Numerically small but statistically significant genetic differentiation has been found in many marine fish species despite very large census population sizes and absence of obvious barriers to migrating individuals. Analyses of morphological traits have previously identified local spawning groups of herring (Clupea harengus L.) in the environmentally heterogeneous Baltic Sea, whereas allozyme markers have not revealed differentiation. We analysed variation at nine microsatellite loci in 24 samples of spring-spawning herring collected at 11 spawning locations throughout the Baltic Sea. Significant temporal differentiation was observed at two locations, which we ascribe to sympatrically spawning but genetically divergent 'spawning waves'. Significant differentiation was also present on a geographical scale, though pairwise F-ST values were generally low, not exceeding 0.027. Partial Mantel tests showed no isolation by geographical distance, but significant associations were observed between genetic differentiation and environmental parameters (salinity and surface temperature) (0.001 < P).
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