Centralised vs Decentralised Citizen Science Infrastructures for Early Warning Systems:

A comparative analysis of *Vespa velutina* monitoring systems in Europe

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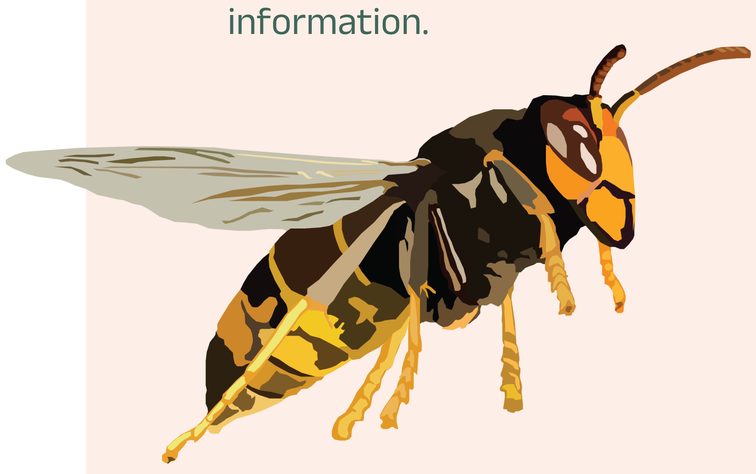
Aim

- To compare centralised and decentralised citizen science (CS) infrastructure for monitoring yellow-legged hornet (*Vespa velutina*) across the UK, Italy, France and Germany.
- To examine how differences in reporting, verification and coordination influence the functioning of early warning systems and how this can be adapted to emerging food risk systems.

Methodology

1. Selected four European countries with differing CS infrastructures for *V. velutina* monitoring.
2. Analysed official reporting platforms, contingency plans and governance documentation.
3. Comparison of infrastructures across three dimensions:
   - Reporting structure
   - Verification pathway
   - Response coordination
4. Examined available reporting and validation data to assess how observations are transformed into actionable information.



References

1. Bonney et al. (2009)
2. Pocock et al. (2017)
3. APHA (2024)
4. UKCEH (2024)
5. BHIP (2024)
6. National *V. velutina* monitoring and reporting platforms: APHA, NBU (UK), STOPVelutina (Italy), INPN/MNHM (France), NABU (Germany)

Results

Reporting Structures

Reporting structures varied substantially across countries, ranging from nationally coordinated platforms (UK and Italy) to more fragmented and regional arrangements (France and Germany). These differences influenced how observations were submitted, processed and incorporated into monitoring systems.

Table 1. Comparison of citizen science infrastructures for *V. velutina* across all four study countries [3,6].

Country	Reporting Structure	Verification Pathway	Response Coordination
UK	National platform	Central triage	National
Italy	Coordinated network	Shared validation	Integrated network
France	Multiple platforms	Regionally variable	Variable
Germany	State-based systems	State-level validation	Regional

Verification

Citizen science efforts generated large volumes of reports which require substantial verification prior to action being taken. The UK reporting funnel demonstrates how thousands of public observations are filtered into a much smaller number of actionable detections through a national triage process – highlighting the importance of effective verification mechanisms within citizen science infrastructures.

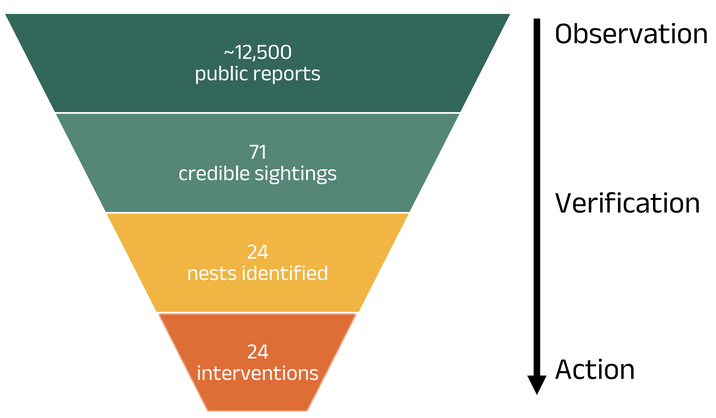


Figure 1. Illustrative UK reporting funnel for *V. velutina* (2024), showing the progression from citizen-generated reports to verified detection and intervention actions. [4,5]

Response Coordination & Integration

More integrated infrastructure provided clearer pathways from detection to intervention through standardised verification and coordinated response mechanisms.
Decentralised systems enabled local flexibility; however, they exhibited greater variation in escalation procedures and response arrangements. As responsibilities were distributed across multiple organisations and jurisdictions, coordination and information sharing appeared less standardised than in more integrated systems.

Data Visibility

The availability of consolidated reporting and verification data varied between countries. Those with a more integrated infrastructure were associated with clearer public reporting data, while fragmented systems often lacked comparable national statistics.

Conclusion

- Citizen science is increasingly functioning as part of formal monitoring systems.
- Infrastructure design shapes how observations are reported, verified and translated into interventions.
- Effective citizen science infrastructure is essential to consider alongside public engagement for successful future emerging food risk systems.

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This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101059813

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