Biologging as a surveillance tool for wildlife diseases

Developing a real-time monitoring system for ASF in Sardinia

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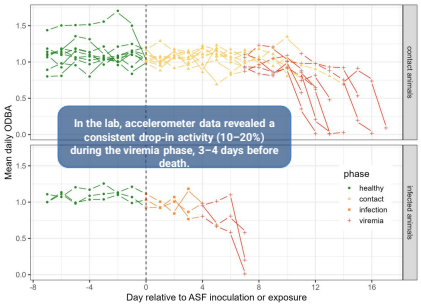
1 Introduction

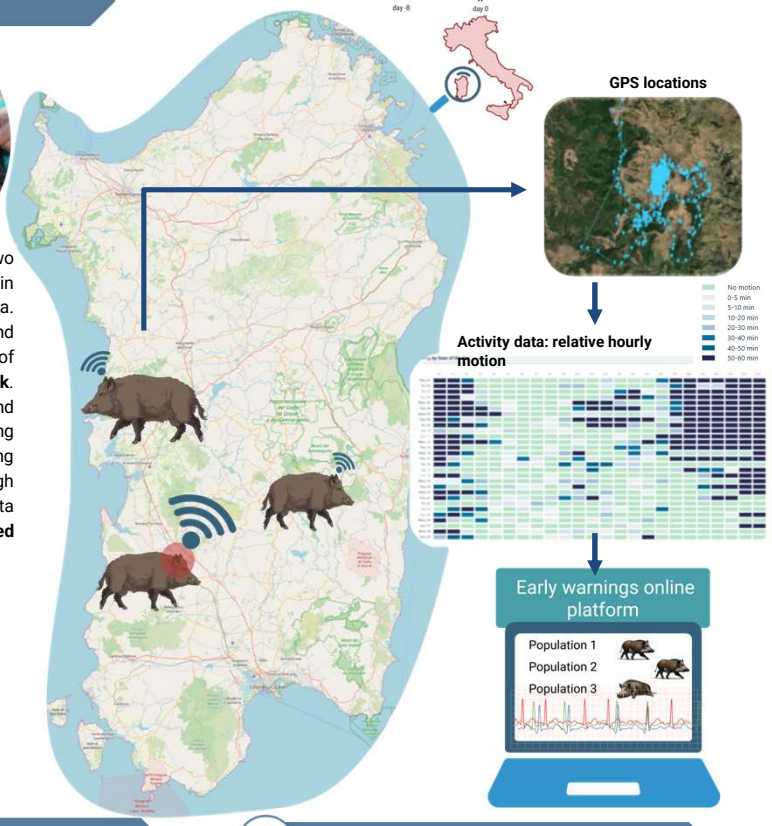
Biologging, the use of miniaturized sensors to monitor animal movement, activity, and physiology, has emerged as a valuable approach for **wildlife health surveillance**. Among these, accelerometers have shown promise in detecting behavioral changes associated with disease, particularly the onset of **sickness behaviors** (Morelle et al. 2023). In the absence of a vaccine against ASF, **early detection is critical** to contain outbreaks in wild boar populations and protect pig farming systems. Within the **framework of the ASF-SuSySens project** (Sensitivity estimation of the surveillance system for African swine fever), we developed and tested for the first time a near real-time biologging-based surveillance system using GPS and accelerometer-tagged wild boar in **Sardinia** , aiming to evaluate the feasibility of using sensor-equipped sentinel wild boar for early ASF detection and to inform surveillance efforts at local and regional scales.



2 Methods

Between December 2023 and April 2024, two wild boars were captured using trap cages in a hunting estate in southern Sardinia. Individuals were fitted with GPS collars and accelerometer-equipped ear tags capable of transmitting data via the **0G Sigfox network**. We collected high-resolution GPS location and activity data every 10 minutes when moving and every 6 hours when stationary, enabling real-time behavioural monitoring at high resolution (average: **80 locations/day**). Data were automatically uploaded to a **cloud-based dashboard**.

Sigfox coverage for Sardinia, in blue are shown the area well covered.



3 Feedback from the field

Field testing in Sardinia highlighted several practical considerations for biologging deployment. GPS **collars** proved **more durable** than ear tags, particularly under field conditions. Selecting animals of **appropriate size and age** was crucial to reduce injury risk and avoid skin damage. Moreover, **transmission** reliability was strongly **influenced by topography** and signal coverage, with the devices performing best in areas where network coverage allowed consistent data transmission.

4 Future Perspectives

Future perspectives for biologging-based ASF surveillance include the development of **next-generation tags with onboard processing**, enabling reliable data transmission even in remote areas with poor connectivity. Integration of temperature and biosensors will enhance detection accuracy, while **European-scale deployment of sentinel wild boar** could support harmonized early-warning systems. Coupling biologging with mobile platforms and AI-driven analytics will reduce false alerts and improve operational efficiency. **Enhancing energy efficiency and storage capacity** will further extend surveillance reach into rugged, unsampled regions where traditional methods fail.

5 Conclusion

We demonstrated that accelerometer and movement based biologging devices can detect sickness behaviour in ASF-infected wild boar, offering a scalable solution for early warning in wildlife health surveillance. While field deployment is feasible, especially in areas with adequate network coverage, **technological improvements**, particularly in ear tag durability and transmission reliability, **are still needed**. Integrating behavioural and spatial data can provide wildlife managers and veterinarians with near real-time insights to anticipate outbreaks and implement more effective control measures, advancing disease surveillance even in remote or logistically challenging areas

6 References & Aknowledgements

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Morelle K, Barasona JA, Bosch J, et al. Accelerometer-based detection of African swine fever infection in wild boar. Proceedings of the Royal Society B: Biological Sciences. 2023;290(2005):20231396. doi:10.1098/rspb.2023.1396

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