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Contribution to the knowledge of Turkish stoneflies with annotated catalogue (Insecta: Plecoptera)

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Abstract

The stoneflies of Turkey are reviewed providing all known distributions and including new records. Additionally, ecological and biogeographical notes are given. The genus *Taeniopteryx* Pictet 1841 is reported from Turkey for the first time and 12 species new for the Turkish fauna: *Leuctra joosti* Braasch 1970, *L. kopetdaghi* Zhiltzova 1972, *Protonemura rauschi* Theischinger 1975, *P. strandschaensis* Braasch & Joost 1972, *Nemoura asceta* Murányi 2007*, N. cambrica* Stephens 1836*, N. uncinata* Despax 1934, *Taeniopteryx caucasica* Zhiltzova 1981, *Brachyptera risi* (Morton 1896), *Pontoperla katherinae* (Balinsky 1950), *Siphonoperla neglecta* (Rostock 1881), and *Bulgaroperla mirabilis nigrita* Zwick 1978.

Protonemura bithynica Aubert 1964 and *Nemoura turcica* Zwick 1972 are recognized as full species. The previously unknown female of *Leuctra marilouae* Vinçon & Sivec 2001 is described. The type locality is also given for each species located in Turkey.

The distributions of several rare endemic species are augmented by additional new records (*Leuctra aculeata* Zwick 1982, *L. brachyptera* Kazancı 1985, *L. karcali* Vinçon & Sivec 2001, *L. kurui* Kazancı 1983, *L. marilouae* Vinçon & Sivec 2001, *L. sipahilerae* Vinçon & Sivec 2001, *L. theischingeri* Vinçon & Sivec 2001, *Protonemura bacurianica bacurianica* Zhiltzova 1957, *P. oreas* Martynov 1928, *P. spinulata* Martynov 1928 (first confirmed records from Anatolia), *P. triangulata* Martynov 1928, *Nemoura dromokeryx* Theischinger 1976, *N. martynovia* Claassen 1936, and *Brachyptera berkii* Kazancı 2001.

Several species previously reported only from females are excluded from the Turkish fauna: *Leuctra minuta minuta* Zhiltzova 1960, *L. svanetica* Zhiltzova 1960, *P. dilatata* Martynov 1928. Other species are also excluded from the Turkish fauna: *L. fusca fusca* (Linnaeus 1758), *N. carpathica* Illies 1963, *Siphonoperla burmeisteri* (Pictet 1841), and *S. libanica* Alouf, 1992.

According to literature and our new faunistic data, 117 stonefly taxa representing 7 families and 24 genera are known from Turkey. Among them, 44 are endemic species from Anatolia.

Key words: Annotated catalogue, bibliography, biogeogaphy, Turkey, Plecoptera

Introduction

This biogeographical study concerns the stoneflies of Turkey, a mountainous region situated at the interchange between three continents, Europa, Asia, and Africa. This region is well-known for its rich biodiversity (Sekercioglu *et al.* 2011).

The first paper treating Turkish stonefly species was by Pictet (1841), followed by: Zwick (1971, 1975, 1982) and Theischinger (1976a, 1976b, 1979). Subsequently, Turkish taxa were included by Kazancı (1982, 1983a, 1983b, 1985, 1986, 1994, 1999, 2000, 2001, 2008, 2009a, 2009b, 2012, 2013), Kazancı *et al.* (1992, 2012), Vinçon & Sivec (2001), Sivec & Stark (2002), Vinçon & Zhiltzova (2004), and Vinçon & Sivec (2011a, 2011b).

Two Websites, **www.faunaturkey.com** and **www.faunaturkey.org**, were created in 2013 by the two first authors of this study as repositories for information about Turkish stoneflies. The objective of this paper is to provide a review of the stoneflies known from Turkey including an annotated list of species.

Material and methods

The basis of this study was to review all available sources of published species records of stoneflies from Turkey (except unpublished theses). Additionally, we considered only those papers that cited species records, excluding papers listing only generic or higher level categories. All reported species from Anatolia were accepted only if males were available for study. Separation of females at this time is not possible for several species of the following genera, *Leuctra, Protonemura, Nemoura, Isoperla,* and *Siphonoperla.*

The distribution of all species known from Turkey is referenced to each literature record or to the author's material. Some literature is mentioned as "country record only" if known only at the province level. Type locality of species is only given if in Turkey. Distribution maps of all species were generated by ArcMap 10.0 GIS software. Currently recognized species taxonomy follows DeWalt *et al.* (2015).

New collections of stoneflies are based primarily on specimens collected in Anatolia by Füsun Sipahiler from 1984 to present. Additional Plecoptera collections were made in Anatolia by Hans Malicky (19 May 1992 – 4 June 1992), Pável Chvojka (4 July 1993–16 July 1993), Bogdan Horvat (13 June.1995 – 4 July 1995) and Gilles Vinçon

(2 May 1997–15 May 1997). Valuable new material was collected in 2007 by Dávid Murányi in the European portion of Turkey (Istranca and Tekirdağ mountains).

In the faunistic list, we use the following abreviations: Ch = Chvojka, Ho = Horvat, Ma = Malicky, Mur. = Murányi *et al.*, Si = Sipahiler, Vi = Vinçon.

ANNOTATED CATALOGUE OF THE TURKISH STONEFLIES

SUBORDER ARCTOPERLARIA Zwick, 1973

SUPERFAMILY NEMOUROIDEA Newman, 1853

FAMILY CAPNIIDAE Banks, 1900

GENUS *Capnia* Pictet, 1841

***Capnia arensi* Zhiltzova, 1964**

Distribution in Turkey. Bolu (Zwick 1975); Ankara (Kazancı 1982); Ankara, Muğla (Kazancı 2009a); Antalya, Rize (Vinçon & Sivec 2011a); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 1).

Distribution and ecology. Caucasus, Armenia, Anatolia. An orophilic, stenothermal cold water species occurring in relatively large mountain streams (1000–2600 m). Adults emerge in spring (II–VI).

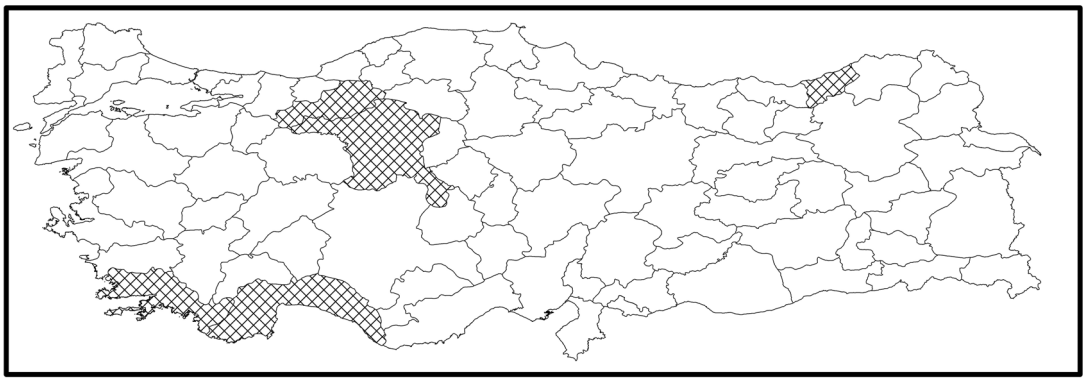

FIGURE 1. *Capnia arensi* Zhiltzova, 1964

***Capnia nigra* (Pictet, 1833)**

Distribution in Turkey. Mersin (Pictet 1841); Erzincan (Vinçon & Sivec 2011a). Map (Fig. 2).

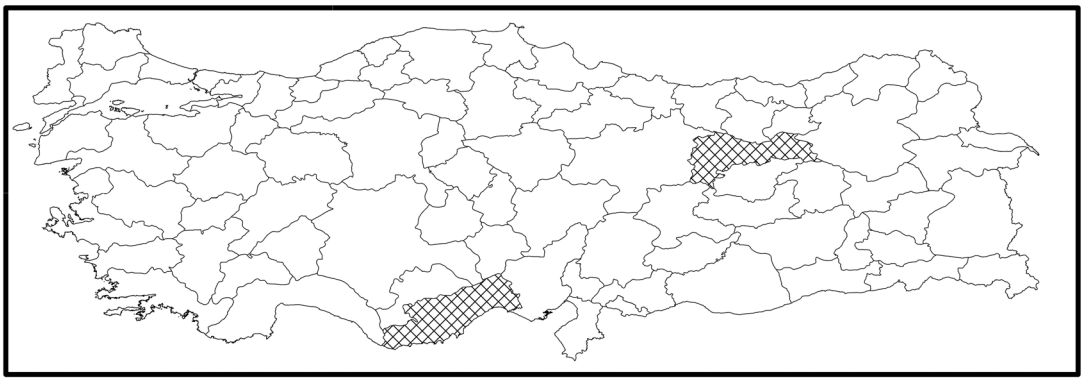

FIGURE 2. *Capnia nigra* (Pictet, 1833)

Distribution and ecology. Eurasian species extends widely into Asia to the Kamtchatka and Kuril Islands (Zhiltzova 2003). A eurytopic species that occurs in various types of mountain and foothill streams. Adults emerge in winter and spring.

GENUS *Capnioneura* Ris, 1905

Capnioneura bolkari Vinçon & Sivec, 2011a

Type country and locality. Turkey, western Taurus, North West Tarsus, brook and spring between Çamlıyalya and Böğrüeğri (the type locality is located in the Province of Mersin) (Vinçon & Sivec 2011a).

Distribution in Turkey. Mersin (Vinçon & Sivec 2011a). Map (Fig. 3).

Distribution and ecology. Turkish micro-endemic species restricted to the western Taurus. It is a crenophilic and stenothermal cold water species, mainly occurring on calcareous substratum at altitudes higher than 1000 m a.s.l . Adults emerge in spring (V).

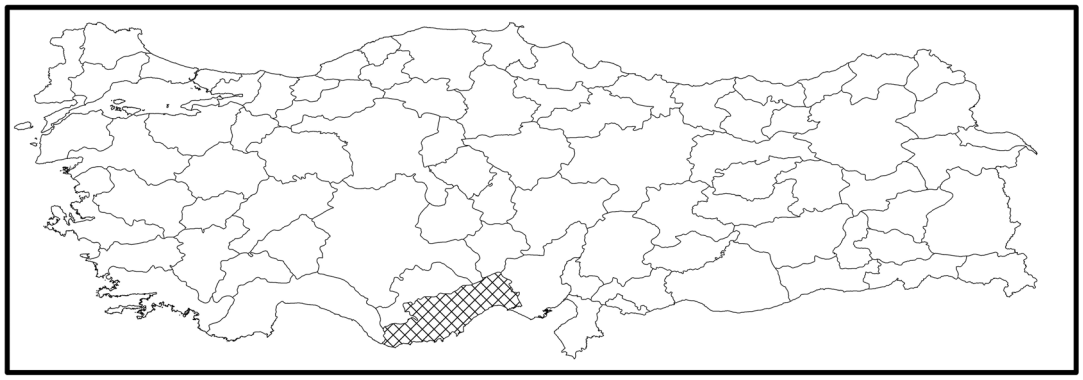

FIGURE 3. *Capnioneura bolkari* Vinçon & Sivec, 2011

Capnioneura gouanerae Vinçon & Sivec, 2011b

Type country and locality. Turkey, Gorgit Yaylası (Gorgit Yaylası is a plateau and is located in the District of Borçka in Camili Village, the province of Artvin) (Vinçon & Sivec 2011a).

Distribution in Turkey. Artvin (Vinçon & Sivec 2011a). Map (Fig. 4).

Distribution and ecology. Turkish micro-endemic species restricted to the Artvin Region (eastern Pontus). It is a crenophilic and stenothermal cold water species, occurring in mountain springs and brooklets (1350–1600 m). Adults emerge in autumn.

Comments. According to Vinçon & Sivec (2011b), Vinçon & Sivec (2011a) failed to designate the types for *Capnioneura veronicae*. Accordingly, in this note Vinçon & Sivec (2011b) proposed the replacement name *C. gouanerae*.

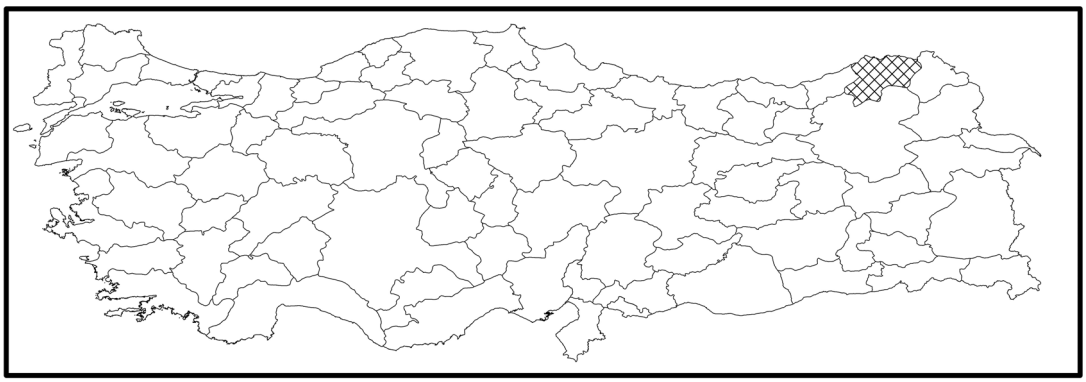

FIGURE 4. *Capnioneura gouanerae* Vinçon & Sivec, 2011

GENUS *Capnopsis* Morton, 1896

Capnopsis schilleri archaica Zwick, 1984

Distribution in Turkey. Bolu, Çankırı, Kars (Kazancı 1994); Rize (Vinçon & Sivec 2011a); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 5).

Distribution and ecology. Caucasus, Armenia, and Northern Anatolia. A orophilic, stenothermal cold water species. It occurs in high altitude brooks and rivers up to 2600 m a.s.l. in the eastern Pontus (Vinçon & Sivec 2011). Adults emerge in spring (III–VI) and summer (VIII).

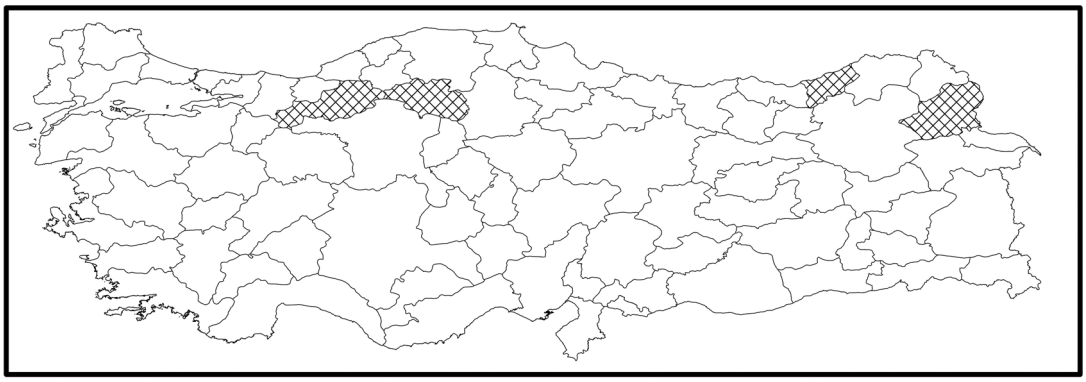

FIGURE 5. *Capnopsis schilleri archaica* Zwick, 1984

GENUS *Zwicknia* Murányi, 2014a (in Murányi *et al.* 2014a)

Zwicknia sevanica (Zhiltzova, 1964)

Distribution in Turkey. Bolu (Zwick 1971); Bolu (Kazancı 1982); Ankara (Kazancı 2009a); Ankara (Murányi *et al.* 2014a); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008; Vinçon & Sivec 2011a). Map (Fig. 6).

Distribution and ecology. Armenia and Northern Anatolia. Orophilic, stenothermal 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). Adult flight period in spring (III–V).

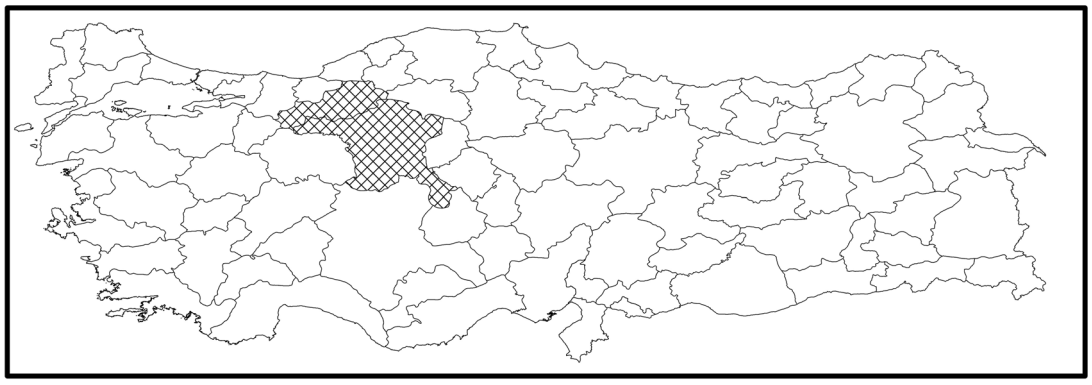

FIGURE 6. *Zwicknia sevanica* (Zhiltzova, 1964)

Zwicknia tuberculata (Zhiltzova, 1964)

Distribution in Turkey. Ankara (Zwick 1975); Ankara (Kazancı 1982); Muğla (Kazancı *et al.* 1992); Ankara, Muğla (Kazancı 2009a); Ankara, Bolu, Ordu (Vinçon & Sivec 2011a); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 7).

Distribution and ecology. Caucasus and Anatolia. An orophilic, stenothermal cold water species. In Anatolia it occurs between 1000 and 1500 m a.s.l. and in the Caucasus it reaches 2000 m (Zhiltzova 1964). Flight period occurs in the spring (IV–VI) but sometimes extending into the summer (VIII) (Kazancı 1982).

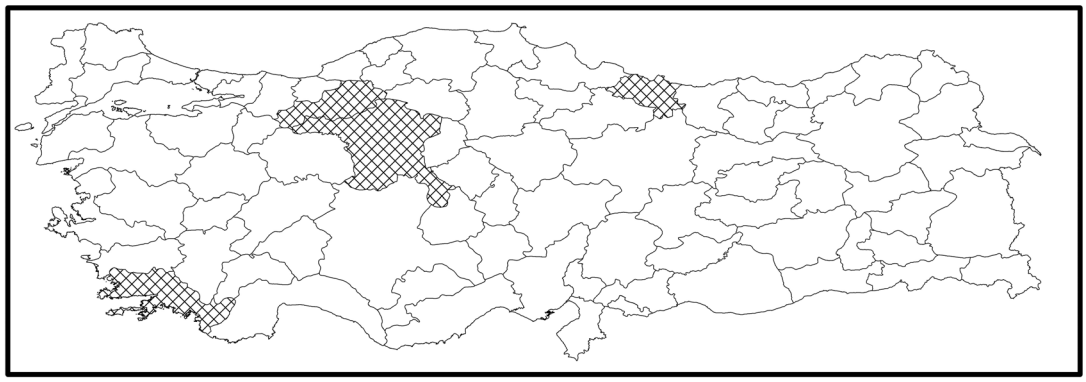

FIGURE 7. *Zwicknia tuberculata* (Zhiltzova, 1964)

FAMILY LEUCTRIDAE Klapálek, 1905

SUBFAMILY LEUCTRINAE Klapálek, 1905

GENUS *Leuctra* Stephens, 1836

Leuctra aculeata Zwick, 1982

Type country and locality. Turkey, Sertavul Pass (Sertavul Geçidi is a mountain pass and is located between Karaman-İçel) (Zwick 1982). This species was only known from one locality in the western Taurus, in the vicinity of Mut (Zwick 1982). We report this species from a second locality in the western Taurus, 200 km west of the type locality.

Material. Konya, Beyşehir, Kurucuova, Dedegöl Mountains, Pınargozü spring, 1400 m, 21.05.2004, 1 ♀ (Si).

Distribution in Turkey. Karaman (Zwick 1982); **country record only:** listed from Turkey (Kazancı 1999; Vinçon & Sivec 2001; Kazancı 2008). Map (Fig. 8).

Ecology. Turkish micro-endemic species restricted to the western Taurus. A crenophilic and orophilic species (1400 m a.s.l.). Adults fly in spring (V).

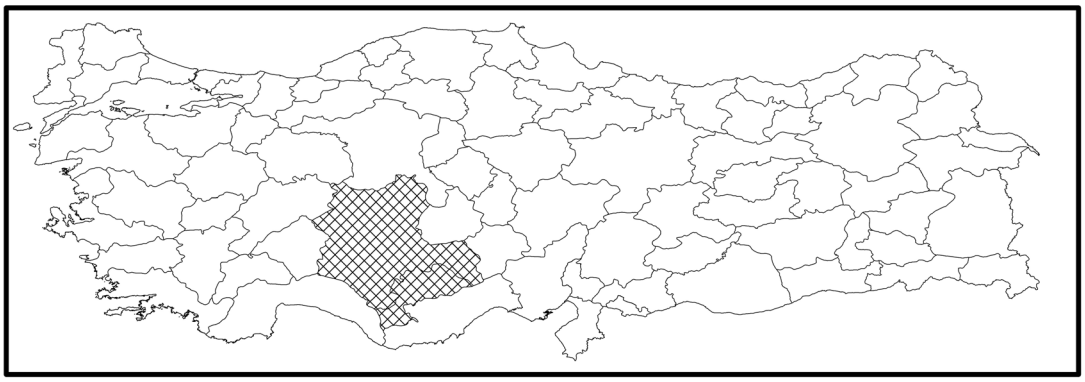

FIGURE 8. *Leuctra aculeata* Zwick, 1982

Leuctra anatolica Kazancı, 1986

Type country and locality. Turkey, Abant (Bolu) (Kazancı 1986).

Distribution in Turkey. Bolu (Kazancı 1986); Bolu (Vinçon & Sivec 2001); Bolu, Çankırı, Kastamonu (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 1999; Kazancı 2008). Map (Fig. 9).

Distribution and ecology. Turkish micro-endemic species restricted to the western Pontus. It occurs in brooks and springs of moderate altitude (800–1300 m). Adults emerge in spring (V–VI).

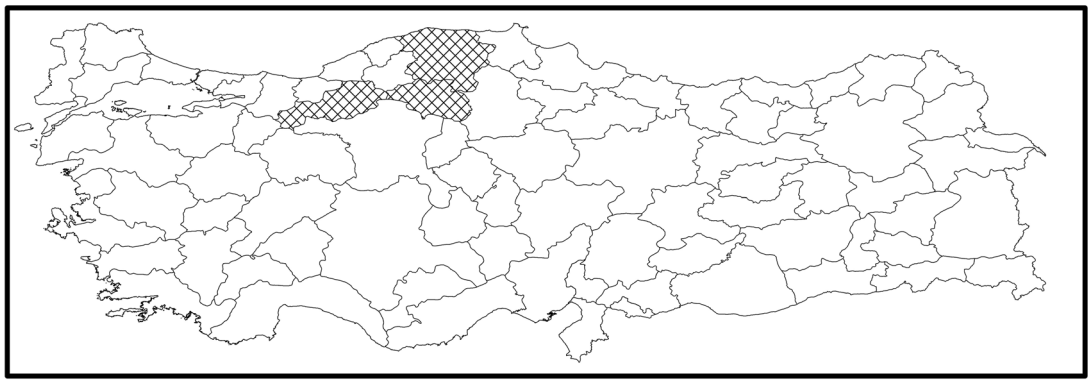

FIGURE 9. *Leuctra anatolica* Kazanci, 1986

***Leuctra antalyana* Vinçon & Sivec, 2001**

Type country and locality. Turkey, Manavgat Çayı (Manavgat Çayı is located in the District of Akseki in Ürünlü village, the province of Antalya) (Vinçon & Sivec 2001).

Distribution in Turkey. Antalya (Vinçon & Sivec 2001); **country record only:** listed from Turkey (Kazancı, 2008). Map (Fig. 10).

Distribution and ecology. Turkish micro-endemic species restricted to the western Taurus (Antalya). It was collected in a lowland torrent (500 m) and adults emerge in autumn (XI).

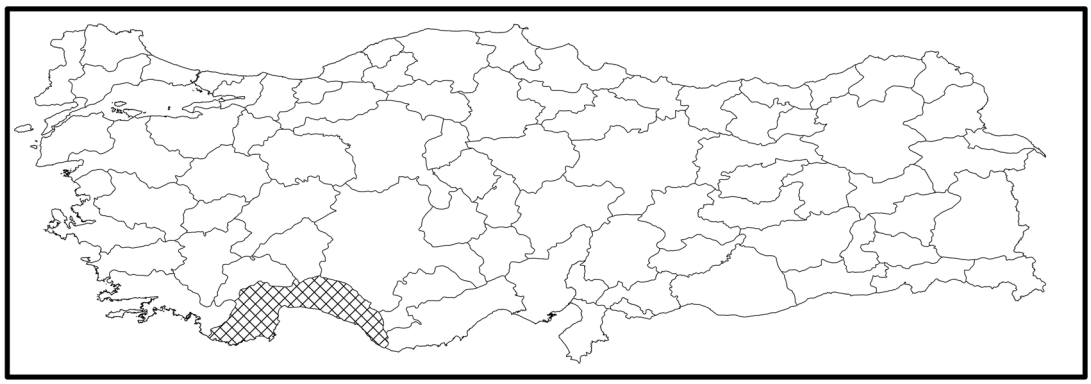

FIGURE 10. *Leuctra antalyana* Vinçon & Sivec, 2001

***Leuctra artvinensis* Vinçon & Sivec, 2001**

Type country and locality. Turkey, Borçka (the type locality is located in the District of Borçka, the province of Artvin) (Vinçon & Sivec 2001).

Distribution in Turkey. Artvin (Vinçon & Sivec 2001); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 11).

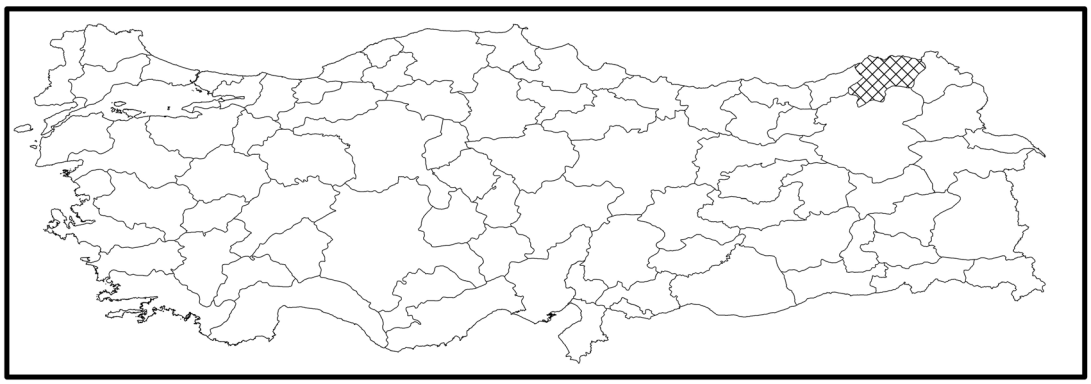

FIGURE 11. *Leuctra artvinensis* Vinçon & Sivec, 2001

Distribution and ecology. Turkish micro-endemic species restricted to the Artvin region (eastern Pontus). It occurs in mountain brooks (1350 m) and emerges in autumn (X).

***Leuctra aspoeckorum* Theischinger, 1976a**

Type country and locality. Turkey, Rize (Theischinger 1976a).

Distribution in Turkey. Rize (Theischinger 1976a); Artvin, Rize (Vinçon & Sivec 2001); Rize (Kazancı 2009a); Rize (Kazancı 2013); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 1999; Kazancı 2008). Map (Fig. 12).

Distribution and ecology. Caucasus and northeastern Anatolia. In Turkey it is restricted to the Artvin region (eastern Pontus). It occurs in high mountain brooks (1500–2200 m) and emerges in spring and summer (V–VIII).

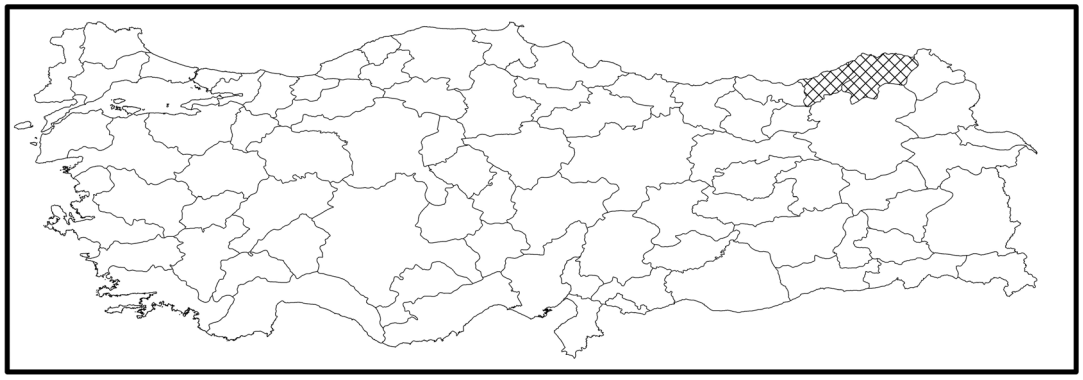

FIGURE 12. *Leuctra aspoeckorum* Theischinger, 1976

***Leuctra boluensis* Kazancı, 1999**

Type country and locality. Turkey, Yedigöller (the Yedigöller National Park, also named Yedigöller, "seven lakes" is located in the north of the Province of Bolu) (Kazancı 1999).

Distribution in Turkey. Bolu (Kazancı 1999); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 13).

Distribution and ecology. Turkish micro-endemic species restricted to the Bolu Region (western Pontus). It occurs in forest brooks at 1100 m a.s.l. Adults emerge in spring (IV–V).

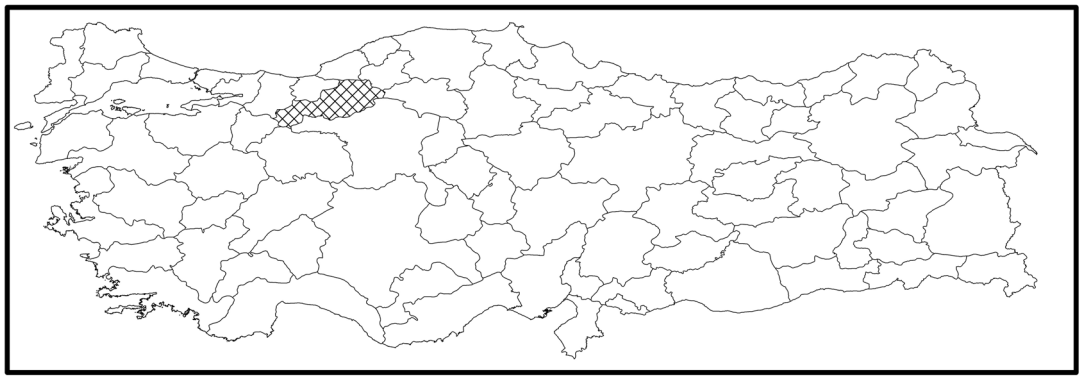

FIGURE 13. *Leuctra boluensis* Kazanci, 1999

***Leuctra bozi* Vinçon & Sivec, 2001**

Type country and locality. Turkey, torrent above Bozdağ (the type locality is located in the District of Ödemiş, the province of İzmir) (Vinçon & Sivec 2001).

Distribution in Turkey. Bursa, İzmir, Konya (Vinçon & Sivec 2001); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 14).

Distribution and ecology. Turkish endemic species widely distributed in western Anatolia. It occurs in high altitude brooks and torrents (1000 m). Adults emerge in spring (V–VI).

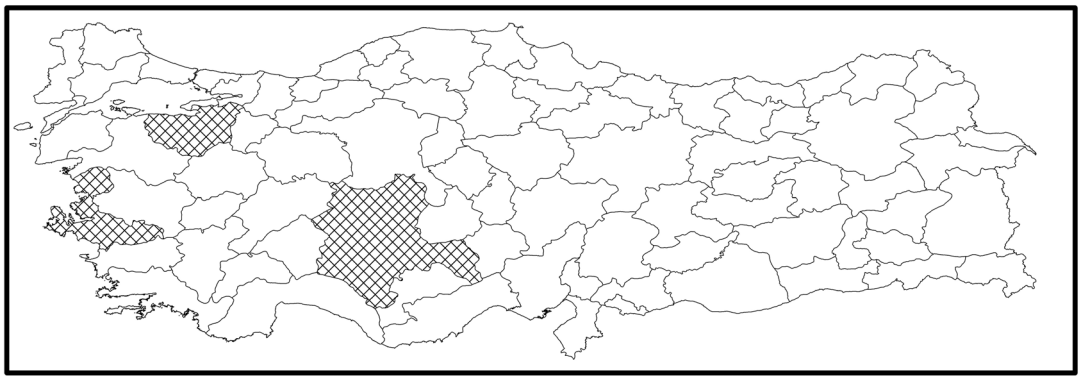

FIGURE 14. *Leuctra bozi* Vinçon & Sivec, 2001

***Leuctra brachyptera* Kazancı, 1985**

Type country and locality. Turkey, Yedigöller National Park ("seven lakes"), located in the north of the province of Bolu) (Kazancı 1985).

Material. Karabük, Kapullu, Baklabostan—Kızılkaya, N41°17'N E32°32', 1100 m, 22.10.2011, 1 ♂, 1 ♀ (Si). **Zonguldak**, Alaplı, Gümeli, direction to Bölüklü Yaylası, N41°03' E31°40', 910 m, 20.09.2011, 1 ♂ (Si); 1085 m, 20.09.2011, 4 ♀ (Si). **Düzce**, Yığılca—Yoğunpelit, N40°58' E31°31', 490 m, 23.10.2012, 1 ♂ (Si).

Distribution in Turkey. Bolu (Kazancı 1985); Bolu (Vinçon & Sivec 2001); **country record only:** listed from Turkey (Kazancı 1999; Kazancı 2008). Map (Fig. 15).

Distribution and ecology. Turkish micro-endemic species restricted to the western Pontus. It occurs in mountain brooks and torrents of moderate altitude (490–1100 m). Adults emerge in summer and autumn (VIII–XI).

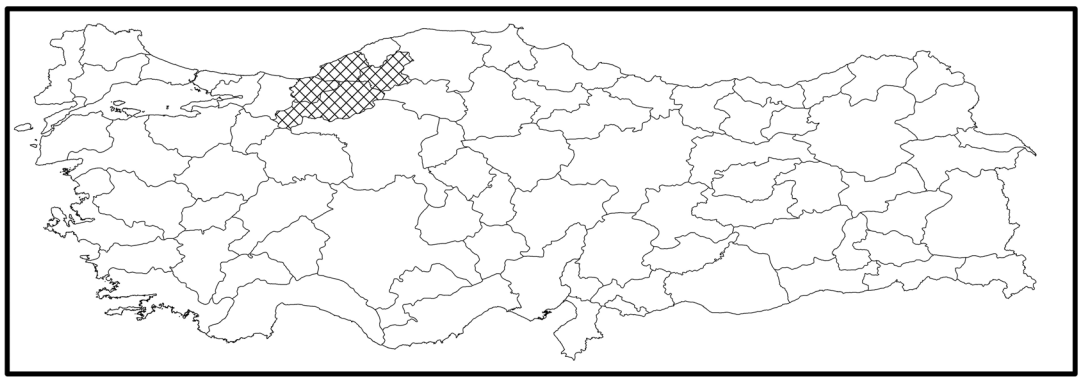

FIGURE 15. *Leuctra brachyptera* Kazanci, 1985

***Leuctra collaris* Martynov, 1928**

Material. Bartın, 30 km E Bartın, Arıt Spring, 16.10.2004, 1 ♂, 2 ♀ (Si). **Trabzon**, Maçka, Sumelas, 1200m, 20.08.2005, 1 ♂, 1 ♀ (Si). **Rize**, Çamlıhemşin, Ayder, 1500 m, 9.10.2006, 1 ♀ (Si). **Tokat**, Niksar—Ordu, Çamiçi Yaylası, 1180 m, 3.07.2007, 1 ♂, 1 ♀ (Si). **Çankırı**, direction to Kastamonu, Ilgaz Mountains, 10.10.2007, 1 ♀ (Si). **Giresun**, Tamdere, İkisu, Karagöl Yaylası, 2070 m, 16.08.2008, 7 ♂, 4 ♀ (Si). **Giresun**, Kümbet Yaylası, stream, 1600 m, 17.08.2008, 1 ♂, 2 ♀ (Si). **Ordu**, Çambaşı Yaylası, Mesudiye direction, Yenice, 1355 m, 19.08.2008, 1 ♂ (Si). **Samsun**, Ladik, Büyükkızoğlu Yaylası direction, 976 m, 14.07.2009, 5 ♂, 1 ♀ (Si). **Sinop**, Hanönü- Ayancık direction, Çangal mountain, 1140 m, 9.08.2009, 1 ♂ (Si). **Sinop**, Türkeli, south, 450 m, 11.08.2009, 1 ♂ (Si). **Karabük**, Kapullu, Başköy, 22.10.2011, 1 ♂, 3 ♀ (Si). **Zonguldak**, Alaplı, Gümeli, Bölüklü Yaylası, 910 m, 20.09.2011, 2 ♂, 1 ♀ (Si); Gümeli, Bölüklü Yaylası, Bacaklı Yaylası, 1085 m, 20.09.2011, 1 ♂ (Si). **Düzce**, Kardüz Yaylası, 710 m, 15.08.2012, 2 ♂, 1 ♀ (Si). **Düzce**, Akçakoca, Aktaş, İdilli village, 80 m, 25.09.2012, 1 ♀ (Si). **Düzce**, Kaynaşlı, Samandere, Abant, 1242 m, 17.08.2013, 1 ♂ (Si.).

Distribution in Turkey. Artvin, Gümüşhane, Rize (Theischinger 1976a); Bolu (Kazancı 1982); Bolu, Erzurum, Kastamonu (Kazancı 1983b); Amasya, Artvin, Bolu, Rize (Vinçon & Sivec 2001); Bolu (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 1999; Kazancı 2008). Map (Fig. 16).

Distribution and ecology. This species occurs in Middle East Asia and Caucasus (Zhiltzova 1997). It is an orophilic species occurring in various types of mountain brooks and rivers (1000–2200 m a.s.l.). Adults emerge in summer and autumn (VII–X).

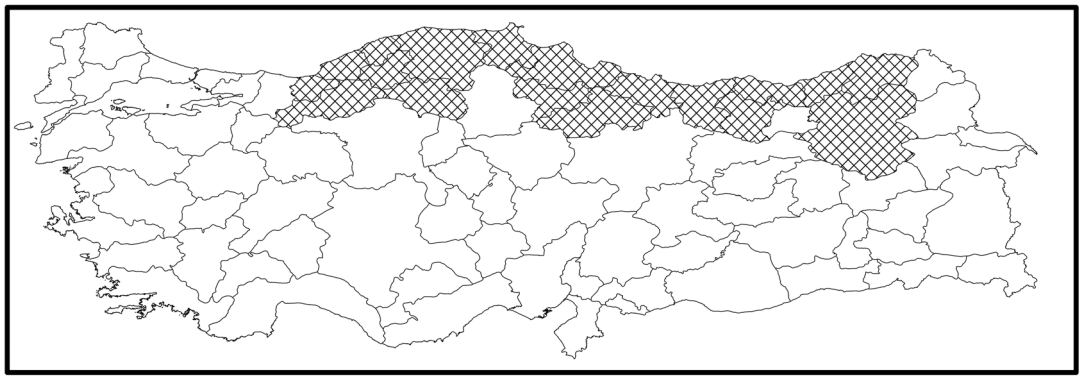

FIGURE 16. *Leuctra collaris* Martynov, 1928

***Leuctra delamellata* Zhiltzova, 1960**

Distribution in Turkey. Erzurum (Kazancı 1994); Rize (Vinçon & Sivec 2001); **country record only:** listed from Turkey (Kazancı 1999; Kazancı 2008). Map (Fig. 17).

Distribution and ecology. Caucasus, Eastern Pontus. A strongly orophilic cold stenothermic species, occurring up to 2600 m. Adults emerge in spring (V).

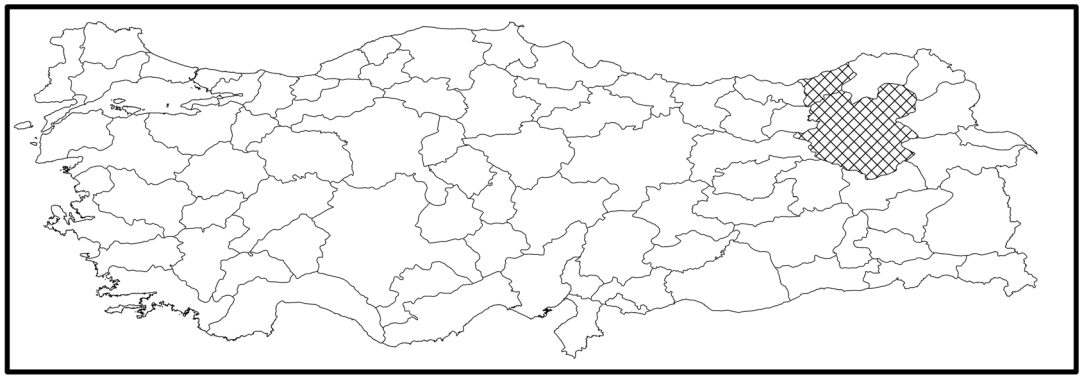

FIGURE 17. *Leuctra delamellata* Zhiltzova, 1960

***Leuctra furcatella* Martynov, 1928**

Material. Ankara: 15 km S Ankara, Yaylabağ Köyü, 1000 m, 11.05.2000, 1 ♀ (Si). **Bolu**: Göynük—Bolu Yolu, 10 km Çubuk deresi, 750 m, 21.05.2006, 1 ♂, 4 ♀ (Si). **Bolu**, Göynük—Mudurnu, Sünnet Gölü, 750 m, 21.05.2006, 1 ♀ (Si). **Giresun**, Şebinkarahisar, Tamdere, 9.07.2008, 1♀ (Si.).

Distribution in Turkey. Ankara, Artvin, Bursa, Giresun (Zwick 1975); Artvin (Theischinger 1976a); Bolu (Kazancı 1982); Bayburt, Bolu, Çankırı (Kazancı 1983b); Ankara, Artvin, Bolu, Bursa, Trabzon (Vinçon & Sivec 2001); Artvin, Bayburt, Bolu, Çankırı, Erzurum, Kastamonu (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 1999; Kazancı 2008). Map (Fig. 18).

Distribution and ecology. This species occurs in the Middle East Asia and the Caucasus (Zhiltzova 1997). In Anatolia, it occurs only in the Pontus and in the surrounding environs of Ankara. It inhabits different types of mountain brooks and rivers (600–1700 m a.s.l.). The flight period is long, extending between winter and early summer (II–VII).

***Leuctra fusca latior* Berthélemy & Dia, 1982**

The previous mentions of *L. fusca fusca* (Linnaeus, 1758) from Anatolia are here assigned to *L. fusca latior* Berthélemy & Dia, 1982 and therefore *L. f. fusca* is removed from the Turkish fauna.

Material. Bartın, Boğazköy, 16.10.2004, 1 ♂ (Si). **Bolu**, 20 km SE Devrek, Karasu, 16.10.2004, 4 ♂, 4 ♀ (Si); Yedigöller, < 10 km Kasadere, 28.10.2005, 2 ♂, 4 ♀ (Si); **Bolu**, Gerede, 122 km NW Ankara, 28.09.2007, 8 ♂ (Si). **Çankırı**, Ilgaz—Kastamonu, 10.10.2007, 1 ♂, 1 ♀ (Si). **Sivas**, Koyulhisar, Eğriçimen Yaylası, 11.10.2007, 1 ♂, 1 ♀ (Si). **Giresun**: İkisu, Karagöl Yaylası—Bektaş Yaylası, 1825 m, 1.10.2008, 2 ♂, 1 ♀ (Si); Kümbet Yaylası—Yağlıdere, Çıkrıkkapı, 1871 m, 2.10.2008, 1 ♂ (Si). **Sinop**, Dikmen, Durağan istikameti, 1015 m, 25.10.2009, 1 ♂, 1 ♀ (Si). **Karabük**, Yenice, Baklabostan direction, Karalkaya, 21.09.2011, 2 ♂, 1 ♀ (Si.).

Distribution in Turkey. Ankara, Bolu, Kastamonu (Kazancı 1983b); Bolu (Kazancı 2009a); Afyon, Antalya (Vinçon & Sivec 2001); **country record only:** listed from Turkey (Kazancı 1999; Kazancı 2008). Map (Fig. 19).

Distribution and ecology. This subspecies extends from Lebanon (Berthélemy & Dia 1982) to Anatolia where it is widespread in its northern range. It is an orophilic species occurring in different kinds of brooks and rivers (500–1900 m a.s.l.). Adults emerge in autumn (X–XI).

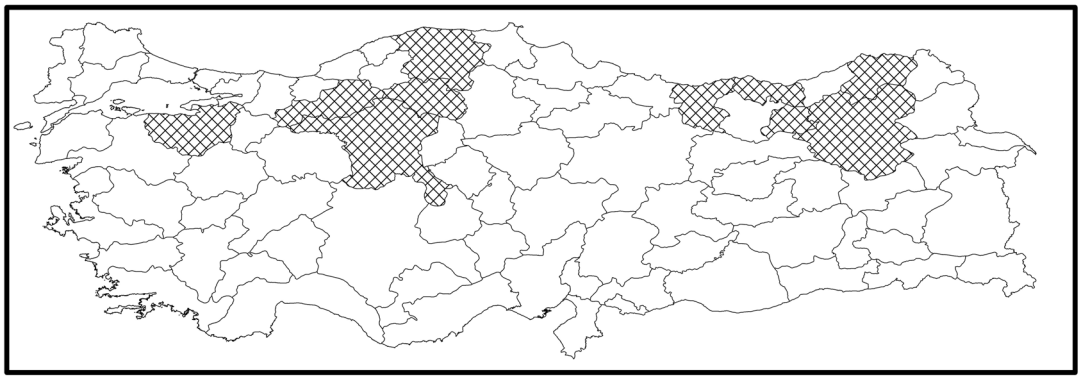

FIGURE 18. *Leuctra furcatella* Martynov, 1928

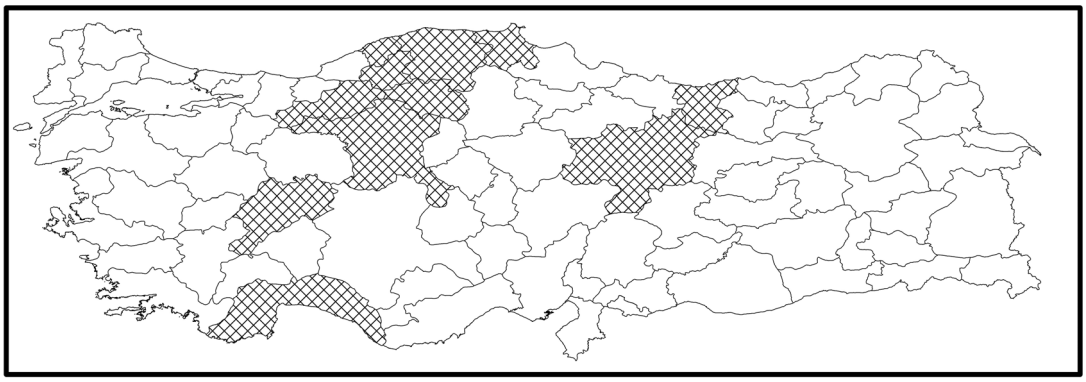

FIGURE 19. *Leuctra fusca latior* Berthélemy & Dia, 1982

***Leuctra hippopus* Kempny, 1899**

Material. Çankırı, Ilgaz Dağı, 9.06.1986, 1 ♀ (Si). **Manisa**, 19 km S Salihli, 1000 m, 22.05.1992, 1 ♂, 1 ♀ (Si). **Aydın**, Bozdoğan, 5 km. S Altıntaş Köyü, Menteşe Dağları, 950 m, 23.05.1992, 1 ♂, 1 ♀ (Si). **Balıkesir**, Edremit—Kalkım, 20 Km NE Edremit, 600 m, 2.06.1992, 1 ♂, 2 ♀ (Si). **Bursa**, Uludag, Soğukpınar yolu, 3 Km N, 1000 m, 4.06.1992, 4 ♀ (Si). **Konya,** Isparta, Gelendost, 10 km S Akşehir, Sultan Dağları, 4.06.1993, 2 ♂, 3 ♀ (Si). **Konya**, Akşehir, Sultan Dağları, 1450 m, 7.05.1994, 2 ♀ (Si). **Bolu**, Gerede, Akyurt vadisi, 1300 m, 19.05.1996, 1 ♀ (Si). **Çankırı**, Çerkeş, Işık Dağı, Sofular deresi, 1550 m, 16.06.1996, 1 ♂, 4 ♀ (Si.). **Kayseri**, > Pınarbaşı, 1500 m, 2.05.1997, 29 ♂, 22 ♀ (Si). **Hatay**, Kurtbağı, E Üçgüllük, Nur Dağları, 3.05.1997, 5 ♂, 6 ♀ (Si). **Antalya**, Alanya, Gündoğmuş—Köprülü, 5.05.1997, 1 ♀ (Vi). **Antalya**, > Kayabaşı, S Sögüt, Ak Dağları, 6.05.1997, 9 ♂, 5 ♀ (Vi). **Aydın**, Nazilli, > Beydağ, > Samailli, 7.05.1997, 1 ♂, 2 ♀ (Vi). **İzmir**, Ödemiş, > Bozdağ, 7.05.1997, 2 ♀ (Vi). **İzmir**, Bergama—Kozak, 15 km, 7.05.1997, 31 ♂, 21 ♀ (Vi). **Balıkesir**, Edremit, > Zeytinli, 8.05.1997, 5 ♂ (Vi). **Bolu**, Hacıayaz Geçidi, Göynük—Mudurnu, 9.05.1997, 25 ♂, 18 ♀ (Vi). **Bolu**, Yedigöller Milliparkı, near Park house, 9.05.1997, 1 ♀ (Vi). **Bolu**, > Karacasu, 9.05.1997, 2 ♀ (Vi). Ayancık, W Sinop, 10.05.1997, 1 ♀ (Vi). **Ordu**, > Gölköy, 11.05.1997, 2 ♂ (Vi). **Ordu**, > Gölköy, near Harçbeli, 11.05.1997, 5

♂, 7 ♀ (Vi). **Gümüşhane**, Zigana Geçidi, SW Trabzon, 11.05.1997, 5 ♂, 2 ♀ (Vi). , > Dereköy, 12.05.1997, 2 ♀ (Vi). **Rize**, Çamlık—Sivrikaya, 12.05.1997, 3 ♂, 3 ♀ (Vi). **Erzincan**, E. Refahiye, > Alacatlı Köyü, 14.05.1997, 2 ♀ (Vi). **Ankara**, N. Ankara, Güvem—Salın, 15.05.1997, 1 ♀ (Vi). 5 km S Ankara, Yaylabağ Köyü, 1000 m, 11.05.2000, 2 ♀ (Si). **Trabzon**, Uzungöl, 1200 m, 18.08.2005, 3 ♂, 4 ♀ (Si). **Bolu**, Göynük—Bolu Yolu, 10 km Çubuk deresi, 750 m, 21.05.2006, 1 ♂, 2 ♀ (Si).

Distribution in Turkey. Bolu, Erzurum, Tunceli (Zwick 1971); Artvin, Bolu, Erzincan, Kars (Theischinger 1976a); Ankara (Kazancı 1982); Bolu, Kastamonu (Kazancı 1983b); Ankara (Kazancı & Girgin 2008); Ankara, Bolu, Erzurum, Giresun, Kars, Kastamonu, Tokat (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 1999; Kazancı 2008); All Anatolia (Vinçon & Sivec 2001). Map (Fig. 20).

Distribution and ecology. West Palaearctic species. It occurs throughout Anatolia. Adults occur in different kinds of mountain brooks and rivers and emerge in spring and early summer (V–VIII).

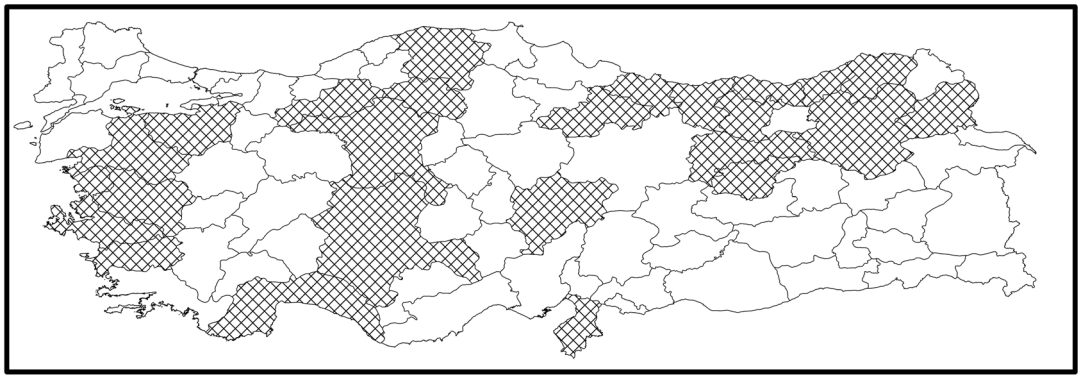

FIGURE 20. *Leuctra hippopus* Kempny, 1899

***Leuctra joosti* Braasch, 1970**

First record from Turkey.

Material. Kırklareli, Istranca Dağları, brook in a beech forest along the Pınarhisar–Demirköy road, 780 m, N41°45.289' E27°40.830', 06.04.2007, 5 ♂, 4 ♀ (Mur); 500 m on same road, N41°46.692' E27°42.261', 06.04.2007, 1 ♂, 1 ♀ (Mur).

Distribution and ecology. Previously known only from the Bulgarian Vitosha, Pirin and Rodope Mts. (Pardo & Zwick 1993), an early spring species of the small streams of montane and submontane regions. Map (Fig. 21).

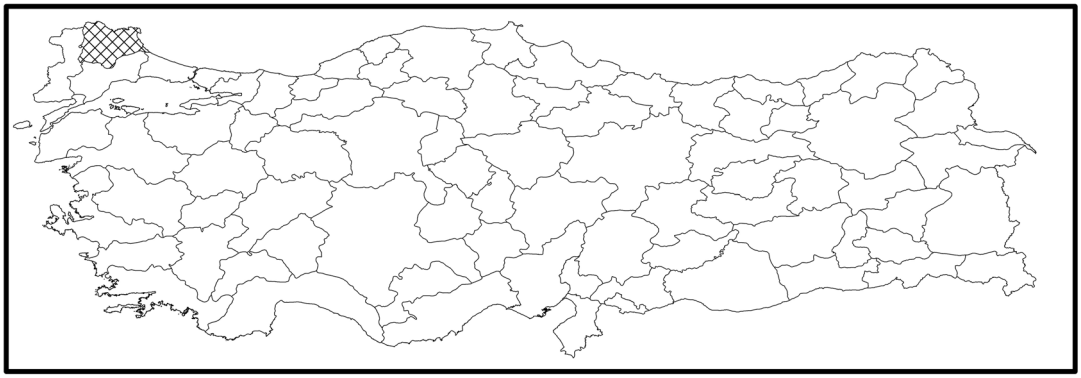

FIGURE 21. *Leuctra joosti* Braasch, 1970

***Leuctra karcali* Vinçon & Sivec, 2001**

Type country and locality. Turkey, Lodivake Yaylası (Lodivake Yaylası is located in the District of Borçka in Camili Village, the province of Artvin) (Vinçon & Sivec 2001).

Material. Artvin, Borçka, Camili: Aralık Yaylası—Sanat Yaylası 2300 m, 2.08.1998, 3 ♂, 2 ♀ (Si); Yıldız göl—Gorgit Yaylası, 2300 m, 3.08.1998, 1 ♂, 4 ♀ (Si). **Artvin**, Karagöl, Heba Yaylası, 2200 m, 16.09.1999, 16 ♂, 15 ♀ (Si).

Distribution in Turkey. Artvin (Vinçon & Sivec 2001); Artvin (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 22).

Distribution and ecology. Turkish micro-endemic species restricted to the far eastern Pontus (Artvin region); it occurs in high altitude brooks and brooklets (1350–2400 m a.s.l.). Adults emerge in summer and autumn (VIII–X).

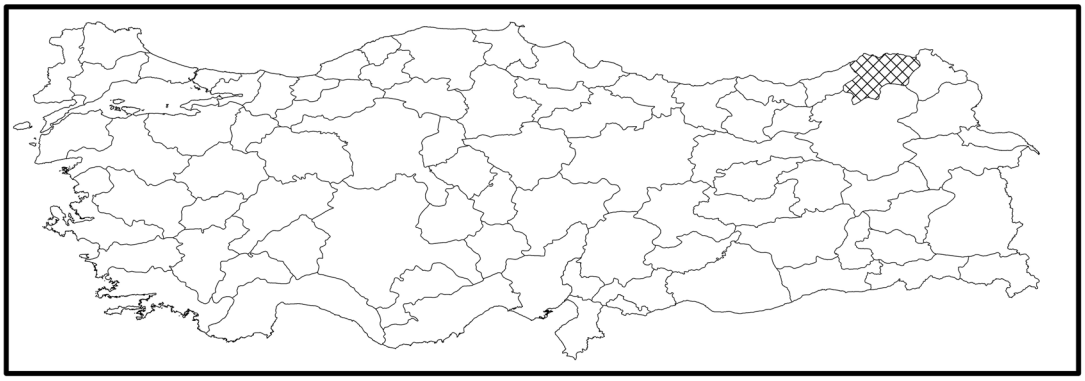

FIGURE 22. *Leuctra karcali* Vinçon & Sivec, 2001

***Leuctra kopetdaghi* Zhiltzova, 1972**

First record from Turkey.

Material. Karaman, Taşkale, İbrala deresi, 22.03.2007, 1 ♂ (Si). Map (Fig. 23).

Distribution and ecology. This species was previously known from one locality in Turkmenistan (Zhiltzova 1972), one locality in Iran (Theischinger 1976b) and four localities in Lebanon (Berthélemy & Dia 1982). Its presence in the Central Taurus extends its distribution area in the Middle East from the eastern edge of the Caspian Sea to the eastern edge of the Mediterranean Sea. Adults emerge in early spring (I–IV).

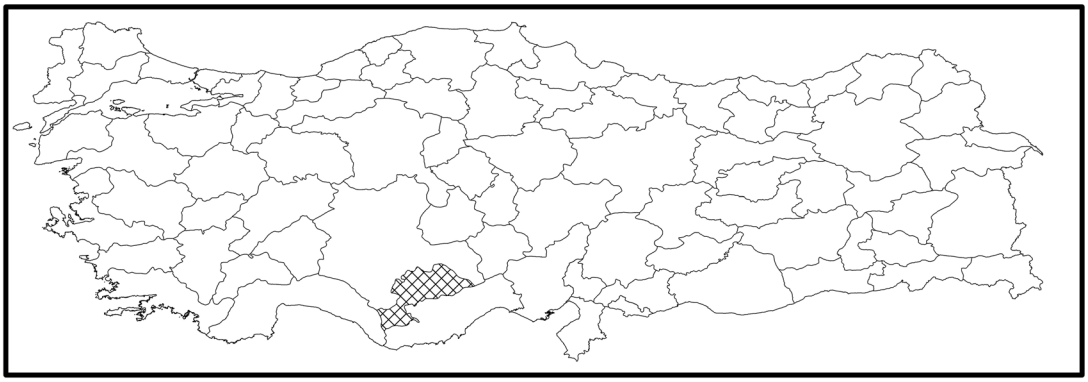

FIGURE 23. *Leuctra kopetdaghi* Zhiltzova, 1972

***Leuctra kurui* Kazancı, 1983**

Type country and locality. Turkey, Yedigöller National Park (Turkish: Yedigöller, "seven lakes"), located in the north of the province of Bolu (Kazancı 1983a).

Material. Bartın, 30 km E Bartın, Arit Spr., 16.10.2004, 1♀ (Si). **Bolu**, 20 km SE Devrek, Karasu, 16.10.2004, 1 ♂ (Si). **Bolu**, Aladağlar Mts, Kartalkaya, 1600 m, 31.10.2004, 4 ♂, 8 ♀ (Si). **Çorum** Kargı, N Pelit Yaylası, 1446 m, 1.10.2009, 4 ♂, 1 ♀; 24.10.2009, 3 ♂, 2 ♀ (Si). **Sinop**, Çangal mountain, Akgöl—Hanönü, 1130 m, 26.10.2009, 6 ♂, 11 ♀. (Si). **Zonguldak**, Alaplı, Gümeli, Bölüklü Yaylası, 910 m, 20.09.2011, 1 ♂, 3 ♀ (Si). **Karabük**, Yenice, Baklabostan, Karakaya, 21.09.2011, 1 ♂ (Si). **Karabük**, Safranbolu, Bulak, Mencilis Mağarası (Mencilis Cave), 690 m, 22.10.2011, 1 ♂, 2 ♀ (Si). **Karabük**, Kapullu Başköy 22.10.2011, 2 ♀ (Si). **Karabük**, Safranbolu, Mencilis, 22.10.2011, 1 ♂, 2 ♀ (Si). **Düzce**, Kardüz Yaylası, 1054 m, 23.09.2012, 2 ♂, 7 ♀ (Si). **Sakarya**, Sapanca, S İkramiye, Akçay, 510 m, 24.9.2012, 1 ♂, 2 ♀ (Si). **Sakarya**, Sapanca, Mahmudiye 1 km S Dereiçi, 362 m, 24.09.2012, 2 ♂, 3 ♀ (Si). **Düzce**, Akçakoca—Aktaş, İdilli, 80 m, 25.09.2012, 3 ♂ (Si). **Düzce**,

Odayeri Yaylası, 832 m, 26.09.2012, 1 ♂ (Si). **Bolu**, Göynük, Sünnet lake, 883 m, 22.10.2012, 2 ♂, 5 ♀ (Si). **Balıkesir**, Edremit, Altınoluk, Darıdere, Kazdağ, 624 m, 24.09.2014, 3 ♀ (Si). **Balıkesir**, Evciler, Ayazma, 25.09.2014, 1 ♂ (Si).

Distribution in Turkey. Bolu (Kazancı 1983a); Bolu, Çankırı, Kastamonu (Kazancı 1983b); Bolu, İzmir (Vinçon & Sivec 2001); Bolu (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 1999; Kazancı 2008). Map (Fig. 24).

Distribution and ecology. This species was previously known from northwestern Anatolia (Vinçon & Sivec 2001) extending in the western half of the Pontus to the Sinop and Çorum regions. It is a crenophilic species occurring in mountains brooks and brooklets (1100–1600 m a.s.l.). Adults emerge mainly in autumn (X) though one male was collected in May (Vinçon & Sivec 2001).

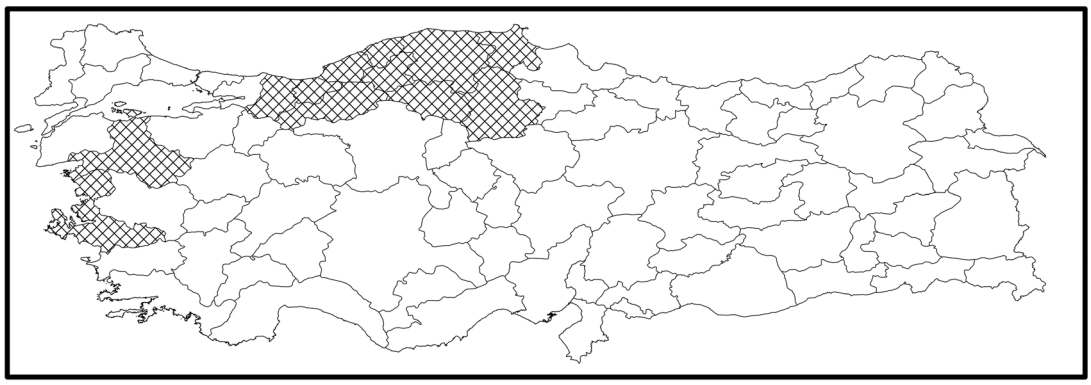

FIGURE 24. *Leuctra kurui* Kazanci, 1983

***Leuctra marilouae* Vinçon & Sivec, 2001**

This species was only known from the type male collected in the Rize region (Vinçon & Sivec 2001). Both males and females were collected during this study and the first description of the female is given.

Type country and locality. Turkey, İyidere River (The type locality is located in the crossroad Kalkandere-İkizdere, the Province of Rize) (Kazancı 1983a).

Material. Rize, Çamlıhemşin, Ayder, 1500 m, 14 ♂, 22 ♀, 9.10.2006 (Si).

Female description: (Fig. 25). Sternite VII with a median wide sclerite, rounded anteriorly fused to sternite VIII posteriorly; a small sub-triangular sclerite laterally of median sclerite, close to the anterior margin. Sternite VIII: subgenital plate elongated, subtriangular, with two globulous lateral lobes separated as wide as width of one lobe. Medially, plate clearly convex in lateral view, prolonged posteriorly by a well developed median lobe that extends between the two lateral lobes; lateral lobes slightly longer than the median lobe.

Distribution in Turkey. Rize (Vinçon & Sivec 2001); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 26).

Distribution and ecology. Turkish micro-endemic species restricted to a small region of the eastern Pontus (Rize region). The flight period is during the cold season, from autumn to spring (Vinçon & Sivec 2001).

***Leuctra martynovi* Zhiltzova, 1960**

Distribution in Turkey. Rize (Theischinger 1976a); Çankırı (Kazancı 1983b); Çankırı, Kayseri (Kazancı 1994); **country record only:** listed from Turkey (Kazancı 1999; Vinçon & Sivec 2001; Kazancı 2008). Map (Fig. 27).

Distribution and ecology. Caucasus, Anatolia. It occurs in mountain brooks (750 m). Adults emerge in spring (VI).

***Leuctra minuta bursaensis* Vinçon & Sivec, 2001**

Type country and locality. Turkey, Uludağ (Bursa) (Vinçon & Sivec 2001).

Distribution in Turkey. Uludağ, Bursa (as *Leuctra minuta*)(Zwick 1971); Balıkesir, Bursa (Vinçon & Sivec 2001); Bursa (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 28).

Distribution and ecology. Turkish micro-endemic subspecies localised in northwestern Anatolia from Edremit to Bursa. It occurs in mountain brooks and torrents (600–2000 m). Adults emerge in spring (V–VI).

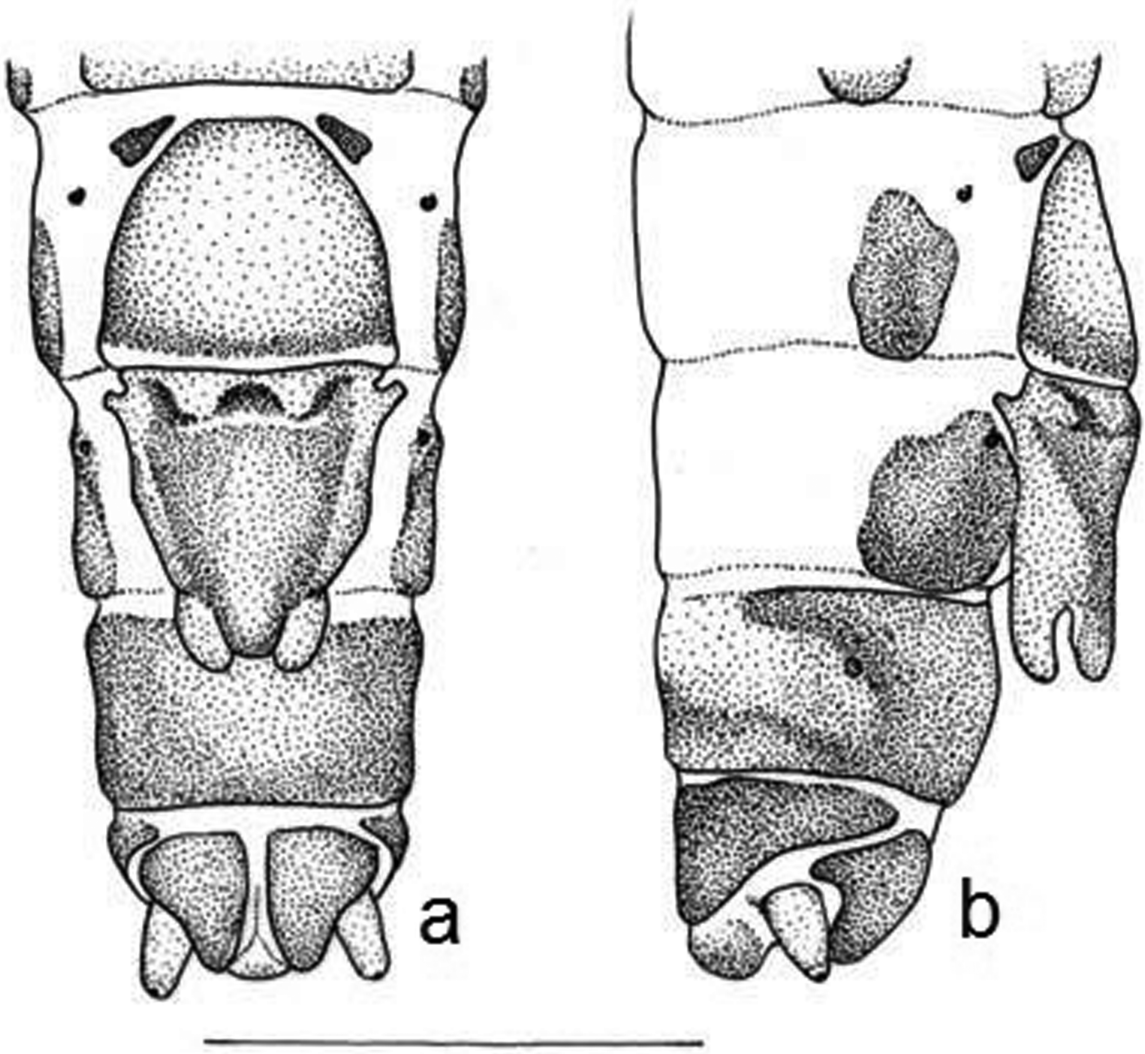

FIGURE 25. *Leuctra marilouae*, female terminalia. a. Ventral view; b. lateral view.

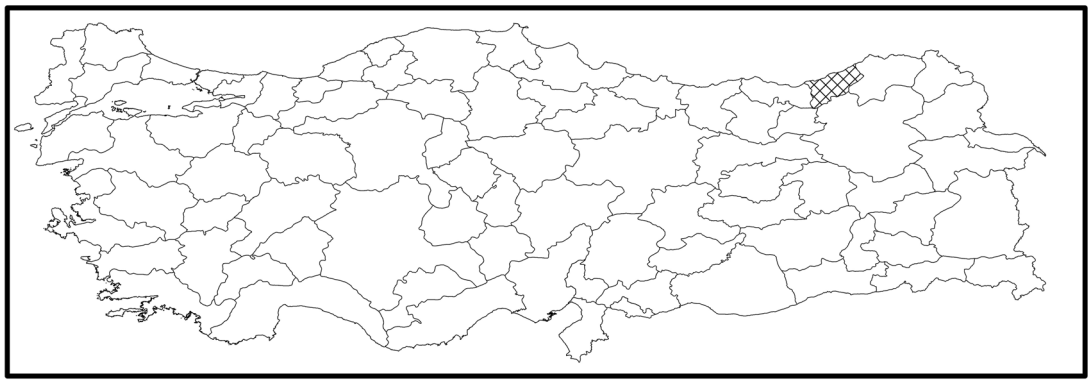

FIGURE 26. *Leuctra marilouae* Vinçon & Sivec, 2001

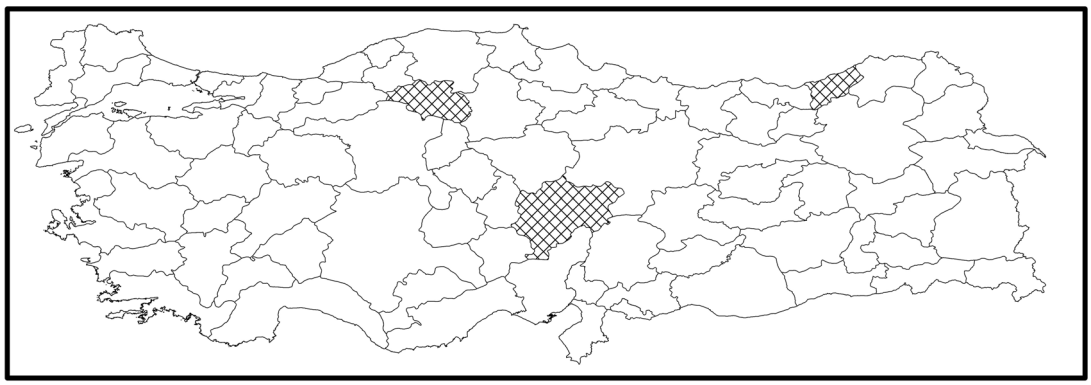

FIGURE 27. *Leuctra martynovi* Zhiltzova, 1960

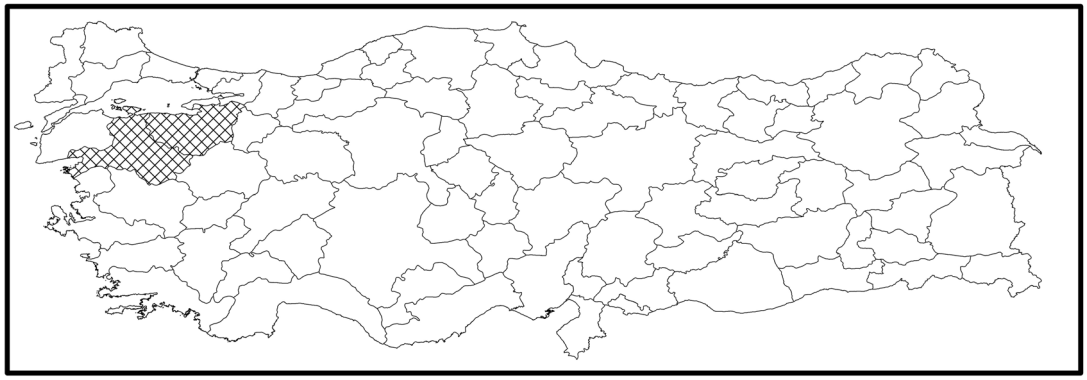

FIGURE 28. *Leuctra minuta bursaensis* Vinçon & Sivec, 2001

***Leuctra minuta kastamonui* Vinçon & Sivec, 2001**

Type country and locality. Turkey, Ilgaz Geçidi, northern slope (the type locality is located in the province of Çankırı) (Vinçon & Sivec 2001).

Distribution in Turkey. Bolu (as *L. minuta*) (Kazancı 1982); Bolu, Çankırı, Kastamonu (Vinçon & Sivec 2001); Çankırı (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 29).

Distribution and ecology. This Turkish micro-endemic subspecies is endemic to the western part of the Pontus from Bolu to Kastamonu. It occurs in mountain brooks and springs (800–1600 m). Adults emerge in spring (V–VI).

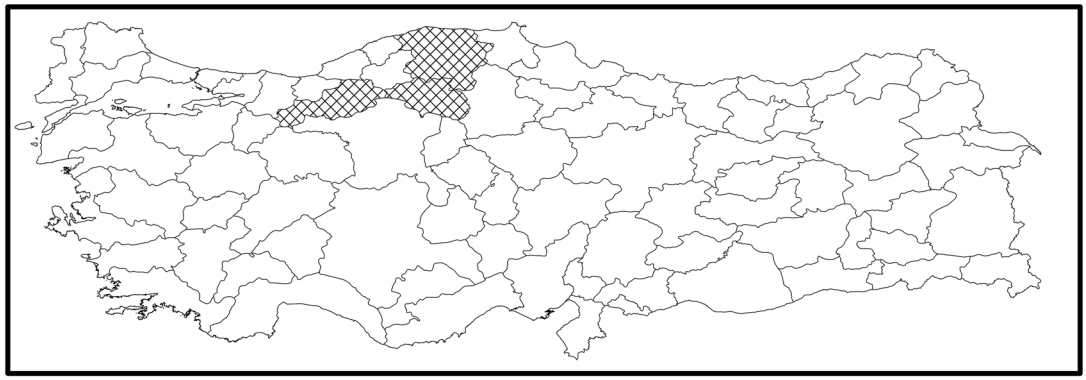

FIGURE 29. *Leuctra minuta kastamonui* Vinçon & Sivec, 2001

Excluded: *Leuctra minuta minuta* Zhiltzova 1960

The presence of this subspecies in Anatolia (Kazancı 2009b) is doubtful since it is only based on female specimens that may be confused with those of the sympatric (in the Giresun region) *L. theischingeri* or *L.*

sanainica. This taxon needs to be confirmed once males are available, but we presently exclude it from the Turkish fauna.

***Leuctra sanainica* Zhiltzova, 1960**

Distribution in Turkey. Artvin (Theischinger 1976a); Ankara, Bolu, Bursa, Çankırı, Erzincan, Ordu, Rize, Trabzon (Vinçon & Sivec 2001); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 1999; Kazancı 2008). Map (Fig. 30).

Distribution and ecology. Caucasus and northern Anatolia. An orophilic, cold stenothermic species. Adults emerge in spring (V–VI).

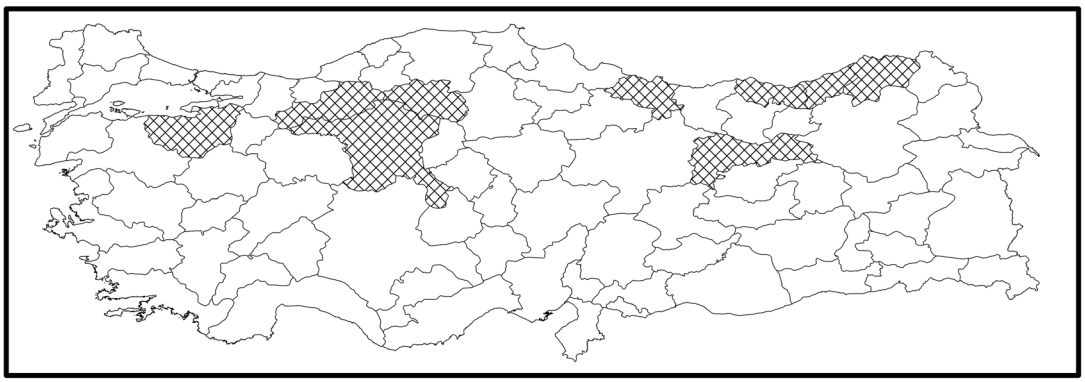

FIGURE 30. *Leuctra sanainica* Zhiltzova, 1960

***Leuctra schistocerca* Zwick, 1971**

Type country and locality. Turkey, Toros Mountains, 24 km north to Kozan (the type locality is located in the province of Adana) (Zwick 1971).

Distribution in Turkey. Adana (Zwick 1971); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 1999; Vinçon & Sivec 2001; Kazancı 2008). Map (Fig. 31).

Distribution and ecology. Turkish micro-endemic species occurring in the Central Taurus. Adults emerge in spring (V).

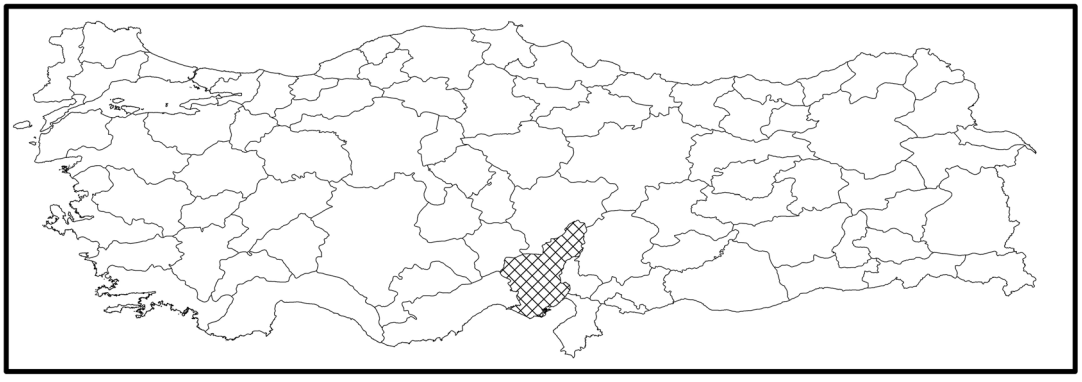

FIGURE 31. *Leuctra schistocerca* Zwick, 1971

***Leuctra sipahilerae* Vinçon & Sivec, 2001**

Type country and locality. Turkey, Sümelas (the type locality is located in the District of Maçka, the province of Trabzon) (Vinçon & Sivec 2001).

Material. Trabzon, Uzungöl, 1200 m, 18.08.2005, 1 ♂ (Si); Maçka, Sumelas, 1200 m, 20.08.2005, 2 ♂, 1 ♀; 1000 m, 13.10.2007, 1 ♀ (Si).

Distribution in Turkey. Rize, Trabzon (Vinçon & Sivec 2001); Trabzon (Kazancı 2009a) Trabzon (Kazancı 2009b); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 32).

Distribution and ecology. Turkish micro-endemic species restricted to a small region of the eastern Pontus

(Rize Region). It occurs in high altitude brooks and torrents (970–1850 m a.s.l.). The flight period extends from late spring to autumn (VI–X).

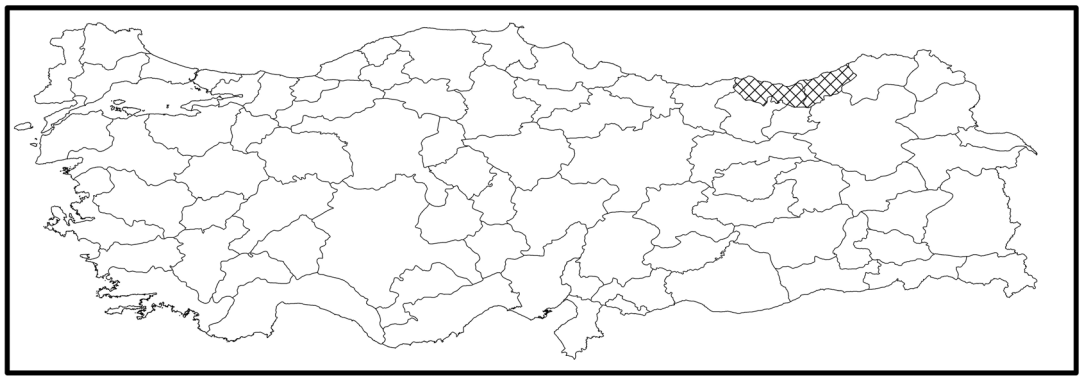

FIGURE 32. *Leuctra sipahilerae* Vinçon & Sivec, 2001

Excluded: *Leuctra svanetica* Zhiltzova, 1960

Leuctra svanetica is reported only from Anatolia based on females (Theischinger 1976a; Kazancı 1984) that may have been confused with *L. aspoeckorum* or *L. zhiltzovae*. It is excluded from the Turkish fauna (Vinçon & Sivec 2001).

***Leuctra theischingeri* Vinçon & Sivec, 2001**

Type country and locality. Turkey, Gorgit Yaylası (Gorgit Yaylası is a plateau and is located in the District of Borçka in Camili Village, the Province of Artvin) (Vinçon & Sivec 2001).

Material. Artvin, Borçka, Camili, Lodivake Yaylası, 1100 m, 16.09.1999, 1 ♂, 5 ♀ (Si).

Distribution in Turkey. Artvin (Vinçon & Sivec 2001); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 33).

Distribution and ecology. A Turkish micro-endemic species restricted to the far eastern Pontus (Artvin region). It occurs in middle mountain streams (1000–1800 m a.s.l.). Adults emerge in summer and autumn (VII–X).

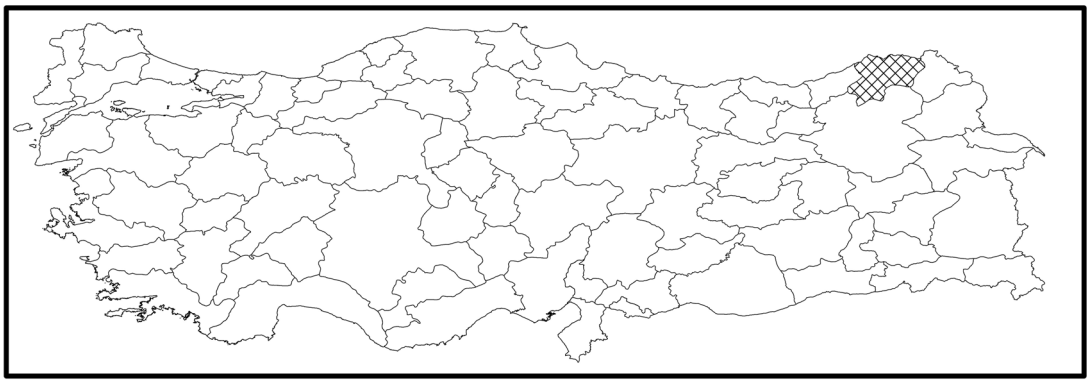

FIGURE 33. *Leuctra theischingeri* Vinçon & Sivec, 2001

***Leuctra zangezurica* Zhiltzova, 1960**

Distribution in Turkey. Rize (Zwick 1978b); Erzincan (Vinçon & Sivec 2001); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 1999; Kazancı 2008). Map (Fig. 34).

Distribution and ecology. Armenia, Caucasus, eastern Anatolia. Adults occur in mountain brooks up to 2700 m a.s.l. The emergence period is in spring (V–VI).

***Leuctra zhiltzovae* Theischinger, 1976b**

Type country and locality. Turkey, Erzurum, 90 km S Rize (Rize) (Theischinger 1976b).

Distribution in Turkey. Rize (Theischinger 1976b); Rize (Vinçon & Sivec 2001); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 1999; Kazancı 2008). Map (Fig. 35).

Distribution and ecology. Turkish micro-endemic species restricted to the eastern part of the Pontus. It occurs in high mountain brooks (1500–2450 m a.s.l.). The emergence period is in spring and summer (VI–VII).

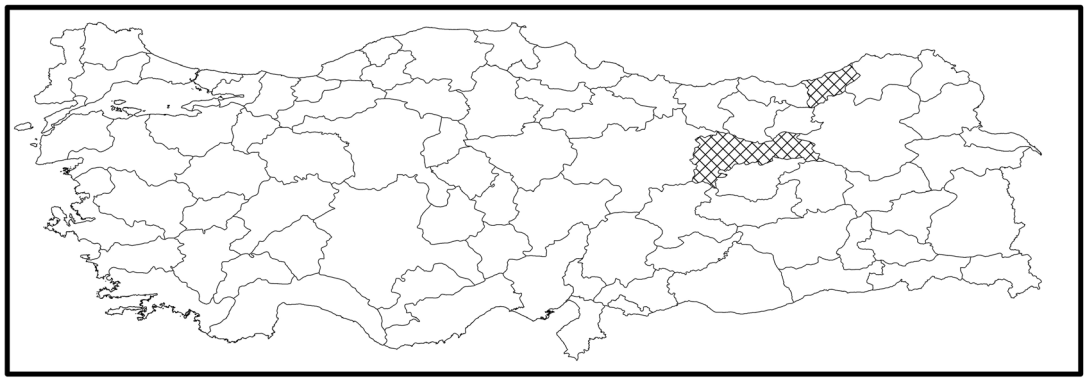

FIGURE 34. *Leuctra zangezurica* Zhiltzova, 1960

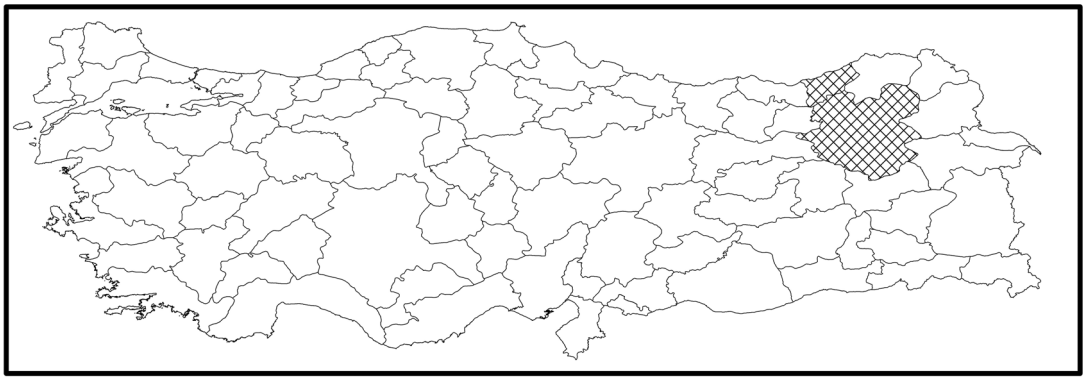

FIGURE 35. *Leuctra zhiltzovae* Theischinger, 1976

FAMILY NEMOURIDAE Newman, 1853

SUBFAMILY AMPHINEMURINAE Baumann, 1975

GENUS *Amphinemura* Ris, 1902

***Amphinemura mirabilis mirabilis* (Martynov, 1928)**

Distribution in Turkey. Bayburt, Tokat, Tunceli (Zwick 1971); Erzincan, Gümüşhane (Theischinger 1976a); Erzurum (Kazancı 1983b); Artvin, Çankırı, Erzurum, Giresun, Gümüşhane, Kastamonu, Tunceli (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 36).

Distribution. Caucasus, Armenia, Iran, Afghanistan, Pakistan, N.E. Anatolia. This orophilic species occurs in mountain streams (1200–1680 m). Adults emerge in spring (V–VI).

***Amphinemura standfussi* (Ris, 1902)**

Material. Kütahya, 20 km E Sökner Kütahya, 30.05.2004, 5 ♂, 2 ♀ (Si). **Konya**: Beyşehir, Uçpınar, 1187 m, 5.06.2009, 11 ♂, 6 ♀ (brachypterous) (Si).

Distribution in Turkey. Antalya, Bolu (Kazancı 1983b); Antalya, Bolu, Kırklareli (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 37).

Distribution and ecology. Europa, western Anatolia. It mainly occurs in slow running streams at various altitudes in mountainous regions. Adults emerge in spring (V–VI).

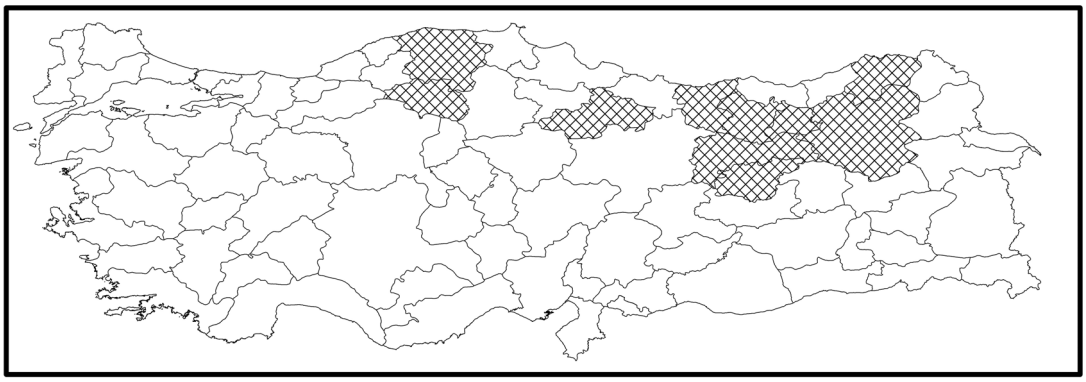

FIGURE 36. *Amphinemura mirabilis mirabilis* (Martynov, 1928)

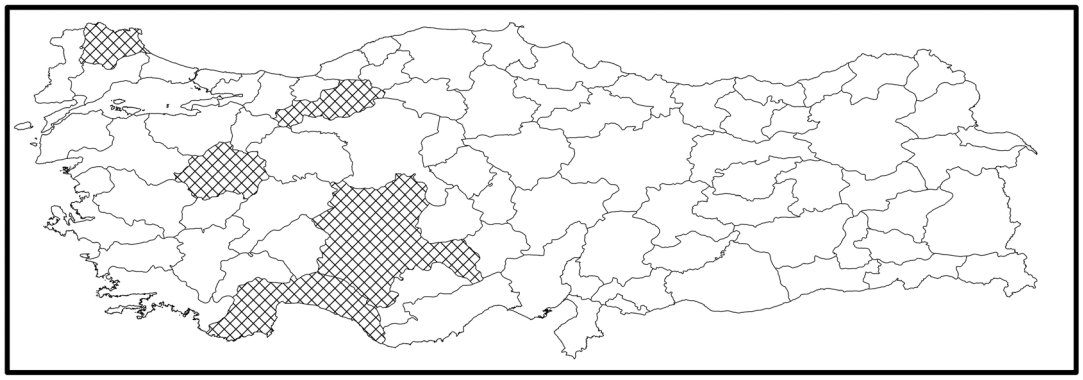

FIGURE 37. *Amphinemura standfussi* (Ris, 1902)

***Amphinemura trialetica* Zhiltzova, 1957**

Material. Bursa, Uludağ, 3 km N Soğukpınar yolu, 1000 m, 4.06.1992, 1 ♂, 1 ♀ (Si). **Bolu**, Gerede, Akyurt vadisi, 1300 m, 19.05.1996, 2 ♀ (Si). **Çankırı**, Çerkes, Işık Dağı, Sofular deresi, 1550 m, 16.06.1996, 1 ♀ (Si). **Rize**, İkizdere, Çamlık, 1380 m, 24.06.1995, 1 ♀ (Ho). **Giresun**, Tamdere, Kümbet, Aksu br., 1550 m, 27.06.1995, 2 ♀ (Ho). **Bursa**, Uludağ, 1 km N Soğukpınar yolu, 1000 m, 4.06.1992, 2 ♀ (Ma). **Rize**, > Dereköy, 12.05.1997, 1 ♂, 2 ♀ (Vi). **Erzincan**, E Refahiye, > Alacatlı Köyü, 14.05.1997, 1 ♂ (Vi). **Ankara**, N Ankara, Güvem—Salın, 15.05.1997, 1 ♀ (Vi). **Artvin**, Uğurköy, 17 km Camili—Mereta Yaylası, 1000 m, 14.07.1997, 1 ♀ (Si).

Distribution in Turkey. Bolu, Tunceli (Zwick 1971); Artvin, Erzincan, Trabzon (Theischinger 1976a); Bolu (Kazancı 1982); Bolu (Kazancı 1983b); Ankara, Artvin, Bolu, Bursa, Çankırı, Tokat (Kazancı 2009a); **country record only:** listed from Turkey (Baumann 1975; Kazancı 1983b; Kazancı 2008). Map (Fig. 38).

Distribution and ecology. Caucasus, Armenia, northern Anatolia. It occurs in various types of mountain streams (1000–1550 m). Adults emerge in spring and early summer (V–VII).

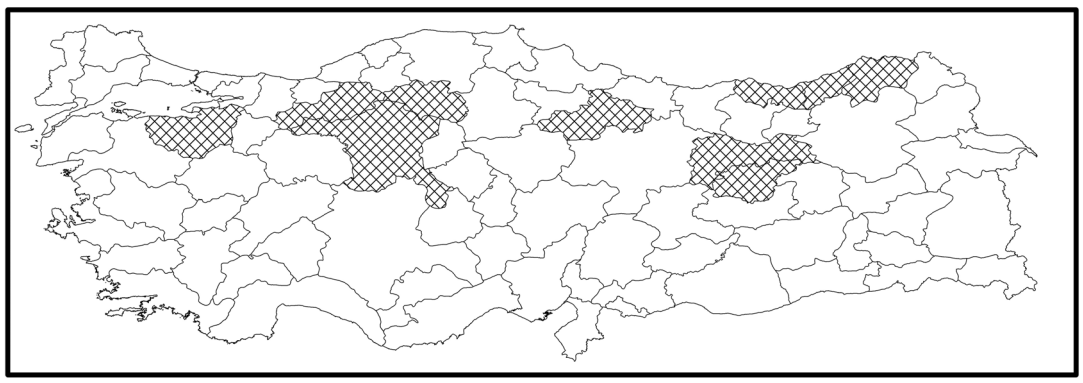

FIGURE 38. *Amphinemura trialetica* Zhiltzova, 1957

GENUS *Protonemura* Kempny, 1898

Protonemura aculeata Theischinger, 1976a

Distribution in Turkey. Bolu, Çankırı, Kastamonu, Rize (Vinçon & Zhiltzova 2004); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 39).

Distribution and ecology. Iran, Caucasus, Anatolian Pontus. It occurs in various mountain streams (1000–2000 m). Adults emerge in spring (V–VI).

Note. This species may be a synonym of *P. ressli* Zwick, 1971, since male genitalia are similar and genitalic characters are highly variable (Vinçon & Zhiltzova 2004).

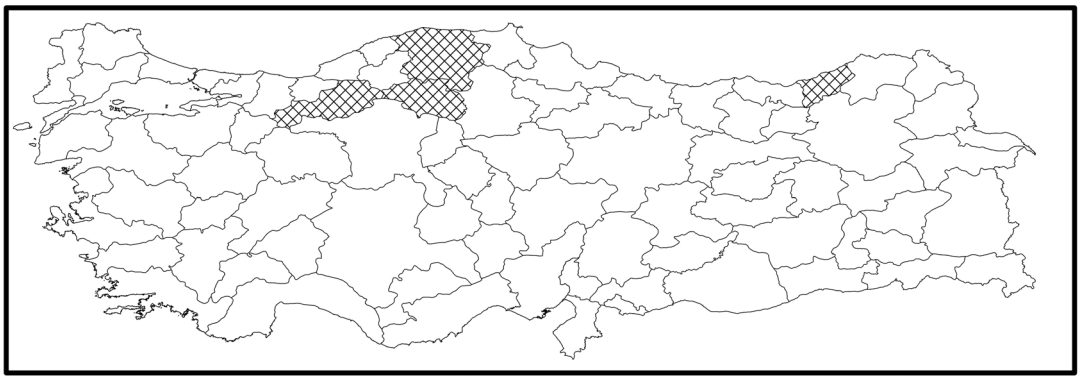

FIGURE 39. *Protonemura aculeata* Theischinger, 1976

Protonemura aki Vinçon & Zhiltzova, 2004

Type country and locality. Turkey, Ak Dağlar (Ak Dağlar is a mountain range located between Muğla and Antalya) (Vinçon & Zhiltzova 2004).

Distribution in Turkey. Antalya (Vinçon & Zhiltzova 2004); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 40).

Distribution and ecology. Turkish micro-endemic species restricted to south western Anatolia. It occurs in high altitude mountain brooks. Adults emerge in spring (V).

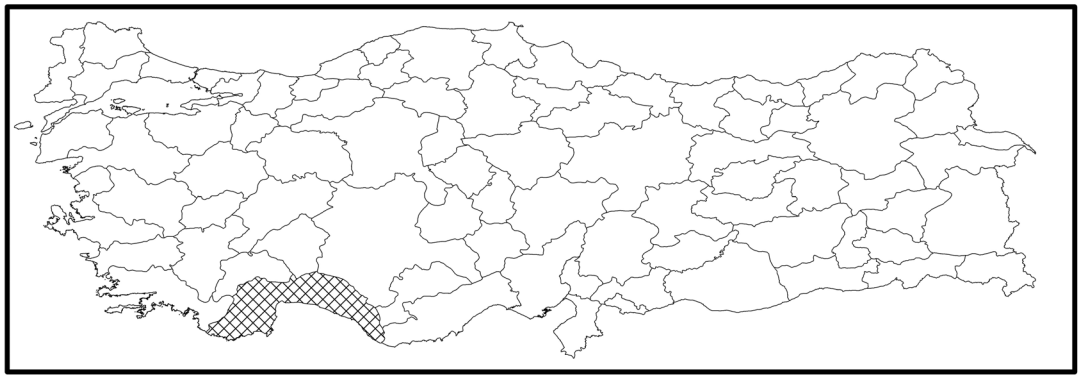

FIGURE 40. *Protonemura aki* Vinçon & Zhiltzova, 2004

Protonemura bacurianica adana Vinçon & Zhiltzova, 2004

Type country and locality. Turkey, Nur Dağları (The type locality is located in the village of Kurtbağı in eastern Üçgüllük, the province of Hatay) (Vinçon & Zhiltzova 2004).

Distribution in Turkey. Adana, Hatay, Kayseri (Vinçon & Zhiltzova 2004); Adana, Adıyaman, İçel Mersin, Kahramanmaraş (as *Protonemura bithynica* Aubert, 1964); Malatya (as *Protonemura bacurianica* Zhiltzova, 1957) (Zwick 1971); Niğde (as *Protonemura bacurianica* Zhiltzova, 1957) (Zwick 1975). Map (Fig. 41).

Distribution and ecology. Turkish micro-endemic subspecies restricted to the Central Taurus to the Iskenderun Region (Nur Daglari). It is orophilic and crenophilic, mainly occurring on calcareous rocks. Adults emerge in spring (V).

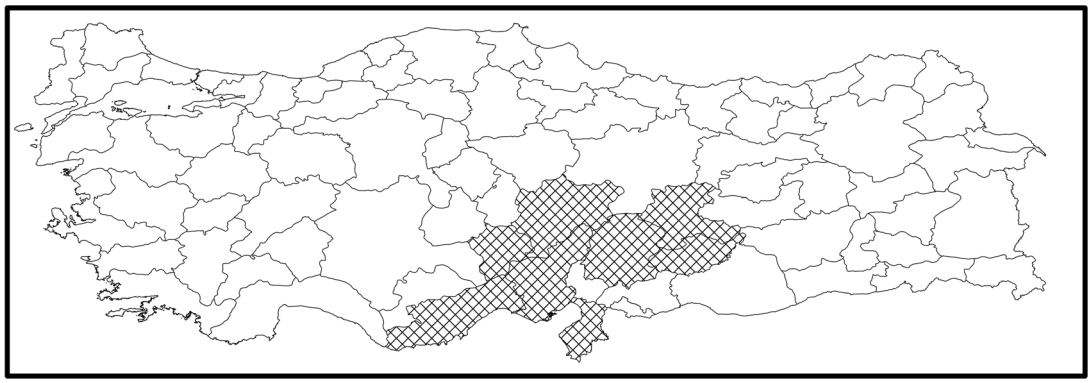

FIGURE 41. *Protonemura bacurianica adana* Vinçon & Zhiltzova, 2004

***Protonemura bacurianica bacurianica* Zhiltzova, 1957**

Material. Bayburt, 35 km S Bayburt—Aşkale, 7.07.2007, 2 ♂, 1 ♀ (Si). **Erzincan**, 48 km W Erzincan—Sivas, 8.07.2007, 1 ♂ (Si). **Bayburt**, 30 km S Bayburt—Aşkale, 1600 m, 12.07.2008, 1 ♂ (Si). **Gümüşhane**, 39 km Gümüşhane—Bayburt, 1900 m, 12.07.2008, 1 ♂ (Si).

Distribution in Turkey. Artvin, Gümüşhane (Theischinger 1976a); Muş (Theischinger 1976b); Bingöl, Muş (Theischinger 1979); Ankara, Bolu, Yozgat (as *Protonemura bacurianica* Zhiltzova, 1957) (Kazancı 1982); Bayburt, Erzurum (Kazancı 1983b); Artvin (Vinçon & Zhiltzova 2004); Ankara, Artvin, Bolu, Erzincan, Erzurum, Giresun, Gümüşhane, Malatya, Sivas (as *Protonemura bacurianica* Zhiltzova, 1957) (Kazancı 2009a); Giresun, Trabzon (Kazancı 2009b); **country record only:** listed from Turkey (Kazancı 1983b). Map (Fig. 42).

Distribution and ecology. Caucasus, Iran, Northern Anatolia. It is an orophilic subspecies (1000–1800 m). Adults emerge in spring (V–VI).

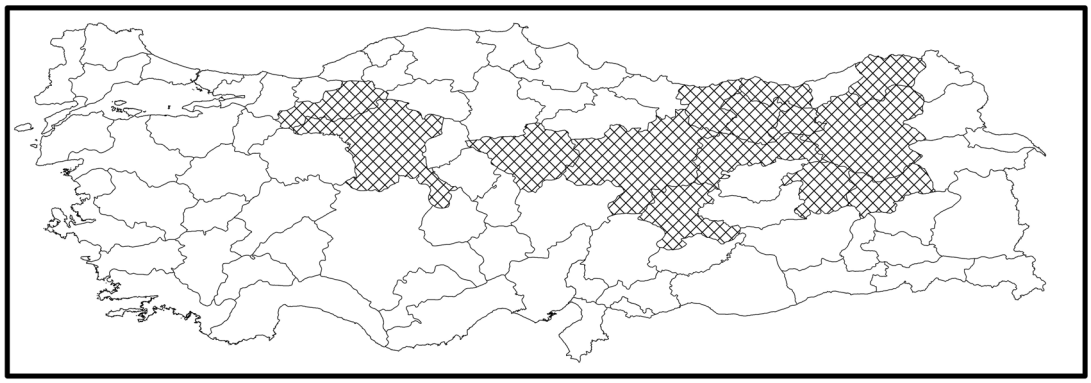

FIGURE 42. *Protonemura bacurianica bacurianica* Zhiltzova, 1957

***Protonemura besucheti* Zwick, 1971**

Type country and locality. Turkey, Nur Dağları (Hatay) (Zwick 1971).

Distribution in Turkey. Hatay (Zwick 1971); **country record only:** listed from Turkey (Baumann 1975; Kazancı 1983b; Vinçon & Zhiltzova, 2004; Kazancı 2008). Map (Fig. 43).

Comments: Turkish micro-endemic species only known by one female and perhaps a synonym of *P. aculeata* or *P. ressli* (Vinçon & Zhiltzova 2004).

***Protonemura bifida bifida* Martynov, 1928**

Material. Rize, İkizdere, Yerelma Köyü, 1050 m, 10.7.1984, 1 ♂ (Si). **Rize**, Çamlıhemşin, Sort 1400 m, 15.08.2005, 1 ♀ (Si). **Trabzon**, Uzungöl, 1200 m, 18.08.2005, 2 ♀ (Si). **Giresun**, Şebinkarahisar, Eğribel pass, 2000 m, 9.07.2008, 2 ♂, 2 ♀ (Si).

Distribution in Turkey. Artvin (Theischinger 1976a); Bayburt, Çankırı (Kazancı 1983b); Artvin, Bayburt, Rize (Kazancı 1994); Artvin, Giresun, Rize, Trabzon (Vinçon & Zhiltzova 2004); Bayburt (Kazancı 2008);

Bayburt, Rize (Kazancı 2009a); Rize, Trabzon (Kazancı 2013); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 44).

Distribution and ecology. Caucasus, central and eastern Pontus. Strongly orophilic species (950–2850 m) occurring in various kind of streams. Adults emerge in late spring and summer (VI–VIII).

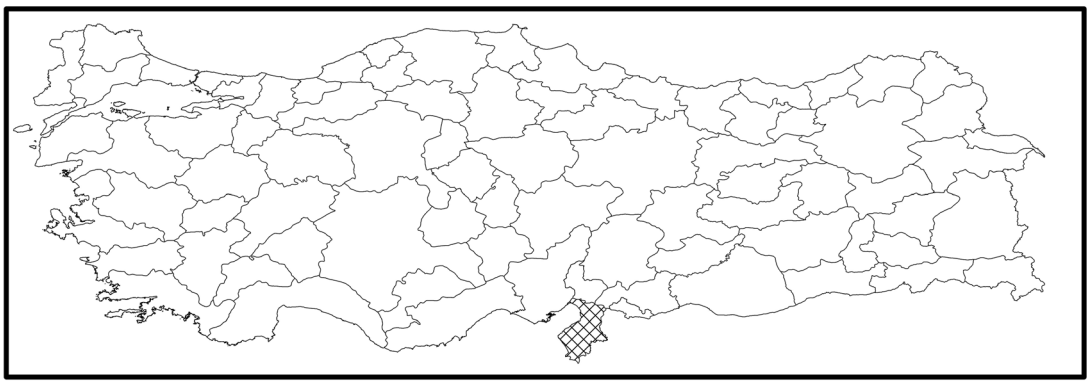

FIGURE 43. *Protonemura besucheti* Zwick, 1971

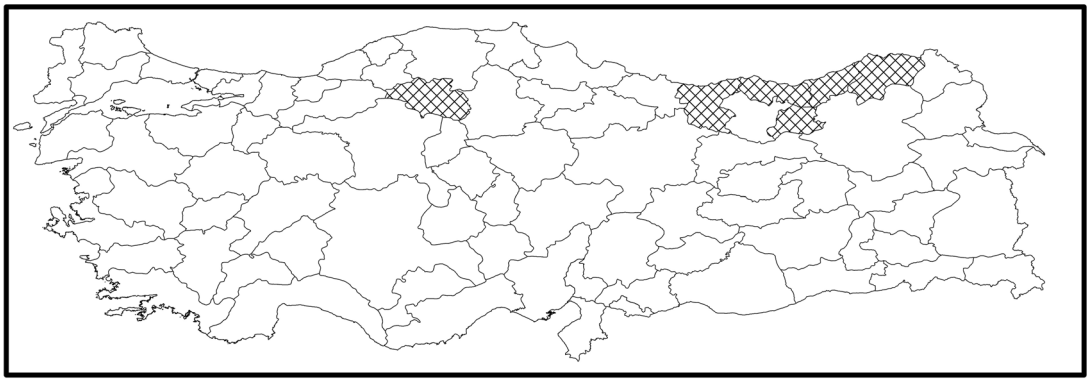

FIGURE 44. *Protonemura bifida bifida* Martynov, 1928

***Protonemura bithynica* Aubert, 1964 (revised status)**

Recent reports of *P. bacurianica* in the western Pontus (Bolu region, Kazancı 2009a) and of *P. bithynica* in the eastern Pontus (see below) indicate that the two forms are sympatric in northern Anatolia, supporting specific status. Therefore, we recognize *P. bithynica* as a valid taxon. However, the subspecific rank of *P. bacurianica adana* Vinçon & Zhiltzova is retained.

Type country and locality. Turkey, Broussa, Turquie (Bursa) (Aubert 1964).

Material. Ankara,15 km S Ankara, Yaylabağ Köyü, 1000 m, 11.05.2000, 1 ♂ (Si). **Konya**, Hadim, Korualan, Borini, 1700 m, 27.06.2000, 15 ♂, 17 ♀ (Si). **Bolu**, Göynük—Bolu Yolu, 10 km Çubuk deresi, 750 m, 21.05.2006, 1 ♂, 1 ♀ (Si). **Erzincan**, 48 km W Erzincan—Sivas, 8.07.2007, 1 ♂, 2 ♀ (Si). **Sinop**, Hanönü, Ayancık, Çangal Mountain, 733 m, 9.08.2009, 1 ♂ (Si). **Karabük**, Kapullu, Yenice istikameti, alabalık çiftliği yanı, 635 m, 14.07.2011, 1 ♂, 1 ♀ (Si).

Distribution in Turkey. Bursa (Aubert 1964); Ankara, Artvin, Bolu, Burdur, Rize (Zwick 1971); Ağrı, Gümüşhane, Kocaeli, Niğde, Yalova (Zwick 1975); Bolu, Bursa (Theischinger 1979); Ankara, Bolu (Kazancı 1982); Ankara, Bolu, Çankırı, Erzurum (Kazancı 1983b); Aydın, Balıkesir, Bolu, Bursa, Çankırı, Konya, İzmir, Karabük, Kastamonu, Konya, Muğla, Sinop (Vinçon & Zhiltzova 2004); Ankara, Bayburt, Bolu, Burdur, Çankırı, Gümüşhane, Kırklareli (Kazancı 2009a); **country record only:** listed from Turkey (Baumann 1975; Kazancı 1983b; Kazancı 2008). Map (Fig. 45).

Distribution and ecology. An Anatolian endemic species also reported from the Greek Lesbos Island, in close proximity to the Anatolian coast. It is a eurytopic species that occurs in various types of mountain streams. The report from European Turkey (Kırklareli, Kazancı 2009a) possibly corresponds to the closely related species of the same species group, *P. strandschaensis* Braasch & Joost, 1972.

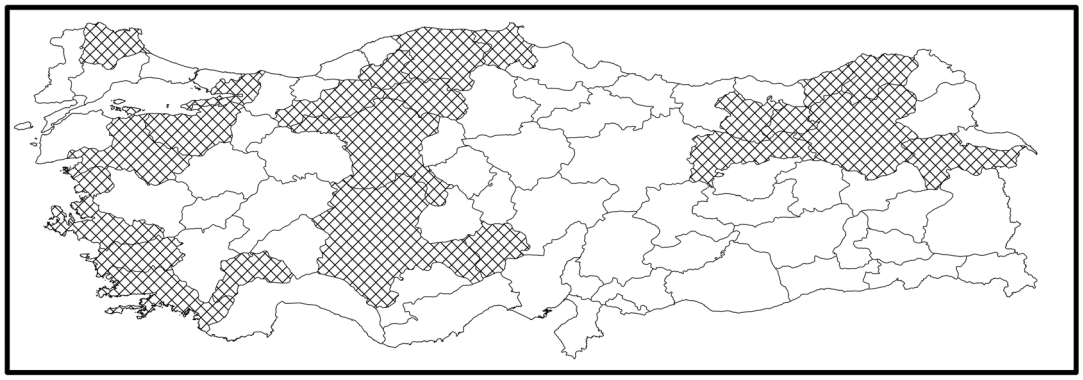

FIGURE 45. *Protonemura bithynica* Aubert, 1964

***Protonemura brachystyla* Zhiltzova, 1988**

Distribution in Turkey. Rize (Vinçon & Sivec 2001); **country record only:** listed from Turkey (Vinçon & Zhiltzova 2004; Kazancı 2008). Map (Fig. 46).

Distribution and ecology. Caucasus, eastern Pontus. A strongly orophilic species. Adults emerge in spring (V).

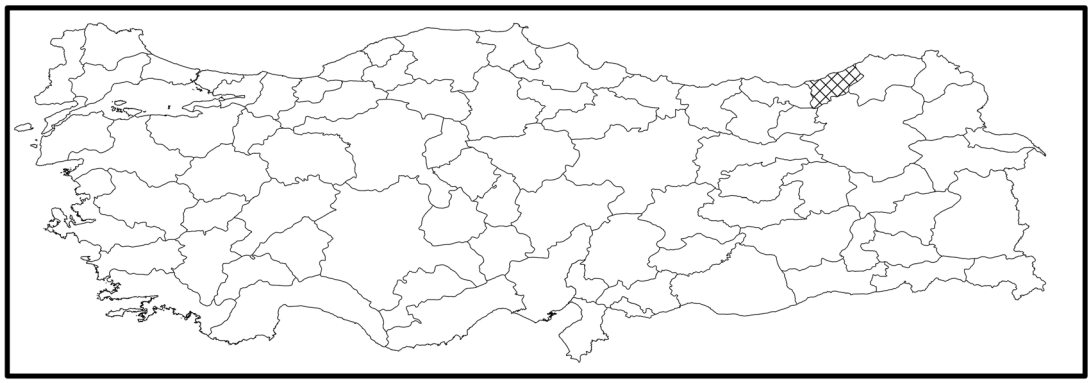

FIGURE 46. *Protonemura brachystyla* Zhiltzova, 1988

***Protonemura capitata* Martynov, 1928**

Distribution in Turkey. Rize (Zwick 1971); Artvin (Theischinger 1976a); Artvin, Kars (Kazancı 1994); Artvin (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 1983b; Vinçon & Zhiltzova 2004; Kazancı 2008). Map (Fig. 47).

Distribution and ecology. Caucasus, Iran, eastern Pontus. A strongly orophilic species. Adults emerge in spring (V).

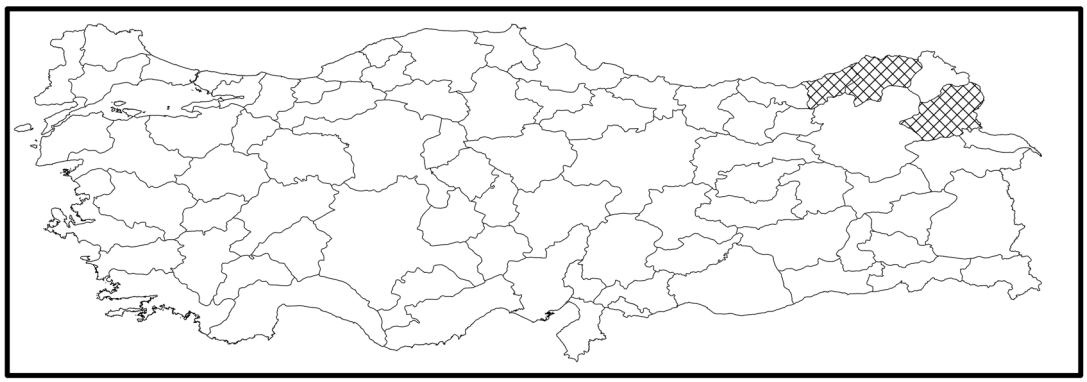

FIGURE 47. *Protonemura capitata* Martynov, 1928

Excluded: *Protonemura dilatata* Martynov, 1928

The presence of *P. dilatata* in Anatolia (Kazancı 2009a) was based only on females and needs confirmation. Females are very close to those of *P. aculeata, P. besucheti*, and *P. ressli* (Vinçon & Zhiltzova 2004). Therefore, this species is excluded from the Turkish fauna.

***Protonemura eumontana* Zhiltzova, 1957**

Material. Trabzon, Maçka, Sumelas, Camiovası Yaylası, 2077 m, 8.08.2008, 1 ♀ (Si).

Distribution in Turkey. Rize (Zwick 1971); Erzurum, Rize (Kazancı 1994); Artvin, Rize (Vinçon & Zhiltzova 2004); Rize, Trabzon (Kazancı 2013); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 48).

Distribution and ecology. Caucasus and eastern Pontus. A strongly orophilic species (1400–2400 m). Adults emerge in summer and autumn (VII–X).

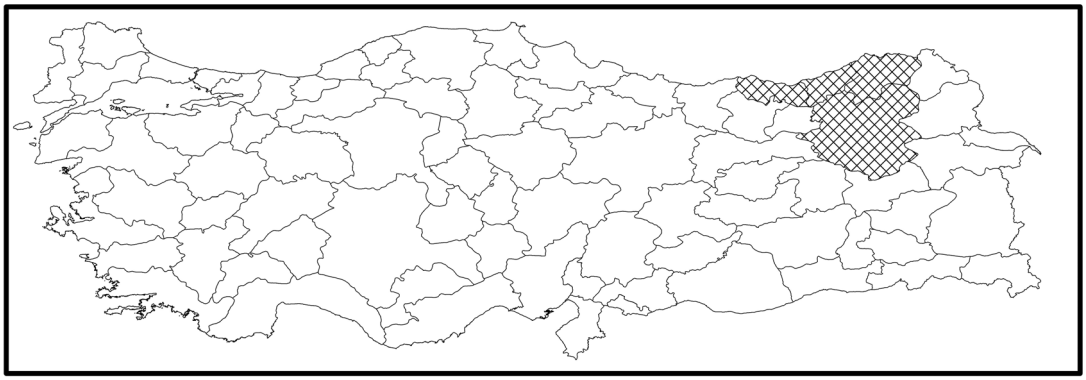

FIGURE 48. *Protonemura eumontana* Zhiltzova, 1957

***Protonemura gladifera* Balinsky, 1950**

Distribution in Turkey. Malatya (Kazancı 2009a). Map (Fig. 49).

Distribution and ecology. Caucasus and eastern Anatolia. A orophilic species (1300–2000 m). Adults emerge in spring and summer (V–VII).

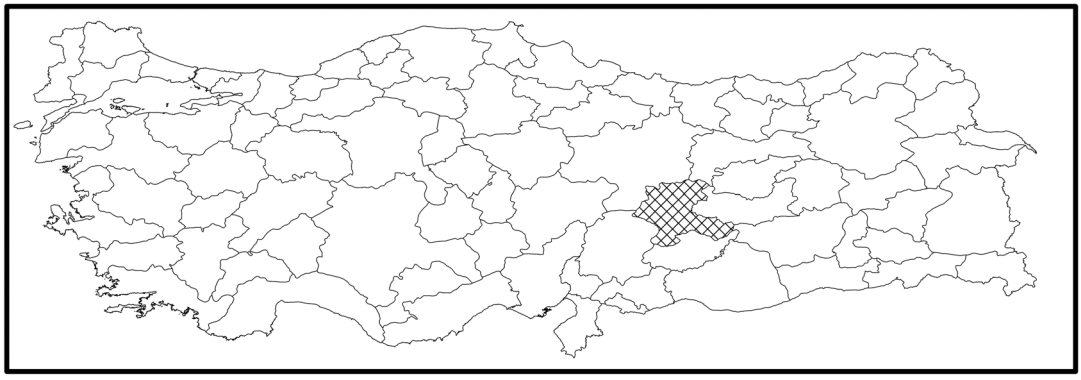

FIGURE 49. *Protonemura gladifera* Balinsky, 1950

***Protonemura intricata pseudointricata* Theischinger, 1975**

Distribution in Turkey. İzmir (Kazancı 1994); İzmir (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 50).

Distribution and ecology. Mainland Greece and western Anatolia.

Note: The specimens reported by Kazancı (1994; 2009a) possibly belong to *P. izmiriana* Vinçon & Zhiltzova, 2004 since both are closely related and known from the same small geographical area where *P. izmiriana* occurs.

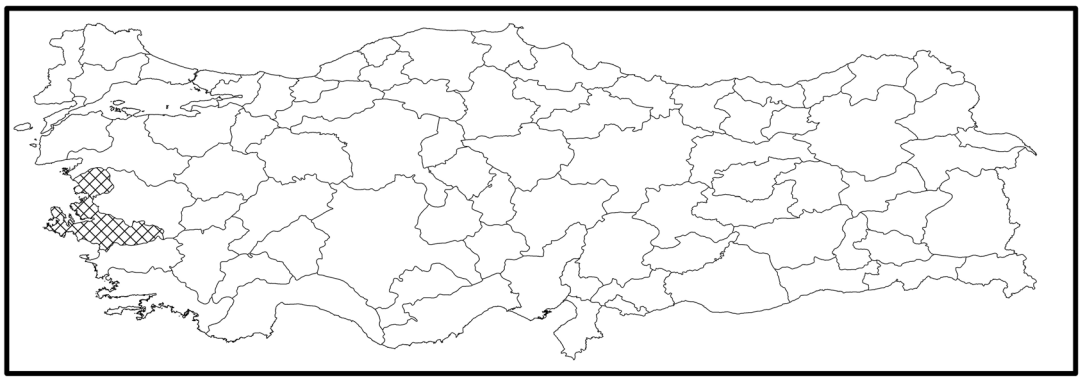

FIGURE 50. *Protonemura intricata pseudointricata* Theischinger, 1975

***Protonemura izmiriana* Vinçon & Zhiltzova, 2004**

Type country and locality. Turkey, Aydın Dağları (The type locality is located in the District of Ödemiş above Beydağ, in the province of İzmir) (Vinçon & Zhiltzova 2004).

Distribution in Turkey. İzmir (Vinçon & Zhiltzova 2004); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 51).

Distribution and ecology. This Turkish micro-endemic species is restricted to the small massifs surrounding İzmir, close to the Anatolian southwestern coast. It occurs in low mountain brooks and springs (400–800 m). Adults emerge in spring (V).

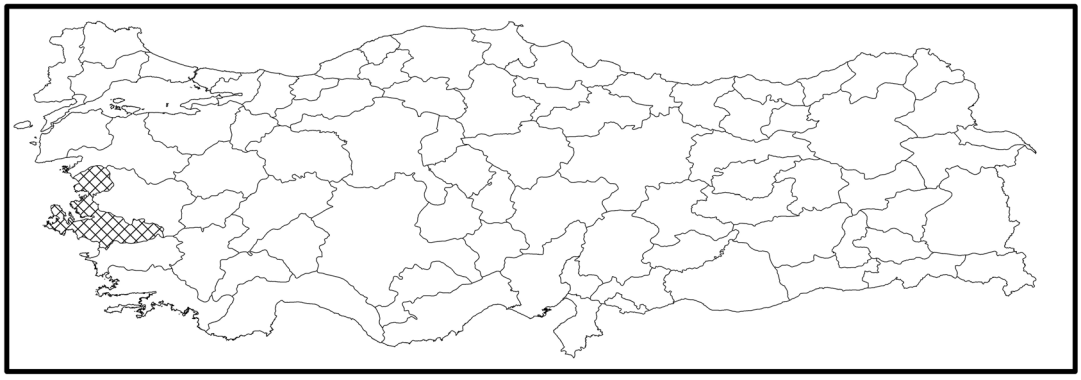

FIGURE 51. *Protonemura izmiriana* Vinçon & Zhiltzova, 2004

***Protonemura microstyla* Martynov, 1928**

Distribution in Turkey. Rize (Theischinger 1976a); Artvin (Kazancı 1994); Rize (Vinçon & Zhiltzova 2004); Trabzon (Kazancı 2009b); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 52).

Distribution and ecology. Caucasus, Armenia, Anatolia where it is limited to the eastern Pontus. This orophilic species occurs in different types of streams at moderate altitudes (700–1700 m). Adults emerge in spring (V–VI).

***Protonemura oreas* Martynov, 1928**

Material. Bayburt, Torul, Özkürtün, Örümcek Ormanı, 1250 m, 13.09.1999, 1 ♂ (Si). **Rize**, Çamlıhemşin, Ayder, 1500 m, 9.10.2006, 2 ♀ (Si). **Gümüşhane**, Zigana Köyü, Limni lake, 1700 m, 11.08.2007, 1 ♂ (Si). **Trabzon**, Maçka, Sumelas, 250 m, 18.08.2008, 1 ♂ (Si). **Karabük**, Safranbolu, Mencilis, 22.10.2011, 1 ♂ (Si). **Balıkesir**, Evciler, Ayazma, 25.09.2014, 1 ♂, 2 ♀ (Si).

Distribution in Turkey. Artvin, Rize (Vinçon & Zhiltzova 2004); Rize (Kazancı 2009a); **country record only:** listed from Turkey (Vinçon & Zhiltzova 2004; Kazancı 2008). Map (Fig. 53).

Distribution and ecology. Caucasus and eastern Pontus. It occurs in different types of streams (250–2200 m). Adults emerge in summer and autumn (VII–X).

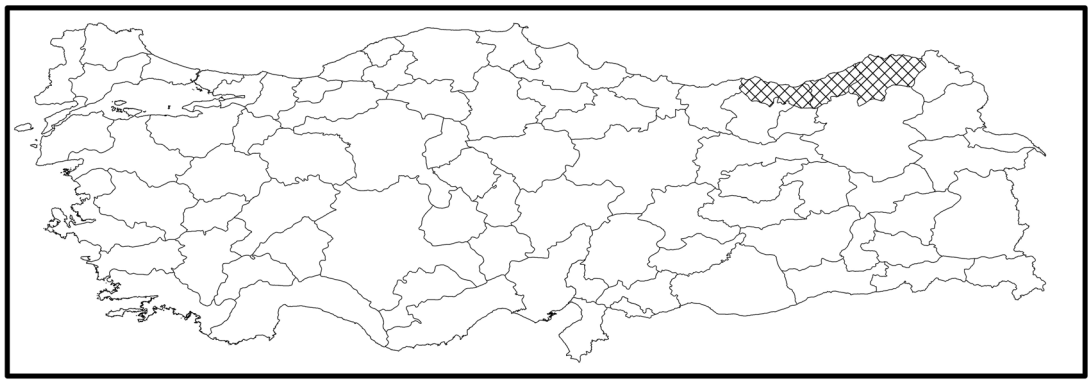

FIGURE 52. *Protonemura microstyla* Martynov, 1928

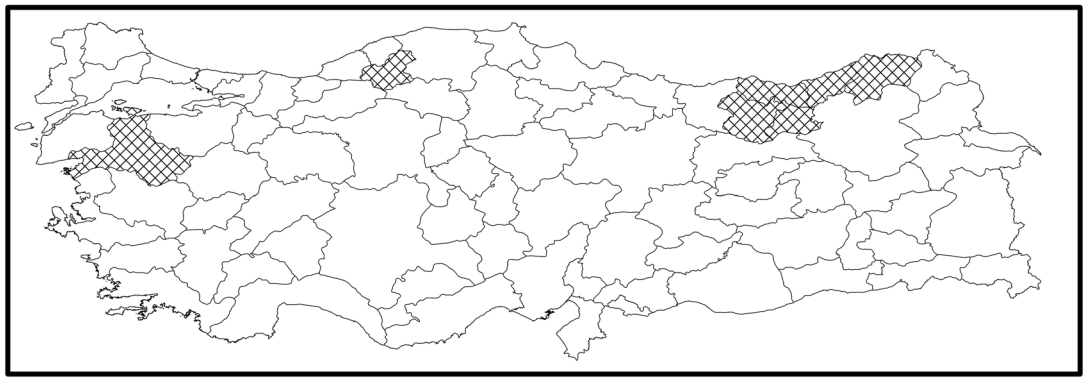

FIGURE 53. *Protonemura oreas* Martynov, 1928

***Protonemura praecox* (Morton, 1894)**

Distribution in Turkey. Ankara, Muğla (Kazancı 1994); Ankara, Çankırı, Erzurum, Kars, Malatya, Muğla (Kazancı 2009a); Muğla (Kazancı *et al.* 1992); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 54).

Distribution and ecology. Europe and western Anatolia.

Comments. According to Vinçon & Zhiltzova (2004) specimens of *P. praecox* from Turkey could be assigned to the subspecies *P. praecox graeca* Berthélemy, 1971, according to its geographical distribution near Turkey.

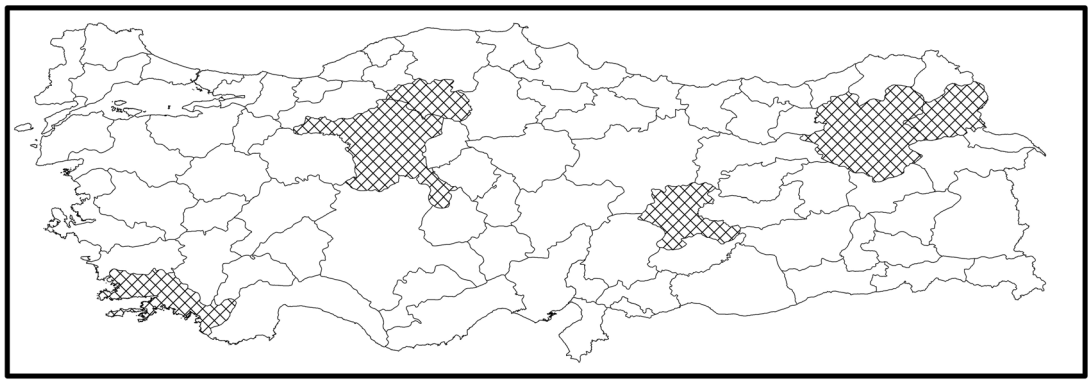

FIGURE 54. *Protonemura praecox* (Morton, 1894)

***Protonemura rauschi* Theischinger, 1975**

First record from Turkey.

Material. Tekirdağ, Tekir Mts., Yeniköy, torrent at the village (W. Şarköy), 255 m, N40°38.707' E27°00.767', 05.04.2007, 5 ♂, 5 larvae, 1 exuviae (Mur).

Distribution and ecology. Known from Greece, Macedonia (Ikonomov 1986), and Serbia (Kaćanski 1972). Data of the Pelopponnes endemic *P. beaumonti* (Aubert, 1956b) from Bulgaria (Braasch & Joost 1971a, 1975) and mainland Greece probably refer also to this species (Zwick 1978). It inhabits small torrents and brooks mainly in the submontane zone. Map (Fig. 55).

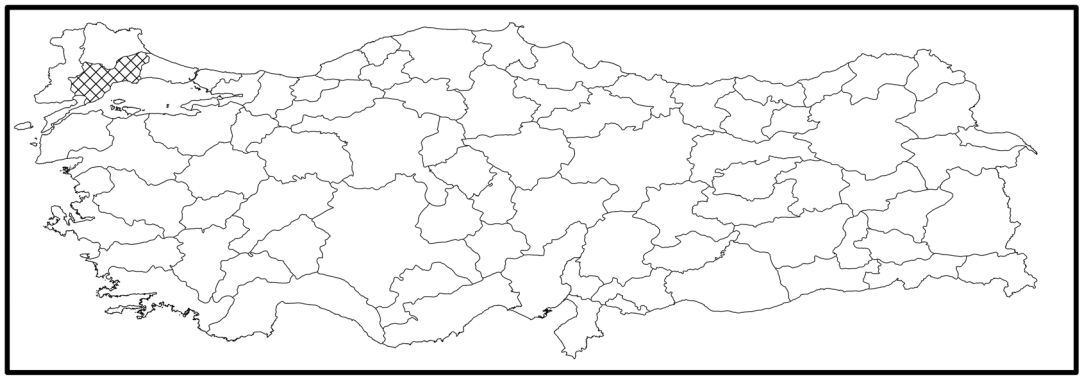

FIGURE 55. *Protonemura rauschi* Theischinger, 1975

***Protonemura ressli* Zwick, 1971**

Type country and locality. Turkey, Zara (Sivas) (Zwick 1971).

Distribution in Turkey. Sivas (Zwick 1971); Bolu (Kazancı 1994); **country record only:** listed from Turkey (Kazancı 1983b; Vinçon & Zhiltzova 2004; Kazancı 2008). Map (Fig. 56).

Distribution and ecology. Turkish endemic species covering a large region of northern Anatolia. It occurs in various types of mountain catchments. Adults emerge in spring (III–V).

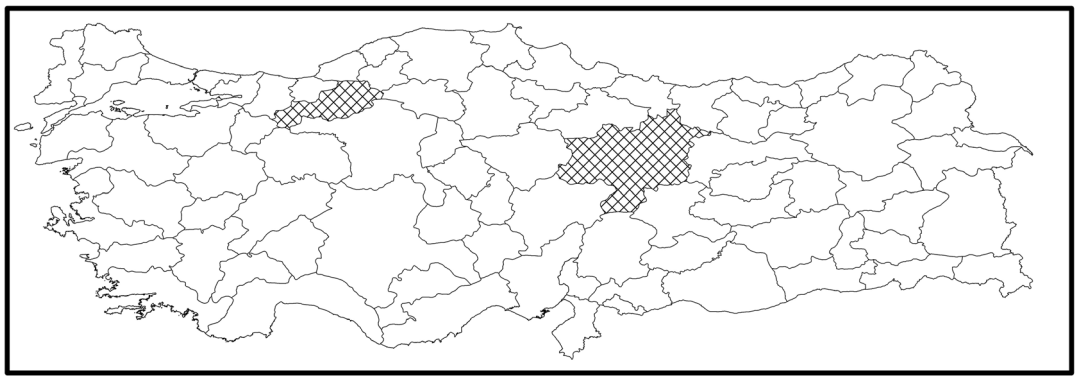

FIGURE 56. *Protonemura ressli* Zwick, 1971

***Protonemura siveci* Vinçon & Zhiltzova, 2004**

Type country and locality. Turkey, Menteşe Dağları (the type locality is located in the District of Bozdoğan in 5 km South of Altıntaş Village, in the Province of Aydın) (Vinçon & Zhiltzova 2004).

Distribution in Turkey. Aydın (Vinçon & Zhiltzova 2004); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 57).

Distribution and ecology. Turkish micro-endemic species restricted to the Menteşe Dağları, close to the Anatolian southwestern coast. It occurs in mountain brooks and springs (600–950 m). Adults emerge in spring (V).

***Protonemura spinulata* Martynov, 1928**

This species was mentioned as occurring in Turkey by Kazancı (2008) but without giving any specific localities. Below are the first confirmed records from Anatolia.

Material. Trabzon, Sumelas, Camiboğazı Yaylası, 2077 m, 8.08.2008, 1 ♀; 3.10.2008, 1 ♂, 1 ♀ (Si).

Distribution in Turkey (country record only): listed from Turkey (Kazancı 2008). Map (Fig. 58).

Distribution and ecology. Caucasus and eastern Pontus. This orophilic species was collected from high altitude streams (> 2000 m). Adults emerge in summer and autumn (VIII–X).

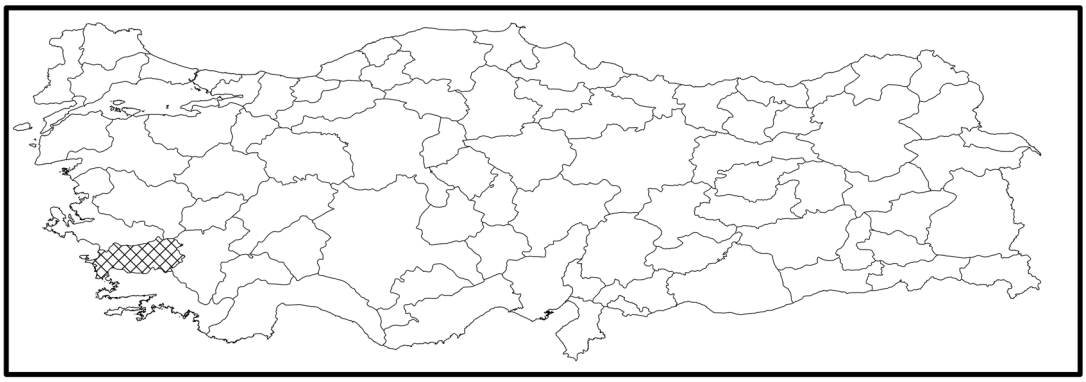

FIGURE 57. *Protonemura siveci* Vinçon & Zhiltzova, 2004

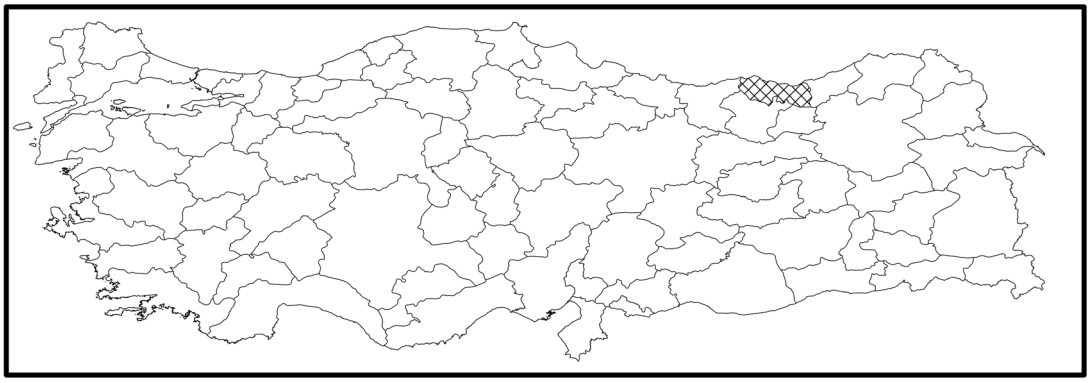

FIGURE 58. *Protonemura spinulata* Martynov, 1928

***Protonemura strandschaensis* Braasch & Joost, 1972**

First record from Turkey.

Material. Tekirdağ, Tekir Mts., Marmaraköy, stream in platan forest 3 km S the village, 250 m, N40°50.115' E27°23.355', 06.04.2007, 3 ♂, 1 ♀, 6 larvae (Mur).

Distribution and ecology. Hitherto known only from the type locality in the Bulgarian Strandcha Mts. It was found in a middle-sized, moderately fast flowing forest stream in the Tekir Mts., a habitat similar to the type locality. Map (Fig. 59).

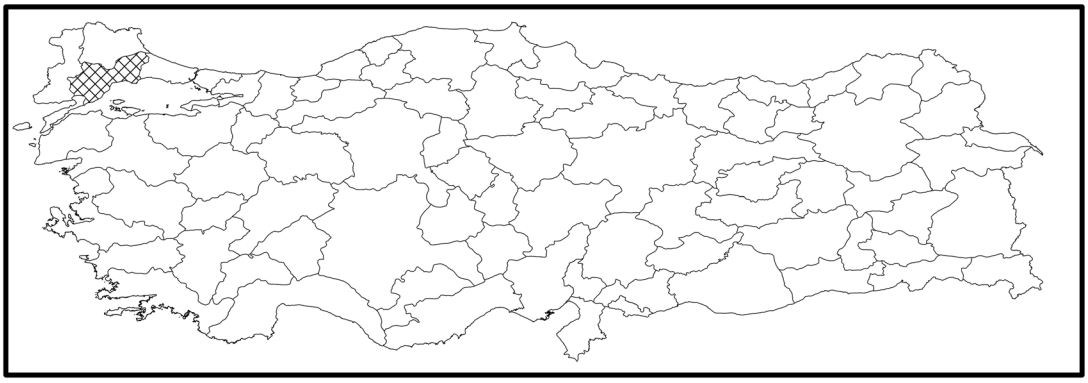

FIGURE 59. *Protonemura strandschaensis* Braasch & Joost, 1972

***Protonemura teberdensis* Zhiltzova, 1958**

Material. Giresun, Şebinkarahisar, Tamdere, 9.07.2008, 1 ♀; Tamdere, İkisu, Karagöl Yaylası, 2070 m, 16.08.2008, 1 ♀ (Si).

Distribution in Turkey. Artvin, Rize (Zwick 1971); Giresun (Zwick 1975); Artvin, Gümüşhane, Rize

(Theischinger 1976a); Trabzon (Kazancı 1994); Artvin, Ordu, Rize, Trabzon (Vinçon & Zhiltzova 2004); Trabzon (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 60).

Distribution and ecology. Caucasian species extending into the eastern Pontus (Ordu—Artvin). This orophilic species occurs in high altitude water courses (1000–2300 m). Adults emerge in spring and summer (V–VII).

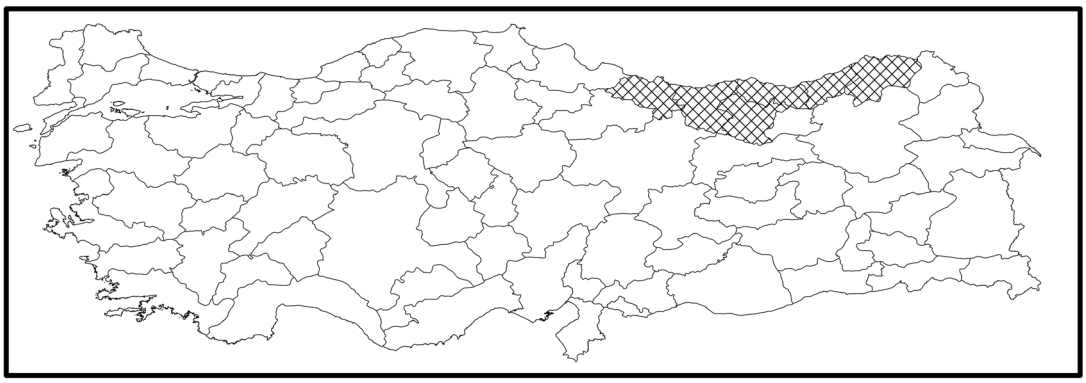

FIGURE 60. *Protonemura teberdensis* Zhiltzova, 1958

***Protonemura triangulata* Martynov, 1928**

= *Protonemura karabagi* Kazancı, 1982 (syn. fid. Kazancı 1994).

Material. Giresun, Koyulhisar Mesudiye—Arpaalan Baldıran, 11.10.2007, 4 ♀, **Giresun**: Kümbet Yaylası, Yağlıdere—Çıkrıkkapı, 1786 m, 10.07.2008, 1 ♂, 1 ♀; Kümbet yaylası, 1600 m, 17.08.2008, 1 ♀; İkisu, Karagöl yaylası,—Bektaş Yaylası, 1825 m, 1.10.2008, 3 ♂, 1 ♀; **Giresun**, Uzundere—Şebinkarahisar, < Tamdere, 1600 m, 1.10.2008, 1 ♂, 1 ♀ (Si). **Çorum**, Ilgaz mountains, Kargı, Pelit Yaylası, 24.10.2009, 1 ♀ (Si). **Sinop**: Dikmen, Durağan istikameti, 1015 m, 25.10.2009, 1 ♀. **Sinop**: Hanönü—Ayancık, Çangal mountain, 1190 m, 26.10.2009, 1 ♀ (Si). **Karabük**, Safranbolu, Bulak, Mencilis Mağarası (Mencilis Cav), 690 m, 22.10.2011, 1 ♂ (Si).

Distribution in Turkey. Bolu (Kazancı 1982); Bolu (as *Protonemura karabagi* Kazancı, 1982) (Kazancı 1983b); Bolu (Kazancı 1994); Bolu (Kazancı 2009a); Rize (Kazancı 2009b); **country record only:** listed from Turkey (Vinçon & Zhiltzova 2004; Kazancı 2008). Map (Fig. 61).

Distribution and ecology. This Caucasian species extends throughout the Pontus. It is an orophilic, stenothermal cold water species. Adults emerge from summer to autumn (VII–X).

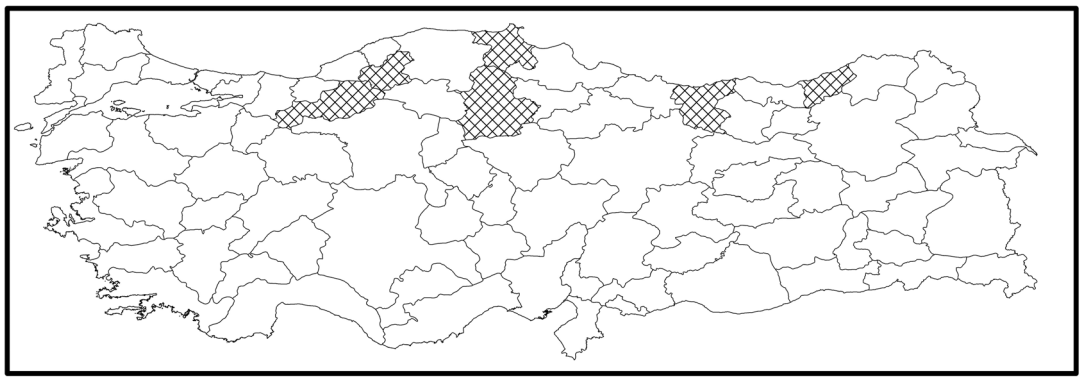

FIGURE 61. *Protonemura triangulata* Martynov, 1928

***Protonemura vernalis* Zhiltzova, 1958**

Distribution in Turkey. Rize (Zwick 1978a); Rize (Vinçon & Sivec 2001); **country record only:** listed from Turkey (Kazancı 1983b; Vinçon & Zhiltzova 2004; Kazancı 2008). Map (Fig. 62).

Distribution and ecology. The range of this Caucasian species barely extends into the eastern Turkish Pontus. Strongly orophilic, stenothermal cold water species occurring in very high brooks and springs (2430–2700 m). Adults emerge in spring (VI).

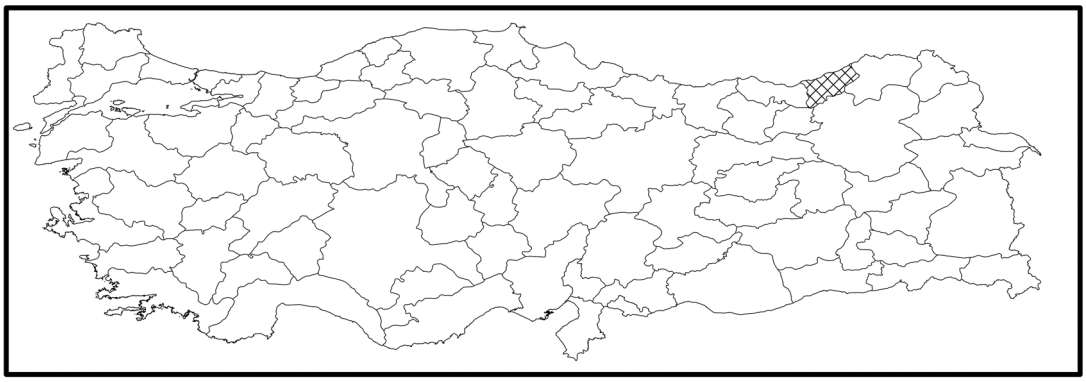

FIGURE 62. *Protonemura vernalis* Zhiltzova, 1958

***Protonemura vonbursa* Theischinger, 1979**

Type country and locality. Turkey, Uludağ (Bursa) (Theischinger 1979).

Distribution in Turkey. Bursa (Theischinger 1979); Bursa (Vinçon & Zhiltzova 2004); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 63).

Distribution and ecology. Turkish micro-endemic species restricted to the Uludağ massif near Bursa. A orophilic cold water stenothermal species occurring in brooks and springs (1000–1450 m). Adults emerge in spring (V–VI).

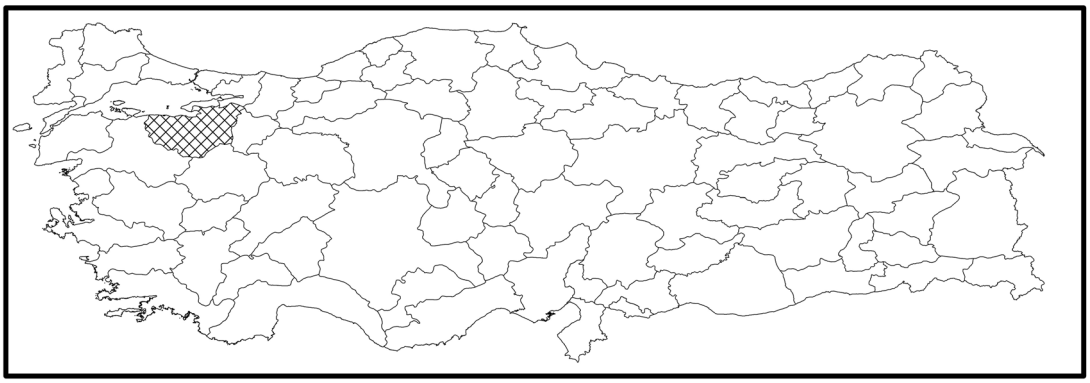

FIGURE 63. *Protonemura vonbursa* Theischinger, 1979

SUBFAMILY NEMOURINAE Newman, 1853

GENUS *Nemoura* Latreille, 1796

***Nemoura asceta* Murányi, 2007**

First record from Turkey.

Material. Tekirdağ, Tekir Mts., Yeniköy, torrent in secondary bush at the village (W Arköy), 255 m, N40°38.707' E27°00.767', 05.04.2007, 7 ♂, 5 ♀, 3 larvae (Mur).

Distribution and ecology. Recently described from North Albania, this is the second known record. A species of small karst torrents. Adults emerge in spring (IV). Map (Fig. 64).

***Nemoura brevipennis* Martynov, 1928**

Distribution in Turkey. Kahramanmaraş (Zwick 1971); Adana (Zwick 1975); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 65).

Distribution and ecology. Caucasus and eastern Anatolia where it is only reported from central Taurus. Adults emerge in spring (V).

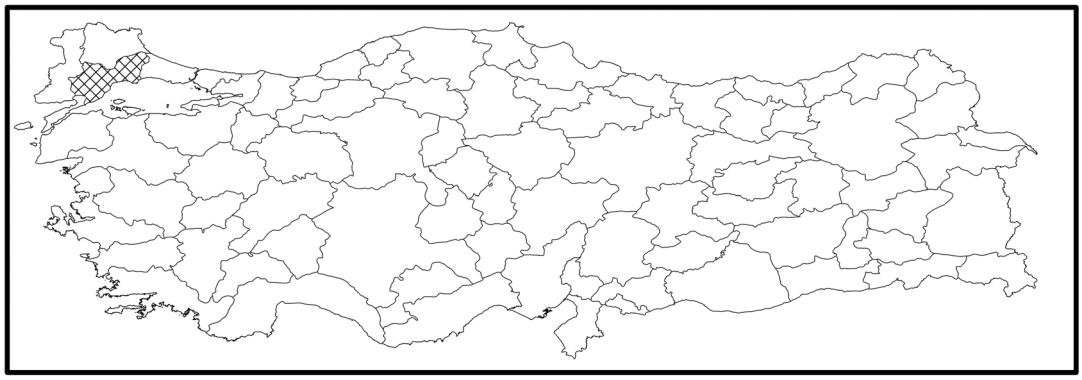

FIGURE 64. *Nemoura asceta* Murányi, 2007

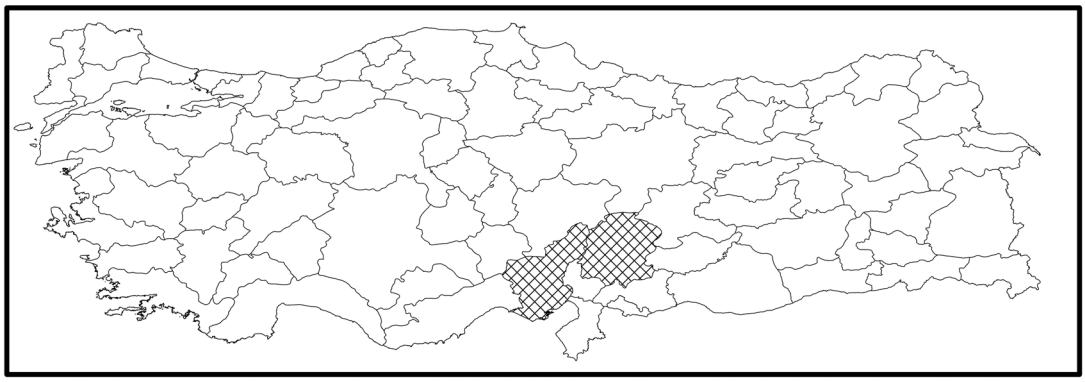

FIGURE 65. *Nemoura brevipennis* Martynov, 1928

***Nemoura cambrica* Stephens, 1836**

First record from Turkey.

Material. Kırklareli, Istrancha Mts., Alabalık Stream along the Pınarhisar –Demirköy road, 540 m, N41°44.667' E27°39.279', 06.04.2007, 1 ♂ (Mur);. **Kırklareli**, Istrancha Mts., brook in a beech forest along the Pınarhisar–Demirköy road, 780 m, N41°45.289' E27°40.830', 06.04.2007, 6 ♂, 2 ♀ (Mur).

Distribution and ecology. A Central European species, occurring in small and middle sized streams of the submontane and montane regions. In the Balkans it was known only from Bosnia-Herzegovina. The records from Macedonian are dubious (Ikonomov 1986). Adults emerge in spring (IV). Map (Fig. 66).

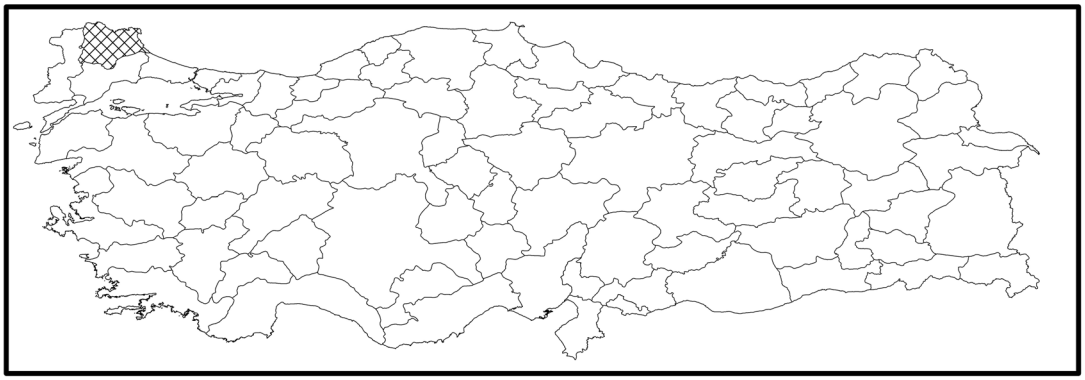

FIGURE 66. *Nemoura cambrica* Stephens, 1835

Excluded: *Nemoura carpathica* Illies, 1963

The drawings of the supposed *N. carpathica* given by Zwick (1971) correspond to *N. subtilis* (Zwick 1975) and they probably have resulted in the following misidentifications by Kazancı (2008, 2009a, 2009b). According to

Zwick (1975), *N. carpathica* should be considered as a Carpathian endemic species. We exclude this species from the Turkich fauna.

***Nemoura cinerea cinerea* (Retzius, 1783)**

Material. Kırklareli, Trakya, Velika, Köprü Yenice, 10 km SW Demirkoy, 350 m, 4.07.1995, 1 ♂, 1 ♀ (Ho). Dupnısa mağarası, Sarpdere İncesırt Demirkoy, 350 m, 3.04.1995, 2 ♂, 2 ♀ (Ho). **İzmir**, Bergama—Kozak, 15 km, 7.05.1997, 1 ♂ (Vi).

Distribution in Turkey. Ankara, Bolu, Çankırı, Eskişehir, Yozgat (Kazancı 1982); Bayburt (Kazancı 2008); Balıkesir, Bursa, Tekirdağ (Kazancı 2009a).

Distribution and ecology. A Eurasian subspecies occurring in western Anatolia. Map (Fig. 67).

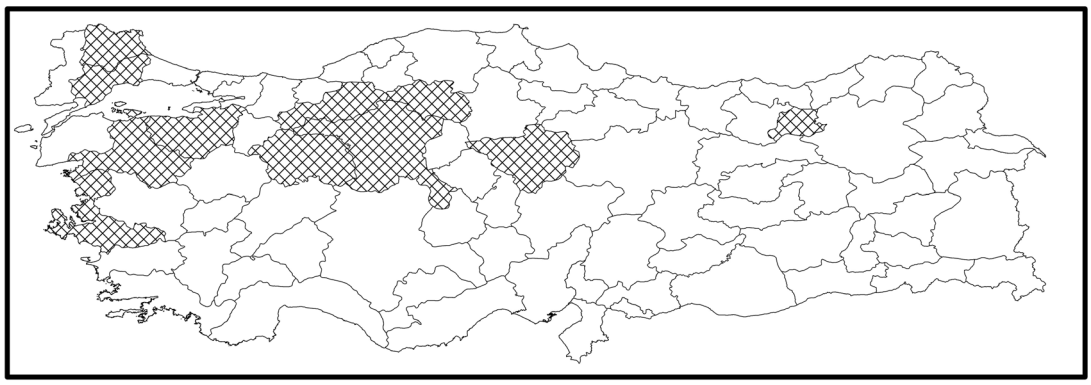

FIGURE 67. *Nemoura cinerea cinerea* (Retzius, 1783)

***Nemoura dromokeryx* Theischinger, 1976b**

Type country and locality. Turkey, Şavşat (The District of Şavşat is located in the Province of Artvin) (Theischinger 1976b).

Material. Trabzon, Of, Dernekpazarı, brook, 12.05.1997, 2 ♂ (Vi).

Distribution in Turkey. Artvin (Theischinger 1976b); Rize (Zwick 1971, sub. nom. *N. martynovia*, fide Theischinger 1976b); the other reports of *N. martynovia* in Zwick (1971) based on females only are not accepted; **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 68).

Distribution and ecology. Turkish micro-endemic species of the eastern region of the Pontus (Of—Artvin). It occurs in mountain brooks and torrents (600–2000 m). Adults emerge in spring (V–VI).

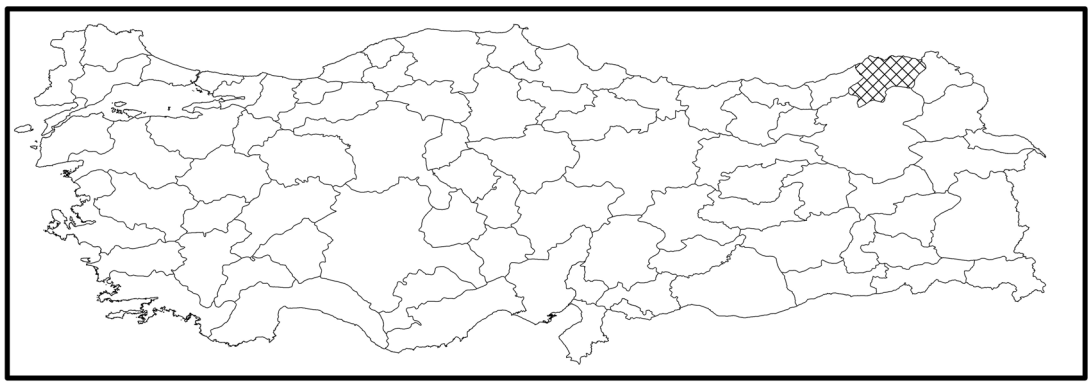

FIGURE 68. *Nemoura dromokeryx* Theischinger, 1976

***Nemoura flexuosa* Aubert, 1949**

Material. Bursa, Uludağ, 7 km NW Soğukpınar yolu, 1200 m, 4.06.1992, 1 ♂ (Ma). **Bolu**, Hacıayaz Geçidi, Göynük—Mudurnu, 9.05.1997, 1 ♂ (Vi). **Ordu**, > Gölköy, near Harcebeli, 11.05.1997, 1 ♂ (Vi). **Ankara**, N. Ankara, Işık Dağı geçidi, 15.05.1997, 1 ♂, 4 ♀ (Vi). **Ankara**, Beypazarı, Karasar > Eğriova, 1500 m, 19.05.1997, 2 ♂ (Si).

Distribution in Turkey. Bolu (Zwick 1971); Bolu (Kazancı 1982); Bolu, Çankırı (Kazancı 1983b); Ankara, Bolu, Çankırı, İzmir, Kastamonu, Zonguldak (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 69).

Distribution and ecology. Central and North European, northern Anatolia (Bursa—Ordu). It occurs in mountain brooks and torrents (1200–1500 m). Adults emerge in spring (V–VI).

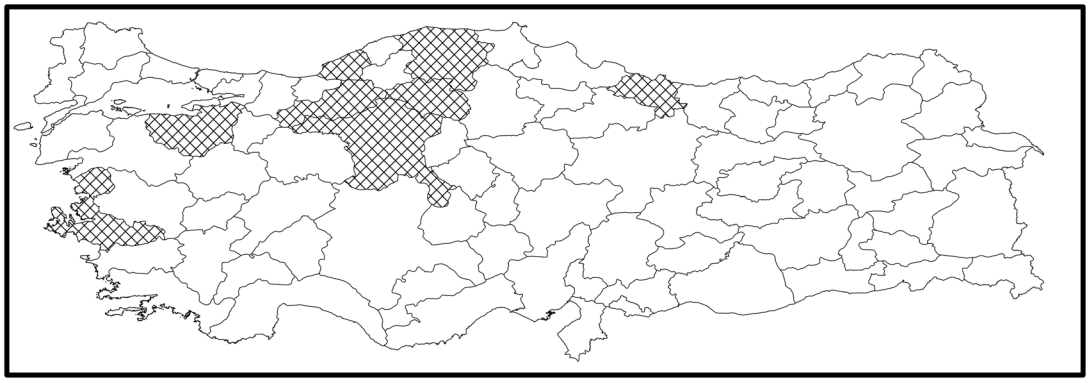

FIGURE 69. *Nemoura flexuosa* Aubert, 1949

***Nemoura martynovia* Claassen, 1936**

The drawings of the supposed *N. martynovia* given by Zwick (1971) correspond to *N. dromokeryx* and subsequent misidentifications may have occurred.

Material. Rize, İkizdere, Anzer, Ballıköy, 2080 m, 19.07.1984, 2 ♂, 1 ♀ (Si). **Artvin**, Borçka, Camili: Mereta Yaylası—Uğurköy, 1500 m, 4.08.1995, 1 ♂, 1 ♀; Lekoban Yaylası, 2400 m, 7.08.1996, 2 ♂, 2 ♀ (Si). **Giresun**, Tamdere, Kümbet, Aksu br., 1550 m, 27.06.1995, 1 ♂, 2 ♀ (Ho).

Distribution in Turkey. Artvin (Theischinger 1976a); Artvin, Erzurum, Gümüşhane (Theischinger 1976b); Ankara, Bolu (Kazancı 1982); Erzurum (Kazancı 2009a); Giresun, Trabzon (Kazancı 2009b); Trabzon (Kazancı 2013); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 70).

Distribution and ecology. Caucasus, eastern Pontus (Giresun—Artvin—Erzurum). A strongly orophilic species that occurs in high mountain streams (1500–2500 m). Adults emerge in late spring and summer (VI–VIII).

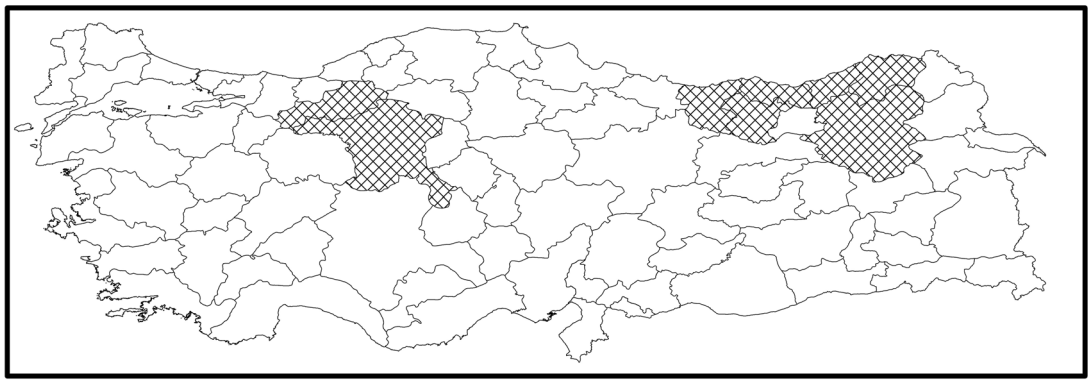

FIGURE 70. *Nemoura martynovia* Claassen, 1936

***Nemoura subtilis* Klapálek, 1896**

Material. European Turkey, **Kırklareli**, Dupnisa Mağarası, Sarpdere İncesırt Demirkoy, 350 m, 3.04.1995, 1 ♂, 5 ♀ (Ho). **Balıkesir**, 20 km NE Edremit—Kalkim, 600 m, 2.06.1992, 1 ♂, 1 ♀ (Ma).

Distribution in Turkey. Ankara, Bolu, İçel, Kahramanmaraş, Kırklareli, Ordu, Sakarya, Tunceli (Zwick 1971 as *N. carpathica*, fide Zwick 1975)**;** Antalya, Bolu (Kazancı 1983b); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 71).

Distribution and ecology. Southwestern Carpathians, Balkans, European Turkey, entire Anatolia. This species occurs in various types of mountain streams (350–1400 m). Adults emerge in spring (IV–VI).

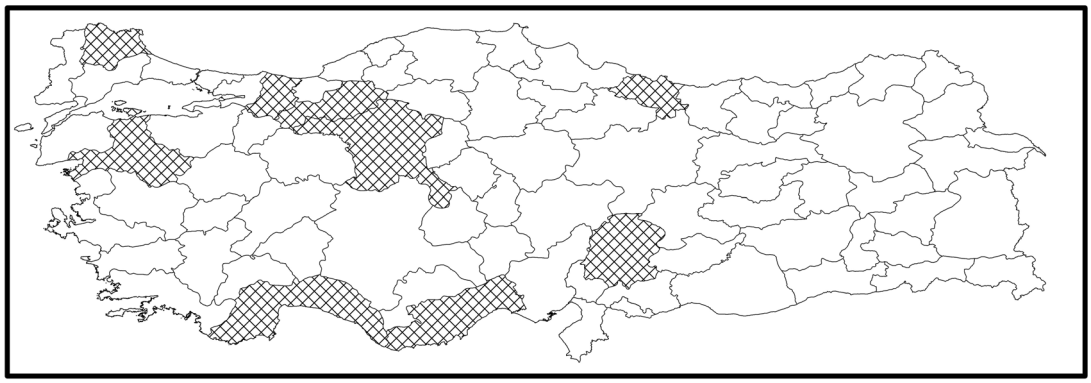

FIGURE 71. *Nemoura subtilis* Klapálek, 1896

***Nemoura taurica* Zhiltzova, 1967**

Material. İzmir, Salihli—Birgi, 20 km from Ödemiş, 800 m, 22.05.1992, 1 ♂, 1 ♀ (Si). **Aydın**, Nazilli, 5 km S Bozdoğan, 600 m, 23.05.1992, 1 ♂ (Si). **Aydın**, Bozdoğan, 5 km S Altıntaş Köyü, Menteşe Dağları, 950 m, 23.05.1992, 1 ♂, 1 ♀ (Si). **Muğla**, Menteşe Dağları, 820 m, 24.05.1992, 5 ♂, 9 ♀ (Si). **Bolu**, Gerede, Akyurt vadisi, 1300 m, 19.05.1996, 1 ♂, 1 ♀ (Si). **İzmir**, Turgutlu—Bayendir, 3 km S Kamberler Köyü, 600 m, 21.05.1992, 9 ♂, 5 ♀; Turgutlu—Bayendir, 7 km S Kamberler Köyü, 430 m, 21.05.1992, 2 ♂, 1 ♀; **Manisa**, 19 km S Salihli, 1000 m, 22.05.1992, 2 ♂; **İzmir**, Salihli—Birgi, 20 km to Ödemiş, 800 m, 22.05.1992, 3 ♂, 2 ♀ (Ma). **Aydın**, Nazilli—Beydağ, 730 m, 23.05.1992, 1 ♂; **Aydın**, Nazilli, 5 km S Bozdoğan, 600 m, 23.05.1992, 2 ♂, 2 ♀ (Ma). **Muğla**, Menteşe dağları, 820 m, 24.05.1992, 32 ♂, 38 ♀ (Si). **Antalya,** Akseki, Karpuz Riv., 5.05.1997, 1 ♂ (Vi). **Antalya**, Alanya: Topraktepe Riv., near Gündoğmuş, 5.05.1997, 1 ♂; near Gündoğmuş, br., 5.05.1997, 16 ♂, 13 ♀ (Vi). **Antalya**, Altınyaka, W Antalya, Bey dağları, 6.05.1997, 5 ♂, 4 ♀ (Vi). **Aydın**, Karacasu, Tavas—Nazilli, 6.05.1997, 4 ♂, 2 ♀ (Vi). **Aydın**, Nazilli: Hasköy—Samailli, br., 6.05.1997, 4 ♂, 4 ♀; > Samailli, br., 6.05.1997, 3 ♂, 2 ♀; **İzmir**,> Beydağ, 7.05.1997, 5 ♂, 5 ♀ (Vi). **Konya**, 4 km NW Hadim, 1800 m, 6.06.1998, 4 ♂, 7 ♀ (Si). **Ankara**, Çamlıdere, Ecevit yaylası, 1350 m, 15.06.2004, 4 ♂, 4 ♀ (Si). **Isparta,** Yenişarbademli, Pınargözü, 1200 m, 13.06.2007, 1 ♂ (Si). **Isparta**, Yenişarbademli, Eğridir, 1758 m, 8.06.2014, 2 ♂, 1 ♀ (Si).

Distribution in Turkey. Adana, Adıyaman, Bolu, İzmir, Kahramanmaraş (Zwick 1971); İçel Mersin (Zwick 1975); Muş (Theischinger 1976b); Ankara, Bolu (Kazancı 1982); Ankara, Antalya (Kazancı 1983b); Giresun (Kazancı 2009b); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 72).

Distribution and ecology. Crimea, Greece, whole Anatolia. This species occurs in various types of mountain streams (430–1800 m). Adults emerge in spring (V–VI).

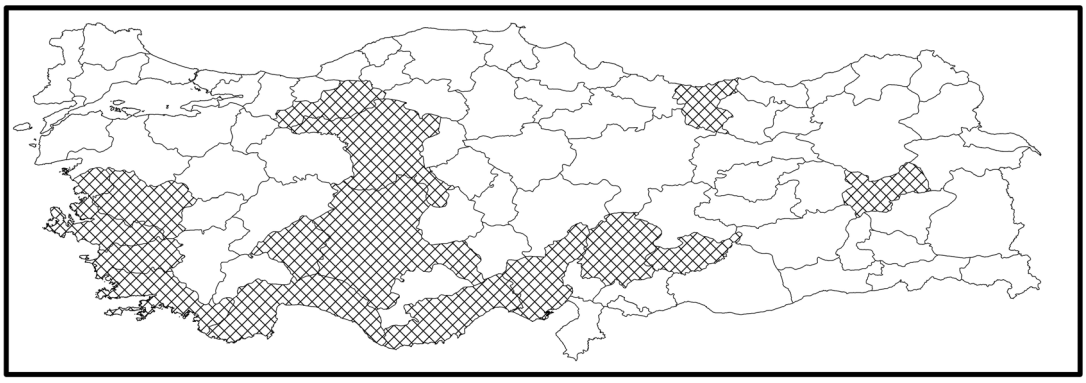

FIGURE 72. *Nemoura taurica* Zhiltzova, 1967

***Nemoura turcica* Zwick, 1972 (new status)**
***Nemoura cinerea turcica* Zwick, 1972**

Nemoura c. cinerea and *N. c. turcica* are sympatric in Greece and western Anatolia, supporting the recognization of two valid species. *Nemoura turcica* is therefore considered a full species.

Type country and locality. Turkey, Akiyama Pass, Civcan Dağı (The mountain located in the Province of Bolu) (Zwick 1972).

Material. Bolu, Abant, Bulanık Yaylası, 18.06.1982, 3 ♂, 4 ♀ (Si). **Rize**, İkizdere, Anzer, Ballıköy, 2080 m, 19.07.1984, 3 ♂ (Si). **Bursa**, Uludağ, 1600–1800 m, 4.06.1992, 1 ♂ (Ma). **Aksaray**, Güzelyurt, 16.05.1993, 2 ♂, 1 ♀ (Si). **Kayseri**, Kıskaçlı, N Sariz, 16.07.1993, 1 ♂ (Ch). **Bursa**, 11 km SW Oylat, Saadet, Köyü, 1000 m, 19.05.1994, 4 ♂, 6 ♀; **Bursa**, İnegöl, Ortaca Köyü, 5 km W Karagöz Yaylası, 20.05.1994, 2 ♂, 1 ♀ (Si). **Kayseri**, 10 km S Hisarcık, Erciyes Mts, 1970–2100 m, 16.06.1995, 2 ♂, 2 ♀ (Ho). **Çankırı**, Ilgaz Dağı Geçidi, 1650 m, 29.06.1995, 11 ♂, 17 ♀ (Ho). **Artvin**, Şavsat, Karaköy, 1900 m, 31.07.1995, 1 ♂, 1 ♀ (Si). **Bolu**, Gerede, Akyurt vadisi, 1300 m, 19.05.1996, 12 ♂, 13 ♀ (Si). **Çankırı**, Çerkes, Işık Dağı, Sofular deresi, 1550 m, 16.06.1996, 17 ♂, 18 ♀ (Si). **Bursa**: 8 km < Uludağ, 8.05.1997, 1 ♂, 3 ♀; Soğukpınar, 8.05.1997, 2 ♂, 2 ♀ (Vi). **Bolu**, Hacıayaz Geçidi, Göynük—Mudurnu, 9.05.1997, 15 ♂, 11 ♀ (Vi). **Ankara**, N Ankara, Güvem—Salın, 15.05.1997, 2 ♂, 1 ♀ (Vi). **Ankara**, Beypazarı, Karasar > Eğriova, 1000 m, 19.05.97, 1 ♂, 6 ♀ (Si). **Konya**, 7 km W Hadim, 1700 m, 5.06.1998, 43 ♂, 29 ♀ (Si). **Ankara**: Yaylabağ Köyü, 1000 m, 11.05.2000, 10 ♂, 12 ♀; 115 km Kızılcahaman—Akyarma, 14.06.2000, 6 ♂, 8 ♀ (Si). **Isparta**, Yenişarbademli, Dedegöl Mts, Aksu, 1650 m, 21.05.2004, 12 ♂, 8 ♀. **Konya**, Akşehir- Gelendost, Sultan Dağları, 1650 m, 19.06.2005, 4 ♂, 4 ♀; **Konya**: Beyşehir, Bakaran Çayı, 1400 m, 3.05.2009, 5 ♂, 7 ♀ (Si).

Distribution in Turkey. Bolu (Zwick 1972); Bolu, Bursa, Çorum, Nevşehir (Zwick 1975); Bolu, Erzincan, Gümüşhane, Kars, Samsun (Theischinger 1976a); Muş (Theischinger 1976b); Ankara, Yozgat (Kazancı 1982); Ankara, Bayburt, Bolu, Çankırı, Erzurum, Giresun, Kars, Kastamonu, Kayseri, Sivas, Yozgat (Kazancı 2009a); Gümüşhane, Trabzon (Kazancı 2009b); Trabzon (Kazancı 2013); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 73).

Distribution and ecology. This species extends into Greece (Zwick 1978b) and in the northern part of Anatolia. It is very eurytopic, occurring in various kinds of mountain streams (1000–2100 m) but preferently with low flow. Adults emerge in spring and early summer (V–VII).

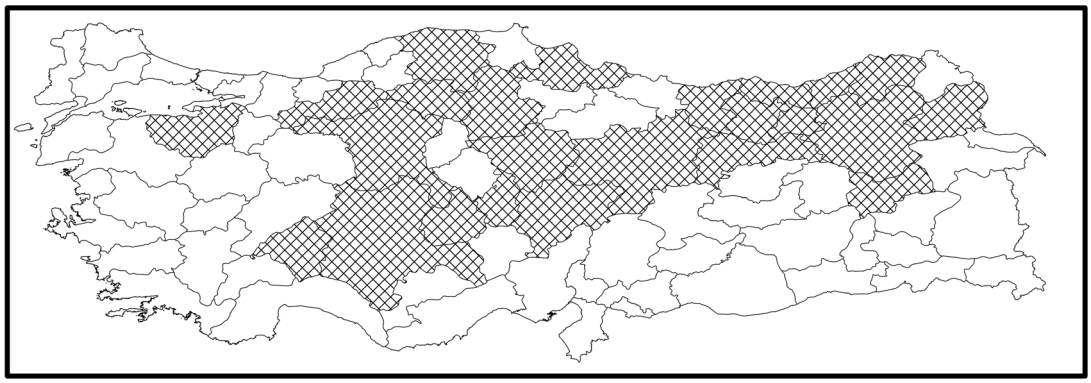

FIGURE 73. *Nemoura turcica* Zwick, 1972

***Nemoura uncinata* Despax, 1934**

First record from Turkey.

Material. Bursa, Uludağ: Soğukpınar yolu, 1200 m, 4.06.1992, 1 ♂ (Si); 7 km NW Soğukpınar yolu, 1200 m, 4.06.1992, 1 ♂ (Ma). **İzmir**, Ödemiş, > Bozdağ, 7.05.1997, 2 ♂, 4 ♀ (Vi). **Bursa**, road to Soğukpınar, 8.05.1997, 3 ♂, 1 ♀ (Vi). **Bolu**, Yedigöller Milliparkı, after the Park house, 9.05.1997, 3 ♂, 1 ♀ (Vi). Map (Fig. 74).

Distribution and ecology. A Central and South European species, occurring in northwestern Anatolia (Ödemiş—Bolu). This species occurs in various types of mountain streams of moderate altitude (1200 m). Adults emerge in spring (V–VI).

***Nemoura wittmeri* Zwick, 1975**

Type country and locality. Turkey, Torul (Torul is a District of the Province of Gümüşhane) (Zwick 1975).

Material. Rize, İkizdere, Sivrikaya, 1850 m, 9.07.1984, 2 ♂, 3 ♀ (Si). **Rize**, Çamlihemşin, Ayder, 1700 m, 17.07.1984, 1 ♂, 1 ♀; 1400 m, 1.08.1989, 1 ♂ (Si). **Ordu**, > Gölköy, near Harcebeli, 11.05.1997, 6 ♂, 6 ♀ (Vi). **Gümüşhane**, Zigana Geçidi, SW Trabzon, 11.05.1997, 11 ♂, 13 ♀ (Vi).

Distribution in Turkey. Gümüşhane (Zwick 1975); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 75).

Distribution and ecology. Turkish endemic species occurring in the eastern half of the Pontus (Ordu—Rize). This orophilic, stenothermal cold water species occurs in high mountain brooks (1300–1850 m). Adults emerge in spring and summer (V–VIII).

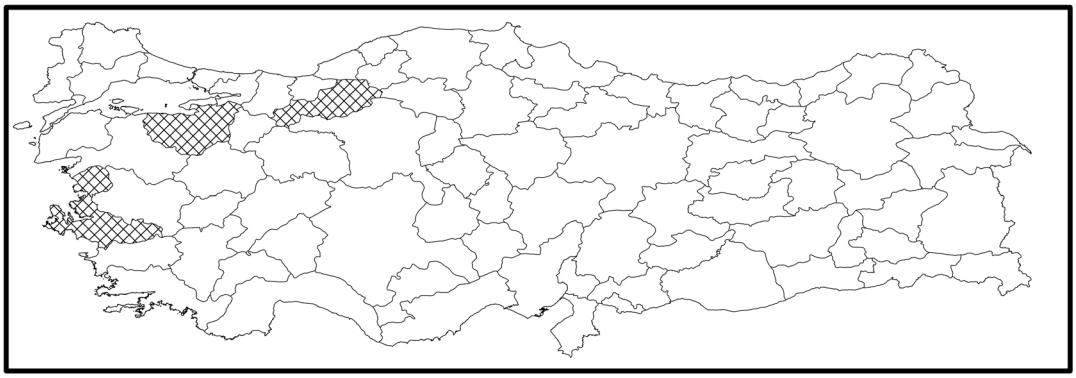

FIGURE 74. *Nemoura uncinata* Despax, 1934

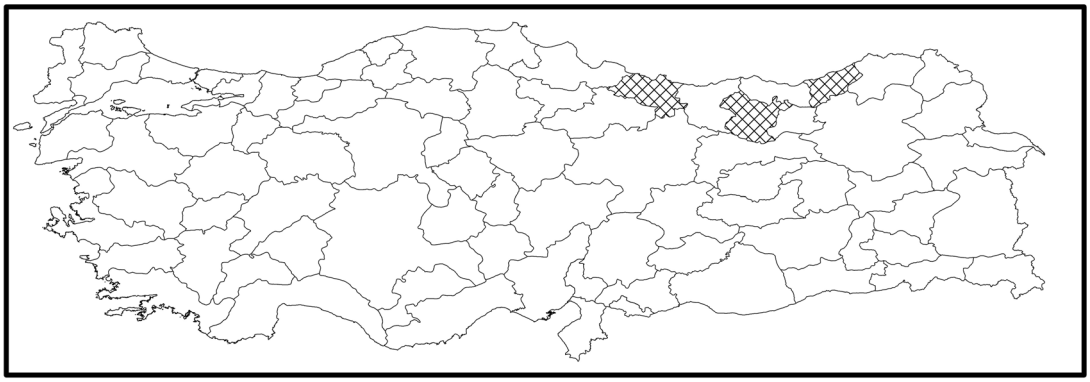

FIGURE 75. *Nemoura wittmeri* Zwick, 1975

FAMILY TAENIOPTERYGIDAE Klapálek, 1905

SUBFAMILY TAENIOPTERYGINAE Zwick, 1973

GENUS *Taeniopteryx* Pictet, 1841

Taeniopteryx caucasica Zhiltzova, 1981

First record of the genus *Taeniopteryx* from Turkey.

Material. Rize, Ovitdagı geçidi, torrent bordered with snow on the southern slope of the pass, 2600 m, 12.05.1997, 10 ♂, 10 ♀ (Vi).

Distribution and ecology. Caucasus, eastern Pontus (Rize). We found adults in May on the snow bordering a high altitude torrent (2600 m a.s.l.). Adults emerge in spring (V). Map (Fig. 76).

SUBFAMILY BRACHYPTERAINAE Zwick, 1973

GENUS *Brachyptera* Newport, 1848

Brachyptera ankara Kazancı, 2000

Type country and locality. Turkey, Çamkoru (Çamkoru is located in the District of Çamlıdere, the Province of Ankara) (Kazancı 2000).

Distribution in Turkey. Ankara (Kazancı 2000); Düzce (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 2001; Kazancı 2008). Map (Fig. 77).

Distribution and ecology. Micro-endemic species occurring in the western part of the Pontus and in the region of Ankara. Adults emerge from autumn to spring (X–IV).

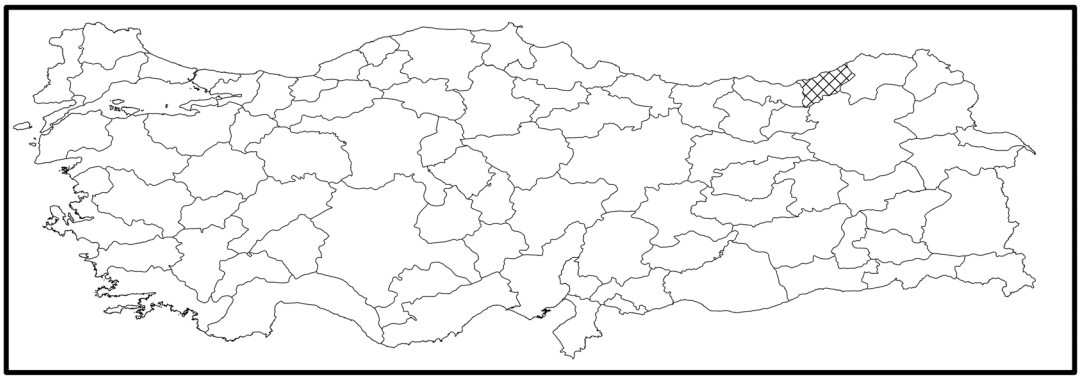

FIGURE 76. *Taeniopteryx caucasica* Zhiltzova, 1981

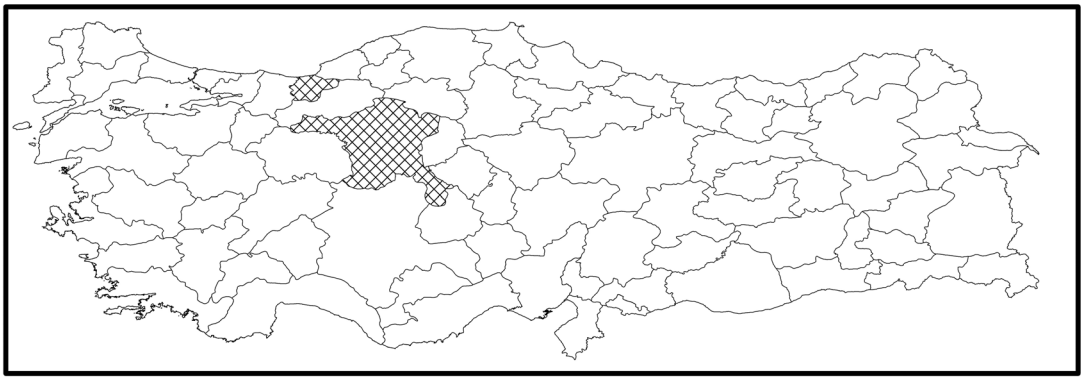

FIGURE 77. *Brachyptera ankara* Kazanci, 2000

***Brachyptera berkii* Kazancı, 2001**

Type country and locality. Turkey, Uludağ (Bursa) (Kazancı 2001).

Material. Muğla, Mentese, Menteşe dağları, 820 m, 24.05.1992, 1 ♀ (Si). **Bursa**, Uludağ, 1100 m, 4.06.1992, 1 ♂, 1 ♀; Soğukpınar yolu, 1200 m, 4.06.1992, 1 ♂, 6 ♀; 11 km SW Oylat, Saadet, Köyü, 1000 m, 19.05.1994, 3 ♂ (Si). **İzmir**, Salihli—Birgi, 20 km from Ödemiş, 800 m, 22.05.1992, 1 ♂, 1 ♀ (Ma). **Aydın**, Nazilli, 5 km S Bozdogğan, 600 m, 23.05.1992, 1 ♀ (Ma). **Muğla**, Menteşe, 820 m, 24.05.1992, 4 ♀ (Ma). **Bursa**: Uludağ, 1600–1800 m, 4.06.1992, 2 ♀; Uludağ, 7 km NW Soğukpınar yolu, 1200 m, 4.06.1992, 13 ♂, 14 ♀; Uludağ, 1 km N Sogukpınar yolu, 1000 m, 4.06.1992, 1 ♀ (Ma). **Aydın**, Nazilli: Hasköy—Samailli, 6.05.1997, 3 ♂, 5 ♀; **İzmir** > Beydağ, 7.05.1997, 11 ♂, 7 ♀ + 3 ex (Vi). **İzmir**, Ödemiş > Bozdağ, tor., 7.05.1997, 3 ♂, 9 ♀ (Vi). **Bursa**, 8 km < Uludağ, tor., 8.05.1997, 2 ♂, 1 ♀; road to Soğukpınar, 8.05.1997, 5 ♂, 7 ♀; S Çekirge, 450 m, 8.05.1997, 1 ♀ (Vi).

Distribution in Turkey. Bursa (Kazancı 2001); **country record only:** listed from Turkey (Kazancı 2008); Büyük Menderes Nehri (Kazancı 2009a). Map (Fig. 78).

Distribution and ecology. Turkish micro-endemic species of western Anatolia (Muğla—Bursa). A orophilic species occurring in various types of mountain streams (450–1800 m). Adults emerge in spring (V–VI).

***Brachyptera demirsoyi* Kazancı, 1983**

Type country and locality. Turkey, Çamkoru (Çamkoru is located in the District of Çamlıdere, the Province of Ankara) (Kazancı 1983a).

Distribution in Turkey. Ankara (Kazancı 1983a); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2000; Kazancı 2001; Kazancı 2008). Map (Fig. 78).

Distribution and ecology. Turkish micro-endemic species of the region of Ankara. A orophilic species only known from the type locality (1340 m). Adults emerge in spring (IV).

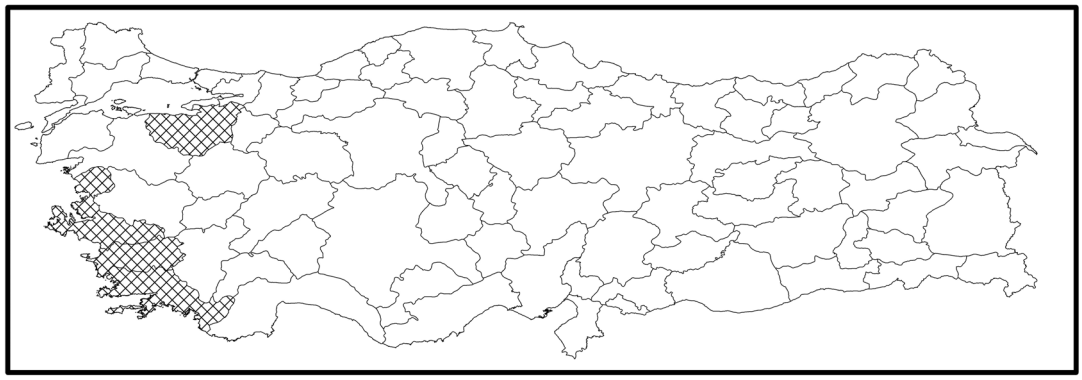

FIGURE 78. *Brachyptera berkii* Kazanci, 2001

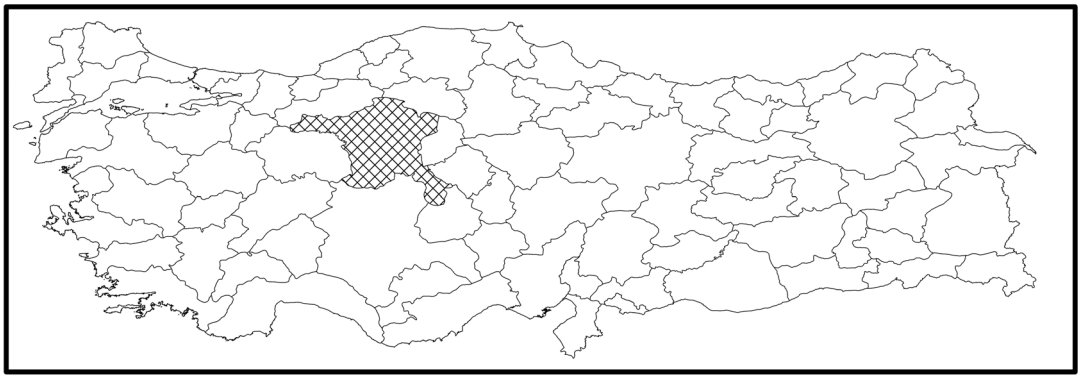

FIGURE 79. *Brachyptera demirsoyi* Kazanci, 1983

***Brachyptera risi* (Morton, 1896)**

First record from Turkey.

Material. Kırklareli, Istranca Dağları, stream in alder gallery along the Demirköy–Dupnisa mağarasi road, 445 m, N41°50.123' E27°39.666', 07.04.2007, 3 ♂, 5 ♀, 7 larvae (Mur).

Distribution and ecology. A European species that occurs in middle-sized and large streams, mainly in the submontane zone. Not known from the Caucasus. In the Balkans, this species reaches Macedonia (Ikonomov 1986) but not yet known from neighbouring Greece and Bulgaria. Map (Fig. 80).

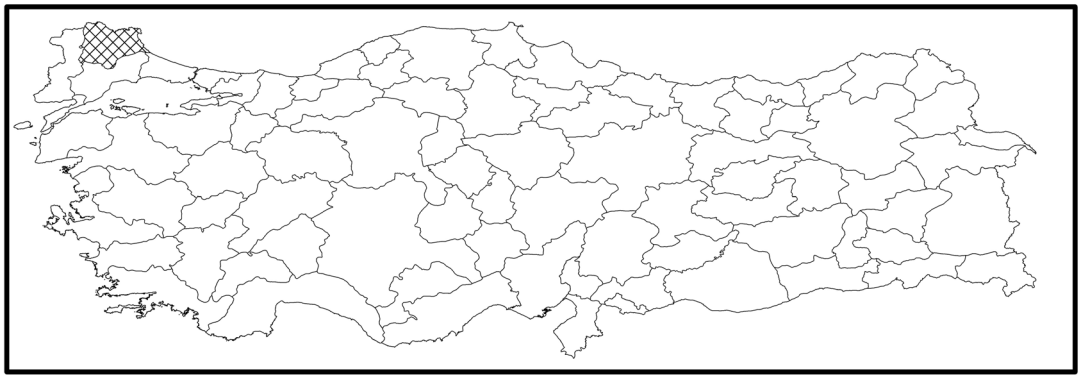

FIGURE 80. *Brachyptera risi* (Morton, 1896)

***Brachyptera sislii* Kazancı, 1982**

Type country and locality. Turkey, İlören (İlören is located in the District of Sivrihisar, the Province of Eskişehir) (Kazancı 1982).

Distribution in Turkey. Eskişehir (Kazancı 1982); Eskişehir (Kazancı 2000); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2001; Kazancı 2008). Map (Fig. 81).

Distribution and ecology. Turkish micro-endemic species reported from the region westward of Ankara in the central part of Anatolia. It is only known from the type locality (1340 m). Adults emerge in winter (II).

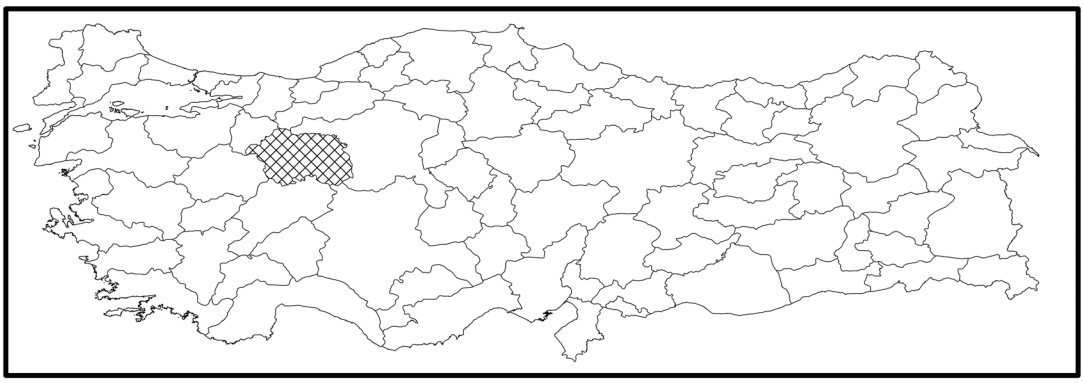

FIGURE 81. *Brachyptera sislii* Kazanci, 1983

***Brachyptera transcaucasica transcaucasica* Zhiltzova, 1956**

Material. Kastamonu, Yaralıgöz geçidi, NE Kastamonu, 10.05.1997, 1 ♀ (Vi). **Ordu**: > Gölköy, 11.05.1997, 22 ♂, 14 ♀ + 6 ex; > Gölköy, near Harcebeli, 11.05.1997, 11 ♂, 6 ♀ (Vi). **Gümüşhane**, Zigana Geçidi, SW Trabzon, 11.05.1997, 1 ♂ (Vi). **Rize**, > Dereköy, 12.05.1997, 2 ♀; **Rize**, Çamlık—Sivrikaya, 12.05.1997, 1 ♀ (Vi). **Erzincan**, E Refahiye, > Alacatlı Köyü, 14.05.1997, 10 ♂, 4 ♀ (Vi). Map (Fig. 82).

Distribution in Turkey. Gümüşhane (Zwick 1975); Kahramanmaraş, Trabzon (Zwick 1975); Gümüşhane (Theischinger 1976a); Giresun, Trabzon (Kazancı 2009b).

Distribution and ecology. Caucasus, Armenia,and in Anatolia it extends in the whole Pontus. Strongly orophilic species occurring in high mountain streams (1700–2010 m). Adults emerge in spring (V–VI).

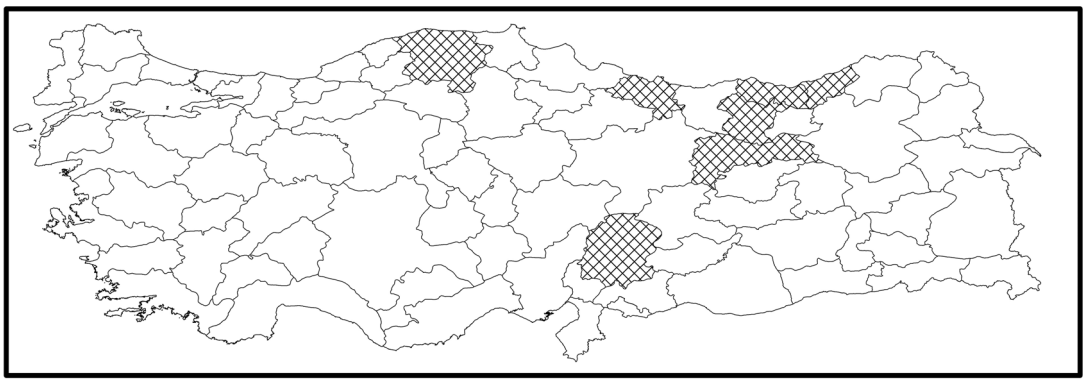

FIGURE 82. *Brachyptera transcaucasica transcaucasica* Zhiltzova, 1956

***Brachyptera transcaucasica turcica* Zwick, 1975**

Type country and locality. Turkey, Akiyama Pass, Civcan Dağı (The mountain located in the Province of Bolu) (Zwick 1975).

Material. N Ankara, Işık Dağı geçidi, 15.05.1997, 1 ♀ (Vi). **Ankara**, Beypazarı, Karasar > Eğriova, 1000 m, 19.05.1997, 10 ♂, 2 ♀ (Si).

Distribution in Turkey. Bolu (Zwick 1971 as *B. transcaucasica,* see Zwick 1975); Ankara, Bolu (Zwick 1975); Ankara, Antalya, Bolu (Kazancı 2009a); **country record only**: listed from Turkey (Kazancı 2000; Kazancı 2001; Kazancı 2008). Map (Fig. 83).

Distribution and ecology. Turkish micro-endemic subspecies of western Anatolia (Bolu—Ankara—Antalya). An orophilic species occurring in mountain streams (500–1500 m). Adults emerge in spring (IV–VI).

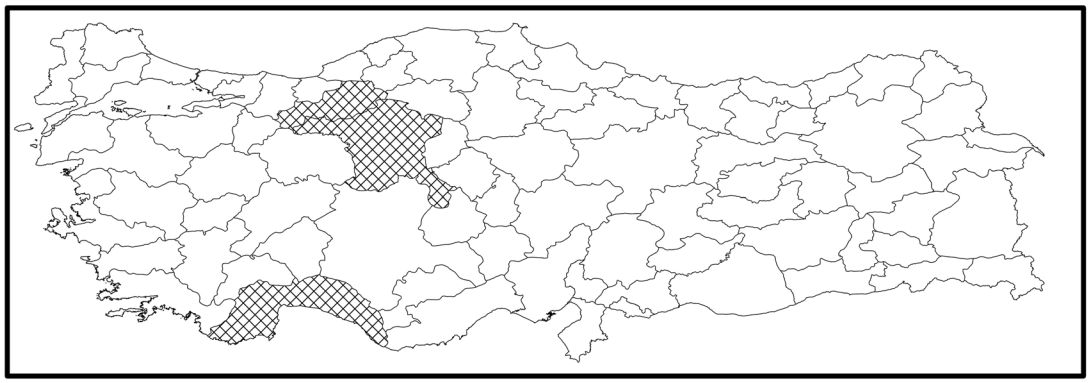

FIGURE 83. *Brachyptera transcaucasica turcica* Zwick, 1975

***Brachyptera zwicki* Braasch & Joost, 1971b**

Material. İzmir, 15 km N Bergama—Kozak, 535 m, 31.05.1992, 1 ♀ (Si). **Bursa**, Uludağ, 1100 m, 4.06.1992, 1 ♀ (Si). **Balıkesir**, 20 km NE Edremit—Kalkim, 600 m, 2.06.1992, 2 ♀ (Si), 7 ♀ (Ma). **Bursa**: Uludağ, 3 km N Soğukpınar yolu, 1000 m, 4.06.1992, 3 ♂, 6 ♀ (Si), 3 ♂, 20 ♀ (Ma); 11 km SW Oylat, Saadet Köyü, 1000 m, 19.05.1994, 2 ♂, 3 ♀ (Si). **Bolu**, Mudurnu, Sülüklü Göl, 1000 m, 25.06.1995, 1 ♀ (Si). **Bursa**, Uludağ, 7 km NW Soğukpınar yolu, 1200 m, 4.06.1992, 1♀ (Ma). **Bursa**, 8 km < Uludağ, 8.05.1997, 9 ♂, 6 ♀; Soğukpınar, 8.05.1997, 1 ♂, 2 ♀; < Soğukpınar, 8.05.1997, 2 ♂, 4 ♀; S Çekirge, 450 m, 8.05.1997, 4 ♂, 3 ♀ (Vi). **Bolu**, > Karacasu, 9.05.1997, 1 ♂, 1 ♀ (Vi). **Çankırı,** Ilgaz geçidi, N slope, 9.05.1997, 4 ♂, 1 ♀ (Vi). **Ankara**, N Ankara, < Güvem, 15.05.1997, 3 ♂, 3 ♀; Güvem—Salın, 15.05.1997, 7 ♂, 6 ♀; Işık Dağı geçidi, 15.05.1997, 7 ♂, 3 ♀ (Vi). **Ankara**, Beypazarı Karasar > Eğriova, 1000 m, 19.05.1997, 2 ♂ (Si).

Distribution in Turkey. Bolu, Sakarya (Zwick 1971); Bolu (Kazancı 1982); Ankara, Bolu, Bursa (Kazancı 2009a); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2000; Kazancı 2001; Kazancı 2008). Map (Fig. 84).

Distribution and ecology. Bulgaria, north western Anatolia. An orophilic species occurring in mountain streams (450–1200 m). Adults emerge in spring (V–VI).

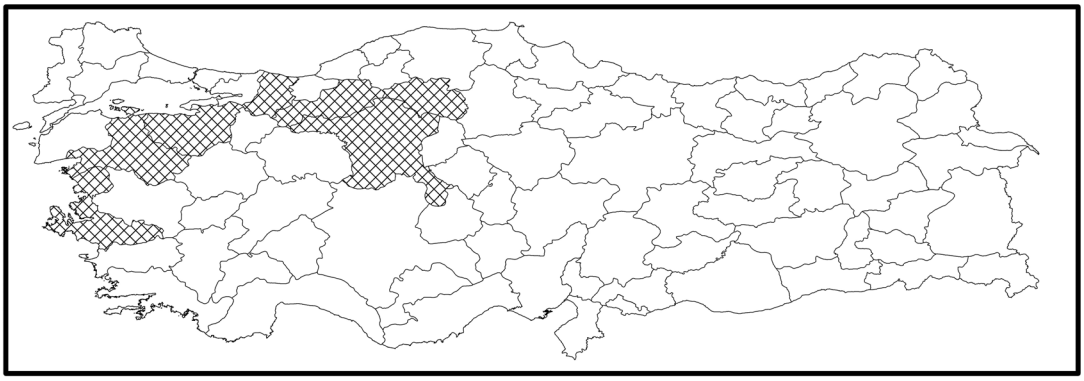

FIGURE 84. *Brachyptera zwicki* Braasch & Joost, 1971

GENUS *Rhabdiopteryx* Klapálek, 1902

***Rhabdiopteryx doiranensis* Ikonomov, 1983**

Distribution in Turkey. Muğla (Kazancı 2000). Map (Fig. 85).

Distribution and ecology. Macedonia, southwestern Anatolia. Adults emerge in winter (XI–I).

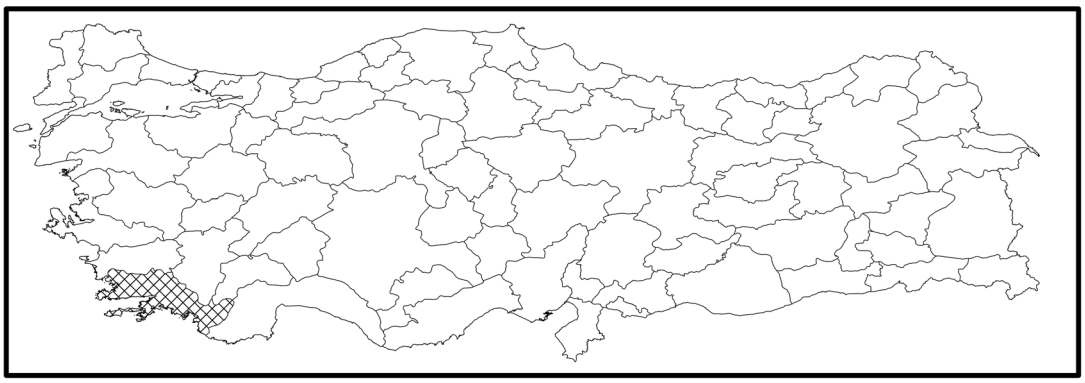

FIGURE 85. *Rhabdiopteryx doiranensis* Ikonomov, 1983

SUPERFAMILY PERLODIDAE Latreille, 1802

FAMILY CHLOROPERLIDAE Okamoto, 1912

SUBFAMILY CHLOROPERLINAE Okamoto, 1912

TRIBE Chloroperlini Okamoto, 1912

GENUS *Chloroperla* Newman, 1836

***Chloroperla zhiltzovae* Zwick, 1967**

Material. İzmir, Turgutlu—Bayındır, Çatma dağı, Osmanlı Köyü, 430 m, 21.05.1992, 2 ♂; **İzmir**, Salihli—Birgi, 25 km from Ödemiş, 800 m, 22.05.1992, 3 ♂, 6 ♀; 20 km from Ödemiş, 800 m, 22.05.1992, 3 ♂, 5 ♀ (Si), 7 ♂, 6 ♀ (Ma). **Muğla**, Yeşilyurt—Ören, Marçal dağı, 500 m, 27.05.1992, 2 ♀ (Si). **Konya**, Isparta, Sütçüler, Yazılı Kanyon, Aksu nehri, 29.05.1993, 1 ♂, 8 ♀ (Si). **Isparta,** Yenişarbademli, Pınargözü mağarası, 31.05.1993, 1 ♂, 3 ♀ (Si). **Konya**, Akşehir, Sultan dağları, 1500 m, 11.06.1994, 2 ♂, 2 ♀ (Si). **Kastamonu**, 20 km W Azdavay, Nalbantoğlu mahallesi, 500 m, 21.06.1996, 1 ♂, 1 ♀ (Si). **Giresun**, Tamdere, Kümbet, r. Aksu, 1550 m, 27.06.1995, 15 ♂, 16 ♀ (Ho). **İzmir**, Turgutlu—Bayındır, 1 km S Kamberler Köyü, 350 m, 21.05.1992, 18 ♂, 20 ♀; 3 km S Kamberler Köyü, 600 m, 21.05.1992, 2 ♀; 7 km S Kamberler Köyü, 430 m, 21.05.1992, 1 ♂, 1 ♀; **Manisa**, 19 km S Salihli, 1000 m, 22.05.1992, 2 ♂, 1 ♀ (Ma). **Aydın**, Bozdoğan, 5 km S Altıntaş Köyü, Menteşe dağları, 950 m, 23.05.1992, 1 ♂ (Ma). **Muğla**, 10 km SE Köyceğiz, Yuvarlakçay br., 100 m, 24.05.1992, 1 ♂, 1 ♀ (Ma). **Muğla**, Marmaris, Çetibeli, 70 m, 26.05.1992, 1 ♂ (Ma). 2 km E Bağyaka, 500 m, 27.05.1992, 1 ♂ (Ma). **Balıkesir**, 20 km NE Edremit—Kalkim, 600 m, 2.06.1992, 29 ♂, 32 ♀ (Ma). **Hatay**, Hüyük, SW Iskenderun, Nur dağları, tor., 3.05.1997, 4 ♂, 2 ♀ (Vi). **Antalya**, Alanya, Gündoğmuş—Köprülü, 5.05.1997, 10 ♂, 4 ♀ (Vi). **Balıkesir**, Edremit, tor. > Zeytinli, 8.05.1997, 6 ♂, 5 ♀ (Vi). **Ordu**, tor. > Gölköy, 11.05.1997, 2 ♂ (Vi). **Rize**, tor. > Dereköy, 12.05.1997, 1 ♀ (Vi). **Konya**, Beyşehir, Kurucuova, Dedegöl Mountains, Pınargozü spr., 1400 m, 21.05.2004, 1 ♂ (Si).

Distribution in Turkey. Adana, İzmir (Zwick 1971); Bolu, Çankırı, Kastamonu (Kazancı 1983b); Muğla (Kazancı *et al.* 1992); Ankara, Bolu, İzmir (Kazancı 2012); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 86).

Distribution and ecology. Caucasus and Anatolia, reported doubtfully from Albania (Murányi 2007). It is a eurytopic species occurring in various mountains streams (70–1550 m). Adults emerge in spring (V–VI).

GENUS *Plesioperla* Zwick, 1967

***Plesioperla sakartvella* (Zhiltzova, 1956)**

Material. Ordu, > Gölköy, near Harcebeli, 11.05.1997, 4 ♂, 12 ♀ (Vi). **Rize**, > Dereköy, 12.05.1997, 1 ♂, 3 ♀ (Vi).

Distribution in Turkey. Bayburt (Kazancı 1983b); Trabzon (Kazancı 2009b); Rize (Kazancı 2013); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 87).

Distribution and ecology. Caucasus, eastern Pontus (Ordu, Rize). A strongly orophilic species occurring in high mountain streams (1800–2010 m). Adults emerge in late spring and summer (V–VIII).

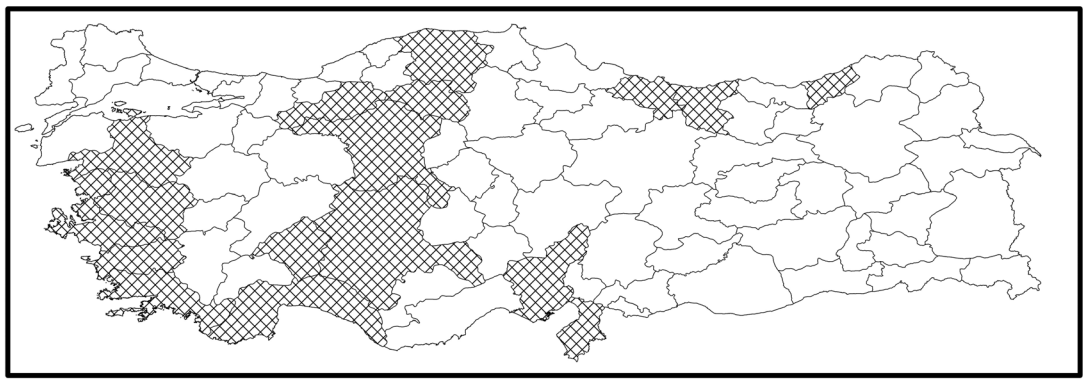

FIGURE 86. *Chloroperla zhiltzovae* Zwick, 1967

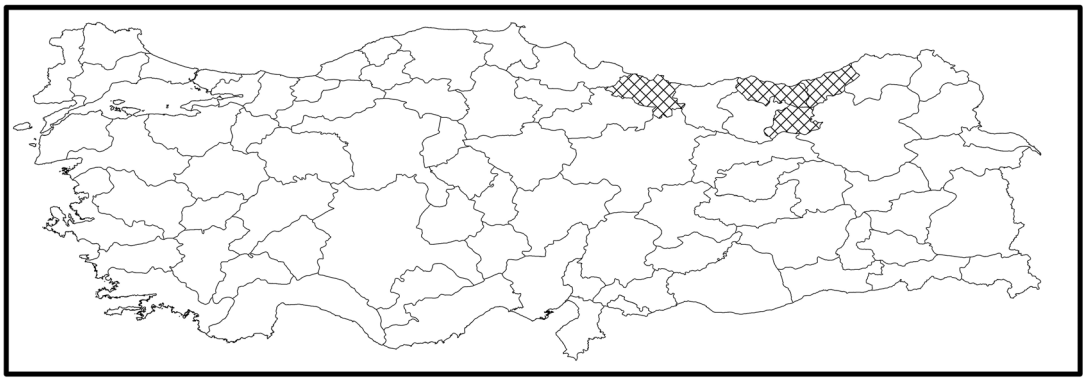

FIGURE 87. *Plesioperla sakartvella* (Zhiltzova, 1956)

GENUS *Pontoperla* Zwick, 1967

Pontoperla katherinae (Balinsky, 1950)

First record from Turkey.

Material. Artvin, Borçka, Camili: Lekoban Yaylası, 2400 m, 7.08.1996, 1 ♂, 1 ♀; Lekoban Yaylası, Naçadirev gölü, 2700 m, 8.08.1996, 1 ♂; **Artvin**, Yıldız göl,—Gorgit Yaylası, 2300 m, 3.08.1998, 1 ♂ (Si). Map (Fig. 88).

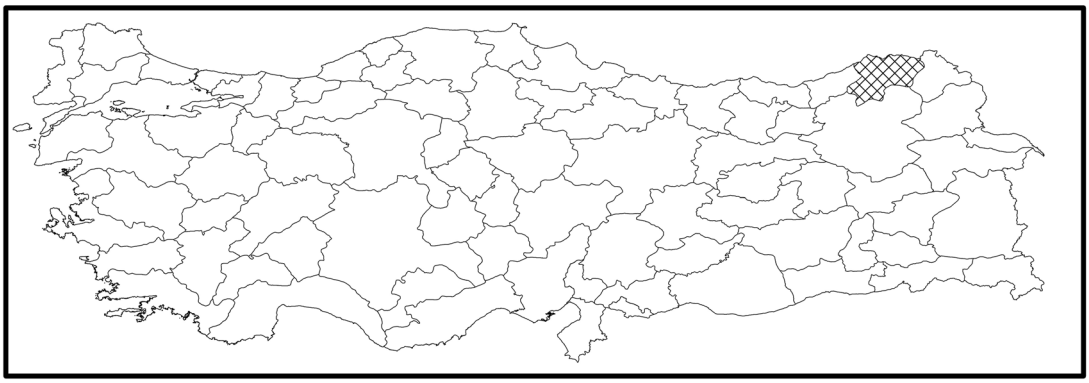

FIGURE 88. *Pontoperla katherinae* (Balinsky, 1950)

Distribution and ecology. Caucasus, eastern Pontus (Artvin). The Anatolian specimens were all collected from high altitude brooks (2300–2700 m a.s.l.). Adults emerge in summer (VIII).

***Pontoperla teberdinica* (Balinsky, 1950)**

Material. Bursa, Uludağ: Soğukpınar yolu, 1200 m, 4.06.1992, 1 ♀; 3 km N Soğukpınar yolu, 1000 m, 4.06.1992, 2 ♂, 3 ♀ (Si), 2 ♂, 8 ♀ (Ma); 7 Km NW Soğukpınar yolu, 1200 m, 4.06.1992, 7 ♂, 11 ♀ (Ma). **Isparta,** Yenişarbademli, Pınargözü mağarası, 31.05.1993, 1 ♂, 2 ♀ (Si). **Bursa**, 11 km SW Oylat, Saadet, Köyü, 1000 m, 19.05.1994, 1 ♂; 15 km SW Oylat, Saadet Köyü, 1500 m, 20.05.1994, 1 ♂ (Si). **Kastamonu**, Ilgaz dağları, NW Küçuk Hacet Tepesi, 1500 m, 14.07.1994, 1 ♀ (Si). **Çankırı**, Çerkes, Işık Dağı, Sofular deresi, 1550 m, 16.06.1996, 1 ♂, 2 ♀ (Si). **Kastamonu**, 25 km NW Azdavay—Cide, 1000 m, 21.06.1996, 1 ♀ (Si). **Giresun**, Tamdere, Kümbet, r. Aksu, 1550 m, 27.06.1995, 5 ♂, 8 ♀ (Ho). **Balıkesir**, Edremit, > Zeytinli, tor., 8.05.1997, 2 ♀ (Vi). **Ordu**, > Gölköy, tor., 11.05.1997, 1 ♂, 7 ♀ (Vi). **Ankara**, Beypazarı, Karasar > Eğriova, 1000 m, 19.05.1997, 6 ♂, 4 ♀ (Si). **Bolu**, Yedigöller, 800 m, 21.06.1997, 1 ♀ (Si). **Konya**, Hadim, Korualan, Borini, 1700 m, 6.06.1998, 1 ♂, 3 ♀ (Si). **Bartın**, 15 km Bartın—Amasra, Karadere spr., 13.04.2004, 1 ♂ (Si). **Bartın**, 30 km E Bartın, Arit spr., Darıören, 18.04.2004, 2 ♂, 3 ♀ (Si).

Distribution in Turkey. Adana, Ankara, Rize, Sakarya, Tunceli (Zwick 1971); Bolu, Bursa (Zwick 1975); Artvin (Theischinger 1976a); Ankara, Bolu (Kazancı 1982); Bayburt, Bolu, Çankırı, Erzurum, Hakkari, Kastamonu (Kazancı 1983b); Ankara, Ardahan, Artvin, Bayburt, Bolu, Çankırı, Erzincan, Erzurum, Giresun, Hakkari, Kastamonu, Tokat (Kazancı 2012); **country record only:** Listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 89).

Distribution and ecology. Caucasus, Anatolia. An orophilic species occurring in high mountain streams (800–1700 m). Adults emerge in spring and early summer (IV–VII).

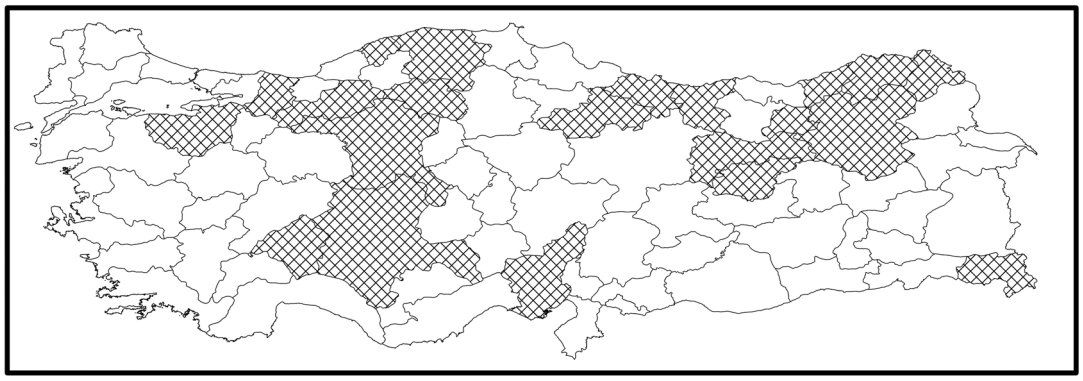

FIGURE 89. *Pontoperla teberdinica* (Balinsky, 1950)

GENUS *Siphonoperla* Zwick, 1967

***Siphonoperla hajastanica* (Zhiltzova, 1961)**

Material. Ordu, N Zara—Ordu, Güllüali, 1620 m, N40°08 ' E37°47', 19.06.1995, 1 ♂ (Si).

Distribution in Turkey. Erzincan, Giresun, Kars (Kazancı 2012); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 90).

Distribution and ecology. This species extends from Armenia (= Hayastan) to the eastern part of the Pontus in Anatolia. Adults emerge in late spring (VI).

Siphonoperla* gr *libanica–burmeisteri

In a revision of *Siphonoperla* by Graf & Vinçon in preparation, *S. burmeisteri* (Pictet, 1841) and *S. libanica* Alouf, 1992 will be excluded from the Turkish fauna. In this work, the supposed specimens of *S. burmeisteri* from central Taurus (Adana, Zwick 1971) are assigned to a new species, close to *S. libanica* Alouf, 1992 that we herein designate as *S.* gr. *libanica* sp. 1. Other specimens from eastern Anatolia (Theischinger 1976a, 1976b) probably correspond to *S. hajastanica* (Zhiltzova, 1961). Other specimens from Konya will be assigned to another new

species that we herein designate as *S.* gr. *libanica* sp. 2 and those occurring in the Edremit region will be assigned to a new subspecies that we herein designate as *S.* gr. *libanica* ssp. 3.

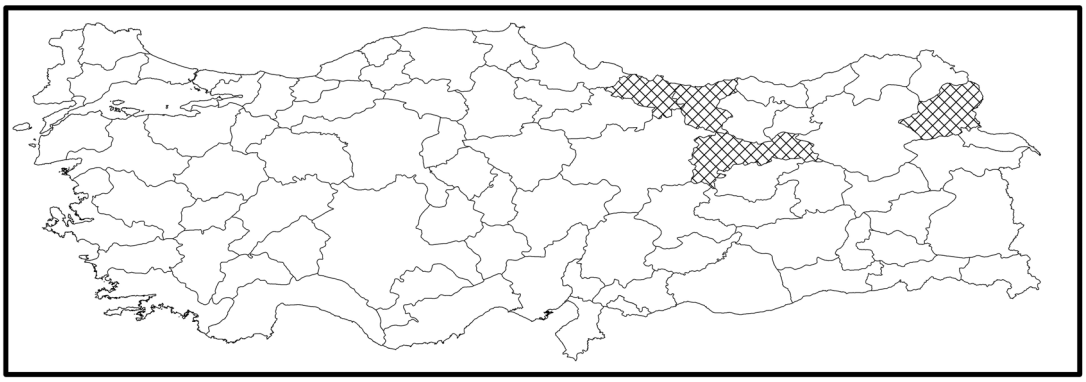

FIGURE 90. *Siphonoperla hajastanica* (Zhiltzova, 1961)

***Siphonoperla* gr. *libanica* sp. 1**

Material. Aksaray, Saratlı, N38°20' E34°37', 24.05.2006, 2 ♂, 1 ♀ (Si). **Kahramanmaraş**, near Göksun, south side of pass, 1400 m, 05.05.1978, 1 ♂ (Besuchet and Löbl leg., in Zwick coll.)

Distribution in Turkey. Adana (Zwick 1971). Map (Fig. 91).

The specimens of *S. libanica* reported from Malatya, Kahramanmaraş and Kayseri (Kazancı 2012) could belong to this species.

Distribution and ecology. Turkish micro-endemic species of the western and central part of the Taurus chain, in Anatolia. Adults emerge in spring (V).

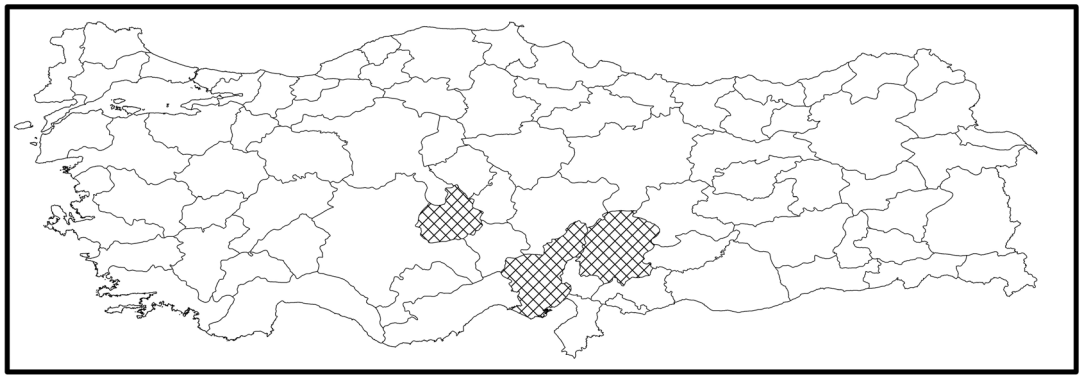

FIGURE 91. *Siphonoperla gr. libanica* sp 1

***Siphonoperla* gr. *libanica* sp. 2**

Material. Konya, Hadim, Korualan, 1 Km E Borini, Borini spr., N37°00' E32°20', 17.07.2006, 1 ♂; Borini, 1470 m, 17.07.2006, 1 ♂, 6 ♀ (Si). Map (Fig. 92).

The specimens of *S. libanica* reported from Muğla (Kazancı 2012) could belong to this species.

Distribution and ecology. Turkish micro-endemic species known from the region of Hadim near Konya in the western Taurus chain. Adults emerge in late spring (VI–VII).

***Siphonoperla* gr. *libanica* ssp 3**

Material. Balıkesir, Edremit—Kalkım, 20 Km NE Edremit, 600 m, N39°42', E27°14', 2.06.1992, 1 ♂ (Si). Map (Fig. 93).

Distribution and ecology. This Turkish micro-endemic species is only known from the coastal mountain chain near Edremit in the northwestern part of Anatolia. The emergence period is in late spring (VI).

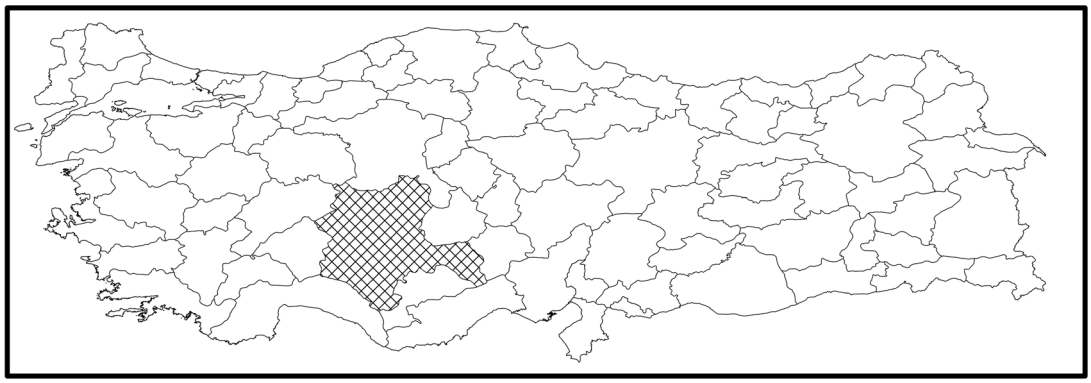

FIGURE 92. *Siphonoperla gr. libanica* sp 2

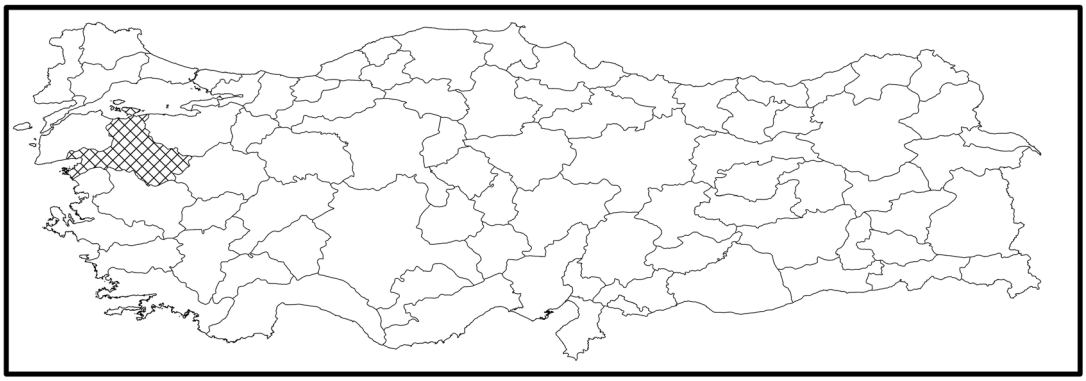

FIGURE 93. *Siphonoperla gr. libanica* ssp 3

***Siphonoperla neglecta* (Rostock, 1881)**

First record from Turkey.

Material. Tekirdağ, Tekir Mts., Marmaraköy, stream in a platan forest 3 km S of the village, 250 m, N40°50.115' E27°23.355', 06.04.2007, 2 ♂ (Mur). Map (Fig. 94).

Distribution and ecology. Central European species, occurring in small and middle sized streams of the submontane and montane regions. It is widespread in the Balkans but missing in the southern regions. Adults emerge in spring (IV).

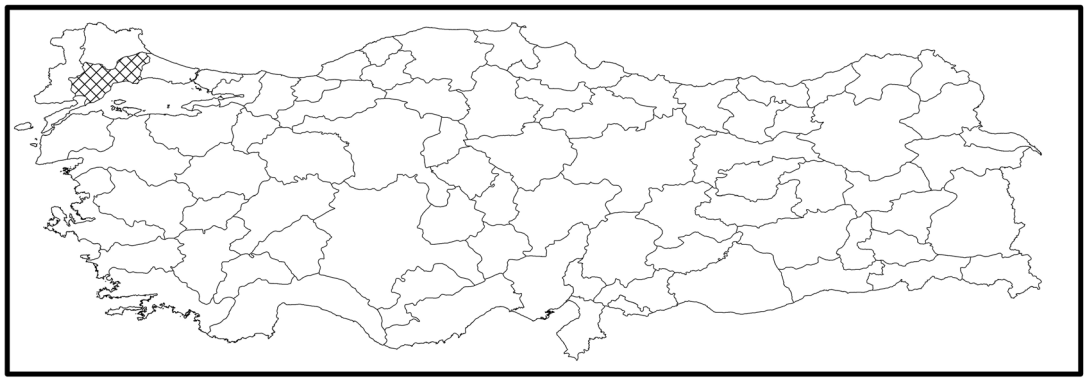

FIGURE 94. *Siphonoperla neglecta* (Rostock, 1881)

GENUS *Xanthoperla* Zwick, 1967

***Xanthoperla yerkoyi* Kazancı, 1983**

Type country and locality. Turkey, Yerköy (District located in the Province of Yozgat) (Kazancı 1983a).

Distribution in Turkey. Ankara, Yozgat (Kazancı 1983a); Erzincan (Kazancı 1994); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 95).

Distribution and ecology. Turkish endemic species of the central plateau from Ankara to Erzincan. This orophilic species occurs in mountain streams (1050–1100 m). Adults emerge in late spring (V–VI).

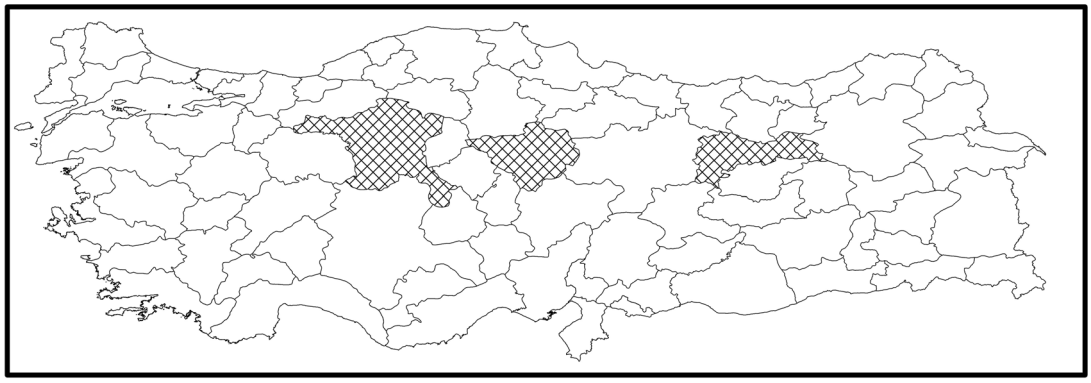

FIGURE 95. *Xanthoperla yerkoyi* Kazanci, 1983

FAMILY PERLIDAE Latreille, 1802

SUBFAMILY PERLINAE Latreille, 1802

TRIBE Perlini Latreille, 1802

GENUS *Agnetina* Klapálek, 1907

Agnetina senilis Klapálek, 1921

Distribution in Turkey. Ankara, Sivas (Kazancı 1994); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 96).

Distribution and ecology. Crimea, Caucasus and Anatolia where it occurs on the central plateau from Ankara to Sivas. Adults emerge in late spring and summer (VI–VIII).

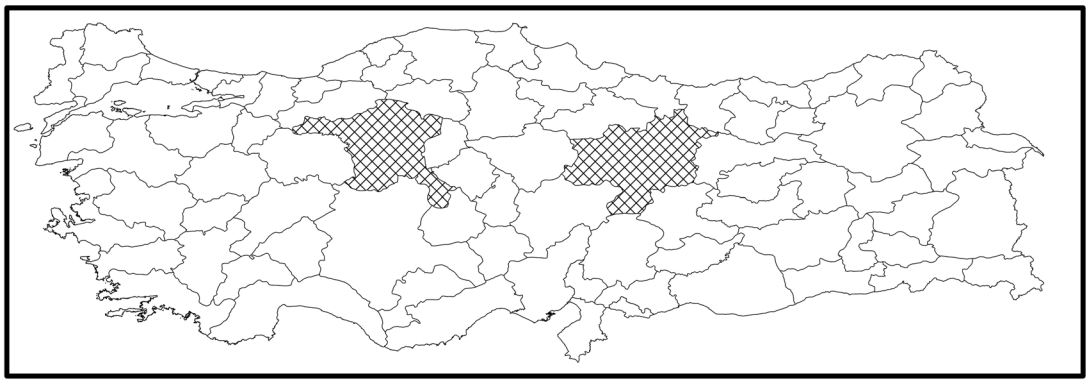

FIGURE 96. *Agnetina senilis* Klapálek, 1921

Agnetina werneri (Kempny, 1908)

Type country and locality. Turkey, Eskişehir, **"**Köktsche Kissik" (= Gökçekısık village) (Kempny 1908).

Material. Konya, Hadim, 3 km N Göksu, 650 m, 18.07.2006, 5 ♂ (Si).

Distribution in Turkey. Eskişehir (Kempny 1908); Ankara, Eskişehir, Kırıkkale (Kazancı 1982); Kütahya (Kazancı 1983b); Eskişehir, Bolu (Mengen), Kırıkkale (Zwick 1984a); Ankara, Bitlis, Muş (Kazancı 1994);

Ankara, Artvin, Bitlis, Kırıkkale, Kütahya (Kazancı 2012); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 97).

Distribution and ecology. This species has been mentioned from Crimea and the Caucasus (Kazancı 2012) but without any detailed localities and may have been confused with *A. senilis*. Since all previous references of this species were only from Anatolia, we consider *A. werneri* as an Anatolian endemic species. It mainly occurs in large streams of moderate altitudes (650–1250 m). Adults emerge in spring and summer (V–VIII).

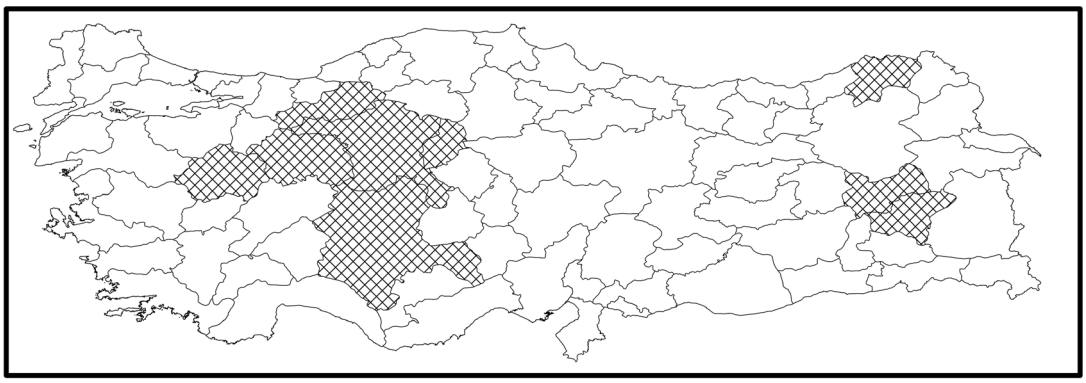

FIGURE 97. *Agnetina werneri* (Kempny, 1908)

GENUS *Paragnetina* Klapálek, 1907

***Paragnetina transoxanica* (Klapálek, 1921) ?**

= *Caucasoperla spinulifera* Zhiltzova, 1967 (syn. fide Zhiltzova (1995)).

Distribution in Turkey. The only one report of this species from Anatolia (Ardeşen) was by Zwick (1971) under the name *C. spinulifera*. This record was based on larvae and was subsequently considered dubious (Zwick 1975). However, Zwick (2004) repeated the figure taken from his 1971 paper in his West Palaearctic key, though mentioning that conspecifity was not confirmed. The generic identity was confirmed by comparison with other East Palaearctic and Nearctic species. Additionally, Teslenko & Zhiltzova (2009) presented a new illustration of the larva (most probably from Caucasus) under the name *P. spinulifera* that seems to be a slightly different from Zwick's (1971) illustration. Teslenko & Zhiltzova (2009) did not cite the new Turkish record, but merely included Turkey in the distribution of the species, probably referring to Zwick (1971). Map (Fig. 98).

Distribution and ecology. Caucasus, eastern Pontus. The unique mention from Anatolia is from a clear river between Ardeşen and Çamlıhemşin. The single larva was collected on the 21.05.1970 (Zwick 1971).

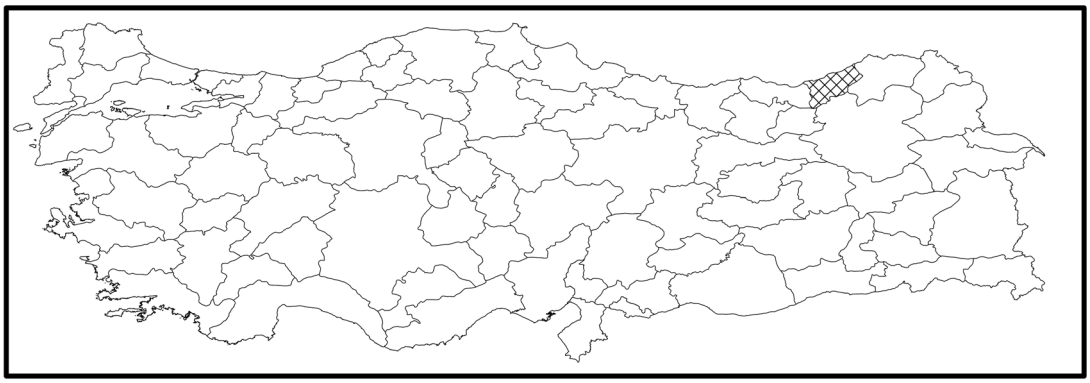

FIGURE 98. *Paragnetina transoxanica* (Klapálek, 1921)

GENUS *Eoperla* Illies, 1956

***Eoperla ochracea* (Kolbe, 1885)**

Distribution in Turkey. Erzurum (Aubert 1956a; Zwick 1971); **(country record only):** listed from Turkey (Illies 1978; Kazancı 1983b; Kazancı 2008). Map (Fig. 99)

Distribution and ecology. Circum-mediterranean species. In Anatolia this species has been reported only from the Eastern Pontus (Erzurum), extending northward around the Black Sea. It occurs in large lowland rivers with rapid flow and stony substrate (Aubert 1956b). Adults emerge in late spring and early summer (V–VI).

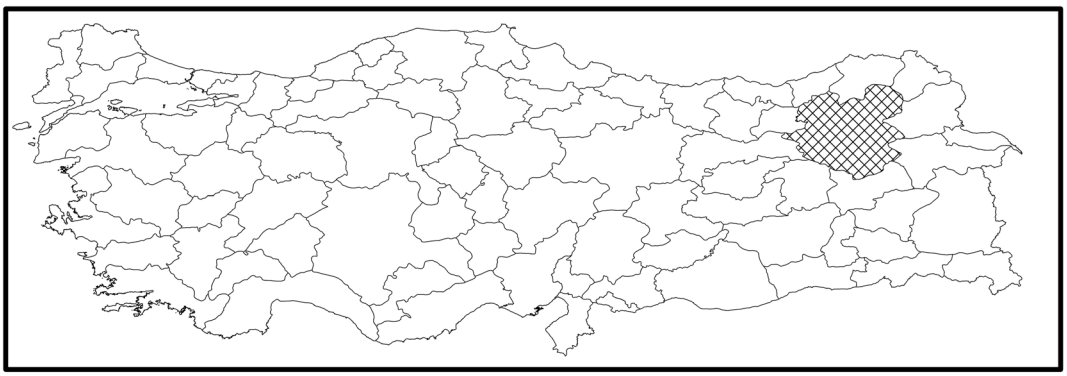

FIGURE 99. *Eoperla ochracea* (Kolbe, 1885)

GENUS Marthamea Klapálek, 1907

***Marthamea selysii* (Pictet, 1841) ?**

Distribution in Turkey. Ankara (Kazancı 1994); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 100).

Distribution and ecology. Europe and Anatolia. Potamophile species extremely threatened with extinction (Zwick 1984b). Adults emerge in spring (V–VI).

Note: The presence of *M. selysii* in Anatolia is questionable since this western European (Graf *et al.* 2009) has not been recorded from eastern Europe.

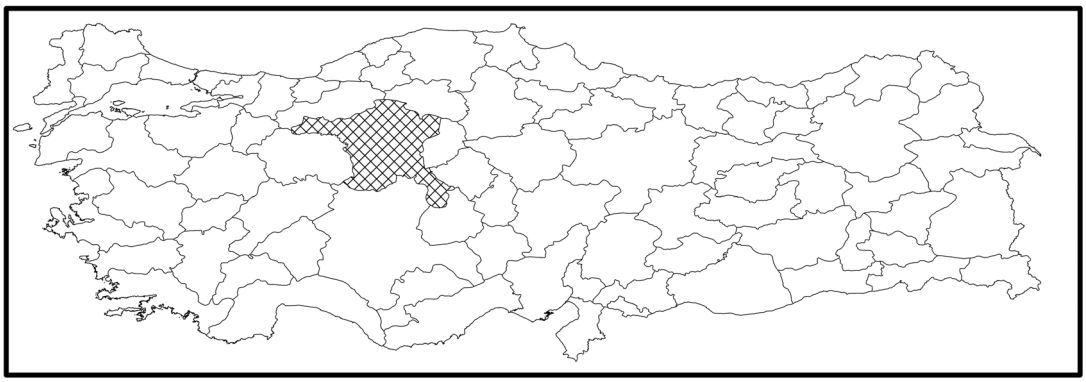

FIGURE 100. *Marthamea selysii* (Pictet, 1841)

***Marthamea vitripennis* (Burmeister, 1839)**

Distribution in Turkey. Ankara, Yozgat (Kazancı 1982); Tokat (Kazancı 2009b); Ankara, Tokat, Yozgat (Kazancı *et al.* 2012); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 101).

Distribution and ecology. This species has a wide distribution area covering Europe and the Middle East. In central Anatolia, this potamophile species occurs in large lowland rivers (hyporhitral—potamal) (850–1000 m) and is threatened with extinction (Kazancı *et al.* 2012). Adults emerge in spring (V–VI).

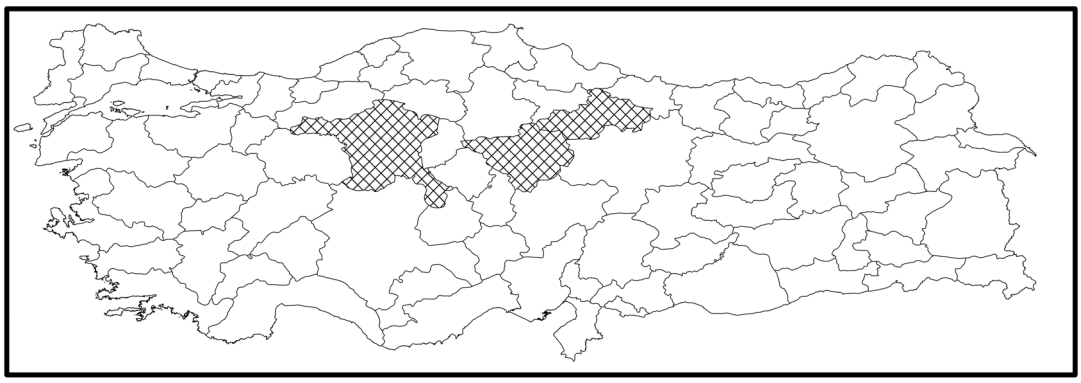

FIGURE 101. *Marthamea vitripennis* (Burmeister, 1839)

GENUS *Perla* Geoffroy, 1762

***Perla caucasica* Guérin-Méneville, 1838**

= *Perla persica* Zwick, 1975 (syn. fide Sivec & Stark 2002)

Distribution in Turkey. Ankara, Artvin, Balıkesir, Eskişehir, Muğla (Kazancı 1994); Antalya, Artvin (as *Perla persica*) (Kazancı 1994); Ankara, Bayburt, Bolu, Giresun, Rize (Kazancı 2012); Muğla (Kazancı *et al.* 1992); Rize (Kazancı 2013); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 102).

Distribution and ecology. Cyprus, Anatolia, Caucasus, Iran. This potamophile species occurs in large mountain rivers (500–1270 m). Adults emerge in spring and early summer (V–VII).

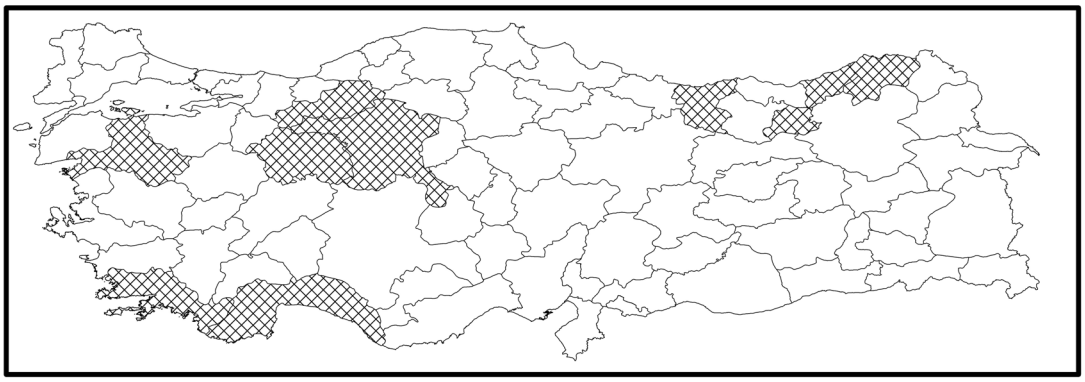

FIGURE 102. *Perla caucasica* Guérin-Méneville, 1838

***Perla horvati* Sivec & Stark, 2002**

Type country and locality. Turkey, Şehitler Geçidi (The type locality is located in the District of Aksu in Tamdere-Kümbet, the Province of Giresun) (Sivec & Stark 2002).

Material. Giresun, Tamdere, 1600 m, 07.07.1996, leg. A. Podlussány: 1 ♀ (topotype).

Distribution in Turkey. Giresun (Sivec & Stark 2002); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 103).

Distribution and ecology. Turkish micro-endemic species only known from the type locality in the central Pontique Mountains. This species is known from a mountain river (1600 m). Adults emerge in summer (VII).

***Perla illiesi* Braasch & Joost, 1973**

Distribution in Turkey. Kırklareli (Kazancı 1994); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 104).

Distribution and ecology. It occurs along the southern coast of Europe from the eastern Italian Alps to Bulgaria. In Turkey, it is restricted to the European part of Turkey and old reports (Zwick 1971, Kazancı 1982,

Kazancı 1983b) probably all refer to *P. zwicki* (Sivec & Stark 2002 and Zwick in litt, reported by Kazancı 1994). This species occurs in mountain streams (600 m). Adults emerge in spring (V–VI).

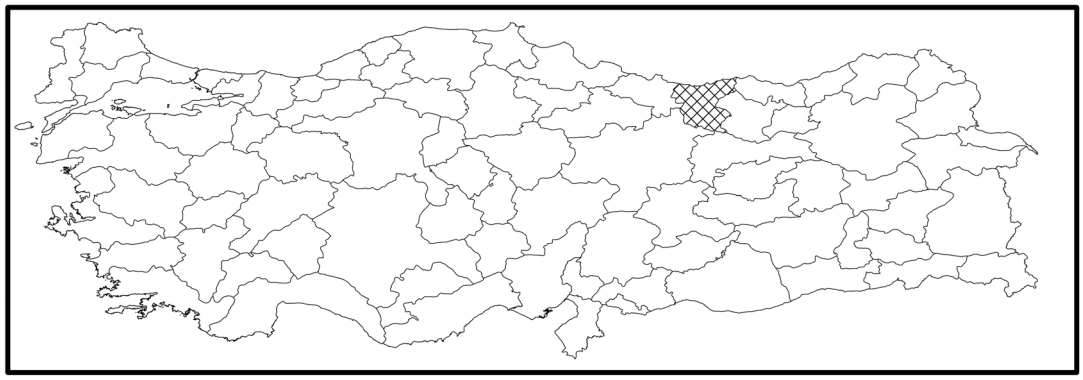

FIGURE 103. *Perla horvati* Sivec & Stark, 2002

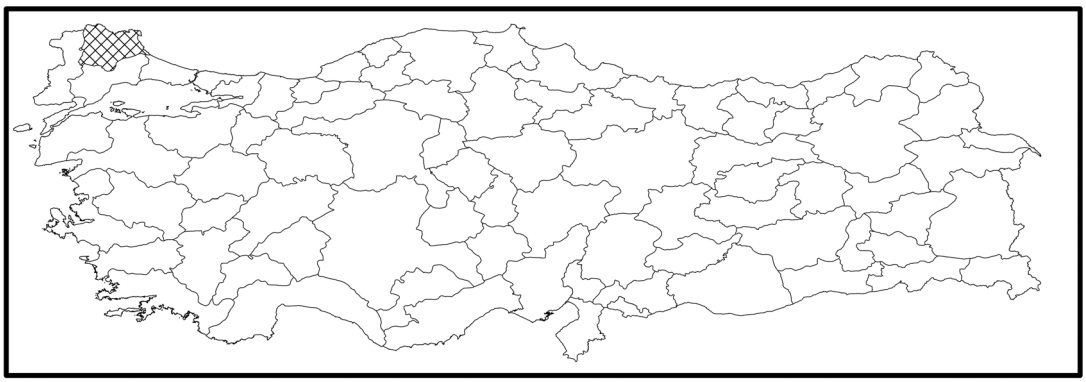

FIGURE 104. *Perla illiesi* Braasch & Joost, 1973

***Perla kiritschenkoi* Zhiltzova, 1961**

Distribution in Turkey. Artvin (Kazancı 1983b); Artvin (Kazancı 2012); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 105).

Distribution and ecology. Armenia, Caucasus, Iran (Elburs massif) and eastern Pontique mountains. Adults emerge in spring and early summer (V–VII).

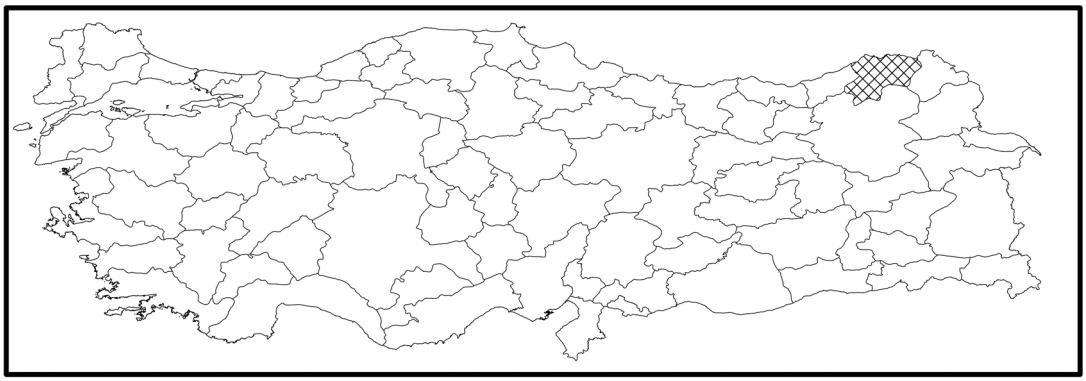

FIGURE 105. *Perla kiritschenkoi* Zhiltzova, 1961

***Perla marginata* (Panzer, 1799)**

The presence of *Perla marginata* in Turkey should be confirmed since it could be confused with *P. pallida* (Sivec & Stark 2002).

Distribution in Turkey. Bursa (Aubert 1964); Adana (Zwick 1971); Bolu, Kütahya (Kazancı 1982); Ankara,

Giresun (Kazancı 1983b); Kırklareli (Kazancı 1994); Ankara (Kazancı & Girgin 2008); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 106).

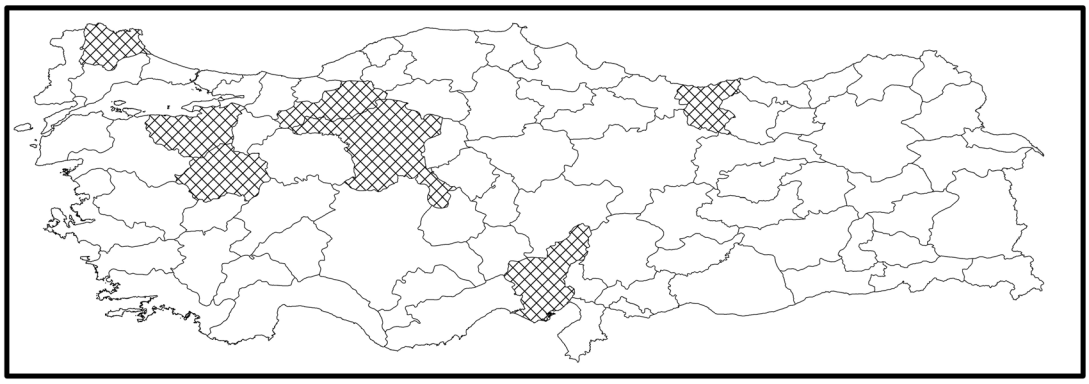

FIGURE 106. *Perla marginata* (Panzer, 1799)

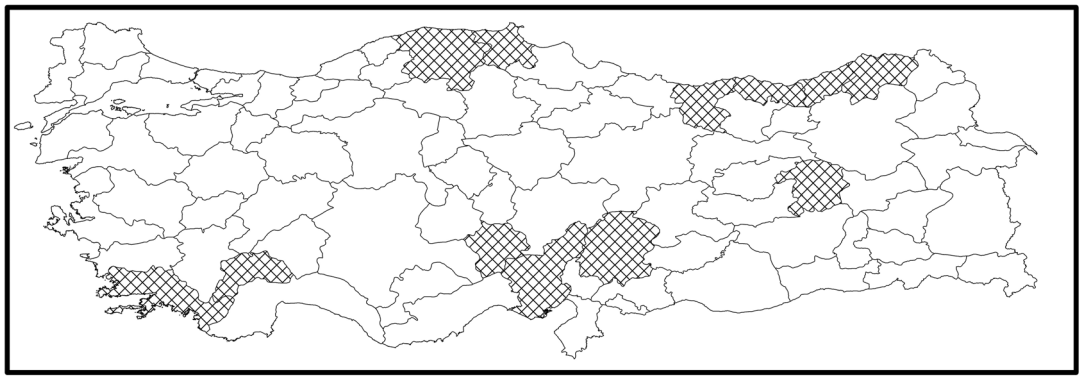

FIGURE 107. *Perla pallida* Guérin-Méneville, 1838 (Type I sensu Sivec & Stark 2002)

***Perla pallida* Guérin-Méneville, 1838 (Type 1, sensu Sivec & Stark 2002)**

All specimens of *P. pallida* reported from Anatolia by Sivec & Stark (2002) are assigned to the same form as topotypes (Type 1) and the European and North African specimens are all assigned to different forms in the same complex; therefore we prefer to consider that only one form of *P. pallida* occurs in Anatolia, Armenia and Caucasus, corresponding to the Type 1.

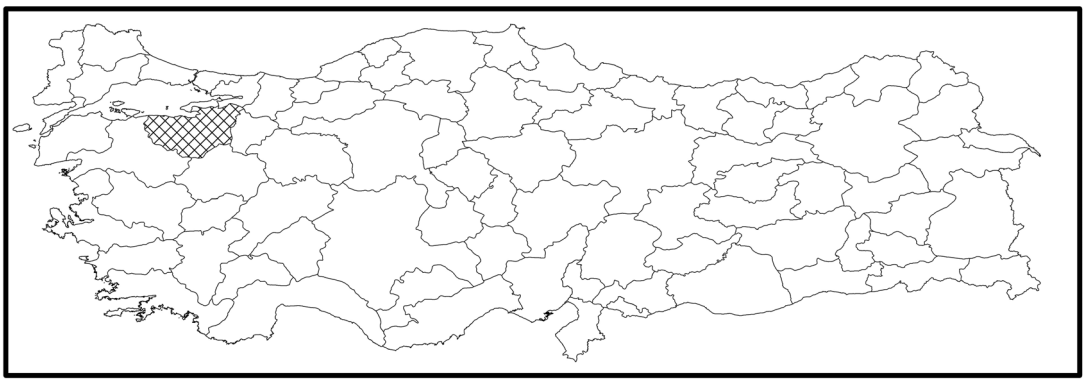

FIGURE 108. *Perla zwicki* Sivec & Stark, 2002

Material. Artvin, Borçka, Camili, Uğurköy, Didrele deresi, 1000 m, 5.08.1983, 1 ♀ (Si). **Rize**, Çamlık, Çat.—Meydan, 1250–1500 m, 15.07.1984, 1 ♂; **Rize**, İkizdere, Çifteköprü, 1210 m, 19.07.1984, 1 ♀ (Si). **Muğla**, Marmaris, Çetibeli, 150 m, 27.05.1992, 1 ♂ (Si). **Rize**, İkizdere, Haldizan, 1850 m, 24.08.1992, 1 ♂, 4 ♀ (Si). **Kastamonu**, Pınarbaşı, Devrekani deresi, Varla mahallesi, 260 m, 16.07.1994, 1 ♂, 1 ♀ (Si). **Artvin**, Borçka,

Camili: Gomvan yaylasi, 2000 m, 1.08.1995, 1 ♀; Didrele deresi, 1050 m, 5.08.1995, 2 ♂; **Artvin**, Uğurköy, 1000 m, 6.08.1995, 3 ♂; **Artvin**, Şavşat, Meydancık, İmerhev vadisi, Mısırlı köyü, 1400 m, 5.08.1996, 4 ♂, 1 ♀; Çermik mahallesi—Lekoban Yaylası, 1800 m, 6.08.1996, 2 ♂, 2 ♀; Lekoban Yaylası, 2400 m, 7.08.1996, 1 ♂, 6 ♀ (Si).

Distribution in Turkey. Adana, Kahramanmaraş (Zwick 1971); Artvin, Giresun (Zwick 1975); Kastamonu, Niğde, Trabzon (Sivec & Stark 2002); Artvin, Bingöl, Burdur, Sinop (Kazancı 2012); Rize (Kazancı 2013); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 107).

Distribution and ecology. The Type 1 form of *P. pallida* is known from the Caucasus, Armenia and Anatolia, where it occurs in different types of streams (150–2400 m). Adults emerge from spring to summer (V–VIII).

***Perla zwicki* Sivec & Stark, 2002**

Type country and locality. Turkey, Soğukpınar (Soğukpınar is a village and is located in the District of Osmangazi, the Province of Bursa) (Sivec & Stark 2002).

Distribution in Turkey. Bolu (Zwick 1971 as *P. illiesi*, fide Sivec & Stark 2002); Bursa (Sivec & Stark 2002); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 108).

Distribution and ecology. Turkish micro-endemic species only known from the western Pontic region. It occurs in mountain streams (1000 m). Adults emerge in spring (VI).

FAMILY PERLODIDAE Klapálek, 1909

SUBFAMILY ISOPERLINAE Frison, 1942

GENUS *Isoperla* Banks, 1906

A revision of the Turkish *Isoperla* is in preparation (Murányi & Vinçon in prep.).

***Isoperla armeniaca* Zhiltzova, 1961**

Material. Antalya, Elmalı, Gömbe, 1800 m, 23.06.1987, 1 ♂ (Si).

Distribution in Turkey. Erzincan, Tunceli (Zwick 1971); Eskişehir (Kazancı 1982); Çankırı, Tunceli (Kazancı 1983b); Aydın, Bolu, Eskişehir, Giresun, Gümüşhane, Kars, Kayseri (Kazancı 2012); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 109).

Distribution and ecology. Armenia, Anatolia.

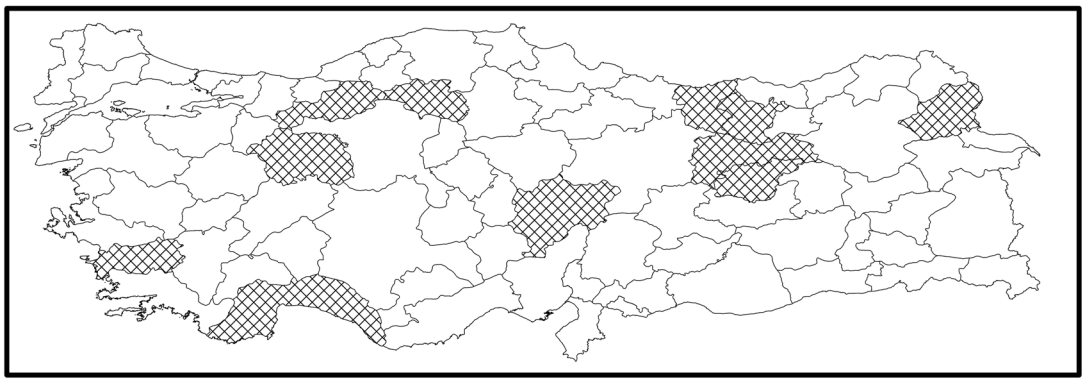

FIGURE 109. *Isoperla armeniaca* Zhiltzova, 1961

***Isoperla bithynica* (Kempny, 1908)**

This species could easily be confused with *I. rhododendri* Zhiltzova, 1956. Detailed complementary descriptions and faunistic lists will be given in Murányi & Vinçon (in prep.).

Type country and locality. Turkey, Olymp bei Brussa (Uludağ, Bursa) (Kempny 1908).

Distribution in Turkey. Bursa (Kempny 1908); Ankara, Artvin, Bolu, Bursa, İçel, Ordu, Rize, Tunceli (Zwick 1971); Niğde (Zwick 1975); Artvin, Gümüşhane, Zonguldak (Theischinger 1976a); Muş (Theischinger 1976b);

Ankara, Bolu (Kazancı 1982); Trabzon (Kazancı 2012); Rize, Trabzon (Kazancı 2013); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 110).

Distribution and ecology. Caucasus, Anatolia.

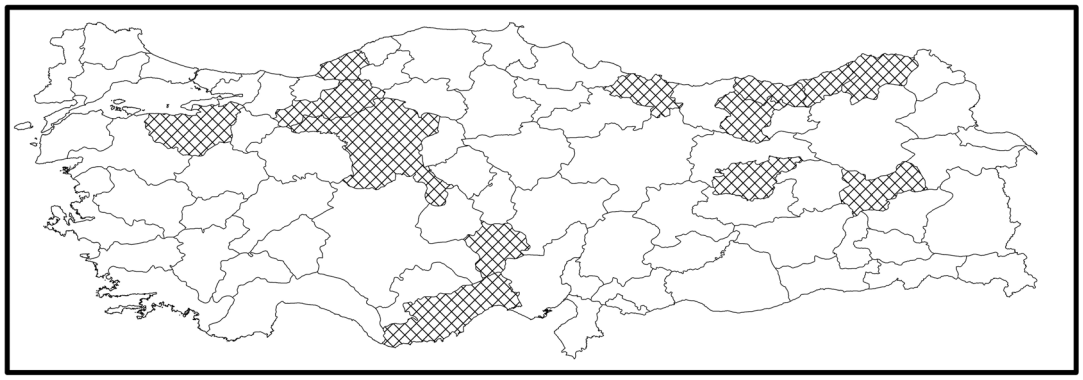

FIGURE 110. *Isoperla bithynica* (Kempny, 1908)

***Isoperla chius* Zwick, 1978**

Distribution in Turkey. Bolu (Kazancı 1983b); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 111).

Distribution and ecology. micro-endemic species of western Anatolia and Greek Chios Island located close to the Anatolian coast.

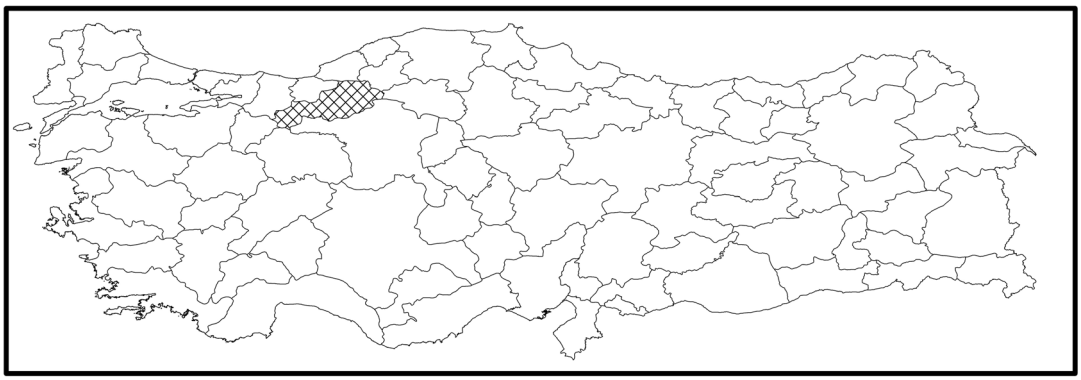

FIGURE 111. *Isoperla chius* Zwick, 1978

***Isoperla grammatica* (Poda, 1761)**

The *I. grammatica* complex needs to be revised since several species may be apparently confused under this name in Europe (Berthélemy 1978). However, in Anatolia, all species appear to represent one taxon.

Material. Osmaniye, Düziçi, Sabun deresi, 300 m, tributary of Ceyhan River, 22.04.2008, 1 ♂ (Si). **Antalya**, Alanya, Topraktepe, near Gündoğmuş, 5.05.1997, 2 ♂, 1 ♀; Gündoğmuş—Köprülü, 5.05.1997, 1 ♂ (Vi). **Isparta,** Yenişarbademli, Pınargözü cave, 10 km S Yenişarbademli, 1200 m, 13.06.2007, 2 ♂ (Si); 1400 m, 21.07.1998, 2 ♂, 14 ♀ (Si). **Konya**, Hadim, 7 km W Hadim, 1700 m, 5.06.1998, 9 ♂, 2 ♀. **Konya**, Hadim, Korualan, Borini, 1700 m, 6.06.1998, 5 ♂, 1 ♀; 3 Km E Korualan, 1300 m, 28.06.2000, 4 ♂, 6 ♀ (Si). **Konya**, Hadim, Dedemli, 1200 m, 17.07.2006, 5 ♂, 9 ♀ (Si). **Isparta**, Sütçüler, Gökbüvet, Aksu Irmağı, 23.04.1991, 1 ♂ (Si). **Antalya**, Sütçüler, Yazılı Kanyon, Aksu nehri, 29.05.1993, 1 ♂ (Si). **İzmir**, Salihli—Birgi, 20 km to Ödemiş, 800 m, 22.05.1992, 1 ♂, 1 ♀ (Ma). **Sakarya**, Taraklı, Mahmudlar Köyü, 500 m, 19.05.2006, 1 ♂ (Si). **Aydın**, Bozdoğan, 5 km S Altıntaş Köyü, 950 m, 23.05.1992, 1 ♂, 2 ♀ (Ma). **Sivas**, Suyu Beypınarı, 20 km NE Sivas, 1480 m, 19.06.1995, 1 ♂ (Ho). **Erzincan**, 30 km E Erzincan, Girlevik, Çaglayan Köyü, 1050 m, 12.07.2008 (Si).

Distribution in Turkey. Gümüşhane (Kazancı 2009b); Bursa (Kazancı 2012); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 112).

Distribution and ecology. European species, throughout Anatolia. It occurs in small rivers and large streams of the submontane zone and the plains. Adults emerge in spring and early summer (IV–VII).

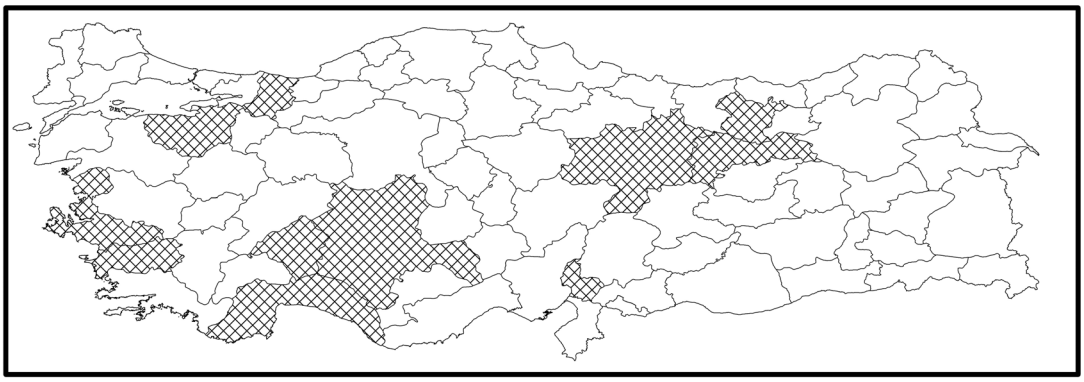

FIGURE 112. *Isoperla grammatica* (Poda, 1761)

***Isoperla lesbica* Zwick, 1978**

Material. Konya, 4 km NW Hadim, 1800 m, 6.06.1998, 8 ♂, 21 ♀. **Konya**, Hadim, Korualan, Borini, 1550 m, 23.06.1998, 1 ♂ (Si). **Isparta**, 5 km S Sütçüler, 31.05.1993, 1 ♂ (Si). **Muğla**, Ören, Marçal dağı, Yeşilyurt, 500 m, 27.05.1992, 4 ♂, 3 ♀ (Si). **Muğla**, 2 km E Bağyaka, 500 m, 27.05.1992, 2 ♀ (Ma). **Aydın**, Nazilli, 5 km S Bozdoğan, 600 m, 23.05.1992, 1 ♂ (Ma). **Bolu**, 4 km N Alancık, 400 m, 2.06.1992, 2 ♀ (Ma). **İzmir**, N Gümüldür, 40 m, 19.05.1992, 1 ♀ (Ma). **Manisa**, Koruköy, Köseler river, 200 m, 30.05.92, 1 ♂ (Ma). **İzmir**, Bergama, 20 km NW Kozak, 250 m, 1.06.1992, 1 ♂, 4 ♀ (Si), 2 ♂, 5 ♀ (Ma); 10 km N Bergama—Kozak, 350 m, 4 ♂, 2 ♀ (Ma). **Balıkesir**, Burhaniye, 2 km E Bahadınlı Köyü, Karınca deresi, 150 m, 1.06.1992, 2 ♂ (Ma). **Balıkesir**, W Yaylacık, Dere, 280 m, 1.06.1992, 2 ♂ (Ma). **Balıkesir**, Bandırma, 23 km SW Manyas göl, Kocaçay, 24.05.1996, 5 ♂ (Si). **Ankara**, Beypazarı, Kosovar, 1500 m, 9.07.1999, 6 ♂, 3 ♀ (Si). **Ankara**, Kızılcahaman Akyarma, 115 km, 14.06.2000, 2 ♂ (Si). **Ankara**, Çamlıdere, Ecevit yaylası, 1350 m, 15.06.2004, 3 ♂, 3 ♀ (Si).

Distribution in Turkey. Aydın (Zwick 1978b); Aydın (Kazancı 1983b); Çanakkale (Kazancı 1994); Çanakkale (Kazancı 2012); **country record only:** listed from Turkey (Kazancı 2008). Map (Fig. 113).

Distribution and ecology. Endemic species of western Anatolia and Greek Lesbos Island located close to the Anatolian coast. It occurs in various types of brooks and torrents (40–1800 m). Adults fly in late spring and early summer (V–VII).

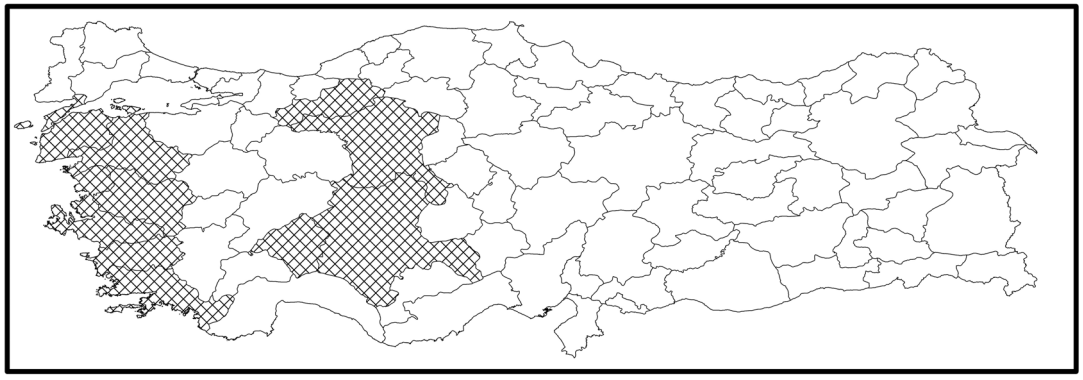

FIGURE 113. *Isoperla lesbica* Zwick, 1978

***Isoperla rhododendri* Zhiltzova, 1956**

This species could easily be confused with *I. bithynica*. Detailed complementary descriptions and faunistic lists will be given in Murányi & Vinçon (in work).

Distribution in Turkey. Adana, Kahramanmaraş, Malatya (Zwick 1971); Ankara, Bolu (Kazancı 1982); Bolu, Çankırı, Erzincan, Kastamonu, Tunceli (Kazancı 1983b); Ankara, Artvin, Aydın, Bilecik, Bolu, Çankırı, Erzincan, Erzurum, Giresun, Gümüşhane, Kars, Kastamonu, Kayseri, Malatya, Sivas, Trabzon, Tunceli (Kazancı 2012); Rize (Kazancı 2013); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 114).

Distribution and ecology. Caucasus, eastern Anatolia. It mainly occurs in high altitude brooks (1600–2700 m). Adults emerge from spring to autumn (IV–IX).

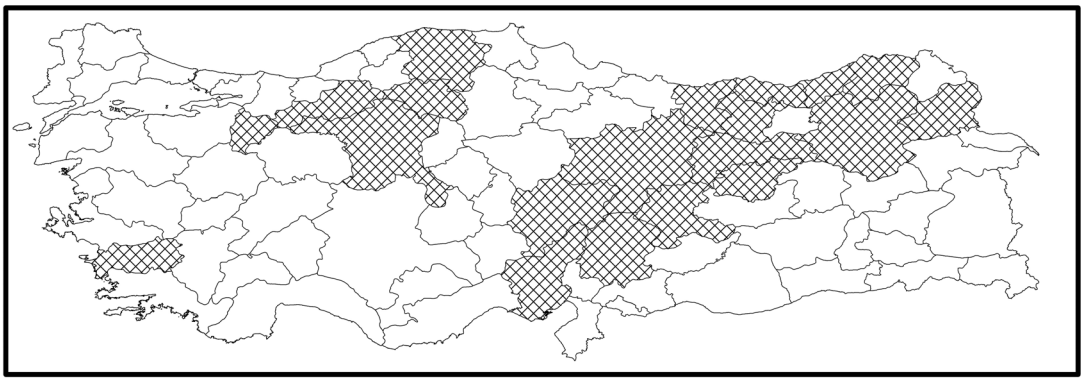

FIGURE 114. *Isoperla rhododendri* Zhiltzova, 1956

***Isoperla tripartita* Illies, 1954**

Isoperla tripartita tripartita could easily be confused with *I. tripartita recta* Zwick, 1978 or *I. obliqua* Zwick, 1978. New descriptions and faunistic lists will be given in Murányi & Vinçon (in prep.).

Distribution in Turkey. Bolu, Kırklareli (Kazancı 2012); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 115).

Distribution and ecology. *Isoperla t. tripartita* is known from the Eastern Alps, Carpathian Basin, and the Balkans. Nymphs can be common in submontane streams and brooks but also in high mountain torrents. Kazancı (2012) does not indicate the subspecific identification of her material.

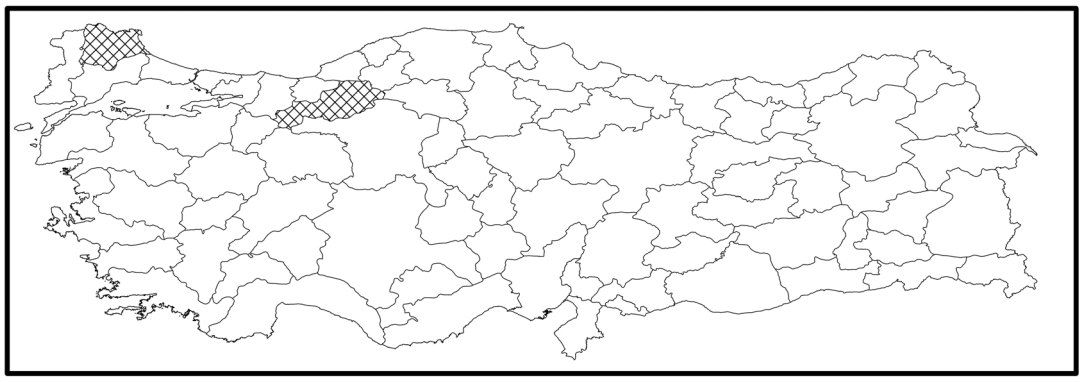

FIGURE 115. *Isoperla tripartita* Illies, 1954

SUBFAMILY PERLODINAE Klapálek, 1909

TRIBE Diploperlini Stark & Szczytko, 1984

GENUS *Bulgaroperla* Raušer, 1966

***Bulgaroperla mirabilis mirabilis* Raušer, 1966**

Distribution in Turkey. Kırklareli (Kazancı 2012); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 116).

Distribution and ecology. Known from Bulgarian and Turkish areas of Thrace. It occurs in lowland streams (800–850 m). Adults emerge in spring (V–VI).

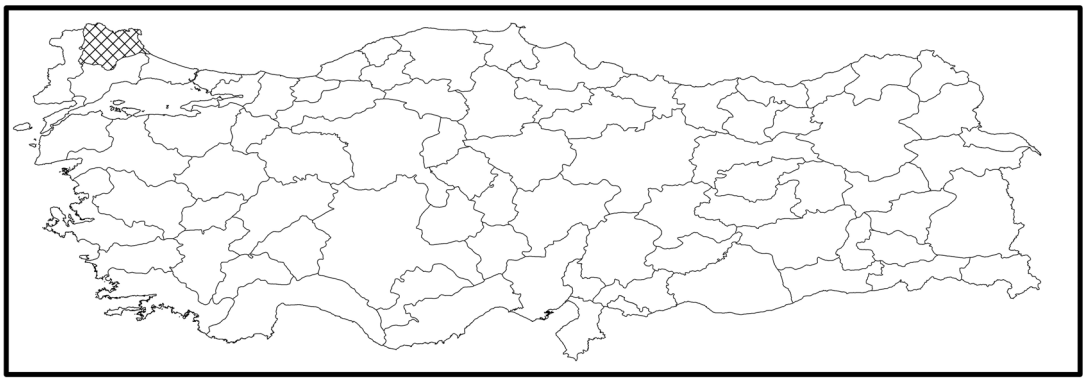

FIGURE 116. *Bulgaroperla mirabilis mirabilis* Raušer, 1966

***Bulgaroperla mirabilis nigrita* Zwick, 1978**

First record from Turkey.

Material. İzmir, Turgutlu—Bayındır, 3 km S Kamberler Köyü, 350 m, 2 ♂, 1 ♀, 21.05.1992 (Ma). Map (Fig. 117).

Distribution and ecology. Micro-endemic species of western Anatolia (İzmir region) and the Greek Lesbos Island located close to the Anatolian western coast. It occurs in the lowland watersheds (350 m). Adults emerge in spring (V).

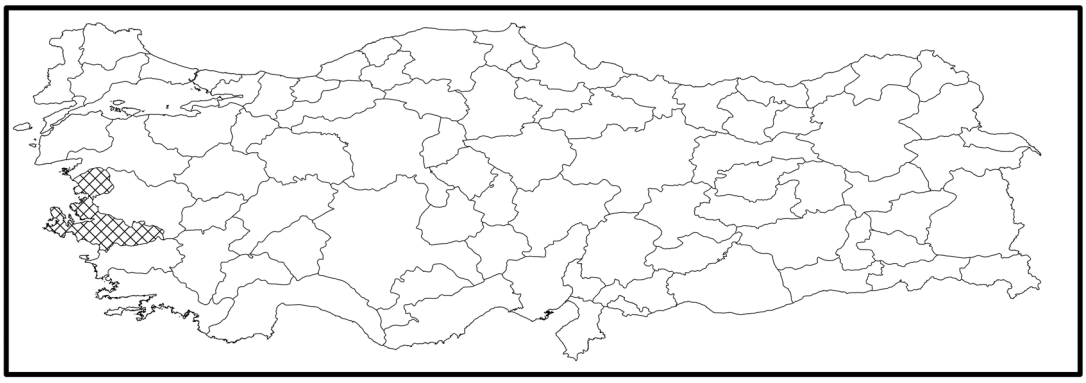

FIGURE 117. *Bulgaroperla mirabilis nigrita* Zwick, 1978

TRIBE Perlodini Klapálek, 1909

GENUS *Perlodes* Banks, 1903

***Perlodes microcephalus* (Pictet, 1833)**

Material. Antalya, Elmalı, Gömbe, 1800 m, 23.06.1987, 1 ♀ (Si). **Antalya**, Ak Dağları > Kayabaşı, S. Sögüt, 6.05.1997, 7 ♂, 6 ♀, 3 la (Vi). **Rize**, > Dereköy, tor., 12.05.1997, 1 ♀ (Vi). **Ankara**, N. Ankara, < Güvem, 15.05.1997, 3 ♀; Güvem—Salın, 15.05.1997, 28 ♂, 15 ♀ (Vi).

Distribution in Turkey. Bolu, Kahramanmaraş, Tunceli (Zwick 1971); Bolu (Theischinger 1976a); Ankara (Kazancı 1982); Ankara, Bolu (Kazancı 2012); Rize (Kazancı 2013); **country record only:** listed from Turkey (Kazancı 1983b; Kazancı 2008). Map (Fig. 118).

Distribution and ecology. West Palaearctic, whole Anatolia. A eurytopic species occurring in various types of brooks and rivers. Adults emerge in spring (V–VI).

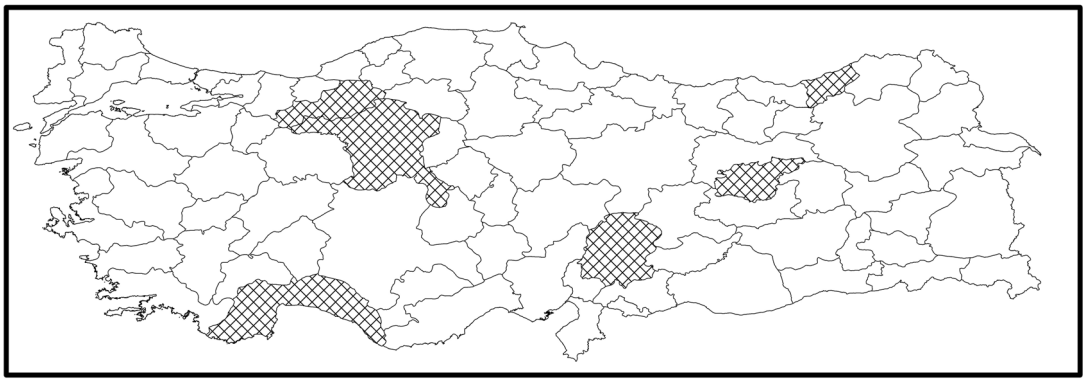

FIGURE 118. *Perlodes microcephalus* (Pictet, 1833)

Stoneflies distribution by biogeographical regions

In Table 1, the geographical distribution of the known species recorded from Turkey is listed. This compilation summarizes the bibliographical information of Anatolian stoneflies as previously presented.

Ten major Turkish regions are recognized. Each region includes several Turkish provinces (Fig. 119):

ETu = European Turkey: Edirne, Kırklareli, Tekirdağ, İstanbul (European part)
NWC = Northwestern coast: Çanakkale, Balıkesir, Manisa, İzmir
WPo = Western Pontus: Bursa, Yalova, Kocaeli, İstanbul (Asian part), Sakarya, Bilecik, Düzce, Zonguldak, Bolu, Bartın, Karabük, Kastamonu, Çankırı
CPo = Central Pontus: Sinop, Çorum, Amasya, Samsun, Tokat, Ordu, Sivas, Giresun
EPo = Eastern Pontus: Trabzon, Gümüşhane, Erzincan, Bayburt, Rize, Erzurum, Artvin, Ardahan, Kars
CAn = Central Anatolia: Kütahya, Uşak, Eskişehir, Afyon, Ankara, Kırıkkale, Kırşehir, Nevşehir, Yozgat
SWC = Southwestern coast: Aydın, Denizli, Muğla
WTa = Western Taurus: Burdur, Antalya, Isparta, Konya, Karaman, Aksaray, Niğde, Mersin
CTa = Central Taurus: Adana, Kayseri, Kahramanmaraş, Osmaniye, Hatay, Kilis, Gaziantep, Şanlıurfa, Adıyaman, Malatya,
ETa = Eastern Taurus: Mardin, Diyarbakır, Elazığ, Tunceli, Bingöl, Muş, Batman, Bitlis, Siirt, Sirnak, Hakkari, Van, Ağrı, Iğdır

FIGURE 119. Biogeographical regions of Turkey.

TABLE 1. Turkish stoneflies**.** The distribution is given according to the previously defined bio-geographical regions. ✸ = Turkish macro-endemic species; □ = Turkish micro-endemic species (known from a very restricted area in Anatolia); ♦ = occurence in neighboring regions (Europa or Caucasus). **?** = doubtful reports. ETu = European Turkey, NWC = North west coast, WPo = West Pontus, Cau = Caucasus, CPo = Central Pontus, EPo = East Pontus, Eur = Europa (without Greek Chios and Lesbos Islands), CAn = Central Anatolia, SWC = South west coast, WTa = West Taurus, CTa = Central Taurus, ETa = East Taurus.

	Eur	ETu	NWC	WPo	CPo	EPo	CAn	SWC	WTa	CTa	ETa	Cau
CAPNIIDAE												
Capnia. arensi				●		●	●	●	●			♦
C. nigra	♦					●			●			♦
Capnioneura bolkari										□		
C. gouanerae						□						
Capnopsis schilleri archaica									●		●	♦
Zwicknia sevanica							●		●			♦
Z. tuberculata							●	●	●	●		♦
LEUCTRIDAE												
Leuctra aculeata									□			
L. anatolica				□								
L. antalyana									□			
L. artvinensis						□						
L. aspoeckorum						●						♦
L. boluensis				□								
L. bozi			✸	✸					✸			
L. brachyptera				□								
L. collaris				●	●	●						♦
L. delamellata						●						♦
L. furcatella				●	●	●	●					♦
L. fusca latior				●	●		●					
L. hippopus	♦		●	●	●	●	●	●	●	●		♦
L. joosti	♦	●										
L. karcali						□						
L. kopetdaghi				●								
L. kurui			✸	✸	✸							
L. marilouae						□						
L. martynovi				●		●				●		♦
L. minuta bursaensis			□	□								
L. minuta kastamonui				□								
L. sanainica				●	●	●	●					♦
L. schistocerca										□		
L. sipahilerae						□						
L. theischingeri						□						
L. zangezurica						●						♦
L. zhiltzovae						□						

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TABLE 1. (Continued)

	Eur	ETu	NWC	WPo	CPo	EPo	CAn	SWC	WTa	CTa	ETa	Cau
NEMOURIDAE												
Amphinemura mirabilis mir.				●	●	●					●	♦
A. standfussi	♦	●		●			●		●			
A. trialetica				●	●	●	●				●	♦
Protonemura aculeata				●		●						♦
P. aki									□			
P. bacurianica adana									□	□		
P. bacurianica bacurianica				●	●	●	●			●	●	♦
P. besucheti										□		
P. bifida bifida				●	●	●						♦
P. bithynica		?	✸	✸	✸	✸	✸	✸	✸		✸	
P. brachystyla						●						♦
P. capitata						●						♦
P. eumontana						●						♦
P. gladifera										●		♦
P. intricata pseudointricata	♦		?									
P. izmiriana			□									
P. microstyla						●						♦
P. oreas			●	●	●	●						♦
P. praecox	♦			●		●	●	●		●		
P. rauschi	♦	●										
P. ressli				✸	✸							
P. siveci								□				
P. spinulata						●						♦
P. strandschaensis	♦	●										
P. teberdensis					●	●						♦
P. triangulata				●	●	●						♦
P. vernalis						●						♦
P. vonbursa				□								
Nemoura asceta	♦	●										
N. brevipennis										●		♦
N. cambrica	♦	●										
N. cinerea cinerea	♦	●	●	●	●	●	●					♦
N. dromokeryx						□						
N. flexuosa	♦		●	●	●		●					
N. martynovia				●	●	●	●					♦
N. subtilis	♦	●	●	●	●	●	●		●	●	●	
N. taurica	♦		●	●	●		●	●	●	●	●	
N. turcica	♦			●	●	●	●		●	●	●	

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TABLE 1. (Continued)

	Eur	ETu	NWC	WPo	CPo	EPo	CAn	SWC	WTa	CTa	ETa	Cau
N. uncinata	♦		●					●				
N. wittmeri					✸	✸						
TAENIOPTERYGIDAE												
Taeniopteryx caucasica						●						♦
Brachyptera. ankara				□			□					
B. berkii			✸	✸				✸				
B. demirsoyi							□					
B. risi	♦	●										
B. sislii							□					
B. transcaucasica transcaucasica				●	●	●				●		♦
B. transcaucasica turcica				✸			✸		✸			
B. zwicki	♦		●	●			●					
Rhabdiopteryx doiranensis	♦							●				
CHLOROPERLIDAE												
Chloroperla zhiltzovae	✍		●	●	●	●	●	●	●	●		♦
Plesioperla sakartvella					●	●						♦
Pontoperla katherinae						●						♦
P. teberdinica				●	●	●	●		●	●	●	♦
Siphonoperla hajastanica					●	●						♦
S. gr. libanica sp 1									□	□		
S. gr. libanica sp 2									□			
S. gr. libanica ssp 3			□									
S. neglecta	♦	●										
Xanthoperla yerkoyi						✸	✸					
PERLIDAE												
Paragnetina transoxanica						♦						♦
Agnetina senilis	♦				●		●					♦
A. werneri						✸	✸		✸		✸	
Eoperla ochracea						●						
Marthamea selysii ?	♦						✍					
M. vitripennis	♦				●		●					
Perla caucasica			●	●	●	●	●	●	●			♦
P. horvati					□							
P. illiesi	♦	●										
P. kiritshenkoi						●						♦
P. marginata ?	♦	●		●	●		●			●		
P. pallida (Type 1)				●	●	●		●	●	●	●	♦
P. zwicki				□								

.....continued on the next page

TABLE 1. (Continued)

	Eur	ETu	NWC	WPo	CPo	EPo	CAn	SWC	WTa	CTa	ETa	Cau
PERLODIDAE												
Isoperla armeniaca				●	●	●	●	●	●	●	●	♦
I. bithynica				●	●	●	●		●		●	♦
I. chius				✸								
I. grammatica			●	●	●	●		●	●	●		♦
I. lesbica			✸	✸			✸	✸	✸			
I. rhododendri				●	●	●	●	●		●	●	♦
I. tripartita	♦	●		●								
Bulgaroperla mirabilis mir.	♦	●										
B. mirabilis nigrita			□									
Perlodes microcephalus	♦			●		●	●		●	●	●	♦
TOTAL: 117 species		**14**	**21**	**52**	**37**	**58**	**37**	**17**	**29**	**24**	**15**	
Endemic species		**0**	**9**	**16**	**5**	**12**	**8**	**4**	**11**	**5**	**2**	
Macro-endemic species		**0**	**5**	**8**	**4**	**4**	**5**	**3**	**5**	**0**	**2**	
Micro-endemic species		**0**	**4**	**8**	**1**	**8**	**3**	**1**	**6**	**5**	**0**	
		ETu	**NWC**	**WPo**	**CPo**	**EPo**	**CAn**	**SWC**	**WTa**	**CTa**	**ETa**	
Total				**84**					**42**			
Macro-endemic species				**11**					**5**			
Micro-endemic species				**17**					**9**			

Diversity among the major Turkish biogeographical regions

For each major biogeographic region, the geographical origin of the stonefly taxa (Asian origin, European origin, endemism or micro-endemism) is given. Comparison with global richness is also provided. The Turkish regions are ordered from the Northwest to the Southeast.

European Turkey. In European Turkey, the stonefly diversity is rather low, with only 14 species confirmed and one dubious species, *P. bithynica* that may refer to *P. strandschaensis.* The majority of these species, eight have a wide distribution in Europe: *A. standfussi, N. cambrica, N. c. cinerea, N. subtilis, B. risi, S. neglecta, P. marginata*?, and *I. tripartita.*

The other six species have a narrower distribution being limited to the Balkan region: *L. joosti, P. rauschi, P. strandschaensis, N. asceta, P. illiesi* and *B. m. mirabilis*. Among them *P. strandschaensis* and *B. m. mirabilis* are Thracian micro-endemic species. *P. illiesi* has an extensive range in the eastern spurs of the Italian Alps.

This low diversity may be the result of the lower altitudes of the region (highest point at 1030 m, Mahya Mount near Kırklareli). There may be additional taxa present in this region that await discovery. For example, Murányi, April 2007 expedition discovered seven species new to the Turkish fauna: *L. joosti*, *P.rauschi*, *P. strandschaensis*, *N. asceta, N. cambrica*, *B. risi,* and *S. neglecta.*

Three species, *B. m. nigrita, I. lesbica,* and *I. chius* occurring in western Anatolia also occur in the Greek Chios or Lesbos Islands. These islands are close to the Anatolian coast and we consider these species as Anatolian elements.

Northern region of the West Coast. This region, close to European Turkey and distant from the Caucasus, is characterized by weak Asian affinities, with only three shared species, *P. oreas*, *C. zhiltzovae, P. caucasica.* Whereas, this region includes eight species of European affinities, *L. hippopus, P. intricata pseudointricata, N. cinerea cinerea, N. flexuosa, N. subtilis, N. taurica, N. uncinata, B. zwicki,* and *I. grammatica.* The level of endemism is high in this region with nine species recorded, five of which are considered micro-endemic taxa: *L.*

minuta bursaensis, P. izmiriana, B. berkii, S. gr. *libanica* ssp. 3 and *B. m. nigrita,* and four species with a wider distributional range: *P. bithynica, L. bozi, L. kurui*, and *I. lesbica.*

The global diversity is moderate (21 species), compared with that of the Pontus, but richer than that of the southwestern coast (17 species).

Western Pontus. The Caucasian or Asian elements are well respresented with 23 species: *Capnia arensi, Capnopsis schilleri archaica, Z. sevanica, Z. tuberculata, L. collaris, L. furcatella, L. martynovi, L. sanainica, A. m. mirabilis, A. trialetica, P. aculeata, P. b. bacurianica, P. b. bifida, P. triangulata, N. martynovia, B. t. transcaucasica, C. zhiltzovae, P. teberdinica, P. caucasica, P. pallida* (Type 1), *I. armeniaca, I. bithynica,* and *I. rhododendri.*

The European influence is strong with at least 11 species: *A. standfussi, P. praecox, N. c. cinerea, N. flexuosa, N. subtilis, N. taurica, N. uncinata, B. zwicki, P. marginata*?, *I. grammatica,* and *I. tripartita.*

The level of endemism of this region is high (16 sp) with eight micro-endemics (*L. anatolica, L. boluensis, L. brachyptera, L. minuta bursaensis, L. minuta kastamonui, P. vonbursa, B. ankara* and *P. zwicki*) and eight macro-endemics (*P. bithynica, L. bozi, L. kurui, P. ressli, B. berkii, B. transcaucasica turcica, I. chius*, and *I. lesbica*).

This region ranks second for its overall global richness (52 sp.). The high number of micro-endemic species could be explained by high altitudes and precipitation, factors that favour orophilic isolation, as it was already observed for instance in the Spanish Cantabrian Cordillera (wettest part of the Iberian Peninsula) (Vinçon & Pardo 2004).

Central Pontus. The Asian and Caucasian influences remains high (23 sp): *Z. tuberculata, L. collaris, L. furcatella, L. sanainica, A. m. mirabilis, A. trialetica, P. b. bacurianica, P. b. bifida, P. dilatata, P. triangulata, N. martynovia, B. t. transcaucasica, S. hajastanica, C. zhiltzovae, P. sakartvella, P. teberdinica, S. hajastanica, A. senilis, P. caucasica, P. pallida* (Type 1), *I. armeniaca, I. bithynica,* and *I. rhododendri.*

European faunal influence decreases (6 sp.): *N. c. cinerea, N. flexuosa, N. subtilis, N. taurica, P. marginata*?, and *I. grammatica.*

The level of endemism is low (5 sp.): *L. kurui, P. bithynica, P. ressli, N. wittmeri,* and *P. horvati.* Among these taxa, only *P. horvati* is considered micro-endemic.

This region is ranked third for overall global richness (37 sp.). The number of endemic species, relatively few as compared to both east and west extremities of the Pontus, is difficult to explain; it could be linked to lower altitudes.

Eastern Pontus. This region, closely connected to the Caucasus and Armenia, has the highest stonefly diversity in Anatolia (58 sp.) (Table 1). This richness is mainly explained by the occurrence of numerous Caucasian species or Middle East species extending in the Pontus through the Caucasus or Armenia (38 sp.): *C. arensi*, *C. s. archaica, L. aspoeckorum, L. collaris, L. delamellata, L. furcatella, L. martynovi, L. sanainica, L. zangezurica, A. m. mirabilis, A. trialetica, P. aculeata, P. b. bacurianica, P. b. bifida, P. brachystyla, P. capitata, P. eumontana, P. microstyla, P. oreas, P. spinulata, P. teberdensis, P. triangulata, P. vernalis, N. martynovia, T. caucasica, B. t. transcaucasica, C. zhiltzovae, P. sakartvella, P. katherinae, P. teberdinica, S. hajastanica, P. transoxanica, P. caucasica, P. kiritschenkoi, P. pallida* (Type 1), *I. armeniaca, I. bithynica,* and *I. rhododendri.*

However, the European influence is very weak (4 sp.): *P. praecox, N. c. cinerea, N. subtilis,* and *I. grammatica*.

The level of endemism is also very high (12 sp) with 8 micro-endemics (*C. gouanerae, L. artvinensis, L. karcali, L. marilouae, L. sipahilerae, L. theischingeri, L. zhiltzovae*, and *N. dromokeryx*) and four macro-endemics (*P. bithynica, N. wittmeri, X. yerkoyi*, and *A. werneri*). This high level of micro-endemism may be explained by the high altitudes and the presence of deep transversal valleys that separate this region from the Caucasus and from the remainder of the Pontus (orophilic isolation). Most cases of micro-endemism concern the Leuctridae (6 sp.), that is also the case in the entire Pyrenees (11 sp.) (Vinçon & Ravizza 2001) or the Spanish Cantabrian Cordillera and Gallicia (7 sp.) (Vinçon & Pardo 2004).

Central Anatolia. The stonefly diversity in the central part of Anatolia is high (37 sp.), due to a rather high Asian influence (14 sp.): *C. arensi, Z. sevanica, Z. tuberculata, L. furcatella, L. sanainica, A. trialetica, N. martynovia, C. zhiltzovae, P. teberdinica, A. senilis, P. caucasica, I. armeniaca, I. bithynica*, and *I. rhododendri.* The European influence is less (9 sp.): *A. standfussi, P. praecox, N. c. cinerea, N. flexuosa, N. subtilis, N. taurica, B. zwicki, M. selysii*, and *P. marginata*?

The level of endemism is also rather high (8 sp.) comprising three micro-endemics (*B. ankara, B. demirsoyi,* and *B. sislii*) and five macro-endemics (*P. bithynica, B. t. turcica, X. yerkoyi, A. werneri*, and *I. lesbica*).

Southern part of the West Coast. Compared to the northern portion of the West Coast (21 sp.), the global diversity in the southern portion of the West Coast is relatively less (17 sp.). This pattern may be explained by the weaker Asian influence (7 sp.): *C. arensi, Z. tuberculata, C. zhiltzovae, P. caucasica, P. pallida* (Type 1), *I. armeniaca*, and *I. rhododendri* along with a weak European influence (3 sp.): *N. taurica, R. doiranensis*, and *I. grammatica,* and a low level of endemism (4 sp.) with one micro-endemic, *P. siveci* and three macro-endemics (*P. bithynica, B. berkii*, and *I. lesbica*).

This poor diversity could be related both to the aridness of this region and rather low altitudes less favourable for orophilic isolation. Such areas, e.g. the southeastern part of Macedonia (Murányi *et al.* 2014b) also can have high diversity, but with most species having winter emergence period that is evidently undersampled.

Western Taurus. The Asian influence remains visible (7 sp.): *C. arensi, L. kopetdaghi, C. zhiltzovae, P. teberdinica, P. caucasica, I. armeniaca*, and *I. bithynica.*

However, the European influence is less (5 sp.): *A. standfussi, N. subtilis, N. taurica, P. pallida* (Type 1), and *I. grammatica.*

The richness of this region (29 sp.**)** is mainly due to a high level of endemism (11 sp.) with six micro-endemics (*L. aculeata, L. antalyana, P. aki, P. b. adana, S.* gr. *libanica* sp. 1 and *S*. gr. *libanica* sp. 2) and five macro-endemics (*L. bozi, P. bithynica, B. t. turcica, A. werneri*, and *I. lesbica*. These micro-endemic species are more threatened than those occurring in the Pontus since the calcareous Taurus mountain range is more exposed to drought and this region should be protected from further development and degradation of water resources.

Central Taurus and Nur Dağları. The Asian influence is more important (9 sp.): *L. martynovi, P. b. bacurianica, N. brevipennis, B. t. transcaucasica, C. zhiltzovae, P. teberdinica, P. pallida* (Type 1), *I. armeniaca*, and *I. rhododendri,* whereas the European influence is only represented by four species: *N. subtilis, N. taurica, P. marginata*?, and *I. grammatica.*

The level of endemism is less high than in the western Taurus (5 sp.) but always comprising a high level of micro-endemics (5 sp.) (*C. bolkari, L. schistocerca, P. b. adana, P. besucheti,* and *S.* gr. *libanica* sp. 1). It indicates a need for water quality studies for this area.

Eastern Taurus. The region seems to have a low diversity (15 sp.), mainly of Asian origin (7 sp.): *A. trialetica, P. b. bacurianica, P. teberdinica, P. pallida* (Type 1), *I. armeniaca, I. bithynica*, and *I. rhododendri,* and with weak European influence (2 sp.): *N. subtilis* and *N. taurica,* and a very low level of endemism (2 sp.): *P. bithynica* and *A. werneri* and without any known micro-endemic species. Nevertheless this apparent depauperate fauna is probably mainly due to the lack of adequate collections in this eastern portion of Anatolia often because of lack of access.

TABLE 2. Diversity among the different families occurring in Turkey Nb = number, % Total = % of total species number, % Fam. = % only within the family).

	Diversity		Endemism			Micro-endemism		
	Nb	% Total	Nb	% Total	% Fam.	Nb	% Total	% Fam.
Capniidae	7	6.0	2	1.7	28.6	2	1.7	28.6
Leuctridae	27	23.1	16	13.7	59.3	14	12.0	51.9
Nemouridae	40	34.2	10	8.5	25	7	6.0	17.5
Taeniopterygidae	10	8.5	5	4.3	50	3	2.6	30
Chloroperlidae	10	8.5	4	3.4	40	3	2.6	30
Perlidae	13	11.1	3	2.6	23.1	2	1.7	15.4
Perlodidae	10	8.5	3	2.6	30	1	0.9	10
Total	117		43	36.8		32	27.4	

As shown in Table 2, the two most diversified families are the Nemouridae (40 sp. = 34.2 % of total), followed by the Leuctridae (27 sp. = 23.1 %). However, the highest level of endemism and micro-endemism (13.7 %, 12.0 %) are the Leuctridae followed by the Nemouridae (8.5 %, 6.0 %). Both two families correspond to 57.3 % of the total stonefly diversity.

This ratios are nearly similar to those occurring for instance in the Maghreb where Nemouridae is also the

family with the highest diversity (14 sp. = 36.8 % of the total of 38 sp.), followed by the Leuctridae (11 sp. = 28.9 %). Both two families correspond to 65.7 % of the total stonefly diversity (Yasri-Cheboubi *et al.* 2013, Errochdi *et al.* 2014).

In an other comparison, the Italian stonefly fauna comprises 165 taxa, among them the Leuctridae have the highest diversity (58 sp., 35 %), followed by the Nemouridae (53 sp., 32 %), both families comprising 111 sp. (67 %) (Fochetti & Tierno de Figueroa 2008).

The two most species rich genera in Turkey are *Leuctra* (27 sp., 23.1 %) and *Protonemura* (25 sp., 21.4 %), followed by *Nemoura* (12 sp., 10.3 %). All remaining genera are represented by less than 10 sp. (Table 3). Concerning the level of endemism, the *Leuctra* is the highest (16 sp., 13.7 %), followed by *Protonemura* (8 sp., 6.8 %) and *Brachyptera* (5 sp., 4.3 %).

TABLE 3. Diversity among the different genera occurring in Turkey Nb = number, % Total = % of total species number, % Genus = % only within the genus)

	Diversity		Endemism			Micro-endemism		
	Nb	% Total	Nb	% Total	% Genus	Nb	% Total	% Genus
Capnia	2	1.7	0	0	0	0	0	0
Capnioneura	2	1.7	2	1.7	100	2	1.7	100
Capnopsis	1	0.9	0	0	0	0	0	0
Zwicknia	2	1.7	0	0	0	0	0	0
Leuctra	27	23.1	16	13.7	59.3	14	12.0	51.9
Amphinemura	3	2.6	0	0	0	0	0	0
Protonemura	25	21.4	8	6.8	32	6	5.1	24
Nemoura	12	10.3	2	1.7	16.7	1	0.9	8.3
Brachyptera	8	6.8	5	4.3	62.5	3	2.6	37.5
Rhabdiopteryx	1	0.9	0	0	0	0	0	0
Taeniopteryx	1	0.9	0	0	0	0	0	0
Chloroperla	1	0.9	0	0	0	0	0	0
Plesioperla	1	0.9	0	0	0	0	0	0
Pontoperla	2	1.7	0	0	0	0	0	0
Siphonoperla	5	4.3	3	2.6	60	3	2.6	60
Xanthoperla	1	0.9	1	0.9	100	0	0	0
Paragnetina	1	0.9	0	0	0	0	0	0
Agnetina	2	1.7	1	0.9	50	0	0	0
Eoperla	1	0.9	0	0	0	0	0	0
Marthamea	2	1.7	0	0	0	0	0	0
Perla	7	6.0	2	1.7	28.6	2	1.7	28.6
Isoperla	7	6.0	2	1.7	28.6	0	0	0
Bulgaroperla	2	1.7	1	0.9	50	1	0.9	50
Perlodes	1	0.9	0	0	0	0	0	0
TOTAL	117		43	36.8		32	27.4	

In comparison, within the Italian fauna, the highest diversity is represented by *Leuctra* (57 sp., 34.5 %), followed by the *Protonemura* (32 sp., 19.4 %). Ther specie of *Leuctra* have the highest endemism (27 sp., 16.4%) followed by the *Protonemura* (17 sp., 10.3 %).

Comparison within the different Turkish regions (Table 4)

The highest similarities between the ten ecoregions are apparent in the three regions of the Pontus (28 to 30 species are shared), whereas only nine to 13 species are in common between the three regions of the Taurus. However these differences are mainly due to the much greater global diversity of the Pontus (84 species), as compared with the Taurus (42 species) and the comparison in percentage is rather similar.

TABLE 4. Stoneflies in common among the different mountainous regions of Turkey. Euro. = Europe, ETu = European Turkey, NWC = North west coast, WPo = West Pontus, CPo = Central Pontus, EPo = East Pontus, CAn = Central Anatolia, SWC = south west coast, WTa = West Taurus, CTa = Central Taurus, ETa = East Taurus, Cauc. = Caucasus. % is given according to the diversity in the region with less diversity among the two compared regions.

	Euro.	ETu	NWC	WPo	CPo	EPo	CAn	SWC	WTa	CTa	ETa	Cauc.
Euro.		14	8 38%	12 23%	9 24%	8 14%	13 35%	5 29%	7 24%	7 29%	4 27%	
ETu	14 100%		2 14%	5 36%	3 21%	2 14%	4 29%	0 0%	2 14%	2 14%	1 7%	1 7%
NWC	8 38%	2 14%		16 76%	11 52%	8 38%	10 48%	9 53%	9 43%	5 24%	3 20%	6 29%
WPo	12 23%	5 36%	16 76%		**30** 81%	**29** 56%	**28** 76%	13 76%	18 62%	16 67%	13 87%	25 48%
CPo	9 24%	3 21%	11 52%	**30** 81%		**28** 76%	22 59%	9 53%	12 41%	13 54%	12 80%	25 68%
EPo	8 14%	2 14%	8 38%	**29** 56%	**28** 76%		21 57%	10 59%	15 52%	14 58%	13 87%	**42** 72%
CAn	13 35%	4 29%	10 48%	**28** 76%	22 59%	21 57%		11 65%	18 62%	13 54%	12 80%	18 49%
SWC	5 29%	0 0%	9 53%	13 76%	9 53%	10 59%	11 65%		11 65%	9 53%	5 33%	9 53%
WTa	7 24%	2 14%	9 43%	18 62%	12 41%	15 52%	18 62%	11 65%		13 54%	11 73%	14 48%
CTa	7 29%	2 14%	5 24%	16 67%	13 54%	14 58%	13 54%	9 53%	13 54%		9 60%	14 58%
ETa	4 27%	1 7%	3 20%	13 87%	12 80%	13 87%	12 80%	5 33%	11 73%	9 60%		10 67%
Cauc.		1 7%	6 29%	25 48%	25 68%	**42** 72%	18 49%	9 53%	14 48%	14 58%	10 67%	

The richness of the Pontus is due to both a very high number of Caucasian species (42 species in common between the Caucasus and the eastern Pontus) and also a very high number of micro-endemic species distributed along the Pontus mountain range (17 sp.). In the Taurus the level of micro-endemism is much lower (9 species) (Table 1).

The Anatolian western coast is composed of several mountain ranges of moderate altitude separated by wide valleys and has a dry climate not favorable for aquatic insect dispersal. Therefore the stonefly fauna occurring in the northern portion of the western coast appears rather distinct to that of the southern portion (9 species in common, 53%). The level of micro-endemism along the entire western coast is only five species.

Caucasian influence in Anatolia. Because of their close geographical proximity, the Caucasus and the Pontus could be considered as two spurs of the same wide mountainous range. Both the Caucasus and the Pontus mountain ranges share 42 stonefly species in common (Table 4). However, this wide range of mountains is cut transversally by wide valleys that favour orophilic isolation. Indeed 17 species are micro-endemic within the Pontus and the level of micro-endemic also remains very high in Caucasus, especially in the *Leuctra* (8 species): *L. dispinata, L. dissimilis, L. m. minuta, L. simplex, L. svanetica, L. tarnogradskii, L. torrenticola, L.uncinata* or in the *Protonemura* (4 species): *P. abchasica, P. alticola, P. dilatata* and *P. viridis* (Graf *et al.* 2009).

European influence in Anatolia. Except for the stonefly fauna of the northwestern coast, that are more related to the European fauna, all the remainder of the stoneflies of Anatolia is more closely related with the Caucasian fauna, and the level of the Caucasian species increases from West to East. For example, in the northern portion of Anatolia, the percentage of the Caucasian species gradually increases: Northwestern coast = 29%, western Pontus = 48%, central Pontus = 68% and eastern Pontus = 73%, while the European elements tend to decrease from West to East: Northwestern coast = 38%, western Pontus = 23%, central Pontus = 24% and eastern Pontus = 14%.

Our results illustrate well the fact that the fauna of Anatolia is mainly of Asian—Caucasian origin instead of European origin, though it can be considered at being at the junction between these two continents. However, it is worth to note that all Asian elements are from the Asian regions of the West Palaearctic, East Palaearctic elements are completely lacking from Anatolia. The Dardanelles and Bosphorus straits (Marmara Sea) between Europe and Asia appears to be a more difficult gap to cross than the wide valleys and plateaus that separate Anatolia from the Caucasus.

Turkish stoneflies distribution patterns

From a biogeographical aspect the Turkish stoneflies can be separated according to their distribution.

West Palaearctic species (1 sp.)

P. microcephalus.

Eurasian species (3 sp.)

C. nigra, L. hippopus, and *N. c. cinerea.*

Species of Asian origin (47 sp.)

Middle East species occurring in Anatolia (6 sp.): *L. collaris, L. f. latior, L. kopetdaghi, A. m. mirabilis, P. aculeata*, and *A. senilis.*

Caucasian species widespread in Anatolia (14 sp.): *C. arensi, Z. sevanica, Z. tuberculata, L. martynovi, P. b. bacurianica, B. t. transcaucasica, C. zhiltzovae, P. teberdinica, A. werneri, P. caucasica, P. pallida* (Type 1), *I. armeniaca, I. bithynica*, and *I. rhododendri.*

Caucasian species widespread in eastern Anatolia (2 sp.): *P. gladifera* and *N. brevipennis.*

Caucasian species widespread throughout the Pontique Mountain range (8 sp.): *C. s. archaica, L. furcatella, L. sanainica, A. trialetica, P. b. bifida, P. oreas, P. triangulata*, and *N. martynovia.*

Caucasian species widespread only in the eastern portion of the Pontus (16 sp.): *L. delamellata, L. zangezurica, P. brachystyla, P. capitata, P. dilatata, P. eumontana, P. microstyla, P. spinulata, P. teberdensis, P. vernalis, T. caucasica, P. sakartvella, P. katherinae, S. hajastanica, P. transoxanica*, and *P. kiritschenkoi.*

Species extending in Anatolia and Greece (1 sp.): *N. turcica*.

Species of European origin (21 sp.)

European species occurring in a wide part of Anatolia (7 sp.): *P. praecox, N. flexuosa, N. subtilis, N. taurica, M. selysii, M. vitripennis* and *P. marginata*? Among them, three species have a peculiar distribution: *N. subtilis* is Balkan-Anatolian, *N. taurica* is Circumpontic and *M. selysii* is only known from western Europe in addition to Anatolia and the Turkish record may be questionable.

European species only occurring in the western part of Anatolia (6 sp.): *A. standfussi, P. i. pseudointricata, N. uncinata, B. zwicki, R. doiranensis*, and *I. tripartita.*

European species only occurring in European Turkey (8 sp.): *N. cambrica, B. risi, L. joosti, P. rauschi, P. strandschaensis, N. asceta, P. illiesi,* and *B. m. mirabilis* (the last six taxa have a restricted area in the Balkan mountain range including European Turkey).

Mediterranean species (1 sp.)

E. ochracea.

Endemic species

The endemic species are separated into two groups, those having a wide distribution in Anatolia (**macro-endemic species)** and those only occurring in a small mountainous massif or in a narrow part of the Taurus or Pontus (**micro-endemic species)**.

Macro-endemic species (10 sp.)

Macro-endemic of whole Anatolia (1 sp.): *P. bithynica* (also extensive in the Greek Lesbos Island).

Macro-endemic of western Anatolia (6 sp.): *L. bozi, L. kurui, B. berkii, B. t. turcica, I. chius* (also in the Greek Chios Island), and *I. lesbica* (also in the Greek Lesbos Island). Both *I. chius* and *I. lesbica* can be considered as Anatolian endemic species since the Lesbos and Chios islands are very close to the Turkish coast.

Macro-endemic of Pontus (2 sp.): *P. ressli* and *N. wittmeri.*

Macro-endemic of central Anatolia (1 sp.): *X. yerkoyi.*

Micro-endemic species (32 sp.)

Micro-endemic of the north western coast of Anatolia (4 sp.): *L. m. bursaensis, P. izmiriana, S. gr. libanica* ssp 3, and *B. m. nigrita* (also in Greek Lesbos Island, close to the Turkish coast).

Micro-endemic of the south western coast of Anatolia (1 sp.): *P. siveci.*

Micro-endemic of western Pontus (8 sp.): *L. anatolica, L. boluensis, L. brachyptera, L. m. bursaensis, L. m. kastamonui, P. vonbursa, B. ankara* (also extending in the region of Ankara), and *P. zwicki.*

Micro-endemic of central Pontus (1 sp.): *P. horvati.*

Micro-endemic of eastern Pontus (8 sp.): *C. gouanerae, L. artvinensis, L. karcali, L. marilouae, L. sipahilerae, L. theischingeri, L. zhiltzovae,* and *N. dromokeryx.*

Micro-endemic of western Taurus (6 sp.): *L. aculeata, L. antalyana, P. aki, P. b. adana, S. gr. libanica* sp 1, and *S. gr. libanica* sp 2.

Micro-endemic of central Taurus and Nur Dağları (5 sp.): *C. bolkari, L. schistocerca, P. b. adana, P. besucheti*, and *S. gr. libanica* sp 1.

Micro-endemic of eastern Taurus (0 sp.): no known micro-endemic species

Micro-endemic in a small part of central Anatolia (3 sp.): *B. ankara, B. demirsoyi*, and *B. sislii.*

Hot spots of biodiversity

If we only consider the micro-endemic species occurring in Anatolia, the global number of 32 species is exceptionally high as compared to other European or West Asian mountainous regions. The main hot spots of diversity in Anatolia is the Pontus with 17 micro-endemic species, that can be separated in three groups: eight species occurring in the western portion of the Pontus, one in the central portion and eight in the eastern portion (Table 1). This wide cordillera is characterized both by high altitudes and higher precipitation, two main factors responsible for orophilic isolation. The mountain ranges of western Anatolia and the Taurus have a lesser diversity with only five and nine micro-endemic species.

However, the biodiversity in western and southern Anatolia is much more threatened with extinction as compared to northern Anatolia. Indeed, these biotopes occur in very dry regions, exposed to global warming and increased human pressure.

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