

Supplementary materials

S1. Hydrographic networks

For each year and each order, we selected the hydrographic network that best explained the distribution of the aquatic insects following Gerber et al. (2022a). For the year 2020, the hydrographic networks used were directly extracted from Gerber et al. (2022a). For 2021, fourteen hydrographic networks were considered in the analyses (Table S1). As the hydrographic network usually decreases from spring to summer, we mapped manually all the water bodies at 4 periods (April 12th, May 5th, May 27th and June 29th). Wetland and puddle were not considered. For networks mapped manually in the field for each date, we distinguished 4 aquatic habitats (the main stream, the tributaries, the ditches with running/standing water and the ponds, Table S1). We also considered and tested all the hydrographic networks, with and without ponds.

Table S1. Description of the fourteen hydrographic networks based on aquatic habitats.

Network	Source	Description		
1	OpenStreetMap (OSM) hydrographic map	It includes the drainage of the Guyoult stream and two permanent ponds		
2	The complete drainage of the Guyoult stream, obtained by manual mapping (compilation of networks 3, 6 and 9) during the field period (April-June)	It includes the drainage of the Guyoult stream with its intermittent and permanent tributaries (unmapped by OSM), and all the full-water ponds during the sampling period		
		Main stream	Tributaries	Ditches with running/standing water
3		Yes	Yes	Yes
4	April 12 th	Yes	Yes	No
5		Yes	No	No
6	May 5 th	Yes	Yes	Yes

7		Yes	Yes	No
8		Yes	No	No
9		Yes	Yes	Yes
10	May 27 th	Yes	Yes	No
11		Yes	No	No
12		Yes	Yes	Yes
13	June 29 th	Yes	Yes	No
14		Yes	No	No

Abundance of Plecoptera in 2020 is best explained by the network 1 without ponds, (pseudo $R^2 = 0.43$), and in 2021, by the full network surveyed the 27th of May, ponds included (pseudo $R^2 = 0.22$). Abundance of Trichoptera in 2020 is best explained by the network surveyed the 5th of May, ponds excluded (pseudo $R^2 = 0.27$) and in 2021 by the network 2, ponds included (pseudo $R^2 = 0.22$). Abundance of Ephemeroptera in 2020 is best explained by the network 3 including the main stream only (pseudo $R^2 = 0.71$), and in 2021 by the network 2, ponds excluded (pseudo $R^2 = 0.55$). For Megaloptera, the best network (3) includes the main stream and the ponds (pseudo $R^2 = 0.63$).

Table S2. List of the 19 factors derived from the environmental maps.

Variables names	Description
Aquatic habitat density 5 m	The number of aquatic habitat pixels divided by the area in a 5 m buffer radius
Aquatic habitat density 25 m	The number of aquatic habitat pixels divided by the area in a 5 m to 25 m radius ring buffer
Aquatic habitat density 50 m	The number of aquatic habitat pixels divided by the area in a 25 m to 50 m radius ring buffer
Distance from the nearest wooded area	Distance from the nearest wooded area (m)
Distance from the nearest aquatic habitat	Distance from the nearest aquatic habitat (m)
Elevation	Elevation (m) of the sticky trap
Elevation mean 5 m	Mean elevation (m) in a 5 m buffer radius
Elevation mean 25 m	Mean elevation (m) in a 5 m to 25 m radius ring buffer
Elevation mean 50 m	Mean elevation (m) in a 25 m to 50 m radius ring buffer
PISR mean 5 m	Potential Incoming Solar Radiation mean (kWh.m^{-2}) in a 5 m buffer radius
PISR mean 25 m	Potential Incoming Solar Radiation mean (kWh.m^{-2}) in a 5 m to 25 m radius ring buffer
PISR mean 50 m	Potential Incoming Solar Radiation mean (kWh.m^{-2}) in a 25 m to 50 m radius ring buffer
PISR var 5 m	Potential Incoming Solar Radiation variance (kWh.m^{-2}) in a 5 m buffer radius
PISR var 25 m	Potential Incoming Solar Radiation variance (kWh.m^{-2}) in a 5 m to 25 m radius ring buffer
PISR var 50 m	Potential Incoming Solar Radiation variance (kWh.m^{-2}) in a 25 m to 50 m radius ring buffer
Session	Sampling session
Wood density 5 m	Number of wooded pixels divided by the area in a 5 m buffer radius
Wood density 25 m	Number of wooded pixels divided by the area in a 5 m to 25 m radius ring buffer
Wood density 50 m	Number of wooded pixels divided by the area in a 25 m to 50 m radius ring buffer

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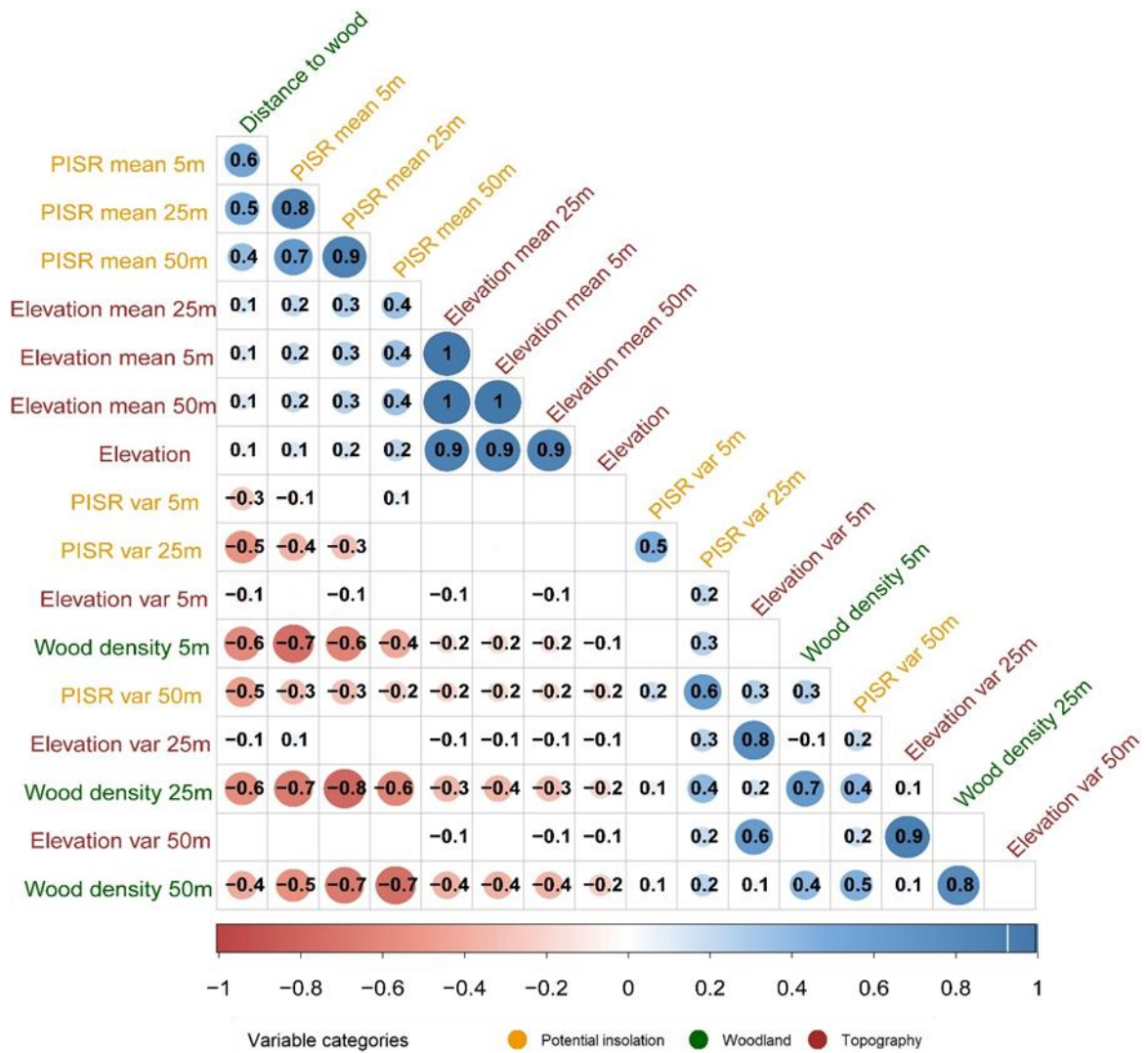


Fig. S3 Correlation matrix of variables. Numbers are the Pearson correlation coefficients. The higher the coefficient, the larger the circle. Squares are blank (*i.e.* no circle) when the coefficient is zero. The colors of the legend represent the 3 categories of variables considered, red for topography, green for woodland and yellow for the potential insolation.

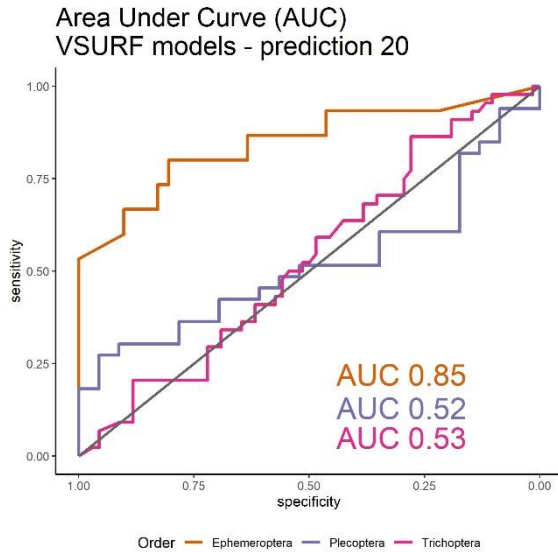
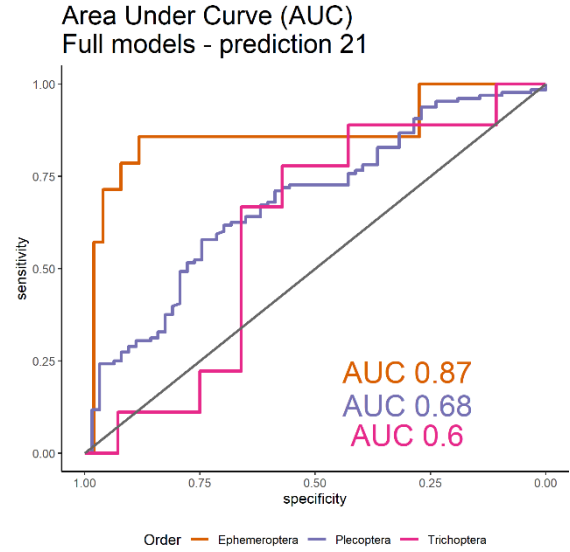
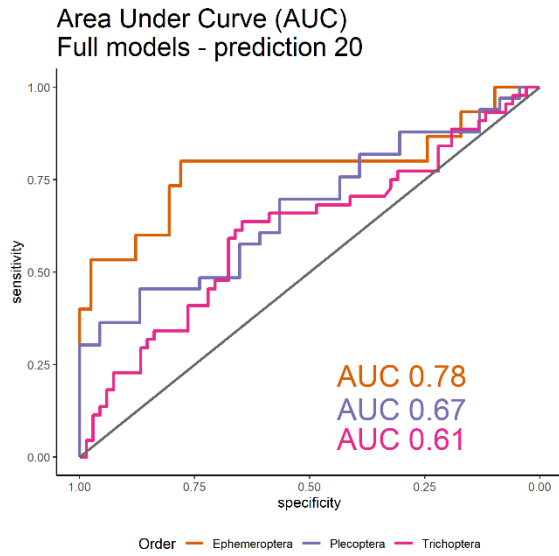


Fig. S4 Area under curve (AUC) For each order, models were calibrated using random forest algorithm. Then the AUC were calculated from the predicted model on environmental variables and order occurrence. A: AUC obtained with all the variables, calibration on dataset of 2021 and prediction on dataset of 2020. B: AUC obtained with all the variables, calibration on dataset of 2020 and prediction on dataset of 2021 dataset. C: AUC obtained from variables selected with the VSURF procedure, calibration on dataset of 2021 and prediction on dataset of 2020. Sensitivity is the proportion of true presence; specificity is the proportion of true absence.