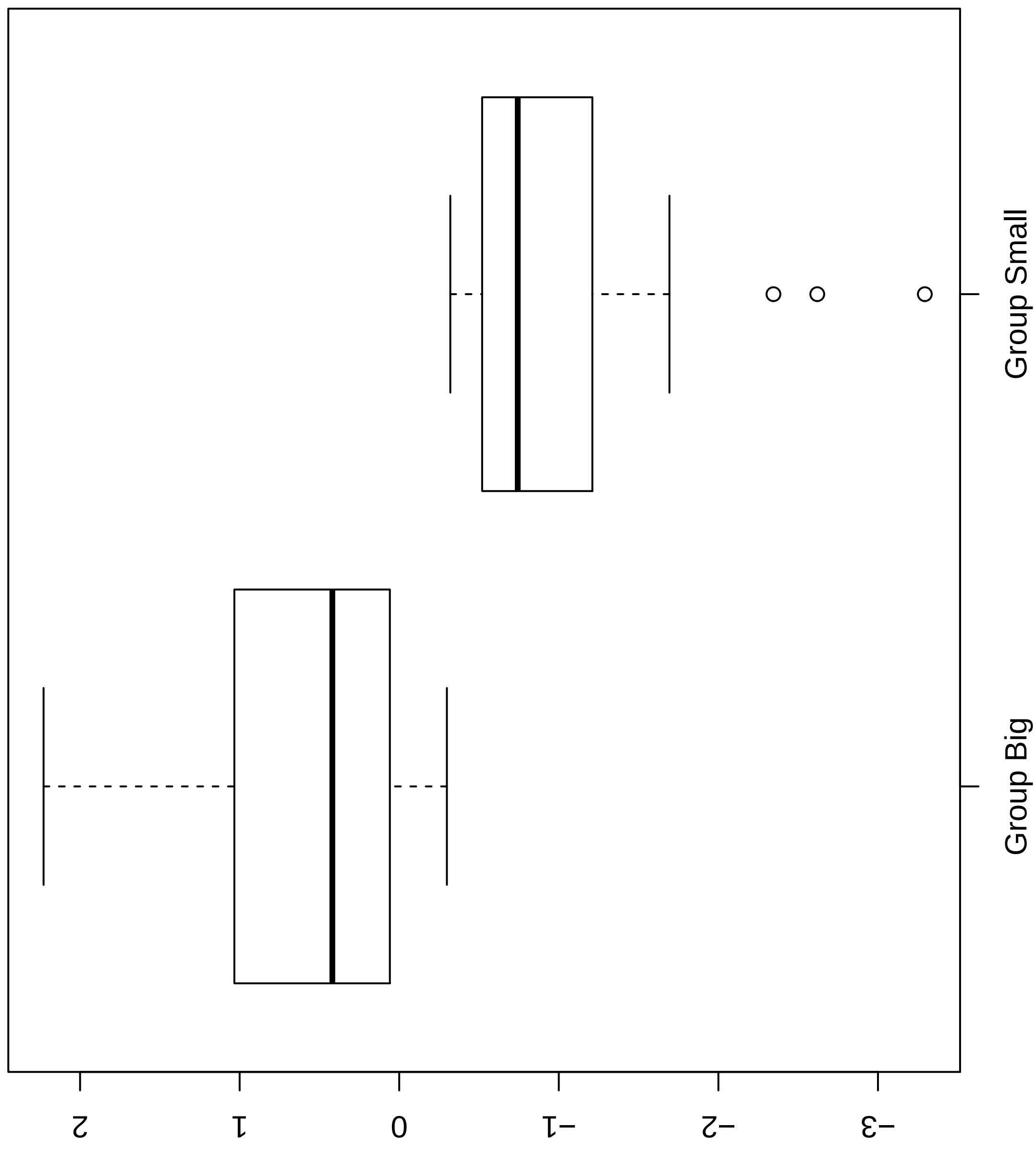

Figure 2: Second figure in landscape format.