Quantifying Dispersal of European Culicoides (Diptera: Ceratopogonidae) Vectors between Farms Using a Novel Mark-Release-Recapture Technique

Studying the dispersal of small flying insects such as Culicoides constitutes a great challenge due to huge population sizes and lack of a method to efficiently mark and objectively detect many specimens at a time. We here describe a novel mark-release-recapture method for Culicoides in the field using fluorescein isothiocyanate (FITC) as marking agent without anaesthesia. Using a plate scanner, this detection technique can be used to analyse thousands of individual Culicoides specimens per day at a reasonable cost. We marked and released an estimated 853 specimens of the Pulicaris group and 607 specimens of the Obsoletus group on a cattle farm in Denmark. An estimated 9,090 (8,918–9,260) Obsoletus group specimens and 14,272 (14,194–14,448) Pulicaris group specimens were captured in the surroundings and subsequently analysed. Two (0.3%) Obsoletus group specimens and 28 (4.6%) Pulicaris group specimens were recaptured. The two recaptured Obsoletus group specimens were caught at the release point on the night following release. Eight (29%) of the recaptured Pulicaris group specimens were caught at a pig farm 1,750 m upwind from the release point. Five of these were recaptured on the night following release and the three other were recaptured on the second night after release. This is the first time that movement of Culicoides vectors between farms in Europe has been directly quantified. The findings suggest an extensive and rapid exchange of disease vectors between farms. Rapid movement of vectors between neighboring farms may explain the the high rate of spatial spread of Schmallenberg and bluetongue virus (BTV) in northern Europe.
