Magnetotactic bacteria (MTB) harbor diverse microbial populations and are ubiquitous in limnic and marine environments. MTB synthesize magnetosomes, which are intracellular membrane-enveloped, species-specific, single-domain magnetite or/and greigite. Fossil magnetosomes can be a major source of ferrimagnetic minerals and important carriers of environmental signals in some sediments and rocks. Nevertheless, the distribution of uncultured MTB in present and past natural habitats as well as their contributions to sedimentary magnetism remains unclear. In this paper we carried out spatial investigation of uncultivated MTB spanning eastern China. MTB were magnetically enriched from surface sediments in freshwater lakes, brackish estuaries, mangrove swamps, and inter-tidal zone sites. A combination of transmission electron microscope and a range of microbial methods were conducted to probe the diversity of MTB. We analysed the composition of MTB communities based on similarities in the phylogenetic lineages, and found that the distribution of MTB communities correlate with the salinity (also nitrate) of sampling sites. The magnetism of those uncultured MTB was also investigated. Furthermore, we experimentally tested the temperature-dependence of uncultivated MTB populations. It indicated that the uncultivated MTB community varies with temperature changes. Together, our new results indicate that there are direct links between MTB diversity and environments, which implies that possibly in future the physical and chemical characteristics of magnetofossils in deep-time sediments could be used as novel proxies for reconstructing paleoenvironments.