INTERNATIONAL MULTI DISCIPLINARY JOURNAL FOR RESEARCH & DEVELOPMENT
eISSN 2394-6334 Impact factor: 7,854 Volume 12, issue 11 (2025)

THE EFFECT OF ANTHROPOGENIC FACTORS ON THE FAUNA OF INSECTS OF THE RIGHT GENUS (ORTHOPTERA)

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Annotation: This article provides an in-depth scientific analysis of the ecological, morphological, ethological, and population-level effects of anthropogenic factors on the fauna of Orthoptera insects. Orthopterans are essential components of natural ecosystems, playing significant roles in vegetation stability, food chain structure, and agricultural ecosystem productivity. Human-induced landscape alterations, chemical pollution, agricultural intensification, and urbanization exert considerable influence on species composition, population density, trophic interactions, and phenology of this insect group. The study highlights reductions, migrations, invasive behaviors, and adaptive changes within Orthoptera populations under increasing anthropogenic pressure. The results demonstrate that regulating anthropogenic impact, implementing ecological monitoring, and applying biotechnical measures are crucial for maintaining the population stability of Orthopteran insects.

Keywords: Anthropogenic factor, Orthoptera, grasshoppers, anthropogenic impact, agroecology, entomofauna, population ecology, landscape alteration.

INTRODUCTION

Orthoptera insects represent one of the most ancient and ecologically important groups of organisms, including grasshoppers, locusts, bush crickets, and other species widely distributed across grassland and steppe ecosystems. As phytophagous organisms, they directly influence vegetation density and are considered essential ecological indicators for assessing ecosystem stability. Human-induced modifications of natural ecosystems—referred to as anthropogenic factors—significantly affect the geographical distribution, trophic behavior, reproductive strategies, and phenotypic characteristics of Orthoptera species. Conversion of land to irrigated systems, intensification of agro-technical practices, widespread application of pesticides, urban development, construction of roads and infrastructure, as well as expansion of technogenic zones have all contributed to habitat fragmentation and degradation.

Orthopterans are highly sensitive to environmental changes caused by anthropogenic stressors. For these insects, factors such as vegetation cover, soil moisture, temperature, illumination levels, pesticide concentrations, and dust pollution play decisive roles. When natural ecological stability is disrupted, some species decline while others increase due to adaptation to anthropogenic environments. For instance, certain phytophagous species proliferate in agroecosystems, whereas endemic species characteristic of natural grassland and desert habitats decrease or completely disappear.

This study aims to investigate the complex influence of anthropogenic factors on Orthoptera fauna, identify population-level changes caused by increased anthropogenic pressure, develop conservation strategies, and provide scientifically grounded conclusions. The research is relevant

not only for insect ecology but also for agriculture, biological control, landscape ecology, and environmental safety.

MATERIALS AND METHODS

The study was conducted across various natural–geographical zones of Uzbekistan, including desert, semi-desert, steppe, foothill, and irrigated agroecosystems. Orthoptera populations were observed seasonally (spring, summer, autumn). The following ecological, statistical, and geobotanical methods were applied:

First, entomological collection techniques were used. Orthopterans were sampled using sweep nets, hand collection, quadrat sampling, and linear transect observations. The number of individuals and species composition at each point were recorded and classified based on morphological characteristics.

Second, the degree of anthropogenic impact on each biotope was assessed. Indicators included the proportion of cultivated land, irrigation intensity, pesticide application frequency, grazing pressure, proximity to infrastructure, and population density.

Third, vegetation cover was examined. Parameters such as phytomass, number of plant species, dominance of anthropophilic or xerophytic species, dry biomass, and soil moisture were measured as they directly influence Orthoptera populations.

Fourth, statistical analysis was performed. Data were processed using dispersion analysis, correlation coefficients, mean values, and variation indicators. Regression analysis was used to assess the relationship between anthropogenic load and changes in Orthoptera abundance.

Fifth, collected specimens were subjected to microscopic laboratory analysis. Morphological traits including body length, wing shape, coloration intensity, and structural details were examined.

These methods enabled identification of ecological correlations between anthropogenic stressors and natural environmental factors affecting Orthopterans.

RESULTS

Research findings revealed that anthropogenic factors exert broad and multifaceted effects on Orthoptera fauna. Species diversity was highest in natural grasslands, while biodiversity declined significantly in areas close to agroecosystems. In regions with high anthropogenic pressure, the number of phytophagous species increased, whereas predator species responsible for ecosystem regulation decreased. Pesticide use led to reductions in sensitive species, while some invasive species showed increased abundance.

The table below presents species richness and density of Orthoptera under varying levels of anthropogenic pressure.

TABLE. Levels of Anthropogenic Load and Orthoptera Indicators in Different Regions

Region Type	Anthropogenic Load	Number of Species	Average Density (indiv/m²)	Dominant Species
Natural grassland	Low	32	4.6	Oedaleus decorus, Calliptamus italicus
Semi-disturbed pasture	Medium	21	3.1	Locusta migratoria, Dociostaurus maroccanus
Intensive agroecosystem	High	11	1.4	Calliptamus italicus
Near technogenic zone	Very high	6	0.9	Eyprepocnemis plorans

The table clearly shows that as anthropogenic pressure increases, both species richness and population density decline. Species numbers in natural grasslands are nearly twice as high as those in technogenic areas.

DISCUSSION

Analysis of the results demonstrates that anthropogenic factors influence Orthoptera fauna through three primary pathways: ecological, population-level, and physiological effects.

Ecological effects:
Human activities alter vegetation cover. As the plant community loses its natural diversity and shifts toward monocultures, food resources for phytophagous Orthopterans become limited. Aerobic and anaerobic decomposition of chemical pesticides negatively affects insect respiration.

Population effects:
In areas with high anthropogenic pressure, population dynamics of grasshoppers become disrupted. Some pest species rapidly increase in number due to the decline of natural enemies such as predators, parasitoids, and insectivorous birds. This imbalance creates ecological and economic risks in agroecosystems.

Physiological effects:
Chemical pollutants influence physiological processes of Orthopterans. Disturbances in wing development, growth rate, pigmentation, and reproductive phenology were observed. These changes affect mobility, adaptability, and migration ability.

The study further showed that some invasive species adapt quickly to modified landscapes. For example, Calliptamus italicus thrives in both agricultural and semi-natural habitats, while Locusta migratoria proliferates near irrigation systems. Under strong anthropogenic influence, competition increases between natural species and anthropophilic ones.

To maintain ecosystem stability, the following measures are scientifically recommended:

– Regulating chemical pesticide use in agroecosystems
– Protecting and restoring natural grasslands
– Applying biological control methods
– Continuous monitoring of grasshopper populations
– Enhancing landscape resilience to anthropogenic pressure

CONCLUSION

The results of this study indicate that anthropogenic factors directly and significantly affect species composition, population stability, trophic activity, adaptive potential, and evolutionary prospects of Orthoptera insects. Increasing anthropogenic load leads to ecosystem degradation, reduction in Orthoptera diversity, and sharp growth of certain pest species. Human interference disrupts ecological balance and threatens agricultural ecosystem stability.

Therefore, minimizing anthropogenic impacts, restoring natural landscapes, developing biological control methods, strengthening monitoring systems, and implementing ecological stabilization strategies are essential tasks. With proper ecological protection measures, the natural dynamics and ecological functions of Orthoptera populations can be preserved.

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