# DISTRIBUTION AREAS AND RESEARCH METHODS OF SYNANTHROPIC INSECTS IN THE CONDITIONS OF THE KHOREZM OASIS

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**Abstract.** The thesis discusses the distribution areas of non-parasitic synanthropic insects adapted to the climatic conditions of the Khorezm Oasis, their potential harmful effects on human life and economic activity, and the methods used to study them.

Synanthropic insects are species that live in close association with environments modified by human activity. They are mainly found in residential buildings, food storage facilities, livestock shelters, markets, gardens, waste accumulation areas, and other anthropogenic habitats. The study of these insects is important for determining their ecological significance, assessing sanitary conditions, preventing excessive reproduction, and developing preventive measures against harmful species. The thesis describes the main habitats of synanthropic insects, research materials, and basic methods of collecting, observing, preserving, and identifying insect specimens. Special attention is paid to field observation, manual collection, entomological nets, different types of traps, laboratory identification, and comparative ecological assessment.

**Keywords:** entomology, synanthropic insects, urbanocenosis, prevention, research methods, trophic factors, ecological monitoring, taxonomy.

## Introduction

Among arthropods, synanthropic insects are of particular importance because they are closely connected with human life and human-made environments. The term synanthropic is used to describe organisms that live near humans and use the conditions created by human activity. The main factors determining the ability of insects to survive in artificial environments are indoor air temperature, humidity, the presence of shelters, and the availability of a suitable trophic base.

Buildings can generally be divided into two categories according to the way temperature and humidity are maintained. The first category includes unheated or occasionally heated buildings and structures used seasonally. The second category includes buildings with a constantly regulated microclimate, which are heated during cold periods of the year. Both facultative and obligate synanthropic insects may inhabit unheated buildings.

The widest distribution of synanthropic insects is often associated with plant-based products. They develop and spread during the long-term storage of grain reserves, medicinal plant materials, vegetables, and fruits. Such conditions may also intensify the development of xylotrophic fungi on wooden structures and promote the growth of

micromycetes on different materials, including technical raw materials, food products, fur clothing, books, and museum exhibits. The temperature regime inside residential buildings depends on their intended purpose and heating systems. It is one of the most important environmental factors regulated by humans in artificial habitats.

**Relevance of the Study**

In the process of social and economic development, human activity has significantly changed the natural environment. The formation of anthropogenic habitats has disrupted the natural living conditions of many organisms and caused certain species to adapt to new environments. As cities, villages, agricultural fields, and household farms expand, many insect species are increasingly adapting to modified environments.

In human settlements, such insects often find more stable food sources, warmer shelters, and favorable conditions for reproduction than in their natural habitats. This has led to the formation of specific anthropogenic-biocenotic structures, including agrocenoses and urbanocenoses, as well as distinctive complexes of synanthropic organisms. In the conditions of the Khorezm Oasis, the species composition, bioecological characteristics, and harmful effects of synanthropic insects have not been studied sufficiently. Therefore, it is important to investigate their distribution, ecological features, and possible damage, including damage caused by pest insects of the family Cerambycidae to historical and cultural heritage sites, and to develop preventive and control measures.

**Aim and Objectives of the Study**

The main aim of this thesis is to study the species composition and bioecological characteristics of non-parasitic synanthropic insects in the Khorezm Oasis, examine their distribution areas, and describe the methods used for their research and control.

To achieve this aim, the following objectives were set:

- to identify the main anthropogenic habitats where synanthropic insects occur in the Khorezm Oasis;
- to describe the ecological conditions that influence the distribution of these insects;
- to determine the main materials used in field and laboratory research;
- to explain the methods of collecting, preserving, and identifying synanthropic insects;
- to assess the importance of synanthropic insects as indicators of sanitary and ecological conditions.

**Object and Subject of the Study**

The object of the research is synanthropic insects found in the anthropogenic environments of the Khorezm Oasis. The subject of the research includes their distribution areas, adaptation to habitats, ecological characteristics, seasonal activity, and the methods used for their collection and identification. The research mainly

focuses on insects associated with human settlements and household environments, including residential buildings, food storage areas, livestock facilities, markets, gardens, waste disposal areas, and other habitats influenced by human activity.

**Natural and Geographical Conditions of the Khorezm Oasis**

The Khorezm Oasis belongs to an arid zone, where evaporation is high and natural precipitation is relatively low. The climate is sharply continental, with hot summers and cold winters. In summer, air temperature may rise significantly, creating favorable conditions for the rapid development of many insect species.

The oasis is strongly influenced by irrigated agriculture. Canals, drainage systems, gardens, crop fields, and household plots are common in the region. These water-related environments create local areas with higher humidity, which can support insect development even under generally dry climatic conditions.

**Main Distribution Areas of Synanthropic Insects**

**1. Residential Buildings and Household Areas**

Residential buildings, especially multi-storey buildings, are among the most common habitats of synanthropic insects. These insects may be found in kitchens, storage rooms, basements, wall cracks, under furniture, and near food residues. Such places provide warmth, shelter, and food sources. Kitchens may contain food leftovers, storage rooms may contain flour or grain products, and basements may provide moisture and darkness. These conditions create suitable habitats for the survival and reproduction of various insect groups.

**2. Food Storage Facilities**

Food storage facilities are important habitats for synanthropic insects. Stored grain, flour, dried fruits, vegetables, animal feed, and other food products may attract different insect species. In such places, insects can damage stored products, reduce their quality, and cause contamination. In the Khorezm Oasis, many households and farms store agricultural products for long periods. If storage conditions, duration, and product quality are not properly controlled, insects may reproduce actively and spread rapidly. Therefore, monitoring insects in food storage areas is important for preventing economic losses, maintaining food safety, and protecting human health.

**3. Markets and Trade Areas**

Markets are another important distribution area for synanthropic insects. In the Khorezm Oasis, local markets often include open areas where fruits, vegetables, meat, dairy products, grains, and other goods are sold. Food remains, organic waste, wet surfaces, and intensive human activity create favorable conditions for insects. Insects in market areas are closely associated with sanitary conditions. If waste is not removed in time or food products are not properly protected, insect abundance may increase. Markets may also serve as transfer points through which insects spread from one product, stall, or storage area to another. Therefore, regular monitoring of synanthropic insects in such places has practical importance.

**4. Livestock Shelters and Poultry Areas**

Livestock shelters, poultry houses, and animal feed storage rooms provide favorable habitats for many synanthropic insects. These places usually contain manure, feed remains, moisture, warmth, and organic matter. Such conditions are suitable for feeding, hiding, and reproduction. In rural areas of the Khorezm Oasis, many families keep cattle, sheep, goats, chickens, or other domestic animals near their homes. As a result, livestock shelters may become centers of insect development. Some insects can disturb animals, whereas others may indicate poor sanitation or excessive accumulation of organic waste. Studying insects in livestock shelters is important for improving veterinary hygiene and maintaining healthy conditions for domestic animals.

**5. Waste Accumulation Sites**

Waste accumulation sites are among the most favorable environments for synanthropic insects. Organic waste, spoiled food, rotten fruits and vegetables, animal waste, and household garbage provide abundant food sources. Moisture and heat further support insect development. Insects found in waste areas may later move to residential buildings, markets, or food storage places, increasing the sanitary importance of such habitats. The number and diversity of insects in waste areas can serve as indicators of waste management quality. A high abundance of insects may show that waste removal is irregular or that organic waste remains exposed for too long.

**6. Gardens, Yards, and Green Areas**

Gardens, yards, and green areas around houses also serve as important habitats. Fallen fruits, plant residues, moist soil, compost, irrigation water, and dense vegetation can attract insects. In such places, synanthropic and semi-synanthropic species may occur together. Gardens are especially important in the Khorezm Oasis because many households have fruit trees, vegetable plots, and irrigated areas. These habitats may connect natural and anthropogenic environments. Insects can move from gardens into houses, storage rooms, or livestock shelters. Thus, gardens and yards should be studied as transitional habitats where different ecological groups of insects interact.

**Research Materials**

Primary materials related to the research were collected in tugai and steppe areas of the Khorezm Oasis, as well as in urban and rural settlements. During the study, buildings and summer recreation houses with different microclimatic conditions were examined, ranging from rural structures to urban apartments equipped with air conditioning. Industrial buildings, recreation camps, summer cottages, and other facilities were also studied. In addition, insects found in attics, balconies, the inner and outer walls of buildings, and basements were identified.

To evaluate, interpret, and generalize the obtained results, standard methods of ecological and biometric analysis were used. The specific features of the species composition of individual synanthropic insect complexes were determined through

pairwise analysis of the inclusion measures (W) of widespread species in each compared complex, using the following formulas:

$W(A,B) = C \times 100 / A$;  $W(B,A) = C \times 100 / B$

Here, A and B represent the number of species in the compared complexes, while C represents the number of common species. The Czekanowski-Sorensen coefficient (K) was used to assess the similarity of insect complexes. This coefficient is equal to the number of common species expressed as a percentage of the average number of species in the two compared complexes:

$K = 2C \times 100 / (A + B)$

This procedure was used to classify the studied insect complexes according to the similarity of their species composition and ecological characteristics. It makes it possible to group objects into classes or clusters so that objects assigned to the same group are more homogeneous than objects assigned to different groups.

During fieldwork, the following information should be recorded:

- location of collection;
- date and time of observation;
- type of habitat;
- temperature and humidity conditions;
- sanitary condition of the area;
- presence of food remains or organic waste;
- number of collected specimens;
- behavior and activity of insects;
- possible sources of insect attraction.

Collected specimens should be placed in special containers, test tubes, paper envelopes, or alcohol solutions depending on the type of insect and the purpose of the study. Each sample must be labeled clearly. Proper labeling is very important because it allows researchers to connect the insect specimen with its habitat and environmental conditions.

**Research Methods**

**1. Field Observation Method**

Field observation is one of the main methods used in the study of synanthropic insects. It allows researchers to observe insects in natural or anthropogenic habitats. During field observation, researchers identify where insects occur, how active they are, and what environmental conditions support their presence. Observations should be carried out at different times of the day because some insects are more active during daylight, whereas others are more active in the evening or at night. Seasonal observations are also important, as insect activity may change in spring, summer, autumn, and winter. In the Khorezm Oasis, special attention should be paid to the summer period, when high temperatures can increase insect activity and reproduction.

**2. Manual Collection Method**

Manual collection is used for collecting visible insects from walls, floors, cracks, stored products, plants, animal shelters, and waste areas. This method is simple but effective, especially when studying insects in houses, storage rooms, and small habitats. Tools such as forceps, brushes, small containers, and collection tubes may be used. Manual collection helps obtain specimens for later laboratory identification. However, this method depends on the skill and attention of the researcher, so it should be combined with other methods.

**3. Collection with Entomological Nets**

Entomological nets are used mainly for collecting flying insects or insects found on vegetation. This method is suitable for gardens, yards, green areas, and places near canals or crop fields. The net is swept through vegetation or used to catch flying insects. Collected insects are then transferred to containers or killing jars for further study. This method is useful for identifying insects that move between natural and human-modified habitats.

**4. Trap Method**

Traps are effective for collecting insects that are difficult to find by direct observation. Different types of traps may be used depending on the insect group and habitat. Sticky traps, bait traps, light traps, and pitfall traps can provide valuable information about insect activity and abundance. Sticky traps may be placed in kitchens, storage rooms, livestock shelters, and markets. Bait traps may be used in areas where insects are attracted to food remains. Light traps are useful for collecting insects active at night. Pitfall traps may be used in yards, gardens, and waste areas. Traps should be placed for a fixed period of time, after which the collected insects are counted and identified. This method allows comparison between different habitats and seasons.

**5. Laboratory Identification Method**

After collection, insect specimens should be studied under laboratory conditions. Identification is usually based on external morphological features such as body shape, size, color, antennae, wings, legs, mouthparts, and other taxonomic characters. A magnifying glass or microscope may be used for detailed examination. Identification keys, entomological atlases, and scientific literature are necessary for determining the taxonomic position of collected insects. Depending on the quality of the material, insects may be identified to order, family, genus, or species level.

**6. Comparative Ecological Analysis**

Comparative analysis is used to compare insect abundance and diversity in different habitats. For example, the number of insects collected from residential buildings can be compared with those from markets, livestock shelters, or waste sites. This method helps determine which habitats are most favorable for synanthropic insects. It also allows researchers to identify the relationship between insect abundance and environmental factors such as temperature, humidity, food availability, organic waste, and sanitary conditions.

**Factors Influencing the Distribution of Synanthropic Insects**

The distribution of synanthropic insects in human-associated environments is influenced by several ecological and sanitary factors. The most important of these are food availability, temperature, humidity, shelter, waste accumulation, and human activity.

Food availability is one of the main factors. Insects are attracted to food remains, stored products, animal feed, manure, and organic waste. Temperature is also very important because warm conditions accelerate insect development. During the hot summer months in the Khorezm Oasis, many insects become more active. Humidity also plays a significant role. Although the region is generally dry, irrigated areas, canals, gardens, basements, and animal shelters may create local humid environments. These places can become suitable habitats for insects. Sanitary conditions directly affect insect abundance. Clean areas with proper waste removal and safe food storage usually have fewer insects, whereas poorly cleaned areas with open food waste and organic residues support insect reproduction.

**Expected Scientific and Practical Results**

The following scientific and practical results are expected:

- the ecological and biological characteristics that allow synanthropic insects to colonize ecological niches formed in human-made structures will be identified;
- natural habitats and reservoirs of species undergoing synanthropization will be determined;
- the patterns of insect colonization of artificial environments will be clarified, and the dynamics of the formation of the regional synanthropic complex will be explained with consideration of the socio-economic conditions influencing this process;
- modern measures for preventing damage caused by harmful synanthropic insects and for controlling them will be developed.

The research may also support ecological monitoring. Since synanthropic insects respond rapidly to changes in sanitary and environmental conditions, they can be used as biological indicators of hygiene levels and anthropogenic impact.

**Conclusion**

Synanthropic insects represent an important ecological group within the arthropod fauna because of their close association with human settlements and human-modified environments. In the conditions of the Khorezm Oasis, their distribution is influenced by climate, irrigation, household farming, livestock keeping, food storage practices, and sanitary conditions. The main distribution areas of synanthropic insects include residential buildings, food storage facilities, markets, livestock shelters, waste accumulation sites, gardens, yards, and other anthropogenic habitats. Each of these environments provides specific conditions for feeding, hiding, and reproduction.

The study of these insects requires the use of several research methods, including field observation, manual collection, entomological nets, traps, laboratory identification, and comparative ecological analysis. The combination of these methods allows researchers to obtain reliable information about insect distribution, abundance, and habitat preferences. Overall, the investigation of synanthropic insects in the Khorezm Oasis has both scientific and practical importance. It contributes to the understanding of insect ecology in anthropogenic environments and provides useful information for improving sanitary conditions, food safety, and ecological monitoring in the region.

**References**

1. Akhmedov, M. H. (2018). Fundamentals of Entomology. Tashkent: O‘qituvchi.
2. Abdullayev, A. A. (2016). Insect Fauna and Ecology of Uzbekistan. Tashkent.
3. Murodov, S. A. (2005). General Entomology. Tashkent: Fan.
4. Gilyarov, M. S. (2009). Ecological Features of Insects in Anthropogenic Areas. Moscow: Nauka.
5. Zakharov, A. A. (2012). Synanthropic Insects and Their Sanitary Importance. Moscow.
6. Service of Sanitary and Epidemiological Welfare and Public Health of the Republic of Uzbekistan. (2020). Sanitary and Hygienic Standards and Regulations. Tashkent.
7. Regional ecological and agricultural materials of the Khorezm region. (2021). Urgench.
8. Greig-Smith, P. (1964). Quantitative Plant Ecology. London: Butterworths.
9. Plokhinsky, N. A. (1970). Biometrics. Moscow: Moscow University Press.
10. Sorensen, T. (1948). A method of establishing groups of equal amplitude in plant sociology based on similarity of species content. Biologiske Skrifter, 5(4), 1-34.