

Biological Observations on *Agapanthia osmanlis* Reiche & Saulcy (Coleoptera: Cerambycidae) Associated with *Cephalaria procera* Fisch & Lall. (Dipsacaceae) in Northeastern Turkey

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ABSTRACT

The biology of *Agapanthia osmanlis* Reiche & Saulcy (Coleoptera: Cerambycidae), associated with *Cephalaria procera* Fisch & Lall. (Dipsacaceae) was studied in Kop Mountain (Erzurum and Bayburt provinces) during 2001-2002. The life cycle lasts one year. The developmental stages of the insect are described briefly. It hibernates as mature larva stage and larvae begin to pupate the second week of May. Duration of the pupal stage is about 13-16 days. Adults appear on the leaves of the host at the end of May. Females oviposit into stems, and most eggs hatch in 8-12 days. The early instars start to feed in the stem intensively after third week of June. Starting mid September, they hibernate in the stem base of the plant. *Cephalaria procera*, named as "Gevrek" in Turkish, is a perennial weed with very deep roots and thus presents a problem in cultivating land for farming. Growth of the plant was considerably slowed by the beetles feeding. The infestation levels were determined as 91% and 86%, in 2001 and 2002, respectively. This cerambycid could potentially be used as a biological control agent.

Key words: Coleoptera, Cerambycidae, *Agapanthia osmanlis*, *Cephalaria procera*, Dipsacaceae, biology, Turkey

INTRODUCTION

Cephalaria procera Fisch & Lall., 1840 (Dipsacaceae), the preferred host of *A. osmanlis*, is distributed in northern Iran, Armenia, and Turkey (Davis, 1972). It is a perennial plant with subglabrous or sparsely pilose stems up to 2 m tall. The flowers are pale yellow or cream. It is located in rocky slopes, steppe areas, and meadows at an altitude of 1120-2450 m. *C. procera* is very close to *C. gigantea*, and possibly it may be considered a subspecies of *C. gigantea* (Davis, 1972). The Turkish name of *C. procera* is "Gevrek" (Aslan *et al.*, 2006). *Cephalaria* plant roots are deep and strong which can be problematic in cultivating the ground (ploughing). In Eastern Anatolia "Gevrek" is regarded as an important weed in meadows and pastures (Aslan *et al.*, 2006). Zengin & Güncan (1996a, 1996b) also recorded *C. procera* as one of the harmful weeds of natural meadows and pastures in Erzurum and Aşkale, Turkey.

The genus *Agapanthia* Serville 1835 is represented by over 30 species in the fauna of the Soviet Union, of which 10 are found in Northern Asia. All of them are ecologically associated with herbaceous vegetation. Larvae live in shoots of

Umbelliferae, Compositae, Ranunculaceae (*Paeonia*), and other plants. Some are pests of medicinal and commercial crops (Cherepanov, 1991).

Agapanthia osmanlis Reiche & Saulcy, 1858 (Coleoptera: Cerambycidae) is distributed in Bulgaria, Hungary, Romania, Syria and Turkey (Hoskovec & Rejzek, 2009). It was recently found in Serbia (Pil & Stojanović, 2005). Information on the biology and host plants of this species is very limited. Danilevsky & Miroshnikov (1985) did not mention any host plants of this species. According to Bense (1995) its lifecycle is unknown. Known host plants are: *Dipsacus laciniatus* L. (Dipsacaceae) in Hungary (Kovacs, 1998), *Cephalaria* sp. and *C. cf. procera* (Dipsacaceae) in Turkey, and *Dipsacus fullonum* L. (Dipsacaceae) in Bulgaria (Rejzek *et al.*, 2001). Rejzek *et al.* (2001) also mentioned *Serratula radiata* (Waldst. & Kit.) M.Bieb. (Compositae) as a host plant of *A. osmanlis* in Eastern Turkey but because of wrong identification it was changed to *Serratula procera* (Rejzek *et al.*, 2003). Record of *A. osmanlis* on another plant of Compositae family - *Tragopogon* sp. in Bulgaria (Georgiev *et al.*, 2005), is most probably due to the occasional visit of adults.

Here I wish to report new data on the biology of *A. osmanlis*, damage caused by its larvae, and infestation levels of the preferred host. The information should support attempts to use the insect in biological control of the weed.

MATERIAL AND METHODS

Biological observations were made from the beginning of May to mid October of 2001-2002 on the slopes located at Kop Mountain Pass (Erzurum-Bayburt provinces) at an altitude of 1750-2000 m. The pest population was observed at 2- to 4- month intervals for feeding habits, type of oviposition, larval development, damage to host plants, pupal stage and overwintering behavior. Hundreds of plants were randomly investigated in the field, and the ratio of infestation was determined by counting the number of plants infested. Totally, 100 plants were taken to the laboratory having 25 ± 2 °C and $50 \pm 5\%$ RH and grouped as ten plants for detailed investigations in the plastic boxes 15x40 in diameters.

The developmental stages are described briefly. The body length was measured (apical margin of head to end of abdomen) on ten individuals. The photographs were taken by using on Olympus C-3030 and HP Photosmart 850 Digital Cameras.

RESULTS AND DISCUSSION

Morphological characteristics

Adult (Fig. 1A): Length 10-16 mm; head, pronotum, elytra and legs metallic blue or green-blue; frons mostly speckled with whitish-grey or yellowish-grey pubescence, anterior area of genae and the area between front margin of eye and frons usually with a stripe of dense white or yellowish-white pubescence, temples and posterior areas of genae also with stripes of white or yellowish-white hairs; vertex with a more or less distinct median stripe of white or yellowish-white pubescence; pronotum usually with 3 longitudinal pale stripes; elytra dull, especially towards apex, with relatively

dense, grey background pubescence; pro-, meso- and metathorax with a longitudinal stripe of white or yellowish-white hairs laterally; antenna long, metallic dark blue to blackish-blue (Bense, 1995).

Egg (Fig. 1B): Cylindrical, white, wide dorsally, narrower toward front and back, and rounded anteriorly and posteriorly; length 3.10-3.80 (3.35) mm, width 0.45-0.85 (0.58) mm. The surface structure of eggs and description of first stage larvae were given by Candan *et al.* (2007) as detailed.

Larva (Fig. 1C, D): Body cylindrical, C shaped after getting out of their galleries, whitish-grey, legless; light brown, the area touching thorax a little darker, slightly prolonged anteriorly and oval shaped, labrum, maxilla and labium white, mandible black in color; thoracic segments wider than head and abdomen; prothorax with a brown spot divided by a white stripe dorsally and two very light spots ventrally; long and strong setae lined between prosternum and metasternum, ventro-lateral part of other segments with more sparse setae; abdomen with blunt apex with a ring of crown-shaped dense and strong setae; body length of first stage larva 3.90-6.10 (4.96) mm; mature larva 22.50-25.00 (23.60) mm.

Pupa (Fig. 1E): Libera type; white, becoming light grey toward end of pupal stage; length 11.80-18.50 (14.52) mm.

Biology

Agapanthia osmanlis hibernates within stems of *C. procera* near the stem base as mature larvae. Pupation in the gallery started on 10 May and 13 May in 2001 and 2002, respectively (Fig. 2). The larval stages lasted from 26 May and 3 June, in 2001 and 2002, respectively (Fig. 2). The adults were observed on 29 May in 2001 and 23 May in 2002. Pupation was completed in 13-16 days. Adults on the leaves of *C. procera* after just emergence were feeding from the edge to the center of the leaves. More active in clear warm weather. The adult population reached the highest level in the field on 12 June (5 specimens / 10 sweep-net) in 2001 and on 17 June (7 specimens / 10 sweep-net) in 2002. Some mating was observed during this period. Having mated, the female begins to oviposit, making a cavity 3-4 mm diameter (Fig. 1G) on a viable plant stems at 10-50 cm height from the ground, inserting its ovipositor in the cavity, laying eggs stems tissue. The first eggs were observed on 10 June in 2001 and on 5 June in 2002. The females laid their eggs into the stem base parallel to the stem. About 2-8 (average 6) eggs were deposited in the part of the plant at a length of 10-50 cm. The oviposition sites on the plant were brown, almost round holes. The number of eggs may easily be counted by this character (Fig. 1G). The last eggs were observed on 21 and 22 July, in 2001 and 2002, respectively (Fig. 2). The larvae first hatched on 18 June in 2001 and 17 June in 2002. The total larval stage lasted 8-12 days. The young larva, which is oriented either down or up, were fed in the stem by constructing a gallery which is enlarged up to 35-40 cm depending on the plant height. The feeding remnants may be seen in the stem. The adults were observed until 8 July in 2001 and 12 July in 2002 in the field, and their activity continued about 40-50 days. The larval feeding in the stem was monitored up to 7 September in 2001 and 28 August 2002. They started to overwinter in the galleries after these dates.



Fig. 1. Biological stages and damage of *Agapanthia osmanlis* Reiche & Saulcy. A) Adult, B) Egg, C) First stage larva, D) Mature larva, E) Pupa, F, H, J) Larva damage, G) Oviposition mark, I) The slopes located at Kop Mountain Pass of the *Cephalaria procera*.

Consequently, *A. osmanlis* had one generation a year under the ecological conditions on the slopes located at Kop Mountain Pass (Fig. 1I) (Erzurum-Bayburt provinces) in 2001 and 2002 (Fig. 2).

Damage and Infestation

Damage by *A. osmanlis* adults feeding on leaves is insignificant. The main damage is made by the larvae constructing a longitudinal gallery in the stem (Fig. 1J). Damaged and weakened plants may be broken by wind at the end of season. When the stem of a plant was cut and opened, the feeding remnants may be seen as sawdust (Fig. 1F, H). At the end of the study, the infestation levels were determined as 91% in 2001 and 86% in 2002.

Information on the biology of *A. osmanlis* is very restricted in the literature. In this study, some information about this topic is presented. Additionally, biological stages of the pest are described briefly.

More detailed studies should be conducted on *A. osmanlis*' role in biological control of *C. procera*, its natural enemies, and effect on seed production of the plant. Until now two parasitoid species were established and reported on this host in the studied region of Turkey: *Zeuxia zejana* Kolomiets (Diptera: Tachinidae) (Tozlu & Kara, 2007) and *Scambus sagax* (Hartig) (Hymenoptera: Ichneumonidae) (Çoruh & Tozlu, 2008).

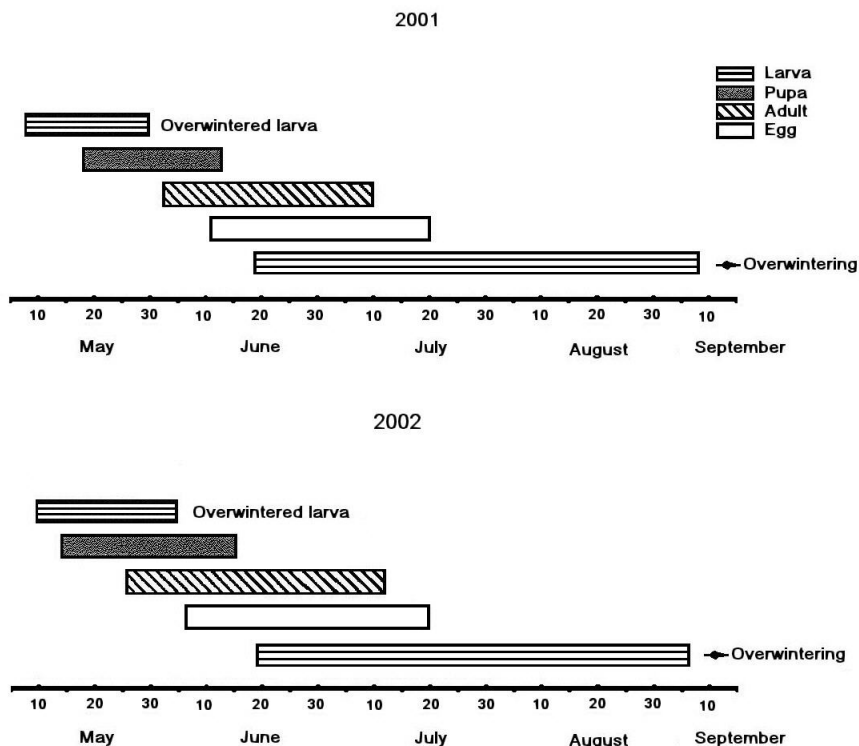


Fig. 2. Duration of biological stages of *Agapanthia osmanlis* Reiche & Saulcy in Erzurum-Bayburt provinces, Turkey during 2001-2002.

Distribution in Turkey

According to some authors (Rejzek *et al.*, 2001; Tozlu *et al.*, 2003) *A. osmanlis* is distributed in Artvin, Bayburt, Bilecik, Erzincan, Erzurum, Gümüşhane, Hatay and Kars (Fig. 3).

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Fig. 3. Distribution of *Agapanthia osmanlis* Reiche & Saulcy in Turkey.

REFERENCES

- Aslan, I., Beenen, R., Özbek, H., 2006, Biological aspects of *Galeruca circassica* Reitter, 1889 (Coleoptera: Chrysomelidae: Galerucinae) in relation to the weed *Cephalaria procera* Fisch. and Lall. (Dipsacaceae) in Anatolia. *Bonner Zoologische Beiträge*, 54: 173-177.
- Bense, U., 1995, *Longhorn Beetles, Illustrated Key to the Cerambycidae and Vesperidae of Europe*. Margraf Verlag, Weikersheim, Germany, 512.
- Candan, S., Suludere, Z., Tozlu, G., 2007, Description of surface structure of eggs and first instar larvae of *Agapanthia osmanlis* Reiche & Saulcy, 1858 (Coleoptera, Cerambycidae). 18th National Congress on *Electron Microscopy* with International Participation. August 26-29, 2007, (Abstracts Book), Eskişehir, 213 p. (In Turkish summary)
- Cherepanov, A. I., 1991, *Cerambycidae of Northern Asia, Volume 3 (Lamiinae)*. Amerind Publishing Co. Pvt. Ltd., New Delhi, 395.
- Çoruh, S., Tozlu, G., 2008, The first host record for *Scambus sagax* (Hartig, 1838) (Hymenoptera: Ichneumonidae) from Turkey. *Pakistan Journal of Biological Sciences*, 11(13): 1757-1758.
- Danilevsky, M., Miroshnikov, A. I., 1985, *Timber beetles of Caucasus. An identification key*. Krasnodar Station of Forest Protection, Russia, 428 (In Russian).
- Davis, P. H., 1972, *Flora of Turkey and the East Aegean Islands*. Edinburgh at the University Press, UK, 657.
- Georgiev, G., Simov, N., Stojanova, A., Doychev, D., 2005, New and interesting records of longhorn beetles (Coleoptera: Cerambycidae) in some Bulgarian Mountains. *Acta zoologica bulgarica*, 57(2): 131-138.
- Hoskovec, M., Rejzek, M., 2009, *Cerambycidae*. <http://www.uochb.cas.cz/~natur/cerambyx.htm>. 17.09.2009.
- Kovacs, T., 1998, Food-plants and locality data of Hungarian longhorn beetles II. (Coleoptera: Cerambycidae). *Folia Historica Naional Museum Matriage*, 22: 247-255 (In Hungarian with English summary).
- Pil, N., Stojanović, D., 2005, Some rare longhorn beetles (Coleoptera: Cerambycidae) without protection on the national level found on Mt. Fruška gora, Serbia. *Archives of Biological Sciences*, Belgrade, 57(2): 137-142.
- Rejzek, M., Sama, G., Alziar, G., 2001, Host plants of several herb-feeding Cerambycidae mainly from east Mediterranean region (Coleoptera: Cerambycidae). *Biocosme Méditerranéen*, Nice, 17(4): 263-294.

- Rejzek, M., Sama, G., Alziar, G., Sádlo, J. 2003, Host plants of longhorn beetles (Coleoptera: Cerambycidae) from the Balkan Peninsula, Asia Minor and Iran (Part II). *Biocosme Mésogéen, Nice*, 19(3): 161-189.
- Tozlu, G., Kara, K., 2007, The first host record for *Zeuxia zejana* Kolomiets, 1971 (Diptera: Tachinidae) from Turkey. *Turkish Journal of Zoology*, 31(4): 357-358.
- Tozlu, G., Rejzek, M., Özbek, H., 2003, A contribution to the knowledge of Cerambycidae (Coleoptera) Fauna of Turkey. Part II. Subfamily Lamiinae. *Biocosme Mésogéen*, 19: 95-110.
- Zengin, H., Güncan, A., 1996a, Investigation on plants and their intensity and frequency in grasslands of Erzurum and Aşkale. *Proceedings of the 3rd. Turkish Grassland and Forage Crops Congress*, 17-19 June 1996, 82-89 p. (In Turkish with English summary)
- Zengin, H., Güncan, A., 1996b, Investigation on plants and their intensity and frequency in natural pastures of Erzurum and Aşkale. *Proceedings of the 3rd. Turkish Grassland and Forage Crops Congress*, 17-19 June 1996, 115-129 p. (In Turkish with English summary)

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