This study discusses the detailed chronobiostatigraphic history and paleoenvironmental features in the Quaternary period at Lake Iznik (NW Turkey) based on fossil ascidian spicules and nannofossil records. New ascidian spicule data and nannofossils were identified in three lake bottom mud cores, K-1, K-2, and K-3, and in the muddy sediments of two drilled samples, SK-1 and SK-2. In the samples, eleven fossil ascidian spicule species, including two new species, were recorded: Bonetia acuta Varol & Houghton, Bonetia brevis Varol & Houghton, Bonetia quasitruncata Varol & Houghton, Micrascidites vulgaris Deflandre & Deflandre-Rigaud, M. gothicus sp. nov., Monniotia aciformis Varol & Houghton, M. fasciculata Varol & Houghton, M. minutula sp. nov., Rigaudia multiradiata Varol & Houghton, and R. praecisa Varol & Houghton. Ascidian spicules in the core muds probably released from the Didemnum species (i.e., D. candidum) were compared to Holocene nannofossil data, such as Alisphaera sp., Coronosphaera mediterranea, Emiliania huxleyi, small Gephyrocapsa spp., and Scyphosphaera spp., representing the NN21 Emiliania huxleyi zone. Drilling core sediments also include the same ascidian fossils, and also one nannofossil species, Gephyrocapsa oceanica, indicating the NN21 zone of upper Pleistocene stage, as found in sample SK-1.

Based on the ascidian spicules and nannofossil records of the coring/drilled muds of Lake Iznik was marine, as an inlet or lagoon connected to the modern Gulf of Gemlik, during the Pleistocene to Upper Holocene. It was likely separated from the Marmara Sea and turned into a freshwater lake after the upper Holocene.