SEASONAL OCCURRENCE AND BIOLOGY OF GLOBE THISTLE CAPITULUM WEEVIL *LARINUS ONOPORDI* (F.) (COLEOPTERA: CURCULIONIDAE) IN NORTHEASTERN TURKEY

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ABSTRACT: The biology of weevil species, *Larinus onopordi* (F.) living on globe thistle *Echinops sphaerocephalus* L. was described for the first time. The species is univoltine, adults overwinter under hiding object as aggregated. Eggs are inserted into the flowerhead; *L. onopordi* deposited eggs superficially, 1-23 (3.76) eggs each capitulum may be occur in one flowerhead, larvae develop in capitulum eating and destroying the seeds. In late summer, larvae complete their growth; prepare pupal case 1-4 (0.84) case in each flowerhead and pupation occurs in here. New generation adults emerge from flowerhead after waiting several days. Thus, this weevil has one generation per year in northeatern Turkey. A braconid wasp, *Bracon facialis* Thom. (Hymenoptera: Braconidae) reared from the pupal stage of *L. onopordi*.

KEY WORDS: *Larinus onopordi*, *Echinops sphaerocephalus*, biology, Curculionidae, Lixinae, northeastern Turkey.

Echinops L. are perennial or biennial spiny herbs with erect ridged stems. Leaves simple to three-pinnatisect, petiolate or sessile. Capitula single-flowered, congested into globose heads subtended by small reflexed bracts. The genus *Echinops* has sixteen species in all Turkey. Of these, *Echinops sphaerocephalus* L. is distributed mainly in northeastern Anatolia (Davis, 1975). This plant is on the weed list in Turkey in common pastures, meadows, environs of airport, highways and railways (Uluğ et al., 1993), maize, cotton fields, field margins and other crops (citrus, okra, grape, soybean, wheat, tomato, sesame, groundnut and bean) in Çukurova Region (Okşar & Uygur, 2000). Also, *E. sphaerocephalus* is on the invasive weed list of North America (Hartman & Nelson, 2000) and it is commonly found in Nebraska (McCarty et al., 1984).

Even though informed about the weed characteristics of *E. sphaerocephalus* in current literature, this plant also has medicinal uses (Kucherov, 1978). *E. sphaerocephalus* contains the non-poisonous alkaloid, echinopsin, which gives sufficiently recovery in chronic radiation sickness (Gubina & Omelyanenko, 1959). Polysaccharides isolated from *E. sphaerocephalus* have been used in traditional Chinese medicine as drugs with anti-inflammatory effect and anti-tumor promoting action in the osseous system (Horvath et al., 1998).

Except for its useful peculiarities discussed above and though *E. sphaerocephalus* may become a weed in some areas, it is used as a honey

plant: *E. sphaerocephalus* and *E. ritro* were planted in Michigan, USA (Wrobleswka et al., 1993). Values of honey efficiency and attraction for bees were found highest among those recommended for gardens as investigated in ten plants in Poland (Jabonski, 1990). In addition, Burzynski et al. (1981) indicated that several species of shrubs and herbaceous plants have been introduced into young Polish Scots pine stands as nectar plants, the most effective being *Peucedanum oreoselinum* L., *Daucus carota* L., *Echinops sphaerocephalus* and *Asclepias syriaca* L.

The genus *Larinus* Dejean comprising ca. 180 species is represented by approximately 140 species in the Palaearctic (Csiki, 1934). *Larinus* is species-richest in the Mediterranean where about 100 species occur (Ter-Minassian, 1967). Host plant range is confined to the tribe Cardueae of the family Asteraceae (Zwölfer et al., 1971).

According to Ter-Minassian (1967), *Larinus onopordi* (F.) host plant is *E. sphaerocephalus*. Though this weevil has a large distribution area and is common, there is no biological record published in current literature. In the present paper, seasonal occurrence and biology of *L. onopordi* were described on the widely perceived plant *E. sphaerocephalus*, for the first time.

MATERIAL & METHODS

The study was conducted in Northeastern Anatolia in 2003; collections were also made in Eastern Anatolia and Mediterranean Turkey in 2004 and 2005. Biological observations were made weekly (sometimes with intervals of 10–15 days) in the research areas throughout the season. Different biological stages of *L. onopordi* feeding on the both *Echinops* species were observed mostly in natural habitats; observations were made also in the laboratory and in the rearing cage in the field. In the provinces of Northeastern Anatolia where the weevil is common, it was collected from 20 flowerheads randomly at every visit and dissected under microscope in the laboratory. Seasonal occurrence of biological stages and duration of stages were described in the field.

RESULTS

This species main host plant is *E. sphaerocephalus* L. in Northeast Anatolia, but rarely prefers *E. orientalis* Truatv. to complete their generation in this plant. Overwintered adults associated with host plants from mid May. After feeding several days on leaves (Fig. 1), they mated (Fig. 2) and laid their eggs in flowerheads using rostrum by excavation of the oviposition hole. In addition, the adults damage the stem below flowerhead opening vertical holes. Adult activity period lasted approximately 44 days (Fig. 9). Adult population rise to a peak level in the last week of May and adult occurrence per flowerhead is 0.05-0.9 (0.59) (Table, 1-2). Mating activity duration lasted approximately the

adult activity period which is 37 days. After depositing eggs, females closed on eggs a pale green secretion then this secretion dried, hardened and turned black (Fig. 3). The eggs were laid superficially and it was easy to see the eggs when opening this dry secretion (Fig. 4). There were 1-23 (3.76) eggs in one flowerhead and each flowerhead had 0.35-8.2 (3.76) eggs, on average which oviposit on upper and lateral part of flowerhead (Table 2). Eggs occurrence span was 33 days (Fig. 9). Hatching and feeding in flowerhead larvae continue to grow (Fig. 5.) untill mid September. Larval period duration was 79 days and each flowerhead had 0.2-1.55 (0.84). From the third week of July, pupae were seen in flowerhead (Fig. 6). In one flowerhead, four larvae can grow, also mature larva made up the pupal cell by using mouth secretion and plant remnant where 4 pupal cells occur. If there are more than one larva or pupa in one flowerhead, this flowerhead abnormally shaped. Pupa duration was 51 days and there were 0.2-0.7 (0.5) pupa on each flowerhead, on average. Upon reaching the new generation adult stage, they waited in the flowerhead 7-10 days (Fig. 7) and emerged from here for find a suitable hibernating site such as under stones. This weevil showed aggregation behavior which is possibly seen in 1-3 specimens together hiding under a stone for hibernation. Thus, *L. onopordi* produced one generation per year.

A braconid wasp, *Bracon facialis* Thom. (Hymenoptera: Braconidae) reared from the pupal stage of *L. onopordi*.

DISCUSSION

As field investigation results show, *L. onopordi* main host plant is *E. sphaerocephalus* (Fig. 8), however, it can complete their generation on *E. orientalis* in NE Anatolia. In addition, this weevil species used two different *Echinops* species and *E. sphaerocephalus* in SE Anatolia, Central Anatolia and Mediterranean Turkey as a host plant. Conducted in 2004-2005 field expedition covered approximately half of Turkey (eastern part) examining 106 different localities, *L. onopordi* host range was confined to only the *Echinops* genus. According to current literature, *L. onopordi* host plants were *E. sphaerocephalus* and *E. ritro* (Ter-Minassian, 1967; Campobasso et al., 1999). This weevil is distributed in Algeria, Tunisia, Syria, Lebanon, Iran, Egypt, Caucasus, Cyprus, Greece, Turkey, Italy, southeastern Ukraine, Lower Volga region, Transcaucasus, southern Kazakhstan, Turkmenistan, Tajikistan, southern Europe (Petri, 1907; Csiki, 1934; Ter-Minassian, 1967; Fremuth, 1982). In the eastern part of Turkey, this weevil is distributed in Adana, Adıyaman Artvin, Bingöl, Bitlis, Diyarbakır, Elazığ, Erzurum, Erzincan, Gaziantep, Hatay, Iğdır, Kars, Kırıkkale, Kilis, Malatya, Nevşehir, Osmaniye, Sivas and Şanlıurfa provinces.

Kasparyan & Gültekin, (2002) informed that an ichneumonid wasp, *Exeristes roborator* F. (Hymenoptera: Ichneumonidae) is parasitoid of this species. By this present paper an additional parasitoid is recorded

which is including Braconidae.

Even if this plant is on the weed list of Turkey (Uluğ et. al., 1993; Okşar & Uygur, 2000), *E. sphaerocephalus* is being used as both medicinal plant (Gubina & Omelyanenko, 1959; Kucherov, 1978; Horvath et al., 1998) and cultivated as a honey garden plant (Jabonski, 1990; Wrobleswka et al., 1993). There is not sufficient data about the economical importance of this plant to come to final conclusions regarding this is invasive weed. In investigated region this plant occur roadsides, field margins, abandoned fields and non-cultivated natural habitats commonly. Here, it is not suitable to declare *E. sphaerocephalus* as an invasive plant and *L. onopordi* a potential biological control agent. It is possible to discuss, here, the main feeder of *E. sphaerocephalus* is *L. onopordi* which is consuming seed of this plant. Accordingly its biological peculiarities and the relative population level, this weevil can balance this plant population level and prevent for jumping an invasive weed plant group.

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Figure 1-8. Biological stages of *Larinus onopordi* (F.): 1- adult and feeding damage on leaves. 2- mating. 3- oviposition mark. 4- eggs. 5- larva and pupa. 6- pupa. 7- new generation adult. 8- host plant and habitat.

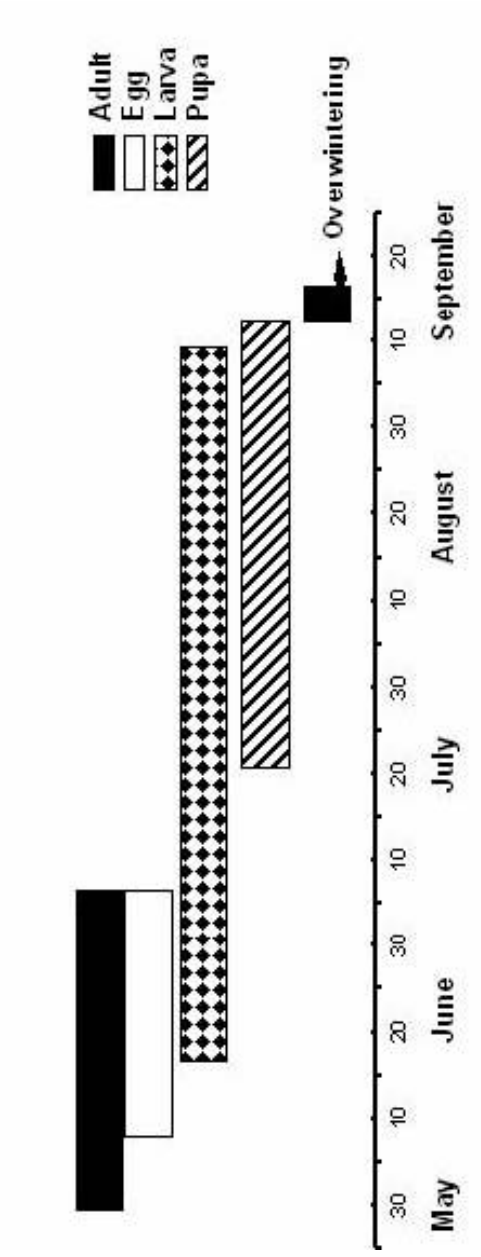

Figure 9. Duration of biological stages of *Larinus onopordi* (F.) in Northeastern Anatolia, in 2003.

Table 1. Presence and seasonal activity of *Larinus onopordi* (F.) in NE Anatolia in 2003

Date	Locality	N. adult (20 plant)	N. copulation pair	N. eggs	N. larvae	N. pupae	N. new adult	N. parasitoit or predator	N. flowerhead collected /examined
4.5.2003	Kars	0	0	0	0	0	0	0	0 (not bud)
6.5.2003	Bingöl	0	0	0	0	0	0	0	0 (not bud)
19.5.2003	Bingöl	1	0	0	0	0	0	0	20
26.52003	Bingöl	28	4	0	0	0	0	0	20
1.6.2003	Kars	18	5	27	0	0	0	0	20
8.6.2003	Bingöl	17	3	164	0	0	0	0	20
11.6.2003	Kars	8	2	90	12	0	0	0	20
17.6.2003	Erzincan	5	1	88	20	0	0-	0	20
3.7.2003	Bingöl	6	2	7	31	0	0	0	20
22.7.2003	Kars	0	0	0	22	4	0	0	20
3.8.2003	Kars	0	0	0	16	9	1	0	20
30.8.2003	Erzincan	0	0	0	13	14	4	2	20
14.9.2003	Erzincan	0	0	0	4	13	12	7	20

Table 2. Relative population density of *Larinus onopordi* (F.) in NE Anatolia in 2003

Date	Locality	% Head attacked	Adult per head average	Eggs laid per head average	Larvae per head average	Pupae per head average	New generation adult average	Mortality factors (parasitoit and predator)
4.5.2003	Kars	0	0	0	0	0	0	0
6.5.2003	Bingöl	0	0	0	0	0	0	0
19.52003	Bingöl	0	0.05	0	0	0	0	0
26.52003	Bingöl	0	1.4	0	0	0	0	0
1.6.2003	Kars	45	0.9	1.35	0	0	0	0
8.6.2003	Bingöl	75	0.85	8.2	0	0	0	0
11.6.2003	Kars	75	0.4	4.5	0.6	0	0	0
17.6.2003	Erzincan	70	0.25	4.4	1.0	0	0	0
3.7.2003	Bingöl	80	0.30	0.35	1.55	0	0	0
22.7.2003	Kars	65	0	0	1.1	0.2	0	0
3.8.2003	Kars	75	0	0	0.8	0.45	0.1	0
30.8.2003	Erzincan	85	0	0	0.65	0.7	0.2	0.1
14.9.2003	Erzincan	80	0	0	0.2	0.65	0.6	0.35
	Total average	72.2	0.59	3.76	0.84	0.5	0.3	0.225