New exploration opportunities in Equatorial Guinea

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Although Equatorial Guinea has virtually no mining industry, it does have potential for gold, columbo-tantalite and diamond deposits and its Ministry of Mines and Energy is keen to encourage minerals exploration.

Introduction

Equatorial Guinea is located in the Gulf of Guinea, local to key markets in West Africa and Nigeria, and well-served by port infrastructure. The mainland enclave of Rio Muni comprises the Archean Congo Craton granite-gneiss-greenstones, partly reworked in the Paleoproterozoic (Eburnian) and in the Pan-African, all traversed by onshore structures continuous with Atlantic transform faults. Recently, the entire area of Rio Muni has become available for minerals exploration, and together with new Licensing Contract arrangements and an integrated GIS database of exploration results, must qualify as an important greenfields exploration opportunity.

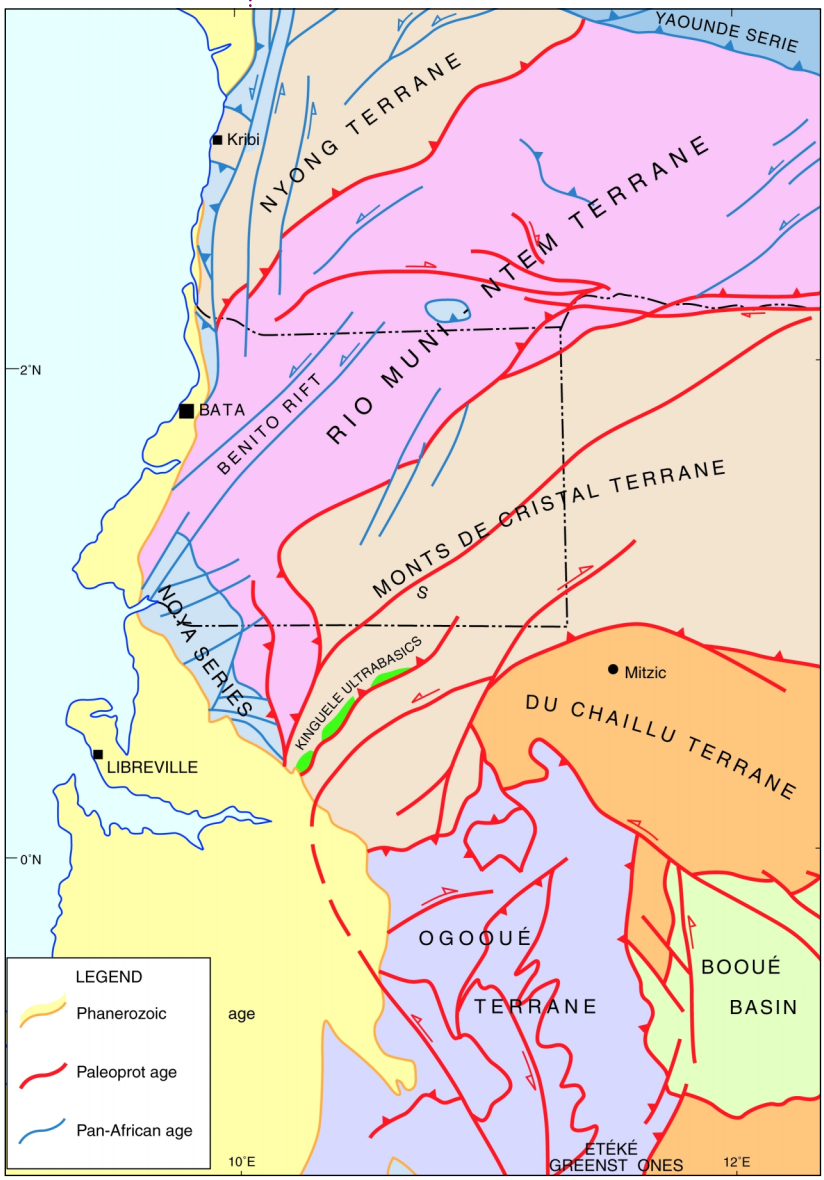

Fig. 1: Regional tectonics map of Rio Muni (after Feybesse et al 1998).

The Country

The territory of Equatorial Guinea includes the islands of Bioko and Annobon, and the mainland enclave of Rio Muni, which is bordered to the north by Cameroon and to the south and east by Gabon. The total surface area of the country is 28 051 km², with mainland Rio Muni accounting for approximately 26 000 km². Rio Muni has a coastal plain and a mountainous interior, and the climate is tropical with four seasons (two wet and two dry). The population of the country is about 500 000 with an annual growth rate of 2,5 %. One third of the population lives in the urban areas, mainly in the capital of Malabo on the island of Bioko, and in Bata, the largest town, port and administrative centre on the mainland. Spanish is the official language but English and French are widely spoken.

The economy is based mainly on forestry and hydrocarbon production, which together accounted for around 97 % of total exports in 1997. Hydrocarbon production includes oil, natural gas and condensate, most of which is exported. The exciting discovery of the Ceiba field in 1999 by US company Triton has now confirmed the Gulf of Guinea as a major new petroleum province. Fast track-development of Ceiba, plus field expansion in the Niger Delta province, is expected to increase production rates to over 200 000 bbl/d during 2001. Revenues from hydrocarbons are already leading to major infrastructural improvements, including a new deep-water Freeport and processing facilities on Bioko, and road improvement and electrification programmes throughout the country.

Geological Background

Rio Muni comprises the Archean terranes of the Ntem Complex and the Monts de Cristal Massif, both of which were partly reworked during the Paleoproterozoic Eburnian orogeny, **Figure 1**.

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Exploration in Rio Muni has indicated the presence of greenstone belts and major shear zones, including Eburnian terrane boundaries, which have a significant gold potential. Pan African transpressive structures are common in the west and are associated with granitic intrusions and pegmatite bodies, and these also occur across the interior. Low-metamorphic-grade shales, dolomites and quartzites occur in the south-west, representing the northernmost extension of the Niari foreland basin of the Pan-African-age West Congolian Orogeny. Higher-grade sedimentary packages, also attributed to the Pan-African, are found along the northern border of the country where they are associated with major strike-slip and thrust faults.

The coastal strip of Rio Muni comprises Cretaceous sands, shales and carbonates with basal conglomerates, developed in the early rifting phases of Atlantic opening. Significant transcurrent structures (such as the Fang and Bata fracture zones) link to major onshore lineaments, at least one of which shows evidence of Cainozoic rifting (the Benito Rift).

Exploration Potential

Current minerals production is negligible other than from minor artisanal gold mining activities in Rio Muni. Nevertheless, several studies have demonstrated the potential for gold, columbo-tantalite and diamond deposits, with previous exploration highlighting several areas of immediate interest. There is also potential for platinoids, dimension stone, base metals, and bauxite amongst other commodities.

Gold exploration has identified three main areas – Coro, Aconibe and the Wele River basin on the northern margins of the Monts de Cristal terrane, as well as several other occurrences. These are small alluvial prospects currently yielding gold, including several nuggets that occur with vein-quartz and lateritic minerals, attesting to nearby primary and secondary gold sources. The sources of the alluvial gold have yet to be delineated. South of Rio Muni in Gabon, the Monts de Cristal, Du Chaillu and Ogooué terranes have numerous alluvial workings and areas actively being explored by international gold mining companies including the important prospects in the Etéké greenstone belt, **Figure 2**.

The diamond potential relates in part to post-Eburnian structural lineaments containing basic intrusives that extend along strike from the Mitzic diamond mines in Gabon into the Nsork area of Rio Muni, 50 km to the north and west. Heavy-mineral sampling results have identified zinc-rich chromites found in the Nsork area, similar to those found in the meta-kimberlites at Mitzic. Recent exploration in Gabon for both gold and diamonds has identified trends right up to the southern borders of Rio Muni.

Columbo-tantalite mineralisation is known in at least two areas (Aconibe and Ayamiken) defined by Nb and Ta soil anomalies, and heavy minerals associated with Nb-Ta-rich pegmatites. Neither area has been explored in great detail and thus they represent early-stage exploration prospects for pegmatite and/or skarn systems associated with Pan African granitic intrusions. The Aconibe occurrence comprises discrete, laterally extensive pegmatites,

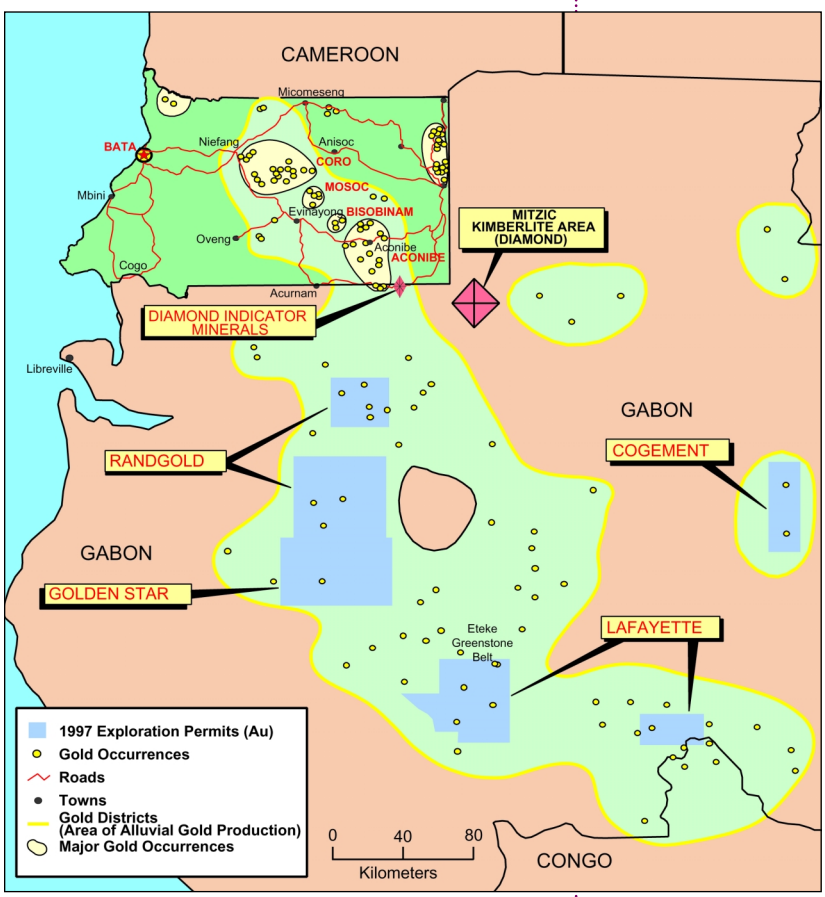

Fig. 2: Regional Gold trends in Gabon and Rio Muni (after UMC/TerraView).

which are also overlain by eluvial and alluvial deposits yielding grades of 3,0 to 7,5 kg/m^3. Sample assays have demonstrated niobium-rich columbo-tantalite (62,36 % Nb_2O_5) with subordinate tantalum (18,74 % Ta_2O_5).

Widespread lateritisation and indications of bauxitic laterite, with grades up to 58,3 % Al_2O_3, and 2,1 % to 5,3 % SiO_2, indicate some potential for bauxite, particularly in the Nzangayong, Ncoasas, Ayamiken and Churu areas. Anomalous values of U, Ni, Co, Pb, Zn, Cu, As, Ag, Mn and Mo have been detected in laterite above black shales which occur in the red-bed sequence near Cogo. The red-bed sequence is part of the West Congolian Niari foreland basin, with known base metal deposits immediately to the south in Gabon, and is also equivalent in age to the Katangan sequences of the Democratic Republic of Congo and Zambia. Serpentinised ultramafics and other basic intrusives along the footwall of the Benito Rift constitute an untested exploration prospect with some potential for base metals and platinoid elements. Similar basic intrusives have also been reported in southern Rio Muni, which may be a northern extension of the Kinguélé ultrabasics trend.

Previous Campaigns

Between 1980 and 1986, BRGM and a Spanish exploration company undertook regional and follow-up stream-sediment surveys utilising heavy mineral separates and sediment geochemistry. These highlighted the potential for gold production from alluvial deposits at Coro, as well as the occurrences of columbo-tantalite, diamond indicators, iron ore, radioactive minerals, rare earths and base metals in other areas. Other activities included a side-looking radar survey and a 1970s vintage aero-

magnetic survey of Rio Muni.

In the late 90s the Exploration Licence for all of Rio Muni was held by United Meridian Corp (later named Ocean Energy) and BoMc Holdings Inc. These companies undertook a wide range of exploration activities including regional and prospect geological mapping, reconnaissance evaluation of the gold and bauxite potential of laterites, sampling and prospect evaluation of the artisanal workings, stream sediment sampling, interpretation of high-resolution radar imagery, and the generation of a comprehensive GIS database. At the end of 2000, the Exploration Contract lapsed and the entirety of Rio Muni became open for exploration.

Current Licensing Situation

The Ministry of Mines and Energy is keen to encourage an exploration-friendly environment, and to this end the Mining Law is in the process of being re-drafted. Exploration Licence Contracts are being drafted to permit large areas to be explored over a one to three year period. The explorer may also opt for registration of smaller Prospect Areas (up to 100 ha) to permit detailed evaluation of individual prospects. Exploitation Licences will be granted upon submission of a mining programme that must include environmental management strategies.

Archived Data

In 2001 Exploration Consultants Ltd were appointed as Technical Advisers on minerals to the Ministry of Mines and Energy, having been Technical Advisers for hydrocarbons for six years. ECL are now actively involved in redrafting of exploration and mining regulations, as well as the promotion of exploration opportunities, contract negotiations, and compilation and sales of archive data.

Reports from previous exploration campaigns are available in hardcopy format. In addition, all the heavy mineral and geochemical sample data from the previous surveys, together with regional and prospect-scale maps, have been digitised and are available to be purchased from the Ministry in either hard-copy or GIS-file format. Regional geochemical/heavy mineral maps (1:100 000 scale, 4 sheets) and customised packages of all data will be available in the near future, **Figure 3**. A full catalogue and price list will be available from ECL or the Ministry by mid-2001.

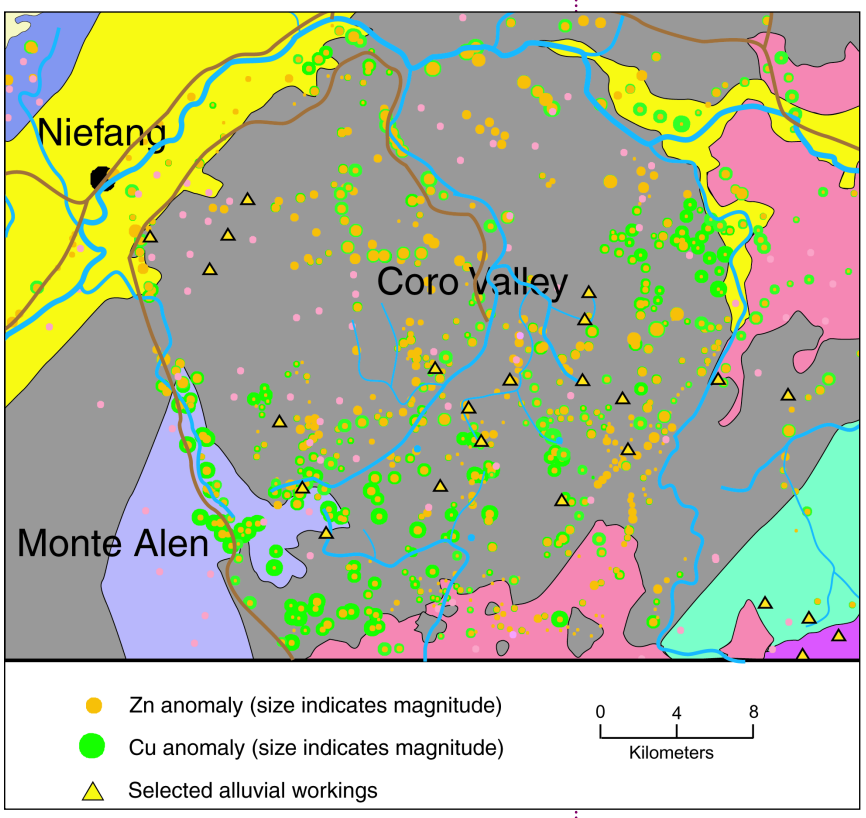

***Fig. 3**: Sample of GIS database – Coro gold area, central Rio Muni, showing geochemical anomalies.*

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Additional backing for Katangan project

Phelps Dodge Corp has joined BHP World Exploration Inc in its option agreement with Tenke Mining for the proposed development of the Tenke Fungurume copper/cobalt deposits in the Democratic Republic of Congo.

The Tenke Fungurume concessions are located in Katanga province in the southernmost part of the country. The concessions, says Tenke Mining, host large, high-grade copper/cobalt deposits that are world renowned and considered as one of the largest and richest undeveloped copper/cobalt deposits. BHP holds an option to acquire a controlling interest in Tenke Fungurume and to function as the primary operator of the project.

Since the middle of 2000, Tenke has been working closely with BHP on the preparation of technical and economic studies related to potential future development of Tenke Fungurume. The agreement provides Phelps Dodge with the opportunity to earn up to 50 % of BHP's position in the project.

"Our strategy is to advance the project as quickly as possible and having Phelps Dodge join with BHP significantly strengthens our ability to do this," says Adolf Lundin, president of Tenke Mining. "This agreement will bring the resources of two of the world's largest copper producers to bear on the development of this world-class deposit."

Discussions are continuing with Gecamines, the DRC state mining company, focused on the best approach for future development of the project. These discussions are expected to continue over the next few months. ❑