Mycoplasma bovis is an important pathogen causing severe disease outbreaks in cattle farms. Since 2011, there has been an apparent increase in M. bovis outbreaks among Danish dairy cattle herds. The dairy cattle industry performed cross-sectional antibody screening for M. bovis on four occasions, using the indirect BIO K 302 M. bovis enzyme-linked immunosorbent assay (ELISA) (Bio-X, Belgium) in bulk tank milk from all dairy herds between June 2013 and July 2014. The objective of this study was to investigate the evolution of the spatial distribution of M. bovis in the Danish dairy herd population throughout the study period. Repeated bulk tank milk samples were used as a proxy for the herd-level diagnosis. Descriptive and spatial analyses were performed for the four screening rounds. Based on a previous diagnostic test evaluation study, the M. bovis status for each herd was determined as test-positive or test-negative using a cut-off of 50 optical density coefficient %. The spatial global clustering was evaluated through a modified K-function method, and local clusters were identified by scan statistics. The results showed that M. bovis test-positive herds had a dynamic pattern in space. The global clustering analysis showed that M. bovis test-positive herds were spatially correlated in rounds one, three and four. These findings were supported to some extent by the local clustering analysis, which found significant high- and low-risk spatial clusters in rounds one and three in the north and south of the mainland. The clusters with a high risk of observing test-positive herds did not remain between sampling rounds, indicating that M. bovis did not tend to persist upon emergence in dairy herds. In contrast, the clusters with a low risk of observing test-positive herds persisted in the same area throughout the study period.