

6. RECOGNITION OF A. PLANCI IN THE SEDIMENTARY RECORD

Frankel (1974, 1978) identified whole and fragmented skeletal debris in the "very poorly sorted and unconsolidated (reefal) sediment" that he examined. According to Frankel (1978) the parts most often preserved are spines, pedicels and ambulacral ossicles. The preservation of elements in the sedimentary record will largely depend on their original size, shape and abundance and the hydrodynamic conditions at the time of deposition.

If crown-of-thorns starfish are present in hundreds of thousands during an outbreak on a single reef, as suggested by Endean (1982), enormous potential exists for the deposition and incorporation into sediment of millions of skeletal elements. This is particularly so for ambulacrals, adambulacrals, actinal intermediates, secondary abactinals, and spines, each of which numbers several hundred per animal.

The hydrodynamic conditions prevalent when each animal dies and disintegrates is clearly a major determinant in the type of element incorporated into the sediment and their state of preservation. Small, fragile pedicellariae, encrusting granules, and subspherical granules would be especially susceptible to transport, dispersion, and physical breakdown by the action of waves and currents.

The elements most likely to survive turbid conditions and be preserved more or less intact are those which are compact and relatively robust. Based on this criterion, adambulacrals, actinal intermediates and the less common interbranchial ossicles should be present in any A. planci-rich zone in which ossicles are present.

Spines, and ornately-sculptured ambulacrals, orals, primary abactinals, and some secondary abactinals, would be susceptible to physical disintegration.

The prominence of pedicles and spines in Frankel's samples may be due to their size and shape which allowed them to fall into cracks and crevices, thereby avoiding perturbation.

Despite the potential for the preservation of some elements, the recognition of large numbers of crown-of-thorns parts in sediment will necessarily lead to the identification of elements via a detailed study of the microstructure.

The recognition of whole or fragmentary elements in sediment is assisted by the distinct mauve colouration of A. planci parts. Only the madreporite, pedicellariae, and pedicellarial cups lack this pigmentation.

Intensity of pigmentation varies between ossicle series and within some series. Those in which the colour is most pronounced are the ossicles situated close to the surface of the animal i.e. the primary and secondary abactinals, actinal intermediates, marginals, and spines. Adambulacrals and ambulacrals are considerably lighter in colour although still with a distinct purple tinge. First adambulacrals, orals and the interbranchial ossicles are a very pale mauve. Actinal spines display a large range of colours from pale mauve to dark mauve.

The ossicles of other stars examined by the author and all other "stelleroids" studied by Frankel (1974, 1977, 1978) are white or cream. Blake (1979) reported that the ossicles of some specimens of Echinaster modestus Pervier are pale purple in colour whilst the Oreasteridae have white ossicles.

Skeletal elements of four stars common on the Great Barrier Reef were compared to those of A. planci. Species considered were three starfish (Echinaster luzonicus (Gray), Euretaster insignis (Sladen), Linkia laevigata (L.)) and one brittle star (Ophiocoma sp.). Elements which resemble ossicles in A. planci were studied. Those with no physical similarity were not considered.

Some elements, particularly ambulacral and dermal ossicles, superficially resemble their counterparts in A. planci (Plate 12). Major morphological differences exist, however, especially in ossicle size and the sculpturing of articulation surfaces. Possible confusion is avoided by the smaller size and brilliant white colouration of ossicles examined from each of the four species.

According to Maxwell (1971), most asteroids can be differentiated from Acanthaster by their "dense, moderately porous skeletal material"; it is the Ophiuroids which most closely resemble Acanthaster. Maxwell considered that fragmented portions of Acanthaster skeleton can only be distinguished from Ophiuroids if coarser meshwork fragments are present.

These conclusions are not readily apparent in Plate 13. The ossicle microstructure of some other sea stars does appear to be similar to that of A. planci. In the species examined, this was particularly the case with the oral ossicle of E. insignis (Plate 13, Number 6). In general, however, the microstructure of the elements of other asteroids is denser and less porous, as suggested by Maxwell.