TRIASSIC MIOFLORAS SOUTH OF THE TETHYS*

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ABSTRACT

Triassic miofloras known from the territories of Algeria, Tunisia, Libya, the Saudi Arabian peninsula, Pakistan, India and western Australia have been reviewed. These Triassic miofloras seem to represent four floral provinces, viz., 1) North Africa, 2) Arabian peninsula, 3) Pakistan-western Australia, and 4) peninsular India. Certain miospore groups and genera show an interesting distribution in the Triassic. For example, striate bisaccate pollen which usually go up to the Middle Triassic are conspicuously absent in the Saharan region. *Lunatisporites* s. stricto which is found throughout the Triassic in most of the areas is also absent in the Sahara. *Ovalipollis*, which is found in North Africa — Arabian region, is not known from the eastern regions. In North Africa, the bisaccate pollen started dwindling in the Keuper and were almost extinct by the Rhaetic. *Classopollis* is present in the Middle Triassic of Sahara and Israel. Elsewhere the genus does not appear before the Rhaetic.

THERE is compelling evidence from various scientific disciplines in support of the concept of continental drift. The concept involves the existence of two super-continents — Laurasia and Gondwanaland — in the Palaeozoic. These two were separated from each other by a narrow sea, the Tethys, on the southern shore of which lay the Gondwanaland. Gondwanaland probably did exist in the Cambrian and late Precambrian also. It has been suggested that there were at least two drift phases. The first drift phase, in the Lower Palaeozoic, involved " (i) the creation of Laurasia by the fusion of Angaraland with Europe and North America and (ii) the fusion of Laurasia and Gondwanaland to create Pangea " (Creer, 1970). The second drift resulted in the separation of the present continents.

Until the end of the Triassic, Laurasia and Gondwanaland were joined together. The rifting between North-West Africa and the eastern U.S.A. occurred at the end of the Triassic. Within the Gondwanaland the earliest drift movement appears to have involved Australia during the Permo-Triassic. The development of South Atlantic Ocean appears to have started in the Jurassic. The final fracture between Africa, Antarctica and India had occurred by the Jurassic (Creer, 1970). The palaeomagnetic data do not support a fit between western Australia and eastern India. The east coast of India, on the other hand, fits rather well with the Dronning Maud Land coast of Antarctica.

Thus, during the Triassic some of the areas just south of the Tethys would have been located in the territories of Algeria, Tunisia, Libya, Egypt, the Arabian peninsula, Pakistan, India and western Australia. The southern shore of the Tethys did not touch South America during the Triassic.

In the present paper, Triassic miofloras from the above-mentioned countries, South of the Tethys, have been reviewed. Triassic miofloras from territories which were more than 1500 km south of the Tethys have not been taken into account.

ALGERIA

Triassic miofloras in Algeria have been studied from 18 deep wells located in five geological provinces (Reyre, 1970). Following palynomorphs were obtained: *Gleicheniidites* spp., *Peromonolites* sp., *Tsugaepollenites* sp., *Enzonalapollenites vigens*, *E. tenuis*, *Scopulisporites toralis*, *Pteruchus dubius*, *Ovalipollis lunzensis*, *O. breviformis*, *Platysaccus* sp., *Parcisporites* sp., *Klausipollenites staplinii*, *Sulcatisporites interpositus*, *Alisporites australis*, *Cycadopites dikjstrae*, *Camerosporites secatus* and *Classopollis* spp. Reyre (1970) recognizes following palynological zones on the basis of 5 per cent or more quantitative occurrence of palynomorphs:

1) Zone of non-striate bisaccates + *Classopollis* (rare), minus *Ovalipollis* (lower Middle Triassic).

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2) Zone of non-striate bisaccates + *Classopollis* + *Ovalipollis* + *Camerosporites* (upper Middle Triassic — Upper Triassic).
3) Zone of *Classopollis* + *Ovalipollis* + *Enzonalapollenites* + *Callialasporites* (Rhaetic-Hettangian).

TUNISIA

In southern Tunisia, the Triassic sediments can be divided into three 'formations'. These formations are, from bottom to top — Kirchaou Formation (arenaceous), Azizia Formation (carbonatic), and Adjadj Formation (Evaporitic). The Triassic sediments unconformably overlie the Palaeozoic sediments.

Grignani (1967) figured the following species from the Kirchaou Formation: *Pityosporites* sp., *Podocarpidites* sp., *Kosankeisporites elegans* and *Scopulisporites toralis*. He found *Kosankeisporites elegans* to be the most commonly occurring species, being almost fifty per cent of the total, and assigned a Lower Triassic age to the Kirchaou Formation.

Reyre (1970) described a comparatively rich mioflora from Trias gréseux and Salifère principal in southernmost Tunisia. He, too, found a non-striate bisaccate rich mioflora in the Kirchaou Formation (argilo-gréseux inférieur) but assigns it a Middle Triassic age. The mioflora of the Azizia and Adjadj formations (argilo-carbonate and Évaporites Infra d2 or argilo-gréseux supérieur) is characterized by the presence of non-striate bisaccates, *Classopollis quezeli*, *Ovalipollis lunzensis*, *Camerosporites secatus* and *Enzonalapollenites* sp. The above two formations are supposed to be of Upper Triassic age.

In the Rhaetic and Hettangian (upper part of Salifère principal), the mioflora is characterized by *Classopollis* (mostly *C. kieseri*), *Ovalipollis* (mostly *O. breviformis*), and rare occurrences of *Enzonalapollenites* and *Callialasporites*.

LIBYA

Triassic sediments are known to occur in the Ghadames Basin of Libya lying unconformably over the Palaeozoic strata (Wray, 1964). Permian-Triassic miofloras are known from two deep wells, viz., AI-61 and KI-23. Kar, Kieser and Jain (1972) recognize three palynological zones, viz., zones 3, 4 and 5, in the Triassic of the two deep wells, which they presume as representing Lower, Middle and Upper Triassic horizons respectively.

Important miospore genera of miofloral zone 3 represented only in AI-61 are: *Punctatisporites*, *Calamospora*, *Apiculatisporis* and *Cyclogranisporites*. The zonate trilete genus *Densoisporites*, though present in all the 4 productive samples, is impressive only at 1783·5 m, where the bisaccate pollen are also comparatively more abundant. Monoletes, aletes and polyplicates are absent; monocolpates and operculates are rare.

Mioflora of zone 4 is known only at 1764 m depth in deep well AI-61. The zonate monolete genus *Saturnisporites* is about 44 per cent; other quantitatively significant genera are: *Punctatisporites* (19%), *Verrucopunctasporites* (11%) and *Lundbladispora* (5%). Bisaccates are about 16 per cent.

Zone 5 mioflora is known from both the deep wells. Non-striate bisaccate pollen such as *Alisporites* (26%), *Klausipollenites* (21%) and *Vitreisporites* (22%) dominate the mioflora. *Punctatisporites* is the only significantly occurring trilete type.

Because of their unique composition, the above three miofloral zones have been referred to Lower, Middle and Upper Triassic on the basis of the distribution of major palynomorph groups. For example, miofloral zone 3 is dated as Lower Triassic because it has a high frequency of pteridophytic spores, a condition similar to that found in the Triassic mioflora of deep well RE-9 of Raniganj Coalfield, India and also because it depicts an abrupt miofloral change from zone 2 mioflora which is regarded as Upper Permian. However, there is no similarity in the generic composition of the Libyan and Indian miofloras. The miofloras from the faunistically dated Lower Triassic strata of Pakistan and western Australia also do not compare as these have relatively larger frequencies of the genera *Lundbladispora* and *Lunatisporites* s.s. In Europe the basal Lower Triassic assemblages show the dominance of Upper Permian elements like *Lueckisporites*, *Gigantosporites*, etc. In the upper part of the Lower Triassic the mioflora shows a change, with a dominance of new bisaccate pollen like, *Triadispora*, *Voltziaceaesporites heteromorpha*, *Alisporites grauvogeli* and *Angustisulcites klausii*. As such it needs further confirmation if the zone 3 mioflora represents Lower Triassic strata in Libya

Mioflora of zone 4 is individualistic as it is dominated by the zonate monolete genus *Saturnisporites* (44%). The genus along with *Verrucopunctasporites* and *Lundbladispora* is confined only to this zone. The zone 4 mioflora is dated as Middle Triassic due to the dominance of zonate monoletes, a similar condition having been found in the Tiers Formation (Middle Triassic) of Tasmania. *Saturnisporites* occurs commonly in the Erskine Sandstone in western Australia and is known from the Narrabeen Group of southern Australia. In the Salt Range, Pakistan the zonate monolete spores are more frequent in the Lower Triassic Narmia Member than in the Middle Triassic Tredian Formation. On the other hand the Tredian Formation is rather predominated by *Falcisporites stabilis*, a species which is not known from Libya. As the zone 4 mioflora is known only from one sample, its age should be further verified.

The mioflora of zone 5 has as much as 72 per cent non-striate bisaccates. In this respect it closely compares with the mioflora of Middle Triassic Argilo-gréseux inférieur of Algeria and southernmost Tunisia.

SAUDI ARABIA

In the Arabian stratigraphic section, three formations, viz., the Sudair, Jilh and Minjur have been recognized as Triassic. Most of the sediments are marine, but a non-marine facies of Middle Triassic occurs in northcentral Arabia.

Very little is known of Triassic palynology in Saudi Arabia. Hemer (1965) has figured a few forms from the Triassic subsurface samples. Details of different assemblages are not known, but it is reported that the Arabian Triassic can be zoned by miofloral assemblages.

According to Hemer (1965), the key Lower Triassic miospores of Saudi Arabia re *Striatites* sp. cf. *Taeniaesporites antiquus* and *Taeniaesporites noviaulensis*. The Middle Triassic is characterized by *T. interruptus* and *T. obex* in the lower part and *Alisporites progrediens*, *Striatites samoilovitchii* and *Microcachryidites fastidioidites* in the upper part. The upper Triassic has two distinct assemblages, one having *Microcachryidites doubingeri* and *Tsugaepollenites oriens* and the other having *Ovalipollis* sp. and certain elongated monosaccoid forms.

ISRAEL

The Triassic outcrops in southern Israel comprise three formations, viz., the Gevanim, Saharonim and Mohilla, which are of Anisian, Ladinian-Early Carnian, and Late Carnian-Early Norian age respectively. Another formation, the Ra'af of Anisian age, is known only from the boreholes. No Early Triassic sediments are known, though the lowest 20-25 metres of the Triassic sequence in Zohar 8 borehole is suspected to represent the upper part of the Early Triassic.

Palynological studies on the subsurface Triassic strata of Israel have been conducted by Horowitz (1973). The Triassic sequence of Zohar 8 borehole, the type section, is assigned to *Lunatisporites* (*Taeniaesporites*) *kraeuselii* zone, which is divided into three subzones, viz., 1) the lowermost, unnamed subzone, probably of Lower Triassic age; 2) the middle, *Alisporites grauvogelii* subzone, of Middle Triassic age; and 3) the upper, *Verrucosisporites applanatus* subzone, of Upper Triassic age. A similar miofloral distribution has also been found in the Avdat 1 borehole.

The characteristic elements of the Triassic mioflora of Israel are: *Lunatisporites* (*Taeniaesporites*) *kraeuselii*, *Alisporites grauvogelii*, *Klausipollenites staplinii*, *Voltziaceaesporites heteromorpha*, *Verrucosisporites applanatus* and *Vitreisporites pallidus*.

The species which characterize the *Alisporites grauvogelii* subzone are: *Dictyotriletes bireticulatus*, *Accintisporites ligatus*, *A. diversus*, *Microcachryidites fastidioides*, *M. doubingeri*, *Nuskoisporites muelleri*, *Platysaccus queenslandi* and *Lunatisporites* (*Taeniaesporites*) *novimundi*.

Characteristic species of the *Verrucosisporites applanatus* subzone are: *Eucommiidites triassicus*, *Aratrisporites pilosus*, *Cuneatisporites radialis*, *Concavisporites juriensis*, *Cyathidites minor*, *Angustisulcites klausii*, *Exesipollenites tumulus* and *Classopollis torosus*.

Miofloral resemblance with the European Triassic is quite apparent by the occurrence of *Voltziaceaesporites heteromorpha*, *Alispo-*

rites grauvogelii and *Angustisulcites klausii*. However, absence of the genus *Triadispora* is noticeable.

The mioflora can be distinguished from the Gondwana Triassic miofloras by the apparent lack of the genera *Lundbladispora*, *Kraeuselisporites*, *Playfordiaspora* (= *Guthoerlisporites* p.p.) and *Falcisporites*.

PAKISTAN

The Triassic strata in Pakistan are well exposed in the Salt Range. Here the Permian-Triassic contact is a para-conformity; possible duration of the break in deposition separating the two systems is uncertain. The Triassic strata are referred to two formations, viz., the Lower Triassic Mianwali Formation and the Middle Triassic Tredian Formation. The Mianwali Formation has three members, viz., Kathwai, Mittiwali and Narmia, while the Tredian Formation is divided into Landa and Khatkiara Members.

Triassic microfossils from the Salt Range were first recorded by Sitholey (1943) from the Sakesar Ridge near Sarai Village. The same material was further examined by Pant (1949), Sitholey (1951) and Pant and Srivastava (1964). The most recent and comprehensive study of the Salt Range Triassic miofloras is that by Balme (1970), covering all of the Mianwali and the Tredian formations.

The important miospore taxa of the Kathwai Member are *Punctatisporites fungosus*, *Densoisporites playfordii*, *Lundbladispora obsoleta*, *Lunatisporites noviaulensis* and *L. pellucidus*. The overlying Mittiwali Member also has a comparative miofloral composition except for the presence of *Perotrilites* sp. Balme's figure 16 does not show the distribution of *Lundbladispora brevicula* in the Kathwai Member while in the composite diagram given in figure 21 this species is shown as occurring in the Kathwai Member also. The above species make up from 81 to 98 per cent of the total spore-pollen population. A few striate bisaccate pollen occur in the Mittiwali Member while the non-striate bisaccates are almost absent.

The mioflora of the Narmia Member shows important changes. As the mioflora of the upper part of the Mittiwali Member is not known it is not possible to say if the change took place at the base of the Narmia Member or in the top part of the Mittiwali Member. In the Narmia Member *Densoisporites nejburgii*, which occurs only sporadically in the Mittiwali Member, suddenly becomes important, while *D. playfordii*, *Lundbladispora brevicula* and *L. obsoleta* are either absent or found only in insignificant numbers. *Aratrisporites paenulatus*, *A. fischeri*, *Verrucosisporites narmianus*, *Simeonospora khlonovae*, *Alisporites landianus*, *Sulcatisporites institatus*, *Platysaccus queenslandi* and *Cyclogranisporites arenosus* appear for the first time in the Narmia Member. *Falcisporites stabilis*, which occurred rarely in the upper part of the Chhidru Formation, reappears in larger numbers in the Narmia Member. The species though probably present in the Kathwai and Mittiwali Members (Balme, 1970, fig. 17) is not encountered with in the population counts (*ibid*, fig. 21).

Mioflora of the Tredian Formation is more or less similar to that of the Narmia Member. Though *Densoisporites playfordii*, *Lundbladispora obsoleta*, *Punctatisporites fungosus*, *Cordaitina gunyalensis* and *Simeonospora khlonovae* do not occur, yet no new form makes its appearance.

INDIA

Triassic strata occur both in the peninsular as well as in the extra-peninsular India. The peninsular Triassic strata are usually divided into two groups, viz., Panchet and Mahadeva. The Panchet Group is subdivided into two formations — Maitur and Hirapur — while the Mahadeva Group comprises Pachmarhi, Tiki-Maleri and Parsora Formations. The Panchet Group is dated as Lower Triassic on the basis of vertebrate fossils. The Pachmarhi and Tiki-Maleri formations represent Middle to Upper Triassic while the Parsora Formation is probably Upper Triassic — Rhaetic. The Triassic in extra-peninsular India is represented by the Krol Group which forms an important stratigraphic unit of the lesser Himalayan zone, stretching from Simla to Nainital.

Extra-peninsular India

Miofloras are known from the Lower Krol of the Nainital area (Sitholey, Sah & Dube, 1954; Lakhanpal, Sah & Dube, 1958; Sah, Venkatachala & Lakhanpal, 1968), and

Krol A and D from the Tals of Mussorie (Ghosh & Srivastava, 1963).

The Krol mioflora is dominated by non-striate bisaccate pollen, e.g., *Platysaccus*, *Sulcatisporites*, *Cuneatisporites*, *Alisporites*, *Voltziaceaesporites* and *Triadispora*. The striate bisaccate pollen are not common whereas the triletes are rare. In the predominance of the non-striate bisaccates the Krol mioflora is comparable with the Nidhpuri mioflora from the peninsula, but the generic composition of the two miofloras is quite different.

Peninsular India

Miofloras are known from the early and Late Triassic (Shrivastava & Pawde, 1962; Bharadwaj & Srivastava, 1969; Kar, 1970; Trivedi & Misra, 1970; Sarbadhikari, 1972; Satsangi, Chandra & Singh 1972; Banerji & Maheshwari, 1974, 1975; Mathur & Mathur, 1974; Venkatachala & Rawat, 1974; Maheshwari & Banerji, 1975). Triassic miofloras known to date seem to fall in five distinct miofloral zones, three within the Lower Triassic, the fourth probably in the upper part of the Lower Triassic or the lower part of the Middle Triassic, and the fifth in the Late Triassic.

The oldest Triassic mioflora is known from the Nonia Nala Exposure near Asansol in the Raniganj Coalfield (Banerji & Maheshwari, 1974; Maheshwari & Banerji, 1975) and from the Sukri River Exposure near Kaima, in the Auranga Coalfield (Banerji & Maheshwari, 1975). This mioflora is dominated by the genera: *Punctatisporites*, *Verrucosisporites*, *Decisporis*, *Alisporites*, *Gondwanipollenites and Protohaploxypinus*. The miofloral distribution is not uniform throughout the whole thickness of the beds containing this flora. In the Raniganj Coalfield, the lower samples have azonate-triletes at their lowest (10%) but the group gradually increases in frequency reaching up to 50 per cent in the higher samples. The zonate-triletes are fairly well represented in the lower samples but gradually decrease in frequency and are not encountered with in the upper samples. The most characteristic forms of this mioflora are *Punctatisporites maiturensis*, *Verrucosisporites* spp., *Kraeuselisporites wargalensis*, *Lundbladispora* sp., *Densoisporites complicatus*, *Playfordiaspora cancellosa*, *Falcisporites stabilis*, *Alisporites* spp., *Platysaccus queenslandi*, *Chordasporites* spp. and *Lunatisporites* (= *Taeniaesporites*) spp. In the Auranga coalfield mioflora some additional forms are present while some of the above are absent. However, the overall picture is the same.

The second miofloral zone, which seems to be slightly younger than the first one, is known from the subsurface in Purnea (Venkatachala & Rawat, 1974). In this zone, saccate gymnospermous pollen are 52 per cent, pteridophytic spores 42 per cent, polyplicates only 2 per cent and the algal sporomorphs are about 4 per cent. This assemblage is said to be closely comparable with the Early Triassic assemblages known from Pakistan and western Australia. Characteristic elements of this assemblage are *Tigrisporites*, *Aratrisporites* and *Neevesisporites*, alongwith the algal sporomorphs. The assemblage has a distinct marine influence.

The succeeding mioflora is known from bore-holes R. O.-1 (B) (Shrivastava & Pawde, 1962), R. E.-9 (Kar, 1970) and R. E.-1 (Sarbadhikari, 1972) in the Raniganj Coalfield. The mioflora is dominated by the trilete spores (71-80%) while the bisaccates are only 13-22 per cent of the total. The dominant genera are *Decisporis* and *Divaripunctites*. *Playfordiaspora cancellosa*, which is so characteristic of the older mioflora, is conspicuously absent; so also are the genera *Verrucosisporites*, *Kraeuselisporites*, *Lundbladispora*, *Densoisporites*, *Klausipollenites*, *Falcisporites*, *Chordasporites* and *Lunatisporites*. This mioflora is definitely younger than the previous miofloras in having sharply reduced frequencies of the striate bisaccate pollen.

The fourth mioflora is known from the *Dicroidium* — bearing grey micaceous shale exposed in the Gopad River near Nidhpuri, Madhya Pradesh. As only one layer has proved to be palynologically productive, variations in the miospore frequencies are not known. The assemblage is dominated by the non-striate bisaccate pollen, viz., *Falcisporites* (= *Nidipollenites*), *Alisporites* (incl. *Satsangisaccites*) and the costate *Weylandites*. Bharadwaj and Srivastava (1969) suggest that this mioflora may lie within the Panchet 'Stage'. This view is not acceptable as the Panchet Group of the type area is not only lithologically different but also has different miofloras having a sizeable population of the pteridophytic spores which are almost absent at Nidhpuri. Further, the genus *Dicroidium* is absent in the type area while it is very prominent at Nidhpuri, only slightly less than it is in the Parsor Formation. According to Bharadwaj (1969), palynologically, too, the Parsora 'Stage' would not have been much different from the Nidhpuri horizon. Shah, Singh and Sastry (1972) place the Parsora Formation in the Rhaetic. The Nidhpuri beds, however, seem to be older than the Parsora Formation as the former have a significant occurrence of *Glossopteris* species which are almost absent in the latter. The age of the 'Triassic' mioflora described by Trivedi and Misra (1970) from Nidhpuri is as yet uncertain. This mioflora is probably much older than the one described by Bharadwaj and Srivastava.

The youngest Trisassic mioflor' is known from the core samples obtained from the Banni well-2 drilled in Kutch (Mathur & Mathur, 1974). The assemblage reportedly compares with the Upper Keuper of Worcestershire, England. Details of the assemblage are not available at present.

WESTERN AUSTRALIA

The Triassic strata in western Australia occur in the Canning, Carnarvon and Perth basins, overlying marine or continental Upper Permian sediments. Except in the Canning Basin, they are mainly known from the subsurface records.

In the Perth Basin, Lower Triassic plant microfossils are known from the Kockatea Shale (Balme, 1963). In this shale the microplanktons usually outnumber the miospores. Quantitatively important palynomorphs are: *Osmundacidites senectus*, *Kraeuselisporites saeptatus*, *Lundbladispora playfordii*, *L. wilmottii*, *L. brevicula* and *Lunatisporites* sp. cf. *L. noviaulensis*.

A similar mioflora is reportedly known also from the Blina Shale in the Canning Basin (Balme, 1964). The basal Triassic is characterized by *Lunatisporites*, selaginelloid spores and abundant acritarchs.

In the Carnarvon Basin, the typical *Lunatisporites*-acritarch association has been found at the very base of the Locker Shale (Balme, 1969). Strata 60 m above this horizon contain late Early or Middle Triassic miofloras. Details are not available.

Near the top of the Kockatea Shale occasional occurrence of the genus *Pteruchipollenites* has been noted. The genus becomes common in the continental Triassic sediments overlying the Kockatea Shale. In the Erskine Sandstone of the Canning Basin the genus *Saturnisporites* occurs commonly. Details are not available.

GENERAL REMARKS

In the previous pages, published information on some of the Triassic miofloras South of the Tethys has been summarized. It seems that these Triassic miofloras represent four distinct floral provinces, respectively encompassing: 1) North Africa, 2) Arabian peninsula, 3) Pakistan, western Australia, and 4) Peninsular India.

Except for India the Triassic sediments in other regions have marine influence. The marine influence is also expressed in the microfloras. Large numbers of small acritarchs are found in most of the marine Triassic reviewed, though such data are not available for Tunisia, Saudi Arabia and Israel. At the same time the miofloras from the Triassic of North Africa—Arabian peninsula are quite different from those of Pakistan—western Australia. The Lower Triassic in North Africa—Arabia is palynologically not well known except perhaps for Libya. However, as remarked elsewhere also, the 'Lower Triassic' mioflora from Libya does not compare at all with other Lower Triassic miofloras. Therefore, the postulation by Kar and Jain (1975) that Libya formed a part of 'Gondwanaland' (? Gondwana floral province) needs additional supporting data.

The Upper and Middle Triassic miofloras of the Arabian peninsula have strong European affinities as are shown by the presence of *Voltziaceaesporites heteromorpha*, *Alisporites grauvogelii* and *Angustisulcites klausii* in Israel, and *Ovalipollis lunzensis* and *Microcachryidites doubingeri* in Saudi Arabia. The Arabian Triassic miofloras differ from those of North Africa in having taeniate bisaccate pollen which are absolutely missing in the latter. This probably means that either by the Middle Triassic, the African—Arabian land mass and Laurasia had rotated complimentary to each other bringing the Arabian peninsula in closer proximity of

Laurasia, or the Arabian peninsula was not a part of the Gondwanaland.

According to Balme (1970) the palynological data provide evidence for sweeping floral changes in the Salt Range area, coincident with the Permian-Triassic boundary. Here it must be remembered that the boundary is a paraconformity and we do not know the miofloral distribution in the unrepresented time. It is possible that several of the miospore species became extinct by the end of the Permian Period, but it is seen that emergence of new forms does not coincide with the beginning of the Triassic Period. Most of the Triassic species had already established themselves in the upper part of the Permian Chhidru Formation. The miofloral change at the Permian-Triassic boundary does not look so sweeping if we leave out of consideration those miospore species which are confined to or originate in the upper Chhidruan only, and keep in view that some of the striate bisaccate pollen may have been counted as taeniate forms due to poor preservation of many Triassic assemblages (Balme, 1970, p. 309). Emergence of new forms is more indicative of the change in the biota, rather than the extinction of the older species. It would thus seem that the floral change took place in the upper part of the Permian of the Salt Range.

Another floral change in the Triassic of the Salt Range is evidenced at the base of the Narmia Member where new forms like, *Simeonospora khlonovae*, *Verrucosisporites narmianus*, *Aratrisporites fischeri*, *A. paenulatus*, *Sulcatisporites institatus*, and *Platysaccus queenslandi* emerge and species like *Densoisporites nejburgii* and *Falcisporites stabilis* become quantitatively very significant.

The Lower Triassic miofloras from the Salt Range of Pakistan, Purnea region of India and the Kockatea Shale of western Australia have strong resemblances, particularly in the occurrence of the genera *Tigrisporites*, *Aratrisporites*, *Lunatisporites* (*Taeniaesporites*), *Falcisporites*, *Lunabladispora* and *Kraeuselisporites*. This relationship would probably be more clear if miofloras from the Triassic of Kashmir, and Thakkhola region in Central Nepal could be recovered.

The fresh-water Lower Triassic mioflora from the peninsular India is characterized by the presence of large numbers of striate bisaccate pollen, same as those found in the Permian, along with certain trilete forms such as *Verrucosisporites* spp., *Decisporis panchetensis*, and the monosaccoid *Playfordiaspora cancellosa*. Monolete forms are almost absent. Zonates and colpates are few. Such an association is so far not known elsewhere. The supposed Middle Triassic mioflora from India is also different from other Triassic miofloras in the paucity of pteridophytic pollen. Mioflora from the 'Triassic' Krol beds of extra-peninsular India is very poorly known. In the occurrence of the genera *Triadispora* and *Voltziaceaesporites* the Krol mioflora is more akin to the European Lower Triassic miofloras than it is to the Gondwanaland miofloras. This, however, is inexplicable under the continental drift concept. A study of better preserved material is needed to correct this anamoly.

The present study shows that certain miospore groups and genera have an interesting distribution in the Triassic. For example, striate bisaccate pollen which usually go up to the Middle Triassic are conspicuously absent in the Algero-Tunisian Sahara. *Lunatisporites* (= *Taeniaesporites*) which is found throughout the Triassic in most of the areas is also absent in the Sahara. *Chordasporites* has been identified only in Pakistan and India. *Ovalipollis*, which is found in North Africa — Arabian region, is not known from the eastern regions.

In North Africa the bisaccate pollen started dwindling in the Keuper and were almost extinct by the Rhaetic. In contrast, bisaccate pollen have been found in large numbers even in the Lower Cretaceous, of the Gondwanic region (Maheshwari, 1974) and elsewhere also (Hughes, 1969).

The genus *Playfordiaspora* (= *Guthoerlisporites* p.p.) occurs in Upper Permian of Saudi Arabia, Permian and Triassic of Pakistan and Lower Triassic of peninsular India. It is, however, absent in western Australia, though present in the Triassic and Rhaetic of South Australia. *Classopollis* is present in good percentages in the Middle Triassic of Sahara and Israel. Its history in Sahara is very interesting. The first occurrence of the genus in the region is in Middle Muschelkalk, gradually increasing in numbers by Lower Keuper. It then declines to increase again in Rhaetic-Hettangian. The genus again declines in numbers to increase in Callovian-Neocomian. The highest percentage is, however, reached in the Turonian. Elsewhere, the genus does not appear before Rhaetic, becomes and remains abundant in the Jurassic, though its dominance has been noted in certain Valangianian samples also. Hughes (1969) suggests that some of the younger records may be exaggerated by reworking. Maheshwari (1974) suspects that *Classopollis* may be a suprageneric taxon as similar pollen was probably produced by several types of plants.

Eucommiidites, known from Middle-Upper Triassic of Israel is probably also known from the Middle Triassic of Russia. Elsewhere it usually appears in the Liassic.

It would thus seem that inter-continental correlations based upon occurrence or frequency of miospore genera have certain inherent drawbacks and hence are not always necessarily correct. Such correlation within a floral province are quite reliable if conditions of deposition are also taken into account.

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