Appendix S1

Rarefaction

We used individual-based rarefaction (Gotelli & Colwell, 2001) to evaluate whether the relationship of insect species richness and plant richness was solely driven by changing abundances of the insect groups. We rarefied plot-level abundances of aphids, primary parasitoids, hyperparasitoids and mummy parasitoids to 2 individuals per group and then analysed the resulting rarefied richness in the same way as original species richness (see *Data analysis* in the main text). Rarefied richness was computed with the Vegan package version 1.15-4 (Oksanen *et al.*, 2009) in R version 2.9.2 (R Development Core Team, http://www.r-project.org). The rarefaction procedure for the function "rarefy" in Vegan is based on the formulation by Hurlbert (1971).

The relationships of rarefied insect species richness with plant richness were somewhat weaker (primary parasitoids) or similar (the other groups, Fig. S3, Table S3) compared with results from analyses of the original richness, indicating that densities had an effect on species richness (see also Fig. 7) but were not the only driver of changes in insect species richness along the plant richness gradient.

Figures:

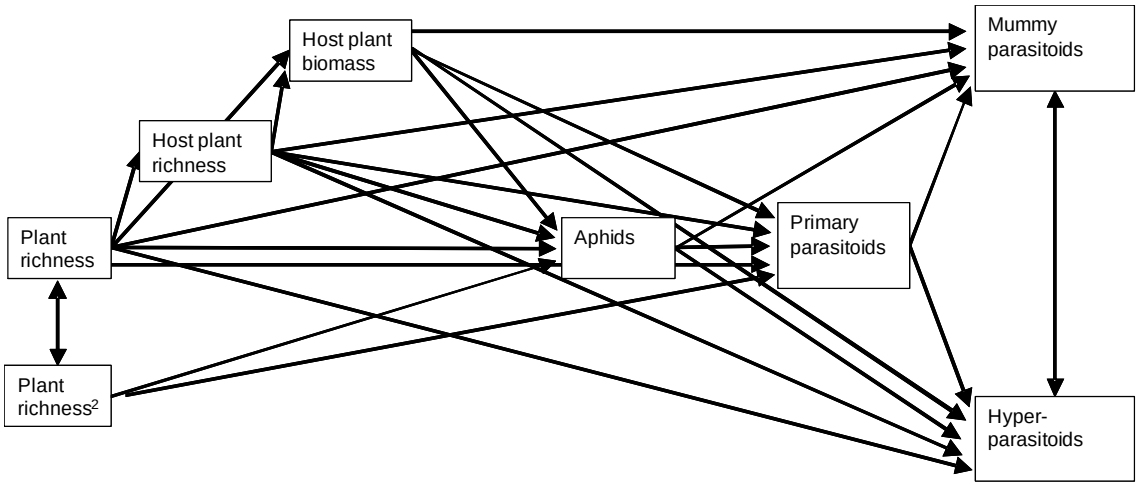
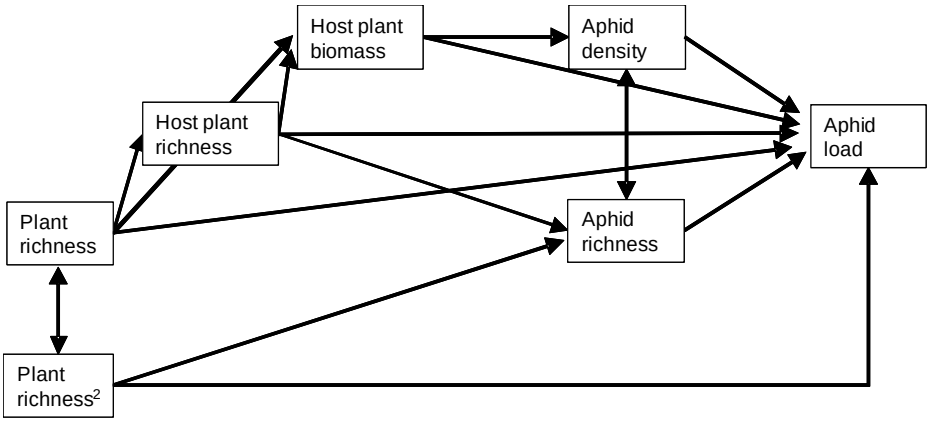


Fig. S1: Initial *a priori* model for effects of plant richness on insect densities or insect species richness. Insect densities and richness were square-root transformed. Double-headed arrows indicate covariance. The final most parsimonious model for species densities is presented in Fig. 5a, the final most parsimonious model for species richness in Fig. 5b.

a



b

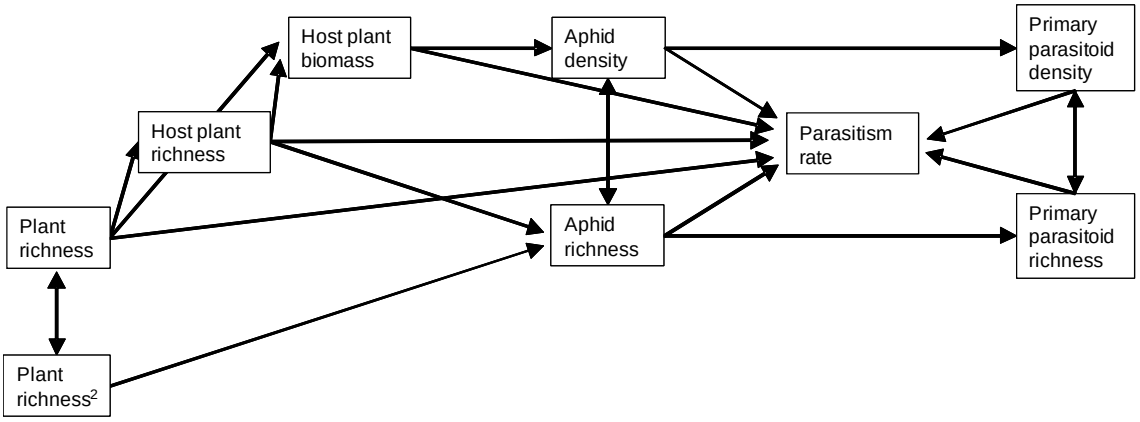


Fig. S2: Initial *a priori* model for effects of plant richness on a) aphid load (aphid individuals per host plant biomass) and b) parasitism rate (proportion of parasitized aphids). Insect densities and species richness were square-root transformed, aphid load and parasitism rate were arcsine-square-root transformed. Double-headed arrows indicate covariance. The final most parsimonious models are presented in Fig. 6.

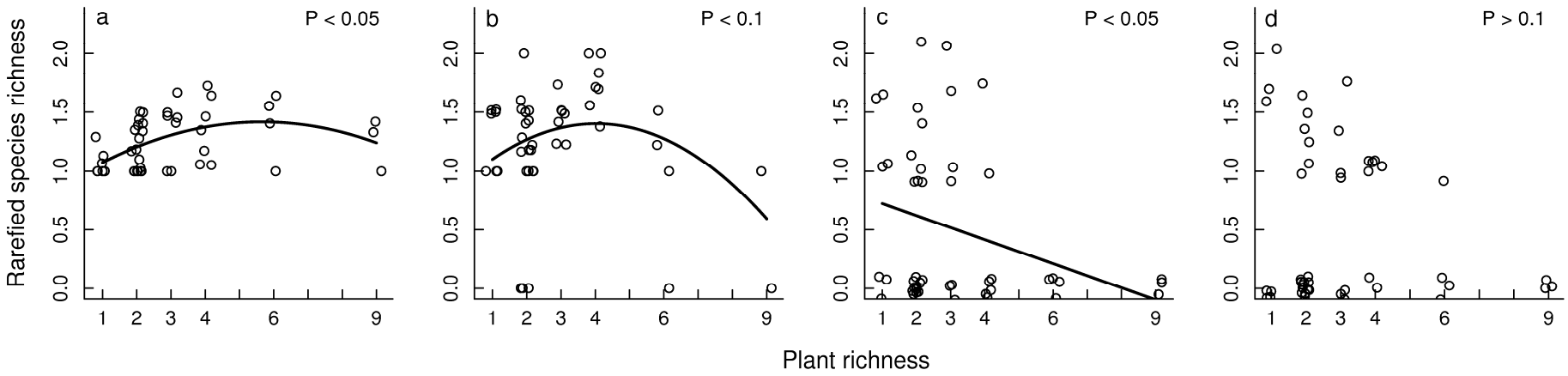


Fig. S3: Rarefied species richness of a) aphids, b) primary parasitoids and secondary parasitoids (c)hyperparasitoids and d) mummy parasitoids) as a function of plant richness in the plots. Fitted lines are drawn for relationships significant at P<0.1. Untransformed data are shown but P-values refer to transformed data. For statistical analyses see Table S3.

Tables:

Table S1: List of all 47 sampled plots with their block number, plot number, composition code, plant species richness, the presence of legumes, the presence of the nine plant species in the plant assemblage and the total host plant biomass (sum across all host plant species and both harvests in 2006). In some cases, replicate plots with the same plant composition were used (same composition codes). The presence of a plant species refers to its presence in the seed mixture at plot establishment in 2002, independent of its actual abundance through 2006. Only the first four plant species hosted aphids in our study. *Ant*: *Anthriscus sylvestris*, *Arr*: *Arrhenatherum elatius*, *Phl*: *Phleum pratense*, *Tri p*: *Trifolium pratense*, *Alo*: *Alopecurus pratensis*, *Dac*: *Dactylis glomerata*, *Ger*: *Geranium pratense*, *Poa*: *Poa trivialis*, *Tri r*: *Trifolium repens*.

Block	Plot	Composition code	Species richness	Legume presence	*Ant*	*Arr*	*Phl*	*Tri p*	*Alo*	*Dac*	*Ger*	*Poa*	*Tri r*	Host plant biomass
2	86	S01M21	1		1									499.8
4	62	S01M21	1		1									356.7
3	57	S01M22	1			1								384.7
4	48	S01M22	1			1								374.2
2	8	S01M44	1				1							326.95
3	11	S01M44	1				1							199.65
2	20	S01M60	1	1				1						505.25
4	24	S02M18	2			1			1					101.35
1	92	S02M19	2		1	1								314.9
1	9	S02M24	2		1						1			37.11
4	54	S02M25	2			1					1			234.25
2	63	S02M27	2				1		1					48.55
3	9	S02M28	2		1		1							476.15
2	19	S02M29	2			1	1							680.95
3	33	S02M31	2				1				1			137.2
1	12	S02M37	2				1					1		406.3
4	2	S02M38	2	1				1	1					23.4
3	1	S02M39	2	1	1			1						858.15
1	39	S02M40	2	1		1		1						631.45
4	32	S02M41	2	1				1		1				32.16
3	28	S02M42	2	1				1			1			116.3
2	82	S02M43	2	1			1	1						513.1
2	69	S02M44	2	1				1				1		165.6
2	18	S02M46	2	1	1								1	309.15
2	25	S02M47	2	1		1							1	394.35
4	19	S02M50	2	1			1						1	273.3
3	75	S03M05	3			1	1				1			399.6
4	56	S03M13	3	1	1			1			1			290.79
1	41	S03M15	3	1		1	1	1						743.25
4	50	S03M15	3	1		1	1	1						271.45
4	35	S03M16	3	1	1			1				1		556.95
2	46	S03M20	3	1	1						1		1	435.85
4	43	S03M21	3	1			1				1		1	359.3
1	17	S04M20	4		1	1	1					1		379
1	54	S04M23	4	1	1	1		1			1			432.45
2	67	S04M23	4	1	1	1		1			1			248.9
2	91	S04M26	4	1			1	1			1	1		409.85
4	78	S04M27	4	1	1	1					1		1	271.25
4	36	S04M29	4	1	1				1			1	1	33.4
3	19	S04M34	4	1	1		1	1					1	364.65
2	64	S06M03	6	1		1	1	1	1	1		1		267.2
1	3	S06M06	6	1	1	1	1		1			1	1	248.85
1	11	S06M07	6	1	1		1			1	1	1	1	32.58
4	64	S06M08	6	1	1	1		1	1		1		1	178.67
2	2	S09M01	9	1	1	1	1	1	1	1	1	1	1	134.7
3	91	S09M01	9	1	1	1	1	1	1	1	1	1	1	153.15
4	12	S09M01	9	1	1	1	1	1	1	1	1	1	1	142.55
Total			**47**	**30**	**22**	**21**	**22**	**21**	**10**	**6**	**17**	**12**	**14**	

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Table S2: List of all species in observed plant–aphid–parasitoid communities, sorted by trophic level, with average densities across all plots (biomass in g per m^2 for plants, individuals per m^2 for aphids and parasitoids, sums over all sampling dates). Because mummy parasitoids attack primary parasitoids and hyperparasitoids (Müller *et al.*, 1999) they can be considered a slightly higher trophic level than hyperparasitoids, i.e level 4–5 in the sampled food webs. Nomenclature follows Rothmaler (2002) for plant species and Stresemann (Stresemann, 1994) for aphid species. Authorities for parasitoids are given in brackets following species names. Provisional species names are used for three undescribed *Alloxysta* species (F. van Veen, pers. comm.). Two rare aphid species and one rare mummy parasitoid species could not be identified and were assigned to morphospecies.

Trophic level	Group	Species	Density
1	Plant	*Anthriscus silvestris*	83.8
1	Plant	*Phleum pratense*	79.9
1	Plant	*Trifolium pratense*	42.6
1	Plant	*Arrhenatherum elatius*	107.6
2	Aphid	*Aphis fabae*	12.65
2	Aphid	*Cavariella aegopodii*	149.44
2	Aphid	*Dysaphis anthrisci*	0.60
2	Aphid	*unidentified species 1*	0.04
2	Aphid	*unidentified species 2*	0.71
2	Aphid	*Diuraphis muehlei*	251.77
2	Aphid	*Schizaphis graminum*	4.63
2	Aphid	*Sipha maydis*	79.46
2	Aphid	*Aphis scaliai*	24.89
2	Aphid	*Therioaphis trifolii*	21.95
3	Primary parasitoid	*Adialytus arvicola* (Starý)	3.26
3	Primary parasitoid	*Aphelinus asychis* (Walker)	1.79
3	Primary parasitoid	*Aphelinus flaviventris* (Kurdjumov)	0.08
3	Primary parasitoid	*Aphelinus varipes* (Förster)	0.40
3	Primary parasitoid	*Aphidius salicis* (Haliday)	2.64
3	Primary parasitoid	*Lysiphlebus fabarum* (Marshall)	0.53
3	Primary parasitoid	*Praon exoletum* (Nees)	0.03
3	Primary parasitoid	*Trioxys brevicornis* (Haliday)	4.19
4	Hyper parasitoid	*Alloxysta brachyptera* (Hartig)	0.285
4	Hyper parasitoid	*Alloxysta circumscripta* (Hartig)	0.005
4	Hyper parasitoid	*Alloxysta "fl3"*	0.282
4	Hyper parasitoid	*Alloxysta "new"*	0.096
4	Hyper parasitoid	*Alloxysta "o2"*	0.087
4	Hyper parasitoid	*Alloxysta victrix* (Westwood)	0.106
4	Hyper parasitoid	*Phaenoglyphis villosa* (Hartig)	0.090
4 (5)	Mummy parasitoid	*Asaphes suspensus* (Nees)	0.841
4 (5)	Mummy parasitoid	*Asaphes vulgaris* (Walker)	0.721
4 (5)	Mummy parasitoid	*Coruna clavata* (Walker)	0.979
4 (5)	Mummy parasitoid	*Dendrocerus aphidum* (Rondani)	0.861
4 (5)	Mummy parasitoid	*Dendrocerus carpenteri* (Curtis)	1.989
4 (5)	Mummy parasitoid	*Syrphophagus aphidivorus* (Mayr)	0.050
4 (5)	Mummy parasitoid	unidentified Chalcidoidea	0.010

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Table S3: Summary of regression models (with normal errors and identity link) testing the linear and quadratic effects of plant richness on the rarefied species richness (square-root transformed) of the insects in the community. The model formula was in all cases: "response variable" ~ "block" + "plant species richness" + "(plant species richness)^2". P values < 0.1 are printed in bold. "Res. df": residual degrees of freedom, "%SS": percent sum of squares explained.

		Plant richness			(Plant richness)2		
Response	**Res. df**	**% SS**	**F**	**P**	**% SS**	**F**	**P**
Rarefied species richness							
Aphids	43	7.4	3.96	**0.053**	12.3	6.58	**0.014**
Primary parasitoids	43	3.6	1.73	0.196	6.1	2.93	**0.094**
Hyperparasitoids	43	10.6	5.08	**0.029**	0.1	0.03	0.871
Mummy parasitoids	43	2.4	1.13	0.293	3.7	1.75	0.192

References:

Gotelli, N. J. & Colwell, R. K. (2001) Quantifying biodiversity: procedures and pitfalls in the measurement and comparison of species richness. *Ecology Letters*, **4,** 379-391.

Hurlbert, S. H. (1971) The nonconcept of species diversity: a critique and alternative parameters. *Ecology*, **52,** 577-586.

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Rothmaler, R. (2002) *Exkursionsflora von Deutschland*, Spektrum, Heidelberg-Berlin.

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