Three new species for the odonatofauna of Piedmont (NW Italy)

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Abstract - Between 2020 and 2023, three new species of Odonates were recorded in Piedmont (NW Italy). *Lestes barbarus* was observed at an artificial wetland in the Turin Plain in 2021. Even though at least one individual was fresh, we cannot conclude that the species developed at the site. Subsequent visits did not permit to confirm the species. *Coenagrion hastulatum* was discovered at a peat bog in the NW Alps (Lac Falin, Valle di Viù) in 2023, and here reproduction was confirmed. This population is the fifth to be recorded for the central and western Italian Alps. *Trithemis annulata* was first recorded in Piedmont in July 2020, and subsequently, the observations of the species in the region rapidly increased, with a total of 66 records relative to 29 sites up to the end of 2023. These are distributed in most of the low-altitude areas of the region. The species was reported mostly in late summer, with only one site where the early spring records suggest successful overwintering. However, this needs further confirmation. The odonate list of Piedmont now accounts for 70 species, representing 73.6% of the taxa reported for Italy, and this makes Piedmont, along with Lombardy, the most odonate-rich region of Italy.

Key words: *Coenagrion hastulatum*, Dragonflies, *Lestes barbarus*, *Trithemis annulata*, Odonata.

Riassunto - Tre specie nuove per l'odonatofauna del Piemonte (Italia Nord-Occidentale)

Tra il 2020 e il 2023, sono state segnalate tre nuove specie di odonati in Piemonte (Italia nord-occidentale). *Lestes barbarus* (almeno tre individui) è stato contattato nel 2021 in una zona umida artificiale della pianura torinese. Sebbene almeno uno degli individui fosse immaturo, non si può concludere che la specie si sia sviluppata nel sito; inoltre, la specie non è stata segnalata in seguito. *Coenagrion hastulatum* è stato scoperto nel 2023 in una torbiera nelle Alpi nord-occidentali (Lac Falin, Valle di Viù) dove è stata confermata la presenza di individui in attività riproduttiva. Si tratta della quinta popolazione segnalata nelle Alpi centrali e occidentali italiane. *Trithemis annulata* è stata osservata per la prima volta in Piemonte nel luglio 2020; successivamente, le segnalazioni della specie sono aumentate rapidamente nelle aree planiziali della regione (66 segnalazioni relative a 29 siti al 2023). Le segnalazioni si concentrano principalmente alla fine dell'estate; per un solo sito sono riportate segnalazioni primaverili, che potrebbero suggerire un precedente svernamento allo stadio larvale, anche se sono necessarie ulteriori conferme. L'elenco degli odonati del Piemonte ora comprende 70 specie, che rappresentano il 73,6% delle specie segnalate in Italia, facendo di questa la regione italiana più ricca insieme alla Lombardia.

Parole chiave: *Coenagrion hastulatum*, libellule, *Lestes barbarus*, *Trithemis annulata*, Odonata.

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INTRODUCTION

Italy has always had a good odonatological scientific tradition, as shown by the fact that a review of the Italian Odonata was the first volume published in the series 'Fauna d'Italia' (Conci & Nielsen, 1956); however, in the last ca. 20 years, increased availability of information on the web and the publication of several excellent field guides (e.g., Dijkstra & Lewington, 2006) resulted in an increased interest in this taxon among amateur naturalists. This led to the foundation of the Italian Odonatological Society (Odonata.it) in 2009 and the publication of the first distribution atlas (Riservato *et al.*, 2014a), which gave an up-to-date overview of the distribution of the species found in the peninsula and its islands. This paved the way for several other contributions that significantly contributed to the faunal knowledge of the country (e.g., Riservato *et al.*, 2014b; Sindaco *et al.,* 2018; Assandri, 2019; Dal Cortivo & Roncen, 2019; Bonometto, 2020; Zandigiacomo *et al.,* 2020; Bazzi *et al.,* 2023; Dijkstra *et al.,* 2023). Altogether, these contributions led to the recent publication of the updated checklist of the Italian dragonflies (La Porta *et al.,* 2023).

Piedmont, located in the northwestern part of Italy, is bounded by two mountain ranges, the Alps and the Apennines. This region has always been one of the best investigated for its odonatological fauna. The seminal work of Capra & Galletti (1978) reported 58 species for Piedmont. This list was updated to 61 by the regional atlas (Boano *et al.,* 2007). In the recent update of the Italian checklist, this count increased to 67 (updated 15 June 2020; La Porta *et al*., 2023). The new species added since the publication of the atlas were *Calopteryx haemorrhoidalis* (Van der Linden 1820) (Rossi *et al.,* 2018); *Coenagrion scitulum* (Rambur 1842) (Evangelista, 2009); *Somatochlora arctica* (Zetterstedt 1840) (Bionda *et al.,* 2013); *Leucorrhinia dubia* (Van der Linden 1825) (Bionda *et al.,* 2013); *Pan-*

tala flavescens (Fabricius 1798) (Piretta & Assandri, 2019), *Selysiothemis nigra* (Vander Linden 1825) (Subrero, 2014). Subsequently, three new species, i.e., *Lestes barbarus* (Fabricius 1798), *Coenagrion hastulatum* (Charpentier 1825), and *Trithemis annulata* (Palisot de Beauvois 1817), were discovered in less than four years, and this motivated this paper, which describes and contextualizes these new findings.

MATERIALS AND METHODS

The site at which *Lestes barbarus* was found is called Cascina Lai pond (Santena TO, Piedmont, NW Italy – 7.788° E; 44.936° N – EPSG: 4326 – 240 m a.s.l.). It is a long and wide ditch with rich aquatic vegetation, with *Typha latifolia* L. covering part of the banks. The hydrological regime is mainly temporary, with a water level that can vary from a few cm to ca. 110 cm. From an odonatological point of view, the site is well known, as it has been surveyed in the past by Evangelista (2011), and by GS in 2012. The site was visited 14 times between May and August 2021 by GS in the framework of the LIFE *Insubricus* project. A further 12 visits were performed between May and August of the years 2022 and 2023.

The site at which *Coenagrion hastulatum* was found is called Lac Falin (Usseglio TO, Piedmont, NW Italy - 7.177° E; 45.209° N - EPSG: 4326 – 1705 m a.s.l.; Fig. 1). This is a well-preserved transitional peat bog, a habitat (7140 - Transition mires and quaking bogs) listed by the EU Habitats Directive (Miserere *et al.,* 1997; Chiariglione, 2012). Further details on the site are reported by Cucco (2015). Lac Falin was surveyed by GA e LP four times in July – August 2021-2023 aiming at improving the odonatological knowledge of this important peat bog, which to date is not under any legal protection despite its high conservation value.

Following the first observation of *Trithemis annulata* for Piedmont reported in July 2020, we collated and reviewed the records available up to the end of 2023. To this aim, we merged our data and those of collaborators and consulted all the available repositories of citizen science: www.ornitho.it (last accessed: 26.12.2023); www.observation.org (no data available by 17.09.2023); www.inaturalist.org (last accessed: 26.12.2023). Nomenclature and systematics follow La Porta *et al*. (2023).

Fig. 1 – Lac Falin peat bog (TO; NW Italy). 14.08.2021. Photo: G. Assandri. / Torbiera di Lac Falin (TO; Italia Nord-Occidentale). 14.08.2021. Foto: G. Assandri.

RESULTS

Lestes barbarus (Fabricius 1798)

New data: 3 adults – 20.07.2021 (GS *observavit*); 1 immature male – 23.07.2022 (GS *legit*) – Cascina Lai pond. A voucher specimen collected on the second day is preserved in Giacomo Assandri's collection (Specimen ID: ASG1132; Fig. 2).

Coenagrion hastulatum (Charpentier 1825)

New data: several adults present and at least one pair mating – 15.07.2023 – Lac Falin (LP and E. Nigra *observavit*; Fig. 3).

Trithemis annulata (Palisot de Beauvois 1817)

New data: see Table 1.

In Piedmont, the first record of the species was one male on 20.07.2020 at Lago di Viverone (BI; A. Angiari *pers. com.*; Fig. 4). Subsequently, reports of the species in the region rapidly increased, with a total of 66 records relative to 29 sites of occurrence up to the end of 2023 (Table 1; Fig. 5). The sites are localized exclusively in lowland areas (90-355 m a.s.l.) in a variety of lentic habitats, among which quarry lakes have a considerable importance.

DISCUSSION AND CONCLUSIONS

With the inclusion of the three new species reported here, the checklist of the Odonata of Piedmont now includes 70 species. Furthermore, there is a historical record of *Gomphus pulchellus* Sélys 1840 kept in the "Ghilliani" collection at the Regional Museum of Natural Sciences of Turin, generically labelled as "Pedemontio" (=Piedmont) (Schneider & Utzeri, 1994). This addition makes Piedmont the most odonate-rich region of Italy (along with Lombardy), with 73.6% of the species known to occur in Italy (La Porta *et al.,* 2023). This particular faunal situation is probably attributable to the strong climatic and geomorphologic gradients that characterise the region, whose climate ranges from almost Mediterranean in the southern part (Apennines and Monferrato-Langhe hills) to Alpine in the Alps, with a strong rainfall heterogeneity and a considerable diversity of freshwater habitats.

Fig. 2 – Immature male *Lestes barbarus*. Artificial pond at Cascina Lai (TO; NW Italy). 20.07.2021. Photo: M. Pavia. First record for Piedmont. / *Lestes barbarus* maschio immaturo. Stagno artificiale presso Cascina Lai (TO, Italia Nord-Occidentale). 20.07.2021. Foto: M. Pavia. Primo dato per il Piemonte.

Fig. 3 – *Coenagrion hastulatum* (male and mating pair). Lac Falin peatbog (TO; NW Italy). 15.07.2023. Photo: L. Piretta/E. Nigra. First record for Piedmont. / *Coenagrion hastulatum* (maschio e coppia in accoppiamento). Tobiera di Lac Falin (TO, Italia Nord-Occidentale). 15.07.2023. Foto: L. Piretta/E. Nigra. Primo dato per il Piemonte.

Lestes barbarus is a widespread species in the central and western Palearctic. Historically limited to southern Europe prior to the mid-1990s, it has subsequently expanded northward, facilitated by its capacity to colonize temporary wetlands, likely benefiting from climate warming (Boudot & Kalkman, 2015). In Italy, the species occurs mainly in the centre and south of the peninsula, and in the main islands. Conversely, the species appears localized north to the Apennines, where it has established populations in Friuli-Venezia-Giulia, Veneto, and Emilia-Romagna (Riservato *et al.,* 2014a; Zandigiacomo *et al.,* 2014; Dal Cortivo & Roncen, 2019), becoming scarcer to the West (Lombardy, Trentino-Alto Adige) where probably only ephemeral populations exist (Lösch *et al.,* 2018; Assandri, 2019; Bazzi *et al.,* 2023). The records reported here represent the first for Piedmont (La Porta *et al.,* 2023). We cannot conclude that the observed individuals developed at the site, even though at least one individual appeared freshly metamorphosed. In fact, subsequent visits in 2022 and 2023 did not confirm the species, despite considerable research efforts.

In southern Europe, *Coenagrion hastulatum* is confined to higher elevations and is experiencing a decline in the western portion of its range (Boudot & Kalkman, 2015; Termaat *et al*., 2023). In Italy, the species is found only in the Alps, being widespread but localised in the east (Lösch *et al.,* 2018; Assandri, 2019; Bonometto, 2020; Zandigiacomo *et al.,* 2020), and rare proceeding westwards, with only a confirmed population in Lombardy (Balestrazzi *et al.,* 1983; Riservato *et al.,* 2014a). In 2012, three populations were discovered in the Aosta Valley, representing the first records from the western Italian Alps (Riservato *et al.,* 2014b). At least two of these sites still harbour populations of the species, but no populations have been discovered subsequently (D. Baroni, pers. com). The species is more common in the northern part of the western Alps, from the Savoie to the Valais, which are quite far from the Italian border (Wildermuth *et al.,* 2005; Deliry, 2008). The record presented here is the first for Piedmont (La Porta *et al.,* 2023). The record of mating pairs, the suitability of the habitat, and the fact that the species only disperses over limited distances suggest the occurrence of a stable autochthonous population. *Coenagrion hastulatum* is likely to have been overlooked in Piedmont until now, as it has probably occurred at a low density at Lac Falin for a long time. Most likely, it is genuinely rare in Piedmont, considering the relatively high and increasing research effort on Odonata in this region. Possible reasons for this rarity are the paucity of suitable habitats and the fact that *C. hastulatum* reaches here its European southern range limit (Boudot & Kalkman, 2015).

The occurrence site, Lac Falin peat bog, although of limited extension (4.5 ha) has a rich dragonfly community with large populations of tyrphophilous species overall scarce in Piedmont, including the southernmost population of *Leucorrhinia dubia* (Vander Linden 1825) known for Italy (Cucco, 2015). Lac Falin represents one of the few examples of acidic transitional mire for the western Italian Alps (Miserere *et al.,* 1997, 2003). These habitats are more common in the central and eastern Alps (Casella *et al.,* 2007; Assandri & Bazzi, 2022). Therefore, Lac Falin should be considered a true hotspot for biodiversity and should be adequately protected (Chiariglione, 2022), i.e., by the creation of a Special Area of Conservation according to the Habitats Directive 92/43/EEC.

Trithemis annulata is an Afrotropical species that in recent decades has widely expanded its range in the Mediterranean basin and Europe (Boudot & Kalkman, 2015). In Italy, by 2013, it was confined to southern and central Italy, reaching as far north as Romagna and Liguria (Fabbri, 2011; Riservato *et al.,* 2014a). The species further expanded northwards, reaching Lombardy by 2015, Veneto by 2018, where it has now established populations (Gheza *et al.,* 2019; Chiari *et al.,* 2020; www.ornitho.it), and even the Alps, with the first occurrences in Trentino-Alto Adige reported in summer 2023 (Puff *et al*., 2023).

In Piedmont, the species was first recorded in 2020. Between 2020-2022, it was observed mainly from late summer, with only three out of 29 records before September. Similarly, in 2023 all the records were from September onward, except for a site (Laghetto Vittoria, Cameri NO) where fresh individuals were reported from 5 June (Antonio Gennaro *observavit*), possibly supporting a successful overwintering of the nymphs at the site. A similar pattern was observed in Lombardy, where the first report for the region occurred in 2015, and spring observation associated with confirmed reproduction started in 2018 (Gheza *et al.,* 2019).

The colonization of Piedmont by *Trithemis annulata* has been most likely supported by the constant trend of temperature increase driven by climate warming, which is pushing southern odonate species towards the north (Subrero, 2014; Gheza *et al.,* 2019; Piretta & Assandri, 2019). Of the nine new species added to the regional list since the 2007 atlas (Boano *et al.,* 2007), five (*Calopteryx haemorrhoidalis, Coenagrion scitulum, Pantala flavescens, Selysiothemis nigra,* and *Trithemis annulata*) were probably supported in their spread by temperature increase. The other four *(Lestes barbarus, Coenagrion hastulatum, Somatochlora arctica, and Leucorrhinia dubia*) have been likely overlooked until recent years. This applies in particular to the last three, which are peatland species adapted to cold climates, rare and, in Italy, confined to the Alps.

Fig. 4 – Male *Trithemis annulata*. Lago di Viverone (BI; NW Italy). 20.07.2020. Photo: A. Angiari. First record for Piedmont. / *Trithemis annulata* maschio. Lago di Viverone (BI; Italia Nord-Occidentale). 20.07.2020. Foto: A. Angiari. Primo dato per il Piemonte.

Tab. 1 – Occurrence sites of *Trithemis annulata* in Piedmont from the first report of the species (2020) until the end of 2023. For each site, the first date of occurrence is given, along with the name of the first observer and the relative source (IN: www.inaturalist.org; O: www.ornitho.it; PC: personal communication; PO: personal observation), and the maximum number of observed individuals (if available). / Siti di presenza di *Trithemis annulata* in Piemonte a partire dalla prima conferma della specie (2020) fino alla fine del 2023. Per ogni sito è fornita la prima data di presenza, il nome del primo osservatore e la relativa fonte (IN: www.inaturalist.org; O: www.ornitho.it; PC: comunicazione personale; PO: osservazione personale), nonché il numero massimo di individui osservati (quando disponibile).

Map code	Locality	Municipality	Province	Lon (EPSG: 4326)	Lat (EPSG: 4326)	Elevation	Max	First date	First observer	First source
1	Lago di Viverone	Viverone	BI	8.048	45.415	231		2020-07-20	Andrea Angiari	IN
2	Castell'Apertole	Livorno Ferraris	VC	8.180	45.243	155	1	2020-09-09	Marco Porciani, Riccardo Cavalcante, Nicola Destefano	O
3	Lago di Cava presso C.na Clara & Buona	Alessandria	AL	8.595	44.871	98	2	2020-09-15	Alessio Martinoli	PC
4	Oasi La Madonnina	Sant'Albano Stura	CN	7.701	44.500	325		2020-09-22	Elio Giacone	IN
5	Lagone di Mercurago	Arona	NO	8.552	45.734	299	1	2020-10-11	Lorenzo Laddaga	PC
6	Palude di S. Genuario	Crescentino	VC	8.171	45.217	145	2	2021-09-04	Alfonso Di Rienzo, Lorenza Piretta	PC
7	Laghetto Vittoria	Cameri	NO	8.648	45.508	166	134	2021-09-15	Antonio Gennaro	IN
8	Laghetti della Falchera	Torino	TO	7.719	45.133	224	26	2021-09-28	Romeo Nicolini	PC
9	Torrente Chisola	Vinovo	TO	7.626	44.951	232	1	2022-08-22	Claudio Abbà	O
10	San Mauro Torinese	San Mauro Torinese	TO	7.765	45.102	222		2022-09-15	Arturo Ricalzone	IN
11	Centro Cicogne	Racconigi	CN	7.665	44.793	250		2022-09-17	Elio Giacone	IN
12	Cava presso Agnellengo	Momo	NO	8.540	45.571	209		2022-09-18	Antonio Gennaro	IN
13	Laghetto, Agnellengo	Barengo	NO	8.528	45.569	210		2022-09-20	Roberto Pegolo	IN
14	Lago Grande	Avigliana	TO	7.392	45.069	355	1	2022-09-27	Davide Giuliano	PC
15	Cave Ceretto	Carmagnola	TO	7.658	44.858	238	4	2022-10-19	Roberto Ostellino	IN
16	Lanche C.na Solferina	Oleggio	NO	8.689	45.607	156	1	2022-10-31	Nicola Pilon	O
17	Torrente Agogna, Mirasole	Momo	NO	8.549	45.553	199		2023-09-08		IN
18	Lago Borgarino	San Gillio	TO	7.515	45.131	330	7	2023-09-12	Paolo Marotto	IN
19	Lago Piccolo	Avigliana	TO	7.392	45.054	341	20	2023-09-17	Giacomo Assandri	PO
21	Dint. Dora Baltea	Rondissone	TO	7.974	45.252	189	1	2023-09-23	Foca G. Torchia	O
20	Lago di Cava	Rondissone	TO	7.944	45.240	211	1	2023-09-23	Foca G. Torchia	O
22	Laghi della Pellerina	Torino	TO	7.638	45.090	249	10	2023-09-24	Dario Pozzan	IN
23	Zona industriale	San Gillio	TO	7.544	45.140	302	3	2023-09-26	Paolo Marotto	O
24	Fiume Ticino	Robecco sul Naviglio	MI	8.839	45.405	99	2	2023-09-27	Marco Cazzola	IN
25	Garzaia di Valenza	Valenza	AL	8.644	45.052	90		2023-09-29	Matteo Paveto	IN
26	Lago di Arignano	Arignano	TO	7.889	45.047	294	8	2023-10-01	Lorenza Piretta	PO
27	Lago di Candia	Candia Canavese	TO	7.898	45.321	227	1	2023-10-01	Foca G. Torchia	O
28	Lago Sirio	Chiaverano	TO	7.884	45.486	268		2023-10-09	Lorenza Piretta	PO
29	Barbellotta	Novi Ligure	AL	8.833	44.746	217	1	2023-10-22	Nicola Larrorux	O

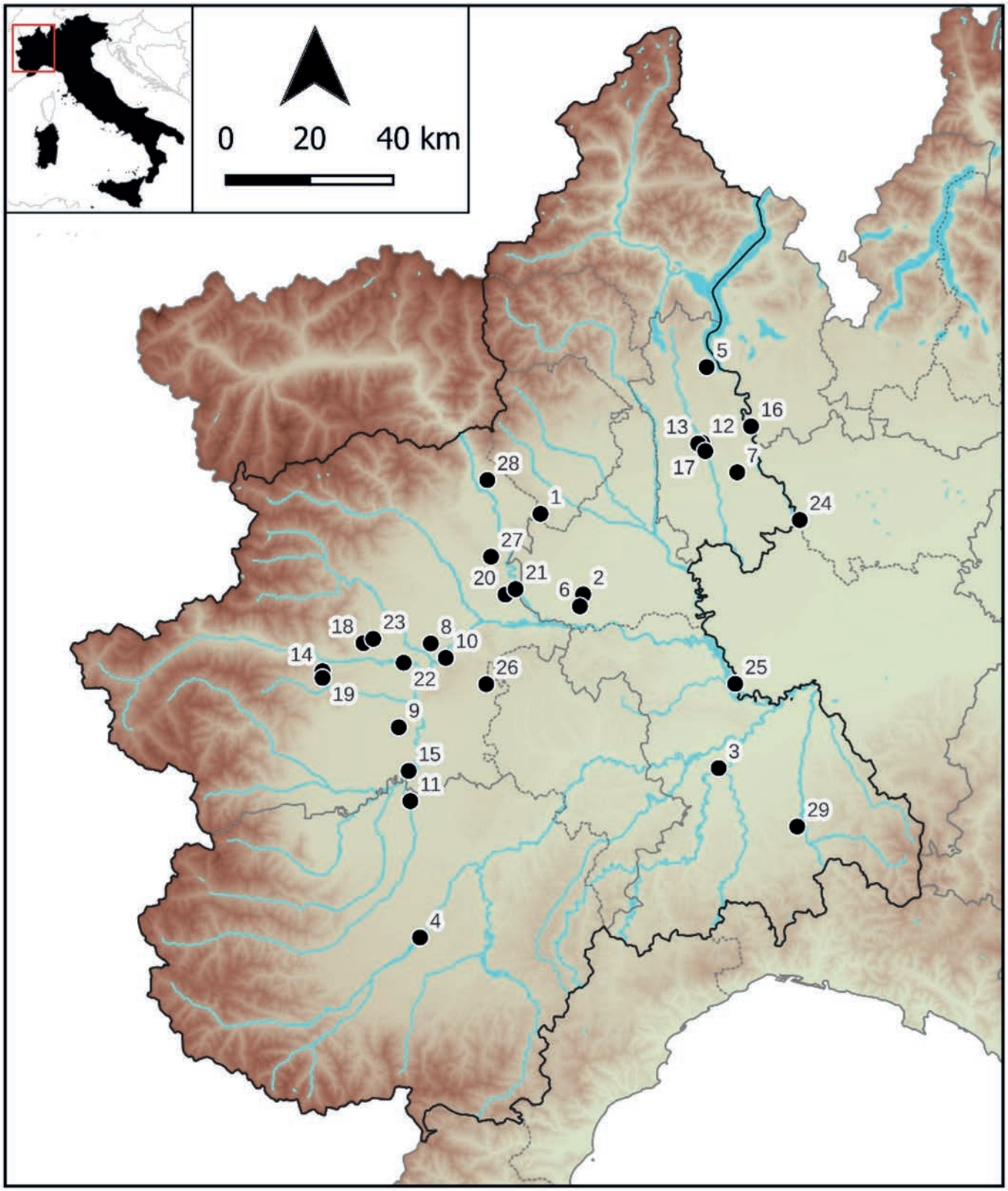

Fig. 5 – Distribution of the occurrence sites of *Trithemis annulata* in Piedmont from the first report of the species (2020) until the end of 2023. The numbers refer to Tab. 1. / Distribuzione dei siti di presenza di *Trithemis annulata* in Piemonte dalla prima segnalazione della specie (2020) alla fine del 2023. I numeri fanno riferimento alla Tab. 1.

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