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FACING THE INVASION OF ALIEN ARTHROPODS SPECIES
ecology, modelling and control of their economic impact and public health implication
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BOOK of ABSTRACT



Natural and human-mediated diffusion of *Vespa velutina* in Italy and forecasting short term spread to improve management activities

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Implementing a cost-effective management plan for an invasive species requires the development of tools that could help to improve the performance of control activities. When the goal of the management plan is the spatial containment of a species, to understand the diffusion of the species within the present range and to evaluate where the species is most likely to spread in the short term can be really helpful to direct and localize control activities. This requires to assess the proportion of landscape that should be surveyed and the intensity of the monitoring activity allocated in each area. The yellow-legged hornet *Vespa velutina* is an invasive species, accidentally introduced into France in 2004 and rapidly colonizing other European countries. In Italy the species arrived in 2012, with the first nests located in 2013, and it is now spreading throughout the northwest part of the country, particularly in Liguria region. Aims of this work are to 1) reconstruct the spread of *Vespa velutina* since his arrival in Italy and establish a method to disentangle the natural diffusion from human-mediated transportation; 2) define buffer zones with different monitor and control intensity around the current Italian distribution range of the species with different likelihood of nests probability. The analyses were performed based on nests distribution, cluster analysis and nearest neighbour analysis of nests in respect to possible source sites of the previous year. In 2015 the frontline of the species was at 55 km along the coast from the French border, with a linear spread of 18.3 ± 3.3 km/year. A human-mediated dispersion could be recognized in different occasions. A cluster analysis of the range allowed the identification of 17 core areas used by the species, with a mean nest density of 2.9-3.5 nests/km². Mean distances of nests observed in 2015 from possible source sites were used to define areas where the species could naturally spread in 2016. The estimated probabilities of spread were: 33.5% within 500 m from the current range, 52.8% within 1 km, 75.2% within 2 km, 92.7% within 5 km and 98.2% within 10 km. Three expansion models were then elaborated at 700, 900 and 1200 m a.s.l., considering the altitude limits where nests and adults were observed. These results could be used to improve the effectiveness of *Vespa velutina* control, and better focusing possible expansion areas.

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