# Primer registre de *Vanessa virginiensis* (Drury, 1773) a Catalunya

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**Abstract. First record of *Vanessa virginiensis* (Drury, 1773) in Catalonia.** The nymphalid butterfly *Vanessa virginiensis* (Drury, 1773) is documented for the first time in Catalonia, which represents the easternmost record in the Mediterranean for this species. Photographs of a specimen from Tossa de Mar, Girona, enabled unambiguous identification, distinguishing it from *Vanessa cardui* (Linnaeus, 1758), a locally abundant species. Wind backtracking analyses tend to discard a long-distance migration event from America or Macaronesia, and suggest an origin in the Iberian Peninsula. Given current evidence (a single individual, no observation of breeding), we consider *V. virginiensis* as an accidental species in Catalonia.

**Resum.** Documentem la presència de la papallona *Vanessa virginiensis* (Drury, 1773), Nymphalidae, per primera vegada a Catalunya, fet que representa l'observació més oriental de la Mediterrània per a aquesta espècie. Les fotografies d'un exemplar capturat a Tossa de Mar, a la Selva, han permès una identificació inequívoca, diferenciant-la de *Vanessa cardui* (Linnaeus, 1758), una espècie ben coneguda per la seva abundància. Les anàlisis de les trajectòries dels vents tendeixen a descartar un esdeveniment de dispersió a llarga distància des d'Amèrica o la Macaronèsia, i suggereixen un origen a la península Ibèrica. Ateses les evidències actuals (un sol exemplar, sense observació de cria), es considera *V. virginiensis* com una espècie errant a Catalunya, tot i que caldrà estar atents a possibles noves observacions.

**Keywords:** Lepidoptera, Nymphalidae, butterflies, biodiversity, species diversity, entomology, new occurrence, dispersal.

## Introduction

The American lady butterfly *Vanessa virginiensis* (Drury, 1773) is a medium-sized nymphalid. Its larval stage feeds on various plants within the Asteraceae (Glassberg 2001; Tolman and Lewington 2014), but also other families such as Fabaceae, Malvaceae, Boraginaceae, Urticaceae, Balsaminaceae, and Scrophulariaceae (Tolman and Lewington 2014). The species demonstrates remarkable dispersal capacity and is considered migratory (Hentz *et al.* 2022; Tolman and Lewington 2014), aligning with the behaviour observed in other members of its genus, such as *V. atalanta* (e.g., Brattström *et al.* 2018; Larsen 2005) or *V. cardui* (e.g., Stefanescu *et al.* 2007; Talavera *et al.* 2023). Thus, *V. virginiensis*, theoretically, could extend its distribution and even establish populations in regions previously beyond its documented range. Despite being abundant

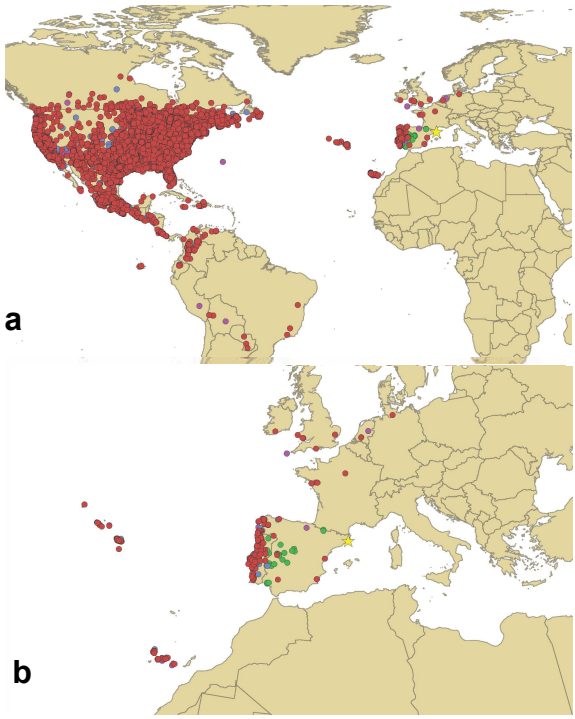


**Fig. 1** Occurrences of *Vanessa virginiensis* (**a**) at the global scale, and (**b**) in the Western Palearctic. Red dots indicate data from GBIF (n = 39,984), data from iNaturalist are blue, n = 38,319), data from García-Barros *et al.* (2004) in green, and data from Observation.org in purple. The yellow star represents the specimen observed in Catalonia. Records from Madeira had been considered to be erroneous (Aguiar and Karsholt 2006) and are not shown here.

in Northern and Central America, it is notably less common in Western Europe and the Macaronesian islands (figure 1) (Hentz *et al.* 2022; Moussus *et al.* 2022; Tolman and Lewington 2014). This study documents the recent occurrence of *V. virginiensis* in the province of Girona, Catalonia, and discusses the potential origin of the specimen observed.

## Material and Methods

An entomological survey with a regular entomological handnet was carried in the area of Cala de Salionç (Tossa de Mar, Girona, Catalonia) between the 13$^{th}$ and the 16$^{th}$ of October 2023. Figures were done using either QGIS 3.32.3 or Adobe Illustrator 2021

and global occurrences of *V. virginiensis* were retrieved from GBIF.org (2023), iNaturalist (2023), Observation.org (2023) and García-Barros *et al.* (2004).

To investigate the potential origin of the specimen detected in Girona, a wind trajectory analysis was done using the National Oceanographic and Atmospheric Administration's (NOAA) software HYSPLIT (Stein *et al.* 2015) and a custom R pipeline (https://github.com/etd530/Hysplit_R_interface). Input data was from NOAA's NCEP/NCAR Reanalysis database (Kalnay *et al.* 1996). HYSPLIT reconstructs wind trajectories for any user-specified set of coordinates, date, and duration; the R pipeline automates the calculation of multiple trajectories and then summarizes them. Wind trajectories were reconstructed and plotted at 48-hour intervals from the time of observation until eight days prior, at a density of one trajectory per hour, and at three different altitudes above ground level (AGL): 50, 500 and 1000m. Each trajectory ran backwards for a duration of 200 hours since their starting time.

## Results and Discussion

One specimen of *V. virginiensis* was caught with the handnet in Cala de Salionç, Tossa de Mar, Girona (latitude 41.7446, longitude 2.9593; alt. 171m; 14 Oct. 2023; 12:32 CEST). The weather was sunny, with breezes and few gusts of wind during the entomological survey. Pictures of both upper- and underside of the specimen were taken on the field (*Samsung s21 ultra camera*) (figure 2), and the specimen was then released alive. The specimen was identified based on the external morphology, and the record, including the pictures taken, was uploaded in the participative science database iNaturalist (https://www.inaturalist.org/observations/187483484). Unfortunately, the sex of the specimen cannot be determined based on the photograph.

**Fig. 2** Habitus of the *Vanessa virginiensis* specimen caught in Tossa de Mar, Girona; left: upperside; right: underside.

The reconstructed wind trajectories for the day of collection and the previous ones describe a circular pattern, crossing over France and the north and west of the Iberian Peninsula (figure 3). Further backwards in time they spread, with a less consistent pattern. Only occasionally do some trajectories pass over the Canary Islands or Azores, and a few reach the Canadian coast, but at very high latitudes (Newfoundland and Labrador), where the species is not present in October (e.g., Brock and Kaufman 2003; Lotts and Naberhaus 2023). Furthermore, these trajectories tend to originate from high altitudes making far populations less likely sources of the observed specimen. Therefore, if arrived by natural means, it most probably arrived from European mainland populations, localized in eastern and central Iberian Peninsula. A good candidate source, given its proximity and density, is a recently detected population in the region of Vitoria-Gasteiz, Álava, Basque Country (Yeray Monasterio, pers. comm.). Human-mediated breeding and release, however, cannot be completely ruled out.

In the Iberian Peninsula, the host plant most commonly used is *Pseudognaphalium luteoalbum* L. (Asteraceae) (García-Barros *et al.* 2004). As this plant is present in Catalonia, as well as other potential host plants, it is not impossible that the species may breed in this region, although it is likely that the specimen observed represents a dispersing individual. This specimen was not noticeably worn out, although not completely fresh either (figure 2), which suggests it lived several days as adult, but apparently not several weeks.

To our knowledge, *V. virginiensis* had never been previously recorded in Catalonia (Vila *et al.* 2018) and, given current evidence (a single individual, no observation of breeding), we consider *V. virginiensis* as an accidental new species for Catalonia. The nearest observations known are those of Aragón (mentioned in García-Barros *et al.* 2004) and Benicassim, Castellón (mentioned in Montagud and Alamá 2010). However, these seemed to represent dispersing individuals, rather than potential populations, as do most records in France and the UK. Interestingly, the present record in Catalonia represents the easternmost known in the Iberian Peninsula, the Mediterranean and Southern Europe in general. It seems speculative to presuppose that the species is currently expanding eastwards, and only the appearance of further specimens, at these latitudes especially at the larval stage, would support this hypothesis.

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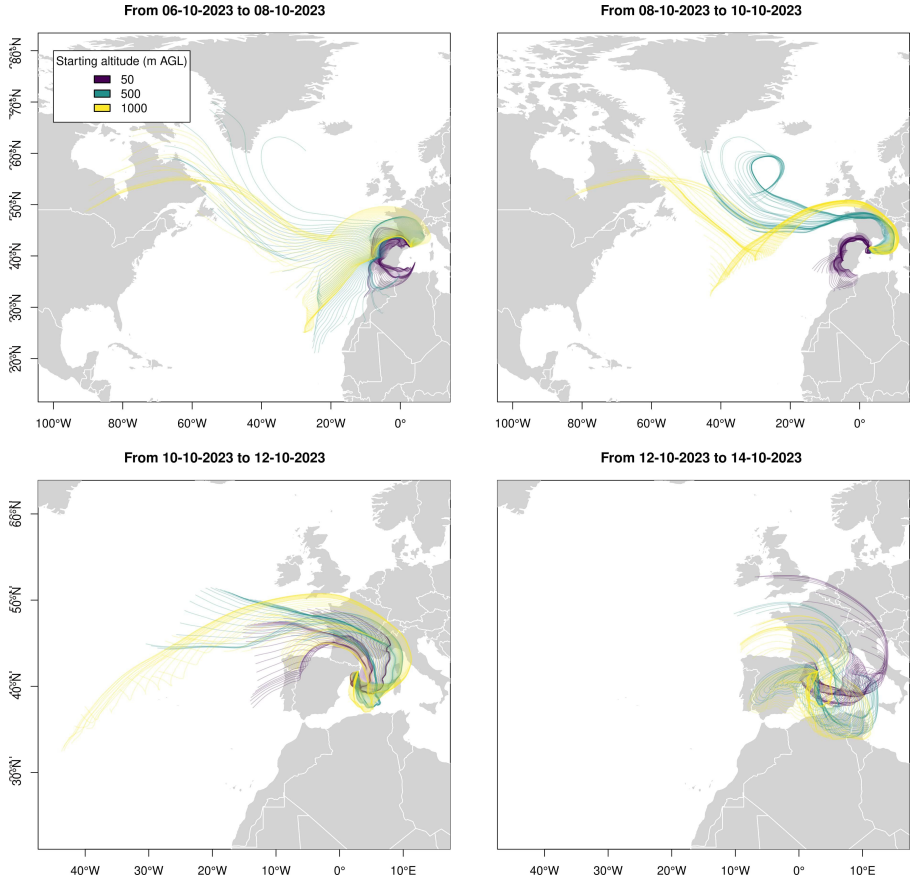


**Fig. 3** The reconstructed wind trajectories for 48-hour periods from the day of the observation until eight days prior, at final altitudes of 50, 500 and 1000 meters above ground level (m AGL). All trajectories end at the coordinates where the *V. virginiensis* specimen was observed and were reconstructed backwards in time for a duration of 200 hours.

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## References

Aguiar, A. & Karsholt, O. 2006. Lepidoptera Vol. I – Systematic Catalogue of the Entomofauna from the Madeira Archipelago and Selvagens Islands. *Boletim do Museu Municipal do Funchal (História Natural)* Supl. 9: 5-139.

Brattström, O., Shapoval, A., Wassenaar, L.I., Hobson, K.A. & Åkesson, S. 2018. Geographic origin and migration phenology of European red admirals (*Vanessa atalanta*) as revealed by stable isotopes. *Movement Ecology*, 6, 25. https://doi.org/10.1186/s40462-018-0143-3

Brock, J.P. & Kaufman, K. 2003.*Butterflies of North America, Kaufman focus guides*. Houghton Mifflin, New York, N.Y.

García-Barros, E., Munguira, M.I. & Martín Cano, J. 2004. *Atlas of the Butterflies of the Iberian Peninsula and Balearic Islands (Lepidoptera: Papilionoidea & Hesperoidea): Atlas de las mariposas diurnas de la Peninsula Iberica e islas Baleares*. Monografías Soc. Ent. Aragonesa.

GBIF.org User 2023. Occurrence Download. https://doi.org/10.15468/DL.ZTZ3EY

Glassberg, J. 2001. *Butterflies through binoculars: the West: a field guide to the butterflies of western North America, Glassberg field guide series*. Oxford University Press, Oxford ; New York, N.Y.

Hentz, J.-L., Dhondt, J.-P. & Dauguet, P. 2022. Guide photographique des papillons de jour et zygènes de France. Gard nature, Beaucaire.

iNaturalist, 2023. *Vanessa virginiensis*, the American lady, iNaturalist dataset.

Kalnay, E., Kanamitsu, M., Kistler, R., Collins, W., Deaven, D., Gandin, L., Iredell, M., Saha, S., White, G., Woollen, J., Zhu, Y., Chelliah, M., Ebisuzaki, W., Higgins, W., Janowiak, J., Mo, K.C., Ropelewski, C., Wang, J., Leetmaa, A., Reynolds, R., Jenne, R. & Joseph, D.1996. The NCEP/NCAR 40-Year Reanalysis Project. *Bulletin of the American Meteorological Society*, 77: 437-472. https://doi.org/10.1175/1520-0477(1996)077<0437:TNYRP>2.0.CO;2

Larsen, T.B. 2005. *Butterflies Of West Africa*. Brill Academic Pub, Stenstrup.

Lotts, K. & Naberhaus, T. 2023. *Butterflies and Moths of North America*.

Montagud, S.A. & Alamá, J.A.G. 2010. *Mariposas diurnas de la Comunitat Valenciana (Papilionoidea & Hesperioidea)*. Generalitat Valenciana, València.

Moussus, J.-P., Lorin, T. & Cooper, A. 2022. *Guide pratique des papillons de jour: Tous les Papilionoidea de France métropolitaine, Illustrated édition*. ed. DELACHAUX, Paris.

Observation.org 2023. *Vanessa virginiensis*, the American lady, Observation.org dataset.

Stefanescu, C., Alarcón, M. & Àvila, A. 2007. Migration of the Painted Lady Butterfly, *Vanessa cardui*, to North-Eastern Spain Is Aided by African Wind Currents. *Journal of Animal Ecology*, 76: 888-898.

Stein, A.F., Draxler, R.R., Rolph, G.D., Stunder, B.J.B., Cohen, M.D. & Ngan, F. 2015. NOAA's HYSPLIT Atmospheric Transport and Dispersion Modeling System. *Bulletin of the American Meteorological Society*, 96: 2059-2077. https://doi.org/10.1175/BAMS-D-14-00110.1

Talavera, G., García-Berro, A., Talla, V.N.K., Ng'iru, I., Bahleman, F., Kébé, K., Nzala, K.M., Plasencia, D., Marafi, M.A.J., Kassie, A., Goudégnon, E.O.A., Kiki, M., Benyamini, D., Reich, M.S., López-Mañas, R., Benetello, F., Collins, S.C., Bataille, C.P., Pierce, N.E., Martins, D.J., Suchan, T., Menchetti, M. & Vila, R. 2023. The Afrotropical breeding grounds of the Palearctic-African migratory painted lady butterflies (*Vanessa cardui*). *Proceedings of the National Academy of Sciences*, 120, e2218280120. https://doi.org/10.1073/pnas.2218280120

Tolman, T. & Lewington, R. 2014. *Papillons d'Europe et d'Afrique du Nord*. Delachaux et Niestlé, Paris.

Vila, R., Stefanescu, C. & Sesma, J.M. 2018. *Guia de les papallones diürnes de Catalunya.* Lynx Edicions, Barcelona.

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