

***Cephalaromyia capituli* gen. nov. et sp. nov. (Diptera: Cecidomyiidae)
causing galls in flower heads of *Cephalaria microcephala*
(Caprifoliaceae) in Iran**

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Abstract. *Cephalaromyia capituli* Skuhrová, gen. nov. and sp. nov. is described based on specimens reared from flower heads of *Cephalaria microcephala* Boiss. (Caprifoliaceae) found in northern Iran. Male, female, larva, pupa and biology are described and morphological characters are illustrated. Several larvae develop together in one flower head. Each larva lives in a flower bud of the capitulum, forming a small gall. Up to 13 galls were found in one attacked capitulum. Two generations develop per year. Larvae of the first generation pupate in flower heads, larvae of the second generation leave places where they develop and pupate in the soil.

Key words. Taxonomy, new species, Diptera, Cecidomyiidae, *Cephalaria*, Iran.

INTRODUCTION

Cephalaria Schrader is a genus of flowering plants in the family Caprifoliaceae, native to southern Europe, western and central Asia, and northern and southern Africa. Members are annual or perennial herbaceous plants growing to 0.8–2 m high. The genus *Cephalaria* including 65 species was originally included in the family Dipsacaceae, but now it is a member of the family Caprifoliaceae (TPL 2013).

The species *Cephalaria microcephala* Boiss. includes stout, erect perennial herbs, with stems reaching up to 1 m high. Compound flower heads (capitula) are globose or ovoid, 1.5–2.5 cm in diameter in flower, 1.5–1.9 cm in diameter in fruit. *C. microcephala* is an Irano-Turanian element and occurs in eastern and south-eastern Anatolia in Turkey, northern and western Iran, and Iraq (Göktürk & Sümbül 2014). *C. microcephala* is given in the list of plant species occurring in the North Khorasan Province of Iran (Jankju et al. 2011).

Till this time only one gall-inducing species has been known to be associated with this host plant: the moth *Diceratura roseofasciana* Mann, 1855 (syn. *Conchylis leucantha* Constant, 1888) (Lepidoptera: Tortricidae). The galls of this moth were discovered on *Cephalaria leucantha* in southern France. This gall-inducing species is given in Houard (1909). Alipanah (2009) gives the recent distribution of this moth species from several countries of southern Europe, from Transcaucasia, Kazakhstan and also from Iran (Khuzestan Province).

In 2009 Y. Karimpour in the course of investigations of gall midges in the environs of Urmia in the West Azerbaijan Province in north-western Iran discovered small galls in flower heads of *Cephalaria microcephala* Boiss. caused by an undescribed species of gall midges. We included this undescribed species among the gall midge fauna of Iran (Skuhrová et al. 2014). In the present article we describe it as a new species which belong to a new genus.

MATERIAL AND METHODS

Flower heads of *Cephalaria microcephala* including small galls with gall midge larvae were discovered at several places around the city of Urmia in northern Iran. Branches of *Cephalaria microcephala* with flower heads after collecting in nature were put into polyethylene bags and brought to the laboratory. Attacked plants were placed in rearing cages and emergence of adults was observed each day. Larvae, pupae and adults obtained from flower heads were put into 75% ethanol and later mounted on microscope slides using Canada balsam as medium. Flower heads after emergence of adults were examined using lengthwise sections to see where galls including larval chambers occur and how many galls develop in one flower head.

TAXONOMY

Cephalaromyia Skuhravá, gen. nov.

TYPE SPECIES. *Cephalaromyia capituli* Skuhravá, sp. nov.

DESCRIPTION. Wing with R_5 uniting with costa at the wing apex; basal part of Cu running close to R_5 ; Cu ramifies in the wing middle forming a large fork; fully developed mouthparts with four segmented palpi; antennae with 2+17 flagellomeres in both sexes; legs with simple tarsal claws; male terminalia with undivided gonocoxal apodeme and strongly expressed parameres bearing lobes; female eight tergite lengthwise, anteriorly divided into two arms; long ovipositor ending with soft lamella covered with long setae. Larva with bilobed sternal spatula, pupa with small sclerotized antennal protuberances.

DIFFERENTIAL DIAGNOSIS. The new genus belongs to the tribe Oligotrophini (Gagné & Jaschhof 2017: 611) and in the key of Skuhravá (1997: 130) may be included in the tribe Oligotrophini in the group of genera with four segmented palpi. It is close to the genus *Janetiella* Kieffer, 1898, from which it differs by the wing vein R_5 which is in *Janetiella* united with the costa before wing apex and in *Cephalaromyia* at the wing apex.

ETYMOLOGY. The name of this genus is derived from the Latin name of the host plant genus, *Cephalaria*, where larvae of the new species cause galls in flower head, and the suffix “myia” which means fly.

Cephalaromyia capituli Skuhravá, sp. nov.

(Figs. 1–15)

TYPE MATERIAL. **Holotype**: male, Iran, Urmia, 27 July 2009, reared from small gall inside flower head of *Cephalaria microcephala*, leg. Y. Karimpour. – **Paratypes**: 6 males, 10 females, 4 larvae, 6 pupae; Iran, Urmia, June 2009, obtained from galls inside flower heads of *Cephalaria microcephala*, leg. Y. Karimpour.

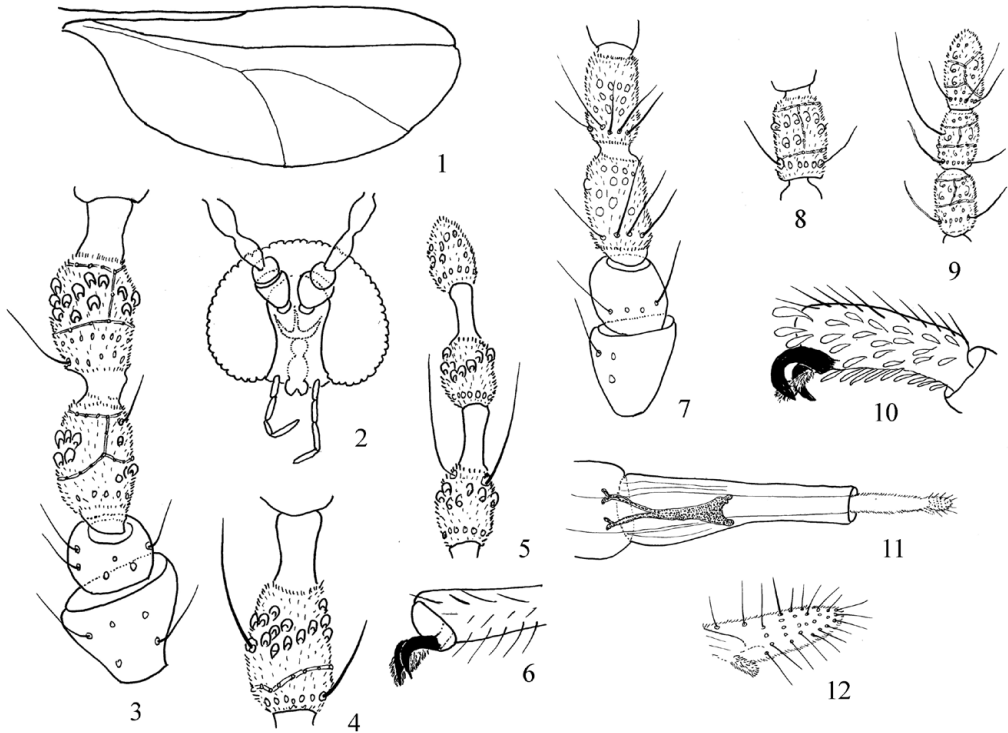
DESCRIPTION. **Male**. Body size: 2.4–2.7 mm (n=5); wing length: 2.7–3.3 mm, wing width: 1.2–1.3 mm (n=5); head black, thorax and abdomen honey coloured. Head relatively small, with large holoptic eyes, eye bridge ten ommatidia long at vertex. Ommatidia relatively small, densely arranged. Mouthparts normally developed, frontoclypeus with several setae; palpi four-segmented, slender, covered with long setae; first and second segments are shorter, third segment a little longer and the fourth segment is the longest.

Antennae 2+17 segmented (n=10); scape obconical, pedicel subglobular; flagellomeres composed of basal node and neck; necks are about one half of nodes; the first flagellomere with shortened neck; 1st and 2nd flagellomeres fused, flagellomeres gradually diminishing, the 17th flagellomere egg-shaped. Nodes of flagellomeres are densely covered with microtrichia and each with a whorl of short setae which form a regular row at the base of the node; in the middle are several conspicuous hemispherical formations called alveoli each including an opening (hooded

alveoli in Gagné 2016: 410; horse-shoe shaped sockets in Yukawa 1971: 6); some of them with long setae; circumfila in middle part are joined closely, forming a ring; necks of flagellomeres are naked.

Thorax. Wing with R_5 uniting with costa at the wing apex; basal part of Cu running close to R_5 ; Cu ramifies in the wing middle forming a large fork; legs long, covered with short setae; tarsal claws simple, strong, without tooth at the base, sickle-shaped bent, empodium as long as claws.

Abdomen. Second to seventh segments relatively large with sclerotized dorsal side covered with short setae, ventral side sclerotized and covered with short setae; eighth segment small and unsclerotized. Terminalia with undivided gonocoxal apodeme at base and strongly sclerotized parameres bearing lobes; gonocoxites cylindrical, about two times longer than broad, sparsely covered with long setae which are more abundant on inner apical part; gonostyli short, about half of length of gonocoxites, tapering, densely covered with microtrichia and sparsely with setae, apically with black claw; cerci broad, lobes ellipsoid, deeply separated, broadened laterally in basal third; hypoproct narrow, with deep excision, as long as cerci; aedeagus tubular with rounded tip,



Figs. 1–12. *Cephalaromyia capituli* Skuhrová, sp. nov. 1–6 – male. 1 – wing, 2 – head, 3 – scape, pedicel and first and second flagellomeres, 4 – fifth flagellomere, 5 – three last flagellomeres, 6 – fifth tarsomere with claw and empodium. 7–12 – female. 7 – scape, pedicel and first and second flagellomeres, 8 – fifth flagellomere, 9 – three last flagellomeres, 10 – fifth tarsomere with claw and empodium, 11 – terminal part of abdomen with tergite of characteristic shape on eighth abdominal segment, 12 – detail of ovipositor with fused cerci and hypoproct.

as long as gonocoxites; mediobasal lobes of gonocoxites with small protuberances at tip, a little shorter than cerci.

Female. Body size: 2.7–3.1 mm long excluding ovipositor (n=6), wing length 2.4–3.7 mm, wing width 0.6 mm (n=5), body similarly coloured as in male. Head, mouthparts and palps as in male.

Antennae 2+17 segmented (n=9); scape obconical, pedicel subglobular, both with several short setae; flagellomeres cylindrical, without stems; 1st and 2nd flagellomeres fused, flagellomeres gradually diminishing, the 17th flagellomere slightly prolonged.

Flagellomeres are densely covered with microtrichia and each with a whorl of short stronger setae which form a regular row at the base of the node; in the middle and in the upper part with circumfilar rings which are connected by a circumfilar band; between them four or five conspicuous hemispherical formations including an opening, some of them with long thin setae.

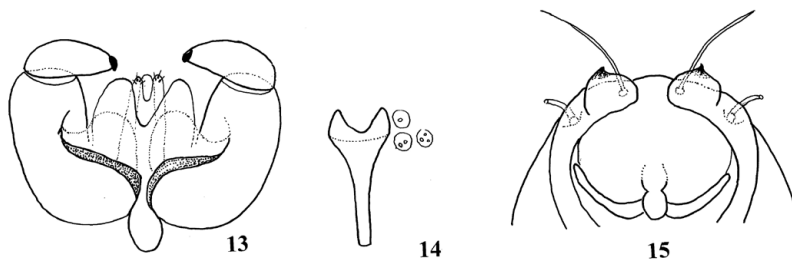
Thorax. Wings as in male. Legs long, covered with short setae; fifth tarsomere short, densely covered with short setae and with many scales, tarsal claws simple, strong, without tooth at the base, sickle-shaped bent, empodium a little longer than claws.

Abdomen. Second to sixth segments relatively large, with oblong tergites, seventh segment smaller, eighth segment very long, about three times longer than seventh segment, with strongly sclerotized tergite consisting of two narrow parallel basal parts which join together and then gradually broaden; ovipositor telescopic; cerci fused at the end into one lengthened lamella, hypoproct small and narrow; ovipositor and cerci densely setose; lamella densely covered with microtrichia and sparsely with projecting, separated setae which arise from small pits ventral part of ovipositor with short setae.

Larva. The third larval instar (mature larva) is 3.4–3.6 mm long, 1.3–1.4 mm broad (n=6), orange coloured; integument covered with small oval plates. Head is small, conical, with a pair of small short antennae. Spatula sternalis on ventral side of prothoracic segment is brown coloured, 210–220 μm long, with bilobed anterior blade and slender stem. All papillae with relatively short setae. Terminal segment with eight papillae, each with short seta.

Pupa. The pupa of the future female is 3.2–3.3 mm long, 1.4 mm broad, of future male 4.0–4.2 mm long, 1.5 mm broad. Antennal bases enlarged and pointed apically; cephalic papilla on vertex on each side with long seta; face smooth, without protuberances; prothoracic spiracle with short and bent tube; integument hyaline, consisting of small spiculae.

Gall. The gall is 1.2–3.5 mm in diameter, has thin walls and is formed of an enlarged single flower bud in the flower head. Only one larva develops inside a chamber which is formed in receptacle



Figs. 13–15. *Cephalaromyia capituli* Skuhravá, sp. nov. 13 – terminalia of male (dorsal), 14 – spatula and associated papillae of larva (ventral), 15 – head part of pupa with enlarged and pointed antennal bases, long cephalic setae and bent tubes of prothoracic spiracle (ventral).

Table 1. Flower heads of *Cephalaria microcephala*, arranged after size into six groups, and occurrence of galls of *Cephalaromyia capituli* Skuhravá, sp. nov.

group	size (diameter in mm)	number of heads	without galls	with galls	number of galls per one head
1	5–7	10	8	2 (+1 cocoon)	0–1
2	7–9	9	7	2	1
3	9–10	9	0	9	1–2
4	10–12	10	0	10	3–5
5	14–16	10	0	10	6–8
6	18–20	10	0	10	9–10

tissues of the capitulum (= flower head). Galls are situated near the axis of the flower head which is swollen as a result of the presence of gall midge larvae. Attacked flower heads are not obvious externally, but the attacked flower heads are usually a little larger than unattacked flower heads and are very hard (Figs. 16–17).

We analysed sixty flower heads of *Cephalaria microcephala* Skuhravá, sp. nov, arranged into six groups according to their size, in November when the galls were without larvae (Table 1). We found that smaller flower heads bear only one or two galls and larger flower heads may bear ten up to thirteen galls. Depending on the attack rate of gall midges and the size of flower heads, there is at least one gall to around seven galls in each seed head (Table 1).

HOST PLANT. *Cephalaria microcephala* Boiss. (Caprifoliaceae).

LIFE HISTORY. Orange-red larvae of *Cephalaromyia capituli* Skuhravá, sp. nov. develop in flower buds forming small rounded galls in flower heads (capitula) of *Cephalaria microcephala*. Two



Figs. 16–17. *Cephalaria microcephala* Boiss. 16 – habitus of flower head in nature, 17 – flower head (= capitulum) in partial section showing one flower bud gall inside with orange coloured larva of *Cephalaromyia capituli* Skuhravá, sp. nov.

generations develop per year. Larvae of the first generation develop in small galls inside inflorescences in the spring. When larvae are fully developed, they leave galls, spin a weak cocoon and pupate inside it. After emergence, the females lay eggs on flower heads or seed capsules where larvae of the second generation develop. Fully developed larvae (of the third instar) leave the galls and drop to the soil where they hibernate until the spring of the following year. In 2009 adults of *Cephalaromyia capituli* Skuhrová, sp. nov. emerged from galls from the middle up to the end of July.

DISTRIBUTION. *Cephalaromyia capituli* Skuhrová, sp. nov. is an Asian-Turanian species as is its host plant. The galls of *Cephalaromyia capituli* Skuhrová, sp. nov. in flower heads of *Cephalaria microcephala* were found only in the surroundings of the city of Urmia in north-western Iran at an altitude of 1332 m a. s. l.

ETYMOLOGY. The specific name of this new species is derived from the Latin name of the plant organ where larvae develop: the flower head (botanically “capitulum”) of the plants belonging to the family Caprifoliaceae.

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