

CONTRIBUTIONS TO THE KNOWLEDGE OF THE MAYFLY (INSECTA, EPHEMEROPTERA) FAUNA OF THE DOBROUDJA "DERELE"

NICOLAE GÁLDEAN

On présente des données systématiques et écologiques concernant les espèces d'Ephéméroptères des « derele » de Dobroudja. On considère les espèces *Baetis vernus* Curtis et *Baetis tenax* Eaton comme espèces jumelles. On procède à une analyse zoogéographique de la faune d'Ephéméroptères de Dobroudja.

The small water courses of Dobroudja known under the name of "derele"¹ have minimum discharges in summer, autumn and winter and maximum ones in spring (Ujvary, 1959).

The group of the Dobroudja rivers include two categories of water courses: those of northern Dobroudja flowing into the littoral lakes and having a permanent discharge (Taița, Telița, Slava, Casimcea) and those of southern Dobroudja with temporary discharge and flowing into the Danube (Oltina, Carasu, Boascic, Topolog etc).

From a geological viewpoint, the "derele" area is characterized by the presence of green schists that are strongly eroded and covered with loess. The valleys of northern Dobroudja follow the general slope of the relief; they pushed the watershed to the west, bringing it nearer the Danube (Orghidan, 1962).

The "derele" fauna has been little studied. It is only the Casimcea "dereca" that has been studied in detail (Botoșăneanu, Negrea, Burghiele, Dancău, Decu, 1959); among the Ephemeroptera, the species *Baetis rhodani* Pictet is mentioned from there.

MATERIAL AND METHOD

The material was collected from the Taița, Telița and Slava "derele" in 1972 and 1978 by my colleagues Dan Manoleli and Teodor Nalbant whom I wish to thank once more and by myself in 1980. The collecting was a quali-

¹ "Dereca" (plural "derele") is a name of Turkish origin.

tative one by dredging, having in view a representation of the biocoenoses as accurately as possible.

In the studied area (Fig. 1) the "derele" show two distinct aspects: a) hard, clayey bottom, little visible detritus, clear water without suspensions; b) a thick layer of mud and detritus, a strong turbidity of water. The samples were collected on these types of substratum.

In the examined "derele", the mayfly fauna is represented by *Baetis vernus* Curtis, *Baetis tenax* Eaton, *Cloeon dipterum* (L.) and *Caenis robusta* Eaton.

RESULTS AND DISCUSSION

The studied material revealed the presence of some distinct populations in the Telița "derele": a massive population of larvae of *Baetis vernus* in association with larvae of *Cloeon dipterum* and separately, in another locality, a less numerous population that I attributed to the species *Baetis tenax*.

The record of these two populations requires certain remarks concerning the systematic status of the species *Baetis vernus* and *Baetis tenax*. Macan (1950) states that the species *B. vernus* cannot be distinguished from *B. tenax*. Grandi (1960) separates the two species in larval stages according to the length of the article III of the labial palp. Bogoescu and Tăbăcaru (1957) consider that *B. tenax* is related to *B. rhodani* and *B. vernus* to *B. bioculatus*. Müller-Liebenaу (1969) synonymizes *B. tenax* with *B. vernus*. In Romania, *B. tenax* has been recorded since 1918 by Mocșary and *B. vernus* by Bogoescu (1958).

The study of the larvae collected at Tichilești (Fig. 1) made me realize that the species present there was *B. tenax* and not *B. vernus*. The description given by Müller-Liebenaу (op. cit) does not correspond entirely to the specimens of the material that I studied. From the morphological point of view, the specimens of the two species are very similar. The distal article of the labial palp rounded, without strong horns, the last article of the maxillary palp only with hairs; mandibles with molar sides of a characteristic shape; subanal plate with a series of marginal teeth and short conical spines; the margin of gills with hairs; the posterior margin of femora with long spines and with hairs placed regularly, with large spaces between them; hind claws without hairs between the last tooth and the tip of the claw (Fig. 2, A-L). At the ♀♀ nymphs I could observe the ovules (Fig. 2 M) and the subanal plate (Fig. 2 I). The only morphological differences are the different aspects of the abdominal tergites (Fig. 2 C and D).

From the ecological point of view, note should be made that the two species are represented by populations living in distinct biotopes: the population of *B. tenax* on clayey, hard substratum in clear water while the population of *B. vernus* on a silty substratum, in turbid water.

When it has been collected (25.IX.1972) the population of *B. vernus* showed several larval stages. The size categories from Fig. 3 were calculated through the ratio between the total length of the body (without cerci), the maximum width of the thorax (which also indicates the degree of development of the wing-buds) and the maximum width of the abdomen. The size category F includes larvae the abdomen of which is full of ovules.

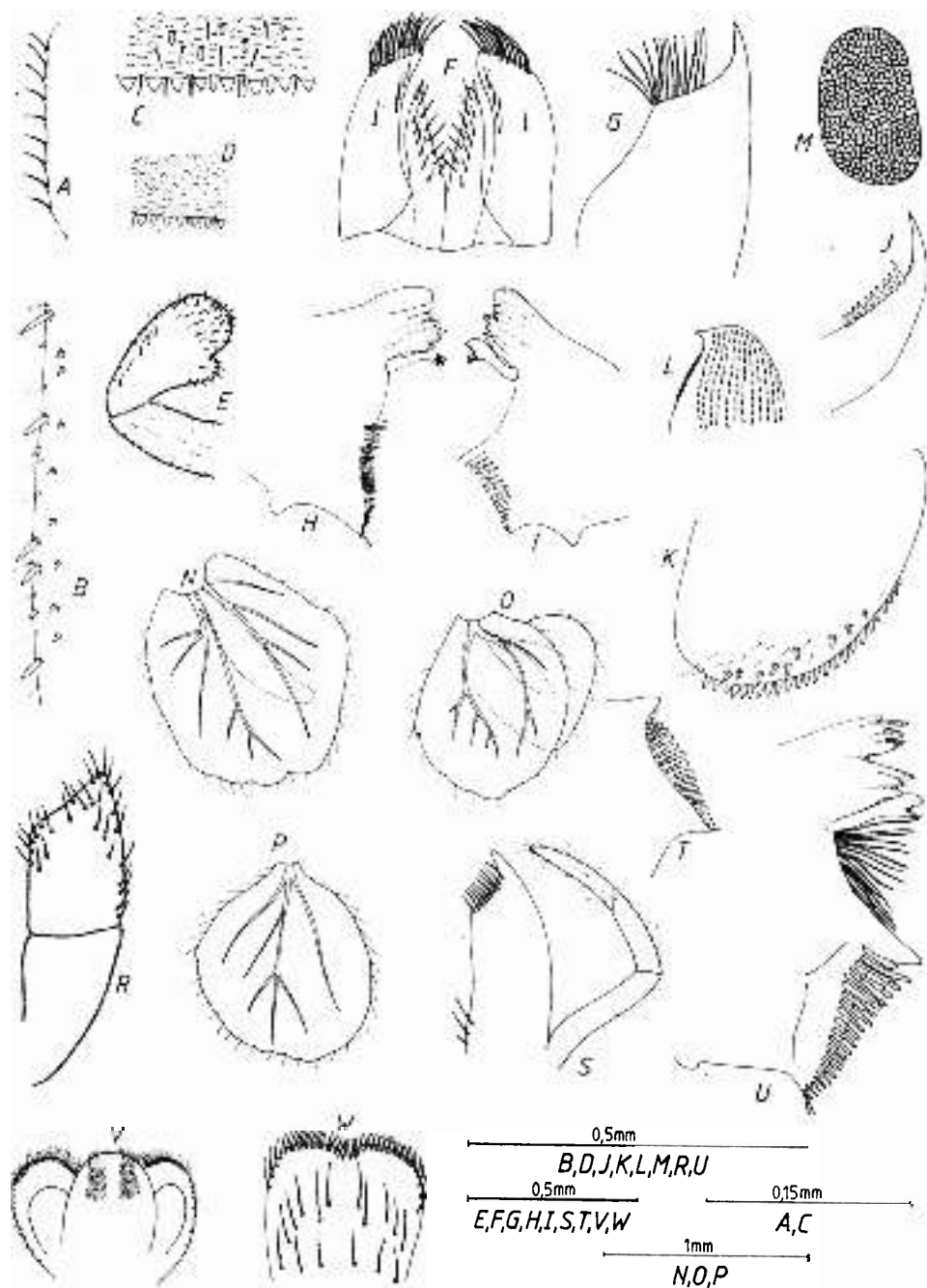


Fig. 2. A, B, D—K, M, *Baetis vernus*; C, L, *B. tenax*; N—W, *Cloeon dipterum*. (A, the margin of the gill; B, the margin of the femora; C, D, the hind margin of the abdominal tergites; E, labial palp; F, labium; G, maxilla; H, I, mandibles; J, claw; K, L, subanal plate; M, egg; N, O, P, the 1st, 6th and 7th gill; R, labial palp; S, maxilla and maxillary palp; T, G, mandibles; V, hypopharinx; W, labrum).

At the same date (25.IX.1972) the population of *B. tenax* showed a poor structure, with a single size category, corresponding to the size category C from the *B. vernus* population. Emphasis should be made that the two species did not compete with each other, as they occurred in different biotops.

The *B. tenax* population found in the "derele" corresponds to the description given by Bogoescu and Tăbăcaru (op. cit.). The two species, *B. tenax* and *B. vernus* could be considered as sibling species. Although they occur in the same "derele", the two populations are located on a certain type of substratum. Macan (1970) remarks the differences of biotop between *B. tenax* and *B. vernus*: "...*tenax* is found in the upper reaches of small stony streams rising at high altitudes in the mountains of Britain, whereas *vernus* is found in slow weedy rivers".

I noticed in the "derele" specimens some significant differences as concerns food. Accordingly, the intestinal content of the *B. vernus* larvae includes more than 70% algae (Diatoma) and 30% bacteria; in the *B. tenax* larvae, the algae and bacteria represent equal parts in the food. It is noteworthy that in the *Cloeon dipterum* larvae found in the biocenosis with *B. vernus*, the food is predominantly made of bacteria.

The record of *B. tenax* larvae at the beginning of December (5.XII.1978) and their early development stage show that the eggs were laid at the end of autumn. The climatic conditions of Dobroudja allow a winter stay both as larvae and eggs.

At that date, the *B. vernus* larvae didn't appear. Another ecological distinction between the two sibling species would be the wintering.

B. vernus is a species with two generations per year (Landa, 1968). *B. tenax* must be included in the same category, taking into account the resemblances between these two species.

From the zoogeographic point of view, Landa (1969) places *B. vernus* in the species group of taiga and of leaf-bearing forests, while Sowa (1975 a) includes it in the European species group. Considering the ways of post-glacial distribution of the European fresh-water fauna (Bănărescu, 1972, 1973 a), the question rises whether the mayfly species found in Dobroudja spread through the Danube basin.

The aquatic insects, particularly the mayflies, stoneflies and caddis represent a special category of fresh-water animals; many of them are closely connected to a mountain mass (Bănărescu, 1972); their spreading takes place especially through the aquatic basins (in a passive way) and less in an active way, through a long-distance flight. The populations of mayflies from the "derele" are strictly located to these areas of Dobroudja: they cannot fly for a long time and they couldn't reach here from long distances, from other rivers of the Danube basin. The climatic conditions of Dobroudja (dryness, winds) in the flight period of the "derele" mayflies prevent their possible long distance travel. Their strict location in a certain biotop is proved by the fact that both *B. vernus* and *B. tenax* don't occur in the Danube Delta, an area which is geographically very near. These two species that usually occur in the running waters of the hilly or mountain area (Bogoescu and Tăbăcaru, op. cit.) astonishingly appear in the Dobroudja "derele". Taking into account that in the ice ages Romania's territory was

not covered with ice (Voitești, 1936) one may suppose that at least these species did not retire into southern waters, subsequently repopulating the area. They remained on the spot, in those streams with a permanent character. This may be also valid for other mayfly species of Romania. Just as, very often, the plain springs keep reophilic elements, the "derele" could preserve species characteristic of the hilly or mountain areas. Botoșăneanu, Negrea, Burghеле, Dancău and Decu (op. cit.) mentioned the caddis *Plectrocnemia conspersa* Curtis from the Casimcea "derele"; it is a surprising presence for Dobroudja, as this species occurs in the cold mountain areas reaching up to 2,000 m high. This could confirm the hypothesis that at least some of the aquatic insects remained on the spot during the ice ages, on the present day territory of Romania, whence they subsequently spread.

As concerns the other mayfly species of the family Baetidae occurring in the "derele", i. e. *Cloeon dipterum*, I must note that its presence in this region isn't surprising, as I have also found it in the southern Dobroudja (Alimanu, Vlăhi, Lake Vederoasa). It was living in association with *B. vernus* (Fig. 1), an association characteristic of Telița "derele". The specimens that I found there undoubtedly belong to the species *dipterum*; the group of species discussed by Sowa (1975 b.), *C. dipterum*, *C. cognatum* Steph. and *C. inscriptum* Bengtss. is represented in the "derele" by *C. dipterum*. To this effect, I present the mouthparts and the 1st, 6th and 7th gills (Fig. 2, N-W) in which the variability is too little marked and does not allow to discuss about significant differences.

Caenis robusta was found only sporadically. It is a species that abounds in the Danube Delta lakes and occurs in many aquatic basins of Romania.

CONCLUSIONS

The identification of the species *B. vernus* and *B. tenax* in the "derele" is an interesting fact considering the dryness of the Dobroudja region. The presence of the species *B. vernus* and *B. tenax* in this region could be zoogeographically explained through their remaining on the spot during the ice ages.

The analysis of the biocoenoses and of the larvae associations as well as of the gut content made me consider the species *B. vernus* and *B. tenax* as "sibling" species. As for the status of the sibling species, Bănărescu (1973) specified that: "... they show the fundamental features of the species and they come into being as a result of the same process, the geographic isolation (in most of the sibling species, the distribution areas are only partially superimposed, the remaining areas being vicariant, which shows that the respective species originally were geographic races)".

Together with *B. rhodani*, mentioned in the Casimcea "derele" (Botoșăneanu et coll., op. cit.), the record of these mayfly species complete the knowledge about the aquatic fauna of Dobroudja.

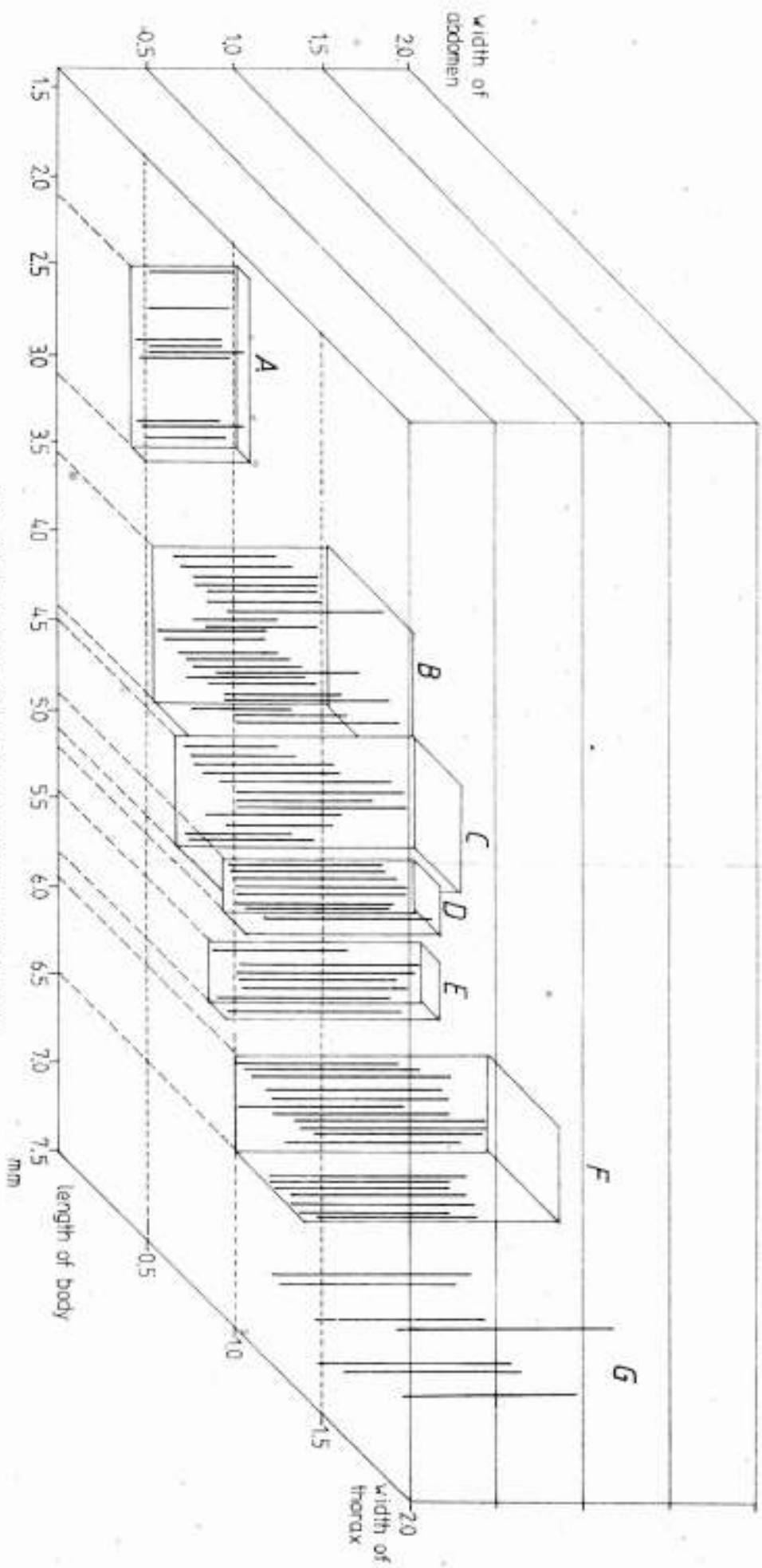


Fig. 3. The structure of the larval population of *Baetis venosus*

CONTRIBUȚII LA CUNOAȘTEREA FAUNEI DE EFEMEROPTERE
(INSECTA, EPHEMEROPTERA) DIN DERELELE DOBROGENE

REZUMAT

În lucrare sînt prezentate date sistematice și ecologice privind speciile de efemeroptere din cîteva derele dobrogene. Se discută speciile *Baetis vernus* Curtis și *Baetis tenax* Eaton pe baza caracterelor morfologice, a tipului de substrat pe care trăiesc larvele, a hranei și a structurii populației și se propune ca ele să fie considerate specii gemene.

Se prezintă unele concluzii de ordin zoogeografic asupra faunei de efemeroptere a Dobrogei. Se avansează ipoteza rămîinerii pe loc, pe teritoriul de azi al României, în timpul perioadelor glaciare, a cel puțin unora din speciile de insecte acvatice.

Se fac unele considerații asupra speciei *Cloeon dipterum* (L.) prezentă în derele.

BIBLIOGRAPHY

- BĂNĂRESCU (P.), 1972 — Types of distribution pattern among freshwater animals. *Rev. Roum. Biol. Ser. zool.*, **17**, 1: 23—30.
- BĂNĂRESCU (P.), 1973 a — Probleme generale ale zoogeografiei și zoogeografia R. S. România. *Soc. Științ. Biol. Rom., Com. zool.*, București.
- BĂNĂRESCU (P.), 1973 b — Principiile și metodele zoologiei sistematice: 40—43, *București*.
- BOGOESCU (C.), 1958 — Ephemeroptera. In: Fauna Republicii Populare Române: 1—187, *București*.
- BOGOESCU (C.), TĂBĂCARU (I.), 1957 — Contribuții la studiul sistematic al nimfelor de efemeroptere din R.P.R. I. Genul *Baetis* Leach. *Bul. științ. Sect. biol. științ. agric. (Ser. zool.)*, **9**, 3: 241—284.
- BOTOȘĂNEANU (I.), NEGREA (S.), BURGHELE (ANCA), DANCĂU (D.), DECOU (V.), 1959 — Contributions à l'étude hydrobiologique d'une déceară de Dobrogea: la Casimcea. *Arch. f. Hydrobiol.*, **55**, 1: 30—51.
- GRANDI (MARTA), 1960 — Ephemeroidea. Fauna d'Italia, 354—395, *Bologna*.
- LANDA (V.), 1968 — Developmental Cycles of Central European Ephemeroptera and their interrelations. *Acta ent. bohemoslov.*, **65**, 4: 276—284.
- LANDA (V.), 1969 — Jepice — Ephemeroptera, In: Fauna CSSR: 1—347, *Praha*.
- MACAN (T.T.), 1950 — Descriptions of some nymphs of the British species of the genus *Baetis* (Ephemeroptera). *Trans. Soc. Brit. Ent.*, **10**, 3: 143—166.
- MACAN (T.T.), 1970 — A Key to the Nymphs of British Species of Ephemeroptera with notes on their Ecology. *Freshwater Biological Association. Scient. Publ.* **20**: 29—45.
- MOCSARY (A.), 1918 — Ordo. Pseudo-Neuroptera, In: Fauna Regni Hungariae Arthropoda; 23—45, *Budapest*.
- MÜLLER-LIEBENAU (INGRID), 1969 — Revision der europäischen Arten der Gattung *Baetis* Leach, 1815 (Insecta, Ephemeroptera)., *Gewasser u. Abwässer*, **48/49**: 1—214.
- ORGHIDAN (N.), 1962—1963 — Bazinul văii Casimcea. Observații geomorfologice. *Lucr. Inst. Speol. « Emil Racoviță »*, **1—2**: 209—227.
- SOWA (R.), 1975 a — Ecology and biogeography of mayflies (Ephemeroptera) of running-waters in the Polish part of the Carpathians. 1. Distribution and quantitative analysis. *Acta hydrobiol.*, **17**, 3: 223—297.
- SOWA (R.), 1975 b — What is *Cloeon dipterum* (Linnaeus, 1761)? *Ent. scand.*, **6**: 215—223.
- UJVARI (I.), 1959 — Hidrografia RPR: 53—54, *București*.
- VOITEȘTI (I. P.), 1936 — Evoluția geologico-paleogeografică a pămîntului românesc: 1—211, *Cluj*.

