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Baetis atlanticus n. sp., a new species of the subgenus *Rhodobaetis* JACOB, 2003 from Madeira, Portugal (Ephemeroptera: Baetidae)

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ABSTRACT. A new species of mayfly, *Baetis atlanticus* n. sp. belonging to the subgenus *Rhodobaetis* JACOB, 2003 is described and illustrated in the larval, subimaginal and imaginal stage based on the material collected nn Madeira, Portugal (type locality Ribeira do Inferno near São Vicente). Critical characters distinguishing this species from other representatives of *Rhodobaetis* are proposed and comments on its distribution, vertical distribution, habitat and substrate preference, mating flight and life cycle are given.

Key words: entomology, taxonomy, Ephemeroptera, Baetidae, *Baetis*, *Rhodobaetis*, new species, distribution, biology, Madeira, Macaronesia.

INTRODUCTION

Three species of mayflies (all of them from the only family Baetidae) have been so far known from Madeira, Portugal. The first record originates from HAGEN (1865: 25-26) who described a new species, namely *Cloë maderensis* HAGEN, 1865 from this island. This material was revised by EATON (1871) who found it to actually contain two females of *Cloeon dipterum* (LINNAEUS, 1758) and 4 males, 2 females and 1 female subimago of *Baetis rhodani* PICTET, 1843. On the basis of the study of the original HAGEN's specimens he found *Cloë maderensis* conspecific with *B. rhodani* and suggested respective synonymy (EATON 1871: 15). These

species are mentioned also in his later monograph (EATON 1885). Since then, mayflies of Madeira have been mentioned only by BRINCK & SCHERER (1961) and STAUDER (1991, 1995). BRINCK & SCHERER (1961) found *B. rhodani* at altogether 13 localities spread all over the island (*C. dipterum* is not recorded to occur in Madeira in this paper). The latter author mentioned, in addition to *B. rhodani* and *C. dipterum*, also *B. pseudorhodani* MÜLLER-LIEBENAU, 1971. However, on the basis of recently collected material, the record on the occurrence of this species on Madeira seems to be most probably based on misidentification. Comparison of material from the Canary Islands and Madeira clearly showed pronounced morphological differences in both larvae and adults as well as species-level differences of Madeira material from all so far known species of the subgenus *Rhodobaetis* JACOB, 2003 as recently summarized in tabular form by GODUNKO et al. (2004), BEKETOV & GODUNKO (2005) and SOLDÁN et al. (2005).

Description of a new species of the subgenus *Rhodobaetis* accompanied by some data on its distribution and biology is the main objective of the present paper.

***Baetis atlanticus* n. sp.**

Baetis pseudorhodani: STAUDER, 1995: 716; nec MÜLLER-LIEBENAU, 1971: 28.

ETYMOLOGY

The species is named after the Atlantic Ocean since it inhabits the relatively removed Island of Madeira.

DESCRIPTION

Male imago

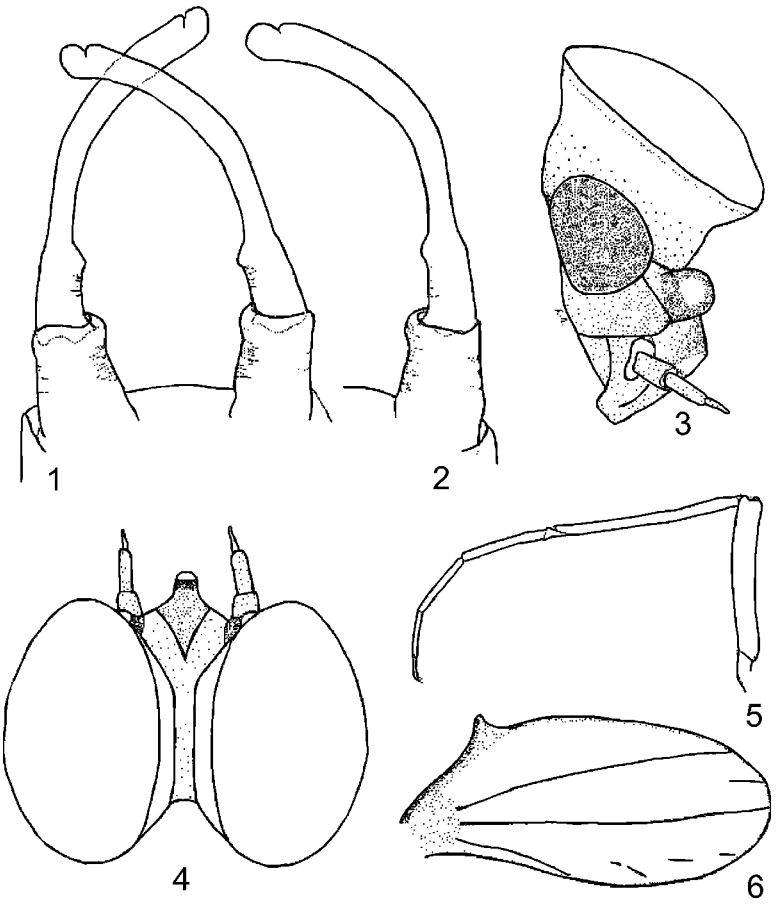
Size: body length: 5.0-6.0 mm; fore wings length: 4.8-5.2 mm; cerci length: 9.6-10.2 mm; fore legs length: femora + tibiae = 2.55-2.87 mm; tarsal segments: T1 = 0.57-0.62 mm; T2 = 0.37-0.45 mm; T3 = 0.22-0.27 mm; T4 = 0.14-0.16 mm; general relative tarsal segments length ratio: 1>2>3>4 (Fig. 5).

General body color light, yellowish-white to yellowish-brown or brown. Head dark, yellowish-brown to brown. Antennae unicolorous, brown. Eyes and basal part of ocelli grey or black, eyes surrounded by yellowish ring, ocelli whitish-grey apically. Turbinate eyes oval in dorsal view, with slightly convex outer margin (Fig. 4). Their facetted surface dark orange, occasionally with narrow light ring around the margin. The shaft orange, slightly paler than turbinate eyes surface, with narrow dark orange subapical ring and orange-grey or orange-violet band at the base (Fig. 3).

Dorsal part of thorax yellowish-brown to brown with small blackish spots. Mesonotum with two light spots laterally. Fore wings hyaline, transparent, and slightly yellowish in color. Pterostigma with 5-9 simple cross veins. Hind wings of the same color as fore wings, with well-developed costal projection and three longitudinal veins (Fig. 6). Venation brownish. Legs light yellowish-white to light

brown, forelegs darker than middle and hind ones. Femora light brown, without spots. Tibiae brownish, dark brown distally, tarsi lighter. Middle and hind legs distinctly lighter than fore ones, yellowish-white to yellow.

Abdominal tergum I distinctly darker than the others, yellowish-brown to brown, terga II-VI light yellowish-white to yellowish-brown with brownish band at the posterior margin of segments, terga VII-X darker than terga II-VI, light brown. Surface of terga with a pair of dissolved spots. Abdominal sterna of the same color. Cerci yellowish to light brown, slightly darker at the base, segments darker near intersegmental area. Genitalia yellowish to light brown. Basal segments of forceps slightly elongated, 1.3-1.5 times as long as wide (Fig. 1). Segment 1 elongated with subparallel margins. Segment 2 expanded towards



1-6. *B. atlanticus* n. sp., male imago (paratypes): 1, 2 - forceps, ventral view; 3 - head, lateral view; 4 - head, dorsal view; 5 - fore leg, dorsal view; 6 - left hind wing, dorsal view

segment 3, expanded part apparent at 1/2-2/3 of its length, its inner margin generally straight, sometimes only slightly concave. Segment 3 oval, occasionally with truncate inner margin (Figs 1, 2).

Female imago

Size: body length: 5.5 mm; fore wings length: 5.2 mm; cerci length: 7.6-8.0 mm.

General color similar to male imago, but slightly darker, abdominal terga brownish. Wing venation more pronounced, darker.

Male subimago

Size: body length: 4.6-5.4 mm; fore wings length: 4.8-5.0 mm; cerci length: 7.5-8.0 mm.

General body color yellowish-brown to light brown, head light brown. Scape and pedicel light brown, flagellum brown. Eyes and basal part of ocelli black, apex of ocelli whitish. Facetted surface and shaft of turbinate eyes unicolorous, orange with narrow light ring around the margin. Shaft with orange-violet subapical and basal bands.

Thorax yellowish-brown to light brown with darker brown spots dorsally and laterally. Fore and hind wings uniformly greyish, venation whitish to greyish-brown. Legs light, forelegs generally of the same color as middle and hind ones, yellowish to yellowish-grey. All femora with distinctly visible light brown spots distally. Joints of legs segments black. Abdominal terga unicolorous, yellowish-brown to light brown, sometimes with narrow brown strip on the posterior part of terga I-VIII. Surface of terga with two elongated and two slim rounded light spots on segments I-IX. Abdominal sterna paler than terga, yellow to yellowish-grey with drawings similar to those on terga. Cerci yellowish grey.

Female subimago

Size: body length: 4.7-5.4 mm; fore wings length: 4.5-5.0 mm; cerci length: 7.2-7.6 mm.

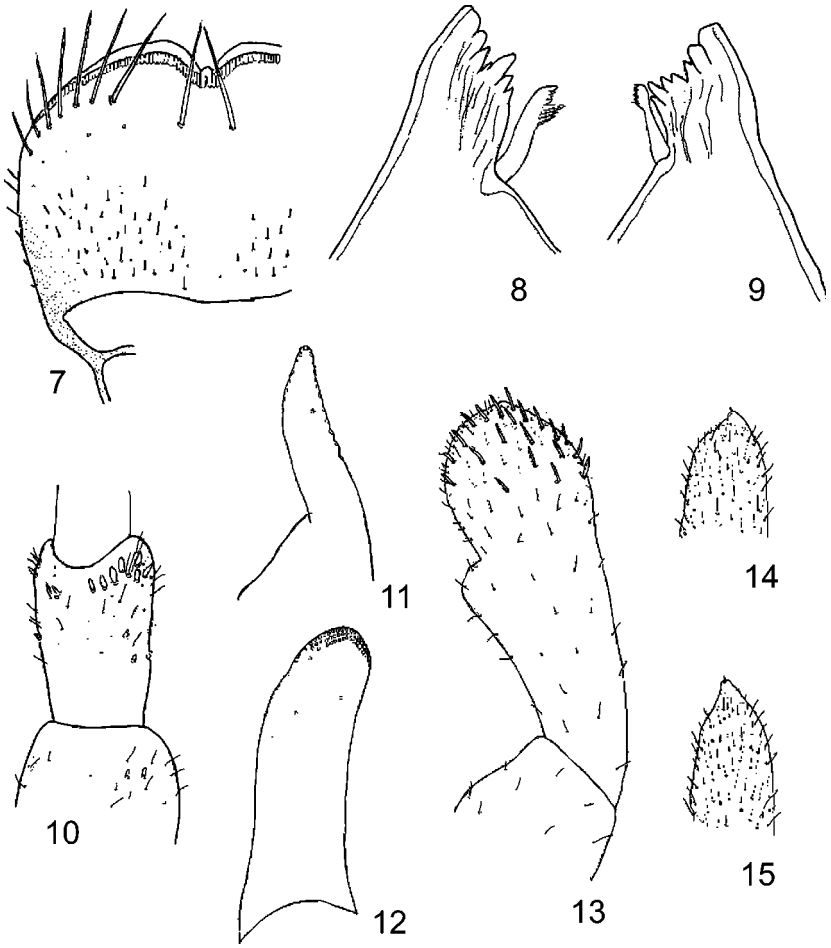
General color of body similar to male subimago.

Mature larva

Size: body length: 6.1-7.8 mm (male larvae), 5.8-8.7 mm (female larvae); cerci length: 5.4-6.3 mm; paracercus length: 2.6-3.2 mm.

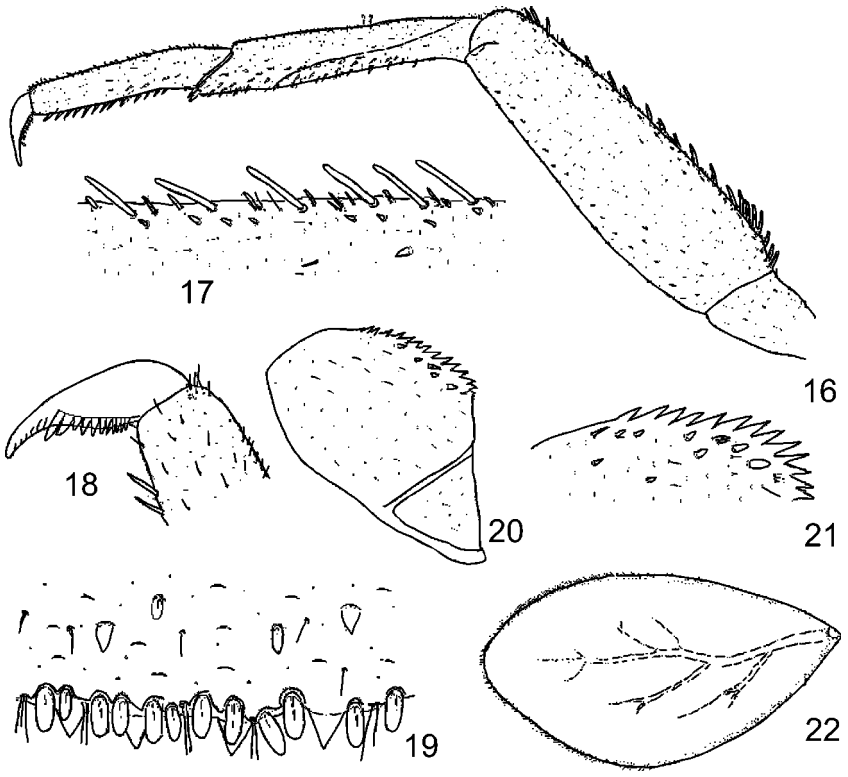
General color of body yellow to light brown. Head yellowish-brown to light brown with rather narrow medial longitudinal strip. Eyes and ocelli black, larval turbinate eyes of male larvae orange. Antennae yellow to light brown. Scape with rare small spatulas (Fig. 10), pedicel with apically rounded spatulas arranged in one irregular row, some spatulas scattered also over the segment surface. Spatulas relatively elongate, narrow, with parallel margins or slightly convergent towards the apex. Surface of frons with distinct scales bases and fine hairs only. Labrum distinctly wide (width/length ratio 1.40-1.44) with 1 + 7-9 (rarely 6-10) long

bristles (Fig. 7). First tooth of mandible incisors approximately quadrate, with straight outer and anterior margins and several distinctly bluntly pointed inner teeth (Figs 8, 9). Distal segment of maxillary palps with well visible rounded projection bearing a small scale (Figs 14, 15). Segment 2 of labial palps with slightly concave inner margin, segment 3 approximately symmetrical (Fig. 13). The length/width ratio of segments 2 + 3 = 2.3-2.5 (2.7-3.0 in *B. ingridae*, see THOMAS & SOLDÁN 1987). Glossae and paraglossae relatively large (Figs 11, 12), glossae with 10-12 bristles at the inner margin, paraglossae with three regular rows of bristles apically.



7-15. *B. atlanticus* n. sp., mature larva: 7 - labrum; 8 - incisors of the left mandible; 9 - incisors of the right mandible; 10 - antennal scape and pedicel; 11 - glossa; 12 - paraglossa; 13 - labial palpus; 14, 15 - apical portion of the last segment of maxillary palpus

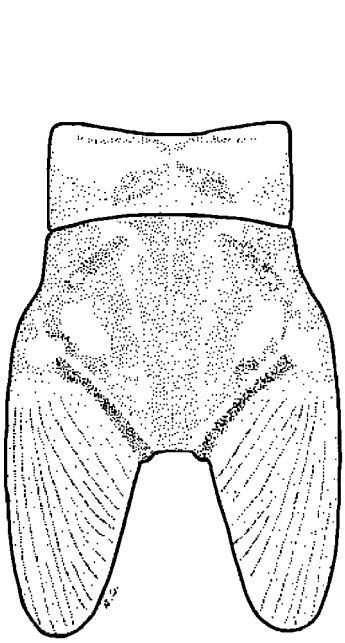
Thorax yellow to light brown. Dorsal part of pronotum with two elongated brown spots centrally and dissolved yellowish smudges laterally (Fig. 23). Medial longitudinal strip yellowish, narrow, generally present. Mesonotum yellowish to light brown with distinctly visible group of light spots near base of larval wing pads and two elongate brown spots near posterior margin. Medial longitudinal strip apparently visible. Surface of thorax with scale bases and fine hairs only. Legs light brown. Femora with diffuse and broad brownish central spots. Both femoral margins and distal part of femora distinctly darker. Occasionally, femora light yellowish, without spot. External margin of femora with dense row of 16-28 large and distinctly rounded setae at the apex alternating with submarginal pointed spines and fine hairs (Figs 16, 17), usually situated in 2 or 3 rows proximally. Inner margin of femora with pointed spines and hairs. Surface of femora with rare small pointed spines and spatulas, fine hairs, and spines and spatula bases. Tibia light brown, darker proximally. Tarsi light brown, distinctly darker distally. Tibiae and tarsi with pointed spines on their surfaces, as well as on the outer and



16-22. *B. atlanticus* n. sp., mature larva: 16 - hind leg; 17 - detail of proximal part of femur; 18 - detail of distal part of tarsus; 19 - posterior margin of the fourth abdominal tergum; 20 - paraproct plate; 21 - detail of the outer margin of paraproct plate; 22 - fourth gill

inner margins. Tarsal claw elongated, pointed, with 10-13 teeth, without apical setae in all the specimens examined (Fig. 18).

Abdominal terga yellowish-brown to light brown. Tergum I light with two longitudinal darker spots laterally; terga II and III generally unicolorous with two light oval lateral spots on darker background and some small darker spots near anterior part of segments; tergum IV lighter, with light triangular and oval central spots and some small darker spots; tergum V lightest with central paler spot and small darker spots. Color of terga VI-VIII generally similar to terga II and III; tergum IX dark with darker smudges near anterior part of segment and central light zone; tergum X unicolorous light brown (Fig. 24). Lateral portions of all terga with light spots. Medial longitudinal strip partly visible on terga IV, IX and



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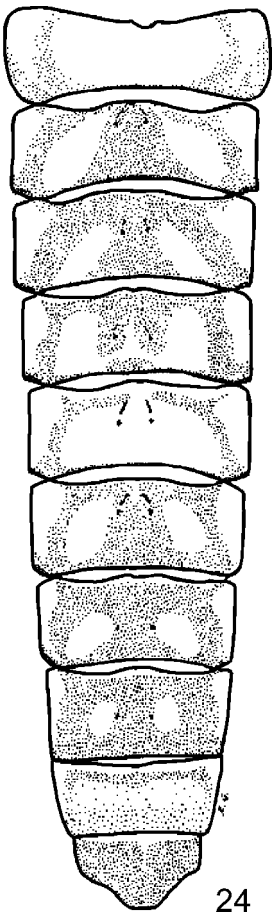

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23-24. *B. atlanticus* n. sp., mature larva: 23 - pro- and mesonotum, dorsal view, color patterns; 24 - abdominal color patterns, dorsal view, color patterns

X only. Posterior margins of terga of various patterns: tergum I with irregular row of relatively slender and slightly expanded rounded spatulas alternating with fine hairs; tergum II generally with irregular row of rare triangular spines alternating with marginal and submarginal slender rounded spatulas and fine hairs; terga III-VII with regular row of triangular spines alternating with submarginal and rare marginal spatulas and fine hairs; terga VIII-X with prevalence of triangular spines, submarginal spatulas and fine hairs (Fig. 19). Surface of terga with numerous spatula bases and scales, rare small spatulas, triangular scales and fine hairs. Gills light yellow to yellowish-brown in color with distinct tracheae. Gill 1 symmetrical with 1-3 strong spines on external margin. Gills 2-6 elongated, slightly asymmetrical with strong spines on the outer margin (Fig. 22). Gill 7 longer than gill 1. Inner margin of all gills with small denticulations and fine hair. Paraproct plate with 12-14 large pointed teeth and subapical bluntly pointed scales (Figs 20, 21). Cerci mainly unicolorous, yellowish to light brown, sometimes slightly darker apically. Paracercus well developed, shorter by 1/2 than cerci.

MATERIAL EXAMINED

Holotype: mature male larva, Portugal, Madeira, Ilha da Madeira, Ribeira do Inferno, at bridge of the regional route No. 101 between São Vicente and Seixal, elevation cca 10-20 m, 28.V.2003, leg. T. SOLDÁN. Paratypes: 11 male imagines, 4 male subimagines, 4 female imagines, 12 female subimagines, 442 larvae, from same locality and date as holotype, leg T. SOLDÁN.

Other material (no types): 8 larvae, Ribeira da Serra de Água, Serra de Água, elevation cca 450 m, 23.V.2003; 115 larvae, Ribeira da Serra de Água, Adega, elevation cca 200 m, 23.V.2003; 64 larvae, Ribeira Brava, Fajă, elevation cca 50 m, 23.V.2003; 13 larvae, Levada do Ribeira da Silveira, Fonte da Pedra, elevation cca 400 m, 25.V.2003; 65 larvae, Ribeira das Furnas, Fajă das Conteiras, elevation cca 10 m, 26.V.2003; 18 larvae, Ribeira do Passo, Passo, elevation cca 100 m, 26.V.2003; 258 larvae, Ribeira de São Vicente, Senhora de Fálima, elevation cca 15 m, 26.V.2003; 3 larvae, Ribeira do Curral das Freiras, Curral das Freiras, elevation cca 630 m, 27.V.2003; 10 larval skins (parts on slides), from same locality and date as holotype; 122 larvae, Ribeira da Metade, São Roque do Faial, elevation cca 80 m, 29.V.2003; 23 larvae, Ribeira do Machico, Paraiso, elevation cca 50 m, 29.V.2003. All specimens, collected by T. SOLDÁN and preserved in 75 % alcohol, are deposited in the Institute of Entomology, Academy of Sciences, České Budějovice, Czech Republic, except for some paratypes deposited in the State Museum of Natural History, National Academy of Sciences of Ukraine, L'viv, Ukraine (2 male imagines, 1 female imago, 1 male subimago, 1 female subimago, 50 larvae of the type series) and the Municipal Museum of Natural History in Funchal, Madeira, Portugal (1 male imago, 1 male subimago, 1 female subimago, 50 larvae of the type series).

DIFFERENTIAL DIAGNOSIS AND AFFINITIES

B. atlanticus n. sp. belongs to the subgenus *Rhodobaetis* JACOB, 2003. From other species it can be distinguished by the following combination of characters: (1) facetted surface of turbinate eyes dark orange; (2) shaft orange, slightly paler than turbinate eyes surface, with narrow, dark orange subapical ring and orange-grey or orange-violet band at the base; (3) basal segments of forceps slightly elongated, 1.3-1.5 times as long as wide; (4) segment 1 elongated with approximately subparallel margins; (5) segment 2 widened towards segment 3, the expanded part apparent at 1/2-2/3 of its length; (6) segment 3 oval, occasionally with truncate inner margin; (7) pedicel spatulas rounded apically, relatively elongate, narrow, with parallel or slightly apically convergent margins; (8) labrum distinctly wide (width/length ratio 1.40-1.44) with 1 + 7-9 (rarely 6-10) long bristles; (9) first tooth of mandible incisors approximately quadrate with straight outer and anterior margins and several distinctly bluntly pointed inner teeth; (10) segment 2 of maxillary palps mainly with well visible rounded projection bearing a small scale; (11) segment 2 of labial palps with slightly concave inner margin, segment 3 approximately symmetrical; (12) paraglossae with 3 regular rows of bristles apically; (13) femora with diffuse broad brownish central spot; (14) external margin of femora with dense row of 16-28 large setae distinctly rounded at the apex; (15) tarsal claws without setae at the tip; (16) color of abdominal terga; (17) gills 2-6 elongated, slightly asymmetrical with strong spines on external margin; (18) paraproct plate with 12-14 large pointed teeth and subapical bluntly pointed scales; (19) paracercus well developed, shorter by 1/2 than cerci.

The combination of characters (1) – (6) (especially 1 and 2) distinguishes the male imago of *B. atlanticus* n. sp. from all other species of the subgenus *Rhodobaetis*. In larvae, the presence of rounded setae on external margin of femora shows close relationships to *B. canariensis* MÜLLER-LIEBENAU, 1971 from the Canary Islands, *B. braaschi* ZIMMERMANN, 1980 described from the Crimean Peninsula and *B. ingridae* THOMAS & SOLDÁN, 1987 from Corsica (MÜLLER-LIEBENAU 1971, ZIMMERMANN 1980, THOMAS & SOLDÁN 1987). However, the larva of *B. atlanticus* n. sp. markedly differs from that of *B. canariensis* by a combination of characters (8, 9, 11, 13, 15-17). *B. braaschi* can be distinctly distinguished from this new species by characters (8, 11, 13, 16, 17-19). *B. ingridae* can be easily separated from *B. atlanticus* n. sp. by color patterns of pronotum, mesonotum and abdominal terga; shape and relative length (ratio) of segment 2 and 3 of labial palps, more elongated and slender setae on the outer margins of femora, and the shape of tracheal gills.

DISTRIBUTION AND VERTICAL DISTRIBUTION

B. atlanticus n. sp. most probably represents a Macaronesian endemite restricted to Madeira only, however the mayfly fauna of some other islands (e.g., the Cabo Verde) remains still unknown. No species of the genus *Baetis* were found on the Azores (BRINCK & SCHERER 1961), 3 endemic species of this genus, namely

B. canariensis MÜLLER-LIEBENAU, 1971, *B. nigrescens* NAVÁS, 1931, and *B. pseudorhodani* MÜLLER-LIEBENAU, 1971 occur in the Canary Islands (MÜLLER-LIEBENAU 1971, ALBA-TERCEDOR et al. 1987, ALBA-TERCEDOR & JÁIMEZ-CUÉLLAR 2003). Although it is much more remote, Madeira is inhabited also by *B. rhodani*, the species actually not occurring on the Canary Islands. The only record on its distribution on Tenerife by EATON (1885) represents a misidentification (MÜLLER-LIEBENAU 1969, 1971) similarly to that on the occurrence of *B. pseudorhodani* on Madeira (STAUDER 1995: 716). Since STAUDER (1991, 1995) mentioned just *B. rhodani* as well, his *B. pseudorhodani* most probably refers to our new species, *B. altanticus* n. sp. The material of *B. rhodani* collected on Madeira shows no morphological differences from the nominative subspecies *B. rhodani rhodani* PICTET living in the European mainland (GODUNKO & PROKOPOV 2003, GODUNKO et al. 2004, SOLDÁN et al. 2005).

B. atlanticus n. sp. is evidently distributed all over the main island (Ilha da Madeira) and missing on adjacent smaller islands with permanent aquatic biotopes like, e.g., on the Ilha de Porto Santo. Larvae were found at localities situated mostly in the central part of Madeira. There is the only locality in the western part of the island near Porto Moniz but numerous streams in the area of Calheta with suitable biotopes have not yet been sampled. Similarly, there is only a single locality near Machico in the island's eastern part but this area generally exhibits a low number of permanent running waters.

As noted by STAUDER (1991, 1995) there are pronounced differences in vertical distribution between *B. rhodani* and *B. atlanticus* n. sp. Distribution of the latter is restricted to lower altitudes up to about 650 m a.s.l., while larvae of *B. rhodani* live evidently also in montane streams. For example, this species was found at the localities of the Levada do Risco at Rabaçal (18 larvae, 26.V.2003), Ribeira da Janela at Pico da Urze in Paúl da Serra (128 larvae, 26.V.2003), and Ribeira de Santa Luzia, Poço da Neve, S slope of Pico do Areeiro (34 larvae, 2 male imagines, 5 male subimagines, 25.V.2003) at elevations of 1064 m, 1450 m, and 1650 m, respectively. Larvae of *B. atlanticus* n. sp. are solitary to rare at altitudes above about 400 m, their quantitative representation ranges between 1-10 % of mayfly standing crop and they were not found at places higher than 650 m in May 2003. The locality of the highest altitude is Ribeira do Curral das Freiras, Curral das Freiras, situated at the elevation of 630 m. The same concerns larvae of *B. rhodani* in the altitudes below 200-300 m, they are missing at most of "lowland" localities (e.g. Ribeira das Furnas, Fajã das Conteiras, elevation cca 10 m and Ribeira de São Vicente, Senhora de Fálima elevation, of about 15 m). The ratio of quantitative distribution of both species changes gradually, the percentage of larvae of *B. atlanticus* n. sp. decreases with increasing altitude. For instance, about 85 % of mayfly standing crop belong to *B. atlanticus* n. sp. larvae at the locality of Ribeira da Serra de Água at Adega (elevation cca 200 m), while those of *B. rhodani* reached more than 90 % of mayfly standing crop in the same stream at the elevation of about 450 m on May 23, 2003. The factors limiting vertical

distribution of larvae of *B. atlanticus* n. sp. remain unknown. Undoubtedly, water temperature plays a certain role but the occurrence of this species seems to be influenced also by evidently narrower ecological range in comparison to *B. rhodani* (see below).

BIOLOGY

Larvae of *B. atlanticus* n. sp. evidently prefer the "lowland" biotopes within the island. They show the highest densities in larger streams or smaller rivers about 3-8 m across with an average depth of 10-40 cm, moderate to fast current velocity and stony bottom. Although collected there as well, their densities in smaller streams with smaller depth are much lower. Contrary to larvae of *B. rhodani*, which currently inhabit artificial running water biotopes like "levadas" (shallow irrigation brooks up to about 1-1.5 m across with uniform and sometimes concrete bottom and considerably fluctuating water level), those of *B. atlanticus* n. sp. occur only incidentally at these places. Of about 15 localities of such biotopes sampled in May, 2003, several larvae of *B. atlanticus* n. sp were found only in one of them (Levada do Ribeira da Silveira, Fonte da Pedra), otherwise levadas are inhabited solely by larvae of *B. rhodani*.

As to substrate roughness, larvae prefer gravel places (lithal) covered with cobble (up to 64.0 mm) and pebble (up to 4.4 mm) according to substrate classification by GORDON et al. (1992) although they were collected from compact rocks and boulders as well. Their densities in places covered with granules (2.0 mm) and very coarse (1.0 mm) or coarse (0.5 mm) sand are very low showing rather incidental occurrence. Larvae never live on fine substrates like medium to very fine sand, silt or clay. If submerged aquatic plants occur at the places preferred, larval densities among vegetation are comparable with those on stony places.

As to current velocity, larvae of *B. atlanticus* n. sp. seem to prefer places with velocities of about 20-50 $cm.s^{-1}$. Their occurrence decreases with decreasing current velocity rapidly, places with lower current are inhabited rather incidentally but larvae can evidently survive in oxygenated pools as well. Contrary to larvae of *B. rhodani*, densities of those of *B. atlanticus* n. sp. decrease with increasing current velocity above about 50 $cm.s^{-1}$. Consequently, larvae of *B. atlanticus* n. sp. in most streams do not generally prefer streamline places and provided that the two species occur together, larvae of *B. rhodani* mostly exhibit higher densities here.

Subimagines emerge from among partly submerged stones and vegetation during day hours, from about 10.00 a.m-16.00 p.m. of the local time with maximum emergence peak round noon. When reared, the subimaginal stage lasts for about 14-20 hours. *B. atlanticus* n. sp. evidently shows early morning mating flight activity. Mating flight generally occurs from about 6.30-9.30 a.m. of the local time but its actual timing depends on local conditions (shadowing and insolation of field markers on the banks). First males start to appear approxi-

mately half an hour before sunrise. Flight activity lasts for at most 2 hours, with a maximum in the period of 0.5-1 hour after sunrise. First females start to appear about 0.5-1 hour later, their oviposition upstream flight lasts for about 1 more hour after males have disappeared. The oviposition is realized in the usual way within the genus *Baetis* LEACH, 1815 – females lay their eggs on the surface of submerged stones.

Life cycle of *B. atlanticus* n. sp. remains unknown in detail. However, judging from the size of larvae in May 2003 and timing of mating flight we might suppose a seasonal, bivoltine winter life cycle (MBws in the classification by CLIFFORD 1982). Adult emergence by the end of May shows a possibility of two generations a year (second generation might fly from late August to early October). Owing to favorable conditions (generally mild climate, relatively high water temperatures) there is a chance to complete development of larvae originating from the eggs laid in May in the same year. On the other hand, half grown and young larvae were collected at the localities investigated at the same time in May. This indicates two more alternatives: either the possibility of different development rate of larvae originating from the same egg cohort or polyvoltine life cycle (MP in the classification by CLIFFORD 1982). Although details on the life cycle of related species *B. rhodani* on Madeira are not at disposal, all these possibilities have been described in Mediterranean or west European populations living in similar conditions (cf. CLIFFORD 1982). Moreover, this species exhibits also the seasonal univoltine winter life cycle (Uw in the classification by CLIFFORD 1982) that is very likely at montane localities above 900-1000 m also on Madeira.

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