Modelling West Nile virus transmission in Emilia-Romagna region (Italy): 2018 vs. previous seasons

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Background

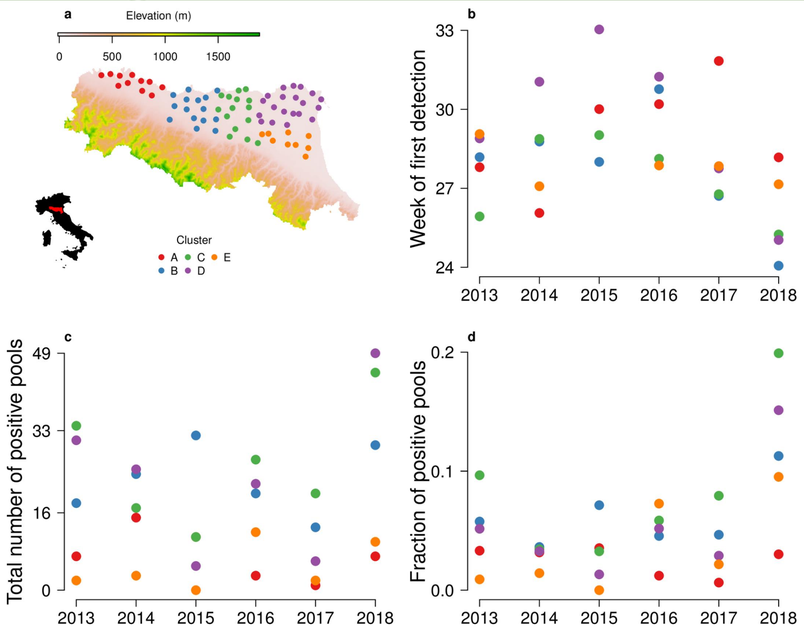

Fig 1: study area (a) and observed data (b-d).

Emilia-Romagna region (Fig 1a, 4.46 million inhabitants) has a mosquito surveillance program based on weekly captures performed between June and October each year with CO_2 baited traps located across the area (70 selected sites, grouped in 5 clusters) [1].

West Nile Virus (WNV) is present since 2013 with lineage 2.

In 2018, WNV was recorded **earlier** and in a **higher fraction** of mosquito pools (Fig 1 b-d).

Transmission resulted in **100 neuroinvasive human cases**, more than the total number of cases recorded between 2013 and 2017.

We compared 2018 to previous seasons by modelling the WNV mosquito-bird transmission cycle (Fig 2).

Computational framework & models fit

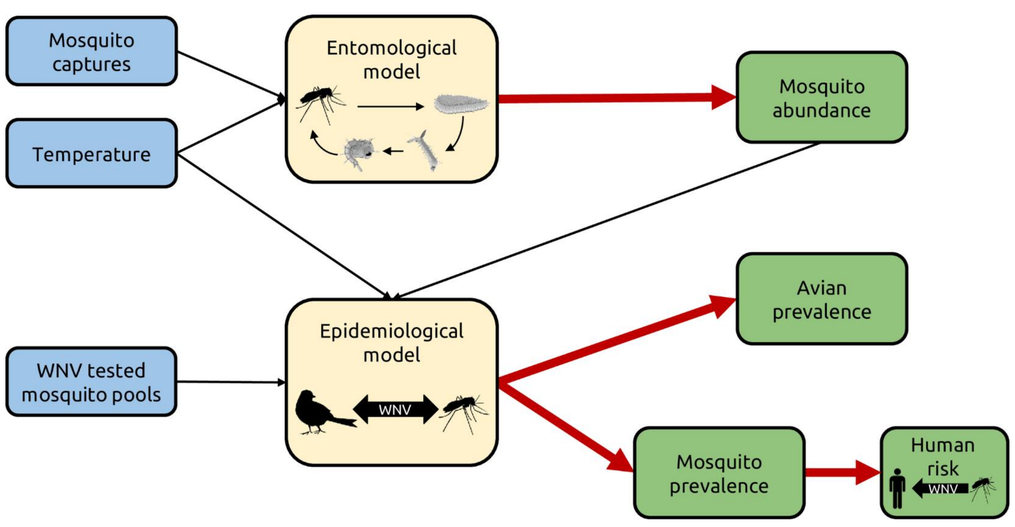

Fig 2: Computational framework. Models, based on [2, 3], are calibrated through MCMC.

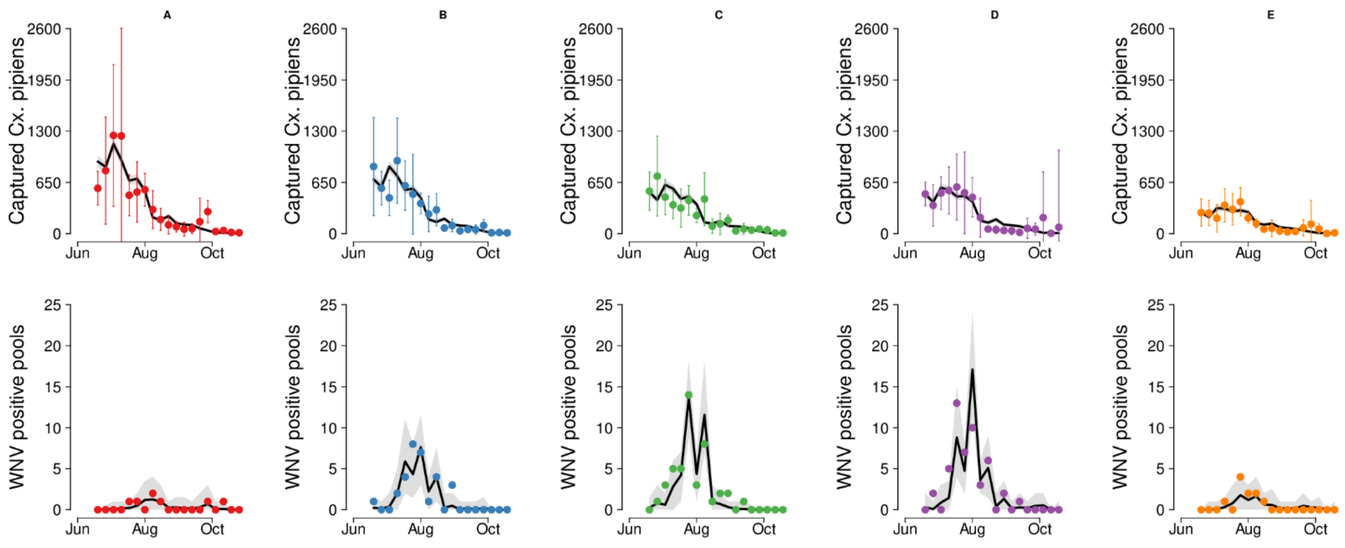

Fig 3: Fit for 2018. Overall 96% of the number of weekly positive pools lie within the 95%CI.

Main findings

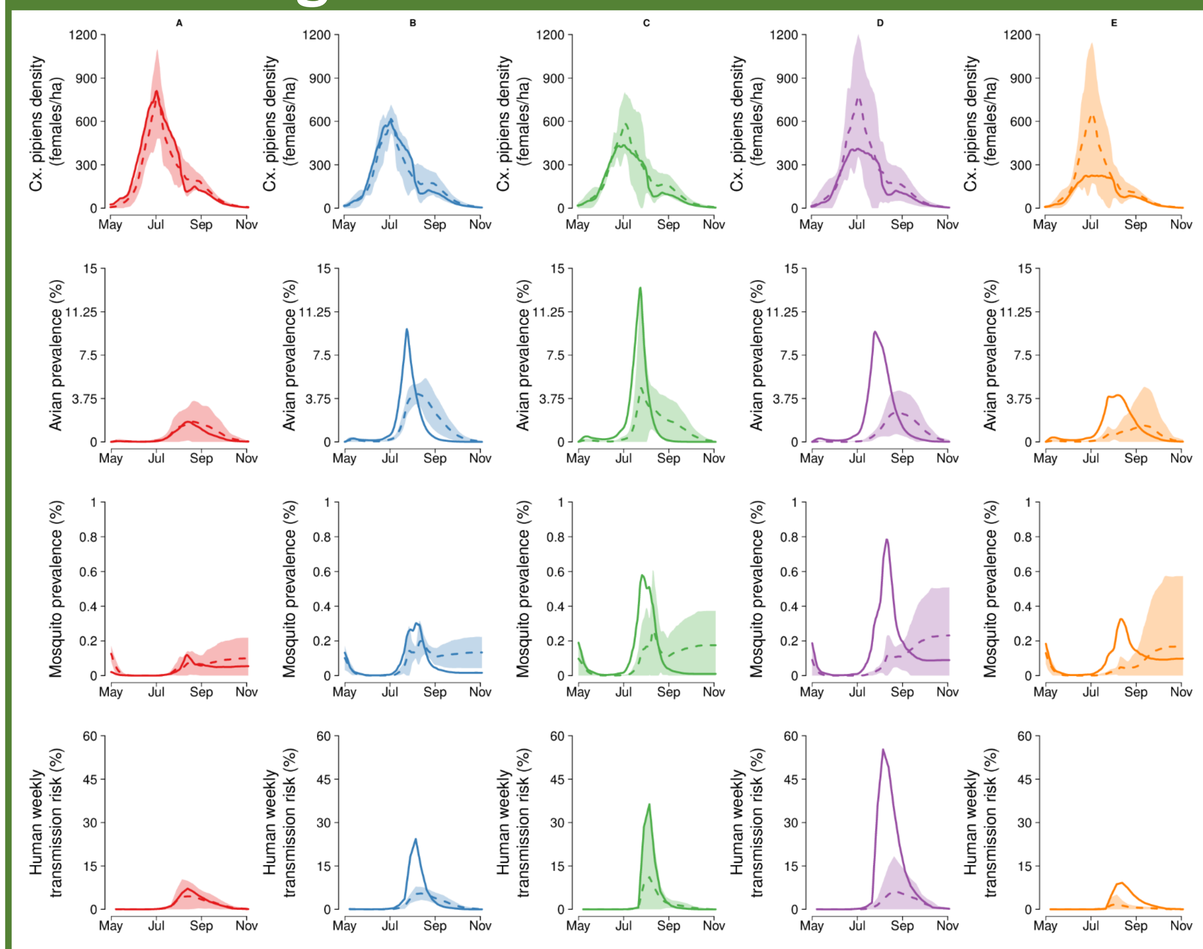

Fig 4: Comparison between 2018 (continuous lines) and averaged previous seasons (2013-2017, dashed lines, shaded areas represent the 95%CI of the averaged 2013-2017 seasons).

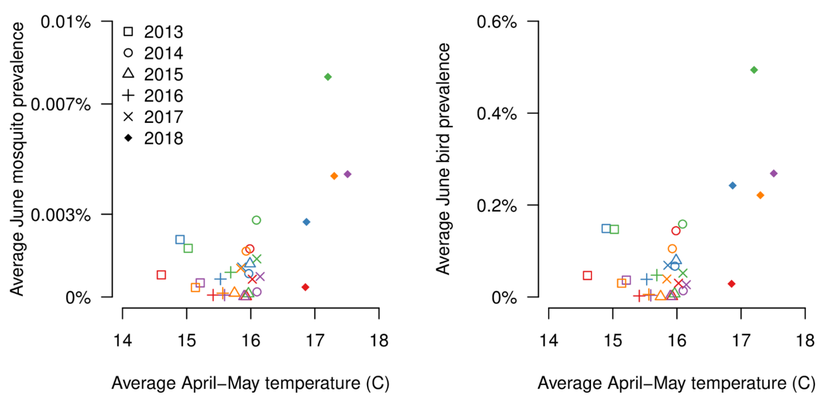

Fig 5: Estimated average June mosquito and avian prevalence VS spring average temperatures.

Conclusions

- Estimated maximum mosquito and avian prevalence for 2018 was up to more than three times the maximum of the 2013-2017 average.
- In some clusters the peak avian prevalence occurred earlier, followed by a steeper decline.
- Higher predicted risk for human transmission in 2018 (more than eight times higher than previous seasons in cluster D).
- Positive statistically significant correlation between avian and mosquito average prevalence in June and the average April-May temperature (Fig 5).
- Spring was exceptionally warm in 2018 with respect to previous years and it seems likely to have played a key role in amplifying WNV transmission at the beginning of the season.

Bibliography

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This study was partially funded by the Autonomous Province of Trento.

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