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## ***Torleya nazarita* sp. n., a New Species from Southern Spain (Ephemeroptera: Ephemerellidae)**

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### **Abstract**

After an intensive study, we concluded that the species described by Alba-Tercedor and Sánchez-Ortega (1982) from the foothills of the Sierra Nevada mountains in Southern Spain as *Torleya* cf. *belgica*, actually belongs to a new species which we name *Torleya nazarita* sp. n. The new species is closely related to *Torleya major* (Klapálek, 1905), which up to now was considered to be the only European representative of the genus. Description and figures of the nymph and imago and the features distinguishing the new species from other species of the genus are given.

**Keywords:** Nymphs, imagines, taxonomy.

### **Introduction**

The genus *Torleya* was established by Lestage (1917), who described *Torleya belgica* from nymphs from Belgium. Ulmer (1928) placed *Ephemerella major* (described by Klapálek, 1905, from a male imago collected in the Bavarian Alps) in the genus *Torleya* and discussed the possible synonymy between *T. major* and *T. belgica*. Mikulski (1938) considered *T. major* and *T. belgica* to be two closely related distinct species inhabiting different areas (*T. major* the Carpathians and *T. belgica* central and western Europe). Landa (1969) compared nymphs and adults of *T. major* and *T. belgica* from different parts of Europe. According to him, differences between western and eastern populations in the genus are not valid at the species level. Therefore, *T. belgica* should be synonymised with *T. major*. However, Alba-Tercedor and Sánchez-Ortega (1982) studying nymphs (described as *T. cf. belgica*) from the foothills of the Sierra Nevada mountains, in southern Spain, concluded that a thorough study comparing this material with other European material was necessary to clarify the taxonomical situation. After careful examination and comparison of this

material with other European material (from former Czechoslovakia and Belgium) we found that the population from southern Spain belongs to a new species, which we name *T. nazarita* sp. n. This species is clearly distinct from the closely related species *T. major* in both the nymphal and imaginal stage.

*Torleya nazarita* sp. n. (Figs. 1, 4, 7–13, 19–22, 27, 29–36)

*Chitonophora* sp., Alba-Tercedor & Jiménez-Millán, 1978: 100, 102.

*Torleya* cf. *belgica*, Alba-Tercedor & Sánchez-Ortega, 1982: 84–87, figs: 1 & 2.

*Torleya* cf. *belgica* Lestage, 1917, Alba-Tercedor, 1990: 15–16, fig. 4.

**Material**

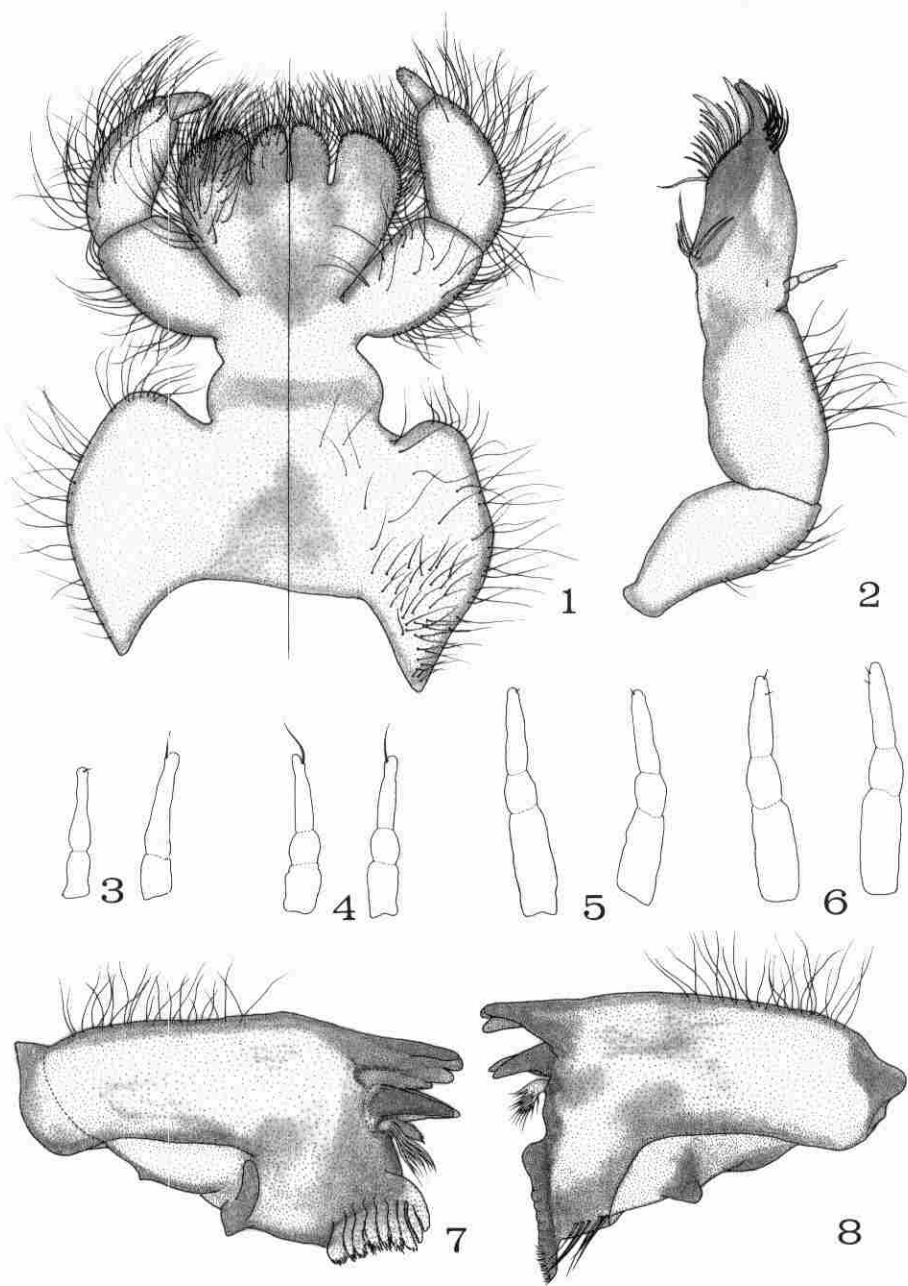
*Holotype*: male imago (genitalia on slide), Spain: Río Aguas Blancas, prov. Granada, 1140 m. a.s.l., U.T.M.: 30S VG 649 206, 22-VI-1979, J. Alba-Tercedor leg. *Paratypes* (all from the Río Aguas Blancas): 6 male and 10 female imagines, 1140 m. a.s.l., U.T.M.: 30S VG 649 206, 22-VI-1979, J. Alba-Tercedor leg.; 4 nymphs, 1-IV-1979; 14 nymphs, 29-IV-1979; 2 nymphs, 2-VI-1979; 2 nymphs 29-VI-1979; 8 nymphs, 30-X-1979; 3 nymphs, 1-XII-1979; 2 nymphs, 8-I-1980; 3 nymphs, 8-III-1980 (all nymphs from the same locality as holotype, J. Alba-Tercedor leg.); 2 nymphs, 2-IV-1979; 1 nymph, 29-IV-1979; 10 nymphs, 10-VI-1979; 1 nymph, 29-VI-1979; 3 nymphs, 30-X-1979; 6 nymphs, 1-XII-1979; 6 nymphs, 8-I-1980; 12 nymphs, 3-II-1980 (all from Río Aguas Blancas, 1300 m. a.s.l., U.T.M.: 30S VG 689 210, J. Alba-Tercedor leg.); 2 nymphs, 6-V-1995, U.T.M. 30S VG 6320, M.G. Toral leg. The material is in the senior author's collection in the Department of Animal Biology and Ecology (Zoology), University of Granada, Spain.

*Etymology*. the new species is named after the 'Nazarita Kingdom', the last Muslim kingdom in Southern Europe, which disappeared when the city of Granada was conquered by the Catholic Kings (Ferdinand and Elisabeth) in 1492.

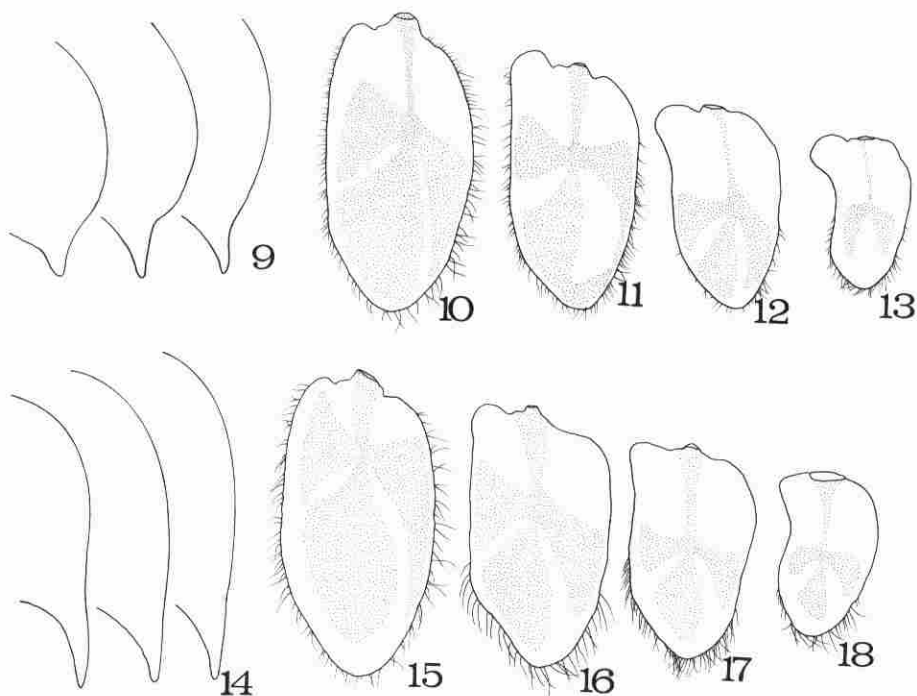
*Male imago* (in alcohol). Length (mm): body 9–10; forewings 9.5–11. General body colour yellowish-brown. Head brown; upper portion of eyes yellowish-brown, lower portion black. Thorax with some pale maculae forming a variable pattern on the pronotum; generally with conspicuous pale bands on the mesoscutellum; mesoscutellar hind projection relatively long and narrow (Figs. 34–36). Wings hyaline, veins light yellow. Legs yellowish-brown. Length of segments in foreleg (mm): femur 2.0, tibia 3.5, tarsal segments 1.1, 1.0, 0.8, 0.4. Abdominal terga light brown, segments 8–10 slightly darker; sterna pale brownish. Cerci and terminal filament yellowish, with dark-brown annulations at apex of each segment. Genitalia (Figs. 19–22, 27, 29–33): yellowish-brown. Penes with dorso-apical lobes forming a conspicuous and narrow notch at apex (Figs. 20–21, 29–31).

*Female imago* (in alcohol). Length (mm): body, 9–10; forewings, 9.5–11. Similar to male imago except as follows: eyes black; well developed postero-lateral apophysis on eighth abdominal segment (Figs. 34–36); length of segments in foreleg (mm): femur 1.4–1.6, tibia 1.9–2.0, tarsal segments 0.25–0.4, 0.25–0.3, 0.2–0.25, 0.25–0.4.

*Mature nymph* (in alcohol). Length (mm): body (male: 5.5–8.5; female: 6.2–9.8); caudal filaments: 4.0–4.5. General body colour yellowish-brown. Head brown, antennae yellowish-brown; female eyes black; upper portion of male eyes brown.

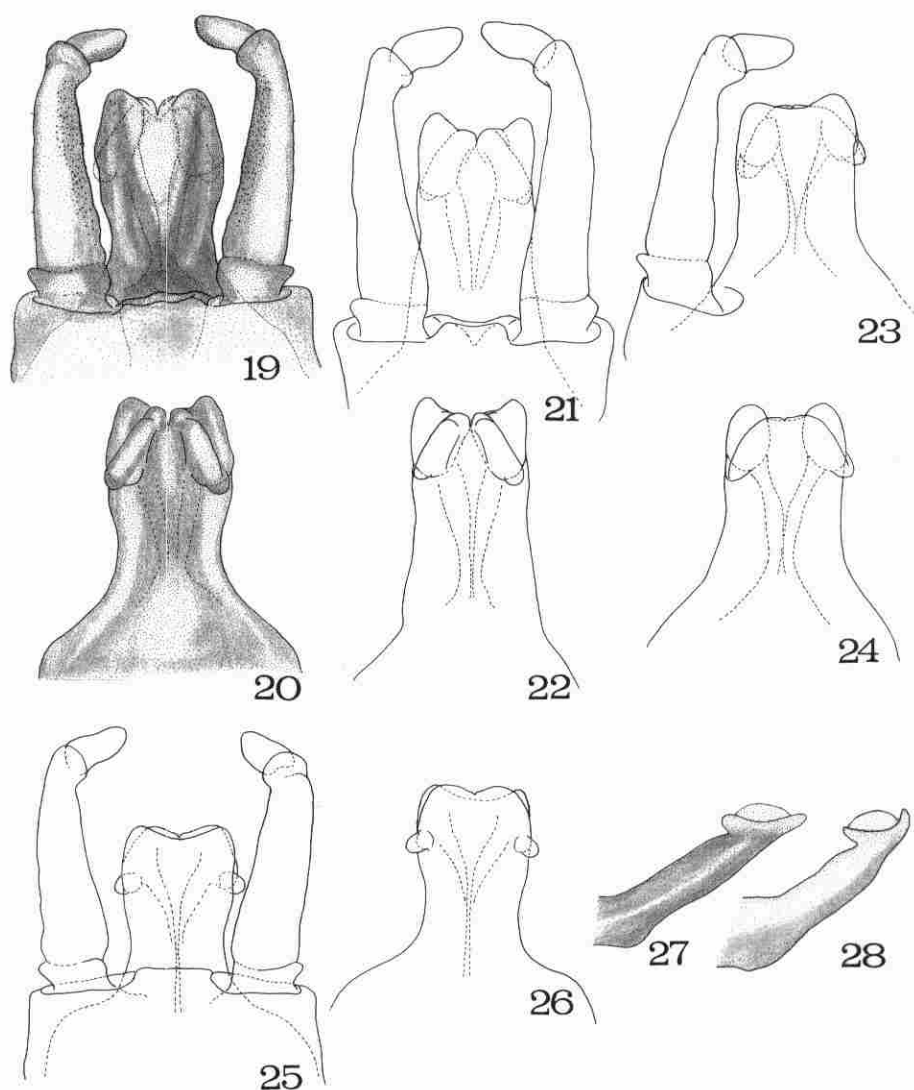


Figures 1-8. Mouthparts of the nymphs, *T. nazarita* sp. n. (1-4, 7, 8) *T. major* Klap. (5, 6). (1) Dorsal (left) and ventral views (right) of labium. (2) Maxilla. (3-6) Maxillary palps. (7) Left mandible. (8) Right mandible.



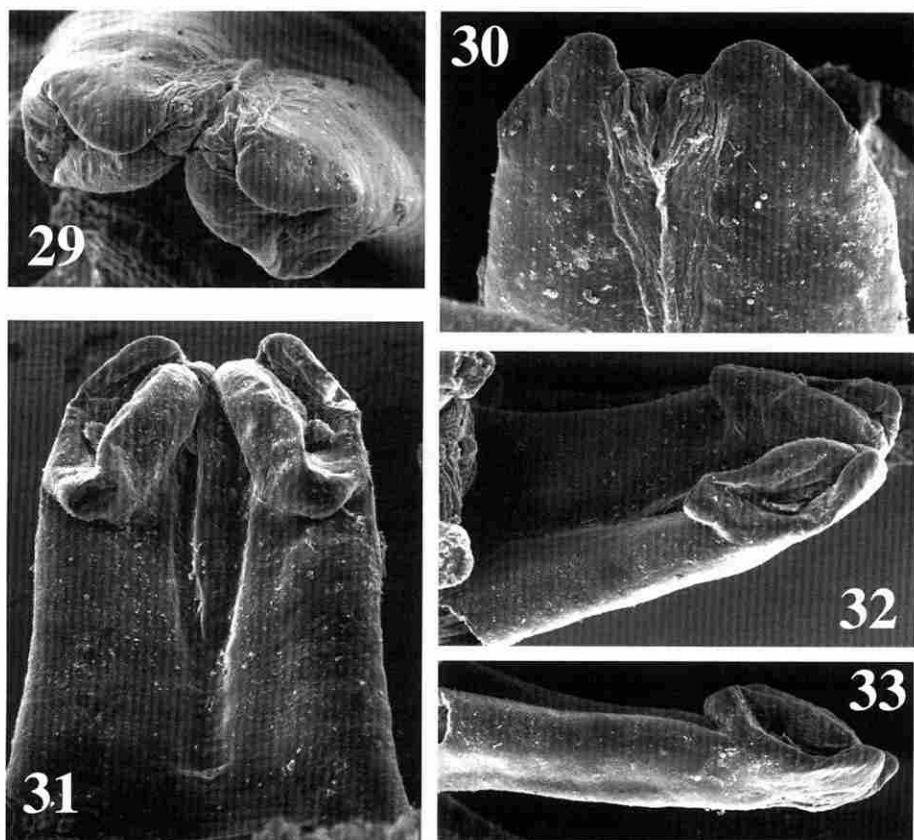
Figures 9–18. *T. nazarita* sp. n. (9–13) from Spain and *T. major* Klap. (14–18). (9, 14) Edge of the 8<sup>th</sup> abdominal segment of the nymph. Lamellae of the 1<sup>st</sup> (10, 15), 2<sup>nd</sup> (11, 16), 3<sup>rd</sup> (12, 17) and 4<sup>th</sup> (13, 18) gills, respectively.

Mouthparts (Figs. 1–4, 7, 8; see also Alba-Tercedor and Sánchez-Ortega, 1982: Fig. 1): labrum yellowish-brown with darker postero-lateral and antero-median margins; mandibles (Figs. 7, 8) yellowish-brown, incisors dark brown; outer margin of mandibles with a row of long hairs; hypopharynx (see Alba-Tercedor & Sánchez-Ortega, 1982: Fig. 1a) pale yellow, outer margins distally with two dark brown bands, and apically with a row of long fine hairs; maxillae (Figs. 2–4) yellowish-brown, teeth of lacinio-galea dark brown, outer margin of cardo and stipes with long fine hairs; maxillary palpi small and short, shorter than width of maxilla at the point of insertion of palpus (Fig. 2), apex of the third segment of maxillary palpus with one long thick pointed seta (Figs. 3–4; see also Alba-Tercedor and Sánchez-Ortega, 1982: Fig. 1g); segments 2 and 3 appear to be fused in some individuals (Fig. 3); labium (Fig. 1) pale yellow, glossae and paraglossae with long, fine hairs, generally glossae slightly longer than paraglossae, segments 1 and 2 of labial palpi with long, fine hairs, apex of segment 3 with short spines, margins and ventral face of submentum with long fine hairs. Thorax yellowish-brown, with some darker brown spots. Legs yellowish-brown, tarsal claws with brown apex; forefemora with transversal row of long thick spines, all femora with numerous long, fine hairs; tibiae and tarsi with long, thick,



Figures 19–28. Male genitalia of *T. nazarita* sp. n. (19–22, 27) and *T. major* Klap. (23–26, 28). Ventral views (19, 21, 23, 25), dorsal views (20, 22, 24, 26) and lateral views (27, 28).

apically pointed setae along ventral margin, hind tibiae with similar setae also along dorsal margins, all tibiae and tarsi with long, fine hairs. Abdominal terga and sterna yellowish-brown, tergum 10 and sternum 9 darker, postero-lateral margins of terga with tuft of long setae; lateral margins of sternum 8 curved and with relatively short postero-lateral spines (Fig. 9); gills 1–4 with a characteristic pattern (Figs. 10–13;

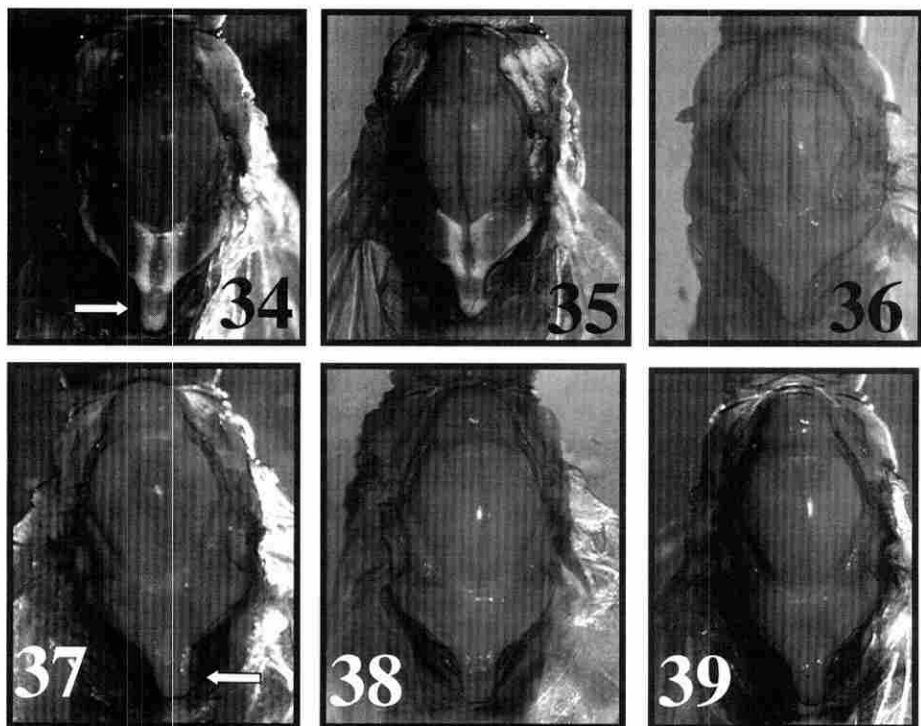


Figures 29–33. SEM (critical point dried, gold coated, 15 KV) views of the penes of *T. nazarita* sp. n.: apico-ventral (29), ventral (30), dorsal (31), latero-dorsal (32) and lateral (33).

Alba-Tercedor & Sánchez-Ortega, 1982: Fig. 3), gill 5 with 6–9 finger-like filaments (Alba-Tercedor & Sánchez-Ortega, 1982: Fig. 3e). Caudal filaments yellowish, with 1–2 brown annulations distally; short, stout spines at apex of each segment.

## Discussion

Allen (1980) revised the distribution and classification of Ephemerellidae, restoring *Torleya* as a valid genus. At that time four described species (not five, as Allen wrote) were included in the genus, but only three of them were valid species, described by Klapálek (1905), Allen and Edmunds (1963) and Kazlauskas (1963). Since then, five additional species have been described in the genus so that at present, the genus *Torleya* contains seven species: one European (*T. major*) and six Asian species: *T. nepalica* (Allen & Edmunds, 1963) from the Himalayan region; *T. japonica* Gose,



Figures 34–39. Thorax of female adults of *T. nazarita* sp. n. (34–36) and *T. major* Klap. (37–39).

1980 from Japan; *T. glareosa* Kang & Yang, 1995 and *T. lutosa* Kang & Yang, 1995 from Taiwan; *T. arenosa* Tong & Dudgeon, 2000 from Hong Kong, China; and *T. padunica* Kazlauskas, 1963 and *T. mikhaili* Tiunova, 1995 from the Far East of Russia. These species can be divided into two groups, according to the presence or absence, respectively, of maxillary palps in the nymphs: a) the *major*-group (*T. major*, *T. japonica* and *T. padunica*) and b) the *nepalica*-group (*T. nepalica*, *T. mikhaili*, *T. glareosa*, *T. lutosa* and *T. arenosa*).

*T. nazarita* sp. n. belongs to the *major*-group and closely resembles *T. major*; however it can easily be distinguished by the following characters:

(a) nymph: lateral margins of eighth abdominal segment very curved and with relatively short postero-lateral spines (compare Figs. 9 and 14), pattern on lamellae of abdominal gills (compare Figs. 10–13 with Figs. 15–18, and with Lestage, 1917: Fig. 35d, as well as Belfiore, 1983: Fig. 43e), especially of the second gill (compare Fig. 11 with Fig. 16, and with Belfiore, 1983: Fig. 43b); the width of the maxilla at the site of insertion of palpus is roughly twice the palpus length, while in *T. major* length and width are similar (compare Fig. 2 with Lestage, 1919: Fig. 9d), length of segment 3 of the maxillary palpi is similar to that of segments 1 and 2 together (compare Figs.



3, 4 with 5, 6), and segment 3 of the maxillary palpi bears a long stout apical seta (Figs. 2–4) while *T. major* has 1–3 short spines (Figs. 5, 6) and a much shorter segment 3;

(b) imagines: mesoscutellar hind projection relatively long and narrow (compare Figs. 34–36 with Figs. 37–39, and with figures in Studemann et al., 1992); apical space between penes more V-shaped and clearly incised, while in *T. major* this has a wide U-shape and is only very slightly incised (compare Figs. 19–22 with Figs. 23–26); in lateral view the ventral margin of the penes are straighter (compare Figs. 27 and 33 with Fig. 28); and female with developed postero-lateral apophysis on the eighth abdominal segment.

*Additional remarks:* the number of finger-like filaments on the fifth gills was used by Mikulski (1938) to separate nymphs of *T. major* and *T. belgica*. According to this author, *T. major* has five filaments while *T. belgica* has eight (see original description by Lestage, 1917: Fig. 35i). However, according to our observations this character is variable, and Thibault (1971) also recorded nymphs of *T. belgica* in southern France with 8–11 finger-like filaments; for *T. nazarita* sp. n., we found 6–9 such filaments.

Some variability in the nymphal labium of *T. major* exists. In Italy, Gaino and Spano (1975: Fig. 1a) and Belfiore (1983: Fig. 43f) published a photograph and a drawing, respectively, of the labial palps of *T. major*, with the third segment of palp shorter than according to the original description of *T. belgica* (Lestage, 1917: Fig. 35b) and of *T. nazarita* sp. n. (Fig. 1; see also Alba-Tercedor & Sánchez-Ortega, 1982: Fig. 1c). Alba-Tercedor and Sánchez-Ortega (1982) argued that there were either different species or that some significant geographical variation occurred. However, among the studied material of *T. major* from former Czechoslovakia we found nymphs with both kinds of labial palps.

The new species has an univoltine 'seasonal, summer' life cycle, according with the life cycle classification by Clifford (1982), see Alba-Tercedor (1990, sub nom. *T. cf. belgica*). Nymphs were found in low densities and very localized, as seems to be the case with recent European finding of *T. major* (Reusch et al., 1996; Wegher & Turin, 1993). They inhabit especially stream edges (5–17 cm deep) on sandy and muddy substrates with dense vegetation and a thin layer of detritus. None were found in areas without current or where the current exceeded 77 cm/sec, larvae preferred velocities between 1 and 59 cm/sec (Alba Tercedor & Jiménez-Millán, 1978; Alba-Tercedor, 1990).

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