34.4. PHYTOLITHARIA

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The main purpose of this short report is to call the attention of micropalenontologists to the presence in some Mediterranean cores of a group of siliceous microfossils less common in marine sediments–the phytolitharians.

Although these microfossils do not appear to be of particular value at first sight (which fact explains the lack of interest hitherto shown in their study), I considered that at least a summary inventory of the various morphological types of phytolitharians found in the investigated cores would be worth making. Aside from the fact that the completion of such an inventory permits a more complete knowledge of the siliceous microfossil thanatocenoses, it certainly would have other significance as well.

Any fossil group, however insignificant, may be found useful at a certain moment. As for the phytolitharians, they might give, besides pollen, useful evidence about the existence of some types of vegetation on the land adjacent to the sedimentary basin. On the other hand, taking into account that the phytolitharians are extremely rare in marine in comparison with freshwater sediments, they might help us to elucidate some paleoecological questions. And, finally, it is quite possible that the phytolitharians should have potential applicability in biostratigraphy.

The phytolitharians, a name coined by Ehrenberg (see Deflandre, 1963), or opal-phytoliths (Baker, 1960), are siliceous sclerites that, for the most part, come from the cells of Gramineae and subordinately from those of Equisetales. They exhibit a wide morphological variety, from smooth, spiny or denticulate rod-like sclerites, to dumbbell-like, hook-like, hatchet-like, spearhead-like, berry-like, etc., or quite irregular sclerites.

Ehrenberg (1854), that assiduous researcher of the microscopic world, was the first, and almost the only person until now, who separated and classified into genera and species all morphological types of phytolitharians found by him in various soils and diatomaceous earths. Thus, he initiated a system of classification, unfortunately completely forgotten afterwards.

Ehrenberg's system is an artificial, parataxonomic system, as in fact is any classification based on organites or fragmentary fossils. To realize the difference between the species (as a Linnean taxonomic unit) and the paraspecies (as a parataxonomic unit of the phytolitharians), it is probably sufficient to cite F. Smithson's observation (*fide* Deflandre, 1963). He writes that in soils the phytoliths may usually be assigned only to a tribe or a group of tribes of Gramineae, and only quite exceptionally to a recognized species living on that soil. In spite of this circumstance, Ehrenberg's classification still remains the most practical tool for micropaleontologists and pedologists involved in the study of this group, because, as Deflandre (1963) remarked, a nameless microfossil does not exist, does not tell anything, and cannot be cited. That is the case of the phytolitharians studied by Baker (1960) and others (for complete references see Deflandre, 1963). On the contrary, by giving a name to each type of phytolitharians, Ehrenberg (1854) could list them each time he met with them during his micropaleontological investigations.

According to his system, which was reviewed by Deflandre, the phytolitharians have been classified in four paragenera: *Lithostylidium, Lithodontium* and *Lithomesites* originating from Gramineae, and *Lithodermatium* from Equisetales.

The paragenus *Lithostylidium* (Ehrenberg) Deflandre (type paraspecies unestablished) includes the simple, spiny or denticulate rod-like sclerites.

The paragenus *Lithodontium* Ehrenberg (type paraspecies *L. bursa* Ehrenberg, established by Deflandre, 1963) includes the tooth-like, conical or polygonal massive sclerites.

The paragenus *Lithomesites* (Ehrenberg) Deflandre (type paraspecies *L. pecten* Ehrenberg, established by Deflandre, 1963) includes the globular or pluriglobular sclerites with one, two, three or more spherical, ellipsiodal or irregular swellings joined by isthmuses of variable width.

The paragenus *Lithodermatium* Ehrenberg (type paraspecies *L. gemmatum* Ehrenberg, established by Deflandre, 1963) includes all phytolitharian sclerites coming from the Equisetales.

Although the four paragenera do not appear to be sufficient to comprise the wide morphological variety of the phytolitharians, no new taxon will be proposed herein, because that requires a more thorough study of this group. The author confined himself to separating, without naming, the various new paraspecies he encountered in the investigated samples. The description of the new parataxa (both of paraspecies or paragenus rank) however, is a necessity for any advance in our study of these neglected microfossils.

PHYTOLITHARIA IN MEDITERRANEAN CORES

In the Mediterranean cores recovered on Leg 13, the presence of the phytolitharians was recorded in levels rich in siliceous microfossils at the following three sites: 124, 130 and 131.

Site 124

At this site phytolitharians were encountered only in the Miocene Section 124-13-2, in the interval 60 to 129 cm, and particularly at 89 to 90 cm, where there is a rich assemblage composed of diatoms, silicoflagellates, ebridians, archaeomonads, sponge spicules, etc. The occurrence of phytolitharians in such a marine assemblage is a rather rarely cited case in the literature, since they are, as a rule, frequent members of freshwater siliceous sediments. The only known similar cases are in two Miocene diatomites: one from Borostelek (Hungary), the other from Nancoori Island (Indian Ocean) (Deflandre, 1963).

Unlike the other members of the assemblage, which are autochthonous and of marine origin, the phytolitharians have probably been transported by wind or water from the surrounding land. However, judging by their very good preservation (see Plate, Figures 4, 22-27 and others, that show sclerites armed with very thin spines or even double sclerites), they might have undergone a rather short transport.

Most types of phytolitharians of this section are shown in Plate 1 (Figures 1-10, 12-34, 39-45). They belong to *Lithostylidium, Lithodontium* and *Lithomesites.*

The members of the paragenus *Lithostylidium*, most of them new, are among the most frequent phytolitharians. The following paraspecies have been recorded:

Lithostylidium parasp. 1 (Figure 1). Massive long rod, with rough surface and serrate sides, the teeth being better developed and more regular on a side. It is rather similar to *Lithostylidium*, Figure 59 in Deflandre (1963). One specimen.

Lithostylidium parasp. 2 (Figure 2). Slightly flattened thick long rod, with transverse constrictions and toothed sides. On the flattened sides the central part of the swellings is either flat, or slightly depressed. It is similar by its constrictions to *Lithostylidium*, Figure 10 in Deflandre (1963). One specimen.

Lithostylidium parasp. 3 (Figures 3, 10). Simple spiny rods, with more or less regular outline. Several specimens.

Lithostylidium parasp. 4 (Figure 4). Massive rod with the surface covered by several (4?) rows of lamellar teeth obliquely directed. One specimen.

Lithostylidium parasp. 5 (Figures 22-25). Small spiny sclerites, with simple or club-like ends. In Section 124-13-2, 89 to 90 cm most of them constitute closely tied couples. Several specimens.

Lithostylidium (?) parasp. 6 (Figure 26). Spiny club-like sclerites. Although doubtfully assigned to this paragenus, it appears rather similar to the preceding paraspecies. One specimen.

Lithostylidium (?) *biconcavum* Ehrenberg (Figures 12, 13, 14, 18-21). Together with these typical specimens there is a large series of usually spiny and more elongate specimens (Figures 5-8, 15-17). Theri common features are: (1) the concavity of their sides, and (2) the asymmetry of their ends, namely the existence of a flat or slightly concave "basal" end, usually broader than the "upper" one that is generally narrower and with a few prominences or apophyses. Numerous specimens. Of the same type are the specimens of *Lithodontium*, Figures 8 to 10, 25, 26, 39 in Deflandre (1963). I am inclined to ascribe all such forms to a new paragenus because they are not conveniently placed in either *Lithostylidium*, in which they have been included by Ehrenberg (1854), or in *Lithodontium*, as did Deflandre (1963).

Lithostylidium (?) parasp. 7 (Figure 30). Its short height would argue its assignment to *Lithodontium*, but its general features suggest an affinity with *Lithostylidium* (?) *biconcavum*. One specimen.

Lithostylidium cf. *polyedrum* Ehrenberg (Figure 31). Short sclerite with several longitudinal wings. One specimen.

The paragenus *Lithodontium* is represented in this section only by two paraspecies: *Lithodontium nasutum* Ehrenberg (Figure 29) and *Lithodontium* parasp. 1 (Figure 39).

Regarding the paragenus *Lithomesites* (Ehrenberg) Deflandre, the following paraspecies belonging to this paragenus have been recorded in Site 124:

Lithomesites ex gr. *clepsammidium* (Ehrenberg) Deflandre (Figures 32-34, 41, 42, 44, 45) is the most frequent member of this paragenus. Several specimens.

Lithomesites nodosum (Ehrenberg) Deflandre (Figure 28). Sclerite with three rough globular swellings tied by narrow necks. The correspondence with Ehrenberg's paraspecies (Ehrenberg, 1854, Plate 14, Figure 133) seems to be almost perfect. One specimen.

Lithomesites aff. *pecten* Ehrenberg (Figure 9). By its features this parataxon is rather similar to *Lithomesites*, Figure 40 in Deflandre (1963). One specimen.

Lithomesites parasp. 1 (Figure 27). Sclerite with three constrictions, the swollen parts being armed with lamellar teeth obliquely directed. Similar by this feature to *Lithostylidium* parasp. 4. One specimen.

Sites 130 and 131

As the phytolitharian assemblages of these two sites are rather similar, they will be discussed together. The results are based on the following samples of Quaternary age: 130-3-CC, 130-4-CC, 131-1-CC, 131A-3-CC, 131A-4-CC and 131A-5-CC. Except for the last mentioned, all of them contain, in addition to the phytolitharians, a diatom flora consisting of two or three species particularly belonging to *Melosira*, and subordinately silicoflagellates and sponge spicules.

At these sites, the phytolitharian assemblage is distinguished by the prevalence of *Lithomesites* ex gr. *clepsammidium* (Ehrenberg) Deflandre (Plate 1, Figures 35-38, 46-50), characterized by a wide range of variation. Much rarer are the sclerites of *Lithostylidium* type, as for example *L. amphiodon* Ehrenberg (Figure 11), or of *Lithodontium* type, among which *L. furcatum* Ehrenberg (Figure 51) could be determined.

CONCLUSIONS

The results given above are quite informative. They are not sufficient, nor is the study of the phytolitharians sufficiently advanced, to draw biostratigraphic conclusions. I hope that they will stimulate some micropaleontologists, since study of this group (a virtual *terra incognita*) should provide many satisfactions.

REFERENCES

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Ehrenberg, C. G., 1854. *Mikrogeologie*. Atlas, 31 p, pls. 1-40.

PLATE 1

(Figures 1-34, 39-45, 51: X835.
Figures 35-38, 46-50: X1253)

Figure 1. *Lithostylidium* parasp. 1.
13-124-13-2, 89-90 cm.

Figure 2. *Lithostylidium* parasp. 2.
13-124-13-2, 89-90 cm.

Figures 3, 10. *Lithostylidium* parasp. 3.
13-124-13-2, 89-90 cm.

Figure 4. *Lithostylidium* parasp. 4.
13-124-13-2, 89-90 cm.

Figures 5-8, 15-17. *Lithostylidium* (?) ex gr. *biconcavum* Ehrenberg.
13-124-13-2, 89-90 cm.

Figure 9. *Lithomesites* aff. *pecten* Ehrenberg.
13-124-13-2, 89-90 cm.

Figure 11. *Lithostylidium amphiodon* Ehrenberg.
13-130-3-CC.

Figures 12-14, 18-21. *Lithostylidium* (?) *bioconcavum* Ehrenberg.
13-124-13-2, 89-90 cm.

Figures 22-25. *Lithostylidium* parasp. 5.
13-124-13-2, 89-90 cm.

Figure 26. *Lithostylidium* (?) parasp. 6.
13-124-13-2, 89-90 cm.

Figure 27. *Lithomesites* parasp. 1.
13-124-13-2, 60-61 cm.

Figure 28. *Lithomesites nodosum* (Ehrenberg) Deflandre.
13-124-13-2, 89-90 cm.

Figure 29. *Lithodontium nasutum* Ehrenberg.
13-124-13-2, 89-90 cm.

Figure 30. *Lithostylidium* (?) parasp. 7.
13-124-13-2, 89-90 cm.

Figure 31. *Lithostylidium* cf. *polyedrum* Ehrenberg.
13-124-13-2, 89-90 cm.

Figures 32-38, 41, 42, 44-50. *Lithomesites clepsammidium* (Ehrenberg) Deflandre.
32-34, 41, 42, 44, 45: 13-124-13-2, 89-90 cm.
35-38, 46-50: 13-130-3-CC.

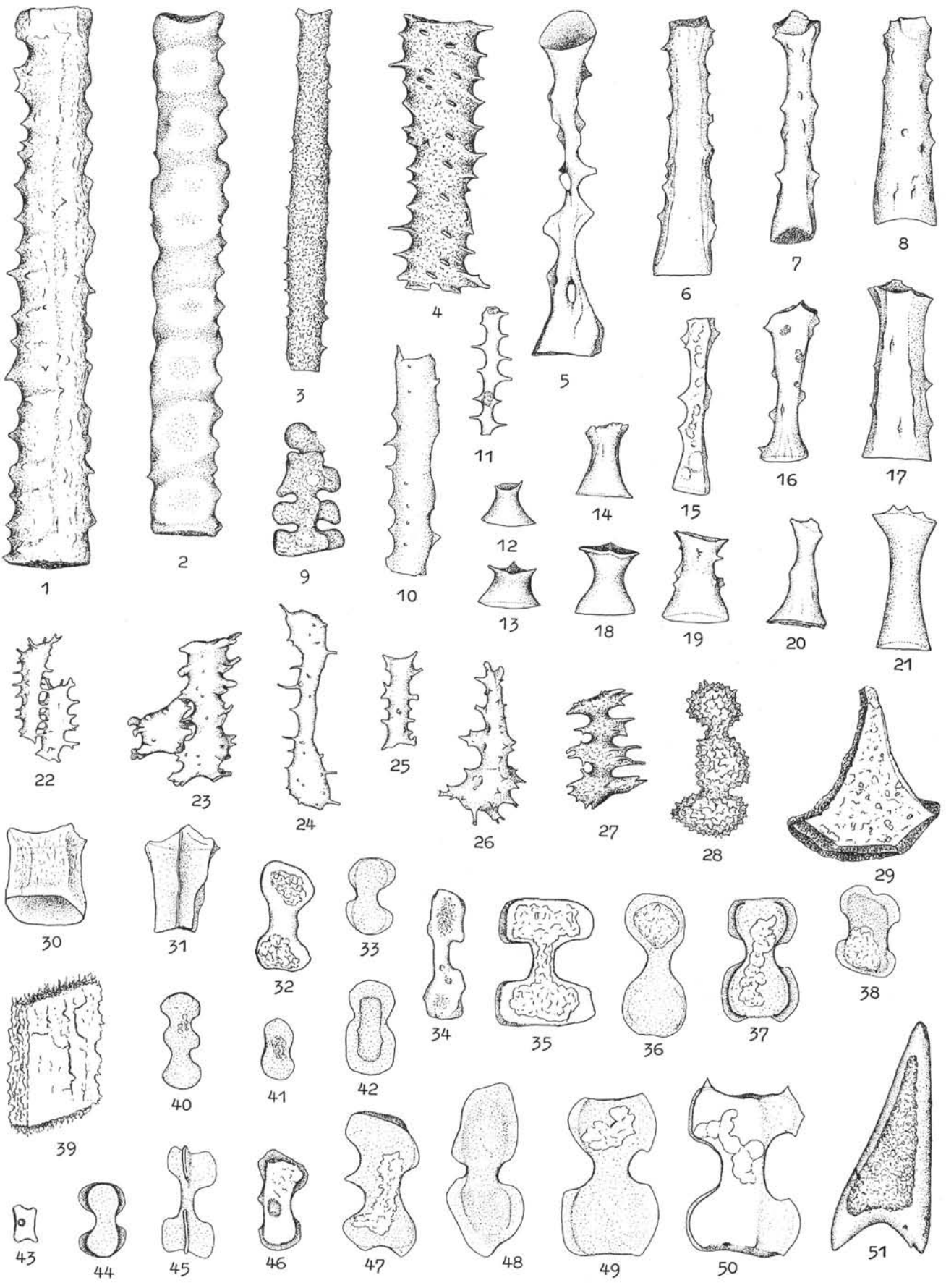
Figure 39. *Lithodontium* parasp. 1.
13-124-13-2, 89-90 cm.

Figure 40. *Lithomesites* parasp. (? *L. nodosum* Ehrenberg.).
13-124-13-2, 89-90 cm.

Figure 43. *Lithodontium* or a young specimen of *Lithomesites* ex gr. *clepsammidium* (Ehr.) Deflandre.
13-124-13-2, 89-90 cm.

Figure 51. *Lithodontium furcatum* Ehrenberg.
13-130-4-CC.

PLATE 1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