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**Yusifov EF**  
Institute of Zoology of  
Azerbaijan National Academy of  
Sciences, Azerbaijan

**Ahmadov BA**  
Institute of Zoology of  
Azerbaijan National Academy of  
Sciences, Azerbaijan

**Narimanova VS**  
Institute of Zoology of  
Azerbaijan National Academy of  
Sciences, Azerbaijan

**Correspondence**  
**Ahmadov BA**  
Institute of Zoology of  
Azerbaijan National Academy of  
Sciences, Azerbaijan

## Diversity study of scarab beetles belonging to the subfamily cetoniinae spread in the natural region of the greater Caucasus of Azerbaijan

**Yusifov EF, Ahmadov BA and Narimanova VS**

### Abstract

The paper contains information about distribution of trophic relations and seasonal flight activity of adult scarab beetles from Cetoniinae subfamily in the Greater Caucasus.

The seasonal activity of adults of the most species lasted from early April to the mid and sometimes end of August. Mass flight occurred in the period May-July.

In the Sheki-Zagatala and Guba-Khachmaz natural areas the scarab adults were active mainly in May-July and mass flight occurred from mid May to the early July.

**Keywords:** Coleoptera, Scarabaeidae, Cetoniinae, distribution, trophic relations, flight activity of adults

### Introduction

Beetles or coleopterans (Coleoptera) are one of the largest insect orders, with about 400 000 described species.

The order is divided into two suborders: Adephtaga-predaceous beetles (species feeding on animals) and Polyphaga (species feeding on various substances).

Polyphaga includes large and economically important families: scarab beetles, longhorn beetles, leaf beetles, click beetles, weevils, golden beetles, darkling beetles and bark beetles.

They play an important role in the chain of biological diversity and metabolism: The larvae of beetles play an important role in the soil softening and create conditions for the growth of young shoots by weakening affected, damaged trees, pollinate plants, regulate the number of insect larvae feeding on plant roots, play a role of forage base for birds and predatory insects.

The scarab beetles are rich with interesting and highly economically important species for their biology among these families. It is one of the most common and widely researched species.

It has been given wide information on systematics, morphology, biology, ecology, damage of various species, belonging to this family in the territory of the former Soviet Union in the works of researchers Medvedev, Lopatin, Prochenko, Nikolayev, Lobanov, Frolov and etc <sup>[1]</sup>.

Damage of the stag beetle is up to 20% flowers in apricot and cherry orchards, in some regions of Rostov province (Russia) in the 50s of the last century, damage of this parasite in 15-20% flowers of 80% wild apples have been observed by the Russian scientist A. D. Dobrovolsky. At the same time, vineyards' seriously suffering from the pest in the regions of Stavropol province (Russia), getting destroyed of 32-68% of the flowers of fruit trees have been recorded by the author.

At the same time, a massive damage caused by increasing of the species such as *Anisoplia austriaca* Hrbst., *A.segetum* Hr., *A.agricola* Poda, *Amphimallon solstitialis* L. and *Epicometis hirta* Poda in different regions of the former USSR, especially in Stavropol, Kabardino-Balkaria and some regions of the North Caucasus and even their numbers reaching at 15-20 larvae per m<sup>2</sup> have been recorded by the author.

According to Zyuzin and Negrobov's researches, insects living in the soil, as well as the scarab beetles have a great scientific practical importance not only in causing damage by their phytophagous activity to agriculture, but also as pathogens of human and animal diseases in epidemiological and epizootological terms, they are actual. As a result of experiments conducted by researchers, pathogens of the terrible disease like typhoid fever can pass through in human, animal and aquatic environments by living on insects for a long time. Beetles, a chain of basic food chains play an important role in the transition of disease pathogens from one source to another.

A brief information on the small insects' species composition, economic importance and their distribution in the Caucasus, including in Azerbaijan have been given (Bogachov A.V., Zaytsev F.A., Medvedyev S.I., Olsufyev G.V., Yacobson G.G., Faldermann, Coyenig E., Menetries E., Samadov N.H., and etc.) [2].

Apparently, the scarab beetles have a great economic importance not only in causing damage in various bio and agrocenoses, but also as an intermediate host of dreadful diseases and their pathogen carriers.

### Materials and Methods

The materials of research have been collected in 3 natural regions of the Greater Caucasus of Azerbaijan, Guba-Khachmaz area, Shaki-Zagatala area and Absheron Peninsula during 2012-2015.

The materials have been collected not only in crop fields and orchards, but also in natural cenoses, throughout the whole year, including all seasons.

Collecting and treatment of the species in agro and biocenoses have been carried out according to the methods widely accepted in entomological science.

Counting of insects number and identifying physiological status of their population have been carried out according to A.Z. Zlotin's methodology [3].

Assignment of beetles has been given according to A. Smetana's catalogue of the insects in Poli-Arctic information in the official website of the Institute of Zoology (Russia).

The materials have been checked with the catalogue of Scarabiidae [8].

### Results and Discussion

The scarab beetles – one of the main species of the order Coleoptera- have a great importance in ecosystem. More than 25000 species of the family have been described in the world according to A.B. Frolov's information.

General information on the insects in Azerbaijan, as well as the scarab beetles has been published in N.H. Samadov's works [2] in the 60's of the last century. Some other authors have dedicated some papers on the fauna, systematics and other aspects of biology of some species [4-6].

The material has been collected during 2012-2015 in Guba-Khachmaz area, Sheki-Zagatala area and Absheron Peninsula. Below we provide the list of the species that have been found during our investigation. The spread of the following species has been identified in researches.

Family: Scarabaeidae

Subfamily: Cetoniinae

Genus: *Epicometis*, 1842.

Species: *Epicometis suturalis* Reitter., 1913.

Distribution: Western Asia, Iran, Syria, Afghanistan, South Caucasus

Xerophilous species inhabiting lowland and foothill zones and sometimes in the forests. It is found in alluvial and black soil and open areas.

They cause damage to the flowers of various grasses, bushes, trees and vineyards.

Their larvae feed on crop residues. The generation development continues in a year.

They have been recorded on quince, apple, apricot, pear, plum, peach, almond, cherry trees and hips, rose in stationary areas.

The beetles are found especially from the second half of April (Khachmaz, 25.04.2014) to the end of June (Mardakan, 28.06.2014), (Fig. 1.). Sometimes, it can be observed in the beginning of July.

It has not been frequently found, and their individual flies have been recorded on the above-mentioned plants. This species has not a great economic importance. But, it should be mentioned that, if they massively increase, perhaps, it can cause damage to agriculture.

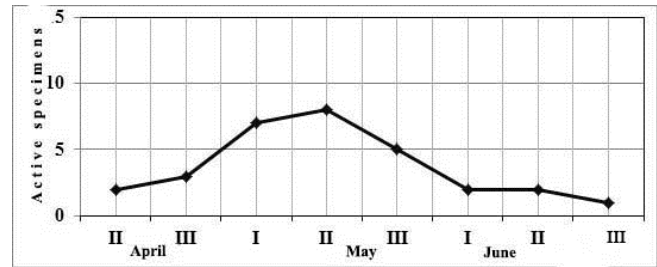


Fig 1: Seasonal activity of *E. suturalis* (Kachmaz, Hasangala)

Family: Scarabaeidae

Subfamily: Cetoniinae

Genus: *Epicometis*, 1842.

Species: *Epicometis senicula* Menetries., 1832

Distribution: Turkey, Iran, South Caucasus

The xerophilous species inhabiting lowlands and foothills, sometimes 1700 meters above sea level. They are found in black, brown, regur soil and open areas.

Beetles are active mainly in the afternoon. Their flies are recorded from the second half of March to the end of July (Fig.2).

Beetles live in the soil in winter. The female individuals of overwintering beetles put up to 20 eggs on the soil containing much humus in early spring. Larvae, that hatch from eggs become pupae at the same place. Insects, that hatch from larvae overwinter after long feeding period to the spring of the next year.

They cause damage to the flowers of apple, pear, quince, cherry, apricot fruit trees and vineyards.

The mature individuals of this species are found in each 3 regions in nature from April to the beginning of July. We observed insect flight in Absheron on March 28, 2014. They feed on the flowers of various plants. These beetles are found in apple, pear, cherry, apricot, peach, plum, grapes, alfalfa, peas, potato fields in the stationary areas (Guba, 14.05.14).

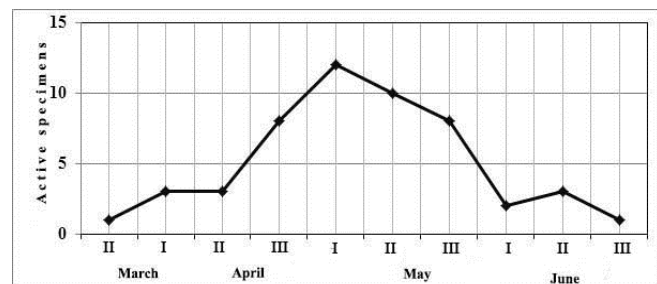


Fig 2: Seasonal activity of *E. senicula* (Absheron, Hovsan)

Family: Scarabaeidae

Subfamily: Cetoniinae

Genus: *Oxythyrea*, 1842.

Species: *Oxythyrea cinctella* Schaum., 1841

Distribution: South Caucasus, Iran, Afghanistan, Pakistan, Middle Asia, Caucasus.

The xerophilous species inhabiting lowlands, foothills and forest zones. They inhabit open, dry areas of various soils. The bird flight is observed from April to the end of August (Fig.3). They overwinter in the mature stage.

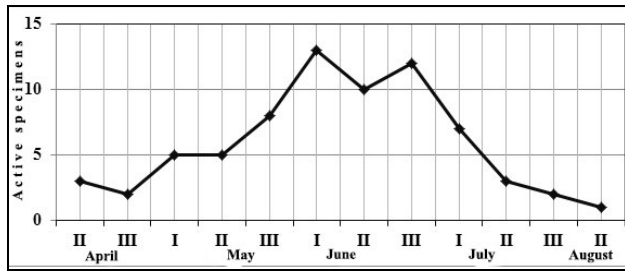


Fig 3: Seasonal activity of *O. cinctella* (Absheron, Hovsan)

Oviposition is recorded from the first day of July and it continued to the beginning of August. Fertilized female individuals lay 8-10 eggs. Larvae hatch from eggs and then become pupae after 22-26 days depending on temperature. Mature insects hatch from pupae in the second half of November and then overwinter. One generation exists over the year. Though larvae feed on humus, insects can cause economic damage in a large degree by feeding on the flowers and leaves of various plants.

It has been found in each 3 zones.

Family: Scarabaeidae

Subfamily: Cetoniinae

Genus: *Oxythyrea*, 1842.

Species: *Oxythyrea albopicta* Motschylsky., 1845

Distribution: Middle Asia, Caucasus.

The xerophilous species inhabiting lowland, foothill and forest zones. They occur in arid and humid biotopes of various soils.

The flight is observed from the middle of April to the end of August (Fig.4).

They overwinter at the mature stage. Oviposition was recorded at the beginning of July and it continues to about two months. Each fertilized female laid up to 10 eggs. Development of larvae continues up to 25 days. Then they become pupae in the soil. Adult insects hatch from the pupae beginning from the end of October to the first half of November and then overwinter at the same place. There is one generation per year. Their larvae feed mainly on plant humus. They do not cause damage to economically important plants.

But insects can cause damage to the flowers and leaves of plants.

It is found in the Greater Caucasus region, rarely in Zagatala.

It is found individually in fruit orchard. It can be belonged to the second grade pests.

Family: Scarabaeidae

Subfamily: Cetoniinae

Genus: *Oxythyrea*, 1842.

Species: *Oxythyrea funesta* Poda, 1761

Spreading: Middle and South Europe, Russia (north), North Africa, Kazakhstan (west) and Crimea Caucasus.

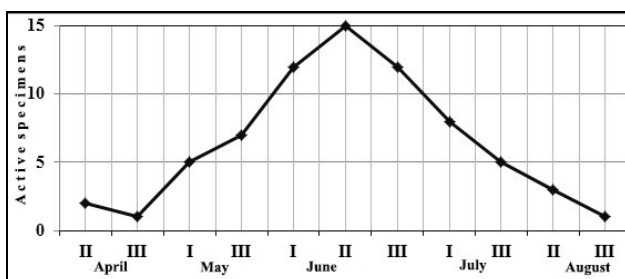


Fig 4: Seasonal activity of *O. albopicta* (Zagatala, Aliabad)

It is a mesophilic species. It is found in lowland and foothill zones. Sometimes, it is found in forest cenoses.

The insect length is not very long, varying from 10 to 12 mm. Female differs from the male with white dots on the ventral side of the abdomen.

The other representatives of this subfamily spend its pupal period in cocoon in the soil.

This insect has been found in the gardens of Zagatala for the first time on May 8, 2013. The insect flight has been recorded in the gardens of Guba on April 30.

It is similar to the haired stag beetle for its life-cycle. It overwinters at imago stage. Post-overwintering period is the second half of April (Absheron 18.04.14). It is found in nature up to the middle of August (Fig. 5).

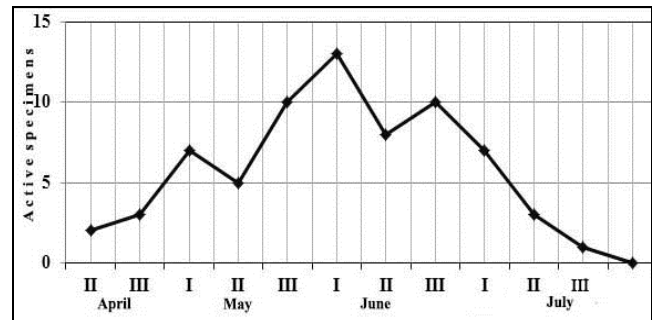


Fig 5: Seasonal activity of *O. funesta* (Absheron, Novkhany)

Interbreeding starts between insects after overwintering insects' feeding on the flowers of trees in the gardens, its feeding on wild flowering plants in the meadows from the second half of May to the beginning of June.

Females start to oviposit after a few days (5-8) from fertilization. The first oviposition take place at the end of May. Although oviposition continues during 3-4 days, their numbers of eggs are not more than 25-30. Embryonal development lasts 7 – 10 days. The hatching of the first larvae from eggs begins in the second 10 days of June (12.06.13). Larvae can develop from 17mm to 20 mm in a month (12-15. until VIII).

The larvae are found in the field from the beginning of June to the beginning of August.

Pupation continues from the third 10 days of August to the mid of September.

Being polyphagous this beetle causes damage to the fruit trees, such as apple, pear, quince and the flowers, leaves of bushes and field crops.

This species can be considered as less economically important, secondary pest in research areas.

Family: Scarabaeidae

Subfamily: Cetoniinae

Genus: *Potosia* Muls.

Species: *Potosia affinis* Andersch., 1797

Distribution: Russia (the northern part of Europe), Middle and South Europe, West Asia, North Iran, Turkmenistan, Caucasus. It is a mesophilic species. It prefers lowland, foothill and forest zones. It is found in deciduous forests. Their larvae can be found in the nest of ants.

The flight was observed on May-July (Zagatala, 2014). It can be found on the fruit trees, rose bushes, sunflower. Sometimes, they feed on the juice secreted from trees.

The insects cause damage mainly to the late flowering plants (sunflower, Autumnal grain, hips thistle, etc.).

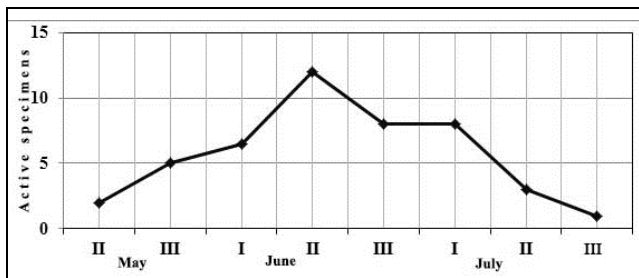


Fig 6: Seasonal activity of *P. affinis* (Zagatala, Aliabad)

This species can be considered as less economically important, the secondary pest species in the Greater Caucasus region of Azerbaijan. It occurs in the natural region of Shaki-Zagatala.

Family: Scarabaeidae

Subfamily: Cetoniinae

Genus: *Potosia* 1852.

Species: *Potosia metallica* Herbst., 1782

Distribution: Russia (the part of Europe), Siberia, China, Mongolia, Korea, Asia Minor, Caucasus.

It is a mesophilic species. It prefers lowland, foothill zones. The species is primarily distributed in the mild forests with dry climate. The flight starts from June. They feed mainly on juice secreted from flowers and trees. It causes damage to the plants, such as apple, pear, quince, rose.

It is a rare species. Some individuals belonging to this species have been found in the territory of Sheki-Guba region.

Family: Scarabaeidae

Subfamily: Cetoniinae

Genus: *Potosia*

Species: *Potosia cuprina* Motschulsky, 1849

Distribution: Balkans, Asia Minor, Crimea, Caucasus

It is a mesophilic species. It can be found in lowland and foothill zones (1800 meters above sea level). They feed mainly on juice secreted from trees in forests, especially in lawns, meadows.

The flight can be observed on May-August. It develops in rotten trees. It causes damage to the fruit trees, such as apple, pear, medlar and etc.

It can be mentioned as a rare species in research areas. It has been found only in the fruit gardens in Zagatala.

Family: Scarabaeidae

Subfamily: Cetoniinae

Genus: *Potosia*, 1852.

Species: *Potosia speciosa* Adams., 1817

Distribution: Iran, Turkmenistan, Syria, Iraq, Crimea, Caucasus

It is a mesophilic species. It inhabits lowland, foothill and forest zones. It prefers deciduous forests.

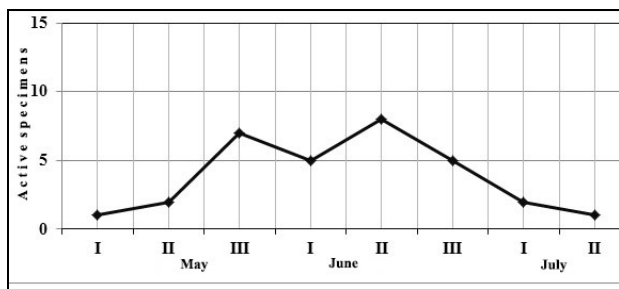


Fig 7: Seasonal activity of *P. speciosa* (Zagatala, Aliabad)

The beetles were observed from March to the mid of August.

Their larvae develop in the hollows of trees. It has one generation per year.

Maximum flight for the species has been recorded on May-June (Zagatala 04.06.15). It is observed on the bushes of hips, hawthorn, elder. It is found in orchards.

It has not any economic importance.

Family: Scarabaeidae

Subfamily: Cetoniinae

Genus: *Potosia* Muls.

Species: *Potosia hieroglyphica* Menetries, 1832

Distribution: Asia Minor, Iran, Turkmenistan, Caucasus

It is a mesophilic species. It inhabits lowland, foothill and forest zones. It prefers mainly black and brown soil. The flight was observed from May to August (Fig.8.). It feeds on the juice, flowing through the tree.

Their larvae develop in the hollows of trees and plant humus.

The species cause damage to the plants of apple, pear, apricot, peach. It can be found in low numbers in each 3 zones.

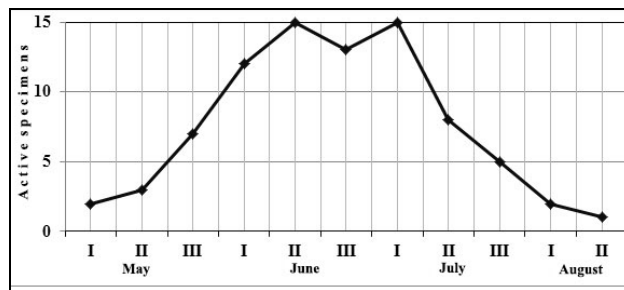


Fig 8: Seasonal activity of *P. hieroglyphica* (Khachmaz, Hasangala)

Family: Scarabaeidae

Subfamily: Cetoniinae

Genus: *Potosia* Muls., 1852.

Species: *Potosia hungarica* Hbst., 1832

Distribution: Asia Minor, Iran, Syria, South Caucasus

It is a xerophilic species. It inhabits lowland, foothill, semidesert zones. It can be found on the dry south slopes, in gray-brown and black soil.

Insects were found from April to the end of August (Fig. 9.).

It spends its overwintering period in cocoons in the soil. It has one generation per year.

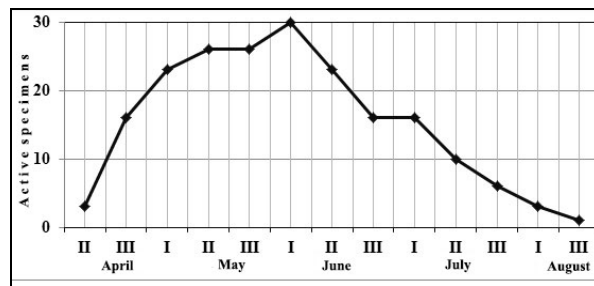


Fig 9: Seasonal activity of *P. hungarica* (Absheron, Hovsan)

Insects cause damage to the thistle plants and other plants - beets, sunflower, cabbage, grapes, apples, pears, plums, and cherries.

Their larvae develop in soil with plant humus. They have not any economic importance.

It serves as an intermediate host for helminthes [7].

It can be found at least sometimes both in forest and fruit cenoses in each 3 research areas. As a result of conducted investigation in the stationary areas in 2013-2015, the flight phenology (seasonal activity) of species in biocenosis in the

imaginal period has been prepared in graphics.

Most of the species started their flights mainly from April to the mid of August, but sometimes to the end of August (*Valgus hemipterus*, *Oxythyrea cinctella*, *Oxythyrea funesta*, *Amphicomma bombylifformis*, *Melolontha aceris*). Their main periods of mass flight starts from May to July. Adult activity in the natural regions of Shaki-Zagatala and Guba-Khachmaz is May-July and maximum flights were recorded in the second half of May and June. Apparently, the dynamics of flight phenology is regulated by climatic conditions of the regions.

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