Biostratigraphy of Late Miocene to present-day sediments of the Caspian Sea: over 5 million years of palynological records from Azerbaijan

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Biostratigraphic age-dating of Caspian Sea sediments, notably the mainly Pliocene Productive Series in Azerbaijan, has always been problematic. Marine connections occurred in the Late Miocene (Pontian) before c.5.5 Ma and again in the Late Pliocene (Akchagyl) after 3.4 / 3.1 Ma. During the intervening period, deposition occurred in a non-marine, isolated basin setting, and no reliable age-dating is possible from foraminifera or nannofossils. The Productive Series, Akchagyl, Apsheron and more recent Quaternary sediments, are rich in palynomorphs (pollen, spores, algae and dinoflagellate cysts). These do not provide direct age-dating, but give a "biostratigraphic signature" for each time period / formation, and are useful for regional correlation and interpretation of palaeo-climate and depositional environments. The palynological records from Azerbaijan give a detailed insight into the geological history of the Caspian Sea from the Late Miocene to Recent.

Palynological studies of core and outcrop from Azerbaijan show that the Lower Productive Series (Kalin, PK, Kirmaky Suite, NKP and NKG) contains frequent brackish dinocysts, which thrived after the Pontian marine connection in a low-salinity lake basin. Influxes of freshwater algae equate to periods with greater freshwater dilution (e.g. in the Kirmaky Suite) and localised pulses of fungal bodies and reworking represent periods of relative lowstand (e.g. NKG). The Upper Productive Series (Pereriv / Fasila, Balakhany, Sabunchi and Surakhany) was also deposited in a closed lake basin. The Pereriv / Fasila (main reservoir sand) has an erosive base and contains fluvio-lacustrine palynofloras which continue up-section into the Balakhany Suite (Bal X-V). The Bal X and Bal IX contain frequent freshwater algae and show a regressive trend upsection, a pattern that is repeated in the Bal VIII-VII and Bal VI-V. The palynofloras indicate seasonally controlled lacustrine / deltaic (palaeo-Volga) deposition during a period of relatively warm climate with alternating humid and arid conditions. Floras from the Sabunchi and Surakhany reflect the gradual infilling of the lake basin, with lake-margin and salt-marsh habitats becoming more widespread.

The Akchagyl (Late Pliocene) marine connection is marked by an abundance peak of marine dinocysts, and the overlying Apsheron Formation (Early Pleistocene) sees the re-appearance of frequent brackish dinocysts. Later Pleistocene sediments can be dated by ^{14}C and OSL (Optically Stimulated Luminescence) and broadly tied to the Bakunian, Khazarian and Khvalynian local stages. These "Soil Units" contain alternating warm and cold pollen and dinocyst assemblages, which can be tentatively correlated to glacial / interglacial episodes, and reflect the migration northwards of the Volga delta in recent times.