

CONTRIBUTION TO THE ZOOGEOGRAPHY OF THE SPANISH EPHEMEROPTERA

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Abstract. The spatial distribution of Spanish Ephemeroptera /families Baetidae, Oligoneuriidae, Ephemerellidae, Leptophlebiidae, Polymitarcyidae, Potamanthidae, and Ephemeridae/ mainly in the River Duero and Tajo basins is studied, comparing the geographic characteristics with some ecological factors of the waters where they exist. Baetis digitatus Bengtsson, 1912, Rapto-baetopus tenellus /Albarda, 1878/ and Acentrella sinaica /Bo-goescu, 1931/ are first cited in Spain. Among the family Heptageniidae, not studied here, Heptagenia coeruleans Rostock, 1878 is also present and cited for the first time in the Iberian peninsula.

Faunistics, Duero and Tajo basins, nymphs, biology

Sixty-three species of Ephemeroptera are cited in the Iberian peninsula by Puthz (1978). Alba-Tercedor (1981b) has posteriorly reviewed all the bibliography dealing with Spanish Ephemeroptera and cites 97 species including 15 Navas' species considered as dubious by Puthz and 20 species not mentioned as present in the area by this author.

Four new species have been described recently (Alba-Tercedor in press; González del Tánago and García de Jalón 1983) and also 5 species have been first cited in Spain (Alba-Tercedor 1983; González del Tánago and García de Jalón 1983; González del Tánago in press) summarizing ninety two certain Ephemeroptera species present in the Iberian peninsula.

In this paper some data on the distribution of several Ephemeroptera families are reviewed including some notes on the biology of the nymphs. Heptagenia coeruleans Rostok and Habro-leptoides umbratilis Eaton are first cited in the Iberian peninsula.

METHODS

The data used in this paper come from the reviewed bibliography and many samplings carried out around Spain along the last five years. Most of the specimens collected by the author were nymphs which were captured using hand nets in a qualitative manner, in the lotic and lentic parts of the current. The best studied area has been the Spanish area of the Duero basin where a general study of the aquatic fauna was carried out recently (González del Tánago and García de Jalón 1982).

RESULTS AND DISCUSSION

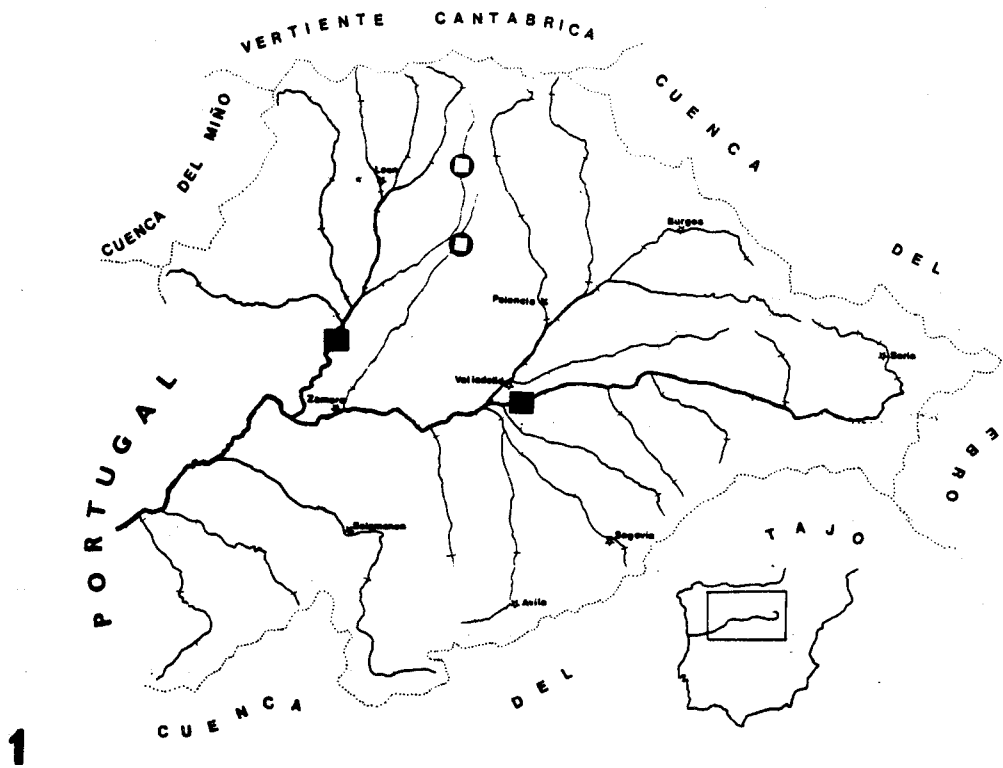
Family Baetidae

Some new records of this family for the Iberian peninsula are worthy to be cited here, as the presence of Baetis digitatus Bengtsson and Raptobaetopus tenellus Albarda in the Duero Basin (González del Tánago in press). Both species have been found in a reduced number of specimens. Baetis digitatus inhabits the upper reaches of two little plain rivers, Cea and Valderaduey, living among the lentic microhabitats (Fig. 1). Raptobaetopus tenellus is in the area a very rare species, like in other countries where also exists (Soldán 1978, Fontaine and Perrin 1981). Only two nymphs of this species were collected in the low reaches of rivers Duero and Esla, where there is a strong water flow, located in the lentic part of the current (Fig. 1).

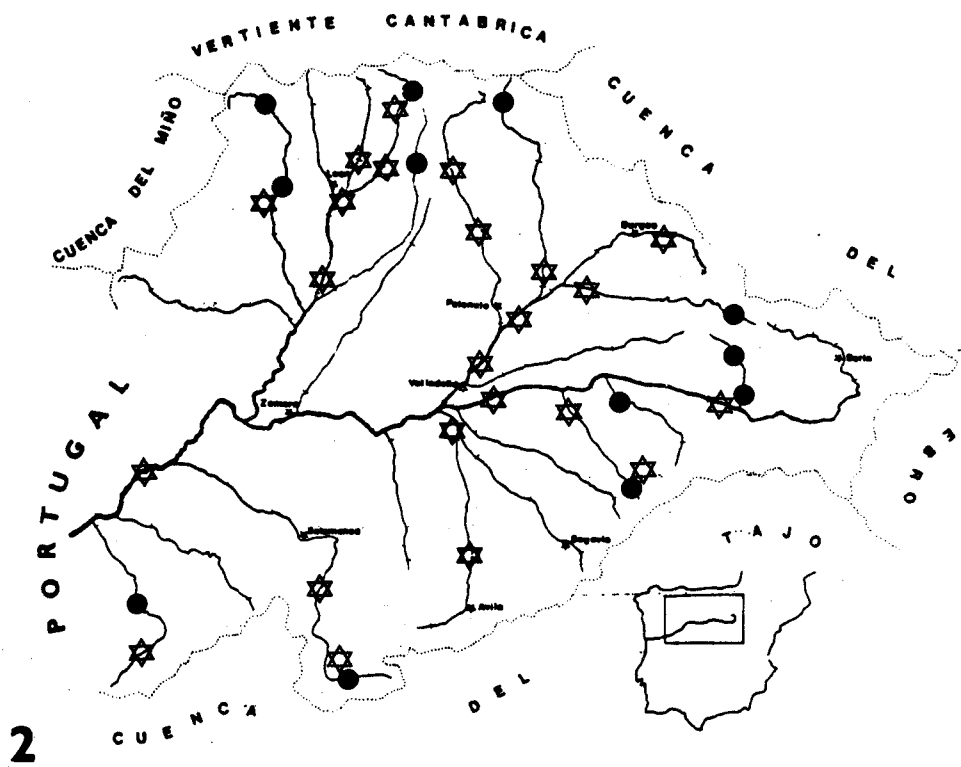
Baetis rhodani Pictet is present in almost all the studied localities and has resulted one of the most frequent and also abundant species in the Duero Basin, not only among the rest of Ephemeroptera as it occurs in nearly all the Palearctic countries (Clifford 1980) but also among the all studied macroinvertebrate fauna, having its largest populations in winter time. In this area, the rest of the year is partially substituted by Baetis fuscatus Linné, which is very abundant in the middle reaches of the rivers and can be considered as indicator of water eutrophication.

Some captures of Centroptilum luteolum Müller (Alba-Tercedor 1981b, Herranz 1983, González del Tánago in press) show that this species is relatively frequent in the lentic margins of the upper and oligotrophic Spanish streams, being substituted by Centroptilum pennulatum Eaton downstream. In the Duero Basin this distribution pattern is very clear (Fig. 2) contrarily as it has been mentioned in other regions (Sowa 1975, Macan 1979)

Acentrella sinaica Bogoescu has been recently first cited in Spain (Alba-Tercedor 1983) and found in several places which denote its large distribution in the country although always with a short number of specimens (Herranz 1983, González del Tánago in press) (Fig. 3).

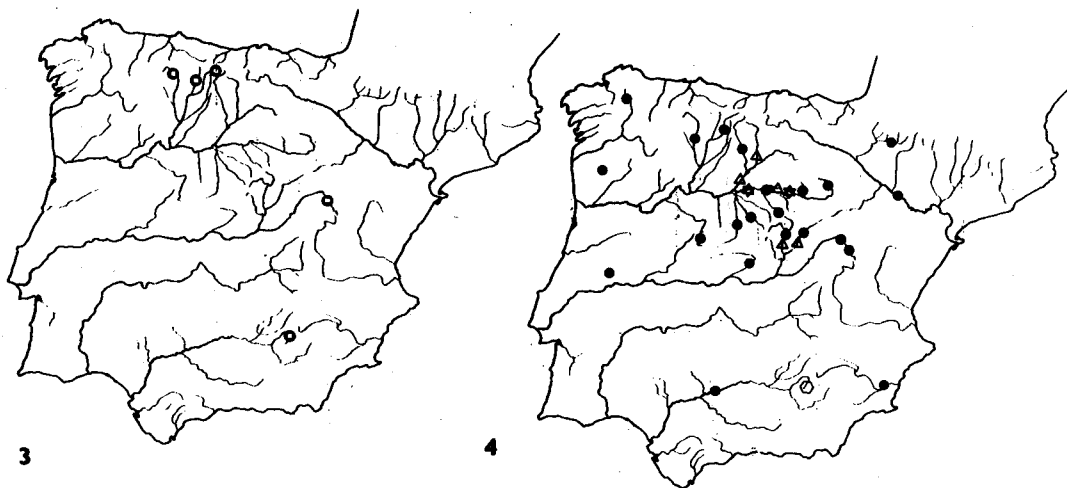


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Figs. 1 - 2: 1 - Distribution of Baetis digitatus / ○ / and Raptobaetopus tenellus / ■ / in the Duero basin /Spain/. 2 - Distribution of Centroptilum luteolum / ● / and Centroptilum pennulatum / ☆ / in the Duero basin /Spain/.



Figs. 3 - 4: 3 - Distribution of Acentrella sinaica / ● / in the Iberian peninsula. 4 - Distribution of the Iberian Oligoneuriidae: Oligoneuriella duerensis / ◆ /, O. marichuae / ◻ /, O. rhenana / ● /, and Oligoneuriopsis skhounate / ▲ /.

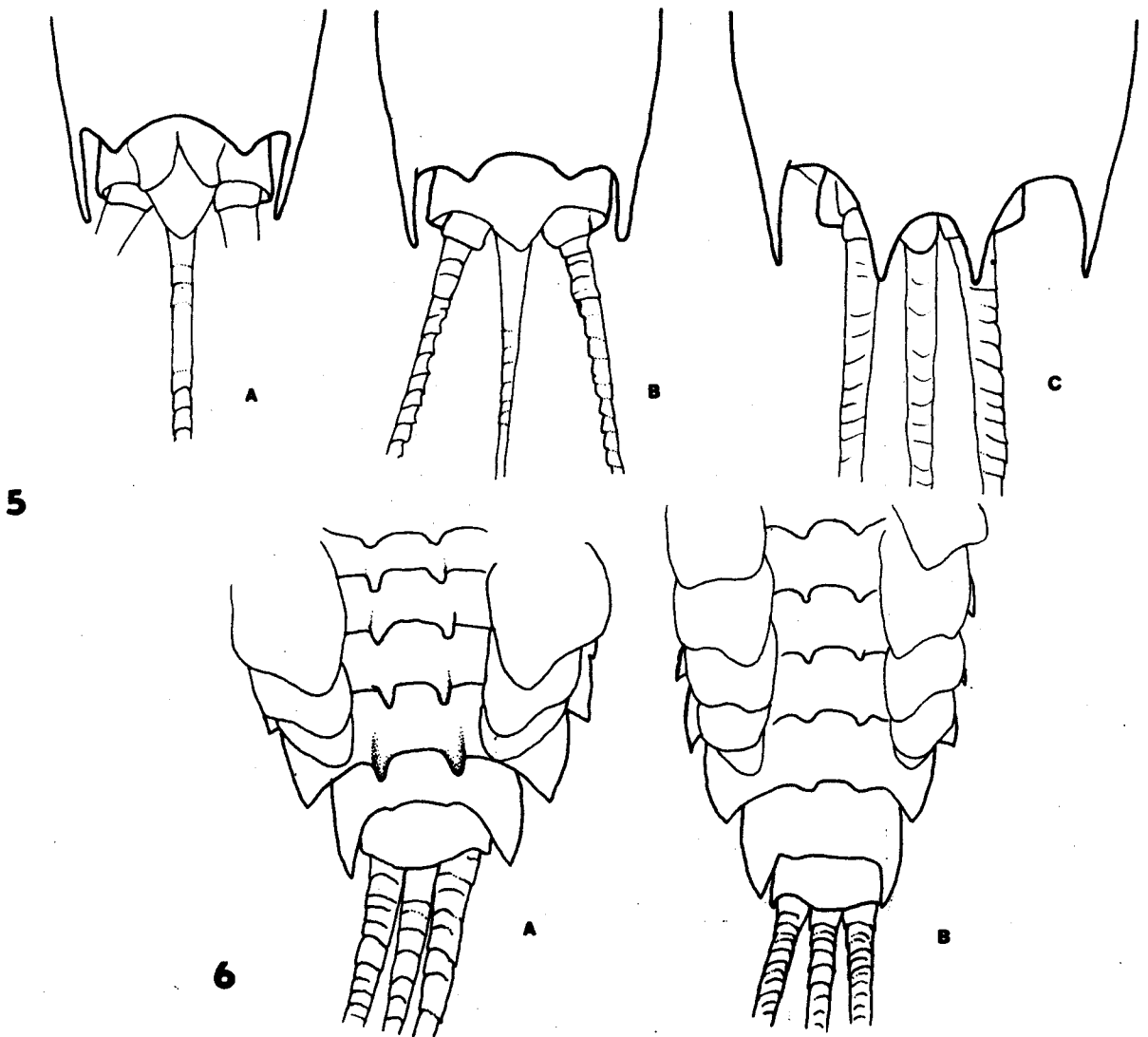
Family Oligoneuriidae

Oligoneuriella rhenana Imhoff is the species most widespread in the Iberian peninsula (Fig. 4). Two other species of the genus have been recently described from Spain, O. marichuae Alba-Tercedor (1983) and O. duerensis González del Tánago and García de Jalón (1983), whose distribution area is very restricted as far as it is known (Fig. 4).

The species Oligoneuriopsis skhounate Dakki and Giudicelli has been first cited in Europe being collected in the Duero Basin (see González del Tánago and García de Jalón 1983). It also inhabits the middle reaches of rivers Henares (Espinosa de Henares (20-VIII-79): 9L; Alarilla (20-VIII-79): 13L) and Jarama (Torrelaguna (15-VII-79): 5L; Talamanca (26-IX-79): 5 males + 1 female) which belong to the Tajo Basin (Fig. 4) and probably is present in many other rivers not studied until now. The female of this species has the 9 abdominal sternite characteristic, with the central processes as long as the lateral ones (Fig. 5), being the largest Oligoneuriidae in Spain (body length: 19 mm).

Family Ephemerellidae

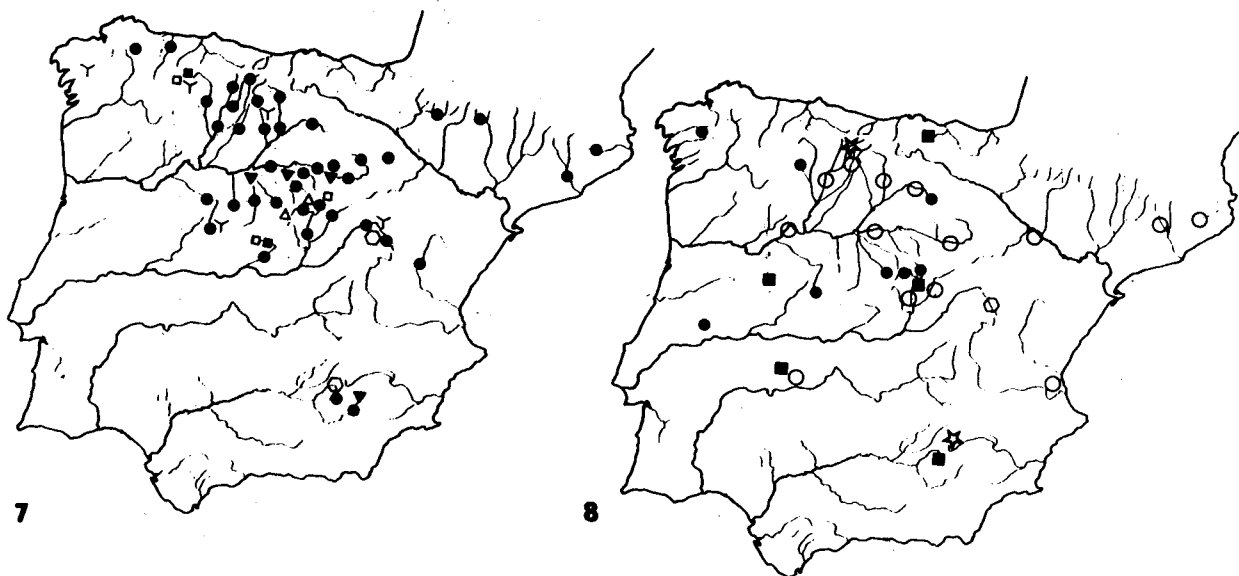
The species Ephemerella ignita Poda has the most widespread distribution in the Iberian peninsula, being present in nearly all the water courses studied (Fig. 7). Ephemerella mesoleuca Brauer was first cited in Spain by Alba-Tercedor (1981b)



Figs. 5 - 6: 5 - Ventral view of abdominal sternite 9 of female of Oligoneuriella rhenana /a/, O. duerensis /b/ and Oligoneuriopsis skhounate /c/. 6 - Dorsal view of abdominal segments of the nymph of Drunella paradinasi /a/, and Ephemerella ignita /b/.

who found several nymphs of this species in Sierra Nevada. Posteriorly it has been collected in the Duero Basin, living in the middle reaches of the rivers Duero (S. Esteban de Gormaz (27-VI-81): 6L; Roa (17-VI-81): 3L), Duratón (Laguna de Contreras (27-VI-81): 1L), Adaja (Valdestillas (13-VI-81): 2L) and Eresma (Hornillos (12-VI-81): 10L), located in the lotic parts of the current and being relatively tolerant to water eutrophication (Fig. 7).

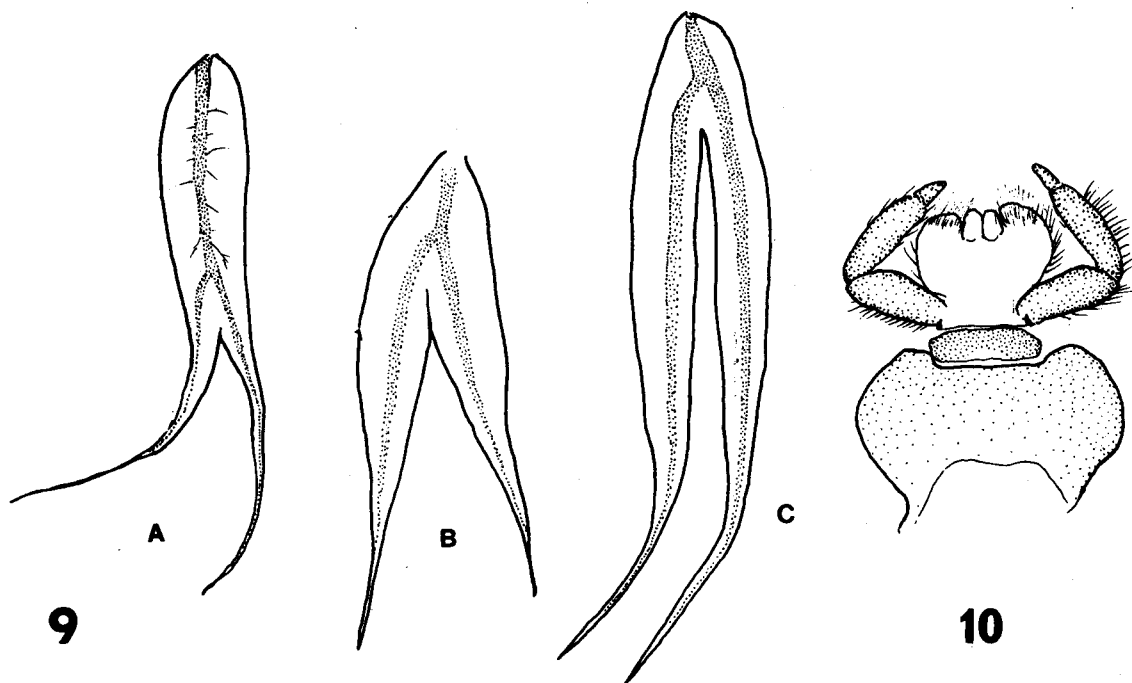
Eurylophella iberica Keffermüller and da Terra is a rare species in Spain and seems to be associated to Drunella paradinasi González del Tánago and García de Jalón. Both species have been collected always in soft waters, as in the rivers



Figs. 7 - 8: 7 - Distribution of the Iberian Ephemerellidae: Ephemerella ignita / ● /, E. mesoleuca / ▼ /, Drunella paradinasi / □ /, Eurylophella iberica / ■ /, Serratella hispanica / △ /, Serratella albai / Y /, and Torleya maior / ○ /. 8 - Distribution of some Iberian Leptophlebiidae: Leptophlebia marginata / ○ /, Calliarcys humilis / ● /, Habroleptoide umbratilis / ★ /, Thraulius bellus / ■ /, Choroterpes picteti / ○ /.

Tera (Trefacio, see González del Tánago and García de Jalón in press) and Tietar (Piedralaves (19-V-83) E. iberica: 5L + 1 female; D. paradinasi: 7L), living on a dark rocky substratum matching with their black body (Fig. 7). Drunella paradinasi is also present in the upper reaches of Jarama river (Montejo de la Sierra (6-VI-79): 4L; (7-VIII-79): 2L; La Hiruela (6-VI-79): 10L). The nymphs of this species show a great variety of the length of abdominal tubercles as it has been pointed out for the genus (Allen and Edmunds 1962). In early instar nymphs these tubercles are reduced like in Ephemerella ignita and other characters must be used distinguishing these two species as the shape of pronotum and relative size of tubercles. Drunella paradinasi has the pronotum with lateral expansions horizontally flattened that do not exist in Ephemerella ignita (see González del Tánago and García de Jalón in press). The abdominal tubercles of segment 8 are always bigger than tubercles on segment 7 in D. paradinasi and always smaller in E. ignita (Fig. 6).

The species Serratella hispanica Eaton inhabits also only soft waters and its known distribution is restricted to the Guadarrama mountains (Fig. 6). It has been collected in the upper reaches of rivers Eresma (see González del Tánago and García de Jalón in press), Lozoya (El Paular (10-VI-77): 4L and



Figs. 9 - 10: 9 - Five pair lamella of the nymph of Calliarcys humilis /a/, Habroleptoides sp. /b/, and Paraleptophlebia submarginata /c/. 10 - Labium of Serratella hispanica.

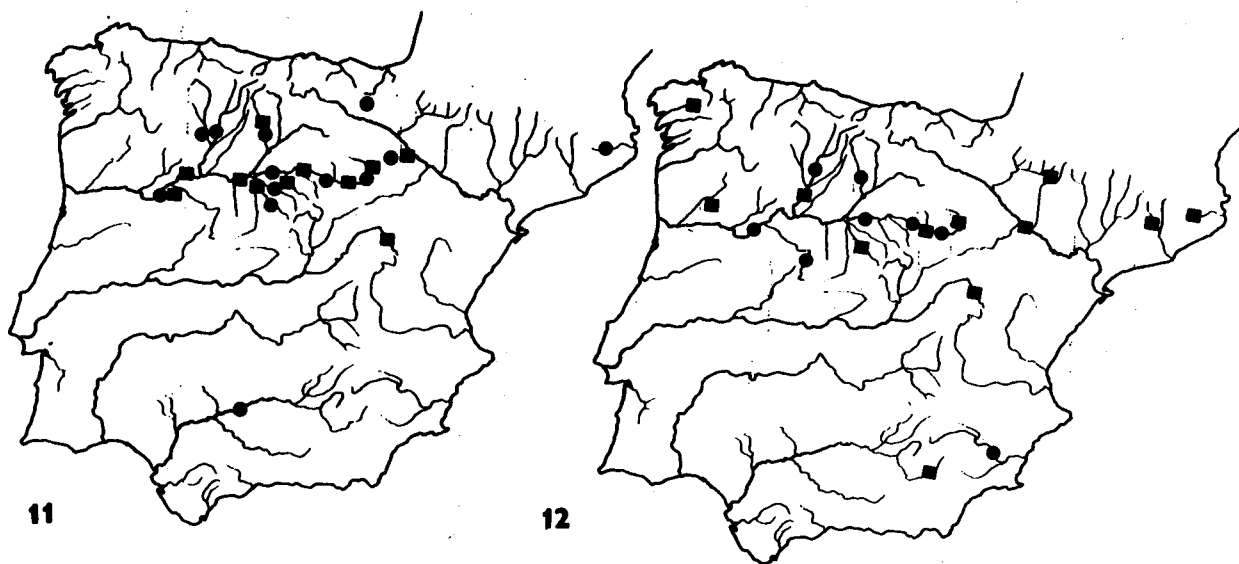
Jarama (Montejo de la Sierra (21-IV-79): 2L; (10-VI-79): 26L). The mentum sclerite of the nymph of this species is not always divided (Fig. 10). Better characteristics distinguishing this species from the other Iberian Serratella are the shape of the rest of labium and the dark ring at base of tails not present in Serratella albai González del Tánago and García de Jalón. The nymphs of this last species live as much in soft water as in hard water. They have been collected in the upper reaches of rivers Agueda, Tera, Tormes and Carrión (see González del Tánago and García de Jalón in press), in Galicia (Puig 1983) and also in the calcareous region of river Tajo between Poveda de la Sierra and Trillo (Herranz 1983)(Fig. 6).

Nymphs of Torleya Lestage have been collected in several places of the Iberian peninsula (Fig. 6) always related to hard waters (Herranz and González del Tánago 1981). The consideration of Torleya belgica Lestage as synonymous to Torleya major Klapalek by Landa (1969) is not very clear (Alba-Tercedor in press) and a deeper study on the characteristics of both types seems very necessary.

Family Leptophlebiidae

Seven species of this family are cited in the Iberian peninsula by Puthz (1978). Leptophlebia marginata Linné has been found in the upper reaches of rivers Cea and Hoz Seca (Herranz and González del Tánago 1981)(Fig. 8).

Calliarcys humilis Eaton appears always restricted to the



Figs. 11 - 12: 11 - Distribution of Ephoron virgo / ● / and Potamanthus luteus ■ Spain. 12 - Distribution of Heptagenia coerulans / ● / and Heptagenia sulphurea / ■ / in the Iberian peninsula.

upper reaches of soft water streams. It is relatively abundant in the epirhithron zone of Guadarrama mountains (García de Jalón and González del Tánago in press). Also it inhabits the upper reaches of rivers Arlanzón (Pineda de la Sierra (23-II-81): 4L), Tera (Trefacio (20-II-81): 2L), Agueda (El Payo (21-III-81): 2L) and Tormes (Angostura (15-III-81): 3L) which flow over a granitic substratum being considered as a typical species of places with such characteristics (Fig. 8). The nymph of this species can be easily differentiated by the shape of abdominal lamellae (Fig. 9) which have the lateral margins almost parallel and are bifurcated only in their posterior half, although some other characters are also different from the rest of Leptophlebiidae nymphs (Peters and da Terra 1974).

Habroleptoides umbratilis Eaton has been collected in Alcazar mountains (sources of river Mundo (5-VII-78): 7 males + 3 females) and in Riaño mountains (Vegacerneja (7-VIII-83): 8 males + 2 females) which constitute the first records of this species in the Iberian peninsula (Fig. 8).

Thraulius bellus Eaton is a rare species in the country although shows a widespread distribution (Fig. 8). It inhabits shallow waters generally, with different ecological characteristics (Herranz and González del Tánago 1981) and was collected as relatively abundant in the river Guadarranque (31 km below Guadalupe (14-VIII-78): 18L + 1 subim. male), during a drought period with stagnant water, being together with Choroterpes picteti Eaton which was extremely abundant there (same locali-

ty and date: >100 males). This last species also inhabits the middle reaches of many Spanish rivers and is relatively frequent in such places (Fig. 8).

Family Polymitarcyidae

The species Ephoron virgo Olivier has a large distribution in Spain (Fig. 11). It is relatively common in the Duero Basin, living in the middle reaches of the rivers Duero (Tardajos (26-VI-81): 2L; Andaluz (26-VI-81): 56L; (24-VIII-81): 5L; San Esteban de Gormaz (27-VI-81): 27L; (25-VIII-81): 3L; Roa (17-VI-81): 38L; (26-VIII-81): 9L; Quintanilla (13-VI-81): 13L; (26-VIII-81): 3L; Puente Duero (13-VI-81): 6L; (27-VIII-81): 1L), Pisuerga (Soto de Cerrato (12-X-81): 3L), Arlanza (Torrepadre (18-VI-81): 44L), Esgueva (Cabanes de Esgueva (17-VI-81): 26L), Carrión (Villoldo (28-VIII-81): 2L), Esla (Sta. Colomba de las Carabias (23-VI-81): 3L; (18-VIII-81): 14L), Orbigo (Sta. Cristina de la Polvorosa (23-VI-81): 225L), Duratón (Laguna de Contreras (27-VI-81): 2L; (26-VIII-81): 2L), Eresma (Bernardos (31-VIII-81): 2L; Hornillos (12-VI-81): 7L) and Agueda (La Fregeneda (8-VI-81): 2L).

Family Potamanthidae

Potamanthus luteus Linne is probably a common species in Spain although has been cited in few places before (Fig. 11). In the Duero Basin it has been collected abundantly in the middle and low reaches of rivers Duero (Tardajos (26-VI-81): 31L; (3-X-81): 4L; Andaluz (24-II-81): 11L; (26-VI-81): 19L; (3-X-81): 21L; S. Esteban de Gormaz (25-II-81): 8L; (27-VI-81): 7L; (2-X-81): 17L; Roa (17-VI-81): 18L; (7-XI-81): 2L; Quintanilla (8-III-81): 14L; (13-VI-81): 30L; (3-XI-81): 3L; Puente Duero (16-III-81): 195L; (13-VI-81): 25L; (9-XI-81): 130L; Castronuño (15-III-81): 2L; (7-VI-81): 5L; Fresno de la Ribera (7-VI-81): 4L; Carrascal (15-III-81): 3L; La Fregeneda (8-VI-81): 2L), Pisuerga (Cordovilla (18-VI-81): 31L; (12-X-81): 2L; Soto de Cerrato (7-III-81): 10L; (18-VI-81): 2L; Cabezón (8-III-81): 6L; (14-VI-81): 5L), Arlanza (Torrepadre (18-VI-81): 10L; (10-X-81): 7L; Quintana del Puente (7-III-81): 4L; (18-VI-81): 4L), Esgueva (Cabanes de Esgueva (10-X-81): 5L), Carrión (Villoldo (19-VI-81): 56L), Valderaduey (Benegiles (21-II-81): 5L; (7-VI-81): 55L; (2-XI-81): 4L), Esla (Villarroaño (21-VI-81): 9L), Duratón (Laguna de Contreras (8-III-81): 16L; (27-VI-81): 27L), Adaja (Valdestillas (9-XI-81): 23L), Eresma (Bernardos (19-III-81): 6L; (12-VI-81): 18L; (15-XI-81): 4L; Hornillos (6-III-81): 4L; (9-XI-81): 7L), Tormes (Ledesma (22-III-81): 2L) and Agueda (La Fregeneda (8-VI-81): 2L). As the data show the nymphs are collected in the rivers nearly all the year. This species is partially substituted in a temporal scheme by Ephoron virgo which has its larval development during spring and summer months, with a distribution area more restricted than Potamanthus luteus in the Duero Basin.

This paper does not deal with Heptageniidae family because of the great difficulties that appears determining Ecdyonurus and Rhithrogena Spanish nymphs, which need a clear revisi-

on in the characters used in their identification. Nevertheless it is worthy to cite here the presence of Heptagenia coeruleans Rostock in Spain, having being collected in the rivers Duero (Andaluz (24-VIII-81): 2L; (3-X-81): 5L; S. Esteban de Gormaz (27-VI-81): 2L; (25-VIII-81): 2L; (2-X-81): 2L; Quintanilla (13-VI-81): 17L; Puente Duero (27-VIII-81): 2L; La Fregeneda (8-VI-81): 10L), Carrión (Villoldo (28-VIII-81): 11L), Esla (Sta. Colomba de las Carabias (18-VIII-81): 5L) and Tormes (Ejeme (12-VIII-81): 2L) into the Duero Basin, always in the lotic part of the current, on a gravel substratum, and also in the river Segura (P. Fuensanta (20-XI-81): 1L; leg. López and Vidal Abarca). In some places this species is temporally replaced by Heptagenia sulphurea (Müller) which is more abundant in winter (R. Duero: Hinojosa (23-II-81): 9L; (3-X-81): 2L; Garray (24-II-81): 2L; Andaluz (24-II-81): 2L; S. Esteban de Gormaz (25-II-81): 4L; Puente Duero (16-III-81): 1L; (13-VI-81): 2L; (27-VIII-81): 2L; R. Pisuega: Nogales (22-II-81): 16L; R. Esla: Bretó (21-II-81): 1L; R. Eresma: Bernardos (9-III-81): 2L; (15-XI-81): 8L) whilst H. coeruleans has been collected in summer mainly (Fig. 12).

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