

THE PREPARATION OF SECTIONS OR PEELS OF CORALS AND STROMATOPOROIDS: A QUESTION OF CURATORIAL POLICY

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ABSTRACT. The need for the preparation of thin sections or acetate peels for the proper study of internal structures in corals and stromatoporoids is stressed. Type specimens of species in these groups which have not already been sectioned or peeled will ultimately require preparation for adequate revision. Curators are urged to allow such work to be done on type material in their care and a procedure is suggested to help them assess the need for preparation and to ensure that the original form of the specimen is adequately recorded.

SOME groups of fossils, particularly corals and stromatoporoids, normally require as a matter of routine the examination of internal structures for their description and identification. This is usually achieved by the preparation of thin sections or acetate peels of surfaces cut at orientations normal to and parallel to the growth vector of the skeleton. Even where the external form of the corallum or coenosteum is 'perfectly' preserved and can be freed from matrix, many scleractinian and rugose corals, tabulate corals, and most stromatoporoids cannot be safely identified to specific level (in some cases not even to generic level) without such preparations.

Other groups that pose similar problems are bryozoans and archaeocyathids. Many other taxa can be usefully studied by the preparation of thin sections and peels but are not so reliant on these techniques for basic identification. Specific cases are critical, however, such as the need to determine crural structures in rhynchonellid brachiopods. I shall confine my remarks here to corals and stromatoporoids, however, and leave others to extend the arguments to their particular fields.

THE NEED FOR PREPARATION

Palaeozoic corals are identified chiefly on the basis of the form and disposition of the septa, tabulae, and dissepiments. Ontogenetic considerations are also becoming increasingly important. In colonial corals the interrelationships of the constituent corallites, and their mode of increase (formation of new corallites), are also significant. These latter criteria may be quite clear on well-preserved external surfaces of coral colonies and their diagnostic value may make some colonial forms more readily identifiable without further preparation. Large groups of Palaeozoic colonial corals, however, are not particularly distinctive when viewed on external surfaces. The favositids and lichenarids are good examples among the tabulate corals in which details of wall structure and the presence and disposition of mural pores, tabulae, and septal spines are critical. Quite often, however, species of these groups have been established, particularly by early workers and originally as species of 'sack' genera, without recourse to sections or peels. Modern advances in the use of wall structures

to subdivide and classify these corals may leave these species unrecognizable and generically unassignable.

Solitary rugose corals, when calicular details are obscured, are almost always unidentifiable without sections or peels. Even in cases when the calice is well preserved, identification is not securely founded on external form alone and the types of many early established solitary coral species are far from perfectly preserved.

These problems do not seem to have been quite so acute in the past in Mesozoic to Recent scleractinian corals. Despite an early realization of the importance of microstructure in classification, there appears to have been less historical emphasis on internal structures in species characterization. Well-preserved coralla, in which the form and disposition of the septa and other calicular details are clear, have been considered adequately defined, particularly among younger scleractinian corals, perhaps because of the lack of figured sections of Recent corals. Even so, few serious researchers on fossil scleractinians would now work without sections of their material. In recent years there has been a resurgence of interest and emphasis on their skeletal microstructure in classification. In addition, knowledge of other internal structures not easily seen on corallum surfaces is becoming as important for identification in scleractinian corals as in rugose and tabulate corals.

Very few stromatoporoids can be identified from surficial coenosteal features alone. Since the last century it has been the practice to section material for description and there cannot be many species in this group based on unsectioned type material.

PREPARATION OF MUSEUM MATERIAL

In summary, modern work on all corals and stromatoporoids, with very few exceptions, requires the use of thin sections or acetate peels for reliable species identification. This is obvious in the case of specimens preserved in hard limestone matrices from which they cannot be removed by physical or chemical means. The main problem from a curatorial point of view concerns material freed from matrix and presenting a 'well-preserved' external appearance. Such material is prized in museums and was often used by early workers, without the preparation of sections or peels, as the type specimens of new species. Type and non-type material in museum collections clearly requires separate consideration.

Ultimately, the only way to deal with the type material of most species established without the use of thin sections or acetate peels is to allow such preparations to be made. Generally, if not invariably, the sectioning of supposedly conspecific material, even if topotypic or syntypic, is not a solution. I have examined type series that have turned out to consist of multiple species that are not even congeneric (e.g. Scrutton 1973, p. 253); this is not an uncommon occurrence, particularly among the syntypes of early established species. Curators are faced with a difficult problem. They rightly regard type material as of special value and their desire to conserve it in its original condition often leads them to refuse requests for preparations to be made. The question to be asked is, 'What *is* the value of type material?' It surely rests in its use to define a particular taxon. If in its unprepared state it fails to meet this need then it has no value. If curators persist in refusing preparation under these circumstances, valuable information is withheld; the species may be widely misinterpreted on the

subsequent description of supposedly conspecific secondary material, possible junior or senior synonyms remain unrecognized, and inaccurate biostratigraphical data may accrue. Species based on unsectioned and unrecognizable type material are often found in collections from remote parts of the world, from where little additional material is available and collection of further material is difficult. Failure to prepare such types may obscure important biogeographical information as well as provide spurious endemic species for the unwary.

The preparation of a coral for peeling or sectioning will result in partial destruction of the specimen. Where possible, original figured surfaces should be left intact for future verification of the specimen's authenticity. It is not uncommon for older type and figured specimens to have been 'lost' or mislaid and only subsequently recognized for what they are by comparison with the original illustrations. If, however, some loss or even total loss of the figured surface is unavoidable for the minimum necessary preparation then this must be accepted. There are various ways that the surface can and should be recorded first—by photography and by casting. Modern casting techniques can produce results virtually indistinguishable on visual inspection from the original if the replica is accurately coloured. For small specimens the use of a metallurgical, or an annular saw will considerably reduce the amount of material lost in sectioning. Where an acetate peel is adequate, it may only be necessary to polish smooth one surface for the cross-section, and in colonial material another surface at right angles for the longitudinal section. Unfortunately, solitary corals will almost certainly need the cutting of an axial longitudinal section. In the case of delicate material, again a metallurgical saw with gravity feed may be an advantage and the impregnation of the area to be prepared with resin will minimize fragmentation.

I have said that a distinction should be made between type material in museum collections and other well-preserved material that may be available. Contrary perhaps to the inclinations of curators it is the type material that requires the preparation and not necessarily the other, particularly if it is good display material. Once the identity of a species is securely founded on well-prepared type material it is not unreasonable to expect investigators to carry out further detailed study on material collected for the purpose if this is reasonably readily available. Preparation of good-quality museum material can be justified, however, when material from remote regions may yield important biogeographical or biostratigraphical information, or when localities are no longer available, or additional material is extremely rare. When the external features of the corallum or coenosteum are not well preserved, there is seldom any difficulty over the preparation of sections and peels since they enhance the value of the material.

CURATORIAL PROCEDURE

Finally, there is the question as to how curators should respond. They may well feel that they cannot easily judge the merit of a particular request to section type material. In this case it would be reasonable for them to ask the applicant to set out the case for preparation, including details of the cutting and grinding necessary, which could then be submitted with photographs of the specimen in question to a recognized expert for comment. The system is analogous to the refereeing of papers submitted for

publication, with all its advantages and disadvantages. The latter would be heavily outweighed, in my opinion, by the former and would result in a better solution to the problem than a blanket policy of refusing all preparation of type material. Ultimately the decision is the curators', but advice of this sort would surely help them to make it on an informed basis.

Having agreed on the necessity for preparation and the extent of cutting and/or grinding required, the curator should decide whether or not the photographs available of the specimen are an adequate record or whether a cast should also be made before the work is done. The simplest policy is to always have a cast made unless the preparation involves only the taking of acetate peels from an already flat surface. Whether or not casting is done by the museum or the applicant will depend on the circumstances, but if the latter, the curator should ensure its adequacy before preparation begins. I am assuming that the thin sections or peels themselves will be made by the applicant. Normally this would be the best policy but in exceptional cases large and well-equipped museums, with the necessary technical and scientific expertise, could prepare the specimen. In either case, it is a fundamental rule that the sections or peels remain with the specimen and are returned after study to the museum for proper storage with the photographic record and the cast if one is made. The period of loan for study will probably vary from case to case but that the type material *should* be available for loan is implicit in this discussion.

A similar procedure could be followed for figured material, although for other museum material whether or not a cast is made is more likely to depend on the display quality of the specimen rather than purely scientific considerations.

In conclusion, I would add that not all curators are obsessively protective of their collections and insensitive to the needs of the specialist. I have met the complete spectrum from this extreme through to those whose attitudes to type and figured material in their care may be described as cavalier. Most curators are neither and are understandably concerned by the conflict between preservation (and the need to conserve for posterity) and preparation (meeting current scientific requirements). I would seek to influence them, in the case of types unrecognizable in their present state, to lean towards the latter.

REFERENCES

- SCRUTTON, C. T. 1973. Palaeozoic coral faunas from Venezuela, II. Devonian and Carboniferous corals from the Sierra de Perijá. *Bull. Br. Mus. nat. Hist. (Geol.)*, **23**, 221-281, pls. 1-10.

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DISCUSSION

M. G. Bassett. Dr. Scrutton has raised one of the issues that we are constantly faced with as curators; not only do we get requests to section material, which is an extreme case of preparation, but also to develop and prepare type material in general. This again raises the point made by Drs. Waterston and Rickards in their papers (this volume) and brings in the role of intuition in curators. There are no firm guide-lines for these procedures, but as individuals we must weigh up the merits and demerits of both the science and the

research workers involved. I think that your suggestion of some kind of referee assessment is a good one if curators themselves are uncertain as to whether particular material should be sectioned.

As a brachiopod worker who also uses serial sectioning techniques fairly often, I always photograph and make a plaster cast of a specimen before I start. Do coral workers not do this automatically?

C. T. Scrutton. As far as I know there is no general policy among coral workers to routinely cast material before sectioning. I am sure that many do this, and I certainly cast specimens before preparation when external features of the corallum are well preserved. In some cases, of course, blocks of material sectioned for corals show no external features which would be picked up by casting. Such material, however, has seldom been designated as type material and it would seem to be a wise and reasonable policy always to cast types before sectioning.

W. D. I. Rolfe. A similar ethical problem to that outlined by Dr. Scrutton can exist with material preserved as moulds. Delicate structures such as nerve and blood vessel canals may be preserved as sedimentary infills traversing the main mould that represents the fossil. In studying Ordovician calcichordates from Girvan, Dr. R. P. S. Jefferies has pointed out that great circumspection is required before such specimens are latex-peeled since these delicate structures can easily be stripped away. Again one can only rely on the integrity of a senior research worker acquainted with the problem to say when or when not to allow such casts to be made.

C. T. Scrutton. This is a good point. A corresponding problem from my point of view is whether information subsequently to prove of importance may be lost in sectioning material. We must judge each case carefully as it arises, but we should not allow hypothetical future possibilities to prevent adequate preparation for today's scientific requirements. Such an attitude would simply stop the progress of most research.