

Ellis & Solander's 'Zoophytes', 1786: six unpublished plates and other aspects

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Abstract

Ellis & Solander's (1786) *The natural history of many curious and uncommon zoophytes* . . . set a new standard of taxonomic excellence in studies of the 'zoophytes', or animals whose colonies bear a superficial resemblance to plants. The book underpins much subsequent work on hydroids, sea fans, black corals, soft corals, stony corals, some other colony-forming invertebrates, and coralline algae. Several of the intended plates were not published with the work but six of these survive as apparently unique proof-pulls bound in Sir Joseph Banks's copy, held in the British Library. These are reproduced, and modern taxonomic assessment is made of the 22 nominal species depicted. These comprise 15 stony corals, three hydrozoans, two bryozoans and two red algae. In addition some 20 further species depicted on six of the originally issued plates but without captions are identified where possible and taxonomic notes given. This group includes eight stony corals, three sea fans, one hydroid, four bryozoans and three sponges. No type material is designated, but a number of types are recognized.

Several other aspects are discussed in varying detail: the dispersal and subsequent fate of the specimens and collections on which the book was based; the fate of all Ellis's collections, manuscripts and library; the location and identity of the original pencil drawings for the Ellis & Solander book and the identities of the engravers where known; the joint authorship and production of the 1786 book; the lives and work of the two men; and notes on some of their manuscript material and correspondence.

Keywords Sir Joseph Banks, Bibliography, Biography, British Museum, Bryozoa, Cnidaria, Collections, Corals, Coralline algae, Drawings, Jonas Dryander, John Ellis, History of Science, Hydrozoa, Manuscripts, Museums, Portland Catalogue, Scleractinia, Daniel Solander, Stylasterina, Taxonomy, Zoophytes.

Introduction

From its first publication in 1786 Ellis & Solander's *The natural history of many curious and uncommon zoophytes* . . . became a standard work in many branches of taxonomic zoology and botany, and has remained so for two hundred years. During its preparation Solander was for much of the time employed at the still young British Museum, and Ellis had tables there. The book was one of the first fruits to follow from the establishment of that world-famous institution. A feature of the work was its sixty-three exquisitely-engraved plates. The engravings for further plates had evidently been lost by that time, and only single proof-pulls from just six of them survive. These have long been known in a copy of the book once belonging to Sir Joseph Banks and now preserved in the British Library, but have been almost completely overlooked by taxonomists and bibliographers alike. Their scientific value is considerable. The six are at last reproduced herein (Figs 2-7; see also Fig. 8), and for the first time are taxonomically assessed (p. 27). Some other illustrations perhaps intended for the book survive only as the original pencil drawings (p. 51), but these are not assessed here.

Various other aspects of the work of the two authors are considered, among them the background against which the joint book was produced, the division of authorship within it, the fate of the coral specimens illustrated in the book and of Ellis's manuscripts and other collections, the provenance of the largely extant original drawings for the plates, and taxonomic notes on the several illustrations in the book for which captions were not provided.

Background

Zoophytes: an obsolete concept

At one time there was a widespread belief among naturalists that the several groups of animals forming sessile, branched colonies were actually plants. Such forms were uncritically classified together as 'zoophytes'. At the start of the eighteenth century the term encompassed animal groups as diverse as coralline algae, bryozoans, sponges, and the cnidarian (formerly 'coelenterate') classes today known as scleractinian corals, gorgonians, antipatharians and hydroids.

The grouping together of 'zoophytes' is no longer acceptable in biology but in the context of the present subject the term serves a purpose and we have used it to avoid circumlocution. For a similar reason we have in places used the now restricted generic term *Madrepora* in the original, wide sense to embrace almost all the scleractinian corals, in the way that it was employed by Ellis & Solander (1786) and their contemporaries.

During the eighteenth century zoophytes became better known and group by group their animal nature was revealed. But some authorities were slow to accept these revolutionary findings. A protracted international debate ensued. It was well documented by Johnston (1847; see also Savage, 1948: iv). In common with many others, Johnston considered that it was a London-based amateur naturalist John Ellis who, in the eighteenth century, became the champion of those who rightly considered most 'zoophytes' to be animals.

John Ellis, F.R.S. (?1710-1776)

Ellis's eminence and the international respect he enjoyed resulted from the excellence of his scientific work. Paradoxically, until recently rather little had been written about him. Groner (1987) has recently surveyed many little-known aspects of Ellis's life. For example, he has advanced evidence that the birth date of 1710 is probably correct; but has challenged the traditional view that Ellis was born at an unrecorded place in Ireland, concluding that he was born near London. Rauschenberg (1978*a*, 1978*b*), too, summarized many aspects of Ellis's scientific and non-scientific life. Ellis became a successful and respected merchant and was for some years King's Agent for West Florida and Colonial Agent for Dominica. Groner has given an extended account of these activities. Further biographic information about Ellis is given by Smith (1819, 1821), Stephen (1889), Carruthers (1901), Harmer (1931*a*), Savage (1934, 1948), and Rauschenberg (1978*a*, *b*).

In his zoological activities Ellis covered all the main zoophyte groups but his most detailed work was on the British hydroids. He published numerous scientific papers, mostly in the *Philosophical Transactions of the Royal Society* but also in the *Gentleman's Magazine* and elsewhere. A nearly complete list is available in one of his publications (Ellis & Solander, 1786 – Ellis, 1766, is omitted; see also the bibliography in Ellis, 1767). Among his non-zoological scientific activities were many botanical, agricultural and horticultural projects (Rauschenberg, 1978*a, b*; Mackay, 1985; Groner, 1987) and the improvement of the crude microscopes of the day (Rowbury, 1982; Groner, 1987).

His first book (Ellis, 1755) provided the earliest illustrations of some of the zoophyte groups and achieved a descriptive excellence and comprehensiveness which were unparalleled for many years. The illustrations were unusually accurate for the day, and were engraved by leading craftsmen (pp. 51–54). French, Dutch and German translations followed (Ellis, 1756*a*, 1756*b*, 1767), the last being an expanded edition including a useful bibliography of Ellis's works then available and of those of other zoophyte workers.

The 1755 work can be dated accurately. Ellis's own manuscript annotation to the title page of the presentation copy in the Royal Society, London, states 'March 6, 1755', indicating publication at or around that time. A stamp on the reverse states 'Soc. Roy. Lond./ex dono. Auctoris'. Since the dedication at the start of the work was dated 15 December 1754, it seems that publication was swift. Ellis's own copy of the work is preserved in Glasgow University Library (shelf mark Sp. Coll. q 450; P. K. Escreet, pers. comm.).

Some other particular copies can be mentioned. A copy of the French edition (Ellis, 1756*a*) in the Zoology Library of the British Museum (Natural History) [BMNH] (Cnidaria Section, shelf-mark 45E) bears a library book-plate of 'Alex^r. Watt', the husband of Ellis's daughter Martha (Dawson, 1958), together with Watt's coat of arms. Martha Watt's great importance in Ellis & Solander's joint book is discussed below (pp. 23, 36, 50). Also in this copy of Ellis, 1756*a*, is a printed label stating 'Meriel Nevill Watt'; and a third, indicating 'Rev^d. Alfred Gatty' with his coat of arms. Written on the fly-leaf is 'Margaret Gatty October 1857 for 5/6'. The last-named was an amateur nineteenth century algologist. 'Margaret Gatty, a Yorkshire clergyman's wife . . . wrote a History of British seaweeds' (Barber, 1980: 31). Evidently the copy had a pedigree before coming to the BMNH in 1928. Comments on the previous ownership of a copy of the English edition (Ellis, 1755) preserved in the BMNH were given by Sawyer (1964).

Ellis's work was not without fault. Ironically, he wrongly considered what are today known as coralline algae to be animals (Johansen, 1981: 179). But perhaps an even greater oversight was that he almost totally ignored the important work on *Hydra*, the 'freshwater polyp', which appeared when he was in his early thirties. The pioneer work was published in French by Trembley (eventually appearing in 1744), and almost identical subsequent research was reported by Henry Baker (published more quickly, in 1743). Trembley was mentioned only briefly in Ellis's first book (Ellis, 1755: xvi) and Baker not at all, despite his skilful work. Given that *Hydra* was already widely accepted as animal, and that it was clearly similar to the hydranths or feeding polyps which Ellis had studied closely in hydroids, it is odd that he did not invoke this similarity as a forceful argument for hydroids and hence other zoophytes being animal (p. 47). Ellis (1755: xvi, pl. 28, fig. c) mentioned *Hydra* and illustrated it with a figure so poor and unrepresentative that it would seem probable that he had not seen *Hydra* by this date. However, he later noted (Ellis & Solander, 1786: 10) that he made a thorough examination of specimens in 1770 – when already elderly – and was by then clear about their structure and affinity. Baker was still not cited, perhaps since he was widely, but possibly unfairly, considered to have plagiarized Trembley's work (J. R. Baker, 1952; Lenhoff & Lenhoff, 1985, 1986). There would seem little doubt that the books of Trembley and Baker were readily available to Ellis in London. Trembley's even appeared in the sale catalogue of Ellis's library (Robson, 1786: 62). Although the books of S. Dayrolles were mingled with those of Ellis in the catalogue Dayrolles apparently had no connection with biology (D.N.B.; B.M. Catg. Printed Books) and the Trembley book would most probably have belonged to Ellis. Given that Trembley's impact on biological thought was great, with repercussions quite outside the study of zoophytes, Ellis's omission must be judged a major one. Archinard (1985:

340) felt that 'Ellis, who often mentions Trembley in his book, was greatly influenced by his work with aquatic creatures' but the occurrence of just a single reference to Trembley in Ellis's book (in the introduction) seems to contradict this.

But such oversights as these were unusual in Ellis's work and his subsequent high standing in the scientific community was well deserved. Linnaeus perhaps overstated the case when he remarked that Ellis was 'the main support of natural history in England' and that he had 'derived more information, through [Ellis's] various assistance, than from any other person' (Rauschenberg, 1978a: 150; Stearn, 1981: 19). But Ellis was certainly a leading naturalist and was highly talented. He corresponded with some 150 British and foreign naturalists (Savage, 1948; Groner, 1987), a number of contacts which would indicate industry even in today's mechanized world. His correspondents included many of the most senior naturalists of the day.

Some measure of the excellence of his pioneer work on hydroids can be gained from the following. In the tenth edition of the *Systema naturae* (1758) Linnaeus, not being able to read English, based many of his zoophyte species on Ellis's (1755) illustrations (Cornelius, 1979: 309, note 13). Since zoological nomenclature is taken as starting with this edition of the *Systema*, Ellis's illustrations and the specimens from which they were drawn have a considerable importance in the several animal and plant phyla represented. An indication of Ellis's success in defining species is that, of the 26 hydroid species based by Linnaeus almost solely on the illustrations in Ellis's (1755) book, the validity of only one is doubted today. This one is *Sertularia argentea* Linnaeus, 1758 (discussion in Cornelius, 1979; see also Cornelius & Ryland, in press). The question of its validity is still not resolved but Ellis's reputation is undiminished. There can be few eighteenth century naturalists whose species lists are virtually accepted today, and still fewer who at the same time were pioneers in their fields. It may be that in his major research field none has a better record than Ellis.

In addition to advancing these several fields of zoology Ellis was active in horticulture and agriculture, being especially interested in importing plants likely to be of economic use and making similar translocations between certain British colonies. In addition he made refinements to the still primitive single-lens microscopes of his time.

These and many other aspects of Ellis's life and achievements were reviewed by Groner (1987), who provided an extensive bibliography of books, articles and manuscript material.

Ellis died in 1776. Although his daughter, Martha Watt, gave the date as 15 October in the introduction to her father's book (Ellis & Solander, 1786) different dates were given in contemporary publications and Groner (1987), who examined the evidence, concluded that 5 October 1776 was the correct date.

The state of biology in Ellis's England

Ellis's scientific achievements should be evaluated in their contemporary perspective. During his lifetime the study of most fields of terrestrial natural history was, in Britain as in most other countries, still only a little beyond the accumulation of folk-lore; and that of the sea was less advanced still. When Ellis's first book was published in 1755 the inauguration of the British Museum and its famous Department of Natural and Artificial Productions was still a year away. Ellis was about 45, and had already made a great impact on the world of science without the benefit of contact with a learned institution. The British Museum's first 'Under Librarian of Natural History', James Empson (d. 1765), was perhaps the earliest publicly-salaried biologist in Britain, the study of natural history being almost exclusively in the hands of wealthy amateurs at that time. Ellis was evidently among the first amateur scientists to make use of the facilities of the British Museum. The recent and masterly historical account by Carter (1988) has provided a wealth of information on Sir Joseph Banks and his scientific circle in these very early days of the 'BM'; and Groner (1987) has given a detailed analysis of Ellis's place in that embryonic scientific community.

Many of the popular books on natural history produced in the mid-eighteenth century were merely a repetition of country gossip or religious dogma. Gilbert White (1720–1793), author of one of the earliest and most celebrated popular works that were trustworthy (White, 1789),

was in 1755 just re-settling in his childhood Selborne. Those of his journals and letters which were subsequently published commence in or soon after 1767 (Windle, in White, 1906; White, 1982) when Ellis was already about 57 and had achieved international fame as a scientist. At this time White was about to join in a debate that went on for some twenty years concerning whether swallows and martins migrated southwards to avoid the British winter or whether they settled in mud at the bottoms of ponds! Such was the state of British natural history. The cultural circle of naturalists, especially in London, must have been small and it was perhaps not just coincidence that one of the eventual publishers of Ellis's second (and posthumous) book (Ellis & Solander, 1786) was Benjamin White, brother of Gilbert and the leading natural history publisher in London at that time (Johnson, in White, 1982: xix, xxxv).

Thus Ellis can be regarded as one of the leading amateur naturalists in mid-eighteenth century England. At this time there were virtually no professionals and his contributions both to the methodology of invertebrate zoology and to its total knowledge were great.

Daniel Carlsson Solander (1733–1782)

In the late 1750s John Ellis, together with another British naturalist, Peter Collinson (1694–1768), had the foresight to ask Linnaeus to nominate an able student to visit England 'for a year or two' to promulgate his binominal system and views on classification (Banks, in Rauschenberg, 1964; Marshall, 1977; Rauschenberg, 1978*a*). Linnaeus recommended Daniel Solander, an unusually capable scholar brought up in Piteå in the far north of Sweden before studying under Linnaeus in Uppsala. A resumé of Solander's years in Sweden has been given by Jonsell (1984). Linnaeus regarded him as one of his most talented students.

Solander based himself in London for many years and fully achieved what was expected of him. He arrived in 1760 and in 1763 took a post at the British Museum. He was charged with cataloguing the natural history collections (Rauschenberg, 1968; Marshall, 1977; Stearn, 1981; Diment & Wheeler, 1984). Later, from 1768 to 1771, he accompanied Sir Joseph Banks (1743–1820) in his capacity as naturalist on James Cook's first circum-global expedition, in H.M.S. *Endeavour*. On returning Solander assumed a second major commitment, of assisting Banks in writing up the results from the enormous collections from this voyage (Marshall, 1977; Stearn, 1984; Wheeler, 1984*b*, 1986), though relatively little appeared in print. During these years Solander was again employed by the British Museum, of which Banks was a leading Trustee, and he was in consequence also one of the first salaried biologists in Britain (Stearn, 1981, 1984; Wheeler, 1984*a*, 1984*b*). Thus, in contrast to Ellis, Solander was for most of his career a full-time, professional naturalist.

Solander was evidently well aware of the dangers that can beset a museum-based naturalist, an awareness perhaps instilled by Linnaeus himself. The following seldom-quoted anecdote conveys a warning still valid for any collection-oriented systematist:

'. . . when a green living plant was brought to Solander by a lady to be named, he studied it attentively and then said: "Madam, if you shall take this plant home and put it between paper and shall sit upon it for a week, I shall tell you its name.".' [Cole (1895); cited in *Geological Magazine* (1895) 32: 477]

Also in contrast to Ellis, Solander's numerous scientific activities have recently become well documented. Rauschenberg (1968) provided a long account which considered most aspects of Solander's life and work. Summaries of Solander's career after coming to London were given by Marshall (1977, 1984), and of Solander's role during and after the *Endeavour* expedition by Marshall (1977), Wheeler (1984*a*, 1984*b*, 1986), Stearn (1984), Tingbrand (1984), and others whom they cite. Solander's manuscripts have been exhaustively documented by Diment & Wheeler (1984).

The date of Solander's death was 13 May 1782 (Rauschenberg, 1968; H. B. Carter, pers. comm.). Some authors have misquoted it (Banks, in Alströmer, 1785, as 12 March 1782, translated similarly in Rauschenberg, 1964; Marshall, 1984, as 12 May 1782).

The recent scholarly work by Carter (1988) includes a great deal of information about many aspects of Solander's life and work.

The association between Ellis and Solander, and their joint work

At the start of the *Endeavour* expedition in 1768 Banks was 25 years of age, Solander 35 and Ellis, who did not take part, around 58. Their relative ages have some bearing on Ellis & Solander's (1786) subsequent joint publication, a book on zoophytes slightly longer than Ellis's first and rivalling it in excellence.

Ellis had been preparing this second book over many years, starting at least as early as 1765 (letter from Ellis to David Skene, p. 41). The book was in the end posthumous to them both. It, too, can be dated fairly precisely since a copy was presented to the Royal Society on 23 February 1786 (note inside Royal Society copy), implying publication early that year.

Lamouroux (1821) reprinted the 63 Ellis & Solander (1786) plates in his own book. In his preface he modestly stated that his book could be regarded a new edition of theirs, but it has never been so cited.

Before Solander arrived in England Ellis seems not to have had the advantage of a scientific collaborator. Ellis was clearly eager to meet, and the two lunched on Solander's second day in England (Rauschenberg, 1968: 16). They became close colleagues. Indeed, it was the essence of Solander's great contribution to the English scientific scene that he assisted numerous naturalists in their endeavours – often without taking his due credit in authorship (Banks, in Rauschenberg, 1964). With Ellis, as perhaps with others, Solander evidently developed an informal friendship. Thus one letter to Ellis is marred by an enormous ink blot. At the end he wrote:

‘To acct. for this Curious blot, contemplating on a fine Lady I threw the Ink instead of the Sand on your Letter which you must excuse as I have no time to copy it fair.’
[undated; *BL Add MSS* 29–533, f. 39]

Diment & Wheeler (1984) recorded that under this same British Library number are preserved 34 letters from Ellis to Solander written in less than three years from 1760 to 1763. Bearing in mind the paucity of ‘biologists’ at that time this leaves no doubt that they were intimate friends. Despite their difference in age they made at least one historic field trip to coastal localities in southern England looking at zoophytes (Ellis, 1766; Rauschenberg, 1968: 18; 1978*a*).

A letter from Ellis to Dr David Skene, an Edinburgh physician and prominent naturalist (Lenman & Kenworthy, 1977), indicates the working relationship he had with Solander:

‘. . . I have told Dr Solander that we must sit down and arrange [the zoophytes] properly for him . . . Dr Solander has all this day been busy at the Museum . . . but is to come and spend a day in order to answer your very proper objections to [the classification of] Linnaeus Zoophytes’ [25 April 1765, University of Edinburgh Library MS; transcription published in Thomson, 1860.]

Clearly Ellis at this time valued Solander's advice on the then important question of generic divisions within the zoophytes.

The authorship of Ellis & Solander, 1786

Solander undoubtedly had some role in Ellis's second book but its extent has been debated and is discussed further below (p. 36). The title page has led to its being cited as Ellis & Solander, but opinions have differed as to whether one or the other was sole author. Curiously, none of the critics has suggested that they each contributed sections but it seems that they did.

The point is important since both Ellis's books (Ellis, 1755; Ellis & Solander, 1786) have long been regarded as major works. They occupy key positions in the early literature of groups as diverse as algae, sponges, bryozoans, hydroids and various of the anthozoan groups, especially the true or stony corals.

Solander's reputation

Assigning authorship of the different sections of the Ellis & Solander book is interesting also in bibliographic history, since it was the biggest zoological publication in which Solander was named as author. He produced an enormous amount of manuscript material (Rauschenberg, 1968; Wheeler, 1984*a*, 1984*b*, 1986; Diment & Wheeler, 1984; Stearn, 1984) and sustained his fame posthumously through his past and continuing connections with Linnaeus, Banks, Ellis, James Cook and many others. In the context of the times much of his fame was surely justified. But published works by him were few, and in consequence during the nineteenth century his contribution to science was not given great credit (Stearn, 1984). This, and perhaps comments such as those by Banks (Rauschenberg, 1964) and several others on Solander's life style, have led to his reputation being tarnished in some quarters (Rauschenberg, 1968; Marshall, 1977; Wheeler, 1984*b*).

However, as noted by Rauschenberg (1968) and Wheeler (1984*b*) among others, his poor publication record belied his extraordinary energy, skill and output of manuscripts. Thus Krok (1925, quoted in Rauschenberg, 1968, and in Stearn, 1981) listed no fewer than 66 botanical publications in which Solander's work was included, and Stearn (1981) listed another. Jonsell (1984) even went so far as to say that in quality [some of] Solander's unpublished descriptions 'surpassed those of Linnaeus himself', though in such comparison the sheer magnitude of Linnaeus's output has to be considered.

Solander made the demanding but successful voyage with Banks – a much younger man – and Cook, and remained Banks's closest colleague afterwards (Banks, in Rauschenberg, 1964). Their friendship also withstood a testing voyage to the Hebrides and Iceland in 1772 (Rauschenberg, 1968). It should be recalled that Banks was one of the foremost cultural figures in Europe at that time, so to remain his close associate over many years, and after the confines of these voyages, was some testimonial.

Solander died unexpectedly when only 49. His surviving manuscripts indicate that given more time he might have produced a work rivaling the *Systema naturae* itself in authority and scope (Whitehead, 1975; Diment & Wheeler, 1984; Stearn, 1984). Solander's critics have themselves been criticized by Rauschenberg (1968), Marshall (1977); Stearn (1981, 1984), Wheeler (1984*a*, 1984*b*, 1986) and Tingbrand (1984) all of whom emphasized Solander's achievements.

Martha Watt, the book's editor

Martha Watt was Ellis's sole surviving offspring. During her short life (27 December 1754 – January 1795) she had several misfortunes, but can be remembered as the person whose industry was responsible for the publication of Ellis & Solander's important book. Her mother died in childbirth when she was four and she was raised by an aunt, but it would seem that John Ellis had contact with her since she subsequently battled to have his book published. She lost her father when she was 22, and was 28 when Solander died. Thus it may well be that during her mid-twenties she was well aware of her father's virtually complete manuscript, with its beautiful and costly plates, lying untouched in Solander's office. On Solander's death she evidently lost no time in getting it published (p. 50). She herself died in childbirth at age 41. Groner (1987, ch. 2, note 59) has provided a more detailed synopsis of her life.

We have not determined whether or not she was the 'Miss Ellis' responsible for Ellis & Solander's (1786) plate 28 (see below, p. 52).

The six unpublished plates

Solander died some six years after Ellis. The manuscript of their book passed to Banks and soon after to Martha Watt who saw it through to publication (p. 50). Many copies of this seminal work survive. All from the published issue known to us have 63 plain, or in some copies coloured, engraved plates. But in Banks's personal copy (British Library 461.1.19), evidently a proof, there are 6 extra plates numbered in manuscript 64–69. In size, style and manner of engraving they are roughly uniform with the others, and with them is a contemporary manuscript page of captions.

The copy seems unique in having these extra plates. We have examined it to determine the species depicted, and have included reproductions of the plates and accompanying manuscript captions herein (Figs 2–8). Students of the several groups covered by the work had been puzzled for years by some of the brief and often vague Latin diagnoses of species assigned by Ellis & Solander to the genus *Madrepora*, which at the time included all the scleractinian corals. Some of these and other taxonomic issues have been resolved from study of the six plates. The analyses of the bryozoan and the alga have been prepared respectively by Miss P. L. Cook and Mrs L. M. Irvine, both of the British Museum (Natural History), and we are grateful to them.

Other aspects

During our work we have collected information on other aspects of Ellis & Solander's book, and have included much of it in supplementary sections. Many of the exquisite drawings from which the plates were engraved are preserved in London. Several other drawings were perhaps also intended for engraving since there is brown transfer powder on their backs, but no reproduction of them is known. We have catalogued some of the drawings (pp. 51–54) and provided notes on what we know of the fate of some other Ellis manuscripts and of his important but largely lost collections (pp. 54–61). The Ellis manuscripts in the Linnean Society, London, are particularly valuable since in the genus *Madrepora* they include much biologically important detail omitted from the book (p. 43). Lastly, we have commented on the identity of several corals and some other zoophytes illustrated in Ellis & Solander's book without captions.

Sir Joseph Banks's copy of Ellis & Solander's *Zoophytes*

Text and plates

The text of the copy (British Library 461.1.19) is identical with that of published copies and has the same pagination. Plates 1–63 are like those of other copies but have minor differences. They are clearly proofs on Whatman paper pulled before lettering. Most of the figure and plate numbers are in manuscript but correspond to the published captions to the plates (Ellis & Solander, 1786: 192–206). Plate 8 (holothurian and pennatulid) is oversize and folded: in published copies it is closely trimmed and unfolded. Plate 36 (*Madrepora virginea*) is duplicated. The first is in an earlier state than in the published version with more of the base of the coral showing and including three additional figures of enlarged details lacking in the issued plate; and there are no plate or figure numbers. The second is as published.

But the most notable features of this apparently unique copy is that it has six extra plates after the normal 63, numbered 64–69 in manuscript (present Figs 2–7). They too are proof pulls. Following them is bound in a sheet with manuscript explanations of all but the last (Fig. 8). The handwriting is not certainly identifiable but comparison with examples of the handwriting of such likely persons as Solander and Dryander (Marshall, 1978) suggests Dryander, who may have compiled the captions from notes of Ellis or Solander when the volume was being assembled. J. B. Marshall kindly examined the explanation sheet and thought Dryander as the likely writer. Like the published edition, Banks's copy has no caption to plate 63.

The earliest printed reference to Banks's copy was by Dryander (1796, 2: 338) in his catalogue of Banks's library, which was incorporated into the British Museum library (now forming part of the British Library):

'In nostro exemplo ectypa etiam adsunt 6 tabularum, quae post mortem auctoris deperditae, in libris editis desiderantur.'

A piece of text showing this lettering, and evidently cut from a copy of Dryander's (1796) *Catalogue*, is pasted to the front endpaper of the Banks copy.

H. Milne Edwards & Jules Haime (1850: 68; 1857, 1: xxii, 2: 107), who in the late 1840s spent some time in the British Museum studying the coral collections, noted the existence of the volume in that institution:

‘. . . six des planches préparées par Ellis furent perdues après sa mort et ne sont connues que par les épreuves avant la lettre accompagnant l'exemplaire de Sir Joseph Banks, qui possède aujourd'hui la bibliothèque du British Museum, à Londres.’
(Milne Edwards & Haime, 1857, 1: xxii)

and

‘Cet exemplaire [in the BM] renferme les épreuves de six planches qui n'ont pas été publiées et dont on n'a pu retrouver les cuivres après la mort d'Ellis.’ (Ibid, 2: 107, footnote)

We know of no other comment on the timing of the loss of the six engravings, here implicitly – but not certainly – placed between Ellis's death in 1776 and Solander's in 1782 (p. 51). The comments may simply be a paraphrasing and elaboration of Dryander's note. There is evidence that there were other intended plates since some of the original drawings, which still survive in London and of which engravings or prints are not known, nevertheless have brown transfer powder on the reverse (p. 51).

Edwards and Haime also cited one of the plates in the BM copy in their account of *Madrepora mammilaris* (see below, pp. 30–31). But the only other reference to Banks's copy we have found is that in the *Printed Catalogue of the British Library*.

Watermarks

Study of the watermarks of the Banksian copy provides some additional information. The majority of plates have a watermark but most of the text-pages lack one. There are two main types and some subsidiary ones.

The most frequent watermark is a coat-of-arms with a bend (broad diagonal band) on the shield, a complex fleur-de-lis above, and the initials GR below. This occurs in the paper on plates 3, 4, 9, 12–13, 15, 19, 22, 28–30, 33, ?34, 38–41, 44–46, 48, ?51, 52–53, 56 and 60. It is closely similar to that dated 1776, from a ‘place unknown’, by Heawood (1950: pl. 24, type 158). Heawood associated the maker's-name watermark ‘J WHATMAN’ with this type, suggesting that James Whatman of Kent, whose name became associated with this kind of paper, supplied this batch. A ‘J WHATMAN’ watermark occurs on most intermediate plates, viz. plates 2, 5–6, 10–11, 14, 16–18, 20–21, 24–26, 31, 36 (normal version), 42, 47, 57–59, 61–62, 64. Possibly the paper was cut so that the coat-of-arms watermark fell on one side of the cut and ‘J WHATMAN’ on the other.

A type of watermark similar to the first appears on the flyleaf at the back of the book bearing Dryander's captions (present Fig. 8). But here the initials GR are replaced by a complex looped design. It is thus similar to that recorded from a James Whatman paper by Churchill (1935: cccx, type 415) except that his illustration shows a posthorn on the shield not a bend. That illustration is dated 1784 (Churchill, p. 84). The looped design appears in the watermark recorded from another Whatman paper, dated 1777 (Churchill, type 324). Thus although the paper bearing Dryander's captions is unique within the book it is nonetheless contemporary and from the same manufacturer as the bulk of it.

A more complex design appears in a few places. It comprises a shield bearing a fleur-de-lis with a P in the central arm, an elaborate crown above, a simple geometrical figure below, and below this the initials LVG (pls 43, 54, 65, 67) or VCL (pl. 23). Plate 1 has a similar watermark but its letters are obscured by the printed figure, and plate 49 has the letters, if once present, off the edge of the paper. The LVG design corresponds closely to Churchill's Type 406 (his p. 301), and the VCL one to his Type 407 (p. 302). The LVG design he dated as introduced in 1733, and was apparently in use for many years. The LVG type was mentioned also by Heawood (1950: 105, pl. 254, type 1824) but with a minor difference, and classified as ‘England, Kent, 1741’. On plates 7 and 55 the watermark comprises the paper maker's name

I VILLEDRAI. This was linked by Churchill (p. 302, Type 407) to the VCL design. Thus these 8 plates were printed on paper perhaps made some 30–40 years before that of the main batch. Possibly their engravings were among the first to be done (p. 41) and the proofs were stored by Ellis for many years.

Several plates have no watermark, in common with most of the text (pls 8 (oversize), 32, 35, 37, 50). Some others lacking watermarks are on slightly thicker paper than the rest [pls 36 (the oversize copy), 63, 66, 69]. The paper of plate 68 bears just the tip of an unidentified but apparently still further kind of watermark, and that of plate 51 has the watermark obscured.

Lastly, the watermark of plate 27 is unique within the Banks copy. It comprises the initials HR with a cross below and a geometrical figure above, the whole contained within a vertically-orientated oval. We have not identified this watermark.

The surviving proofs of the six extra plates (64–69) unique to the Banksian copy were thus printed on a variety of papers. The paper of plate 64 dates from around the period 1777–1784; that of plates 65 and 67 is probably much earlier, from 1733 on; plates 66 and 69, and also plate 63, which lacked a caption in the published version, are on a thicker paper lacking a watermark; and plate is printed 68 on a paper of normal weight with perhaps yet another watermark type.

The evidence from the watermarks thus shows that the Banks copy was printed on a small range of English papers. Their intermingling suggests that the text and most of the plates were printed within a short period. Though it is possible that some of the plates, being on a slightly different paper, were printed on other occasions we have no evidence whether or not this was so or of the time scale involved.

Binding

The inner endpaper at the front of the volume comprises two sheets with the 'LVG' watermark (see previous section) pasted together, implying that the existing binding is contemporary with the printing. The rear endpapers were present in 1978 when we jointly examined the book but since then, around the time that the photographic work was done for the present figures 2–8, they have gone missing. The binding has deteriorated over this period. The boards are now loose and it would seem likely that rebinding might occur. Hence it should be recorded that the lettering piece on the spine reads 'SOLANDER/ZOOPHYTES', an interesting wording since the book was written mainly by Solander's then late friend Ellis (pp. 36–51)! Solander had died some four years before publication, Ellis about ten. Dryander, Banks's librarian when and after the book was produced, later attributed the book to Ellis alone (p. 38) and would seem unlikely to have put Solander's name on the spine. Banks had been close to Solander for many years (p. 23) and it would seem plausible that he might have authorized the wording. Possibly he was partly responsible for the incorrect opinion that Solander wrote most of the book (p. 39). In the opinion of E. M. B. King, of the Department of Preservation Services of the British Library, the book was rebacked at an early stage – probably before transfer to the British Museum library in 1827 (the transfer taking place seven years after Banks's death). It is not clear if the lettering piece is the old one transferred to the new spine or an early replacement, but it is certainly contemporary or nearly so with Banks and his staff. Thus Banks's influence on the wording would seem likely.

Published copies

Three copies of the published version of the book preserved in the British Museum (Natural History) have slightly differing watermarks, though nearly all of the paper has the 'GR' type described above or a variant of it. In these copies the watermarks overlap the centrefolds, so that all are partly concealed with the binding. In the plates of the Banks copy, although the paper on which the text was printed was similar to that in the BMNH copies, nearly all watermarks occur in the centres of the pages or at least away from the edges. A copy in the Cnidaria Section of the Department of Zoology has the text on 'GR' paper and the plates lacking any watermark. Another in the Harmer Library, Bryozoa Section, has the text on this

paper (excepting pages 97/98, which bear the LVG watermark) while the plates have a variant of the GR design. A third copy, in the Rare Books Room under the care of the Zoology Library, has both text and plates on paper with the GR watermark. In all three copies the plates are on slightly thicker paper than the text. Thus although the normal issue of the book was evidently produced on a range of papers, it is clear that the text and most of the proof pulls of plates in the Banks copy were on 'GR' paper contemporary with the main run.

Conclusion

The Banks copy was, therefore, probably assembled from several proof pulls of plates already made, possibly many years earlier, plus proofs of many other plates pulled around the time the text was printed, together with a set of text pages which were probably not proofs. If the text pages had been proofs they might have borne annotations and corrections but there are none. Hence it would seem likely that the text of the Banks copy was taken from the printing chases as finally set and imposed by the compositor.

The six unpublished plates

This section includes an analysis of the six Ellis & Solander plates newly published here (Figs 2–7) and unique to Banks's copy of the book in which they are numbered 64–69 in manuscript (p. 24).

Our analyses have been written as follows: Miss Patricia L. Cook (PLC), pl. 64 (1–2); Mrs Linda M. Irvine (LMI), pl. 64 (3–4, 7–8); Paul F. S. Cornelius (PFSC), pl. 64 (5–6); John W. Wells (JWW), pls 65–9. The identifications of the specimens illustrated are summarized in Table 1.

The single page of MS captions in Banks's copy is also reproduced here (Fig. 8). As noted (p. 24), the writing is probably by Dryander. It is incomplete, and though it relates to the extra plates it includes no captions for the unpublished plate 69. Banks's copy also has marginal annotations in the text of the book against the account of each species, referring to the illustrations on the six plates, but again plate 69 is not indicated.

Plate 64, Figures 1–2. *Cellaria ternata*

(Present Fig. 2)

Gymnolaemata, Cheilostomata, Scrupocellariidae

Cellaria ternata Ellis & Solander, 1786: 30 [pl. 64, figs 1–2].

Menipea ternata: Hincks, 1880: 38, pl. 6, figs 1–4.

Tricellaria ternata: Ryland & Hayward, 1977: 144, fig. 69.

Part of a colony is illustrated life size in the unpublished plate 64, figure 1, in Banks's copy of Ellis & Solander's book, and shown at an approximate magnification of $\times 10$ in their figure 2. Our reproduction of each is slightly reduced. Their figure 2 clearly shows internodes of three zooids, scuta covering the opesia of some zooids, prominent oral spines, narrow, jointed nodes, and rhizoids. All are characteristic of modern concepts of *Tricellaria ternata*, and since the only other British species today referred to the genus, *T. peachi* (Busk), has many more zooids in each internode, a reduced number of spines and no scuta, the two species cannot be confused.

T. ternata is type species of the genus *Tricellaria* Fleming, 1828, and is currently referred to this genus (Ryland & Hayward, 1977).

Plate 64, Figures 3–4. *Sertularia spicata*

(Present Fig. 2)

Algae, Chlorophyta, Dasycladaceae

Genus *Batophora* J. Agardh, 1854*Batophora oerstedii* J. Agardh 1854: 107; Børgesen, 1913: 73–75, figs 58–59; Taylor, 1960: 98, pl. 4, figs 3–4, pl. 5, fig. 4.*Sertularia spicata* Ellis & Solander, 1786: 58 [pl. 64, figs 3–4].

Figure 3 on the unpublished plate 64 shows five erect plants of what appears to be a dasycladacean green alga, connected by a stolon. Figure 4 is a stylized magnified drawing of part of an axis bearing whorls of ternate branchlets: some of these are omitted from the drawing, presumably for clarity, but their positions on the axes are indicated. Several of the branchlets are fertile and show clusters of sporangia at the basal nodes. The aggregation of sporangia in this way suggests that the alga illustrated should be referred to the genus *Batophora*, rather than to *Dasycladus* itself. In the latter genus the sporangia are borne singly on the basal cells of the branchlets (Taylor, 1960: 97). *Batophora* also differs from *Dasycladus* in having a naked stipe below, rather than being clothed with branchlets throughout.

The provenance of the original specimen of *S. spicata* was not indicated in the original description. *B. oerstedii* occurs throughout the Caribbean, a region from which many of Ellis's zoophytes were collected.

As far as LMI is aware *Sertularia spicata* Ellis & Solander has not previously been considered an alga, no doubt because the description was difficult to interpret without the accompanying plate. It should be noted that the specific epithet antedates that currently used in the monotypic genus *Batophora* (*B. oerstedii* J. Agardh) by many years.

B. oerstedii is usually described as occurring as single individuals, not with erect shoots connected by a stolon as in the previously unpublished plate 64, figure 3; although Børgesen (1913) illustrated the base of a specimen with many irregular, lobed and ramified rhizoids. Dr M. Nizamuddin, University of El Fatah, Libya (pers. comm. to LMI), commented that his work on the related genus *Udotea* indicates that this feature is not easy to detect and careful field observations are necessary to determine the presence or absence of a stolon.

Plate 64, Figures 5–6. *Sertularia evansi*

(Present Figs 2, 9)

Hydrozoa, Hydroida, Syntheciidae

Genus *Synthecium* Allman, 1872*Sertularia evansi* Ellis & Solander, 1786: 58–59 [pl. 64, figs 5–6]; Johnston, 1838: 127.*Dynamena evansi*: Lamouroux, 1816: 177; da Costa, 1842: 20–22, pl. 8, fig. 1A, a.*Dynamena tubulosa* Heller, 1868: 35, pl. 1, figs 5–6.*Synthecium evansi*: Marktanner-Turneretscher, 1890: 248–249 (syn. *Dynamena tubulosa* Heller, 1868); Stechow, 1919: 82; Stechow, 1923: 150; Cornelius, 1980: 7–8.

Stechow (1919) provided additional references.

Figure 5 on previously unpublished plate 64 shows two branched hydrocauli on a substrate which could well be the furoid indicated in the text; and figure 6 a single, branched hydrocaulus enlarged. Two pencil drawings from which the engravings were prepared are preserved in the Royal College of Surgeons of England (p. 51; Fig. 9). However, the specimen itself is lost (pp. 54–61). Previous comment was provided by Cornelius (1980).

The engraving corresponds closely with the textual description except that the illustrated specimen is infertile. However, the comment in Ellis & Solander that the 'ovaries are lobated, and arise from opposite branches, which proceed from the creeping, adhering tube' would seem to relate not to reproductive structures but either to part of the stolon or to a structure which is not part of the hydroid. The description does not indicate whether these tissues were alive or preserved in spirit. But since they were examined by Ellis after being 'brought from' Great Yarmouth, Norfolk, England, implicitly to London some 140 miles distant, it would seem they were in spirit. The statement that the species 'creeps on fucus's' indicates that Ellis might have removed the stolon from the alga before the drawing was prepared, and subsequently misinterpreted this part of the specimen. Indeed, the unusual reproductive structures found in *Synthecium* were not described until 1868 (by Heller, as *Dynamena tubulosa*) and next only by Broch (1912) without illustration and Leloup (1934); so that Ellis might be excused his wrong interpretation of this part of the specimen. Ellis & Solander stated that the specimen was 'about two inches' (50.8 mm) in height, a dimension in keeping with the size implied by the drawing.

The species was originally assigned to the genus *Sertularia* Linnaeus, 1758, the only suitable genus then available; and later became one of the originally included species in the genus *Dynamena* Lamouroux, 1816. The earliest *published* illustrations of the species were probably those by da Costa (1842), who was the second to record material of it. His identification was remarkable since Ellis & Solander's description was confusing and incomplete, and of course then lacked illustrations; and also because at the time the Italian da Costa wrote *Synthecium evansi* had been nominally recorded only from English coastal waters. *S. evansi* was not included in the original scope of the genus *Synthecium* Allman, 1872, and was first assigned there by Marktanner-Turneretscher (1890) who was also the earliest to regard *Dynamena tubulosa* Heller, 1868, as conspecific.

The Ellis & Solander record was based on the specimen reportedly from Great Yarmouth, Norfolk, England, but the species has not since been reliably recorded north of the Mediterranean Sea. Arguments are roughly balanced as to whether or not the Norfolk record is valid. Ellis obtained the specimen from an East India Company employee, John Evans, who was evidently based at Great Yarmouth, so it could have come from warmer waters by ship (Cornelius, 1980; see also Johnston, 1847: 67, footnote).

Norfolk summer sea temperatures are the warmest around mainland Britain (Garstang, 1901). In certain areas the water is warmed as the incoming tide flows over the extensive intertidal sand flats of the Wash. Some other warm water hydroids have been recorded from the Norfolk area. Thus, *Obelia bidentata* Clarke and *Clytia paulensis* Vanhöffen have been found in this region and from almost no other British localities (Cornelius, 1982). *Sertularella cylindritheca* (Allman) has been tentatively recorded from off Norfolk but not otherwise north of the Strait of Gibraltar, almost paralleling *Synthecium evansi* (W. Vervoort, in Cornelius, 1979: 306). Thus by analogy it is possible that the *S. evansi* locality is valid. It would be odd if it were proved that so large and distinctive a species had otherwise gone undetected along so well worked an area as the English coast of the southern North Sea. But the inshore waters of south-east England were for long poorly worked for hydroids (Hamond, 1957). For example, the much larger and shallower-water *Obelia bidentata* was undetected until the 1950s yet commonly occurs stranded intertidally along this coastline (Hamond, 1957; Cornelius, 1982). Against this background it is difficult at present to determine the validity of the locality of this record of *S. evansi*.

Several authors of faunal lists have regarded the Ellis & Solander record as British without comment (Gmelin, in Linnaeus, 1791; Lamouroux, 1816; de Blainville, 1834; Johnston, 1838, 1847; Gray, 1848; Landsborough, 1852) but none has reported further British material (Cornelius, 1980). Hincks (1868), the main nineteenth century monographer of British thecate hydroids, seems to have been the first reviewer to have omitted the species from the British faunal list.

Plate 64, Figure 7. *Corallina pinnata*

(Present Fig. 2)

Algae, Rhodophyta, Helminthcladiaceae

Genus *Liagora* Lamouroux, 1812.*Liagora pinnata* Harvey, 1853: 138, pl. 31B; Taylor, 1960: 329.*Corallina pinnata* Ellis & Solander, 1786: 117 [pl. 64, fig. 7].

Figure 7 on the unpublished plate 64 shows a twice pinnate, bushy plant with a percurrent axis. The branches shown are blunt ended and scarcely tapering. These features, together with the comment in the text (Ellis & Solander, 1786: 117) that it was 'covered with a mealy substance', suggest that the plant depicted should be referred to the genus *Liagora*. In fact, the illustration closely resembles *L. pinnata* Harvey, originally described from Sand Key, Florida. The original specimen of *Corallina pinnata* Ellis & Solander had been found on the coast of the Bahamas, whence *L. pinnata* has also been recorded (Taylor, 1960).

Although Ellis & Solander's epithet *pinnata* is much earlier than Harvey's, transfer to the genus *Liagora* would result in an inadmissible combination constituting a later homonym of *L. pinnata* Harvey.

Plate 64, Figure 8. *Corallina loricata*

(Present Fig. 2)

Algae, Rhodophyta, Corallinaceae

Genus *Corallina**Corallina officinalis* Linnaeus, 1758: 805; Ellis & Solander, 1786: 118–119, pl. 23, figs 14–15; Hamel & Lemoine, 1952: 31, pl. 1, fig. 1.*Corallina loricata* Ellis & Solander, 1786: 117 [pl. 64, fig. 8].

Figure 8 on the previously unpublished plate 64 is an illustration of a sterile plant typical of the genus *Corallina*. The description given by Ellis (p. 117) states that it was 'much larger than the Coralline of the Shops, being four times as big' and that it was found in the Mediterranean Sea. The 'Coralline of the Shops' was *Corallina officinalis* L. The illustration of it on Ellis & Solander's plate 23, figures 14–15, is certainly of a very small plant or part of a plant but it is otherwise closely similar to that on the previously unpublished plate 64, figure 8. There is no fundamental difference between Ellis & Solander's description of the two. The reference to 'knobs' in *C. officinalis* simply indicates the presence of reproductive conceptacles. There is nothing to suggest that *C. loricata* is anything other than a sterile specimen of *C. officinalis*, a species which is widespread in the Mediterranean (Hamel & Lemoine, 1952) and elsewhere.

Plate 65, Figures 1–2. *Madrepora mammillaris*

(Present Fig. 3)

Anthozoa, Scleractinia, Oculinidae

Genus *Oculina* Lamarck, 1816*Madrepora mammillaris* Ellis & Solander, 1786: 154 [pl. 65, figs 1–2].*Madrepora mamillosa* Lightfoot, 1786: 98 ('A large and perfect specimen').*Oculina banksi* Milne Edwards & Haime, 1850: 68; Milne Edwards & Haime, 1857 (vol. 2): 107 (nom. nov. for *Madrepora mammillaris* Ellis & Solander, 1786).*Oculina valenciennesi* Verrill, 1901: 176, pl. 32, fig. 5.non *Astroites mammillaris* Walch, 1775: 50, (homonym; nom. nov. for 'Héliolithe cylindrique' Guettard, 1770 (vol. 3): 514–515, pl. 54, fig. 3).non *Madrepora mammillaris*: Wilkens, in Pallas, 1787: 131.

Guettard's 'Héliolithe cylindrique', named *Astroites mammillaris* by Walch and later referred to *Madrepora* by Wilkens, is a fossil coral from the Middle Jurassic near Besançon (Doubs).

Milne Edwards & Haime evidently renamed Ellis & Solander's *M. mammillaris* because of supposed pre-occupation by Walch rather than from a sense of propriety. The type of *O. banksi* is in the BMNH (regd. no. 1834.12.15.3) and is the same species as the coral figured by Ellis & Solander. Pourtalès (1871: 66) suspected that *O. banksi* was the same species as *O. varicosa* (Lesueur, 1821), and Verrill (1901) tentatively included it in *O. valenciennesi* Milne Edwards & Haime. Verrill stated that the type of *O. valenciennesi* was probably from the collection of Sir Joseph Banks who may have received it amongst the Bahamian corals Mark Catesby presented to Banks. However, while the type of *banksi* is in the BMNH it is not the specimen figured by Ellis & Solander which was probably Banks's specimen. Verrill was apparently misled by Milne Edwards & Haime's indication '*Madrepora mammillaris* Ellis & Solander Zooph., pl. 65, f. 4 [sic] de l'exemplaire de Joseph Banks' – a reference to Banks's copy of the *Zoophytes* (Ellis & Solander, 1786), with its six extra plates, and not to the specimen.

Plate 65, Figure 3. *Madrepora oculata*

(Present Fig. 3)

Anthozoa, Scleractinia, Oculinidae, Oculininae

Genus *Madrepora* Linnaeus, 1758

Madrepora oculata Linnaeus, 1758: 798; Ellis & Solander, 1786: 154–155 [pl. 65, fig. 3]; Zibrowius, 1980: 36, pl. 13 (*cum syn.*).

The figure on unpublished plate 65, figure 3, is a good representation of a typical specimen of *M. oculata*.

Plate 66, Figures 1–2. *Madrepora erubescens*

(Present Fig. 4)

Hydrozoa, Stylasterina, Stylasteridae

Genus *Stylaster* Gray, 1831

Madrepora erubescens Ellis & Solander, 1786: 156 [pl. 66, figs 1–2].

Stylaster erubescens Pourtalès, 1868: 135 (non Ellis & Solander, 1786, homonym); Pourtalès, 1871: 34, pl. 4, figs 10–11; Boschma, 1957: 8 (*cum syn.*); Cairns, 1983: 142 (*passim*); Cairns, 1986: 58, fig. 26.

By coincidence Pourtalès's *Stylaster erubescens* from the West Indies is evidently the same as Ellis & Solander's nominal species of the same name from St Vincent. Pourtalès gave no reference to the earlier usage by Ellis & Solander, nor has any subsequent author.

The specimen figured on unpublished plate 66 is one of the many corals collected in the West Indies about 1764 by John Greg of Charleston, South Carolina, while serving as secretary to the commissioners sent to dispose of lands in the islands ceded to Great Britain by the treaty ending the French and Indian wars.

Plate 66, Figures 3–4. *Madrepora rosea*

(Present Fig. 4)

Hydrozoa, Stylasterina, Stylasteridae

Genus *Stylaster* Gray, 1831

Madrepora rosea Pallas, 1766: 312; Houttuyn, 1772: 170, pl. 129, fig. 4; Ellis & Solander, 1786: 155 [pl. 66, figs 3–4].

Stylaster rosea (Pallas) Boschma, 1957: 14 (*cum syn.*).

Ellis & Solander's figures of their specimen from St Vincent (W.I.) sent by John Greg resemble very closely the first illustrations by Houttuyn of this West Indian hydrocoral, an illustration regarded by Boschma as typical. Ellis & Solander noted the pink blush of the main branches and white colour of the branchlets.

The 'Rose Madrepora' of Shaw & Nodder (1799: vol. 10, pl. 383), listed as '*Madrepora rosea*' in their index (vol. 24), is not *Stylaster* but *Allopora*, possibly *A. nobilis* Kent of southern African waters; and the primary homonymy needs resolving.

Plate 67, Figure 1. *Madrepora agaricites*

(Present Fig. 5)

Anthozoa, Scleractinia, Agariciidae

Genus *Agaricia* Lamarck, 1801

'Madrepore d'une structure raboteuse' Dezallier, 1755: 367, pl. 22, fig. 7.

'Agaricus seu Fungus quercinus' Seba, 1758: 205, pl. 110, fig. 6cc.

Madrepora agaricites Linnaeus, 1758: 795 (no references or figures indicated); Pallas, 1766: 287 (syn. 'Agaricus seu Fungus . . . ' Seba, 1758, *M. agaricites* Linnaeus, 1758); Houttuyn, 1772: 130, pl. 127, fig. 2; Linnaeus, 1775: 683–684, pl. 21, fig. 2 (same plate as Houttuyn); Ellis & Solander, 1786: 159–160 [pl. 67, fig. 1], *non* pl. 63.

The citations above, except for Linnaeus's introduction of the binominal, are to the early illustrations of *Agaricia agaricites*. For further usage see Weisbord's (1974) uncritical synonymy.

Linnaeus, in his original diagnosis of *M. agaricites*, cited no figure. Pallas indicated Seba's good illustration which can be considered the protograph of this well known West Indian hermatypic coral. The specimen figured by Ellis & Solander on the previously unpublished plate 67, with no explanation, is *A. agaricites* forma *danai* (Milne Edwards & Haime, 1860). The specimen illustrated on the published plate 63 by Ellis & Solander, identified as *A. agaricites* by some authors (Lamouroux, 1821; de Blainville, 1830, 1834; Milne Edwards & Haime, 1860; Gregory 1895; *inter alia*), is not *Agaricia* but a species of *Pavona*.

Plate 67, Figure 2. *Madrepora sinuosa*

(Present Fig. 5)

Anthozoa, Scleractinia, Mussidae

Genus *Isophyllia* Milne Edwards & Haime, 1851

? 'Meandrites costis amplioribus acutis' Gualtieri, 1742: No. 43 (verso pl. 51).

Madrepora sinuosa Ellis & Solander, 1786: 160–161 [pl. 67, fig. 2]; Gmelin, *in* Linnaeus, 1791: 3761.

Oulophyllia ?spinosa Milne Edwards & Haime, 1848: 239; Milne Edwards & Haime, 1849: 269.

Isophyllia spinosa: Milne Edwards & Haime, 1851: 87, 374; Matthai, 1928: 237, pls 2, 3, 23, 35–39, 55, 57, 61 (*cum syn.*).

Isophyllia sinuosa: Matthai, 1928: 237, pls 2, 3, 23, 35–39, 55, 57, 61 (*cum syn.*); Alloiteau, 1957: 261, text-fig. 184, pl. 12, figs 4–5.

The original description of *M. sinuosa* by Ellis & Solander, published without a figure, was insufficient to permit reliable identification of the species. Esper (1790: 286), in his review of Ellis & Solander's species, considered *M. sinuosa* to be a form of his *M. maeandrites* with broader valleys and shorter meanders in which he included *M. labyrinthica* of Ellis & Solander. However, Esper's figure (pl. 4) shows a coral of the dimensions and growth form of *I. sinuosa* with mussid septal dentations. Quoy & Gaimard's (1833) identification of their *Meandrina sinuosa* from New Ireland with *M. sinuosa* Ellis & Solander was a good but incorrect guess. Milne Edwards & Haime made no reference to Ellis & Solander's *M. sinuosa* although they must have seen the unpublished plate 67 in Banks's copy of the *Zoophytes* at the British Museum along with its accompanying MS captions. Matthai, in his elaborate analysis and iconography of *I. sinuosa*, noted (p. 245) that the type specimen of *I. spinosa*, type-species of the genus *Isophyllia*, could not be found in the Paris Museum. However, Alloiteau, after a long search, found the holotype in the Michelin collection in Paris and figured it.

Figure 2 on the previously unpublished plate 67 is a passable representation of this common West Indian coral, based on a specimen, now presumed lost, from the West Indies collected by John Greg.

Plate 68, Figure 1. *Madrepora spongiosa*

(Present Fig. 6)

Anthozoa, Scleractinia, Acroporidae

Genus *Montipora* Quoy & Gaimard in de Blainville, 1830

Madrepora spongiosa Ellis & Solander, 1786: 164, without reference to figure [pl. 68, fig. 1].

Montipora verrucosa Quoy & Gaimard, 1833: 247, pl. 28, fig. 11.

Manopora foveolata Dana, 1846: 507.

Montipora foveolata: Bernard, 1897: 54, pl. 6, fig. 1, pl. 32, fig. 1 (*cum syn.*); Wells, 1954: 434, pl. 146, figs 5–7.

Figure 1 on previously unpublished plate 68 is poor but resembles the textual description indicated in the manuscript explanation (Fig. 8). The infundibuliform (foveolate) deep 'stars' surrounded by obtuse ridges (ambulacra) are typical of *Montipora foveolata* as described and illustrated by Bernard.

The only published use of the combination *M. spongiosa* Ellis & Solander is in Lamarck's (1836: 439) description of his *Porites verrucosa* under which is 'An madrepora spongiosa? Solander & Ellis, no. 49'. *M. spongiosa* (Ehrenberg) Klunzinger and *M. verrucosa* (Lamarck) are both papillate species (*vide* Bernard, 1897: 86, 103).

This coral belongs to Ellis & Solander's group 'Aggregatae' under which they described 24 species, 14 of them figured on the published plates, 5 not figured but identified with earlier figures, and 5 with neither figures nor references. Of these last, one is *Montipora verrucosa* (unpublished plate 69, fig. 1), one is *Montipora spongiosa* (pl. 68, fig. 1), one is *Acropora papillosa* (pl. 68, fig. 5), one, *Madrepora hyades*, has been identified as a *Siderastrea*, and the remaining two, *M. cavata* and *M. bulliens*, from the brief descriptions, are probably species of *Favites*.

Plate 68, Figure 2 (No manuscript caption or text reference)

(Present Fig. 6)

Anthozoa, Scleractinia, Astrocoeniidae

Genus *Stylocoeniella* Yabe & Sugiyama, 1935

[Ellis & Solander, 1786: pl. 68, fig. 2]. (Not included in text, and illustration not included in book.)

Porites armata Ehrenberg, 1834: 119.

Porites astreoides Ehrenberg, 1834: 119 (*non* Lamarck).

Stylophora ehrenbergi Milne Edwards & Haime, 1857: 139.

Stylocoeniella armata: Wells, 1954: 409, pl. 96, figs 1–4 (*cum syn.*); Wells, 1966: 205, fig. 10.

The calices of the small coral illustrated in unpublished plate 68, figure 2, are circular, nearly flush, about 1.5 mm in diameter, slightly separated with suggestions of spinose intercalicular areas, with 12 thick, equal septa the upper margins of which extend about halfway to the calicular axis, dropping steeply to the bottom of the calice where there is a styliform columella. None of the descriptions in Ellis & Solander's 'Aggregatae' fits this coral. Its combination of structures can only be interpreted as those of the astrocoeniid *Stylocoeniella*, an inconspicuous but widespread Indo-Pacific hermatype genus. *S. armata*, first described as *Porites* by Ehrenberg and placed in *Stylophora* by Milne Edwards & Haime, was first illustrated by Klunzinger (1879: pl. 8, fig. 12). The styliform pillars commonly present at the margins of the calices in this genus are not evident in figure 2; but in many specimens they are very small or even absent, as in the example from the Great Barrier Reefs figured by Veron & Pichon (1976:

fig. 50). It is curious that Ellis or Solander had access to a specimen of this species, considered a great rarity for 150 years thereafter.

Plate 68, Figure 3. (No manuscript caption or text reference)

(Present Fig. 6)

The figure is of a ramose, subplicate colony. It lacks any details of corallites, but the growth form and general aspect is that of figure 4 of the previously unpublished plate 69 (*Psammocora contigua* (Esper)), described on page 36, with which it is here associated.

Plate 68, Figure 4. (No manuscript caption or text reference)

(Present Fig. 6)

Anthozoa, Scleractinia, Poritidae

Genus ?*Goniopora* de blainville, 1830

?*Madrepora botryotes* Ellis & Solander, 1786: 172.

The previously unpublished plate 68, figure 4, depicts a clump or tuft of short, blunt branches arising from a worn, vasiform base. Details of the surface of the branches are very poor: suggestions of irregular, slightly separated calices can barely be made out. It might represent one of the 9 species in Ellis & Solander's (1786: 170–173) 'Ramulosae' 6 of which (*damicornis*, *digitata*, *seriata*, *muricata*, *porites*, and *verrucosa*) they figured or referred to earlier-described species and pertain to forms of *Pocillopora*, *Stylophora*, *Seriatopora*, *Acropora*, and *Porites*. The remaining three (*limitata*, *botryotes*, and *granosa*) have not been generically identified. Of these the only one figure 4 might represent is *botryotes*, all too briefly described as having very short, obtuse branches bunched together, and having intercalicular areas (ambulacra) rough and uneven.

Plate 68, Figure 5. *Madrepora papillosa* Ellis & Solander

(Present Fig. 6)

Anthozoa, Scleractinia, Acroporidae

Genus *Acropora* Oken, 1815

Madrepora papillosa Ellis & Solander, 1786: 169 [pl. 68, fig. 5; probably also pl. 69, fig. 3].

Madrepora securis Dana, 1846: 486, pl. 43, fig. 2.

Madrepora cuneata Dana, 1846: 487.

Madrepora plicata Brook, 1891: 465; Brook, 1893: 134, pl. 9, fig. D.

Acropora plicata: Vaughan, 1918: 179, pl. 80, figs 1, 1a, 1b.

Acropora cuneata: Wells, 1954: 429, pl. 100, fig. 3, pl. 131, figs 1–3, pl. 132, fig. 4.

The figure represents a small, very convex or subglobose corallum with two small offsets, covered with crowded, short, thick-walled tubiform corallites about 1.5 mm in diameter. It is a species of the *Acropora* group lacking prominent axial corallites ('*Isopora*') in which Brook (1893) included 5 species: *pallifera* Lamarck, *hispida* Brook, *securis* Dana, *cuneata* Dana, and *plicata* Dana. The first two have the inner walls of the corallites very thin or incomplete, whereas the walls of the last three are complete as are those of the figure 5. The differences among the nominal species *cuneata*, *securis*, and *plicata* are trifling and Wells (1954) regarded them a single species under the name *A. cuneata*, of which *Madrepora papillosa* Ellis & Solander is a senior but hardly used synonym. In the brief description of their species Ellis & Solander noted that it was very much like *Madrepora muricata* Linnaeus, and was possibly an early stage of that species.

The previously unpublished plate 69, fig. 3, probably also represents this species (see below).

Plate 69, Figure 1. (No manuscript caption or text reference)

(Present Fig. 7)

Anthozoa, Scleractinia, Acroporidae

Genus *Montipora* Quoy & Gaimard, in de Blainville, 1830

Madrepora verrucosa Lamarck, 1816: 271.

Porites verrucosa Lamarck, 1836: 439.

Montipora verrucosa Bernard, 1897: 103, pl. 19, fig. 2 (*cum syn.*); Vaughan, 1907: 160, pls 53–59 (*cum syn.*); Wells, 1954: 438, pl. 143, figs 6, 7, pl. 147, fig. 3.

The rather poor figure with two small enlargements of calices represents a submassive corallum with calices about 1 mm in diameter with 11 thick septa shown on one enlarged calice. On the sides of the calices on the lower left side of the corallum are papillae of the *M. verrucosa* type. These are not shown over the rest of the corallum. This is possibly because the specimen was worn, although many colonies of *M. verrucosa*, especially those from Hawaii, lack papillae over small areas.

M. verrucosa of Quoy & Gaimard (1833) is not that of Lamarck and was renamed *M. foveolata* by Dana.

Plate 69, Figure 2. (No manuscript caption or text reference)

(Present Fig. 7)

Anthozoa, Scleractinia, Faviidae

Genus *Cyphastrea* Milne Edwards & Haime, 1848

Ellis & Solander, 1786: [pl. 69].

Madrepora chalcidicum Forskål, 1775: 136.

Cyphastrea chalcidicum: Veron & Pichon, 1976: 173, figs 342–349 (*cum syn.*).
non *Astroites* Seba, 1758: 208, pl. 112, fig. 18 (= *Porites* sp.).

Figure 2 of the previously unpublished plate 69 is a good representation of a small nodular colony with an enlargement of four calices. These are circular, nearly flush, about 1.5 mm in diameter with 24 slightly alternating septa that are thick marginally and thin internally, most of them extending to a spongy columella. The intercalicular surface is spinose. These are the characters of *C. chalcidicum* as illustrated by Veron & Pichon (1976: fig. 344).

This common Indo-Pacific species, resurrected by Klunzinger in 1879, was also first figured by him (pl. 5, fig. 8, pl. 10, figs 11a–c). None of the three still unplaced species (*nodulosa*, *cavata*, and *bulliens*) of Ellis & Solander's 'Aggregatae' corresponds to this coral. *M. nodulosa*, referred (Ellis & Solander, 1786: 165) to Seba's pl. 112, fig. 18, is probably a *Porites*, and from the short descriptions *M. cavata* and *M. bulliens* seem referable to *Favites*.

Plate 69, Figure 3. (No manuscript caption or text reference)

(Present Fig. 7)

Anthozoa, Scleractinia, Acroporidae

Genus *Acropora* Oken, 1815

Madrepora papillosa Ellis & Solander, 1786: 169 [pl. 68, fig. 5].

Madrepora cuneata Dana, 1846: 487.

Acropora cuneata: Wells, 1954: 429, pl. 100, fig. 3, pl. 131, figs 1–3, pl. 132, fig. 4.

The figure shows a small corallum with growth form and corallites like those of *M. papillosa*

Ellis & Solander (unpublished plate 68, fig. 5, discussed above). Two enlarged figures of the corallites show them to be tubular with complete, thick walls and 12 septa with primaries reaching the corallite axis.

Plate 69, Figure 4. (No manuscript caption or text reference)

(Present Fig. 7)

Anthozoa, Scleractinia, Thamnasteriidae

Genus *Psammocora* Dana, 1846

Ellis & Solander, 1786: [pl. 68, fig. 4]

Madrepora contigua Esper, 1795: 81, pl. 66, figs 1–4.

Psammocora contigua Veron & Pichon, 1976: 22, figs 13–22 (*cum syn.*).

Figure 4 on the previously unpublished plate 69 shows a ramose, subplicate corallum suggesting *Psammocora*, and the small enlargement of the surface reveals the characteristic petaloid aspect of the large septa – a detail that confirms that it is *Psammocora*. No description remotely suggesting this coral can be found among those species lacking figures or references in Ellis & Solander's text. The first description of the species was by Esper (1795). Veron & Pichon included under *P. contigua* four, possibly six, other ramose nominal 'species'.

The preparation, production and authorship of Ellis & Solander's *Zoophytes* (1786)

Ellis died in 1776 and Solander in 1782, and their book was posthumous to them both. Many contradictory published comments have left doubt about who was responsible for the final text. The question is important since the book provided a foundation for much subsequent work on cnidarians, sponges, bryozoans and coralline and other calcified algae (see Introduction). Though the book has usually been ascribed solely to Ellis, a few commentators have stated or implied that Solander wrote it. In fact, it seems that Ellis wrote most of it and Solander a little. Curiously, this view has not been advanced before.

Much of the published and manuscript material pertaining to the question of authorship also provides information on how the book came to have its final scope, and in part on where and when it was written and edited. The sources for these different categories of information are often the same, and the two aspects of authorship and production are treated together to avoid undue repetition of source material.

The book is unusual in lacking an introductory section. After a brief preface by the editor, it starts straight in with the account of the first genus treated. This is in contrast to Ellis's (1755) first book which has a lengthy introduction.

Title page and introductory advertisement

Both the title page and the introductory advertisement to the book included ambiguities and contradictions that need resolving. The absence of punctuation at the end of the fifth line of the title (Fig. 1) might be taken to indicate that Ellis himself collected all the material described in the book, while introducing a full stop or comma would change the sense to imply that Ellis just described the specimens and did not necessarily collect them. In fact both authors collected some of the material, Solander for example bringing many of the true corals (*Madrepora*) back on the *Endeavour* (p. 57); but probably most of the specimens described came from the collections of others (pp. 54–61).

The presence of a large capital initial at the start of line six, implicitly starting a new sentence, supports the interpretation that Ellis wrote all the text. However, lower down the page it is stated that the species in the book were 'systematically arranged and described' by Solander. But, again in contrast, the book's subsequent editor Martha Watt, who was Ellis's

daughter, stated on page vi of the introductory advertisement that (only) 'the arrangement of the descriptions' was done by Solander, implying that Ellis had actually written them. On the same page she stated that Ellis alone was responsible for having the plates both drawn and engraved. Probably neither of her statements is entirely correct, nor did Ellis write all the text.

Strangely, her assertion (Ellis & Solander, 1786: vi) that Ellis had 'proceeded no farther than the completion of [the] plates' before he died also seems incorrect since there is overwhelming evidence that in fact Ellis had by this time written most of the text! Indeed, she implied as much on the same page by stating that Solander just *arranged* the descriptions. Again in contrast, in the dedication of the book (to Banks), Ellis alone is indicated and Solander's name does not appear.

It may be that Martha Watt did not intend that a detailed analysis should be made of her dedication and introductory advertisement, but the above inconsistencies and some others require explanation. Thus she stated (Ellis & Solander, 1786: vi) that the book was 'published at the request of Sir Joseph Banks, Bart. P.R.S.'. Yet a surviving letter (p. 47) from Mrs Watt to Banks suggests that it was *her* initiative that led to its publication some four years after Solander's death and ten years after her father's. There seems no reliable evidence that during these ten years Banks or his assistant Solander worked on the book at all. The evidence we offer below shows that had it been published in 1776, when Ellis died, it would have been virtually the same book. Banks and Solander had apparently left it untouched, and in view of its scientific excellence one might ask why.

In 1786 Banks was already President of the Royal Society and was undoubtedly a central figure on the British and European scientific scene. Martha Watt was in contrast merely the daughter of an amateur who had been dead nearly ten years. Solander was Banks's closest colleague (Banks, in Rauschenberg, 1964). The text of the book would possibly have been shown to Banks, who might well have read at least the introductory advertisement. It could be that Banks's unwitting influence resulted in Martha Watt incorporating the implication that Solander was greatly involved in authorship. Indeed, it seems that he did write a small yet important part, that written at the British Museum (p. 44). Ellis also worked there (p. 44) and Banks would have had ample opportunity to discuss Ellis's work and to realize that Ellis had prepared an extensive manuscript. Later, others also gained the impression that Solander was its author (pp. 37–39).

It would seem plausible that there was genuine misunderstanding of Solander's role. Ellis was long since dead, and had been sickly towards the end of his life (p. 50); but Solander had still been active when Ellis died, being only about 43 years of age. He had undoubtedly helped Ellis in his later years, especially at the BM where Banks would have known that Solander had worked on the section he actually wrote (p. 39). Ellis, meanwhile, had a full professional life of his own (reviewed by Groner, 1987, and by others whom he cites) and might have appeared only occasionally at the Museum. Indeed, even within London there was much communication between Ellis and Solander by letter. Hence it might be argued that Ellis's major contribution to the book could have been overlooked by Banks (p. 39). Solander could have unwittingly given the impression that he was himself responsible for more of the book than he was, simply by working on it where he did. Apparently he worked on the *Madrepora* section for only about three weeks (p. 44), but perhaps that was enough to give the impression that he was more deeply involved with Ellis's book than he was.

Thus the statements at the start of the book are contradictory. Some of the evidence which is analysed below is equivocal even when the sources seem authoritative. Yet the overall implications of the title page and of the introductory advertisement, written by Ellis's daughter, that Ellis was largely responsible for the book, seem in the end correct.

Contemporary comment

Remarks in the *Dictionary of National Biography* by Boulger (in Lee, 1898) and elsewhere by Rauschenberg (1968) suggest that Solander alone wrote the book. But neither author considered contemporary comments which, apart from the ambiguities of Martha Watt's introduction, indicate Ellis alone. Thus Lightfoot (1786), when referring to the book, used the

abbreviation 'Ellis Zooph.' some 27 times, and 'E&S' 16 times, clearly implying a major involvement by Ellis.

The work attributed to Lightfoot (1786) was the extensive sale catalogue of the Duchess of Portland's collections, known as the *Portland Catalogue*. It included many zoophytes. Lightfoot was one of the Duchess of Portland's curators (Pennant, 1789: preface) and would certainly have been well placed to have compiled it. Slightly earlier Solander also curated her collections, and for part of the 1770s visited her one day each week (Banks, in Rauschenberg, 1964; Rauschenberg, 1968). Thus Lightfoot could well have known about the authorship of the Ellis & Solander work. It happens that authorship of the work ascribed to Lightfoot (1786) has itself been debated (Dance, 1962; Clench, 1964; Kay, 1965; Rehder, 1967; other references in Wheeler, 1984a, 1984b), undermining the authority of the comment attributed to Lightfoot. But Banks (in Rauschenberg, 1964) implied that Lightfoot was indeed the author, and in addition that the zoophyte entries in the work ascribed to Lightfoot were drafted by Solander.

Lettsom (1786: 54), writing of John Fothergill's important coral collection, said '[Fothergill's] corals, from whence Ellis . . . delineated his system, and created a new species . . .', and did not even mention Solander.

Similarly Dryander (1796, 2: 338), Banks's librarian, ascribed the book to Ellis alone and did not mention Solander's name in his catalogue entry. Dryander was successor to Solander's post. He must have had frequent opportunity to become well aware of which of the nominal authors was responsible for writing the text. It seems virtually certain that conversation about the writing of such a major work, with its expensive plates, would have taken place occasionally between Banks, Dryander, Solander, and Ellis – though not necessarily together. And yet it seems that Dryander was incorrect in ascribing the book entirely to Ellis.

Two contemporary book reviews offered some views on authorship. The first (Anon. 1, 1786) indicated Ellis as sole author, Solander's contribution being only to 'arrange' the work – the word perhaps being taken from the title page. Concerning the treatment of the genus *Madrepora*, the author of the review commented (p. 5): 'The madrepora is generally described; but here we begin to lose our author's [Ellis's] assistance . . .', a comment on the less detailed treatment in that section. This is the section apparently written by Solander (p. 44).

The second book review (Anon. 2, 1786) was still more explicit. It stated that Solander's contribution was to 'introduce system, that vital principle of all researches', implying in this context that Solander grouped the species according to the Linnean system. This may be what was meant on the title page and in the introductory section by the use of the word 'arranged'. Indeed, contemporary dictionaries suggest that the word implied 'putting into a definite and logical order' rather than the present-day meaning which tends towards simply 'putting in the sequence observed'. The review continued: 'At the same time, [Solander] has added such new objects as have been discovered since Mr Ellis's [1755] publication, either by himself, or by others . . .', but this is hardly true since it seems that most of the non-coral text and related plates of the 1786 work were prepared by Ellis – albeit possibly with occasional help from Solander.

Thus the strong implication from this review is that Solander's contribution was to *arrange* the species and genera along the lines of the Linnean system, with genera and higher taxa logically ordered, and to add descriptions of material additional to that which Ellis knew. This may well be so: and would explain the origin of some manuscript notes extant in the Linnean Society of London (p. 43), written (albeit in Ellis's hand) at least 10 years before the book was published, delimiting the genera and defining some of them. The notes suggest that Solander early on showed Ellis how to adopt a Linnean-style classification, lacking in Ellis's first book (see also the Ellis letters to David Skene, p. 41). Indeed, this is why Solander had been asked to come to London – to promulgate Linnaeus's views on classification; and Ellis had been among those responsible for inviting him (p. 21) and clearly welcomed his input. Nevertheless, despite the implications of the second review, there is no evidence that Solander did any of the writing outside the important *Madrepora* section.

Curiously, contemporary comment on the book made no direct reference to this major

contribution by Solander. This might suggest that neither of these two anonymous reviewers, or the other authors mentioned (Dryander, Lettsom, Lightfoot), had really detailed knowledge of the authorship. They were perhaps writing partly from hearsay, and it should be remembered that the book was posthumous to both authors. Neither of the two who knew both authors well and who lived to see the book published, Banks and his assistant Dryander, implied or mentioned contributions from Solander.

Solander's obituary by Sir Joseph Banks, written in 1784 (published in Swedish by Alströmer, 1785, and in English by Rauschenberg, 1964), points to a similar conclusion. It serves as an obituary of Solander. Banks knew Solander extremely well. He greatly praised Solander's work and mentioned his friendship and scientific cooperation with Ellis but, notably, did not mention the Ellis & Solander book. The book was already in advanced manuscript in 1784, and at that time it could even have been with the printer since a copy was presented to the Royal Society in London on 23 February 1786 (note inside Royal Society copy). Its introductory advertisement confirms that Banks was well aware of it. So its omission from the obituary by Banks is noteworthy, especially since the book became the biggest published zoological work with which Solander's name is associated as author and almost certainly included descriptions of many corals which Solander and perhaps also Banks had collected on their epic voyage with James Cook. Banks mentioned several works in which Solander had been deeply involved and his lack of comment on the then unpublished Ellis & Solander book might simply have reflected the minor role Solander had had in it. There were many other works by Solander worthy of inclusion to comment on. If, as is deduced below, Solander's contribution to the book was 'just' the bulk of the *Madrepora* descriptions then Banks might have considered it too small an item to include. Indeed, it seems that Solander wrote the *Madrepora* descriptions briskly, in less than three weeks (p. 44): and Banks was commenting on more than twenty years of energetic scholarship. The evidence for considering that Solander helped Ellis to some extent in preparing some of the illustrations may also be valid. But even so, this too might not have ranked high enough in Banks's estimation to warrant inclusion in the letter. Still, the omission is bibliographically misleading and with hindsight it can be regarded an unfortunate error by Banks.

Thus there seems no support from contemporary published evidence for the contentions of Boulger (in Lee, 1898) and Rauschenberg (1968) that Solander wrote the book.

A confusing note by Stoeber (1794, p. 300) implies that Solander handled proof pulls of some of the plates:

'In 1771, the father of Linnaeus [Jr] complained that he had not heard of Solander for several years, yet he had done so much for him as [for] any one of his pupils. He rejoiced, however, at seeing the new edition of Ellis's *Essay on corallines*, published under the auspices of Solander, who sent him some of the proof-plates.'

The 'new edition' referred to would probably have been the much amended German edition of Ellis's first book (Ellis, 1755, translated into German as Ellis, 1767). No involvement by Solander is mentioned in its detailed introductory passages, but although it may seem that Stoeber was mistaken in this it remains plausible that Solander handled some aspects of the book's publication. The proof pulls which Solander is said to have sent to Linnaeus [Sr] would have been from the 1786 joint work. In or soon after 1771 Solander had some of the scleractinian coral (*Madrepora*) engravings prepared (p. 40), under Ellis's supervision to an unknown extent, and it would seem likely to have been these which Solander would have proudly sent to Linnaeus. They probably depicted specimens collected by Solander on the *Endeavour* and passed to the collector John Fothergill who evidently returned them to the BM for Solander and Ellis to work on (p. 43). Though Stoeber's passage is confused and hence suspect it does provide some corroboration that Solander started to supervise these engravings, which became incorporated into the book, in 1771 soon after his return from the voyage of the *Endeavour*.

Later published opinions

Lamouroux (1821), in his introduction, stated that Ellis wrote the descriptions and that Solander only corrected them ('Les descriptions faites par Ellis et corrigées par Solander . . .'). Although he might simply have been quoting Martha Watt it seems he could have had near-contemporary knowledge since he or his publisher had obtained most or all of the copper engravings of the 63 plates from the book as published and he may well have learnt something about its history. He could have heard directly from Banks. Lamouroux died in 1825, at the relatively early age of 45 (Redier, 1967), and had little opportunity for further comment. We have not attempted to locate any relevant correspondence of Lamouroux or others involved in the production of his book.

Similarly, Milne Edwards & Haime (1857: xxii) considered Ellis the sole author:

'Ce livre . . . porte les noms d'Ellis et de Solander, comme si ce dernier avait réellement contribué à sa rédaction; mais il est évident qu'il est dû tout entier à Ellis.'

This is an assertion that Solander was not involved. But the new evidence we have examined suggests that he was. Although Milne Edwards and Haime visited the BM and might have obtained evidence for their view they were writing long after the book's appearance, and their published opinion has to be treated cautiously. Paradoxically, they overlooked Solander's important contribution to the section on scleractinian corals (*Madrepora*) which was their main interest in the work.

In contrast, Boulger (in Lee, 1898, article on Solander) recorded that Solander 'arranged and described [all] the material for John Ellis's *Natural History of Zoophytes* (1786)', but he was not so close to the events as Dryander, Lamouroux and Lettsom, and was perhaps simply repeating what might be inferred from the title page.

Concerning the illustrations, Rauschenberg (1968: 19) pointed out that Ellis had asked Solander to 'supervise the production of the illustrations for publication' of an article on hydroids in the *Philosophical Transactions of the Royal Society* as early as 1762, some fourteen years before Ellis's death; and Solander is known to have supervised some of those used in the book (p. 39). In a letter to Borlase, written in 1764, Ellis stated that 'Solander [was] to describe those plants' on which Ellis was working at that time (Rauschenberg, 1968: 24). Similarly, Sir Joseph Banks wrote in 1784 – two years after Solander's death – concerning a joint botanical work by Banks and Solander, that there was 'hardly a clause written in it . . . in which [Solander] had not shared' (Banks, in Rauschenberg, 1968: 43), adding weight to the general opinion that although Solander only infrequently published under his own name, he made major contributions to the scientific writing of others. Rauschenberg (1968: 54) considered that 'John Ellis was the person whom Solander aided the most . . . Solander wrote the descriptions for Ellis's book on Zoophytes'. However, although Solander might have helped Ellis with the text, Rauschenberg gave no evidence that Solander was author of all the descriptions and seems almost entirely misled on the question of authorship.

Several of the biographies about Ellis or accounts of his work (Smith, 1819, 1821; Stephen, 1889; Carruthers, 1901; Harmer, 1931a; Savage, 1934, 1948) have failed to touch upon the question of authorship of the book. A note published to commemorate the birth of Solander (Anon. 4, 1936) mentioned his involvement with the work but similarly gave no detailed information about who wrote what.

Rauschenberg (1978a: 15), citing pages v–vii of the book (Ellis & Solander, 1786), later commented that after Ellis's death Solander had given 'aid on taxonomic matters' to Ellis's daughter during production of the book, and that John Fothergill and later Sir Joseph Banks had helped financially with it. However, in the book itself (Ellis & Solander, 1786: vi) it is stated that Fothergill paid for some of the engravings and that they were done under Ellis's supervision and, therefore, during Ellis's lifetime. Though Banks is discussed there is no statement that he helped financially, although Fothergill's generosity is mentioned. It seems that Rauschenberg was partly wrong.

The wide-ranging accounts by Wheeler (1984a, 1984b) noted that Solander was involved

with the coral section and repeated the statement in Martha Watt's preface to the book that (only) the 'arrangement of the descriptions' was due to Solander. Wheeler aptly cited our view that 'some of the credit' for the importance of the book in subsequent invertebrate taxonomy 'must lie with Solander who from their correspondence and from the text of the book clearly made a significant contribution to the work'. Our analysis corroborates this view.

Manuscripts and letters

Some evidence on authorship exists amongst the extensive manuscript material pertaining to Ellis & Solander's book. It is preserved mainly in the archives of the Linnean Society of London and was recorded briefly by Savage (1948: 92, item 14; also p. 50, 'Daniel Solander, eight letters'). Recently it was mentioned by Wheeler (1984*a*, 1984*b*) and catalogued by Diment & Wheeler (1984). Some of the letters have been published in a variety of places. The manuscripts are incomplete and do not include more than a few of the published species descriptions. Nevertheless, there are several pages in Ellis's hand of drafts for the introductions to the genera *Sertularia*, *Antipathes*, *Gorgonia*, *Millepora* and *Madrepora*, as well as several *Madrepora* species descriptions which, however, were not eventually published (see next section). Thus it is clear that Ellis was very much involved in the early drafting of at least these sections. Unfortunately, the authorship of the published species descriptions in any of the genera cannot be deduced from this material save that in most of the *Madrepora* species it was evident that they were *not* based on these notes and, therefore, were implicitly not due to Ellis.

In the late 1760s Ellis evidently considered himself to be sole author. Thus, he wrote to Dr David Skene (26 March 1765):

'I have already sufficient for six plates as large as my frontispiece, and the Royal Society have oblig'd me with the use of those plates that belong to the Papers I have at different times laid before them.' (Quoted in Groner, 1987.)

Groner has identified these papers as *Phil. Trans.* 49: 449, 50: 188, 50: 845, and 53: 419. They are not necessarily cited in the present reference list.

Groner (1987: chapter 5) considered that Ellis's correspondence with Skene about this time provides the earliest indication that Ellis was working on a second zoophyte book, though he cited evidence from as early as 1765 that Ellis planned a book on algae which was evidently soon abandoned. We too have come across no evidence that Ellis worked on his second book before 1765 but this possibility is not precluded.

Ellis wrote again to Skene (30 January 1766):

'As to my part I shall . . . in my next book . . .' [Edinburgh University Library MS.]

And to the same (28 July 1768):

'I have done little or nothing in the Zoophytes having been otherwise engaged. Indeed the getting the plates executed is so troublesome that I am quite disheartened. I had a few which you sent me and am in hopes to tempt a good engraver to live near me for I grow too old to walk 3 mile a day after them.' [Ibid.]

This gives the clear impression that Ellis was sole author. A later letter to Skene also implies this:

'What little description [there is] will be in English for I shall only be laugh'd at [if I attempt Latin descriptions]. If I can give my friends an idea equal to what I have myself of them I shall be satisfied.' [Ibid.]

This might suggest that someone else did the Latinized species definitions in the book, but

many were copied from the 1755 book. Solander could well have supervised them – but we have no evidence for or against this.

Solander left on the *Endeavour* a month later (26 August 1768; Rauschenberg, 1968), and would probably have been too busy to be of effective assistance to Ellis at this period. Later, Ellis wrote to Skene (26 December 1770):

‘I have so much business to direct my attention that I have not minded my 2nd volume.’ [Ibid.]

This, too, implies that Ellis was intending to be sole author at the time the *Endeavour* left.

Descriptions of the true corals (*Madrepora*)

Most of the extant archival material concerns the *Madrepora* section, which is that most likely to have been written by Solander. Solander returned with Banks from their long voyage with James Cook on HMS *Endeavour* (1768–1771) to a hero’s welcome which in a sense went on for several months (Rauschenberg, 1968); but the corals and other cnidarians collected by the expedition were not written up as a collection. The *Madrepora* descriptions (excepting the first three) which appeared in the book probably included some of the *Endeavour* material. Most are quite perfunctory and much less detailed than the species descriptions throughout the rest of the book. Furthermore, Ellis was in poor health from 1773 – soon after the return of the *Endeavour* – and is thought to have had impaired sight from 1774 (Savage, 1934), additional reasons for suspecting that he might not have written the bulk of the *Madrepora* descriptions. Ellis’s health perhaps declined gradually until his death in 1776. But Solander is known still to have been healthy, since his death at the age of 49 came as a surprise (Banks, in Rauschenberg, 1964). He was more than 20 years younger than Ellis, and was apparently at that time the more capable of doing the work.

It seems plausible, if Ellis was incapacitated and contributed little to the book after the *Endeavour* returned, that the text was largely written by that time and that he delayed its publication to accommodate the exciting *Endeavour* coral material.

Although many of the coral descriptions were based on earlier accounts, chiefly those of Pallas (1766) and Linnaeus (1767), half (41 out of 81) were described as new to science. One of the ‘new’ species (the first, described in detail, probably by Ellis) was from the Mediterranean, six were from the ‘East Indies’, three were from the ‘Pacific’, two were from the ‘West Indies’, and in 29 no locality was recorded in the book. In only three of the ‘new’ species were the collectors named. Such imprecision as to localities and collectors would have been unusual for Ellis, even perhaps in ill health. Hence it seems likely that these are Solander’s descriptions, many perhaps being based on his own collections from the *Endeavour* voyage. They are written in a sloppy style quite unlike anything Ellis ever published under his own name alone. Nevertheless, the descriptions can be included among the short list of zoological material from the *Endeavour* voyages said to have received contemporary attention (Rauschenberg, 1968; Whitehead, 1969).

Ellis, it seems, wrote only the introduction to the *Madrepora* section (although this could have been redrafted by Solander: there is no evidence either way) and the descriptions of the first three species; and Solander the rest of that section.

Some further evidence is provided by the pencil illustration of ‘*Madrepora interstincta*’ [*Millepora coerulea* Pallas, 1766 (*Heliopora*)] for plate 56, preserved in the Royal College of Surgeons of England (p. 53). It was engraved by the distinguished Georg Ehret (1708–1770) in 1752, some 24 years before Ellis’s death: yet no description of the species is given in the text of the book (p. 167), merely a short synonymy. Such perfunctory treatment differs from Ellis’s usually detailed approach and lends weight to the idea that the account of this and hence of most other *Madrepora* species were not his work. It seems inconceivable that Ellis would not have written any notes to accompany such a beautiful and presumably costly illustration. And indeed, it is now known that Ellis had prepared notes on some *Madrepora* species and that Solander did not make use of them (p. 43).

Kerr (1910) implied that Ellis wrote all the coral descriptions, but his was only a passing

reference) in a sub-heading to a list of specimens in Glasgow University. He headed the table 'List of specimens of corals described by Ellis, and now in the University collection'. Almost certainly the heading represents an unfortunate choice of words rather than an intended opinion on authorship. It happens that none of the three *Madrepora* species described by Ellis was listed by Kerr.

The Ellis manuscripts preserved in the Linnean Society of London include (MS book No. 287, items 109–124; ?Savage, 1948: 92) what the original curator referred to as Ellis's 'home made note book'. It includes drafts of descriptions of several *Madrepora* species. Many of the species were eventually treated in the book (*M. cyathus*, *M. fungites*, *M. undata*, *M. agaricites*, *M. cristata*, *M. rotulosa*, *M. radiata*, *M. astroites*, *M. labyrinthiformis*, *M. meandrites*, *M. sinuosa*); but some were not (*M. talpa*, *M. exarata*, *M. molaris*, *M. acropora*, *M. cavernosa*, *M. indivisa*). Curiously, none of the descriptions nor much of the information in the note book was published. For example, the note book account of *Madrepora undata*, a species newly described in Ellis & Solander (1786: 157, pl. 40), comprises a Latin definition and nearly 100 words of English prose stating *inter alia* that the specimen came from 40 fms (73.15 m) off the north coast of Jamaica, and that it was 8 inches (20.3 cm) long and 7.5 inches (19.1 cm) broad. Under several other species, too, Ellis's notes include details lacking in the book, so it seems most unlikely that Ellis was responsible for their published accounts.

As shown by other evidence also, it seems that although Ellis prepared these drafts Solander wrote most of the *Madrepora* section and did not use Ellis's notes. Unfortunately space does not allow their publication herein, but there is little doubt that in several of the species some information supplementary to that in the book awaits evaluation by scleractinian taxonomists.

Several letters from Solander to Ellis refer to the work on the *Madrepora* section:

Solander to Ellis. London. 22 July 1774.

'... However, I have waited on Dr Fothergill, to let him know that I would, according to your desire, deliver back to him all the corals that are already figured; but he chose rather that they should remain in your chamber till his return . . .'
(Smith, 1821: 14–18)

Solander to Ellis. London. 7 November 1774.

'... This week I shall certainly settle and mark your corals; it vexes me very much that I have not been able to do it long ago . . .'
(Smith, 1821: 20)

Evidently Ellis had Fothergill's corals in Solander's rooms at the British Museum and Solander was working on them for Ellis.

Two other letters from Solander to Ellis also give a tantalisingly brief insight into how the two friends worked together:

Solander to Ellis. London. 9 November 1774.

'My Dear Sir,

'Yesterday I began to look over and write names to Dr Fothergill's coralls; I went through two of the boxes which stood in the passage, and has selected those who were not figured or engraved. Those that are engraved is placed in the same boxes, and they are now ready to send home [presumably to Fothergill, and hence into oblivion, p. 57]; the others I have laid upon one of your Tables 'till I can find a box to lay them in. Either next Saturday or some day next week I will proceed with the rest. I have also looked over all your plates, and wrote on the paper which they are wrapped up in, the proper names of the subjects which are engraved upon them.

I am with great regard,

My Dear Sir,

Your sincere friend,
and humble servant,

Dan Solander.'

[Linn. Soc. London MS] (Listed by Savage, 1948: 50, under 'undated letters, Daniel Solander, eight letters of no great importance . . .').

The first sentence confirms that at least some of the coral material, perhaps Ellis's, was already illustrated, and that some was Fothergill's – perhaps a later batch, originating from the *Endeavour*. Fothergill's name appears only once in the *Madrepora* section, on page 149, but no other collectors are mentioned and it would seem likely that he supplied many of the illustrated specimens. Indeed, it is implied by this letter; and Ellis, in the manuscript description of *M. rotulosa* mentioned already, stated that he had seen a specimen of that species in Fothergill's cabinet. It would seem that Ellis worked on Fothergill's corals himself, presumably some time before Solander worked on them, and maybe on Fothergill corals from sources other than the *Endeavour*.

Evidently Ellis had more than one table at the British Museum in Solander's area. Solander stated his intention to do all Fothergill's coral specimens that were piled up in his passageway; and that he had identified all Ellis's copper engravings – presumably some or all of the coral ones done up till then – and written the names on. This suggests that Ellis was not sufficiently familiar with scleractinians to name for himself all the copper plates he had had made, though it appears that he had at least some knowledge of the scleractinian (madreporan) corals: or perhaps his health prevented him from doing the work. The reference to 'all your plates' perhaps relates only to those of some of the scleractinians (p. 42) and might or might not have embraced the six published herein.

The introductory section of the book (Ellis & Solander, 1786: vi) states that the wealthy John Fothergill paid for some of the engravings, and it may be that these were of his own specimens (which had quite possibly come from the *Endeavour*, p. 57). Thus it seems likely that Solander collected the corals on Cook's voyage and gave or sold them to Fothergill who paid for their engraving (and initial illustration?) for inclusion in Ellis's book – with Solander providing their scientific diagnosis. The impression is overwhelming that Solander was almost entirely responsible for the description of these later 'Fothergill corals' though Ellis might earlier have prepared descriptions of pre-*Endeavour* Fothergill corals which were not eventually used in the book. The advertisement of the book clearly stated that the plates 'were all engraved under Ellis's immediate inspection'; so there seems to have been collaboration over the *Madrepora* species.

Several of these facts indicate that Solander wrote the bulk of the published version of the *Madrepora* section. A further letter adds a little more to the picture:

Solander to Ellis, London. 22 November 1774.

'My Dear Sir,

If this morning had not turned out to be so very bad, I had proposed to have finished the naming of Dr Fothergill's coralls and begin with yours. Now it must be postponed till next Monday or Tuesday. Last week I went through the aggregated and branched ones. Yesterday I saw Dr Fothergill, when I told him we wanted boxes to lay them in for to send them home, in a safe manner; when he promised to send two or three empty chests to your chambers for that purpose.

My best compts to Mr Scott and all about you.

I am with utmost regard

My Dear Sir

Your sincere friend
and humble servant

Dan. Solander'

P.S. Mr Banks & Omai are still in the country.

[Linn. Soc. London, MS] (Savage, 1948).

Solander evidently worked fast, and it was clearly in and around November 1774 that he wrote the descriptions of Fothergill's corals eventually published. He did not make use of Ellis's notes; and it might be deduced that those notes on some of the coral *species*, preserved in the Linnean Society, London (p. 41), relate to non-*Endeavour* material. Solander's modest 'Last week I went through the aggregated and branched ones' indicates that he rushed through

most of this section for Ellis in about a week, yet subsequently he became credited by some with having written the whole book (pp. 37–39).

Some of the available evidence suggests that Ellis was for much of the time handling the production of the plates with little or no assistance from Solander. Thus he wrote to David Skene (24 February 1767), a year and a half before Solander left on the *Endeavour*:

‘. . . I shall send you specimens of my plates as soon as I can get them struck off . . .’ [Edinburgh University Library MS]

See also Ellis’s letter of 28 July 1768 (p. 41), in which use of the first person implies the same; and that of 26 December 1770, when Solander was away, also indicating that Ellis was supervising the plates (p. 56).

The original drawing for Ellis & Solander’s (1786) plate 12, figures 2 and 4, also indicates that Ellis was mainly responsible for the plates. The single illustration comprises a specimen of ‘*Gorgonia ceratophyta*’ supposedly growing on one of ‘*Millepora caerulea*’ (= *Heliopora*). The original drawing for the engraving is preserved (Royal College of Surgeons, London, Hunterian Drawings vol. 1, f. 16) and shows that the drawing of *Gorgonia* has been stuck over that of the coral. The engraving shows an identical figure, except that it is reversed. This famous collection of drawings has always been referred to as being of Ellis, and was sold with Ellis’s effects (rather than with Solander’s) (Hutchins, 1791). The circumstantial evidence from this and the rest of the original drawings is strong that Ellis was responsible for them. Nowhere in the Hunterian volume do contemporary MS annotations indicate an involvement by Solander.

Solander’s slip catalogue

Another possible source of evidence on authorship might have been the extensive slip catalogue of plants and animals prepared by Solander and still preserved in the Botany and Zoology Libraries of the British Museum (Natural History) (the ‘Solander Slips’ mentioned and discussed by among others Sawyer, 1971; Marshall, 1977; Diment & Wheeler, 1984; and Wheeler, 1984a, 1984b, 1986, all of whom commented on its preparation and contents). However, there are only a few ‘zoophyte’ slips. Three are of corals (*Madrepora cornucopia*, *M. hirtella* and *M. turbinata* (= *M. prolifera*)), but only one of these appears in the book (*M. hirtella*, p. 155, pl. 37). Two slips relate to *Alcyonium* species; one to *Spongia* (Porifera); 6 to *Flustral/Eschara* (Bryozoa); 37 to ‘*Corallina*’, including hydroids and bryozoans as well as coralline algae; and 7 to *Pennatula* species. But that is all. The joint book includes many more species in each of these genera and it is evident that Solander did not enlarge the slip catalogue from the manuscript of the book which he is known to have had in his possession (p. 47). It could be argued that Ellis might have borrowed any extra slips there were, but this seems unlikely since Solander would have had the opportunity to retrieve them after Ellis died. There is thus no evidence from the slip catalogue that Solander wrote the book. It is noteworthy that there are no slips preserved relating to the extensive Scleractinia material which Solander collected with Banks on Cook’s first voyage and which probably formed the basis of much of the published *Madrepora* section.

General correspondence

A letter written by Ellis to Dr David Skene, dated 26 December 1770, included the following:

‘The tediousness and impertinence of engravers have been the great occasion of delay in publishing my 2d volume . . . We live in hopes of hearing from Banks and Solander tho’ our fears encrease as the time is nearly expir’d when they were expected.’ (Savage, 1948: 77)

Banks and Solander were on the *Endeavour* with Cook and it seems from Ellis’s letter that he was at that time being held up by the engravers, implying that the text was well advanced;

and his use of the first person suggests that at least in 1770 he was intending to be sole author. Possibly when Solander returned with his coral collection Ellis considered joint authorship, but there is no evidence for this.

Two letters from Ellis to Skene indicate Solander's role in assisting Ellis in choosing the generic divisions for the book, and also that Ellis was the senior author:

'... I am beginning to arrange the sea-zoophytes, beginning with the most simple, neither following Linnaeus nor Pallas but my own plan. [A list almost identical with that adopted follows.] I should be glad of your opinion. Since Solander left this [list, before going on the voyage,] I have no friend that knows anything of this dark part of Natural History . . . ' (24 September 1768) [MS in Edinburgh University Library]

'... I have attempted to place those of which I have or shall give figures in the following order. [There follow 16 generic names as finally adopted in the book.] I have left out the *Cellopora* of Linnaeus . . . I have adopted some of Pallas' genera because I think him right, but I shall bring back the true red coral or *Isis nobilis* to the Gorgonias and call it *Gorgon: estimabilis* . . . ' (12 November 1768) [Ibid.]

The two letters suggest that Solander had drafted out the generic divisions for Ellis before leaving on the *Endeavour* in August 1768; but that once he had gone Ellis himself took decisions on which genera to admit. Solander would clearly have had opportunity to alter the order in which the genera appeared after Ellis's death eight years later, but there is no indication that he did so; and he evidently did not change the generic divisions themselves. His role in this can hardly be considered authorship.

Ellis's correspondence with Linnaeus might also be expected to provide a clue. The correspondence is largely available, preserved in the Linnean Society of London. Most of it was published by Smith (1821), with his own apparently random emendations, and a few additional items by Savage (1948). Here again there is good evidence which points to Ellis having written the descriptions. In a letter to Linnaeus dated 25 September 1770 Ellis stated (six years before his death):

'I have not time from public business to attend . . . my System of Zoophytes as I could wish but live in hopes to print it in time. At least *I will leave my figures and descriptions to the world* and wish they were done by abler hands . . . ' (from the original; italics ours; Smith's published transcription has emendations).

From this it would seem likely that Ellis did leave many of the species descriptions but the extent to which they were emended by Solander, or for that matter by Martha Watt, is hard to determine. The *Endeavour* had not yet returned and Ellis's comments do not contradict the idea that the book was largely ready; and that on the return of the *Endeavour* publication was delayed to accommodate the new, largely scleractinian, zoophyte material from it.

Some of Ellis's letters to Linnaeus (Smith, 1821), as hinted by Rauschenberg (1968), indicate that Solander might have helped prepare some of the descriptions made towards the end of Ellis's life, particularly those of the *Madrepora* species. But there is no firm evidence of his having a role after Ellis's death in 1776.

However, there is a suggestion that Solander might have continued to work on corals after Ellis died. Sir William Hamilton (1730–1803), who 'resided at Court' in Naples, wrote 9 February 1779 from near there to Banks:

'I have sent Solander a collection of corals for our Museum. There are duplicates of many, which he may give to you if they should be curious and worth your acceptance.' (Smith, 1911: 62).

However, only two localities given in the *Madrepora* section of the book are Mediterranean (species 1, '*Madrepora patella*', probably described by Ellis and hence too early to have been

part of Hamilton's shipment; and species 15, '*Madrepora oculata*', one of Solander's descriptions). Hamilton's name does not appear in the section and almost none of the species descriptions is accompanied by a locality. Thus although the amount of use made of Hamilton's collection by Solander when preparing the *Madrepora* descriptions cannot be deduced accurately, it seems to have been little or none.

Martha Watt evidently had some difficulty in recovering the manuscript of the book when Solander died in 1782 since she wrote to Sir Joseph Banks on 1 September 1782 thanking him for:

'the trouble you have taken in recovering my Father's papers. Not having received any account previously to that you had kindly indulged me with last week, I began to apprehend the Manuscript was mislaid amid such variety of papers relating to Natural History as our late worthy friend [Solander] must have had in his possession.'
[British Library Manuscripts Dept., *Add. MSS 33977*, f. 173].

The letter confirms that when Solander died he had the (?entire) manuscript in his possession. He might have been writing parts of it, but there is no evidence for this and he might merely have been working in an editorial capacity, or even doing no work on it at all. Bearing in mind that Solander was a close friend of Banks, it would have been discourteous of Martha Watt to have implied in her letter that the MS of the book was Ellis's alone unless this were true. Possibly she did not know of Solander's role in the *Madrepora* section.

Expertise and seniority

Ellis undoubtedly enjoyed the assistance of Solander in later years both in his zoophyte research and in Solander's having supervised the preparation of at least some of the engravings of Ellis's specimens (above evidence; also Rauschenberg, 1968). Although Solander did not have a great published output, he nevertheless spread himself widely in research over both animal and plant kingdoms and is validly regarded as having been one of the earliest professional biologists in Britain (Rauschenberg, 1968; Marshall, 1977; Stearn, 1981; Wheeler, 1984b). A student of Linnaeus, he eventually became the sole natural history curator in the British Museum. Ellis, on the other hand, was an amateur naturalist, being by profession a merchant and both a King's Agent and a Colonial Agent (exhaustive account in Groner, 1987; other references above). But Ellis had a deep interest and great expertise in hydroids and other zoophytes, and in a number of other rather specific aspects of natural history. In contrast to Solander's youthful impact on the European cultural scene Ellis was probably about 45 when his first book appeared (Ellis, 1755), and he did not communicate with Linnaeus until the following year (Carruthers, 1901). It would seem natural, therefore, for Ellis to concentrate in the joint book with Solander on the description of those zoophyte groups on which he had already published – in fact almost all of them – and for Solander to help whenever he could. Since Solander was about twenty-three years Ellis's junior it might have been natural for this reason also for Ellis to have had the greater share of the writing.

Ellis, too, was unusually talented, rising from obscurity in which even the year and place of his birth were uncertain (p. 18; discussion in Groner, 1987) to become a successful merchant, a King's Agent, a Colonial Agent, a Fellow of the Royal Society, and a leading light in one of the great international biological debates of the eighteenth century, that concerning the animal nature of zoophytes. He stood significantly above most contemporary European writers on zoophytes. By 1755 he had developed a rare style of writing in which there was a strong tendency for the observed facts alone to find place so that even today his works seem remarkably free of errors.

In striking contrast, bibliographic sources show that Solander never otherwise published on zoophytes and during his whole life published hardly a single item on any zoological subject as senior author (Rauschenberg, 1968). He was, however, junior author of several botanical works and sole author of some lengthy manuscript catalogues – mostly now preserved in the British Museum (Natural History) (Diment & Wheeler, 1984). The greatest zoological

publication with which he was associated as nominal author was the book with Ellis. Perhaps if he had lived beyond the age of 49 some of the promised works might have followed, and it should be borne in mind that there was little pressure to publish quickly in those days. Nevertheless, it must be said that many other naturalist authors of the time were relatively prolific, and almost all were amateurs in that they were not paid for their work. Solander, the professional, seemingly had ample opportunity to publish but he hardly ever did. The conclusion that he was the sort of person who is slow to publish is inescapable. This does not necessarily detract from his scientific ability. Such people are of course common today, and it seems unnecessary to invoke special eighteenth-century conditions to explain the lack. It has been suggested that the 'slip catalogue' preserved in the BMNH was to have been along the lines of the *Systema naturae* (p. 23). In Rauschenberg's (1968: 57) opinion Solander's death came at the height of his career. Yet the near absence of published zoological works is striking, considering the opportunities he must have had.

In the 1770s there were hardly any publications on hydroids and other zoophytes available (Bedot, 1901) and certainly few comparable in merit with Ellis's (1755, 1767) first book. Hence it seems still less likely that Solander might have written the bulk of the joint work.

The manuscript captions in the British Library copy

Jonas Dryander (1748–1810) was once Solander's shared assistant and was successor to his post. Dryander (1796) noted that the six extra plates were found after the death of 'the author' (p. 25), implicitly Ellis, though whether this was before or after Solander's death is not clear. The manuscript captions on the fly-leaf are in Dryander's hand (J. B. Marshall, pers. comm.; Marshall, 1978). If Solander had seen these six plates, and had Solander written the text of the book, one would have expected a printed cross-reference to them by Solander on the appropriate pages. But the only cross-references are those written in the margins, probably also by Dryander, suggesting that Solander did not prepare the text or modify it later and, therefore, that the text had already been written before Ellis's death.

Evidence from the published text

Some of the evidence on authorship presented so far is open to alternative interpretation. Among the strongest evidence, however, is that which can be gleaned from the published work itself. Throughout the text there are occasional sentences in the first person singular, and the contexts in which they occur suggest overwhelmingly that Ellis was the author. It remains possible, but seems most unlikely, that Solander wrote these passages as though written by Ellis. Although the quotation from Banks already mentioned (in Rauschenberg, 1964) indicates that Solander did this kind of 'ghost writing' a much simpler explanation is that Ellis was the true author. A typical example (Ellis & Solander, 1786: 33) runs: 'In my Essay on Corallines [Ellis, 1755: 32] I have taken notice that . . .'. Further, *nowhere in the joint work does use of the first person singular imply authorship by Solander.*

Apparently unequivocal indications that Ellis wrote at least the draft of the text occur in most of the 16 included genera (though *Madrepora* must be excepted: p. 42). In the list which follows the page numbers refer to indications of this sort. The extent of the account of each genus is indicated by the page numbers following its name.

I *Actinia* (Pp. 1–8) Pp. 1 (re *Actinia sociata*; see also p. 5); 7.

II *Hydra* (Pp. 8–10) No direct evidence, but use of the first person singular suggests that Ellis wrote this section.

III *Flustra* (Pp. 10–18) Pp. 12, 15, 16, 17.

IV *Cellaria* (Pp. 18–30) No direct evidence, but since so many as 13 of the 18 species included were described earlier by Ellis alone it seems probable that he would have written at least most of this section. The remaining five species were described as new in the joint work.

V *Tubularia* (Pp. 30–32) No direct evidence, but the three included species had each been first described by Ellis so that it seems probable that he would have written this section.

VI *Sertularia* (Pp. 32–60) Pp. 33, 34, 35, 41, 43, 45, 45–46, 46, 50, 54. No fewer than 27 of the 36 included species had been described earlier by Ellis (1755) so it seems highly likely that he would have written this section. Indeed, it is in this genus – now largely disbanded amongst other hydroid genera and some ectoproct ones – that Ellis made his greatest contribution to ‘zoophyte’ studies.

VII *Pennatula* (Pp. 60–67) Pp. 62, 62–63, 63, 64, 65. Of the ten included species nine had been described by Ellis in earlier works, six as new to science. Almost certainly he would have written this section.

VIII *Gorgonia* (Pp. 67–97) Pp. 68 (twice), 70, 75 (twice), 76, 84 (‘The specimen was presented to me by Dr Solander’), 86 (The specimen was ‘sent to me . . . in the year 1755’ – before Ellis had started to correspond with Linnaeus, and even longer . . . before he had met Solander), 89.

IX *Antipathes* (Pp. 97–104) Although the first person singular is used in places in this section there seems no unequivocal clue as to authorship.

X *Isis* (Pp. 104–108) Again, no decisive evidence. The clause ‘We likewise find that’ (pp. 106–107) could be a turn of phrase and not a valid use of the first person plural. Ellis (1755) frequently wrote in this way in his earlier book, unquestionably a single-author work.

XI *Corallina* (Pp. 108–128) Pp. 109, 119, 122, 127.

XII *Millepora* (Pp. 128–143) Pp. 128, 133 (‘We frequently observe . . .’ – see note under *Isis*), 139, 140 (‘I had . . . a specimen . . . from Dr Solander’), 141.

XIII *Tubipora* (Pp. 143–145) P. 144 (‘Dr Solander saw [*Tubipora musica*] in vast abundance . . .’).

XIV *Madrepora* (Pp. 145–173) Pp. 146 (‘By Madrepore corals, we mean . . .’, conceivably indicating joint authorship – see note under *Isis*, above), 149. Authorship of this section was probably largely by Solander, and is discussed above (pp. 42–45).

XV *Alcyonium* (Pp. 173–182) Pp. 176 (twice), 177 (‘We have but an imperfect figure of it in Rondeletius; but . . . Dr Schlosser has given us a very good figure of it in . . .’, again almost certainly a turn of phrase rather than an indication of joint authorship: see note under *Isis*), 178, 188.

XVI *Spongia* (Pp. 182–191) P. 182 (three times); also p. 182 (‘. . . my letter addressed to Dr Solander . . . Phil. Trans. vol. 55, p. 280’).

The published captions

Many of the captions to the plates are extremely brief but others are more extensive. It is perhaps justifiable to ascribe them respectively to Solander and Ellis; but many are intermediate and could have been written by either of them, so that a detailed analysis would be necessary. Only in two is there a firm indication that Ellis was not the author: Pl. 26 ‘No explanation of this plate was found in Mr Ellis’s papers’; Pl. 32 ‘No explanation of this plate was found.’ One might have expected Solander to have identified the species depicted on these particular plates had he worked on Ellis’s manuscript following Ellis’s death. It is possible that the book’s eventual editor, Martha Watt, was responsible for these and for some of the other captions. It would seem inescapable for her not to have been involved with them at least to some extent, since ensuring that they matched the plates and the names used in the text would have been a necessary editorial task. There is no firm evidence for or against Solander’s having been involved in writing the captions, but it would seem likely that he was at least partly involved since he had identified the coral plates. Similarly, neither is Ellis precluded.

Authorship: concluding remarks

The date when Ellis started working on the 1786 book is unclear. The earliest indication is 1765 but the absence of information before that date does not preclude an earlier start.

The book is unusual in lacking an introduction, excepting that provided by Martha Watt which really comprises a preface to the main text. This is in striking contrast to Ellis's (1755) earlier work in which the introduction spans 13 pages. We have come across no manuscript material which might have formed an introduction, but this does not preclude Ellis's having written one which was subsequently lost. Solander clearly had ample opportunity to prepare an introduction. But though he might have done so and it might have been lost, the lack of evidence of his having done detailed editing of the book makes it seem more likely that he did not prepare one.

There seems good evidence that Ellis wrote almost all the text of the book in its final form, and this is in keeping with his having published widely on the 'zoophyte' groups. Nowhere in the text is there a reference to any event between Ellis's death in 1776 and Solander's in 1782, nor indeed to any between 1776 and the book's publication early in 1786: circumstantial but strong evidence that the text was written before Ellis's death. Solander, the younger man by some 23 years, although undoubtedly helpful to Ellis, seems to have written only the bulk of the *Madrepora* section, just 21 of the book's 206 pages of text. However, Solander's contribution should be seen in perspective. It includes a disproportionate number of species per page; and Solander's assistance with the plates (p. 39) also justifies his nominal joint authorship. Evidence on authorship of the captions is inconclusive.

Ellis's drafts of the *Madrepora* species descriptions preserved in the Linnean Society of London were not used by Solander. The first three species in the *Madrepora* section were probably written by Ellis. The remainder of the account of this genus was probably written by Solander in November 1774 (p. 43), towards the end of Ellis's life. Ellis's health and eyesight were failing in 1774 (Savage, 1934) and it would perhaps have been natural for Solander to take on the remaining work. As Whitehead (1969) remarked, it was probably based partly on Banks's and Solander's *Endeavour* material, but also on Fothergill's (some of which originated from the *Endeavour*), on a few specimens in the collections of the Duchess of Portland, and on material from several other collections (p. 54).

It might be expected that after Ellis's death Solander would have played some editorial role, and as much is implied by the title page and by Martha Watt's introduction. However, there seems no evidence that Solander materially altered Ellis's descriptions other than in the genus *Madrepora* as outlined – and then only by not using Ellis's drafts. Why he did not use them is unexplained. Both authors were alive at the time and the extant correspondence shows that they were in friendly contact, yet Solander's descriptions left out such important data as collecting localities that were included in Ellis's drafts (p. 43). With the rest of the book, it may be that Solander simply collated the manuscript material left by Ellis with the illustrations – but there is no evidence that this task was not done by Martha Watt who, being Ellis's daughter, might well have known enough of the subject to have done it. Indeed, her letter to Banks in 1782 (p. 47) suggests that in fact Solander had *not* been working on the manuscript.

Production of the book

Solander died some six years after Ellis. Sir Joseph Banks retrieved the manuscript from amongst Solander's effects soon after Solander's death and passed it to Martha Watt. A letter from Martha Watt written in September 1782 shows that Banks had located the manuscript and offered to help in the editing of the book, and also that she accepted his offer (BM Add. MSS. 33977 f. 173; précis in Dawson, 1958: 861). However, we have no evidence on the extent to which she actually drew on his help. Her energy, it seems, was largely responsible for the eventual publication of this remarkable book. There is no evidence that either she or Banks changed the text, but either might have done some work on the captions. The introduction, written by her, implies by default that Banks was not deeply involved in the book's production – though it was dedicated to him. Banks's implied lack of involvement is surprising since he was clearly able to help and had known both authors, and perhaps also Martha Watt, for a

long time. All the evidence suggests that the manuscript they left was in an advanced state so perhaps Banks had confidence in Martha Watt to see it through publication. There is evidence that around 1 September 1782 Martha Watt sought Banks's advice on the process of publication (Watt to Banks, BL *Add. MSS.* 33977 f. 173). Slightly prior to this all Solander's manuscripts had been impounded by the Swedish embassy in London. An undated letter from Martha Watt apparently to the then publisher of the book indicates that she was relying heavily on Banks to retrieve the Ellis & Solander manuscript from the embassy (BL *Add. MSS.* 33982 f. 243). Whether or not the copper engravings were included is not indicated in the letter, and we have not determined if the six missing ones (present figs 2–7) might still be extant in Sweden. Certainly the effusiveness of Martha Watt's introduction to the book would suggest that had Banks been more greatly involved, she would have acknowledged him appropriately.

The sequence of known events concerning certain aspects of the production and publication of the book as deduced herein is as follows:

September 1770, Ellis wrote to Linnaeus implying that he had completed the 'figures and descriptions';

12 July 1771, *Endeavour* returned (Rauschenberg, 1968); Ellis perhaps delayed the book to incorporate new material, especially scleractinian corals;

1773, Ellis in poor health;

November 1774, Solander prepared most of the *Madrepora* section and shortly after returned many (?*Endeavour*) coral specimens to Fothergill;

October 1776, Ellis died, the book still unpublished;

May 1782, Solander died;

August 1782, Banks retrieved the manuscript from Solander's effects, apparently impounded by the Swedish embassy, and passed it to Martha Watt;

23 February 1786, copy presented to Royal Society.

Notes on some of the original drawings for Ellis & Solander's *Zoophytes*

The history and provenance of these drawings was outlined by Sir Sidney Harmer (1931*b*) who commented on them in some detail. One, of the coralline alga '*Corallina lichenoides*', has recently been reproduced by Woelkerling & Irvine (1986: fig. 2), and another is reproduced here (Fig. 9). The drawings were purchased by John Hunter (1728–1793) at the Ellis Sale in 1791. Some of these aspects are discussed further elsewhere (pp. 54–61). Today the drawings are preserved in the Library of the Royal College of Surgeons, London, in a folio volume entitled 'Hunterian Drawings, Vol. I'. As noted by Harmer, the volume includes all the original drawings for most of the plates of stony corals and for many of the illustrations of other groups in the Ellis & Solander (1786) book; and a number of Ellis's pencil sketches and some of the drawings for three of the six previously unpublished plates (64, 65, 67). It includes also many of the drawings for the plates in the earlier book (Ellis, 1755), and some from his papers in *Philosophical Transactions*. Some helpful typewritten notes by Harmer are bound in. In addition a few rough sketches by Ellis are preserved in the manuscript collection of the Linnean Society of London (Item 287).

There follows an annotated list of the drawings relevant mainly to the scleractinian corals in the 1786 book from notes made by JWW in 1934, by both of us in 1978, and by PFSC in 1986. Asterisks (*) indicate specimens now in the Hunterian Museum, Glasgow, following a manuscript list compiled in 1978 by Dr P. E. P. Norton (see also Table 2). The lists published by Young (1877) and Kerr (1910) were less complete. The artist is listed where indicated on the drawings or otherwise known to us. Most of the plates were reversed from the drawings

when published. A note under pl. 12 indicates that at least some of the drawings were arranged for the plates by Ellis himself (rather than by Solander).

Plate/Fig.

- 12 Fig. 1 *Gorgonia mirabilis* (Folio 16)
 Fig. 2 *Gorgonia ceratophyta* on Fig. 4 '*Madrepora caerulea* (= *Heliopora*). Two drawings, that of *Gorgonia* stuck over and overlapping that of *Pocillopora*. (Folio 16)
 Fig. 3 Wanting.
 Fig. 4 *Millepora* (*Pocillopora*) *caerulea* (See under Fig. 2.)
 Fig. 5 *Isis coccinea* (Folio 16)
- 13 Fig. *5 *Madrepora axillaris*. Pencil (Folio 17).
- 28 Miss Ellis. Reversed (on the printed plate). *Madrepora patella*, *M. fungites*, *M. cyathus*.
- *29 Simon Taylor. Not reversed. *M. anthophyllites*.
- 30 J(ames) R(oberts) fecit 1769. *M. fascicularis*.
- *31 G. D. Ehret pinx_t, 1753. Coloured. Figs 5–6, *M. flexuosa*. Figs 3–4, not those of the engraving: they show a non-carinate species of *Pavona*. Not reversed.
- 32 Fig. 1 Drawing shows dentate septa more clearly. Reversed. *M. tibicina*? Appears to be *Hoplania durotrix*. Only part of drawing finally engraved. See also p. 60.
 Fig. 2 Only part was engraved.
- 33 J. R. 1769. *M. fastigiata*. Folio 55 has an ink-and-wash drawing by J. Roberts, dated 1769. It is not the engraved version, which lacks a patch of *Porites* just below the middle corallite.
- *34 J. R. delin., 1769. *M. angulosa*. Much of the background not engraved.
- *35 *M. carduus*. Reversed.
- 36 *M. virginea*. Not reversed. Part of the substrate not engraved.
- 37, 38 No drawings.
- *39 G. Miller sculp. Ink and wash. Not reversed. *M. aspera*.
- *40 G. D. Ehret del. 1755. Coloured. Not reversed. Drawing shows about half as many septa as the engraving. *M. undata*.
- *41 Drawn March 1773. *M. ampliata*.
- 42 *M. cucullata*. Not reversed. J. Barnes on engraved plate.
- *43 J. Barnes del. et sculp. Not reversed. *M. cinarescens*. Verso: fine drawing of *M. agaricites*.
- 44 J. Roberts del. *M. lactuca*. Also a sketch for this in oils. See also present Fig. 10.
- *46 J. Roberts del. 1 January 1774. *M. daedalea*. Fig. 3 shows a continuous spongy columella better than the engraving.
- 47 Figs 1–2 *M. porites*.
 Fig. 3 appears to be *Favites* sp.
 Figs 4–5 *M. areolata*.
 Fig. 7 *M. galaxea*, tinted brown.
- 48 No drawing.
- 49 J. Roberts del., 1772. Fig. 1, *M. denticulata*.
 Fig. 2 *M. siderea*.

- Fig. 3 *M. exesa*.
The drawings are better than the engravings.
- *50 Fig. 1 *M. favosa*. Drawing shows mussid teeth and columella well.
Fig. 2 *M. abdita*.
- 51 *M. gyrosa*.
- 52 No drawing.
- 53 **M. annularis*; *M. stellulata*; **M. faveolata*; *M. pleiades*.
- 54 J. Barnes del. et sculp.
Fig. 1 *M. spongiosa*.
Fig. 2 *M. retepora*, ink-and-wash.
- *55 *M. rotulosa*. A very poor oil sketch. Reversed.
- 56 Ehret, 1752. *M. interstincta* [*coerulea*]. Coloured blue on ink drawing. Reversed.
- 57 J. Barnes. *M. muricata*.
- 58–63 No drawings.
- 64 (See present Figs 2, 9).
Fig. 2 *Cellaria ternata*. Reversed. Pencil. (Folio 53, D).
Fig. 3 *Serularia spicata*. Reversed. Pencil. (Folio 47, H).
Fig. 4 *S. spicata*. Reversed. Pencil. (Folio 52, I).
Fig. 5 *S. evansi* on *Fucus*. Reversed. Pencil. (Folio 47, B).
Fig. 6 *S. evansi*. Reversed. Pencil. (Folio 49, E).
Fig. 7 *Corallina pinnata*. Reversed. Pencil. (Folio 48, C).
Fig. 8 *C. loricata*. Reversed. Pencil. (Folio 57, A).
A life-size habit drawing of '*Cellaria ternata*' also appears on Folio 53, but although it has brown transfer powder on the verso it does not appear on plate 64.
- 65 (See present Fig. 3)
On verso of Folio 28. Figs 1, 2 *M. mammillaris*.
Fig. 3 *M. oculata*. Reversed.
- 66 (See present Fig. 4)
See 'Folio 58', below.
- 67 (See present Fig. 5)
Fig. 1 *M. agaricites*. On verso of Folio 30.
Fig. 2 *M. sinuosa*. On verso of Folio 32.
In addition there are some drawings by Ellis, probably tentative sketches or lay-outs for plates:
- FOLIO:
- 47 Hydrocoral (*Stylaster* or *Allopora*).
- 50 Verso. Sketch for details of *Tubipora*.
- 53 & 54 Verso. Four sheets of pencil sketches of corals. None seems to be for engravings. They are marked in upper corners 'Pl. 55', 'Pl. 56', 'Pl. 57', but are not the originals for those plates.
- 58 Upper sheet: pencil sketches, evidently a study for a plate. One is *M. rosea*, same as Pl. 66, fig. 4 (present Fig. 4); another is *M. violacea*, same as Folio 47 above, but not *M. violacea* of the text.
Folio 58 also includes several unpublished drawings of species described in Ellis & Solander (1786):

- Tubularia ramosa* Ellis & Solander, 1786: 32 (today referred to *Eudendrium* [Hydrozoa]).
Millepora spongites Ellis & Solander, 1786: 132.
M. cervicornis Ellis & Solander, 1786: 134.
M. skenei Ellis & Solander, 1786: 135.
M. verrucaria Ellis & Solander, 1786: 137.
M. alcicornis Ellis & Solander, 1786: 141.
Madrepora rosea Ellis & Solander, 1786: 155 (today referred to *Stylaster*, p. 31).

- 59 Rough pencil sketches of *M. astroites*, *M. radiata*, *M. cavernosa* and *M. interstincta*. Also a sketch of a coral, pl. 20, fig. 14, of Ellis (1764: *Phil. Trans.*, p. 52) [*Galaxea ellisi* Milne Edwards & Haime, 1857].

The dispersal and fate of Ellis's manuscripts and collections

The Ellis manuscripts that survive are tolerably well documented (Savage, 1948), much of his correspondence is published (Smith, 1821), and the drawings from which the 'zoophyte' illustrations for his two books (Ellis, 1755; Ellis & Solander, 1786) were engraved are well preserved (Harmer, 1931*b*; personal observation by both of us in 1978). Recently Groner (1987, appendix) has listed much archival material either written by Ellis or concerning his life. In contrast, most of his collections and those of others on which he worked were dispersed soon after his death and now can hardly be traced.

Origins of the Ellis & Solander material

The origins of many of the specimens described in the book were indicated in the text. Groner (1987) has provided a summary, from which the following is drawn: John Greg (11 specimens direct to Ellis, a further 6 via the Earl of Hillsborough) [Greg and Hillsborough each gave material to the BM as well; A. C. Wheeler, pers. comm.]; John Fothergill (5 given to Ellis); Banks and Solander (several *Endeavour* specimens); the following, small numbers – Jean-Baptiste Bohadsch, Rev. Dr William Borlase, Gustavius Brander, Mark Catesby, Rev. Clarke, Vitaliano Donati, Joseph Gaertner, Corbyn Morris, P. S. Pallas, Dr James Parsons, Thomas Pennant and William Webber. The sources of many other specimens were not indicated. Both Ellis and Solander had ready access to the collections of Fothergill, the BM, and the Duchess of Portland, and many specimens from these sources were described in the book. Lastly, many of the species included were those that had been described already in Ellis's earlier book (Ellis, 1755) based largely on Ellis's own cabinet – at that time collected largely by himself.

Thus, apart from Ellis's own collections, the material came from many sources. With this exception, there never was a single large repository of Ellis & Solander types; and their subsequent whereabouts would be difficult to trace. However, the fate of a small proportion can at least be commented on; and if only a small amount of type material survives, at least the way can be shown to be largely clear for the future designation of neotypes.

Surviving material

The potential importance of any surviving Ellis or Ellis & Solander material would be great. For example, Ellis's earlier book (Ellis, 1755) was cited as sole taxonomic indication under many of the *Sertularia* species described by Linnaeus (1758) so that some, perhaps many, of the specimens in Ellis's cabinet were probably types of the corresponding Linnean species. Short notes concerning other aspects of the Linnean *Sertularia* species and Ellis's publications and collections have been published elsewhere (Cornelius, 1975*a*: 267, 273; 1975*b*: 394; 1979: 309). Probably similar importance would attach to Ellis (1755) zoophyte specimens referred to other genera by Linnaeus (1758). In addition, numerous species were first described in the second book (Ellis & Solander, 1786) and mentioned specimens from that work are similarly important. A review of a lot of the earlier work attempting to locate the Ellis collections of

both animals and plants was provided by Dixon (1960). The notes which follow largely present an account of the continued loss of these important collections.

Most noteworthy of the surviving specimens are the dozen or so Ellis & Solander corals still preserved in Glasgow (Young, 1877; Kerr, 1910; Wheeler, 1986: 29; see also Table 2). There is another of the illustrated coral scleractinian specimens in the BMNH (present Fig. 10). A single hydroid specimen said to have originated from Ellis is preserved in the Royal College of Surgeons (p. 61). A single sponge specimen surviving intact in the BMNH collections has recently been located by Professor P. R. Bergquist and S. M. Stone. It is currently labelled *Phyllospongia foliascens* (Pallas, 1766), regd. no. 1872.9.25.1, presented by R. G. Whitfield; and is illustrated in Ellis & Solander, 1786: pl. 59, fig. 1, without textual comment apart from the caption 'sponges from Otaheite' (Tahiti). This interesting specimen has been studied by Bergquist *et al.* (in press). At least one species, a coralline alga, now has a designated neotype specimen and the original pencil drawing of it has been reproduced (Woelkerling & Irvine, 1986). It is probable that most of the hydroid specimens in the Linnean Herbarium in London were given to Linnaeus by Ellis (Svoboda & Cornelius, in press) but this certainly occurred after the publication of Ellis's first book (Ellis, 1755). Though the specimens might have originated from Ellis most are probably not primary types of the species included in the tenth edition of the *Systema naturae* (Linnaeus, 1758) (Cornelius, 1979: 309, notes 13–14). However, a specimen of the hydroid *Aglaophenia pluma* (Linnaeus, 1758) in the Linnean collection has been designated neotype (Svoboda, 1979; redesignated lectotype by Svoboda & Cornelius, in press); and others of *A. kirchenpaueri* (Heller, 1868) recognized as perhaps comprising the earliest record of the species from the British Isles although the species was not at that time recognized as distinct (Svoboda & Cornelius). Both these *Aglaophenia* specimens were almost certainly collected by Ellis. Certain of the Linnean hydroids are known to have origins other than Ellis but these are only a few (Cornelius, 1979: 309).

Engravings for the plates

Lamouroux (1821), in his preface, recorded that he had obtained the 63 copper plates of Ellis & Solander (1786) for reproduction in his own book. We have not attempted to trace their subsequent fate.

British Museum material (see also section on Ellis's hydroids, below)

It seems that some, maybe all, of the 1421 specimens of 'corals, sponges &c' in the collections of Sir Hans Sloane (1660–1753) (de Beer, 1953) were in the BM when Solander and Ellis worked. Some were undoubtedly used by them when compiling the book, for in just a few places in the text they acknowledged the BM collection. But there is little specific evidence of the subsequent fate either of Sloane's zoophyte collections as a whole or of the particular specimens indicated by Ellis & Solander (1786). Many might have perished in the early years of the nineteenth century (p. 57).

Ellis & Solander (1786) indicated BM material on pages 44–45 (*Sertularia myriophyllum*), 66 (*Pennatula argentea*), 86 (*Gorgonia placomus*), 110 (*Corallina monile*, a green alga, today known as *Halimeda monilis* (E&S)), 141 (*Millepora alcicornis*), 158 (*Madrepora lactuca*), and 179–80 (*Alcyonium mammillosum* and *A. ocellatum*). Of this material, only the specimen of the coral *Madrepora lactuca* has definitely been located in the modern BMNH collections (see caption to Fig. 10). A contemporary herbarium-preserved hydroid specimen of *Sertularia myriophyllum* [regd. no. 1973.10.5.50 (sic)], today referred to the genus *Lytocarpia* (= *Thecocarpus* in part), might be that mentioned by Ellis and Solander. But there is no definite indication and the specimen is smaller than the illustration in the book implies. In addition to the material indicated to be in the BM by Ellis & Solander, material they noted as being then in other collections might have been deposited there after the book was printed: but we have not checked this possibility.

In 1983 our colleague Dr Shohei Shirai, of Mie-Kon, Japan, surveyed all the recent scleractinian types in the BMNH and found no Ellis & Solander type specimens.

Whitehead (1975: 61) noted that in 1809 many natural history specimens were sold by the

BM to the Museum of the Royal College of Surgeons of England, London. The sale included many specimens, and is well known (e.g. also Barber, 1980: 162; Stearn, 1981: 21–22). A. C. Wheeler kindly showed PFSC typed transcripts of the manuscript reports indicated by Whitehead. They included no reference to cnidarian material so it would seem that Ellis & Solander specimens did not reach the Royal College of Surgeons by this route. One memorandum, dated 5 March 1836, by W. Clift (1775–1849), Curator at the Royal College of Surgeons, details all the specimens. It is clear that they were almost entirely vertebrate, mainly medical and anatomical (Clift, 1836).

The statement by Cornelius (1975a: 267) that some Ellis hydroid material is present in the Hans Sloane herbarium, preserved in the BMNH, differed from the opinion of Dandy (1958) who considered the material Cornelius cited to have originated from Buddle. Dandy was probably correct.

The ‘four glazed frames’ of Ellis’s ‘zoophyte’ specimens mentioned by Ellis (1755: vii), exhibited at the Royal Society in June 1752, and once hanging in a room in the old British Museum building, have still not been traced. They were probably decorative montages comprising hydroids, bryozoans, coralline algae and ‘keratophytes’. The BM building was ‘transformed’ between 1823 and 1847, partly to accommodate the fast-growing natural history collections (Stearn, 1981: 41). The four frames have not been reported subsequently, possibly being disposed of at that time. Ellis’s own account and description indicates that they were prepared at least as early as 1752. Since many of the species accounts in Ellis’s (1755) first book were used as indications by Linnaeus it follows that some of the specimens in the glazed cases would have been eligible for type status. Rymdsdyk & Rymdsdyk (1791: 53) also mentioned the specimens: ‘They have in the British Museum, in the Coral Room, on the chimney four pictures disposed in the form of landscapes of various classes of Coral, with their explanations given by Mr. Ellis, who endeavoured to prove that they are all of the animal kind.’ They thus formed part of a scientific exhibit demonstrating one of the much-debated biological questions of the day; but whether they were originally prepared with that in mind cannot be determined. They were mentioned also by Harmer (1931a: 83): ‘four glazed frames containing specimens presented by Ellis to the Royal Society, were later in the British Museum, but no trace can be found of this collection’; and by Sherborn (1940: 49): ‘Antipathes were in a case over a mantel in the British Museum but no trace could be found in 1929.’ It is not clear what evidence Sherborn had that antipatharians were involved. Wheeler (1984a: 27) recorded the presenting of these framed montages of specimens to the BM shortly before 7 September 1758. He told us of an entry in the *Donation Book* of the BM for 1756–1782: ‘7 September 1758, 4 pictures of corallines, and nine specimens of corals and keratophytes, from John Ellis, Esq.’ which are presumably these items. Further literature citations to these ‘pictures’ were given by Dixon (1960) who confirmed their continued loss.

A. C. Wheeler kindly brought to our attention what is apparently the only relevant entry in the *Diary and Occurrences Book* of the BM (Add. MSS 45875, f. 5) for 21 October 1774 (shortly before Solander wrote the *Madrepora* descriptions for the Ellis & Solander book – see p. 43): ‘John Ellis of Wimpole Street, Esq., has presented several specimens of corall [sic], from Jamaica. D. Solander.’

Rauschenberg (1978a: 162) stated that during Ellis’s lifetime his zoophyte collections were ‘housed in his own quarters for a time, then in the British Museum, and finally in Ellis’s last years at the Royal Society’. However, it is evident that with perhaps a single exception (Fig. 10) the specimens are no longer in either institution and were sold some time after Ellis’s death. The specimens concerned might have been the four glazed frames already discussed, or other material from Ellis’s collections. Thus Ellis wrote to David Skene (26 December 1770):

‘I . . . could not send you the specimen of Zoophytes that you desire having long left off collecting, and what few I have I have given to the British Museum and have framed for the Royal Society.’ [Edinburgh University Library, MS]

Between Banks's death in 1820 and the 1840s when the energetic curator J. E. Gray became involved with the zoological collections, the British Museum was not a safe place for delicate or unfashionable biological material. One historian has commented:

'The inability of the Natural History Department even to conserve its specimens . . . was so notorious [at this time] that the Treasury frequently refused to entrust it with specimens that had been collected at the Government's expense' (Barber, 1980: 162).

Many specimens were burnt, and eventually the 'basement was cleared of its former dross' (Miller, 1973: 115). Among it was possibly much zoophyte material from Sloane, Ellis, Solander, Banks and the *Endeavour*. The Museum's reputation for curation has since changed!

Numerous herbarium-mounted hydroid specimens stored in the botanical collections survived this sorry period, however, including many which had been collected from Ireland by Robert Brown (1777–1858), the first Keeper of Botany. These are now preserved in the Zoology Department of the BMNH. Apart from these there are few hydroids from the eighteenth century zoological collections of the BM extant today.

Fothergill's collections

The extensive collections of John Fothergill (1712–1780) were examined by Ellis & Solander in the 1760s and 1770s (presently cited correspondence, p. 43). A number were described in their book and would be types. Thus in a letter to David Skene Ellis wrote (22 October 1765):

'I . . . have the pleasure of often seeing my good friend Dr J. Fothergill who [visits me at home – Ellis was temporarily sick]. He has the best collection perhaps of any one person, of shells, corals, sponges and other marine substances. He has promised to lend me some of his sponges and what else may be curious in any way.' [Edinburgh University Library, MS]

Evidently Ellis made use of Fothergill's collection over a long period, since he and Solander examined Fothergill's corals in 1774.

Fothergill's collections were eventually sold and became largely untraceable. Whitehead (1978: 70, 82) dated the sale at 1781 and stated the price to be £1,100. Only a few of the corals remain (p. 55). Whitehead stated 'Fothergill undoubtedly had many Cook specimens', which were almost certainly seen by both Ellis and Solander when preparing their account. Durant & Rolfe (1984) concurred and drew attention to the existence of some of the Fothergill corals in William Hunter's collection in Glasgow. They were partly listed by Young (1877) and Kerr (1910), and a more complete list is given in Table 2. Indeed, surviving letters indicate that many of Fothergill's corals were being examined by Solander at the BM for Ellis in November 1774, when Solander was writing that part of the book (p. 43); and the published caption to plate 60 states that the illustrated specimen of the crown-of-thorns starfish, today known as *Acanthaster planci* (Linnaeus, 1758), 'was brought from Batavia by Captain W. Webber, and is in the possession of Dr. Fothergill'. Thus many of the specimens coming into Fothergill's possession became Ellis & Solander types (that of *A. planci* was not a type, the species having been described earlier by Linnaeus).

It is curious that Banks and Solander, who had jointly collected the corals originating from the *Endeavour*, did not incorporate them into the BM collection. Whitehead also stated that 'Hunter intended selling Fothergill's duplicate shells, flies and perhaps corals after they were arranged and labelled by his assistant'. Maybe that is why only a fraction of the total complement of coral species that there might have been survives. The scant evidence suggests that many of the Ellis & Solander *Madrepora* types, collected by Banks and Solander on James Cook's HMS *Endeavour*, were eventually sold as curios!

Sales of Ellis specimens

The bulk of Ellis's collections, including some corals, was sold by auction on 10 June 1791, by the London dealer Hutchins. It is likely that species illustrated in both books (Ellis, 1755, Ellis & Solander, 1786) were involved. Lettsom (1786) recorded that Hunter bought 'Ellis's corals . . . and other curious subjects of natural history' for £1,500, an enormous amount of money. He commented: 'his corals, from which Ellis . . . delineated his system, and created a new species of animal beings . . . was the foremost in Europe. It included some corals from Cook's voyages. These and other curious objects of natural history were purchased by Dr Hunter for £1500.' (Lettsom, 1784, vol. 3: liii; Lettsom, 1786: 55). Lettsom implied that many of these were Fothergill coral specimens and were Ellis & Solander types, and this seems to have been so. We have no evidence that any *Endeavour* corals passed into Ellis's hands, although since Ellis and Solander were friendly this is a possibility. Only a few survive (Young, 1877; Kerr, 1910; see also Table 2).

By implication, A. C. Wheeler (in Chalmers-Hunt, 1976: 15) rated the Ellis collection among the few foremost in zoological importance, other than those of mollusc shells, to be sold by auction during the long period 1700–1972. A copy of the Ellis sale catalogue (Hutchins, 1791) preserved in the Prints & Drawings Room of the British Museum, London, has annotations giving many of the buyers and the prices paid. The sale comprised 107 lots. Number 97, annotated as purchased by the London dealer George Humphreys (1739–1826) for seven guineas, included 'seven large glazed frames, six of them in a mahogany case, with shelves and folding doors, in which are arranged a very fine and extensive collection of corals and corallines, sponges, &c. from which the figures and descriptions in the History of Zoophyte [Ellis & Solander, 1786] were taken; most of the specimens, which are chosen ones, are labelled, either by Mr. Ellis or Dr. Solander; . . .' Nine of the lots (11, 25, 42, 47, 61, 74, 79, 86, 93) included corals or other zoophytes, some 33 specimens of which were specifically named comprising 22 identified species of *Madrepora*, all species described in the 'Zoophytes'. Lot 93 consisted of two specimens: 'Madrepora protrusa [lapsus for *M. pertusa*], from the South Seas; and madrepora axillaris, both kinds extremely scarce. – See Ellis Zoophyte [sic], the descriptions and figures in which were taken from these specimens.' An H in the margin of the BM copy of the sale catalogue suggests that these were purchased by Humphreys, who was identified by annotations of his full name at other places in the copy. Ellis's six-drawer cabinet and the seventh, separate, case evidently contained numerous specimens from which the illustrations were prepared and many would no doubt qualify for type status.

Lot 98 in the Ellis Sale was: 'A parcel of sketches and drawings of corallines, sponges, and other zoophyte', sold to John Hunter for five guineas. Four other lots (100, 101, 102, 104) of drawings, including four by G. D. Ehret, were also purchased by him for £1 2s 6d. These drawings are now in the Royal College of Surgeons of England, London (Harmer, 1931*b*) where they were examined jointly by the present authors (p. 51). Included among this magnificent collection of drawings of scleractinians, sponges, hydroids and other zoophytes were examples of the work of Roberts, Taylor and Ehret.

Humphreys also bought from the Ellis sale Lot 30 'A wainscott box containing a very large collection of fuci, or sea-weeds, the whole of which are arranged by Mr. Ellis' (MS note in BM copy of Hutchins, 1791). Its subsequent fate is unknown to us. The coralline algae from Ellis's collections were also sold at this sale, and can no longer be traced (Woelkerling & Irvine, 1986). Other lots in the Ellis sale included various 'zoophyte' items, almost certainly with a few types, but the buyers are not recorded in the BM copy.

George Humphreys was active for many years (summary in Whitehead, 1975: 72). Some clue as to the subsequent fate of some of the Ellis specimens might be hoped for in following his activities after the sale. A MS note by W. Clift, Curator at the Royal College of Surgeons, London, dated 16 June 1830, states that George Humphreys's collection was bought by 'Mr Sowerby, Dealer & Auctioneer, and afterwards sold at various sales and times'. He continues with a note on the fate of a specimen of *Enocrinus* from the Ellis sale in 1791 [Royal College of Surgeons of England, London, *Hunterian Drawings* vol. 1, f. 11].

Whitehead (1975) listed some of Humphreys's purchases at the Ellis sale but corals were not

among them. In 1786 Humphreys bought at the 'Portland Sale' (Skinner, 1786); and in 1797 he conducted a sale for a Paris dignitary, C. A. de Calonne. In fact, the only sale catalogue ascribed to G. Humphreys in the British Library *Catalogue of Printed Books* was that of the de Calonne sale (Humphreys, 1797). Humphreys's name does not appear on the title page and the reasons for associating the catalogue with him are not known to us. The 84-page catalogue included a section of corals (*Madrepora*), lots 1202–1242 inclusive, of which 18 (or 19: lot 1213 is problematical), that is just under half, were identified in the catalogue using the Ellis & Solander book. For example:

'Lot 1202 *Madrepora cyathus* Mediterranean. Ell. & Sol. Zooph., pl. 28, fig. 7.'
[*Caryophyllia cyathus* (Ellis & Solander)]

'Lot 1204 *Madrepora fungites* E Indies.' [*Fungia fungites* (L.)]

Only the first of these species was described as new by Ellis & Solander, and no other of the 41 listed specimens were from their respective type localities (all but two had localities listed). The task of determining whether these might have been Ellis & Solander specimens is made difficult since in many cases Solander did not state the type locality in the book, but a preliminary impression is that the material in Humphreys's de Calonne sale did not include relevant specimens. A later sale of de Calonne artefacts in the same year (King, 1801), although comprising largely mollusc shells, 'zoophytes' and other marine curios, did not have a systematic arrangement such as might reflect the dispersal of a scientific collection such as Ellis's.

The Portland Catalogue

Another sale catalogue giving a small amount of evidence about the fate of specimens relating to both Ellis (1755) and Ellis & Solander (1786) is the so-called *Portland Catalogue* (Lightfoot, 1786). The catalogue records the sale of the enormous collection of marine invertebrates, and of numerous art treasures and the like, following the death of Margaret Cavendish, Dowager Duchess of Portland. Evidently Ellis had occasional access to it. Thus, he wrote to David Skene (14 July 1786):

'I have sent you a sketch of a New Barnacle which the Duchess of Portland has desired me to get drawn . . .' [Edinburgh University Library, MS]

There are also indications in the text (Ellis & Solander, 1786) that the Duchess's collections were examined (for example *Gorgonia exserta* Ellis & Solander, their pp. 87–88).

The *Portland Catalogue* is long and was prepared skilfully. The Rev. John Lightfoot is now thought to have been the author (discussion in Dance, 1962; Kay, 1965; see also Rauschenberg, 1964, Rehder, 1967, and comments on p. 38). Many of the 4156 lots were corals, and a large proportion was identified thus, citing the Ellis & Solander book:

'Lot 263 *Madrepora cinarescens*. Ell. Zooph. Tab. 43' [*Turbinaria cinarescens* (Ellis & Solander)], and '*Madrepora damicornis*, L.' [*Pocillopora damicornis* (L.)].

Manuscript annotations in a British Library copy name the buyers and the prices paid – in this case 'Sykes', for 4s 6d. Most of the zoophyte entries follow this form; but three state definitely that the item was an illustrated specimen, viz:

'Lot 3610 A most curious and elegant white Coral, of a globose form, with delicate angulated cells, figured in *Ellis Zooph. tab. 54. fig. 3. and by him named Madrepora Retepora* [*Alveopora retepora* (Ellis & Solander)]. *It is extremely rare.*' [Italics original. Bought by Humphreys, 12s 0d.]

'Lot 3747 The body, with the rays folded up, of a curious and rare species of

Encrinus [*Encrinus lilliformis* Lamarck], described by Rosinus, and figured in Ellis' *Corall.* [i.e. Ellis, 1755] *pl.* 37. *fig.* K with great part of it's stem, imbedded in a calcareous stone, replete with marine bodies of this and other kinds.' [Italics original; buyer not recorded; £1 5s 0d.]

'Lot 3804 A very curious un-named species of Madrepora, figured in Ellis *Zooph.* tab. 32 *fig.* 1' [*Madrepora tibicina* Ellis & Solander, 1786 = *Hoplanguia durotrix* Gosse; see p. 52]. [Italics original; no buyer entered, but Humphreys bought lots 3803 and 3805; 7s 0d.]

The published list of the prices fetched and the names of the buyers at the 'Portland Sale', for convenience ascribed to the auctioneer, Skinner (1786), gives the information shown above under these three lots. The same prices and buyers are entered in MS in two BL copies of the *Portland Catalogue* except that in one of them no price is given for lot 3804. However, an MS note in the other, and also in a copy of the catalogue in Cornell University library, records the price as 7s 0d, as entered in Skinner's published sale list.

Thus Ellis & Solander was clearly used extensively by Lightfoot in preparing the catalogue, which followed it in the same year. It seems unlikely that during his apparent repeated comparison of the Portland specimens with the Ellis & Solander plates that Lightfoot would have overlooked the possibility of very much more of the illustrated material being included. The marvellous Ellis & Solander book had just appeared, and illustrated items in the sale would be sought after: hence the italics in the entries for lots 3610, 3747 and 3804. One can imagine that Lightfoot would have been on the look-out for such items. But it seems that he recorded only these three, implying that this was all the Ellis & Solander material included in the Duchess of Portland's collections at the time of her death. We know also that Solander probably helped compile the *Madrepora* entries to the *Portland Catalogue* (Banks, in Rauschenberg, 1964), making it still less likely that opportunities were missed of indicating which specimens were mentioned in Ellis & Solander (1786).

Sale of Ellis's library

Ellis's library, along with that of Solomon Dayrolles, was sold by auction in 1786 (Robson, 1786). Though the two lots of books were not distinguished in the auction catalogue, it is evident that Ellis's library included many important works today regarded as rarities. Three Ellis works were included: a copy of Ellis, 1755, Lot 1806, asking price a guinea; a copy of Ellis & Solander, 1786, ascribed to Ellis alone, in boards, with 63 plates, Lot 7940, asking price 15s 0d; and a second copy of Ellis & Solander (1786), with coloured plates, in boards, Lot 8781, no asking price stated.

Much can be deduced from the catalogue and from these entries. The catalogue is dated '1786', no day or month being indicated; though the sale was advertised in *The Times* for 6 May of that year. It was clearly impossible for the two copies of Ellis & Solander (1786) to have been acquired by Ellis, who died in 1776. It is conceivable that the copies came from Dayrolles' library. But there is no evidence that he collected natural history literature and most biological items in the catalogue are not duplicated, indicating a single source which would certainly have been Ellis. The inclusion of the copies of the 1786 book, however, throws doubt on the possibility that the sale copy of Ellis (1755) was genuinely Ellis's (and the same as that now in Glasgow and which was perhaps bought by Hunter (p. 58)). It is possible that the auctioneer added books from other sources to the sale, or held back others of either collection from it. Thus, although the catalogue undoubtedly represents the dispersal of Ellis's books it cannot be taken as a definitive list of the natural history works he owned, even if any of Dayrolles' could certainly be distinguished. The catalogue does confirm however, that copies of the 1786 book had only 63 plates; and suggests too that coloured copies were included in the original issue.

William Hamilton

The possibility that specimens sent from Naples in 1779 by Sir William Hamilton were

described by Solander in the book has been discussed already (p. 46). The specimens were mentioned also by Miller (1973: 86).

Ellis's hydroid collection and other material

Sadly it is almost certain that, with the exception of a single non-type specimen, and of the material given by Ellis to Linnaeus and preserved in the collections of the Linnean Society of London, all of Ellis's hydroid collection is lost. At an unknown date some of it became part of the Hunterian Museum of the Royal College of Surgeons of England, London (Royal College of Surgeons of England, 1830, 1860; Harmer, 1931*a, b*). This raises the possibility that the manuscript entry against lot 97 (the zoophyte cabinet) in the British Library copy of the Ellis sale catalogue (Hutchins, 1791) should have read Hunter, and not Humphreys! Lot 98, the drawings, was recorded in the BL copy as bought by Hunter. It is tempting to think that Hunter, during his lifetime, acquired the Ellis collections to accompany the drawings. Hunter's collections, including large numbers of Ellis zoophytes, passed to the Royal College of Surgeons of England (then called the Corporation of Surgeons) in 1799 or 1800 (Anon. (3), 1799). Either then or on another occasion the Ellis non-coralline zoophytes also went there.

Many of the hydroid, sponge and bryozoan collections survived until the Second World War (Royal College of Surgeons of England, 1971) when they were destroyed by a bomb along with other priceless relics including almost all the known skeletons of the extinct Tasmanian aborigines. PFSC was told that the sole surviving hydroid specimen was a colony of *Nemertesia ramosa*, regd no. XI (Cornelius, 1975*a*: 267, footnote), preserved in spirit and lacking original documentation. We have not checked the authenticity of this specimen.

A note by S. F. Harmer bound in with the Ellis drawings in the Royal College of Surgeons, London (p. 51), gives clues to the identities of a few of the specimens lost at that time. He states that the catalogue by Richard Owen (Royal College of Surgeons, 1860) implied that about eight specimens undoubtedly came from Ellis: *Corallina* (Royal College of Surgeons, 1860, p. 10, no. 41, and p. 140, no. C37); *Sertularia operculata* (p. 134, no. C6); *Isis hippuris* (p. 173, no. C23 'Hunterian'); 'specimen from which Mr Ellis' drawing was made' (p. 170, no. 213, considered by Harmer to have been illustrated in *Phil. Trans.* vol. 50, pl. 3 [or 111]); unnamed (p. 273, no. E3, p. 255, no. E16 'Hunterian', p. 257, no. E20 'from Mr Ellis' collection'). The labels from the first and second, *Corallina*, were said to have been written by Ellis. All this material was probably destroyed in the Second World War (see above).

Other references to the fate of the Ellis hydroid collections are similarly unrewarding. Thus Boulger (in Stephen, 1889, entry under John Ellis) stated that some Ellis hydroid material was deposited in the British Museum – possibly the four wall cases mentioned already (p. 56). All natural history specimens were transferred from there to the British Museum (Natural History) from 1882 onwards. PFSC has curated the cnidarian collections in the Zoology Department there for some eighteen years and, excepting a single scleractinian specimen probably described by Solander (Fig. 10), has found no trace of any material described by Ellis or Ellis & Solander from any cnidarian order. Indeed, Gray (1848: 71), in a review of the British cnidarian specimens in the BM, listed no specimens of '*Sertularia evansi*' Ellis & Solander (p. 28). Gray included the species only on faunistic grounds, from Ellis & Solander's published record, and it is clear that he saw no specimen.

No Ellis hydroid specimens accompany the 20 Ellis & Solander coral specimens listed by Kerr (1910) and others (see also Table 2) in the collections of the Zoology Department, Glasgow University (Dr C. H. Brock & Miss E. Macartney, pers. comm).

Ellis's herbarium not at Lund

Mrs Linda Irvine kindly told us that Stafleu & Cowan's (1976: 743) assertion that the 'Ellis Herbarium' was bought by the Herbarium of Lund University, Sweden, in 1905, was probably incorrect. She contacted both Botany and Zoology Curators in Lund and no record of such an acquisition could be found. Dr Stafleu kindly told PFSC (in litt.) that he was unable to confirm that the collection went to Lund, and his published report unfortunately seems wrong.

The unidentified figures of Ellis & Solander's *Zoophytes*

There are figures on Ellis & Solander's (1786) Plates 26, 32, 41, 47, 51 and 63 for which the editor of the posthumous book evidently found no captions 'in Mr. Ellis's papers' (e.g. caption to pl. 26; see also p. 49). Lamouroux (1821) reprinted the plates from the work, mostly from the original engravings, and identified these unlabelled figures. His identifications are indicated below. We have added corrections based on our own or on other opinions. See also Table 1.

PLATE 18

- Fig. 1 *Eunicea limiformis* (see Lamouroux, 1821: 36)
 Fig. 2 *E. clavaria* (see Lamouroux, 1821: 36)
 Fig. 3 *Plexaura friabilis* (see Lamouroux, 1821: 35)

PLATE 26

- Fig. 1 *Hornera frondiculata* (Lamarck, 1816). (Lamouroux, 1821: 106) = *Millepora tubipora* Ellis & Solander (1786: 139) = 'corail blanc' Ellis (1755: 95, pl. 35, figs B, b) (see Borg, 1944).
 Fig. 2 *Retepora cellulosa* (Linnaeus, 1767). (Lamouroux, 1821: 106) = *Millepora foraminosa* Ellis & Solander (1786: 139) = 'Retepora marina' Ellis (1755: 72, pl. 25, figs D, d, F) (see Harmer, 1933).
 Figs 3-4 *Distichopora violacea* (Pallas, 1766) = *Millepora violacea* Ellis & Solander (1786: 140) (see Cairns, 1983). Stylasterina.
 Fig. 5 *Krusensterna verrucosa* (Ellis & Solander, 1786). (Lamouroux, 1821: 41, 107, 'fig. mal') = *Millepora verrucosa* Ellis & Solander (1786: 138) (see Harmer, 1933).

PLATE 32

- Fig. 1 *Hoplangia durotrix* Gosse, 1860. Synonymy as follows:
Madrepora tibicina Ellis & Solander, 1786: 152 ('nomen oblitum').
 ?— *tuba* 'or trumpet coral Ellis MSS' Lightfoot, 1786: 9.
 'A very curious un-named species of *Madrepora*, figured in Ellis Zooph., tab. 32, fig. 1' Lightfoot, 1786: 177.
Caryophyllia flexuosa Lamarck, 1816: 227.
Caryophyllia flexuosa Lamouroux, 1821: 49, pl. 32, fig. 1.
Hoplangia durotrix Gosse, 1860: 338, text-fig., pl. 10, fig. 9; Zibrowius, 1980: 123, pls 64, 65.
Coenopsammia flexuosa Milne Edwards and Haime, 1860: 126.

The lack of an illustration with Ellis & Solander's brief description of their *M. tibicina* has made its identity uncertain, and the absence of any explanation of their Plate 32, fig. 1, has added to the uncertainty. Esper (1790: 265), in his review of the *Zoophytes* which had just reached him, thought that the figured coral was the same as his *M. fascicularis* (= *Cladocora caespitosa*). Lamarck cited Ellis & Solander's figure ('optima sed absque descripta') under his *Caryophyllia flexuosa* (non *M. flexuosa* Linnaeus). Lamouroux (1821) followed Lamarck. Milne Edwards and Haime cited the figure under *Coenopsammia flexuosa* ('*Madrepora flexuosa* Solander & Ellis, Nat. Hist. Zooph., tab. 32, f. 1'). Their description is that of the coral on Ellis & Solander's plate 32, figure 1, but it is clearly not a *Coenopsammia* (*Tubastraea*). The figure in question on plate 32 is a very good one of a coral identical with *Hoplangia durotrix* by comparison with Zibrowius' photographs of examples of that species, which is certainly the coral described by Ellis & Solander under the name *Madrepora tibicina*. Lightfoot's '*Madrepora tuba* or trumpet coral Ellis MSS' may have been changed by Solander to the more appropriate *tibicina*. Young (1877), in his list of figured Ellis & Solander corals in the Hunterian Museum, noted '2. Pl. 32, fig. 1?'. Kerr's (1910) catalogue of the Hunterian specimens listed '*M. tibicina* (?) E. & S. The specimen may be of the species figured on Plate 32, fig. 1'; but our colleague Dr J. E. N. Veron, Australian Institute of Marine Science,

searched for the specimen in 1980 and considered it missing; and Dr P. E. P. Norton also did not report it (in litt. to JWW; Table 2).

Fig. 2 *Lophelia prolifera* (Pallas, 1766). Ellis & Solander, 1786: 153.

Figs 3–5 *Cladocora caespitosa* (Linnaeus, 1767). Identified by Lamouroux (1821: 50) as *Caryophyllia ramea* (Pallas), and as *Cladocora caespitosa* by Zibrowius & Grieshaber (1977: 380).

Figs 6–8 Figures 6–8 were copied from Donati (1753) with no explanation. Lamouroux (1821: 107) remarked of figs 6–8 'Je ne les crois pas exactes' and (p. 50) '. . . je suis tenté de les regarder comme un effet de l'imagination de l'auteur'.

PLATE 41

Fig. 3 *Cellepora spongites* (Pallas, 1766). (Lamouroux, 1821: 2). = *Eschara spongites* Pallas = *Millepora spongites* Ellis & Solander (current name *Stylopoma spongites* – see Thomas & Hastings, 1974).

Fig. 4 *Porites conglomerata* (Esper, 1795). (Lamouroux, 1821: 61). Ellis & Solander's figure is poor and may not even represent a specimen of *Porites*. A photograph of Esper's specimen made by Dr Georg Scheer suggests *P. lobata* (Dana, 1846).

PLATE 47

Figs 1–2 *Porites porites* (Pallas, 1766). Fig. 4 shows details of calices.

Fig. 3 *Astrea* (ex Lamouroux, 1821: 108). 'Impossible à déterminer et à décrire'. It is a worn corallum of *Favites*.

PLATE 51

Fig. 1 *Colpophyllia natans* (Houttuyn, 1772). Identified by Lamouroux (1821: 55) as *Meandrina pectinata* Lamarck, 1801, and also plate 48, figure 1, which is *Meandrina meandrites* (Linnaeus). But plate 51, figure 1, is not this but the *amaranthus* form of Houttuyn. Esper (1790: 293) included both figures 1 and 2 in *Madrepora natans*, recognizing that figure 2 represented a worn specimen.

Fig. 2 *Colpophyllia natans* (Houttuyn, 1772). = *Madrepora gyrosa* Ellis & Solander (1786), the type species of *Colpophylla* Milne Edwards & Haime (1848).

PLATE 54

Figs 1–2 *Spongia cellulosa* (see Lamouroux, 1821: 29).

PLATE 59

Figs 1–3 *Spongia othaitica* (see Lamouroux, 1821: 29).

Fig. 4 *S. ficiformis* (see Lamouroux, 1821: 29).

PLATE 63 *Pavona cristata* Ellis & Solander (1786). Synonymy as follows:

Madrepora agaricites Müller, in Knorr, 1766: 25, pl. AX, fig. 1.

Madrepora cristata Ellis & Solander, 1786: 158, pl. 31, figs 3–4; Esper, 1790: 292.

Madrepora agaricites Linnaeus var., Esper, 1790: 292.

Madrepora boletiformis Esper, 1795: 61, 84, pl. 56.

Pavona cristata Lamarck, 1801: 372 (pl. 63 = protograph); Lamarck, 1836: 377.

Pavona agaricites (sensu Linnaeus) Lamarck, 1816: 239 (in errore).

Agaricia agaricites Milne Edwards & Haime, 1860: 81 (in part).

Lophoseris boletiformis Milne Edwards & Haime, 1860: 66.

Lophoseris knorri Milne Edwards & Haime, 1860: 68 (nom. nov. for *Madrepora agaricites* Knorr, 1766, pl. AX, fig. 1). non *Madrepora agaricites* Linnaeus, 1758: 795; Pallas, 1766: 287; Ellis & Solander, 1786: 159; Gmelin, in Linnaeus, 1791: 3758; Esper, 1789: 150, pl. 26.

The specimen figures on plate 63 has previously been identified as *Madrepora agaricites*, first by P. L. S. Müller in his descriptions of Knorr's corals in 1766, the same year that Pallas fixed Linnaeus's species on Seba's (1758) plate 110, figure 6c. This is the coral today taken as typical *Agaricia agaricites*, and is quite different from Knorr's figure which shows a *Pavona* as that

genus is now understood. Esper (1790) identified Plate 63 with *M. cristata* Ellis & Solander, but later (Esper, 1795) thought that it was close to his *M. boletiformis*. Lamarck (1801) named it a new species, *Pavona cristata*, one of the two species originally included by him in the genus *Pavona* Lamarck, 1801, which he introduced. Lamarck noted that he doubted that it was the same as Linnaeus's *M. agaricites* but did not mention Ellis & Solander's *M. cristata*. In 1816 Lamarck referred Ellis & Solander's plate 63 to his *Pavona agaricites* (Linnaeus), an error followed by Lamouroux (1821). In the 1836 edition of Lamarck's work, under *Pavona cristata*, only Knorr's figure was cited (Lamarck, 1836: 377), and plate 63 was cited under *P. agaricites* (Lamarck, 1836: 376). Klunzinger (1879: 73, 74) considered that *M. cristata* was identical with *M. cactus* Forskål, a conclusion that was followed by Vaughan (1918: 132). But Crossland (1941) described and figured one of Forskål's syntypes of *M. cactus*, showing that it was not the same as Ellis & Solander's *M. cristata*. The conclusions reached here are that plate 63 is another illustration of *M. cristata* Ellis & Solander, and that the illustrated specimen later became included under the original description of *Pavona cristata* Lamarck, 1801. The latter species is regarded type species of *Pavona* (for example by Veron & Pichon, 1979: 6); and *M. boletiformis* Esper and *Lophoseris knorri* Milne Edwards & Haime are regarded conspecific with *P. cristata*.

Conclusion

When Ellis & Solander's (1786) book finally appeared it was excellent both technically and scientifically. Indeed, Ellis told in a letter to Linnaeus (in Smith, 1821) how he had over a number of years patiently sought the best artists and engravers available (see pp. 52–54 for identification of many of the artists and engravers). Lamouroux's (1821) reprinting of the 63 originally-issued plates 35 years later is itself testimony, as is the respect with which all subsequent zoophyte workers have mentioned this splendid book. Indeed, no subsequent publication has included first descriptions of species from such a variety of cnidarian and other zoophyte orders, and the work underpins fields of study sufficiently distinct that today they are virtually separate disciplines.

The book was partly conceived and written under the influence of the still young British Museum, and represents one of the first fruits of that institution and indeed of publicly-financed biology. The British Museum and its now century-old daughter institution, the British Museum (Natural History), have become two of the most respected scholarly institutions in the world. It is not unreasonable to suggest that the scientific excellence of Ellis & Solander's book contributed to the foundations of the scholarly traditions of these places. Doubtless their history would have been much the same without this book. But it is sobering nonetheless to reflect that without the timely intervention of Ellis's daughter, Martha Watt, Ellis & Solander's magnificent book might have passed into oblivion.

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Tables

Table 1 Summary of identifications of animals and plants on Ellis & Solander's (1786) previously unpublished plates 64–69 (present Figs 2–7). All are Scleractinia unless otherwise indicated. An asterisk (*) denotes that there are no data on the page of manuscript captions by Dryander (present Fig. 8).

PLATE 64

- 1–2 = *Cellaria ternata* Ellis & Solander, 1786: 30 = *Tricellaria ternata* (Ellis & Solander) [Bryozoa]
 3–4 = *Sertularia spicata* Ellis & Solander, 1786: 58 = *Batophora oerstedii* J. Agardh, 1854 [Algae]
 5–6 = *Sertularia evansi* Ellis & Solander, 1786: 58–59 = *Syntheicum evansi* (Ellis & Solander) [Hydrozoa]
 7 = *Corallina pinnata* Ellis & Solander, 1786: 117 = *Liagora pinnata* Harvey, 1853 [Algae]
 8 = *Corallina loricata* Ellis & Solander, 1786: 117 = *Corallina officinalis* Linnaeus, 1758 [Algae]

PLATE 65

- 1–2 = *Madrepora mammillaris* Ellis & Solander, 1786: 154 = *Oculina banksi* Milne Edwards & Haime, 1850
 3–4 = *Madrepora oculata* Linnaeus, 1758; Ellis & Solander, 1786: 154

PLATE 66

- 1–2 = *Madrepora erubescens* Ellis & Solander, 1786: 165 = *Stylaster erubescens* (Pourtalès, 1868) [Hydrozoa]
 3–4 = *Madrepora rosea* Pallas: Ellis & Solander, 1786: 155 = *Stylaster rosea* (Pallas, 1766) [Hydrozoa]

PLATE 67

- 1 = *Madrepora agaricites* Linnaeus, 1758; Ellis & Solander, 1786: 159 = *Agaricia agaricites* (Linnaeus, 1758).
 2 = *Madrepora sinuosa* Ellis & Solander, 1786: 160 = *Isophyllia sinuosa* (Ellis & Solander)

PLATE 68

- 1 = *Madrepora spongiosa* Ellis & Solander, 1786: 164 = *Montipora foveolata* (Dana, 1846)
 *2 = *Stylocoeniella armata* (Ehrenberg, 1834)
 *3 = *Psammocora contigua* (Esper, 1795)
 *4? = *Madrepora botryotes* Ellis & Solander, 1786: 172? = *Goniopora*
 5 = *Madrepora papillosa* Ellis & Solander, 1786: 169 = *Acropora cuneata* (Dana, 1846)

PLATE 69

- 1 = *Montipora verrucosa* Lamarck, 1816
 2 = *Cyphastrea chalcidicum* (Forskål, 1775)
 3 = *Acropora cuneata* (Dana, 1846)
 4 = *Psammocora contigua* (Esper, 1795)

Table 2 Type and figured specimens of corals described in Ellis & Solander's *Natural history of . . . zoophytes*, 1786, preserved in the Hunterian Museum, University of Glasgow. From a list prepared in 1978 by P. E. P. Norton, University of Glasgow, with current names appended by J. W. Wells in parentheses. A single Ellis & Solander scleractinian specimen is preserved in the BMNH collection (see caption to present Fig. 10).

PLATE 29, p. 151

	<i>Madrepora anthophyllites</i> Type and 2 syntypes, and another specimen. [<i>Pourtalesmilium anthophyllites</i> , f. Zibrowius, 1976]
31, figs 5-6, p. 151	<i>M. flexuosa</i> . [<i>Cladocora caespitosa</i> (L.)]
34, p. 152	<i>M. angulosa</i> Pallas. [<i>Mussa angulosa</i> (Pallas)]
35, p. 153	<i>M. carduus</i> . Type. [<i>Mussa angulosa</i> (Pallas)]
38, p. 155	<i>M. ramea</i> L. Specimen figured by E. & S.? [<i>Dendrophyllia ramea</i> (L.)]
39, p. 156	<i>M. aspera</i> . Type. [<i>Echinophyllia aspera</i> (E. & S.)]
40, p. 157	<i>M. undata</i> . Piece of type. [<i>Agaricia undata</i> (E. & S.)]
41, figs 1-2, p. 157	<i>M. ampliata</i> . Type [<i>Merulina ampliata</i> (E. & S.)]
43, p. 157	<i>M. cinarescens</i> . Type. [<i>Turbinaria cinarescens</i> (E. & S.)]
45, p. 159	<i>M. pileus</i> L. [<i>Herpolitha limax</i> (Esper)]
46, fig. 1, p. 163	<i>M. daedalea</i> (non Forskål). [<i>Platygyra rustica</i> (Dana)]
47, fig. 4, p. 166	<i>M. areolata</i> L. [<i>Manicina areolata</i> (L.)]
48, fig. 2, p. 162	<i>M. phrygia</i> . Type. [<i>Leptoria phrygia</i> (E. & S.)]
50, fig. 2, p. 162	<i>M. abdita</i> . Type. [<i>Favites abdita</i> (E. & S.)]
52, p. 164	<i>M. foliosa</i> . [<i>Montipora foliosa</i> (Pallas)]
53, fig. 1, p. 169	<i>M. annularis</i> . Type. [<i>Montastraea annularis</i> (E. & S.)]
53, figs 5-6, p. 166	<i>M. faveolata</i> . Type. [<i>Montastraea annularis</i> (E. & S.)]
55, fig. 1, p. 166	<i>M. rotulosa</i> . Type. [<i>Plesiastrea annuligera</i> (E. & S.)]

Not found in 1978, but listed by Young (1877) and Kerr (1910):

56, figs 1-3, p. 167	<i>M. interstincta</i> . [<i>Heliopora coerulea</i> (Pallas)]
57, p. 171	<i>M. muricata</i> . [<i>Acropora muricata</i> (L.)]

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The letters printed in **bold** at far right following each reference indicate its approximate subject areas and serve as a crude bibliographic index, as follows: **A** algae, **Ba** Sir Joseph Banks, **Bi** bibliography, **Br** Bryozoa, **C** Cnidaria other than Hydrozoa and Scleractinia, **Ck** James Cook, **E** John Ellis, **F** John Fothergill, **G** geology, **Hi** historical and biographical, **Hu** William Hunter, **Hy** Hydrozoa, **Lig** Lightfoot, **Lin** Linnaeus, **Mi** microscopy, **Mu** museum collections, **O** other animal and plant groups and other topics, **P** Portland Catalogue and collections, **Sc** Scleractinia, **Sk** David Skene, **Sl** Sir Hans Sloane, **So** Daniel Solander, **T** Abraham Trembley, **W** Gilbert White, **Z** 'zoophytes'.

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T H E
N A T U R A L H I S T O R Y

OF MANY CURIOUS AND UNCOMMON

Z O O P H Y T E S,

COLLECTED FROM VARIOUS PARTS OF THE GLOBE

BY THE LATE JOHN ELLIS, Esq. F. R. S.
SOC. REG. UPSAL. SOC.

AUTHOR OF THE NATURAL HISTORY OF ENGLISH CORALLINES,
AND OTHER WORKS.

SYSTEMATICALLY ARRANGED AND DESCRIBED

BY THE LATE DANIEL SOLANDER, M. D. F. R. S. &c.

WITH SIXTY-TWO PLATES ENGRAVEN BY PRINCIPAL ARTISTS

L O N D O N :

PRINTED FOR BENJAMIN WHITE AND SON, AT HORACE'S HEAD, FLEET-STREET;
AND PETER ELMSLY, IN THE STRAND.

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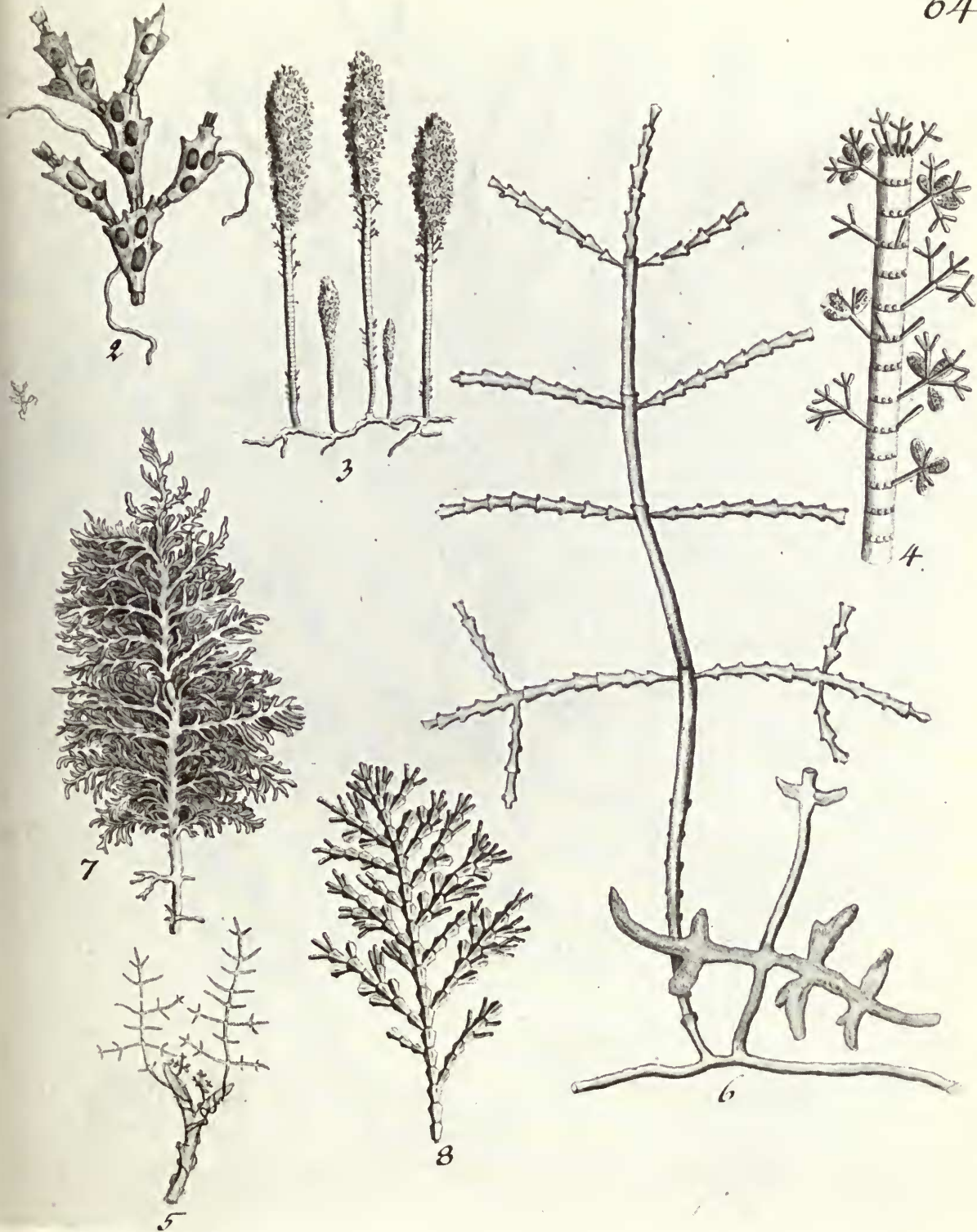


Fig. 2 The unpublished plate 64 from Ellis & Solander (1786). For identification of the species see Figure 8 and the text (pp. 27-30, 66). See also Figure 9.



Fig. 3 The unpublished plate 65 from Ellis & Solander (1786). For identification of the species see Figure 8 and the text (pp. 30–31, 66).

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Fig. 4 The unpublished plate 66 from Ellis & Solander (1786). The wording at lower left reads 'Barnes delin et sculp.'. For identification of the species see Figure 8 and the text (pp. 31–32, 66).

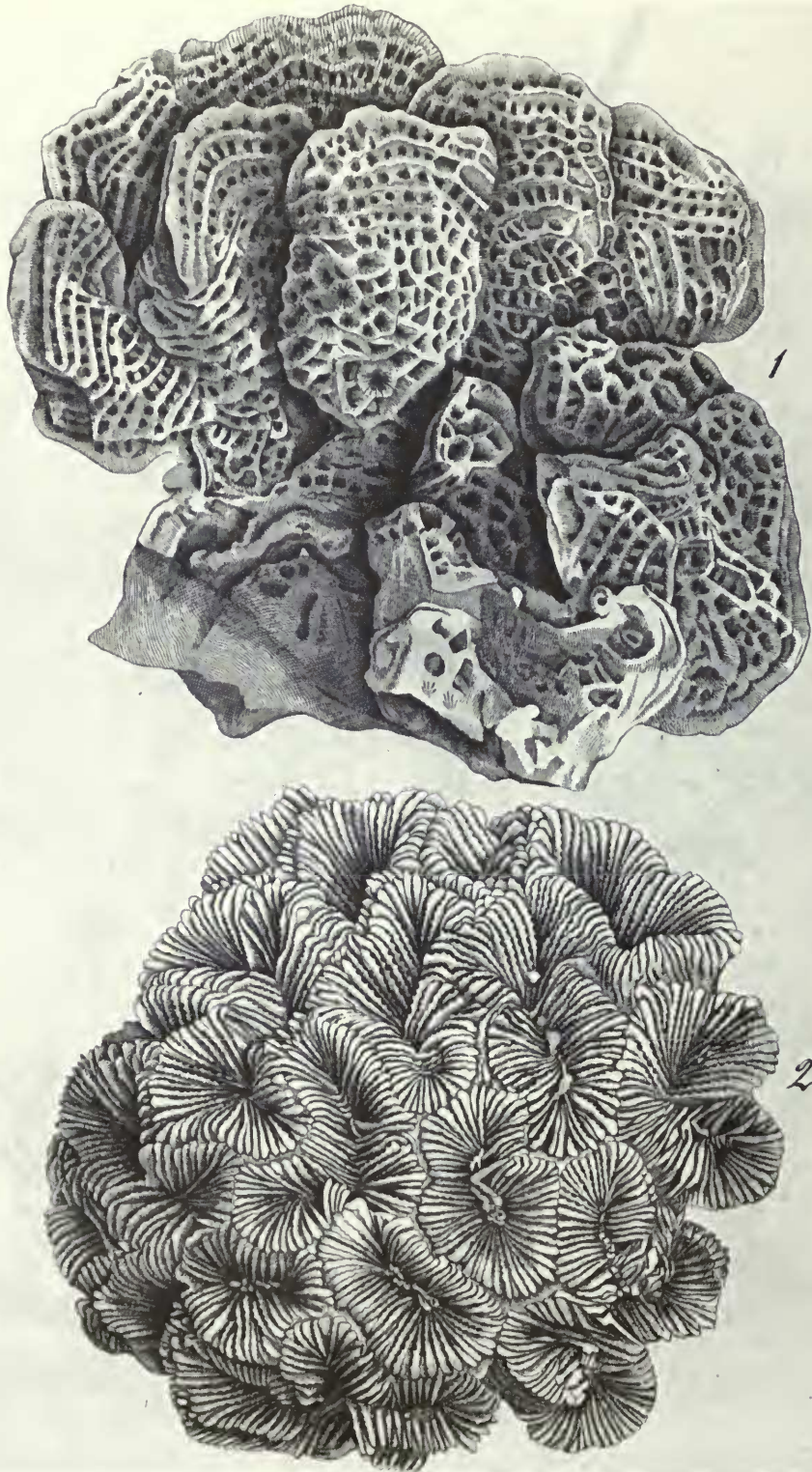


Fig. 5 The unpublished plate 67 from Ellis & Solander (1786). For identification of the species see Figure 8 and the text (pp. 32, 66).

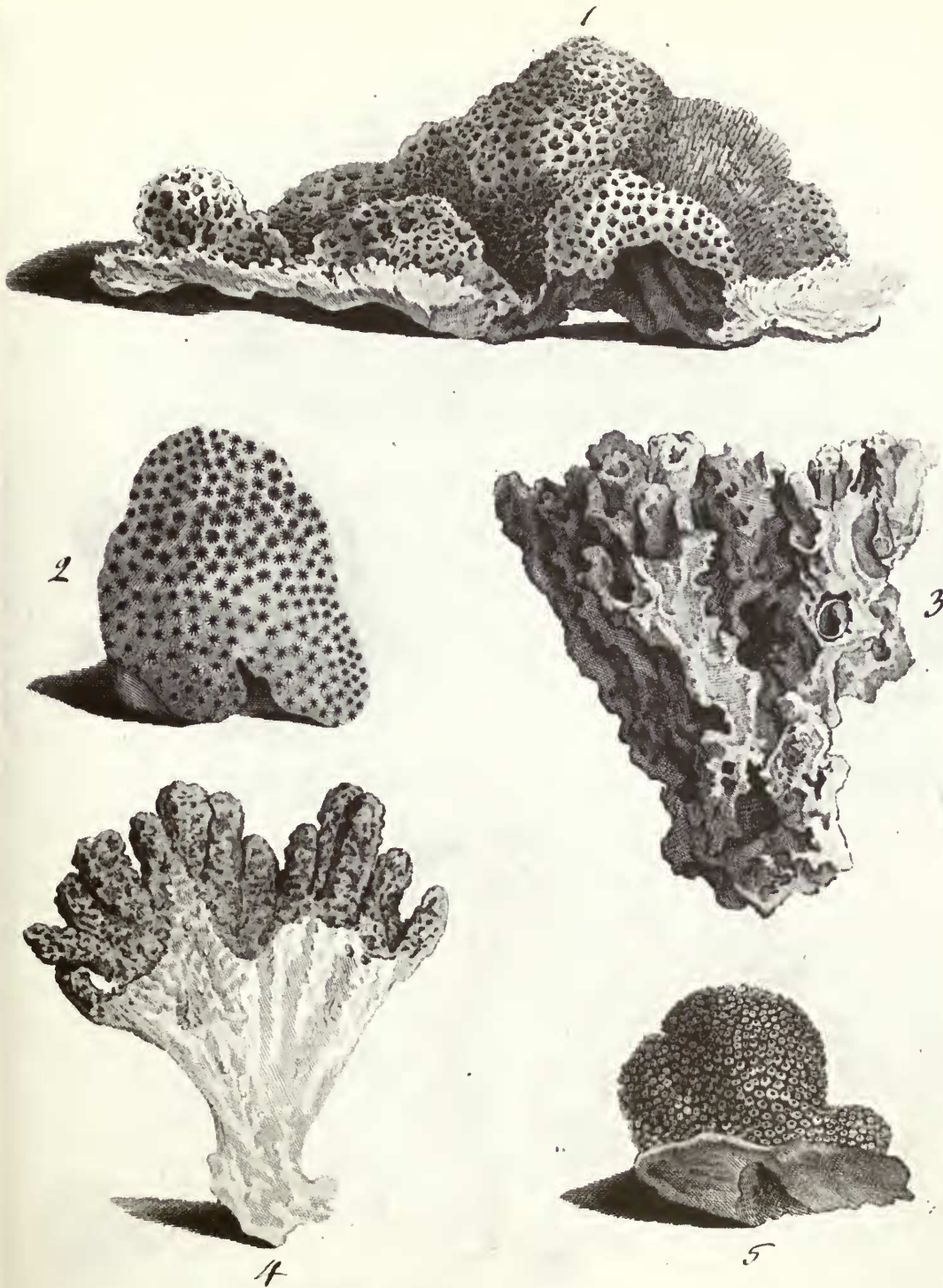


Fig. 6 The unpublished plate 68 from Ellis & Solander (1786). For identification of the species see Figure 8 and the text (pp. 33-34, 66).

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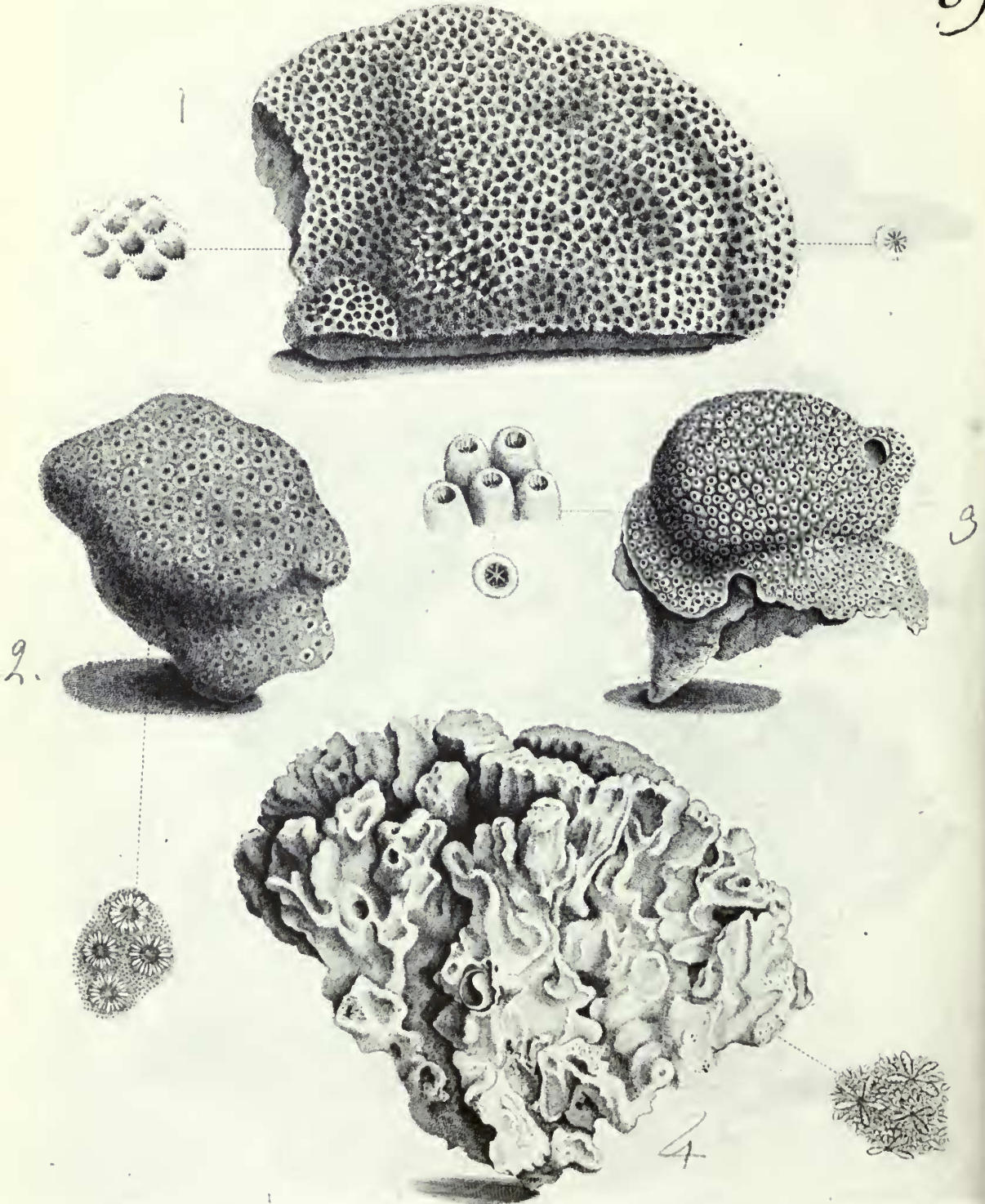


Fig. 7 The unpublished plate 69 from Ellis & Solander (1786). For identification of the species see Figure 8 and the text (pp. 35-36, 66).

Tab. 64.

- Fig. 1. 2. *Cellaria ternata* pag. 30. n. 18.
 3. 4. *Sertularia spicata* pag. 58. n. 34.
 5. 6. ————— *Swansü* pag. 58. n. 35.
 7. *Corallina pinnata* pag. 117. n. 17.
 8. ————— *loricata* pag. 117. n. 19.

Tab. 65.

- Fig. 1. 2. *Madrepora mammillaris* pag. 154. n. 14.
 3. ————— *oculata* pag. 154. n. 15.

Tab. 66.

- Fig. 1. 2. *Madrepora crubescens* pag. 156. n. 20.
 3. 4. ————— *rosea* pag. 155. n. 18.

Tab. 67.

- Fig. 1. *Madrepora Agaricites* pag. 159. n. 32.
 2. ————— *sinuosa* pag. 160. n. 35.

Tab. 68.

- Fig. 1. *Madrepora spongiosa* pag. 164. n. 49.
 2.
 3.
 4.
 5. *Madrepora papillosa* pag. 169. n. 70.

Fig. 8 Manuscript captions to the six previously unpublished plates, written by Jonas Dryander, Sir Joseph Banks's librarian. See text (pp. 24, 66).

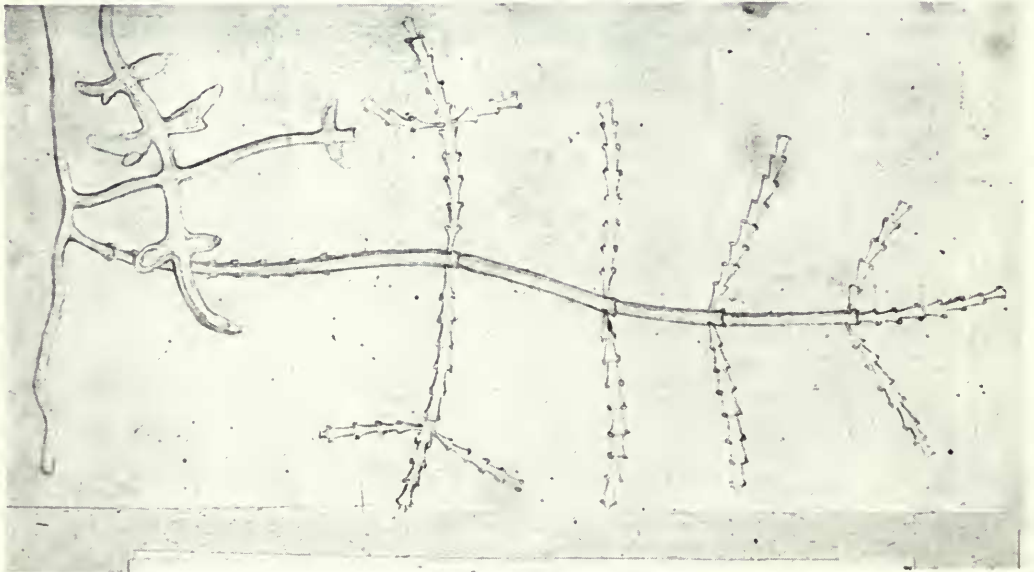
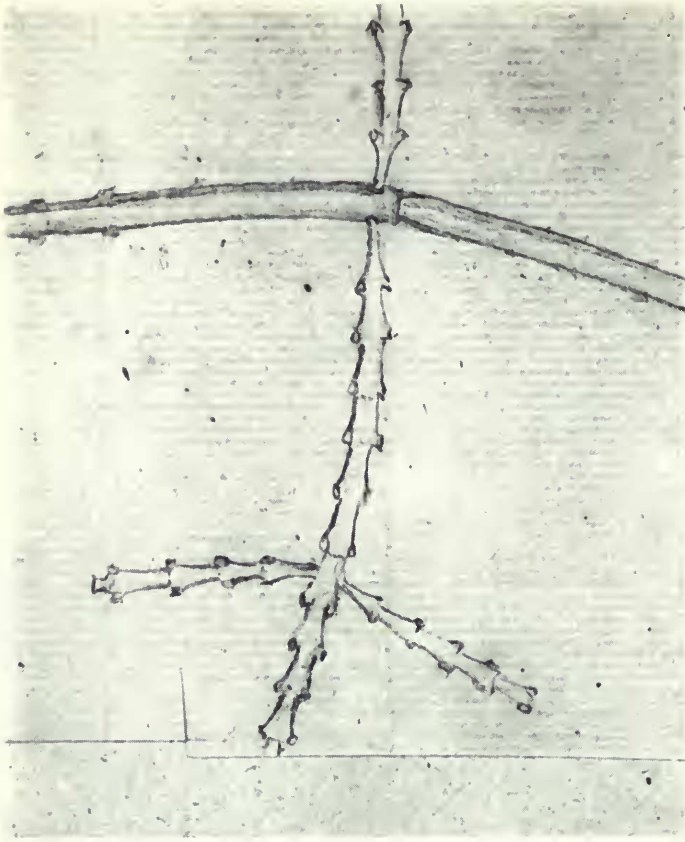


Fig. 9 Original pencil drawings, either by John Ellis or commissioned by him, for the figures of *Syntheticum evansi* appearing in the present Figure 2. The top figure shows a detail from the bottom figure. See text (pp. 64-65) for further details.



Fig. 10 *Pectinia lactuca* (Pallas, 1766, as *Madrepora*) (BMNH regd. no. 1987.6.1.1). The specimen was illustrated by Ellis & Solander (1786, pl. 44) whose published engraving, like the present photograph, was reversed. Comparison shows many similarities, and gives an idea of the level of precision accomplished. The specimen was stated by Ellis & Solander to be in the BM collection, one of the few so indicated (p. 55). Apparently few corals were in the BM collections at the time and the specimen might have come from Sir Hans Sloane's collection. Circumstantial evidence suggests that it was probably not an *Endeavour* specimen. Only one other Ellis & Solander specimen, a sponge, is known to be in the BMNH today (p. 55; Bergquist, in press). The original drawing for the engraving of the present specimen, one of the finest in the book, is also still preserved (p. 52). The species was based on Seba's *Permagna & valde elegans conche fungiformis* . . . (Seba, 1758, vol. 3, p. 180, pl. 89, the two figures numbered 10). The Ellis & Solander illustration was the first following Pallas' redescription and introduction of the specific name. Since the holotype is lost the present specimen would be available to be made neotype, but this is not proposed here. The specimen is also illustrated in Anon. (5) (1987), in colour.

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Inclusion of generic and specific names is for indexing purposes only and does not imply nomenclatural availability. See also the bibliographic index incorporated in the reference list (p. 68).

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