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An updated checklist of thrips from Slovakia with emphasis on economic species

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Abstract: Almost sixty years after the first published plea for more systematic research on thrips in Slovakia, the checklist undisputedly requires an appropriate revision with a special emphasis on the economic consequences of climate change and biological commodity trade globalisation synergic effects, followed by the dynamic and significant changes in the native biodiversity due to alien species introduction. The updated checklist contains 189 species recorded from the area of Slovakia, from three families: Aeolothripidae Uzel, 1895 (15 species), Thripidae Stephens, 1829 (113 species) and Phlaeothripidae Uzel, 1895 (61 species), including 7 beneficiary and 35 economic pest elements, such as one A2 EPPO quarantine pest (*Frankliniella occidentalis*) and five potential transmitters of tospoviruses (*F. occidentalis, F. intonsa, F. fusca, Thrips tabaci, Dictyothrips betae*). Several species (e.g., *Hercinothrips femoralis, Microcephalothrips abdominalis, F. occidentalis, T. flavus, T. tabaci, Limothrips cerealium, L. denticornis,* etc.) may possess a heavy introduction and invasion potential with well-developed mechanisms for successful dispersion.

Keywords: alien species; biodiversity; globalisation; invasions; crop pests; tospoviruses

Thrips (Thysanoptera) are generally known as crop pests throughout the world (Lewis 1997). Although only approximately 1% of all recently recorded species are considered as pests (Morse & Hoodle 2006), their economic importance remains very serious due to their invasive and reproductive potential and ability to transmit tospoviruses (Lewis 1997; Trdan et al. 2006, 2008; Ciuffo et al. 2010; Rotenberg et al. 2015). Moreover, globalisation and climate change provide new and appropriate conditions for alien species, usually with a tropical and subtropical distribution, to spread into new environments (e.g., Jenser & Czenz 1988; Pelikán 1989, 1991; Lewis 1997; Collins 1998; Karadjova & Krumov 2003; Trdan et al. 2005a; Rodikatis et al. 2006; Vierbergen et al. 2006; Fedor & Varga 2007; Varga & Fedor 2008; Goldarazena 2011; Masarovič et al. 2017a; Fedor et al. 2018). Such a synergy of factors may support the fact that exotic pests have recently become a serious problem in Europe with applied environmental, ecological and even economic consequences for natural ecosystems as well as urban and farmland areas (Hulme 2009). Alien species continuously adapt to local climatic and ecological conditions and expand into other regions (Masarovič et al. 2014a) even passively through zoochory (Fedor et al. 2011) and anthropochory (Štefánik et al. 2019). Approximately 12.5 billion EUR annually have been spent on the prevention of biological invasions in the European Union for over the 20 past years (Kettunen et al. 2008).

Despite the outstanding tradition in Thysanoptera research by Heinrich Uzel (Uzel 1895) during the Austro-Hungarian Empire that has provided the basis for almost all subsequent work on this group of insects

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in Europe at least for decades (Fedor et al. 2010), the first faunistic data on at least 11 thrips species: *Hoplothrips pedicularius* (Haliday, 1836), *Hoplothrips ulmi* (Fabricius, 1781), *Megathrips lativentris* (Hegeer, 1852), *Phlaeothrips coriaceus* Haliday, 1836, *Bolothrips bicolor*, (Heeger, 1852), *Parthenothrips dracenae*, (Heeger, 1854), *Chirothrips manicatus* Haliday, 1836, *Limothrips cerealium* Haliday, 1836, *Limothrips denticornis* Haliday, 1836, *Baliothrips dispar* Haliday, 1836, *Thrips minutissimus* Linnaeus, 1758 from the territory of the current area of Slovakia were actually published by Jablonowski (1899). Shortly before the World War II, Kratochvíl (1939a, 1939b), predominantly oriented on pests, offered a pioneer study on Thysanoptera taxo-coenoses from eastern Slovakian farmlands. However, the most generous era in systematic thrips research (Figures 1 and 2) has been associated with Moravian entomologist Jaroslav Pelikán (Fedor & Sierka 2006), publishing 73 first records (e.g., Pelikán 1952, 1977, 1983), including descriptions of 5 new species, *species novae*: *Oxythrips tatricus* Pelikán, 1955; *Oxythrips priesneri* Pelikán 1957; *Ankothrips flavidus* Pelikán 1958; *Rhipidothrips elegans* Pelikán 1961; *Hoplothrips carpathicus* Pelikán 1961 from the Slovak territory (Pelikán 1954, 1955, 1958, 1957, 1961). Later, under his essential supervision, the knowledge on Slovak Thysanoptera fauna has been enriched in 28 first records, especially by Hešková (1967) and Dobrovodská (1973), offering a checklist with 123 species (Aeolothripidae: 10 species, Thripidae: 78 species, Phlaeothripidae: 35 species) (Pelikán 1977).

Since the turn of the century, the need for a more complex approach to research on thrips has established a new generation of thysanopterologists dealing with all aspects of Thysanoptera diversity, including the faunistics (Fedor 2003, 2004, 2005), taxonomy (Fedor et al. 2008, 2009, 2014), ecology (Pelikán et al. 2002; Varga et al. 2010; Fedor et al. 2011; Zvaríková et al. 2016; Masarovič et al. 2017b) and the global change consequences (Varga 2007; Varga & Fedor 2008; Masarovič et al. 2017a; Zvaríková et al. 2017; Fedor et al. 2018), publishing 41 first records (Figure 1 and 2).

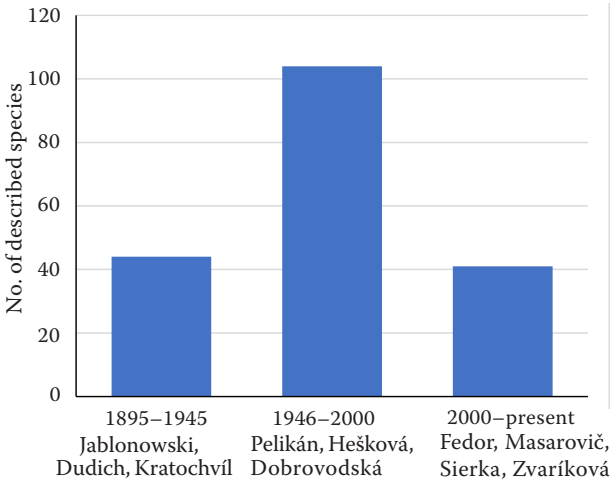

Figure1. A summary of the first records on Thysanoptera from the Slovak territory

y axis – the number of species discovered in Slovakia; x axis – the research period and first record authors

Almost sixty years after the first published plea for a more systematic research on thrips in Slovakia (Potúčková 1960), the checklist undisputedly requires an appropriate revision with a special emphasis on the economic consequences of climate change and

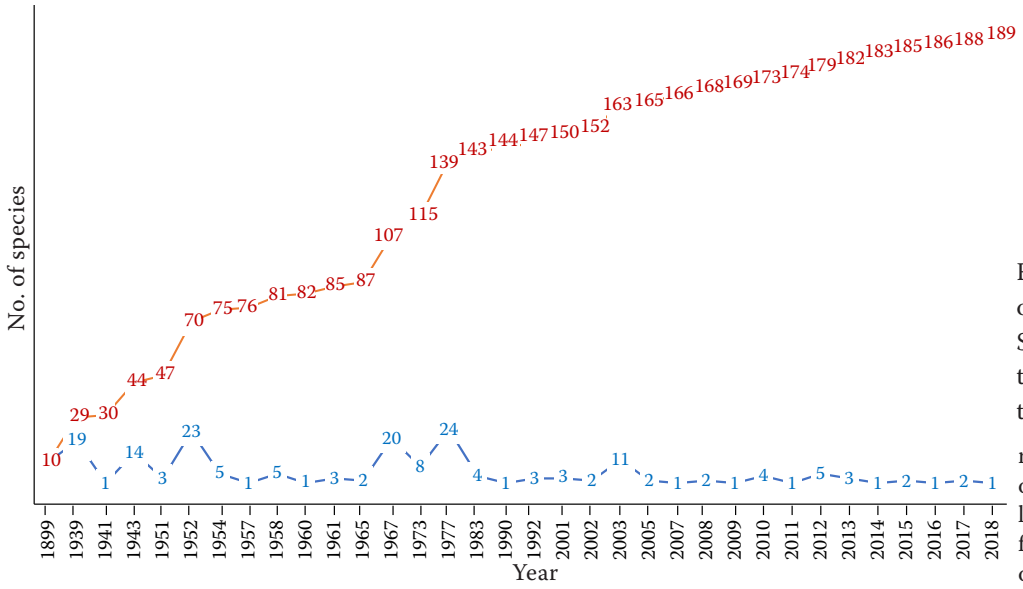

Figure 2. Development of the knowledge on the Slovakian Thysanoptera diversity during the last 120 years

red line – the number of known species; blue line – the number of the first records throughout this time

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biological commodity trade globalisation synergic effects followed by dynamic and significant changes in the native biodiversity due to alien species introduction. The last national checklist published 16 years ago (Fedor et al. 2004) has been predominantly based on the former Czechoslovak surveys, such as Enumeratio Insectorum Bohemoslovakiae (Pelikán 1977) with 123 known species (Terebrantia 88, Tubulifera 35), including some of them with a "probable occurrence". By 2003, 151 thrips species (Terebrantia 107, Tubulifera 44) in total with 26 considered pests, were recorded in the area of Slovakia. The primary purpose of this study is to provide an updated list of species, including their supplementary economic, ecological, and zoogeographical data, even as a useful platform for the environmentally induced biodiversity dynamics assessment. Without a doubt, the outstanding geomorphological and ecological heterogeneity of Slovakia as well as its central continental position with active connections to neighbouring regions (Zur Strassen 2003; Sierka et al. 2008; Jenser 2011) should have been reflected in the markedly higher biodiversity than presented in historical literature. In this paper, we provide an updated checklist of 189 thrips species including 35 of them possessing a certain economic and invasion potential.

MATERIAL AND METHODS

The thrips were collected within the complex research on the Thysanoptera diversity, ecology, distribution and control in Slovakia with a special emphasis on the Bratislava region (SW Slovakia) during the years 2005–2019. All the relevant localities and study sites with their geo-ecological details are presented in the mentioned references for each species. However, the particular and long-term research activities refer to Martinský les forest (SW Slovakia; 48°16'N, 17°23'E – Masarovič et al. 2009, 2011, 2012; Dubovský et al. 2010; Doričová & Fedor 2012; Fedor et al. 2012), the National Nature Reserve Devínska Kobyla (SW Slovakia; 48°08'N, 16°58'E – Fedor 2006), Vysoké Tatry National Park (Central Slovakia; 49°10'N, 20°14'E – Masarovič et al. 2012, 2013a, 2013c, 2014) or the National Nature Reserve Bábsky les (Central Slovakia; 48°18'N, 17°53'E – Masarovič et al. 2013b, 2015). The glasshouse species were predominantly studied in university glasshouses in Bratislava (SW Slovakia; 48°08'N, 17°06'E) and Košice (Eastern Slovakia; 48°44'N, 21°14'E) (Varga 2008, Fedor & Varga 2007, Varga & Fedor 2008, Masarovič et al. 2017).

The thrips specimens were sampled using various collection methods, including shaking and sweeping through vegetation (grass and weed-dwelling thrips), applying sticky traps (glasshouse thrips) and tree photoeclectors (forest-dwelling species) as well as soil photoeclectors and sieving the leaf litter (soil-dwelling Thysanoptera) (Fedor 2006; Masarovič et al. 2009, 2011, 2012, 2013a, b, c, 2014, 2015; Dubovský et al. 2010; Doričová & Fedor 2012; Fedor et al. 2012, 2018; Sigmund et al. 2015; Zvaríková et al. 2017). The new recorded pest species were sampled individually using pincers and a brush (Fedor & Varga 2007; Varga & Fedor 2008; Varga 2008; Masarovič et al. 2016, 2017). An AGA solution (84% of ethyl alcohol, 8.3% of glycerol, 8.3% of acetic acid) was used as a conservation liquid. The thrips were slide-mounted according to the standard preparatory techniques (Sierka & Fedor 2004; Fedor et al. 2012) and identified according to reliable determination keys (Priesner 1964; Schliephake & Klimt 1979; Mound 1972; Zur Strassen 2003; Kobro & Rafoss 2006; Dang & Qiao 2013). The material has been deposited in the collections of the authors. All faunistic data published before 2005 are cited in older works (Jablonowski 1899; Kratochvíl 1939a; Dudich et al. 1943; Pelikán 1951, 1952; Hešková 1967; Dobrovodská 1973) and in the previous checklist (Fedor et al. 2004).

RESULTS

Being exclusively based on published information, the checklist contains 189 thrips (Thysanoptera) species recorded from the area of Slovakia from three families: Aeolothripidae Uzel, 1895 (15 species), Thripidae Stephens, 1829 (113 species) and Phlaeothripidae Uzel, 1895 (61 species), both Terebrantia (128) and Tubulifera (61). Moreover, these species belong to eight subfamilies with 61 genera, as presented in Table 1, including the most diverse Thripinae with 104 species.

A particular location of Slovakia inside the Carpathian arch with intensive contact towards the Pannonian and Mediterranean regions undisputedly supports the existence of a wide spectrum of zoogeographic elements, including European (35.4%), Holarctic (12.6 %), Euro-Siberian (11.6 %), Palaearctic (8.5%) and Cosmopolitan species (6.3%).

The checklist provides basic information on ecological preferences of all the species (Table 1) in accordance with their microhabitat affinity, with

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Table 1. Thysanoptera of Slovakia: an updated and revised checklist

Order	Thysanoptera Haliday, 1836	Reference	Distribution	Ecology	EI
Family	Aeolothripidae Uzel, 1895				
1	*Ankothrips flavidus* Pelikán, 1958	Fedor et al. (2004)	EUR	?	
2	*Ankothrips niezabitowskii* Schille, 1910	Fedor et al. (2004)	EUR	of	
3	*Melanthrips acetosellae* John, 1927	Fedor et al.(2004)	SBM	fl	
4	*Melanthrips fuscus* (Sultzer, 1776)	Fedor et al. (2004)	W-PAL	fl	
5	*Melanthrips pallidior* Priesner, 1919	Fedor et al. (2004)	SBM	pf, fl	
6	*Aeolothrips albicinctus* Haliday, 1836	Fedor et al. (2004)	HOL	gr	
7	*Aeolothrips ericae* Bagnall, 1920	Fedor et al. (2004)	HOL	fl	Pr
8	*Aeolothrips fasciatus* (Linnaeus, 1758)	Kratochvíl (1939a)	HOL	zf	Pr
9	*Aeolothrips intermedius* Bagnall, 1934	Fedor et al. (2004)	PAL	zf, fl	Pr
10	*Aeolothrips melaleucus* Haliday, 1852	Fedor et al. (2004)	HOL	zf, ar	Pr
11	*Aeolothrips propinquus* Bagnal, 1924	Fedor et al. (2004)	EUR	fl	
12	*Aeolothrips versicolor* Uzel, 1895	Fedor et al. (2004)	HOL	fol, ar	
13	*Aeolothrips vittatus* Haliday, 1836	Masarovič et al. (2013a)	EUR	zf, fol	Pr
14	*Rhipidothrips elegans* Pelikán, 1961	Fedor et al.(2004)	PAL?	gr?	
15	*Rhipidothrips gratiosus* Uzel, 1895	Fedor et al. (2004)	W-PAL	gr	
Family	Thripidae Stephens, 1829				
Subfamily	Dendrothripinae Priesner, 1925				
16	*Dendrothrips degeeri* Uzel, 1895	Fedor et al. (2004)	EUR	fol, ar, ni	
17	*Dendrothrips ornatus* (Jablonowski, 1894)	Fedor et al. (2004)	PAL	fol, ar, ni	
18	*Dendrothrips saltatrix* Uzel, 1895	Fedor et al. (2004)	EUR + ASIA	fol, ar, ni	
Subfamily	Panchaetothripinae Bangnall, 1912				
19	*Heliothrips haemorrhoidalis* (Bouché, 1833)	Fedor et al. (2004)	COS	fol	G
20	*Hercinothrips femoralis* (O. M. Reuter, 1891)	Varga (2008)	COS	fol	G,I
21	*Parthenothrips dracaenae* (Heeger, 1854)	Fedor et al. (2004)	COS	fol	G
Subfamily	Sericothripinae Karny, 1921				
22	*Neohydatothrips abnormis* (Karny, 1910)	Fedor et al. (2004)	EUR	?	
23	*Neohydatothrips gracilicornis* (Williams, 1916)	Fedor et al. (2004)	PAL	fol, gr	
24	*Sericothrips bicornis* (Karny, 1910)	Pelikán (1952)	EUS		P
Subfamily	Thripinae Stephens, 1829				
25	*Anaphothrips badius* (Williams, 1913)	Fedor et al. (2004)	EUR	fol	
26	*Anaphothrips euphorbiae* Uzel, 1895	Fedor et al. (2004)	SBM	fl	
27	*Anaphothrips gracilimus* Priesner 1923	Sigmund et al. (2015)	EUR	gr	
28	*Anaphothrips obscurus* (Müller, 1776)	Fedor et al. (2004)	COS	gr	P
29	*Aptinothrips elegans* Priesner, 1924	Fedor et al. (2004)	SBM	gr	
30	*Aptinothrips karnyi* John, 1927	Fedor (2006)	PAL	gr	
31	*Aptinothrips rufus* (Haliday, 1836)	Fedor et al. (2004)	COS	gr	P
32	*Aptinothrips stylifer* Trybom, 1894	Fedor et al. (2004)	HOL	gr, ni, sc	
33	*Baliothrips dispar* (Haliday, 1836)	Fedor et al. (2004)	EUS	fol, ni	
34	*Belothrips acuminatus* (Haliday, 1836)	Fedor et al. (2004)	EUR + ASIA	fl	
35	*Belothrips morio* O. M. Reuter, 1899	Fedor et al. (2004)	EUR	fl	
36	*Bolacothrips jordani* Uzel, 1895	Fedor et al. (2004)	EUR	gr	
37	*Ceratothrips ericae* Haliday, 1836	Fedor et al. (2004)	HOL	fl	
38	*Chirothrips aculeatus* (Bagnall, 1927)	Fedor et al. (2004)	EUS	gr	

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Table 1. continue

Order	Thysanoptera Haliday, 1836	Reference	Distribution	Ecology	EI
39	*Chirothrips ambulans* Bagnall, 1932	Fedor et al. (2004)	EUR	gr	
40	*Chirothrips hamatus* Trybom, 1895	Fedor et al. (2004)	HOL	gr	P
41	*Chirothrips manicatus* Haliday, 1836	Fedor et al. (2004)	HOL	gr, ni	P,G
42	*Chirothrips molestus* Priesner, 1926	Dobrovodská (1973)	EUS	gr	
43	*Chirothrips pallidicornis* Priesner, 1925	Pelikán (1951)	EUR	gr?	
44	*Dichromothrips corbetti* (Priesner, 1936)	Masarovič et al. (2017b)	ORIENT	fl, of	G
45	*Dictyothrips betae* Uzel, 1895	Fedor et al. (2004)	EUR + ASIA	?	P,T
46	*Drepanothrips reuteri* Uzel, 1895	Fedor et al. (2004)	HOL	fol	P
47	*Echinothrips americanus* Morgan, 1913	Varga & Fedor (2008)	NEA	fol, pf	G
48	*Frankliniella intonsa* (Trybom, 1895)	Fedor et al. (2004)	COS	fl, ni	P,T
49	*Frankliniella occidentalis* (Pergande, 1895)	Klímová (1992)	COS	fl, fol, pf	P,G,T
50	*Frankliniella tenuicornis* (Uzel, 1895)	Fedor et al. (2004)	COS	gr, ni	
51	*Frankliniella pallida* (Uzel, 1895)	Fedor et al. (2004)	EUR + ASIA	fl	
52	*Iridothrips iridis* (Watson, 1924)	Fedor et al. (2004)	EUR	fol	
53	**Kakothrips dentatus* Knechtel , 1939	Dubovský et al. (2010)	SBM	fl	
54	[1]*Kakothrips pisivorus* (Uzel, 1895)	Fedor et al. (2004)	HOL	fl	P
55	*Limothrips angulicornis* Jablonowski, 1894	Fedor et al. (2004)	W-PAL	gr, ni	
56	*Limothrips cerealium* Haliday, 1836	Fedor et al. (2004)	COS	gr	P,I
57	*Limothrips consimilis* Priesner, 1926	Fedor et al. (2004)	EUS	gr	
58	*Limothrips denticornis* Haliday, 1836	Fedor et al. (2004)	HOL	gr, ni	P,I
59	*Microcephalothrips abdominalis* (Crawford, D. L., 1910)	Fedor et al. (2018)	COS	pf	P,G,I
60	*Mycterothrips albidicornis* Knechtel, 1923	Fedor et al. (2004)	EUR	ar, ni	
61	*Mycterothrips annulicornis* (Uzel, 1895)	Fedor et al. (2004)	EUR	?	
62	*Mycterothrips consociatus* (Targioni - Tozzetti, 1886)	Fedor et al. (2004)	PAL	fol, ar	
63	*Mycterothrips latus* (Bagnall, 1912)	Fedor et al. (2004)	EUS	ar	
64	*Mycterothrips salicis* (O. M. Reuter, 1879)	Fedor et al. (2004)	EUS	of, ar, ni	
65	*Odontothrips confusus* Priesner, 1926	Fedor et al. (2004)	EUS	fl	P
66	*Odontothrips intermedius* (Uzel, 1895)	Fedor et al. (2004)	EUR	fl	
67	*Odontothrips loti* (Haliday, 1852)	Fedor et al. (2004)	HOL	fl, pf	P
68	*Odontothrips meliloti* Priesner, 1951	Fedor et al. (2004)	EUS	fl	
69	*Odontothrips phaleratus* (Haliday, 1836)	Dobrovodská (1973)	EUS	fl?	
70	*Oxythrips ajugae* Uzel, 1895	Fedor et al. (2004)	EUR	fol	
71	*Oxythrips bicolor* (O. M. Reuter, 1879)	Fedor et al. (2004)	EUR	ar, ni	
72	**Oxythrips nobilis* Bagnall, 1927	Masarovič et al. (2012)	PAL?	?	
73	*Oxythrips priesneri* Pelikán, 1957	Fedor et al. (2004)	SBM	fl	
74	*Oxythrips tatricus* Pelikán, 1955	Fedor et al. (2004)	EUR	?	
75	*Oxythrips ulmifoliorum* (Haliday, 1836)	Fedor et al. (2004)	EUR	fol, ni	
76	*Pezothrips dianthi* (Priesner, 1921)	Fedor et al. (2004)	W-PAL	fl	P,G
77	*Pezothrips frontalis* (Uzel, 1895)	Fedor et al. (2004)	EUR	?	
78	[2]*Pezothrips nigriventris* (Pelikán 1956)	Fedor et al. (2004)	EUR	fl	
79	*Platythrips tunicatus* (Haliday, 1852)	Fedor et al. (2004)	EUR	fl	
80	*Prosopothrips vejdovskyi* Uzel, 1895	Fedor et al. (2004)	EUR + ASIA	?	
81	[3]*Pseudoxythrips dentatus* (Knechtel, 1923)	Fedor et al. (2004)	EUR	?	
82	*Rhaphidothrips longistylosus* Uzel, 1895	Fedor et al. (2004)	HOL	gr	

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Table 1. continue

Order	Thysanoptera Haliday, 1836	Reference	Distribution	Ecology	EI
83	*Rubiothrips ferrugineus* (Uzel, 1895)	Fedor et al. (2004)	EUR	?	
84	*Rubiothrips silvarum* (Priesner, 1920)	Fedor et al. (2004)	EUS	fol	
85	*Rubiothrips sordidus* (Uzel, 1895)	Fedor et al. (2004)	EUR	?	
86	*Rubiothrips validus* (Karny, 1910)	Fedor et al. (2004)	EUR	fl	
87	*Scolothrips longicornis* Priesner, 1926	Masarovič et al. (2013b)	HOL	ar	Pr
88	*Sphaeropothrips vittipennis* (Bagnall, 1927)	Fedor et al. (2004)	EUR	gr	
89	*Stenothrips graminum* Uzel, 1895	Fedor et al. (2004)	W-PAL	gr	
90	*Taeniothrips inconsequens* (Uzel, 1895)	Fedor et al. (2004)	HOL	ar	P
91	*Taeniothrips picipes* (Zetterstedt, 1828)	Fedor et al. (2004)	PAL	fl	
92	*Tenothrips frici* (Uzel, 1895)	Fedor et al. (2004)	PAL	fl	
93	*Theilopedothrips pilosus* (Uzel, 1895)	Fedor et al. (2004)	EUR	fl	
94	*Thrips albopilosus* Uzel, 1895	Fedor et al. (2004)	EUS	fl, ni	
95	*Thrips alni* Uzel, 1895	Fedor et al. (2004)	EUR	ar, ni	
96	*Thrips angusticeps* Uzel, 1895	Fedor et al. (2004)	W-PAL	fl, po	P
97	*Thrips atratus* Haliday, 1836	Fedor et al. (2004)	HOL	fl, ni	P
98	*Thrips brevicornis* Priesner, 1920	Hešková (1967)	EUR + ASIA	fol	
99	*Thrips calcaratus* Uzel, 1895	Dubovský et al. (2010)	EUR	ar	
100	*Thrips dilatatus* Uzel, 1895	Fedor et al. (2004)	EUS	fl	
101	*Thrips discolor* Haliday, 1836	Fedor et al. (2004)	EUR	fl	
102	*Thrips dubius* Priesner, 1927	Fedor et al. (2012)	EUR + ASIA	?	
103	*Thrips flavus* Schrank, 1776	Fedor et al. (2004)	COS	fl, pf, ni	P,I
104	*Thrips fulvipes* Bagnall, 1923	Fedor et al. (2004)	EUR	?	
105	*Thrips fuscipennis* Haliday, 1836	Fedor et al. (2004)	PAL	fl, fol, pf	P
106	*Thrips herricki* Bagnall, 1926	Fedor et al. (2004)	EUR	fl	
107	*Thrips juniperinus* Linnaeus, 1758	Fedor et al. (2004)	EUR	fl	
108	*Thrips linarius* Uzel, 1895	Fedor et al. (2004)	EUR	?	P
109	*Thrips major* Uzel, 1895	Fedor et al. (2004)	PAL	pf, ni	P
110	*Thrips menyanthidis* Bagnall, 1923	Fedor et al. (2004)	EUR	?	
111	*Thrips minutissimus* Linnaeus, 1761	Fedor et al. (2004)	EUR + ASIA	fol, ar, ni	
112	*Thrips nigropilosus* Uzel, 1895	Fedor et al. (2004)	EUR + ASIA	fl	
113	*Thrips palustris* O. M. Reuter, 1899	Fedor et al. (2004)	EUS	fl?	
114	*Thrips physapus* Linnaeus, 1758	Fedor et al. (2004)	EUS	fl	
115	*Thrips pillichi* Priesner, 1924	Fedor et al. (2004)	EUR	fl	
116	*Thrips pini* (Uzel, 1895)	Fedor et al. (2004)	HOL	ar	P
117	*Thrips praetermissus* Priesner, 1920	Fedor et al. (2004)	EUS	gr	
118	*Thrips roepkei* Doeksen, 1953	Fedor et al. (2012)	EUR?	?	
119	*Thrips sambuci* Heeger, 1854	Fedor et al. (2004)	EUR	fl, sc	
120	*Thrips simplex* (Morison, 1930)	Masarovič et al. (2016)	COS	fl	P,G
121	*Thrips tabaci* Lindeman, 1889	Fedor et al. (2004)	COS	fl, fol	P, I
122	*Thrips trehernei* Priesner, 1927	Fedor et al. (2004)	HOL	fl, ni	
123	*Thrips trybomi* (Karny, 1908)	Fedor et al. (2004)	EUR	fl	
124	*Thrips urticae* Fabricius, 1781	Fedor et al. (2004)	EUR	fl	
125	*Thrips validus* Uzel, 1895	Fedor et al. (2004)	EUR + ASIA	fl	
126	*Thrips verbasci* (Priesner, 1920)	Fedor et al. (2004)	EUR	fl	

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Table 1. continue

Order	Thysanoptera Haliday, 1836	Reference	Distribution	Ecology	EI
127	*Thrips viminalis* Uzel, 1895	Fedor et al. 2004	EUR + ASIA	fol, ar	
128	*Thrips vulgatissimus* (Haliday, 1836)	Fedor et al. 2004	EUR	fl, ni	
Family	Phlaeothripidae Uzel, 1895				
Subfamily	Idolothripinae Bagnall, 1908				
129	*Allothrips pillichelus* (Priesner, 1925)	Zvaríková et al. (2017)	EUR	sf	
130	*[5]*Bacillothrips nobilis* (Bagnall, 1909)	Dubovský et al. (2010)	EUR	?	
131	*Bolothrips bicolor* (Heeger, 1852)	Fedor et al. (2004)	EUR	gr	
132	*Bolothrips dentipes* (O. M. Reuter, 1880)	Fedor et al. (2004)	EUR	gr, ni	
133	*Bolothrips icarus* (Uzel, 1895)	Fedor et al. (2004)	EUR	gr	
134	[6]*Cryptothrips nigripes* (O. M. Reuter, 1880)	Fedor et al. (2004)	PAL	ar, cor, mf	
135	*Megalothrips bonannii* Uzel, 1895	Fedor et al. (2004)	EUR	cor, ar	
136	*Megathrips lativentris* (Heeger, 1852)	Fedor et al. (2004)	HOL	ar	
Subfamily	Phlaeothripinae Uzel, 1895				
137	*Acanthothrips nodicornis* (O. M. Reuter, 1880)	Fedor et al. (2004)	HOL	cor, ar	
138	*Cephalothrips monilicornis* O. M. Reuter, 1880	Fedor et al. (2004)	HOL	gr	
139	*Gynaikothrips ficorum* (Marchal, 1908)	Fedor & Varga (2007)	PANTR	fl, fol	G
140	*Haplothrips acanthoscelis* (Karny, 1909)	Fedor et al. (2004)	EUS	fl	
141	*Haplothrips aculeatus* (Fabricius, 1803)	Fedor et al. (2004)	PAL	gr, ni	P
142	*Haplothrips alpester* Priesner, 1914	Fedor et al. (2004)	EUR	fl	
143	*Haplothrips alpicola* Priesner, 1950	Fedor et al. (2004)	C-EUR s.l.	fl	
144	*Haplothrips angusticornis* Priesner, 1921	Fedor et al. (2004)	EUR	fl	
145	*Haplothrips crassicornis* (John, 1924)	Fedor et al. (2004)	EUS	gr	
146	*Haplothrips dianthinus* Priesner, 1924	Dobrovodská (1973)	EUR + ASIA	fl	
147	*Haplothrips distinguendus* (Uzel, 1895)	Fedor et al. (2004)	EUR + ASIA	fl, fol	
148	*Haplothrips dudichi* Priesner, 1961	Fedor et al. (2004)	SBM	?	
149	*Haplothrips flavicinctus* (Karny, 1910)	Fedor et al. (2004)	SBM	gr	
150	*Haplothrips floricae* Knechtel, 1960	Fedor et al. (2004)	EUR?	fl	
151	*Haplothrips knechteli* Priesner, 1923	Fedor et al. (2004)	EUR + ASIA	fol?	
152	*Haplothrips kurdjumovi* Karny, 1913	Fedor et al. (2004)	HOL	fol, ar, ni	
153	*Haplothrips leucanthemi* (Schrank, 1781)	Fedor et al. (2004)	HOL	fl	
154	**Haplothrips minisetosus* Klimt, 1969	Fedor et al. (2012)	EUR?	?	
155	*Haplothrips niger* (Osborn, 1883)	Fedor et al. (2004)	PAL	fl	P
156	*Haplothrips pannonicus* Fabian, 1938	Fedor et al. (2004)	EUR	?	
157	*Haplothrips propinquus* Bagnall, 1933	Dudich et al. (1943)	EUR	fl	
158	*Haplothrips phyllophilus* Priesner, 1914	Fedor et al. (2004)	EUR	fol, cor, ar	
169	*Haplothrips setiger* Priesner, 1921	Fedor et al. (2004)	EUR	fl	
170	**Haplothrips statices* (Haliday, 1836)	Dudich et al. (1943)	EUR	fl?	
161	*Haplothrips subtilissimus* (Haliday, 1852)	Fedor et al. (2004)	PAL	fol, cor, ar, ni	
162	*Haplothrips tritici* (Kurdjumov, 1912)	Fedor et al. (2004)	EUR	gr	P
163	[7]*Haplothrips verbasci* (Osborn, 1896)	Dudich et al. (1943)	HOL	fl	
164	*Haplothrips vuilleti* Priesner, 1920	Fedor et al. (2004)	EUR	?	
165	*Hoplandrothrips bidens* (Bagnall, 1910)	Fedor et al. (2004)	EUR	cor, ar	
166	[8]*Hoplandrothrips famelicus* (Priesner, 1926)	Fedor et al. (2004)	C-EUR	gr, ni	
167	*Hoplandrothrips williamsianus* (Priesner, 1923)	Fedor et al. (2004)	EUR	cor, ar	

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Table 1. continue

Order	Thysanoptera Haliday, 1836	Reference	Distribution	Ecology	EI
168	*Hoplothrips carpathicus* Pelikán, 1961	Fedor et al. (2004)	EUR?	mf?	
169	*Hoplothrips corticis* (Degeer, 1773)	Masarovič et al. (2009)	HOL	ar, cor, mf	
170	*Hoplothrips lichenis* Knechtel, 1954	Fedor et al. (2004)	SBM	ar	
171	*Hoplothrips pedicularius* (Haliday, 1836)	Jablonowski (1899)	EUR	ar, cor	
172	*Hoplothrips polysticti* (Morison, 1949)	Masarovič et al. (2014b)	NEUR	mf	
173	*Hoplothrips quercinus* Knechtel, 1935	Fedor et al. (2004)	?	?	
174	*Hoplothrips semicaecus* (Uzel, 1895)	Fedor et al. (2004)	EUR	fl, ni	
175	*Hoplothrips ulmi* (Fabricius, 1781)	Jablonowski (1899)	EUR + ASIA	ar, cor	
176	*Hoplothrips unicolor* (Vuillet 1914)	Masarovič et al. (2013c)	EUR	cor, mf	
177	*Liophloeothrips hungaricus* (Priesner, 1924)	Fedor et al. (2004)	C-EUR?	?	
178	*Liothrips austriacus* (Karny, 1909)	Fedor et al. (2004)	EUR	fol, ar	
179	*Liothrips pragensis* Uzel, 1895	Fedor et al. (2004)	EUR	fol, ar, ni	
180	*Liothrips setinodis* (O. M. Reuter, 1880)	Fedor et al. (2004)	EUR	fol, ar	
181	*Lispothrips crassipes* (Jablonowski, 1894)	Fedor et al. (2004)	EUR	fl, cor	
182	*Maderothrips longisetis* (Bagnall, 1910)	Masarovič & Fedor (2015)	EUR	ar, mf, zf	Pr
183	[9]*Nototrhips albovittatus* (Schille, 1911)	Fedor et al. (2004)	EUR	ar	
184	*Phlaeothrips annulipes* O. M. Reuter, 1880	Fedor et al. (2004)	EUR	cor, ar, ni	
185	**Phlaeothrips bispinoides* Bagnall, 1926	Dubovský et al. (2010)	W-PAL	ar, gr, cor	
186	**Phlaeothrips bispinosus* Priesner, 1919	Doričová & Fedor (2012)	EUR	cor	
187	*Phlaeothrips coriaceus* Haliday, 1836	Fedor et al. (2004)	EUR	cor, ar, ni	
188	*Poecilothrips albopictus* Uzel, 1895	Masarovič et al. (2011)	HOL	cor, ar, pf, mf	
189	*Xylaplothrips fuliginosus* (Schille, 1911)	Fedor et al. (2004)	EUR	cor, ar	

Distibution: C-EUR – Central European; C-EUR s.l –; Central European in sensu lato; C-EUR? – Central European (data Deficient); COS – cosmopolite; EUR – european; EUR? – european (data deficient); EUR+ASIA – european and asian; EUS – eurosiberian; HOL – holarctic; NEA – nearctic; NEUR – north-european; ORIENT – oriental; PAL – palaearctic; PAL? – palaearctic (data deficient); PANTR – pantropic; SBM – sub-mediterranean; W-PAL – west-palearctic; Ecology: ol – oligophagous; fl – floricolous; po – polyphagous; gr – graminicolous; zoo – zoophagous; ar – arbolicolous; fol – foliicolous; ni – nidicolous; sc – sciophilous; cor – corticicolous; my – mycophagous; ? – data deficient; pf – polyphagous; mf – mycophagous; of – oligophagous; EI – economic importance: Pr – predator of insects and acarids; G – exotic glasshouse pest; P – pest in the field; I – potentially invasive species; [1–9] – see notes to the checklist in text

considerable proportion of floricolous (35%), foliicolous (14.8%) and corticicolous (10%) elements. Concerning the trophic particularities, the list predominantly contains phytophagous thrips (up to 90%) with a lower participation of mycophagous or zoophagous species, mostly Aeolothripidae and Phlaeothripidae.

The recent Thysanoptera fauna of Slovakia includes 3.7% beneficiary (mainly in terms of pest predatory species) and 18.5% pest species, while 14.3% of them are considered transmitters of tospoviruses and 22.9% creating a glasshouse pest cohort. In the area of Slovakia, only one EPPO A2 list species has been detected so far.

Notes to the checklist. *needs taxonomic revision

[1] *K. robustus* synonymised by *K. pisivorus* (Williams, 1916)

[2] in the previous checklist (Fedor et al. 2004) mentioned as *Taeniothrips nigriventris* Pelikán, 1956

[3] in the previous checklist (Fedor et al. 2004) mentioned as *Oxythrips dentatus* Knechtel, 1923

[4] *T. inopinatus* synonymised by *T. roepkei* Doeksen, 1953 (Vierbergen 2004)

[5] in Dubovský et al. (2010) mentioned as *Megathrips nobilis* Bagnall, 1909

[6] in the previous checklist (Fedor et al. 2004) mentioned as *Cryptaplothrips nigripes* (O. M. Reuter, 1880)

[7] in the previous checklist (Fedor et al. 2004) mentioned as *Neoheegeria verbasci* (Osborn, 1896)

[8] in the previous checklist (Fedor et al. 2004) mentioned as *Cryptaplothrips famelicus* (Priesner, 1926)

[9] in the previous checklist (Fedor et al. 2004) mentioned as *Acanthothrips albovittatus* (Schille, 1911)

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DISCUSSION

The status of thrips as pests may differ considerably between crops and geographical areas (Lewis 1997). The fauna of Thysanoptera in Slovakia, for instance, contains 35 generally known pests in agriculture, horticulture and forestry, including *Kakothrips pisivorus, Sericothrips bicornis, Odontothrips confusus, O. loti and Haplothrips niger* feeding on Fabaceae (Fedor et al. 2012); *Aptinothrips rufus, Anaphothrips obscurus, Chirothrips hamatus, Limothrips cerealium, L. denticornis, Haplothrips aculeatus and H. tritici* feeding on cereals (Fedor et al. 2012), or *Drepanothrips reuteri, Taeniothrips inconsequens, Thrips angusticeps, Thrips linarius, Thrips major, Thrips pini* and *Thrips atratus* feeding on other crops (Fedor et al. 2012). Moreover, one of them has been considered as an A2 EPPO quarantine pest (*Frankliniella occidentalis*) (EPPO 2020) and five more (*Frankliniella occidentalis, Frankliniella intonsa, Frankliniella fusca, Thrips tabaci, Dictyothrips betae*) as potential transmitters of tospoviruses (*F. occidentalis, F. intonsa, F. fusca, Thrips tabaci, Dictyothrips betae*) (Ciuffo et al. 2010; Rotenberg et al. 2015). The biological commodity trade globalisation corresponds with the increasing diversity in glasshouse pest species cohorts, including *Heliothrips hemorrhoidalis* (Fedor et al. 2004), *Hercinothrips femoralis* (Varga 2008), *Parthenothrips draceanae* (Jablonowski 1899), *Dichromothrips corbetti* (Masarovič et al. 2017a), *Echinothrips americanus* (Varga & Fedor 2008), *F. occidentalis* (Klímová 1992), *Microcephalothrips abdominalis* (Fedor et al. 2018) and *Gynaikothrips ficorum* (Fedor & Varga 2007), four of them only recently firstly recorded. However, certain damage to glasshouse plants has been caused by many native species, such as *Thrips tabaci, T. simplex, T, flavus, T. fuscipennis, Frankliniella intonsa, Chirothrips manicatus, Pezothrips dianthi* (Lewis 1997; Fedor et al. 2012). Concerning the direct and indirect damage activities and crop loss estimations, pest thrips are now arguably comparable to whiteflies (Aleurodidae), scale insects and mealy bugs (Coccoidea), and even aphids (Aphididae) worldwide (Lewis 1997). Therefore, the effective monitoring of the pest species plays a crucial role in the national economic loss mitigation.

Apart from pests Thysanoptera, without a doubt, include several beneficiary species, such as *Scolothrips longisetis* (six-spotted thrips), a well-known predator of mites (Pakyari et al. 2009) and a bio-control agent (Mound 2011). Five species of Aeolothripidae (*Aeolothrips ericae, A. fasciatus, A. intermedius, A. melaleucus, A. vittatus*) are considered to be predators of mites and other thrips and their eggs (Lewis 1997; Trdan et al. 2005b). For instance, *A. vittatus* feeds on the pest *Thrips pini* (Sabelis & Van Rijn 1997) and *A. intermedius* preys on 44 other thrips species (Riudavets 1995), including economic pests, such as *Thrips tabaci* (onion thrips) (Franco et al. 1999), *Heliothrips haemorrhoidalis* and *Odontothrips confusus* (Khosbayar 2001). The predation of other insects is also known for *Maderothrips longisetis* (Kobro 2003).

A lot of species (e.g., *Hercinothrips femoralis, Microcephalothrips abdominalis, Frankliniella occidentalis, Thrips flavus, T. tabaci, Limothrips cerealium, L. denticornis,* etc.) may carry a heavy introduction and invasion potential (Morse & Hoddle 2006; Reynaud et al. 2008; Reynaud 2010; Diaz-Montano et al. 2011; Masarovič et al. 2014a, 2017b; Fedor et al. 2018) with well-developed mechanisms for their successful dispersion. According to the above-mentioned facts on the natural and human-induced dispersion mechanisms, together with recent knowledge on European alien thrips fauna (Vierbergen 1999, 2001; Reynaud et al. 2008; Šimala & Masten Milek 2008; Goldarazena 2011; Pizzol et al. 2014; Orosz et al. 2017; Muntyan et al. 2018; Makra et al. 2018), a wide variety of new exotic economic species (e.g., *Thrips hawaiiensis, Frankliniella schultzei* or *Scirtothrips* spp.) may undisputedly occur in Slovakia over the next couple of years.

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