A. Biostratigraphic classification and distribution charts:

For establishing the biostratigraphy of this area, the writer has followed the general micropalaeontological practice like sampling, preparation of thin sections, description, identification and recording of the microfauna (larger foraminifera). Vertical variations of the faunal character in the local sequences have been studied from emergence, extinction, abundance and such other features of the larger foraminifera present. The stratigraphic distribution and zonation of important larger foraminifera in Waior - Cheropodi is shown in Table 1. The vertical distribution of larger foraminifera in Waior - Cheropodi section is shown in Table 2. The areal distribution of the faunal zones is also shown (Map C).

Study of these distribution charts revealed the presence of three kinds of forms in the sequence:
(i) those having considerable vertical range (e.g. Austrotrillina howchini and Archaias angulatus),
(ii) those having short vertical duration (e.g. most of the species of Lepidocyclina, Miogypsina, Miogypsinoides and Nummulites and
(iii) those showing marked change of their frequency (e.g. Miogypsina globulina). Eight faunal zones have been recognised in this area.

B. Generalised faunal succession of the area:

A generalised faunal succession of the area is given below. The leading larger foraminifera fossils of each zone are also shown:

- **Zone H**
  - Taberina malabarica
  - Sorites marginalis, Archaias angulatus
  - Miogypsina (Miogypsina) globulina
  - Miogypsina (Miogypsina) bhogatensis
  - Lepidocyclina (Nephrolepidina) tournoueri
  - Austrotrillina howchini

- **Zone G**
  - Archaias angulatus
  - Miogypsina (Miogypsina) globulina
  - Miogypsina (Miogypsina) bhogatensis
  - Lepidocyclina (Nephrolepidina) tournoueri
  - Austrotrillina howchini
Zone F
- Archaias angulatus
- Miogypsina (Miogypsina) globulina
- Lepidocyclina (Nephrolepidina) tournoueri
- Austrotrillina howchini

Zone E
- Archaias angulatus
- Miogypsina (Miogypsina) tani
- Miogypsinoïdes dehaarti
- Lepidocyclina (Nephrolepidina) morganii
- Austrotrillina howchini

---------- Minor faunal break ----------

Zone D
- Archaias sp.
- Miogypsina (Miogypsina) gunteri
- Miogypsinoïdes bantamensis
- Lepidocyclina (Nephrolepidina) parva
- Austrotrillina striata
- Spiroclupeus ranjanae var. II
- Miogypsinoïdes complanata

Zone C
- Lepidocyclina (Nephrolepidina) parva
- Spiroclupeus ranjanae var. I

---------- Apparent faunal break ----------
Lepidocyclina (Eulepidina) dilatata

Zone B
- Nummulites fichteli
- Nummulites clipeus

Zone A
- Nummulites fichteli
- Nummulites clipeus

------------------ Faunal break ----------------------------- ■--------

Zone of Discocyclina sowerbyi, Discocyclina dispansa,
Discocyclina omphalus, Nummulites spp., Alveolina
elliptica etc.

C. Local correlation of faunal zones:

Faunal succession established in five nalab sections
have been correlated so as to get a generalised biostratigraphic succession of the area and to prepare a regional
biostratigraphic map (Map C). The principle which was adopted
for this purpose, is matching of similar fossils in different
nalab sections. Zone A (assemblage zone of Nummulites fichteli
and Nummulites clipeus) has been recorded from all the sections
and so also the assemblage zone (Zone B) of Nummulites and
Lepidocyclina (Eulepidina) dilatata. Zone C (zone of
Miogypsinoides complanata, Lepidocyclina (Nephrolepidinae)
parva and Spiroclypeus ranjanae) is recognised in all the
nalab sections except the easternmost one (Khari river section).
Fossils of Zone D also are recorded from different nalah sections but are poorly represented in the Khari river. In the Khari river section, the rocks (including upper part of 'Ochreous marl' and the overlying 'Gypseous shale' formations) are practically unfossiliferous. The lateral variation of fauna in 'Ochreous marl' and the unfossiliferous nature of 'Gypseous shale' is possibly due to local environmental condition. Zones E, F, G and H are uniformly developed in all the nalah sections. However, the type section of this area is the Waior - Cheropodi nalah from where a most complete and fully fossiliferous succession has been obtained (Table 2).

D. Description of faunal zones:

Zone A: Reticulate Nummulites is the only dominant form of Zone A; it is represented by two species viz. Nummulites fichteli - intermedius and Nummulites clipeus - subclipeus. This zone is distinguished by the absence of most of the foraminifera fossils of the underlying zone including the different species of Discocyclina, Alveolina, Assilina, Asterocyclina etc. Nummulites is also represented in the underlying zone but by the different species. They show radial, sigmoidal, meandering but never reticulate septal filaments. The abrupt change of faunal character in Zone A and the absence of an association of reticulate
Nummulites, Discocyclina and Pellatispira below this zone, probably suggest a faunal break in the sequence and this is also marked by a slight change in lithology. Soft 'Yellowish white limestone' is the characteristic lithology of Zone A (which also includes a coral bioherm), while the underlying zone contains compact 'White limestone'. However, the upper part of this zone includes basal part of the overlying 'Dolomitic limestone' and hence this lithological boundary does not coincide with the boundary between Zone A and Zone B. The other associated fossils in Zone A are Gypsina sp. and Operculina sp. Within the coral bioherm six different types of corals including Astrocoenia sp., Styliina sp., Porites sp., Stylophora sp. etc. are found. Fossils of echinoids and mollusca are also found.

Zone B : The boundary between Zone A and Zone B is defined on the basis of first appearance of Lepidocyclina (Eulepidina) dilatata in Zone B which is also associated with the pre-existing Nummulites fichteli and Nummulites clipeus. The zone constitutes the lower part of 'Dolomitic limestone'. Both megalospheric and microspheric forms of Lepidocyclina (Eulepidina) dilatata occur here and the species is also restricted in this zone. On the other hand, Nummulites fichteli - intermodius group are less common than Nummulites clipeus - subclipeus group. The other associated fossils are Gypsina sp., lamellibranch and gastropod shells and echinoids like Breynia multituberculata, Cidaris sp. etc.
Zone C: The assemblage of larger foraminifera in Zone C is different. It is characterized by the first occurrence of *Miogypsinoides* represented by *Miogypsinoides complanata*, and *Spiroclypeus*, represented by *Spiroclypeus ranjanae*. They are associated with *Lepidocyclina (Nephrolepidina)* parva. Lithologically, it occupies the upper part of 'Dolomitic limestone'. Both megalospheric and microspheric forms of *Spiroclypeus ranjanae* are found. A few samples (e.g. S-324, S-260 and S-188) collected from this zone, are characterised by abundant *Spiroclypeus ranjanae* constituting about 80% of the framework. However, these samples have no definite stratigraphic position. *Lepidocyclina (Nephrolepidina)* parva is mainly represented by very small megalospheric forms. *Miogypsinoides complanata* is less common, but recognised from their considerable development of ancestral rotaloid stage and subapical position of embryonic apparatus. The other important associated forms are echinoids, represented by *Breynia multituberculata*, *Cidaris* sp. etc.

Zone D: This zone is assumed to begin with the first appearance of *Miogypsina*, represented by *Miogypsina (Miogypsina) gunteri*, *Australitellina*, represented by *Australitellina striata*, and *Archaia* sp. *Miogypsinoides bantamensis* also appeared here with the elimination of the earlier species, *Miogypsinoides complanata*. Both *Spiroclypeus ranjanae* and *Lepidocyclina (Nephrolepidina)* parva made their last appearance in this zone and the former is represented by a different variety.
Lithologically, this zone includes 'Ochreous marl'. Other associated fossils are shells of gastropods, lamellibranchs and echinoids, worm-tubes, algae etc.

Zone E: Zone E is marked by first appearance of two different species of Miogypsinidae, represented by Miogypsinoides dehaasti and Miogypsin (Miogypsin) tani (both are restricted here). Austrotrillina howchini and Archaeas angulatus also made their first appearance here. Lepidocyclina (Nephrolepidina) morgani is also restricted in Zone E. Lithologically, 'Shaly marl' formation constitutes this zone. Among the other associated fossils, foraminifera like Operculinoides sp. and Gypsin sp., gastropods like Turritella sp., and Conus sp. lamellibranchs like Pecten sp. and Ostrea sp. are common.

Zone F: The boundary of this zone is demarcated by the first appearance of new forms of Miogypsin and Lepidocyclina viz. Miogypsin (Miogypsin)globulina and Lepidocyclina (Nephrolepidina) tournoueri. Both Archaeas angulatus and Austrotrillina howchini also persisted here. The other associated megafossils include a large number of shells of mollusca such as Turritella angulata (very abundant), Cerithium sp., Voluta sp., Venus sp., Lucina sp., Pecten sp., Ostrea sp., etc. Echinoids are represented by Clypeaster sp. and Breynia carinata. Lithologically this zone is composed of 'Turritella marl'.
Zone G: This zone is characterised by abundant *Miogypsina* represented by two species, one of which is the pre-existing *Miogypsina (Miogypsina) globulina* and the other is *Miogypsina (Miogypsina) bhogatensis*. Besides these, the same species of *Lepidocyclina*, *Austrotrillina* and *Archaia* of the underlying zone are found to persist. The other megafossils are rather rare in this zone. Lithologically this zone corresponds to 'Hard ferruginous marl' formation.

Zone H: Zone H is defined by the first appearance of *Taberina malabarica*, represented by both megalospheric and microspheric forms. Another new form of this zone is *Sorites marginals*. All the pre-existing forms of *Miogypsina*, *Lepidocyclina*, *Austrotrillina* and *Archaia* are found to continue, but *Lepidocyclina (Nephrolepidina) tournoueri* are less common in Zone H. Among the associated megafossils, *Ostrea* sp., *Arca* sp., *Pecten* sp., *Clypeaster* sp. and *Breynie carinata* are fairly common. Lithologically this zone is composed of 'Yellowish brown marl' formation.

E. Some observations:

Presence of some important larger foraminifera in this sequence permits the writer to draw up a biostratigraphic classification of the Mid-Tertiary sequence of this area and to recognise 8 faunal zones within it. The local range of the important larger foraminifera in Waior - Cheropodi area is shown in Table 3.
In most of the cases lithostratigraphic and biostratigraphic boundaries coincide and are probably isochronous. In one instance, for example, in the lower part of the sequence the boundary between Zone A and Zone B cuts across the lithologic boundary between 'Yellowish white limestone' below and 'Dolomitic limestone' above in the Waior - Cheropodi section (Map C). 'Ochreous marl' shows a lateral variation of frequency of foraminifera fossils (its upper part in the Khar1 river section being nearly devoid of larger foraminifera). 'Gypseous shale' developed in the eastern part of the area is also unfossiliferous. Thus, part of 'Ochreous marl' and 'Gypseous shale' together constitute an 'unfossiliferous zone' in the sequence, especially developed in the Khari river section.

There is one distinct faunal break at the base of the sequence, between Zone A and underlying zone of abundant Nummulites and Discozyclina evident from abrupt change of faunal character (already mentioned). This faunal break is accompanied by a little change of lithology. Apparently, a faunal break is present between Zone B and Zone C, marked by abrupt extinction of Lepidocyclina (Eulepidina) dilatata at the base of Zone C. But lithological conformity between Zone B and Zone C suggests that this break is a local feature and there is possibility of occurrence of Eulepidina with earliest Miogypsinoides outside this area. Abrupt change of lithological characters from Zone C to Zone D has little or no effect on fauna. The boundary between Zone D and Zone E is, however,
marked by a minor gap in faunal sequence, as most of the species of larger foraminifera of Zone D became extinct in Zone E. This faunal break is also accompanied by a lithological discordance.