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Interesting species of the genus *Helicopsyche* von Siebold (Trichoptera: Helicopsychidae) from Vietnam

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Abstract. Three **new species** of the genus *Helicopsyche* von Siebold (Trichoptera: Helicopsychidae), *H. botosaneanui*, *H. verrucaspinosa*, and *H. inusitata*, from Vietnam are described, and 1 new country record, *H. pathoumthongi* Johanson and Malm, is reported. The male of *H. boniata* Malicky and Chantaramongkol is redescribed to facilitate comparisons with two of the new species.

Key words: Caddisfly, Trichoptera, *Helicopsyche*, new species, Vietnam

Introduction

Johanson and Pham (2012) reported 74 species of the genus *Helicopsyche* von Siebold 1856 (Trichoptera: Helicopsychidae) in the Oriental Region. Seventy-two of these species were placed in the subgenus *Helicopsyche* von Siebold 1856. The other two species were placed in the subgenus *Galeopsyche* by Johanson (1998). However, one of these species, *H. coreana* Mey (1991) is actually from the East Palaearctic Region (North Korea); and, the second species, *Helicopsyche* sp. B, from Vietnam, to the best of our knowledge, remains undescribed.

Seven species of *Helicopsyche* (*Helicopsyche*) were described from Vietnam: *H. azwudschgal* Malicky 1995; *H. azunensis* Schefter and Johanson 2001; *H. dacklestensis* Schefter and Johanson 2001; *H. khemoiensis* Schefter and Johanson 2001; *H. lamnata* Johanson and Pham 2012; *H. meander* Johanson and Pham 2012; and, *H. melina* Johanson and Pham 2012. Two additional species, *H. admata* Malicky and Chantaramongkol 1992 and *H. boniata* Malicky and Chantaramongkol 1992, were recorded from Vietnam by Malicky (2010).

During a survey of the Trichoptera fauna from Vietnam 3 new species of *Helicopsyche* (*H. botosaneanui*, *H. verrucaspinosa*, and *H. inustitata*) and 1 new country record, *H. pathoumthongi* Johanson and Malm 2007, were revealed. As a result, 13 species of *Helicopsyche* are now known from Vietnam.

According to Johanson (1998), the interantennal setal warts of *Helicopsyche* are spherical or obscure. He also indicated that the postantennal warts are tubular in most New World *Helicopsyche* species, and that in the East Palaearctic species, *H. coreana* Mey, these warts are tubular and bifurcated. Surprisingly, unlike all other known *Helicopsyche* species in the World, 2 of the new species (*H. botosaneanui* and *H. verrucaspinosa*) from Vietnam share a unique, novel character: tubular interantennal warts, bent posterad at the base. In addition, postantennal warts in both species are absent. Cephalic warts in these new species, instead of being flat or slightly convex, common features within the genus, are noticeably inflated over the surface of the head. The male genitalia of these 2 new species, similar in lateral view, also appeared to be similar to those in the published description and figures of *H. boniata* Malicky and Chantaramongkol 1992. Prof. Hans Malicky kindly provided us with a paratype of *H. boniata*, which allowed us to compare it with *H. botosaneanui* and *H. verrucaspinosa*. As a result, we determined that these 2 new species, based on unique characters of the wings, head, and genitalia, are not related to *H. boniata*. It appears that *H. botosaneanui* and *H. verrucaspinosa* do not fall within the current definition of the subgenus *Helicopsyche*. Future analyses could provide the basis for creation of a new

subgenus. The male of *H. boniata* is redescribed and reillustrated to facilitate comparisons with these new species.

Materials and Methods

The species included in this paper were collected in provinces located in northern and central Vietnam by personnel of the Royal Ontario Museum (**ROM**) in Toronto, Canada and of the American Museum of Natural History (**AMNH**) in New York City, USA. Malaise traps or UV lights were employed for the collections. *Helicopsyche* males were examined under a dissecting microscope. Abdomens from potential new species were removed, cleared in 10% KOH, rinsed, and reexamined. The genitalia, heads, and wings of each species were drawn employing a drawing tube. Final drawings were inked by hand. Terminology used in this paper generally follows Johanson (1998). Type specimens are stored in 75% ethanol and deposited in the respective source museums.

Helicopsyche botosaneanui sp. n.
(Fig. 1)

Diagnosis. Within all species of the genus *Helicopsyche*, *H. botosaneanui* most closely resembles *H. verrucaspinosa* by having tubular interantennal warts, similar tuft of dark setae in the anal area of the hind wing, and paired parameres in the phallic apparatus. The new species can be easily distinguished from *H. verrucaspinosa* by size (*H. botosaneanui* nearly twice as large as *H. verrucaspinosa*); by the absence of spines on the cephalic warts of the vertex; and, by some differences in the male genitalia (e.g., the shape of segment X in dorsal view and shape of the parameres of the phallic apparatus). In addition, the male genitalia of this new species share close similarity with those of *H. verrucaspinosa*, as well as *H. boniata*, but the phallic apparatus of the latter lacks parameres (Fig. 3). Additional differences with *H. boniata* are noted in the Introduction.

Description of adult male. Color light brown in alcohol. Length of forewing 7.1-7.2 mm; hind wing – 5.2-5.3 mm (n=2). Hind wings with 28 hamuli at basal half of anterior margin and with anal tuft of dark long hair. Wing venation as in Fig. 1A. Head with interantennal warts tubular, as long as two-thirds of scapus, bent posterad at base, covered with trichoid setae, those most long and dense on lateral surfaces (Fig. 1B); postantennal warts absent; cephalic warts somewhat oval, convex. Scapus subequal in length to head. Maxillary palps 2-segmented, basal segment with long setae on dorsomesal surface; distal segment slightly longer, with apical portion tapering and covered with shorter setae. Labial palps shorter than maxillary palps, 3-segmented, 1st and 2nd segments equal in length, 3rd segment slightly shorter. Tibial spurs 1-2-4. Abdominal segment VI with sternal process about half as long as sternum VI, straight, tapering, directed posteroventrad (Fig. 1C).

Male genitalia (Fig. 1 D-H). Segment IX, in lateral view, extended anteriorly in middle of lateral sides, narrow dorsally, widened ventromesally. Preanal appendages small rounded, nearly as long as wide, flattened laterally. Segment X tapering in lateral view, bent posterodorsad mesally; in dorsal view subrectangular, "shoulders" angled, straight and narrow posteromesal processes aligned to each other, one-third length of segment X. Inferior appendages straight in lateral view, gradually widening distally; ridge-like lobe in middle of inner surface, bearing few setae; basomedian branch knob-like. Phallic apparatus complex: phallotheca sclerotized, bent ventroposterad; endotheca with a pair of dorsolateral finger-like processes directed posterolaterally, each with sclerotized tip and additional membranous appendage of nearly same length on mesal side; paired parameres attached dorsally to phallotheca, sclerotized portion of parameres parallel-sided in ventral view, their apices with acuminated tips bent sharply laterad; phallic sclerite bean-shaped.

Female and larva unknown.

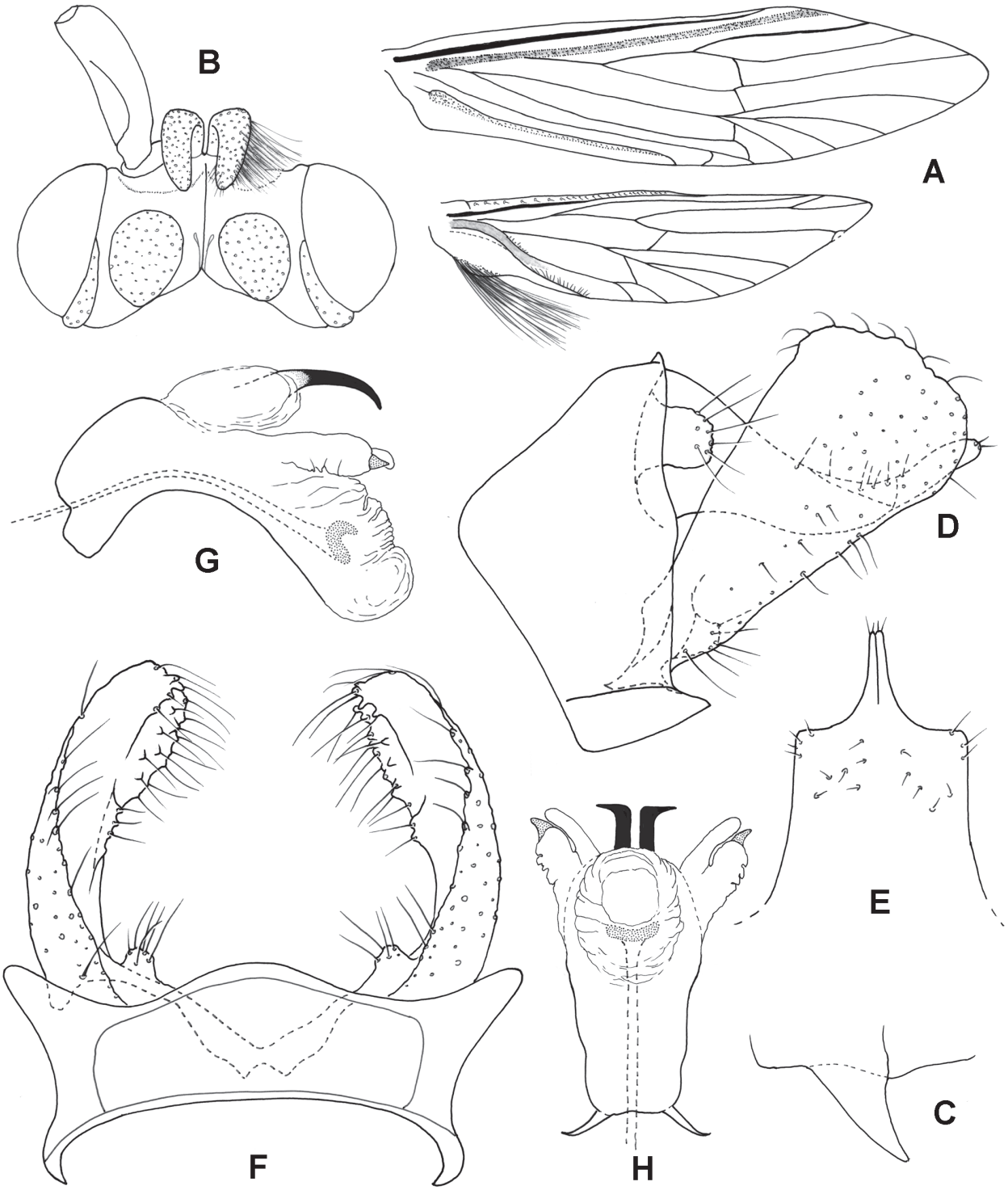

Figure 1. *Helicopsyche botosaneanui* sp. n., male. A) Wings; B) Head, dorsal; C) Sternal process of segment VI, lateral. Male genitalia: D) Lateral; E) Dorsal; F) Ventral; G) Phallic apparatus, lateral; H) Phallic apparatus, ventral.

Material examined. Holotype male. VIETNAM, Ha Tinh Province, Huong Son, 900 m, 18°21'N, 105°15'E, 18 May 1998, J. Carpenter, K. Long, D. Grimaldi, L. Herman, D. Silva (AMNH). **Paratype:** 1 male, Cao Bang Province, Ba Be NP, 3 km along trail to ethnic village overlooking river, 24 May 1995, D. Currie, J. Swann (ROM 956131).

Etymology. The species is named after Dr. Lazar Botosaneanu, late of the Institute of Zoology of the Amsterdam University, The Netherlands, for his numerous contributions to trichopterology, in general, and to the genus *Helicopsyche*, in particular.

***Helicopsyche verrucaspinosa* sp. n.**
(Fig. 2)

Diagnosis. *Helicopsyche verrucaspinosa* most closely resembles *H. botosaneanui* by possessing tubular interantennal warts on the head, a similar tuft of dark setae in the anal area of the hind wing, and paired parameres in the phallic apparatus. The new species can be easily distinguished from *H. botosaneanui* by size (it is nearly half as large); by the presence of spines on the cephalic warts of the vertex; and, by some differences in male genitalia, (e.g., shape of segment X in dorsal view, and shape of the parameres of the phallic apparatus). The male genitalia of the new species resemble those of *H. botosaneanui*, as well as *H. boniata*, but the phallic apparatus of the latter lacks parameres (Fig. 3). Additional differences with *H. boniata* are noted in the Introduction.

Description of adult male. Color light brown in alcohol. Length of forewing 3.7-4.1 mm (n=16). Hind wings with 21 hamuli at basal half of anterior margin and with tuft of long, dark setae in anal area. Wing venation as in Fig. 2A. Head with interantennal warts tubular, bent posterad at base, as long as one-half of scapus (Fig. 2B); postantennal warts absent; cephalic warts subquadrate anteriorly and rounded posteriorly, convex and slightly conical, bearing a few dark spines in center. Scapus subequal in length to head. Maxillary palps 2-segmented, distal segment slightly longer, with apical portion tapering. Labial palps shorter than maxillary palps, 3-segmented, 1st and 2nd segments equal in length, 3rd segment slightly shorter. Tibial spurs 1-2-4. Abdominal segment VI with sternal process about one-third as long as sternum VI, straight, tapering, directed posteroventrad.

Male genitalia (Fig. 2 C-G). Segment IX extended anteriorly in middle of lateral sides, narrow dorsally, widened ventromesally. Preanal appendages small, rounded, nearly as long as wide, flattened laterally. Segment X tapering in lateral view, apical third bent posterodorsad; in ventral view, lateral margins slightly concave, bilobed mesoposterad; lobes vary in shape from triangular to digitate (Fig. 2E). Inferior appendages straight in lateral view, slightly widening distally, ventral margin nearly straight at apical half and slightly depressed at basal half (some paratypes with even ventral margin); basomedian branch knob-like. Phallic apparatus complex: phallotheca sclerotized, slightly bent ventroposterad; endotheca with a pair of lateral finger-like processes directed posterad, each with sclerotized tip; paired parameres attached dorsally to phallotheca, sclerotized portion of parameres with apices acute, directed posterolaterad; phallic sclerite bean-shaped.

Female and larva unknown.

Material examined. Holotype male. VIETNAM, Thua Thien-Hue Province, Nam Dong District, Huong Loc commune, ca. 9 km SE Khe Tre, 26 May-1 June 2002, Malaise trap, C. Darling (ROM 2002508). **Paratypes:** 15 males, same data as holotype; 1 male, Ha Tinh Province, Huong Son, 200 m, 18°21'N, 105°15'E, 15 May 1998, Malaise trap, J. Carpenter, K. Long, D. Grimaldi, L. Herman, D. Silva (AMNH); 1 male, ibid., 18°22'N, 106°13'E, K. Long (AMNH).

Etymology. This species is named for the spine-bearing cephalic warts (from the Latin, *verrucas* – warts and *spinosis* – spiny).

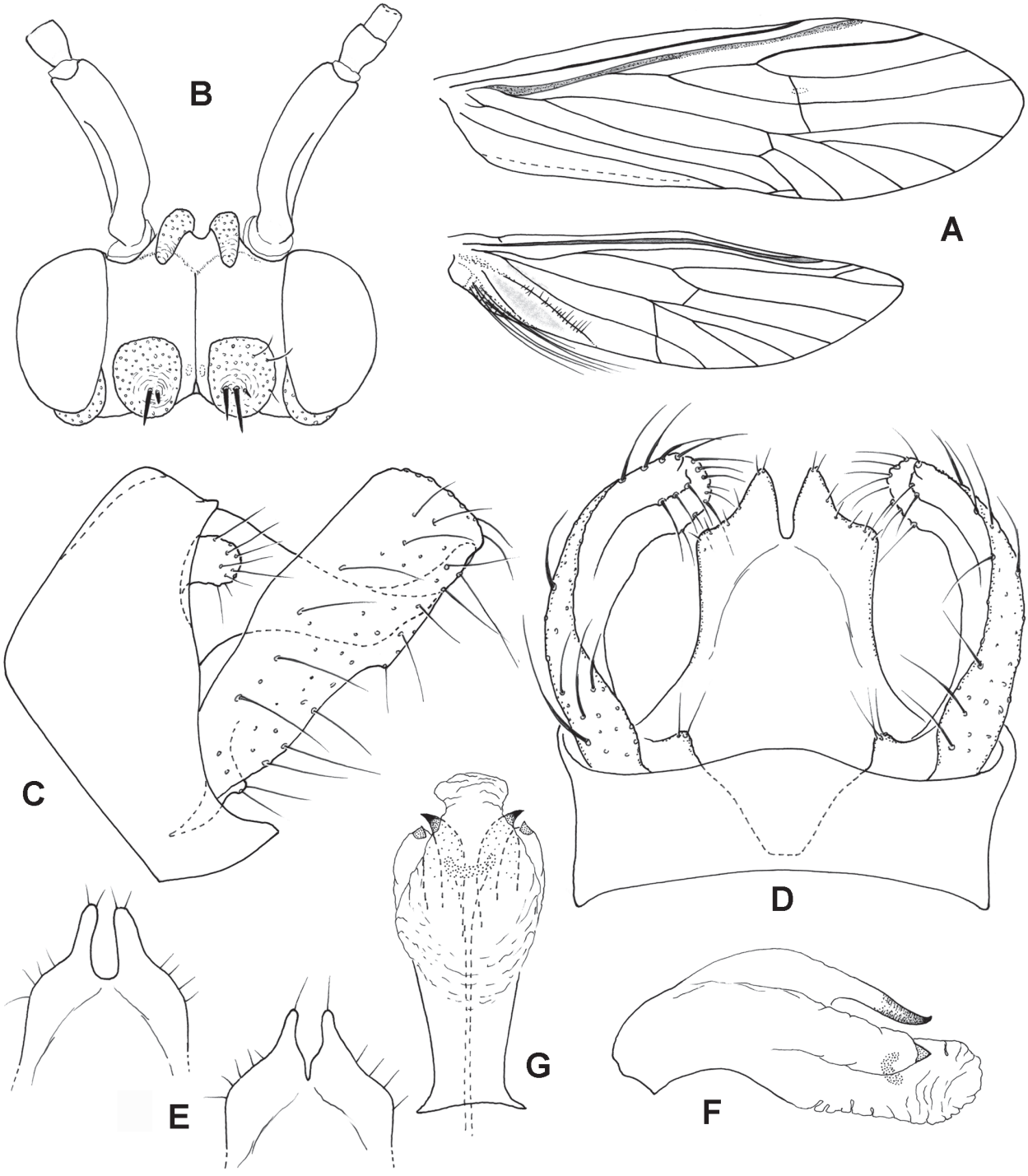

Figure 2. *Helicopsyche verrucaspinosa* sp. n., male. A) Wings; B) Head, dorsal. Male genitalia: C) Lateral; D) Ventral; E) Ventral, showing variation in shape of lobes of segment X; F) Phallic apparatus, lateral; G) Phallic apparatus, ventral.

***Helicopsyche boniata* Malicky and Chantaramongkol 1992**
(Fig. 3)

Diagnosis. The male genitalia of *H. boniata* resemble those of *H. botosaneanui* and *H. verrucaspinosa* but differ in the absence of the parameres in the phallic apparatus. The adult male of *H. boniata* can also be distinguished from these 2 new species by the spherical interantennal warts (typical for most representatives of *Helicopsyche* in the Oriental Region); and, by the absence of a tuft of long setae in the anal area of the hind wing.

Description of adult male. Color yellowish-brown in alcohol. Length of forewing 3.4-3.5 mm (n=2). Hind wings with 22 hamuli at basal half of anterior margin; no tuft of dark long hair on anal area. Wing venation as in Fig. 3A. Head with interantennal warts spherical; postantennal warts not observed; cephalic warts slightly convex, egg-shaped (Fig. 3B). Scapus slightly shorter than head, nearly as long as first 2 segments of labial palps. Maxillary palps 2-segmented, segments equal in length. Labial palps shorter than maxillary palps, 3-segmented, 1st and 2nd segments equal in length, 3rd segment slightly shorter. Tibial spurs 1-2-4. Abdominal segment VI with sternal process about half as long as sternum VI, straight, tapering, directed posteroventrad.

Male genitalia (Fig. 3 C-F). Segment IX extended anteriorly in middle of lateral sides, narrow dorsally, slightly widened ventromesally. Preanal appendages small rounded, nearly as long as wide, flattened laterally. Segment X tapering in lateral view, apical third bent posterodorsad, ventrocaudal margin emarginate; in dorsal view subrectangular, "shoulders" rounded, posteromesally producing 2 tapering digitate processes; processes nearly one-fourth length of segment X. Inferior appendages straight in lateral view, slightly widening distally, ventral margin slightly sinusoid in studied specimens; basomedian branch short. Phallic apparatus complex with phallotheca sclerotized, slightly bent ventroposterad; endotheca with a pair of lateral finger-like processes directed posterad, each with weakly sclerotized tip; parameres absent; phallic sclerite bean-shaped.

Distribution. Laos, Thailand, Vietnam (Vinh Phu).

Material examined. THAILAND, Phuket Island, Tonesai Waterfall, 4 March 1990, P. Chantaramongkol, 1 male (paratype); **VIETNAM,** Vinh Phu Province, Tam Dao Hill Station, lower waterfall of stream flowing through town, UV light, 11 May 1996, B. Hubley, C. Darling, 1 male (ROM 961030).

***Helicopsyche inustitata* sp. n.**
(Fig. 4)

Diagnosis. The male genitalia of this species most closely resemble those of *H. myrrhine* Schmid 1993 from India. It differs by the apical portion of the inferior appendage being slightly enlarged in lateral view while greatly enlarged in *H. myrrhine*; segment X rounded distally in dorsal view, but truncate in *H. myrrhine*; and, basomedian branch of the inferior appendage bilobed apically in ventral view (digitate in *H. myrrhine*). According to Schmid the holotype of *H. myrrhine* was headless; therefore, we cannot compare the unusual, longitudinal setal warts on head of the new species to it. Among known *Helicopsyche* species, only *H. rodschana* Malicky and Chantaramongkol 1992 has similarly modified setal warts on the head. Additionally, the male genitalia of *H. inustitata* are similar to those of *H. minyas* Malicky and Nawvong 2004 (in Malicky et al. 2004), but the cephalic warts are not modified in the latter species (personal communication Dr. Hans Malicky).

Description of adult male. Color pale brownish in alcohol. Length of forewing 2.9 mm. Hind wings with 16 hamuli at basal half of anterior margin. Wing venation as in Fig. 4A. Setal warts on vertex represented by pair of longitudinal warts covering entire length of head (Fig. 4B), with the anterior part narrowed, rounded apically and free from head surface. Scapus slightly shorter than head, nearly subequal in length with either segment of maxillary palps. Maxillary palps 2-segmented, nearly equal in length. Labial palps shorter than maxillary palps, 3-segmented, 1st and 2nd segments equal in length, 3rd segment

almost twice shorter. Tibial spurs 2-2-4. Abdominal segment VI with sternal process directed posteroventrad, about one-fourth as long as sternum VI, straight, tapering to acute apex in lateral view; in ventral view, apex rounded.

Male genitalia (Fig. 4 C-G). Segment IX nearly even in width laterally and ventrally, dorsally fused with segment X. Segment X weekly sclerotized, roof-like, tapering posterad in lateral view; in dorsal

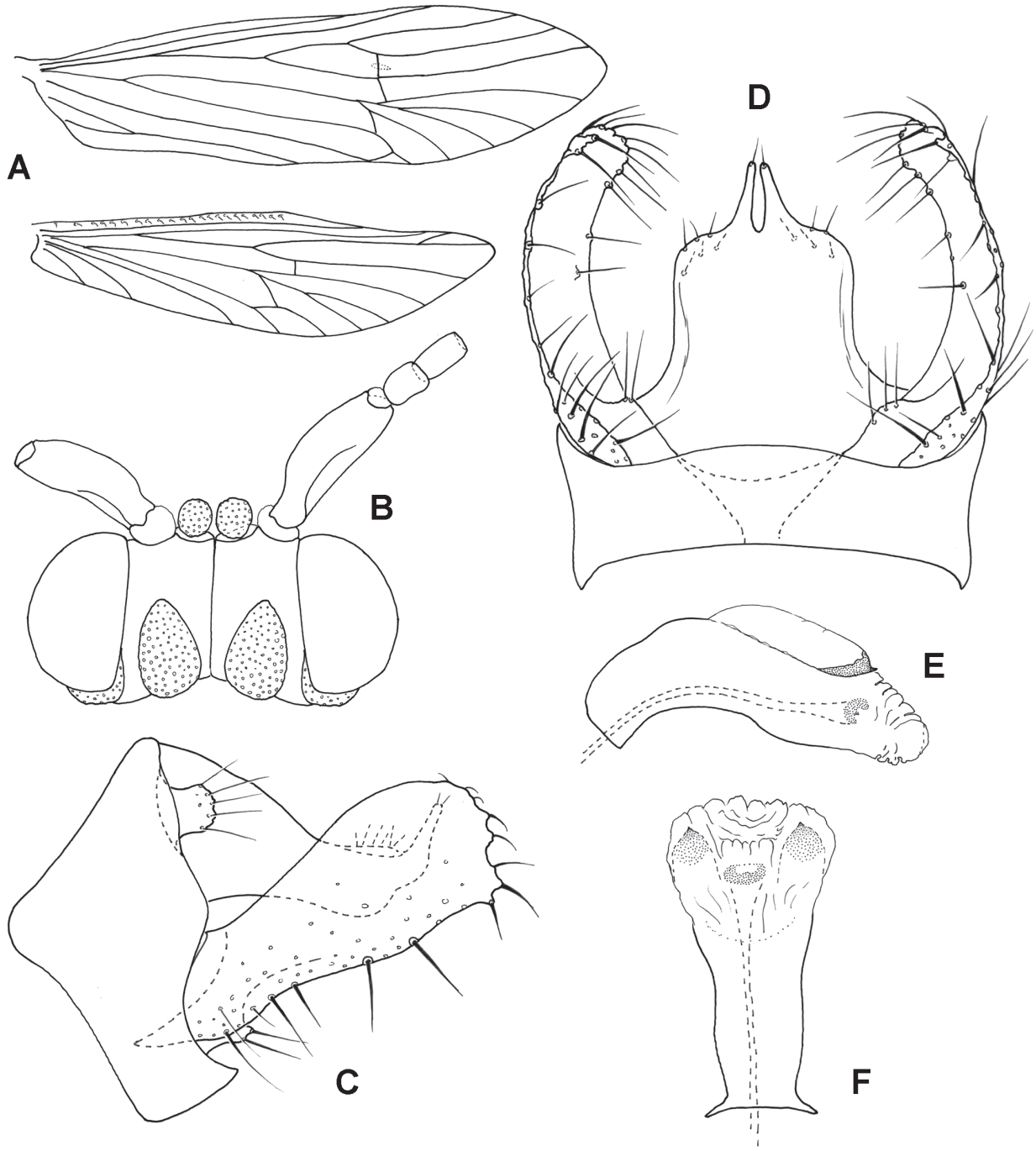

Figure 3. *Helicopsyche boniata* Malicky and Chantaramongkol, male. A) Wings; B) Head, dorsal. Male genitalia: C) Lateral; D) Ventral; E) Phallic apparatus, lateral; F) Phallic apparatus, ventral.

view, 1.5 times as long as wide, parallel-sided with rounded apical portion. Preanal appendages slightly elongate, apex rounded. Inferior appendages almost parallel-sided, slightly enlarged in apical portion; gently bent at base dorsad and then subapically posteroventrad; basomedian branch elongate, bilobed apically in ventral view. Phallic apparatus simple, tubular, bent mid-length posteroventrad in lateral

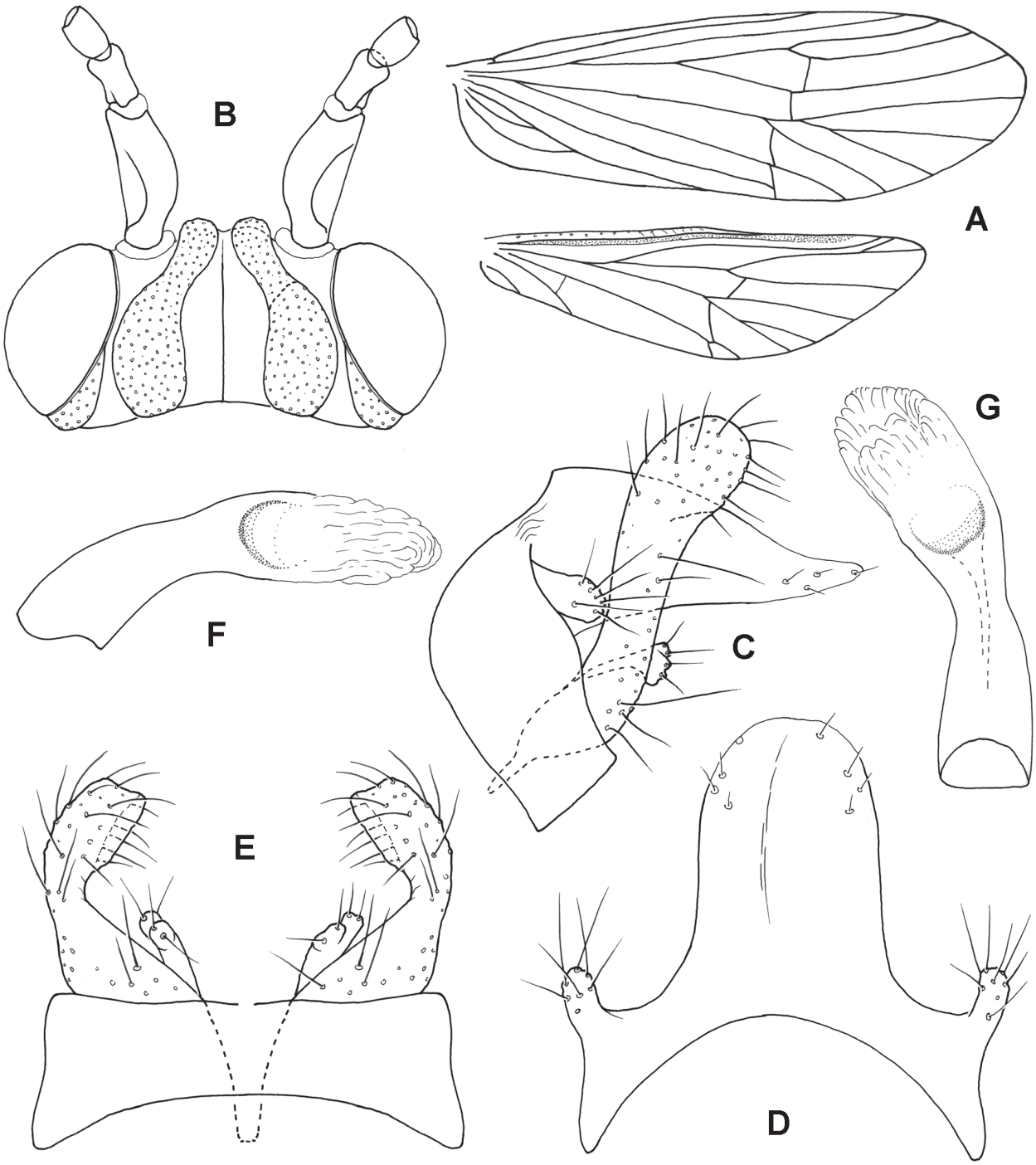

Figure 4. *Helicopsyche inustitata* sp. n., male. A) Wings; B) Head, dorsal. Male genitalia: C) Lateral; D) Dorsal; E) Ventral; F) Phallic apparatus, lateral; G) Phallic apparatus, ventral.

view; in ventral view, bent mid-length along symmetry axis toward left; phallic sclerite large, crescent-shaped.

Female and larva unknown.

Material examined. Holotype male. VIETNAM, Nghe An Province, W of Con Cuong, Khe Moi Forestry Camp, 24-29 October 1994, Malaise trap, D. Currie (ROM 946105).

Etymology. Latin *inustitata* - odd or unusual; refers to modified setal warts on the head of male.

Helicopsyche pathoumthongi Johanson and Malm 2007 **New country record**

Material examined. VIETNAM, Nghe An Province, ca. 25 km SW of Con Cuong, Khe Moi River Forestry Camp, tributary of Khe Moi River, 308 m, 18°56'N, 104°49'E, 6 June 1995, UV light, B. Hubley, 3 males (ROM 956172).

Distribution. Laos, Vietnam (Nghe An).

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Literature Cited

Johanson, K. A. 1998. Phylogenetic and biogeographic analysis of the family Helicopsychidae (Insecta: Trichoptera). Entomologica Scandinavica, Supplement 53: 1-172.

Johanson, K. A., and T. Malm. 2007. Three new *Helicopsyche* from Laos (Trichoptera: Helicopsychidae). Zootaxa 1407: 13-22.

Johanson, K. A., and H.-T. Pham. 2012. Three new species of *Helicopsyche* (Trichoptera, Helicopsychidae) from northern Vietnam, with a key to *Helicopsyche* species of Vietnam. European Journal of Taxonomy 6: 1-10.

Malicky, H. 1995. Neue Köcherfliegen (Trichoptera, Insecta) aus Vietnam. Linzer Biologische Beitragen 27: 851-885.

Malicky, H. 2010. Atlas of Southeast Asian Trichoptera. Biology Department, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand. 346 p.

Malicky, H., and P. Chantaramongkol. 1992. Neue Kocherfliegen (Trichoptera) aus Thailand und angrenzenden Landern. Braueria 19: 13-23.

Malicky, H., P. Chantaramongkol, P. Bunlue, N. Changthong, J. Nawvong, A. Nuntakwang, T. Prommi, P. Thamsenanupap, and D. Thapanya. 2004. 27 neue Köcherfliegen aus Thailand (Insecta, Trichoptera) (36. Arbeit über thailändische Köcherfliegen). Linzer Biologische Beitraege 36: 287-304.

Mey, W. 1991. Faunistische Daten über Köcherfliegen der Ostpaläarktis und Beschreibung neuer Arten (Insecta, Trichoptera). Deutsche Entomologische Zeitung, N.F. 38: 349-363.

Schefter, P. W., and K.A. Johanson. 2001. Three new species of *Helicopsyche* from Vietnam (Trichoptera: Helicopsychidae). Pan-Pacific Entomologist 77: 9-18.

Schmid, F. 1993. Considérations sur les Hélicopsychides (Trichoptera, Integripalpia). Beaufortia 43(5): 65-100.

von Siebold, C. T. E. 1856. Wahre Parthenogenesis bei Schmetterlingen und Bienen. Wilhelm Engelmann; Leipzig (English translation, 1857). 144 p.

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