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New Records of the Craneflies (Diptera: Limoniidae, Tipulidae) from the Western Balkans

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ABSTRACT

We collected adult cranefly specimens during 2016 and 2017 with entomological nets from some localities in Kosovo, North Macedonia and Serbia. A number of 7 species belonging to 5 genera and 2 families were collected. Four species found during this investigation are first records for Republic of Kosovo: *Geranomyia fuscior* Stary, 2012, *Limonia macrostigma* (Schummel, 1829), *Rhypholophus bifurcatus* Goetghebuer, 1920, *Tipula* (*Savtshenkia*) *benesignata* Mannheims, 1954 and three other species are first records for Republic of North Macedonia: *Erioptera* (*Erioptera*) *fusculenta* Edwards, 1938, *Tipula* (*Savtshenkia*) *gimmerthali gimmerthali* Lackschewitz, 1925 and *Tipula* (*Schummelia*) *variicornis variicornis* Schummel, 1833. The most interesting finding are *Geranomyia fuscior*, which was previously known only from Albania, Portugal and Libya, and *Tipula* (*Savtshenkia*) *gimmerthali gimmerthali* which is reported for the first time from the Western Balkans, due to the fact that less is known about their distribution in the area. This study represents an important contribution to the knowledge of species composition and distribution of crane flies in Western Balkans.

Key words: Diptera, new records, rare species, Kosovo, North Macedonia.

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INTRODUCTION

Craneflies are one of the largest groups of the Diptera, containing over 15609 valid species and subspecies (Oosterbroek, 2021). The immature stages of the majority of the species live in aquatic or semiaquatic habitats. Some aquatic species live entirely submerged and lack functional spiracles, while others come to the surface to take oxygen. Semiaquatic species occur in a wide range of habitats. The semiterrestrial and terrestrial larvae live in environments that are considerably moisturised. All adult craneflies are terrestrial (de Jong, Oosterbroek, Gelhaus, Reusch, & Young, 2008). Some species occupy wetlands such as salt marshes (Autio, Salmela, Suhonen, & Suhonen, 2013; Rogers, 1932).

Craneflies are crucially important in the trophic webs, exhibiting mostly a detritivorous diet during their larval phase. Adults of most of the species do not feed, but in some species they will take nectar, pollen, and water. Their position in food webs makes them an important trophic link between aquatic and terrestrial environments (e.g., Baxter Fausch, & Sauders, 2005).

The survey of the species from the Western Balkans began in the second half of the 19th century and at the beginning of the 20th century and was undertaken by Egger (1863), Loew (1873), Bergroth (1888), and Strobl (1893, 1902), who had described and/or documented most of the presently known taxa. The numbers of taxa in some of the Balkan countries are as follows: Slovenia 211, Croatia 185, Bosnia and Herzegovina 154, Serbia 200, Montenegro 147, and Republic of North Macedonia 191 (Oosterbroek, 2021). For Kosovo there are no comprehensive data on the number of species.

The goal of this paper is to contribute to the distribution of crane flies in the Balkan Peninsula, which remains relatively under-investigated in terms of the cranefly fauna.

MATERIALS AND METHODS

Sampling and study area

Adult crane fly specimens were collected with entomological nets during 2016 and 2017 in Kosovo, North Macedonia and Serbia. Four of the sampling sites are located in Kosovo: S1 is in Bollosicë village in Kopaonik Mountain, spring area of Llap River, S2 and S3 are in the Karadak Mountain (Dërmjak and Stanqiq), while S4 is located in Sharr National Park (Gajre). Three localities (S5, S6 and S7) are in the Republic of North Macedonia (Tanushë, Tabanovc and Dolno Sonje) and one locality (S8) is in Serbia (Jastrebac) (Table 1 and Fig. 1).

The collected samples were preserved in 96% ethanol.

Male terminalia were left overnight in 10% KOH and for one hour in undiluted glacial acetic acid to neutralize and wash out the soap created from the soft tissues. Then they were transferred to a larger amount of glycerol to wash out the acid, and then to a drop of glycerol on a slide with rounded excavation. The slide was carefully transferred to the compound microscope to take the photos. Photos of the wing

were taken with an Olympus stereomicroscope (SZ51) with Cannon Camera (650D) attached. Photos of the genital structures were taken with a compound Olympus microscope (CX23) equipped with standard planchromatic objectives. The camera was Cannon 750D, and as stacking software we used Zerene Stacker. Stacking results consists of 10-15 single exposures with the stereomicroscope and 20-50 exposures with the compound microscope.

Table 1. Locality data for the 8 sampling stations of crane fly in Kosovo, Republic of North Macedonia and Serbia.

Code	Sampling Stations	Latitude ˚N	Longitude ˚E	Altitude
S1	Bollosicë	43.118169	20.99330	1330
S2	Dërmjak	42.17264	21.31582	625
S3	Stanqiq	42.25506	21.55029	836
S4	Gajre	42.21016	21.24076	653
S5	Tanushë	42.23356	21.42733	1358
S6	Tabanovc	42.219713	21.697831	380
S7	Dolno Sonje	41.942766	21.377597	635
S8	Jastrebac	43.398180	21.395490	997

The material, representing adult specimens, was preserved in ethanol 98% and deposited in the Diptera Collections of the Faculty of Biology and Geology, affiliated to the Zoological Museum of the University of Babes-Bolyai, Cluj Napoca, Romania.

The systematic, distribution and nomenclature follow the Catalogue of the Craneflies of the World (CCW: Oosterbroek, 2021).

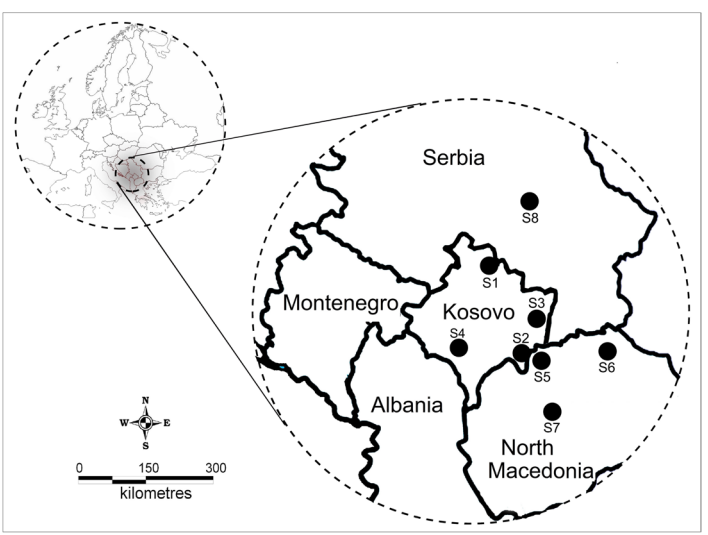

Fig. 1. Eight sampling stations in Kosovo, Republic of North Macedonia and Serbia. Details of sampling stations are in Table 1.

RESULTS AND DISCUSSION

During this investigation we collected 17 cranefly specimens (14 males and 3 females), belonging to 7 species, 5 genera and 2 families. Four species belong to the family Limoniidae and three species belong to the family Tipulidae.

Two species were registered with higher numbers of specimens: *Rhypholophus bifurcatus* (11 specimens) and *Tipula* (*Savtshenkia*) *benesignata* (2 specimens), while other species were found with only one specimen each.

Four species that were found during this investigation were recorded for the first time from Kosovo: *Geranomyia fuscior* Stary, 2012, *Limonia macrostigma* (Schummel, 1829), *Rhypholophus bifurcatus* Goetghebuer, 1920 and *Tipula* (*Savtshenkia*) *benesignata* Mannheims, 1954**.** Three other species are the first records for the Republic of North Macedonia: *Erioptera* (*Erioptera*) *fusculenta* Edwards, 1938, *Tipula* (*Savtshenkia*) *gimmerthali gimmerthali* Lackschewitz, 1925 and *Tipula* (*Schummelia*) *variicornis variicornis* Schummel, 1833.

The most interesting finding during this investigation is the species *Geranomyia fuscior,* which was described only a few years ago based on specimens that were collected in Portugal and Libya, as well as preserved mater ial from Albania. The finding of this species in Kosovo indicates that its areal extent in the Balkans may be bigger than previously considered. The finding of other first records from Kosovo and North Macedonia also greatly expands their area of distribution. For example, the following species were only known from a limited number of localities until now: *Erioptera* (*Erioptera*) *fusculenta and Rhypholophus bifurcates. Tipula* (*Savtshenkia*) *gimmerthali gimmerthali***,** which was found in North Macedonia, is also reported for the first time from the Western Balkans.

There are many under investigated areas in the Balkan Peninsula with respect to craneflies and future studies will most certainly reveal many other rare species.

Systematic list of the found species with distributional data, number of male and female specimens and other collection details. First records are indicated with an asterisk (KS - Kosovo, NM - North Macedonia).

***Erioptera* (*Erioptera*) *fusculenta* Edwards, 1938 * NM** (Fig. 2.)

Material examined: Republic of North Macedonia (S6 Tabanovc), 21.09.2016, 1 ♂, leg.: Bilalli, A., Musliu, M., and Ibrahimi, I.

Distribution: Austria (Vienna), Belgium, Bulgaria, Czech Rep., Denmark, Estonia, France, Germany, Great Britain, Hungary, Italy (incl. Sicily), Lithuania, Moldovia, Montenegro, Netherlands, Poland, Portugal, Romania, Serbia, Slovakia, Sweden, Switzerland, Turkey (European part: widespread), Ukraine; Russia: RUE (Bashkortostan Rep.), North Caucasus; Georgia, Armenia, Azerbaijan, Turkey (Asiatic part), Israel, Turkmenistan (Oosterbroek, 2021).

Habitat: It is a common species, occurring in a range of different habitats with a preference for wet habitats (Boardman, 2007; Kolcsar et al, 2013; Starý & Delmastro,

2001; Ujvárosi, 2005). We found this species in a riverbed vegetation, dominated by willows [*Salix*].

Flight period: month (s) 4 - 12 (Kolcsar, Soos, Torok, Graf, Rakozy, & Keresztes, 2017; Starý & Freidberg, 2007).

Altitude: 16 - 2195 m (Obona, Stary, Manko, Hrivniak, & Papyan 2016; Ozgul, Koc, & Stary, 2006).

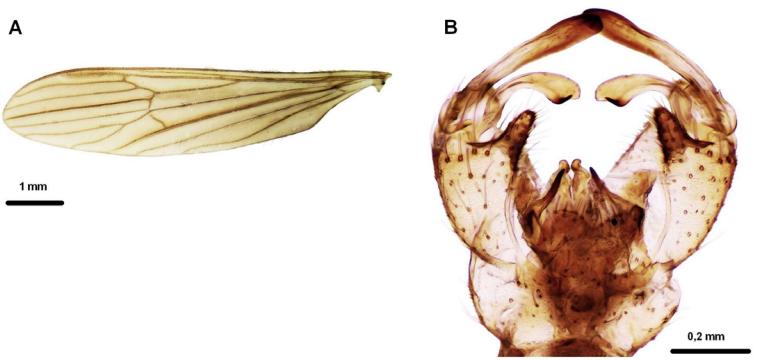

Fig. 2. Photograph of the wing and morphological structures of the male terminalia of *Erioptera fusculenta* Edwards, 1938. A. left wing of the male; B. male terminalia, dorsal view.

***Geranomyia fuscior* Stary, 2012 * KS** (Fig. 3.)

Material examined: Kosovo (S1 Bollosicë), 15.08.2016, 1 ♂, leg.: Ibrahimi, H.

Distribution: Albania, Libya, Portugal (Stary, 2012).

Habitat: This species is reported as common from saltmarsh habitats (Stary, 2012). During our investigation we found this species near a mountainous eucrenal freshwater habitat surrounded by mixed vegetation, dominated by high woods, mainly beech [*Fagus*] and herbaceous plants along the watercourse.

Flight period: month(s) 4 - 7 (Stary, 2012), while during this investigation we found it in August.

Altitude: 24 m (Stary, 2012), during our investigation we found this species at 1330 m a.s.l.

***Limonia macrostigma* (Schummel, 1829) * KS** (Fig. 4.)

Material examined: Kosovo (S3 Stanqiq), 09.10.2017, 1 ♂, leg.: Bilalli, A. and Musliu, M.

Distribution: Austria, Belarus (Minsk region), Belgium, Bulgaria, Croatia, Czech Rep., Denmark, Finland, France (incl. Corsica), Germany, Great Britain, Greece (incl. Evvoia [Evia]), Hungary, Iceland, Ireland, Italy (incl. Sicily), Latvia, Lithuania, Macedonia, Netherlands, Norway, Poland, Romania, Serbia, Slovakia, Slovenia, Spain (Gerona, Guipuzcoa, Lerida, Lugo), Sweden, Switzerland, Turkley (European part: Edirne, Kikrlareli), Ukraine, Russia: RUN, RUW, RUC (Mordoviya Rep., Tverskaya

oblast), Saratovskaya oblast), North Caucasus, Morocco (High Atlas), Georgia, Armenia, Azerbaijan, Turkey (Asiatic part: Aydin, Denizli, Eskisehir, Isparta, Mugla, Marmara region), Cyprus, Russia: WS (Altay), FE (Primorskiy kray), Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzstan, Mongolia, North Korea, Pakistan (Oosterbroek, 2021).

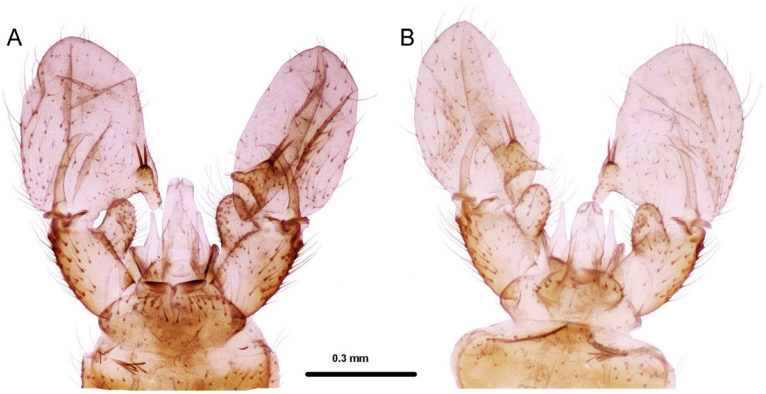

Fig. 3. Photograph of the morphological structures of the male terminalia of *Geranomyia fuscior* Starý, 2012. A. male terminalia, dorsal view; B. male terminalia, ventral view.

Habitat: species with a wide range of habitats, both terrestrial and aquatic, can attain relatively high densities in spring habitats, citing various sources (Salmela, 2001). We found this species nearby the freshwater habitats.

Flight period: month(s): 3 - 11 (Mederos, Claramunt-Lopez, & Eiroa, 2019; Kolcsar et al, 2013).

Altitude: 368 - 2350 m (Kolcsar, Ivkovic, & Ternjej, 2015; Starý & Oosterbroek, 2008).

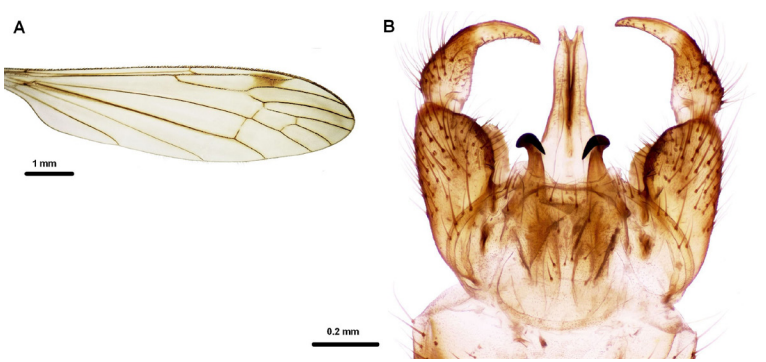

Fig. 4. Photograph of the wing and morphological structures of the male terminalia of *Limonia macrostigma* (Schummel, 1829). A. right wing of the male; B. male terminalia, dorsal view.

***Rhypholophus bifurcatus* Goetghebuer, 1920 * KS** (Fig. 5.)

Material examined: Kosovo (S3 Stanqiq) 09.10.2017, 1 ♂, 2 ♀♀, leg.: Bilalli, A. and Musliu, M.; Kosovo (S4 Gajre) 02.10.2016, 7 ♂♂, leg.: Bilalli, A. and Musliu, M.; Serbia (S8 Jestrebac, Majorva Cesma), 21.11.2016, 1 ♂, leg.: Ibrahimi, H. and Bilalli, A.

Distribution: Austria, Belgium, Bulgaria, Czech Rep., France (incl. Corsica), Germany, Great Britain, Greece (Evritania), Hungary, Ireland, Italy (Calabria), Lithuania, Netherlands, Romania, Serbia, Slovakia, Switzerland, Turkey (European part: Kirklareli), Ukraine, Russia: RUW, Turkey (Asiatic part: Balikesir, Canakkale, aeli), Georgia (Oosterbroek, 2021).

Habitat: found in lowland calcareous woodlands, in a damp deciduous forest with undergrowth largely of *Aegopodium podagraria* and forest floor with much dead wood (Boardman, 2007; Dek & Oosterbroek, 2013). We found it nearby streamlet habitats.

Flight period: month(s) 8 - 11 (Ashe, O'Connor, Chandler, Stubbs, Vane-Wright, & Alexander, 2007; Hubenov, 2015; Koc, Ozgul, Hasbenli, 2016; Podenas, Geiger, Haenni, & Gonseth, 2006; Stary & Oosterbroek, 2008).

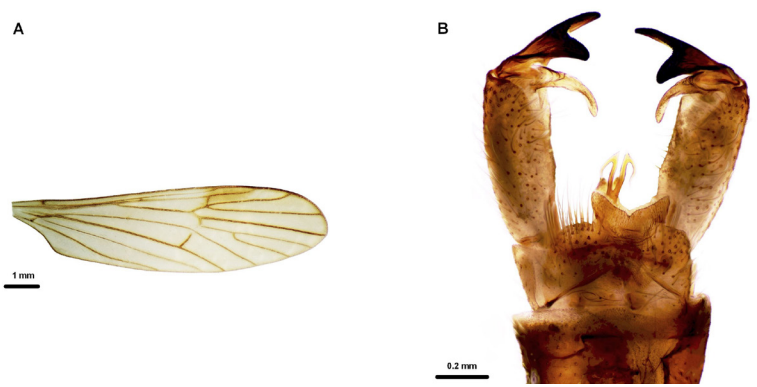

Fig. 5. Photograph of the wing and morphological structures of the male terminalia of *Rhypholophus bifurcatus* Goetghebuer, 1920. A. right wing of the male; B. male terminalia, dorsal view.

***Tipula* (*Savtshenkia*) *benesignata* Mannheims, 1954 * KS** (Fig. 6.)

Material examined: Kosovo (S2 Dërmjak) 2.10.2016. 1 ♂, leg.: Bilalli, A. and Musliu, M.; Kosovo (S4 Gajre) 2.10.2016. 1 ♂, leg.: Musliu, M. and Bilalli, A.

Distribution: Austria, Belgium (Ardennes), Croatia, Czech Rep., Finland, France (Alps, Auvergne), Germany, Greece (incl. Evvoia [Evia]), Hungary, Italy (north), Luxembourg, Montenegro, Norway, Romania, Slovakia, Slovenia, Sweden, Switzerland, Ukraine, Russia: NET (Kareliya, Leningradskaya oblast), CET (Moskovskaya oblast), North Caucasus, Turkey (Asiatic part: Bursa, Canakkale), Kyrgyzstan (Tien Mts) (Oosterbroek, 2021).

Habitat: found in riversides within moist forests, semiaquatic substrata from a cold spring habitat. Larvae abundant in water margin zone of an oligotrophic lake, developing in microhabitats with dense cover of mosses; extensive notes on feeding and gut contents, species is possibly a poly-saprophage with elements of bryophagy and facultative predation (Koc et al, 2015; Przhiboro, 2003, 2009). We also collected this species from nearby riverside habitats within moist forests.

Flight period: month (s) 8 - 11 (Heiss, Graf, Keresztes, Kolcsar, Torok, & Vogtenhuber, 2016; Hofsvang, Olsen, Oosterbroek, & Boumans, 2019).

Altitude: 52 - 1900 m (Koc et al, 2015; Tillier & Oosterbroek, 2019; Ujvárosi, 2003).

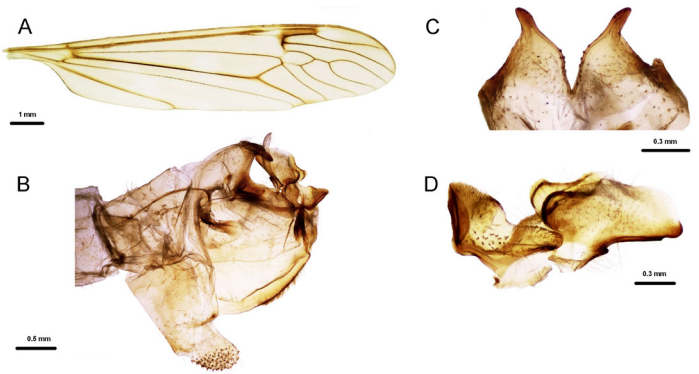

Fig. 6. Photograph of the wing and morphological structures of the male terminalia of *Tipula* (*S.*) *benesignata* Mannheims, 1954. A. right wing of the male; B. male terminalia, lateral view; C. tergite 9, posterior edge, dorsal; D. inner gonostylus , outer-lateral view.

***Tipula* (*Savtshenkia*) *gimmerthali gimmerthali* Lackschewitz, 1925 * NM** (Fig. 7.)

Material examined: Republic of North Macedonia (S5 Tanushë) 25.09.2016. 1 ♂, leg.: Bilalli, A., Musliu, M. and Ibrahimi, H.

Distribution: Austria, Czech Rep., Finland, France (Alps, Auvergne), Germany, Great Britain, Italy (north), Latvia, Norway, Romania, Spain (Granada), Sweden, Switzerland, Ukraine, Russia: NET (Murmanskaya oblast, Arkhangelskaya oblast), SET, Mongolia (Oosterbroek, 2021).

Habitat: mires, springs and headwater streams with a preference for calcareous soils (Salmela, 2011; Stubbs, 2008). We found it near a small stream.

Flight period: month (s) 8 - 10 (Heiss et al, 2016; Salmela, 2008; Tillier & Oosterbroek, 2019).

Altitude: above 300 - 2650 m (Lantsov, 2007; Reusch & Heiss, 2012; Stubbs, 2003; Tillier & Oosterbroek, 2019).

***Tipula* (*Schummelia*) *variicornis variicornis* Schummel, 1833 * NM** (Fig. 8.)

Material examined: Republic of North Macedonia (S7 Dolno Sonje) 28.9.2016, 1 ♀, leg.: Ibrahimi H.

Distribution: Austria, Belarus, Belgium, Bosnia-Herzegovina, Bulgaria, Czech Rep., Denmark, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Montenegro, Netherlands, Norway, Poland, Romania, Serbia, Slovakia, Slovenia, Spain (Lerida), Sweden, Switzerland, Turkey (European part: Kirklareli), Ukraine, Russia: NET, CET (Chuvash Rep., Mayi El Rep., Moskovskaya oblast), SET, Georgia, Armenia, Azerbaijan, Turkey (Asiatic part: Ankara,

Bursa, Canakkale, Kocaeli), Russia: WS (incl. Altay, Tyva), ES, FE (Sakhalin (incl. Moneron), Kuril Is), Kazakhstan (east), Japan (Honshu) (Oosterbroek, 2021).

Habitat: Occasionally in springs or spring brooks and small rivers; larvae may dwell in terrestrial, semiaquatic or hygropetric habitats, citing various sources (Salmela, 2001). We found it in wet habitats, near a small river.

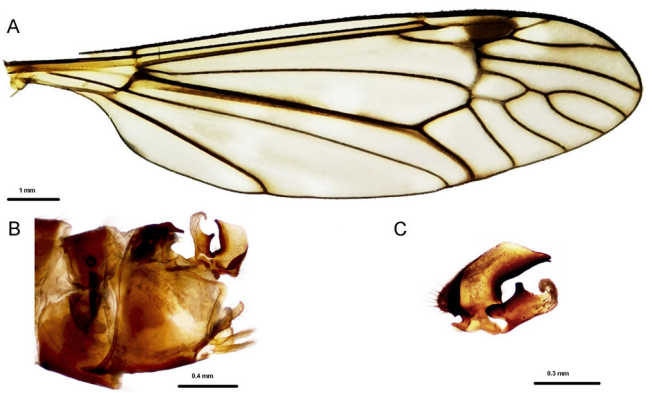

Fig. 7. Photograph of the wing and morphological structures of the male terminalia of *Tipula* (*S.*) *gimmerthali gimmerthali* Lackschewitz, 1925. A. right wing of the male; B. male terminalia, lateral view; C. inner gonostylus, outer-lateral view.

Flight period: month(s) 4 - 8 (Oosterbroek, 2008; Quindroit, 2020; Salmela and Autio, 2007).

Altitude: 500 - 1850 m (Dufour, 2003; Merkel-Wallner, Kehlmaier, & Heiss 2011; Oosterbroek, 2008; Koc and Oosterbroek, 2001).

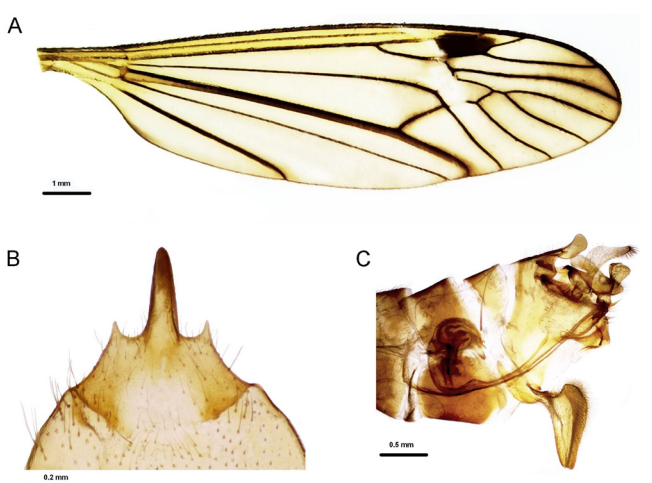

Fig. 8. Photograph of the wing and morphological structures of the male terminalia of *Tipula (S.) variicornis variicornis* Schummel, 1833. A. right wing of the male; B. tergite 9, posterior edge, dorsal; C. male terminalia, lateral view.

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