

**Supplemental figure 1.** Molecular structure of the complex sex chromosome complement in *S. araneus* and *S. granarius* revealed by chromosome painting. Localization of the probe X (blue line) of *S. granarius* on *S. araneus* chromosomes; probe Y2 (green line) of *S. araneus* and probe Y1 (red line) of *S. araneus*. The X chromosome probes of *S. araneus* and *S. granarius* each painted in addition to X chromosomes (**de**) of both species and the long arm (**d**) of SAR Y2, the small distal segment on SAR Y1. The *S. araneus* Y2 (**d**) painting probe also marked the small proximal segment on the true Y-chromosome SAR Y1 as well as the expected SAR Y2 and its homolog on SAR X (**d**). The Y-chromosome painting probe (SAR Y1) painted in addition to the Y-chromosome a segment on the distal part of the short arm of X chromosome (**e**) in both species, a small part of SARY2 and an additional segment on the proximal part of the p-arm of *S. granarius* X.

