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First documented records of breeding of *Gomphus pulchellus* in the Czech Republic with notes on its habitat preferences (Odonata: Gomphidae)

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Abstract

In the Czech Republic, only single individuals of *Gomphus pulchellus* with no reproductive behaviour were observed until 2017. Since 2018, reproduction has been recorded at six localities in the Czech Republic. All known localities of *G. pulchellus* from the Czech Republic are reported. Additionally, habitat descriptions and the circumstances of unpublished records (after 2017) are presented and discussed. The discussed data proves the extension of the generative range of *G. puchellus* to the east.

Zusammenfassung

Erste dokumentierte Reproduktionsnachweise von *Gomphus pulchellus* in der Tschechischen Republik mit Angaben zur Habitatpräferenz (Odonata: Gomphidae) – In der Tschechischen Republik wurden bis vor 2017 nur einzelne Individuen von *Gomphus pulchellus* ohne Fortpflanzungsverhalten beobachtet. Seit 2018 konnte die Reproduktion an sechs Fundorten in der Tschechischen Republik nachgewiesen werden. Alle Fundorte

von *G. pulchellus* aus der Tschechischen Republik werden gemeldet. Zusätzlich werden Lebensraumbeschreibungen und die Umstände unveröffentlichter Nachweise (nach 2017) vorgestellt und diskutiert. Die präsentierten Daten zeigen eine Ausweitung des Verbreitungsgebietes mit Reproduktion von *G. pulchellus* nach Osten.

Souhrn

První doklady rozmnožování klínatky západní (*Gomphus pulchellus*) v České republice a poznámky k jejím stanovištním nárokům (Odonata: Gomphidae) – České republice byli do roku 2017 pozorováni pouze jednotliví jedinci druhu *Gomphus pulchellus* bez reprodukčního chování. Od roku 2018 bylo rozmnožování zjištěno na šesti lokalitách v České republice. Uvádíme všechny lokality *G. pulchellus* z České republiky. Dále jsou uvedeny a diskutovány popisy stanovišť a okolnosti nepublikovaných nálezů (po roce 2017). Z předložených údajů vyplývá, že areál výskytu *G. pulchellus* se zvětšuje směrem na východ.

Introduction

Gomphus pulchellus is a species initially endemic to Southwest and West Europe (Dijkstra & Lewington 2006; Wildermuth & Martens 2019; Dijikstra et al. 2020). A growing number of records over the last two decades indicate that its range is expanding eastwards (e.g. Rudolph 1980; Monnerat 2005; Gros 2006; Westermann 2006; Buczyński 2013; Černý et al. 2014; Tájková 2015; Boudot & Kalkman 2015; Vlašánek et al. 2016; Buczyński et al. 2017). In the Czech Republic, the first observation of *G. pulchellus* was recorded in 2014 (Černý et al. 2014). Another four records were reported in 2015 (Vlašánek et al. 2016), but no evidence of reproduction was found until 2018. Here, we report all the records of this species from the Czech Republic since 2017, highlighting records of its reproduction, and discuss its habitat preferences at the limits of the distribution range.

Methods

We checked the database of the Nature Conservation Agency of the Czech Republic (AOPK ČR 2021) and also social networks. From the total number of 15 unpublished findings (i.e since 2016), 12 of them are supplemented by photo documentation, in another two cases the individuals were collected and placed in a collection.

Here, only unpublished records since 2017 are reported. The order of other species of dragonflies and damselflies corresponds with the frequency of appearance and the abundance of adults. Localities are labelled and sorted according to the order of observation in the Czech Republic (the same labels are also used in the map – Figure 1).

Records

Records of *G. pulchellus* prior to 2017 were published by Černý et al. (2014 – locality 1) and Vlašánek et al. (2016 – localities 2–5), including habitat descriptions. These records are joined in the summary table (see Table 1).

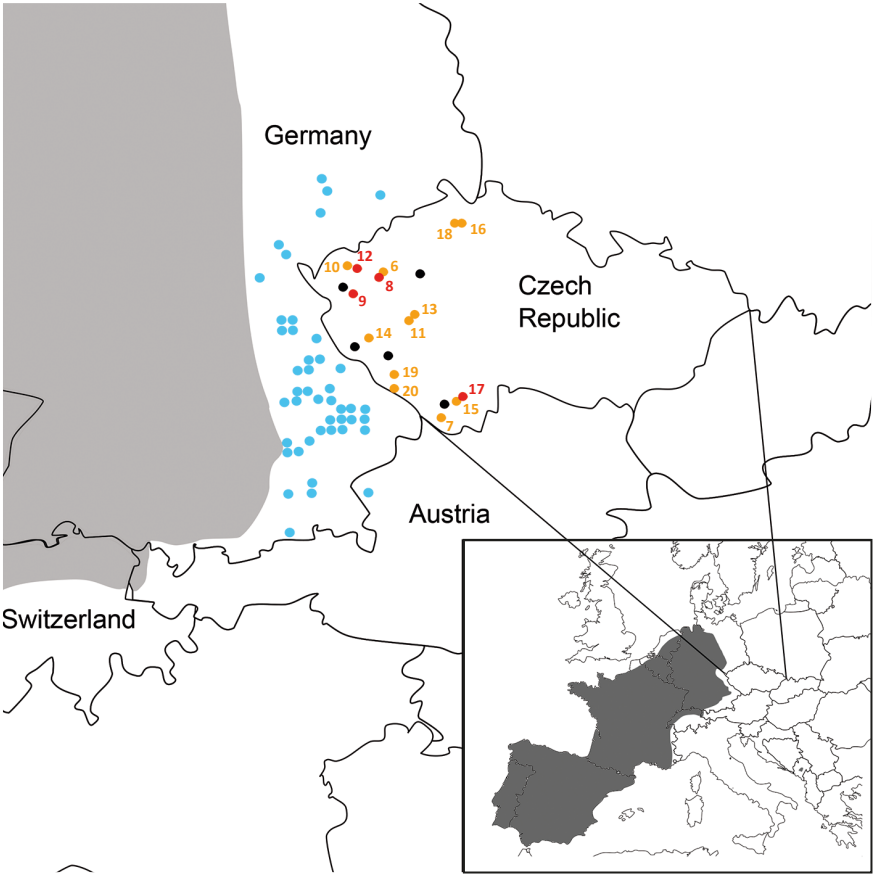

Figure 1. The range of *Gomphus pulchellus* based on Gros (2006), Buczyński et al. (2013), Suhling (2015,) and Vlašánek et al. (2016). Black circles according to Vlašánek et al. (2016), blue circles: closest occurences of the species (BN 2016, LfULG 2021). Orange and red dots indicate the new records from this paper, orange adults and red immature individuals. – **Abbildung 1:** Verbreitungsgebiet von *Gomphus pulchellus* nach Gros (2006), Buczyński et al. (2013), Suhling (2015) und Vlašánek et al. (2016). Schwarzer Kreis: Nachweis aus Vlašánek et al. (2016). Orange und rote Kreise: hier erwähnte Nachweise, orange adulte, rot juvenile Individuen.

(1) Lány, Pánova louka, Velký rybník (fishpond) – see Černý et al. (2014).
(2) Chvalšiny, Potoční rybník (fishpond) – see Vlašánek et al. (2016).
(3) Buršice kamenolom (water body in a quarry) – see Vlašánek et al. (2016).
(4) Kladská, rašeliniště Tajga (peatbog) – see Tájková (2015) and Vlašánek et al. (2016).
(5) Domažlice, nádrž u Pískovny (fishpond) – see Vlašánek et al. (2016).

(6) Buškovice. Adult male was caught flying repeatedly around the northern edge and grassy dam of a pond. Sunny weather, windless, 12:15. Přemysl Tájek and Pavla Tájková not. et det.

Fishpond with slightly muddy water, but fertilization and liming is probably not applied here. In the mid-20th century, waste clay flowed into the pond from the kaolin mine nearby. The dam of the pond is sunlit with short mowed grass, with dense reeds at the tributary and southern banks, and bordering tree and shrub vegetation composed of Black Alder *Alnus glutinosa*, Crack Willow *Salix fragilis*, and Grey Willow *Salix cinerea*. The wider perimeter of the pond consists mainly of spontaneously developed tree and shrub vegetation, predominantly Blackthorn *Prunus spinosa*. Other dragonfly species present: *Coenagrion puella*, *Platycnemis pennipes*, *Codulia aenea*, *Libellula depressa*, *Anax imperator*, *Orthetrum cancellatum*, *Ischnura elegans*, *L. quadrimaculata*.

(7) Kovářov u Lipna. One immature female flying slowly over a meadow was observed and caught. Sunny weather, windless, about 9:30. Petr Hesoun leg. et det. (deposited in: author‘s private collection)

Regularly mowed meadow. About 500 m from the place of observation is Lipno dam, the largest reservoir in the Czech Republic. The dam is used for recreation, water sports and recreational fishing. Due to the absence of other water bodies in the vicinity, the individual almost certainly emerged from Lipno dam, probably in the southern bay (called Hruštická zátoka), where ribbon grass *Phalaris arundinacea* dominate in the littoral.

(8) Nepomyšl. Newly emerged and unskilfully flying male observed at the edge of dry meadows and a strip of shrubs on the slope of a hill, 500 m east of a fishpond. Sunny weather, mild wind, 13:00. Přemysl Tájek not. et det.

Fishpond with a clay bottom into which flowed waste clay from a nearby kaolin mine in the mid-20th century. The pond is used for bathing and recreational fishing. Apart from a few grassy bathing places, the whole pond is surrounded by trees (*Alnus glutinosa*, *Salix fragilis*, silver birch *Betula pendula*) with branches extending above and over the water surface. Apart from a few narrow stripes with *Typha latifolia*, littoral vegetation is not developed.

(9) Horní Kramolín. Newly emerged and unskilfully flying male observed at the meadow at the edge of an alder wood, about 20 m from the bank of a pond. Sunny weather, windless, 12:10. Přemysl Tájek not. et det.

Table 1. List of records with annotations to the habitat. **Loc** Locality; **Hab** Habitat: **W** water habitat, **T** terrestrial habitat; **Fish** presence and quantity of fish at locality: **0** no fish, **1** fish are present in small numbers, **2** fish are present in significant numbers, **3** excessive numbers of fish; **Photo: x** individual(s) photographed; **Quantity** number of individuals observed; **Sex: M** male, **F** = female; **Ad./juv.** = adult or juvenile (immature) individuals observed; **Grid** Number of grid square according to the Central European mapping grid system (see EHRENDORFER & HAMANN 1965). – **Tabelle 1:** Fundorte und Anmerkungen zum Habitat. **Loc** Lokalität; **Hab** Habitat: **W** Gewässer, **T** Landhabitat; **Fish** Fischbesatz am Gewässer: **0** keiner, **1** wenige Fische, **2** viele Fische, **3** sehr viele Fische; **Photo: x** Belegfoto liegt vor. **Quantity** Anzahl der beobachteten Tiere; **Sex: M** Männchen, **F** Weibchen; **Ad./juv.** Beobachtung ausgefäbter (ad.) oder juveniler (juv.) Tiere; **Grid** Rasterfeldnummer nach dem europäischen Kartierraster (vgl. EHRENDORFER & HAMANN 1965). * The sex of one individual was recognized (according to the photo).

Loc	Name	Date	Coordinates	Hab	Area (ha)	Fish	Altitude	Photo	Quantity	Sex	Ad./juv.	Grid
1	Lány, Pánova louka, Velký rybník	14.06.2014	50.108470N, 13.944969E	W	0.89	1	415	×	1	M	ad.	5849
2	Chvalšiny, Potoční rybník	07.07.2015	48.873722N, 14.178244E	W	0.35	3	590		1	M	ad.	7151
3	Buršice, kamenolom	07.07.2015	49.327747N, 13.464927E	W	0.28	0	614		1	M	–	6646
3	Buršice, kamenolom	31.07.2015	49.327747N, 13.464927E	W	0.28	0	614		1	–	ad.	6646
4	Kladská, rašeliniště Tajga	10.07.2015	50.030215N, 12.685710E	T	–	–	810	×	1	F	ad.	5942
5	Domažlice, nádrž U pískovny	11.07.2015	49.442170N, 12.906328E	W	0.12	3	438	×	1	F	ad.	6543
6	Buškovice	28.05.2018	50.227883N, 13.345617E	W	0.84	2	368	×	1	M	ad.	5746
7	Kovářov u Lipna	21.06.2018	48.684111N, 14.121576E	T	4870.1	2	738		1	F	juv.	7350
8	Nepomyšl	01.06.2019	50.211473N, 13.321381E	T/S	4.57	2	476	×	1	F	juv.	5745

Loc	Name	Date	Coordinates	Hab	Area (ha)	Fish	Altitude	Photo	Quantity	Sex	Ad./juv.	Grid
9	Horní Kramolín	06.05.2019	49.980970N, 12.804052E	S	0.08	0	728	×	1	M	juv.	6042
10	Nová Role	13.06.2019	50.252098N, 12.871904E	S	19.94	3	434	×	1	–	ad.	5742
11	Chaloupky v Brdech, rybník Pod Valdekem	14.06.2019	49.766501N, 13.898394E	W	2.37	1	528	×	4	M*	ad.	6249
12	Otovice u Karlových Varů	15.06.2019	50.251987N, 12.871898E	S	0.79	3	408	×	1	M	juv.	5743
13	Lochovice, rybník Brodí	15.06.2019	49.830850N, 13.967123E	W	2.42	?	324	×	1	M	ad.	6149
14	Čermná u Staňkova, rybník Čermná	30.06.2019	49.537710N, 13.113019E	W	1.25	2	425	×	5	M*	ad.	6444
15	České Budějovice, Tůně u Špačků	27.05.2020	48.947383N, 14.490111E	W	0.81	2	390	×	1	F	ad.	7052
16	Stvolínky	22.06.2020	50.625282N, 14.425424E	T	–	–	328	×	1	M	ad.	5352
17	Jivno, rybník Mrhal	13.06.2020	48.988352N, 14.571321E	W	7.07	2	514	×	1	M	juv.	7053
18	Konojedy, Dubičenský rybník	13.06.2020	50.621256N, 14.350641E	W	0.59	2	298		1	–	ad.	5352
19	Stachy	20.07.2020	49.098210N, 13.659715E	T	–	–	791		1	–	ad.	6947
19	Stachy	30.07.2020	49.098532N, 13.659060E	T	–	–	788	×	1	F	ad.	6947
20	Horní Světlé hory, Žďárecké jezírko	22.07.2020	48.935568N, 13.652729E	W	1.42	1	953		1	M	juv.	7047

Shallow pond in the alder wood surrounded by pastures. The half of the pond closest to the dam was more shaded, with an open surface and a thick layer of leaf litter at the bottom. The other half of the pond is sunny, shallow, and overgrown with littoral vegetation including bottle sedge *Carex rostrata*, blister sedge *C. vesicaria*, common rush *Juncus effusus* and Broadleaf bullrush *Typha latifolia*. The pond is not used for fish farming and dries out almost completely during dry years. Other dragonfly species present: *C. puella*, *Lestes sponsa*, *Sympetrum sanguineum*.

(10) Nová Role. An adult individual observed in a potato patch in an allotment gardening colony, 30 m from the eastern edge of a pond. Sunny weather, about 14:00. The dragonfly flew several times, resting in between. No other individuals were observed in the following days. Manfred Štěřík photographed, Martin Štěříkdet.

The fishpond is intensively stocked and used for recreational fishing and bathing. Most of the bank is densely covered with trees (*Alnus glutinosa*), eastern and western perimeter is surrounded by gardens. Other dragonfly species present: *P. pennipes*, *I. elegans*, *O. cancellatum, C. aenea*, *C. splendens*, *C. puella*.

(11) Chaloupky v Brdech, rybník Pod Valdekem. Four adult individuals were observed flying territorially around the edges of the pond, one of which (male) was caught and photographed. Sunny weather, (27°C). Kateřina Landová not. et det.

Oligotrophic fishpond with minimal fish stock and poorly developed narrow littorals (*Carex rostrata*, european bur-reed *Sparganium emersum*, marsh balrush *Eleocharis palustris*). The northern part of the pond is sunny (steep bank at the dam with grassy vegetation), and the rest is surrounded by dense spruce forest. In the southern part of the pond, the slopes of the banks are less steep and macrophytic vegetation with floating broad-leaved pondweed *Potamogeton natans* is present. Other dragonfly species present: *C. aenea*, *Aeshna cyanea*, *C. puella*, *P. pennipes*, *S. sanguineum*, *A. grandis*, *Enallagma cyathigerum*, *Somatochlora metallica*, *A. imperator*, *I. elegans*, *L. quadrimaculata*, *O. cancellatum*, *L. sponsa*, *Pyrrhosoma nymphula*, *Cordulegaster boltonii*, *Sympetrum vulgatum* and *S. fonscolombii*.

(12) Otovice u Karlových Varů. Newly emerged and unskilfully flying male observed in a corn field, about 20 m from the bank of a pond. Sunny weather, about 16:00. No other individuals were observed in the following days. Martin Štěřík not. et det.

A shallow fishpond with a muddy bottom, probably from a historic kaolin mine. The pond is used for recreational fishing, is regularly stocked, and in the middle is divided by a narrow clay dam. Half of the bank is densely covered with trees (*Betula pendula*, *Alnus glutinosa*), the northwest bank is overgrown with *Phragmites australis*, and the vegetation of the remainder is formed by grasses and common reed *Typha* sp.

The locality has been irregularly monitored for 5 years, during which the following species of dragonflies were recorded: *I. elegans*, *O. cancellatum*, *P. pennipes*, *S. vulgatum*, *S. sanguineum*, *P. nymphula*, *Sympecma paedisca*, *Aeshna mixta*, *S. fusca, L. sponsa*, *L. dryas*, *Erythromma najas*, *E. viridulum*, *A. imperator*, *L. quadrimaculata*, *E. cyathigerum*, *C. puella*, *C. aenea*, sometimes also *Crocothemis erythraea*, *S. pedemontanum*, *S. flaveolum*. Rarely were recorded *L. depressa*, *A. cyanea*, *A. grandis*, *Anax parthenope*, *Gomphus vulgatissimus*, *L. fulva*, *O. coerulescens,* and *Sympetrum striolatum.*

(13) Lochovice, rybník Brodí. One adult male was observed and caught flying around the edges of the pond. Sunny weather, (26°C). Kateřina Landová not. et det.

A eutrophic shallow fishpond surrounded mainly by alder wood. Littoral vegetation is well developed with *Typha latifolia*, lesser bullrush *T. angustifolia*, *Phragmites australis*, Yellow iris *Iris pseudacorus*, common bur-reed *Sparganium erectum*, swamp sedge *Carex acutiformis*, elongated sedge *C. elongata*, cyperus sedge *C. pseudocyperus*.

(14) Čermná u Staňkova, rybník Čermná. At least five adult individuals observed flying repeatedly around the edge of the pond. One adult male photographed with visible signs of wing wear. Sunny weather, at 15:10. Olga Havlíčková photographed, Martin Waldhauser det.

Shallow fishpond with steep banks, without littoral vegetation. The pond is used for pond farming, recreational fishing and bathing. About one half of the perimeter is surrounded by alder (*Alnus glutinosa*), the rest of the pond is adjacent to unmown grassland surrounded by mown meadows and fields.

Other dragonfly species present: *P. pennipes*, *I. elegans*, *E. cyathigerum*, *O. cancellatum*, *S. vulgatum*, and *A. imperator*.

(15) České Budějovice, Tůně u Špačků. One adult female was observed and caught flying around the edges of the water body. Sunny weather, windless (about 20°C), 14:00. Ladislav Černý leg. et det. (deposited in: Jihočeské muzeum v Českých Budějovicích, JMBC).

A system of marshland, channels and pools adjacent to the meandering River Malše. The pool where *Gomphus pulchellus* was caught is the largest one, surrounded mainly by alder and oak woods. Littoral vegetation is partly developed with *Typha latifolia*, *Juncus effusus*, and *Iris pseudacorus*. Macrophytic vegetation with floating leaves is partly developed too, with water knotweed *Persicaria amphibia* and others. The locality has been irregularly monitored for three years, during which these species of dragonflies were recorded: *C. puella*, *P. pennipes*, *Anaciaeshna isosceles*, *A. mixta*, *O. cancellatum*, *A. grandis, C. aenea, S. sanguineum*, *S. vulgatum*, *A. imperator*, *L. quadrimaculata*, *L. depressa*, *S. metallica*, *I. elegans*, *E. cyathigerum*, *C. splendens*, *C. virgo*, *Chalcolestes viridis*, *S. fusca*, *L. sponsa*, *Ischnura pumilio*, *A. affinis*, *Ophiogomphus cecilia*, *C. erythraea*.

(16) Stvolínky. One adult male photographed resting on bare ground. Sunny weather. Zdeňka Nováková photographed, Martin Waldhauser det.

A regularly mowed mesophilic meadow surrounded by shrubs and trees. There are several larger and smaller ponds about 1 km away, but the link between the observation and any of these sites remains unclear.

(17) Jivno, rybník Mrhal. Newly emerged male observed basking on a sunny part of a willow shrub on a bank of the pond suitable for bathing. Sunny weather, 11:20. Jiří Řehounek photographed, Martin Waldhauser det.

Fishpond with poorly developed narrow littorals (e.g. *Iris pseudacorus*, *Phalaris arundinacea*, *Juncus effusus*), which is used for pond farming, recreational fishing and bathing. Other dragonfly species present: *O. cancellatum, P. pennipes*.

(18) Konojedy, Dubičenský rybník. Adult individual was caught flying repeatedly around the northern edge of the pond. Sunny weather (28°C), about 11:00. Martin Waldhauser not. et det.

A system of three ponds on the nameless tributary of the Konojedský brook. Dubičenský pond, the last in the system, is used mainly for recreational fishing. The banks of the pond are steep, and fertilization and liming is probably not carried out here. The north bank is sunlit and adjacent to a narrow strip of ruderal meadow, a cornfield, and limited littoral with *Phragmites australis*, *Typha* sp. and *Carex* sp. Southern and eastern banks are near alder woods, and on the western side there is a dam with road. Macrophytic vegetation with floating leaves is absent. Dominant dragonfly species: *P. pennipes*, *I. elegans*, *O. cancellatum*, and *S. sanguineum*.

(19) Stachy. Within 10 days, one adult was recorded twice, flying slowly over a meadow and occasionally resting on a haystack, always about 18:00. On July 30, it was a female with visible signs of wing wear. Jakub Legát and Jiří Žalman not. et det.

A regularly mowed cultural meadow. About 50–100 m from the site of the observation, there is a small spring in the meadow with *Carex* spp., *Juncus* spp. and mayflower *Caltha palustris*, and in 2020 there were small shallow pools with free water surface (old tractor tracks). However, the occurrence of *Gomphus pulchellus* is most likely not related to this habitat and the connection between the observation and a water body in the wider area remains unclear.

(20) Horní Světlé hory, Žďárecké jezírko. One immature male was observed and caught flying around the edges of the pond. Sunny weather, windless, (25°C), about 15:00. Petr Hesoun and Eva Zelenková leg. et det. (deposited in: author's private collection).

An oligotrophic pond with peat bank, minimal fish stock, and well developed littoral vegetation composed of beaked sedge *Carex rostrata,* floating sweet-grass *Glyceria fluitans,* and bog moss *Sphagnum* sp. Sunny banks with peat vegetation

prevail followed by a belt of grassland. The wider area is mainly spruce forest. Other dragonfly species present: *C. puella*, *L. quadrimaculata*, *C. hastulatum*, *E. cyathigerum*, *L. sponsa*, *C. aenea*, *P. nymphula*, *Aeshna juncea*, *Leucorrhinia dubia,* and *A. imperator.*

Conclusions

To date, immature and mature individuals of *G. pulchellus* have been found at 20 localities in the Czech Republic, in 17 cases either at or close to water bodies. All of the localities are formed by habitats with stagnant or standing water and are predominantly smaller or medium sized fishponds (53% of them are smaller than 1 ha, 82% smaller than 5 ha). The range of habitas is very wide – from oligotrophic to eutrophic waters in different altitudes (298–953 m), with very low to very high fish production. Most of the ponds are "ordinary" fishponds used for fish production, but still quite suitable for swimming or bathing, usually without floating vegetation and with poorly developed littoral vegetation. The most frequent species of dragonflies co-occurring with *G. pulchellus* were *O. cancellatum*, *I. elegans*, *P. pennipes*, *C. aenea*, *C. puella*, and *S. sanguineum*.

Six of the documented observations are of immature *G. pulchellus* individuals. All of these dragonflies had soft wings and therefore limited capability of dispersal. There is little doubt that these records represent clear evidence that the species reproduces in the Czech Republic. The location of emergence is obvious in four cases (localities 9. Horní Kramolín, 12. Otovice u Karlových Varů, 17. Jivno, rybník Mrhal and 20. Horní Světlé Hory, Žďárecké jezírko), and in two further cases the site of emergence can be inferred with high probability (locality 7. Kovářov u Lipna and 8. Nepomyšl). Each of these sites have stagnant waters in common, but few other similarities, and most of the environmental parameters are very variable: area (0,08–4870 ha), altitude (408–953 m), the presence or development of littoral vegetation, and even the abundance of fish (from complete absence to a high density of fish). Three of these sites are associated with historical kaolin mining. However, given the low number of observations, this is likely to be coincidental, and is not supported by further observations of adults from other localities.

Since all of the recorded immature individuals were at most one day old, the emergence period can be defined from early May to mid-June, which corresponds with the majority of observed adults recorded in the second and third quarter of June. At higher altitudes, emergence probably begins later, as shown by the observation of an immature individual at locality 19. Horní Světlé hory, Žďárecké jezírko (22.07.2020). It is worth noting that, on several occasions, *G. pulchellus* was found in different localities on the same day (see Table 1). Most of the records originate from the years 2018–2020, when unusually hot summer periods were experienced in Central Europe.

Overall, 18 of 20 records are represented by the observation of single individuals. However, in two cases, more individuals were recorded (see Table 1). It is

possible that our records represent the first breeding populations to be recorded in the Czech Republic. It is clear that the number of sightings of *G. pulchellus* in the Czech Republic has grown significantly in the last few years. However, the distribution of the species still remains limited to the western part of the country. With regard to the overall warming of the climate, it seems likely that the number of new localities of *G. pulchellus* will increase rapidly, and that the species will extend its range beyond the eastern boundary of its current distribution.

The easternmost localities of *G. pulchellus* found in the Czech Republic are situated more than 70 km to the east from the easternmost localities in Saxony and more than 90 km from the easternmost localities in Bavaria (BN 2016; Suhling 2015; LfULG 2021). From Poland the species is not listed (Polish entomological society 2021). Four of the newly presented localities are situated behind the eastern border of the currently known distribution of the species (Vlašánek et al. 2016). More than one half of the Czech localities are located further east than all other known sites in any other Central European countries and thus create the easternmost known edge of its more or less continuous distribution in Western and Central Europe (Fig. 1). In the area of Central Europe, the locality 17. Jivno, rybník Mrhal represents the easternmost known habitat of reproduction of *G. pulchellus* at all (WGS 1984: N 48.9948, E 14.5682). Even further east, there are known only a few very isolated localities (but also with reproducing populations) in the Balkan Peninsula, the eastermost is at WGS 1984: N 42.1769, E 19.4330 (Buczyński et al. 2013; Buczyński et al. 2017).

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References

AOPK ČR [Agentura ochrany přírody a krajiny České republiky] (2021) Nálezová databáze ochrany přírody. https://portal.nature.cz/nd/, last access: 30.03.2021

BN [Bund Naturschutz in Bayern e.V.] (2016) Westliche Keiljungfer (Gomphus pulchellus): Steckbrief / Artenschutzkartierung Bayern. https://www.bund-naturschutz.de/tiere-in-bayern/libellen/steckbriefe/westliche-keiljungfer, last access: 30.03.2021

Boudot J.-P. & V.J. Kalkman (2015) Atlas of the European dragonflies and damselflies. KNNV Publishing, Zeist

Buczyński P., A. Zawal, E. Stępień, E. Buczyńska & V. Pešić (2013) Gomphus pulchellus Selys recorded on the eastern edge of its distribution area in Montenegro (Anisoptera: Gomphidae). *Odonatologica* 42: 293–300

Buczyński P., G. Tończyk, E. Buczyńska, P. Gadawski, G. Michoński & A. Zawal (2017) On the occurence of Gomphus pulchellus Selys, 1840 (Odonata: Gomphidae) in the Balkan Peninsula. *Acta Zool. Bulg.* 69(1): 43–47

Černý M., M. Waldhauser & L. Vintr (2014) First documented record of Gomphus pulchellus in the Czech Republic (Odonata: Gomphidae). *Libellula* 33: 189–194

Dijkstra K.-D.B. & R. Lewington (2006) Field Guide to the Dragonflies of Britain and Europe. British Wildlife Publishing, London

Dijkstra K.-D.B., A. Schröter & R. Lewington (2020) Field Guide to the Dragonflies of Britain and Europe, second edition. Bloomsbury Wildlife, London – Oxford – New York – New Delhi – Sydney

Ehrendorfer F. & U. Hamann (1965) Vorschläge zu einer floristischen Kartierung von Mitteleuropa. *Berichte der Deutschen Botanischen Gesellschaft* 78: 35–50

Gros P. (2005) Ausbreitung der westlichen Keiljungfer Gomphus pulchellus Sélys, 1840 in Zentraleuropa: erster Nachweis dieser Art im Bundesland Salzburg, Österreich (Odonata: Gomphidae). *Mitteilungen aus dem Haus der Natur* 17: 118–121

LfULG [Landesamt für Umwelt, Landwirtschaft und Geologie] (2021) Artdaten Online. Zentrale Artdatenbank. https://www.umwelt.sachsen.de/umwelt/infosysteme/ida/, last access: 30.03.2021

Monnerat C. (2005) Gomphus pulchellus Sélys, 1840. In: Wildermuth H., Y. Gonseth & A. Maibach (Ed.) Odonata – Die Libellen der Schweiz: 176–179. *Fauna Helvetica* 12, CSCF/SEG, Neuchâtel

Polish entomological society (2021) Odonata. https://wazki.pl/systematyka.html), last access: 5.11.2021

Rudolph R. (1980) Die Ausbreitung der Libelle Gomphus pulchellus Selys 1840 in Westeuropa. *Drosera* 80: 63–66

Suhling F. (2015) Gomphus pulchellus Selys, 1840. *Libellula Supplement* 14: 190–193

Tájková P. (2015) Nečekaný nález v rašeliništi aneb o novém druhu vážky pro Českou republiku. Arnika, přírodou a historií Karlovarského kraje 2015/2: 10–11

Vlašánek P., V. Kolář & P. Tájková (2016) New records of Gomphus pulchellus on the eastern edge of its range in the Czech Republic (Odonata: Gomphidae). *Libellula* 35: 93–98

Westermann K. (2006) Erster Bodenständigkeitsnachweis der Westlichen Keiljungfer (Gomphus pulchellus) für den höheren Schwarzwald. *Naturschutz am südlichen Oberrhein* 4: 235–237

Wildermuth H. & A. Martens (2019) Die Libellen Europas. Alle Arten von den Azoren bis zum Ural im Porträt. Quelle & Meyer Verlag, Wiebelsheim

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ZOBODAT - www.zobodat.at

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