

The population of Bark Beetles (Scolytinae) and their entomophages on endemic spruce in the Zaili Alatau

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ABSTRACT

The article provides monitoring of the population of bark beetles (*Scolytinae*) and their entomophages in the forests of the Zaili Alatau on the territory of the Ile-Alatau state national natural Park. As a result of monitoring of bark beetles (*Scolytinae*), the species composition of bark beetles and their entomophages was established on the endemic shrenka spruce in the Zaili Alatau. One of the possible centers of outbreaks of mass reproduction of bark beetles is shrinking Shrenka spruce trees found in a number of gorges. In this regard, we carried out a monitoring of the populations of bark beetles (*Scolytinae*) in the endemic spruce spruce in The Zaili Alatau. In the years of the study, there were 17 species from the family of bark beetles (*Scolytidae*), and the gauser bark beetle (*Ips hauseri* Reitt) dominated the registered species of bark beetles (*Scolytinae*). Also found is a predator from the order of Hemiptera (*Hemiptera*) bugs crumb-*Scoloposcelis pulchella* Zetterstedt which has not been previously recorded in Kazakhstan.

Key words: *Shrenka spruce, The pheromone, The bark beetle, Entomophage.*

Introduction

One of the early Messages of the President of the country to the people of Kazakhstan (October 10, 1997) States: “the Symbol of our country in the future should not be deserts, but forests” (Message of the President of the Republic of Kazakhstan, 1997; Zhaparkulova *et al.*, 2019; Anuarbekov *et al.*, 2018). This should be the programme of action for the present and future generations of foresters in the twenty-first century. Today, our forests are threatened not only by negative anthropogenic factors, but also by some natural biological factors, such as epiphytic diseases or an outbreak of mass reproduction of dangerous and quarantine pests. Sometimes the invasion of dangerous pests threatens the existence of forests. It is necessary to raise forest pathology monitoring and forest protection measures to a

scientific and methodological level.

A very important problem is the use of biological methods and means of replacement against the main enemies of the bark beetles of the Shrenka spruce, which will allow preserving the biodiversity of forest cenoses. All these and other problems are held in Kazakhstan, the species that gave us the basis for this research direction, that is, to establish the species composition of insects -xylophagous bark beetles (*Scolytinae*) of the Tien-Shan spruce, and to determine the role of entomophages in the regulation of the number of stem pests bark beetles (*Scolytinae*) were eaten in the mountains of Zaili Alatau.

Place of Research

The research was carried out directly in the forests of the Zaili Alatau, in the laboratory of KazNIIZIR

LLP. J. Jeenbaeva" and Saint Petersburg state forest technical University named after S. M. Kirov. When conducting research, we were guided by generally accepted methods in plant protection, forest entomology, and forest pathology surveys (Manual on supervision, accounting and forecast of mass reproduction 1975; Nikitsky, 1980; Kharlamova *et al.*, 2010).

Results

According to the results of the research, the species composition of bark beetles (Scolytinae) on the endemic schrenka spruce in the mountains of the Zaili Alatau was revealed. Conducting forest entomological monitoring in our research is the main priority, so the assessment of the forest-pathological situation of forest ecosystems was the main condition for establishing the forest-pathological state of endemic Shrenka spruce trees.

The conducted surveys revealed certain regularities, where it was found that in the Medeu and Butakov gorges there is a weakened state in comparison with other other areas, as well as noticeable curt shrinkage due to the invasion of bark beetles, probably due to the consequences of a large volume of previously fallen trees and ongoing forest restoration work. In 2019, 8.3 hectares of shrunken forest with a volume of 556 cubic meters is planned to be cut down in the Butakov gorge from bark beetles ' harmfulness.

The hanging of the traps was carried out from April 15 to 30, and they were inspected regularly every 7-12 days. the results are shown. The use of pheromone traps of the barrier and triangular type and scouring of fallen shrinking trees in the areas allowed collecting the species composition of bark beetles. It should be noted that the higher efficiency of sex pheromone traps have barrier-type compared to the adhesive Treugolnik type. Pheromone traps

and monitoring were carried out in various gorges and at various altitude levels; at the beginning of spruce growth, in the middle and at the end (from 1650 m. n.m. to 2,750 m. n.m.). In General, the number of bark beetles has decreased by 30-45% in comparison with previous years due to a decrease in the forage base and ongoing forestry activities in places of drying and wind, as well as preventive measures in places of wood storage.

From Table 1 it is evident that forest pest condition of the spruce trees spruce is assessed overall as satisfactory. We took into account at least 100 trees when evaluating the condition of temporary test sites. It was found that in Medeuski and Butakovsky gorges there is a weakened state compared to the other sections, as well as noticeable curt shrinkage due to the invasion of bark beetles. Gorges that are closer to the city are more weakened than remote areas, and the impact of anthropogenic factors is likely. The main forest-forming species are Shrenka spruce of the senior class of age, where 11.0-31% of the stands are shrinking and dry-top stands. In General, the condition is satisfactory, but there are chronic foci of pests and diseases, mainly sucking pests (aphids, Hermes) and rust of needles that cover the surface of needles and branches. After damage to the old conifer, yellowish spots appear, turning into rust and Shute needles, later the needles fall off, spread almost everywhere, on average, 25-37%. This is well observed in the month of June, after which the damaged branches gradually crumble and overlap with a new growth. Of the diseases, there are root and core rot, which are manifested by 25-36% in old-growth plantations, where after falling for 3-6 months they are populated by bark beetles, the main of which is gauser's bark beetle, gravers, and others. They quickly multiply and attack nearby stands. In order to improve the sanitary condition of forests from biological means

Table 1. Assessment of the forest pathologic status of Shrenka spruce in the Zaili Alatau, 2018-2019

Place monitoring sites'	General the number of trees, pieces	The status category trees, %				Preserved trees, %	trees %, V-VI-category
		I	II	III	IV		
Turgenev branch, Issyk gorge	105	-	18.6	65.4	5	89.0	11.0
Talgar branch, Soldier 's gorge	105	-	11.2	72.3	5	88.5	11.5
Medeu branch, Alma Arasan gorge	105	-	10.0	54.8	19.1	83.9	16.1
Medeu branch of the Butakovka gorge	105	-	8.3	50.2	10.5	69.0	31.0
Medeu branch, Bolshoe-Almaty forestry	105	-	10.3	54.0	14.7	79.0	21.0
Aksay branch, Kaskelen forestry	105	-	16.6	63.3	9.1	89.0	11.0

of pest control, in addition to nesting sites for birds, it is necessary to create remeznye sites, to register drugs against bark beetles and other xylophages for timely preventive and protective treatments. The species composition of scolytinae bark beetles was established on the endemic schrenka spruce in the mountains of the Zaili Alatau as a result of the collection and monitoring. During the study period, the family of bark beetles (*Scolytinae*) met - 17 species: gauser's bark beetle (*Ips hauseri* Reitt.), six-toothed bark beetle or stenographer (*Ips sexdentatus* Boerner), double bark beetle (*Ips duplicatus* Sahalb.), pozharishch bark beetle (*Orthotomicus suturalis* Gyllenhal), Baikal engraver (*Pityogenes conjunctus* Reitter), common engraver (*Pityogenes chalcographus* L.), Asian engraver (*Pityogenes perfossus* Bees.), the micrograph of the Kirghiz (*Pityophthorus kirgisticus* Pjat.), Spessivtsev's engraver (*Pityogenes spessivtsevi* Lebedev, 1926*), parfentjev's micrograph (*Schrenk's Micrograph*) *Pityophthorus parfentjevi* Pjatnitzky (p. schrenkianus Pjatnitzky), purple or small spruce luboed *Hylurgops palliatus* Gyllenhal, taiga For-ester, hectograph (*Dryocoetes hectographus* Reitter), Kyrgyz root beetle (*Hylastes substriatus* Strohmeyer) arboreal (*Trypodendron lineatum* (Olivier, 1795)), Kholodkovsky's luboed (*Carphoborus cholodkovskiy* Spessivtsev, 1916). Naibolshim the number of met - bark of Hauser (*Ips hauseri* Reitt.).

The Kyrgyz kornezhil-*Hylastes substriatus* Strohmeyer 1914 is a pest of many coniferous trees,



Fig. 1. Damage to wood by gauser's bark beetle



Fig. 2. Six-tooth bark Beetle or stenographer *Ips sexdentatus* Boern, 1776 Note-photo By N. S. Mukhamadiev



Fig. 3. Gauser's bark Beetle (mountain Kyrgyz bark beetle) *Ips hauseri* Reitter, 1895 Zaili Alatau, Russia. Gorelnik, 28.06.2012, under the bark of a Shrenka spruce Note-photo by S. V. Kozlov

including Shrenka spruce and common pine. It is found mostly in wet shady places: near mountain rivers and streams, in low terrain. Inhabits the root neck, roots of large and medium-sized trees, stumps of the current and last year of felling. Populating trees weakened by other types of pests, kornezhil significantly accelerates their death, and thus is able to cause significant damage. At the end of may-the first decade of June, an active period of *Hylastes substriatus* was observed.

A series of beetles was collected and the biological features of this species endemic to the Tien Shan were clarified, consisting in the pubescence of the elytra and the structure of the male abdomen. Special attention is paid to the biology of *Hylastes substriatus* – the only subendemic species of Central



Fig. 4. *Pityogenes spessivtsevi* Lebedev, 1926-det. M. Mandelstam, 2017 Zaili Alatau, Russia. Gorelnik, 28.06.2012, under the bark of a Shrenka spruce Note-photo by S. V. Kozlov



Fig. 5. Lobed purple or small spruce lubed – *Hylurgops palliatus* (Gyllenhal.1 813) - det. Mandelshtam. Zaili Alatau mountain Beaver under the spruce bark spruce Note-photo by S. V. Kozlov <https://www.zin.ru/Animalia/Coleoptera/rus/hylsubsk.htm>

Asia, restricted in distribution by the Tien Shan (Kazakhstan, Kyrgyzstan, China).

The purple lubeed or small spruce lubeed-*Hylurgops palliatus* (Gyllenhal, 1813), collected on a lying Tien Shan spruce in the Kazachka tract, is a trans-Paleartic species. The pest is widely distributed in coniferous, mostly raw forests. When settling, it prefers more dark places, and therefore to damaged fallen trees, it chooses the lower side facing the ground. Attacks equally willingly, as on standing strongly weakened firs (preferably) and pines (less often-other breeds), populating mainly part of the trunk with thick and transitional bark, and on trees lying on the ground, uncut timber and thick 1-2-meter firewood. The uterine course is longitudinal, the beginning of it is expanded stepwise. The larval passages are very confused. The area of Almaty was probably filled with pine or spruce timber.

Entomophages are important in regulating the number of bark beetles. In 2018-2019, entomophages were registered from the order Coleoptera, which include representatives of 12 families, 13 genera, 14 species; from two-winged (*Diptera*): 2 families, 2 genera, 2 species and Hymenoptera (*Hymenoptera*) - 2 families, 6 genera, 9 species and from the order Hemiptera - representatives of 3 families, 4 genera and 4 species.

Conclusion

Hylastes substriatus is the only endemic species of Central Asia, limited in distribution by the Tien Shan (Kazakhstan, Kyrgyzstan, China). During the period of our research, a predator from the Hemi-

ptera order was found – *Scoloposcelis pulchella* Zetterstedt, which was not previously recorded in Kazakhstan. Small bug 3,0-3,8 mm, shiny, glabrous. Elytra for the most part whitish. The shins and legs are light yellow.

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