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## An Ophiuroid from the Triassic of Makhtesh Ramon (Negev, Israel)<sup>1)</sup>

By HANS HESS<sup>2)</sup>

With 4 figures in the text

### ABSTRACT

A complete but weathered ophiuroid from the Ladinian of Makhtesh Ramon (Negev, Israel) is described and figured. It belongs to the genus *Aplocoma* D'ORBIGNY (as amended by HESS, 1965) and shows close resemblance to specimens from the Upper Muschelkalk of Spain previously described by the author as *Aplocoma* cf. *agassizi* (v. MUENSTER).

### Introduction

The ophiuroid described in the present note has been preserved for some time in the collections of the University of Jerusalem. It was recently brought to Basle by Prof. G. HAAS and shown to Prof. HOTTINGER who asked me to carry out its identification.

The specimen lies near the edge of a slab of concretionary, partly weathered, yellowish limestone (dimensions 20 × 10 cm, thickness 1.5 cm). The only other fossil remains are some small and indeterminable crinoid ossicles, apparently brachials. The slab was found in the Makhtesh Ramon area in Ladinian strata, probably lithologic unit 6 of PARNES (1962, Text Fig.3). Since this appears to be the first ophiuroid from the Triassic of Israel a short description seems warranted.

### Description

The specimen presents the oral (or ventral) side. Extensive weathering has caused almost half of the skeletal substance to disappear, especially in the area of disk and proximal arm parts. Only in three places are the arms relatively well preserved and present the original aspect.

The disk has a diameter of 40 mm and is more or less pentagonal in outline, which may be the result of shrinkage *post mortem* after partial desiccation or due to flattening

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of the animal after burial or it may even be a characteristic of the living animal. In the center of the disk three pairs of bar-like elements stand out clearly; they are the weathered remains of the oral plates (mouth angle plates), or more exactly the adambulacral (inner) parts of these ossicles. The two remaining pairs corresponding to these elements are not so clearly visible. No trace of oral papillae is preserved but right in the center of the disk a few rather small and obtuse teeth can be distinguished. The outer or ambulacral parts of the oral plates are separated by a fissure from the inner parts, e.g. on the arm pointing to left, even though these elements were fused together during lifetime. These outer or ambulacral parts are not developed into wings. (Oral frames with well-developed lateral wings are a characteristic of the suborder Gnatophiurina.) These parts now appear to be fused into a single piece but were separated during life-time; they can be distinguished easily as U-shaped pieces at the base of the two arms pointing downward where they meet the first, or mouth, vertebra.

While the material of these ossicles consists of white calcite, the space between most of the vertebrae and also between the oral plates is partly filled by darker material, presumably also calcite, possibly coloured by former organic material. The dark spaces must not, of course, be mistaken for tentacle pores. BOEHM (1889) figured a very similar arm of a recent ophiuroid (Pl. V, Fig. 4) after considerable grinding down.

Between these ambulacral or radial structures the interradial parts of the disk are visible. Apart from the genital scales and plates all the small plates of the oral side have been destroyed so that only those of the aboral side are visible from below. At one point, where a cleft has separated the ossicles, some very small granules can be seen on the aboral side; these granules obviously covered the disk during life-time. In analogy to similar ophiuroids it may be concluded that a dense granulation covered both the aboral and the oral side of the disk. A larger shield of the aboral disk covering, again seen from below, is interpreted as a radial shield; its length appears to have been about one third or one fourth of the diameter of the disk.

The genital plates (radial bursal plates) and genital scales (interradial bursal scales) are preserved near most of the arm bases. The best preserved ones are marked by an arrow in Figure 1 and shown enlarged in Figure 2. The genital plate is rather long and thin whereas the genital scale is high and relatively massive.

The arms must have reached a length of about 30 mm and have been composed of close to 40 segments. Their width at the base is 1.7 mm. Weathering has obliterated most of the ventral shields and the ventral part of the lateral shields as well as of the vertebrae. Only a very small number of lateral and ventral shields have been preserved to a reasonable extent. It may be inferred, however, that the ventral shields met each other at least on the proximal part of the arms so that the lateral shields were here separated ventrally. Tentacle pores are developed also in the distal part of the arms. Each pore is covered with two tentacle scales. These are leaf-like on the proximal part of the arms (Fig. 3) but more thornlike on the distal part (Fig. 4). The exact shape of the lateral shields is difficult to make out but the plates appear to have been rather thin, with a straight outer side (see side view of isolated fragment near left border of Fig. 1). In one or two places traces of the arm spines are preserved. The spines appear to have been only about one third of the length of the lateral shields.

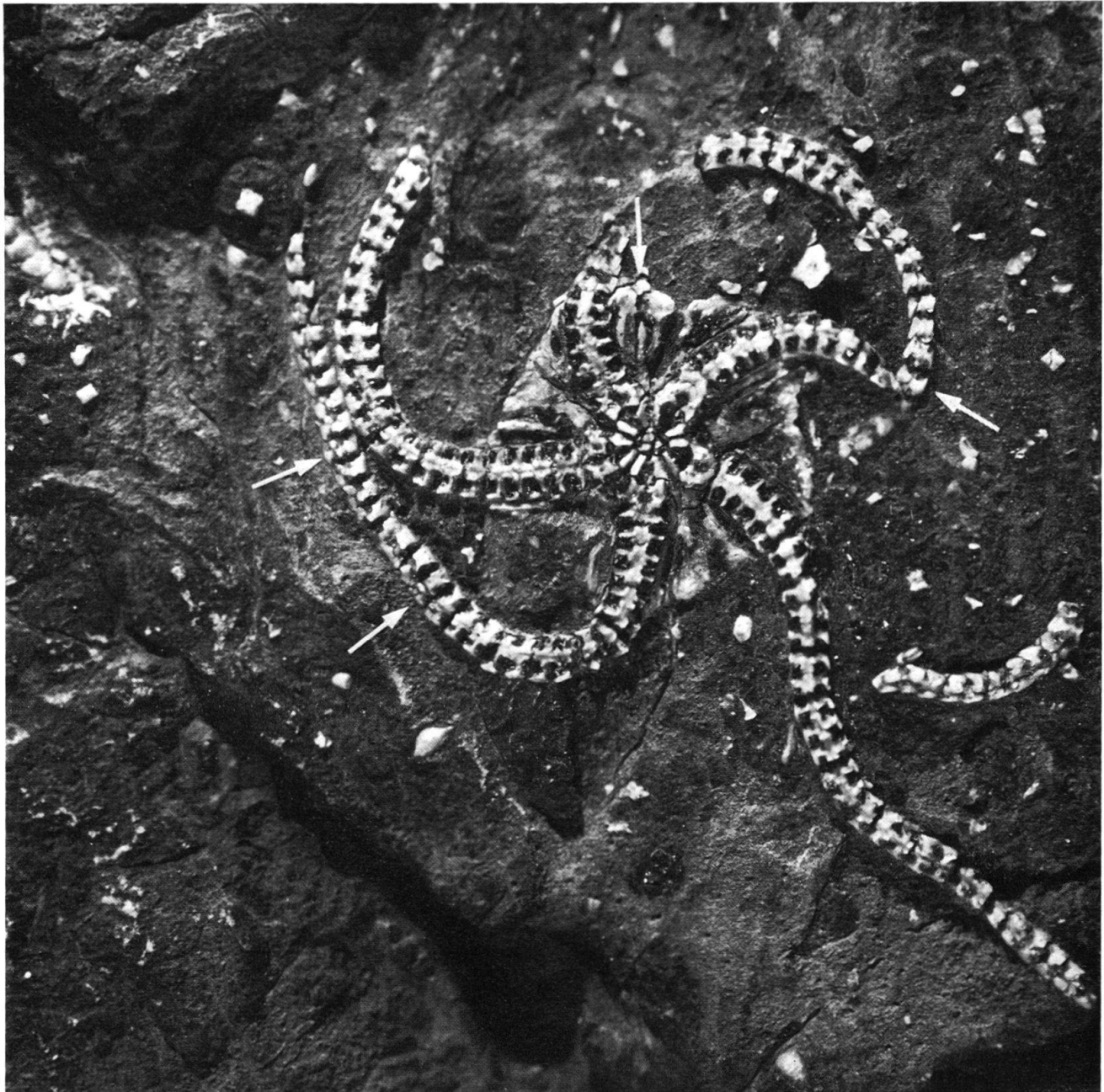


Fig. 1

*Aplocoma* sp., oral (ventral) side.  $\times 4$ . Ladinian, Makhtesh Ramon (Negev, Israel). Collection of the University of Jerusalem, Zoological Institute.

Arrows point to parts shown in Fig. 2–4: two arrows on left arm see Fig. 3 (arm segments 16 and 23); arrow on right arm see Fig. 4 (arm segment ca. 29); arrow on disk see Fig. 2 (genital plate and scale).

From the foregoing the following *diagnosis* can be formulated:

Disk granulated; arms long and slender; lateral shields with very small spines; tentacle pores developed through most of the arms, proximally two leaf-like tentacle scales, distally tentacle scales thorn-like; genital plate slender, genital scale high and rather massive; teeth obtuse.

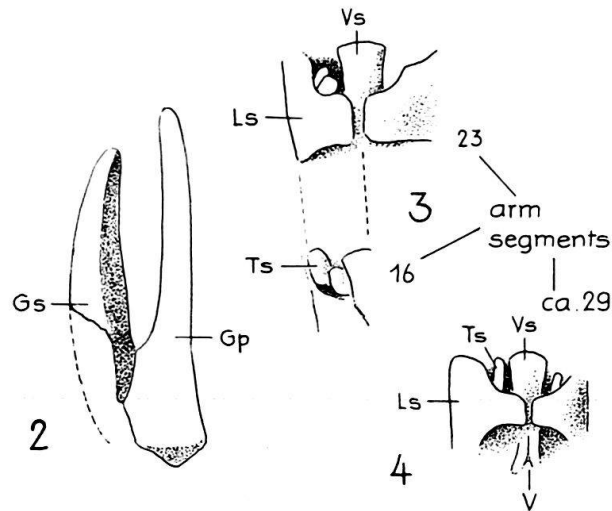


Fig. 2-4

*Aplocoma* sp., Ladinian, Makhtesh Ramon (Negev, Israel). Collection of the University of Jerusalem, Zoological Institute.  $\times 15$ .

Fig. 2: Genital scale (Gs) and genital plate (Gp), ventral aspect.

Fig. 3: Arm segments 16 and 23 (position: see Fig. 1), ventral aspect. Ls = lateral shield, Vs = ventral shield, Ts = tentacle scale.

Fig. 4: Arm segment ca. 29 (position: see Fig. 1). V = vertebra (part of proximal, ventral furrow bordering proximal muscular fossae is only visible).

### Systematic position

It is reasonably certain that this ophiuroid belongs to the family Aplocomidae HESS (1965) and more exactly to the genus *Aplocoma* D'ORBIGNY (see HESS, 1965). This family also embraces two other genera, namely *Ophiopetra* HESS (1962) and *Praeaplocoma* BROGLIO LORIGA and CAVICCHI (1969). Prominent characters of *Ophiopetra* are, among others, the blunt, rounded-off teeth and the comparatively long arm spines. In both characteristics the present specimen is closer to *Aplocoma*. *Praeaplocoma* from the Lower Triassic (Werfenian) of the Dolomites, Italy, is characterised by thick lateral shields and tapering arms. Another genus, *Arenorbis* HESS (1970) of doubtful affinity possesses a very resistant granulation of the disk, very slender arms, and a series of small inner tentacle scales in addition to the two large outer scales, a characteristic which is missing in the ophiuroid from Israel.

Let us now examine whether the present specimen can be assigned to one of the existing species of *Aplocoma*. The following species have been placed in this genus: *Aplocoma agassizi* (v. MUENSTER, 1839), type species of the genus, Upper Muschelkalk of Laineck near Bayreuth, *Aplocoma torrii* (DESIO, 1951), Rhaetic of Monte Albenza near Bergamo, *Aplocoma mutata* HESS (1970), Hettangian of Ceilhes, Hérault.

Our specimen is distinguished from *A. torrii* by the slender genital plates and the thicker teeth; it resembles the Rhaetic species in the arms, however. *A. mutata* has longer arm spines and the tentacle scales remain rather broad throughout the arm. The type species, *A. agassizi*, is characterised by large tentacle pores and correspondingly broad tentacle scales throughout the arm.

The closest resemblance is shown with some ophiuroid specimens from the Upper Muschelkalk of the Teruel province, Spain, which I have described as *Aplocoma* cf. *agassizi* (HESS, 1965). These specimens show very small arm spines and the tentacle pores (as well as the scales) are somewhat smaller than in *A. agassizi* proper and also the mouth papillae are different. It is possible that the Teruel specimens, together with the Makhtesh Ramon specimen of similar age constitute a separate species. In order to warrant the establishment of a new species the material should, however, be better preserved. As remains of *Aplocoma* from the English Rhaetic demonstrate, these ophiuroids are rather difficult to classify and necessitate well preserved material for this purpose (see HESS, 1965).

The vertical distribution of *Aplocoma* species thus embraces strata from Upper Muschelkalk to Lowermost Lias. It is interesting to note that an arm fragment probably belonging to this genus (the specific affinity is doubtful) has been found in the Lower Triassic (Kathway Member) of the Salt Range, West Pakistan (KUMMEL and TEICHERT, 1970).

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