Zeitschrift: Bollettino della Società ticinese di scienze naturali
Herausgeber: Società ticinese di scienze naturali
Band: 111 (2023)

Artikel: Contribution to the knowledge of alien Aedes and native Anopheles mosquitoes (Diptera: Culicidae) in Northwest Lombardy (Northern Italy)

Autor: Martignoni, Marco

DOI: https://doi.org/10.5169/seals-1044516

Contribution to the knowledge of alien *Aedes* and native *Anopheles* mosquitoes (Diptera: Culicidae) in Northwest Lombardy (Northern Italy)

Marco Martignoni

Piazza Giacomo Matteotti 25, 21050 Lonate Ceppino, Italy

marcomartignoni.sn@gmail.com

Abstract: Extemporaneous mosquito survey performed from May 2019 to October 2022 contributes to the knowledge of some alien *Aedes* and native *Anopheles* mosquito species in Northwest Lombardy (Northern Italy). The present findings extend and update the recent known distribution of *Aedes koreicus*, *Aedes japonicus japonicus*, *Anopheles claviger*, *Anopheles plumbeus*, *Anopheles maculipennis* s.s., *Anopheles messeae*/*Anopheles daciae* and provide further information on the ecology of these mosquito species, useful for better monitoring, control or conservation purposes.

Keywords: *Aedes koreicus*, *Aedes japonicus japonicus*, *Anopheles claviger*, *Anopheles plumbeus*, *Anopheles messeae*, *Anopheles daciae*, *Anopheles maculipennis*

Contributo alla conoscenza di zanzare (Diptera: Culicidae) aliene del genere *Aedes* e native del genere *Anopheles* in Lombardia nord-occidentale (Nord Italia)

Riassunto esteso

Introduzione: Le zanzare (Diptera: Culicidae) influenzano la salute e il benessere delle popolazioni umane e animali ma contribuiscono anche alla biodiversità di molti ecosistemi naturali. La distribuzione delle zanzare sia aliene che native, essendo condizionata da molti fattori (naturali e antropici), necessita di essere regolarmente aggiornata allo scopo di mettere in atto programmi della loro gestione tempestivi, ponderati ed efficaci. Lo scopo di questo lavoro è quello di acquisire maggiori conoscenze sulla distribuzione e l'ecologia di alcune specie di zanzare aliene del genere *Aedes* e autoctone del genere *Anopheles* nella Lombardia nord-occidentale (Nord Italia).

Materiali e metodi: Le raccolta di esemplari è stata effettuata tra Maggio 2019 e Ottobre 2022 in 66 siti distribuiti nella Lombardia nord-occidentale (nei territori della Città metropolitana di Milano e delle Province di Varese, Como e Sondrio), a quote comprese tra 91 m e 1'168 m s.l.m. (vedi Fig. 1, Tab. 1 e Appendice 2). Le larve e le pupe di 4° stadio sono state raccolte con un campionatore a mestolo (dipper) da 350 ml mentre le femmine adulte sono state catturate con un aspiratore raccordato a bicchieri di carta (Coluzzi & Petrarca 1973). Le uova delle zanzare del "Complesso Maculipennis" sono state raccolte nei siti di riproduzione con un dipper o ottenute dopo l'ovodeposizione forzata di femmine gravide, a loro volta catturate mentre riposavano al chiuso o ottenute da allevamento in laboratorio di larve e pupe raccolte in precedenza sul campo. I campioni sono stati quindi osservati con un microscopio ottico e identificati mediante criteri morfologici. La nomenclatura adottata in questo lavoro segue quella di Becker et al. (2020). Il materiale su cui si basano le osservazioni è conservato nella collezione privata dell'autore.

Risultati: In tabella 1 vengono sintetizzati i dati raccolti sul campo sulla presenza delle specie indagate, evidenziati in rosso nelle figure 2D, 3D, 4D, 5D, 6D, 7B e 8B. In particolare questo studio estende le attuali conoscenze sulla distribuzione e l'ecologia di *Ae. japonicus japonicus*, *Ae. koreicus*, *An. claviger*, *An. plumbeus* e *An. maculipennis* s.l. in Lombardia nord-occidentale. Tramite l'osservazione delle uova si è potuto inoltre confermare la presenza di almeno due membri del "complesso *maculipennis*" nell'area: *An. maculipennis* s.s. e *An. messeae*/*An. daciae* (la discriminazione fra queste ultime due entità necessita di indagini più sofisticate, non alla portata dell'autore). In Appendice 2 vengono riportati maggiori dettagli relativi ai siti e ai metodi di campionamento.

Discussione: È plausibile che la mancanza di precedenti segnalazioni di queste zanzare in vaste aree, come illustrato nelle mappe proposte (Figg. 2-8) sia dovuta a lacune nella loro ricerca piuttosto che alla loro effettiva assenza. I dati qui presentati, basandosi su ricerche estemporanee condotte nel tempo libero e con mezzi e attrezzature poco sofisticate, risultano di conseguenza puntiformi e non esaustivi; l'autore si augura comunque che questo studio possa fornire un modesto contributo alla conoscenza delle zanzare nella Lombardia nord-occidentale e che possa risultare in qualche modo utile per il monitoraggio, il controllo o la conservazione della fauna culicidica nell'area.

Parole chiave: *Aedes koreicus*, *Aedes japonicus japonicus*, *Anopheles claviger*, *Anopheles plumbeus*, *Anopheles messeae*, *Anopheles daciae*, *Anopheles maculipennis*

INTRODUCTION

Mosquitoes (Diptera: Culicidae) affect the health and well-being of human and animal (e.g. birds, livestock, pets) populations because of the risk of transmission of arthropod-borne diseases (malaria, filariasis and arboviruses) and the nuisance associated with their bites. However, they also contribute to biodiversity and increase the health of many natural ecosystems (made up of biodiversity) (Hawkes et al. 2020). Thus, knowledge of mosquitoes in specific regions (with accurate identification and information on distribution, density and autoecology) is important from a medical, veterinary, socio-economic and conservation point of view and can help us to design and implement thoughtful and effective mosquito-management programs. Environmental (natural and anthropogenic) and climate changes, together with globalization and interspecific competition phenomena, influence the distribution of both alien and native mosquitoes that, therefore needs to be regularly updated. This is particularly important in the European dynamic context, in which Lombardy can be considered an example of a territory which is under rapid and severe land cover changes (Fasolini et al. 2011; Sanesi et al. 2017). The spread of alien mosquito species of the genus *Aedes* is a cause of increasing concern in Europe owing to their potential role as vectors of arboviruses like Japanese encephalitis, Chikungunya, West Nile, Dengue and Tahyna virus (Schaffner et al. 2013; Medlock et al. 2015, Becker et al. 2020, Calzolari 2022). Native mosquito species of the genus *Anopheles* with very variable vectorial competence for human malaria parasites (mainly *Plasmodium vivax* and *Plasmodium falciparum*) occur widely all over Europe, even if their actual distribution and density are still poorly known and subject to spatio-temporal modifications (Bietolini et al. 2006; Novikov & Vaulin 2014; Hertig 2019; Calzolari et al. 2021, Bertola et al. 2022). The aim of this paper is to gain more knowledge on the distribution and the ecology of some alien *Aedes* and native *Anopheles* mosquito species in the Northwest of Lombardy, useful for medical, veterinary and conservation purposes.

MATERIALS AND METHODS

Study area

This study is based on mosquito collections carried out from May 2019 to October 2022 in 66 sites (see Fig. 1 and Tab. 1) distributed in four districts of the Northwest of Lombardy (Metropolitan City of Milan, Provinces of Varese, Como and Sondrio) at altitudes between 91 m and 1'168 m above sea level, in a variety of habitats. A detailed description of the sites utilized in this study is presented in Appendix 2. All sites, except one (site n. 1), were visited by the author of this paper. Site n. 29 was also visited in June 2008.

Species identification and nomenclature

Specimens were observed for morphological identification on a 1947' compound microscope (Wild Heerbrugg M9 AR, Heerbrugg, Switzerland, adjusted also at low magnifications as suggested by Amies 1953). Images in figures 2-8 were photographed with a digital eyepiece camera (Amscope MD500, Irvine, California, USA) mounted on the same microscope and USB-connected to a personal computer. Identification of the specimens was undertaken by morphological criteria as described in Tanaka et al. (1979), Ree (2003), Becker et al. (2020) and Severini et al. (2022) for *Aedes* adults and larvae; in Romi et al. (1997), Schaffner et al. (2001), Severini et al. (2009), Becker et al. (2020) and Severini et al. (2022) for *Anopheles* adults and larvae; and in Missiroli et al. (1935), Angelucci (1955), Gutsevich (1974), White (1978), Jetten & Takken (1994) and Becker et al. (2020) for Anopheles Maculipennis Complex eggs.
The nomenclature adopted in this paper follows that of Becker et al. (2020).
Collected voucher specimens are deposited in the personal collection of the author.

Collection of specimens

4th instar larvae and pupae were collected with a 350 ml WHO standard long-handled dipper (Valent Biosciences Corporation, Libertyville, USA), following the slow dipping technique described by Collins & Resh (1989) and O'Malley (1995) or (site n. 25) with a 3 ml plastic Pasteur pipette with the apex cut to 4 mm inner diameter. All pupae and some larvae were reared in laboratory up to the adult stage in order to observe further diagnostic characters. Adult female mosquitoes were captured with a home-made paper cup aspirator (based on the description of Coluzzi & Petrarca 1973) when landing on the author's legs or arms or resting inside and outside buildings. In one case (site n. 57) an *Anopheles maculipennis* s.l. female was caught with a Biogents BG-Sentinel mosquito trap baited with Biogents BG Lure (Biogents AG, Regensburg, Germany) attractive and a home-made CO_2 generator (mixtures of yeast, sugar and water prepared in bottles, based on the experiments of Smallegange et al. (2010). Anopheles Maculipennis Complex eggs were collected in breeding sites with a 350 ml WHO standard dipper or obtained after forced oviposition of gravid female. For the latter method gravid females in one site (site n. 64) were caught while resting indoor, in other two (sites n. 30 and n. 36) came from captivity colony following the procedure described below: emerging adults, obtained from 4th instar larvae or pupae collected in breeding sites were separated by sex and transferred into a paper-cup with netting and feed with 10 % sucrose solution. Ether-anaesthetized adults (males of at least 72 hours old and females at least 48-72 hours old), were than induced to mate (artificial mating was necessary because of the eurigamy of some species of the Anopheles Maculipennis Complex) by the simplified technique described by Ow Yang et al. (1963) and World Health Organization (1975) with the only difference that in our case female mosquitoes were blood-fed after and not before mating. Mated females rested in a paper-cup with netting and, after 2 days were allowed to feed blood from the

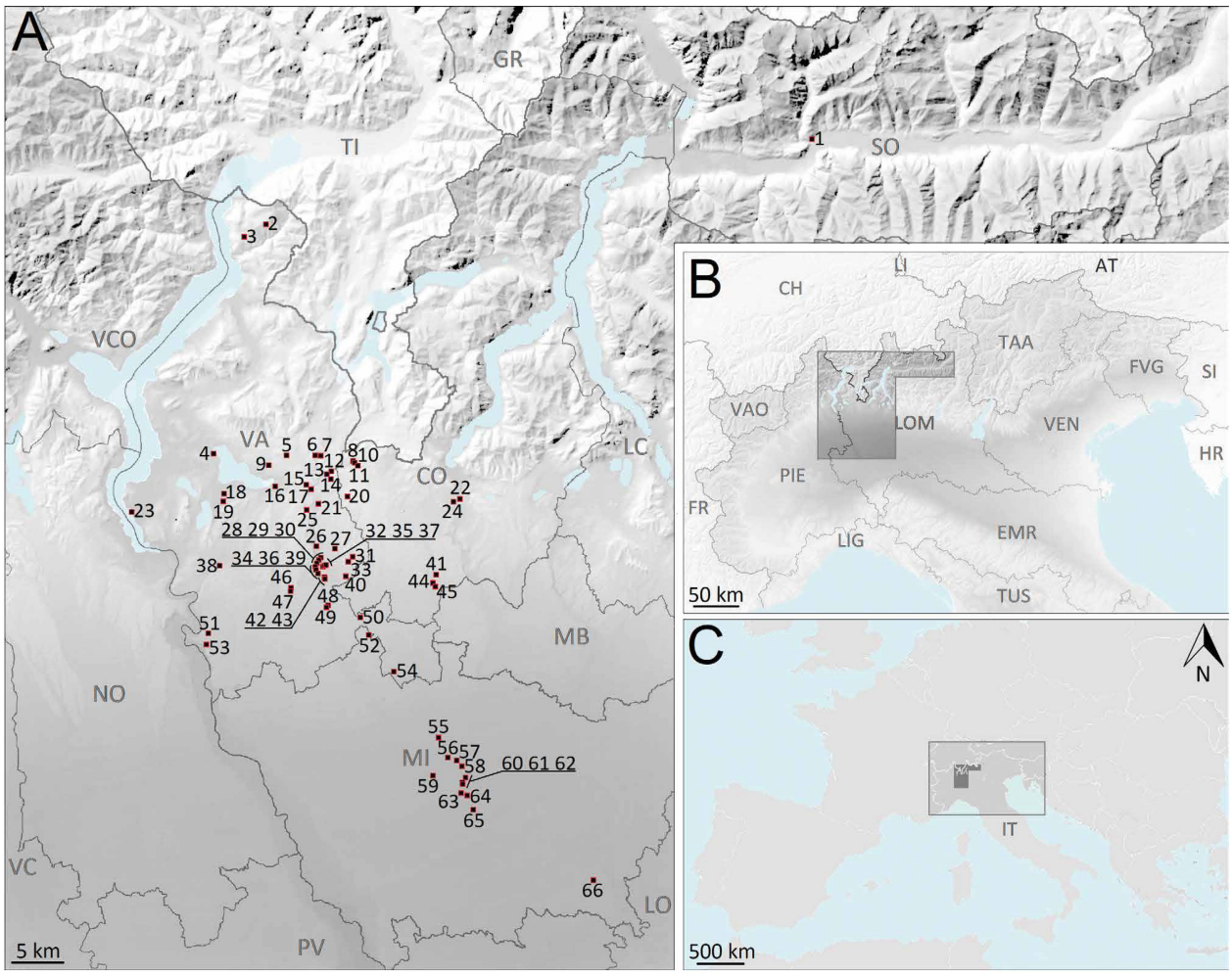

Figure 1: Study area and sampling sites of some *Aedes* and *Anopheles* species. A: Detailed map showing the study area and sampling locations (indicated with red dots, see also Tab. 1 and Appendix 2). Location of the study area (highlighted in dark grey) in North Italy (B) and Central Europe (C), respectively. The base map of B and C is modified from Tarquini et al. (2007). Abbreviations. European Countries: AT = Austria, CH = Switzerland, FR = France, HR = Croatia, IT = Italy, LI = Liechtenstein, SI = Slovenia; Swiss Cantons: TI = Canton Ticino, GR = Canton Grisons; Italian Regions: EMR = Emilia Romagna, FVG = Friuli Venezia Giulia, LIG = Liguria, LOM = Lombardy, PIE = Piedmont, TAA = Trentino-South Tyrol, TUS = Tuscany, VAO = Aosta Valley, VEN = Veneto; Districts of Lombardy: CO = Province of Como, LC = Province of Lecco, LO = Province of Lodi, MB = Province of Monza e Brianza, MI = Metropolitan City of Milan, SO= Province of Sondrio, VA = Province of Varese; Districts of Piedmont: NO = Province of Novara, VC = Province of Vercelli, VCO = Province of Verbania Cusio Ossola.

author's right forearm. Full-gravid females were finally forced to oviposit in 1.5 ml Eppendorf tubes with the technique described by Morgan (2015).

RESULTS

To the best of the author's knowledge, this manuscript reports new data regarding the following mosquito species, thus providing information on their ecology and distribution in the Northwest of Lombardy:

Aedes (Hulecoeteomyia) japonicus japonicus (Theobald, 1901)

Analysed *Ae. japonicus* specimens were collected in mixed deciduous woodlands, south-east of the Province of Varese (Fig. 2D, Tab. 1 and Appendix 2). Larvae and pupae were found in a concrete water trough (together with larvae and pupae of *Ae. koreicus*, *Ae. albopictus*, *Ae. rusticus* and *An. maculipennis* s.l.) half full of brown water (water containing large quantities of organic matter) while adult females were found outdoor (Appendix 2). *Aedes japonicus*, first found in Italy in 2015 by Seidel et al. (2016a), is currently known in Friuli Venezia Giulia, Veneto, Piedmont and Lombardy (see Fig. 2E and references in Appendix 1). Results confirm the presence of *Ae. japonicus* in Northwest Lombardy, about 15-20 km from the nearest previously reported ones in the Province of Como, Verbania Cusio Ossola (Piedmont) and Canton Ticino (southern Switzerland) (Fig. 2D).

Aedes (*Hulecoeteomyia*) *koreicus* (Edwards, 1917)

Analysed *Ae. koreicus* specimens were collected in woodlands, peri-urban and urban green areas. Larvae and pupae were found in artificial water-filled containers, south-east of the Province of Varese: in a 20 l bucket (together with larvae and pupae of *Ae. albopictus* and *An. plumbeus*) and a concrete trough (together with larvae and pupae of *Ae. japonicus japonicus*, *Ae. albopictus*, *Ae. rus-*

Table 1: Presence of the investigated *Aedes* and *Anopheles* species at 66 sampling sites. For further details on sampling sites and specimen collection see Appendix 2. Site numbers (Site #) are the same used in figure 1A and Appendix 2. Abbreviations: *Ae. jap. jap.* = *Aedes japonicus japonicus*; *Ae. kor.* = *Aedes koreicus*; *An. cla.* = *Anopheles claviger*; *An. plu.* = *Anopheles plumbeus*; *An. mac.* s.l. = *Anopheles maculipennis* s.l. (sensu lato); *An. mac.* s.s. = *Anopheles maculipennis* s.s. (sensu stricto); *An. dac./mes.* = *Anopheles daciae/messeae*.

Sampling sites		Species presence						
Site #	Municipality	*Ae. jap. jap.*	*Ae. kor.*	*An. cla.*	*An. plu.*	*An. mac.* s.l.	*An. mac.* s.s.	*An. dac./mes.*
1	Ardenno (SO)		●					
2	Veddasca (VA)					●	●	
3	Maccagno (VA)					●		
4	Bardello c. M. e B. (VA)					●		●
5	Varese (VA)		●					
6	Arcisate (VA)					●	●	
7	Cantello (VA)					●		
8	Valmorea & Rodero (CO)			●				
9	Varese (VA)					●	●	
10	Valmorea (CO)			●		●	●	
11	Valmorea (CO)					●	●	
12	Malnate (VA)					●	●	
13	Malnate (VA)					●		
14	Malnate (VA)					●		
15	Varese (VA)					●	●	
16	Buguggiate & Varese (VA)					●		●
17	Malnate (VA)					●	●	
18	Inarzo (VA)					●	●	
19	Casale Litta (VA)					●		
20	Binago (CO)					●	●	
21	Lozza (VA)					●	●	
22	Como (CO)					●	●	
23	Angera (VA)					●		●
24	Casnate c. B. (CO)					●		
25	Castiglione Olona (VA)				●			
26	Gornate Olona (VA)			●		●	●	
27	Tradate (VA)					●	●	●
28	Lonate Ceppino (VA)	●	●					
29	Lonate Ceppino (VA)	●	●		●			
30	Castelseprio (VA)					●	●	
31	Tradate (VA)					●	●	
32	Lonate Ceppino (VA)		●			●	●	
33	Tradate (VA)					●	●	

Sampling sites		Species presence						
Site #	Municipality	*Ae. jap. jap.*	*Ae. kor.*	*An. cla.*	*An. plu.*	*An. mac.* s.l.	*An. mac.* s.s.	*An. dac./mes.*
34	Castelseprio (VA)					●	●	
35	Lonate Ceppino (VA)		●					
36	Castelseprio (VA)					●	●	
37	Lonate Ceppino (VA)		●		●			
38	Arsago Seprio (VA)					●		●
39	Cairate (VA)					●	●	
40	Tradate (VA)		●					
41	Bregnano (CO)		●			●	●	
42	Lonate Ceppino (VA)		●		●			
43	Lonate Ceppino (VA)				●			
44	Lomazzo (CO)					●	●	
45	Lomazzo (CO)					●		●
46	Cassano Magnago (VA)					●	●	
47	Cassano Magnago (VA)					●		
48	Gorla Maggiore (VA)					●		
49	Gorla Maggiore (VA)					●	●	
50	Cislago (VA)	●	●			●	●	
51	Vizzola Ticino (VA)					●	●	
52	Rescaldina (MI)						●	
53	Vizzola Ticino (VA)		●					
54	Origgio (VA)					●	●	
55	Pero (MI)					●	●	
56	Milano (MI)					●		●
57	Milano (MI)					●	●	●
58	Milano (MI)					●		●
59	Settimo M.se (MI)					●		
60	Milano (MI)					●	●	
61	Milano (MI)					●	●	●
62	Milano (MI)					●	●	●
63	Milano (MI)					●		
64	Milano (MI)					●		●
65	Corsico (MI)					●		
66	San Giuliano M.se (MI)					●		

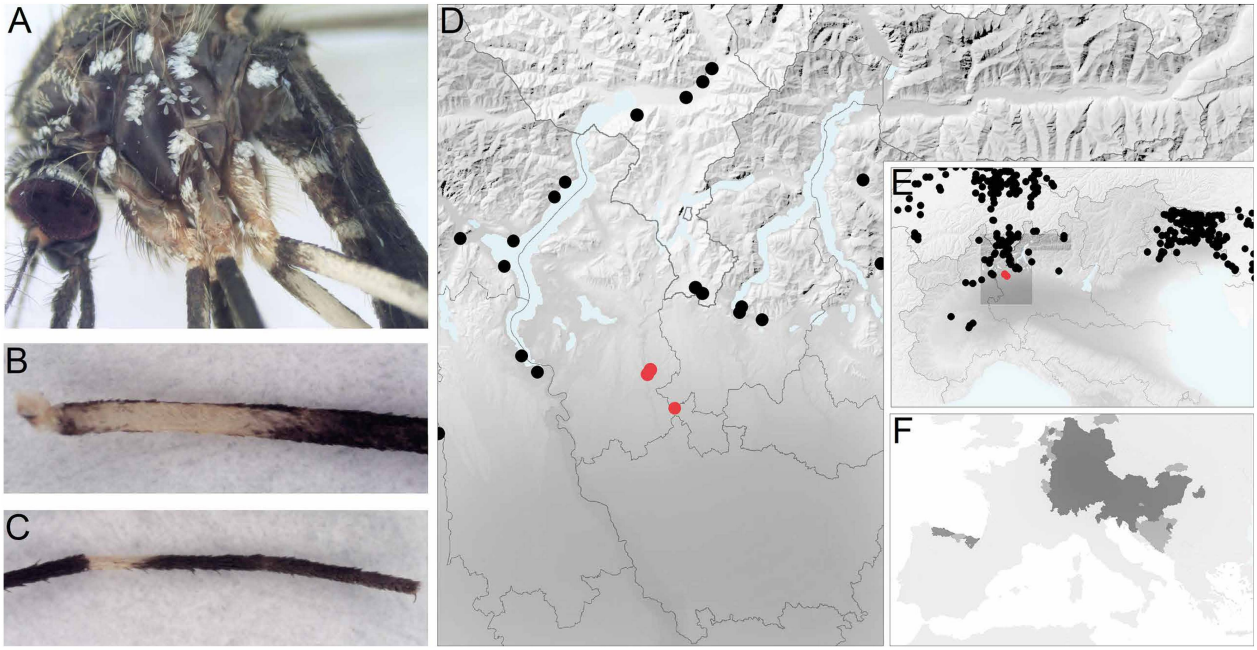

Figure 2: *Aedes japonicus japonicus*. A: Lateral view of thorax of adult female. B: Hind femur of adult female. C: Hind tarsus with tarsomeres III-V of adult female. D: Locations in the study area. E: Locations in North Italy (and neighbouring countries). F: Distribution in Central Europe at 'regional' administrative level. Black solid circles in D and E: distribution data according to references in Appendix 1; red solid circles in D and E: records from this paper, see also Tab. 1 and Appendix 2; grey areas in F: established (dark grey) or introduced (medium grey), according to [ECDC] (2023). Swiss data from [CSCF] - Info Fauna 2023 are shown in E but omitted in D as based on a 5 km × 5 km model grid resolution. Specimen in A, B and C collected in site n. 29, on 5.7.2019. The base map of D and E is modified from Tarquini et al. (2007).

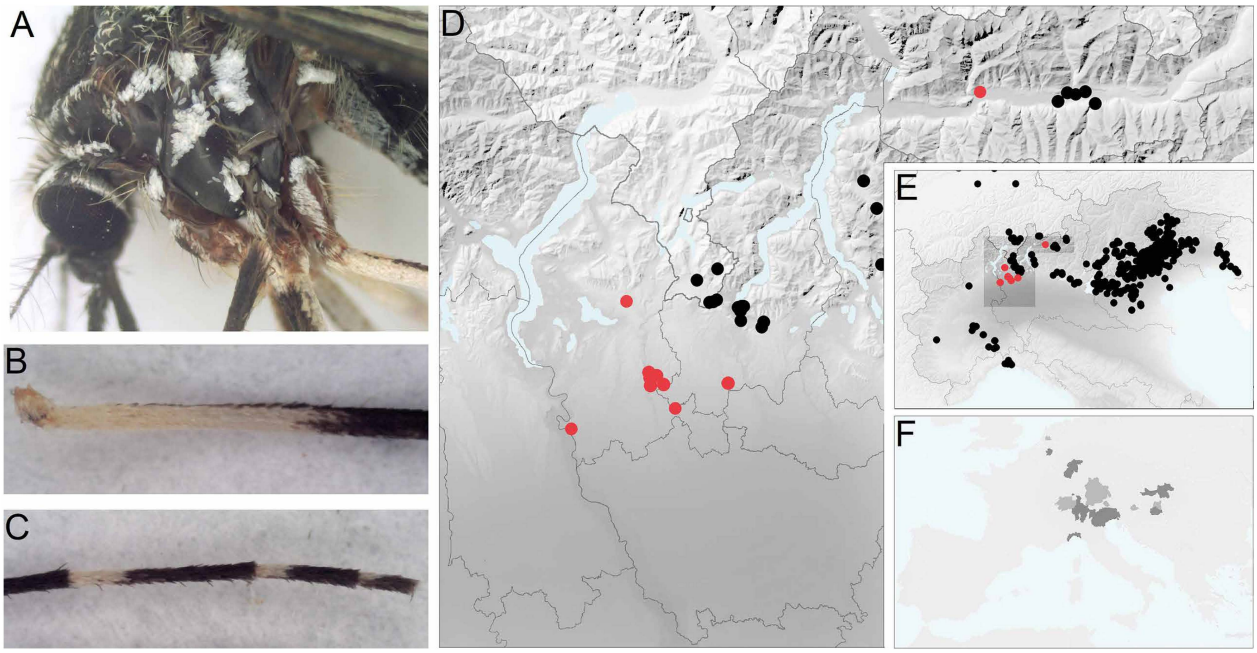

Figure 3: *Aedes koreicus*. A: Lateral view of thorax of adult female. B: Hind femur of adult female. C: Hind tarsus with tarsomeres III-V of adult female. D: Locations in the study area. E: Locations in North Italy (and neighbouring countries). F: Distribution in Central Europe at 'regional' administrative level. Black solid circles in D and E: distribution data according to references in Appendix 1; red solid circles in D and E: records from this paper, see also Tab. 1 and Appendix 2; grey areas in F: established (dark grey) or introduced (medium grey), according to [ECDC] (2023). Swiss data from [CSCF] - Info Fauna 2023 are shown in E but omitted in D as based on a 5 km × 5 km model grid resolution. Specimen in A, B and C collected in site n. 37, on 14.5.2020. The base map of D and E is modified from Tarquini et al. (2007).

ticus and *An. maculipennis* s.l.) in mixed deciduous woodlands, both half full of brown water, and two 1000 l tubs in a peri-urban garden, full of clear rainwater (together with larvae and pupae of *Ae. albopictus* and *An. maculipennis* s.l. and eggs of *An. maculipennis* s.s.) while adult females were found both outdoor (in woodlands and in a peri-urban garden) and indoor (in dwellings with gardens), in the Provinces of Varese, Como and Sondrio (Fig. 3D, Tab. 1 and Appendix 2). This alien species, first found in Italy in 2011 by Capelli et al. (2011), is currently reported in the Northern Italian Regions of Friuli Venezia Giulia, Veneto, Trentino-South Tyrol, Liguria, Piedmont and Lombardy (Fig. 3E and references in Appendix 1). Results confirm the presence of *Ae. koreicus* in Northwest Lombardy, in localities about 10-15 km far from the nearest previously reported ones in the Provinces of Como, Sondrio (Lombardy) and Canton Ticino (southern Switzerland) (Fig. 3D).

***Anopheles (Anopheles) claviger* s.s. (Meigen, 1804)**
Analysed *An. claviger* larvae and pupae were collected in cold, slowly flowing freshwater (springs and stream pools) of Olona valley (Province of Varese) and Lanza valley (Province of Como) (Fig. 4D, Tab. 1 and Appendix 2). Previous reports of *An. claviger* in Northwest Lombardy are dated more than a century ago in "malarial woods of Ticino" valley (by Grassi 1898, 1901 without specifying the district and region), near Sondrio (Province of Sondrio, Galli-Valerio B. 1902) and Porlezza (Province of Como, Galli-Valerio B. & Rochaz-de Jongh J. 1903), all sub *An. bifurcatus* Meigen, 1818. More recent data refer to the neighbouring territories of Piedmont (Provinces of Verbania Cusio Ossola and Novara) and Switzerland (Canton Ticino), about 5-15 km from present data reports (Fig. 4D and references in Appendix 1).

***Anopheles (Anopheles) plumbeus* (Stephens, 1828)**
Analysed *An. plumbeus* specimens were all collected in the Province of Varese (Fig. 5D, Tab. 1 and Appendix 2). Larvae and pupae were found in one case in a water-filled tree-hole (*Quercus robur* L., isolated tree in countryside), in other cases in artificial containers with brown water, in a mixed deciduous woodland (a 20 l bucket, together with *Ae. albopictus* and *Ae. koreicus* larvae and pupae and two 50 l barrels, together with *Ae. albopictus* larvae and pupae) confirming the adaptivity of this species to artificial breeding sites (as reported by Bertola 2022, see also Appendix 2). Adult females were found outdoor, in woodlands and in an urban garden. Previous reports of *An. plumbeus* in Northwest Lombardy are dated more than a century ago in "malarial woods of Ticino" valley (by Grassi 1898, 1901 without specifying the district and region), Rovellasca (Province of Como, Grassi 1898), Lago del Piano (Province of Como, Galli-Valerio & Rochaz-de Jongh 1903), all sub. *An. bifurcatus* Meigen, 1818 var. *nigripes*. Like *An. claviger*, more recent data refer only to the neighbouring territories of Piedmont (Provinces of Verbania Cusio Ossola and Novara) and Switzerland (Canton Ticino), about 10-15 km from present data reports (Fig. 5D and references in Appendix 1).

Anopheles Maculipennis Complex
– *Anopheles (Anopheles) maculipennis* s.l. (sensu lato)
Anopheles maculipennis sensu lato (s.l.) is a species complex (i.e., the Maculipennis Complex or Maculipennis Group) consisting of more than a dozen separate spe-

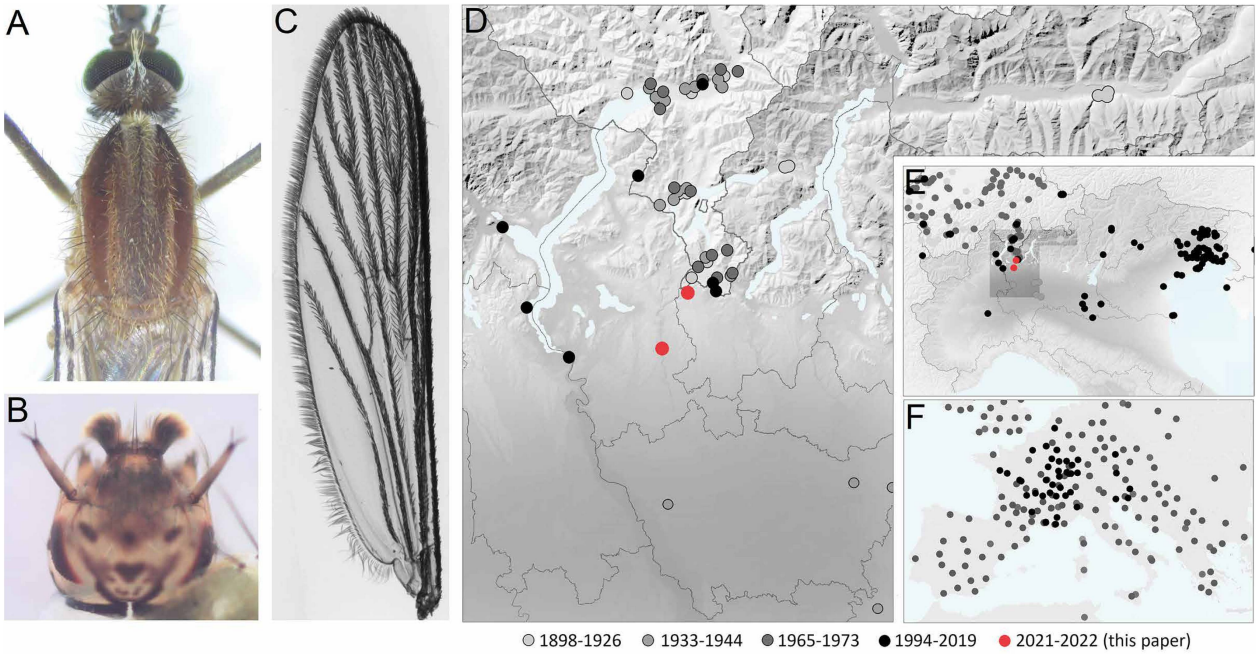

Figure 4: *Anopheles claviger*. A: Dorsal view of head and thorax of adult female. B: Wing of adult female. C: Dorsal view of the head of 4th instar larva. D: Locations in the study area. E: Locations in North Italy (and neighbouring countries). F: Locations in Central Europe. Black and grey solid circles in D, E and F: distribution data according to references in Appendix 1. Red solid circles in D and E: records from this paper, see also Tab. 1 and Appendix 2. The date ranges of the reports are shown at the bottom of the figure. Swiss data from [CSCF] - Info Fauna 2023 are shown in E but omitted in D as based on a 5 km × 5 km model grid resolution. Specimens in A, B and C collected in site n. 26, on 5.9.2021. The base map of E and F is modified from Tarquini et al. (2007).

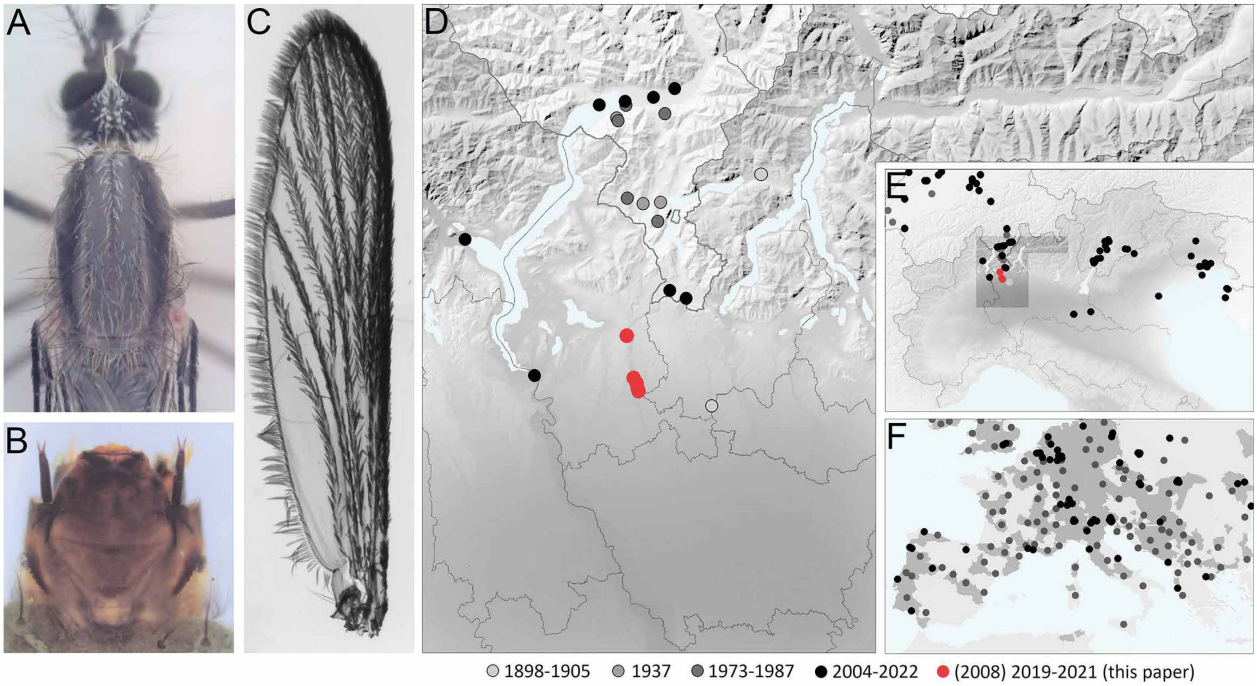

Figure 5: *Anopheles plumbeus*. A: Dorsal view of head and thorax of adult female. B: Wing of adult female. C: Dorsal view of the head of 4th instar larva. D: Locations in the study area. E: Locations in North Italy (and neighbouring countries). F: Distribution in Central Europe. Black and grey solid circles in D, E and F and dark areas in D: distribution data according to references in Appendix 1. Red solid circles in D and E: records from this paper, see also Tab. 1 and Appendix 2. The date ranges of the reports are shown at the bottom of the figure. Swiss data from [CSCF] - Info Fauna 2023 are shown in E but omitted in D as based on a 5 km × 5 km model grid resolution. Adult specimen in A and C from larva collected in site n. 43, on 31.8.2021; larval specimen in B collected in site n. 25, on 8.7.2020. The base map of E and F is modified from Tarquini et al. (2007).

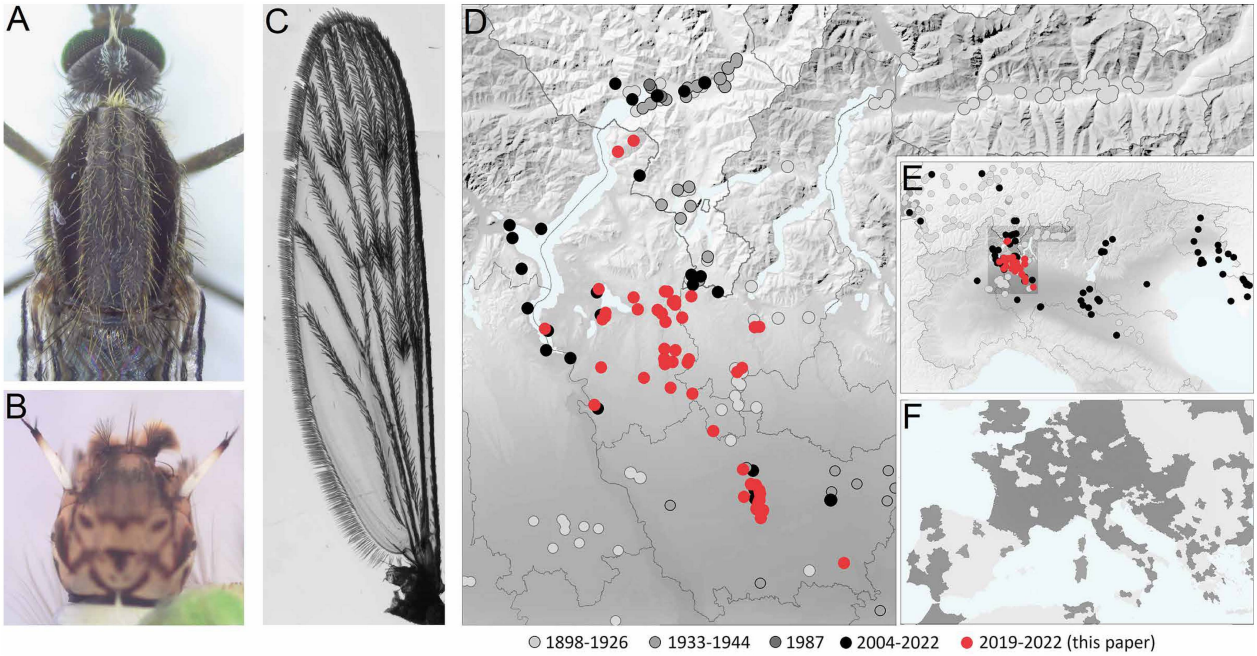

Figure 6: *Anopheles maculipennis* s.l. A: Dorsal view of head and thorax of adult female. B: Wing of adult female. C: Dorsal view of the head of 4th instar larva. D: Locations in the study area. E: Distribution in North Italy (and neighbouring countries). F: Distribution in Central Europe at 'regional' administrative level according to [ECDC] (2023). Black and grey solid circles in D and E and dark areas in F: distribution data according to references in Appendix 1. Red solid circles in D and E: records from this paper, see also Tab. 1 and Appendix 2. The date ranges of the reports are shown at the bottom of the figure. Swiss data from [CSCF] - Info Fauna 2023 are shown in E but omitted in D as based on a 5 km × 5 km model grid resolution. Specimens in A, B and C collected in site n. 26, on 5.9.2021. The base map of E and F is modified from Tarquini et al. (2007).

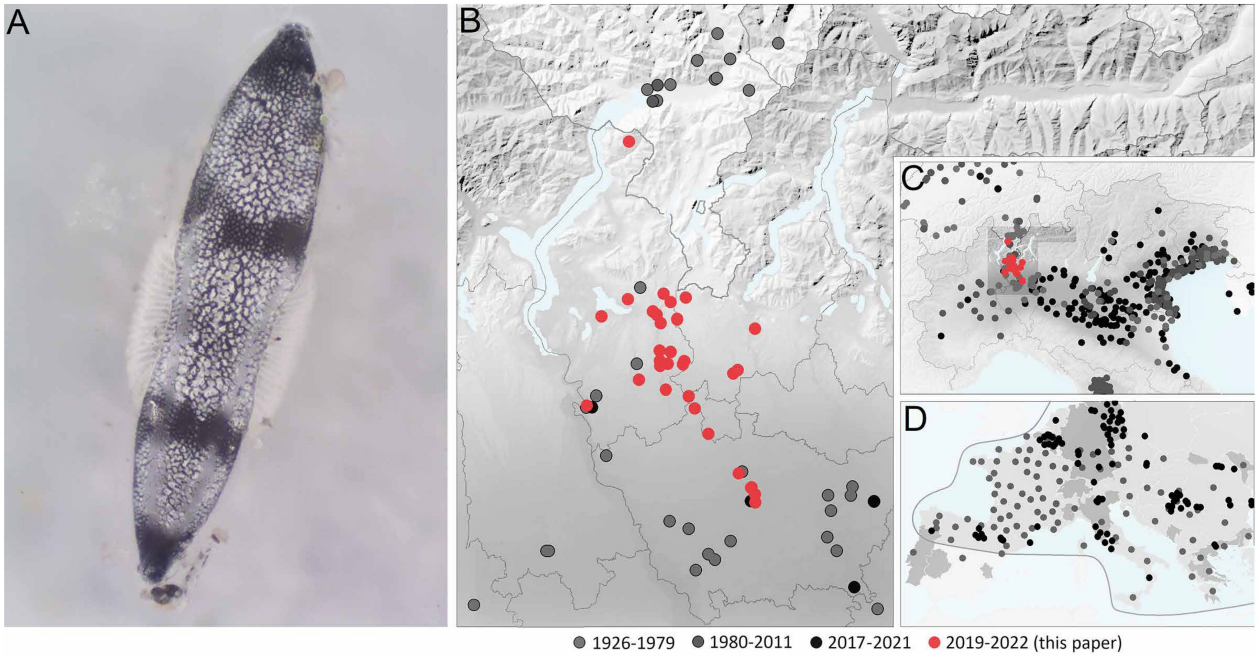

Figure 7: *Anopheles maculipennis* s.s. A: Egg (collected in site n. 27, on 11.8.2020). B: Locations in the study area. C: Locations in North Italy. D: Distribution in Central Europe. Black and grey solid circles in B, C and D and dark areas in D: distribution data according to references in Appendix 1. Black curve line in D: south-western limit distribution according to White (1978), Carnevale & R. (2009) and Novikov & Vaulin (2014). Red solid circles in B and C: records from this paper, (see also Tab. 1 and Appendix 2). The date ranges of the reports are shown at the bottom of the figure. Swiss data from [CSCF] - Info Fauna 2023 are shown in C but omitted in B as based on a 5 km × 5 km model grid resolution. The base map of B and C is modified from Tarquini et al. (2007).

cies (9 of which occur in Europe, Becker et al. 2020) differing in distribution, behaviour, ecology and vectorial capacity for malaria. These species are distinguishable with molecular tools or, morphologically with acceptable (but in some cases not exhaustive) results only on the basis of egg features. Due to the poor means of this study, specimens were identified by observing their morphology with an optical microscope therefore larvae, pupae and adults of this complex not identifiable to species level (only *An. sacharovi* can be excluded), had to be ascribed to *An. (Anopheles) maculipennis* s.l. (sensu lato), providing however new recent data about their distribution in the Northwest of Lombardy (Fig. 6D). The *An. maculipennis* s.l. larvae and pupae analysed were collected in a variety of natural and artificial breeding site while adult females were collected while resting indoor or in semi-outdoor lobbies, in the Provinces of Varese and Como and the Metropolitan City of Milan (Fig. 6D, Tab. 1 and Appendix 2).
Furthermore, the observation of the eggs collected in breeding sites or obtained from gravid females, allowed me to refine the identification and confirm the presence in the study area of *An. maculipennis* s.s. and *An. messeae*/*An. daciae*:

– *Anopheles (Anopheles) maculipennis* s.s. (sensu stricto) (Meigen, 1818)

The *An. maculipennis* s.s. eggs analysed were collected both in natural and artificial breeding sites (see Appendix 2). Previously reported in Northwest Lombardy in the Province of Varese and the Metropolitan City of Milan (Tagliabue & Perilli 1936; Frizzi 1952, later reported also by Bietolini et al. 2006), this species was more recently confirmed to be widespread in the north of Italy (see references in Appendix 1). Results of the present paper extend the recent known distribution of this species in some territories of Northwest Lombardy particularly in the highlands of the Provinces of Varese and Como (Fig. 7B, Tab. 1 and Appendix 2).

– *Anopheles (Anopheles) messeae* (Falleroni, 1926) / *Anopheles (Anopheles) daciae* (Linton, Nicolescu and Harbach, 2004)

The recently described *An. daciae* was mistaken for *An. messeae* in the past because the eggs of these two species are quite similar (Nicolescu et al. 2004). In the dichotomous keys used in this study (see materials and methods) the eggs of *An. daciae* could be identifiable as those of *An. messeae*; for this reason, I provisionally refer to my findings as *An. messeae* confer (cfr.) *An. daciae* (*An. messeae*/*An. daciae*) as the discrimination between these two closely related species requires more sophisticated means such as molecular studies or more accurate morphological analyses. Similarly, past reports of *An. messeae* that do not take into account the differences between these two species must be taken with caution and considered as *An. messeae*/*An. daciae*.
The *An. messeae*/*An. daciae* eggs analysed in this study were collected in a variety of breeding sites (see Appendix 2), mainly natural or semi-natural (including rice fields). Indoor-resting females were also collected in site n. 64. *Anopheles daciae*, reported in Italy by some authors (blue dots in Fig. 8C, see references in Becker et al. [2020] and in Appendix 1), was recently confirmed to be widespread in the Po plain, including two districts of Northwest Lombardy (in the Province of Varese and the Metropolitan City of Milan, Fig. 8B and Fig. 8C, blue dots) by Calzolari et al. (2021), sub

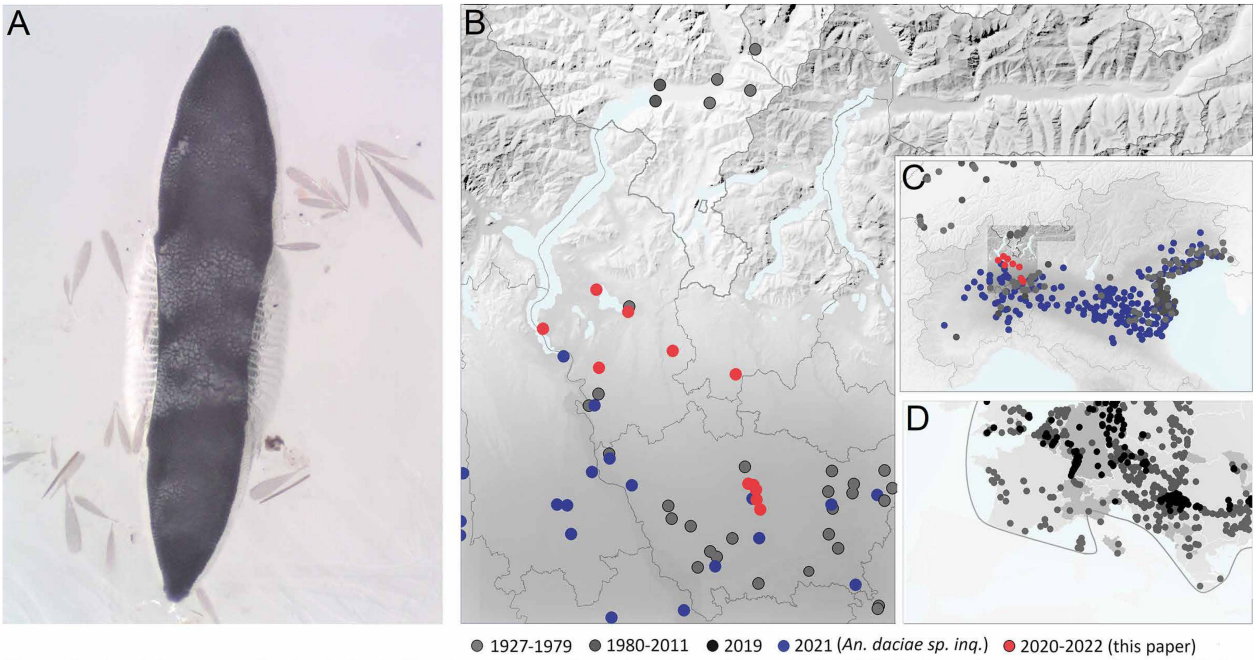

Figure 8: *Anopheles messeae* cfr. *An. daciae* A: Egg (specimen collected in site n. 64, on 12.7.2020). B: Locations in the study area. C: Locations in North Italy. D: Distribution in Central Europe. Black and grey solid circles in B, C and D and dark areas in D: distribution data according to references in Appendix 1 (Note: past reports that do not take into account the differences between the two species are considered as *An. messeae*/*An. daciae*). Black curve line in D: south-western limit distribution according to Carnevale & R. (2009). Red solid circles in B and C: records from this paper (see also Tab. 1 and Appendix 2). Blue solid circles in B and C: distribution data of *An. daciae sp. inq.* according to Calzolari et al. (2021). The date ranges of the reports are shown at the bottom of the figure. Swiss data from [CSCF] - Info Fauna 2023 are shown in C but omitted in B as based on a 5 km × 5 km model grid resolution. The base map of B and C is modified from Tarquini et al. (2007).

An. daciae species inquirenda (*sp. inq.*). The results of the present paper extend and update the recent known distribution of *An. messeae*/*An. daciae* in some territories of Northwest Lombardy particularly in the highlands of the Provinces of Varese and Como (Fig. 8B, Tab. 1 and Appendix 2).

DISCUSSION

It is plausible that the lack of previous reports of the mosquito species treated in this study in large areas (at local and regional scale), as illustrated in the proposed maps in figures 2-8, is due to spatio-temporal gaps in research rather than their actual absence. Recent studies (Calzolari et al. 2010; Calzolari et al. 2021; Calzolari et al. 2022; [ECDC] 2023) on the distribution of mosquitoes are in fact either based on large areas but with incomplete coverage or concentrated on areas of reduced extension and/or focused on single mosquito species control campaigns or arboviruses surveillance programs while past studies (Galli-Valerio 1902; Galli-Valerio 1905; Tagliabue 1936; Borrani 1937) on *Anopheles* mosquitoes were, for obvious reasons, concentrated in areas with a high incidence of malaria. Moreover, mosquito species distribution (especially the alien ones) is dynamic and continuously changing (Bietolini et al. 2006; Medlock et al. 2012; Schaffner et al. 2013; Novikov & Vaulin 2014; Hertig 2019; Bertola et al. 2022) and thus needs to be regularly updated and refined. The data here presented, as based on extemporaneous mosquito survey conducted in the spare time and with very limited means and equipment, are consequently punctual and not exhaustive. Nevertheless, the author hopes that this study contributes to increase our knowledge of mosquitoes in Northwest Lombardy and provides at least some support to improve monitoring, control or conservation actions.

ACKNOWLEDGEMENTS

I am grateful to Claudia Longhi (Provincia di Varese, Gestione Aree Protette), Silvio Anderloni (Italia Nostra), Gabriele Pozzi and Andrea Mologni (Parco Pineta), Mario Roberto Girelli and Paolo Ventura (Parco delle Groane e della Brughiera Briantea) and Adriano Martinoli (Università degli Studi dell'Insubria) for collecting permits and access to protected and institutional areas; Alberto Fioriti, Renato Mancon, Marco Restelli and Carlo Tognola for facilitating collection in private sites; Federico Del Barba for alerting me of the presence of *Ae. koreicus* in Ardenno (site n. 1); Danilo Baratelli and Nicola Pilon for suggesting natural sampling sites; Angioletta Bianchi Cervini and Luana Fioriti for the English language review. Thank you also to Eleonora Flacio for valuable comments on the manuscript and Brigitte Marazzi for editorial assistance.

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APPENDIX

Appendix 1: References (see Literature Cited) reporting the occurrence of mosquito species in European countries and Regions of Northern Italy, reported in the maps in figures 2-8. Abbreviations. European Countries: AT = Austria, CH = Switzerland, FR = France, HR = Croatia, IT = Italy, LI = Liechtenstein, SI = Slovenia; Italian Regions: EMR = Emilia Romagna, FVG = Friuli Venezia Giulia, LIG = Liguria, LOM = Lombardy, PIE = Piedmont, TAA = Trentino-South Tyrol, VEN = Veneto.
* = *An. daciae sp. inq.* ** = sub *An. claviger* (Fabricius, 1805) auct. nec Meigen, 1804

		Aedes		*Anopheles*				
		j. japonicus	***koreicus***	***claviger***	***plumbeus***	***maculipennis* s.l.**	***maculipennis* s.s.**	***daciae/messeae***
EUROPE		Cunze et al. 2016 Eritja et al. 2021 [ECDC] 2023	[ECDC] 2023 Ganassi et al. 2022	Coluzzi et al. 1965 Ramsdale & S. 2000 Schaffner et al. 2003	Ramsdale & S. 2000 Bertola et al. 2022 [ECDC] 2023	[ECDC] 2023	Ramsdale & S. 2000 Carnevale & R. 2009 Novikov & V. 2014 Bertola et al. 2022	Ramsdale & S. 2000 Kuhn et al. 2002 Carnevale & R. 2009 Piperaki & D. 2016 Bertola et al. 2022
EUROPEAN COUNTRIES	**AT**	Seidel et al. 2016a Seidel et al. 2016b Koban et al. 2019						
	CH	Schaffner et al. 2009 [GLZ & FBM] 2015 Koban et al. 2019 Müller et al. 2020 [CSCF] - Info Fauna 2023	Suter 2015 [GLZ & FBM] 2015 Müller et al. 2020 [CSCF] - Info Fauna 2023	Galli-Valerio & R. 1903 Galli-Valerio 1905 Galli-Valerio 1917 Bangerter 1926 Borrani 1937 Gaschen & B. 1944 Briegel 1973 Flacio et al. 2014 [CSCF] - Info Fauna 2023	Borrani 1937 Briegel 1973 Focarile 1987 Flacio et al. 2014 Flämig & Flacio 2018 [CSCF] - Info Fauna 2023	Galli-Valerio & R. 1903 Galli-Valerio 1905 Galli-Valerio 1917 Bangerter 1926 Borrani 1937 Gaschen 1940 Gaschen & B. 1944 Focarile 1987 Flacio et al. 2014 Flämig & Flacio 2018 [CSCF] - Info Fauna 2023	Gaschen 1940 Gaschen 1944 Briegel 1973 Briegel 2002 [CSCF] - Info Fauna 2023	Gaschen 1940 Gaschen & B. 1944 Briegel 1973 Briegel 2002 [CSCF] - Info Fauna 2023
	FR			Schaffner et al. 2003				
	HR			Merdić et al. 2008	Merdić et al. 2008	Merdić et al. 2008	Vignjević 2014	
	IT			Schaffner et al. 2003 Busani et al. 2012			Bietolini et al. 2006 Busani et al. 2012 Calzolari et al. 2021	Bietolini et al. 2006 Busani et al. 2012 Calzolari et al. 2021*
	LI	Seidel et al. 2016b Koban et al. 2019						
	SI	Seidel et al. 2016a Kalan et al. 2017 Koban et al. 2019		Schaffner et al. 2003				
ITALIAN REGIONS	**EMR**					Falleroni 1926** Calzolari et al. 2022		
	FVG	Seidel et al. 2016a Koban et al. 2019 Montarsi et al. 2019 Ministero d. S. 2019 Gradoni et al. 2021	Montarsi et al. 2015 Zamburlini & C. 2015 Zamburlini et al. 2019 Gradoni et al. 2021	Zamburlini & C. 1998a Zamburlini & C. 1998b Zamburlini & C. 1998c Zamburlini et al. 2019	Zamburlini et al. 2019	Zamburlini et al. 2019	Zamburlini & C. 1998a Toma et al. 2008 Zamburlini et al. 2019	Zamburlini & C. 1998a Zamburlini et al. 2019
	LIG		Ballardini et al. 2019 Arnoldi et al. 2022					
	LOM	Arnoldi et al. 2022	Montarsi et al. 2015 Suter 2015 Negri et al. 2021 Arnoldi et al. 2022	Grassi 1898 Grassi 1901 Galli-Valerio 1902 Galli-Valerio & R. 1903 Piccinini 1933 Ascoli et al. 2006 Drago et al. 2012	Grassi 1898 Grassi 1901 Galli-Valerio & R. 1903 Toma 2004 Ascoli et al. 2006	Grassi 1898** Grassi 1901** Galli-Valerio 1902 Galli-Valerio & R. 1903 Falleroni 1926** Piccinini 1933 Toma 2004 Calderara 2006 Ascoli et al. 2006 Soncin et al. 2008 Calzolari et al. 2010 Drago et al. 2012 Flacio et al. 2014 Chiari et al. 2016	Piccinini 1933 Tagliabue 1936 Frizzi 1952	Piccinini 1933 Tagliabue 1936 Frizzi 1952
	PIE	IPLA 2020 Mosca 2021 Bruciaferri 2021 Arnoldi et al. 2022 Mosca et al. 2022	Mosca 2021 Arnoldi et al. 2022 Mosca et al. 2022	Calderara 2005	Calderara 2005	Falleroni 1926** Rossi et al. 1999 Calderara 2005	Falleroni 1926 Talbalaghi & S. 2011	Talbalaghi & S. 2011
	TAA		Montarsi et al. 2015 Ministero d. S. 2019	Tagliapietra et al. 2019	Tagliapietra et al. 2019	Tagliapietra et al. 2019	Tagliapietra et al. 2019	
	VEN	Montarsi et al. 2019 Ministero d. S. 2019 Gradoni et al. 2021	Montarsi et al. 2013 Montarsi et al. 2015 Ministero d. S. 2019 Gradoni et al. 2021	Zamburlini & C. 1998a Zamburlini & C. 1998b Zamburlini & C. 1998c Toma et al. 2008	Toma et al. 2008	Falleroni 1926** Cancrini et al. 2003	Zamburlini & C. 1998a Toma et al. 2008	Zamburlini & C. 1998a

Appendix 2: Details on sampling sites and specimen collection, with dates and methods of collection. The sites' numbers (Site #) are the same used in figure 1A and table 1. Coordinates are in World Geodetic System 84 (WGS84), in some cases approximated for privacy protection. Altitudes (Alt.) are in meters above sea level. Dates of collection are reported as dd.mm.yyyy.
Abbreviations.
Landscape (Lan.): Fvf = Fluvial valleys (flood plain), Fvr = Fluvial valleys (risers), Il = Insubric lakes, Lp = Lower plain, Mh = Morainic hills, Mm = Mountains (metamorphic), Ms = Mountains (sedimentary), Udp = Upper diluvial plain, Vf = Valley floor.
Ecosystem (Eco.): C = Crops, Me = Meadows, Pa = Pastures, Pe = Peri-urban (urban-rural/natural), U = Urban, W = Woodlands, Wma = wet Woodlands and marshes, Wme = wet Woodlands and flooded meadows.
Habitat (Hab.): Ac = Artificial containers, Di = Ditches, G = Garden (with trees), Ib = Inside buildings, Ob = Outside buildings, Pds = Puddles in drying stream bed, Po = Pool (small or medium), Pu = Puddles (on path), Qp = Quarry pond, Rb = Reed beds, Rf = Rice fields, Rm = River margins, Sp = Stream pool, Spm = Semi-permanent marsh, Sw = Spring wells , Swa = Swamp, Tdf = Temperated decidous forest, Th = water-filled Tree holes, Up = Urban Park, Vp = Vernal (temporary) pool.
Collection methods (superscript on dates): BGT = BG-Sentinel mosquito trap, EC = Eggs Collection, EO = Eggs Oviposition, IHLC = Indoor Human Landing Collection, IRC = Indoor Resting Collection, LC = Larval Collection (larvae and pupae), OHLC = Outdoor Human Landing Collection, SORC = Semi-Outdoor Resting Collection.

Sampling sites								Dates and methods of specimens collection						
								Aedes		*Anopheles*				
Site #	**Municipality**	**Toponim**	**Coordinates**	**Alt.**	**Lan.**	**Eco.**	**Hab.**	***japonicus japonicus***	***koreicus***	***claviger***	***plumbeus***	***maculipennis s.l.***	***maculipennis s.s.***	***daciae / messeae***
1	Ardenno (SO)	Masino	46°10'00. "N 9°38'24. "E	285	Vf	Pe W Me	Ib G		03.05.2020ORC 20.10.2021IRC					
2	Veddasca (VA)	Piana del Carmizun	46°04'29.43"N 8°47'17.22"E	1.168	Mm	W P	Po					17.07.2022LC 11.08.2022LC	11.08.2022EC	
3	Maccagno (VA)	La Montagnola	46°03'34.45"N 8°45'2.76"E	916	Mm	W P	Po					11.08.2022LC		
4	Bardello c. M. e B.(VA)	Lago di Biandronno	45°49'50.28"N 8°42'16.38"E	242	Il	Wma	Po Rb					16.08.2021LC 25.08.2021LC		25.08.2021EC
5	Varese (VA)	Ippodromo	45°49'44. "N 8°49'25. "E	422	Mh	U	Ib Up		23.06.2022IHLC					
6	Arcisate (VA)	Val Bevera	45°49'44.38"N 8°52'03.62"E	326	Fvf	W C Me	Pu					26.08.2022LC	26.08.2022EC	
7	Cantello (VA)	Val Bevera	45°49'44.16"N 8°52'34.96"E	327	Fvf	W	Pu					26.08.2022LC 11.09.2022LC 18.09.2022LC		
8	Valmorea (CO) Rodero (CO)	Rio Gaggiolo (torrente Lanza)	45°49'11.59"N 8°55'18.09"E	334	Mh Fvf	W Me	Sp Pds			26.08.2022LC				
9	Varese (VA)	Calcinate degli Orrigoni	45°49'10.72"N 8°47'27.68"E	323	Mh Ms	W Me	Po					29.05.2022LC 14.06.2022LC	14.06.2022EC	
10	Valmorea (CO)	Stagno Buzum	45°49'10.64"N 8°55'17.96"E 45°49'10.70"N 8°55'18.89"E	330	Mh Fvf	W Me	Sw			20.08.2021LC 29.08.2021LC 30.08.2021LC		19.08.2022LC	21.08.2022EC	
11	Valmorea (CO)	fitodepuratore	45°48'48.17"N 8°55'28.57"E	387	Mh Fvf	W	Po					18.08.2022LC	18.08.2022LC	
12	Malnate (VA)	Cave di Molera	45°48'36.42"N 8°53'27.17"E	320	Mh Fvf	W Me	Pu					17.08.2022LC 27.08.2022LC	17.08.2022EC 27.08.2022EC	
13	Malnate (VA)	Rio Gaggiolo (torrente Lanza)	45°48'26.14"N 8°52'57.00"E	307	Mh Fvf	W Me	Rm					17.08.2022LC		
14	Malnate (VA)	Fugascè	45°47'57.95"N 8°53'18.59"E	372	Mh Fvf	Pe W Me	Pds					26.08.2022LC 10.09.2022LC		
15	Varese (VA)	Bizzozzero	45°47'44.25"N 8°51'11.10"E 45°47'46.84"N 8°50'58.56"E	385 390	Mh	Pe W Me	Po					02.08.2021LC 25.08.2021LC	25.08.2021EC	
16	Buguggiate (VA) Varese (VA)		45°47'37.67"N 8°48'1.76"E 45°47'41.27"N 8°48'2.55"E	240	Il	Pe Wme	Di					16.08.2021LC		16.08.2021EC
17	Malnate (VA)	Stagno di Gurone	45°47'28.60"N 8°51'36.36"E	286	Mh Fvf	Wme	Po					30.05.2021LC	25.08.2021EC	
18	Inarzo (VA)	Palude Brabbia	45°47'04.96"N 8°43'47.68"E 45°47'12.32"N 8°43'29.69"E	246 242	Il	Wma	Po					04.06.2019LC 01.06.2019LC 18.06.2019LC	16.08.2019EC	
19	Casale Litta (VA)	Palude Brabbia	45°46'48.81"N 8°43'29.02"E	246	Il	Wma	Po					04.06.2019LC		
20	Binago (CO)	Stagno San Siro	45°46'43.53"N 8°54'28.06"E	367	Udp	W Me C	Po					09.08.2021LC 29.08.2021LC	29.08.2021EC	
21	Lozza (VA)	Torrente Quadronna	45°46'11.02"N 8°52'16.33"E	272	Fvf	W Me C	Pds					28.06.2020LC	28.06.2020EC	
22	Como (CO)	Oasi del Bassone	45°46'09.12"N 9°5'40.81"E	273	Mh	Wma	Pds					25.08.2021LC 30.08.2021LC	30.08.2021EC	
23	Angera (VA)	Oasi della palude Bruschera	45°46'00.90"N 8°34'44.39"E	199	Il	Wma	Swa Rb					07.08.2021LC 25.08.2021LC		25.08.2021EC
24	Casnate con Bernate (CO)		45°45'59.82"N 9°04'51.51"E	276	Mh	Pe W	Di					25.08.2021LC		
25	Castiglione Olona (VA)	Caronno Corbellaro	45°45'58.84"N 8°51'23.71"E	365	Udp	W Me C	Th				08.07.2020LC			
26	Gornate Olona (VA)	Torba	45°43'47.29"N 8°52'4.13"E	246	Fvf	Wme	Sw			05.09.2021LC		13.08.2019LC 05.09.2021LC	08.08.2020EC	
27	Tradate (VA)	Lodula	45°43'31. "N 8°53'56. "E	314	Udp	W C	Ac					11.08.2020LC 14.08.2020LC	11.08.2020EC	14.08.2020EC
28	Lonate Ceppino (VA)	Valle Olona	45°42'55.01"N 8°52'34.41"E	290	Fvr	Pe W	Tdf	05.07.2019OHLC 06.07.2019OHLC	23.06.2019OHLC 05.07.2019OHLC					
29	Lonate Ceppino (VA)	Valle Olona	45°42'46.58"N 8°52'23.26"E 45°42'39.38"N 8°52'16.43"E	245 240	Fvf	W	Tdf	17.06.2019OHLC 05.07.2019OHLC 06.07.2019OHLC	25.05.2019OHLC 05.07.2019OHLC		07.06.2008OHLC			
30	Castelseprio (VA)	Refregg	45°42'45.16"N 8°52'16.75"E	238	Fvf	Wme	Sw					16.08.2019LC	16.08.2019EO 16.08.2019EC	

Sampling sites								Dates and methods of specimens collection						
								Aedes		*Anopheles*				
Site #	**Municipality**	**Toponim**	**Coordinates**	**Alt.**	**Lan.**	**Eco.**	**Hab.**	***japonicus japonicus***	***koreicus***	***claviger***	***plumbeus***	***maculipennis* s.l.**	***maculipennis* s.s.**	***daciae / messeae***
31	Tradate (VA)	Ronchi di Abbiate	45°42'42.31"N 8°55'52.93"E	320	Udp	W Me	Po					30.08.2021[LC]	30.08.2021[EC]	
32	Lonate Ceppino (VA)		45°42'31. "N 8°53'15. "E	290	Udp	Pe C	Ac		18.07.2019[LC] 02.10.2019[LC]			04.05.2019[LC]	12.08.2020[EC]	
33	Tradate (VA)		45°42'24.88"N 8°55'33.75"E	292	Udp	Pe W Me	Po					10.08.2021[LC] 29.08.2021[LC]	10.08.2021[EC] 29.08.2021[EC]	
34	Castelseprio (VA)	Valle Olona	45°42'23.45"N 8°52'0.78"E 45°42'25.59"N 8°52'0.68"E 45°42'30.86"N 8°52'1.09"E	274	Fvf	W	Po Di					25.08.2022[LC] 29.08.2022[LC]	25.08.2022[EC] 29.08.2022[EC]	
35	Lonate Ceppino (VA)		45°42'22. "N 8°52'54. "E	288	Udp	U	Ib		11.09.2021[IHLC]					
36	Castelseprio (VA)	Buzunel	45°42'19.35"N 8°52'2.05"E	237	Fvf	Wme	Po					04.05.2019[LC] 26.05.2019[LC]	04.05.2019[EO] 26.05.2019[EO]	
37	Lonate Ceppino (VA)		45°42'16. "N 8°52'26. "E	285	Udp	U	Ib G		28.09.2019[IHLC] 09.08.2019[IHLC] 01.09.2019[IHLC] 15.09.2021[IHLC] 14.05.2020[IRC] 18.05.2020[IRC] 26.05.2020[IRC]		04.09.2021[OHLC]			
38	Arsago Seprio (VA)	Peverascia	45°42'13.32"N 8°43'2.81"E	274	Mh	Wma	Spm					20.06.2020[LC]		17.07.2020[EC]
39	Cairate (VA)	Valle Olona	45°42'08.05"N 8°52'12.44"E	261	Fvf	W	Pu					25.08.2022[LC]	25.08.2022[EC]	
40	Tradate (VA)	Abbiate Guazzone	45°41'58. "N 8°55'15. "E	286	Udp	U	Ib		10.07.2021[IHLC]					
41	Bregnano (CO)	Rosorè	45°41'55.86"N 9°3'23.27"E	297	Udp	Pe W Me	Up Po		16.08.2021[OHLC]			16.08.2021[LC] 25.08.2021[LC]	16.08.2021[EC] 25.08.2021[EC]	
42	Lonate C. (VA)	Valle Olona	45°41'45.76"N 8°52'40.21"E	274	Udp	W	Tdf		08.07.2019[OHLC] 09.07.2019[OHLC] 09.07.2019[LC] 19.07.2019[LC]		09.07.2019[OHLC] 19.07.2019[OHLC] 19.07.2019[LC]			
43	Lonate C. (VA)	Carunat	45°41'40. "N 8°52'45. "E	285	Udp	W	Tdf				31.08.2021[LC]			
44	Lomazzo (CO)	Centro biodiversità Valle Lura	45°41'30.12"N 9°02'48.31"E	256	Fvf	W C	Po					13.08.2021[LC]	13.08.2021[EC]	
45	Lomazzo (CO)	Prati del Ceppo	45°41'14.44"N 9°03'0.44"E	250	Fvf	Wme	Po					13.08.2021[LC] 25.08.2021[LC]		25.08.2021[EC]
46	Cassano Magnago (VA)	Oasi palude Boza	45°40'49.56"N 8°48'58.85"E	291	Udp	Pe W C	Po					18.08.2021[LC] 27.08.2021[LC] 29.08.2021[LC]	29.08.2021[EC]	
47	Cassano Magnago (VA)	Oasi palude Boza	45°40'44.20"N 8°48'59.30"E	284	Udp	Pe W C	Po					18.08.2021[LC] 27.08.2021[LC] 29.08.2021[LC]		
48	Gorla Maggiore (VA)	Valle Olona	45°39'54.47"N 8°53'9.62"E	219	Fvf	Wme	Po					02.08.2021[LC]		
49	Gorla Maggiore (VA)	Valle Olona	45°39'52.95"N 8°53'9.30"E	218	Fvf	Wme	Po					02.08.2021[LC] 29.08.2021[LC]	29.08.2021[EC]	
50	Cislago (VA)	Bosco del Rugareto	45°39'08.94"N 8°56'26.26"E 45°39'11.40"N 8°56'20.94"E	260	Udp	W	Tdf Ac	14.05.2022[LC] 22.05.2022[LC] 22.05.2022[OHLC]	14.05.2022[LC] 22.05.2022[LC]			01.06.2022[LC] 22.05.2022[LC]	01.06.2022[EC]	
51	Vizzola Ticino (VA)		45°37'57. "N 8°42'1. "E	203	Udp	Wme	Qp					22.05.2022[LC]	22.05.2022[EC]	
52	Rescaldina (MI)	Bosco del Rugareto	45°37'49.04"N 8°57'1.96"E	240	Udp	W	Po						09.08.2022[EC]	
53	Vizzola Ticino (VA)	Fondovalle	45°37'16.66 N 8°41'42.75 E	165	Fvf	W Me C	Tdf		10.06.2022[OHLC]					
54	Origgio (VA)	Bosco dei Conti Borromeo	45°35'31.78"N 8°59'27.28"E 45°35'28.07"N 8°59'30.66"E	202 203	Udp	W	Di					06.08.2022[LC]	06.08.2022[EC]	
55	Pero (MI)	Laghetto Amsa	45°30'21. N 9°4'11. E	136	Lp	Pe W C	Qp					17.06.2022[LC] 15.09.2022[LC]	17.06.2022[EC]	
56	Milano (MI)	Boscoincittà	45°29'41.84"N 9°4'39.64"E	135	Lp	Pe W C	Po					09.07.2020[LC]		09.07.2020[EC]
57	Milano (MI)	Boscoincittà	45°29'34.35"N 9°5'14.15"E	133	Lp	Pe W C	Po					08.07.2020[BGT] 02.07.2020[LC]	02.07.2020[EC]	02.07.2020[EC]
58	Milano (MI)	Boscoincittà	45°29'30.54"N 9°5'16.69"E 45°29'18.64"N 9°5'27.23"E	132 131	Lp	Pu W C	Rf					09.07.2020[LC] 23.07.2020[LC]		09.07.2020[EC] 23.07.2020[EC]
59	Settimo M.se(MI)		45°28'41. "N 9°3'35. "E	133	Lp	Pe C	Ob					30.06.2020[SORC]		
60	Milano (MI)	Cascina Caldera	45°28'33.58"N 9°5'59.70"E	128	Lp	Pe C	Di					23.08.2022[LC]	23.08.2022[EC]	
61	Milano (MI)	Cava Ongari	45°28'24.25"N 9°5'47.54"E 45°28'25.08"N 9°5'49.40"E 45°28'25.40"N 9°5'49.04"E	125	Lp	Pe Me	Vp					10.09.2019[LC] 16.09.2019[LC] 04.05.2020[LC] 28.05.2020[LC] 22.06.2020[LC] 08.07.2020[LC]	08.07.2020[EC]	08.07.2020[EC]
62	Milano (MI)	Cava Ongari	45°28'23.03"N 9°5'48.64"E	124	Lp	Pe Me	Po					06.06.2022[LC]	06.06.2022[EC]	06.06.2022[EC]
63	Milano (MI)	Baggio	45°27'38. "N 9° 5'43. "E	122	Lp	U	Ob					17.07.2020[SORC]		
64	Milano (MI)	Baggio	45°27'36. "N 9° 6'18. "E	121	Lp	U	Ib					06.07.2020[IRC] 12.07.2020[IRC]		06.07.2020[EO] 12.07.2020[EO]
65	Corsico (MI)		45°26'05. "N 9°7'1. "E	116	Lp	U	Ib					25.08.2022[IRC]		
66	San Giuliano M.se (MI)	Mezzano	45°22'10. "N 9°18'1. "E	91	Lp	C	Ib					12.07.2020[IRC]		