

**GEOLOGICAL AND MINERAL MAP OF GOA, 1996**, Scale 1:125,000; published by Geological Survey of India. Price Rs.150/-

The best method of presenting knowledge about the geology of an area is through geological map. In India only the Geological Survey of India provides Geological Maps, but unfortunately at too infrequent intervals. The geological map of Goa under review is a compilation of geological mapping carried out over a period extending for nearly 20 years between 1962 to 1989. The map covers 3307 sq.km which is the area of Goa State, on 1:125,000 scale. The map is a welcome addition to our knowledge of the geology and mineral resources of Goa.

A major part of Goa is covered with either laterite or thick forest, especially over the hilly tracts in the eastern and southern parts of Goa State. Fresh outcrops are rare and there is also the problem of access to outcrops in the thickly forested hilly tracts. Notwithstanding these problems, the geology of the intricately folded Precambrian terrain of Goa has been well brought out. The map is accompanied by a brief description of the Geology and mineral resources which is printed in the body of the map and is a welcome change from the practice adopted in the issue of geological maps of other States released earlier (viz. Karnataka, Kerala).

The map presents outlines of 20 major rock units many of which are extensions from the adjacent Karnataka State. These rocks include metavolcanics, layered ultramafics, conglomerates, quartzites, phyllites, BIF, greywacke and limestones. They have been classified into 4 Formations under the Goa Group which is stated to be equivalent to the Chitradurga Group of Dharwar Supergroup. The Goa Group is stated to unconformably overlie "Peninsular Gneissic Complex". The change in terminology from "Peninsular Gneiss" in the geological map of adjoining Karnataka to "Peninsular Gneissic Complex" has not been clearly explained. There is no indication of unconformable relation between the Gneissic Complex and the overlying Goa Group in the stratigraphic column given under LEGEND.

Unlike in the 1980 Geological Map of Karnataka, the map of Goa shows foliation symbols and bedding symbols — a marked improvement in the presentation of geological data.

BIF and conglomerate have been shown as restricted to only one stratigraphic level. But a careful study of the distribution of rocks with respect to regional anticlines and synclines together with bedding attitudes shown on the map reveals occurrence of BIF and conglomerate at more than one stratigraphic level.

Some discrepancies occur: (i). Contrary to the description of the regional structure, anticlines are not shown in south Goa, south of Betul; (ii). In all, 4 phases of deformation have been depicted, but they have not been distinguished with different symbols; (iii). It is stated that "The N-S system of steep dipping (diagonal) faults often displacing the structures of  $F_2$  deformation are associated with emplacement of mafic-ultramafic complexes". The map shows only two N-S trending faults with no indication of dip or displacement. There is also no indication of association of mafic-ultramafic complexes with N-S structures; (iv). Explanation to certain structure symbols at far NE of Valpoy and at NE of Mapuca is missing.

There are some discrepancies in the colour scheme and codes which require to be rectified.

- (i) At NE of Valpoy  $APt_1$  biqs (quartz-sericite schist) is wrongly shown as  $Apt_1$  bicq.
- (ii) At E of Panaji the colour given for  $APt_1$  bb is different from the colour in the Legend.
- (iii) At ESE of Ponda  $APt_1$  biif which is the code for BIF is given a different colour.
- (iv) At NE of Dicholi (Bicholim), a big band of  $APt_1$  biif is wrongly given the code  $APt_1$  bb.
- (v) Ptg at east of Chauri is given the colour intended for Ptpy

Certain important locations referred to in the explanatory legend are not shown in the map. For example Usgaon which is famous for the layered ultramafic complex, (ii) Betul referred to in connection with the structure, (iii) Location (s) of occurrence of gold is missing though its symbol appears under "Mineral Index", (iv) The spelling of Sanvordem is wrongly printed as Sadordem.

The map is stated to be based upon Survey of India map with the permission of the Surveyor General of India. Surprisingly the latitude and longitude information is missing. While Karnataka map shows these details the reason for excluding such essential data is not clear.

The colour scheme adopted do not match with the scheme adopted in the map of the adjacent State—Karnataka. A uniformity of colour code is desirable.

Legend indicates that sixteen officers of the GSI were involved in mapping 3307 sq.km of Goa terrain over 20 long years commencing from 1962. Eight officers took up compilation of the map after the mapping programme ended in 1989. In all, therefore, it has taken 34 years to bring out the first Geological map of this mineral-rich State. Such slow progress appears to be responsible for the inordinate delay in bringing out a map of such an important region as Goa.

Despite these limitations the map is an excellent production of the complicated geology of a least known Precambrian terrain of India and is sure to revive interest in the geology and mineral resources of the State. The map will also be of interest to the International earth science community interested in the study of the Precambrian. We do sincerely trust the Geological Survey of India will bring out maps of the other States of India, more speedily, adopting certain uniformity in presentation.

The map is priced at Rs.150/- and is stated to be available at all regional offices of the Geological Survey of India.

*Bangalore*

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## Geological Society of India

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