Palynostratigraphiy of Middle Triassic Strata of Salt Range, Pakistan.

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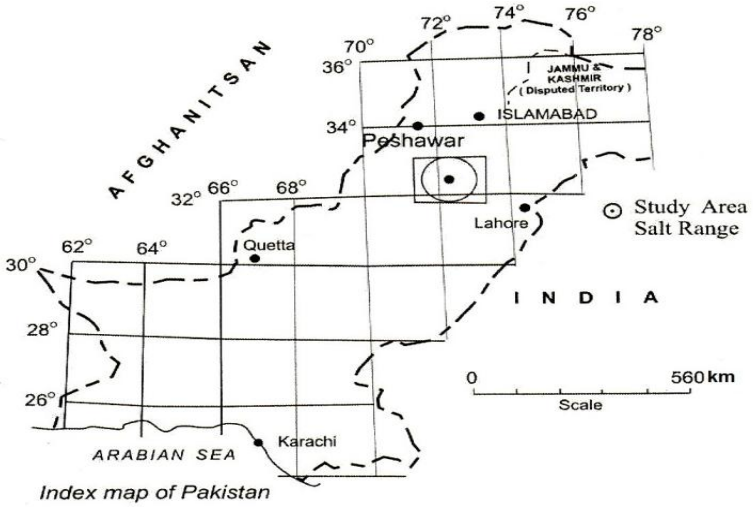
INTRODUCTION

- **PURPOSE AND SCOPE**

  Palynological analysis of the rock samples of the Tredian Formation (Middle Triassic-Anisian/Ladinian) Western Salt Range, Pakistan was carried out. This included isolation, identification and systematic description of palynomorphs. Palynological data was resolved in terms of Palaeoclimate and reconstruction of Paleovegetation.

STUDY AREA

- Tredian Formation exposed at Nammal Gorge (lat. 32° 43′ N; long. 71° 46′ E), Mianwali district, Punjab Province, Pakistan.



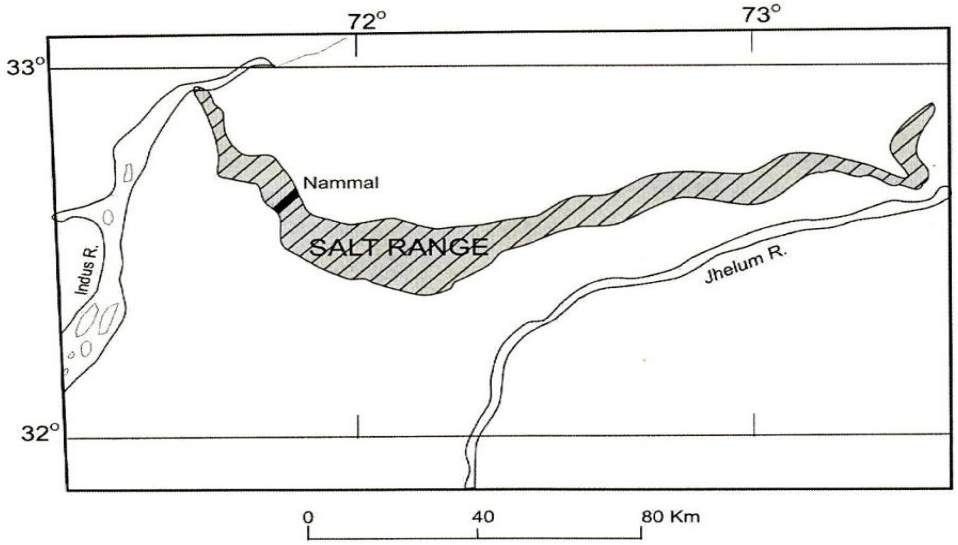


Fig 1: Location Map of Investigated Area in the Salt Range

TREDIAN FORMATION

The Formation is divisible into two members:

2. Khatkiara Member

White sandstone

Massive, thick bedded

1. Landa Member

Sandstone and Shale

Thin to thick bedded, with ripple marks and slump structures


Tredian Formation
Landa member
Mid Triassic
OB
Mianwali Formation
Narmia member


LANDA MEMBER
MIANWALI FORMAT
NARMIA MEMBER
(EARLY TRIASSIC


A


KINGRIALI FORMATION
(UPPER TRIASSIC)
KHATKIARA MEMBER

RESEARCH METHODOLOGY

- **PREPARATORY TECHNIQUES**

  Standard techniques (Phipps and Playford 2000; Doher 2008) were employed for maceration.

EXTENT OF PRESERVATION

- Most samples contained well-preserved identifiable palynomorphs. Pollen and spores varied in colour from dark yellow to reddish brown or dark brown.

COMPOSITION OF PALYNOFLORA

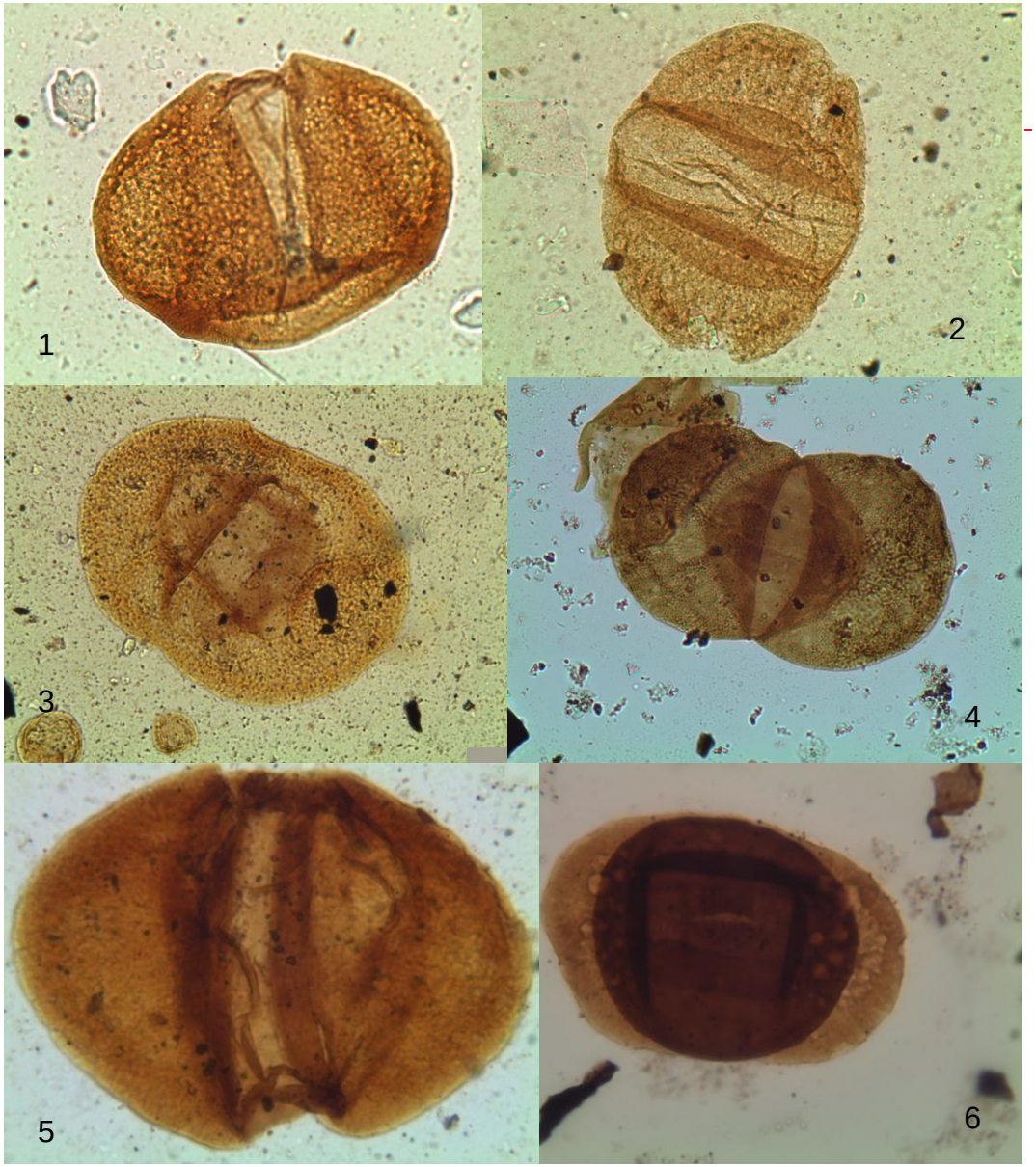
- The miospore assemblage consists of 131 species belong to 68 genera.
- Of the 68 palynomorph genera recorded during the present investigation 27 belong to Triletes, 23 to Bisaccates, 04 to Monoletes, 08 to Monosaccates, 01 to Trisaccate, 01 to Monocolpate, 01 to Acolpate and 03 to Dinoflagellates. Rich assemblage of megaspores also occurred in some samples. Megaspores comprised 03 genera and 03 species.

DETAILS OF MIDDLE TRIASSIC PALYNO-ASSEMBLAGES IN THE TREDIAN FORMATION, WESTERN SALT RANGE, PAKISTAN.

Palynoassemblage	Quantitatively Important Taxa	Qualitatively Important Taxa	Distribution (m)	Total Thickness (m)	PALYNOZONE (Assemblage Zone)
Calamospora -Verrucosisporites **Assemblage Zone**	(i). *Vitriesporites pallidus* (ii). *Alisporites plicatus*	**(i).** *Calamospora mutabilis* **(ii).** *Verrucosisporites microtuberosus* **(iii).** *Osmundacidites senectus*	33-54	21	4
Granulatisporites – Raistrickia **Assemblage Zone**	**(i).** *Camptotriletes bacculensis* **(ii).** *Lundbladispora obsoleta*	**(i).** *Granulatisporites pannosites* **(ii).** *Raistrickia aculeolata* **(iii).** *Cyclogranisporites aureus*	18-32	14	3
Lophotriletes – Goubinispora **Assemblage Zone**	**(i).** *Protohaploxypinus kaykai* **(ii).** *Marsupipollenites triradiatus*	**(i).** *Lophotriletes parryensis* **(ii).** *Goubinispora morondavensis* **(iii).** *Goubinispora indica* **(iv).** *Corisaccites stradivarii*	09-17	08	2
Apiculatisporis – Convolutispora **Assemblage Zone**	**(i).** *Plicatipollenites gondwanensis* **(ii).** *Sulcatisporites institatus* **(iii).** *Striatoabeietes borealis*	**(i).** *Apiculatisporis setulosus* **(ii).** *Convolutispora fromensis* **(iii).** *Kraeuselisporites rallus* **(iv).** *Nevesisporites fossulatus*	00-08	08	1

MID TRIASSIC PLANT COMMUNITIES

1. FERNS (ACAVATE TRILETES AND MONOLETES)
2. LYCOPODS (CAVATE SPORES AND TETRADS)
3. CONIFERS (ALETE BISACCATE)
4. GLOSSOPTEROIDS (STRIATED AND TAENIATE BISACCATES)
5. CYCADS (MONOSULCATES)
6. EQUISETALES (CALAMOSPORA TYPE)



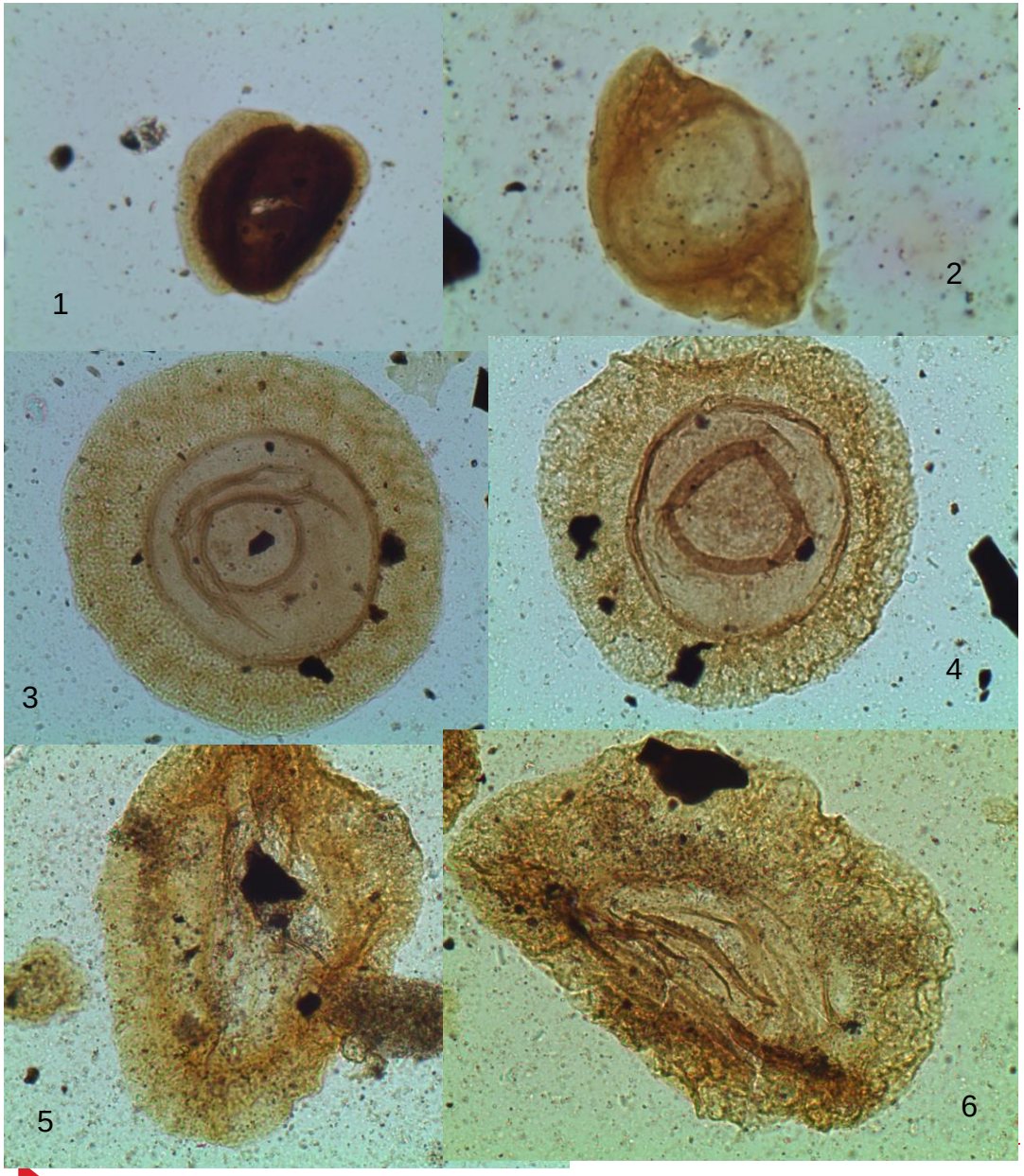
1& 2. ***Vitriesporites pallidus*** Ressinger.

3& 4. ***Alisporites plicatus*** Jizba, 1962.

5. ***Sulcatisporites institatus*** Balme, 1970.

6. ***Protohaploxypinus kaykai*** Utting, 1994.

40um



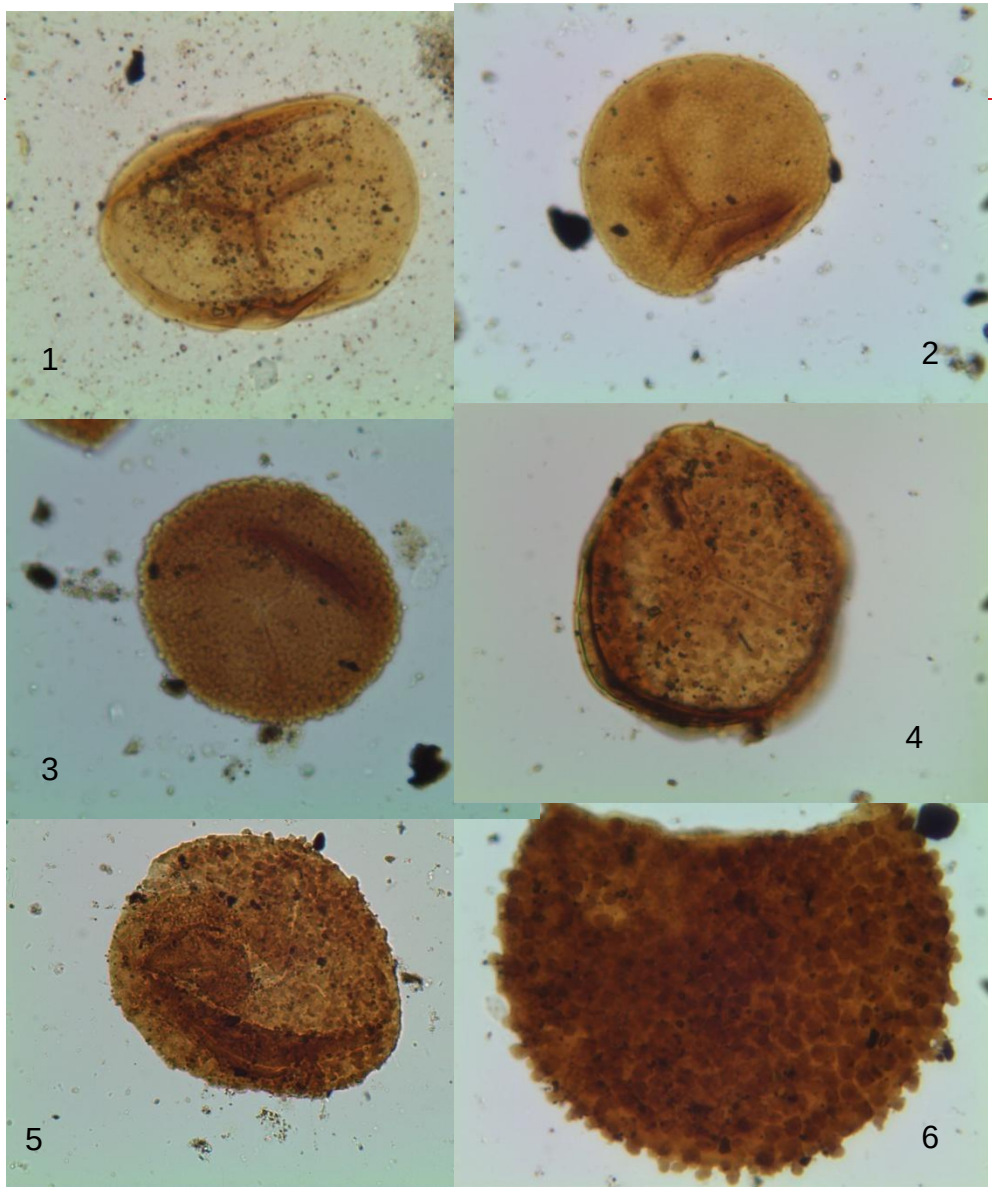
1. ***Corisaccites stradivarii*** Utting, 1994.
2. ***Striatoabieites borealis*** Utting, 1994.

3 & 4. ***Plicatipollenites gondwanensis*** (Balme & Hennelly) Lele, 1964.

5. ***Goubinispora indica*** Tiwari & Rana, 1981.

6. ***Goubinispora morandavensis*** (Goubin) Tiwari & Rana, 1981.

40um



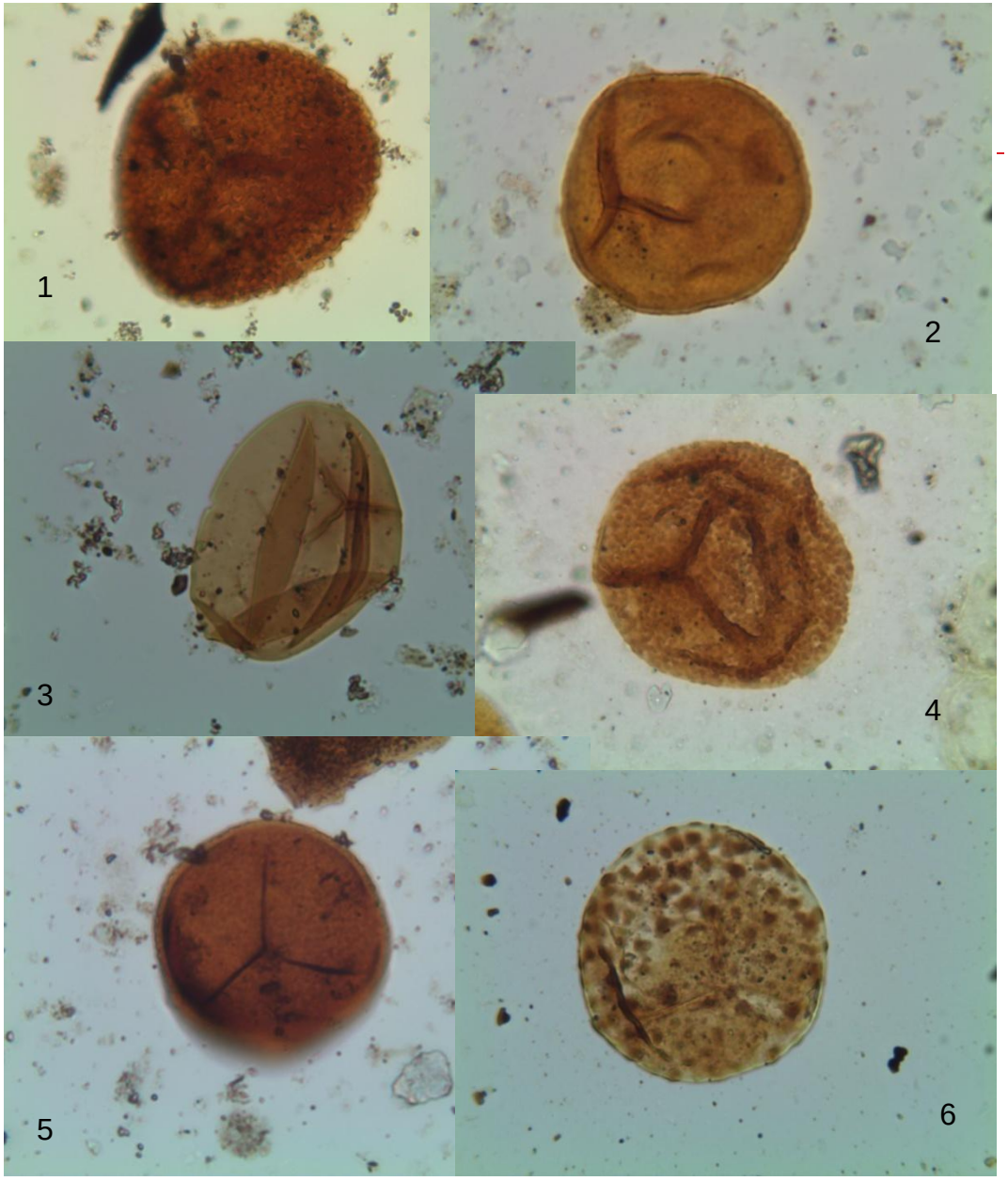
1. ***Osmundacidites senectus*** Balme, 1970.

2& 3. ***Verrucosisporites microtuberosus*** (Loose) Smith & Butterworth, 1967.

4& 5. ***Camptotriletes bacculentus*** (Loose) Potonie & Kremp, 1955. Fig. 7

6. ***Convolutispora fromensis*** Balme & Hassell, 1962.

40um



1 ***Convolutispora fromensis*** Balme & Hassell, 1962.

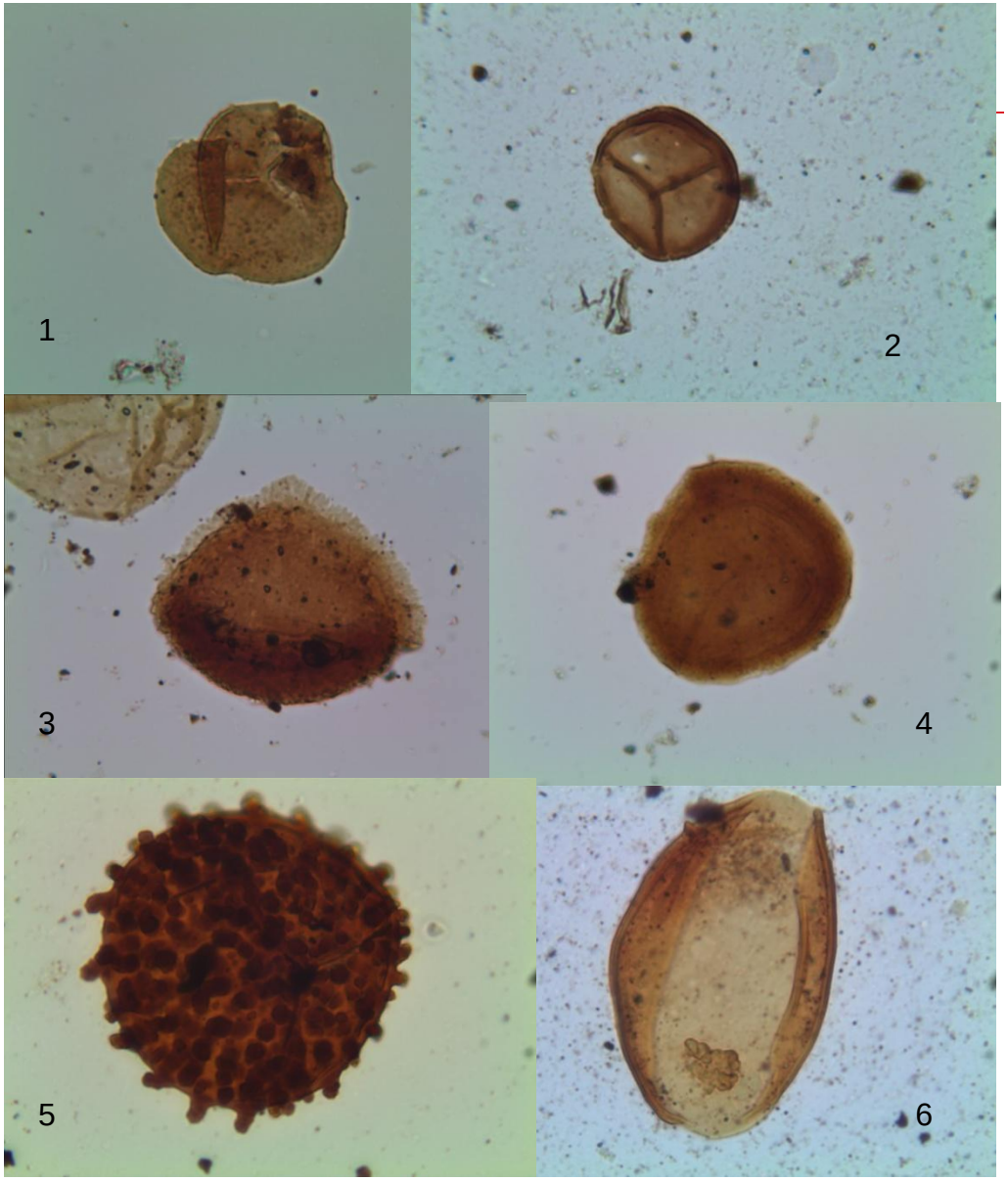
2. ***Granulatisporites pannosites*** Peppers, 1970.

3. ***Calamospora mutabilis*** (Loose) Schopf, Wilson & Bentall. 1944.

4& 5. ***Cyclogranisporites aureus*** (Loose) Potonie & Kremp, 1955.

6. ***Apiculatisporis setulosus*** (Kosanke) Potonie & Kremp, 1955.

40um

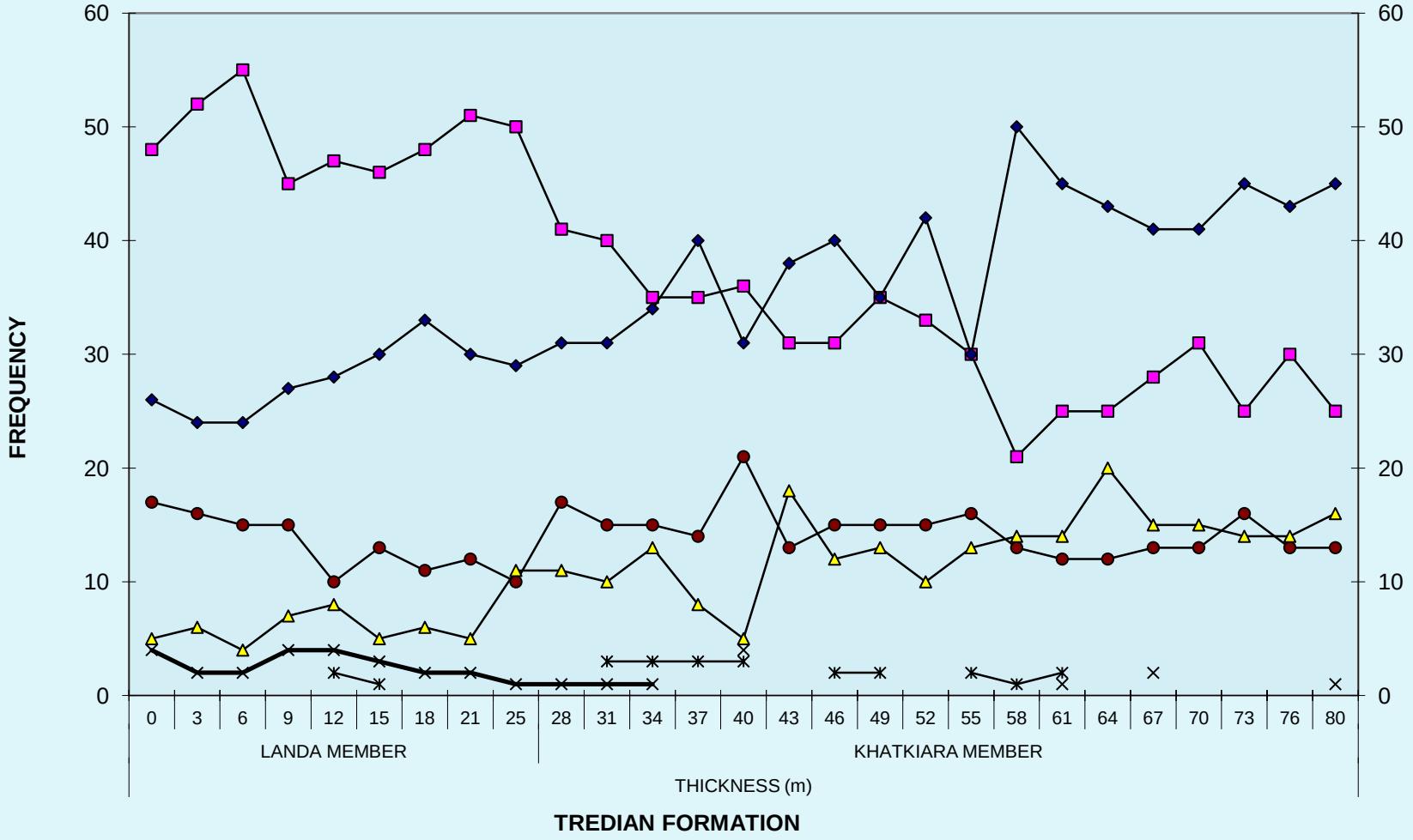


1. ***Lophotriletes parryensis*** Utting, 1994.
2. ***Nevesisporites fossulatus*** Balme, 1970.
3. ***Kraeuselisporites rallus*** Balme, 1970.
4. ***Lundbladispora obsoleta*** Balme, 1970.
5. ***Raistrickia aculeolata*** Wilson & Kosanke, 1944.
6. ***Marsupipollenites triradiatus*** Balme & Hennelly

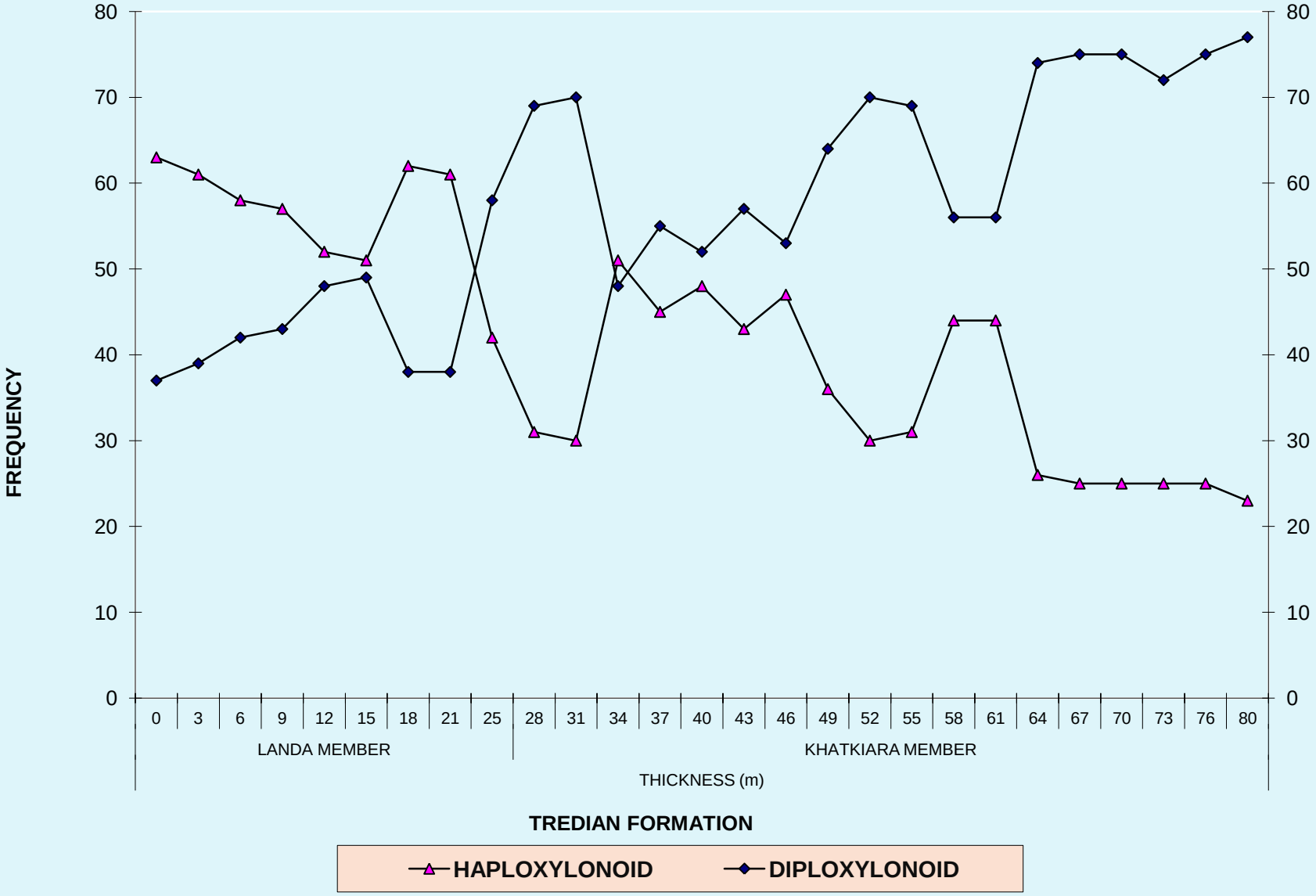
40um

RESULTS

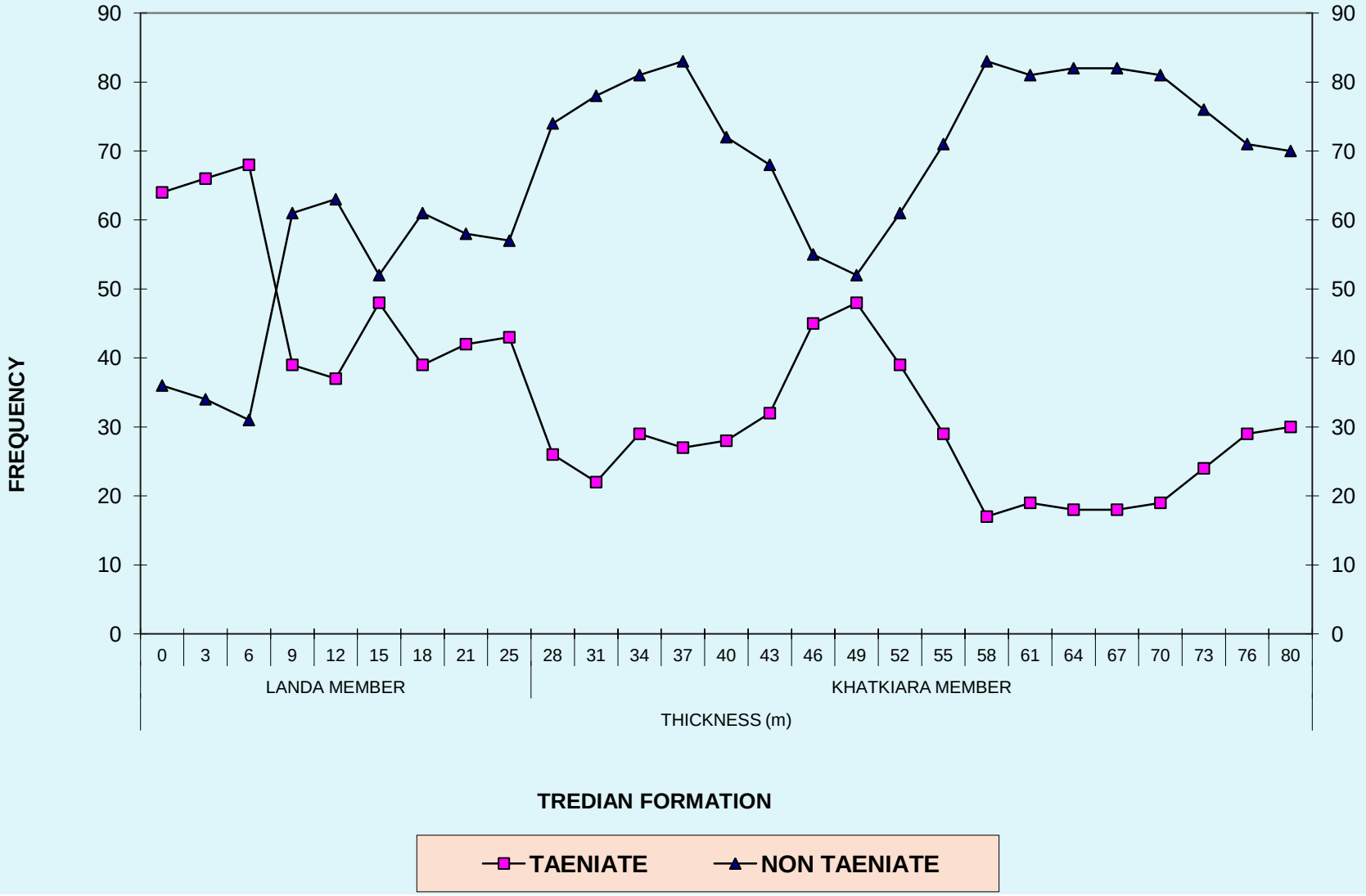
TRILETE DIVERSITY ACROSS TREDIAN FORMATION, WESTERN SALT RANGE, PAKISTAN.



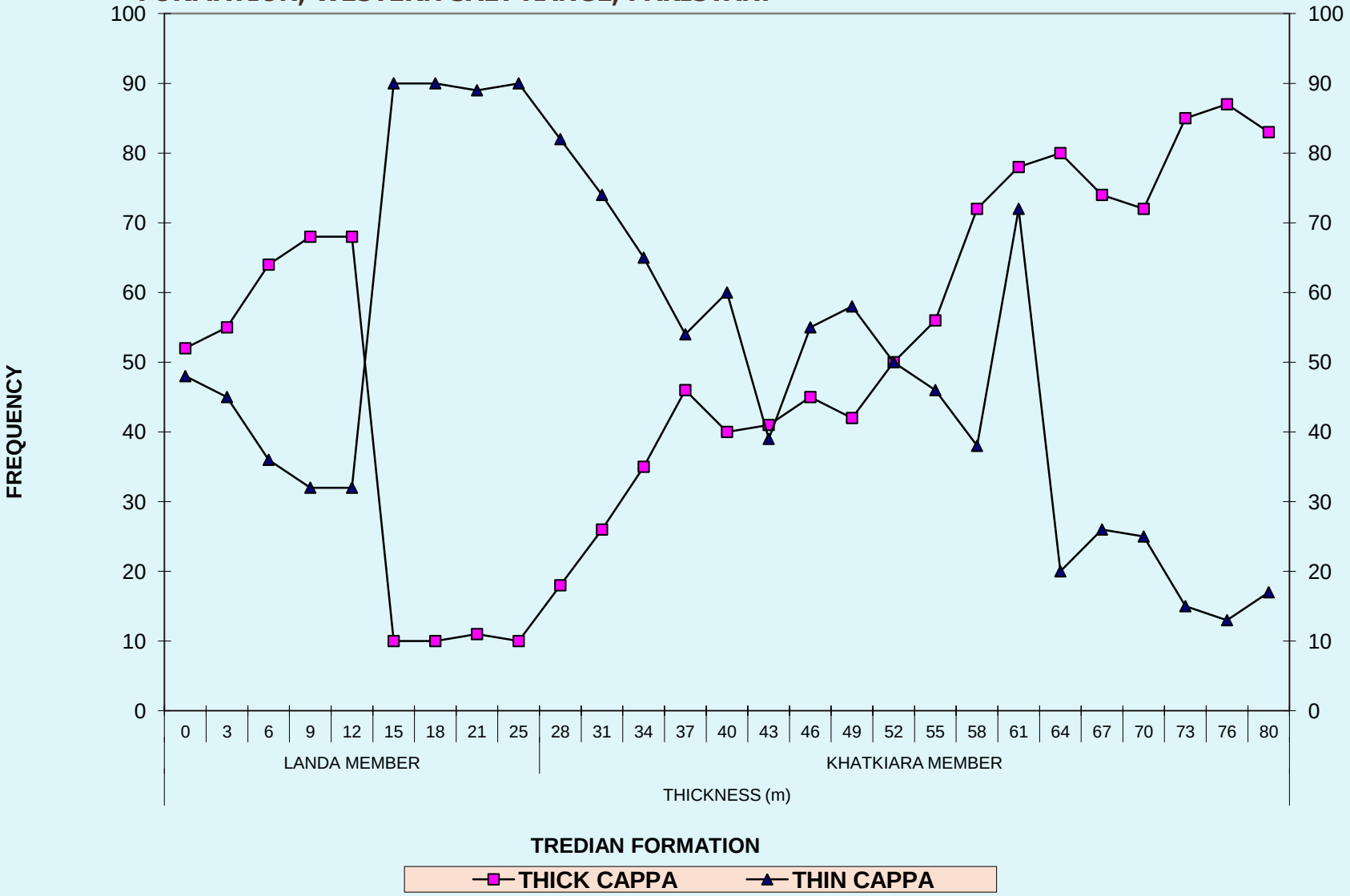
BISACCATE DIVERSITY IN TERMS OF HAPLOXYLONOID AND DIPLOXYLONOID ACROSS TREDIAN FORMATION, WESTERN SALT RANGE, PAKISTAN.



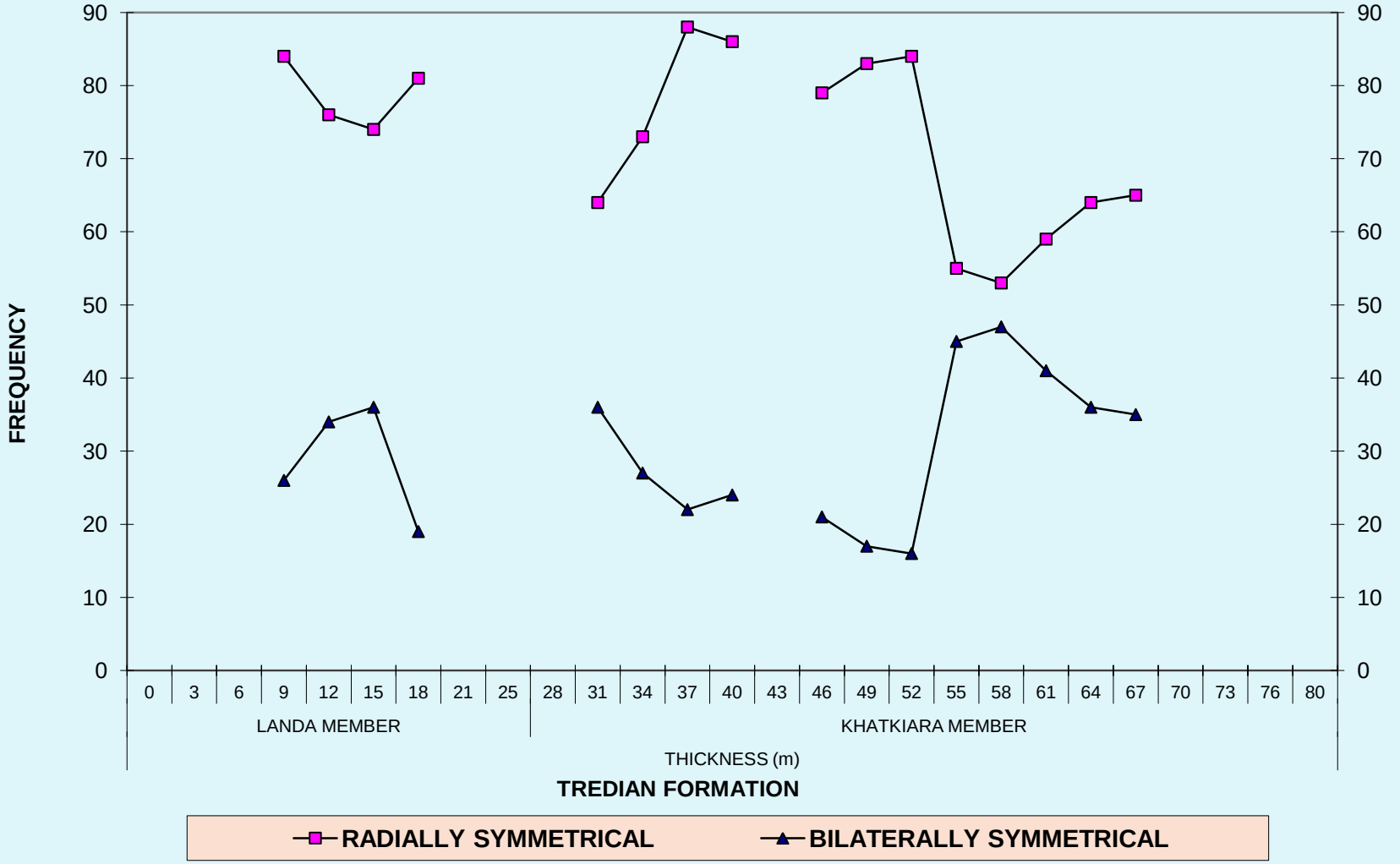
BISACCATE DIVERSITY IN TERMS OF TAENIATE AND NONTAENIATE CORPUS ACROSS TREDIAN FORMATION, WESTERN SALT RANGE, PAKISTAN.



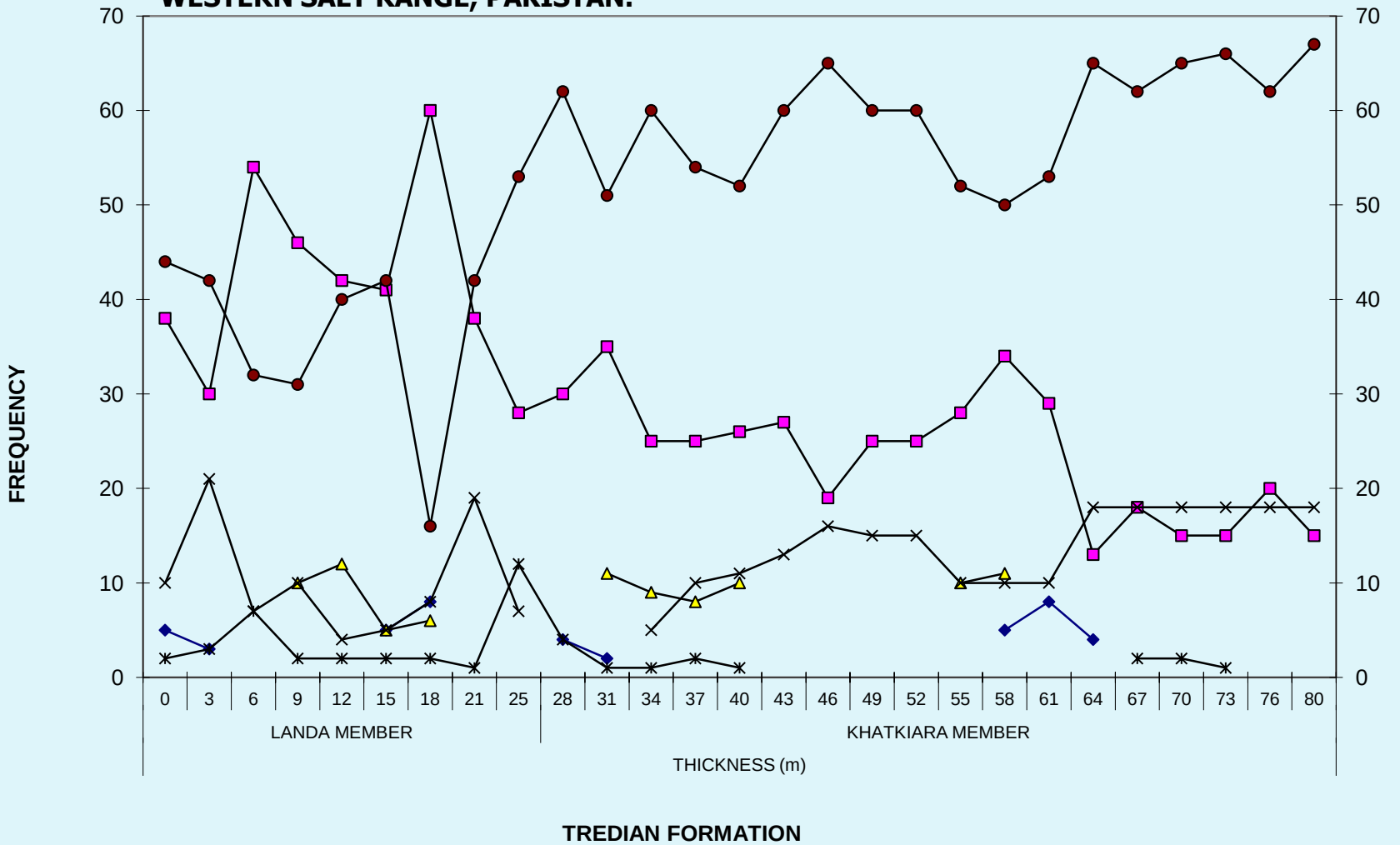
BISACCATE DIVERSITY IN TERMS OF THICK AND THIN CAPPA ACROSS TREDIAN FORMATION, WESTERN SALT RANGE, PAKISTAN.



MONOSACCATE DIVERSITY IN TERMS OF RADIALLY SYMMETRICAL AND BILATERALLY SYMMETRICAL ACROSS TREDIAN FORMATION, WESTERN SALT RANGE, PAKISTAN.



DISTRIBUTION OF MAJOR PLANT GROUPS ACROSS TREDIAN FORMATION, WESTERN SALT RANGE, PAKISTAN.



PALAEOCLIMATE

- The climate during the early depositional phase of the Tredian Formation was mild humid hot, which gradually progressed towards arid hot tropical to sub-tropical during the terminal phase.

CONCLUSIONS

1. Palynoflora obtained from the Tredian Formation as a result of present investigation exists in a good state of preservation. It is far more diverse quantitatively - qualitatively as compared to any other Middle Triassic Palynoflora reported else ware in the world.
2. Palynomorph complexion is dominated by trilete bearing azonate smooth cum sculptured spores and bisaccate pollen. Fragmented population(s) of radially symmetrical monosaccate pollen also exists at certain horizons.

CONCLUSIONS

3. Careful analysis of the botanical affinities of the Sporae dispersae with the plant mega fossils suggested that 6 major plant groups existed on the nearby land, during the entire depositional phase of the Tredian Formation. These plant groups are as follows: (i) Ferns, (ii) Lycopods, (iii) Conifers, (iv) Glossopteroids, (v) Cycads and (vi) Equisetales.
4. Lycopods and Sphenopsids (Equisetales) were rare. Lycopods despite low occurrence were uniformly distributed in contrast to Sphenopsids whose distribution was fragmentary.

CONCLUSIONS

5. Based on detailed examination of morphographic characters of different groups of palynomorphs and their vertical distribution, regular climatic changes are suggested during the depositional phase of the Tredian Formation. It is suggested that the climate during the early depositional phase was mild temperate with high or low humidity ultimately shifting to arid subtropical to tropical in the end.

THANK YOU