

Parasitoids of *Cynaeda gigantea* (Wocke, 1871) (Lepidoptera: Crambidae), a Pest of *Anchusa leptophylla* Roemer and Schultes (Boraginaceae) from the East Anatolia Region of Turkey

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ABSTRACT

Larvae and pupae of the lepidopteran pest *Cynaeda gigantea* (Wocke, 1871) (Lepidoptera: Crambidae) were collected from *Anchusa leptophylla* Roemer and Schultes (Boraginaceae) in the Erzincan and Kars provinces of Turkey during 2007-2008. Three parasitoid species, *Exeristes roborator* (Fabricius, 1793) (Hymenoptera: Ichneumonidae), *Pseudoperichaeta palesoidea* (Robineau-Desvoidy, 1830) (Diptera: Tachinidae), and *Elasmus steffani* Viggiani, 1967 (Hymenoptera: Elasmidae) were obtained from larvae and pupae in the cocoon (gall) made by *C. gigantea*. *E. roborator* was the most numerous parasitoid and accounted for 6.22% of all parasitoids reared. *C. gigantea* is a new host for these parasitoid species.

Key words: *Cynaeda gigantea*, Crambidae, parasitoids, *Anchusa leptophylla*.

INTRODUCTION

The Lepidoptera, a large order of insects that includes moths and butterflies, contains more than 180,000 species in 128 families and 47 superfamilies. The Pyraloidea (pyraloid moths) are a superfamily of moths, containing about 16,000 described species worldwide (Munroe and Solis, 1998), generally small in size, with probably at least as many more remaining to be described. One representative family, the Crambidae, consists of species that are quite variable in appearance. Members of the nominal subfamily Crambinae (grass moths) take up closely folded postures on grass-stems, becoming inconspicuous, while other subfamilies include brightly colored and patterned insects that rest in wing-spread attitudes. In many classifications, the Crambidae have been treated as a subfamily of the Pyralidae or snout-moths. The principal difference is the presence in the Crambidae of a structure in the ears, called the praecinctorium, which joins two tympanic membranes; this is absent in the Pyralidae. The latest review by Munroe and Solis 1999, retains the Crambidae as a full family.

Representatives of the family Crambidae are mainly medium-sized moths. The insects fly massively on masse in the middle and late summer, being active at dusk

and at night, but can be also flushed from grass in the daytime. Among the typical habitats of the moths are meadows, steppes, and other open biotopes populated by gramineans. Crambidae and Pyralidae larvae are very common and cause economic losses to agriculture (maize, sorghum, sugarcane, maize rice and millet). Species of Crambidae can injure hay meadows, pastures, and grain-crops (some species of the genera *Agriphila* Hbn., *Pediasia* Hbn., *Talis* Gn., etc.). Most species of the family are widely distributed. A total of 137 genera and about 1600 species are known in the world fauna, with 50 genera and 400 species occurring in the Palearctic regions and 20 genera and 110 species found in the fauna of the European part of Russia and the Commonwealth of Independent States (CIS) (Falkovitsh, 1986).

In Turkey, *Cynaeda gigantea* (Wocke) poorly studied, although it is an important defoliator of *Anchusa leptophylla* Roemer and Schultes (Boraginaceae), particularly in eastern and central Turkey. Limited numbers of studies have been conducted in our country on two *Cynaeda* species: *Cynaeda dentalis* (Denis and Schiffermüller 1775) and *C. gigantea* (Wocke, 1871) species have been reported by Koçak (1989) and several authors (Staudinger, 1879; de Latin, 1951; Amsel, 1953; Koçak, 1989) have reported finding this pest in the Bursa, Amasya, Kahramanmaraş, Van, Bolu and Ankara provinces (Fig. 1). *C. gigantea* feeds on *A. leptophylla*, pupating in a rough, rounded cocoon (gall) made among the leaves of this food plant (Fig. 2. d-f).



Fig. 1. Distribution of *Cynaeda gigantea* (Wocke, 1871) in Turkey. ●Existing ★New

The genus *Anchusa* L. is one of the largest genera of the Boraginaceae, centered in the Mediterranean and extending through Europe, Western Asia, and Tropical Africa (Selvi and Bigazzi, 1998). The southern part of the Balkan Peninsula is a major center of diversity of *Anchusa*, because here the Mediterranean, Central European, and endemic species come into contact and overlap to a considerable extent (Selvi and Bigazzi, 2003). *Anchusa* is represented by 15 species, 2 of which are endemic to Turkey (Ekim *et al.*, 2000). The Turkish name for *Anchusa* species is “sığirdili” (Baytop 1984; 1994).

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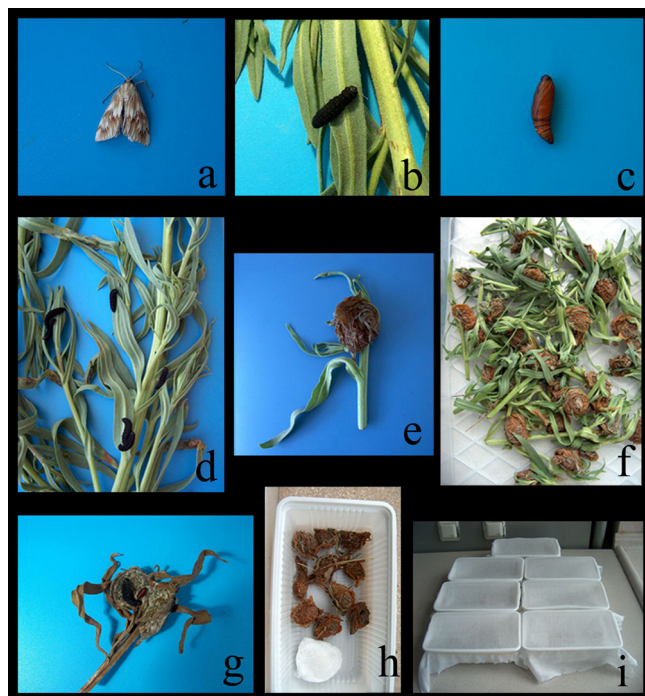


Fig. 2. Biological stages and damage of *Cynaeda gigantea* (Wocke, 1871). a) adult, b) mature larva, c) pupa, d) larva feed on leaves, e,f) larva damage (cocoon (gall)), g) parasitized larva and tachinid pupa, h,i) parasitoid rearing container.

Akçin and Ulu (2007) investigated the morphological and anatomical characteristics of *Anchusa leptophylla*. They are biennial or perennial herbs woody at the base with stem prostrate-ascending, 35-145 cm, branched from the base, puberulous. Basal leaves are linear and are 6.5-20.0 × 0.8-1.9 cm. Cauline leaves 3.5-24.5 × 0.3-2.0 cm, linear, linear-lanceolate or oblanceolate and puberulous. Cymes are dense, elongating in fruit. Bracts measure 3.0-4.5 × 1.0-1.8 mm, and are linear, linear-lanceolate or ovate-lanceolate. Calyx are 4.5-8.0 × 5.0-8.0 mm in flower, divided to 1/2-2/3 into obtuse lobes, elongating in fruit, lobes acute, subacute or obtuse. Corolla are usually bright blue with throat, 5.0-9.3 × 5.0-11.0 mm, limb 2.0-4.0 mm, with stamens inserted below the scales. Style 3.5-9.0 mm, long. Nutlets measuring 2.0-3.5 × 2.5-5.5 mm, are obliquely-ovoid with lateral beak, grayish-brown, coat surfaces papillae with lobed, rosette-like shape.

Some authors (Zengin and Güncan, 1996; Çoruh and Zengin, 2001; Çoruh, 2010) recorded *A. leptophylla* as a harmful weed in natural pastures and in some crop plants in Erzurum, Turkey (wheat and sainfoin, etc.). These weed are also visited by 13 bee species (Özbek, 1998).

A. leptophylla has been located along the Aras Valley, approximately 2–5 km in the valley that extends from the Karakurt (1450-1550 m; Sarıkamış-Kars) and the Yedisu

crossroads, towards Erzincan (1350 m). These areas have attracted attention to this plant and were the source of materials investigated in the present study.

MATERIAL AND METHODS

The study materials were collected from Kars (Sarıkamış-Aras Valley, 40° 07.543' N, 42° 29.941' E, elevation 1500-1550 m) and Erzincan (Tercan-Üzümlü between, 39° 34.076' N, 40° 08.288' E, elevation 1305 m) provinces in the East Anatolia region of Turkey during 2007–2008. Samples of galls infested with *C. gigantea* (biological stages are given Fig. 2. a-c) were collected at 2 different localities every 7-15 days from the second week of April until the middle of September.

The branches with *C. gigantea* galls, about 5-8 cm long, were cut with pruning scissors and each gall was placed in a small plastic container (10x20 cm) and fitted with a cotton stopper. After transfer to the laboratory (25±2°C and 50±5% RH), groups of 10 galls were placed in plastic containers lined with fitted wet cotton to provide moisture (Fig. 2. h, i). Containers were checked every 1 or 2 days for parasitoid emergence. The parasitoids that emerged were transferred into tubes filled with 70% alcohol. After completion of emergence, all parasitoid specimens and pests were identified.

The insect materials were deposited in the Entomology Museum, Erzurum, Turkey (EMET). Plant specimens were collected by hand, pressed, and also deposited in the Herbarium of the Plant Protection Department.

RESULTS

In this study, three parasitoid species *Exeristes roborator* (F.) (Hymenoptera: Ichneumonidae), *Elasmus steffani* Viggiani (Hymenoptera: Elasmidae), and *Pseudoperichaeta palesoidea* (Robineau-Desvoidy) (Diptera: Tachinidae) were obtained from larvae and pupae in the galls of *C. gigantea*.

These three parasitoids are reported for the first time on *C. gigantea*. A total of 31 ichneumonids, 22 tachinids (Fig. 2. g), and 4 elasmids were obtained from the two sites. Among these parasitoids, *E. roborator* was recorded as the most common parasitoid (Table 1). The female: male ratio for this species is shown in Table 1. The female rate of all species was higher (Table 1).

In total, 514 galls of *C. gigantea* containing larvae and pupae were collected during this study in 2007 and 2008 (Table 2). A total of 230 galls were collected in 2007 and 284 galls in 2008 at the two different sites. In 2007, a total of 107 galls were collected from the Aras Valley (Kars) and 123 galls from Tercan-Üzümlü between (Erzincan). In 2008, a total of 134 galls were collected from the Aras Valley and 150 from Erzincan.

Parasitism rate on larvae and pupae was 10.88%, ranging from 7.78% at Aras Valley (Kars) to 3.1% at Tercan-Üzümlü between (Erzincan). A total of 40 parasitoids were obtained from the first collection site (Aras Valley-Kars). At this site parasitism rate was 16.59% and *E. roborator* was the most successful parasitoid (7.88%). A total of 17 parasitoids were obtained from the second collection site (Tercan-Üzümlü

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between) Erzincan. At this site, parasitism rate was 6.22%. *E. roborator* was again the most successful parasitoid (6.22%) (Table 2).

Table 1. Number of specimens (N), percentage of total parasitoid species and gender of parasitoids species from *Cynaeda gigantea* (Wocke).

Species	N	%	Females (%)	Males (%)
<i>Exeristes roborator</i>	31	54.38	61.90	38.19
<i>Pseudoperichaeta palesoidea</i>	22	38.60	63.63	36.37
<i>Elasmus steffani</i>	4	07.02	75	25
Total	57	—	—	—

Table 2. Percentage parasitism and diversity of parasitoid species.

Location	Collected galls	% of pupae parasitoided	Number of parasitoids	% of total ichneumonid	% of total tachinidae	% of total chalcidoidea
Aras Valley (Kars)	241	16.59	40	7.88	7.47	0.83
Tercan-Üzümlü between (Erzincan)	273	6.22	17	6.22	4.28	0.78
Total	514		57			

DISCUSSION

So far the presence of *C. gigantea* has only been confirmed in Turkey by Koçak (1989). According to this author, *Cynaeda* has two species in Turkey: *Cynaeda dentalis* and *C. gigantea*. Apart from this study, it is not found any other published data on this species.

Three species were reared from *C. gigantea* in the present study: *E. roborator*, *P. palesoidea*, and *E. steffani*. *E. roborator* is a common species that is widely distributed in the Palaearctic region (Townes *et al.*, 1965; Momoi, 1973; Aubert, 1969a; Kasparyan, 1981; Selafa *et al.*, 1999). As hosts of this species, the literature reports many species from various families in the orders Coleoptera, Lepidoptera, and Hymenoptera (Thompson, 1957; Kolarov, 1997). So far, this parasitoid has been obtained from *Cryptorrhynchus lapathi* L., *Larinus cynarae* F., *L. scolymi* Oliv., *L. sturnus* Schall., *L. latus* Hbst., *Lixus bardanae* F., *L. cardui* Oliv., *L. obesus* Petri, *L. junci* Boh., *L. ochraceus* Boh., *Pissodes harcyniae* Herbst (Coleoptera: Curculionidae); *Exoteleia dodecella* (L.) (Lepidoptera: Gelechiidae); *Hyponomeuta malinellus* Zell., *Eulimneria alkae* E. and S., (Lepidoptera: Yponomeutidae); *Malacosoma franconica* D. & S., *M. neustria* L. (Lepidoptera: Lasiocampidae); *Depressaria heracleana* L. (Lepidoptera: Oecophoridae); *Achatodes zaeae* Harr., *Arzama obliqua* Walk (Lepidoptera: Phalaenidae); *Earias insulana* Boisd., *Homoeosoma nebulella* Schiff. *Myelois cribrumella* Hbn., *Ostrinia nubilalis* Hbn. (Lepidoptera: Crambidae); *Loxostege sticticalis* L. (Lepidoptera: Pyraustidae); *Chamaesphecia affinis* Stgr., *Conopia* sp., *C. formicaeformis* Esp., *C. myopaeformis* Borkh., *C. sphecoformis* D. & S., *Pyropteron affinis* Staudinger (Lepidoptera: Sesiidae); *Blastesthia turionella* (L.), *Cydia pomonella* L., *Blastesthia turionella* (L.), *Petrova resinella* (L.), *Rhyacionia buoliana* Schiff., *R. pinicolona* Doubleday, *Zeiraphera rufimitrana* H. & S. (Lepidoptera:

Tortricidae); *Chelonus annulipes* Wesm. (Hymenoptera: Braconidae); *Biorhiza pallida* Ol., *Diplolepis fructuum* (Rubsaaamen) (Hymenoptera: Cynipidae); *Angitia punctoria* Roman, *Gregopimpla malacosomae* Seyrig (Hymenoptera: Ichneumonidae) (Aubert, 1969b, Anonymous, 1971; Özdemir, 1990; Kolarov, 1997; Özbek *et al.*, 1999; Yıldırım *et al.*, 1999; Kasparyan and Gültekin, 2002; Gültekin *et al.*, 2003; Çoruh *et al.*, 2004; Gültekin, 2005; Çoruh and Özbek, 2005). The finding of this species in *C. gigantea* feeding on *A. leptophylla* introduces *C. gigantea* as a new host for *E. roborator*.

P. palesoidea was obtained from larvae of *C. gigantea*. This species is distributed in Austria, Belgium, Bulgaria, Croatia, Czech Republic, Finland, French mainland, Germany, Greek mainland, Hungary, Italian mainland, Moldova, Norwegian mainland, Poland, Romania, Sardinia, Sicily, Slovakia, Spanish mainland, Sweden, Switzerland, Ukraine, Yugoslavia (Tschorsnig and Herting 1994). Elsewhere, Tschorsnig (1992) has reported that specimens have been collected by net on *Euphorbia* spp. In Turkey, Kara and Alaoğlu (2002) reported collection of a single female by net on weeds. So far, this parasitoid has been obtained from *Amphisa joannisiana* Rag., *Depressaria heracleana* Deg., *D. marcella* Reb., *D. pastinacella* Dup. (Lepidoptera: Oecophoridae) (Herting, 1960; Tschorsnig and Herting, 1994). Finding this species on *C. gigantea* feeding on *A. leptophylla* makes *C. gigantea* a new host for *P. palesoidea* as well.

According to the Universal Chalcidoidea Database (Anonymous, 2010), the lepidopteran species is a new host for *E. steffani*. This parasitoid is distributed in Croatia, France, Greece, Israel, Italy, Spain, Syria, Turkey and the United Arab Emirates. So far, this species has been obtained from *Lobesia botrana* Den. and Schiff. (Lepidoptera: Tortricidae), *Prays citri* Mill., *P. oleae* Bern., *P. oleellus* (F.) and *Yponomeuta malinellus* (Zeller) (Lepidoptera: Yponomeutidae).

ACKNOWLEDGEMENTS

The authors are thankful to the following scientist for the identification of insects and weed: Dr. Janko Kolarov (ichneumonid), Dr. Kenan Kara (tachinid), Dr. Peter S. Boyadzhiev (elasmid), Dr. Ole Karsholt and Dr. Wolfgang Spediel (crambid) and Dr. İrfan Çoruh (weed).

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Received: June 01, 2011

Accepted: October 26, 2011