Zootaxa 4896 (1): 113–122
https://www.mapress.com/j/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.4896.1.6
http://zoobank.org/urn:lsid:zoobank.org:pub:BDED8D7D-B401-4BE7-8D98-6026BFC96CB7

A List of the Caddisflies (Insecta: Trichoptera) from Kyrgyzstan, with a New Record (*Triaenodes reuteri* McLachlan 1880)

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ABSTRACT

The Trichoptera include more species than any of the other primarily aquatic orders of insects, which are usually found in clean fresh water. Distribution of the species of an order based on geography can provide guidance for researchers working in the field. In the current study, for the first time, a list of known Trichoptera species in Kyrgyzstan is given along with a new record. The list is prepared based on the relevant literature between 1875 and 2020 and a study conducted in 2012. Literature search revealed that 21 known species of caddisflies of 13 genera and 8 families have been reported from Kyrgyzstan; our research found that *Triaenodes reuteri* McLachlan 1880 is also present in Kyrgyzstan. We also re-illustrate the male genitalia of *T. reuteri* and provide a detailed redescription. Based on literature search and our observations, the Kyrgyzstan caddisfly fauna has been poorly studied; it is expected that new records and new species will be found in Kyrgyzstan through further research.

Key words: Leptoceridae, fauna, distribution, Lake Issyk-Kul, male genitalia

INTRODUCTION

The Kyrgyz Republic is a mountainous country sharing its northern border with Kazakhstan, western border with Uzbekistan, southwestern border with Tajikistan, and southeastern border with China (Farrington 2005). Kyrgyzstan's total area is 199.949 km^2. Water resources in Kyrgyzstan consist of such sources as springs, perennial and ephemeral rivers that are fed by melting snow and glaciers, and lakes including freshwater and brackish water. The average natural surface water flow is about 46 km^3/year while renewable groundwater resources are about 14 km^3/year. Despite the fact that total internal renewable water resources are equal to 48.93 km^3/year, the actual renewable water resources are equal to 23.62 km^3/year (Food and Agriculture Organization of the United Nations, FAO 2012). Lake Chatyr-Kul, Lake Issyk-Kul, Lake Song-Kul, and Lake Sary-Chelek are the four largest natural lakes of Kyrgyzstan. In addition to these, there are many smaller mountain lakes dispersed all around Kyrgyzstan. The Talas, Syr Darya, Chu, Amu Darya, and Tarim Rivers are the most prominent rivers and the longest river is the Naryn River (Farrington 2005).

The first caddisfly species reported from Kyrgyzstan, according to the Trichoptera World Checklist (TWC, Morse 2020), was *Apatania copiosa* (McLachlan 1875). Further literature from studies of the Trichoptera from Kyrgyzstan appeared more than 50 years after that first report (Ivanov 1994; Kučinić *et al.* 2016; Malicky 1999; Malicky & Chantaramongkol 2000; Martynov 1927, 1928a, 1928b; Mey 1981, 1986; Mey & Jung 1989). The delay can be attributed to the lack of indigenous scientists working on the caddisfly fauna.

The abundance and diversity of species of the order Trichoptera is correlated with an unusually broad range of ecological specialization. Due to the importance of caddisflies for monitoring and sustaining environmental quality and freshwater resources, the present study provides the first published checklist for Trichoptera of Kyrgyzstan as a guide for future researchers working on the Trichoptera fauna of Kyrgyzstan. The present checklist brings together

Accepted by J. Morse: 1 Dec. 2020; published: 18 Dec. 2020

the published records on Kyrgyz Trichoptera and recent research done in 2012, adding a new record, and resulting in a total of 22 known species in 14 genera and 9 families. The low number of known caddisfly species in Kyrgyzstan can be explained by the limited studies done in this area.

MATERIAL AND METHODS

Literature search

The Trichoptera World Checklist (Morse 2020) database and the Google Scholar (scholar.google.com) search engine were used to collect published papers on the Kyrgyz Trichoptera fauna. Kyrgyzstan, Kirgizia, and Kirgizistan along with Trichoptera and caddisfly were used as keywords. Literature given in English, Turkish, French, and German were included in the study.

Collection and characterization of new record

The specimens were collected from Lake Issyk-Kul by hand-net and preserved in ethanol (80%). In the laboratory, the posterior half of the abdomen was excised with a dissection needle and placed in 10% KOH solution for twenty minutes; after maceration, the genitalia were cleaned in one drop of soapy water and transferred into a few drops of glycerin. The specimens were examined using a stereomicroscope (Leica Apo S8). The specimens were then stored in the Entomology Laboratory of the Department of Biology at the Sciences and Arts Faculty in Kastamonu University, Turkey. Illustrations of the new record were drawn by CorelDraw Graphic Suite 2017 (Corel, the UK).

RESULTS

In the current study, for the first time, a list of known Trichoptera species in Kyrgyzstan is given along with a new record. The list is prepared based on the relevant literature between 1875 and 2020, and the study conducted in 2012. Literature search revealed that 21 known species of caddisflies of 13 genera and 8 families have been reported from Kyrgyzstan, and our research found out that *Triaenodes reuteri* McLachlan 1880 is also present in Kyrgyzstan. We also re-illustrate the male genitalia of *T. reuteri* and provide a detailed redescription.

Family Rhyacophilidae

Himalopsyche gigantea (Martynov 1914)—Range: China, Kazakhstan, Tadzhikistan, and Kyrgyzstan (Huang *et al.* 2005; Ivanov 1994; Lepneva 1964; Morse 2020; Smirnova *et al.* 2016).

Himalopsyche kuldschensis (Ulmer 1927) —Range: China (Tibet) and Kyrgyzstan (Malicky & Chantaramongkol 2000; Yang *et al.* 2005).

Rhyacophila extensa Martynov 1928a—Range: Pakistan, India, Nepal, Kazakhstan, and Kyrgyzstan (Kiss 2013; Morse 2020; Oláh 1994; Saini *et al.* 2001; Smirnova *et al.* 2016)

Family Glossosomatidae

Agapetus kirgisorum Martynov 1927—Range: Kazakhstan and Kyrgyzstan (Morse 2020; Oláh 2010; Smirnova *et al.* 2016).

Glossosoma (*Synafophora*) *kiritchenkoi* (Martynov 1927) —Range: Kyrgyzstan (Martynov 1927; Morse 2020).

Family Hydroptilidae

Pseudoxyethira schmidi Mey 1981—Range: Kyrgyzstan (Mey 1981; Morse 2020).

Stactobia malickyi Mey 1981—Range: Kyrgyzstan (Mey 1981; Morse 2020).

Family Psychomyiidae

Tinodes turanicus Martynov 1927—Range: Uzbekistan, Kazakhstan, and Kyrgyzstan (Kučinić *et al.* 2016; Morse 2020; Smirnova *et al.* 2016).

Family Hydropsychidae

Hydropsyche ardens McLachlan 1875—Range: Iran, Afghanistan, Uzbekistan, Pakistan, Turkmenistan, and Kyrgyzstan (Malicky & Chantaramongkol 2000; Mirmoayedi & Malicky 2002; Oláh 1994).
Hydropsyche carbonaria McLachlan 1875—Range: Iran, China (Xinjiang), Uzbekistan, Afghanistan, and Kyrgyzstan (Huang *et al.* 2005; Malicky & Chantaramongkol 2000; Mirmoayedi & Malicky 2002).
Hydropsyche demavenda Malicky 1977—Range: Iran, China, Uzbekistan, and Kyrgyzstan (Huang *et al.* 2005; Malicky 1977; Malicky & Chantaramongkol 2000; Mirmoayedi & Malicky 2002; Yang *et al.* 2005).
Hydropsyche guttata Pictet 1834—Range: Czech Republic, Switzerland, Poland, Kazakhstan, and Kyrgyzstan (Buczynska *et al.* 2018; Chvojka & Komzak 2008; Morse 2020; Smirnova *et al.* 2016; Vereshchagin 1993); presence in Kyrgyzstan not certain (Ivanov 2011).
Hydropsyche nuristanica Schmid 1963—Range: Afghanistan, Uzbekistan, Pakistan, Kashmir, Nepal, India, and Kyrgyzstan (Malicky & Chantaramongkol 2000; Oláh 2010; Pandher *et al.* 2017).
Hydropsyche ornatula McLachlan 1878a—Range: Uzbekistan, Turkey, Ukraine, China, Siberia, Poland, Romania, Russia, Kazakhstan, Switzerland, Iran, France, and Kyrgyzstan (Abdullaeyva 2002; Buczynska *et al.* 2018; Ivanov 2011; Ivanov & Melnitsky 2007; Morse 2020; Sipahiler 2005, 2016; Statzner & Dolédec 2011; Szczesny & Godunko 2008; Ujvárosi *et al.* 2008; Vereshchagin 1993; Yang *et al.* 2005; Yang *et al.* 2016); presence in Kyrgyzstan not certain (Ivanov 2011).
Hydropsyche stimulans McLachlan 1878a—Range: Afghanistan, Uzbekistan, Kazakhstan, and Kyrgyzstan (Malicky & Chantaramongkol 2000; Oláh 2010; Smirnova *et al.* 2016).

Family Lepidostomatidae

Lepidostoma nigrescens (Mey & Jung 1989)—Range: China, Kazakhstan, and Kyrgyzstan (Huang *et al.* 2005; Mey & Jung 1989; Morse 2020; Yang, *et al.* 2016).
Lepidostoma posdnjakovi (Mey 1986)—Range: Kyrgyzstan (Mey 1986; Morse 2020).

Family Limnephilidae

Pseudostenophylax micraulax (McLachlan 1878b)—Range: Afghanistan, Kazakhstan, China (Tibet), Uzbekistan, Pakistan, Kashmir, India (Jammu, Kashmir, Ladak and Uttar Pradesh), Nepal, and Kyrgyzstan (Malicky 2013; Malicky 2017; Oláh 1994, 2010; Saini *et al.* 2001; Smirnova *et al.* 2016; Yang *et al.* 2005; Yang *et al.* 2016).
Psilopterna hirsuta Martynov 1928a—Range: Kazakhstan (Smirnova *et al.* 2016). Also the type country of this record is given as Kyrgyzstan (Morse 2020).

Family Apataniidae

Apatania copiosa (McLachlan 1875)—Range: China, Kazakhstan, Russia, Uzbekistan, and Kyrgyzstan (Huang *et al.* 2005; Morse 2020; Smirnova *et al.* 2016; Yang *et al.* 2005); presence in Kyrgyzstan not certain (see below).
Apataniana rauschorum Malicky 1999—Range: Kyrgyzstan (Malicky 1999).

Family Leptoceridae

Triaenodes reuteri McLachlan 1880—New record for Kyrgyzstan. Range: Kyrgyzstan, United States of America, Norway, Nederland, Germany, Poland, Denmark, Sweden, Finland, United Kingdom, Mongolia, Ukraine, Turkey, Union of Soviet Socialist Republics (Caucasus, Europe, Siberia), Lithuania, Ireland, and Canada (Andersen *et al.*

1990; Andersen & Wiberg-Larsen 1987; Baijens & Joose 2009; Berlin 2005; Blinn & Ruiter 2009; Botosaneanu & Malicky 1978; Cibaite 2003; Czachorowski & Pietrzak 2004; Gullefors 2008; Ivanov 2011; Panter *et al.* 2011; Ruiter *et al.* 2013; Sipahiler 2005; Szczesny & Godunko 2008;).

Material examined: Kyrgyzstan, Issyk-Kul Region, Lake Issyk-Kul, Cholpon Ata, Ruh Ordo Cultural Complex, 42°38'49.26"N/77°05'43.80"E, 26.ix.2011, 4 m#, leg. and coll. İ. Küçükbasmacı.

General Description: Colors of general body, head and mesothorax, and wings light brown, brown, and light brown, respectively. Antennae each consisting of 70 segments; lengths of each antenna and forewing are 18 mm and 7 mm, respectively; tibial spur formula 1, 2, 2; ocelli absent; number of maxillary palp segments 5.

Male genitalia (in alcohol): Genitalia light brown. In lateral view (Fig. 1a), abdominal segment IX anterior margin nearly straight and slightly produced anteroventrally; pleural regions except for segment IX each membranous and sparsely setose, the pleural region of segment IX sclerotized and without setae, with slightly convex posterolateral margins; sternum IX long, projecting posterad, subquadrate in lateral and ventral views (Figs. 1a, 1b); tergum IX, in dorsal view (Fig. 1c), with rounded posteromesal margin and with dorsomesal papillae not evident. Preanal appendages in dorsal view (Fig. 1c) setose, each with length at least 5 times as long as width, constricted basally, and with blunt apex. Dorsomesal process of tergum X digitate and originating basally, about half as long as tergum X, and with apical setae; dorsal view of tergum X with subparallel lateral margins and apex slightly excavated medially (Fig. 1c); in lateral view (Fig. 1a), subparallel-sided, convex subapicoventrally, straight dorsally, with lateral flange, and with blunt apex, its apicolateral margins with no apparent microtrichia. Inferior appendages each with lateral view (Fig. 1a) subquadrangular and setose with apicodorsal lobe as long as tergum X, heavily setose, blunt apically and apicoventral projection 2/3 as long as apicodorsal lobe, thick, round apically; basodorsomesal process abruptly downturned, subtriangular, and with blunt apex; in ventral view (Fig. 1b) apicodorsal lobe convex laterally, straight mesally in distal 2/3 to blunt apex; apicoventral lobe also convex laterally and nearly straight mesally, apex acute. Phallus in lateral view (Fig. 1d) with phallobase small, triangular, and highly convoluted, with prominent endothecal membranes, with pair of parameres (subequally long, strongly recurved basally then gently curved, tapering to apices).

DISCUSSION

A list of the known Trichoptera species in Kyrgyzstan is given based on a literature search and the new records obtained from our studies. There is no fully accepted consensus on which of these Trichoptera species inhabit the various waterways in Kyrgyzstan. For instance, Vereshchagin (1993) reported *Himalopsyche gigantea*, *Hydropsyche guttata*, and *H. ornatula* species as inhabitants of Tian-Shan (Issyk-Kul Lake Basin and Sary-Dzhaz River Basin), but Ivanov (1994) questioned the reliability of the identifications of *H. guttata* and *H. ornatula*.

Genus-group names have changed since some species were reported from Kyrgyzstan. *Hydropsyche stimulans* was transferred from genus *Ceratopsyche* back into genus *Hydropsyche* (*Hydropsyche newae* Species Group, *Hydropsyche newae* species Clade) by Oláh & Johanson (2008). *Lepidostoma nigrescens* was described originally in genus *Dinarthrum* McLachlan 1871, a synonym of genus *Lepidostoma* according to Weaver (2002). *Pseudoxyethira schmidi* has been treated as a species of genus *Madioxyethira* by Mey (1981) and Malicky (2005), a species of genus *Orientalitrichia* by Koçak & Kemal (2012, an invalid genus according to Zhou *et al*. 2016), and a species of genus *Scelotrichia* by the Integrated Taxonomic Information System (2020), all three of which genus-group names are synonyms of *Pseudoxyethira* (Morse 2020).

In addition to these genus-group synonyms, synonyms for a variety of species have been used in the literature; our list provides only names as cited in the Trichoptera World Checklist (Morse 2020). For example, *Hydropsyche demavenda* was also given as *Hydropsyche integrata* Mey 1981 by Huang *et al.* (2005) and Yang *et al.* (2005), a species synonymized by Malicky (1986).

The type country of *Lepidostoma yuechiorum* Oláh 2010 was given as Kyrgyzstan by Morse (2020), but the holotype male of *L. yuechiorum* was described originally from Kazakhstan in the *Lepidostoma ferox* Branch near *Lepidostoma nigrescens* (Mey & Jung 1989). Therefore, this species has not been reported from Kyrgyzstan, and the type country of *L. yuechiorum* should be changed to Kazakhstan in the Trichoptera World Checklist (TWC). The type country of *A. copiosa* is reported as Uzbekistan and Kyrgyzstan according to TWC due to the fact that the habitat of *A. copiosa* was reported as Sarafschanensi Valley (Morse 2020). This valley belongs partially to Uzbekistan and partially to Kyrgyzstan, so that the presence of the species in Kyrgyzstan is not certain.

The genus *Ylodes* Milne 1934 was synonymized with genus *Triaenodes* McLachlan 1865 by Holzenthal & Andersen (2004). *Triaenodes reuteri* has been reported from the Eastern Palearctic (Mongolia, eastern Russia), the Western Palearctic (Finland, Ireland, Norway, western Russia, Sweden, Turkey, Ukraine, United Kingdom), and the Nearctic (Canada, the United States of America) as either *T. reuteri* or *Ylodes reuteri* (McLachlan) by Andersen *et al.* 1990; Blinn & Ruiter 2005, 2006; Chuluunbat & Morse 2007, Chuluunbat *et al.* 2016; Gullefors & Johanson 2007; Gullefors 2005, 2008; Gullefors & Johanson 2007; Gullefors & Peterson 1993; Hougton 2001; Houghton & Holzenthal 2010; Ivanov 2011; Manuel 2010; Neu et al. 2018; O'Connor 2015; Rinne & Wiberg-Larsen 2017; Ruiter *et al.* 2013, 2014; Salokannnel & Mattila 2018; Salokannel et al. 2019; Sipahiler 2005; Szczesny & Godunko 2008; Wallace 2016). Its subspecies *T. reuteri turkestanicus* Martynov 1928a is known from Kazakhstan and its subspecies *T. reuteri zeitounensis* Mosely 1939 is known from Egypt. The species is now also known from Kyrgyzstan.

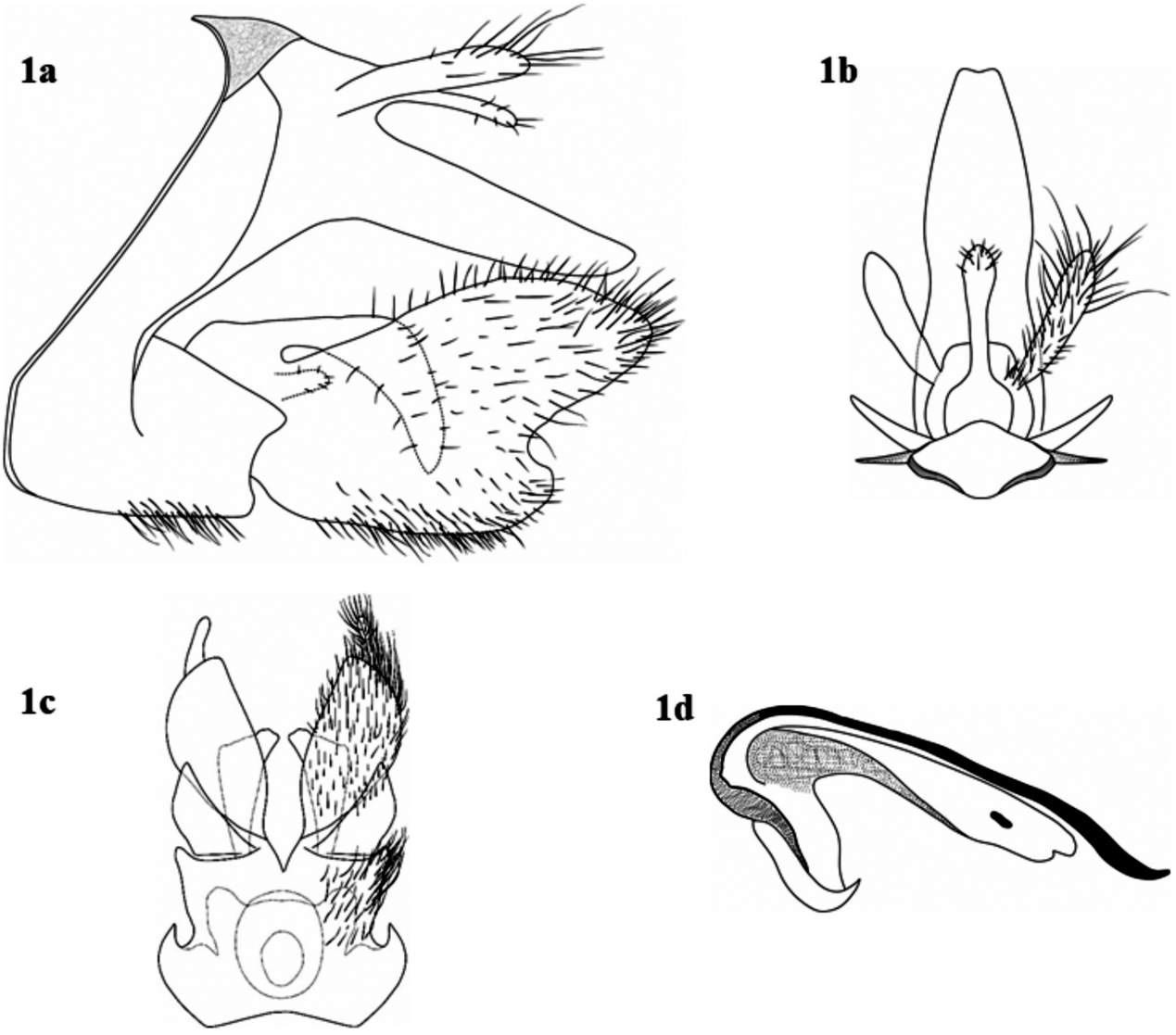

FIGURE 1. *Triaenodes reuteri* McLachlan 1880, male genitalia. 1a, left lateral; 1b, dorsal; 1c, ventral; 1d, phallus, left lateral.

Details of the biological and morphological characteristics of *Triaenodes reuteri* have been published by a variety of research groups from different parts of the world. Sexual dimorphism, swarming behavior, and pair formation were described by Gullefors & Petersson (1993); emergence dates, community structure, and distribution in Arizona were reported by Blinn & Ruiter (2005). The species was considered to develop in the brackish water of the Gulf of Bothnia, Sweden, by Gullefors (2005). The mean frequency, maximum percent composition, percent of streams inhabited, and mean percent embeddedness were reported in lower Colorado River Basin by Blinn & Ruiter (2006). Male and female morphological characteristics were redescribed in subgenus *Ylodes* by Manuel (2010). The relative historical and contemporary abundance of the species in ecoregions of Minnesota (United States of America)

were reported by Houghton & Holzenthal (2010). The sternum V glands of males and females were described by Djernaes (2011). Adults and larvae of Churchill, Manitoba, Canada, were associated with DNA sequences, and a larva and case were imaged by Ruiter *et al.* (2013).

From the zoogeographical point of view, the terrestrial fauna of Kyrgyzstan is known to be in the East Palearctic zoogeographical region of the Holarctic (Morse 2020). The relationships of 4 major zoogeographical regions are seen in Kyrgyzstan. As a result of our zoogeographical evaluation, 7 (31.8%) species belong to only the East Palearctic Region (EP), 10 (45.4%) species belong to the East–West Palearctic (EP-WP), 3 (13.6%) species belong to the East Palearctic–Oriental (EP-OL), 1 (4.5%) species belongs to East–West Palearctic and Oriental (EP-WP-OL), and 1 (4.5%) belongs to the Holarctic (EP-NA-WP). Zoogeographic regional classifications are given in Table 1.

TABLE 1. Known species list of Kyrgyzstan Trichoptera, general distribution and type country status. Abbreviations: EP = East Palearctic; NA = Nearctic; OL = Oriental; WP = West Palearctic.

Family	Species	General Distribution	Type Country
Rhyacophilidae	*Himalopsyche gigantea*	EP	Kazakhstan
	Himalopsyche kuldschensis	EP and OL	China
	Rhyacophila extensa	EP	Kyrgyzstan
Glossosomatidae	*Agapetus kirgisorum*	EP and WP	Kyrgyzstan
	Glossosoma (Synafophora) kiritchenkoi	EP and WP	Kyrgyzstan
Hydroptilidae	*Pseudoxyethira schmidi*	EP	Kyrgyzstan
	Stactobia malickyi	EP and WP	Kyrgyzstan
Psychomyiidae	*Tinodes turanicus*	EP and WP	Uzbekistan, Kazakhstan
Hydropsychidae	*Hydropsyche ardens*	EP and WP	Uzbekistan
	Hydropsyche carbonaria	EP	Uzbekistan
	Hydropsyche demavenda	EP and WP	Iran
	Hydropsyche guttata	WP	Switzerland
	Hydropsyche nuristanica	EP and OL	Afghanistan
	Hydropsyche ornatula	EP and WP	Poland
	Hydropsyche stimulans	EP	Uzbekistan
Lepidostomatidae	*Lepidostoma nigrescens*	EP	Kyrgyzstan
	Lepidostoma posdnjakovi	EP and WP	Kyrgyzstan
Limnephilidae	*Pseudostenophylax micraulax*	EP and OL	India
	Psilopterna hirsuta	EP and WP	Kyrgyzstan
Apataniidae	*Apatania copiosa*	EP, OL, and WP	Uzbekistan, Kyrgyzstan
	Apataniana rauschorum	EP	Kyrgyzstan
Leptoceridae	*Triaenodes reuteri*	EP, NA, and WP	Sweden, Finland

Until this study, 21 species belonging to 8 families of the order Trichoptera have been recorded from Kyrgyzstan. Along with the new record of *T. reuteri* for Kyrgyzstan, the known Trichoptera fauna for this country now includes 22 species in 14 genera of 9 families.

CONCLUSION

The current paper reveals a new record of *Triaenodes reuteri* for the Kyrgyzstan fauna, which expanded the known caddisfly fauna given in the literature to 22 known species in 14 genera and 9 families. In the study, also, the male genitalia of *T. reuteri* were re-illustrated along with a detailed redescription. A detailed checklist compiled in the paper will provide a valuable guide for future caddisfly researchers working in Kyrgyzstan.

REFERENCES

Abdullaeyva, L.N. (2002) On a finding of larvae [larva] *Hydropsyche contubernalis* (Hydropsychiidae, Trichoptera) in water streams of Özbekistan. *Uzbekskii Biologicheskii Zhurnal*, 3, 74–76.

Andersen, T., Hansen, L.O., Johanson, K.A., Solhoey, T. & Søli, G.E.E. (1990) Faunistical records of caddisflies (Trichoptera) from Aust-Agder and Vest-Agder, South Norway. *Fauna Norvegica*, Series B, 37 (1), 23–32.

Andersen, T. & Wiberg-Larsen, P. (1987) Revised check-list of NW European Trichoptera. *Scandinavian Entomology*, 18, 165–184.

Baijens, A.M. & Joosse, R. (2009) Nachtvlinders in Zeeland (Jaarverslag 2008) Stichting Het Zeeuwse Landschap. Available from: http://www.vlinlibzeeland.nl/ (accessed 10 March 2020) [in Dutch]

Berlin, A. (2005) Zur Köcherfliegen fauna naturnaher Fließgewässer-Abschnitte in Mecklenburg-Vorpommern–faunistische und typologische Aspekte. *Lauterbornia*, 54, 123–134. [in German]

Blinn, D.W. & Ruiter, D.E. (2005) Caddisfly (Trichoptera) community structure and distribution in Arizona, USA: Effects of selected environmental determinants. *In*: Tanida, K. & Rossiter, A. (Eds.), *Proceedings of the 11th International Symposium on Trichoptera*, Osaka & Shiga. Tokai University Press, Hadano-shi, Kanagawa, pp. 63–71.

Blinn, D.W. & Ruiter, D.E. (2006) Tolerance values of stream caddisflies (Trichoptera) in the lower Colorado River Basin, USA. *The Southwestern Naturalist*, 51 (3), 326–337.
https://doi.org/10.1894/0038-4909(2006)51[326:TVOSCT]2.0.CO;2

Blinn, D.W. & Ruiter, D.E. (2009) Caddisfly (Trichoptera) assemblages along major river drainages in Arizona. *Western North American Naturalist*, 69, 299–308.
https://doi.org/10.3398/064.069.0303

Botosaneanu, L. & Malicky, H. (1978) Trichoptera. Limnofauna Europaea, *In*: Illies, J. (Ed.), *Eine Zusammenstellung aller die europaischen Binnengewasser bewohnenden mehrzelligen Tierarten mit Angaben über ihre Verbreitung und Okologie*. Gustav Fischer Verlag, Stuttgart & Amsterdam, pp. 333–359. [in German]

Buczynska, E., Szlauer-Łukaszewska, A., Czachorowski, S. & Buczynski, P. (2018) Human impact on large rivers: The influence of groynes of the River Oder on larval assemblages of caddisflies (Trichoptera). *Hydrobiologia*, 819, 177–195.
https://doi.org/10.1186/1472-6785-13-5

Chuluunbat, S. & Morse, J.C. (2007) Caddisflies (Insecta: Trichoptera) of Selenge River Basin, Mongolia. *In*: Bueno-Soria, J., Barba-Alvarez, R. & Armitage, B. (Eds.), *Proceedings of the XIIth International Symposium on Trichoptera*, *June 18–22*, *2006*. The Caddis Press, Columbus, Ohio, pp. 51–57.

Chuluunbat, S., Morse, J.C. & Sosorburam, B. (2016) Caddisflies of Mongolia: Distribution and diversity. *In*: Vshivkova, T.S. & Morse, J.C. (Eds.), Proceedings of the 14th International Symposium on Trichoptera, Vladivostok, Russia. *Zoosymposia*, 10, pp. 96–116.
https://doi.org/10.11646/zoosymposia.10.1.10

Chvojka, P. & Komzák, P. (2008) The history and present state of Trichoptera research in the Czech Republic. *Ferrantia*, 55, 11–21.

Cibaite, G. (2003) Checklist of Lithuanian caddisflies (Insecta, Trichoptera). *Braueria*, 30, 7–14.

Czacharowski, S. & Pietrzak, L. (2004) Is sustainable coexistence between aquatic insects and people possible in urban areas? *In*: Walter, L. & Ubelis, A. (Eds.), *Integrative approaches towards sustainability in the Baltic Sea region*. *Environmental education, communication and sustainability.* Peter Lang Publishing, Bern, pp. 511–518.

Djernaes, M. (2011) Structure and phylogenetic significance of the sternum V glands in Trichoptera. *Zootaxa*, 2884 (1), 1–60.
https://doi.org/10.11646/zootaxa.2884.1.1

Food and Agriculture Organization of the United Nations (2012) *AQUASTAT Country Profile—Kyrgyzstan*. Food and Agriculture Organization of the United Nations (FAO). Rome, Italy. Available from: http://www.fao.org/aquastat/en/countries-and-basins/country-profiles/country/KGZ (accessed 15 November 2020)

Farrington, J.D. (2005) *A Report on Protected Areas, Biodiversity, and Conservation in the Kyrgyzstan Tian Shan with Brief Notes on the Kyrgyzstan Pamir-Alai and the Tian Shan Mountains of Kazakhstan, Uzbekistan, and China*. US. Fulbright Program, Environmental Studies Section, Bishkek, Kyrgyzstan, 267 pp.

Gullefors, B. (2005) Trichoptera from the brackish water of the Gulf of Bothnia. *In*: Tanida, K. & Rossiter, A. (Eds.), *Proceedings of the 11th International Symposium on Trichoptera, Osaka & Shiga*. Tokai University Press, Hadano-shi, Kanagawa, pp. 137–147.

Gullefors, B. (2008) Limes norrlandicus—A natural biogeographical border for caddisflies (Trichoptera) in Sweden. *Ferrantia*, 55, 61–65.

Gullefors, B. & Johanson, K.A. (2007) Gotlands nattslandor (Trichoptera). *Entomologisk Tidskrift*, 128, 61–70. [in Swedish]

Gullefors, B. & Petersson, E. (1993) Sexual dimorphism in relation to swarming and pair formation patterns in leptocerid caddisflies (Trichoptera: Leptoceridae). *Journal of Insect Behavior*, 6 (5), 563–577.
https://doi.org/10.1007/BF01048123

Holzenthal, R.W. & Andersen, T. (2004) The caddisfly genus *Triaenodes* in Neotropics (Trichoptera: Leptoceridae). *Zootaxa*, 511 (1), 1–80.
https://doi.org/10.11646/zootaxa.511.1.1

Houghton, D.C. (2001) Caddisfly (Trichoptera) records from the Apache National Forest, eastern Arizona. *Entomological News*,

112 (2), 85–93.
Houghton, D.C. & Holzenthal, R.W. (2010) Historical and contemporary biological diversity of Minnesota caddisflies: A case study of landscape-level species loss and trophic composition shift. *Journal of the North American Benthological Society*, 29 (2), 480–495.
https://doi.org/10.1899/09-029.1
Huang, X.Y., Zhang, J.H. & Wang, W. (2005) Studies on Trichoptera in Xinjiang. *Journal of Shihezi University* (*Natural Science*), 23 (4), 468–472.
Integrated Taxonomic Information System (2020) *Scelotrichia schmidi*. Available from: https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=607554#null (accessed 9 November 2020)
Ivanov, V.D. (1994) Russian bibliography. *Braueria*, 21, 21–25.
Ivanov, V.D. (2011) Caddisflies of Russia: Fauna and biodiversity. *In*: Majecka, K., Majecki, J. & Morse, J. (Eds.), *Proceedings of the 13th International Symposium on Trichoptera. Zoosymposia*, 5, pp. 171–209.
https://doi.org/10.11646/zoosymposia.5.1.15
Ivanov, V.D. & Melnitsky, S.I. (2007) New data on the Trichoptera of Siberia. *Braueria*, 34, 31–35.
Kiss, O. (2013) Three new species of *Rhyacophila* (Trichoptera: Rhyacophilidae) from Taiwan and Nepal. *Zootaxa*, 3640 (2), 213–223.
https://doi.org/10.11646/zootaxa.3640.2.5
Koçak, A.Ö. & Kemal, M. (2012) A generic nomenclatural correction among micro-caddisflies in the Oriental region (Hydroptilidae, Trichoptera). *Centre for Entomological Studies Ankara, Miscellaneous Papers*, 158, 4–5.
Kučinić, M., Ćukušić, A., Podnar, M., Landeka, M., Plavec, H., Plantak, M., Akimbekova, N. & Žalac, S. (2016) The first record of *Tinodes antonioi* Botosaneanu & Taticchi-Viganò, 1974 (Insecta, Trichoptera) in Croatia with DNA barcoding and ecological data and notice of biodiversity and distribution of the genus *Tinodes* in Croatia. *Natura Croatica*: *Periodicum Musei Historiae Naturalis Croatici*, 25 (1), 131–149.
https://doi.org/10.1186/1472-6785-13-5
Lepneva, S.G. (1964) Fauna of the USSR, Trichoptera. Vol II. No. 1. Larvae and pupae of Annulipalpia. *Zoological Institute of the Academy of Sciences of the USSR*, New Series, 88, 1–638. [in Russian]
https://doi.org/10.5962/bhl.title.46536
Malicky, H. (1977) Ein Beitrag zur Kenntnis der *Hydropsyche guttata*-Gruppe (Trichoptera: Hydropsychidae). *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen*, 29, 1–28. [in German]
Malicky, H. (1986) Die Köcherfliegen (Trichoptera) des Iran und Afghanistans. *Zeitschrift der Arbeitsgemeinschaft Österreichische Entomologen,* 38 (1–2), 1–16. [in German]
Malicky, H. (1999) Neue Köcherfliegen aus Europa, Asien und von den Seychellen. *Braueria*, 26, 44–48. [in German]
Malicky, H. (2004) Trichoptera taxa described in *Braueria* (*Trichoptera Newsletter*). No. 14–32. *Braueria*, 32, 24–30.
Malicky, H. (2005) Ein kommentiertes Verzeichnis der Köcherfliegen (Trichoptera) Europas und des Mediterrangebietes. *Linzer Biologische Beiträge*, 37, 533–596. [in German]
Malicky, H. (2013) Übersicht über die Gattung *Pseudostenophylax* (Trichoptera, Limnephilidae) mit Neubeschreibungen. *Linzer Biologische Beiträge*, 45 (1), 793–827. [in German]
Malicky, H. (2017) Neue Köcherfliegen (Trichoptera) aus Nepal, mit Bemerkungen zu bekannten Arten sowie Meldungen von Neufunden für das Land. *Linzer Biologische Beiträge*, 49 (2), 1453–1488. [in German]
Malicky, H. & Chantaramongkol, P. (2000) Ein Beitrag zur Kenntnis asiatischer *Hydropsyche*-Arten (Trichoptera, Hydropsychidae). (Zugleich Arbeit Nr. 29 über thailändische Köcherfliegen). *Linzer Biologische Beiträge*, 32, 791–860. [in German]
Manuel, K.L. (2010) *The Longhorn Caddisfly Genus* Triaenodes (*Trichoptera: Leptoceridae*) *in North America*. The Caddis Press, Columbus, Ohio, 109 pp.
Martynov, A.V. (1914) Contributions à la faune des Trichoptères de la Chine. *Annuaire du Musée Zoologique de l'Académie Impériale des Sciences de Petrograd*, 19 (12), 323–339. [in French]
Martynov, A.V. (1927) Contributions to the aquatic entomofauna of Turkestan. I. Trichoptera Annulipalpia. *Annuaire du Musée Zoologique de l'Académie Impériale des Sciences de Saint Pétersbourg*, 28, 162–193.
Martynov, A.V. (1928a) Contributions to the aquatic entomofauna of Turkestan. II. Trichoptera Integripalpia, with a note on a new species of *Rhyacophila*. *Annuaire du Musée Zoologique de l'Académie Impériale des Sciences de Saint Pétersbourg*, 28 ("1927"), 457–495.
Martynov, A.V. (1928b) Les Trichopteres de l'Expedition scientifique d'Olonetz (1921–1923). *Travaux de l'Expédition Scientifique d'Olonetz, Leningrad*, 6, 1–30. [in French]
McLachlan, R. (1865) Trichoptera Britannica: A monograph of the British species of caddis-flies. *Transactions of the Entomological Society of London*, Series 3, 5, 1–184, pls. 1–14.
https://doi.org/10.1111/j.1365-2311.1967.tb01433.x
McLachlan, R. (1871) On some new forms, &c., of extra-European trichopterous insects. *Journal of the Linnean Society*, *London*, *Zoology*, 11 (50), 98–141.
https://doi.org/10.1111/j.1096-3642.1870.tb02011.x
McLachlan, R. (1875) Neuroptera. *In*: Fedtschenko, A.P. (Ed.), Reise in Turkestan von Alexis Fedtschenko, auf veranlassung des General-Gouverneurs von Turkestan, General von Kaufmann, herausgegeben von der Gesellschaft der Freunde der Naturwissenschaften in Moskau. *Zoogeographicheskia Izsledovania, Tipografiya M. Strasvuleyicha, St. Petersburg*, 2 (5),

pp. i–ii + 1–60, pls. 1–4. [in German]
McLachlan, R. (1878a) s.n. *In*: *A Monographic Revision and Synopsis of the Trichoptera of the European Fauna*. *Part 7*. John van Voorst, London, pp. 349–428, pls. 38–44.
McLachlan, R. (1878b) Neuroptera. *In*: *Scientific Results of the Second Yarkand Mission*; *Based upon the Collections and Notes of the Late Ferdinand Stoliczka*. *Ph. D*. Government of India, Calcutta, pp. 1–6.
McLachlan, R. (1880) s.n. *In*: *A Monographic Revision and Synopsis of the Trichoptera of the European Fauna*. S*upplement*. Napier Printers, London, pp. 13–84, pls. 52–59.
Mey, W. (1981) Die von R. Jung und A. Müller in Mittelasien gesammelten Köcherfliegen (Trichoptera). *Deutsche Entomologische Zeitschrift*, 28 (1–3), 55–66. [in German]
https://doi.org/10.1002/mmnd.19810280107
Mey, W. (1986) Drei neue Köcherfliegen aus Mittelasien (Trichoptera). *Deutsche Entomologische Zeitschrift für Natur Forschung*, 33, 65–70. [in German]
https://doi.org/10.1002/mmnd.4800330117
Mey, W. & Jung, R. (1989) Neue Köcherfliegen aus dem westlichen Tienschan (UdSSR) (Trichoptera). *Deutsche Entomologische Zeitschrift für Natur Forschung*, 36, 283–292. [in German]
https://doi.org/10.1002/mmnd.19890360410
Milne, L.J. (1934) *Studies in North American Trichoptera. Part 1*. Privately printed, Cambridge, Massachusetts, 19 pp.
Mirmoayedi, A. & Malicky, H. (2002) An updated check-list of caddisflies (Insecta, Trichoptera) from Iran, with new records. *Zoology in the Middle East*, 26 (1), 163–168.
https://doi.org/10.1080/09397140.2002.10637932
Morse, J.C. (2020) Trichoptera World Checklist, Clemson University. Available from: http://entweb.clemson.edu/database/trichopt/index.htm. (accessed 25 February 2020)
Morse, J.C. & Yang, L.F. (2004) The world subgenera of *Glossosoma* Curtis (Trichoptera: Glossosomatidae), with a revision of the Chinese species of *Glossosoma* subgenera *Synafophora* Martynov and *Protoglossa* Ross. *Proceedings of the Entomological Society of Washington*, 106 (1), 52–73.
Mosely, M.E. (1939) New African caddis flies. *Annals and Magazine of Natural History*, Series 11, 3 (13), 1–28.
https://doi.org/10.1080/00222933908526894
Neu, P.J., Malicky, H., Graf, W. & Schmidt-Kloiber, A. (2018) Distribution Atlas of European Trichoptera. *Die Tierwelt Deutschlands*, 84, 1–891.
O'Connor, J.P. (2015) *A Catalogue and Atlas of the Caddisflies (Trichoptera) of Ireland.* Occasional Publication of the Irish Biogeographical Society, Dublin, 646 pp.
Oláh, J. (1994) Three new Trichoptera from the Kopet-Dagh and Karakoram mountains. *Folia Entomologica Hungarica*, 55, 281–286.
Oláh, J. (2010) New species and new records of Palaearctic Trichoptera in the material of the Hungary Natural History Museum. *Annales Historico-Naturales Musei Nationalis Hungarici*, 102, 65–117.
Oláh, J. & Johanson, K.A. (2008) Generic review of Hydropsychinae, with description of *Schmidopsyche*, new genus, 3 new genus clusters, 8 new species groups, 4 new species clades, 12 new species clusters and 62 new species from the Oriental and Afrotropical regions (Trichoptera: Hydropsychidae). *Zootaxa*, 1802 (3), 1–248.
https://doi.org/10.11646/zootaxa.1802.1.1
Pandher, M.S., Kaur, S., Parey, S.H. & Saini, M.S. (2017) Review of genus *Hydropsyche* Pictet 1834 (Insecta: Trichoptera: Hydropsychidae) from India. *Zootaxa*, 4365 (3), 331–360.
https://doi.org/10.11646/zootaxa.4365.3.4
Panter, C., Mossman, H.L. & Dolman, P.M. (2011) *Biodiversity audit and tolerance sensitivity mapping for the Broads. Broads Authority Report, The Broads*. School of Environmental Sciences, University of East Anglia, Norwich, 44 pp.
Pictet, F.J. (1834) *Recherches pour Servír à l'Histoire et à l'Anatomie des Phryganides*. A. Cherbuliez, rue de la Cit, Geneva, 235 pp. [in French]
https://doi.org/10.5962/bhl.title.8547
Rinne, A. & Wiberg-Larsen, P. (2017) *Trichoptera Larvae of Finland*: *A Key to the Caddis Larvae of Finland and Nearby Countries*. Trificon, Tampere, 152 pp.
Ruiter, D.E., Boyle, E.E. & Zhou, X. (2013) DNA barcoding facilitates associations and diagnoses for Trichoptera larvae of the Churchill (Manitoba, Canada) area. *BMC ecology*, 13 (1), 5–39.
https://doi.org/10.1186/1472-6785-13-5
Ruiter, D.E., Baumann, R.W. & Flint, O.S. (2014) Studies on the caddisfly (Trichoptera) fauna of Nevada. *Pan-Pacific Entomologist*, 90 (1), 23–32.
https://doi.org/10.3956/2014-90.1.23
Saini, M.S., Kaur, M. & Bajwa, P.K. (2001) An updated check-list of the Indian Trichoptera along with an illustrated key to its families. *Records of the Zoological Survey of India*, 99 (1–4), 201–256.
Salokannel, J. & Mattila, K. (2018) *Suomen vesiperhoset Trichoptera of Finland*. Tibiale, Helsinki, 448 pp. [in Finnish with English species summaries]
Salokannel, J., Lagunov, A., Rantala, M.P., Nupponen, K. & Silvonen, K. (2019) Contribution to the caddisfly fauna of the Southern Urals. *Braueria*, 46, 5–10.

Schmid, F. (1963) Trichoptères d'Afghanistan. *Annales Historico-naturales Musei Nationalis Hungarici*, 55, 435–445. [in French]
Sipahiler, F. (2005) A checklist of the caddisflies of Turkey (Trichoptera). *In:* Tanida, K. & Rossiter, A. (Eds.), *Proceedings of the 11th International Symposium on Trichoptera, Osaka & Shiga*. Tokai University Press, Hadano-shi, Kanagawa, pp. 393–405.
Sipahiler, F. (2016) Faunistic studies on the Trichoptera fauna of northwestern Turkey and Thrace. *Braueria*, 43, 11–16.
Smirnova, D., Kushnikova, L., Evseeva, A., Grishaeva, O., Kraynyuk, V., Pilin, D., Olga Sklyarova, O., Epova, J., Baymukanova, Z. & Timirkhanov, S. (2016) The Trichoptera of Kazakhstan: A review. *Zoosymposia*, 10 (1), 398–408. https://doi.org/10.11646/zoosymposia.10.1.36
Statzner, B. & Dolédec, S. (2011) Phylogenetic, spatial, and species‐trait patterns across environmental gradients: The case of *Hydropsyche* (Trichoptera) along the Loire River. *International Review of Hydrobiology*, 96 (2), 121–140. https://doi.org/10.1002/iroh.201111325
Szczęsny, B. & Godunko, R. (2008) Checklist of Ukrainian Trichoptera. *Braueria*, 35, 11–20.
Ujvárosi, L., Robert, S.C., Neu, P. & Robert, B. (2008) First revision of the Romanian caddisflies (Insecta: Trichoptera). Part 1: systematic checklist (updated 12/2005). *Ferrantia*, 55, 110–124.
Ulmer, G. (1927) Einige neue Trichopteren aus Asien. *Entomologische Mitteilungen*, 16, 172–182. [in German]
Vereshchagin, A.P. (1993) Winter invertebrate fauna of the mountain torrents of Tian-Shan (exemplified by rivers of the Issyk-Kul Lake Basin and Sary-Dzhaz River Basin). *In*: Kerzhner, I.M. & Pesenko, Yu. A., (Eds.), *Advances in entomology in the USSR. Ecology and faunistics, smaller orders of insects*. Zoological Institute, Russian Academy of Sciences, St. Petersburg, pp. 157–158.
Wallace, I.D. (2016) A Review of the Status of the Caddis Flies (Trichoptera) of Great Britain—Species Status No.27. *Natural England Commissioned Reports*, No. 191, 1–132.
Weaver, J.S. (2002) A synonymy of the caddisfly genus *Lepidostoma* Rambur (Trichoptera: Lepidostomatidae), including a species checklist. *Tijdschrift voor Entomologie*, 145 (2), 173–192. https://doi.org/10.1163/22119434-900000110
Yang, L.F., Sun, C.H., Wang, B.X. & Morse, J.C. (2005) Present status of Chinese Trichoptera, with an annotated checklist. *In*: Tanida, K. & Rossiter, A. (Eds.), *Proceedings of the 11th International Symposium on Trichoptera*, Osaka & Shiga. Tokai University Press, Hadano-shi, Kanagawa, pp. 441–465.
Yang, L.F., Sun, C.H. & Morse, J.C. (2016) An amended checklist of the caddisflies of China (Insecta, Trichoptera). *In*: Proceeding of the 14th International Symposium on Trichoptera. *Zoosymposia*, 10, pp. 451–479. https://doi.org/10.11646/zoosymposia.10.1.42
Zhou, L., Yang, L.F. & Morse, J.C. (2016) New species of microcaddisflies from China (Trichoptera: Hydroptilidae). *Zootaxa*, 4097 (2), 203–219. https://doi.org/10.11646/zootaxa.4097.2.3