



# Grazing Effects on Insect Communities in Western Mongolia

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**Abstract.** Insect communities play a vital role in ecosystem functioning, particularly in arid and semi-arid rangelands. The Mongolian Altai region in western Mongolia encompasses a diverse array of ecosystems, characterized by its complex topography, arid climate, and traditional pastoral land use. This study assessed how insect diversity and community composition vary across habitat types under different grazing intensity. Pitfall traps were used to sample ground-dwelling insects at six paired sites (grazed vs. ungrazed) representing meadow, mountain steppe, and lakeshore habitats in Khovd Province during June and August 2022. In total, 2,560 individuals belonging to 153 species across 33 families and five insect orders were collected, with Coleoptera dominating both in richness and abundance. Statistical analysis showed no significant effects of habitat type, grazing intensity, or their interaction on insect species richness. NMDS ordination revealed limited differentiation in community composition between grazed and ungrazed sites. These results suggest that insect communities in this arid and semi-arid region may exhibit resilience to moderate grazing pressures. The findings provide baseline data for future biodiversity monitoring and can inform sustainable grazing management in fragile arid-steppe ecosystems.

**Keywords:** Insect diversity, desert steppe, community structure, arid ecosystems, western Mongolia.

## 1 Introduction

The Mongolian Altai, extending over 800 km along the country's western frontier, is a prominent mountain system that transitions into the Gobi-Altai range and includes parts of Bayan-Ulgii, Khovd, Uvs, and Gobi-Altai provinces. Its elevation ranges between

3,200 and 3,500 m, with several peaks exceeding 4,000 m. The region lies within the desert steppe zone, experiencing harsh continental conditions, low precipitation (100–130 mm annually), and short growing seasons interrupted by droughts [1]. Despite climatic severity, it supports over 700 vascular plant species [2], [3]. Located within the broader Mongolian Altai region, Khovd Province is characterized by complex topography and diverse climatic zones, ranging from arid deserts to alpine tundra. This geographical heterogeneity supports a mosaic of ecosystems and microhabitats, which in turn influence the distribution and composition of insect communities. The climate is distinctly continental, with sharp seasonal and diurnal temperature fluctuations and minimal annual precipitation, and strong winds. Average annual temperatures range between  $-1.5^{\circ}\text{C}$  and  $6.0^{\circ}\text{C}$ , and precipitation generally declines from east to west, ranging from 300 mm in mountain zones to less than 100 mm in desert steppe areas [4], [5], [6]. Due to its climatic extremes and ecological isolation, the Mongolian Altai supports distinct biological communities. However, comprehensive studies of insect communities in this region remain limited. Previous research has focused primarily on specific insect groups such as grasshoppers [7], [8], [9], [10], aquatic insects (surveyed between 2008 and 2010 by an American-Mongolian team), and soil beetles [11]. More recently, Oyundelger and Pfeiffer [12] studied beetle diversity in the Altai Mountains. This study aims to evaluate insect diversity and community structure across habitat types under varying grazing intensities in the Mongolian Altai. Using pitfall traps, we examine how ecological conditions and livestock grazing, particularly by goats and sheep, influence ground-dwelling insect communities. The results provide baseline data for biodiversity monitoring and inform sustainable pasture management in this ecologically sensitive region.

## 2 Materials and Methods, Study Area

### 2.1 Study area

The field surveys were conducted in June and August of 2022 across selected sites in Khovd Province, located in the western part of Mongolia. The study sites encompassed diverse habitats within the Mongolian Altai Mountain region, including arid steppe, semi-arid grasslands, and mountain meadows. Khovd Province lies within a transitional zone between desert steppe and mountain steppe ecosystems, influenced by elevation, aridity, and seasonal grazing dynamics. Elevation across the sampling area ranged from approximately 1,400 to 2,800 m above sea level, with some areas subject to seasonal livestock grazing, primarily by sheep and goats while others remained relatively undisturbed. The selection of contrasting sites allowed for the examination of both natural variation in insect communities across habitats and anthropogenic influences, particularly grazing pressure, on insect diversity and abundance.

### 2.2 Sampling Sites

A total of six paired study sites (grazed vs. ungrazed) were selected in Khovd Province, western Mongolia, to examine the effects of livestock grazing on insect communities (Figure 1). Each site pair consisted of one grazed (GR) and one ungrazed (UNG) sites, located in close proximity (mean distance =  $1.16 \pm 0.79$  km) and situated within similar environmental conditions but differing in grazing intensity.

The ungrazed sites were located within areas that had been fenced to exclude livestock grazing for approximately 5 to 10 years prior to sampling. These exclosures were established as part of rangeland protection efforts and allowed for natural vegetation recovery, resulting in visibly denser plant cover and structural complexity compared to adjacent grazed sites.

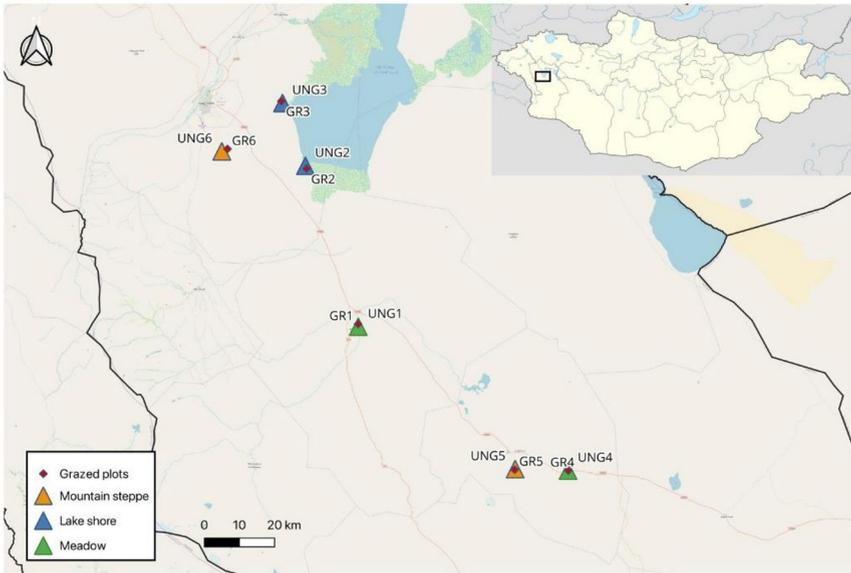
The sampling sites span a range of elevations from 1,097 to 1,683 m above sea level and include diverse habitats such as meadows, mountain steppe, and lakeshores, all situated within the desert steppe biome and adjacent ecotones of the Mongolian Altai region. Site selection was guided by information from local herders and past land-use practices to represent a range of grazing.

All sampling sites represent the arid or semi-arid ecological zone, and vegetation varies across habitat types, influenced by grazing pressure. A complete list of site attributes including GPS coordinates, elevations, and grazing status is presented in Table 1.

Descriptions of the study sites:

- Mankhan soum: Meadow habitat with fenced (UNG1) and grazed (GR1) sites.

- Jargalant soum: Two study sites along the Khar-Us Lake shoreline (UNG2/GR2 and UNG3/GR3).
- Zereg soum:
  - Meadow habitat ~14 km east of the soum center (UNG4/GR4).
  - Mountain steppe site ~7 km south of the soum center (UNG5/GR5).
- Jargalant soum: Mountain slope site located ~18 km south of the provincial center (UNG6/GR6).



**Fig. 1.** Geographic locations of the grazed and ungrazed sampling sites in western Mongolia.

All sites represent arid and semi-arid environments shaped by grazing activities, with variable vegetation types including meadows, mountain steppes, and lakeshores. A complete list of GPS coordinates, elevations, and grazing status of the sites is provided in Table 1.

**Table 1.** Characteristics of the study sites with installed pitfall traps in western Mongolia.

Site Code	Grazing Intensity	Elevation (m a.s.l.)	GPS Coordinates (Latitude, Longitude)
UNG1	Ungrazed	1344	47.42778, 92.23183
GR1	Grazed	1338	47.43443, 92.23101
UNG2	Ungrazed	1167	47.84273, 92.02448
GR2	Grazed	1162	47.83546, 92.02918

UNG3	Ungrazed	1160	48.00463, 91.93416
GR3	Grazed	1162	48.00916, 91.92948
UNG4	Ungrazed	1213	47.05747, 93.02328
GR4	Grazed	1215	47.05787, 93.02430
UNG5	Ungrazed	1097	47.06146, 92.82505
GR5	Grazed	1097	47.05996, 92.82333
UNG6	Ungrazed	1652	47.87701, 91.70577
GR6	Grazed	1683	47.88338, 91.72701

### 2.3 Data Collection

To account for unmeasured local heterogeneity and the nested structure of the sampling design, the sampling site was treated as a random effect in subsequent analyses. In total, 12 s (6 grazed and 6 ungrazed) were sampled.

Ground-dwelling insects were collected using pitfall traps, a widely accepted and cost-effective method for sampling surface-active arthropods [13], [14], [15]. Each trap consisted of a 150 ml polystyrene cup filled with ethylene glycol, which served both as a killing and preservation agent. Traps were installed flush with the soil surface in a regular grid layout: 12 traps per plot, arranged in four rows with 300 m spacing between rows and 100 m between columns. Traps remained in the field for 4–5 days, after which all collected specimens were transferred to 96% ethanol for preservation and later analysis.

This paired-sites design across distinct habitat types enabled a robust comparative assessment of insect community responses to grazing intensity under natural arid and semi-arid steppe conditions.

### 2.4 Laboratory Methods

All collected specimens were sorted, cleaned, and mounted on cardboards using standard entomological procedures. Taxonomic identification was performed by the authors and in consultation with expert taxonomists (see Acknowledgements).

Specimens were identified based on key morphological characteristics, including external features and genital structures, examined under a Motic SMZ-T4 stereomicroscope. The identification process followed regional and group-specific literature, including: Bologna & Pinto [16], Medvedev G.S. [17], Medvedev L.N. [18], [19], Lafer [20], [21], Zhao & Bologna [22], Kataev [23], Nikolajev & Puntsagdulam [24], Dorjderem [25], Bielawski [26].

All collected material was deposited in institutional collections: The Institute of Biology, Mongolian Academy of Sciences, Ulaanbaatar (IB MAS), the Museum and Institute of Zoology, Polish Academy of Sciences, Warsaw (MIZ), and the Upper Silesian Museum, Bytom, Poland (USMB).

## 2.5 Statistical Analysis

To evaluate the effects of grazing management on insect diversity and community structure, we conducted a series of statistical analyses focusing on species richness and abundance across different habitat types and grazing intensity. Specifically, we compared three habitat types: meadow, lakeshore, and mountain steppe, under grazed and ungrazed.

A two-way analysis of variance (ANOVA) was employed to assess the main and interactive effects of habitat type and grazing insect species richness and abundance. Both habitat and grazing were treated as fixed factors. All analyses were conducted using JMP Pro version 16.1. The data met the assumptions of normality and homogeneity of variance, as assessed through residual diagnostics. Additionally, the sampling design was balanced across habitat types and grazing intensity ( $n = 6$  plots per group), making the dataset suitable for two-way ANOVA to evaluate the main and interactive effects of habitat and grazing on insect richness and abundance.

To assess the adequacy of sampling and estimate true species richness beyond the observed values, we constructed species accumulation and extrapolation curves using the iNEXT package (version 3.0.1) in R. These curves were generated separately for each habitat type and grazing intensity, with species richness plotted against the number of individuals collected. This approach allowed us to evaluate sampling completeness and determine whether observed richness patterns were influenced by variation in sampling effort.

To examine differences in insect community composition across habitats and grazing intensity, we conducted a non-metric multidimensional scaling (NMDS) ordination based on Bray–Curtis dissimilarity matrices. Abundance data were square-root transformed prior to analysis to reduce the influence of highly dominant species. NMDS was performed using a two-dimensional solution with 100 random starts to ensure stable convergence, implemented in R. This ordination allowed us to visualize and interpret patterns in community structure associated with habitat variation and grazing pressure.

## 3 Results

### 3.1 Insect species composition and taxonomic diversity

A total of 2,560 individuals were collected using pitfall traps from six paired sites (grazed vs. ungrazed) representing different habitat types across Khovd Province, western Mongolia. Taxonomic analysis identified 153 species, encompassing 33 families from five insect orders: Coleoptera, Hemiptera, Hymenoptera, Orthoptera and Mantoptera (see the Appendix).

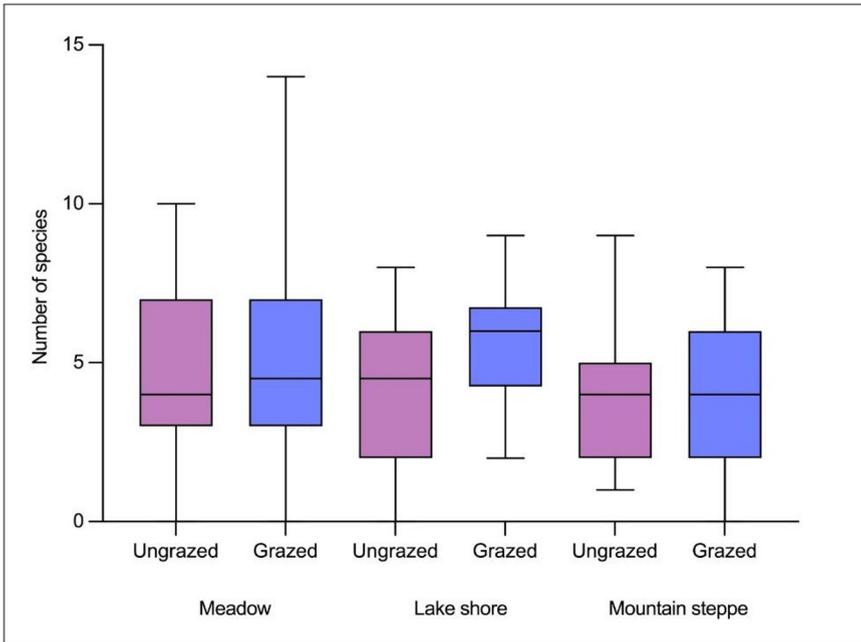
The most taxonomically diverse and numerically abundant group was Coleoptera (beetles), comprising 17 families and accounting for the highest proportion of both species richness and total individuals. Among them, the families Carabidae (ground beetles) and Tenebrionidae (darkling beetles) were particularly dominant. These beetles play ecologically important roles in arid grassland ecosystems, functioning as predators, scavengers, and decomposers and thereby contributing significantly to nutrient cycling and soil health.

Other insect orders recorded included Hymenoptera (e.g., ants, wasps), Hemiptera (true bugs), Orthoptera (grasshoppers), and Mantoptera (mantids), which together contributed to the remaining taxonomic diversity observed in the study area.

### 3.2 Statistical assessment of grazing and habitat effects

A two-way analysis of variance (ANOVA) was conducted to assess the effects of habitat type, grazing intensity, and their interaction on insect species richness. The results showed that the effect of habitat type was not statistically significant ( $F = 1.69$ ,  $p = 0.187$ ); The effect of grazing intensity (grazed vs. ungrazed) was also not significant ( $F = 1.42$ ,  $p = 0.230$ ); The interaction between habitat type and grazing intensity had no significant effect ( $F = 1.48$ ,  $p = 0.220$ ).

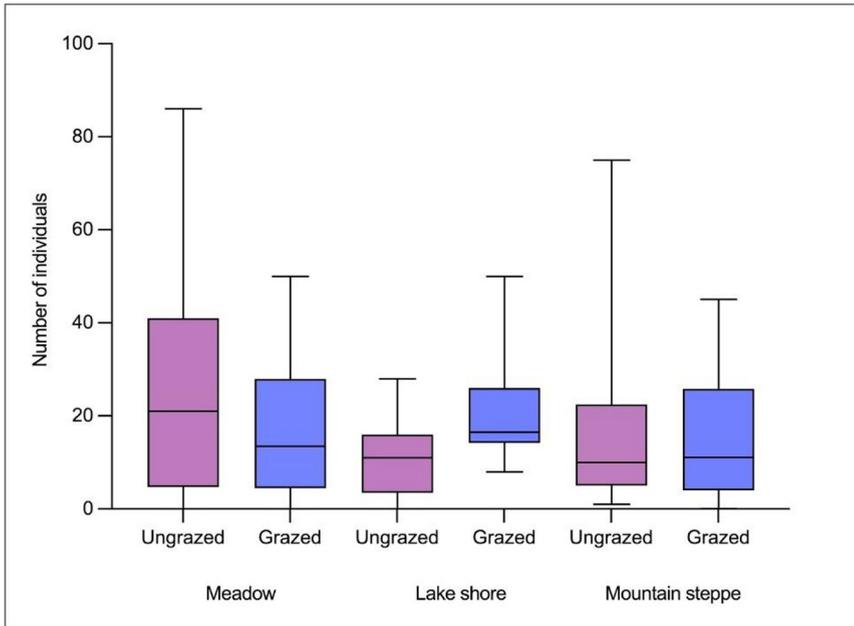
These findings suggest that insect species richness was not strongly influenced by either grazing pressure or habitat type within the desert steppe ecosystems examined (Fig. 2). This may reflect a degree of ecological resilience among insect communities to moderate grazing or point to the influence of other abiotic or landscape-scale variables as primary drivers of community composition in these arid environments.



**Fig. 2.** Species richness across three habitat types under grazed and ungrazed conditions. Boxplot colors indicate grazing intensity type: purple represents ungrazed plots, and blue represents grazed plots.

The main effect of habitat type on species richness was approaching significance ( $F = 2.92$ ,  $p = 0.0567$ ), suggesting a potential influence of habitat on insect diversity, although it did not reach the conventional threshold. The effect of grazing intensity alone was not statistically significant ( $F = 0.009$ ,  $p = 0.9245$ ), indicating no overall difference in species richness between grazed and ungrazed plots.

However, the interaction between habitat and grazing intensity was statistically significant ( $F = 5.52$ ,  $p = 0.0049$ ), indicating that the influence of grazing on species richness varied across habitat types. This interaction implies that the response of insect communities to grazing pressure is habitat-specific, with certain habitats exhibiting stronger sensitivity to grazing than others (Fig.3).



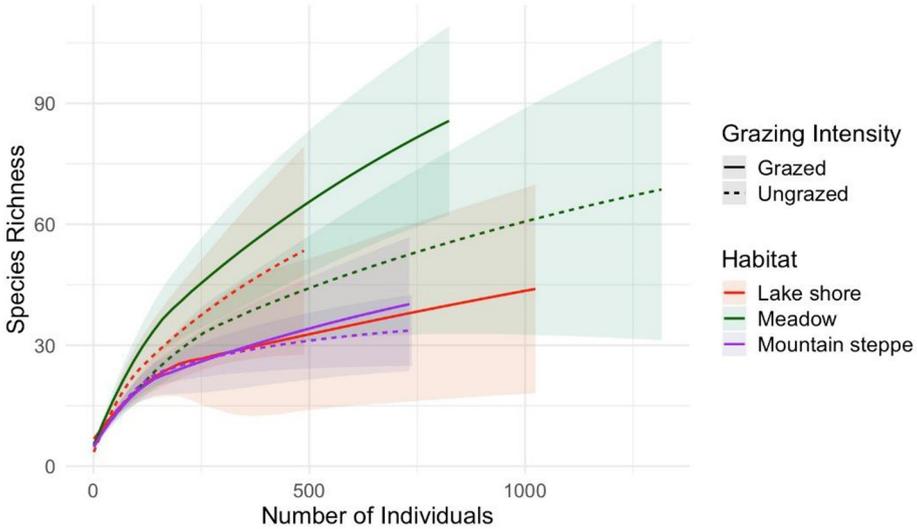
**Fig. 3.** The number of individuals across three habitat categories under grazed and ungrazed. Boxplot colors indicate intensity type: purple represents ungrazed plots, and blue represents grazed plots.

Species accumulation curves supported the observed differences in insect community structure across habitat types and grazing intensity. In meadow habitats, species richness was consistently higher in grazed plots, while ungrazed plots showed higher total abundance. This suggests that moderate grazing may enhance habitat heterogeneity and promote richness while reducing overall insect density (Fig. 4).

In lakeshore habitats, the pattern was reversed: ungrazed plots exhibited higher species richness, whereas grazed plots supported greater abundance. This indicates that reduced grazing pressure may benefit overall diversity, while disturbance-tolerant species dominate in grazed s.

In mountain steppe habitats, both species richness and abundance were relatively similar between grazed and ungrazed plots, suggesting that insect communities in this habitat may be more resilient or adapted to grazing impacts.

These findings highlight that the response of insect diversity and abundance to grazing is habitat-dependent, with meadow and lakeshore environments showing stronger responses to grazing exclusion than mountain steppe (Fig. 4).

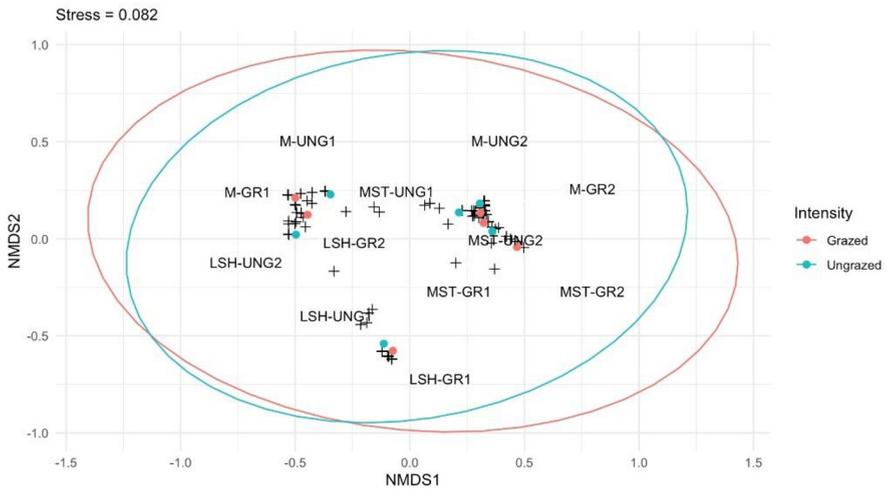


**Fig. 4.** Species accumulation curves showing the relationship between the number of individuals and observed species richness across different habitats and grazing intensity. Solid lines represent grazed areas, while dashed lines indicate ungrazed areas. The curves include both rarefaction (interpolation) and extrapolation estimates, with shaded areas representing confidence intervals.

To assess variation in insect community composition across habitats and grazing intensity, we performed a non-metric multidimensional scaling (NMDS) ordination based on Bray–Curtis dissimilarities. The analysis yielded a low stress value (0.082), indicating a reliable two-dimensional representation of community differences (Fig. 5).

The ordination plot showed distinct clustering by habitat, with insect assemblages from mountain steppe habitats clearly separated from those in meadow and lakeshore environments. This suggests that habitat type is the primary driver of community composition (Fig. 5).

Within habitats, grazing effects were more subtle and context-dependent. In the lakeshore habitat, grazed and ungrazed plots largely overlapped, indicating limited influence of grazing on community structure. In contrast, meadow habitats exhibited moderate separation between grazed and ungrazed plots, suggesting some grazing-driven differentiation. Notably, in mountain steppe habitats, a few grazed plots appeared as outliers, potentially reflecting localized environmental variation or disturbance responses.



**Fig. 5.** Non-metric multidimensional scaling (NMDS) ordination plot ( $k = 2$ , stress = 0.082) visualizing differences in insect community composition across habitat types and grazing intensity. Each point represents a sampling plots; with red indicating *grazed* and blue indicating *ungrazed* conditions. Ellipses represent 95% confidence intervals around the centroid of each intensity group. Site codes denote habitat type and grazing intensity: M – Meadow, LSH – Lakeshore, MST – Mountain Steppe; GR – Grazed, UNG – Ungrazed.

The ordination reveals that habitat type primarily drives variation in community composition, as indicated by the clustering of points by site type. Grazing effects appear to be relatively weak, with substantial overlap between grazed and ungrazed plots, particularly in lakeshore habitats. Some separation is observed in mountain steppe plots, suggesting potential localized responses to grazing.

## 4 Discussion

This study aimed to assess the effects of livestock grazing and habitat type on insect species richness, abundance, and community composition in desert steppe ecosystems of western Mongolia. Despite expectations that grazing would strongly influence insect diversity, our results suggest that these communities are relatively resilient to short- and long-term grazing exclusion. Across all sites, Coleoptera emerged as the most dominant and diverse order, particularly the families Carabidae and Tenebrionidae, which are known to thrive in arid environments due to their adaptive life history traits and ecological roles as predators and decomposers. This taxonomic dominance aligns with other studies in dryland ecosystems [27], [28], highlighting the ecological importance of beetle assemblages in maintaining soil processes and trophic dynamics. Habitat type had a more consistent effect on community composition than grazing. NMDS

ordination clearly separated mountain steppe assemblages from those of meadows and lakeshores, indicating that environmental heterogeneity between habitats (e.g., soil texture, vegetation structure, microclimate) plays a stronger role in structuring insect communities. This supports previous findings that habitat heterogeneity is a major driver of insect biodiversity in arid and semi-arid regions [29].

Contrary to expectations, species richness and abundance did not significantly differ between grazed and ungrazed plots across habitats. While meadow habitats showed slightly higher richness in grazed plots, abundance was greater in grazed plots. In lakeshore habitats, the opposite trend was observed. These inconsistencies suggest that grazing impacts are context dependent and maybe mediated by habitat-specific factors such as vegetation productivity, soil compaction, and disturbance intensity.

It is important to note that our reliance on pitfall trapping may have introduced sampling bias, especially in ungrazed plots where denser vegetation could reduce the mobility of ground-dwelling insects and limit trap efficiency. To obtain a more comprehensive assessment of insect diversity across grazing intensities and habitat types, future studies should integrate complementary sampling methods, such as pitfall traps and sweep-netting, to better capture the full spectrum of insect diversity.

The absence of a strong grazing signal in insect diversity could be attributed to several factors. First, the study sites are located in arid environments where insect species are often adapted variable and harsh conditions, including grazing pressure. Second, moderate grazing, as observed in the study area, might maintain or even promote habitat heterogeneity, thus supporting a diverse insect community. Similar patterns have been reported in other rangeland systems [30].

While overall species richness remained stable, NMDS analysis indicated subtle shifts in community composition due to grazing, particularly in the mountain steppe sites. This suggests that although species numbers do not change significantly, species turnover or replacement may occur in response to grazing-induced changes in vegetation or microhabitats. Such compositional changes without loss of richness are often overlooked but may have important implications for ecosystem function. Moreover, the relatively low value of the NMDS ordination (0.082) indicates a robust representation of ecological distances, reinforcing the observed patterns of habitat-driven community structure. The substantial overlap in grazed and ungrazed plots, especially in lakeshore habitats, suggests that insect communities are capable of buffering against moderate grazing pressures, at least in the short to medium term.

Grazing had varying effects on insect communities across different habitat types. In meadow habitats, grazing significantly reduced insect abundance, while species richness remained relatively unaffected. At lakeshore sites, grazing had minimal impact on both species richness and abundance. Interestingly, in mountain steppe habitats,

grazing slightly increased insect abundance without a notable change in species richness. These results suggest that the impact of grazing on insect communities is highly habitat-dependent, with more pronounced negative effects in more productive environments like meadows. Our results are consistent with those of previous studies. For instance, Pöyry et al. [31] demonstrated that insect abundance and species richness are directly influenced by habitat type. Similarly, Sjödin et al. [32] found that grazing tends to affect abundance more strongly than species richness, with more productive and vegetated habitats, such as meadows, showing greater sensitivity to grazing pressure.

Our findings add to the growing body of data that insect assemblages in dry steppe ecosystems are more significantly influenced by habitat type than moderate grazing. This suggests that conservation and land-use planning in these landscapes should prioritize habitat heterogeneity and integrity over blanket exclusion of grazing. However, further research is needed to evaluate long-term trends, seasonal variation, and the functional consequences of species turnover.

Future studies could also incorporate additional trophic levels, such as pollinators or parasitoids, and link insect community changes to vegetation dynamics, soil health, and ecosystem services. Experimental manipulations of grazing intensity and duration would help clarify thresholds beyond which insect communities begin to degrade.

## 5 Conclusion

Our study on insect communities across grazed and ungrazed habitats in the Mongolian Altai revealed relatively stable species richness and composition regardless of grazing intensity or habitat type. Although Coleoptera, particularly Carabidae and Tenebrionidae, dominated the insect fauna, statistical analyses found no significant differences in richness between grazing intensity or among habitats. These results suggest a potential ecological resilience of ground-dwelling insects to moderate grazing pressures in arid and semi-arid ecosystems. However, other unmeasured environmental variables or landscape-level processes may play a more significant role in shaping insect diversity. Continued long-term monitoring is recommended to detect subtle changes over time and to better understand the thresholds at which grazing may begin to impact biodiversity. These insights contribute to the development of evidence-based, sustainable rangeland management strategies in Mongolia's fragile dryland environments.

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## Appendix

## Species list from sampling sites

	Taxon names	Meadow- UNG	Lake shore- UNG	Meadow- GR	Lake shore- GR	Mountain steppe- UNG	Mountain steppe-GR
	<b>Coleoptera</b>						
	<b>Anthicidae</b>						
1	<i>Anthicus subarmatus</i> Pic, 1899 (cf.)		1				
2	<i>Notoxus monoceros</i> (Linnaeus, 1760)			1		1	
3	<i>Cyclodinus mongolensis</i> (L. Medvedev, 1974)		1				
4	<i>Cordicomus baicalicus</i> (Mulsant & Rey, 1866)			2			
5	<i>Notoxus hirtus</i> La Ferté-Sénéctère, 1849		3		9		
	<b>Carabidae</b>						
6	<i>Agonum gracilipes</i> (C. Duftschmid, 1812)				1		
7	<i>Agonum impressum</i> (Panzer, 1797)	7		44			
8	<i>Amara abdominalis</i> (Motschulsky, 1844)				1		
9	<i>Amara infuscata</i> (Putzeys, 1866)					3	2
10	<i>Amara</i> sp.			1			3
11	<i>Amara apricaria</i> (Paykull, 1790)			1			
12	<i>Amara daurica</i> (Motschulsky, 1844) (cf.)	1					
13	<i>Bembidion axillare</i> Motschulsky, 1844		2	1			
14	<i>Bembidion difforme</i> Motschulsky, 1844			1			

15	<i>Bembidion obscurellum</i> Motschulsky, 1845			1			
16	<i>Bembidion saxatile fuscomaculatum</i> Motschulsky, 1844			19	14		
17	<i>Bembidion semipunctatum</i> Donovan, 1806			5			
18	<i>Bembidion</i> sp.	1	1	1		1	
19	<i>Chlaenius stschukini</i> Ménétrière, 1837			1			
20	<i>Cymindis binotata</i> Fischer von Waldheim, 1820 (cf.)	1	1			11	1
21	<i>Corsyra fusula</i> (Fischer von Waldheim, 1820)					5	1
22	<i>Cymindis semenovi</i> V. Jakowlew, 1890		1	10	4	6	2
23	<i>Curtonotus tumidus</i> (Morawitz, 1862)					1	
24	<i>Dyschirius</i> sp.						
25	<i>Elaphrus sibiricus</i> Motschulsky, 1844			1			
26	<i>Nebria livida</i> (Linnaeus, 1758)			1			
27	<i>Harpalus amplicollis</i> Ménétrière, 1848	6		1	1	8	1
28	<i>Harpalus amputatus obtusus</i> (Gebler, 1833)	1					
29	<i>Poecilus fortipes</i> (Chaudoir, 1850) (cf.)	13					
30	<i>Pogonus</i> sp.				30		
31	<i>Pseudoophonus griseus</i> (Panzer, 1797)			1			
32	<i>Pseudotaphoxenus</i> sp.1					10	10
33	<i>Pseudotaphoxenus</i> sp.2					19	15
34	<i>Pseudotaphoxenus rugipennis</i> (Faldermann, 1835)				1		
35	<i>Pterostichus planipennis</i> (R.F.Sahlberg, 1844) (cf.)	6					

36	<i>Reflexiphodrus refleximargo</i> (Reitter, 1894)				9	
37	<i>Taphoxenus gigas</i> (Fischer von Waldheim, 1823)					
38	Carabidae (gen.sp. 1)			1		
39	Carabidae (gen.sp. 2)	1				
	<b>Cerambycidae</b>					
40	<i>Eodorcadion maurum</i> (Jakovlev, 1889)	3		12		2
	<b>Chrysomelidae</b>					
41	<i>Chaetocnema</i> sp. 1			4		
42	<i>Chaetocnema</i> sp. 2			7		
43	<i>Chaetocnema</i> sp. 3				1	
44	<i>Chaetocnema</i> sp. 4			1		
45	<i>Cylindera obliquefasciata</i> Adams, 1817			1		
	<b>Clambidae</b>					
46	<i>Clambus</i> sp.				4	
	<b>Cleridae</b>					
47	<i>Opetiopalpus scutellaris</i> (Panzer, 1797)		1			
	<b>Cryptophagidae</b>					
48	<i>Cryptophagus pseudoschmidti</i> Woodroffe, 1970	1				3
49	<i>Micrambe nigricollis</i> Reitter, 1876	1				1
	<b>Coccinellidae</b>					
50	<i>Tetrabrachys kozlovi</i> (Barovsky, 1910)				1	19

	<b>Curculionidae</b>						
51	<i>Asproparthenis punctiventris</i> (Germar, 1824) (cf.)				4		
52	<i>Bothynoderes declivis</i> (Olivier, 1807)		13				
53	<i>Conorhynchus conirostris</i> (Gebler 1829)						
54	<i>Megamecus argentatus</i> (Gyllenhal, 1840)			2	4		
55	<i>Megamecus bidentatus</i> (Gebler, 1829)	1		1			
56	<i>Megamecus cervulus</i> (Reitter, 1903)		8				
57	<i>Lixus incanescens</i> Boheman, 1836			1			
58	<i>Sitona lineellus lineellus</i> (Bonsdorff, 1785)	2					
59	<i>Sitona cylindricollis</i> (Fahraeus, 1840)	1					
60	<i>Stephanocleonus kobdoanus</i> Suvorov, 1915				1		
61	<i>Phacephorus nebulosus</i> (Fähræus, 1840)	4		2			
62	<i>Temnorhinus oryx</i> (Reitter, 1897)				1		
63	<i>Tournotaris bimaculata</i> (Fabricius, 1787)	2		1			
	<b>Heteroceridae</b>						
64	<i>Augyles</i> sp.			1			
	<b>Languridae</b>						
65	<i>Leucohimatium</i> sp.	1					
	<b>Elateridae</b>						
66	<i>Agriotes</i> sp.	5					
	<b>Leiodidae</b>						

67	<i>Anisotoma</i> sp.		1				
<b>Scarabaeidae</b>							
68	<i>Protaetia ungarica sibirica</i> (Gebler, 1830)		1	1			
69	<i>Onthophagus gibbulus</i> (Pallas, 1781)						1
70	<i>Aphodius plagiatus</i> (Linnaeus, 1767)	1		1		1	
71	<i>Aphodius grafi</i> Reitter, 1901		1				
<b>Staphylinidae</b>							
72	<i>Bisnius</i> sp.1						
73	<i>Bledius</i> sp.2		1	6			
74	<i>Heterothops</i> sp.						
75	<i>Neobisnius</i> sp.			1			
76	<i>Philonthus</i> sp.	1					
77	<i>Rabigus purkynei</i> Smetana 1963	6					
78	<i>Stenus comma</i> LeConte, 1863 (cf.)			1			
79	<i>Tachinus</i> sp.	2					
80	<i>Tachyporus</i> sp.	1				4	
<b>Tenebrionidae</b>							
81	<i>Anatolica amoena</i> (Faldermann, 1835) (cf.)		38		68		
82	<i>Anatolica amoenula</i> Reitter, 1889				28		
83	<i>Anatolica paradoxa</i> Reitter, 1900						5
84	<i>Anatolica polita borealis</i> Kaszab, 1964						

85	<i>Anatolica sternalis gobiensis</i> Kaszab, 1964				7	18
86	<i>Blaps femoralis femoralis</i> Fabricius, 1792		10		14	
87	<i>Blaps femoralis</i> Fabricius, 1792	9		4	9	11
88	<i>Colposcelis microderoides strigipleuris</i> Kaszab, 1967	1				
89	<i>Crypticus quisquilius</i> (Linnaeus, 1760)	3				
90	<i>Crypticus zuberi</i> Marseul, 1875			1	2	
91	<i>Cyphogenia intermedia</i> Bogatshev, 1962		1			
92	<i>Gonocephalum granulatum pusillum</i> (Fabricius, 1792)	9		4		
93	<i>Melanesthes jenseni</i> Schuster, 1922					
94	<i>Melanesthes heydeni</i> Csiki, 1901				1	
95	<i>Microdera interrupta</i> Reitter, 1897				3	
96	<i>Microdera globata</i> (Faldermann, 1835)					1
97	<i>Microdera kraatzii</i> Reitter, 1900		23		24	
98	<i>Microdera jurganovae</i> Skopin, 1964				7	20
99	<i>Penthicus altaicus</i> (Gebler, 1830)				1	
100	<i>Microdera punctipennis</i> Kaszab, 1967		7		16	
101	<i>Opatrum</i> sp.			2	1	
102	<i>Scythis pusillus</i> Skopin, 1964	1	2	1	1	1
103	<i>Scythis sulciceps</i> (Gebler, 1841)					1
104	<i>Alydus calcaratus</i> (Linnaeus, 1758)	1				
	<b>Hemiptera</b>					

	<b>Anthocoridae</b>					
105	Anthocoridae sp.		1			
	<b>Sydniidae</b>					
106	<i>Byrsinus</i> sp.		1	27		
	<b>Oxycarenidae</b>					
107	<i>Jakowleffia setulosa</i> (Jakovlev, 1874)		4			13
	<b>Reduviidae</b>					
108	<i>Coranus hammarstroemi</i> Reuter, 1892 (cf.)	5				
	<b>Rypharochromidae</b>					
109	<i>Emblethis brachynotus</i> Horvath, 1897	1				
110	<i>Plinthis</i> sp.	1		1		
111	Rypharochromidae (gen.sp.)			1		
	<b>Saldidae</b>					
112	Saldidae (gen.sp. 1)			4		
113	Saldidae (gen.sp. 2)			18		
114	Saldidae (gen.sp. 3)			1		
	<b>Hymenoptera</b>					
	<b>Apidae</b>					
115	<i>Bombus melanurus</i> Lepeletier, 1836	1	1			
116	<i>Bombus sibiricus</i> (Fabricius, 1781)		1			
	<b>Bethylidae</b>					

117	Bethylidae (gen.sp.)		1				
	<b>Chrysididae</b>						
118	<i>Hedychridium</i> sp.		1				
	<b>Astatidae</b>						
119	<i>Astata</i> sp.		16				
	<b>Crabrinidae</b>						
120	<i>Miscophus</i> sp.		2				
	<b>Formicidae</b>						
121	<i>Cardiocondyla koshewnikovi</i> Ruzsky, 1902		78		30		1
122	<i>Cardiocondyla</i> sp.		1				
123	<i>Cataglyphis aenescens</i> (Nylander, 1849)	112	1	88	6	95	114
124	<i>Formica candida</i> Smith, 1878	95	2	2	109	97	
125	<i>Formica manchu</i> Wheeler, 1929	3					
126	<i>Formica lemami</i> Bondroit, 1917	2					
127	<i>Formica orangea</i> Seifert & Schultz, 2009	28		17	21		
128	<i>Formica rufibarbis</i> Fabricius, 1793		1	7	28		
129	<i>Formica uralensis</i> Ruzsky, 1895	123				14	7
130	Formicidae (gen.sp.)						1
131	<i>Formica sanguinea</i> Latreille, 1798				45		
132	<i>Myrmica eidmanni</i> Menozzi, 1930		4		6		
133	<i>Myrmica pisarskii</i> Radchenko, 1994	2					

134	<i>Proformica mongolica</i> (Emery, 1901)		9			
135	<i>Formica</i> sp.1	119		4	17	14
136	<i>Formica</i> sp.2	28		54	14	4
137	<i>Lasius</i> sp.1			1		
138	<i>Myrmica</i> sp.1	9		9		
139	<i>Proformica</i> sp.1			38	1	14
140	<i>Proformica</i> sp.2			5		
141	<i>Tetramorium tsushimae</i> (Emery, 1925)					35
142	<i>Tetramorium</i> sp.1	26		9	24	58
143	<i>Tetramorium</i> sp.2	1		1	2	9
144	<i>Tetramorium caespitum</i> (Linnaeus, 1758) (cf.)			1		
	<b>Ichneumonidae</b>					
145	Ichneumonidae (gen.sp.)	1			1	
	<b>Pompilidae</b>					
146	Pompilidae (gen.sp. 1)					
147	Pompilidae (gen.sp. 2)					
148	Pompilidae (gen.sp. 3)	1	3			
	<b>Orthoptera</b>					
	<b>Acrididae</b>					
149	<i>Epacromius tergustinus</i> (Charpentier, 1825)	6		2		
150	<i>Chortippus</i> sp.	1				

151	<i>Leptopternis gracilis</i> (Eversmann, 1848)			1			
152	<i>Oedaleus decorus</i> (Germar, 1825)						
	<b>Mantoptera</b>						1
	<b>Eremiaphilidae</b>						
153	<i>Iris polystictica mongolica</i> (Sjostedt, 1932)						1

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