



## CONTRIBUTION TO THE KNOWLEDGE OF THE CAPNIIDAE (PLECOPTERA) OF TURKEY.

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### ABSTRACT

*Capnioneura bolkari* sp. n., a spring emerging species from the central Taurus, and *C. veronicae* sp. n., an apterous autumnal relict species from the eastern Pontic Mountains, are recorded as the first *Capnioneura* species from Turkey. *Capnia nigra* (Pictet) is confirmed from Turkey and the distribution of the seven known Turkish capniids is compared to that of other West Palearctic capniids.

**Keywords:** New species, *Capnioneura*, Capniidae, Plecoptera, Turkey, *C. bolkari* sp. n., *C. veronicae* sp. n.

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### INTRODUCTION

The Caucasian and Armenian Capniidae were studied by Zhiltzova (1964) who provided descriptions for *Capnia arensis* Zhiltzova, *C. sevania* Zhiltzova, *C. tuberculata* Zhiltzova and *Capnioneura caucasica* Zhiltzova. Subsequently three of these species, *C. arensis*, *C. sevania* and *C. tuberculata* have been reported from Anatolia (Zwick 1971; 1975), and later genus *Capnopsis* was recorded from the Caucasian region (Zwick 1984) and from Anatolia (Kazanci 1994), however no Turkish records for genus *Capnioneura* are currently known (Kazanci 2008, 2009).

The present revision of the Turkish Capniidae is mainly based on the material collected by Füsün Sipahiler (Ankara) between 1995 and 1997 and by Gilles Vinçon in 1997. For each species, bibliographical, biogeographical, ecological and morphological remarks are provided.

The material is preserved in alcohol. Type specimens are deposited in the Zoological Museum

of Lausanne, Switzerland. Other specimens are held by G. Vinçon, Grenoble, France, and I. Sivec, Ljubljana, Slovenia.

### RESULTS AND DISCUSSION

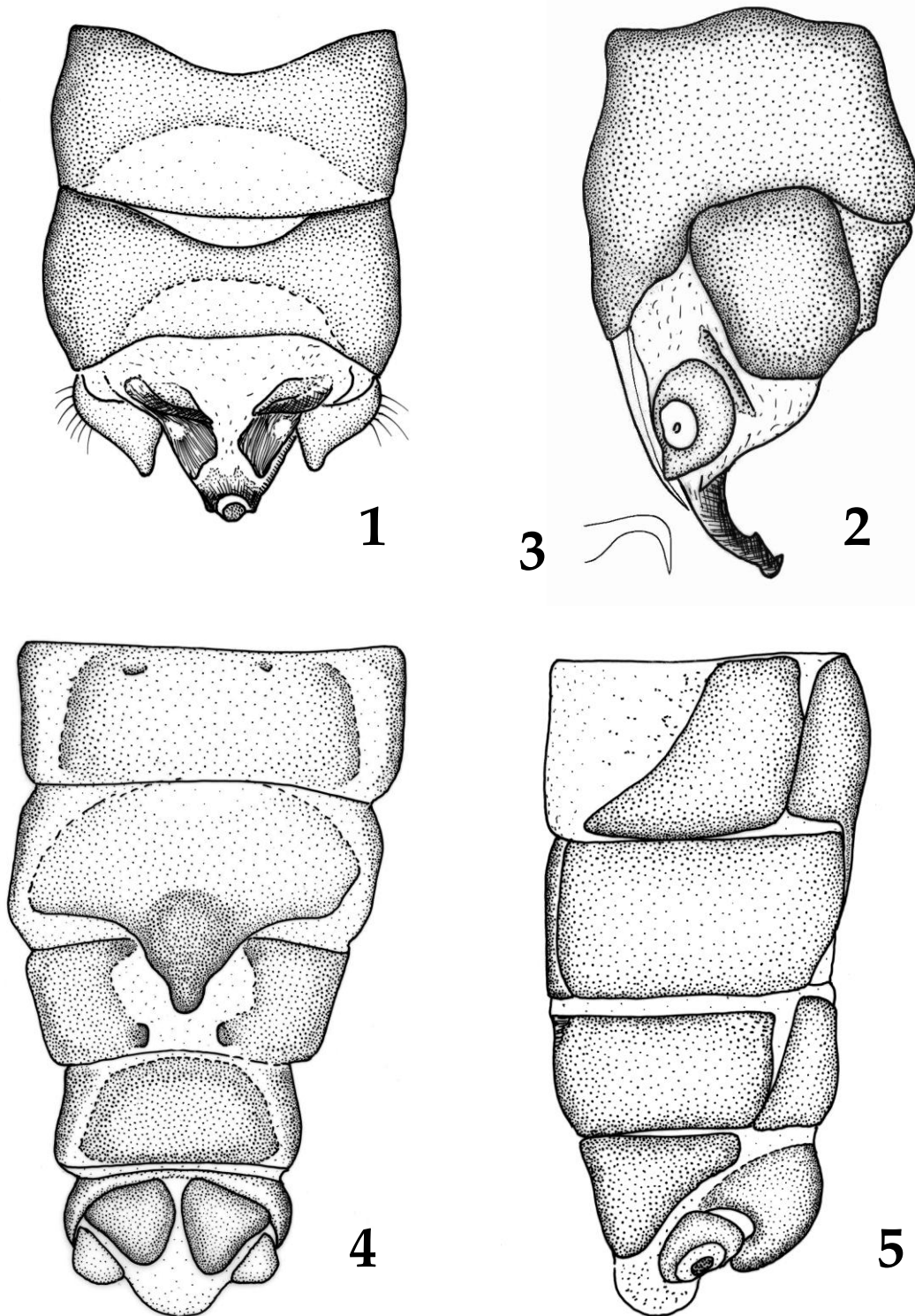
#### Genus *Capnioneura*

##### *Capnioneura bolkari* sp. n.

(Figs. 1-5)

**Material examined.** Holotype ♂: Turkey, Central Taurus, North West Tarsus, brook and spring between Camliyalya and Bögrüegri, 34°36'E/37°09'N, 4-V-97. The holotype and one female paratype are deposited in the Zoological Museum of Lausanne, Switzerland. Other paratypes, same locality, 5♂, 13♀; brook below Dorak, South Camliyalya, 34°42'E/37°02'N, 4-V-97, 3♂, 2♀ (held in Sivec and Vinçon collections).

**Description.** Body length ♂ 5.5 – 6.1 mm, ♀ 5.8 –



Figs. 1-5. *Capnionевра болкари* sp. n., 1. Male abdominal tip, dorsal view. 2. Male abdominal tip, lateral view. 3. Specillum. 4. Female abdominal tip, ventral view. 5. Female abdominal tip, lateral view.

6.5 mm. ♂ slightly brachypterous: anterior wing 3.8 – 4.1 mm. ♀ normally winged: anterior wing 5.7 – 6.0 mm. Head and whole body dark brown.

**Male** (Fig. 1-3). Tergite VII-VIII with a wide rounded membraneous field on the posterior margin. Tergite IX similar, forming a transversal sclerotized strip that narrows medially; the anterior margin is strongly curved. Tergite X with rounded anterior margin and sub-triangular median membraneous field (Fig. 1). Epiproct regularly curved at its base and ending into a rounded apex with a triangular anterior tooth; another tooth is also present one third of the distance from the tip of the epiproct, on the anterior edge (Fig. 2). Specillum hook-shaped, ending in a sharp point (Fig. 3). Paraproct shaft more or less rectilinear, blade-shaped, and regularly narrowing toward the apex (Fig. 2). Cercus rather thick, becoming thinner towards the apex (Fig. 1).

**Female** (Fig. 4-5). Tergite I-VIII with wide median membraneous area. Tergite IX-X fully sclerotized. Sternite VII: the wide subgenital plate has a sub triangular posterior extension that covers the median part of sternite VIII and nearly reaches the middle of sternite VIII. Sternite VIII with a median membraneous area, partly crossed by the projection of sternite VII; on each side of this membraneous field, two anterior and two posterior dark spots are clearly visible on the inner edge of the lateral plates.

**Affinities.** Male related to *Capnioneura petitierrae* Aubert by the shape of the specillum and paraproct blades, but the epiproct is quite different and resembles that of *C. mitis* Despax and *C. caucasica* Zhiltzova. It differs from *C. caucasica* and *C. mitis* by the shape of the specillum, ending in an acute hook, and by the slightly curved apex of the paraproct blades. The female is close to those of *C. caucasica* and *C. petitierrae*, from which it differs mainly by the two posterior spots on sternite VII.

**Etymology.** Named after the mountainous region where the species occurs. The Bolkar Daglari is a high altitude mountain range that culminates at 3524 m a.s.l. (Medetsiz Tape), in the Central Taurus.

**Ecology.** Orophilic, crenophilic species occurring in mountain springs and brooklets on a calcareous substratum. The altitude of the localities, though not measured with precision, is higher than 1000 m a.s.l.

**Distribution.** This micro-endemic species is only known from two localities in the same mountainous

region, northwards Tarsus (Central Taurus) (Fig. 12).

### *Capnioneura veronicae* sp. n.

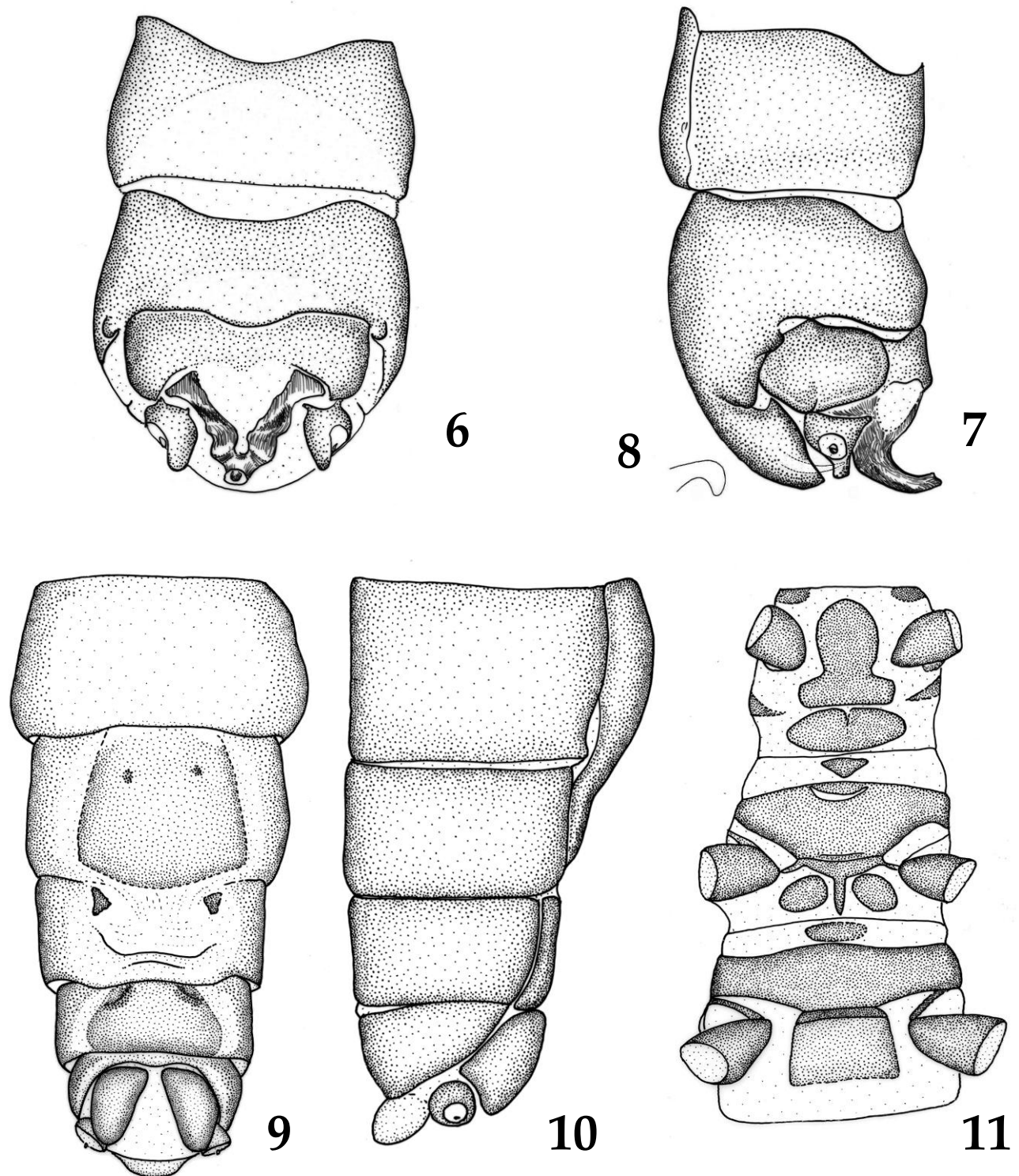
(Fig. 6-11)

**Material examined.** Artvin, Borcka, Camili, Gorgit yaylasi, 1600 m a.s.l., 41°55'E/41°25'N, 26-X-95, 9♂, 14♀; Camili, 1350 m, 29-X-97, 1♂, 3♀.

**Description.** Body length ♂ 5.8 – 6.1 mm, ♀ 6.5 – 7.8 mm. Fully apterous species in both sexes. Head, antennae, body and legs brown. Pronotum with dark pattern. The meso- and meta-thoracic sclerites (Fig. 11) are modified in the same way as in the other apterous *Capnioneura* species, *C. aptera* Berthélemy and *C. narcea* Vinçon & Sánchez-Ortega. Meso- and metanotum are both formed by a single non divided sclerite; no trace of wings. The anterior lateral extensions of the prothoracic basisternite are absent, therefore the basisternite I appears rounded with a wide rectangular base instead of Y-shaped or triangular in the other *Capnioneura* species (Berthélemy 1969, Fig. 2). Spinal sternite I is strongly reduced and disconnected from basis sternite II. Basis sternite II is also reduced. The meso-thoracic post furcasternite plates (PF II) are not fused to the furcasternite. Basis sternite III without anterior lateral expansions.

**Male** (Fig. 6-8). Tergite VIII with a wide rounded posterior membraneous field; the sclerotized strip strongly narrows medially. Tergite IX similar, but the transversal sclerotized strip is thicker medially. Tergite X with a heart-shaped median membraneous field (Fig. 6). Epiproct regularly curved and narrowing towards the tip (Fig. 7). The apex of the epiproct is obliquely truncate and does not carry any tooth that is exceptional for this genus. Specillum regularly curved, ending into a rounded tip (Fig. 8). The shaft of the paraproct, with a wide base, is regularly curved, narrowing toward the apex, and ending into a sharp point (Fig. 7); it is partly retracted inside the abdomen apex and only slightly visible (Fig. 7). Cercus with a long finger-shaped inner process (Fig. 6).

**Female** (Fig. 9-11). All tergites fully sclerotized, like in the other apterous *Capnioneura* species. Subgenital plate formed by the almost complete fusion of sternite VII and VIII. Both sternite VII and VIII are membraneous except two dark spots on the anterior lateral edges of sternite VIII. Sternite IX



Figs. 6-11. *Capnioneura veronicae* sp. n. 6. Male abdominal tip, dorsal view. 7. Male abdominal tip, lateral view. 8. Specillum. 9. Female abdominal tip, ventral view. 10. Female abdominal tip, lateral view. 11. Female pro, meso and methathoracic sternites.

membraneous with two dark spots on the anterior corners (Fig. 9).

**Affinities.** *C. veronicae* is clearly different from all the other *Capnioneura* species. The male epiproct and paraproct's shaft are very simple, which probably is a plesiomorphic feature. The female subgenital plate, without median sclerotisation, is also exceptional. For these reasons *C. veronicae* could be considered as a relict species.

**Etymology.** Named in honour of Véronique Gouanere, wife of Gilles Vinçon.

**Ecology.** Crenophylic, stenothermic cold water species, occurring in mountain springs and brooklets (1350-1600 m). The adults emerge in autumn.

**Distribution.** Far eastern Pontic Mountains, close to the Georgian border (Fig. 12).

**Apterism.** The high body sclerotisation and the strong reduction of meso- and meta-thoracic sclerites in both sexes are specializations also observed in the other apterous or micropterous *Leuctra* and *Capnioneura* species. These adaptative features, linked with apterism, probably help the adults to move in the dense aquatic vegetation surrounding the springs; indeed most short winged species are strongly crenophilic (Vinçon & Pardo 1994, Vinçon & Sánchez -Ortega 2002).

## Genus *Capnia*

### *Capnia arensis* Zhiltzova 1964

Previous records from Turkey: Zwick (1975), Kazanci (1982, 2008, 2009).

**Material examined.** Above Kayabasi, south Sögüt, Ak Daglari, 29°51'E/36°57'N, 6-V-97, 1♀ (Vinçon coll.), Rize, Ovitdagi gecidi, S. slope of the pass, 2600 m a.s.l., 40°48'E/40°37'N, 12-V-97, 4♂ (Vinçon coll.).

**Affinities.** *C. arensis* belongs to the *pedestris* group that has a mainly central Asian distribution (Zwick & Sivec 1980).

**Ecology.** Orophilic, stenothermic cold water species, occurring in fast flowing and rather large mountain streams, mainly between 1000 and 2000 m a.s.l. (Zhiltzova 1964) and up to 2600 m in the Eastern Pontic Mountains. The adults emerge in spring (II-VI) and are often captured on snow.

**Distribution.** Caucasus, Armenia and Anatolia. In Anatolia, it was only known from the Ankara region

(Zwick 1975, Kazanci 1982), but its distribution extends over the whole peninsula, from the eastern Pontic Mountains up to the south-western coast (Ak Daglari) (Fig. 12).

### *Capnia nigra* (Pictet 1833)

Pictet (1841) is reported to have received a somewhat aberrant specimen of *C. nigra* collected in the Taurus from the Vienna Museum. This old record can no longer be verified since the specimen under consideration is lost; but according to Zwick (1971) this record has nevertheless a certain probability. This supposed presence of *C. nigra* in Turkey is now confirmed by specimens collected in northern Anatolia.

**Material examined.** West Erzincan, East Refahiye, above Alacaatli Koyu, 38°54'E/39°53'N, 14-V-97, 3♀ (Vinçon coll.).

**Ecology.** Eurytopic species occurring in various types of mountain and foothill water courses. The adults emerge in winter and spring.

**Distribution.** Eurasiatic. In the Anatolian Peninsula, it is reported from the Taurus (Pictet 1841) and the central Pontic Mountains. It also occurs in the Caucasus and Armenia (Fig. 12).

### *Capnia sevanica* Zhiltzova 1964

Previous records from Turkey: Zwick (1971), Kazanci (1982, 2008, 2009).

**Affinities.** Close relative of *C. bifrons* (Newmann).

**Ecology.** Orophilic, stenothermic cold water species occurring in high altitude streams from 1500 m a.s.l. in the Ankara region (Zwick 1971) up to 2200 m in Armenia (Zhiltzova 1964). Flight period in spring (III-V).

**Distribution.** Armenia and Northern Anatolia. In Anatolia it is only reported from the Central Pontic Mountains, from Bolu (Kazanci 1982) to Ankara (Zwick 1971) (Fig. 12).

### *Capnia tuberculata* Zhiltzova 1964

Previous records from Turkey: Zwick (1975), Kazanci (1982, 2008, 2009).

**Material examined.** Bolu, Gerece, Akyurt vadisi, 1300 m a.s.l., 32°10'E/40°50'N, 19-V-96, 2♀; Ankara,

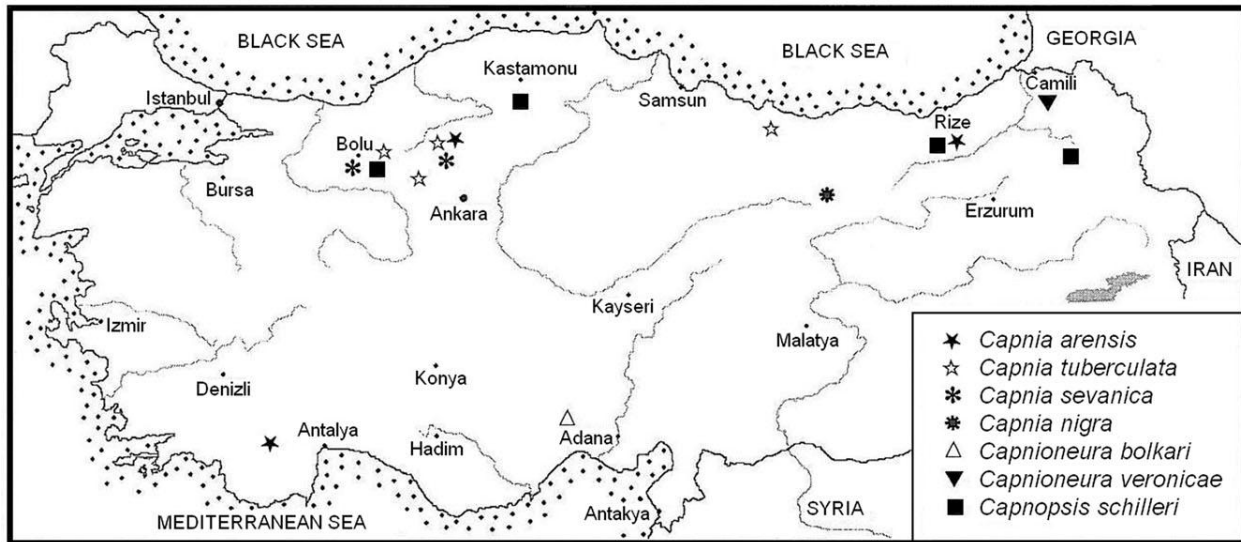


Fig. 12. Distribution area of the Turkish Capniidae.

Bey pazari, Karasar above Egriova, 1000 m, 31°50'E/40°15'N, 19-V-97, 1♀ (Sipahiler leg.); Ordu, Between Ozlu and Ulubey, 37°42'E/40°49'N, 11-V-97, 1♀ (Vinçon coll.).

**Affinities.** Close relative of *C. bifrons* and *C. turkestanica brevicula* Berthélemy & Dia (Lebanon).

**Ecology.** Orophilic, stenothermic cold water species. In Anatolia it occurs in brooks and small mountain rivers between 1000 and 1500 m a.s.l. It even reaches 2000 m in the Caucasus (Zhiltzova 1964). The main flight period is in spring (IV-VI) but it was also collected in summer (VIII) (Kazanci 1982).

**Distribution.** Caucasus and northern Anatolia. In Anatolia, it is only reported from the central Pontic Mountains, from Bolu to Ordu (Fig. 12).

### Genus *Capnopsis*

#### *Capnopsis schilleri archaica* Zwick 1984

Previous records from Turkey: Kazanci (1994, 2008).

**Material examined.** Rize, Ovitdagi gecidi, Southern slope of the pass, 2600 m, 40°48'E/40°37'N, 12-V-97, 3♂, 2♀ (Vinçon coll.).

**Ecology.** Orophilic, stenothermic cold water species. It occurs in high altitude brooks and rivers up to 2600 m a.s.l. in the eastern Pontic Mountains. The

adults emerge in spring (III-VI) and summer (VIII).

**Distribution.** Caucasus, Armenia, and Northern Anatolia, where it occurs in the Pontic Mountains from Kars to Bolu (Fig. 12).

### BIOGEOGRAPHICAL RELATIONSHIPS

Table 1 gives the list of the 34 Capniidae occurring in the West Palearctic region (Europe, Anatolia, North Africa, Lebanon and Caucasus).

The Turkish biogeographic relationships are influenced by the position of Anatolia at a crossroads between Europe, Asia and North Africa. The European influence is clearly visible. Indeed, among the seven Turkish Capniidae, three species belong to the West Palearctic genera *Capnopsis* and *Capnioneura* that do not occur eastward the Caspian Sea. *C. sevanica* and *C. tuberculata* are close to the European species *C. bifrons*, but they are also close to the Central Asian species *C. turkestanica*. On the other hand, *C. arensis* has an obvious Asiatic origin; it belongs to the *pedestris* group, occurring mainly in Central Asia (Zwick & Sivec 1980, Zhiltzova 1997).

The European influence was also observed in the Caucasus by Martynov (1928), followed by Zhiltzova (1997). According to them, most of the Caucasian and Mediterranean species have originated from the same ancestor, namely a widespread Tertiary Mediterranean species. These observations could be

**Table 1.** Capniidae distribution within the main West Palearctic regions, from West to East: North Africa, Iberian Peninsula, Pyrenees, Italian Region, Alps, Central Europe, Northern Europe, Balkan Region, Lebanon, Southern and Northern Anatolia and Caucasus. Endemic species are marked by a star. Small dots indicate that the species occurs at the limit of the current region.

	Western Mediterranean Sea					Central + Northern Europe		Eastern Mediterranean Sea			Black Sea	
	N. Afri.	Iber. Pen.	Pyr.	Ital. Reg.	Alps	C. Euro.	N. Euro.	Balk.	Leb.	S. Anat.	N. Anat.	Caucas-us
<i>Capnia</i>												
<i>C. bifrons</i> (Newman)	●	●	●	●	•	●	●	●				
<i>C. nigra</i> (Pictet)	●	●	●	●	●	●	●	●		●	●	●
<i>C. vidua vidua</i> Klapalek			●	●	●	●	●					
<i>C. vidua collarti</i> Aubert						*						
<i>C. atra</i> Morton						●	●					
<i>C. pygmaea</i> (Zetterstedt)							●					
<i>C. vidua anglica</i> Aubert							*					
<i>C. vidua brachyptera</i> Hynes							*					
<i>C. zaicevi</i> Klapalek							•					
<i>C. vidua rilensis</i> Raušer						●		●				
<i>C. bicornata</i> Alouf									*			
<i>C. turkestanica brevicula</i> Bert.									*			
<i>C. arensis</i> Zhiltzova										●	●	●
<i>C. sevanica</i> Zhiltzova											●	●
<i>C. tuberculata</i> Zhiltzova											●	●
<i>Capnioneura</i>												
<i>C. petitpierreae</i> Aubert	●	●										
<i>C. gelesae</i> Bert. & Baena		*										
<i>C. narcea</i> Vin. & Sánchez-Ort.		*										
<i>C. libera</i> (Navás)		●	●									
<i>C. brachyptera</i> Despax		●	●									
<i>C. mitis</i> Despax		●	●			•						
<i>C. aptera</i> Berthélemy			*									
<i>C. petricola</i> Giudicelli				*								
<i>C. nemuroides</i> Ris				●	●							
<i>C. balkanica balk.</i> Bau. & Kačanski								*				
<i>C. balk. macedonica</i> Ikonomov								*				
<i>C. valandovi</i> Ikonomov								*				
<i>C. bolkari</i> sp. n.										*		
<i>C. veronicae</i> sp. n.											*	
<i>C. caucasica</i> Zhiltzova												*
<i>Capnopsis</i>												
<i>C. schilleri schilleri</i> (Rostock)	●	●		●	•	●	●					
<i>C. schilleri balcanica</i> Zwick								*				
<i>C. schilleri archaica</i> Zwick											●	●
<i>Mesocapnia</i>												
<i>M. variabilis</i> (Klapalek)							•					
Total <i>Capnia</i> (15)	2	2	3	3	3	6	8	3	2	2	4	4
Total <i>Capnioneura</i> (15)	1	6	4	2	1	1		3		1	1	1
Total <i>Capnopsis</i> (3)	1	1		1	1	1	1	1			1	1
Total <i>Mesocapnia</i> (1)							1					
<b>Total (34)</b>	<b>4</b>	<b>9</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>8</b>	<b>10</b>	<b>7</b>	<b>1</b>	<b>3</b>	<b>6</b>	<b>6</b>

extended to the Anatolian region; indeed as it is observed in the Capniidae, most Anatolian *Protonemura* and *Leuctra* species and species groups have a European or Mediterranean origin (Vinçon & Sivec 2001, Vinçon & Zhiltzova 2004).

There is also close relationship between the Anatolian and Lebanese Capniidae: *C. bicornata* Alouf is close to *C. arensis* (Anatolia and Caucasus) and *C. turkestanica brevicula* is very close to *C. tuberculata* (Anatolia and Caucasus) though it is assigned to the Central Asian species *C. turkestanica* Kimmins. According to Berthélemy & Dia (1982), for orophilic aquatic insects, Lebanon could be considered as a southern peninsula of Anatolia.

Within the West Palearctic Region, Capniidae distributions are quite different (Table 1). The genus *Mesocapnia* is only known near the Arctic Circle. The genus *Capnia* is diversified in Northern Europe (eight species or subspecies) and Central Europe (6 species or subspecies), but only 2 or 3 species are known in the Mediterranean area and 4 for the Black Sea region.

The genus *Capnopsis* is widely distributed throughout the whole European continent. Nevertheless, it has a discontinuous distribution area that largely excludes the highest mountain areas (Pyrenees, French Massif Central, Alps and Carpathians).

Finally, the genus *Capnioneura* is mainly diversified in the areas around the Mediterranean and Black Seas, but is absent from Northern Europe, and only represented by *C. mitis* in the western part of Central Europe and by *C. nemuroides* Ris in the Alps and in the Jura Mountains. The highest diversity occurs in the Iberian Peninsula (6) and the Pyrenees (4) suggesting that the genus could have a western Mediterranean origin (Vinçon & Sánchez - Ortega 2002).

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