**Dominant pest insect species of the southern aral region**

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**Abstract.** This article discusses the distribution and trophic relationships of dominant pest insect species in the conditions of the Southern Aral region. Particular attention is given to the selection of 31 plant species of the flora of Uzbekistan as food sources. In addition, the necessity of implementing preventive measures against dominant pest insects is emphasized.

**INTRODUCTION**

The climate of the Republic of Uzbekistan is predominantly hot, arid, and sharply continental, belonging to the desert zone. In the natural and anthropogenically transformed territories of the Southern Aral region, the problem of pest insects has become increasingly acute, as their destructive activity has been widely recorded on both living and desiccated plants.

Geographically, much of the Southern Aral region consists of sandy desert landscapes, which represents a major factor driving the proliferation of phytophagous pest insects. Furthermore, a significant portion of the area is occupied by natural tugai (riparian) forests and anthropogenically transformed lands, including agrocenoses established through human activity.

Currently, special attention is being given to the inventory of faunal representatives, the conservation of rare species, the identification of harmful taxa, and the development of control strategies. The species composition and spatial distribution of economically important insects have been determined, the ecological factors influencing their reproduction have been assessed, and preventive measures are being designed. Thus, the inventory of pest insects, identification of dominant harmful species, and elaboration of advanced control methods in the natural and anthropogenically transformed tugai landscapes of the region are of considerable scientific and practical significance.

In recent years, representatives of termites (order Isoptera Brullé, 1832) have become dominant insect species under the conditions of the Southern Aral region. They are widely distributed in nature and are frequently observed forming colonies in various soil-associated ecological environments. Globally, more than 2,900 termite species have been identified, of which 120 species are recognized as pests. Termites are widely distributed in nature and form colonies in diverse ecological habitats related to soil.

In all tropical and warm countries, termites are considered a serious calamity. As examples, one may note the destruction of residential buildings, furniture, clothing, and footwear, as well as the withering of wild plants, trees, and cereal crops. Furthermore, irrigation canals, piers, barges, dams, and hydraulic structures often collapse under water pressure due to termite damage, which weakens their integrity. Termites are also responsible for the complete destruction of many books preserved in archives and libraries [5; 7].

In the Southern Aral region, two termite species of the genus Anacanthotermes have been recorded: the Turkestan termite (A. turkestanicus Jacobs.) and the Greater Caspian termite (A. ahngerianus Jacobs.). In recent years, these species have been observed throughout the region, causing significant damage not only to natural tugai forests and both living and dried plants, but also to human dwellings, agricultural buildings, and even historical monuments.

Although control measures against termites have been developed, their cryptic lifestyle, protection from external environmental factors, functional specialization of caste members within colonies, their extremely high numbers, and the ability of even small residual populations to rapidly recover all demonstrate the inefficiency and limited prospects of currently applied methods. Considering the aforementioned challenges, the development of new environmentally safe and highly effective technologies for termite management is urgently required.

In the tugai forests of the Southern Aral region, representatives of the order Coleoptera (Linnaeus, 1758) — beetles — include families belonging to the group of xylophagous insects feeding on dried plants. Although not among the most numerous insect groups in terms of species diversity, under favorable environmental conditions they can produce a high level of biomass due to their abundance in individuals.

In recent years, significant changes have been observed in the insect fauna of both natural and anthropogenically transformed habitats, particularly reflected in the increased taxonomic diversity and the expansion of their ecological niches. However, this process has also led to the contraction of the ranges of beneficial insect species. As is well known, beneficial insects constitute an integral part of the country’s biodiversity and play a key role in maintaining ecological balance in nature. From an ecological perspective, the influence of abiotic, biotic, and anthropogenic factors contributes to constant variability and adaptability within habitats, shaping the dynamics of insect communities.

The main forest-forming tree species of the tugai ecosystems in the Southern Aral region of the Republic of Karakalpakstan include the diverse-leaved poplar (Populus diversifolia), grey-leaved poplar (Populus pruinosa), narrow-leaved oleaster (Elaeagnus angustifolia), oriental oleaster (Elaeagnus orientalis), as well as tamarisk (Tamarix spp.), saxaul (Haloxylon spp.), Salsola arbuscula, Ferula spp., Halimodendron spp., and other plants.

During our research, the species composition of the entomofauna inhabiting tugai vegetation of the Southern Aral region was studied, with a special focus on xylophagous pest insects and the damage they cause to plants. As a result, within the family Cerambycidae (order Coleoptera), 3 subfamilies (Cerambycinae, Prioninae, and Lamiinae), 12 genera (Aeolesthes, Chlorophorus, Turanium, Xylotrechus, Neoplocaederus, Turcmenigena, Hesperophanes, Plocaederus, Mesoprionus, Prionus, Psilotarsus, and Tetrops), and 16 species were identified: Aeolesthes sarta, Chlorophorus faldermanni, Chlorophorus elaeagni, Chlorophorus varius, Turanium scabrum, Xylotrechus namanganensis, Xylotrechus grumi, Neoplocaederus scapularis, Turcmenigena warenzowi, Hesperophanes heydeni, Plocaederus scapularis, Mesoprionus angustatus, Mesoprionus komarovi, Prionus turkestanicus, Psilotarsus brachypterus, and Tetrops elaeagni.

In the natural ecosystems of the Southern Aral region, the distribution levels, frequency of occurrence, and habitats of longhorn beetles vary significantly. These differences are primarily associated with the geobotanical structure and plant composition of the vegetation cover. For example, in desert and semi-desert zones, they are closely associated with Haloxylon and Tamarix species; in tugai forests with Populus and Salix species; and in sandy areas with Elaeagnus and Ferula species.

This research was conducted in the Southern Aral region of the Republic of Karakalpakstan, where a total of 16 xylophagous insect species were identified in both natural and anthropogenically transformed habitats. Among them, the dominant species included: Aeolesthes sarta (Solsky, 1871) — the City Longhorn Beetle (larvae feed on the cambial tissues of Populus and Salix, causing severe damage); Xylotrechus namanganensis (Arkhangel’skii, 1941) — the Namangan Longhorn Beetle (on Populus and Salix, larval density 31/dm²); Xylotrechus grumi (Semenov, 1889) — the Grum Longhorn Beetle (on Elaeagnus, 80% damage rate); Turanium scabrum (Kraatz, 1882) — the Turanian Longhorn Beetle (on Populus and Elaeagnus, feeding on leaves and twigs); Mesoprionus angustatus (Jakovlev, 1887) — the Angustatus Longhorn Beetle (on Haloxylon and Populus, with a 4-year cycle); and Mesoprionus komarovi (Dohrn, 1885) — the Komarov Longhorn Beetle (on Haloxylon, 60% damage rate).

Studies of natural ecosystems were conducted separately, with observation routes established across the Orolkum desert, the Amu Darya delta, the Ustyurt plateau, and riparian forests along riverbanks. As a result, nine longhorn beetle species of the family Cerambycidae were identified, inhabiting plants such as Ferula spp., Salsola arbuscula, Tamarix spp., Haloxylon spp., and Halimodendron spp.

Anthropogenically transformed areas were also investigated. In particular, observation routes were organized in the orchards and agrocenoses of Turtkul, Beruniy, Kanlikul, Ellikqala, Khojayli, and Kegeyli districts. As a result, nine species of longhorn beetles of the family Cerambycidae were recorded. Most of these species are polyphagous and damage various trees and shrubs, including Populus, Salix, Elaeagnus, Haloxylon, and Tamarix [11].

During the research, it was found that representatives of the order Coleoptera (Linnaeus, 1758) — beetles — inhabiting shrubs and subshrubs include certain pests whose larvae, measuring 50–60 mm in length, damage the stem parts of plants until late summer. With the onset of winter, they remain in the first larval stage, passing through phases up to the second instar before entering diapause. In the following spring, during adult emergence, the beetles were observed to cause longitudinal damage of 3.0–3.6 cm in length and 1.1–1.7 cm in width to plant stems.

In the Tien Shan mountain ranges of the Zhetysu Alatau (Republic of Kazakhstan), representatives of the order Coleoptera (Linnaeus, 1758), particularly families Cerambycidae, Buprestidae, Curculionidae, Siricidae, and Xiphydriidae, were studied, comprising 52 genera and 85 species. In the natural ecosystems of the country’s southeastern regions — Ile, Koral, Aksu, Lepsi, Kaskelen, and Sharyn steppes — 45 species of jewel beetles (family Buprestidae) were identified. Moreover, 29 species belonging to 16 genera within the subfamilies Julodinae, Polycestinae, Chrysochroinae, Buprestinae, and Agrilinae were recorded. Among these, genera Sphenoptera, Agrilus, and Acmaeoderella were found to be dominant [2; 3].

In the forests of the CIS and foreign countries, the damage caused by pest insects began to be seriously observed from the late 19th century to the 1990s. Later, in the forests of Primorsky and Khabarovsk in Russia, the slender-bodied metallic wood-boring beetle Agrilus planipennis, belonging to the family Buprestidae (Leach, 1815), caused significant damage, having been introduced with construction materials. Beetles of the family Buprestidae (Leach, 1815) were first recorded in China on the introduced ash tree Fraxinus americana imported from North America. The natural range of the beetle includes northeastern China (Jilin, Liaoning, Heilongjiang, Hebei), as well as Japan, Mongolia, and the Korean Peninsula. Its serious outbreaks were observed in the 1960s in Harbin and the districts of Tianjin on elm (Fraxinus rekyina). Moreover, in recent years, species of the family Buprestidae (Leach, 1815) have caused severe damage in Michigan (USA) and Ontario (Canada), primarily affecting F. americana, F. nigra, and F. pensylvanica. The damage caused by these beetles differs from that of other pest insect species: Agrilus planipennis lays its eggs under the bark of living trees, and its larvae create tunnels up to 5 cm deep, leading to tree mortality within three years. In some cases, mass outbreaks of xylophagous insects such as Phaenops cyanea and Monochamus galloprovincialis have led to forest dieback, and due to increased heat, even to cases of forest fires [9; 10].

Within the scope of the available literature, comprehensive scientific studies on the problem of pest insects—namely, the biofunctional characteristics of plant pests—have not been carried out. The biology, harmful impact, monitoring level, species dominance, and preventive control measures of pest insects have not been sufficiently developed. Taking these factors into account, the broad investigation of pest insects and the practical application of the obtained results represent one of the urgent tasks of today.

**EXPERIMENTAL RESEARCH**

The research was conducted during 2010–2025 in the natural conditions of the Southern Aral region, encompassing the tugai forests of the Republic of Karakalpakstan and Khorezm region, the Lower Amu Darya State Biosphere Reserve, as well as anthropogenically transformed areas. These included cultural heritage sites under the State Inspectorate for the Protection and Utilization of Cultural Heritage Objects of the Republic of Karakalpakstan: Akshakhan, Tashkyrman fortress (Beruniy district), Toprak, Kirk-Kiz, Ayaz-1-2 fortresses (Ellikqala district), Jambas, Qumbaskan fortress (Turtkul district), Jampik, Sultan Uvays mountain Gaur fortress (Qorauzyak district), Mizdahkan complex (Khojayli district), Shibili ota pilgrimage site, Ichan Kala (Kegeyli district), Uroq Bolga, the former bus station residential area (Nukus city), Taqirkol village (Nukus district), as well as historical monuments in Khiva city, Khorezm region, including Ichan Kala Juma Mosque, Pahlavon Mahmud mausoleum, and Tosh-Hovli. Field experiments were mainly conducted in the Shibili ota pilgrimage site (Kegeyli district) and the Ichan Kala historical monument museum in Khiva city.

During the research, special attention was given to the dominant pest insect species in the natural and anthropogenically transformed habitats of the Southern Aral region. Observations focused on major host plants belonging to the flora of Uzbekistan, including *Populus afghanica* (Aitch. et Hemsb.), *Catalpa bignonioides* (Walt.), *Quercus ilex* (L.), *Quercus robur* (L.), *Quercus rubra* (L.), *Gymnocladus dioicus* (L.), *Ailanthus altissima* (Mill.), *Juniperus seravschanica* (L.), *Pinus sylvestris* (L.), *Populus pruinosa* (Schrenk.), *Populus nigra* (L.), *Populus alba* (L.), *Picea abies* (L.), *Robinia pseudoacacia* (L.), *Salix alba* (L.), *Betula pendula* (Roth.), *Crataegus pontica* (C. Koch.), *Ulmus densa* (Litv.), *Caragana arborescens* (Lam.), *Aesculus hippocastanum* (L.), *Gleditsia triacanthos* (L.), *Tilia tomentosa* (Moench.), *Acer platanoides* (L.), *Biota orientalis* (L.), *Platanus orientalis* (L.), *Fraxinus pubescens* (L.), *Acer negundo* (L.), *Sophora japonica* (L.), *Tamarix hispida* (Willd.), *Elaeagnus angustifolia* (L.), and *Haloxylon aphyllum* (Minkw.) [8].

Pest insect collection was carried out in riparian and sandy areas with trees and shrubs. The main experiments were conducted in spring and summer by wrapping additional plastic film around tree trunks, which facilitated the capture of the main proportion of xylophagous insects. In addition, dried trees (due to strong winds, salinization, or other factors) were cut with a chainsaw, and insect larvae, adults, and dead specimens were collected from the inner wood and bark. Severely damaged wood samples (20 cm in length) were placed in mesh containers for laboratory observations.

Under the conditions of the Southern Aral region, the population ecology, evolutionary adaptation mechanisms, and survival patterns of pest insects within biocenotic communities were studied. Their adaptation to local conditions, monitoring levels, and harmful impact were assessed. The species composition of pests was analyzed based on general entomological and ecological methods [1, 5-11], as well as biological, systematic, faunistic, bioecological, and developmental phase approaches [1-4]. Based on analytical data, representatives of the orders *Isoptera* (Brullé, 1832) and *Coleoptera* (Linnaeus, 1758) were identified as dominant, with six species recorded as dominant pest insects in the Southern Aral region.

**RESEARCH RESULTS**

According to the research results, in the process of clarifying the dominance of pest insects under the conditions of the Southern Aral region, insect specimens were collected from 31 plant species belonging to the flora of Uzbekistan throughout all seasons of the year (spring, summer, autumn, and winter), and their life development was observed (Table 1).

**Table 1.** Occurrence rates of dominant pest insect species under the conditions of the Southern Aral region

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| № | Insect species | Natural environment | | | | |  | | --- | | Anthropogenic environment | | | | |
| Spring | Summer | Autumn | Winter | Spring | Summer | Autumn | Winter |
| 1 | *Anacanthotermes turkestanicus* | ттт | тт | ттт | т | тт | т | ттт | ттт |
| 2 | *Anacanthotermes ahngerianus* | ттт | тт | ттт | т | тт | тт | ттт | ттт |
| 3 | *Xylocopa valga* | - | ++ | +++ | - | + | ++ | ++ | - |
| 4 | *Buprestis rustica* | ++ | - | +++ | + | ++ | - | +++ | + |
| 5 | *Hylotrupes bajulus* | ++ | ++ | +++ | - | ++ | +++ | +++ | + |
| 6 | *Anobium pertinax* | - | + | +++ | + | ++ | ++ | +++ | + |
| 7 | *Cleonis pigra* | ++ | ++ | +++ | - | +++ | ++ | +++ | + |
| 8 | *Rhabdorrhynchus seriegranosus* | +++ | ++ | ++ | - | ++ | ++ | + | - |
| 9 | *Lixus juncii* | ++ | ++ | ++ | - | ++ | ++ | ++ | + |
| **Total:** | | 8 | 8 | 9 | 4 | 9 | 8 | 9 | 7 |

**Legend:** **+** – very rare species (1 specimen per 50 trees),**++** – rare species (4–10 specimens per 50 trees),**+++** – permanent species (11–20 specimens per 50 trees),**т** – swarm-forming species, very low occurrence, **тт** – swarm-forming species, moderate occurrence,**ттт** – swarm-forming species, high occurrence

In the Southern Aral region, dominant pest insect species were recorded both in natural habitats and in anthropogenically transformed sites on the flora of Uzbekistan, including the main tree and shrub species: Populus afghanica (Aitch. et Hemsb.), Catalpa bignonioides (Walt.), Quercus ilex (L.), Quercus robur (L.), Quercus rubra (L.), Gumnocladus dioicus (L.), Ailanthus altissima (Mill.), Juniperus seravschanica (L.), Pinus sylvestris (L.), Populus pruinosa (Schrenk.), Populus nigra (L.), Populus alba (L.), Picea abies (L.), Robinia pseudoacacia (L.), Salix alba (L.), Betula pendula (Roth.), Crataegus pontica (C. Koch.), Ulmus densa (Litv.), Caragana arborescens (Lam.), Aesculus hippocastanum (L.), Gleditsia triacanthos (L.), Tilia tomentosa (Moench.), Acer platanoides (L.), Biota orientalis (L.), Platanus orientalis (L.), Fraxinus pubescens (L.), Acer negundo (L.), Sophora japonica (L.), Tamarix hispida (Willd.), Elaeagnus angustifolia (L.), and Haloxylon aphyllum (Minkw.).

The frequency of occurrence of pest species was mainly recorded on these woody plants. It was clarified that the termites Isoptera (Brullé, 1832), Anacanthotermes turkestanicus, and Anacanthotermes ahngerianus remain active as swarm-forming species throughout all seasons of the year. In contrast, other pest species belonging to Coleoptera (Linnaeus, 1758)—including Xylocopa valga, Buprestis rustica, Hylotrupes bajulus, Anobium pertinax, Cleonis pigra, Rhabdorrhynchus seriegranosus, and Lixus juncii—were found to occur at different times of the year.

**CONCLUSIONS**

In the natural conditions of the Southern Aral region and in anthropogenically transformed agrocenosis fields, pest insects were collected from trees, shrubs, and semi-shrubs using adhesive films and cotton fabric wrappings. As a result, it was clarified that nine dominant pest insect species—Isoptera (Brullé, 1832), Anacanthotermes turkestanicus, Anacanthotermes ahngerianus, and Coleoptera (Linnaeus, 1758): Xylocopa valga, Buprestis rustica, Hylotrupes bajulus, Anobium pertinax, Cleonis pigra, Rhabdorrhynchus seriegranosus, and Lixus juncii—select certain plants as their food sources.

Overall, the identification of pest insect diversity in both natural and anthropogenically transformed habitats, the assessment of their harmful impact on riparian forests, human settlements, administrative buildings, cultural and strategic facilities, as well as the improvement of control measures against them, are of great scientific importance.

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