



Welcome to the seventh **VectorNet** newsletter. **VectorNet** is a joint project of the European Food Safety Authority (EFSA) and the European Centre for Disease Prevention and Control (ECDC), which started in May 2014, and is now in its second iteration (2019–2023). The project is supported by a Scientific Coordination Committee with members from the Public and Animal Health community. This is the last newsletter of this iteration.

VECTORNET: COLLABORATIVE MAPPING OF ARTHROPOD DISEASE VECTORS

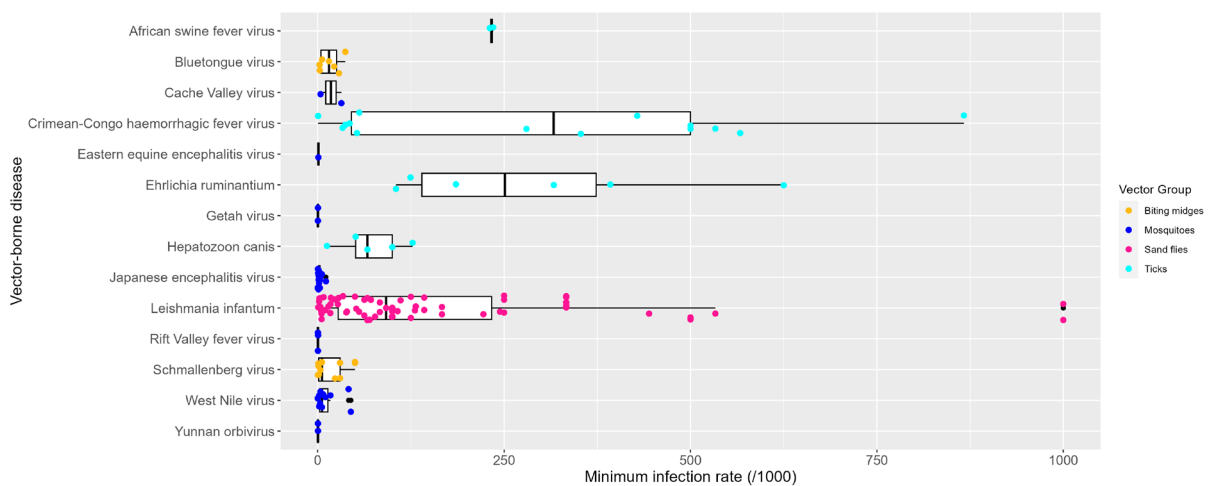
The **VectorNet** archive publishes data for more than 40 vector species from four groups – mosquitoes, ticks, sand flies and biting midges, and the maps are very widely used as a reference by public health professionals, academics, the media, and the public. Until recently, however, nothing had been published about the way in which these data are compiled and processed, and little had been available in the way of interpretation or description of the major outputs. We published this information for several reasons: to encourage and help standardise similar efforts by other data gathering initiatives; to provide a document with high level interpretations of the mapped distributions to assist public health professionals evaluate risks; to evaluate the products in relation to its peers; to ensure the limitations of the data are understood; and, finally, to set out plans for future improvement. <https://doi.org/10.2807/1560-7917.ES.2023.28.26.2200666>

SPATIAL DISTRIBUTION OF CRIMEAN-CONGO HAEMORRHAGIC FEVER

Crimean–Congo haemorrhagic fever (CCHF) is considered to be spreading across the globe, with many countries reporting new human CCHF cases in recent decades including Georgia, Türkiye, Albania, and, most recently, Spain. We update a human CCHF distribution map produced in 2015 to include global disease occurrence records to June 2022, and we include the recent records for Europe. The predicted distributions are based on long-established spatial modelling methods and are extended to include all European countries and the surrounding areas. The map produced shows the environmental suitability for the disease, taking into account the distribution of the most important known and potential tick vectors *Hyalomma marginatum* and *Hyalomma lusitanicum*, without which the disease cannot occur. This limits the disease’s predicted distribution to the Iberian Peninsula, the Mediterranean seaboard, along with Türkiye and the Caucasus, with a more patchy suitability predicted for inland Greece, the southern Balkans, and extending north to north-west France and central Europe. These updated CCHF maps can be used to identify the areas with the highest probability of disease and to therefore target areas where mitigation measures should currently be focused. *Technical Report in clearance with ECDC.*

SYSTEMATIC LITERATURE REVIEW ON VECTOR STATUS OF POTENTIAL VECTOR SPECIES OF 36 VECTOR-BORNE PATHOGENS

Vector-borne pathogens pose risks for animal and human health, underlining the importance of surveillance activities and mapping efforts to support risk assessments. As part of a living risk assessment project, EFSA-Animal disease profiles were developed to visualise the current knowledge on vector status of 36 selected pathogens of relevance for EFSA. To keep these profiles up-to-date, a systematic literature review was conducted, aiming to review the vector status of species of mosquitoes, ticks, sand flies and biting midges. To this end, two systematic literature reviews were conducted, both focusing on the different criteria that determine the vector status of a species. For the first review data was collected on detection of the 36 selected pathogens in field collected mosquitoes, sand flies, biting midges and ticks. The second review looked for vector competence studies and host infection studies under laboratory conditions. While combining these two data sets allowed to determine the vector status of species occurring on a global scale, we focused on the (**VectorNet** priority) species that occur within the EU/EEA region. In the end, this review not only discloses potential risks, but also highlights the gaps in the current knowledge regarding this topic.



Example figure: Boxplots representing MIR (%) larger than zero summarized per vector group and VBD.



VectorNet

NEWS FROM THE NETWORK

ANNUAL ENTOMOLOGICAL NETWORK MEETING

The final Annual Entomological Network Meeting (AENM) of this [VectorNet](#) iteration took place in Leiden, the Netherlands, 12–14 September 2023. The main objective of the AENM was to celebrate 15 years of Putting vectors on the Pan European map. The AENM consisted of three days with each a specific theme, namely Output, Lessons learned and the Future, respectively. Day 1 was organised as a hybrid meeting and covered the output of the project in the current but also of the preceding related projects. The morning of Day 2 was dedicated to a workshop on the best practices of mapping pipeline on site, while the remaining of the day was spent on networking activities involving a visit the Natural History museum and a joint conference dinner. The last morning, Day 3, was devoted to discussing possible future activities such as connecting to other database network such as GBIF to improve and also to discuss questions submitted to the coordinator on Day 1.



Participants AENM 2023, Leiden, the Netherlands

CAPACITY BUILDING ACTIVITIES

Upon request of EFSA, [VectorNet](#) provided the field training for specific vector surveillance activities in member states during the 2023 vector season (see Table). The overall aim of the field training is to strengthen European public and veterinary entomologists in surveillance of specific vector groups for which there are gaps in the Vector maps for their country due to lack of capacity or knowledge. The main objective of these field trainings is to build the capacity of surveillance of particular vector group, encouraging surveillance and filling gaps in distribution maps in the future.

Vector Group	Field	Host	Trainers besides VGLs	#	##	Dates in 2023
Ticks	Slovenia	University of Primorska	Gandy S.	3	1	17 to 21 April
Sand flies	Benelux & Germany	National Museum of Natural History Luxembourg	Oether S., Risueño J., Schaffner F.	8	4	9-15 July
Sand flies	France	EID Rhône-Alpes	Schaffner F.	6	1	3-5 July
Other Vectors	Romania	Summer school of Field Parasitology, Danube Delta*	Modrý D., Balmoş O., Rabei S.	25	9	25 July-3 August
Mosquitoes	Poland	University of Łódź	-	5	1	26-29 September
Biting midges	Italy	IZS Teramo	Goffredo M.	8	7	2-6 October

number of participants without trainers, ## number of countries, * partly funded by [VectorNet](#)



RECENTLY PUBLISHED

- Wint G.R. William, Balenghien Thomas, Berriatua Eduardo, Braks Marieta, Marsboom Cedric, Medlock Jolyon, Schaffner Francis, Van Bortel Wim, Alexander Neil, Alten Bulent, Czwienczek Ewelina, Dhollander Sofie, Ducheyne Els, Gossner Celine M., Hansford Kayleigh, Hendrickx Guy, Honrubia Hector, Matheussen Tom, Mihalca Andrei Daniel, Petric Dusan, Richardson Jane, Sprong Hein, Versteirt Veerle, Briet Olivier. **VectorNet**: collaborative mapping of arthropod disease vectors in Europe and surrounding areas since 2010. *Euro Surveill.* 2023;28(26):pii=2200666. <https://doi.org/10.2807/1560-7917.ES.2023.28.26.2200666>
- Messina Jane P, Wint, G.R. William 2023 The Spatial Distribution of Crimean–Congo Haemorrhagic Fever and Its Potential Vectors in Europe and Beyond. *Insects* 2023, 14(9), 771; <https://doi.org/10.3390/insects14090771>
- The spatial relationship between the presence and absence of *Leishmania* spp. and leishmaniasis, and phlebotomine sand fly vectors in Europe and neighbouring countries. PI: E. Berriatua; <https://www.ecdc.europa.eu/sites/default/files/documents/Spatial-relationship-presence-absence-Leishmania-march2023.pdf>
- The updates of the vector distribution maps resulting from the routine **VectorNet** distribution data extraction and mapping activities for contract period 8, July-August 2023 respectively. The summary distribution highlights are described and presented under Vector maps at the website and provided below: <https://www.ecdc.europa.eu/en/data/maps>.

DISTRIBUTION HIGHLIGHTS

In total, almost 45,000 data lines have been entered this period. The summary distribution highlights for Period 8 are set out below.

Ticks

A total of 1217 data lines relating to six of the seven priority tick species have been generated during period 8 and have been uploaded via the Excel template submission process. Updates for the seven species are as follows:

- *Dermacentor reticulatus*: data captured for 5 NUTS3s, with no changes suggested for any NUTS3s
- *Hyalomma lusitanicum*: data captured for 6 NUTS3s, with no changes suggested for any NUTS3s
- *Hyalomma marginatum*: data captured for 8 NUTS3s, and changes suggested for 2 NUTS3 – including **new areas of presence in Algeria and Tunisia**
- *Ixodes persulcatus*: no new data captured for this reporting period
- *Ixodes ricinus*: data captured for 128 NUTS3s, and changes suggested for 3 NUTS3s – including **new areas of presence in Croatia, France and Spain**
- *Ornithodoros erraticus*: no new data captured for this reporting period
- *Rhipicephalus sanguineus*: data captured for 10 NUTS3s, and changes suggested for 4 NUTS3s – including **new areas of presence in Spain (northern and Tenerife) and Western Sahara**

Mosquitoes

A total number of 27,434 mosquito distribution data lines have been uploaded via the Excel™ template submission process, through ten separate files. The reported data address 84 taxa and are distributed over 66 countries/territories, with 10,153 **VectorNet** species/AdminUnit combinations. Among these species/AdminUnit combinations, 9.3% (n=947) address IMS and 90.7% (n =9,209) address NMS. Overall, 87.5% (n=8,884) combinations address **VectorNet** priority species, with absence data reaching 85.6% (n=8,413), and presence 14.4% (n=1,418).

Main outcomes in terms of vector distribution changes (species-AdminUnits statuses)

Invasive mosquito species: 49.8% of the data report presence (47.5% 'Established' and 2.3% 'Introduced') and 50.6% report 'Absent', with changes being:

- *Aedes aegypti*: new introductions in Netherlands (but controlled); more absences reported thanks to the extension of surveillance in some countries (Estonia, Hungary, Türkiye).
- *Aedes albopictus*: the updated map shows the species' spread with additional established populations in France, Germany (northernmost established population in Berlin), Hungary, Israel and Turkey; additional introductions in the Netherlands; first introductions into Scandinavia (at two locations in Sweden, which are the northernmost observations in Europe to date for the species).
- *Aedes atropalpus*: more absences reported thanks to the extension of surveillance in some countries (Estonia, Hungary, Portugal, Türkiye).
- *Aedes japonicus*: first findings of introduced and already established populations in southern Poland; further establishment in northern Czech Republic, Hungary, northern Italy, Netherlands, Slovakia and northern Spain; more absences reported in some countries (Estonia, Portugal, Türkiye).
- *Aedes koreicus*: the updated map shows further spread in Hungary and northern Italy (established populations) and first report of an established population in Slovenia; more absences reported in some countries (Estonia, Portugal, Spain, Türkiye).

Native mosquito species: Datasets were completed for a wide range of species, with 10.1% as 'Present' data, and 89.4% as absence data (83.7% 'Anticipated Absent' and 2.1% 'Observed Absent'). Important data sets for the occurrence of native species are reported for Israel and Palestine, for which all maps can now be considered completed, according to the published data. However the species distribution may still slightly change when further field studies are implemented and published, and if mosquito populations do shift. Other notable reports are:

- *Aedes caspius*: distribution is completed in e.g., Egypt, Israel, Romania.
- *Aedes detritus/coluzzii*: distribution is completed in e.g., Egypt, Israel.
- *Aedes vexans* s.l.: distribution is completed in e.g., Romania.



- *Anopheles claviger* s.l.: distribution is completed in e.g., Jordan and Israel.
- *Anopheles maculipennis* s.l.: distribution is completed in e.g., Netherlands and Romania.
- *Anopheles plumbeus*: first presence data for Poland are reported.
- *Coquillettidia richiardii*: distribution is completed in e.g., Czech Republic, Netherlands, Romania.
- *Culex modestus*: first presence report in Finland is reported.
- *Culex pipiens*: distribution is completed in many countries, in particular in Germany and Romania.
- The maps are completed and ready to be published for *Culex antennatus*, *Culex theileri*, *Culex tritaeniorhynchus*, *Culex perexiguus/univittatus*, *Anopheles claviger* s.l., and *Culiseta annulata*.

Culicoides

A total of 14,204 data lines related to 68 taxonomic units, including the 10 priority species, have been generated during Period 8, and have been uploaded via the Excel template submission process. These data were related to 286 locations in 198 different NUTS3 from 14 countries (namely Albania, Austria, France, Germany, Lithuania, The Netherlands, North Macedonia, Poland, Russia, Serbia, Spain, Tunisia, Turkey, and United-Kingdom). During this current period, systematic literature screening allow the data extraction from 15 papers, corresponding to 3.8% of the submitted data. The rest of the data came from 4 other sources. Two are related to national surveillance activities from Poland (7,607 lines - 54% of the dataset) and North Macedonia (1,824 lines - 13%). The two others are related to data extraction from reports on the results of national surveillance activities, one in Germany (2,772 lines - 20%) and the other in Austria (1,458 lines - 10%).

Even if the number of NUTS3 concerned by this dataset seems quite high (198 from 14 countries), the global picture of **VectorNet** maps was quite the same as for the previous period. Indeed, 180 NUTS3 were moved from NoData to presence or absence statuses. Most of them concerned Germany (48%) and Austria (17%). In these both countries, surveillance activities were carried out after 2006 bluetongue emergence. We extracted data from a German report and a paper published in an Austrian journal reporting surveillance results. From Germany, report described retrospective identification down to species of subsamples of collections identified initially at the group level.

Sandflies

(i) Search and identification of relevant sand fly distribution articles

SCOPUS and WOS searches for articles published between **April 2023 and early August 2023** yielded 15 articles in Scopus and 3 in WOS. After reading title and abstract, when necessary, we were left with 7 to check for suitable sand fly distribution data. Among them 4 articles provided suitable sand fly distribution data in the study area. In addition, 9 articles (3 recent and 6 historical) report data on sand flies from Romania.

(ii) Number of distribution records

A total of 2125 data lines from 13 articles relating to 14 sand fly species, including 8 proven or suspected vectors of *Leishmania* spp., from 5 countries (Tunisia, Egypt, Palestine, Israel and Spain) have been generated during Period 8 in which we **extracted information published between April 2023 and early August 2023** and we have corrected the data available from Romania. Apart from changes resulting from the correction of the Romanian data, no changes in distributions were reported.

DATA AND DISTRIBUTIONS OVER THE PROJECT LIFETIME

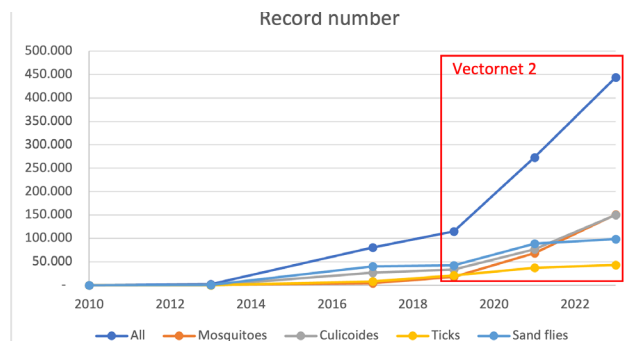
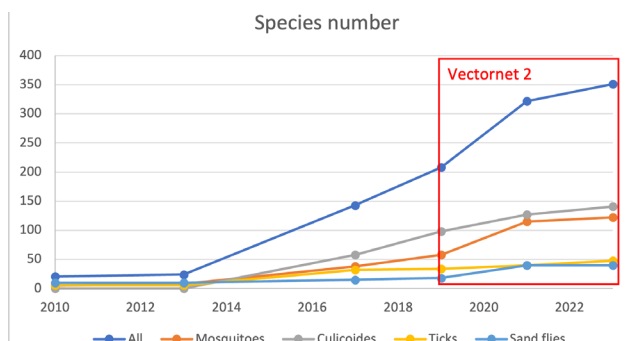
The total number of records for the database now exceeds 444,000 and covers more than 350 species. The table below shows the number of species and records held in the archive from 2010 onwards. The current project has run from 2020. The majority of the records in the archive have been generated in the current project. The overall proportion is nearly three quarters and ranges from just over half for sand flies and ticks, to nearly 90% for mosquitoes.

Year	Species number					Record number				
	All	Mosquitoes	Culicoides	Ticks	Sand flies	All	Mosquitoes	Culicoides	Ticks	Sand flies
2010	21	5	0	6	10	494	370	-	-	124
2013	24	8	0	6	10	2.565	1.125	-	234	1.206
2017	143	38	58	32	15	80.511	5.004	27.080	8.181	40.246
2019	208	58	98	34	18	114.856	17.855	33.474	20.857	42.670
2021	322	115	127	40	40	273.119	69.256	77.381	37.420	89.062
2023	351	122	141	48	40	443.868	150.905	150.666	43.709	98.588
This project numbers	143	64	43	14	22	329.012	133.050	117.192	22.852	55.918
This project %	41%	52%	30%	29%	55%	74%	88%	78%	52%	57%

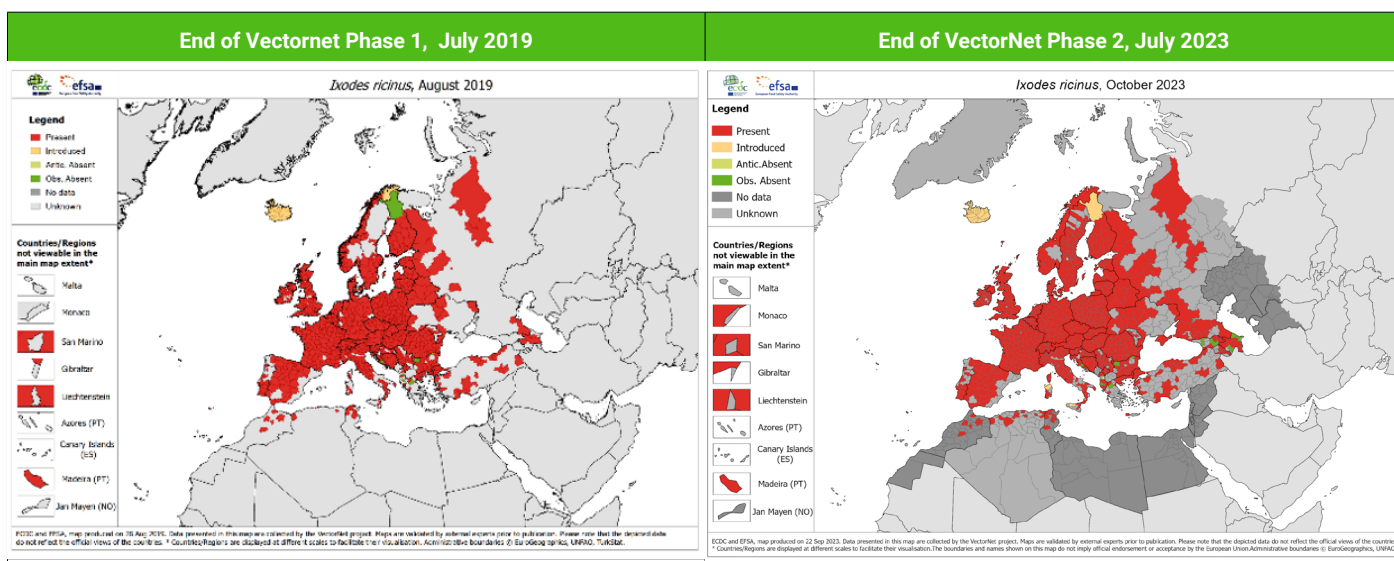
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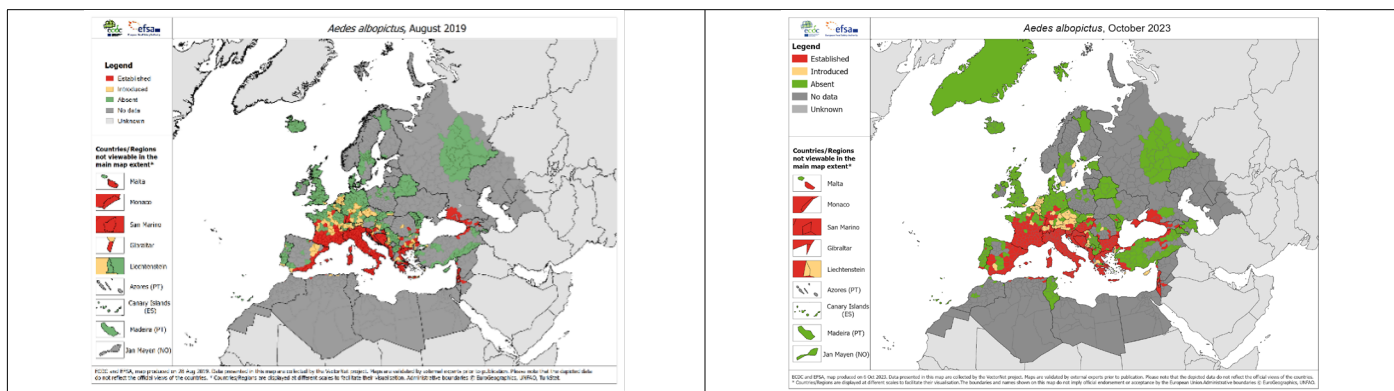
The accompanying graphs chart these data and clearly show that the rate of record addition shows no sign of reducing, which suggest substantial amounts of relevant literature will continue to be published.



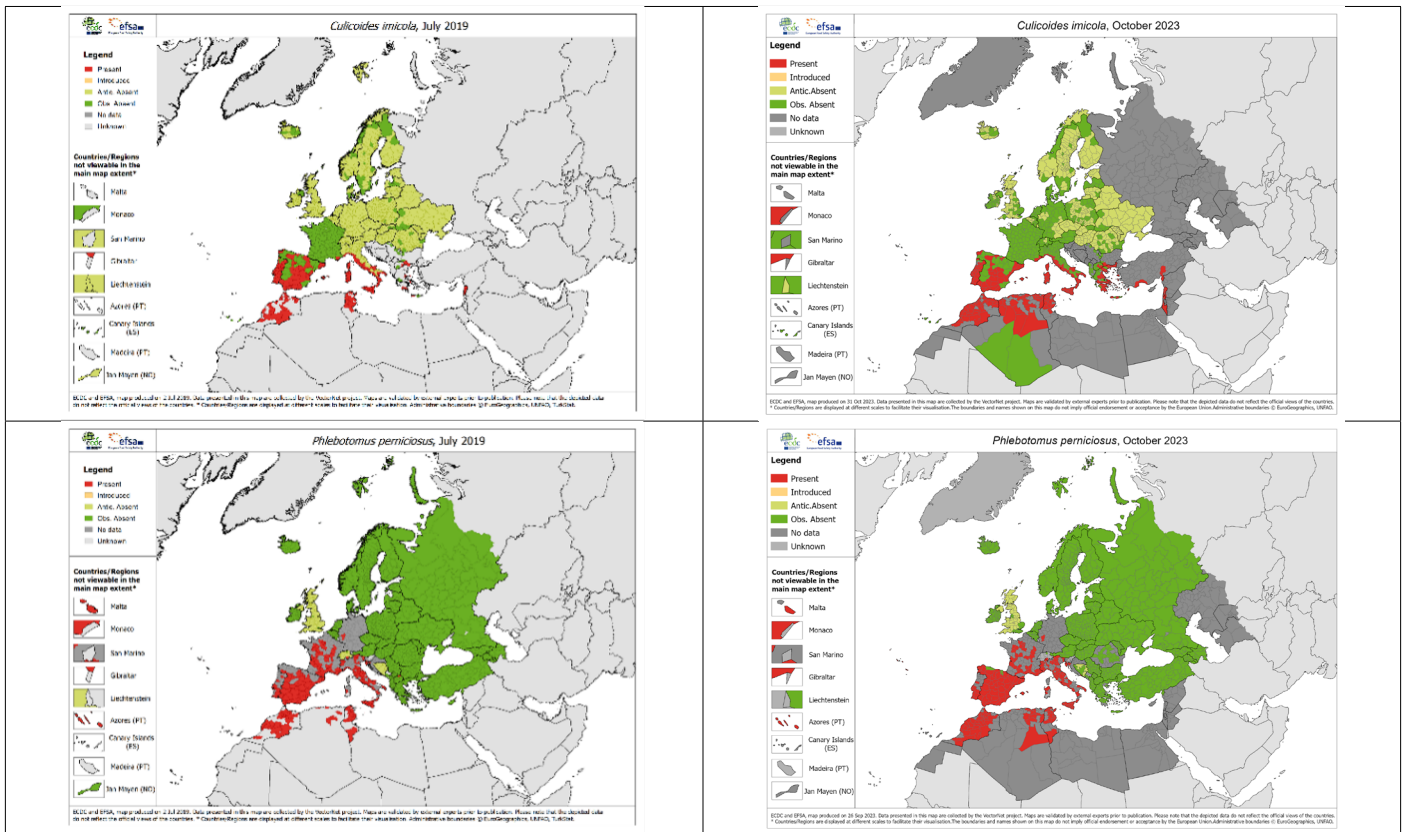
The maps below show the first and last maps of 'flag species' for each vector group produced during this Phase of VectorNet. The biting midge map has changed the most as they only started in the current project, and the Tiger Mosquito map reveals a significant northward expansion of range over the 4 year period. The tick distribution is now substantially more complete for the eastern and northern parts of the project area. The sand fly map is also more complete especially around the southern edges of the reported range.



ECDC NORMAL



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This is the last Newsletter of VectorNet 2019-2023. We, the **VectorNet** consortium as well as the ECDC and EFSA coordinators, like to **THANK YOU**, the Vector Community, for a great collaboration.

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