Current State of Jewel Beetles (*Buprestidae*) in Azerbaijan

Ellada Aghamelik Huseynova[1]

[1]Assoc. Prof., Institute of Zoology, National Academy of Sciences, Passage 1128, block 504, Az1073, Baku, Azerbaijan.
E-Mail: ella_line@mail.ru

***Abstract**:*

The article presents data on the current status of the population of family Buprestidae, quantity and species composition, distribution by region of Azerbaijan, occurrence on the different species of plants. An assessment of the physiological state of 2 representatives of the family – Coraebus elatus Fabricius, 1787a, Capnodis tenebrionis Linnaeus, 1761 is also given.

Key Terms: jewel beetles, phytophagous, species, genus, subfamilies, populations.

Introduction:

There are more than 15 thousand species of jewel beetles (*Buprestidae*) in the world; in the former Soviet Union - about 500, mostly in the southern regions. Jewel beetles are widely distributed (about 80% of species in tropical countries) in the world. The family Buprestidae is divided into five subfamilies. The entire family includes 185 genera. From them 26 genera and 338 species occur in Europe and the Caucasus (Gornostayev, 1970).

The first studies on fauna of jewel beetles of Azerbaijan have been carried out by the first Russian entomologist Menetries E. Serial collections and research on fauna of jewel beetles in the beginning of the last century were done by Vinovsky M.A., Bogachev A.V, etc. So, Bogachev A.V. (Bogachev, 1951) presents about 80 species of jewel beetles for Azerbaijan fauna. In the works of N.H. Samedov much attention devoted to the jewel beetles. From 171 species of jewel beetles presented in his monograph (Samedov, 1963) he described 26 ones as harmful pests of cereals. M.G. Volkovich(Volkovich,2006) carried out collections of Buprestidae in Azerbaijan in the 70's and 80's of last century. He recorded 150 species in Azerbaijan.

In the collection fund of the Institute of Zoology of the National Academy of Sciences of Azerbaijan Buprestidae occupy one of the important places where there are specimens collected in the 80-ies of the 19th century.

Materials and Methods:

Collections were conducted by standard entomological methods, shaking the trees, sweeping, hand-picking (Fasulati, 1971). Evaluation of the physiological state of populations of the jewel beetles was carried out according to ZlotinA.Z (Zlotin, 1989). Entomological keys were used to determine the beetles (Opredelitelnasekomixevropeiskoichasti SSSR. Jestkokrilie I veerokrilie.1965).

Results and Discussion:

Among the beetles - forest pests they occupy third place (after bark beetles and long-horned beetles) and often the 1st place as pests of fruit orchards. Jewel beetles also contribute to the spread of wood-destroying fungi. However, the fact is known that the jewel beetles affect mostly dead or dry up (rarely healthy) plants, thereby contributing to their more rapid decomposition, which has a positive effect on the recovery of the state of forest. Thus, the formed idea about jewel beetles as dangerous pests can cause irreparable damage to their biodiversity.

Changing environmental conditions are also adversely affecting the state of jewel beetles: the processes of transformation, shrinking forests, pollution of the environment. So study the effect of oil pollution on the state of the insect fauna of forests of the North-East of Azerbaijan revealed that representatives of the family Buprestidae make only 5% of the total

fauna of the Coleoptera (Huseynova, et al 2002). Moreover, this figure had a tendency to decrease depending on the degree of contamination. Consequently, the jewel beetles can be attributed to risk group in relation to anthropogenic pollution.

Jewel beetles (Buprestidae) - one of the most beautiful families of the Coleoptera. They are small, medium, rarely large sized beetles, often with a metallic sheen. The body is elongated, flattened or cylindrical, covered with strong armor, elytra narrowed at the end. Antennae short, serrated, legs short.

They feed on the leaves or thin bark of plants, often causing substantial harm, damaging the cambium layer. Adults are active in the daytime, sun-loving, usually fly well. Larvae whitish, flat, with a long, thin abdomen and expanded prothorax, without legs, a small dark head retracted into prothorax (Volkovich, 2006). This form helps the body to move in the wood. Covers of jewel beetles are very hard, so the beetles are well preserved in the dry form. Large, brightly colored samples are often used for the manufacture of brooches, bracelets and other jewelry.

The larvae feed on the milled bark and wood. The beetles fly during the hottest time of the year and during the hottest hours of the day, mostly found on the trunks and leaves of trees. In case of danger they take off or immediately fall to the ground pursingantennae and legs. They are exclusively herbivorous insects. The female lays eggs on the bark of trees. Duration of development - 2 or 3 years. Many species of jewel beetles are very active and attack relatively healthy trees, settling them before long-horned beetles and bark beetles. For breeding they choose sparse, well-warmed xerophytic plantations growing. Very few of jewel beetles are typical wood destroyers. Many of the most common and dangerous species live under the bark, and do not destroy the wood, or make relatively shallow passages and thus only slightly lower the yield of timber and accelerate the process of destruction of the tree, opening the ways for fungal infection.

However, notall jewel beetles associated with woody or shrub vegetation. There are some species of jewel beetles the larvae of which live in the roots of grasses or develop in the soil. To the latter group belong beautiful, soil species from the genus *Julodis*, which reach a length of several centimeters. They are frequent in Azerbaijan. Their strongly convex body decorated with white and yellowish spots and felt strips complicated in pattern. The larvae have a broad spade-shaped jaws, with help of which they lay moves in the soil, feeding on roots of plants.

Among jewel beetles there are many dangerous pests. Some of them attack the weakened trees andlaid them the last, fatal blow, the second damage wood and the others gnaw the roots, etc.Being exclusively phytophagous many species of the family are of interest as forest pests and crops. The most important feature of trunk pests is that they usually do not colonize the healthy trees. Their species can colonize either weakened, but still alive, often apparently healthy trees, or dying or freshly dead (including freshly cut), or the old dead wood. Trunk pests that can settle on the still-living trees, paving the tunnels under the bark, destroying the bast, cambium and quickly result tree, or part of it (branch, top) to the death. These insects are dangerous for forests affected by the drought, flooding, fires, gas or dust emissions, by leaf-eating pests and other unfavorable factors. In the weakened forests the trunk pests form center of outbreak, staying in some cases, 2-3 years, in others - a lot of years, as long as there is a supply of weakened trees. Trunk pests are very dangerous for artificial forest plantations suffering from lack of moisture. Beetles can be found in the flowers and inflorescences of white, yellow, white and yellow, sometimes other colors.

Only a few species are useful to humans. Thus, *A.hyperici* has been specially introduced from Europe to America to control the pasture weed tutsan. Damaging the roots, jewel beetles larvae cause itsdrying and clean the pastures of this competitor of other useful herbs. Covers of jewel beetles are very hard, so the beetles are well preserved in the dry form. Large, brightly colored jewel beetles are often used for the

manufacture of brooches, bracelets and other jewelry (Suitmen, 1964).

Despite the fact that Buprestidae of Azerbaijan has been studied for a long time, researches are far from complete. Many species are known according to descriptions only. Identification of the larvae, which is now considered to be the most reliable, is not carried out. Therefore study of the fauna of Buprestidae of Azerbaijan seems topical. This requires the mass collection of beetles, data on ecology, the collection and study of the larvae. We have conducted research on jewel beetles since 2002. From 6 known subfamilies we registered representatives of 5 ones. Figure 1 presents the percentage of each of the subfamilies.

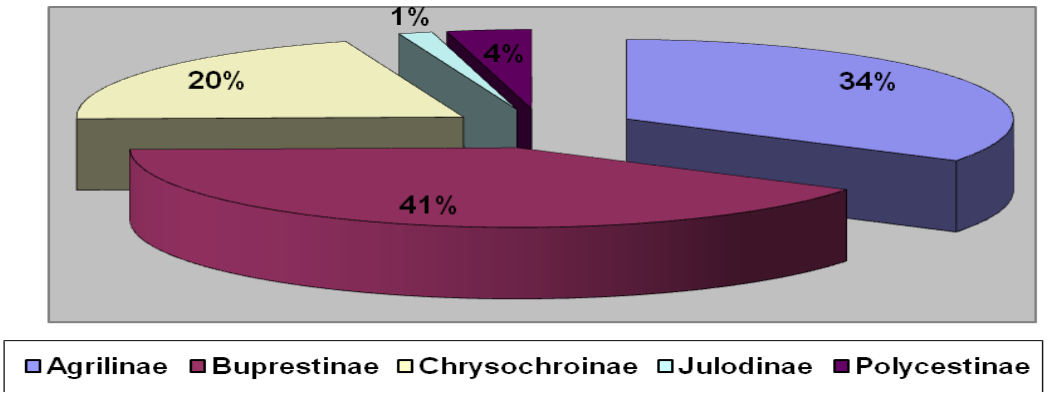

Figure 1.Percentage of the subfamilies ofBuprestidae.

The check list of species of jewel beetles collected during research period from the different regions of Azerbaijan (Baku, Absheron, Guba-Khachmaz, Saatly, Ismayilli, Sheki, Nakhchivan, Lankaran) is below. The check list is made by modern nomenclature.

BUPRESTIDAE Leach, 1815

subfamilia **Julodinae** Lacordaire, 1857

genus *Julodis* Eschscholtz, 1829

***andreae andreae* (Olivier, 1790)**

***variolaris variolaris* (Pallas, 1771)**

subfamilia **Polycestinae** Lacordaire, 1857

tribus **Acmaeoderini** Kerremans, 1893

genus *Acmaeoderella* Cobos, 1955

subgenus *Carininota* Volkovitsh, 1979

***flavofasciata flavofasciata* (Piller & Mitterpacher, 1783)**

flavofasciata albifrons (Abeille de Perrin, 1891)

subgenus *Acmaeoderella* Cobos, 1955

***oresitropha* (Obenberger, 1924)**

subgenus *Euacmaeoderella* Volkovitsh, 1979

***vetusta* (Ménétriés, 1832)**

subfamilia **Chrysochroinae** Laporte, 1835

tribus Dicercini Gistel, 1848

genus *Perotis* Dejean, 1833

***lugubris longicollis* Kraatz, 1880**

genus *Dicerca* Eschscholtz, 1829

***scabida* Marseul, 1865**

***fritillum* Ménétriés, 1832**

genus *Capnodis* Eschscholtz, 1829

***tenebricosa tenebricosa* (Olivier, 1790)**

***tenebrionis* (Linnaeus, 1761)**

***miliaris miliaris* (Klug, 1829)**

tribus Sphenopterini Lacordaire, 1857

genus *Sphenoptera* Dejean, 1833

subgenus *Sphenoptera* Dejean, 1833

****antiqua antiqua* (Illiger, 1803)**

***lapidaria* (Brullé, 1832)**

subgenus *Deudora* Jakovlev, 1898

***sculpticollis* Heyden, 1886**

subgenus *Chrysoblemma* Jakovlev, 1889

***scovitzii scovitzii* Faldermann, 1835**

***sancta* Reitter, 1890**

****orichalcea* (Pallas, 1781)**

***artemisiae* Reitter, 1889**

subfamilia **Buprestinae** Leach, 1815

tribus Anthaxiini Gory & Laporte, 1837

(classification follows Richter (1949)

genus ***Cratomerus*** Solier, 1833 (Pal.Cat.: *Anthaxia*, subgenus)

subgenus *Cratomerus* Solier, 1833

***hungaricus sitta* (Küster, 1852)**

***sponsa* (Kiesenwetter, 1857)**

***diadema shelkovnikovi* Obenberger, 1940**

***mirabilis* (Zhikharev, 1918)**

genus *Anthaxia* Eschscholtz, 1829

subgenus *Haplanthaxia* Reitter, 1911

***cichorii* (Olivier, 1790)**

Subgenus *Euanthaxia* Richter 1949

***signaticollis* Krynicki, 1832** (Pal.Cat.: *Anthaxia* s.str.)

***anatolica anatolica* Chevrolat, 1838** (Pal.Cat.: *Anthaxia* s.str.)

Subgenus *Cyclanthaxia* Richter 1949 (Pal.Cat.: *Anthaxia* s.str.)

***plicata vinogradovi* Obenberger, 1938**

***ephippiata* L. Redtenbacher, 1850**

***salicis salicis* (Fabricius, 1777)**

subgenus *Anthaxia* Eschscholtz, 1829)

***bicolor bicolor* Faldermann, 1835**

***podolica lucniki* Richter, 1949**

***muliebris* Obenberger, 1918**

Subgenus *Callanthaxia* Richter 1949)(Pal.Cat.: *Anthaxia* s.str.)

***passerini* (Pecchioli, 1837)**

subgenus *Melanthaxia* Richter, 1949

***nigrojubata nigrojubata* Roubal, 1913**

tribe Chrysobothrini Gory & Laporte, 1938

genus Chrysobothris Eschscholtz, 1829

subgenus *Chrysobothris* Eschscholtz, 1829

***affinis tetragramma* (Ménétriés, 1832)**

subfamilia **Agrilinae** Laporte, 1835

tribus Coraebini Bedel, 1921

subtribus Coraebina Bedel, 1921

genus *Coraebus* Gory & Laporte, 1839

***elatus elatus* (Fabricius, 1787)**

***rubi* (Linnaeus, 1767)**

subtribus Meliboeina Majer, 2000

genus *Meliboeus* Deyrolle, 1864

subgenus *Meliboeoides* Théry, 1942

***parvulus parvulus* (Küster, 1852)**

***robustus* (Küster, 1852)**

tribus Agrilini Laporte, 1835

subtribus Agrilina Laporte, 1835

genus *Agrilus* Curtis, 1825

subgenus *Agrilus* Curtis, 1825

***cuprescens cuprescens* (Ménétriés, 1832)**

****lineola shamyl* Obenberger, 1922**

Species marked with a * are indicated for the first time for jewel beetles fauna of Azerbaijan. The material has been compared with the catalog of the family Buprestidae (Volovich, 2006). I express my gratitude to Mark G.Volkovich for his help in species determination. Subfamily Buprestinae is the largest according to quantitative and qualitative composition. The main share of the species falls on the genus Anthaxia. In this paper we used our own material collected in Baku, Absheron, Guba-Khachmaz, Shamakhi, Sheki, Lankaran and Ismailli areas and material received from various collectors, for what I want to express my gratitude.

Being exclusively phytophagous species many representatives of the family are of interest as forest pests and agricultural plants. Among the jewel beetles there are both thamnobionts (inhabitants of bushes and low trees) and dendrobionts (inhabitants of trees). Both of these groups are merged into a single category of life forms, as the insects inhabiting trees as well as bushes, have about the same features of adaptation to environment. In the settlement of trees and shrubs, there is also an effect of tier (various high areas of the trunk and branches). Many jewel beetles arechortobionts, but there are endo-and ektobionts, too. In economic respect, these beetles are of horticulturaland forestry importance only, but cases of outbreak are very rare. According to the degree of damage caused by jewel beetles, they are divided into the following groups: 1) harmless species - larvae live exclusively on dead parts of the tree; 2) relatively harmful species - larvae live on the trunk and branches of viable trees; and 3) very harmful, inhabiting mainly on young trees. In accordance with this gradation some genera of the family among which there are potential pests can be characterized.

Genus Agrilus: Representatives of the genus were collected in the Guba-Khachmas region, Ismayilli and Lankaran districts. Larvae develop under the bark of trunks, in the wood of deciduous trees and shrubs, roots or stems of herbaceous plants. Many species of genus are serious pest. After hatching, the larvae bore roots and stems of the herbs. The beech splendour beetle, *Agrilusviridis* develops on a number of deciduous trees or shrubs (currant, gooseberry, willow, poplar, beech).

Genus Capnodis: Species are numerous in the gardens of the Absheron peninsula and Guba-Khachmas region. Larvae and adults harm saplings and young fruit trees. Beetles gnaw the bark of young, leaf-stalks, buds of fruit trees preferring the stone fruit trees. During mass reproduction the *C.tenebrionis* seriously damage young trees. The economic importance of the pest is greatest in the southern arid regions of Azerbaijan. Watering

the gardens during egg laying is effective to control the beetle.

Genus Chysobothrius: Species were collected in the Absheronpeninsula, Zagatala and Ismayilli districts. Harmful mostly in the larval stage. On damaged branches harvest is reduced by 2 times. The number of beetle is very high in neglected, old gardens. To control of it the infected branches are cut in 4-5 days after flowering. During this measure 70% of the larvae can be destroyed. In the summer the pest is controlled withdouble insecticide treatment: in the early appearance of beetles and again after 3-5 days.

CenusAnthaxia: Representatives of the genus were collected in theGuba-Khachmas region, Ismayilli and Lankaran districts. Larvae develop in decaying branches of coniferous trees; adults are often met on flowers. The larva of the species *Acmaeodera ballioni*Gangl.Lives inside the stems.

Table 1. Adaptation to vegetable crops

Genus		Trees			Herbs	Root system
		Fruit-trees	Other trees	Conifers		
1	*Agrilus*		+		+	
2	*Coraebus*				+	+
3	*Melanophila*		+			
4	*Phaenops*			+		
5	*Anthaxia*	+	+	+	+	
6	*Chrysobotrhis*	+	+	+	+	
7	*Capnodis*	+	+		+	
8	*Dicerca*		+			
9	*Julodis*					+
9	*Sphenoptera*	+	+		+	
10	*Acmaeoderella*		+			

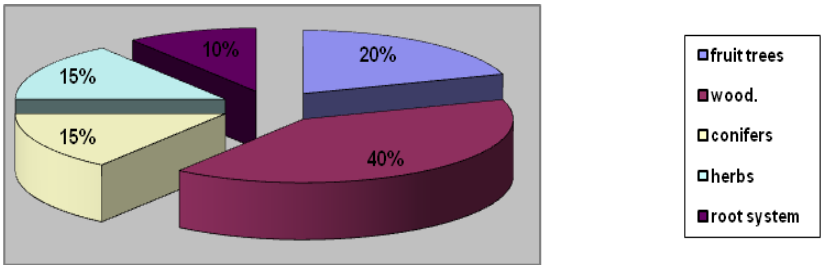

Figure 3.The percentage of groups of jewel beetle species inhabiting various plant forms

Material was collected during expeditions in various regions of Azerbaijan, in the spring-summer period, since 2002. Table 2 presents data on the Buprestidae speciesfrom the different regions of Azerbaijan.

As it can be seen from the table of the regions of the Greater Caucasus are represented by the largest number of species, it is also evident from the diagram 4. The vegetation cover of the Greater Caucasus is diverse and represented by mixed deciduous forests with a great deal of fruit trees and shrubs.

Table 2.Distribution by regions

№	Species	B.A.	B.K	Lankaran	Nakhchivan	Saatly
1	*Julodis andreae andreae*				+	
2	*Julodis variolaris variolaris*	+				
3	*Acmaeoderella flavofasciata flavofasciata*		+			
4	*A. flavofasciata albifrons*		+		+	
5	*A. oresitropha*		+			
6	*Euacmaeoderella vetusta*				+	
7	*Perotis lugubris longicollis*				+	
8	*Dicerca scabida*			+		
9	*Dicerca fritillum*			+		
10	*Capnodis tenebricosa tenebricosa*	+	+			+
11	*Capnodis tenebrionis*	+	+			+
12	*Capnodis miliaris miliaris*				+	
13	*Sphenoptera antiqua antiqua*		+			
14	*Sphenoptera lapidaria*		+			
15	*Sphenopteras culpticollis*				+	
16	*Sphenoptera scovitzii scovitzii*				+	
17	*Sphenoptera sancta*		+			
18	*Sphenoptera orichalcea*		+			
19	*Sphenoptera artemisiae*		+			
20	*Cratomerus hungaricus sitta*		+		+	+
21	*Cratomerus sponsa*				+	
22	*Cratomerus diadema shelkovnikovi*				+	
23	*Cratomerus mirabilis*				+	
24	*Anthaxia cichorii*		+	+	+	
25	*Anthaxia signaticollis*		+			
26	*Anthaxia anatolica anatolica*	+				
27	*Anthaxia plicata vinogradovi*		+			
28	*Anthaxia ephippiata*				+	
29	*Anthaxia salicis salicis*		+			
30	*Anthaxia bicolor bicolor*		+		+	+
31	*Anthaxia podolica lucniki*		+			
32	*Anthaxia muliebris*				+	
33	*Anthaxia passerini*		+			
34	*Anthaxia nigrojubata nigrojubata*		+			
35	*Chrysobothris affinis tetragramma*	+	+	+		
36	*Coraebus elatus elatus*		+		+	
37	*Coraebus rubi*		+		+	
38	*Meliboeus parvulus parvulus*		+			
39	*Meliboeus robustus*			+	+	
40	*Agrilus cuprescens cuprescens*		+			
41	*Agrilus lineola shamyl*			+		

Evaluation of the physiological state of Apsheron and the North-Eastern populations of jewel beetles *Coraebuselatus* and *Capnodistenebricosa*

To understand the processes occurring in the biological system, it is necessary to analyze the state of its components. The population is one of such systems. To this purpose, we have investigated the physiological condition of the population of 2 species of jewel beetles, which are considered as pests of fruit and forest trees. Physiological state is characterized by such indicators as the number, its change in space and in time, the intensity of reproduction (including reproductive characteristics of the species).

Data on the number are always primary stage in studies on determination of degree of harmfulness of insects. Without accurate ideas about the number of pest the control method cannot be chosen. To have an idea about density of the population of studied species we have calculated the absolute, average and relative density of population. The calculations

were made on the basis of collections and census carried out during 5 years (2006-2010). The population of the habitat, or in other words, the density of insect populations is an important indicator of the spatial distribution of members of the population. Calculating the coefficients of reproduction, disperse and population growth are made taking into account the reproductive characteristics of the species. They give an idea of the intensity of species breeding, the trends affecting its change according to Zlotin methods (Zlotin,1989).

Table 3. Indices of the physiological state of populations of *Coraebus elatus* and *Capnodis tenebrionis*

№	Indices	Empirical calculations	Coraebuselatus			Capnodistenebrionis		
			B-A	G-Kh	Sh-I	B-A	G-Kh	Sh-I
1	Absoluteз.б	Ча=К/Н	1,5	0,4	0,7	1,7	0,8	1,2
2	Averageoccupation of biotope	Чс=$К_1$+$К_2$+Кп/Нпо	0,4	0,18	0,3	0,7	0,6	0,3
3	Relativeo.b. (%)	Чо=100с/по	40	50	70	63,2	46,2	39,2
4	Coeff.reproduction	Крм=$Ч_2/Ч_1$	1,15	0,7	1,16	1,2	0,9	0,7
5	Coeff.spreading	Крс=$Чо_2/Чо_1$	0,8	0,7	1,75	0,9	1,1	0,9

Determination of the physiological state of the population of 2 potentially dangerous pests will give an opportunity to establish the rate of reproduction and distribution of the members of population. The data on the biology and ethology of these species will inform us on stability of populations of these species, in accordance with which the most effective ways to control their numbers can be chosen. These data provide a basis for considering the physiological state of 2 potentially dangerous pests of horticultural crops is quite stable, coefficients of reproduction and spreading show a slight increase in the number of species in each subsequent generation. To maintain the number of species in a relatively safe level the preventive measures of control can be carried out.

References

Gornostayev.G.N. 1970. Nasekomie SSSR. Izdatelstvo “Misl”. Moskva: 139-142 .

Bogachev A.V.1951. Jivotnii mirAzerbaydjana.

Samedov N.G.1963. Fauna I bioligiyajukov, vredyashixselskoxozyaistvennimkulturam v Azerbaydjane. Izd. AN Azerbaydjana. Baku:92-101.

VolkovichM.G.2006.CatalogueofPalaearcticColeoptera.Vol.3 Buprestidea.Appolo Books.Stenstrup.p.417.

Fasulati K.K.1971.Polevoe izuchenienazemnixbespozvonochnix.Izd.“Vischayashkola”.Moskva.

Zlotin A.Z. 1989. Texnicheskaya entomologiya.Kiev. “Naukovadumka”: 37-41.

OpredelitelnasekomixevropeiskoichstiSSSR.Jestkokrilie I veerokrilie.1965.Vol.2.“Nauka”Moskva:283-309.

Huseynova E.A., Kerimova I.G., and MagerramovaSh.M. 2002. Zaselennostlesovsevero-vostochnogoAzerbaydjanapredstavitelyami otryada*Coleoptera.*IVMejdunarodnayakonf. “BioraznoobrazieKavkaza”. Maxachkala: 152-153

Suitmen H.1964. Biologicheskiimetodborbi s vredniminasekomimi b sornimirasteniyami.Moskva.Izd. “Kolos”: 523-524.