

# LIVING MARINE MOLLUSCS

C. M. Yonge and T. E. Thompson



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COLLINS

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TO  
FELLOW MALACOLOGISTS  
WHOSE  
OBSERVATIONS HAVE MADE THIS  
BOOK POSSIBLE



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## Introduction

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'So, that alone is worthy to be called *Natural History*, which investigates and records the condition of living things, of things in a state of nature; if animals, of *living* animals . . . this would indeed be *zoology*, i.e. the science of *living* creatures.'

Philip Henry Gosse, *A Naturalist's Sojourn in Jamaica*, 1851

THIS book, initially planned as a single-handed account of British marine molluscs has emerged as a work of wider scope and with a second author whose expert knowledge has greatly increased its value. Each author is, however, solely responsible for the chapters he has written. The original restriction to the British fauna has been widened to cover marine molluscs in general and with necessary concentration on a limited number of animals. There are a number of excellent books about British molluscs most of them largely, if not exclusively, concerned with their shells. It would be pointless to produce just another such survey. It is a general account of living molluscs, of their extraordinary diversity of form and habit, which is lacking and which this book attempts to supply.

The British molluscan fauna, although extensive, is that of the north temperate Atlantic and inevitably lacking in representatives of many groups that live in warmer, or colder, latitudes, in other oceans or in open waters far from land or in profound depths. Such animals appear in these pages but in the majority of cases these have all been personally encountered and studied as living animals during widely ranging visits in many seas.

The author of a faunistic book rightly endeavours to describe the shell or outward appearance – if it be a shell-less sea slug or a squid or octopus – of every mollusc likely to be encountered in that area by the most assiduous collector. Concern with the living animal, on the other hand, involves describing them in some detail and saying a good deal about a selected number of representative molluscs. Those chosen are either extremely common – such as the limpets, winkles, cockles and mussels of the shore – or are of outstanding interest as revealing the bewildering ramifications of molluscan evolution. The dramatis personae are therefore limited, consisting on the one hand of the common and successful and, on the other, of molluscs usually adapted for life under unusual circumstances or that have chosen unusual means to achieve their ends. Instances are the camouflaged carrier shells and also the tridacnid bivalves of Indo-Pacific coral reefs that 'farm' plant cells in widely exposed and richly pigmented tissues (Fig. 1). Only to the sea-slugs, the particular concern of one of us, does this contrast between the commonplace and the

spectacular not apply. Little noted in standard conchologies (after all few have more than the vestige of a shell), they are among the most beautiful of marine animals (Plates 8, 9, 10), and almost every one a *prima donna* with its own colour pattern and its individual food and method of feeding.

Understanding of living animals demands some knowledge of structure. But most emphatically this is *not* a work on comparative anatomy. Little more is mentioned about structure than is normally exposed by the active animal or, in the bivalves, by removal of one valve to expose the mantle cavity with contained gills and foot. Starting with the first, far-remote molluscs, the structure and life pattern of which can only be surmised, evolutionary pathways are traced to their present, often so completely unpredictable, end points (and this excludes freshwaters and the land where we do not follow them). Vertebrate evolution would seem – at least to man – to attain one culmination but in the molluscs it leads to a bewildering diversity of form and to the conquest, by so many routes, of innumerable environments.

Concern here is with molluscan activity, how these animals crawl, swim, burrow or bore into rock or timber, how they feed and respire, how they reproduce, with significant facts about development including larval forms. There is less concern about internal organs although constant preoccupation with behaviour which involves sense organs and muscles – often acting by moving fluid in the extensive molluscan blood spaces – and so bringing in the nervous system. But technicalities are rigidly avoided.

So much of the value of a book like this depends on illustration and here collaboration has had the great added advantage of involving that of G. H. Brown who is entirely responsible for the drawings of sea-slugs in Chapters 10 and 11 and also for redrawing, arranging and lettering the bulk of the other figures. It is a pleasure that half of the colour plates are from photographs by Dr D. P. Wilson. C.M.Y. wishes to record his gratitude to Mrs Ellen Thorson for her kind permission to reproduce several of the late Professor Gunnar Thorson's Christmas cards, famous to all fellow marine biologists and providing such ideal illustrations here because depicting such very vigorously living molluscs. Other figures were originally drawn by Miss Jan Campbell and Mrs Vera Warrender as illustrations for research papers and thanks are renewed for the skill and care they represent. Thanks are added to Mr Dennis Cremer for expert photographic assistance and to Christopher Yonge for copying figures. We unite in gratitude to Vera Fretter and Alastair Graham whose *British Prosobranch Molluscs* has been a rich source of illustrations, and this gives an opportunity of mentioning this wonderfully erudite and comprehensively illustrated book hardly, it is true, for the general reader but representing a supreme achievement of British malacology.

Where the source of a drawing is not acknowledged, it represents either original drawings by G. H. Brown or else the reproduction (sometimes with the addition of lettering) of illustrations that have appeared in previous publications by the authors.

On the subject of shells there is here neither space, nor indeed need, for more than the briefest reference. Of recent years the molluscan shell has been

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the subject matter of a series of magnificently illustrated volumes, revelations of beauty in both form and colour. The colour plates of many have been produced in Japan which has also been responsible for books on the shells of the world as well as those from Japanese waters. All such books are listed at the end of this volume.

Happily we are equally fortunate with descriptions of the British molluscan fauna. All British shells likely to be encountered are covered in *British Shells* by Nora F. McMillan and in the *Identification of the British Mollusca* by Gordon Beedham while, each confined to one major group, are *British Prosobranchs* (marine snails) by Alastair Graham and *British Bivalve Seashells* by Norman Tebble. Both are admirably illustrated and these two provide probably the best accompaniments to this book. To them will be added (about the time this book is published) Volume I of the *Biology of Opisthobranch Molluscs* (sea-slugs) by T. E. Thompson and the synoptic *British Opisthobranch Mollusca* (corresponding to Alastair Graham's *British Prosobranchs*) by T. E. Thompson and G. H. Brown.

Molluscs are further described in the context of the shore – where most of them will be encountered – in *The Littoral Fauna of the British Isles* by Nellie B. Eales and in *Collins Pocket Guide to the Sea Shore* by John Barrett and C. M. Yonge. Mention might also be made of the New Naturalist volume on *The Sea Shore* which, apart from general descriptions of common shore molluscs, contains more colour plates including, in particular, two showing the file shell, *Lima hians*, with extended orange-coloured tentacles and justifying the claim that this is the most beautiful of British bivalves.

Literature about molluscs is endless. Beginning in the fourth century BC with Aristotle – a magnificent marine biologist whom we shall have reason

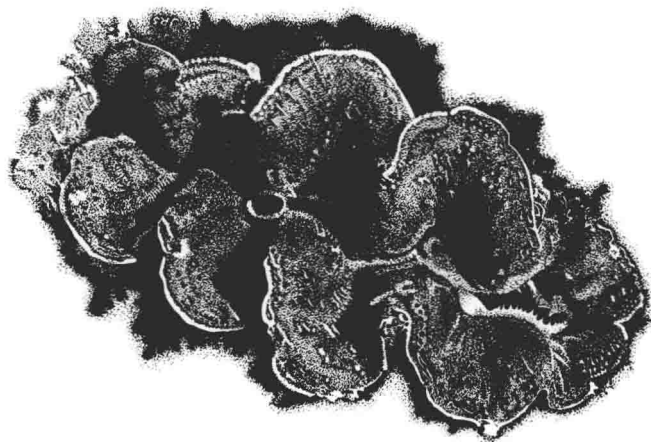


FIG. 1. Boring clam, *Tridacna crocea*: shell within rock but mantle tissues containing symbiotic plant cells fully expanded exposing these plants to the light. (By permission of the Geological Society of America)

### *Living Marine Molluscs*

to mention particularly when dealing with octopods and squids – book after book and ever increasing floods of research papers have been written about them. Generally speaking these dealt first with the shell (although this does not apply to Aristotle) and only later first with the structure and then with the functioning of the entire animal, with its development and the sometimes unexpected course of its life history. Most recently interest has broadened to include ecology and behaviour. There are, at the time of writing this, no less than eighteen journals produced in ten countries together with a further two which are internationally published, all exclusively devoted to the publication of papers on molluscs which also appear in a large number of journals of general zoological content. What should be chosen for description and comment out of this ever growing wealth of knowledge? No two writers who attempted a book of this type would choose the same animals or approach the subject matter from the same standpoint. Each would write about the animals he knew best and this is precisely what we have done, hoping that this bias will be justified by the greater authority with which we write and the greater freedom for comment it confers. We shall be satisfied if it confirms and extends the interests of those who read what we have written.

## Chapter 1

# Historical

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A BOOK dealing with the nature and habits of marine molluscs calls for some brief introductory words about the growth of interest in these animals. Long before the dawn of history man was keenly interested in intertidal and shallow water molluscs as a source of food, to an extent that is indicated by the vast mounds of shells in prehistoric kitchen middens. The larger shells were used as drinking vessels, lamps or trumpets, smaller ones for decoration while fish hooks and other objects were made from shells. In classic times the scallop was to become a motif in decoration and later the badge worn by pilgrims to the shrine of St James at Santiago de Compostela.

Science emerges out of the first stirring of curiosity about the surrounding world which accompanies the birth of civilization. In the western world it takes shape in Greece where Aristotle, a supreme marine biologist, sought to arrange in orderly manner the Mediterranean animals known to him. His subdivisions of the animal kingdom included 'Ostracoderma' which comprised snails, slugs and bivalves, and the more elaborately organized 'Malacia' of octopods, cuttlefish and squids which he placed higher in his static ladder of life, the highest rung of which was occupied by man, the sole possessor of a 'rational' soul. He also collected much information about the habits, including reproduction, of molluscs.

So knowledge long remained, more debased by additions of credulity than increased by critical observations. The gradual removal of the dead hand of authority at the time of the Renaissance led to a reassessment of the then state of knowledge at the hands of a group of encyclopedic naturalists of whom the Swiss, Conrad Gesner, who lived from 1516 to 1565, is the most famous. The great advance in science in the seventeenth century, the age of Harvey, Boyle and Newton in this country, sees the beginning of the scientific study of molluscs. The first book devoted entirely to them, by the Jesuit, Filippo Buonanni, entitled *Ricreatione dell'Occhio e delle Mente nell'Osseruatione delle Chioccioline*, was published in Rome in 1681 and consists largely of conchological information with numerous figures of shells. One of the three title pages is reproduced in Figure 2.

Meanwhile a more significant figure was appearing in this country in the person of Martin Lister, a medical man who practised first in York and then in London, shortly before his death in 1711, where he was to be appointed physician in ordinary to Queen Anne. In zoology he links the pre-Linnean John Ray, whom he befriended over a difficult period, with the eighteenth-century Hans Sloane whom he proposed for election to the Royal Society and whose widely ranging natural history collections were to form the basis of those of the British Museum.



FIG. 2. Title page of *Ricreatione dell'Occhio e della Mente nell'Osseruatione delle Chiocciolle, Proposta a' Curiosi delle Opere della Natura*, by Filippo Buonanni 1681.

Lister's first work, *Historia Animalium Angliae*, published in 1678, is an attempt to describe the British fauna although only dealing with spiders, land, freshwater shells and sea shells together with 'stones figured like them'. These were fossils, the true nature of which he failed to realize, unlike a few more far-seeing contemporaries. Far more significant is his second book, published in sections between 1685 and 1692, which aimed at a comprehensive

## Historical

description of all known shells. This *Historiae sive Synopsis Conchyliorum*, to be described by Linnaeus as the most thorough account available of any group of animals, consists of 1057 engravings of shells made by his daughter Susannah and his wife (just possibly second daughter Anna) and mounted on 486 pages. There is no text apart from what is engraved on the plates and many figures are not even named although the great majority are recognizable. These are useful comments about localities and, most significantly, the plates are grouped in sections based on similarities some of which remain valid.

In Paris around this time, Lister visited the King's Library where he was cordially welcomed by the Deputy Library Keeper who, in his own words (*A Journey to Paris in the year 1668*), 'made me in particular a very great Compliment, as a considerable Benefactor to that place, showing me most of the Books, and the Names of the rest, I had publisht in *Latin*; and shewed a great satisfaction, that he had got the *Synopsis Conchyliorum*, which he had caused to be Bound very elegantly, I told him, that I was sorry to see it there, and wondered how he came by it; for it was, I assured him, but a very imperfect trial of the Plates, which I had disposed of to some few Friends only, till I should be able to close and finish the Design; which I now had done to my



FIG. 3. Native oyster, *Ostrea edulis*, from Martin Lister's *Historiae sive Synopsis Conchyliorum*, 1685.



power, and would redeem that Book with a better Copy at my return into England: The same Promise I renewed to the Abbé Louvois, the Library Keeper, at his own instance, when I had the Honour to Dine with him.' Adding that 'The Reader will pardon me the Vanity, if I tell him, that this Book was no inconsiderable Present, even for so great a Prince, as the King of France; for that besides the time that it took me up (Ten years at least) at leisure hours, to dispose, methodise and figure this part of Natural History, it could not have been performed by any Person else for less than 2000*l*. Sterling; of which Sum yet a great share it stood me in, out of my Private Purse.'

He would have been happy had he known he was to be later designated the 'father of British Testacology'. Overwhelmed by the wealth of shells coming from all over the world, he realized that adequate classification must be preceded by a general survey of all known types and so, in the words of Peter Dance (*Shell Collecting*, 1966), 'the first of the major shell iconographies was born'. There were indeed many to follow, some magnificently illustrated in colour, over the following two centuries as voyages of scientific exploration brought back an ever-increasing diversity of shells. And new species continue to be found to this day.

Lister's final contributions reveal his interest in the animal itself. In three *Exercitationes* produced between 1694 and 1696 he examined and figured the organs of the body and speculated on their function in land snails and slugs, in the snail *Viviparus* and the bivalve *Anodonta*, both from freshwater, and, of more significance here, in the squid *Loligo* and three common intertidal bivalves, species of *Cardium*, *Tellina* and *Tapes* (now *Venerupis*). Finally, in a paper contributed to the 19th volume of the *Philosophical Transactions* of the Royal Society, he deals with the structure of the scallop, *Pecten*.

Linnaeus is important because in his *Systema Naturae*, where he attempted to reveal the plan of creation, he adopted (although he did not originate) binomial nomenclature – one name for the genus, a second for the species. By so doing he established what came to be universally accepted names for every species of plant and animal, including of course the molluscs. In other respects he made little advance. He divided the invertebrates into two classes, Insecta and Vermes, characterized by the supposed general presence of antennae and tentacles respectively. The latter included an order he named Testacea which comprised the shelled molluscs but also barnacles and worms in calcareous shells; he divided all these into multivalves, bivalves and univalves, the last with or without a regular spire to the shell. He was no anatomist and followed earlier customs in largely disregarding the animals or 'testaceous bodies' which he grouped – with minimal reference to the shells – into ten 'genera', *Limax*, *Doris*, *Spio*, *Amphitrite*, *Terebella*, *Nereis*, *Ascidia*, *Tethys*, *Triton* and *Sepia*. Later conchologists who employed the Linnean system would describe the shell in detail merely referring 'its animal' to one of these genera of which only the two first and the last three are even molluscan. The shell-less 'naked tribes' Linnaeus did designate Mollusca this also embracing in 'admired disorder' all manner of worms and zoophytes with starfish, sea urchins and other echinoderms.