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Sudoch Trough Prospective Areas and Local Structures with a High Probability of Hydrocarbon Accumulation

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Abstract: The article gives the geological features of the structure and oil and gas content of the Jurassic "sandy" horizons of the Sudoch trough and the prospects for oil and gas production, the location of hydrocarbon collections and their relationship with certain tectonic elements, as well as the conditions for the preservation and formation of hydrocarbon deposits, issues related to lithological phase and paleographic structure carried out at the field.

Keywords: Sudoch trough, reservoir, oil, gas, oil content, Urga, Dali, Aral, Aralik, trough, uplift, swell, structure, tectonics, sedimentary cover, well, section, deposits, rock, sandy horizons.

To solve the problem of prospecting for oil and gas deposits associated with zones of lithological wedging out and stratigraphic unconformity of deposits within any oil and gas basin, it is necessary to clearly understand the conditions for the formation of these zones, as well as the geological features of the occurrence of lithological and tectonically shielded traps in them that can accumulate oil in themselves. and gas [1].

For a predictive assessment of the prospects for the oil and gas potential of the Sudoch trough and the search for hydrocarbon deposits, the main attention is focused on studying the features of the geological structure of the trough, the lithological and stratigraphic characteristics of sandy horizons, and the facies-paleogeographic conditions for the formation of sediments. This is due to the fact that many of the hydrocarbon deposits discovered in the Sudoch trough turned out to be associated with lithological pinchouts of reservoir rocks and tectonically screened traps formed in certain facies-paleogeographic conditions.

In accordance with the studies of the lithological-stratigraphic and facies-paleogeographic features of the Jurassic terrigenous formation of the Sudochye, the trough revealed the predominant distribution of channel, channel-floodplain and floodplain-lake zones (channel-floodplain and submountain facies), favorably contributing to the lithofacies conditions of formation and conservation of hydrocarbon deposits.

At the same time, the main attention was paid to the lithological, material and reservoir properties of the rocks of the section, which are the result of the study of core and slurry materials obtained in the process of exploration for oil and gas [2; p.240]. Therefore, in order to assess the prospects for the oil and gas potential of the Jurassic terrigenous deposits of the study area, based on lithofacies prerequisites, the following conclusions can be drawn:

In the eastern part of the Sudoch trough, the movement of the paleo-river from the northeast to the southwest was established. The width of the zone is from 25 to 75 km, it is composed of intercalation of channel conglomerates, gravelstones, sandstones, as well as pattums and floodplain siltstones and mudstones. The total thickness of the Lower Jurassic deposits is from 225 to 280 m, respectively, in the Muynak area (well No. 1) and Vostochny Muynak (well No. 1). Judging by the increase in the thickness of these deposits towards the east, there is a trend towards an increase in the thickness of the deposits and

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the coarse clastic component in the Kuanysh sandy horizon. The Lias sequence (Kuanysh horizon) and the lower part of the Aalenian stage (Muynak horizon) with a total thickness of 545 m were tested by aerization. At the same time, the inflow of oil and gas was not obtained, and in the test of two clay-sand intervals (2817-2824 m and 2800-2805 m), they gave inflows of water with oil. The question of the oil and gas content of the Lower-Middle Jurassic terrigenous deposits remains open here, since the author considers it necessary to further study specifically the sandy and conglomerate layers of the aforementioned Kuanysh and Muynak horizons.

Judging by the predicted profile model (along the location line of Berdakh, Vost. Berdakh, Uchsay, Kyzylshali fields), the structures of the structures located in it are a brachianticlinal axis and have a latitudinal direction. At the same time, their arched part is located on the areas of Vostoyany Berdakh and Uchsay, where two hydrocarbon deposits were discovered, which are arched, confined to two domes (Fig. 1.).

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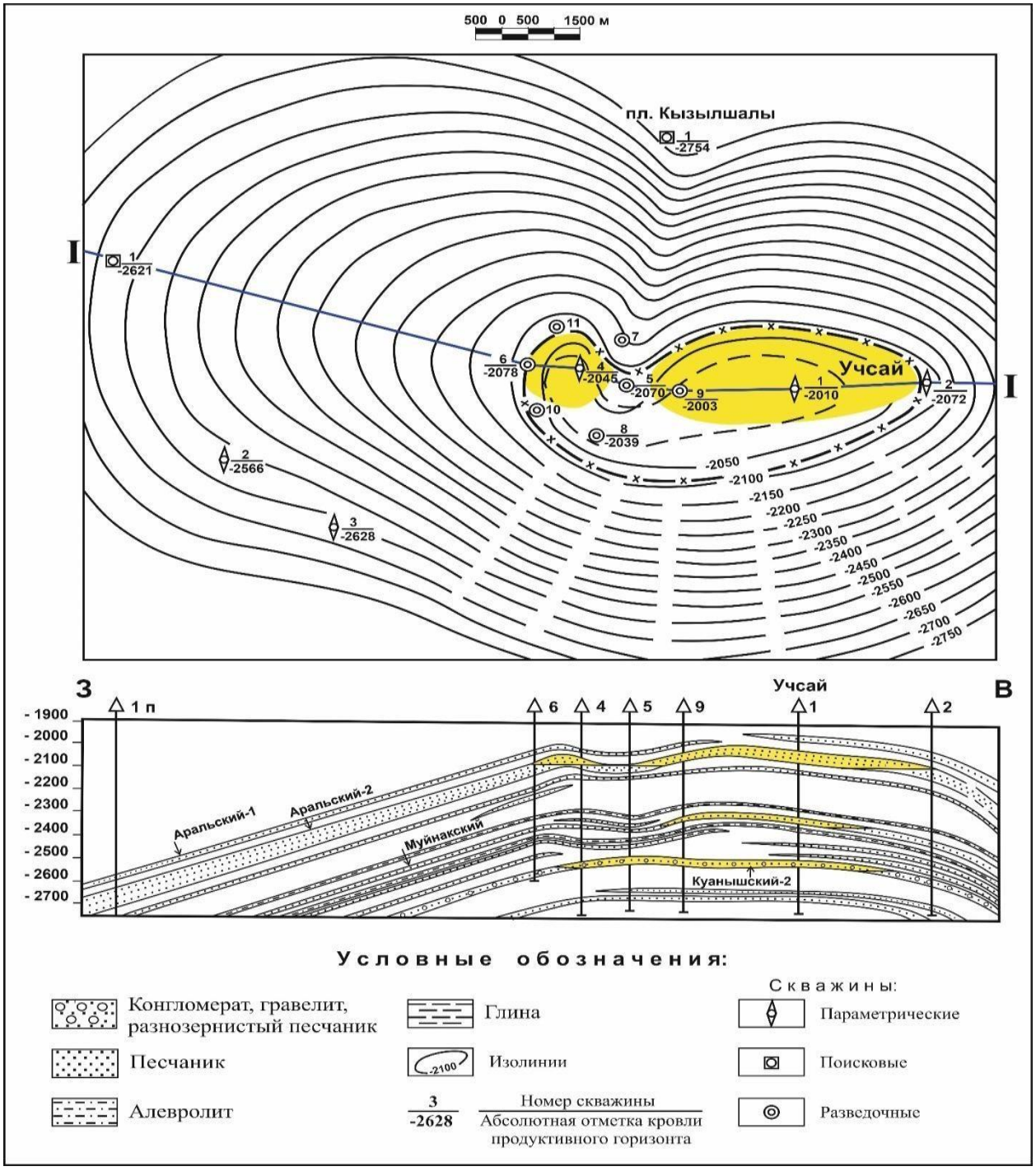

Picture. Fig. 1. Structural map and model of the modern structure of the productive part of the Jurassic sandy horizons of the Sudoch trough, 2021.

It should be noted that along the top of the Aral-2 horizon, the single-dome structure turned into a two-dome structure. Such occurrence of deposits of this horizon continued up to the top of the Lower Jurassic. And according to the structure of the roof of the Lower Jurassic, this structure again turned into a single-dome structure, located on the periphery of well No. 4. She became very gentle, so barely noticeable. In the lower part of the section (along the Kuanysh-2 horizon), the dome of the structure shifts again in the area of well No. 5. The hydrocarbon deposits established here are also connected with the vaults. Consequently, in the direction of the Uchsai field, several new

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productive sand lenses that need further contouring of the lenses and associated deposits.

The section between the squares of Kabanbay, Shimoly Aral, Sev. Urga, East Kuanysh, where a core channel zone was developed in the Early Jurassic deposits with the direction of paleo-rivers from north to south. In the east and west, this zone is replaced by floodplain-lake zones. The width of the core channel zone is 25 km. It is composed of uneven interbedding of conglomerates, siltstones, and clays. The total thickness of the Lower Jurassic deposits is about 800 m; Shimoly Aral-1 ~ 675 m.

At the same time, on the square Murun-1P thickness is reduced by a factor of 2 ~ 236 m, which indicates the presence of a fault here, which can be a tectonic screen for coarse clastic layers of conglomerates, gravelstones and sandstones. Their thickness varies from 20 to 70 m. When testing the Murun-1P area, gas was obtained from the sandy layers of the Lower Jurassic with a flow rate of 3.3 thousand m3/day. In the Kabanbay area, Lower Jurassic deposits were not tested at all. According to the author, this former facies-core channel zone, in modern terms, is promising for the accumulation of hydrocarbons.

In the southeastern part of the Sudoch trough between the Aral, Shagyrlyk, Takhtakair and Kungrad areas, the channel core, channel-floodplain and submountain facies are also developed. They are composed of uneven interbedding of sandy, silty and clay layers. In the bottom part of the section, in the Chink-1P area, there is a 100 m sandy Kuanysh horizon with interlayers of thin siltstones and clays. The exposed thickness of the Lower Jurassic deposits in the Takhtakair area is 527 m. The deposits of this horizon spread towards the south, to the Karaumbet-Kungrad paleouplift and further - wedged out. Therefore, it is recommended to carry out detailed seismic surveys here.

The area located between the areas of Atau, Zhagis and Zhaga, where the core channel facies was also developed, and along the periphery - floodplain-channel. The width of the site is 70 km, along the peripheral part of the paleo-elevation 30 km. In the nearby areas (Urga, Dali), the thickness of the Aalen deposits is 300–350 m, and in the Eastern Kuanysh, it increases to 400 m.). In the selected area, the channel facies at the transition to the south-east are replaced by floodplain-lake formations. Further, when they spread towards the southeast, then wedged out to the paleouplift, therefore this wedging out zone is of exploration interest in hydrocarbon deposits.

On the facies-paleogeographic map of the Bajocian time presented in the work, an area bordering the Kyzylkum paleouplift is identified - from the north, 85 km wide, from the south

– 20-40 km. This section includes Zhiltyrbas, Arkakungrad and Raushan squares. In the selected area, channel, floodplain, and along the periphery paleo-elevations of floodplain-lake facies are mapped. In the northern part of the selected area, the channel facies continues in the direction from the northeast to the southwest. The total thickness of the Bajocian deposits in the Zhyltyrbas area is only 83 m, and in the Takhtakair area (down the paleo-river bed) it increases to 213 m. m. It seems to the author that this channel, channel-floodplain and floodplain-lake zones, which wedge out towards the Kyzylkum paleo-elevation, have positive search signs for the discovery of industrial hydrocarbon deposits.

On the compiled facies-paleogeographic maps of the Bathonian, Callovian and Oxfordian times, areas bordering the Kyzylkum paleouplift and stretching from north to south, capturing the uplift itself, were identified. The width of the plots is up to 65 km in the north. In this area, mainly shallow-sea wave-cut sandy and underwater deltaic facies are distinguished.

The wave-cut sandy zone is composed of rhythmic interbedding of sandstones, siltstones, and clays. The

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thickness of sandy horizons in the areas of Surgil, Muynak, Alpomish, Takhtakair and Arkakungrad (for the Bath time) is from 10 to 30 m. Toward the coast, the thickness of sandy layers usually increases. The thickness of the Bathian deposits in the Takhtakair area is 290 m, Arkakungrad - 185 m. These deposits wedge out in the east direction (toward the paleo-elevation).

A similar picture is observed in the Callovian stage, here only in the Arkakungrad area the thickness of sandy horizons increases, and in the middle part of the section in 2 places. They wedge out towards the east towards the paleo-elevation, and their thickness sharply decreases towards the west (Raushan area).

On the facies-paleogeographic map of the Kimmeridgian-Titonian time, the following stand out: wave-cut-sand zone; underwater delta zone; wave-cut-sand-carbonate zone, as well as the actual carbonate-lime and dolomite zones.

Based on the obtained results, it seems that the Bathonian, Callovian, Oxfordian wave-cut sandy zones, which wedge out to the Kyzylkum paleo-uplift, and in the northern part are replaced by sub-deltaic facies, are of very important prospecting value. Therefore, in this area, in the zones of wedging out of sea-cut and deltaic and continental-channel facies, it is recommended to carry out detailed seismic surveys (MOGT-2D, 3D), and in parallel with geophysical studies, it is advisable to start drilling exploratory wells to determine the facies structure and oil and gas content of Jurassic terrigenous deposits.

Thus, from the geological point of view, consideration of the lithofacies features of the Jurassic terrigenous deposits of the Sudoch Trough in the presented perspective deserves attention as a search criterion when choosing a rational direction for prospecting and exploration for oil and gas and substantiating the forecast of oil and gas potential of individual areas and areas.

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