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PROGRESS REPORT ON THE SYSTEMATIC GEOLOGICAL MAPPING IN SOUTHEASTERN PART OF MONGHYR DIST., BIHAR
(Field Season 1968-69)

By
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Assistant Geologist
Geological Survey of India

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ABSTRACT

Title of the report	:	Systematic geological mapping in Southeastern part of Monghyr district, Bihar.
Author	:	S. Panday.
Location of the area	:	In southeastern part of Monghyr district, Bihar bounded by N. latitudes 24°45' and 24°53' and E. longitudes-86°25' and 86°34' in Toposheets 72L/05 & L/09.
Period of investigation	:	Between 10th Nov.'68 to 10th Dec' 68 and 1st April'69 to 10th May'69
Synopsis	:	An area of 200 sq km was covered in course of systematic geological mapping of southeastern part of Monghyr district. Bihar. Mica schist, quartzite, granite, amphibolite, pegmatite and quartz vein were encountered. The strike of the rock types swerves from NNE to almost E-W as one proceeds the southwestern to the eastern part of the area. A synclinal structure is noted south of Gado Pahar. Three main faults have been found in the area. Bladed kyanite occurs sporadically in pockets in sheared quartz-vein between Belbhinda and Bhika along the entire 10km length. Small books of mica occur in pegmatites. Granite is quarried as building material and quartz-breccia rock is used as road metal and railway ballast. Detailed investigation of kyanite deposit may be under taken in case bladed variety is likely to find any use.

THE SYSTEMATIC GEOLOGICAL MAPPING IN SOUTHEASTERN PART OF MONGHYR DISTRICT, BIHAR
(PROGRESS REPORT FOR 1968-69)

By
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I INTRODUCTION

During the field season 1968-69, I continued the systematic geological mapping on 1:63,360 scale in the south-eastern part of Monghyr district, Bihar (as per item No.GM/3(a) on page 2 of the Field Season Programme of Geological Survey of India for the season). I covered an area of 200 sq km included in the Survey of India Toposheets 72L/05 and L/09. The work was done between 10th Nov and 10th Dec, 1968 and 1st April 69 and 10th May 69. In between during 14th Dec. to 18th March, I was deputed to undergo departmental Field Training. During the previous Field Season the area located further west and north-west was mapped and the present work was in continuation of this earlier work.

Location and accessibility

The area is located in the south-eastern part of Monghyr district and to the northeast of the railway track of Jhajha-Simultala section of Eastern Railway. It is bounded by north latitudes 24°45' and 24°53' and east longitudes 86°25' and 86°34'. The Jamui-Chakai metalled road passes through west of the area, and Katuria-Sultanganj road under construction runs further east of the area. There are a few fair weather cart tracks in the area, connecting the interior with the above named railway stations; the important ones are the Jhajha-Simultala, Jhajha-Nagidam-Barwa and Simultala-Suiabathan tracts.

Physiography

The area under study forms a part of the north-eastern extension of the Pre-Cambrian Peninsular Shield and includes the extreme north-eastern corner of the Bihar mica-fields. The region is an undulating plain with rolling low to moderately high ridges formed of quartzites which have withstood prolonged weathering. The sub-parallel ridges enclose valleys between them. These are occupied by the argillites which have undergone much weathering and erosion. The general elevation of the area varies between 160m and 400m. and the master slope is towards ENE in the

eastern part and towards SW in the western part of the area, the watershed barrier running proximately parallel to the longitude 86°30'E. All the streams rise in the area itself and remain mostly dry in summer. No important river flows through the area; the Badua and the Bela nalas flow further east of the area and the Ulai nala flows further west.

Climate

Tropical climate is experienced in the area with an extreme summer and cold winter and severs monsoon. The annual range of temperature is 2°C to 47°C and the average annual rainfall is well over 1000mm. Summer commences in March and rains start by last week of June. The dry heat in summer in day time is followed by comfortable cool wind in the night making the night pleasant. It is due to this reason that Simultala has been liked as a health resort. Winter sets in the areas, in November and continues till February.

Flora and fauna

The hill slopes and the valleys sustain quite good vegetation but the quartzite ridges are generally devoid of it except for occasional thorny under growth. The argillites in the valleys support luxuriant growth of bamboo (Dendrocalamus strictus) Sal (Shores robusta), Mahua (Bassia 1atifolia), Nim (Melia indica), Kend (Diaspyrs melanoxylon), Palas (Butea frondosa), Jamun (Engenia jumbutaka) and many shrubs. Palm (Borassus flabellifer) is also very common in the plains. Wild life is not abundant, though leopards and bears have been noticed at times by villagers.

Previous work

No systematic geological mapping was carried out in the area earlier, although V. Ball had made a general survey of the adjoining regions (Mem. G.S.I., Vol.VI pt. 2). R. Thiagarajan mapped the country to the west of this area during 1959-61 and V.C. Jacob carried out systematic geological mapping in the neighboring areas in Bhagalpur district during 1961-62, N.K. Jana and S. Panday did systematic geological mapping in the area west of Jamui, i.e, in the area located to the west and north-west of the present area, during the previous field season.

Acknowledgement

The work was carried out under the guidance and supervision of Shri. K.D. Shukla, Director, G.S.I., Bihar Circle, who visited the area twice during the field season and inspected parts of the area mapped.

II GENERAL GEOLOGY

The Geological formations of the area are Pre-Cambrian metamorphites, migmatites and igneous intrusives. The rock types of the region have been tentatively arranged below their probable sequence

RECENT	Alluvium
	Kyanite bearing quartz vein, pegmatites and quartz veins.
ARCHAEAN	Meta-dolerites, amphibolite & hornblende schist.
	Granite and gneiss including porphyro-blastic gneiss, biotite and hornblende gneiss and migmatite.
	Quartzite quartz-mica-schist and mica schist.

Within these rocks there are numerous zones of brecciated and mylonised rocks which have invariably been silicified indicating movement along these zones.

The oldest rocks of the area are mica-schists, quartz mica schists and the intercalated quartzites, which represent metamorphosed earliest sediments of pelitic, mixed arenaceous and arenaceous composition. The hornblende schists associated mica-schists may represent old altered basic intrusives. Individual rock types are described below in detail:-

Quartzite

Quartzite constitutes the bulk of the forming the ridges and almost all the hills. Lateral variation from fine grained massive to ferruginous and gritty quartzite has been noted in the same band. In some rock shows bedding planes decipherable from colour and compositional banding. Due to their being resistant to weathering compared to the associated schist they stand up and form ridges. The ridges run along the strike which is generally ENE-WSW, except in. south-western part of the area, along the railway tract, whore it is nearly north-south. The change is, however, gradual, which may be due to folding of synformal toe, the axis of which may have been faulted. However, the regional structure can be established after the area south is mapped. In Gado Pahar area, the quartzite band shows steep southerly dip whereas in Deoli Pahar and north Dharhasi area the dips are northerly, indicating the presence of a syncline.

In Gado Pahar area, slightly foliated, grey, whitish to pink quartzite, of fine to medium grained texture, constitutes of the hill range. Besides quartz, magnetite, it’s

and at places biotite are associated in the rock very small proportions (each less than 5%). Quartz occurs in the form of grains of various sizes and irregular shapes and show undulose extinction under the microscope. The texture is mossaic with interstitial minute mica flakes and iron oxide. The maximum width of the band is one kilometer in the portion south-east of Asia.

East and north-east of Kumhaini gritty quartzite occurs on the western slope of the hill in a band 10m to 15m wide. Quartz grains are embedded in sericitic matrix and detrital feldspar grains are found very often with it. This band is in the strike continuity of the Gado-Pahar quartzite band.

The quartzite occurring in Deoli Pahar and in the area north and north-west of Dharhasi is massive to very slightly foliated. It ranges in colour from whitish grey to various shades of pink. Pinkish variety is abundant in the portion south of Sarnikura The quartzite occurring in the hillock north of Dharhasi is fine grained, massive, grey and whitish in the eastern part and somewhat gritty in the western part.

Mica-schist

Intercalated with the quartzites and conformable in strike with them, occur bands of biotite-muscovite-schists. These are found to the north of Tetaria and in the area located between Belbhinda and Bhikha. Quartz-mica-sericite schist occurs south of Sarnikura along the northern slope of the hill. Narrow lenticular bands of mica-schist also occur intercalated with the quartzite here and there and as small inclusions within the migmatite rock between Dharhasi and Sarnikura, These micaceous-schists perhaps represent original argillaceous sediments deposited along with the arenaceous ones which have been metamorphosed to form mica-schist and quartzite, respectively. Southeast of Bhikha, the mica schist contains subordinate amount of sillimanite in the shape of micro-needles.

In hand specimien the mica schist is fine grained, schistose bluish white to pinkish in colour and shows flakes of muscovite and biotite. Thin section study reveals the presence of quartz, orthoclase, sericite and iron-oxide. Garnet is common. One specimen from the central portion of the hillock south of Barwa was found to contain sillimanite needles whereas another from the nala cutting north of Salga showed presence of staurolite. Large scale intrusion of pegmatitic material into mica-schist along the schistosity planes is noticed in the mica schists of Sarnikura-Dahua area. Tourmaline, apatite and epidote are found associated with the pegmatites. The maximum width of the outcrop of this rock in this area is two kilometre.

Hornblende schist

Hornblende-schist occurs usually in the form of thin bands in the mica-schists as well as gneisses and quartzites. These are invariably conformable with the foliation. Hornblende schist is fine grained, dark coloured and is composed of hornblende, plagioclase, quartz and garnet. Schistose structure is well defined but massive nature is also not rare. Hornblende is pleochroic from deep green to yellowish brown and shows strong diablastic structure, low extinction angle and moderate birefringence. Hornblende schist bands occur between Beibhinda and Bhikha. They may represent older calcareous in sediments which have undergone metamorphism.

Granite and granite gneiss

Granite and granite-gneiss with their variants are the most dominant country rock of the area. Typical massive granite occur in the northern part of the area forming small dome shaped hillocks which pump out of the soil cover here and there. No distinct intrusive contact is noticed anywhere. On the other hand the granite grades into granite gneiss. The contact between granite and quartzite is also not well defined. The changeover is gradational from pure quartzite feldspathic quartzite and then to granite as is seen north-east of Kumhaini. Therefore, it is possible that the granite of the present area has been formed due to the. granitisation of the pre-existing meta-sediments.

In hand specimen, the granites are coarse grained to pinkish white in colour, consisting mainly of quartz and feldspar arranged in hypidiomorphic pattern. Under the microscope the rock is found to contain quartz, microcline, acid plagioclase, biotite, epidote, sphene and iron oxide in their order of abundance. The texture is hypidiomorphic. Quartz grains show myrmekitic intergrowth with feldspar. Microcline is found to contain laths of plagioclase and perthitic intergrowth is also observed. Highly pleochroic biotite is found to be surrounded by pleochroic epidote. Wedge shaped sphere crystals with very high R.I. and, birefringence and dark opaque iron oxides occur as accessories.

Porphyroblastic gneiss

It occurs in the area around Garha and between Belbhinda and Barwa. Porphyroblasts of potash feldspar are found in the granite gneiss surrounded by biotite rich finer material in such a way as to give rise to crude augen structure. Each porphyroblast may or may not be consisting of a single crystal but it is usually so

oriented that the line joining one tips of augen is parallel to the foliation plane of the gneiss.

In mineral content the rock is not much different from the granite. However, it shows crude foliation conformable to the general trend.

Biotite and hornblende gneiss:

Gneiss occur as conformable patches within the main granitic bodies as their variants. These are generally well foliated. Such bands are found occurring in the core of the syncline, south of Gado Pahar, west of Belbhinda and north of Burhi-khar Foliation in the rock is indicated by concentration of mafic minerals in individual bands varying in thickness from a fraction of a centimeter to a few centimetre. At places biotite is replaced by hornblende as the ferro-magnesian mineral, as is seen north of Kumhaini. The lighter bands of the rock are wider compared to the darker bands and are composed of quartz and feldspar. Structural and lithological study indicates that they are of meta-sedimentary origin.

Migmatite

Migmatite occurs in the area between Dharhasi and Dahua and between Karamdih and Ghoradamgi. In the former area, mica-schist appears to have sufferred lit-par-lit injection of granitic material and in places assimilation by it. Thin pegmatitic and quartz veins are very common in the area The migmatite reveals wide variation in composition within short distance and contains numerous inclusions. It is seen to pass gradually and at places even abruptly into mica-schist along the strike. In Karam-dih-Ghoradangi area the migmatites continue along the strike for two to three kilometres on both sides. In the south-west it is truncated by a fault running beyond Tetaria and Kumhaini. In the north-east the migmatite joins with the banded biotite gneiss described earlier.

Thin section study of the migmatites shows quartz, orthoclase, microcline, acid plagioclase, microcline perthite, biotite, muscovite and epidote in their order of abundance. Hornblende and garnet have also been noted to be present in subordinate amounts in some of the sections.

Pegmatite and Quartz veins

Small veins of pegmatite, rich in tourmaline, are abundant in Dharbasi-Dahua area. Quartz-veins are abundant in the area located north and north-west of Barwa In

the former area the thin pegmatite veins occur along the foliation planes of the mica-schist. White quartz veins of Barwa area on the other hand, are comparatively of larger dimension. One such vein runs for over 10km between Belbhinda and Bhikha along the strike, separating the quartzite from the mica schist. Kyanite occurs associated with this quartz vein all along its length. Coarse crystals of quartz, feldspar, muscovite, tourmaline, garnet and magnetite occur in the pegmatite in their order of abundance.

Basic rocks

These include hornblende schist, amphibolite, metadolerite and pyroxenite. Bodies of these rocks are very often concordant with the foliation of the country rocks and are probably of the nature of sills, and many of that show variation in width. A band of basic rock 20m to 30m wide and over two kilometres in length runs along the strike just north of Kumhaini for some distance but abuts against the quartzite of Gado Pahar south of Karamdih. The rock is hornblende schist in the southern part but becomes massive like amphibolite south of Karamdih. Another band of hornblende schist, 15m to 20m broad, runs from west of Barwa to Chaukijor and continues beyond in its strike direction. Here the rock is well foliated and breaks easily along its foliation plane. It is rich in quartz compared to Kumhaini band. Similar band occur north of Lalbairo, south of Nawadih and east of Nawadih. Very thin and small bands occur all along in the mica-schist between Belbhinda and Bhikha. North of Salga and on the southern bank of Kathara river a dolerite dyke has been seen within mica schist. Here the rock-exhibits spheroidal weathering at the surface and well rounded boulders of cricket ball size are found scatterred all over the ground. In thin section it is found to consist of augite plates being replaced by hornblende and laths plagioclase enclosed within. The texture of the rock is typically ophitic. In one of the sections from the central part of the body individual crystals of augite well found to be within plates of plagioclase. It can be deciphered that the core of the intrusive consists of pyroxenite while near the contact with the country rock dolerite has developed. The band is about 15m in width and 100m in length.

Fault breccia

Brecciated and mylonitised rocks are markedly developed along certain linear zones described below, Those have resulted due to the crushing and pulverisation of the country rock along fault zones. One such zone runs parallel to the railway track from northeast of Jhajha through Narganjo and further south east and another between Belbhinda and Bhikha, Smaller patches of brecciated quartzite are found south of Pargaha and south east of Burhikhar. Near Jhajha and Pargaha the original fine

grained, white to pinkish and grey quartzite has been brecciated and the broken fragments are cemented together by secondary silica and ferromagnesian minerals. Crushed and pulverised granitic rocks occurring north of Narganjo show darker appearance. On account of its being mere resistant to weathering, the quartzitic fault breccia forms conspicuous ridges to the north of Jhajha railway station and also south of Pargaha.

III STRUCTURE

Quartzite bands show bedding strike whereas the gneisses and schists show foliation which is generally parallel to the bedding strike in the quartzite in adjacent areas. The rocks show swerving of strike. In the southwestern part, east of Jhajha railway station, the strike is NNE-SSW but swerves to NS-SW only within two kilometre of the railway line and then becomes ENE-WSW and even east-west in the Belbhinda, Barwa and Bhikha areas. The dip direction consequently changes from east to south but the amount remains, at 60°-70° in the above mentioned areas. In the southern part of the area, around Narganjo, northerly northwesterly dips are found indicating a synclinal structure. The quartzite bands on either side of Pararia nala show opposing dips and are crossed by the fault zone near Narganjo. The biotite-gneiss occupying the core is more or less massive but it shows south-easterly dip near Gerha.

The area has suffered faulting and brecciation as is evident from the presence of numerous brecciated and pulverised zones. Three main faults traceable for appreciable distances have been located in the area. One fault runs to the north of and parallel to the railway track between Jhajha and.Narganjo; another is traceable between Belbhinda and Bhikha and the third which runs parallel to the Bhikha zone is traceable from south of and Pargaha to NE of Bhikha, The second and third faults are strike faults while the first one along the railway line is a traverse one. All the major lithological bands including quartzites are truncated by the fault near Jhajha along the railway line and brecciated and secondary quartz have been formed which form a prominent ridge near Jhajha railway station. Sheared quartz vein is found along the fault near Bhikha. Brecciated secondary quartz is found forming hillocks north of Bhikha. In the area north of the granitic rocks have sufferred much crushing and mylonitisation along the main fault zone.

Quartzite and granite display conspicuous joints in different directions, the most prominent being transfer; joints with very steep to vertical dips. Quartzites are susceptible to development of joints than the gneisses and granite.

IV ECONOMIC MINERALS AND ROCKS

Building stones

Granites and gneiss which are found to be equigranular in the areas near Gerha, south-east of Belbhinda and north-west of Lalbairo are quite suitable as building stones. The porphyroblastic gneiss is also quite fresh and easier to break along the foliation plane. Rough slabs come out with comparative ease from the quartzite ridge running between Belbhinda and Bhikha and the rock is being used for building construction by villagers. Quartzite-breccia is being quarried at many places especial, in the hill near Jhajha, for road material.

Kyanite

Occurrence of kyanite of bladed variety has been noted in association with quartz vein, which has been traced for a length of 10km between Belbhinda and Bhikha. The quartz vein is emplaced at the contact between mica-schist and a thin quartzite band which occurs within the mica schist. Rossets and segregations of kyanite occur as pockets in the quartz-vein. The width of the quartz-vein hardly exceeds three metre and the maximum size of kyanite pocket measures 1.5m × 0.5m. Blades of kyanite measure as much as 20cm × 3cm. Boulders of kyanite weighing about half a quintal are seer as ‘float’ near the vein at a number of places in this zone. However, the mineral does not occur as a continuous band but as small pockets here and there along the quartz vein. Concentration of the mineral is more pronounced near the contact of the quartz vein with the mica-schist. The quartz-vein itself shows signs of shearing all over its length.

Muscovite

Thin veins of pegmatite occurring in that region around Dharhasi and Dahua show development of muscovite books. A few prospecting pits appear to have been made here and there in the area, but the mica books seldom attain a size bigger than 5cm and is not free from flaws and cracks. Therefore, it does not appear to be workable.

Quartz

The entire area north of Gado Pahar is full of white quartz-veins of different dimensions. Clear and unstained variety is also noted which may find its use in ceramic industry.

V SUMMARY AMD RECOMMENDATION

Systematic geological mapping in south-eastern of Monghyr district was continued and an area of 200 sq km was covered. The area is a part of the Pre-Cambrian metamorphic terrain consisting of quartzite, mica-schist, hornblende granite and granite-gneiss, pegmatite, quartz-vein and basic rocks like meta-dolerite, amphibolite and pyroxenite. Quartzite and mica-schist show alternating sequence and the gneiss is conformable to them. Quartzite shows relict sedimentary features like colour banding. Granite of the area might have been formed due to the granitisation of the pre-existing meta-sediments.

The foliation in the area changes from NE to almost E-W as one proceeds from the south-western part-to the eastern part of the area. A synclinal structure if noted south of Gado Pahar, The area has sufferred deformation due be folding and faulting as is evident from existence of a number of faults, three main faults have been noted.

A kyanite bearing quartz-vein has been recorded in the area between Belbhinda and Bhikha, where kyanite-occurs in pockets sporadically along the entire 10km length of the quartz-vein. The kyanite is of long bladed variety, Small books of mica are noted in the pegmatites. Granite is quarried as building material and brecciated quartz rook is worked for road metal. Detailed investigation of the kyanite occurrence may be undertaken in ease bladed variety is likely to find any use. At least a few hundred tonnes may be available from this locality from the surface and residual soil.

LOCALITY INDEX

Locality	Latitude (N)			Longitude (E)			Toposheet No.
	Degree	Minute	Second	Degree	Minute	Second	
Asta	24	47	00	86	27	15	72L/05
Barwa	24	48	00	86	29	30	72L/05
Belbhinda	24	49	30	86	27	00	72L/05
Bhikha	24	50	30	86	30	30	72L/09
Burhikhar	24	51	15	86	30	00	72L/09
Chaukijor	24	49	15	86	31	15	72L/09
Deoli Pahar (Δ1168)	24	45	30	86	33	30	72L/09
Dharhasi	24	45	30	86	29	30	72L/05
Dahua	24	45	00	86	31	00	72L/09
Gado Pahar(Δ1672)	24	46	30	86	31	30	72L/05
Gerha	24	25	15	86	28	30	72L/05
Ghoradamgi	24	47	50	86	26	00	72L/05
Karamdih	24	46	45	86	27	30	72L/05
Karma	24	48	45	86	25	45	72L/05
Kumhaini	24	45	45	86	25	45	72L/05
Jhajha	24	46	15	85	23	00	72L/05
Lalbairo	24	52	30	86	32	15	72L/09
Narganjo	24	44	30	86	27	30	72L/06
Nawadih	24	52	00	86	31	30	72L/09
Pargaha	24	51	15	86	29	30	72L/05
Salga	24	50	00	86	28	30	72L/05
Sarnikura	24	45	30	86	32	00	72L/09
Tetaria	24	46	00	86	24	30	72L/05

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2	Jacob, V.C.(1962)	G.S.I, unpublished progress report 1961-62.
3	Jana, N.K. and Panday, S. (1968)	G.S.I, unpublished progress report for 19 67-68.
4	Thiagarajan, R. (1960-61)	G.S.I, unpublished progress report for 1959-60 and 1960-61.

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PLATE I: GEOLOGICAL MAP OF PARTS OF MONGHYR DISTRICT, BIHAR (PARTS OF TOPOSHEETS 72L/05 & 09)

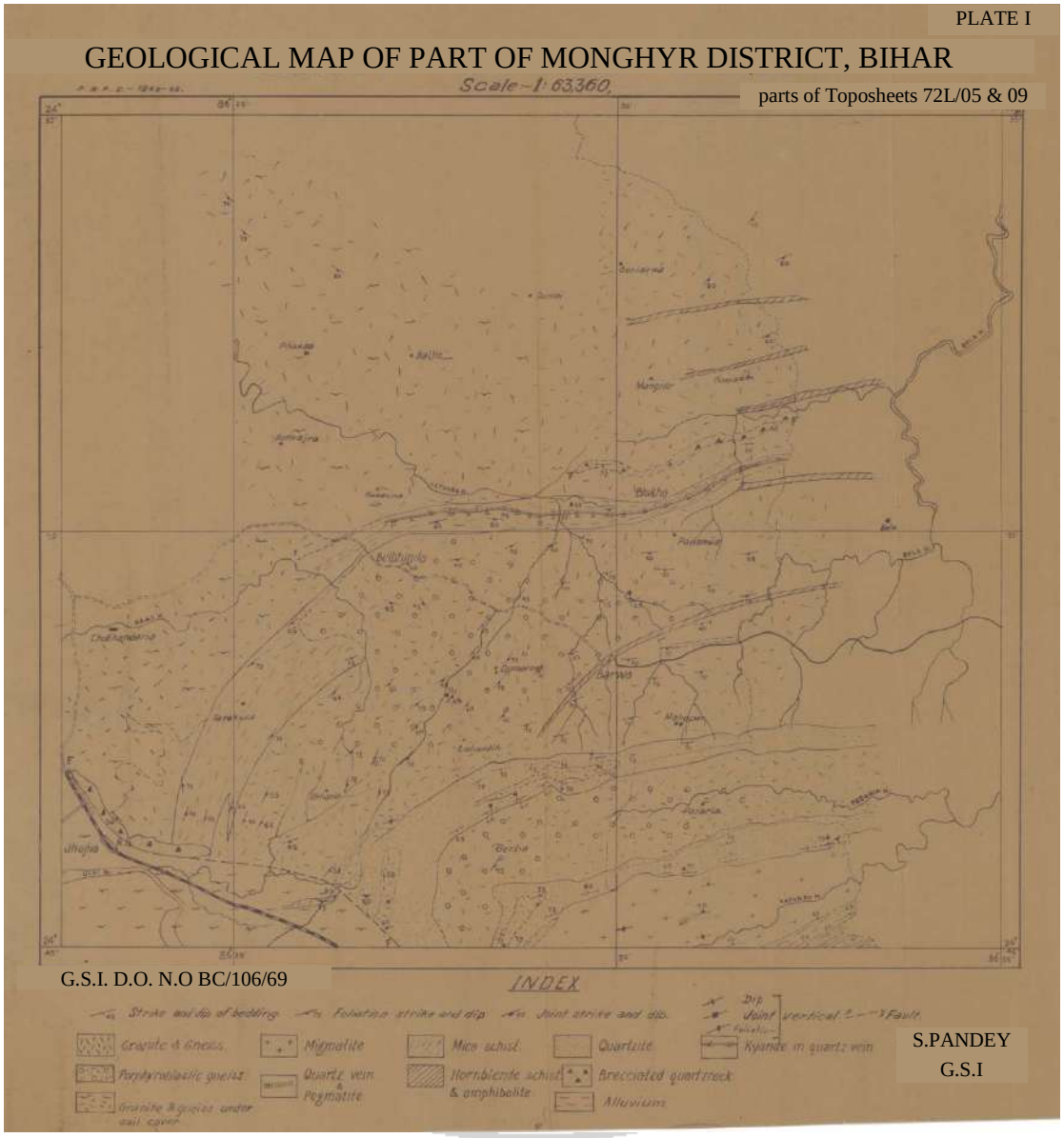


PLATE II: STRUCTURAL MAP OF PART OF MONGHYR DIST., BIHAR (PARTS OF TOPOSHEETS 72L/05 & 09)

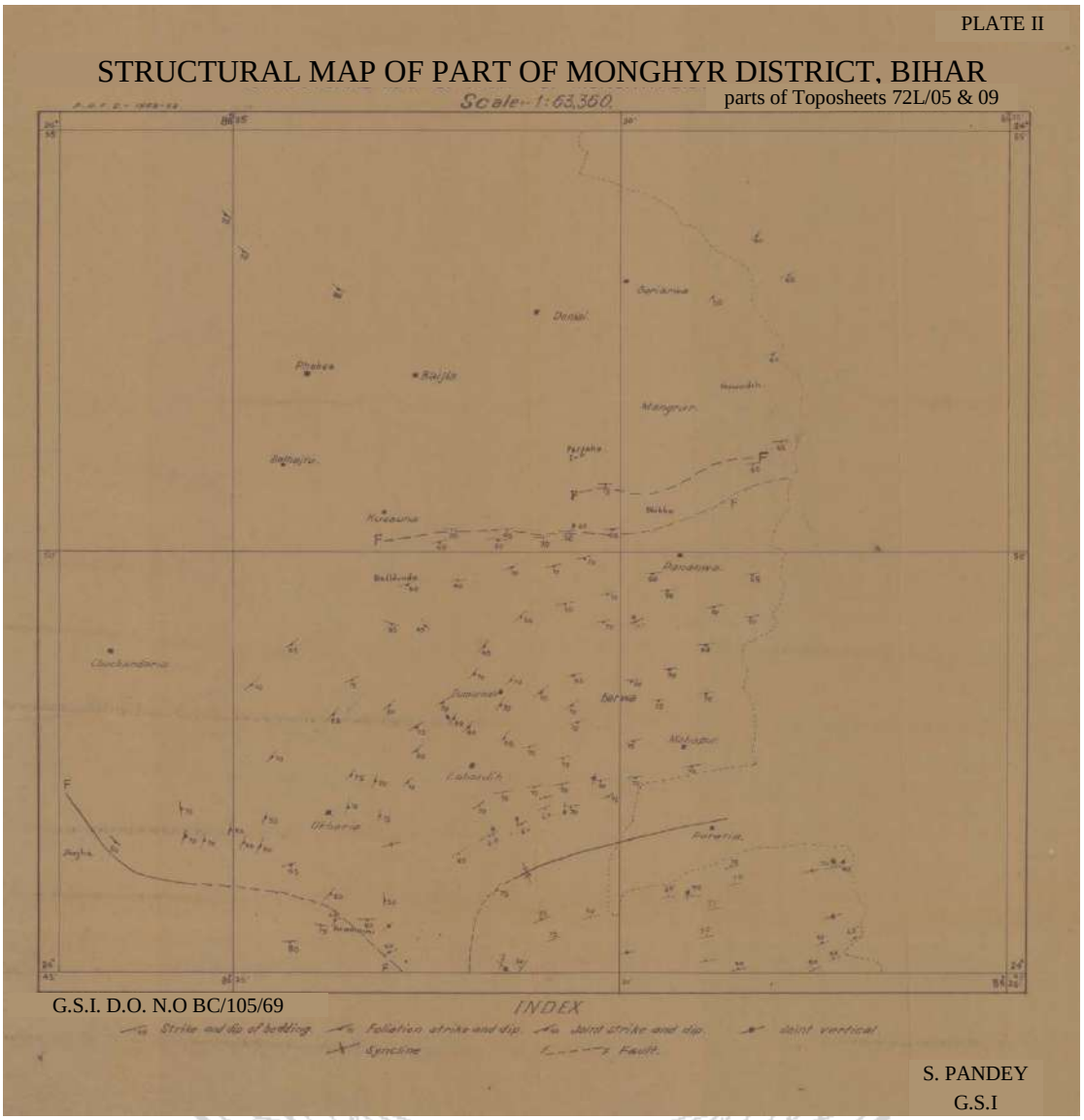


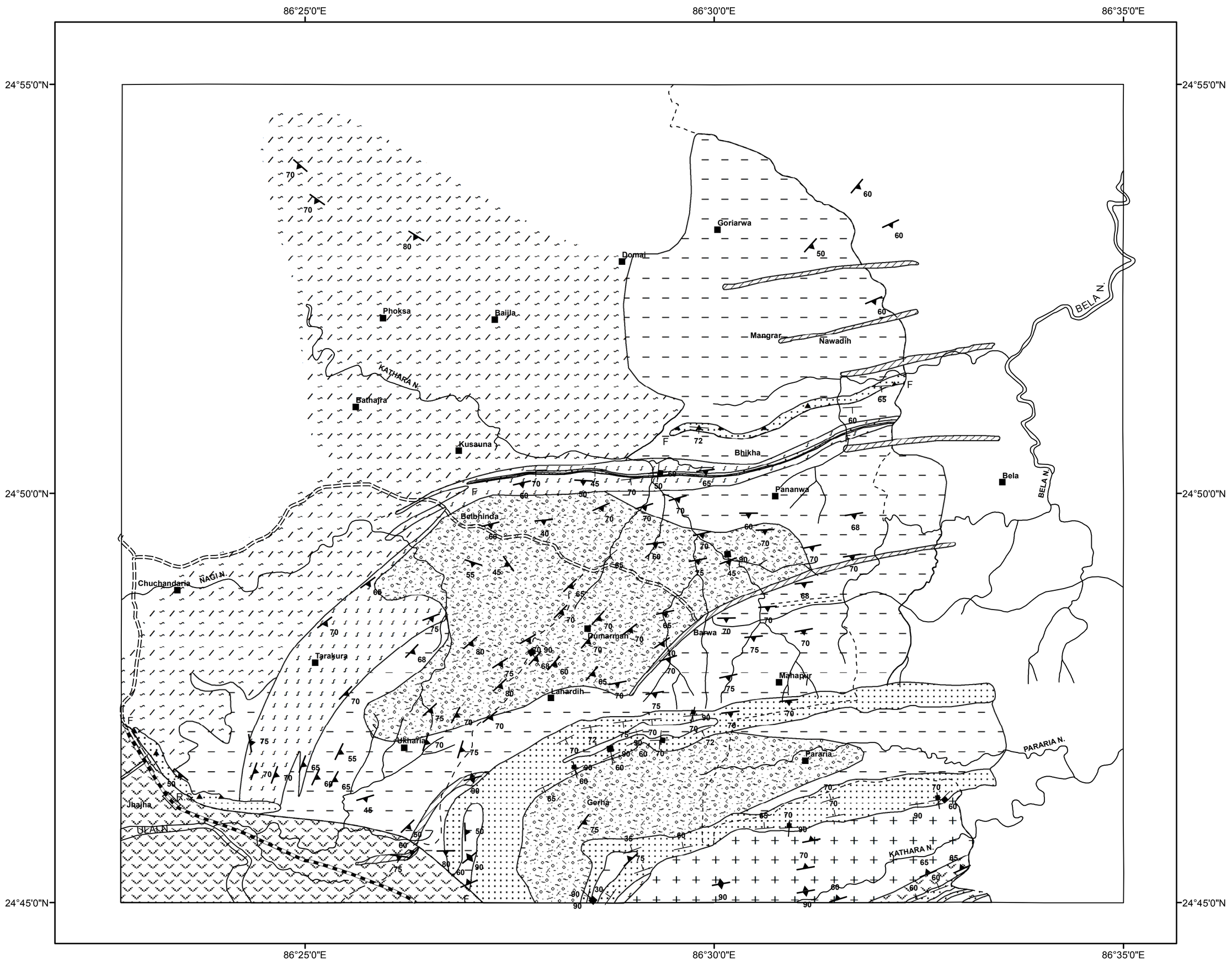
PLATE-I

GEOLOGICAL MAP OF PART OF MONGHYR DISTRICT, BIHAR.
Scale:- 1:63,360

N

Parts of Topo Sheet Nos. 72 L/5 & 9

P.R.F.S.-1968-69.



G.S.I.D.O.No.BC/106/69.

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- Granite & gneiss under soil cover
- Hornblende schist & amphibolite
- Alluvium
- Kyanite in quartz vein

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G.S.I.

PLATE-II

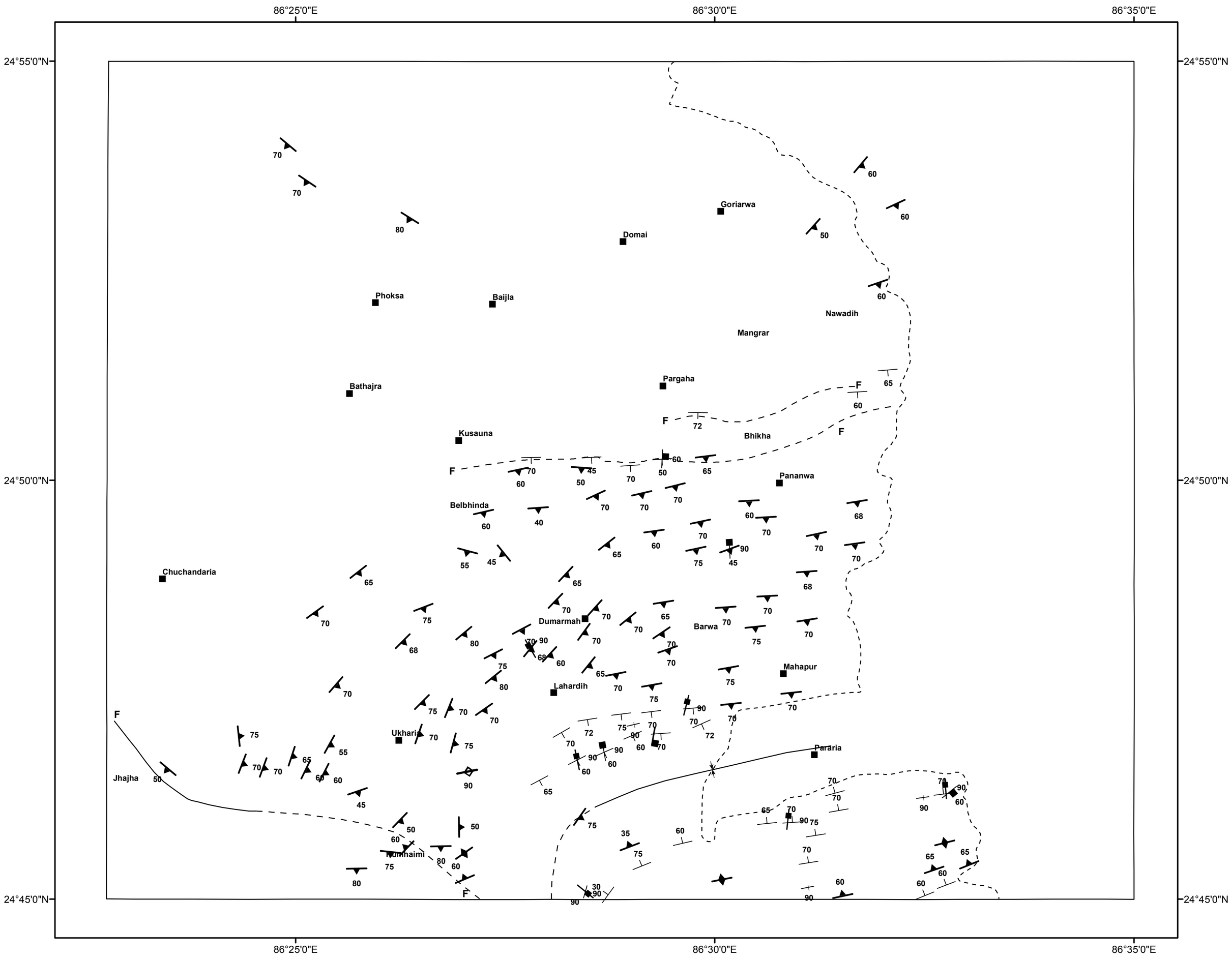
STRUCTURAL MAP OF PART OF MONGHYR DISTRICT, BIHAR.

Scale:- 1:63,360

N

P.R.F.S.-1968-69.

Parts of Toposheet Nos. 72 L/5 & 9



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