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PRELIMINARY REPORT ON THE OCCURRENCE OF TERTIARY GOLD-BEARING GRAVELS IN SURINAM

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ABSTRACT

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As a result of the recently commenced exploration programme of the Geological and Mining Service of Surinam, gold was discovered in gravels of the Tertiary Coesewijne Formation near Jorka Kreek and Loksie Hatti. These gravels form the base of isolated plateaus along the southern margin of the Coesewijne Formation in the vicinity of major rivers. The gravels were deposited in braided river and alluvial fan systems under semi-arid conditions.

It is assumed that at Jorka Kreek both gold and rounded clasts were derived from the Precambrian Rosebel Formation, whereas at Loksie Hatti the gold is derived from local quartz veins. Further evaluation of these placers, now in progress, should reveal whether or not they are economically exploitable.

INTRODUCTION

In describing the white (quartz) sands of the Zanderij Formation in Surinam, several authors (e.g. ZONNEVELD, 1955; BRINCK, 1956; VAN DER EYK, 1957; KROOK & MULDERS, 1971) reported the presence of local gravel-beds at the base of this formation. Traditionally, the bleached sands which characterize the savanna belt in Surinam have been assigned to one lithostratigraphic unit, the Zanderij Formation in the sense of WIJMSTRA (1971) and DIXON (1972) or the so-called Upper Coesewijne Formation (MONTAGNE, 1964; BOSMA & GROENEWEG, 1970). Nowadays the formation is referred to as the Coesewijne Formation. Based on palynological data a Pliocene age had been established for this formation by VAN DER HAMMEN & WIJMSTRA (1964) and WIJMSTRA (1971). Similar gravels are also known from the basal parts of the lithological equivalents of the Coesewijne Formation in the adjacent countries Guyana and French Guiana. In Guyana the gold- and diamond-bearing character of these gravels has been known since the beginning of this century. Gold was also discovered in the basal gravels of three white sand plateaus near St. Jean in French Guiana.

In Surinam, the gravels form the base of white sand terraces and plateaus which are all situated along the southern margin of the Coesewijne Formation in the vicinity of major rivers. Such terrace remnants have been found along the Marowijne River near Jorka Kreek, along the Surinam River near Cassipora, along the Miendrieneti River (Brinck Hill, Klaiber Hill and Lobles Hill) and along the Saramacca River near Loksie Hatti (Fig. 1). These terraces have elevations between 60 and 90 m above sea level. The gravels, varying in thickness from 10 cm to 2 m cover weathered or kaolinized Precambrian rocks. The medium coarse to very coarse sands above the gravels may have thicknesses up to 12 m. Generally, the gravels are badly sorted and chaotically well-packed; the individual components usually consist of extremely well rounded quartz and range in size from pebbles to boulders. The well-rounded quartz pebbles often have a sugary appearance resulting from strong weathering. Angular clasts consisting of smooth non-weathered quartz occur locally.

Recently, the Geological and Mining Service of Surinam (GMD) initiated an exploration programme in which much importance is attached to the evaluation of placer deposits. As a result, gold was discovered in the gravels of the above mentioned terraces near Jorka Kreek and Loksie Hatti.

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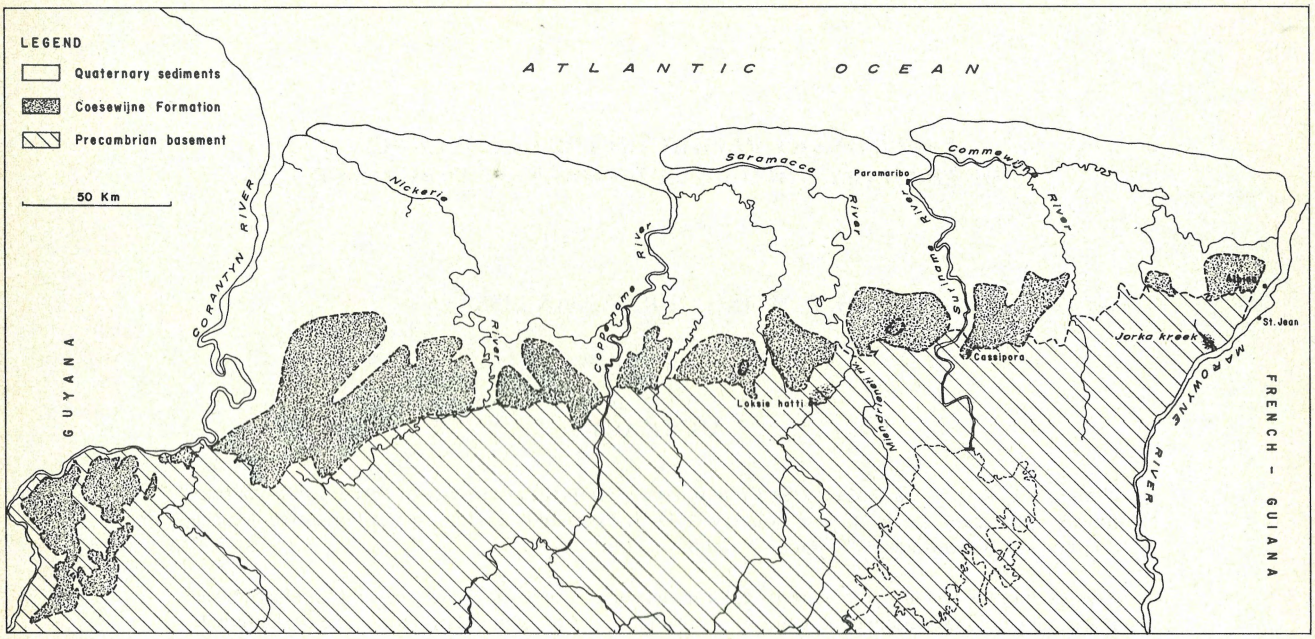

Fig. 1
Generalized map of northern Surinam showing the extension of the Coesewijne Formation.

JORKA KREEK

VAN EYK (1958) and MONTAGNE (1964) reported the presence of white sand plateaus with basal gravel beds in the vicinity of Jorka Kreek along the Marowijne River. There are three isolated plateaus of 6, 3 and 1 km^2 respectively.

In January 1976 exploration of the largest plateau began under supervision of R. V. Van Lissa. By means of a 4″ Banka drill a systematic drilling programme was carried out. Up till now about 40 holes have been drilled and sampled. To get more reliable information, both as to lithology and gold values, the digging of cased shafts was started in March 1977. In digging these shafts steel casing rings, with a diameter of 1 m are used. In this way 6 shafts with a maximum depth of 9 m have been dug to date. When the basement is reached the casing rings are disconnected and withdrawn. In this way excellent lithological profiles became available.

The bed-rock consists of weathered quartz-mica schists with locally garnet and staurolite of the Precambrian Armina Formation. It is in sharp contact with the overlying gravel bed which has an average thickness of about 1 m. The gravel consists of poorly sorted and chaotically well-packed and well-rounded 'sugary' quartz components ranging in diameter from 0.5 to 30 cm. In a few exposures in creeks in the SE part of the plateau boulders up to 80 cm have been met with. The matrix of the gravel is coarse sand mixed with some clay. Towards the bottom the amount of clay increases rapidly and the base of the gravel is often characterized by a dark coloured (organic material) clayey matrix which locally may be indurated.

The medium coarse to very coarse white to brown sands on top of the gravel are 2-9 m thick. In general a fining upwards can be discerned and the grains are angular to subrounded.

The gravel from all localities contains fine, well-rounded gold particles varying in size from 0.2 to 2 mm. The larger pieces, however, are rather scare. Generally, the basal part of the gravel bed yields the highest gold values. Small amounts of flour gold were noted in concentrates of the sands. Heavy minerals, associated with the gold in the gravel, are staurolite, garnet, rutile, zircon, chromite, xenotime and cassiterite.

LOKSIE HATTI

The presence of a coarse basal gravel in the 'Coesewijne sands' west of the Saramacca River, near the village of Loksie Hatti was reported by KROOK & MULDERS (1971). In April 1976 geologists of the GMD, who made a reconnaissance trip in this area, saw several exposures of this basal gravel in which 'po(r)knocking' activities were successfully performed. Hence, exploration of this area started the very same month under supervision of Th. E. Wong.

North of Loksie Hatti there is only one isolated white sand plateau of 1 km^2 with a basal gravel bed. Furthermore, over a distance of 6.5 km along the southern border of the white sand savanna, several exposures of coarse basal gravels have been discovered. For practical reasons an area of 16 km^2 immediately north of Loksie Hatti was selected for detailed exploration. By means of a 6″ Banka drill, hand dug pits and

mechanically dug trenches the subsurface extension of the gravel under the white sands has been investigated. The present information comes from 14 drill holes, 19 pits and 2 trenches.

The basement is composed of kaolinized or weathered phyllites and very fine-grained schists of andesitic origin of the Precambrian Paramaka Formation. No hardrock was encountered in the drill holes, not even after penetrating six meters into the weathered bedrock at one locality. Drillings and pits revealed that the bedrock has a very irregular topography. There is a sharp contact between the basement and the gravel. The occurrences of the gravel are restricted to narrow, elongated zones. At some places, the gravel is outcropping, capping elongated hills. The coarse gravels along the southern margin of the savanna become finer and thinner and finally wedge out in northern and northwestern direction. The thickness varies from 10 cm to 2 m. Two types of gravels can be discerned. The first one almost entirely consists of well-rounded sugary quartz pebbles which are poorly sorted and chaotically well-packed. The second type is composed of a mixture of the aforementioned rounded quartz pebbles and angular, dense, non-weathered quartz. Most of the angular components are generally concentrated in the basal part of the gravel layer. This basal part usually has a clayey matrix in which the clasts are 'floating' (very loosely packed). At one place slumping phenomena have been discerned. Towards the top of the gravel the matrix becomes coarser while the floating character disappears to be replaced by a well-packed character.

The overburden of medium coarse to very coarse, brown to white sands covering the gravels may be 15 cm to 14 m thick. Generally the sands show a fining upward sequence. The grains are angular to subrounded.

Up till now gold has only been found in gravels with the angular quartz and a clayey matrix. The sand-supported gravels with well rounded clasts and the overlying sands proved to be barren. The gold particles are irregularly shaped and angular. Most of the fragments are 1-2 mm in diameter and about 0.2 mm thick. The largest nugget encountered was 1 cm in diameter, the smallest flake was 0.3 mm. The gold was panned or concentrated by means of a manual operated rocker. Among the other heavy minerals in both types of gravel zircon and rutile are predominant. In lesser quantities ilmenite, xenotime and garnet are met with. In one of the recently dug pits cassiterite, columbite, tantalite and monazite were noted.

CONCLUSIONS AND DISCUSSION

The gravel-bearing deposits at the base of the Coesewijne Formation mark a well defined episode in the geological history of Surinam. The poor sorting and chaotically closely packed character of the clasts and the distinct channel structure of the gravel bodies are in favour of deposition by braided rivers. Their position close to major rivers suggests that they were deposited by protostreams of these rivers.

KROOK(1969, 1970) already argued that the braiding of the Surinam rivers must have occurred during a semi arid climate with occasional heavy cloudbursts. The dense evergreen forest had disappeared which caused severe erosion of the weathered soil. Boulders, gravel and sand were transported laterally by gravity induced alluvial fans to rivers which were of the braided type. At Loksie Hatti the clay-supported gravels with floating clasts and slumping phenomena are thought to represent local mudflows which were formed when large amounts of water and detritus streamed downslope. The sand-supported gravels were deposited by braided rivers in several channels which were cut in the basement.

The origin of the well rounded quartz pebbles is still under discussion. At Jorka Kreek tourmaline quartz is known to be associated with the nearby rocks of pegmatitic origin. It seems unlikely that the quartz pebbles became so perfectly rounded over such a short distance. Hence, it is probable that the pebbles were transported over a considerable distance or that they were derived from an older conglomeratic formation. In this respect it is interesting to note that the Precambrian Rosebel Formation also has conglomerate layers with pebbles which strongly resemble those of the Coesewijne Formation.

As for the origin of the gold at Jorka Kreek a great distance of transport in one or more depositional cycles seems likely; in the literature nowhere mention is made of gold mineralization in the Jorka Kreek area. On the other hand the Rosebel Formation is a well known goldbearing formation in Surinam.

The gold at Loksie Hatti is probably derived from local quartz veins which are known to have been worked in the neighbourhood. The gold was concentrated in the basal (colluvial) layer and buried afterwards by the sterile gravels, the clasts of which had been supplied from other areas.

Further detailed research should reveal whether the goldbearing gravels of Jorka Kreek and Loksie Hatti are worth exploiting. Investigation of feasibility and economics of extracting gold by solution rather than washing with the primary objective of raising recoveries to the + 90% range will soon be carried out.

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