Geology and Oil-Gas Prospects of the Naryn Depression

I. A. Shmelev, T. T. Radyushkina

The Naryn depression is one of the largest intermontane depressions of the Central Tian-Shan. It is bounded on the north by the Kirgiz Range and by the system of ranges of the Terskey-Alatau, on the east by the western end of the Khan-Tengri mountain mass, on the south by the Atbashi Range, and on the west by the Fergana Range. The length of the depression is 220 km, and the width is 75 km. See Fig. 1.

Deposits of Jurassic, Cretaceous, and Tertiary age are present in the depression. A description of the section from the bottom upward is given below. See Fig. 2.

Jurassic sediments are found on the north flank of the Dzhaman-Davan-Tau Range on the upper reaches of the Aksay River. Here along the range between Neogene conglomerates is a belt of Jurassic sediments 45 m wide standing “on its head.” At the base occur strongly deformed black, white, and yellow calcareous clays with beds of coal 0.05 to 4.7 m thick, and sandy calcareous siltstones from 0.4 to 2.7 m thick. Higher occur red clays with layers of siltstone and coal. The section is topped by reddish limestones with pebbles of chert, quartz, calcite, and feldspar with a thickness of 12.6 m.

No fossils were found in these sediments. By analogy with Jurassic rocks found to the south around Lake Chatyr-Kul and to the north at Min-Kush, the age of the variegated sediments with coal beds is referred provisionally to the Lower Jurassic. Their thickness is 44.5 m.

Higher up occurs a member of red clastic rocks (Kirgiz formation) with a thickness from 40 to 600 m. Outcrops of redbeds are observed along the north flanks of the Dzhaman-Davan-Tau and Baybiche-Tau Ranges, on both flanks of the Kara-Tau Range, and on the Naryn-Tau Range, as well as along the southeast flank of the Akshtyryak Range and the south flank of the Moldo-Tau and Nura-Tau Ranges. The redbeds are nowhere in contact with the Jurassic sediments; rather, they rest everywhere on the eroded surface of the Paleozoic with angular unconformity. At the base they consist of brick-red conglomerate, sometimes conglomerate breccia with sandy-limey cement. Higher up occur conglomerates that alternate with red inequigranular limey sandstones with a thickness from 2 to 7 m. Yet higher occur red gypsiferous, limey, sandy clays with beds of well sorted gray and rose limey, shaly sandstones and siltstones. No fossils have been found in the sediments of this formation in the area of the Naryn depression.

The greatest thickness of the Kirgiz formation, up to 600 m, is observed in the west and, east parts of the depression; it does not exceed 100 m in the central part (Terek, Karabuk, Karabulun, Bokterek Rivers).

Higher up the Kirgiz formation passes gradually into the lower sub-formation (Na) of the Naryn salt formation of the Neogene with a thickness from 200 to 1050 m. Its outcrops coincide territorially with outcrops of the Kirgiz formation and have a width from 300 to 4000 m.

This formation consists of chocolate yellow limestones and gypsiferous shell clays with beds of gray, greenish gray, and blue gray limey siltstones, sandstones, and gypsum.

No fossils have been found in the lower sub-formation of the Neogene. However, it contrasts sharply with the underlying redbed formation by its characteristics cinnamon yellow color and heavy mineral suite. In this sub-formation are encountered all the minerals typical of the Neogene sediments of the Tian-Shan depressions such as hornblende, chloritoid, and all micas; kyanite, however, is completely absent. Since a unit of rocks of upper Miocene-middle Pliocene age occurs above, the lower sub-formation of the Neogene can be referred provisionally to the middle Miocene. The greatest thickness of the sediments of this sub-formation is observed in the central part of the depression on both sides of the Baybiche-Tau and Kara-Tau Ranges, where it reaches 1049 m (Tarasu) and 1043 m (Atbashi River). The thickness is reduced along the margins of the depression - on the west to 500 m (Kushka-Su), and on the east to 170 m (Orto-Nura River).

The sediments of the lower chocolate-yellow sub-formation pass upward into thick (up to 2000 m) banded variegated sediments of the middle sub-formation of the Neogene (NG). In the western part of the Naryn depression these sediments fill the entire basin of the Alabuga River. On the northeast they form a belt 3-9 km wide.

In the north part of the depression the sub-formation crops out in the cores of the Dzhumatay, Naryn, Dzhirgatal, and Dzhanytal anticlines and on the flanks of the Orto-Nurin anticline.

The sub-formation consists of rapidly alternating variegated sandy, limey, greasy clays, variegated limey siltstones, fine-