Supplementary Methods and Figures for:

Michener's Group-Size Paradox in Cooperatively Breeding Birds

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Supplementary Methods

Prior specification and model convergence

I used inverse Wishart priors (variance = 1 and belief parameter = 0.002) for random effects and model convergence was assessed by evaluating chain mixing through traces of posterior distributions, by examining autocorrelation between iterations, and by comparing within- and between-chain variance. Full details are provided in the R code.

Quadratic effects

There were obvious visual quadratic effects of group size on total reproductive success in 4/26 species examined here. In red-winged fairywrens, laughing kookaburras, Seychelles warblers, and Florida scrub jays, reproductive success initially increased with group size, but declined rapidly when groups reached a critical size (between five and seven group members, Figure S2). Quadratic effects may exist in the other sampled species but are presumably difficult to detect given that large groups are rare. I chose not to model quadratic effects because they were evident in a minority of species and my principal focus is on per capita reproductive success and quadratic effects result in even lower per capita reproductive success since fewer offspring are being divided between more individuals (Figure S1).

Study effort (part C in the R code)

The number of groups studied per species varied from 40 in the pied kingfisher to 9092 in the red-cockaded woodpecker. To account for these differences in study effort, I re-fit the MCMC models described above with each observation of the response variable weighted by its inverse sample size (calculated as 1/N, where N is the sample size associated with each observation) (R code models: *rs_pc_rs_modCA, rs_t_rs_modCA, rs_pc_rs_modCB, rs_t_rs_modCB*). Note, however, that the fact there are few large groups in most species is partly due to biological processes and not just sampling bias. The results from these models are reported in Table S3 and in all cases they are consistent with the unweighted models.

Supplementary Figures

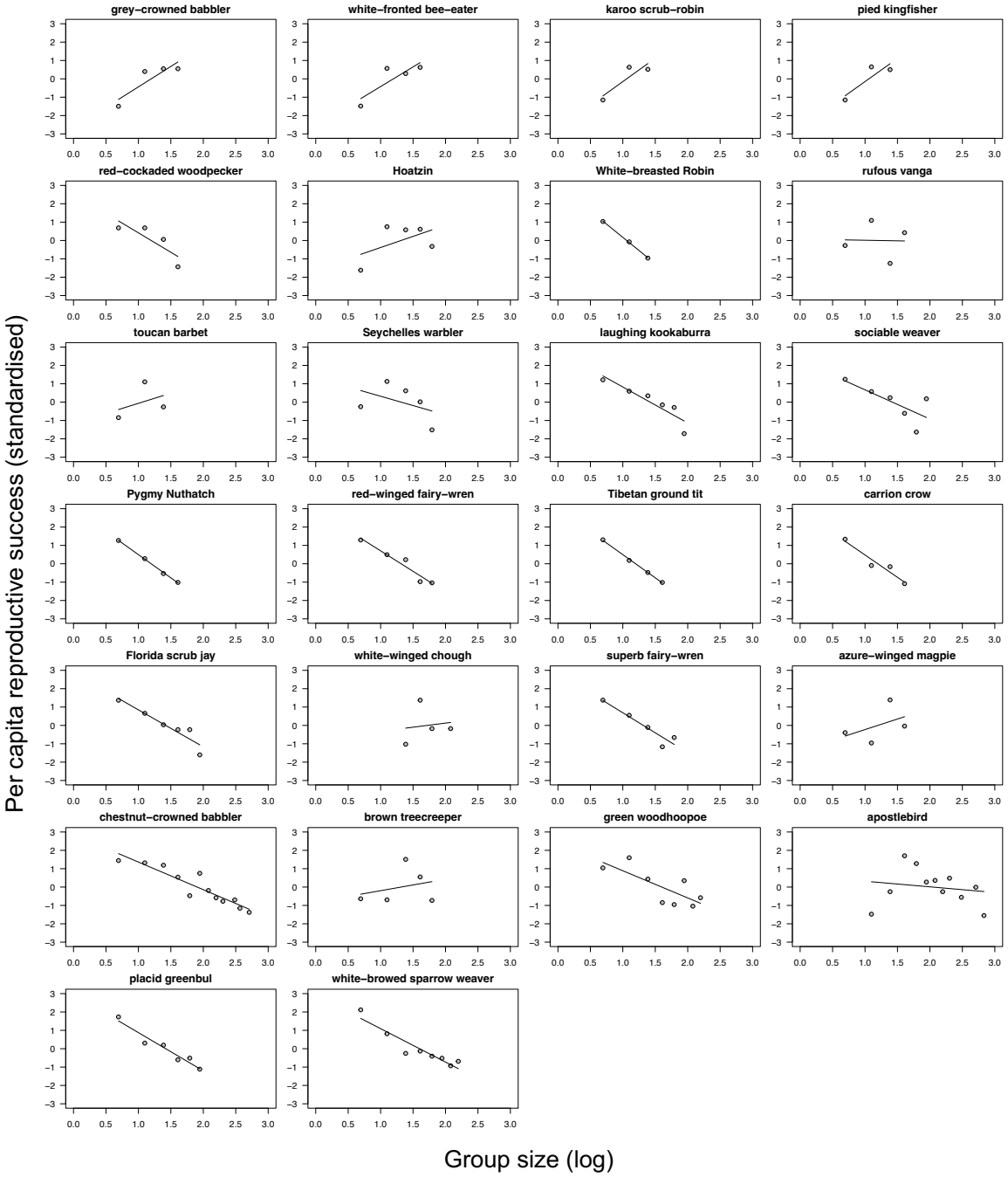

Figure S1. The relationship between standardised per capita reproductive success and (log) group size in 26 species of cooperatively breeding birds.

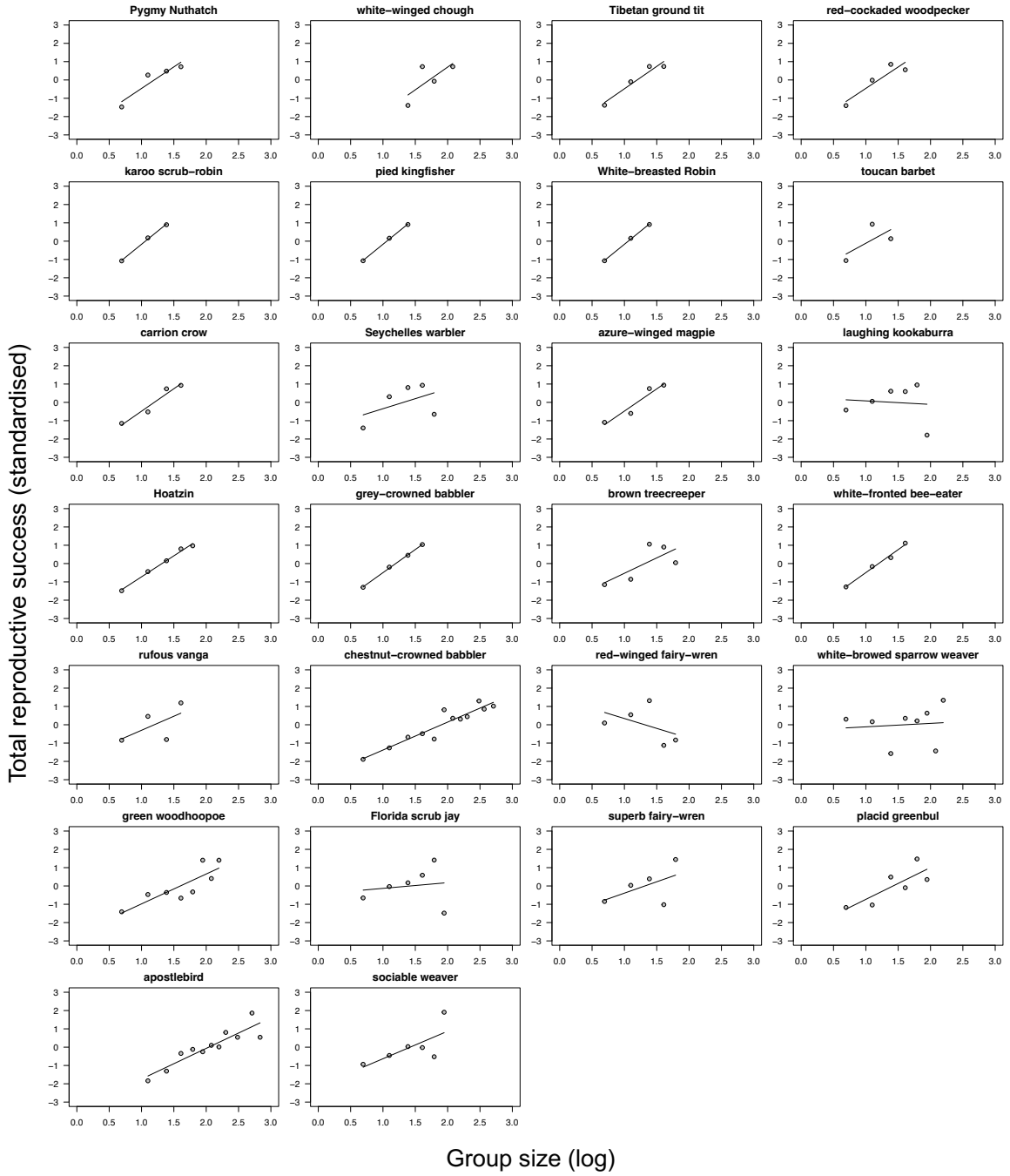

Figure S2. The relationship between standardised total reproductive success and (log) group size in 26 species of cooperatively breeding birds.

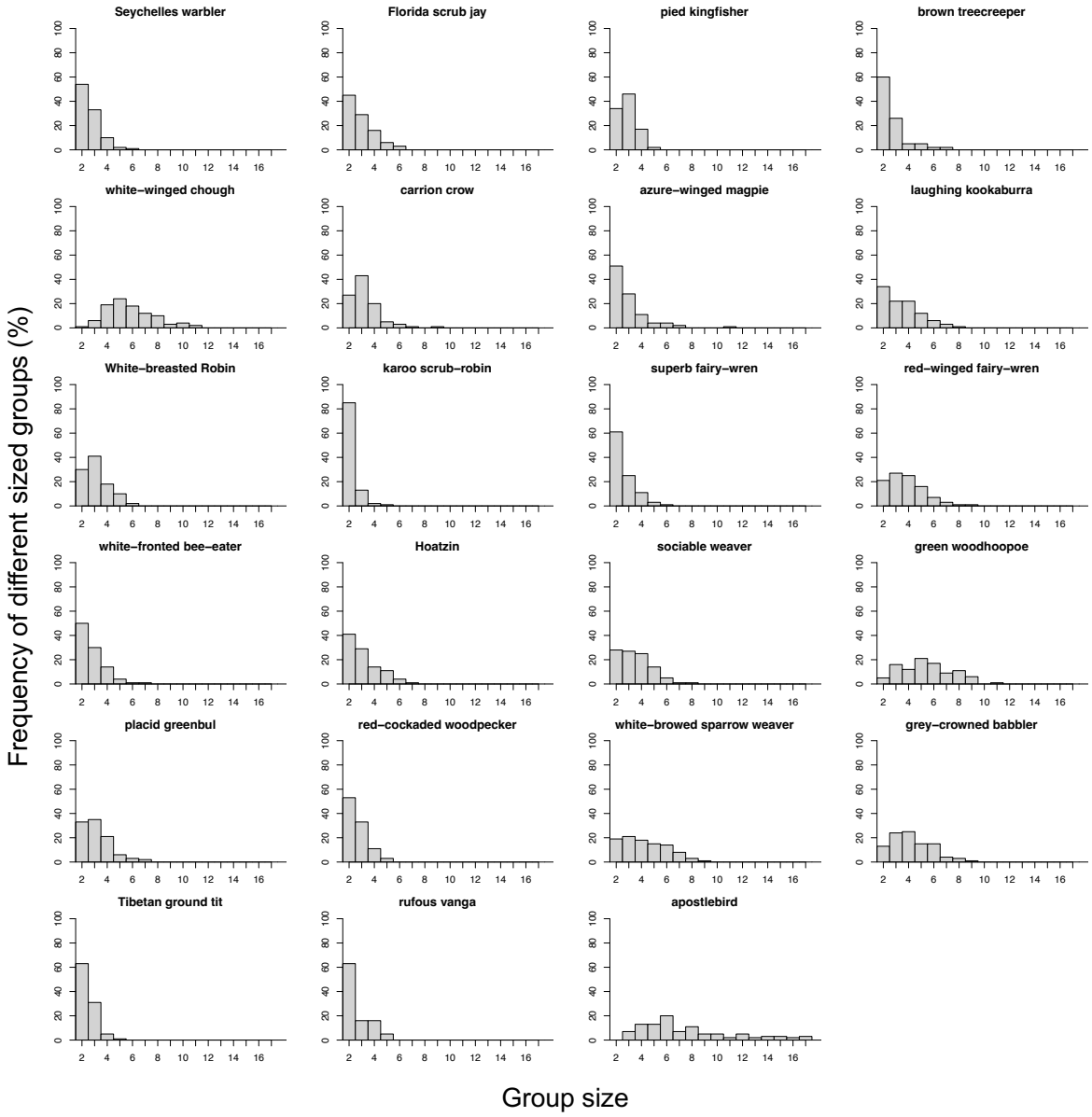

Figure S3. The frequency of different group sizes (%) in 23 species of cooperatively breeding birds.

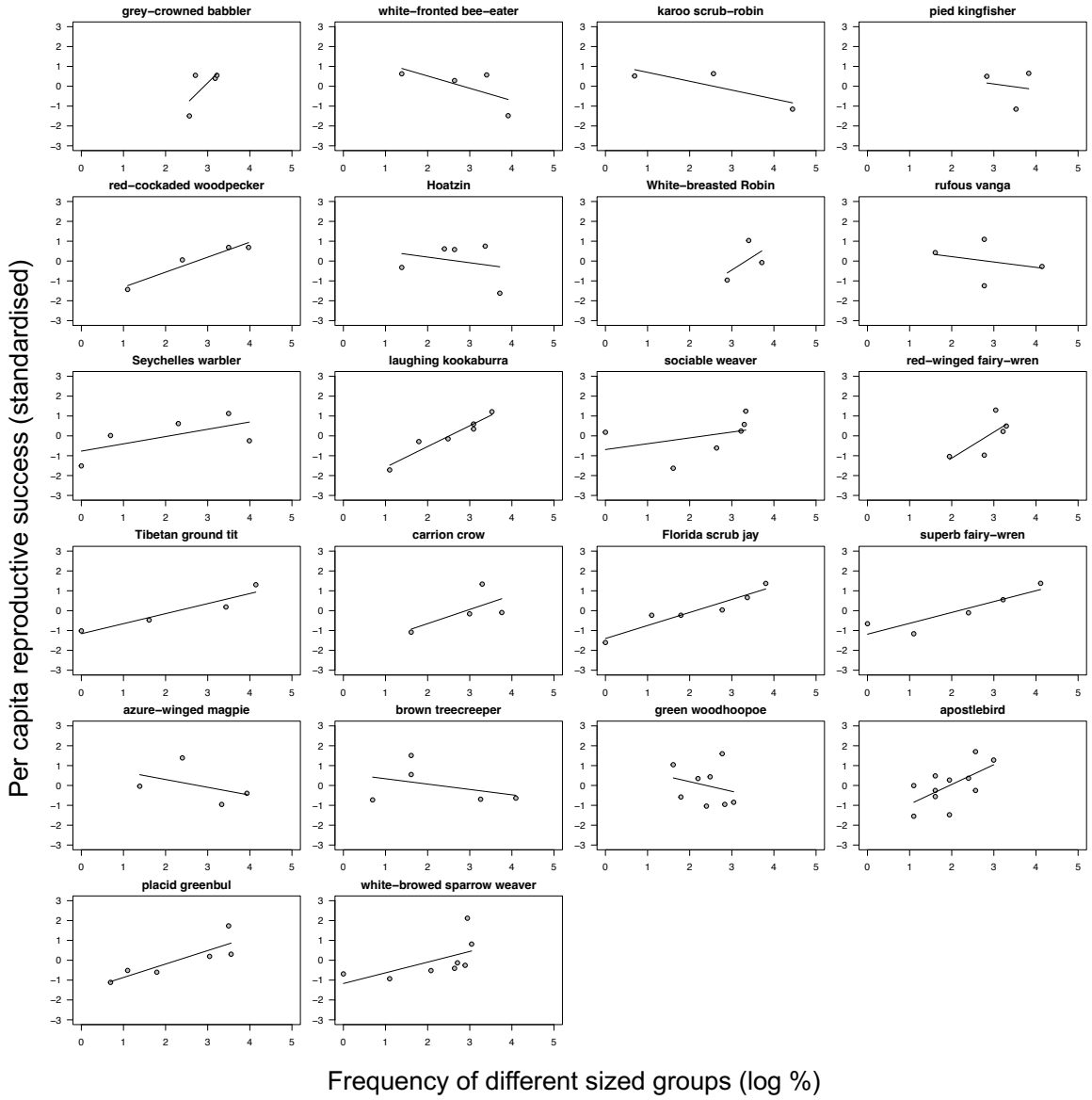

Figure S4. The relationship between standardised per capita reproductive success and the (log) percentage of different sized groups (%) in 22 species of cooperatively breeding birds.

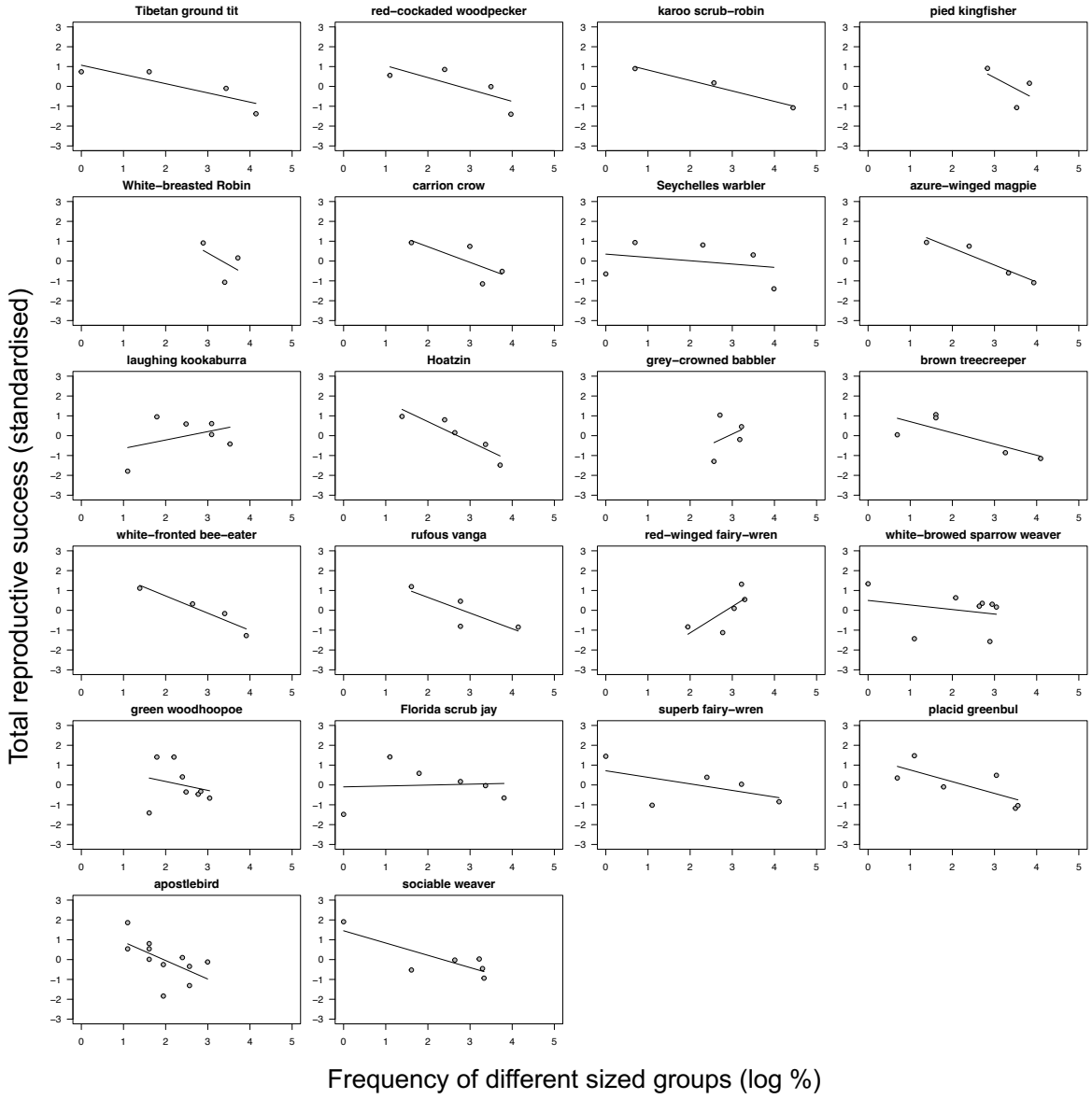

Figure S5. The relationship between standardised total reproductive success and the (log) percentage of different sized groups (%) in 22 species of cooperatively breeding birds.