

Large manipulative experiments revealed variations of insect abundance and trophic levels in response to the cumulative effects of sheep grazing

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Table S1 Descriptions of plant community composition and plant species importance values at five grazing levels in the experimental site.

| Plant species                    | Importance value |       |       |       |       |
|----------------------------------|------------------|-------|-------|-------|-------|
|                                  | CK               | LG    | MG    | HG    | OG    |
| <i>Leymus chinensis</i>          | 0.425            | 0.359 | 0.225 | 0.314 | 0.238 |
| <i>Stipa grandis</i>             | 0.060            | 0.046 | 0.098 | 0.067 | 0.075 |
| <i>Cleistogenes squarrosa</i>    | 0.075            | 0.078 | 0.100 | 0.179 | 0.058 |
| <i>Chenopodium glaucum</i>       | 0.118            | 0.174 | 0.234 | 0.268 | 0.233 |
| <i>Carex korshinskyi</i>         | 0.062            | 0.098 | 0.108 | 0.154 | 0.105 |
| <i>Salsola collina</i>           | 0.016            | 0.044 | 0.051 | 0.079 | 0.071 |
| <i>Koeoeria cristata</i>         | 0.007            | 0.000 | 0.000 | 0.000 | 0.000 |
| <i>Allium anisopodium</i>        | 0.015            | 0.026 | 0.020 | 0.011 | 0.021 |
| <i>Allium bidentatum</i>         | 0.006            | 0.000 | 0.000 | 0.000 | 0.010 |
| <i>Allium tenuissimum</i>        | 0.014            | 0.008 | 0.020 | 0.000 | 0.021 |
| <i>Allium ramosum</i>            | 0.007            | 0.008 | 0.011 | 0.000 | 0.010 |
| <i>Artemisia annua</i>           | 0.020            | 0.022 | 0.000 | 0.011 | 0.000 |
| <i>Astragalus galactites</i>     | 0.007            | 0.008 | 0.010 | 0.011 | 0.011 |
| <i>Chenopodium aristatum</i>     | 0.008            | 0.012 | 0.041 | 0.012 | 0.012 |
| <i>Melissitus ruthenica</i>      | 0.013            | 0.017 | 0.010 | 0.032 | 0.000 |
| <i>Iris tenuifolia</i>           | 0.006            | 0.000 | 0.000 | 0.000 | 0.010 |
| <i>Gueldenstaedtia verna</i>     | 0.007            | 0.000 | 0.000 | 0.000 | 0.000 |
| <i>Thalictrum aquilegifolium</i> | 0.000            | 0.000 | 0.010 | 0.011 | 0.010 |
| <i>Carpesium abrotanoides</i>    | 0.013            | 0.029 | 0.020 | 0.022 | 0.010 |
| <i>Axyris amaranthoides</i>      | 0.006            | 0.000 | 0.000 | 0.000 | 0.010 |
| <i>Heteropappus altaicus</i>     | 0.008            | 0.001 | 0.000 | 0.000 | 0.000 |
| <i>Potentilla tanacetifolia</i>  | 0.006            | 0.000 | 0.000 | 0.000 | 0.000 |
| <i>Artemisia sieversiana</i>     | 0.000            | 0.017 | 0.000 | 0.000 | 0.010 |
| <i>Dontostemon</i>               | 0.000            | 0.010 | 0.010 | 0.000 | 0.000 |
| <i>Setaria viridis</i>           | 0.000            | 0.008 | 0.000 | 0.001 | 0.000 |
| <i>Cynanchum thesiodes</i>       | 0.000            | 0.008 | 0.000 | 0.000 | 0.000 |
| <i>Orostachys fimbriata</i>      | 0.000            | 0.008 | 0.000 | 0.000 | 0.000 |
| <i>Melilotus suaveolens</i>      | 0.000            | 0.009 | 0.000 | 0.000 | 0.000 |
| <i>Potentilla acaulis</i>        | 0.000            | 0.000 | 0.010 | 0.000 | 0.000 |
| <i>Achnatherum sibiricum</i>     | 0.000            | 0.000 | 0.013 | 0.000 | 0.000 |
| <i>Artemisia frigida</i>         | 0.000            | 0.008 | 0.021 | 0.001 | 0.031 |
| <i>Potentilla bifurca</i>        | 0.000            | 0.000 | 0.000 | 0.000 | 0.010 |

Table S2 Correlations between vegetation variables and grazing intensities

| Vegetation variables | Cover  | Biomass | Height | Density  |
|----------------------|--------|---------|--------|----------|
| <i>r</i>             | -0.799 | -0.909  | -0.942 | -0.07617 |
| <i>P</i> value       | 0.0004 | <.0001  | <.0001 | 0.7873   |

Table S3 Correlations between plant variables and insect groups

| Variables |                | Formicidae | Acrididae | Cicadellidae | Primary consumer | Secondary consumer |
|-----------|----------------|------------|-----------|--------------|------------------|--------------------|
| Cover     | <i>r</i>       | 0.30948    | 0.49879   | 0.65558      | 0.58716          | 0.5778             |
|           | <i>P</i> value | 0.2617     | 0.0584    | 0.008        | 0.0214           | 0.0241             |
| Biomass   | <i>r</i>       | 0.02354    | 0.59694   | 0.68374      | 0.61999          | 0.671              |
|           | <i>P</i> value | 0.9336     | 0.0188    | 0.0049       | 0.0137           | 0.0062             |
| Height    | <i>r</i>       | 0.12961    | 0.71274   | 0.72823      | 0.71564          | 0.71438            |
|           | <i>P</i> value | 0.6453     | 0.0029    | 0.0021       | 0.0027           | 0.0028             |
| Density   | <i>r</i>       | 0.25251    | 0.31363   | 0.35154      | 0.25617          | 0.37534            |
|           | <i>P</i> value | 0.3639     | 0.255     | 0.1988       | 0.3568           | 0.168              |

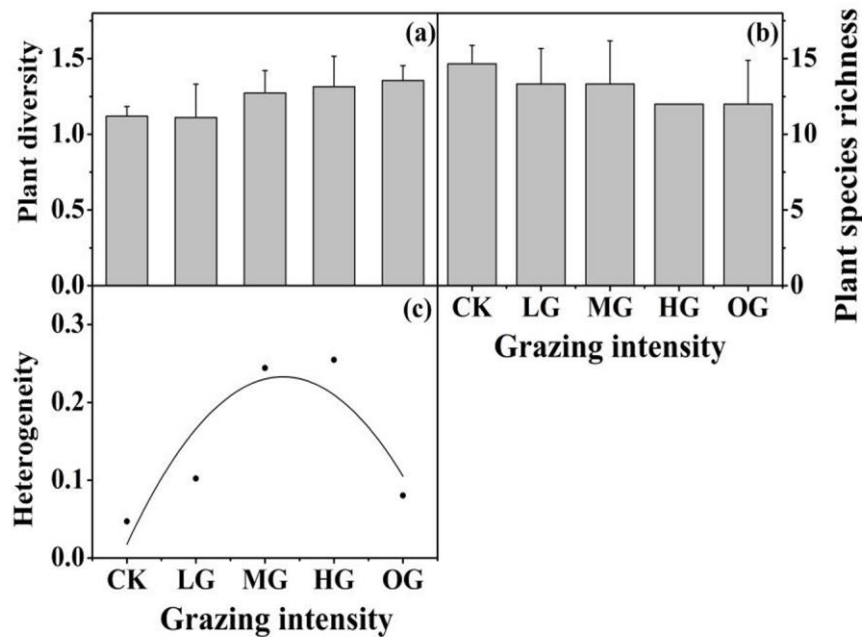


Fig. S1 Effects of grazing intensities on plant diversity, plant species richness and vegetation structure heterogeneity. Values represent means  $\pm$  SE. Different lowercase letters above the bars indicate that values differ significantly between altered grazing intensities at  $P < 0.05$ .