Oil-Gas Prospects of the Lower-Middle Jurassic Sediments of the North and Middle Caspian

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The regional occurrence of oil and gas in Lower-Middle Jurassic sediments on land is a basis for predicting their presence offshore in the North and Middle Caspian Sea.

All the main structural elements onshore extend on out into the sea. Along the east coast of the Middle Caspian extends the Karabogaz-Middle Caspian zone of domal highs (Fig. 1). Conforming with the trend of this zone in the western part of the sea is the Tersko-Caspian foreland downwarp. In the northeast segment of the sea is the offshore continuation of the North Caspian and Shukat arches. In the south part of the North Caspian the character of the junction of the main structural elements on the west (Karpinskiy ridge, Vostochno-Manych downwarp, Pri-Kuma - Tyulenev zone of highs) and east (Buzachi arch, Mangyshlak ridge) coasts is unclear.

Distribution of Lower-Middle Jurassic sediments in the Caspian Sea is known largely from seismic surveys. Individual wells have penetrated these sediments only on the east shelf. Maximum thickness of 3-4 km is found in the Tersko-Caspian foreland downwarp and its offshore continuation. In the Pri-Kuma and Karpinskiy areas it does not exceed 500-700 m. Similar thicknesses are found on the southeast of the Peri-Caspian depression and northeast part of the sea. It increases to 800-1200 m in the North Ustyurt and South Mangyshlak downwarps. These sediments are absent on the Karabogaz arch.

Oil and gas pools occur largely (80%) in Bajocian deposits. A small number are present in Bathian sediments. On approaching the Caspian, the pools in the Jurassic sediments change from oil to oil-gas-condensate to gas.

On a basis of distribution of oil and gas fields on land and analysis of the tectonics of the offshore areas, favorable areas offshore have been determined for the Lower-Middle Jurassic sediments. In the northeast part of the Caspian such areas are the marine continuation of the North Caspian and Shukat arches; on the east - the marine continuations of the Buzachi arch, Zhetybay-Uzen step, and west flank of the Karabogaz-Middle Caspian zone of highs. Granular reservoirs of fluvial facies are expected in these regions.

Favorable areas in the west part of the Caspian Sea are the offshore continuations of the Pri-Kuma-Tyulenev zone of highs and Karpinskiy ridge, where reservoirs associated with shallow-water marine facies are expected.

Discovery of oil and gas pools is possible at depths of 1-3 km in the northeast part of the Caspian in association with salt tectonics on a continuation of the Prorva, Primor, and Novobogatin oil-gas zones.

On the offshore continuation of the Buzachi arch discovery of pools similar to those onshore can be expected at depths of 1-2 km.

The region of the North Caspian high on a continuation of the Buzachi arch and framed on three sides by large areas of downwarping is of practical interest. Pools are predicted here at depths of 2-3 km.

A direct continuation of the Zhetybay-Uzen step offshore has not yet been found; however, gravity data suggests that the structures continue 70-80 km into the sea.

Five seismic profiles are recommended for further study of the structure of the Caspian Sea. See Fig. 1.