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1852

UNITED STATES
EXPLORING EXPEDITION.

DURING THE YEARS

1838, 1839, 1840, 1841, 1842.

UNDER THE COMMAND OF

CHARLES WILKES, U.S.N.

VOL. XII.

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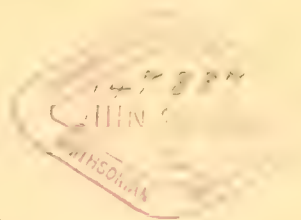
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WITH AN ATLAS OF PLATES.

BOSTON:
GOULD & LINCOLN.
1852.



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INTRODUCTION.

THE following work was undertaken under many disadvantages. The writer did not accompany the Expedition, and, of course, had not an opportunity of observing specimens in their native localities, and in their natural relations. Circumstances relating to food, habits, uses, numbers, and grouping, and other important points which would impress themselves upon the mind of an observer, and by which the dry details of specific description might be greatly relieved, must, therefore, be wanting here.

Mr. Joseph P. Couthouy, the able naturalist of the Expedition in this department, made careful and suggestive notes of all interesting species, and, especially, of the new or doubtful species, with the intention of amplifying them after his return. To him they would have spoken volumes; but he alone could fully understand their import. Up to the time of leaving the Paumotu, or Low Coral Islands, these notes were pretty fully written out in form. On arriving at the Samoa Islands, his health obliged him to separate from the squadron; and the numerous notes he had subsequently made from day to day were left in an imperfect state. Still, these would have been extremely valuable, especially those relating to the land-shells of the Society, Samoa, and Sandwich Islands. But, unfortunately, repeated searches have failed to discover them among the masses of documents pertaining to the Expedition.

Mr. Couthouy was also careful to attach marks, or numbers, to all

specimens described or figured, or to which special interest attached; and they were so disposed of as to be easily accessible and readily recognised. The drawings relating to them had been so far finished as to secure the forms and attitudes, more particularly the colours of the animals, all of which greatly change after death, leaving the more permanent features to be copied at leisure. The identification of these shells was, therefore, very important. But it had been thought necessary, by the Navy Department, that the boxes sent home in advance of the Expedition should be opened, lest, by long packing, the specimens might be injured. Those who performed this service were not fully aware of the importance of replacing the specimens as originally arranged, and hence much labour and difficulty in identifying them. In many instances, the search was quite fruitless, and, consequently, many drawings and descriptions were altogether rejected, and so far lost.

Still an additional difficulty arose from residing at a long distance from Washington, where the collection is deposited, rendering it impossible to have such a frequent recourse to the specimens as would have greatly facilitated the settlement of questions which arose from day to day.

Notwithstanding the disadvantages under which this branch of Zoology laboured, an immense mass of specimens of shells was collected, and among them a very large number of new species,—larger, probably, than has ever been collected by any similar Expedition. Both before and after the separation of Mr. Couthouy, a very decided zeal, in the collection of shells, was manifested by both officers and men, as well as by the other members of the Scientific Corps. Among them must be especially mentioned, as the principal collectors:—Commander Charles Wilkes; Messrs. J. P. Couthouy, C. Pickering, J. D. Brackenridge, T. R. Peale, W. Rich, J. D. Dana, of the Scientific Corps; J. Drayton, Artist; Lieutenants C. Ringgold, A. L. Case, T. A. Budd, W. M. Walker, J. A. Underwood; Passed-Midshipmen W. May, W. Reynolds, H. Eld; Midshipmen G. W. Hammersley, and George Elliott, Jr.; Assistant-Surgeons J. L. Fox and J. S.

Whittle; W. Spieden, Purser; J. R. Howison, Captain's Clerk; F. Monserrat, Steward; C. Erskine, James Sheaf, S. Stearns, E. Verry, Seamen; J. W. W. Dyes, Taxidermist.

The Expedition was also indebted, for many specimens of rare and valuable shells, to Mr. Dimond, of the Sandwich Island Mission; Mrs. Richards, of the same Mission; and Mrs. Mitchill, of New South Wales.

With rare exceptions, the shells were collected on the sea-beach and coral reefs, very few opportunities having been afforded for obtaining specimens from deep water, by the dredge, on account of the incessant employment of the men and boats on special hydrographical duties.

Several zoological provinces not previously explored were examined, and furnished most interesting groups of specimens. Among them are the collections made at Tierra del Fuego; the land-shells of the Society and Samoa Islands, as well as other Pacific islands; and the marine shells of Oregon,—more especially those from Puget's Sound, every one of which appear to be new to collections.

In some genera the number of new species added is quite remarkable; for instance, the species added to the genus *Succinea* equal all those previously known. The genera *Trochus*, *Perna*, *Avicula*, and *Mytilus* have been greatly augmented. To the scanty list of naked mollusks previously known, additions of many new and beautiful forms have been made. The Cephalopods, especially, have received large accessions, which, for life-like colouring and delineation, have not been surpassed.

My instructions were, to name and describe the new species of shells found in the collection, following the system of Lamarck, and, also, to introduce the figures of such animals as had not hitherto been published, or had been but imperfectly delineated, with descriptions of their external features. The figures were all drawn from the living animal, so that they are true to life as to their form and colouring,—more so, indeed, than any that have yet been published. The mollusks of several genera of shells, hitherto unknown, are now, for the first time, delineated, and are important additions to malacology.

In drawing up the descriptions, I have endeavoured to use language as simple and definite as possible, and, by comparing each species with the one most nearly allied to it, to make its peculiar character apparent. Where a shell bore characters somewhat prominent, I have endeavoured to select a specific name significant of them, almost entirely avoiding local and complimentary appellations. I have retained names selected by Mr. Couthouy, unless they had been preoccupied; and, where his descriptions have mainly been used, his initials are appended; the revision of them, and the determination that they did not relate to shells already described, having been made by myself.

After the most scrupulous endeavours to avoid describing shells which had been previously named, consulting all the books and the best collections in the country, with this view, it is quite likely that the evil has not been entirely avoided. The history of a contemporaneous Voyage of Exploration in nearly the same track, has been in the course of publication simultaneously; and, from a recent examination of a few of the plates of the Voyage of the *Astrolabe* and *Zelée*, several species appear to be there figured, which are also described in this work. It is believed, however, that the descriptions published in the Proceedings of the Boston Society of Natural History were of prior date, and must, therefore, be adopted.

The formation of new genera from characters of the shell alone, has been avoided. In some few instances, where new forms of mollusks have been presented, such as could not be united with received genera without violence, a new genus has been instituted. In instances where generic divisions seemed justifiable, I have rested contented with indicating groups, without formally establishing them. In several cases it has been possible to present, for the first time, or essentially to correct, the characters of the mollusk, thus contributing something towards a natural classification.

In this collection of descriptions of new species, where so many genera do not appear at all, and very few are fairly represented, no accurate systematic arrangement could be expected, and none has been attempted.

It is much to be regretted, however, that the descriptions of animals were limited to their external characters, and that dissections and delineations of their anatomical structure had not also been directed; especially in the case of those genera in which the structure of the soft parts is still unknown. A very large supply of mollusks, in spirit, is preserved in the collection, and would afford ample materials for future zoological investigations concerning this class of animals.

As this work was intended to be purely descriptive, no generalizations were expected. A few points, however, have presented themselves so obviously, in examining the specimens and memoranda of the shell collection, that it would seem proper to advert to them.

The doctrine of distinct zoological regions evidently appertains to the mollusks, and is well illustrated by them. In nearly every work, containing any considerable catalogue of shells, the same species will be found quoted as being found in widely distant regions, in different oceans, and even on opposite sides of the globe. The many thousand localities carefully noted on the records of the Expedition, go to prove beyond dispute, that no such random or wide-spread distribution obtains. The error has arisen from two principal causes. One is, that reliable notes of localities have not been taken. A voyage is made to the Sandwich Islands, and all the shells brought home by the vessel are said to be shells from the Sandwich Islands, though they may have been obtained at California, the Society Islands, New Zealand, and, perhaps, half a dozen other places quite as remote from each other. A sea captain purchases a collection at Calcutta or Valparaiso, for his friends at home; and all the shells are marked as denizens of the port where they were purchased, though they might not have lived within thousands of miles. Purchased shells cannot be relied on for localities; for this end a shell must have been found containing the animal, or else dredged, or picked up on the shore, and labelled accordingly. There have been instances where New England shells, which had gone to the west coast of America, in the way of exchange, came back again as Pacific shells.

The second cause is, that shells are regarded as specifically iden-

tical, which, on careful comparison, are found not to be so. And this is very likely to occur, where some one very remarkable peculiarity exists. Thus, a *Lutraria* from Lower California (*L. undulata*), has the thin, milk-white, concentrically undulated valves, so similar to those which characterize a shell from the coast of Carolina (*L. canaliculata*), that no one observing them separately, would hesitate to pronounce them the same; but place the two side by side, and it will be seen that in one the beaks are near the posterior, and in the other near the anterior end of the shell. Equally striking resemblances and differences will be found when we compare *Macra nasuta* and *M. Brasiliana*, *Lutraria ventricosa* and *L. carinata*, the former of which are found in the Gulf of California, and their analogues in the Gulf of Mexico. So too we find on the catalogues *Cytherea chione* and *Natica maroccana*, Mediterranean shells, set down as found also in the Gulf of California; but a direct comparison shows them to be quite different in form and coloration, and well entitled to the distinctive appellations of *Cytherea biradiata* and *Natica Chemnitzii*. *Triton nodosum*, of the West Indies, has also been regarded as identical with a Sandwich Island species (*T. elongatum*). We need not multiply examples of this kind. But if such confusion has arisen among strongly-marked species, how much more liable is it to occur where specific differences are slight. In many genera, as in *Physa* and *Succinea*, the form, surface, and colouring are so uniform throughout, that undoubted species are distinguished by only the slightest differences. Indeed, there are even some genera, like *Helix* and *Nanina*, *Patella* and *Lottia*, which cannot be distinguished but by an examination of the animal. When, therefore, we have before us shells from widely diverse regions, apparently identical, they should be subjected to the most careful scrutiny for structural differences. If no obvious ones are detected, we may not consider the question as settled, unless the animals have been compared; and we may go even further, and require that their internal structure, as well as external features, should be examined. The number of instances where this apparent ubiquity obtains is fast diminishing, as in the cases already mentioned, in those

of *Cyprea exanthema*, *cervina* and *cervinetta*, &c. A large proportion of the shells inhabiting the eastern and western shores of the Atlantic, have been regarded as identical; and many of them are really so. But the closer the comparison, the more it tends to diminish rather than increase the identical species. The same is found true in regard to other classes of animals. In fact, the doctrine of the local limitation of animals, even now, meets with so few apparent exceptions, that we admit it as an axiom in zoology, that species strongly resembling each other, derived from widely diverse localities, especially if a continent intervenes, and if no known or plausible means of communication can be assigned, *should be assumed as different, until their identity can be proved*. Much study of living specimens must be had before the apparent exceptions can be brought under the rule. Some shells undoubtedly have a very extensive range. The species of *Cyprea* are remarkable for this, and more than any other genus would lead us to conclude that oceans present no limitations. Even among them, however, new distinctions are constantly appearing. There are also some shells which may be called cosmopolite. At least they are erratic, and will be found wherever their pabulum is found. Thus, *Helix cellaria*, attaching itself to water-casks, is found in most seaports in all parts of the world. *Helix similaris* is found wherever the coffee-plant grows; and *Helix vitrinoides* in like manner accompanies the *Arum esculentum* or taro. *Bulimus octona*, or a closely allied species, is a parasite of the Banana. But exceptions of this kind confirm rather than militate against the conclusion.

There is a certain local aspect, a peculiar facies, which impresses itself upon us the more we study local collections; just as we learn, by a very little observation, to distinguish men of different nations and neighbourhoods. Thus we distinguish the loose, horny, colourless structure of the northern marine species; the stony, corroded, livid New Zealanders; the polished, absolutely perfect specimens from the coral seas. Certain forms are so characteristic of certain regions that we never expect to find them elsewhere. Thus, we look for *Clausilia* in Europe and Asia; for *Achatina* in Africa; for *Cylindrella* in the

West Indies and their neighbourhood; for *Achatinella* in the Sandwich Islands; for *Partula* in the Pacific Islands, south of the equator; to the United States of America we look for *Helices* with toothed apertures; to the Philippine Islands for the ivory and beautifully painted species, &c., and we venture to call them stragglers, if they are brought to us from any other quarter.

Dr. Pickering remarks, in relation to the Feejee Islands, "It was only here, in the midst of the Coral sea, where I found myself surrounded by a great variety of Cone, Mitre, Olive, Cowry, *Ovula*, *Harpa*, *Terebra*, *Cassis*, *Strombus*, *Conælix*, *Pyramidella*, *Tridacne*, *Vulsella*, *Lima*, &c., that I became fully aware of the imperfect state of this science. We missed *Patella*, *Eburna*, *Terebellum*, *Cancellaria*, *Hippopus*, *Ancillaria*, and *Marginella*. Bivalves seem to prevail less than at Tonga. *Mactra* proper was not met with. In fluviatile shells these islands are richer than the eastern ones, no doubt on account of their larger size and the consequent greater abundance of fresh water. A fresh-water bivalve, *Cyrena*, was here for the first time met with among the islands. Among land-shells we missed *Partula*. The appearance of large *Bulimi* reminded one of the continent." The true *Helices* seem to be supplanted by *Nanina*.

Another point of interest, extensively elucidated by the collections of the Expedition, is the occurrence of analogous species in co-ordinate regions. It is now a received fact that the animals and plants of the northernmost zones are, for the most part, identical throughout the whole circuit; and that the species gradually diverge from each other towards the equator, on the three continents; and that after passing the equator towards the south, there is not a return to the same species, and rarely to the same genera, as we should expect if variation of forms depended mainly on difference of temperature. There is, however, a return to mollusks of a kindred character and form, and oftentimes to the same genera.

The analogies of specimens from distant regions are much stronger when reckoned by isothermal longitude than by isothermal latitude. In the latter case we may have analogous genera. Along our northern

seas, some of the most characteristic shells are *Buccinum*, *Tritonium*, *Fusus*, *Terebratula*, *Rimula*, &c. Around Cape Horn are shells of the same types, so closely allied that they have not yet been separated as distinct genera, though peculiar in many important respects. But this resemblance does not descend to species. In the first case, however, not only have we the same genera, but the species seem to repeat each other: so that species brought from great distances east or west, are scarcely to be distinguished upon comparison. As examples in illustration, we may place against each other the following species from Oregon and from the Eastern States:

<i>Mya præcisa</i> ,	<i>Mya truncata</i> .
<i>Osteodesma bracteatum</i> ,	<i>Osteodesma hyalina</i> .
<i>Cardita ventricosa</i> ,	<i>Cardita borealis</i> .
<i>Cardium blandum</i> ,	<i>Cardium Icelandicum</i> .
<i>Venus calcarea</i> ,	<i>Venus mercenaria</i> .
<i>Alasmodonta falcata</i> ,	<i>Alasmodonta arcuata</i> .
<i>Helix Vancouverensis</i> ,	<i>Helix concava</i> .
<i>Helix loricata</i> ,	<i>Helix inflecta</i> .
<i>Helix germana</i> ,	<i>Helix fraterna</i> .
<i>Planorbis vermicularis</i> ,	<i>Planorbis deflectus</i> .
<i>Planorbis opercularis</i> ,	<i>Planorbis exacutus</i> .
<i>Lacuna carinata</i> ,	<i>Lacuna vineta</i> .
<i>Natica Lewisii</i> ,	<i>Natica heros</i> .
<i>Trichotropis cancellata</i> ,	<i>Trichotropis borealis</i> .
<i>Fusus fidicula</i> ,	<i>Fusus turricula</i> .
<i>Lottia pintadina</i> ,	<i>Lottia testudinalis</i> , &c.

Mingled with these are others very different in type, which mark the two localities as constituting very different zoological regions. Where, for instance, have we the analogues of *Panopæa generosa*, *Lutraria ventricosa*, *Triton Oregonense*, on the one hand, and of *Mactra gigantea*, *Fusus decemcostatus* and *Icelandicus*, *Pyrula canaliculata* and *carica*, *Pandora trilineata*, &c., on the other? The same comparison holds good between the shells of the Gulf of California and the Gulf of Mexico.

From a consideration of the land-shells collected on the Pacific islands, it seems possible to draw some fair inferences as to the relations of the lands which once occupied the area of the Pacific Ocean, and whose mountain peaks evidently now indicate, or constitute, the islands with which it is now studded. By observation of the species, we think there are strong indications that some groups of islands have an intimate relation to each other, and belonged, at least, to the peaks of the same mountain ranges, before they were submerged; while the indications are equally strong that other groups had no such territorial connexion.

The Samoa, Friendly, and Feejee Islands, are near to each other, and seem as if they must have intimate geological relations. The Samoa and Friendly Islands give evidence of such relation, the same forms and many of the same species occurring on both groups. But, if we may draw inferences from the land-shells, these two groups are more intimately related to the Society Islands, though at a much greater distance, than to the Feejee Islands. Not a single species of land-shell, found on the Feejees, was collected on either of the other groups. Several genera which are common to the other groups are wanting in the Feejees. Thus, no specimen of *Succinea* or *Partula*, genera so abundant in the Society and Samoa Islands, was found at the Feejees; and the true *Helix*, especially the pyramidal forms, so remarkable in the other groups, seemed to be replaced by large species of *Nanina*. On the other hand, large and peculiar species of *Bulimus* occur abundantly on the Feejees, while nothing of the kind occurs on any of the other islands. Indeed, judging from the land-shells, the Feejees are more nearly allied to the islands to the westward,—such as the New Hebrides, than to the Friendly Islands, on the east, though so much nearer. When we examine the fluviatile shells, however, we do not find the same distinction. Many of the same species of *Melania*, *Navicella*, and *Neritina*, seem to occur in all the groups, though the large coronated species of *Melania* prevail in the Feejees. There is some reason to suspect, moreover, that the fresh-water shells collected at these islands have accidentally become more

or less mingled. It must also be considered, that the *Navicella*, and more especially *Neritina*, is oftentimes decidedly littoral, and even marine, in its habits.

The little island of *Metia*, or *Aurora Island*, to the northeastward of *Taheiti*, is one of peculiar interest. It is a coral island, which has been elevated 250 feet, or more, and has no other high island anywhere near it. On it were found four small land-shells belonging to three genera, viz. :—*Helix pertenuis*, *Helix dædalea*, *Partula pusilla*, and *Helicina trochlea*. None of these were found upon any other island. They seem to have originated there, after the elevation of the island, and have a significant bearing upon the question of local and periodical creations in comparatively modern times.

As the genus *Partula* is characteristic of the groups just south of the equator, so *Achatinella* is the characteristic shell of the Sandwich Islands. Closely connected as the islands of this group are, they each have their peculiar forms of land-shells; and, as the southern islands bear evidence of greater age than the northern ones, we may infer that, within these narrow limits, we have evidence of the appearance of some species subsequent to the existence of others now living. On the Island of *Kauai*, the oldest of the group, we have *Achatina adusta* and *pyramidata*, a form which does not appear on the other islands; the *Achatinellæ* are chiefly of the elongated glabrous form, which I have grouped under the name *Leptachatina*; the *Helices* are planorboid and multispiral. On *Molokai*, the species of *Achatinella* are large and beautiful, and peculiar in their form and colouring. On *Maui*, the *Helices* are small and glabrous, with some very curious hispid and ribbed species, with lamellæ within the aperture. On *Oahu*, the species of both *Helix* and *Achatinella* are similar to those on *Maui*. On *Hawaii*, *Succinea* seems to prevail in larger proportion than on the other islands, while *Achatinella*, which occurs so abundantly on all the other islands, either does not occur at all, or but very rarely.

BOSTON, December, 1851.