MINERAL DEPOSITS OF THE TERRITORY OF AMAPÁ, BRAZIL

GOLD, TANTALITE AND DIAMONDS NEAR VILA SANTA MARIA

By

M. R. Klepper
U. S. Geological Survey

and

Victor Dequech
Divisao de Fomento, Departamento Nacional da Produção Mineral

1945

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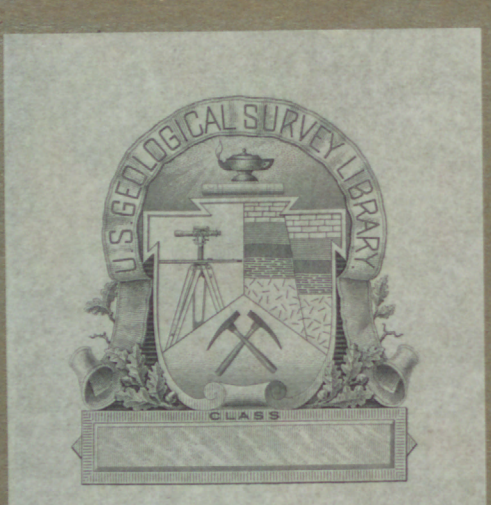
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1. Mineral deposits of the territory of Amapá, Brazil--alluvial gold, cassiterite, and columbite-tantalite in the Amapari River region, by M. R. Klepper and Victor Dequech. 31 p., 10 tables. Library, Departamento Nacional da Produção Mineral, Rio de Janeiro, Brazil.

2. Mineral deposits of the territory of Amapá, Brazil--gold, tantalite, and diamonds near Vila Santa Maria, by M. R. Klepper and Victor Dequech. 28 p., 5 tables. Library, Departamento Nacional da Produção Mineral, Rio de Janeiro, Brazil.

3. Geology and mineral deposits of the San Cristóbal district, Villa Martin Province, Potosi, Bolivia, by Herbert S. Jacobson, Carlos Murillo, Lorgio Ruiz, Oscar Tapia, Hugo Zapata, Hugo Alarcon, Edgar Delgadillo, and Carlos Velasco. 25 p., 2 pl. (1 in color), 7 figs.

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CONTENTS

GOLD, TANTALITE AND DIAMONDS NEAR VILA SANTA MARIA

MINERAL DEPOSITS OF THE TERRITORY OF AMAPÁ

ABSTRACT

During July 1945 the writers examined and sampled small alluvial deposits of gold, tantalite, and diamonds near Vila Santa Maria in the Vila Nova River region of the Territory of Amapá, in the northeast corner of Brazil. The Vila Santa Maria area, between 125 and 135 kilometers from the mouth of the Vila Nova River, is underlain by a sequence of quartzites, itabirite, and phyllite which has been intruded by pegmatites and gold-bearing quartz veins.

Gold and diamonds have been produced from placers along small creeks in the area since 1937, but no tantalite was recovered until April 1945. During the second quarter of 1945 a monthly average of 200 kilograms of tantalite averaging 60 percent Ta_2O_5, between 1 and 2 kilograms of gold, and between 25 and 40 carats of diamonds were produced by about forty men engaged in placer mining. The deposits are small, and the content of tantalite is low. Reserves in the three principal deposits, Leao, Venancio, and Mundico, are about 2,000 kilograms of tantalite averaging 60 percent Ta_2O_5. Most of this reserve is in gravels that contain about one gram of gold per cubic meter. Production of placer gold, tantalite, and diamonds may continue at the present small scale for a few years, but it is not likely to increase.

At the Gaivota gold mine gold-bearing quartz has been introduced along a shear zone in phyllite. Thirty-five kilograms of gold are said

to have been produced. The mine was inactive in July 1945 due to lack of a pump necessary for underground mining.

INTRODUCTION

As part of the program of cooperative investigation of the mineral resources of Brazil being carried on by the Departamento Nacional da Producão Mineral and the U. S. Geological Survey, the principal deposits of gold, tantalite, and diamonds near Vila Santa Maria in the Vila Nova River region were visited during July 1945. This region is in the south-central part of the Territory of Amapá, the rhomb-shaped extreme northeast portion of Brazil, bounded on the southeast by the Amazon River, on the northeast by the Atlantic Ocean, on the northwest by French Guiana, and on the southwest by the Jari River. Vila Santa Maria (latitude 0° 30' N., longitude 52° W.), the center of mining activity, is 133 kilometers by way of the Amazon and Vila Nova Rivers N. 60° W. of Macapa, capital and commercial center of the Territory. Boats of 250 tons can ascend the Vila Nova River as far as Pancada, 27.5 kilometers [1/] downstream from Vila Santa Maria; only canoes and outboard motor boats weighing up to a few tons can pass beyond Pancada, and even these very small craft must be portaged around five or six rapids between Pancada and Vila Santa Maria. An overland trail, which may later be improved to serve as a cart or truck road, is now (1945) being cut between Pancada and Vila Santa Maria. Footpaths lead from Vila Santa Maria and Vila Gaivota to the deposits.

1/ The metric system is used throughout this report.

The region is hot and humid. Temperature normally varies between 21° and 32° C.; annual rainfall averages about 305 centimeters, the greater part falling between November and June. Jungle growth covers the entire region, but is much denser in valleys than on hill slopes. Steep-sided hills rise from the valleys to rather uniform crest levels at between 90 and 110 meters above sea level.

Gold was first discovered in gravels near Vila Santa Maria in 1937 by prospectors working southward from the Calçoene-Cassipore placer gold area. Within two years after this discovery at least 500 people, of whom about half were actively engaged in prospecting and placer mining, had moved into the area. A high proportion of these inhabitants had immigrated to Amapa from the Guianas and from several of the Caribbean Islands and had lived for at least a few years in the Calcoene-Cassipore area.

Monthly production of gold during the peak of activity, from 1939 to 1941, is estimated to have averaged between 5 and 10 kilograms.[2/] Small quantities of diamonds were also recovered from some of the deposits. During 1942, 1943, and 1944, most of the richer deposits were mined out and many of the inhabitants left the region. Interest in the area was renewed in the latter part of 1944, at which time the Territorial Government set up a program under the direction of Dr. Fritz Ackermann, Geologist, to explore the hematite deposits near Vila Santa

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2/ In July 1945 the price paid for gold by the Brazilian Government was about 22,000 cruzeiros ($1,100 U. S.) per kilogram.

Maria and to stimulate production of tantalite, which had been identified during 1944 in the concentrate from one of the gold placers. Monthly mineral production of the area during the second quarter of 1945 is estimated to have averaged between one and two kilograms of gold, 30 or 40 carats of diamonds, and 200 kilograms of tantalite containing about 60 percent Ta_2O_5.

The authors are indebted to the Territorial Government, and in particular to Captain January Gentil Nunes, Governor, and Dr. Miranda Bastos, Chief of the Division of Production, for making available government-owned transportation facilities and for furnishing most of the supplies necessary for the trip. Dr. Fritz Ackermann, geologist for the Territory, accompanied us on the trip. His familiarity with the geography and geology of the region, more than any other factor, made possible rapid and comprehensive examination of all of the principal mineral deposits. A number of miners and prospectors acted as guides and gave valuable information concerning the history of the area and the production of some of the deposits.

GEOLOGY

The geology of the Territory of Amapá is very incompletely known. The published reports of Vieira,[3] Moura,[4] and Borges[5] describe

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3/ Vieira, Antonio Rodrigues, Jr., Ouro no Amapa, Ministeria da Agricultura, Industria e Commercio, Servico Geologico e Mineralogico, Boletim 8, 1924.

4/ Moura, Pedro, Fisiographia e Geologia da Guiana Brasileira, Ministeria da Agricultura, Instituto Geologico e Mineralogico, Boletim 65, 1934

geologic reconnaissances in some of the more accessible parts of the Territory, along the Oiapoque, the Amapá Grande, the Calçoene, the Cunany, the Araguari, and the Amapari Rivers, but the greater part of the Territory has never been visited by a geologist. Prior to 1945 Dr. Ackermann studied the geology along the Vila Nova River, particularly in the vicinity of Vila Santa Maria, and prepared a report on the region for the Governor of the Territory. In June 1945, at the request of the Governor, Dr. Glycon de Paiva, Chief of the Minerals Branch of the office of the Coordinator of Economic Mobilization, examined and sampled the iron deposits near Vila Santa Maria. According to de Oliveira's [6] Geologic Map of Brazil, all of the Territory is underlain by Archean rocks except a small wedge-shaped area of Tertiary and Middle Paleozoic rocks in the southwest and narrow strips of Quaternary deposits bordering the Atlantic Ocean and the Amazon River.

In the region visited by the writers outcrops of bedrock are confined almost entirely to the beds of streams. Most of the hills are covered with iron-rich, partly indurated laterite, but locally in the

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5/ Borges, Josalfredo, Rio Araguari e Seu Maior Afluente: Rio Mapari, Ministeria da Agricultura, D. N. P. M., S. G. e M., Boletim 87, Part II, 1937.

6/ de Oliveira, Avelino Ignacio, Mappa Geologico do Brasil e de Parte dos Paizes Visinhos, Ministeria da Agricultura, D. N. P. M., S. F. P. M., 1938

vicinity of Vila Santa Maria hematite crops out. Ledges of granitized gneiss, granite, syenite, simple pegmatite, and aplite are exposed in the bed of the Vila Nova River between Pancada and Vila Gaivota, and according to Dr. Ackermann similar rocks are exposed between Vila Santa Maria and the headwaters of the river. Brazilian geologists consider these rocks to be of Archean age.

West of Vila Gaivota are quartzite, phyllite, and itabirite (including hematite ore), lithologically similar to parts of the Upper pre-Cambrian (Algonkian) Minas Series of Minas Gerais. Scattered exposures indicate that this section of moderately metamorphosed rocks consists of at least 500 meters of quartzite, including members of itabirite and conglomerate, and about the same thickness of phyllite. It seems probable that all of the known occurrences of itabirite and hematite are part of a single member of the sedimentary sequence, and that the structure of the area is a simple, nearly vertical fold, which trends S. 70° E. from Vila Azul, through Vila Santa Maria to Vila 21, and at this place bends sharply north. In other parts of Brazil narrow belts of steeply-dipping, slightly or moderately metamorphosed sedimentary rocks similar to these surrounded by more intensely metamorphosed rocks have been interpreted as Algonkian infolded into Archean.

Quartzites similar to those near Vila Santa Maria are exposed in the Bacurí-Venancio area several kilometers to the south, but in the limited time available it could not be determined whether the quartzites

in these two areas are part of the same belt or whether they lie in two different belts separated by an axis of intensely metamorphosed rocks.

Pegmatites that contain tantalite and quartz veins that contain gold cut the quartzite-phyllite sequence. The Gaivota was the only gold-bearing quartz vein exposed in the region in July 1945, but Dr. Ackermann states that gold-bearing quartz stringers in quartzite have been found in the bed of at least one stream in the area, and that not uncommonly quartz pebbles in the gravels contain visible gold. Tantalite has been obtained by panning the kaolinized material from the upper portion of several pegmatites 7/ exposed in stream beds, and commercial concentrations have been found in the gravels for short distances downstream from these pegmatites. Neither the age of these pegmatites nor the source of the diamonds in the gravels is known.

Concordance of almost all of the hilltops in the area at an altitude of about 100 meters is believed to indicate that the region was once reduced to an almost flat erosion surface and later uplifted. Sharply incised valleys and rather steep stream gradients suggest that uplift of the peneplain has been a rather recent geologic event.

7/ It is not known whether the gold is a primary mineral of the pegmatites or whether it has worked downward into cracks in the pegmatites from the overlying placer material.

PLACER DEPOSITS

Nature of the deposits

Since 1937 placer deposits of gold have been found along many tributaries of the Vila Nova River. In some of these deposits diamonds or tantalite, or both, occur with the gold. Diamonds were the only valuable mineral in one deposit. Pebbles and cobbles of quartzite and quartz are by far the most abundant constituents of the deposits, but fragments of phyllite, itabirite, and pegmatite are generally associated with them. These deposits are very closely related to the present streams, and undoubtedly valuable minerals derived from pegmatites and gold-bearing quartz veins in the surrounding bedrock are still being deposited in some of them.

The gravel deposits range up to 0.8 meter in thickness, averaging about 0.4, and up to 25 meters in width, averaging 5 or 6. In a few of the larger valleys gravels have been mined almost continuously for a length of about a kilometer. The gravels are generally overlain by a mat of intermixed sand, clay, and vegetable matter up to 1 meter thick, and underlain by quartzite or phyllite bedrock. Colors of gold can often be panned across the full width of a gravelly valley fill, but minable concentrations are generally limited to definite streaks and channels and are richest at or near the contact with bedrock. Very few minable concentrations of gold have been found in steep portions of valleys or in the very flat portions near their confluence with the Vila Nova River. The valley of the Vila Nova River has been prospected, but no minable concentrations of valuable minerals have been found in it. A few of the deposits have been traced to their bedrock source.

Gold in the placer deposits varies in size from flakes barely visible in the pan to nuggets of 10 or 20 grams. Pieces weighing considerably less than 1 milligram predominate. Fineness is reported to average between 950 and 960. Tantalite occurs as lustrous black grains and small, equidimensional nuggets. As is shown in Table 2, only 25 percent of an average lot of concentrate was coarser than 10 mesh (13 millimeters in diameter). The largest nugget observed was about 1.5 centimeters in diameter.

Most of the diamonds are small, but a rather high proportion are equidimensional, only slightly or moderately flawed, and of color suitable for gem cutting. A mixed lot of 46 diamonds which weighed 11.5 carats and probably was the total production from the region during a period of at least a week was examined at Vila Santa Maria. The lot consisted of (1) a 2.6 carat colorless octahedral stone with only one small flaw, (2) eight stones weighing between 0.4 and 0.8 carat of which three were bort and five were suited for gem cutting, (3) eight stones weighing between 0.2 and 0.4 carat of which about half were bort, and (4) 28 stones weighing less than 0.2 carat of which more than half were bort. About half of the stones were clear and colorless; the rest were pale shades of yellow, green, blue, and gray. A number contained dark inclusions. The owners asked 4,000 cruzeiros ($200 U. S.) for this lot, half for the 2.6 carat stone and half for the other 45 stones. A lot recovered from Bernardo Creek, but not seen by the writers, consisted of one stone weighing 2.5 carats, one weighing 1.5 carats, two weighing about a carat, and 20 totalling about 5 carats. The largest diamond found in the region weighed 6.8 carats and was sold for 6,000 cruzeiros ($300 U. S.).

Tenor and reserve

In order to obtain an idea of the tenor of the placer deposits, the amount of gold and tantalite recovered from pits recently dug was ascertained from the miners, the size of the pits and the thickness of the gravel was measured, and the approximate content of valuable minerals per cubic meter was calculated. In localities for which no production data were available the content of tantalite per cubic meter was determined either by panning measured quantities of gold tailings, or by digging small pits and panning measured quantities of gravel from them. The panned concentrates were weighed and the amount of tantalite in them was estimated by Dequech at the D. N. P. M. laboratory at Campina Grande, Paraiba. Partial chemical analyses of two samples were also made at this laboratory.

Although these tests give only approximations of the actual tenor of the deposits, they probably indicate rather closely the amount of mineral that can be recovered by the method of concentration used in the region. In the samples collected the content of tantalite varied up to 0.8 kilogram per cubic meter, and the content of gold up to 1.25 grams per cubic meter. The total indicated and inferred reserve in the deposits examined is about 2,000 kilograms of tantalite averaging about 60 percent Ta_2O_5 and 7,500 grams of gold (Table 4). Although the distribution of diamonds is too irregular to give any sound basis for estimating reserves, there is no reason to believe that production in the future will exceed the current rate of a few tens of carats per month.

Mining and concentration

After a deposit has been discovered by digging test pits in valley fill, two or three miners working in partnership clear away the jungle cover and overburden, and set up a Long Tom.[8/] Gravel within a radius of a few meters of the Long Tom is then shoveled up and washed. When all of the gravel within easy working radius has been extracted, the concentrates are removed from the Long Tom and it is moved to another setup in the minable zone. By this system two or three men working together can wash between three and six cubic meters of gravel per day. Operations are generally discontinued when the valuable mineral content of a zone drops below the equivalent of one gram of gold per cubic meter.

During the past year (1945) most of the gold tailings have been reexamined and portions that contain appreciable quantities of visible tantalite have been rewashed in Long Toms. More than half of the 500 kilograms of tantalite produced during the second quarter of 1945 was thus recovered.

8/ A Long Tom is an apparatus designed to extract heavy minerals, chiefly gold, from a suspension of gravel, sand, and clay in water. It consists of an upper inclined box about four meters long with a perforated plate at the foot and a flume for the entry of water at the head, and a lower very gently inclined box with riffles on the bottom. The mixture of gravel, sand, and clay is shoveled into the upper box through which water is running and agitated with a hoe. Coarse material is picked out by hand and discarded; the fines pass through the perforated plate into the lower box in which the heavy minerals separate out by gravity and are retained by the riffles. Mercury is commonly placed behind the last few riffles to amalgamate the fine gold. The bed of heavy minerals trapped in the lower box is periodically removed, and final concentration and separation is done by panning. When diamonds occur in the deposit a screen is placed below the discharge of the riffle box. The screen is periodically dumped and the sand and small pebbles are carefully inspected for diamonds.

Vila Santa Maria gold-tantalite-diamond area

Leão Creek and tributaries.--One of the principal gold placer areas is along Leão Creek and its tributaries southeast of Vila Santa Maria. The tributaries have also yielded some diamonds and most of the 500 kilograms of tantalite thus far produced in the region.

The area is underlain by quartzite and phyllite, locally cut by pegmatites. Both tantalite and gold have been recovered by panning the kaolinized upper portion of a number of pegmatites, but no pegmatite has been explored below a depth of a few feet.

Along Leão Creek and the lower part of its principal tributary, Boca Alta Creek, the gravel deposits averaged about 0.5 meter in thickness and between 6 and 10 meters in width. Most of this gravel has already been washed for gold, and the tailings contain very little tantalite. In the smaller unnamed tributaries the gravel averages about 0.3 meter and the overburden 0.5 meter in thickness; width of the gravel zone averages about 5 meters. These tributaries contain a small reserve of gravel with about 1 gram of gold, 0.5 kilogram of tantalite, and a fraction of a carat of diamonds per cubic meter (Table 4).

A very small amount of gold and a few diamonds are said to have been recovered from eluvial material on the lower slopes marginal to some of the alluvial deposits.

The three other principal creeks south of Vila Santa Maria, Manoel Santos, Santa Maria, and Bracco da Santa Maria, have been worked extensively for gold, and most of the gravel containing more

than 1 gram per cubic meter has probably already been excavated. No one is mining along these streams at the present time, nor has any tantalite been recovered from them.

Bernardo-Albano area.--Gold and diamonds are being recovered from Bernardo Creek, northwest of Vila Santa Maria, and diamonds have been mined from the headwaters of both this creek and Albano Creek near Vila Ceu Azul. No tantalite has been found in these deposits.

The valley of Bernardo Creek narrows from a width of more than 50 meters at the mouth to about 5 meters in the headwater area. Most of the mining activity has been in the intermediate stretch where the width of the gravel zone is from 10 to 25 meters and the thickness is about 0.4 meter. The gravel near the mouth of the creek is reported to contain very little gold. At locality (1) 12 cubic meters of material of which 8 were overburden were excavated from the most recently dug pit. The remaining four cubic meters were gravel from which six grams of gold, or 1.5 grams per cubic meter, were recovered by washing. Recovery of gold per cubic meter of gravel washed has been about the same at localities (2) and (3). A few diamonds have been recovered at (3). At locality (4) the gravel contains about 1 gram of gold per cubic meter, and each pit of 10 to 15 cubic meters has yielded a few diamonds. Localities (5) and (6) have been mined out, but they are said to have yielded more gold and diamonds per cubic meter of gravel than any other interval along the creek. Twenty-two diamonds weighing 10 carats were here recovered from one pit of 20 cubic meters.

The principal reserve of gravel containing at least one gram of gold is believed to be downstream from locality (1) and marginal to the zone already mined between (1) and (5).

The diamond placers in the small headwater tributaries near Vila Ceu Azul (localities 7 and 8), where the gravel deposits are only a few meters wide and a few tens of centimeters thick, are now inactive. Total production from near Ceu Azul probably did not exceed 200 carats.

Bacuri-Venancio gold-tantalite area

Bacuri Creek.--The gold bearing gravels of Bacuri Creek have been extensively mined between Vila Santiago and the headwaters of the creek, a distance of 2.5 kilometers. The only activity at the present time is at locality (4) where three men are washing gravel containing about 1 gram of gold per cubic meter. No tantalite or diamonds have been found along this creek.

A dark brown, heavy sand concentrate (samples Bac. 1 and Bac. 2) panned from tailings at localities (1) to (4) was examined microscopically and found to consist of about 90 percent staurolite and a few percent each of zircon, rutile, and opaque minerals. Sample Bac. 3 from Malo Creek contained a similar heavy mineral assemblage.

Mundico Creek.--Mundico Creek has been mined for gold from its head to its confluence with Bacuri Creek, a distance of about 300 meters. Locally tantalite occurs in the tailings. Sample Bac. 4 indicates that the best tailings contain 0.68 kilograms of tantalite averaging 60.3 percent Ta_2O_5 per cubic meter (Table 3). Total reserve is about 150 kilograms of tantalite (Table 4).

Venancio Creek.--During May 1945, gold-tantalite-bearing gravels were discovered at the head of Venancio Creek (locality 9). Four men now working in this area have developed 300 cubic meters of gravel

that contain 0.8 kilogram: of tantalite and 0.4 gram. of gold per cubic meter. An additional 300 cubic meters containing 0.5 kilogram of tantalite and 0.4 gram of gold are inferred. The downstream limit of this deposit is not known. This discovery should encourage additional prospecting along this creek and its tributaries.

GAIVOTA GOLD DEPOSIT

The Gaivota gold deposit, one kilometer by foot trail north of Vila Gaivota on the Vila Nova River, was discovered in 1942. Quartz with gold occurs in a shear zone trending about N. 10° E. and dipping 75° W., which is parallel to the schistosity of the enclosing phyllite. The shear zone has been traced along the strike by pits for about 200 meters. All of the rock exposed at the mine, except quartz, is decomposed.

The mine workings consist of 2 pits opened on opposite sides of a small stream. Slumping of the pit walls has concealed the shear zone in the smaller northern pit. In the southern pit the shear zone is about 8 meters wide and consists of sheared sericitic phyllite cut by scattered small stringers and lenses of quartz. A 0.5-1 meter thick band of massive barren quartz lies along the footwall. The greatest concentration of gold is in a rather continuous 0.1 to 0.5 meter thick band of porous limonitic quartz near the center of the zone. A shaft has been sunk in the pit floor to a depth of 11 meters along the richest portion of the shear zone, but it is now filled with water. According to the owner, Sr. João Batista Cavalcante of Vila Gaivota, most of the total production of 35 kilograms of gold has been recovered from this narrow band, which appears to contain about 200 grams of gold

per ton. Rock from this band is crushed by hand, and the gold is concentrated by washing this crushed rock through two small boxes with riffles (caixas). The mine was not operated in July 1945, due to lack of a pump.

About 30 meters northeast of this deposit a pit 4 meters deep has been sunk on a vein of granular quartz. The vein is 4 meters thick, lies parallel to, and is sheeted parallel to the schistosity of the enclosing phyllite. Limonite has been deposited along the fractures. According to test made by Sr. Cavalcante the vein contains only 6 grams per ton of gold which can be recovered by crushing and washing in caixas.

Placer gold has been washed from gravels between the mine and the mouth of Gaivota Creek. According to Sr. Cavalcante the gravel remaining does not contain sufficient gold to be mined at a profit.

SUMMARY

(1) The known deposits of gold, tantalite and diamonds are small, but can be worked profitably by small-scale operations which require the investment of hand labor only.

(2) Deposits that contain less than 1 gram of gold per cubic meter, or the equivalent value in tantalite and/or diamonds cannot be worked profitably at the present time.

(3) The area shown has been intensively prospected. Most, if not all, of the minable placer deposits in it have been found, and many of these have already been exhausted. Recent discovery of the gold-tantalite placer on Venancio Creek suggests that more intensive prospecting in

the relatively little known country south of the area described in this report might lead to other discoveries.

(4) The Gaivota gold deposit merits more extensive exploration by test pitting and sampling along the strike. A diamond drill might be employed to determine the tenor and continuity in depth of the zone of enrichment, and the nature of the zone below the enriched portion.

TABLE 1

VILA NOVA RIVER REGION

Travel-time and approximate distances
Macapa to Vila Santa Maria
1500-kilo boat powered by
Johnson "Sea Horse" 9 H P

FROM	TO	ASCENDING Hrs.	Mins.	DESCENDING Hrs.	Mins.	AVERAGE Hrs.	Mins.	Kilometers at avg. rate of 9 knots.
apa	Mazagao	3	0	3	25	3	13	29.0
agao	Mouth of channel	0	50	0	49	0	50	7.5
th	Ig. do Lago	2	47	2	36	2	41	24.0
do Lago	Ig. Camipi	1	43	1	37	1	40	15.0
Camipi	Rio Pissaca	1	00	0	45	0	53	8.0
Pissaca	Barreiro	1	24	0	53	1	08	10.2
rreiro	Cach. Pancada	1	36	1	00	1	18	11.7
hcada	Ig. Bacuri	0	25	0	18	0	22	3.3
Bacuri	Cach. Carana	0	50	0	25	0	38	5.7
rana	Cach. Bonita	0	20	0	11	0	15	2.3
nita	Cach. Bicho	0	30	0	13	0	22	3.3
cho	Cach. Banco	0	30	0	18	0	24	3.6
nco	Cach. Arraia	0	10	0	03	0	07	1.1
raia	Vila Gaivota	0	48	0	28	0	38	5.7
ivota	Vila Santa Maria	0	20	0	13	0	16	2.4
tal travel time and distance.....		16	13	13	13			132.8
rtages (approximate).....		4	30	1	30			
tal trip-time.....		20	43	14	43			

TABLE 2

VILA NOVA RIVER REGION

A--Samples split from 100-kilo stock of tantalite concentrate purchased from miners at Santa Maria village by the Territorial Government.

Sample No.	Mesh	Weight in grams	Percent Ta_2O_5	Percent Nb_2O_5
T - 1	Over 10	66	49.5	27.1
T - 2	10 to 20	123	61.5	19.2
T - 3	20 to 50	75	62.6	19.2
Total.....		264		
Weighted average.....			58.8	21.2

B--Sample from Vila Santa Maria submitted to D. N. P. M. for analysis by the Governor of Amapa.

Percent Ta_2O_5	Percent Nb_2O_5	Percent TiO_2	Percent SnO_2	H_2O
64.2	17.2	1.1	0.04	0.05

TABLE 3

VILA NOVA RIVER REGION
BACURI-VENANCIO AREA

A--Mechanical analyses of concentrates panned in the field

mple No.	Creek	Description	Mesh	Weight in grams	Est. weight of tantalite (grams)	Kgs. tantalite per M_3 gravel approx.
c.-1	Bacuri	25 liters of Long-Tom tails	--	22	1	0.04
c.-2	Unnamed Trib. of Bacuri	Ditto	--	4	2	0.08
c.-3	Maló, near mouth	Ditto	--	61	Trace	--
c.-4	Mundico, near mouth	Ditto	Over 20	13	13	0.52
			20 to 50	5	4	0.16
			Sub-Total	18	17	0.68
c.-5	Mundico, near mouth	10 liters from pit in kaolinized pegmatite.	--	30		
c.-6	Venancio	25 liters of gravel	Over 50	14	14	0.56

B--Chemical analysis

mple No.	Igarape	Weight in grams	Percent Ta_2O_5	Percent Nb_2O_5
c.-4	Mundico	18	60.3	14.8

TABLE 4

VILA NOVA RIVER REGION

GRADE AND RESERVE OF THE KNOWN PRINCIPAL TANTALITE AND GOLD PLACERS

AREA	CREEK (Igarape)	CLASS	OVERBURDEN average thickness (meters)	GRAVEL (meters) Average thickness	Average length	Average width	Cubic meters	TAILINGS Cubic meters	Kg/m^3	TANTALITE Reserve (kg)	Ta_2O_5: Cb_2O_5 (percent)	GOLD g/m^3	Reserve (grams)	Miners working in July 1945
Vila Santa Maria	Leao and tributaries*	Indicated	0.5	0.35	180	4	250	750	0.6	600	--	1.25	312	15
		Inferred	0.6	0.25	667	6	1,000	500	0.4	600	--	1.0	1,000	
		Subtotal					1,250	1,250		1,200			1,312	
	Bernardos*	Indicated	0.75	0.4	500	6	1,200	--	--	--	--	1.25	1,500	10
		Inferred	0.75	0.4	500	12	2,400	--	--	--	--	1.0	2,400	
		Subtotal					3,600						3,900	
		TOTAL					4,850	1,250		1,200			5,212	25
Bacuri	Bacuri	Inferred	0.6	0.3	750	8	1,800				--	1	1,800	3
	Mundico	Indicated	--	--	--	--	--	300	0.5	150	60:15	-	--	0
	Venancio	Indicated	0.25	0.5	100	6	300	--	0.8	240	--	0.4	120	4
		Inferred	0.25	0.5	100	6	300	--	0.5	150	--	0.4	120	
		Subtotal					600			390			240	
		TOTAL					2,400	300		540			2,040	7
		GRAND TOTAL					7,250	1,550		1,740	59:21**		7,252	32

* Small quantity of diamonds recovered.
** Based on 100 kg lot purchased from miners in area by Territorial Government.

APPENDIX

Hematite deposits near Vila Santa Maria

Hematite was discovered in the vicinity of Vila Santa Maria in 1941, but no attempt was made to outline individual deposits or to estimate reserves until 1944. During 1945 jungle trails have been cut across the area and four deposits have been roughly outlined.

The hematite-bearing zone is considered to be the key to the structure of the Vila Santa Maria area. The zone extends eastward from Vila Ceu Azul, through Vila Santa Maria, to Vila 21 and then turns abruptly to the north. The beds dip almost vertically. Two of the deposits, Braco de Santa Maria and Leão lie along the east-trending limb of the fold; Bacabal lies on the bend; and Braco de Santa Maria lies along the north-trending limb.

Micaceous and compact hematite is extensively exposed in an area of 10,000 or 15,000 square meters on the crest of Bacabal Mountain. Along the north edge of this area a 20-meter vertical section of hematite is exposed in a cliff face. Hematite float and outcrops of siliceous, low-grade iron ore, hematitic sandstones and breccias fringe the area of hematite exposures and continue along the strike of the deposit for a total length of 800 meters. These observations and the analyses of samples collected by Dr. Glycon (Table 5) form the basis for the rough estimate that this deposit contains several million tons of probable ore, of which at least one million is of export quality (50,000 tons per meter of depth underlying the hematite exposed on the crest).

In the Leao deposit hematite crops out extensively over an area 250 meters long and 20 meters wide. Outcrops of canga border the hematite and continue along the strike for a total length of about a kilometer. Vertical sections of hematite up to 15 meters high are exposed in cliffs. This deposit probably contains a reserve of at least 20,000 tons of high-grade ore per meter of depth.

The Braco de Santa Maria and Baxio Grande deposits are not as well exposed, but both of them appear to be at least 500 meters long and 10 meters wide.

Except for a few grab samples taken by Dr. Ackermann in 1944, the only sampling of these deposits was done in June 1945 by Dr. Glycon de Paiva, Chief of the Minerals Branch of the Coordinacao da Mobilizicao Economica (a wartime commission of the Brazilian Government). The analyses of these samples are given in Table 5. All but one of 16 samples contains more than 64 percent Fe, and the average of the 16 is 65.7 percent Fe. Four samples from Bacabal contain 0.03 percent P or less. The average of the 16 is 0.165 percent P. These samples indicate that part of the ore is of Bessemer grade and suitable for exportation. The high-phosphorous, high-iron ore, and the lower grade siliceous itabiritic should be suitable for local smelting using charcoal.

These unexplored showings warrant a program of clearamce of jungle cover, trenching, tunneling, drilling, and sampling to determine the size and tenor of the ore bodies. These deposits are well situated for exportation of ore. A 20-kilometer road or railroad can be built over terrain of moderate relief to link the deposits with a point on the Vila Nova River accessible to barges of 250-or 300-ton capacity. Loading

bins could be installed at this point. Ore could be reloaded from the barges to ocean-going vessels at the mouth of the Vila Nova River or at some point along the Amazon River.

TABLE 5

VILA NOVA RIVER REGION

VILA SANTA MARIA AREA

Samples of hematite ore collected by Dr. Glycon de Paiva and analyzed at the laboratorio Central da Producao Mineral, D. N. P. M.

Number	Deposit	H_2O 110 C.	Total Fe	SiO_2	P	S
1	Leao	0.1	66.8	1.6	0.05	0.01
2	Leao	0.1	68.3	0.7	0.05	0.02
3	Leao	0.2	66.2	2.7	0.06	Tr.
Average of 3.....		0.13	67.1	1.7	0.06	0.01
5	Bacabal	0.1	69.0	0.1	0.01	0.02
6	Bacabal	0.2	69.5	0.2	0.02	--
7	Bacabal	0.1	68.5	0.3	0.02	--
8	Bacabal	0.1	68.4	0.2	0.03	--
9	Bacabal	0.2	68.9	0.9	0.07	Tr.
10	Bacabal	0.2	69.3	0.2	0.25	Tr.
11	Bacabal	0.6	63.7	0.2	0.77	Tr.
12	Bacabal	0.1	67.4	2.3	0.91	Tr.
Average of 8.....		0.2	68.1	0.55	0.26	
13	Braco da Santa	.1	64.6	3.1	0.09	Tr.
14	Maria	0.3	66.8	1.3	0.07	Tr.
15	Maria	1.9	42.6	14.5	0.12	Tr.
Average of 3.....		0.8	58.0	6.3	0.10	
16	Baixio Grande	0.1	65.7	2.4	0.05	Tr.
17	Baixio Grande	0.1	67.0	2.0	0.06	Tr.
Average of 2.....		0.1	66.4	2.2	0.055	
Average of 16.....		0.3	65.7	2.0	0.165	