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CORRELATION OF RAPAKIVI GRANITES AND
RELATED ROCKS ON A GLOBAL SCALE



**SYMPORIUM ON RAPAKIVI
GRANITES AND RELATED ROCKS**

EXCURSION GUIDE:

**THE RAPAKIVI GRANITES OF THE
RONDONIA TIN PROVINCE AND ASSOCIATED
MINERALIZATION**

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THE RONDÔNIA TIN PROVINCE (A BRIEF HISTORICAL DEVELOPMENT)

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Historical development

Cassiterite was first panned from streams in Rondônia Territory in 1952 when the first cassiterite occurrences were discovered in "rubber plantations". During the 1960's intense exploitation by small workers (garimpeiros) was recorded. They came by the thousand and took over the rubber plantation (seringais) as well as the legal mining claims which were all invaded. The tin "rush" endured and they actively carried out large-scale panning and sluicing in the rich pay-streaks which destroyed a good part of the shallow high grade rich alluvial deposits.

By 1969 the central government launched a preliminary economic program in order to evaluate the tin potential of the territory. As a result the Rondônia Tin Province (Fig. 1) was created which comprises an area of nearly 87,000 km² within Rondônia and part of the states of Amazonas, Acre and Mato Grosso do Sul (Fig. 1).

In 1971 several detailed exploration programs and mining operations were launched in many mining sectors. This was a period of significant activity which culminated with the disappearance, in March 1971, of the "grum^{up}" at its peak force of 4,000 workers.

garimpo

This was, for many experts, the most successful government mineral policy ever undertaken in Brazil. The mining companies took over and the tin mining industry began to be successful. The tin concentrate production and metallurgical activities were integrated and it is noteworthy to point out that, up to the collapse of the ITC (International Tin Council) in March 1986, tin in concentrate production was supplied by 18 operating alluvial mines (in the majority) and individual producers in Rondônia.

From 1962 to 1984 the Rondônia Tin Province has contributed, alone, roughly with 78,5% of the total brazilian tin production. From 1962 to 1984 Brazil jumped from a net tin exporter without any importance in the international market up to the

second world producer in 1986 and first ranking in 1988. The vertiginous grow which knocked down all the previous forecast was due to the start of operation of the rich Pitinga mine (Amazonas) and the discovery in 1987 by wood cutters and start of operations of the Bom Futuro "Garimpo" (Rondônia) which alone was responsible for 59% of the record total tin production of Brazil in 1989. All this happened during a time when the world big producers decreased their exports in an attempt to maintain higher prices for tin metal.

After the VI International Tin Agreement collapse in March 1986 the tin prices fell from US\$ 7.5/8.0/kg again to US\$ 7.0/kg at the end of 1986. By 1988 it was noticed an excess of tin in concentrates offers. As a consequence of economic pressures the majority of the tin mines in Rondônia became anti-economic, much more due to the boom of the low mining costs of the rich Pitinga and Bom Futuro mines, which have supplied around 10% of world production. Considering the low tin market prices, other producers could no longer cover their operational cost vis-à-vis to the selling cost and therefore they closed their mines.

Today the tin metal prices are at around of 5.5 to 6.5 US\$/kg/Sn and the situation only favors those mining operations at a cut off grade variable from 600 to 750 g/Sn/m³ which is the case of Bom Futuro, Santa Bárbara, Cachoeirinha (Caritianas) and Massangana sectors.

Reserves and resources

At the time of ITC collapse tin reserves in Rondônia were of the order of 145,530 tons of Sn (Sources DNPM-DEM, 1986). Official measured reserves in 1990 were about 390,569 tons of tin content (source DNPM-DEM, 1991). In our opinion the present reserves and resources of Rondônia are still of the order of 100,000 tons of tin content at the operational cut off grades. At the moment exploration work is scanty.

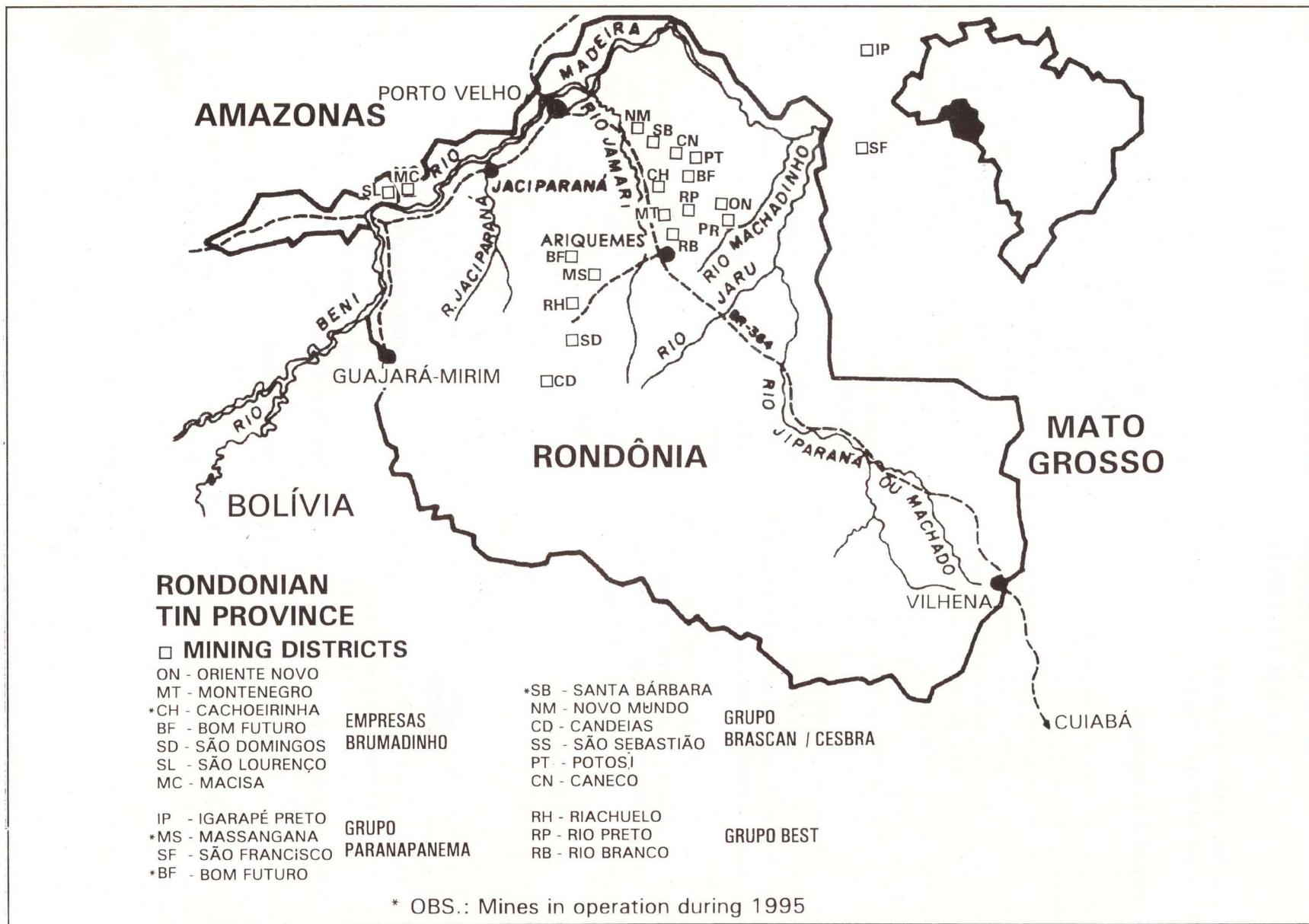


Figure 1 - A general outline of the Rondonian Tin Province showing the mining districts.

YEAR	GARIMPO (t)	MINING COMPANIES (t)	TOTAL (t)
1959	19	0	19
1960	49	0	49
1961	35	0	35
1962	678	0	678
1963	1,038	0	1,038
1964	818	0	818
1965	2,459	0	2,459
1966	2,040	0	2,040
1967	2,239	0	2,239
1968	2,800	0	2,800
1969	3,500	0	3,500
1970	4,721	385	5,106
1971	1,452	1,701	3,153
1972	0	3,754	3,754
1973	0	3,674	3,674
1974	0	3,941	3,941
1975	0	5,094	5,094
1976	0	6,710	6,710
1977		7,494	7,494
1978		8,100	8,100

YEAR	GARIMPO (t)	MINING COMPANIES (t)	TOTAL (t)
1979	0	9,639	9,639
1980	0	10,256	10,256
1981	0	11,980	11,980
1982	0	12,147	12,147
1983	0	11,542	11,542
1984	0	12,131	12,131
1985	0	10,775	10,775
1986	0	8,844	8,844
1987	0	7,745	15,080
1988	7,335	8,622	43,733
1989	35,111	8,974	54,192
1990	45,218	3,319	32,500
1991	29,181	2,414	15,293
1992	12,879	2,748	12,442
1993	9,694	4,999	21,970
TOTAL Cassiterite	178,237	166,988	345,225
Equiv. Sn in concentrate	106,942	100,192	207,135
1994 - Estimated Sn in concentrate production ≈8,000			
TOTAL Sn in concentrate - 1959/1994 = 215,135			

Source:

- Archives of Grupo Brumadinho, SP, Brazil;
- Empresas Brumadinho, 1983/84: A Indústria do Estanho
- Gilberto Dall'Igna, DNPM-PV-Rondônia (verbal communication, 1995).

Table 1 - Cassiterite and tin in concentrate production of Rondônia Tin Province from 1959 to 1994.

Concerning the primary mineralization little is known, the full potential has never been determined and the mining companies are not launching any type of exploration works, which is well understood taking into account the evolution of the international tin prices. In spite of this panorama Bom Futuro is still a first class shallow soft and hard tin mine and still holds a promise. From the initial estimated reserve in 1989 of 266,000 tons of Sn (measured+indicated+inferred), in 1994 there remained still a potential of the order of 60 to 100,000 tons of tin content. Bom Futuro has been exploited for tin since 1987 and has collectively produced up to 1994, about 117,000 tons of tin in concentrates. It is worth noting that the mine has injected about US\$

750,000 into the nation's economy.

On the other hand, total tin output of the Rondônia Tin Province from 1959 up to 1994, as seen in Table 1, is roughly 215,000 tons of tin in concentrate which represent a wealth of about US\$ 2 billions.

Forecast

If the world tin market price is going to be steadily at the levels of US\$ 6.5 to US\$ 7.0/kg/Sn metal for the next five years, our forecast is that one cannot expect any reactivation of the old traditional mining sectors and, some of the mines cited and still in operation are bound to close.