



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2018; 6(6): 07-12

© 2018 JEZS

Received: 02-09-2018

Accepted: 04-10-2018

Ahmadov BA

Institute of Zoology of
Azerbaijan National Academy of
Sciences, Str. A. Abbaszadeh,
1128th side street, 504th block,
Baku, Az1073, Azerbaijan

Maharramova SHM

Institute of Zoology of
Azerbaijan National Academy of
Sciences, Str. A. Abbaszadeh,
1128th side street, 504th block,
Baku, Az1073, Azerbaijan

Safarova IM

Baku State University,
Academic Zahid Khalilov Street,
23, Az1148, Baku, Azerbaijan

About the study of the Egyptian locust (*Anacridium aegyptium* (Linnaeus, 1758)) (Orthoptera: Acrididae) in Azerbaijan

Ahmadov BA, Maharramova SHM and Safarova IM

Abstract

In the article, the phenology of the Egyptian locust (*Anacridium aegyptium* L.) that has been widespread and not studied in Azerbaijan has been learned in Absheron, its bio-ecological and ethological features have been studied firstly in the laboratory in a special regime.

During the studies, it has been defined that, the Egyptian locust goes for the hibernation in the stage of imago and the large older larvae. They exit from the hibernation in the early spring when the temperature of the weather is high from 12-13°C, and after the second half of March the fertilization occurs. The fertilization between individuals continues until the end of June, but the laying-egg process continues from the second decade of May until the end of July. Females lay about 2000 eggs totally by being 65-140 eggs for each nest in the reproduction period. Embryonic development continues in 38-45 days, but the development of the larvae continues in 65-70 days.

Keywords: *Anacridium aegyptium*, locust, Orthoptera, bio-ecology, Azerbaijan

1. Introduction

Order Orthoptera presents more than 27,700 species described and thousands still awaiting description scientific basis ^[1]. They occur on all continents, with the exception of poles and high altitudes, being more abundant in the tropics, where they form an important component of the fauna ^[2].

The first information about the Asian locust (*Locusta migratoria* L.) was given by Mochulski in Azerbaijan, in 1840 ^[3].

In 1846, Fischer de Waldheim also noted 8 species of Orthoptera order which were in Azerbaijan in his work of "Orthoptera Imperii Rossici" ^[4].

In 1874, Hermann ^[5] indicated the species of *Paradrymadusa sordida* around Ganja, and Stal noted the species of *Tmethis bilobus* in Absheron peninsula, in 1876 ^[6].

Two years later from this (in 1878) Brunner v. Wattenwyl stated that there were *Isophya schneider*, *Anacridium aegyptium* L. (*Acridium tataricum* L.) and further 8 species as well around Baku ^[7].

After the studies of the authors such as Redtenbacher in 1891, Zubovskiy in 1899, Jacobson & Bianki in 1902, Shelkanovsev in 1909, Burr in 1913, Uvarov in 1917-1925, Bey-Bienko in 1933-1934, Mistshenko in 1936-1937, Miram in 1938 etc, there were indicated that there were 111 species of the Orthoptera order in Azerbaijan ^[8-17]. As a result of the studies of S.P.Tarbinsky, this figure increased to 146 species ^[18].

In the following years, Hagverdiyev noted that there were 92 species of the Orthoptera order in Lankaran region of Azerbaijan ^[19]. 51 species of them were locusts. The author studied that the Egyptian locust (*Anacridium aegyptium* L.) prevailed in Lankaran and hibernated in the stage of imago and larva. The larvae of these species prevail in the forest area near to the lemon plantation in Lankaran and devastated the leaves of the *Quercus castaneifolia*. The author indicates that there are locust eggs at the beginning of May and larvae in the second half of June (20.VI) ^[19].

After a long break from Hagverdiyev's studies, in recent years, information about the study of locusts in Azerbaijan are only found in works of Safarova ^[20-24]. Although the author gave information on the bioecological features of the Asian, Moroccan and Italian locusts, but she has not studied the Egyptian locust.

If we consider that, there are species of *Anacridium aegyptium* L. in the territory of Absheron,

Correspondence**Maharramova SHM**

Institute of Zoology of
Azerbaijan National Academy of
Sciences, Str. A. Abbaszadeh,
1128th side street, 504th block,
Baku, Az1073, Azerbaijan

in 2017, we set a goal to study phenology, bio-ecology and other features of it.

2. Material and Methods

The examples of males and females of the *A.aegyptium* were collected from the nature in 2017-2018 in the Absheron peninsula for the experiments. One female and one male imago of locusts are fed in the cage of around 50x50x45 cm in the laboratory. The edges of the cages covered with metal mesh (1.5x1.5 mm), and the top side covered with the table made with open/close glass terrarium (plexiglass) in order to feed the locusts. The bottom of the cage is filled with a mixture of soil and sand.



Fig 1: Cage for locusts (photo: Sh. M. Maharramova)

In the laboratory, the locusts were mainly fed by wheat and barley sprouts. For this, wheat and barley were germinated in the small bowls (15x10x10 cm.) of about 10-12 cm. In addition, oak and lemon leaves were tested for eating and it

was observed that both the adult locusts and the larvae eat these plants willingly.

Several cardboard egg cartons (tapes) are placed in the floor and outside (vertically) of the cage for sheltering and free movement of locusts. The excrements of the locust are gathered in the hollow of the egg cartons during their nutrition, so they can be used for the precious nitrogen fertilizers in the future.

The special containers were placed into the cage with width and length of 15-17 cm, and height of 10-12 cm, and mixture of soil and sand of around 6-8 cm was filled for laying eggs of the locusts.

The experiments were followed in the environment adapted as possible to the natural condition from March to the end of September in laboratory. So, during the experiments, the temperature has changed from (March-April) 14-15° to 27-35° (July-August) in the laboratory. The relative humidity was between 45-75 %. The experiments have been repeated not less than 3 times.

In the article, all pictures about the development phases included in experiments are original and have been shot by the authors.

3. Results and Discussion

3.1 Morphological characteristics: The colour of the adults of *A.aegyptium* is oatmeal, dun or grey. Males are slightly darker than females. Antennae are darkish and bright articulated. The frons between two antennae is smooth and has spots. Prothorax is dun-coloured and has spots and transverse stripes. There are vertical black stripes in the eyes that are typical for this species.

Forewings are deep colour with dark marks. The hind wings are transparent, especially is coffee-brown and there are a lot of spots and marks above them (figure 2).



Fig 2: *Anacridium aegyptium* L. Body parts: a – thorax, b – head, c – abdomen, d – prothorax, e – jumping legs, f – walking legs, j – forewings, h – hind wings, i – compound eyes (photo: I. Safarova)

There are three uncertain spots on the femurs. The inside of the lower femur is red. The tibia is dark and the white hooks are above and the darkish on the top (10 pairs). There is sexual dimorphism between male and female individuals. So, the male and female individuals differ from each other for the length of the body, forewings, prothorax, femur length and the width of the head (figure 3, table 1).



Fig 3: Males (a) and females (b) (photo: Sh. M. Maharramova)

Table 1: The signs of sexual dimorphism of the adults of *A. aegyptium*

Signs	Male	Female
Body length	44-46 mm	53-55 mm
Forewing length	43-45 mm	53-54 mm
Prothorax length	9,1 mm	11,3 mm
Head width	6-6,1 mm	7-7,1 mm
Femur length	22-23 mm	26-27m

3.2 Biology: After being engaged of individuals from nature (1♂+1♀) from March (14.03.18), the copulation between individuals began from the next day. Copulation sometimes continues until a few hours constantly and sometimes even within a day (figure 4).



Fig 4: Fertilization process (Photo: B. Ahmadov)

After the copulation of 3-4 days, the individuals close in each other with weak movement or sit still in the different directions.

Although this behaviour continued until the 4th of April, the copulation did not happen again. It should be mentioned that as the created environment for the locusts were adjusted to the natural environment, the temperature was 17-18 °C according to April, and changed between 14-15 °C in some days.

In the next stage of the experiment (04.04.18), the temperature was reached to 26-27 °C in order to check the effect of the temperature to the intensity of the experiment, as a result, the next day the breeding was observed between individuals (05.04.18). Breeding process is almost repeated every day and continues until the end of June.

Laying eggs process began in the females from 11th of May (figure 5, 6).



Fig 5: Laying eggs of female (photo: B. Ahmadov)



Fig 6: The nest where the female lays the egg (photo: B. Ahmadov)

It should be noted that the cover walls and special forms of the cubic, structure of the frothy liquid, the lids of the boxes are the main taxonomic features of the locusts.

This species does not have the egg-pod as the other representatives of *Acrydium* genus. At the same time, they don't have the frothy liquid. The eggs were laid like spikes in the position of leaning on each other (without a firm grip each other) inside the soil and without any extra cover (figure 7 a, b). Besides other species (Moroccan and Asian locusts and so on) as the eggs of these species don't have the foreign protective cover, the egg bunches are easily separated from each other if they were slightly touched (figure 7 c).



a.



b.



c.

Fig 7: *Anacridium aegyptium* L. egg-laying: a – laying of the eggs in the soil; b – location form of the eggs; c – seperated eggs (photo: I. Safarova)

The egg laying ability of the females is higher and can change between 65-140 in each nest. One mother is able to lay eggs up to 2000 for more than 10 nests (a maximum of 12-15 nests) during her life (in our experience, 1 female individual laid eggs max 1894). Laying eggs continue until the end of July. Eggs are in the long form and getting thinner to the top. Its colour is brownish-chestnut, length is 4,5-4,7 mm, and the width in the middle part is about 1mm (fig.7c). Depending on the temperature and humidity, embryonic development continues in 38-45 days. It should be noted that depending on the degree of severity and the relative humidity of soil, the exit of the larvae that were laid at the same day can be different. In the laboratory (27-28 °C, 65-75 % of the relative humidity)

the larvae of eggs laid in May (11.05) began to come out in June (19-20.05). The larvae hatching from the eggs, rising to the surface of the ground, throwing their cuticle become the real larva (figure 8 a, b). This process is also called as interval skin changing process. During the subsequent development stages, the larvae change their skin for 4 more times. While they are changing their skin, they pod out of the cuticle hanging on any substratum (for example, from the cell of the cage) from their head.

The larvae of the egg are very little and their size is about 3.7-4.2mm. At an early age the knob of wing is not observed on them. The wing knobs are only observed at the stage of the third age. Larvae are younger and more active at the early age stage. Nutrition process is observed throughout the day.



Fig 8: The first skin changing of the larvae (a); The larvae of the first age (b) (Photo: Sh. Maharramova)

The hatched larvae gathered together as a group and feed on the leaves of the plants. However, the next day they begin to feed by moving on different directions in the plant. This feature is mainly related to the single lifestyle of the species. Hatching of the larvae continues mainly from the third decade of June to the beginning of August. Hatching of the underdeveloped larvae is observed in the I decade of September. It should be mentioned that after hatching the colour of these larvae is light green, and the individuals with grey, grey-brown and even darkish colour should be observed after the

second skin changing. Most of them (75-80%) are in the grey-brown colour. It is explained by having variation in the stage of the larvae (figure 9). It has been observed that the development of the larvae is about 65-70 day (19.06.-27.08.) Adults begin to hatch at the end of August. The first age stage is longer than others. So, the development of the first age stage is 10-12 day, and the development of the next age stage continues to 6-9 day. After the last skin changing, the imago tries to open the wings with the different directive movements holding the substratum again (figure 10).



Fig 9: Different variations (photo: I. Safarova)

This process continues for a minute (8-10 min) and the wings open completely. In the first minutes the colour of the wings of the adult is transparent and with a few patterns. Around in

50-55 minutes, the colour of the wings is getting darker and the patterns are formed on the cuticle. The colour of the males is darker than females.



Fig 10: Opening of the adult’s wings after the last skin change (photo: B. Ahmadov)

4. Conclusion

According to the experiments and observations, it had been revealed that the phonological calendar of the Egyptian locust was prepared for the first time in the territory of Absheron. It was defined that *A.aegyptium* were going to hibernate not only in the imago stage, but also in the imago and the great old larvae stage. In early spring, even in early march, when the temperature is higher than 12-13 °C, the individuals that exit from hibernation can be observed.

The imagoes that exit from hibernation are pairing at the end of March-beginning of April. Mothers begin to lay eggs in the

first decade of May. Laying eggs process continues up to the beginning of August. Hatching of the larvae begins from the second decade of June and continues to the second decade of September. Mass hatching is observed from the third decade of July to the third decade of August. Coming out of the larvae from the first laid eggs to the adult individual (imago) is observed at the end of August (table 2). The experiments show that the generation period is 105-107 days. It is possible to procreate from *A.aegyptium* in the laboratory by providing optimal temperature and relative humidity.

Table 2: Phonological calendar of *A. aegyptium* in Absheron (2017-2018)

Months	I			II			III			IV			V			VI			VII			VIII			IX			X			XI			XII								
decades	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3			
<i>A. aegyptium</i>	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i			
Note:	i	-hibernated imagoes															□	- The larvae																								
	i	- Imagoes exit from hibernation															√	- hibernated larvae																								
	•	- Eggs															i	- newly-formed imagoes																								

5. References

- Nunes-Gutjahr AL, Braga CE. Gafanhotos da Flona Caxiuanã: guia práctico. Belém: MPEG, 2012, 62
- Cigliano MM, Braun H, Eades DC, Otte D. *Orthoptera Species File*. Version 5.0/5.0. [retrieval date]. <http://Orthoptera.SpeciesFile.org>
- Mochulsky V. Insectes du Caucase et des provinces Transcaucasiennes. Bull. Soc. Nat. Moscou. tab. IV (Orth.; 171-173). 1840; II:169-180,
- Fischer de Waldheim G. Orthoptera Imperii Rossici. Mosquae, 1846-49:1-446, 37 tab.
- Hermann O. Die Dectíciden der Brunner von Wattenwylschen Sammlung. Verh Zool-Bot. Ges. Wien, 1874; XXIV:191-210.
- Stal C. Observations orthopterologiques. Svensk. Akad. Handl., Bihang, 1876; III(14):1-43
- Brunner V, Wattenwyl C. Monographie der Phaneropteriden. Wien, 1878, 401.
- Redtenbacher J. Monographie der Conocephaliden. Verh. Zool.-Bot. Ges. Wien. 1891; XVI:315-562
- Zubovskiy N. Orthoptera caucasica. Radde, Mus. Cauc, 1899; 1:519-520.
- Jacobson G, Bianki B. Pryamokrilie I lojnochetatokriliye Ross. Imp. I sopredeln. stran, 1902-1905; 993.
- Shelkanovsev YP. K poznaniyu fauni pryamokrilikh (*Orthoptera saltatoria*) Kavkaza. Rab. Zool. Labor. Varsh. Univ. 1909, 70.
- Burr M. Orthoptera in the Caucasus and Transcaucasus. Entom. Rec. 1913; XXIV, 12: 297: 302; XXV, 1:12-15; XXV, 2:37-41.
- Uvarov BP. Materialy K Poznaniyu Pryamokrilikh Kavkaza I Sopredelnikh Stran. II: Diaqnozi Novikh vidov I Ras iz Kolleksi Kavkazskogo Muzeya. IZV. Kavk. Muz. 1917; XI:281-298.
- Uvarov BP. Notes on the Acrididae (Orthoptera) of Central Asia, with descriptions of new species and races. Journ. Bomb. Nat. Soc., 1925, 260-272.
- Bey-Bienko G. Records and descriptions of some Orthoptera from USSR. Bol. Soc. Esp. Hist. Nat. 1933; XXXIII:317-341.
- Mistshenko L. Orthoptera palaeartica critica. XII.

- Revision of Palaearctic species of the genus *Sphingonotus* Fieb. Eos, 1936; XII, 1-2:65-192; 1937; XII, 3-4:193-282.
17. Miram EF. Bogomoloviye (Mantodea) I pryamokrilie (Orthoptera) Nakhichevanskoy ASSR. Tr. Zool. Ins-ta AzFAN SSSR. 1938; VIII(42):33-54
 18. Tarbinsky SP. The saltatorian orthopterous insects of the Azerbaidzhan SSR. Moscow Acad. Sci. U.S.S.R. 1940, 245.
 19. Hagverdiyev AR. Pryamokriliye nasekomiye Lenkoranskoy zony Azerbajjana. Baku, 1967.
 20. Safarova IM. Azerbaycanda Merakesh cheyirtkesinin (*Doclostaurus maroccanus* Thunbş, 1815) inkishafi, "Azerbaycan Zooloqlar Cemiyetinin Eserleri", Bakı, Elm, 2008; II:363-368
 21. Safarova IM. Azerbaycanda Italyan cheyirtkesinin bezi biomorfoloji xususiyetleri. "Zoologiya Institutunun Eserleri", Bakı, Elm, 2011; XXIX:270-274
 22. Safarova IM. Azerbaycanda Asiya cheyirtkesinin (*Locusta migratoria* L.) bioekologiyasına dair. "Zoologiya Institutunun Eserleri", Bakı, Elm, cild, N2, 2012; XXX:57-60
 23. Safarova İM. Basic Pest Locusts which have spread in Azerbaijan and Measures of flight effeciencies against them / International Caucasian Forestry Symposium (İCFS) Artvin, Turkey, 2013, 127-136
 24. Safarova İM. Some biological features of Moroccan locust (*Doclostaurus maroccanus* Thumb., 1815). Materials of Conference "Science technology and higher education". April 2nd -3rd, 2015, 26-29