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Walkerana
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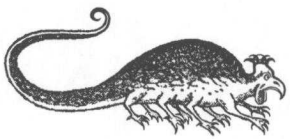
A Naturalist in a University Museum

By

ALEXANDER G. RUTHVEN



ANN ARBOR
PRIVATELY PRINTED

1931

Alexander Grant Ruthven; curator 1906-1913, director 1913-1929, Museum of Zoology; president, 1929-1951, University of Michigan.

Walkerana, 2001, 12(28): i-iv, 1-64

FORWARD

The first museum for any public university in America was built in 1881 on the campus of the University of Michigan in Ann Arbor. From modest beginnings, and few staff, this museum grew over the years, until its collections outgrew the space available to house them. Eventually, in 1928, the old museum building was replaced by a new one. A year later (1929), the museum's director, Dr. Alexander Grant Ruthven (1882-1971), was appointed seventh president of the University of Michigan. The book that is reprinted on the following pages, *A Naturalist in a University Museum,* was written and published (in 1931) by Dr. Ruthven, who presided over the "mother of state universities" for 22 years (1929-1951).

Dr. Ruthven joined the museum's staff in 1906 as curator. In 1913, the Regents gave the museum recognition as a separate independent unit within the University, and appointed Dr. Ruthven its director. It was largely through the efforts of Dr. Ruthven that funding was obtained for the new museum building that was erected shortly before he became president. In 1969, in recognition of Dr. Ruthven's long service to the University, the Museums Building was officially re-named the Alexander Grant Ruthven Museums Building.

Dr. Ruthven was an enthusiastic researcher and a prolific author, authoring or co-authoring some 160 papers in spite of his heavy administrative duties. Although Ruthven was a herpetologist, two of his papers were on mollusks (1904, Notes on the molluscs, reptiles and amphibians of Ontonagon County, Michigan, *Sixth Annual Report of the Michigan Academy of Science,* pp. 188-192; and [with Bryant Walker], 1906, Annotated list of the molluscs of the Porcupine Mountains and Isle Royale, Michigan, pp. 93-99, *In*: Adams, Charles C. [editor], *An ecological survey in northern Michigan,* Report of the State Board of Geological Survey of Michigan, 1905, 638 pp.).

Dr. Ruthven was largely responsible for transforming a small, overcrowded museum into one of the premier university natural history museums in the world, and as president of the university that administered the museum, he had shrewd insight into what a university museum should be, how it should direct and handle the accumulation of zoological knowledge, how it should serve the public, and how it should face the challenges, and perils, in the competitive—and often not very administratively enlightened—atmosphere of a large and distinguished university.

Dr. Ruthven's insight is especially pertinent at the present time, because the University's natural science museums recently narrowly escaped what would surely have been a great reduction, or even their extinction. Fortunately, due a change in University administrators and to the acumen of the new administrator, who, in her brief three-year tenure at the University of Michigan, reversed the

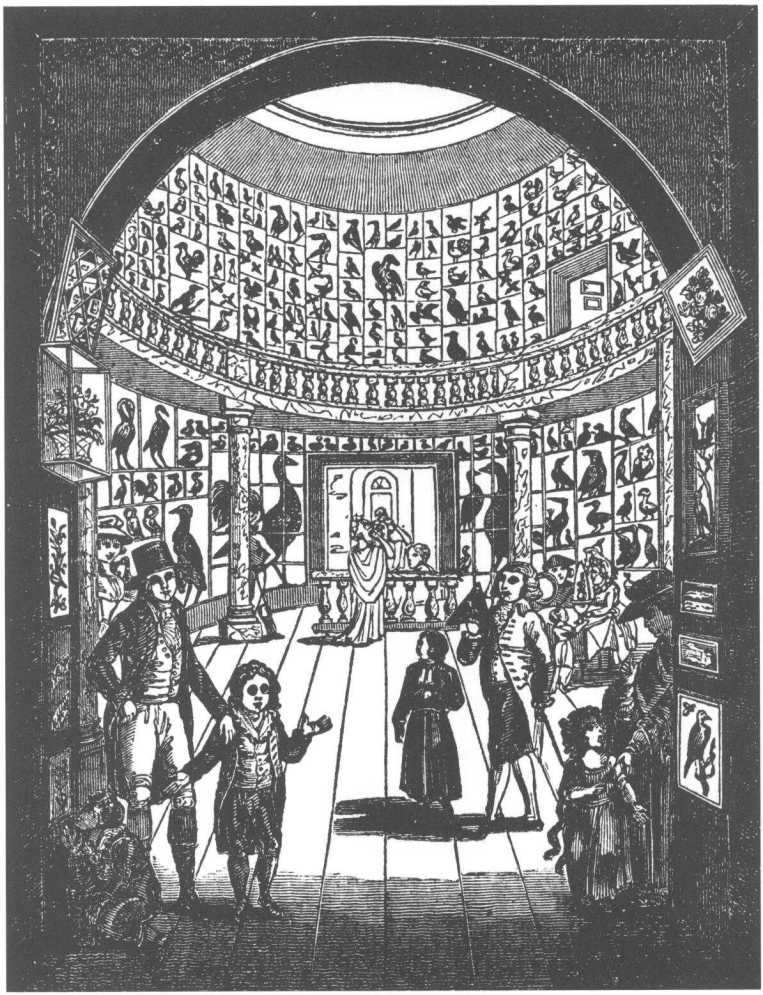
accelerating decline, and strengthened the museums. And, in her own words, she had "put in place the platform" on which further strengthening not only of the natural history museums, but of biological sciences in the College of Literature, Science and the Arts. I am sure that Dr. Ruthven's spirit is now—for the time being at least—resting easier.

Dr. Ruthven's book was published as a "gift" to his colleagues in the Museum of Zoology. But, it was probably also intended for future generations of curators and students who passed through the Museum, alerting them to the benefits of a natural history museum to the intellectual structure of an institution such as the University of Michigan, and to the special vigil needed to preserve the Museum's survival in a sometimes hostile environment.

To make Ruthven's book available to a wider audience, including the staff and administrators of peer museums on other college and university campuses, *Walkerana* is herewith reprinting *A Naturalist in a University Museum*.

JOHN B. BURCH, July 2002

A NATURALIST IN A UNIVERSITY MUSEUM



AN ENGLISH MUSEUM OF THE EIGHTEENTH CENTURY

Contents

Illustrations

Six hundred copies of this book have been printed at the Alumni Press, University of Michigan, Ann Arbor.

Dedication

This little volume is a gift to my colleagues in the Museum of Zoölogy of the University of Michigan. For a quarter of a century we have worked together to develop a needed department for the University, to train people with breadth of vision to comprehend the whole field of a noble science, to demonstrate the proper place and function of a college museum, and to promote the general development of the museum idea. During this period, we have seen our department grow with no serious pauses. The faculty has increased from three to twenty-seven, the collections from a few small nuclei have become important for several groups, and the small building which housed the unit from 1882 to 1928 has been exchanged for a beautiful and efficient one embodying the ideas of the staff as to the proper arrangement, lighting, and facilities for a modern museum building.

Well do I know and ever will I remember that it has been their faithfulness and patience and indefatigability that has been largely responsible for this progress, and I have ever been conscious that the pleasure taken in the work has been owing in no small degree to the comradeship which has existed.

The Museum is not finished. It never can be if it is to be a functioning unit of the University. My earnest hope is that it will grow and change with the times and serve science and the University with increasing effectiveness.

Preface

Riding a cowpony over the sunlit, wind swept prairie, tramping over the black loam of plowed fields under dull autumn skies, listening to the calls of the wildfowl as they dropped into sloughs swollen with floods from melting snows, or curled on a couch by the parlor stove with a copy of Wood's Natural History, a small boy dreamed of knowing wild animals, studying their habits, and being associated with them in a museum or zoölogical garden.

High school contributed to the realization of the dream only to the extent of a few weeks of Steele's Zoölogy. College offered nothing for three years except botany, which proved to be an unsatisfactory substitute. Then followed a glorious summer at the University, eight all too short weeks, partly devoted to field zoölogy under an inspired teacher, and a senior year in which the elements of the science were absorbed by a youth now firmly convinced that his goal was a museum.

This goal was not again lost to sight. An assistantship in the Department of Zoölogy of the mother of state universities (at fifteen dollars per month and not "found") made graduate work possible. Despite a lack of interest in museum work on the part of the staff, and very largely with the encouragement and assistance of the teacher who first directed his feet to the path, the details and ideals of museum administration were absorbed as interest in these institutions increased.

The University Museum was old in years, but it did not command the respect of the authorities. Its history had been a checkered one, for while able men had been at the helm from time to time, it had suffered from long periods of neglect and had had no consistent guiding policy. The Secretary of the University was accustomed to ask each new curator when the museum would be finished so that the staff could be dismissed—a staff consisting of a curator, who had never been paid more than twelve hundred dollars a year, a taxidermist, who received seven hundred and fifty dollars, and a part-time assistant.

Not daunted by the poor collections, the meagre support to be expected, or the opinion of his colleagues that the position could never be more than a stepping stone, the youthful Ph.D. assumed the curatorship, determined, with the enthusiasm of his years, to do what he could for the first museum with which he had become intimately acquainted.

Sustained by a belief in the ideals of his predecessor, by the conviction that zoölogy is a broad field, and that a museum of zoölogy may be a valuable research laboratory and an aid to education for the college student as well as the visiting public, the curator struggled on, developing the museum as best he could, trying to be a scientist of sorts, and endeavoring as the years passed and experience increased to formulate policies which might insure favorable destinies for his and other college museums.

The papers which compose this little volume are contributions to a general policy for college museums made by the youth and the man. That college museums must to be successful adopt any one policy can not be urged, but the fact that, while many have failed, one of these departments has developed under a general point of view, would seem to be sufficient reason for bringing together the several papers in which opinions of the director have been presented.

The Nature of Museums

THE image which appears in the mind when one thinks of the word *museum* is generally that of a specific building, a series of exhibits, or an institution. Seldom is it realized that the term should really represent an idea, like *church* or *state,* and that the institutions do not by any means run true to one or a few types. They have, to be sure, some features in common, but these are usually of a very general nature.

The one common attribute of museums is that they preserve objects of some kind for study or demonstration, or both. In this characteristic they are closely akin to libraries. They differ from libraries, however, not alone in the materials preserved, but to some degree, also, in the fact that a large part of the collections cannot be replaced.

In objectives, museums in general foster instruction and investigation and thus are allied, on the one hand, with establishments for pure research and, on the other, with the schools and colleges. They differ from the latter by the general limitation of their activities to those fields of knowledge the cultivation of which requires series of specimens permanently preserved for investigation, and by emphasizing visual instruction as a method of diffusing knowledge. It is, therefore, quite proper to define the museum in broad terms as an institution preserving collections of objects and data and encouraging and facilitating the use of these materials for research and instruction.

It requires no great familiarity with museums to understand that they may be classified in several ways. Differences and similarities are readily observed in the emphasis placed upon objectives, in the materials preserved, in the clientele, and in the source of support. Thus, one may recognize teaching and research museums, natural history, art, folk, oceanographic, archaeological, anthropological, and other kinds of museums by the fields of knowledge emphasized, private and public museums by the service rendered, and endowed, municipal, county, state, national, and college museums by the support received.

One may combine these classifications in a way to express objectives, materials assembled, clientele, and patronage. Classification here serves a distinct purpose. Museums are created presumably to fill a specific need. Once established they should respond to their surroundings and become fitted into the niche in the social structure indicated by their source of support and the persons to be served.

Failure to recognize their proper sphere of activity has been a widespread cause of decline of museums—failure to prosper if not to exist. A municipal museum cannot ignore the public, the college museum cannot succeed by erecting exhibits for underprivileged children, the county or state museum in America cannot appropriately expend relatively large sums in the exhibition of elephants or dik-diks, and an art museum should not attempt to become a historical museum, or a natural history museum a conglomeration of curios.

Since the museum is not a stereotyped institution like a bank, and individual museums are so different as to resist classification, each must be carefully studied in relation to its environment and organized to perform the work for which it has or should have been created. Directors should constantly pray to be delivered from obsessions of size and diversity and the temptation to follow slavishly the programs of their *confrères*. They should understand that each museum is unique in respect to its field of influence; that its individuality should be cherished within the general scope of institutions of its class; and that all museums are generically related in a broad way through their major activities—the accumulation and preservation of materials for demonstration and research.

Museum Methods

THE use of the word *museum* as an adjective is misleading when it concerns several phases of the activities of the institutions involved. The terms *museum person, museum work,* and *museum training* are correctly employed in the descriptive sense to denote that certain things are done in institutions bearing the generic name, but they should not be interpreted to mean that these activities are peculiar to museums, that a knowledge of these institutions or their activities can be organized into a discipline, or that museum work and familiarity with methods can be considered as a profession. It is important to understand that the relationships of museum work are intimately concerned with the question of museum training in the colleges and thus with problems of curricula, degrees, and the relations of college museums to other teaching units.

Museum work cannot properly be considered a profession for it is only incidental to the recognized disciplines. It is simply a technique, or more generally a group of techniques, which must be determined, guided, and used by those skilled in the several fields of knowledge best cultivated in these institutions.

A museum person is a professional zoölogist, botanist, geologist, archaeologist, business person, teacher, editor, taxidermist, or some other kind of specialist, working in a museum and having a knowledge of methods of gathering, preserving, demonstrating, and otherwise using data which should be saved. He or she cannot be a professional museum person, for his/her institution can only serve the world through the efforts of specialists in particular fields of knowledge. A person skilled in all of the methods known to museums and without special training in a field of knowledge could no more advance knowledge or teach a lesson than could a teacher who knew everything about pedagogy but nothing about subject matter.

As a technique, museum work is too important to be neglected. In the increase of knowledge and the diffusion of knowledge, the methods developed in these institutions furnish indispensable assistance to the specialist in several subjects which are best studied and exemplified by preserved materials. Unless this kind of data is adequately cared for, teaching and research will suffer. While the point should be stressed that the training is only a tool and is never to be considered an end in itself, the tool should be recognized as a necessary one.

The activities of a modern museum are varied in proportion to the number of fields of knowledge receiving attention. It is impossible, therefore, to do more than outline the general scope of museum training. Because the work done in museums differs from that done in other institutions only in that certain methods are employed, it seems obvious that the worker in museums should add to his or her knowledge of a subject, training consisting of a familiarity with museum methods, skill in handling materials, and a general understanding of the history, scope, problems, objectives, and relationships of his or her institution and others of its kind. The training may be obtained through experience, but this method, of course, is wasteful in every way when skills and knowledge of a considerable body of facts are to be obtained. Economy of time, effort, money, and materials is to be effected by providing for college instruction in these techniques.

The faults to be found with most courses in museum work are that they either fail to require training in a field of knowledge as a prerequisite, or that they emphasize only those methods which can be counted upon to produce technologists. A museum can succeed only if it is properly filling its place, and this can be insured only by knowing what other museums have done, are doing, and can do.

I believe that museum training should be given in the universities but that this training should be incidental to a generalized and specialized education. There should be no question of degrees or of credits except for work done by those preparing themselves to be specialists in some field fostered by museums.

Where museum departments exist, training will naturally be given in them, but for reasons which are stated elsewhere credits should be given in the teaching departments concerned with the several disciplines. Where it is not feasible to include in college curricula courses in methods, and possibly when this is done, it would undoubtedly be valuable to arrange for an internship of a half or full year after graduation in an active institution. Almost every experienced curator will agree that some training should precede the assuming of responsibility for institutions or collections since most curators are familiar with examples of collections ruined and data lost through the ignorance on the part of specialists and administrators of the routine of these institutions.

Only by carefully refraining from recognizing museum work as a profession in itself and by considering museum methods as important techniques of specialization can proper direction for these agencies be in-

sured. Directors and curators should be scholars, not technologists, if the museums are to be real "nurseries of living thoughts."

General Objectives

IN 1864 Dr. John Edward Gray defined the *new museum idea,* a term first used by Sir William Flower, as follows: "First, the diffusion of instruction and rational amusement among the mass of people, and secondly, to afford the scientific student every possible means of examining and studying the specimens of which the museum consists." Flower in *Essays on Museums* says:

"I believe that the main cause of what may be fairly termed the failure of the majority of museums—especially museums of natural history—to perform the functions that might be legitimately expected of them is that they nearly always confound together the two distinct objects which they may fulfill, and by attempting to combine both in the same exhibition practically accomplish neither.

"In accordance with which of those two objects, which may be briefly called research and instruction, is the main end of the museum, so should the whole be primarily arranged; and in accordance with the object for which each specimen is required, so should it be treated."

If these ideas are correct they furnish both a plan upon which the authorities may develop their museum, and criteria by which the success of the institution may be judged. The necessity first arises, however, of determining in which category a particular museum is to be placed. As a general rule I believe it may be said that municipal museums must incline toward the side of popular instruction, the national and large privately endowed museums should combine instruction and research about equally, and the university and state museums should strongly emphasize research, that is, the obtaining and study of collections for the advancement of science.

At any rate it seems very evident that the university museums should incline toward this phase of the work. As virtually two staffs have to be maintained in order to carry on efficiently both phases of work, only the larger museums can afford to do it. On the other hand the university museum does not come in touch with the mass of people, as do the municipal and national museums; hence, it does not need to devote a considerable part of its energy to exhibits that are not looked at, and may well limit its demonstrations to those which are needed to illustrate elementary facts to the class of students who come in contact with them.

Again, as so large a percentage of biological problems is being attacked

at the universities, it is very evident that it should be the duty of the university museum to acquire the requisite material. This does not mean that the university museum should attempt to obtain exhaustive series of specimens from everywhere in the world, even if the usually limited funds would permit, but in addition to a collection of the more representative types for illustration and comparison, it should be one duty of such a museum to secure exhaustive collections from its immediate locality. No other similar institution is so well fitted to obtain them, and the local collections furnish material for solving local problems, and for loan or exchange. The need for local collections is recognized by all workers, for as Flower, in *Essays on Museums,* goes on to say: "The collections for the advancement of science, on the other hand, are of value mainly in proportion to their size, and no museum at present existing has come anywhere near what is required for the exhaustive study of natural history."

It seems to me that perhaps the best way in which such collections may be obtained is by the detailed study of small areas, and fortunately a state university museum is situated so that it can attack the problems of a local area to the best advantage. It is able in few instances to compete with the large museums in making investigations of foreign fields, while it can usually by focusing all of its forces attack local problems in an exhaustive way. Local projects are often neglected by the larger museums.

Development of a Museum Policy

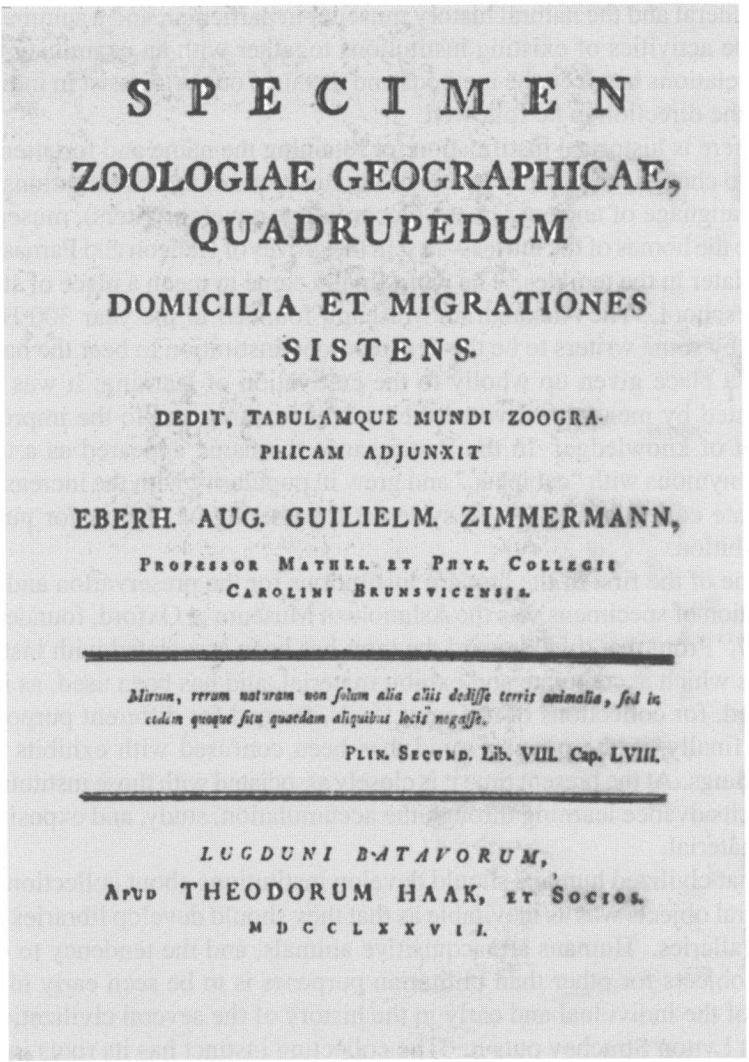
THE word *museum* has become deeply rooted in the languages of civilized nations, but with some differences in meaning. At present there is not generally, at least in America, a definite conception of its meaning or of the scope of its application. Perhaps to most persons the word recalls a collection of some kind housed in a building, and some dictionaries so define it. The objects may be pictures or pieces of sculpture, in which event a synonymous term is Art Gallery. A botanical museum may be called a herbarium, or this term may apply to study series of plants. If the collection is a zoological one, the mental picture may be of rows of stuffed animals or exhibits of mounted animals in groups—a sort of dead circus, as expressed by one youngster. The older generation will recall those horrible assemblages of freaks and curios, labeled "Museum" or "Dime Museum," which displayed unusual and bizarre objects, abnormalities, and such fabulous creatures as mermaids, unicorns, and horned serpents.

Relatively few persons appreciate the scope of modern museums, or realize that they are concerned not with the entertainment of the public but with education and advancement of knowledge.

The main reason for the rather general notion that the museum is a series of exhibits in a building is not far to seek. The public is admitted by most institutions and sees what is meant for it to see. What is not seen may be read or talked about, but there has not been, by natural science museums at least, sufficient effort exerted to present the museum as "a center of learning, a nursery of living thoughts," "a principal agency of the enlightenment of the people," "a consultative library of objects," a repository for data that would otherwise be lost. This is unfortunate, for it robs these institutions of support to which they are entitled.

The popular conception has even on occasion led those who should know better to recommend another term for the museum which aims to stress some activity other than the preparation of exhibits for the public, and has had evil effects upon museum architecture.

An attempt to outline the scope of ideal museums of natural history, in the hope of assisting in the spread of an appreciation of the objects and methods of these institutions, may be based upon the assumption that something approaching a true conception of the nature and possibilities of natural history museums should be obtainable from a consideration of the meaning of the word *museum*. Likewise a brief history of museums



SPECIMEN

ZOOLOGIAE GEOGRAPHICAE,
QUADRUPEDUM

DOMICILIA ET MIGRATIONES
SISTENS.

DEDIT, TABULAMQUE MUNDI ZOOGRAPHICAM ADJUNXIT

EBERH. AUG. GUILIELM. ZIMMERMANN,

PROFESSOR MATHES. ET PHYS. COLLEGII CAROLINI BRUNSVICENSIS.

Mirum, rerum naturam non solum alia aliis dedisse terris animalia, sed in eadem quoque situ quaedam aliquibus locis negasse.

PLIN. SECUND. Lib. VIII. Cap. LVIII.

LUGDUNI BATAVORUM,
APUD THEODORUM HAAK, ET SOCIOS.
MDCCLXXVII.

FIRST COMPREHENSIVE TREATISE ON ZOÖGEOGRAPHY

in general and the natural history museum in particular, and a summation of the activities of existing institutions together with an examination of the relations between the methods and the aims ought to assist in indicating the direction to be followed.

There is historical justification for retaining the name and for attempting to change the popular notion of the functions of these institutions. In the language of ancient Greece (according to several writers), museums were the homes of the muses—first in the groves of Helicon and Parnassus, and later in the temples. The word finally came to mean a place of study or a school. The Alexandrian Museum, founded in the year 300 B.C., said by some writers to be the first recorded institution to bear the name, was a place given up wholly to the cultivation of learning; it was frequented by men who devoted themselves to study and to the improvement of knowledge. In the Renaissance the name appeared as a term synonymous with "cabinets," and grew in popularity with the increase of private collections and with systematic gathering of objects for public exhibition.

One of the first of the modern institutions for the preservation and exhibition of specimens was the Ashmolean Museum at Oxford, founded in 1667. From that time onward the term has been associated with institutions which accumulate and exhibit material, and has been used, as intimated, for collections of different kinds, formed for different purposes, and finally, in the popular mind, has been confused with exhibits and buildings. At the present time it is closely associated with those institutions which advance learning through the accumulation, study, and exposition of material.

That civilized humans should develop institutions about collections of natural objects was as inevitable as that they should develop libraries and art galleries. Humans are acquisitive animals, and the tendency to collect objects for other than utilitarian purposes is to be seen early in the life of the individual and early in the history of the several civilizations.

As Lytton Strachey puts it: "The collecting instinct has its roots in the very depths of human nature." The pebbles and dead mice in a boy's pocket, a collection of seashells on the parlor what-not, mounted trophies of the chase that adorn the walls of library or den, the postage stamp albums (made even by university instructors), perhaps some of the contents of the Indian war-bundle, the grisly trophies of war of such savage tribes as the Kalingas, the votive offerings in pagan temples, the gorilla skins brought from the west coast of Africa by Hanno and hung in the

temple at Carthage, and the stuffed specimens and curios in bars and taverns, are to be considered incipient museums, whether the objects were assembled or came to be preserved for their beauty, for their uniqueness, as an act of homage to the gods, or as souvenirs of the prowess of the collector.

It was inevitable that with civilization the tendency to study collected objects and to collect objects for study should appear. Recent excavations have shown, according to report, that there was a museum at Ur, the home of Abraham, three thousand years ago. The Greeks and Romans had lavish public displays of works of art, and, although the records are few, there is little doubt that they made attempts to accumulate natural objects for purposes of study. Philip and Alexander supplied Aristotle with a great variety of zoölogical specimens from the subdued countries, placed at his disposal thousands of persons to gather material and make observations for him, and furnished him with large sums of money. As has been remarked: "If human nature has not changed more than we suppose, Aristotle must have had a great museum of natural history."

After the destruction of the Alexandrian Museum, in 47 B.C., museums are not mentioned until about the seventeenth century. It has been noted, however, that collections were made with some vigor, and were carefully studied by inquisitive minds during the fifteenth and sixteenth centuries. One of the earliest printed catalogues was that of Samuel Quickelberg, a physician in Munich (1565). Others were Conrad Gesner's catalogue of the Johann Kentmann collection (1600), and the catalogue of the Tradescents' collection (1656), which became the nucleus of the Ashmolean Museum. Other collections of the seventeenth and eighteenth centuries at least in part made possible the great works of Moufet (1634), Johnstonus (1662), Sloane (1707), Seba (1734), and Linnaeus.

Although often called *Cabinets of Natural History,* these collections were museums in the modern sense: developments on the one hand, from the assemblages of curios, trophies, and religious relics, and, on the other hand, from the temples of the muses, lines of descent which in a sense came together in the Alexandrian Museum, to end there for over a thousand years. Reflecting their dual origin, museums since the seventeenth century have exhibited two rather distinct activities: display of material and study of material. Curiosity, no less than a tendency to collect, is an attribute of humans, and demonstration, or visual instruction, has become a recognized method of teaching.

Today natural history museums are still increasing rapidly, and have a

ALBERTUS SEBA

wide range of activities. Most of them maintain exhibits, but many of them support study collections, conduct extension work, offer public lectures, produce both popular and scientific publications, encourage investigations, send out expeditions, give technical advice in conservation matters, form study series, and otherwise preserve data and instruct students. In other words, the name cannot be entirely appropriated by institutions of entertainment, and a museum is or may be more than its exhibits, as a university is more than the classroom instruction which it offers.

Even this brief outline of the history of natural history museums will show not only that the use of the term *museum* for institutions of research and instruction is sanctioned by, and has the dignity of long usage, but that these institutions have if they fulfill their purpose a very definite place among the institutions of civilization. They have been compared appropriately with libraries for they accumulate material and they have two general objects, which are also those of all intellectual work: the increase of knowledge, and its diffusion; the one by investigation and discovery, the other by the education of the people and the application of known facts to the promotion of material welfare.

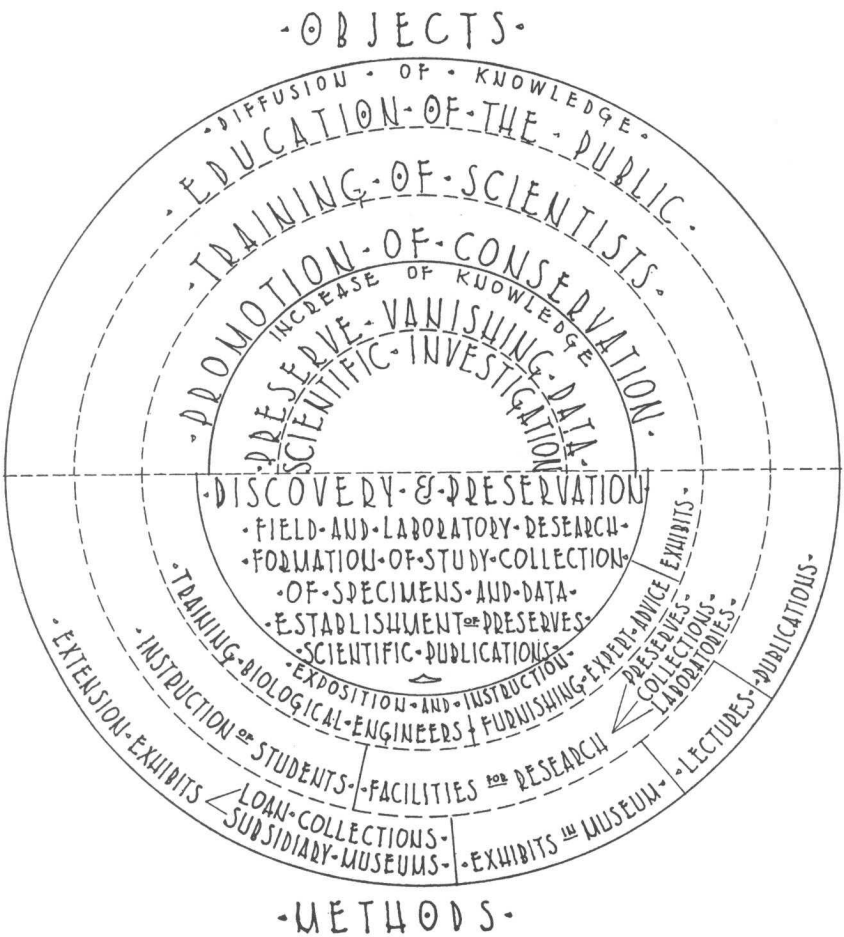
These are the general purposes of modern museums, but different institutions give to them different valuations. Many have failed to recognize the whole field of endeavor which is open to them. Because they assemble materials, museums should, of course, emphasize those fields of investigation which require suites of specimens. This is not equivalent to saying that they should, as do some institutions, restrict their researches to those which can be done with preserved specimens and locality data. Again, educational activities need not be confined, as they are frequently, to the demonstration of specimens in the building.

A chart has been prepared to show the functions and methods of natural history museums, based upon a survey of existing establishments. The major fields of effort are all considered legitimate because the museums as institutions which accumulate material can perform these functions as well as, or even better than other institutions. The success of any museum is to be measured by the extent to which it covers those fields of activity open to institutions of its kind, within limits prescribed only by its facilities and patronage.

The most obvious function of the museum is the diffusion of knowledge, but even so, its importance as an educational center is not generally appreciated. Tigert in *Museums as Mediums of Education* remarks that "no other educational agency or medium is so generally undervalued as

the museum." Because it has the material, this institution has the duty of advancing education by visual instruction, even when it has not been created for the purpose.

Museums have been called the original exponents of visual instruc-



FUNCTIONS AND METHODS OF NATURAL HISTORY MUSEUMS

tion; and most attempt to function as educational institutions for the public at large or a selected group, such as college students. How often, however, do they fail to be true to their responsibility, a responsibility

that becomes tremendous when the value of visual instruction is considered. The education of the public is frequently limited to exhibited specimens not very adequately labeled; and exhibits often degenerate into attempts to excite awe or admiration.

Examination of museum practice reveals that the education of the public can only be considered properly promoted when the exhibits teach lessons, and when, to the limits of the resources, these are supplemented by loan collections and subsidiary museums (including out-of-doors exhibits of specimens best shown or preserved in their natural setting), by public lectures, and by literature written for general consumption.

For example, the public may be well served by museums of zoölogy and botany whose exhibits illustrate biological principles, such as evolution and the laws of inheritance, conservation, and the facts of civic biology, but to be of the greatest service, loan collections designed to assist in the teaching of nature study, civic biology, conservation, and other biological subjects should be formed, subsidiary museums should be organized in connection with schools and libraries, out-of-doors museums should be created to preserve and display for the public the larger plants, the habits of animals, and the native fauna and flora, and lectures and literature summarizing knowledge and new facts should be provided.

Museum curators are sometimes scornful of the public and of exhibits. This attitude is probably in part owing to an apparently growing opinion that much money has been wasted in the construction of groups, often very artistic, but so elaborate that the lesson which they are supposed to teach is obscured, and so expensive that the general growth of the museum is hampered.

If museums are to engage in visual instruction, it must be realized that attention should be focused on the label, and that the specimens, as has been pertinently said, should be considered as illustrations of the label. Certainly extravagant exhibits are to be deplored as unnecessary and detrimental to the well-rounded development of any institution. To insist upon very elaborate exhibits is as unwise as would be insistence that library books for general use have hand-tooled, inlaid bindings, and fore edge paintings.

Objection to exhibits cannot properly be carried further than a demand that they must not be overemphasized. A quotation from the *London Times,* referring to British museums, is to the point: "Only a narrow policy would seek to put a limit on the free entry of the general public into both places [museums and galleries]. Culture, if it is to exert its humanizing

influences, must be spread in the widest commonalty. The exquisite shapes in the Tanagra Room, the stately avenue of books in the King's Library, the stones that still speak of man's struggle with the mastodon, are too good to be treated as if they were part of a circus or a cinema show. They and their companion collections in the national possession cannot be looked at and visited too often. If funds be wanted for their upkeep, let vulgarity find them. It is ubiquitous, and could bear the tax without feeling it."

The training of scientists through instruction of students is particularly a function of university museums, but it can be and is being performed by other museums through association with colleges. It would appear to be true that all colleges should have museum departments if the natural sciences are to be taught in a broad way, which usually they are not; and yet so many of these departments have failed as to lead an eminent museum director to question their usefulness. The failures do not seem to be owing to the fact that museum departments are unnecessary, but to wrong aims and methods of organization.

The necessity for conserving natural resources needs not be discussed. The reasons are varied, conspicuous, important, and urgent. Far from requiring only "arithmetic and common sense," these problems need all of the effort and data that can be brought to their solution. As institutions which can do much to save these resources, the museums must accept the responsibility, although they have been slow to do it.

Other institutions may have the facilities and be more directly concerned with conservation problems, but the museums have the data as to the identity, the characteristics and habits of the objects to be preserved, and the causes and extent of depletion. In general, they have the people with scientific training who can, because of their knowledge and the data available to them, give advice in technical details and, above all, in the formation of general policies. In other words the museum can serve, if it will, as a central record bureau for the data needed in the conservation of the natural resources of its region, and its staff can, with little effort, qualify to give expert advice to departments of conservation.

The museums can do much to educate the public in conservation matters, both by means of exhibits and by publications, and finally, and probably most important, these institutions have the facilities for the training of "biological engineers." In order to apply the results that have been obtained by research it is necessary to develop people of broad experience who can bring into association the investigator in the laboratory and

the animal husbandryman, the farmer, and the officer of public health. The "biological engineer" will seek to prepare for the needs of the future and to meet growing problems before they have become a menace to the welfare of the public. The museum of natural history which will undertake the training of conservation experts will be deserving of great commendation.

The promoting of conservation is an almost undeveloped field for museums. Some of them are successfully illustrating the facts of conservation by exhibits, and a few have sporadically given valuable advice to individuals and state departments of conservation; but the training of experts and the development of a definite program of coöperation with state departments have been undertaken by very few. The museum definitely bridges the gap between diffusion of knowledge and increase of knowledge, for exposition and research are both necessary if conservation is to be promoted.

One of the functions of museums has come to be the assembling and preservation of data in danger of destruction. The actual preservation of data presents only mechanical difficulties, such as sufficient and properly designed space, suitable cases, and catalogue systems, but the gathering of information and objects entails the often far more difficult task of determining the value of data and specimens and the urgency of the need of preserving them. This task is made the harder because museums tend to be conservative, and museum people are of necessity specialists.

At the present time it is not difficult to perceive the need for scientific purposes of preserving every available bit of data on the plants, animals, and primitive peoples that have recently become extinct and on those which are nearing extinction. Not so generally appreciated is the desirability of accumulating detailed information on natural requirements, habits, life-histories, and genetic behavior of animals and plants for their bearing on relationships, and on the folklore and culture of primitive peoples not in immediate danger of extinction but almost certain to be contaminated by contact with civilized races. In a sense all data upon the relation of animals and people to their environments is vanishing data.

Science and the public welfare will ultimately require all possible information concerning natural objects, and because conditions are changing rapidly, and changes mean destruction, it is desirable that the data be assembled rapidly. Since it cannot all be gathered at once, it would seem to be sensible to attempt first to preserve what is obviously needed. This should include not only the raw materials for the investigations under

way or projected, but as far as possible results of investigators, whether in or outside of the museum, and available private collections. Permanent preservation of private collections or data cannot be insured except in institutions specializing in the conservation of materials for study.

Museums of natural history have done and are doing much to preserve vanishing data, but they have also left much undone. Directors and curators have recognized that humans are rapidly changing conditions and that these circumstances generally mean destruction of life and an obscuring of primitive relationships, but either because they already have a heritage of material of a certain type, or because it has become the custom for them to encourage certain types of investigation, museums continue to emphasize a few kinds of work and to assemble the data which were in the past considered sufficient for the solution of the problem.

No one will expect that museums can by taking thought forthwith proceed to collect all kinds of natural history material. Attempts to do this have resulted in a hogdepodge of little value to anyone. Museum people, like all scientists today, are mostly specialists and can only be expected to gather the material which they understand, but it must not be ignored that a knowledge of data to be saved develops with the study of specific problems. The converse of this statement is probably more forceful: when material is assembled without relation to a problem, either by trained or untrained people, it will practically always be unaccompanied by important data.

The solution to the difficulty of recognizing the value of data and the urgency of the need to preserve it is to gather the data and develop the museum by the project method. This method has another value which will be discussed later; but it may be stated here, as a proposition that can be defended, that the museums which are gathering material needed immediately for researches or instruction, are acquiring a larger amount of data in danger of destruction than are those institutions whose principal object is to augment the collections.

The increase of knowledge is now considered to be a legitimate function of museums, at least by most of those who are concerned with their development. There are, however, differences of opinion in regard to the relative importance to be assigned to investigation and diffusion of knowledge, and as to the fields of investigation which the museums should cultivate. In general the increase of knowledge may be considered of equal importance with the diffusion of knowledge in the sense that neither should be neglected.

The training of scientists, the preservation of data, and the promotion of conservation cannot be done efficiently unless investigations are pursued. To be sure the museum may restrict its activities to the education of the public, but the institution which does this is hardly worthy of the name, because it is failing to realize its greatest possibilities of service. Not only is the opportunity of creating another research institution wasted when a museum fails to encourage research, but there is bound to be a deplorable waste of data through neglect to gather or save any material but that which can be used for exhibits.

The fields of investigation open to modern museums are revealed by the methods employed rather than by the material that has been assembled or by the published results. Laboratory and field researches are conducted, study collections of specimens and data are formed, preserves are established, and scientific publications are produced.

The only method that has not been sufficiently emphasized perhaps is the establishment of preserves. There are specimens which cannot be moved, such as petroglyphs, Indian earthworks, primitive mines, and with these, specimens which should not be disturbed because they are more significant in their natural setting: for example, the remains of primitive villages and burial sites. These should be preserved as carefully as if they were specimens in a building. Also worthy of serious consideration now is the need for saving areas of natural conditions for plants and animals to provide for the study of ecology, economics, and life-histories. This need is more apparent, perhaps, in the case of institutions concerned largely with the instruction of students and of the public, for preserves are also needed for demonstration; museums in general owe to science the duty of preserving those natural conditions which are essential to the investigations encouraged.

While a survey of museums shows that several methods of advancing knowledge are being used, a closer study shows that some museums neglect to employ one or more of them, and probably no museum is efficiently using all of them because of the feeling, expressed or unexpressed, among museum people that a certain few kinds of investigation are properly within the scope of these institutions. Because the museum is based upon the necessity of accumulating and preserving material for investigation and concerns itself with visual instruction, there are naturally fields of knowledge, the cultivation of which is stressed. Physical anthropology, ethnology, systematic zoölogy and botany, biogeography, and palaeontology are more and more, properly, centering in these institu-

tions because they require large amounts of material.

Unfortunately, as has been said, because of a heritage of old material and traditions, many museums tend to restrict themselves not only to what can be done with the material at hand, but, what is worse, to the securing of new material of the same kind. In other words, they frequently fail to keep abreast of the latest advances in methods and results, and themselves produce results which, while undoubtedly valuable, are not those to be expected from the present day development of science. To draw again an illustration from biology, classification is an important field of investigation for museums of zoölogy and botany, but, in limiting the researches to analysis and description based upon morphology, the museums are not recognizing that much light can be thrown upon relationships by studies in embryology, physiology, animal behavior, ecology, and genetics.

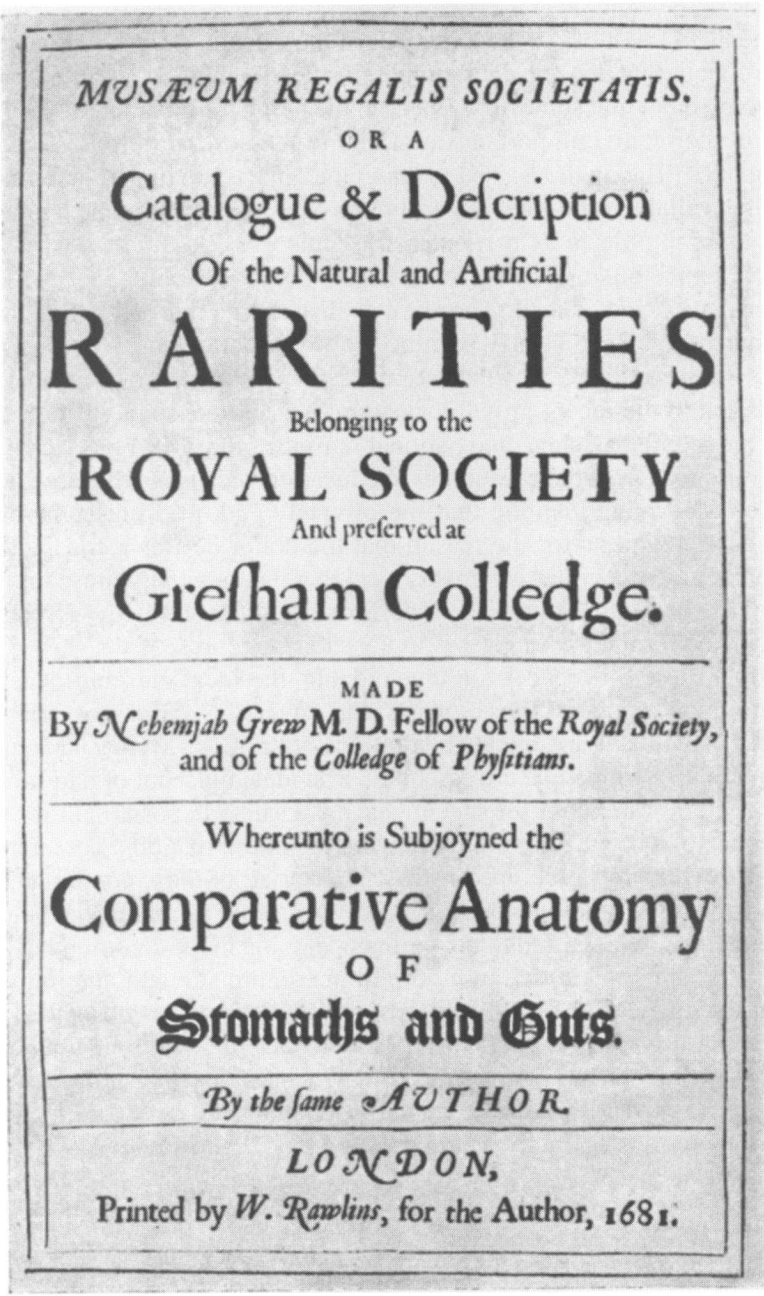
Museums do not need to investigate the structure of protoplasm or problems in biochemistry, but neither do they need to restrict their researches to particular aspects of systematic zoölogy. It should be clear that while analysis and description are necessary, they do not constitute the whole of systematic zoölogy, as this branch of zoölogy must be conceived today, and that there are distinct disadvantages to zoölogy in the practice of emphasizing them. To continue to restrict investigations to those which can be carried on with the material that has been gathered, and to ignore modern trends in science, is to insure for museums a decreasing importance as research institutions. The major fields of investigation for museums may not and therefore should not be exclusively the descriptive phases of the natural sciences, but should be those divisions of the sciences which require accumulation and preservation of material. When problems have been selected in these general fields they should be followed, regardless of where the studies may lead.

It will readily be seen from this discussion that the project method is suggested for researches as well as for the preservation of data. If the criticism is raised that this would develop the collections unevenly, it may be answered that this objection is of little value, since all museum collections develop unevenly. The considerations that only through investigation can be discovered the data which needs to be preserved, that only by taking full advantage of its opportunities for research can the museum hope to occupy a respectable place as an institution devoted to the advancement of learning, that problems cannot be limited, and that no museum can have everything in the way of specimens, constitute ar-

guments in favor of the development of these institutions by projects.

In concluding this consideration of the development of a policy, it may be pointed out that some differences in the number of methods employed and in the relative importance ascribed to the several purposes are unavoidable. The methods used to attain the objects are in part determined by the available funds and in part by the objects stressed. The emphasis placed upon objects by particular museums is or should be determined by the source of support. It has been said that no absolute ratio between investigation and education can be established, and that, even though the administrators keep clearly in mind the two functions of museums, this ratio will be influenced by the nature of the institution. This can be demonstrated in the recent growth of natural history museums. It develops that the municipal, state, and national museums must devote a relatively large proportion of their resources to education because of the large number of tax-paying visitors; that the privately endowed museums often emphasize exhibits for the reason that the donor desires a conspicuous monument to his or her generosity; and that the university museum may stress research and limit educational work quite largely to the display of specimens for the use of classes in the subjects represented.

While these differences are unavoidable, the ideal museum does not fail to avoid unnecessary emphasis, but covers, as far as possible, the whole field of activity open to institutions of its class. Money and equipment are needed; people are essential. The ideal museum of natural history is not a warehouse for specimens, not a safety deposit vault for rare objects, not a beautiful building in which to house exhibits, not an institution devoted to stereotyped researches, nor all of these combined, but an organization of trained people earnestly striving to enlarge the bounds of human knowledge and to disseminate learning in the commonwealths. It is a dynamic institution, not born in maximum strength and immediately able to measure up to its full responsibilities, but never finished and never ceasing to develop, growing as slowly as life, retaining a juvenile elasticity that permits adaptations to new conditions and problems, and at all times correctly emphasizing purposes and methods according to the demands of the environment and the progress of knowledge.



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CATALOGUE OF A SEVENTEENTH CENTURY MUSEUM

The College Museum

TO discuss in any but a derogatory way the institutions known as *college museums* requires considerable courage, and it must be adimitted that to see the good attributes of many of them requires the faith and imagination of a fond parent. It is not surprising that college officials do not agree on the place which museums should occupy in the college, and that these departments are quite frequently scorned by museum people whose institutions, endowed with a larger share of worldly goods, make a better showing to the casual visitor.

The opinion of some college administrators is illustrated by the statement of a newly-appointed president of a large college, reported in current newspaper dispatches, to the effect that his college should retrench by eliminating the museum, "an unnecessary department." The attitude of many museum critics is reflected in a recent article in *Museum Work,* the official organ of the American Association of Museums. According to the writer, the college museum is all but extinct, the historical museum is a senile institution kept alive by a few doddering old men, while from these decadent institutions, like a phoenix from the ashes, is rising gloriously into view the large, privately endowed, municipal museum. It may be gathered from the article referred to that the college museum, having served its purpose, should now cry, "Othello's occupation's gone!" and pass on with as little resistance as possible.

Although there are a number of college museums which are at least not considered moribund by their supporters, owing to the differences of opinion which prevail any discussion of the problems of museum administration in the college must, to be convincing, be preceded by a consideration of the present condition, causes of failure, and probable future of such departments.

The general museum situation in America has been summarized in a report of the Commissioner of Education in which he states that there are in the United States approximately six hundred museums, about fifty per cent of which are devoted exclusively or chiefly to natural science, about twenty-five per cent to history, and about ten per cent to art. The remaining fifteen per cent are devoted to special or to miscellaneous subjects.

"Approximately thirty-eight per cent of these museums derive their financial support from schools, colleges, or universities; thirty-five per cent from societies or associations; fifteen per cent from city govern-

ments; seven per cent from private individuals or endowments exclusively; four per cent from state governments; and one per cent from the National Government.

"These statistics do not indicate the relative importance at the present time of the subjects treated by museums or the importance attached to museums by the various organizations which support them. The value of museums depends, not upon numbers, but upon the efficiency with which they serve the purposes of the supporting organization. This is a matter of judgment in every case and cannot be determined mathematically, but the amount of money appropriated annually for the museum is the best indication of the value placed upon it by those who support it. Financial statistics are difficult to obtain, especially from institutions which give inadequate support to their museums, but such as are available indicate certain significant conditions. Thus: twenty-seven academies, colleges, and universities totaled appropriations of $14,671 for museums, while the same number of municipal museums received a total of $980,900. Only five colleges or universities gave more than $1,000 to museums, while only one municipal museum received less than $1,000. Ten societies and associations reported museum appropriations from general funds to the amount of $38,309, but only five of these gave more than $1,000. Fifteen state museums received $138,650, and sixteen privately endowed museums had an aggregate income of $778,727."

Comparing the number of museums of each class which reported their income with the total number in the country, it is found that reports were received from more than half of the state museums, nearly half of the endowed museums, one-third of the municipal museums, and only one-eighth of the college and university museums. In the last named class the most common report was "Maintained from the general funds of the college" or "Variable and irregular appropriations from college funds."

It is probably safe to say that very few of the college museums which did report their income receive more than $500 a year. Although a few museums under control of colleges or universities or of societies or associations have endowments sufficient to insure their maintenance, the great majority are inactive and deteriorating, while the municipal and state museums are growing in number, size, and usefulness, and are receiving increasing appropriations of public moneys and contributions from private sources. The contrast is shown in a summary of the average incomes of the museums whose statistics are available.

College and university museums receive appropriations averaging about

$500, and an average income from all sources amounting to a little over $6,000; museums supported by learned societies receive appropriations averaging $383, and incomes of a little over $8,000 from all sources; state museums, from appropriations almost exclusively, $9,330; museums dependent upon endowment and miscellaneous sources, $48,670; and municipal museums, from city funds, $41,515, and from all sources, $51,878. These figures would be much smaller were it not for the large income of a very small number of very wealthy museums.

This report also says that from the deplorable condition of the great majority of college museums of natural history, from the small amounts of money appropriated by the colleges for their maintenance, and from the high quality of work in natural science done by colleges which have no extensive museums, the conclusion is forced that a large scientific museum is not essential to college work as at present conceived, and that the proper maintenance of such a museum is a burden which few colleges will carry. Where other funds can be utilized these museums may do valuable educational work under the general auspices of the college, but the demand for such work must usually come from outside the college. It is not questioned that some use of museums is made by college instructors in their class work, but equal results could usually be attained by comparatively small study collections, and the maintenance of extensive display collections is a luxury. On the other hand, large endowed museums in connection with universities undoubtedly constitute an important aid to research, and as such are highly valued.

This summary can do little harm if it is clearly perceived that either it involves a contradiction or the writer considers worthy of the name only those museums which have large systematic collections and extensive exhibits. The latter would seem to be the correct interpretation, for otherwise the conclusion expressed elsewhere that "the college museum is a declining species which must give way to a rising one" would be inconsequent. It can serve no good purpose thus to restrict the meaning of the term, for it is in the college that the principal objects of museums—education and research—come closest together, and no sharp line can be drawn between study collections on the one hand and research collections and exhibits on the other. To apply the name only to those college departments which have sufficient funds to use the elaborate methods and build up the enormous collections of the larger institutions, savors strongly of fetish worship of a kind not uncommon in this country. Under the broad meaning of the term the larger institutions should and will

supplant the college museums only if they can entirely occupy the field of museum work.

It has been said that the main objects of museums are education and research, that methods of education and fields of research which can best be studied in institutions prepared to handle large series of specimens are museum work, and that the museums should not be forced to run true to any one type. If these general statements are correct, then it may be said, as has been pointed out, that the college museum should emphasize teaching and research.

After all, a college museum is a part of the college, and while my *confrères* use the term "mere teaching museums" or "teaching collections" in a disparaging way, I am justified in insisting that the teaching of students is as legitimately a part of the educational work of museums as is the instruction of the general public. This may be enforced by reference to the museums of zoölogy.

It appears to have escaped the attention of museum people that their narrow viewpoint in regard to systematic zoölogy and geographical distribution is in part responsible for the reaction towards morphology, physiology, and other phases of zoölogy which predominate in curricula, and that there is now evidenced a general tendency to give to instruction in biology a wider scope.

There is undoubtedly a growing belief among teachers of zoölogy that the student should be given a comprehensive knowledge of the content of the subject. Where this belief is put into practice there is as clearly a need for the museum as in those institutions where museum researches are considered synonymous with taxonomy. Particularly is this true when it is understood that synthetic systematic zoölogy and geography properly associated with experimental ecology contribute to a knowledge of the relationships of animals and *pari passu* to a knowledge of the course of evolution, for in the teaching of these subjects a museum is indispensable. Few will question the benefit to the student of this new or revived method of instruction which ignores no phase of the subject, and just as certainly it is an end to be desired by all museums, for it is from the college graduates that museum staffs must be recruited.

Teaching should be a function of all college museums. Whether or not research is to be emphasized depends largely upon the size of the parent institution and the courses of study offered. Just as small, privately endowed, and municipal museums must usually give most or entire attention to some phase of educational work, so the museum in the small col-

lege should usually limit its activities to teaching, and it is most likely to be the large colleges which will be in a position to offer graduate work in the fields which require museum collections.

If the larger institutions are manned by people of broad vision they will see that students with a bent toward any of the lines of work which can best be done in museums are given an opportunity to obtain the training necessary to the investigator. It may be said that this need not entail enormous collections in many different groups or elaborate equipment and large appropriations.

From these general considerations I am led to the conclusion that the museum may have an important place in the small college if it provides material for visual instruction, and in the larger colleges if it furnishes facilities for instruction and research. Moreover, this place can be invaded by the larger institutions only when these are in such proximity that through coöperation they become in a sense college museums.

The statement attributed to a college administrator that the museum is an "unnecessary department" is a curious one. It may well be asked, what is a necessary department? Is it one that the college cannot get along without, owing to a bias in the minds of its supporters? If so, then education is to be controlled by peculiar prejudices of the public which supports each institution; but if the college administrators sincerely strive to offer work which will result in general mental development along the lines of endeavor represented by the aptitudes of its students, then every department which offers facilities for work along these lines is important.

Although it cannot be said that the college museum, as an institution, is a failure because the appropriations of those organized as departments are small, it is evident that it has not been as successful as might be expected, since many colleges large enough to do so have not established museum departments, and in some colleges where they exist they are not sufficiently developed. Lack of money may be a contributing cause of the failure of some colleges to establish museums, but it is not likely to be the fundamental cause, except when, to the powers that govern, the term *museum* means large systematic collections and extensive exhibits. Inadequate funds certainly cannot be urged as a cause of failure to develop when the museum is not filling its place.

There are apparently several causes for the disappointing situation in regard to college museum departments, two of which may be discussed here. It is clear that one is the failure to limit the collections. Every

naturalist who, in his or her enthusiasm, starts a private collection is fated to discover that the care of the material involves a constantly increasing expense that only wealthy individuals can hope to carry on during a lifetime, unless the series is one that grows very slowly.

Increasing expense is an appanage of all growing collections. The private collection sooner or later finds its way into a museum, or is destroyed, or at least ceases to grow and begins to accumulate dust; and while the larger institutions can generally expand rapidly enough to delay at least the day of reckoning, they cannot do so indefinitely, and the smaller ones, including those in colleges, relatively soon run afoul of the law of diminishing returns if their growth is not carefully restricted. "A school museum, not less than a school boy, can suffer from the consumption of things too numerous or ill-adapted to its constitution."

Again, it may be demonstrated that the failure of museum departments often results from an attempt to use the methods of the large museums. It is not surprising in this simian world to find college museums aping their big brothers by emphasizing beautiful exhibits on a relatively large scale, but it is difficult by this method to arouse enthusiasm among members of the faculties and administrative boards who see in the college an institution in which study and research are the principal objects, and in which amusements must be subordinated, even when these are on a higher plane than moving pictures and billiard parlors. While the emphasizing of exhibits in college museums may carry the department along for a time, particularly if they appeal to one or more people in authority or to an alumnus of considerable influence, the fact that the bulk of opinion among the authorities is generally against this kind of thing dooms the department to failure in the long run.

This is quite as it should be, for while a certain amount of exhibition is desirable for the students, alumni, and patrons of the college, there can be no excuse for developing exhibits to such an extent that they interfere with, or give a wrong impression of what should be the main objects of the department—instruction of students and research. It is quite as improper for the college museum to emphasize exhibits unduly as for the municipal museum to over-emphasize research.

In brief, the weakness of many of these institutions and the cause of the low birth rate among them may apparently be attributed in large part to a failure to keep within bounds. We may say that they, like sheep, have gone astray, and wandering from their appropriate environment have lost the advantages which would otherwise have been theirs, such as the op-

portunity to train students, the ability to concentrate their facilities upon any desirable field of research independent of outside influences, and, involving these two things, the respect of administration, faculty, and students.

In the foregoing discussion of the relation of college museums to their environment, the problems of the administration have been indirectly brought out and their solution adumbrated. These may now be more concretely summarized. In the first place, the methods of administration should depend upon the nature and scope of the departments, and indirectly upon the size of the college. The care of teaching museums, *sensu strictu,* does not entail special methods when the collections are distributed, as is desirable among departments; and if small exhibit collections are maintained, they may well be placed in charge of the professor or professors most interested. To conclude this line of thought, it may be reiterated that large and expensive exhibits are to be discouraged as foreign to the interests of the college.

When research collections are assembled, however, as they are most likely to be in the larger institutions, the question of the administrative officer becomes a vital one. It should be evident that research collections ought to be under a director whose chief duty is the care of the material. This officer may have other duties, including teaching, but his or her *first* duty should be the accumulation and safeguarding of the specimens.

Experience has shown clearly that it is seldom satisfactory to give the administration of the museum into the hands of a member of the faculty primarily engaged in teaching, for, sooner or later, the research material even if preserved is confounded with the teaching collection. Either no research collections should be assembled, or they should be organized as a department independent of other departments in the college. The ideal arrangement is to have the teaching and research collections in this department, for the teaching staff will be relieved of the labor of gathering and caring for the material used in class work; and the research collections will more easily be kept from "entangling alliances."

If the museum is fortunate in its administrators, the growth of the collections will be carefully guided, but it is unfortunately true that far too many directors, either through a desire to have their departments grow or through yielding to the pressure of enthusiastic or misguided friends of the institution, permit their museums to be swamped by a mass of material which is not useful and which is expensive to maintain.

It has been pointed out that one cause of the non-success of many col-

lege museums is the failure to limit the collections. College administrators may aid the museum departments by not placing too great a premium on growth in numbers of specimens, and by upholding the director when he or she refuses to accept the hair wreath of the dean's great-aunt Mary, or the skeleton of a mounted elephant purchased from a taxidermist by Jones '73. The careful restriction of collections to those needed in the studies that are being made or which are to be made in the college will make the museum much more efficient than will a general collection.

There is undoubtedly a place for the college museum, if teaching collections are included in the meaning of the term and if it is realized that research material should be preserved. Granted their right to exist, the efficiency of such museums is clearly in the hands of their administrators, who should recognize that their usefulness, as that of the other departments, is to be judged by the service which they render to science and education first through the college and the college student.

To insure maximum service to the parent institution, the museum should provide materials for instruction in the smaller schools, and for instruction and research in the larger colleges; the collections should be properly limited, and exhibits should not be emphasized to any greater extent than is necessary to the attainment of the two principal objects of the museum. To safeguard the specimens, the museum which fosters research should be organized as a department in charge of a trained person who will give first attention to it and who will appreciate the fact that for his or her department "the path of duty lies in what is near." In other words, the college museum can be an asset to science and education to the degree in which it serves the parent institution.

College Museums and Allied Units

MUSEUMS are sensitive plants. They require to be nourished and cherished continually, or they quickly become moribund. The reason for this characteristic sensitiveness is that their very life blood consists of materials and data which demand constant and expert attention in order to prevent a deterioration from which they can seldom be rehabilitated.

College museums are in danger of being neglected, particularly in two important and related ways: through poor administration and through interference with their obvious function of training scientists. The reasons for this are to be found in the relations of these units with the teaching departments in the same general field.

Instruction appropriately given in college museums is both undergraduate and graduate. The nature of the material and the qualifications of the staff make it desirable for most of these departments to emphasize graduate instruction and to provide undergraduate training principally through exhibits. This general fact should be kept constantly in mind in any discussion of these units as departments of instruction.

The problem facing each of these units is to find a plan of organization which will insure for them permanency, skilled supervision, and opportunities for the training of undergraduate and graduate students without unnecessary duplication of courses, degrees, and other academic paraphernalia. Several methods of administration have been tried with various results.

One plan which has been followed is to have the museum and teaching unit under one head. The head may have two titles, that is, professor or chairman of the teaching department and director or curator of the museum, or he or she may have only his or her professorial title, the museum being placed more directly under a member of his or her teaching staff. The obvious advantage of this type of organization is that the museum becomes readily available for teaching purposes.

As revealed by the history of several institutions, the disadvantages of the plan are serious. The tendency of the scheme is to make the museum so subservient to the teaching activities that the collections are damaged or destroyed by class use. Most specimens to be preserved must be expertly handled, which they rarely are under this system. Again, more often than not under this form of organization, the director will be a person who understands neither the scope nor the possibilities of museums

with the result that the unit will not prosper. College teachers are specialists, at least in inclination, and, unless the staff member who is given charge of the unit is interested in a subject, the study of which involves museum material, only rarely will he or she have the breadth of interest which will lead to learning the needs of the institution. Experience shows that it is usually difficult to explain to a teacher without museum training that museum specimens are to be used but not "used up."

A second method of administration sometimes adopted lies in maintaining entire independence, including separate staffs and budgets. The merits of the plan are that the administrative officers in the museum unit will, more often than under the previous plan, be museum trained persons, for they will be selected with this qualification in view. Because of this fact the collections will probably receive greater protection than under the first scheme and consequently the unit will have more permanency.

The disadvantages that have been noted reflect the compartment idea which has grown up in our colleges. The museum collections are usually not sufficiently utilized in undergraduate teaching, the museum staff is not used for teaching, and students are forced into programs of instruction which do not lead into those fields emphasized in museums. Because college museums must stress graduate teaching and research, the plan raises the question of separate advanced degrees and otherwise tends to exaggerate segregation of units. Unfortunate as is this tendency, it is preferable to wrecking the museum. The plan should be adopted when coöperation cannot be secured.

A third method of organization sets up separate budgets and technical staffs but gives double appointments to museum curators and directors who are interested in teaching and to members of the allied teaching departments whose work requires museum material and the use of museum methods. For such interlocking staffs the salaries may be carried on the budget of the department where the major work is done, on the budget of the teaching department alone, or they may be divided. The desirable features of this arrangement are that the museum may have a staff of experts, teaching and research may be properly centralized, the research may be distributed and the instruction allocated to the teaching department, the museum staff as members of the faculty of the teaching unit may broaden the scope of the latter, and the teaching faculty may have the use of the museum. There would appear to be no serious disadvantages inherent in this plan of organization. It gives the museum the nec-

essary autonomy and recognizes its value as a teaching unit without setting it up as an independent department of instruction.

While no form of organization can be expected to work automatically, almost any plan will operate satisfactorily if based upon sanity and intelligent idealism. The scheme of interlocking staffs for museums and teaching units recognizes that the tendency towards extreme departmentalization in our colleges and the proneness of specialists to stress their fields of interest should be counteracted. Its successful operation will, of course, be largely dependent upon wise leadership, but this is an attribute of all organization plans. While the method cannot be expected to work automatically, it should, on the whole, provide more safeguards for museum departments than any other with which I am familiar.

Geography in College Museums of Zoölogy

STUDENTS who essay the study of problems in the distribution of animals are quite certain to find, early in their investigations, that the field of zoögeography has been left largely to the museums. They are fated to discover that the materials which have been assembled are inadequate for detailed work. If they believe that geography is likewise concerned with the interpretation of distributions, they will observe the insufficiency of data to be both in specimens and in the information accompanying them.

The records preserved with specimens in most museums of zoölogy concern date of collection, locality, and name of collector. Data on habits, food, habitat, enemies, and exact range are, as a rule, not secured, or at least not permanently recorded. Since the distribution of species is largely determined by their environmental contacts, the information needed to interpret distribution is a knowledge of the habits, habitat preference, conditions in the habitat, and range (all properly to be considered as geographic data), and the results of experiments upon the effect of altering the intensities of environmental conditions. The discerning student, in view of the secretiveness of most animals, the complexity of the environmental relations, and the geographical differences in the physical conditions, cannot believe that increased collections with the kind of information now deemed sufficient in most museums will ever be adequate for comprehensive geographic studies.

Criticism of the kind of data preserved by museums loses none of its force from the fact that many conclusions relative to the environmental factors in the distribution of animals have been reached from studies based upon the records preserved with collections. The careful student is justified in doubting the validity of these conclusions on the grounds of inadequate geographic data and a lack of experimental evidence of the effect of changes in environmental conditions. As is seldom recognized, geographic data yield evidence of the factors which control the distribution of animals. This indirect evidence is most valuable as a guide to experimental studies, but it must be the product of the most detailed field studies and be supported by the results of experimental physiological investigations before our knowledge of the numerous environmental factors can be deemed conclusive.

The failure of museums of zoölogy to gather and preserve a considerable part of the information needed in geographic studies is deplorable. It will not be questioned that in view of the rapid changes in conditions over large areas, which include the disappearance of many animals, there is immediate necessity, at least from the standpoint of geography, for obtaining geographic data. Since museums are in a better position to do field work than most zoological institutions, it should be recognized that it is their duty to be of the greatest possible service to geography, and that this obligation also includes the preservation of all vanishing data.

The observer will, if unbiased, properly attribute the neglect to search for and record all the facts of distribution and environmental relations largely to the fact that study of systematic zoölogy is strongly emphasized in natural history museums. This policy discourages the collecting of important geographic data, for the field person, to obtain the maximum number of specimens, must visit regions favorable for collecting and must spare no time in working over areas that do not yield large returns in specimens and in studying habits and habitat distribution. Moreover, the investigator who is solely interested in taxonomy is prone to neglect the preservation of geographic data other than locality records.

There can be room for no difference of opinion among unbiased minds that systematic zoölogy, as well as zoögeography, would be much advanced if geography and ecology rather than systematic zoölogy were to receive emphasis by museums, at least to the extent of accumulating information on the environmental relations, habits, and exact range of the species. Admittedly this would result in a decrease in the number of specimens obtained and thus contribute to the loss of valuable data, but this is unavoidable and provides a reason for increasing museum resources rather than an objection to stressing geography. The contention is on the whole sound that specimens accompanied by detailed geographic data are more valuable for taxonomic investigations than those without this information, that such data are indispensable for geographic studies, and that it is an anachronous practice to continue the piling up of records of a kind once thought to be adequate but now known to be inadequate for the purposes which they should serve.

The suggestion that geography be emphasized in no way minimizes the importance of systematic zoölogy. The geographer must needs know the species with the greatest possible exactness; and the ecologist who does not have the identity of the forms determined by experts is liable to fall into serious error. There are many forms which differ so slightly in

structure as to be distinguished with difficulty even by specialists in the group to which they belong, and this similarity in form does not necessarily imply similarity in physiology. It is fortunate that specimens for the study of systematic zoölogy would continue to accumulate, although in smaller numbers, if stress were laid upon geography.

If museums of zoölogy will assemble materials for the study of geography they will be doing a distinct service, but those which are in a position to carry on research will not be doing their whole duty if they do not promote the study of these materials. The old and pseudodoxal notion that a museum is a storehouse for freaks and curios seems to be dying, and there is a general understanding, at least in America, that the institutions may quite properly devote some of their resources to research.

As there is nothing in the name which precludes original investigations, just as clearly there is no reason why the investigations in museums of zoölogy should be confined largely to the fields of taxonomy and descriptive zoögeography, and, indeed, no reason why they should not include the entire field of animal ecology. It may be argued with considerable cogency that in view of the importance of obtaining a knowledge of the facts of distribution with the least possible delay, for the reason that geographic data are necessary for ecological and taxonomic studies, and because the interpretation of distributions must depend upon a knowledge of the ecology of the species, museums of zoölogy should not only gather geographic data but should also, as far as their resources permit, carry on investigations in experimental animal ecology.

The objection very likely to be raised by museum administrators that experimental ecology cannot properly be considered within the scope of museum activities is inconsequent and not to be seriously considered. These institutions do not and should not be forced to run true to any one type. The emphasis to be placed upon education and research, the two principal objects, and the scope of the educational work and the researches have to be determined for each institution; but the general scope of legitimate museum activities should be conceived to include every method of education and every field of zoölogy that can be considered most effectively by institutions equipped to do field work and to care for large amounts of material.

The geographer will not be slow to perceive the distinct advantages to geographic science in having work in the cognate fields of ecology, geography, and systematic zoölogy carried on in the same institution, and the systematist and the ecologist will at least ultimately come to appreci-

ate them. The ecologist could then easily and certainly determine his or her material, the systematist could obtain information of assistance in determining the relationships of species, and the geographer could apply experimental methods to the interpretation of problems in distribution which engage his or her attention.

It is believed that a museum of zoölogy which emphasizes geography by insisting upon the accumulation of geographic data and by encouraging researches in zoögeography, even to providing animal houses, laboratories, and equipment for investigations in experimental ecology, would not be pseudonymous. Rather would it, by properly evaluating and stressing the scientific work which must perforce be given to these institutions, come close to the ideal in its service to science.

Systematic Zoölogy in Museums of Natural History

FOR a long time systematic zoölogy has been left largely to museums, as morphology, embryology, physiology, and some other fields of zoölogy have been emphasized by universities and kindred institutions. Museums which encourage research have accepted this division of the general subject, as indeed they should, for one necessity of sound systematic studies is large series of specimens, which can be maintained only by institutions with the proper facilities. Since it can scarcely be disputed that systematic studies must in the future be made in museums to an even greater extent than at the present time, it is quite proper to inquire if the subject is being dealt with in these institutions in a way that will insure results of the greatest and most permanent value to science.

It is not surprising that museums have not only accepted systematic zoölogy as a field of research but have emphasized this field to the neglect of others. It will not be denied by the unprejudiced student that as the result substantial progress has been made in the discovery and definition of the components of the world fauna. The number of forms unknown to science is being rapidly diminished, and as rapidly described forms are becoming better known. No zoölogist who really understands the scope of his or her subject will fail to see that it is necessary to know the components of the fauna, and that this knowledge includes the distinguishing of each form from all of the others, a stable nomenclature, and the preservation of specimens as permanently as may be. All of these things are receiving adequate attention in the better equipped museums, but it does not necessarily follow from this that the general subject is being satisfactorily dealt with, that is, that the most that can be done with the facilities and materials is being accomplished.

Critics are not wanting who maintain that the discovery, defining, and naming of species do not constitute the whole content of systematic zoölogy. There is evidence that in many museums the building up of extensive series of specimens, the revising of names, and the description of new forms are the principal duties of the members of the staff. In other words the museums are not only emphasizing systematic zoölogy but particular aspects of the subject. It should be clear that while these kinds of work are necessary, they do not constitute the whole of systematic

zoölogy, as this branch must be conceived today, and that there are distinct disadvantages to zoölogy in the practice of stressing them.

Acquisitiveness is a human attribute which is apparently fostered in air tainted by the fumes of naphthalene, carbon disulphide, and alcohol; comparatively few museum people seem free from a sort of specimen worship which feeds upon rare and unique specimens and imposing series. No one will quarrel with curators over care exercised in the accumulation and preservation of material when a proper appreciation of relative values is retained, but it should be recognized that the value of a specimen is to be measured by the use which is made of it.

A specimen buried in a museum is no more valuable to science than one buried in a jungle. To amass zoölogical data in the form of specimens and locality data in advance of the needs of students may be defended as a foresighted policy, because much of this data is vanishing, and accumulation of specimens is a slow process. Unfortunately accumulation sometimes becomes a miserly hoarding of specimens with a view to "cornering" the material in particular groups,— an unwise and vicious practice.

To interfere with the freest possible use of material by students of the present generation is at best a shortsighted policy, and at its worst a greedy hoarding as unpleasant to observe as miserliness always is. If museum people are not broad-minded enough to work for science as well as for themselves and their institutions, they may still reflect that to a considerable extent the study of specimens reveals data with which they should be accompanied and points the way to the acquisition of material which will increase the value of the collections and the museum. Not the number of specimens but the use which is made of them should be a matter of satisfaction to museum men.

It is true that some specimens, such as types, should receive extraordinary care, for like first editions of books they will presumably be referred to many times in the future. Even here museum people not seldom overdo the matter. For example, it is now being argued by some zoölogists, particularly entomologists, that all type specimens should be deposited in the United States National Museum on the ground that permanent centralization of these specimens will insure preservation. The argument is unsound, and the proposal if carried out would actually hinder systematic studies. In the first place it is not at all certain that the collections would be properly cared for in the United States National Museum. This institution is comparatively young, poor in financial resources, and suf-

fers from a too close dependence upon politicians. Admittedly it is a disgrace to the United States that these things are true, but true they are.

Centralization is itself a condition that endangers permanency of material. To assemble all type specimens under one roof or even in the same town is to put all of the eggs in one basket and invite disaster. It can scarcely be denied that the danger of total loss is less with the material scattered among several institutions. The most important reason why type specimens should not be centralized is that centralization would, to a considerable extent, withdraw the specimens from use, at least under the plan of not loaning these specimens which has now been adopted by most of the larger museums. Time and expense are still requirements of travel which have to be taken into consideration.

It must be admitted that it is not advisable to make a practice of freely loaning types, owing to the hazards of transportation, and it is also clear that institutions and private investigators not equipped to preserve material of this sort should be encouraged to deposit type specimens in institutions where they can be cared for; but this does not necessarily mean that types should be assembled in one place. The statement that specimens are of value as they are used applies also to types, and these specimens should be located where their permanency and their use are most compatible. Although the suggestion will be looked upon by some museum people with something akin to horror, no doubt the way of progress in systematic zoölogy would be smoothed by distributing all types as loans to the institutions in which work on the groups represented is being conducted.

The problem of securing a stable nomenclature bids fair to be an unsolvable one under the present system. At least the method of priority continues to offer many opportunities for the person so inclined to juggle names. Also it is a curiosity of systematic zoölogy today that not a few systematists seem to regard papers announcing changes in names as contributions to science. Granting that the changing of names long in current use is unavoidable under the present system, and granting that this will if pursued far enough under the present rules lead to a stable nomenclature, it should also be kept in mind that this is not zoölogy and not scientific work in any sense. It is rather the sort of problem given to students of languages together with the interpretation of a sketchy quasi-legal code. In other words, if unavoidable in the main, it is not to be considered as any more a part of the researches of the systematist than the tools which he or she uses, and nothing can be more sad than the

spectacle of a trained zoölogist allowing the search for prior names to absorb a considerable amount of his or her time. The search could be more efficiently conducted by bibliophiles, and the interpretation of the code could be done much better by lawyers or by scientists with a legal training.

In view of our knowledge of zoölogy today, systematic zoölogy should be defined as the study and exposition of the course of evolution in animals. Under this definition it comprises both the differentiation of all forms and the summation of all evidences of relationship. Not a few investigators in museums will contend that at the present time it is desirable to emphasize the discovery and description of species because the forms must be known before their relationship can be discussed. This contention is based on the assumptions that the data which are now being gathered for analysis are sufficient for investigations of relationships and that the present system of classification expresses affinities. The first assumption is quite incorrect; the second is only partly true.

The analysis of the fauna which is being made is, of course, based upon the differences in structure which are discovered. The data used in this work are principally specimens and locality records, and to a lesser extent date of capture. For the reason that descriptions emphasize differences and differences can never point relationship, and because it is essential that similarities in structure, physiology, detailed data on distribution, geographical variation, ecology, and the factors of distribution and evolution must all be considered in investigations of affinities, it is apparent that the material now being gathered will not be sufficient for the study of relationships. As may be seen in the literature, few revisions pretend to present convincingly data on the course of evolution in the groups discussed but usually consist of a rearrangement of forms on the basis of various characters which are supposed to indicate affinities.

It is to be hoped that our present classification groups together the forms which are most nearly related, but at best it does no more than this, and additional data upon the variability of the characters considered diagnostic in the several groups is certain to change profoundly our ideas of relationships. It is probably a percipience of this fact which in large part has made the work of the systematist seem to other zoölogists to miss the mark, and which has brought the subject into disfavor in universities.

In view of these considerations it is more than doubtful if the practice of emphasizing description and classification is an advisable one. Analysis is clearly preliminary work, and while very necessary it is to a consider-

able extent futile unless accompanied or closely followed by an attempt to work out in detail the relationships, origin, and history of the forms, at least to the extent of accumulating data which will permit studies of affinities. It may be reiterated here that the use of material reveals the data needed.

If systematic zoölogy is correctly conceived as the study and exposition of the course of evolution in the animal kingdom, and investigations in this field must be left largely to museums, the conclusion is unavoidable that these institutions should gather data, supply every facility to students in the use of this material, and give early and full consideration to investigations of relationships, regardless of how tentative the results may be. Permanence of conclusions is not all-important.

College Museums and the High Schools and Grade Schools

ONE of the popular indoor sports in America is the criticism of the public schools. Sooner or later most of the ills of our body politic are attributed in one way or another to our institutions of learning, and there seems to be little hesitancy on the part of most to criticize or to suggest improvements, particularly if the task of working out the improvements does not fall to the critic.

Probably owing in part to the fact that nearly everyone feels free to criticize our school system, and the consequence that much of the criticism is not well founded, educators seem to have developed rather generally an insensibility to attacks. This attitude is undoubtedly of considerable benefit since it decreases the number of experiments in teaching and organization, of which we have already had too many; but it is doubtfully commendable when developed so far as to give rise to the attitude that only the opinion of "trained educators" needs to be considered. Surely courses in pedagogy are not necessary to an appreciation of the fact that the results of our zoölogical teaching, for example, are not all that can be desired.

In making the following comments upon the teaching of zoölogy in the public schools I do not fear that they will be very generally contradicted. Most educators will agree that only a small proportion of the children in the grade schools receive any instruction in this science. Nature study is not generally taught in the grades; and if, according to statistics sent out by the Bureau of Education, only thirty-two children out of every one hundred entering the first grade remain to enter the high school, the number receiving instruction in zoölogy in the high school is certainly much less than thirty-two. It is also obvious that, of the thirteen that remain to graduate from high school, less than this number receive instruction in zoölogy in college, because all of the thirteen do not go to college and only a small proportion of the college students take the subject. Furthermore, the character of the work, both in the grades and in the high school, is not, as a rule, satisfactory.

We can at least say of nature study in the grades that too little time is devoted to it, and that there seems not to be a clear understanding of its scope and importance. Of the work in the high school, no one who seri-

ously studies the situation can doubt that in most schools the subject matter offered and method of treatment are fundamentally wrong.

If anyone doubts that the study of animals has not taken the place in our educational system that its importance justifies, he or she should be convinced when contemplating the results. The criteria by which the success of our teaching should be measured are:

1. Does it increase the student's interest in, understanding of, and love for animals?
2. Does it encourage and assist the student so inclined to take up the study of animals as an avocation?
3. Does it acquaint the student with the importance of animals as a part of human's environment?
4. Does it provide a basis for biological vocations for students contemplating such careers?

The objection may be raised at this point that this list does not include training in scientific method. The omission is deliberate. The position can be defended that training in scientific method can be given when ecology, systematic and economic zoölogy, and life-histories constitute the subject matter, and that it is as important to obtain in school life information which can be utilized later as it is to obtain formal discipline. Locke's theory—that the process of learning trains faculties for use in many fields, and that the nature of the subject is of little consequence—is no longer tenable. Scientific training must be given, but subject matter should receive equal emphasis.

Measured by these criteria and considering the small number of students taking them, most of our grade and high school courses in nature study and zoölogy are failures. Most adults have an aversion to animals often amounting to horror; they have not been trained to observe a caterpillar with the wonder and admiration with which they regard a flower; they speak of their "natural fear" of snakes and are inclined to impute poisonous attributes to any unfamiliar animal.

Although I know of no statistics, the relative number of amateur zoölogists seems to be decreasing. At least it is evident that the number is not increasing, as it should, with the growth of the so-called leisure class. As a comment upon this it is sometimes argued that the day of private workers is past, and that the solutions of the present great problems of biology require much equipment, fine laboratories, and coöperation of institutions. This may reasonably be doubted. "Factory-made research" may yield large returns, but the product of the individual

investigator in science, with all of his or her handicaps, working for love of the subject, will still remain important. This is rather beside the point. The argument for private work in zoölogy should rest quite as much upon the benefit to the worker as upon the benefit to science, and, from the educational point of view, it is as important that the person who cannot be a professional zoölogist shall have the opportunity to become an amateur as that any other person be permitted to develop according to his or her preferences and aptitudes.

At the present time we have a large amount of data upon the economic importance of animals, and the time is ripe for improvements in our control of noxious forms and in the conservation of valuable species. To secure the best results the general public should be educated in the facts and problems relating to sanitation, the control of insect-borne diseases, the control of predatory animals, the conservation of animals of value for food or economic products, and the relation of animals to husbandry. Of these the public at large knows little, and yet it elects representatives who pass laws relating to them, with the result that the legislation is often insufficient to secure the desired results, and occasionally is wholly bad. An understanding of the economic relations of animals and humans is not, or only inadequately, conveyed to students of public school age, although it could fittingly be given in courses in zoölogy and nature study.

In regard to zoölogy as a basis for professional work, I believe most university teachers will agree that the zoölogy usually taught in the public schools is in no way preparation for the work which is to follow. So far as can be seen the student brings to the university neither the training equivalent to the first course in zoölogy nor a knowledge of nature that makes any easier his or her advanced work. To be sure many high school courses are modeled after college courses, but the work necessarily has to be abridged and must perforce be carried on with less equipment, so that it cannot take the place of even the beginning college course.

It can serve no good purpose to refrain from criticizing instruction which produces these results. Even when remedies cannot be suggested, criticism will stimulate a search for them, and when suggestions for improvement are made they should be carefully studied.

With the amount of attention at present being given to educational methods no difficulty should be encountered in convincing teachers that topics and material in zoölogy should be near to the pupil's natural interest and needs, that facts and ideas should be presented in a sequence related to the development of the child if they are to be effective in foster-

ing natural interests, and that a science can claim a place in the school curriculum only on the basis of intellectual value and application to life.

A course in pedagogy is not required, but only a familiarity with the youthful mind, to reveal that the child of public school age has a healthy curiosity about animals. This interest is greater in some children than in others; the difference is probably not inherent but owing to the extent to which the child comes in contact with nature, for an interest in natural history is easily cultivated in those unfortunate ones whose lives are restricted to the apartment house, school, and dancing academy.

The first thing a child wants to know is the name of the animal he or she sees. From this stage the child soon wants to know many animals, and then what they do, where they live, what they eat, where they sleep, where they have their young, and how the young are born. In other words, it is the natural history of animals which appeals to the child. At this stage there is no real interest in the form of the intestines of a cat, in learning all of the bones in a frog, or in drawing the manubrium of the ninth sternite of the male earwig. To seat the child at a table, with the child's eyes glued to a compound microscope while he or she struggles to distinguish a paramoecium from a bubble, is certain to kill the child's natural interest in a very short time.

Fortunately, the things in nature which the child wants to know he or she needs to know, and upon the elementary facts of natural history which can easily be imparted in the grades may be developed, in the child's high school years, an interest in some group—if the child is so inclined—and a knowledge of civic biology, mental and physical hygiene, conservation of natural resources, and human's place in nature, which should be part of the mental equipment of civilized people. Indeed, may I not say that only upon such a biological foundation can be developed in the future citizen a reasonable appreciation of him- or herself and his or her place in society that will replace those beliefs based on superstition and authority? Thus, instruction in natural history should yield worthwhile results when judged by the criteria given, even, it may be added, to the extent of providing a foundation for professional work.

It is one thing to agree that natural history should be taught in the public schools, and quite another to teach it. Perhaps the chief difficulty rests in the fact that teachers are moved to teach what they have been taught; and, as a rule, the colleges do not offer graded instruction in natural history. It is a curious fact that while the teachers come from the colleges, the biological curricula are not designed to train high school

teachers, but rather college teachers and investigators. Similarly in normal schools [institutions for training teachers] the training in biology is usually more nearly that which a high school teacher should have than it is equipment for instruction in the lower grades.

In the universities, at least, the theory seems to be that the prospective teacher can get sufficient facts and proper training for high school teaching by taking some of the courses in a long series designed to produce a college instructor or investigator. The theory may be practicable in some subjects but not in zoölogy at the present time. Today most professional zoölogists have a low opinion of natural history; and college zoölogy deals principally with anatomy, embryology, biochemistry, physiology, and genetics—phases of the general subject which are uninteresting, unimportant, and not understandable to the child of public school age. The situation in the normal schools is no better. To be sure, fewer courses are offered—distinctly an advantage—and usually some "bird work" is given, but extensive, graded instruction in natural history which can be used by the elementary school teacher is not provided.

Another difficulty in properly introducing natural history in the grades is that there is, on the part of school boards, superintendents, and principals, little general understanding of the scope and importance of the subject, and as a consequence it does not receive proper attention. It is not uncommon to find schools in which instruction in nature study is given one-half hour a week by the regular teacher. Comments upon this situation are hardly necessary, but it is little less than extraordinary that an educator can hold the opinion that special teachers are necessary for instruction in typewriting, singing, sewing, jigsaw work, and so forth, and not for a science whose facts and principles are basic in the physical, mental, and moral life of every individual.

We conclude from these considerations that the biological instruction needed by the child of public school age lies in the field of natural history and that there are three things to be done to provide this instruction. The character of the college course should be changed as far as it applies to prospective teachers. This is not likely to be done, but it should be observed that until it is accomplished there is little chance to improve and increase instruction in natural history. Special teachers should be appointed for biological instruction in the grades. If this cannot be done because of the need for better instruction, it should be done in fairness to the already overworked grade teacher. Considerable time would be needed to secure results if these changes were made; but, fortunately, teachers

themselves may improve upon the instruction now given. To do this it is necessary to obtain a knowledge of the local fauna and information on the habits, life-histories, and economic importance of the species. The literature may be had in the form of natural histories and government reports, references to which the teacher has a right to ask from the extension department of the state university. The third need is for a closer coöperation between the public schools and the colleges of the state. The teaching of natural history may be assisted by the loan of specimens, literature, lantern slides, and so forth, equipment usually possessed in abundance by the higher institutions of learning. We are now awake to the value of visual instruction, and it is also apparent that it is often difficult to secure live material, to take classes into the field, and to obtain the necessary slides and books. These materials can usually be borrowed from universities, especially if the universities have active museum and extension departments. The universities supported by the public should be required to maintain extension departments and museums, one function of which should be the loan to the public schools of materials for visual instruction.

In short, while there is a need for specially trained instructors, if any nature study teacher will forget her training in zoölogy and read simple, accurate accounts of habits, adaptations, distributions, and values of common wild animals to her classes, give them time, assistance, and encouragement to identify animals from illustrations and specimens and to study habits, she may be sure of having enthusiastic students, and of having contributed to the laying of a good foundation for life. Similarly, if the high school teacher will remember that few of the students will have any chance to impress college instructors with their knowledge of zoölogy, and will give work in identification by keys and comparison of specimens, supplemented by instruction in economic zoölogy, adaptations, life-histories, habits, distribution, and biological theories, she will do more good to a great number than most of her colleagues are doing at the present time. Finally, educators should generally recognize that natural history can properly be taught only by specially trained teachers and with the aid of materials which can be provided by the college and university museums.

It may be added that the universities need not fear the effect of such instruction. We may say what we will of the old way of teaching natural history; it produced not only great professionals but great amateurs as well, and it cannot fail to develop a general understanding of biological phenomena and man's place in nature.

Some Activities of a State University Museum

THE natural and proper activities of a state university museum embody many diverse operations and duties which inevitably present difficulties. Solutions are suggested in this chapter for some of the problems.

The Museum of Zoology of the University of Michigan has long recognized that an important function of the institution is the distribution of information on zoölogical subjects to the residents of the state. A phase of this work is the assistance given to the schools by the gift or loan of collections of Michigan animals for class work in zoölogy. There is a large demand for such material, for the teachers are coming to realize that zoölogy can best be taught by the use of the local fauna and that the student can only become thoroughly familiar with forms by actual contact with specimens.

It is safe to say that a university museum can be of no greater assistance to the schools than by supplying them with the materials needed to demonstrate the local fauna, and it is in a position to do this better than any other state institution. As has been frequently stated in the annual reports most of the facilities of the Museum of Zoölogy of the University of Michigan, for example, are devoted to the accumulation of specimens and data on the Michigan fauna, and large suites of specimens are being rapidly acquired. A part of this material can be spared from the general collection, and specimens not needed in research may properly and profitably be made available for class work in the schools.

There are three methods by which the material may be distributed, each of which has objectionable features. The specimens may be presented to the schools with the provision that the teacher have the students preserve a certain number of specimens of the local fauna and send them to the museum as an exchange. This method has been tested, but has not been found satisfactory, as even with detailed directions the specimens have usually been very poorly preserved, and the material received has not, in most instances, been worth the cost of transportation.

Another method is to encourage the schools to build up local collections and to assist them by contributing, as secured, the specimens needed to complete their series. This method has also been found to be impracticable, except in the case of colleges and normal schools. Few high

school teachers of natural science remain for more than a short time in a particular position, some of them teach botany alone, and in many schools botany and zoölogy alternate, so that in successive years zoölogy, as a rule, receives rather variable emphasis. The result is that after a few years the collections deteriorate and must be replaced.

A third method is to assemble loan collections to be sent to schools for a limited time. This method requires an initial expenditure for proper cases in which to transport the material, for packing and transportation are usually more destructive to the specimens than is the handling to which they are subjected in the laboratories. The great advantage of the plan is that it conserves the materials, and in view of the neglect which is usually the fate of the school collections this is an important consideration.

Of the three methods of providing class material to the schools of the state, the loan collection gives the most satisfactory results. The whole problem is, however, in need of careful study, for it is not evident that the collections are used efficiently, and it may be that the museum has, in addition to the providing of material, the further duty of seeing that it is properly employed.

The establishment of a central record bureau for the natural history work in the state is closely allied with the subject of the distribution of specimens. It has been repeatedly asserted that, in the opinion of its administrators, the Museum of Zoölogy of the University of Michigan should build up exhaustive collections of Michigan forms. One of the principal reasons for doing it is that the work is of distinct scientific value and can be done by this institution better than by any other.

It is unnecessary to dwell upon the advantages accruing to the museum and to students from the pursuit of this policy. Aside from these there are benefits to the people of the state, particularly to teachers and local naturalists, and to biologists generally who are interested in Michigan forms, that make it advisable. A review of the methods employed to facilitate the work will emphasize these.

The natural history material desired by any state university museum consists of specimens and notes of information. The best method of obtaining these is, as has been pointed out elsewhere, by field parties of trained people, but next in importance as a source of material are the gifts of specimens or notes of their occurrence received from interested persons. The information obtained from the latter source has the disadvantage of being fragmentary, but it is often of considerable value, because,

coming as it usually does from residents, it may represent rare records, and also because it may come from a part of the state from which information is particularly desired.

For these reasons an effort should be made to cooperate with teachers, local naturalists, and other residents. These persons should be urged to send to the museum such specimens and notes as they may be able to obtain, and, as a return, the specimens can be properly identified, desired information supplied, and, in the case of teachers, an attempt can be made to furnish synoptic collections of state forms for class use. The assistance rendered to teachers in this way serves the double purpose of increasing the effectiveness of instruction, particularly as far as the local forms are concerned, and of stimulating the study of nature on the part of the students.

When specimens are received by the Museum of Zoölogy of the University of Michigan, they are properly prepared, identified either by the staff or by experts, catalogued, and placed in the proper cases. When notes are received they are examined carefully to determine their authenticity and then properly filed. The collections are available for study at all times, and specimens are freely loaned to responsible persons to aid in research.

When material of sufficient interest is obtained, or when sufficient data has been secured from a particular region to warrant a summary, the results are published in scientific papers to insure a proper circulation among scientists, but always a sufficient number of reprints is secured for interested persons who do not have access to the publications. Desired information on the natural history of the state is furnished on request, both to residents and to naturalists generally.

The methods of work thus make of the museum a central record bureau in which is accumulated the data on the natural history of the state. The ways in which this is of value may be summarized as follows:

1. It centralizes the data on the natural history of the state, insuring their proper care and rendering them more available for study.
2. It tends to increase the amount of material for the study of state problems and thus permits more efficient studies.
3. An information bureau is established.
4. Records are preserved that would otherwise be lost.
5. From the duplicate specimens series are available for class use in the schools or for exchanges.
6. The study of nature is encouraged.

Although the state university museum should emphasize state work, the field cannot be strictly limited to the local area. In the first place, some of the species represented in the local fauna are so rare that a sufficient number of specimens can only be obtained from other regions where they are more abundant, and, second, extralimital material must be available for illustrative and comparative work.

In small institutions sufficient foreign material may usually be obtained by exchange, purchase, or gift, but the larger universities will need suites of specimens accompanied by proper data, and these can best be secured by the museum collectors. It is not enough to say that, like the local material, the specimens from outside the state should be gathered by museum expeditions. Like the local investigations the extralimital work should be done intensively, for as many or more specimens may be obtained in this way, and the material will be much more valuable. Owing to the different objects, however, the two kinds of explorations, local and extralimital, must be carried on rather differently.

As the first aim of the museum is to secure exhaustive information on the biota of the state, the state survey must, as has been repeatedly said, attempt to secure all the data possible for each region. In the extralimital work many groups may be ignored, for the only material sought is that needed for purposes of illustration and research. This must not be so large in amount as to require attention sufficient to interfere with the local investigations. Furthermore, the available funds are generally limited. Both kinds of work cannot receive equal attention as most of the appropriations are made for the investigations in the state. In view of these conditions, it is believed that the best way to obtain extralimital material is to send expeditions to particular regions with instructions to study exhaustively those groups that are needed in projected studies.

There can be no objection to work of this kind either on the part of the university or by scientists. All of the material obtained will be of use to the university, and at the same time the faunal data, as far as the particular groups studied are concerned, will be carefully gathered.

Material acquired by a museum is obtained in any of four ways—by donation, by exchange, by purchase, or by expeditions connected with the museum. Valuable specimens, from any point of view, are secured by each of these methods, but, as the value of the specimens depends principally upon the use that is to be made of them, the question with us is which of these sources if emphasized will result in the acquisition of the largest amount of material bearing upon problems in the local region.

It is generally recognized that the prerequisites of a study collection from a particular region are that the specimens shall be present in large series, illustrating the different kinds of variation to which the forms are subject, that they shall be accurately labeled as to locality, collector, date, and sex, and that they shall be accompanied by data as complete as possible on the habits and habitats.

The four methods of obtaining material are not of equal importance when measured by the requirements of satisfactory collections. When one reads the list of accessions in the reports of many of the smaller American museums, one will note that the gifts occupy a prominent place in point of numbers. The preponderance of donations in the list of accessions can only mean that the museum does not govern the collecting of its material, but, for one reason or another, is depending upon the sporadic contributions of interested friends. From the standpoint of the institution that is endeavoring to gather exact and exhaustive data upon the biota of a particular region, this is unfortunate. A museum that depends upon donations must be content with casual acquisitions of specimens, often not in the best condition, and rarely accompanied by detailed data, which is, to say the least, unsatisfactory from the standpoint of the investigator.

Exchanges are also inadequate as a means of enlarging the study series of local forms. In the first place extensive exchanges by small museums are out of the question, owing to a lack of material to exchange. The difficulty of carrying on exchanges is serious in the museum that is enlarging its study series of local forms, for every specimen that is properly labeled has a peculiar value bearing upon a particular point and cannot be removed from the collection without considerable loss. Then again it is frequently impossible to acquire by exchange any considerable amount of material (and series are a necessity) from the particular region it is desired to investigate. This is because properly trained collectors are rare, and because the exchange material, being of local forms, does not appeal to the amateur collector, who, as a rule, desires only a synoptic collection and is usually most in need of foreign material, as the local forms are easy to obtain.

The same objections to exchanges as a primary means of obtaining material apply in the main to the necessity of relying upon purchases. The proverbial lack of funds in the case of small museums, and the difficulty of obtaining from local collectors the material needed to enlarge the study series of local forms renders this means inadequate.

In brief, experience reveals that the specimens and data required to enlarge series of local forms are not to be satisfactorily obtained through gifts, exchanges, or purchases although these means are far from valueless. Their principal value is in the enlargement of the synoptic collections, and they are here of great importance, for many rare and extralimital forms can be obtained in no other way.

The lack of adequate appropriations, usually a serious hindrance to the small museum, also makes it difficult to send out expeditions for the purpose of gathering material; but, from the standpoint of the museum that is endeavoring to gather as much data as possible on local problems, the advantages of this method so far outweigh those that attach to the other three that it seems that special efforts ought to be made to develop it. The advantages of the expedition method of obtaining material are based on the fact that the material can be gathered and prepared in large quantities by trained people, who, if they do their work properly, may be trusted to get requisite data for problems.

The expedition material when properly gathered will be properly preserved, the specimens will be labeled as exactly as possible as to locality, date, and collector, they will be accompanied by notes on the environment and habits, on food in the alimentary tracts, nests and eggs, and parasites. In many instances they will represent series illustrating points in the variation and life-history of the species. The scientist can readily appreciate the great superiority of material of this kind over that which has been collected in a haphazard manner, with poor facilities and disregard for valuable data.

Subsidiary Museums

AS a general practice, it is easier and more satisfactory to bring the public to the museum than it is to carry the museum to the public. There are, however, conditions under which the additional cost, in money, time, labor, and convenience, of extramural expansion is justified. The importance of distributing loan collections to schools and other educational centers is rather obvious. Similarly, centralization of population often makes it desirable for the museum to maintain some permanent collections at a distance from the main plant for the convenience of particular groups. Such distribution of activities is not improper expansion, but is simply recognition of the conception of the museum as an institution and not a building.

There are other and even more important reasons for subsidiary museums, one of which is of considerable importance to college units. If in their scope they comprehend the study, preservation, and demonstration of objects, it is clear that some specimens cannot be moved easily, or housed in a building satisfactorily, or studied outside of their natural habitat or setting. Examples of materials of the first two groups mentioned will be readily recalled. Large monuments, buildings, camp sites, and Indian mounds may be reproduced within museum walls, but they may be preserved more properly in place to form out-of-door museums.

The type of subsidiary museum of particular value to college museums of natural history is one which provides for the study and demonstration of specimens in their natural habitat. In museums as in biology generally, students too often develop the notion that, for study, the only good animal or plant is a dead one. Needless to say, investigations of life-histories, variability, environmental relations, local distributions, and genetics of the wild species will throw much light upon relationships and histories, and these studies must be carried on with living materials and partly in the natural environmental niches.

The changes accompanying the settlement of any region, together with the need for economizing time, make it highly desirable that the college with museum departments maintain areas where biological research on living forms can be carried on without interference. Such controlled tracts have been maintained under the terms "biological farms" or "preserves," but their importance has not been appreciated or fully realized, especially by the museums. They are truly subsidiary museums and should

form a part of the facilities of every college department which encourages study and teaching in natural history.

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THE PUPILLID GENUS *AULACOSPIRA* IN THAILAND (PULMONATA: STYLOMMATOPHORA)

Somsak Panha[1,2] and John B. Burch[2,3]

ABSTRACT

***Aulacospira smaesarnensis* n. sp.** and ***A. lampangensis* n. sp.** (Pulmonata: Pupillidae: Gastrocoptinae) are described from limestone hills, Smaesarn Village, Chonburi Province, and Ban Thasee, Lampang Province, Thailand. This is the first report of this genus occurring outside of the Philippines Islands. Both Thai species of *Aulacospira* have helicoid, narrowly umbilicate shells with deeply incised sutures, short deflected tubas, apertural barriers, and shell surface sculpture of prominent, rough, growth lines, but lacking spiral striae. The shell of *A. smaesarnensis* has a moderately elevated spire, and three apertural barriers (columellar, parietal and palatal). A broad, low spiral sulcus above the obtuse peripheral angle begins on the penultimate whorl and becomes stronger on the ultimate whorl. The shell of *A. lampangensis* is depressed and has rounded whorls lacking spiral sulci. The shell aperture contains up to five barriers (columellar and parietal lamellae, upper and lower palatal plicae, and a basal plica). The protoconch is sculptured with granulose wrinkles which merge into a pattern of dense, shallow pits that terminate abruptly where the protoconch ends and the teleoconch begins.

Key words: *Aulacospira smaesarnensis*, *A. lampangensis*, Pupillidae, Pulmonata, Thailand.

INTRODUCTION

The pulmonate genus *Aulacospira* was named by Möllendorff (1890) for a few peculiar, tiny, helicoid, pupillid land snail species from the Philippine Islands. Of the seven species known for the Philippines, three were named by Möllendorff (1887, 1888), three by Quadras & Möllendorff (1894, 1895, 1896), and one by Hidalgo (1890).

During a systematic faunistic study of land mollusks in eastern and northern Thailand, two new species of *Aulacospira* were found in April and May, 1998. They were collected from limestone hills at Smaesarn Village, Chonburi Province, and at Ban Thasee, Lampang Province, Thailand (Fig. 1). These are the first records of *Aulacospira* not only for Thailand, but for mainland Asia as well. Since the two Thai species differ from their Philippine counterparts, our new species are named and described below.

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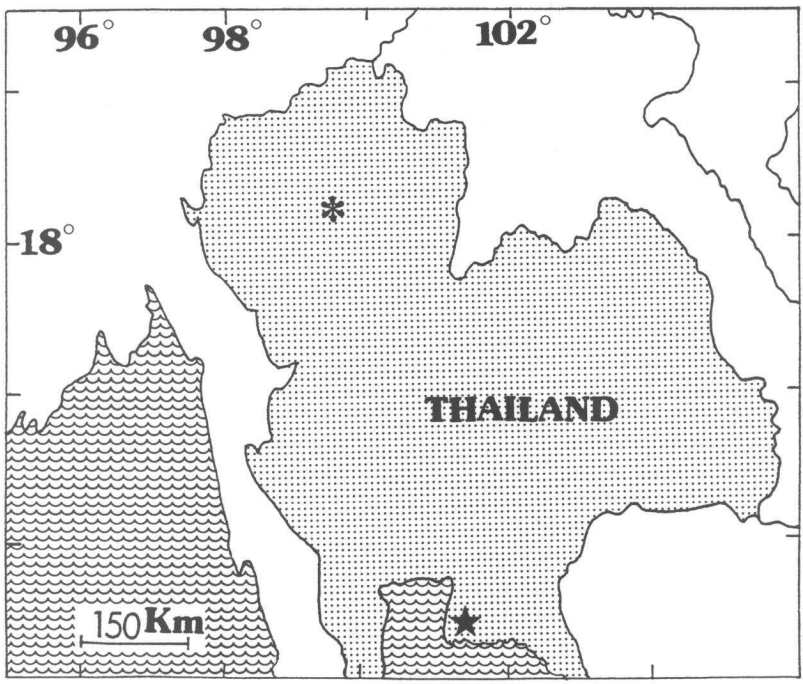

FIG. 1. Map showing limestone hill areas near Smaesarn Village (star) and Ban Thasee, Lampang Province (asterisk), Thailand.

***Aulacospira smaesarnensis* n. sp.**
(Fig. 2)

Description of holotype. Shell 1.8 mm high, 2.0 mm wide, with four whorls, and a free trumpet-shaped last quarter-whorl projecting downwards. The shell is sculptured with pronounced growth striae that give the shell surface a rough appearance. There is no spiral striation. The peristome is continuous, thickened, and expanded. The shell is narrowly umbilicate. The aperture is nearly round, and contains three barriers: an elongate columellar lamella, and tubercular parietal lamella and lower palatal plica. The dimensions of the holotype and paratypes are given in Table 1.

Type locality. Smaesarn Village, Chonburi Province, 12°34'6"N, 100°56'58"E, 60 meters elevation (CUIZM, Ver 079), Thailand, 1998.

Etymology. The specific epithet *smaesarnensis* is from the name of the village where we collected the specimens.

Type material. The holotype (CUIZM, Ver 079) is deposited in the Chulalongkorn University Zoological Museum, together with 10 specimens

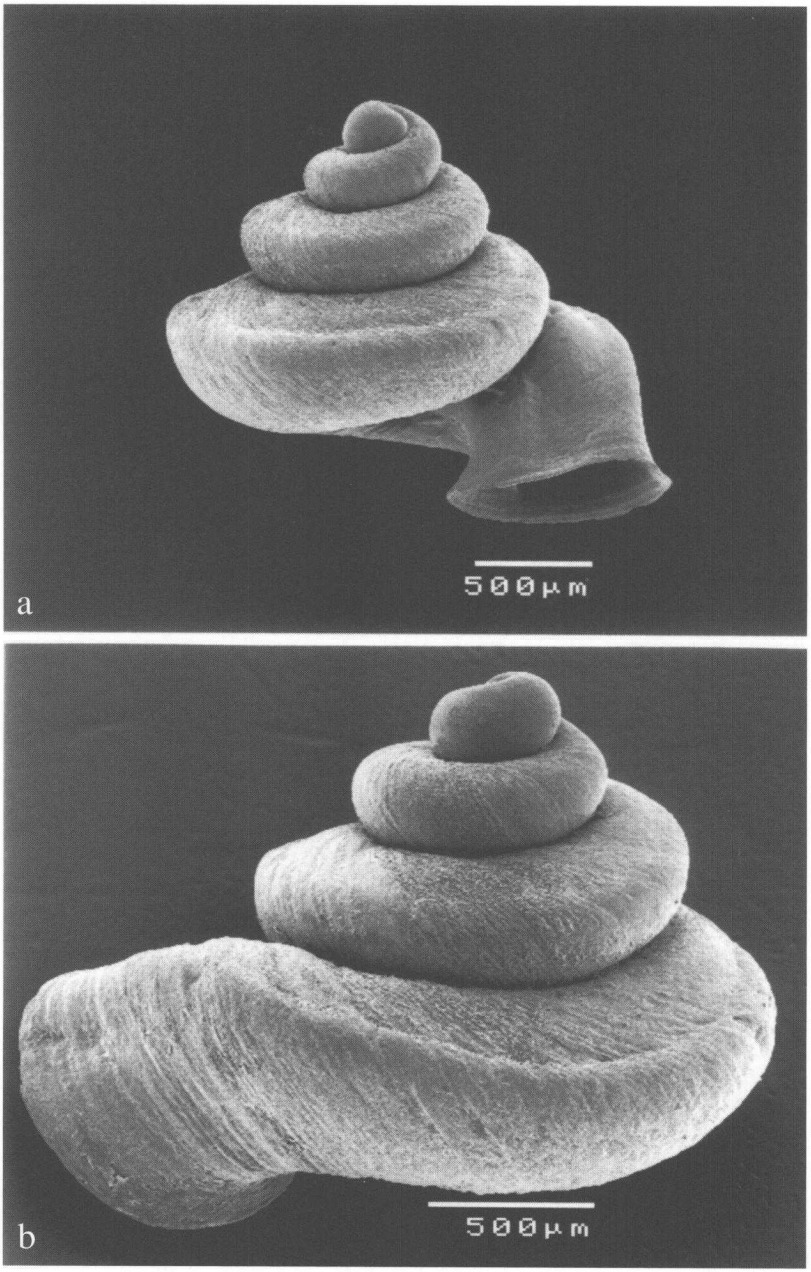

FIG. 2. Shell of *Aulacospira smaesarnensis* n. sp., holotype (CUIZM, Ver 079). **a**, Adapertural side; **b**, abapertural side.

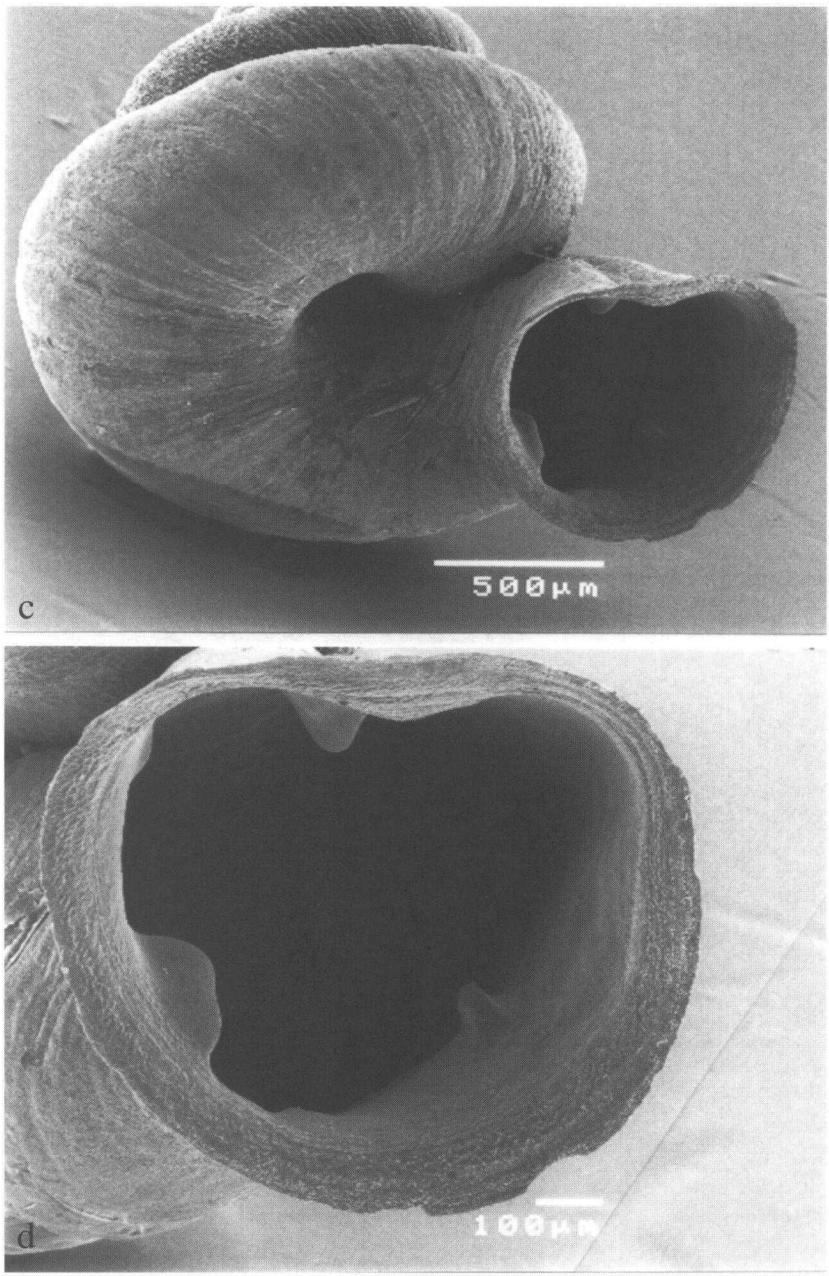

FIG. 2 (continued). Shell of *Aulacospira smaesarnensis*. **c,** Shell tilted to show aperture and umbilicus; **d,** aperture showing dentition and expanded peristome.

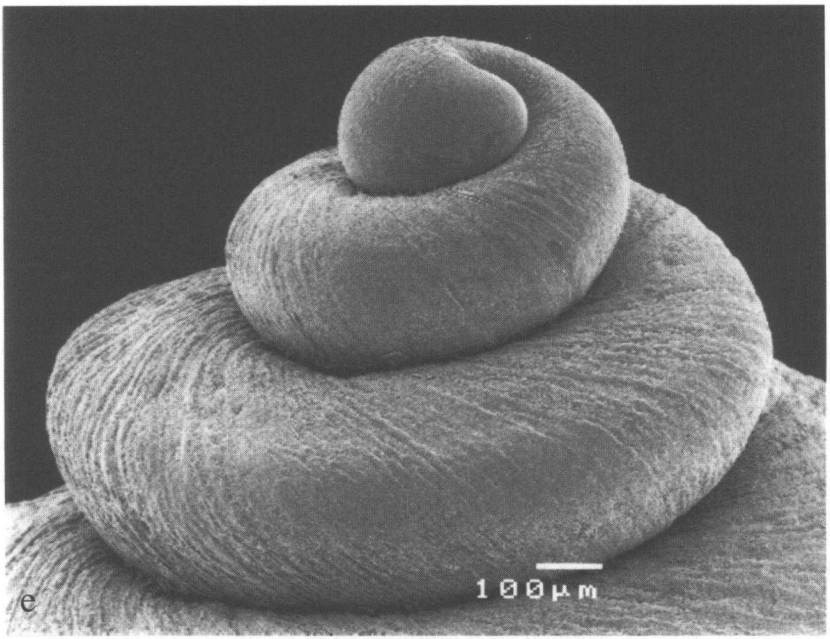

FIG. 2 (continued). Shell of *Aulacospira smaesarnensis*. **e,** First several whorls, showing enlarged view of protoconch.

TABLE 1. Holotype and paratype dimensions (in mm) of *Aulacospira smaesarnensis* n. sp.

Types	Height	Width	Height of aperture
Holotype	1.8	2.0	1.2
Paratype number			
1	1.8	2.0	1.2
2	1.8	2.0	1.1
3	1.8	2.0	1.1
4	1.7	2.0	1.0
5	1.7	2.0	1.0
6	1.7	2.0	1.0
7	1.7	2.0	1.0
8	1.7	2.0	1.0

and nine shell paratypes (CUIZM, Ver 080). Other shell paratypes (CUIZM, Ver 081; seven specimens) will be stored in the University Michigan Museum of Zoology (UMMZ), Ann Arbor (leg. S. Panha).

Geographic distribution and habitat. *Aulacospira smaesarnensis* seems to be limited to eastern Thailand. *Aulacospira smaesarnensis* lives on limestone

walls with some vegetation. *Cryptozona siamensis* (Pfeiffer 1856) was also found in this habitat.

Diagnosis. *Aulacospira smaesarnensis* has a helicoid shell with a *moderately elevated spire,* deeply incised sutures, short deflected tuba, and *three short, poorly developed apertural barriers* (columellar, parietal and palatal). *A broad, low spiral sulcus above the obtuse periphreal angle begins on the penultimate whorl and becomes stronger on the ultimate whorl.* The shell surface sculpture consists of prominent, rough, growth lines. Spiral striae are lacking.

Remarks. *Aulacospira smaesarnensis* is somewhat similar in shell morphology to *A. rhombostoma* Quadras & Möllendorff, but the Thai species has a higher spire, a stronger deflection of the last part of the ultimate whorl, and three barriers in the shell aperture rather than four. *Aulacospira smaesarnensis* differs from *A. hololoma* (Möllendorff) by its longer and more deflected tuba, but also by its more deeply incised sutures, spirally sulcated last whorls, and apertural dentition. *Aulacospira smaesarnensis* differs from *A. triptycha* Quadras & Möllendorff and *A.* (*Pseudostreptaxis*) *azpeitiae* Hidalgo by having a free rather than adnate peristome.

Aulacospira lampangensis n. sp.
(Fig. 3)

Description of holotype. Shell depressed, 1.5 mm high, 2.1 mm wide, with 3½ whorls. There is a free trumpet-shaped last quarter whorl projecting downwards. Shell surface sculptured with uneven oblique growth lines, a few of which are more prominent than the others. There are no spiral striae. The first nuclear whorl begins with a pattern of granulose wrinkles, which then merge into a pattern of dense, shallow pits. The protoconch consists of about 1I whorls. There is an abrupt change in sculptural pattern with the end of the protoconch and the beginning of the teleoconch. The peristome is continuous, thickened, and expanded. The umbilicus is narrow. The aperture is round, and contains five barriers: columellar and parietal lamellae, upper and lower palatal plicae, and basal plica. The parietal, The columellar and lower palatal barriers are the most prominent. The upper palatal plica is bifid, with a larger elevated rear projection, in front of which is situated a small low tubercle. The basal plica is low and small, hardly more than a bump. The parietal lamella is somewhat twisted, perhaps even concrescent. The dimensions of the holotype and paratypes are shown in Table 2.

Type locality. Ban Thasee, Lampang Province, 18°25'55"N, 99°45'17"E, 320 meters elevation (CUIZM, Ver 082), Thailand, 1998.

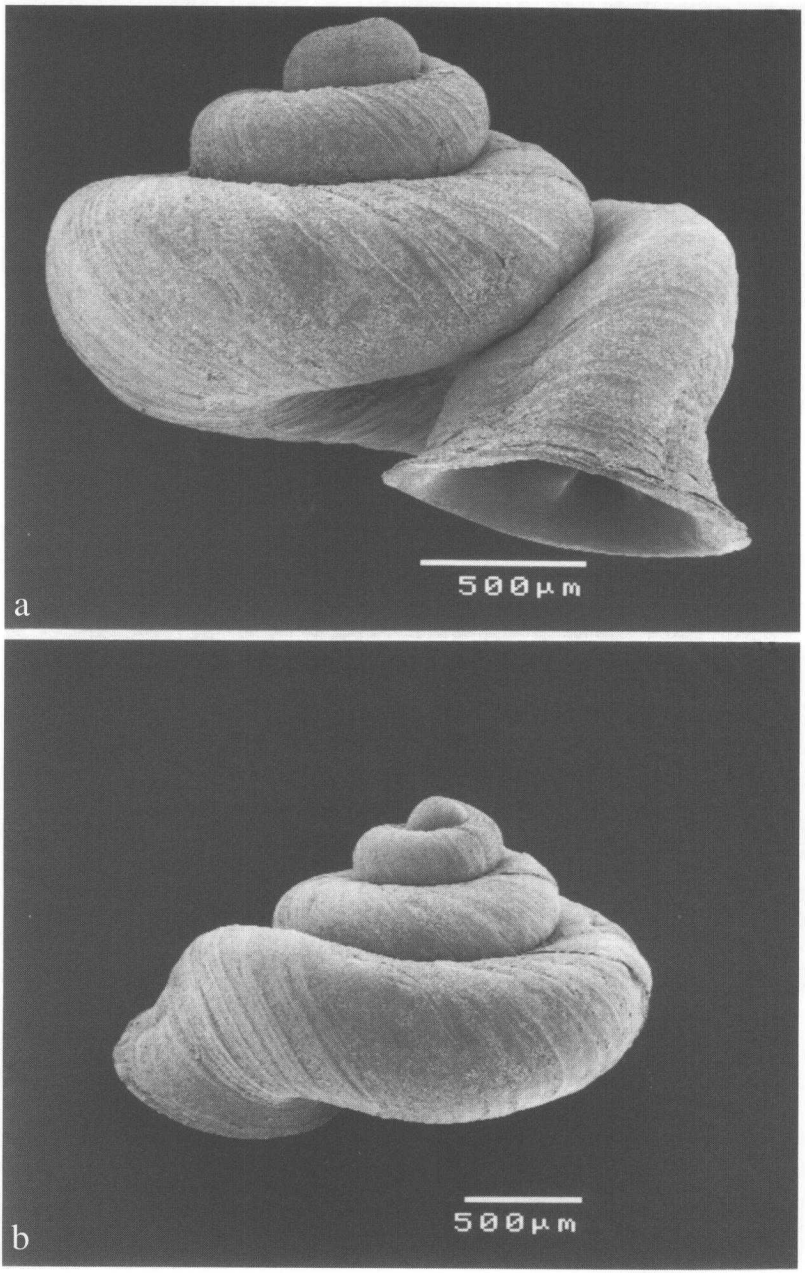

FIG. 3. Shell of *Aulacospira lampangensis* n. sp., holotype (CUIZM, Ver 082). **a**, Adapertural view; **b**, abapertural view.

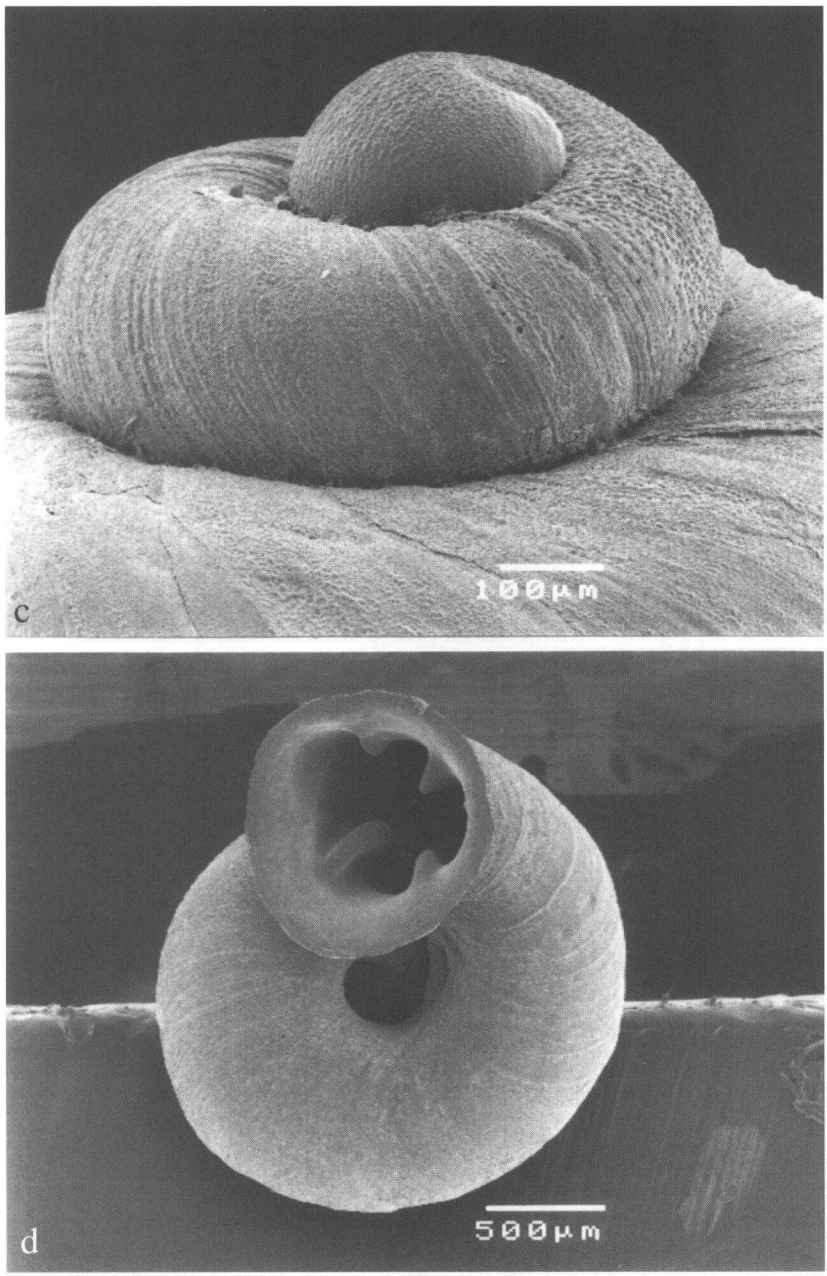

FIG. 3 (continued). Shell of *Aulacospira lampangensis*. **c,** Upper spire whorls, showing enlarged view of protoconch. **d,** ventral side, showing aperture and umbilicus.

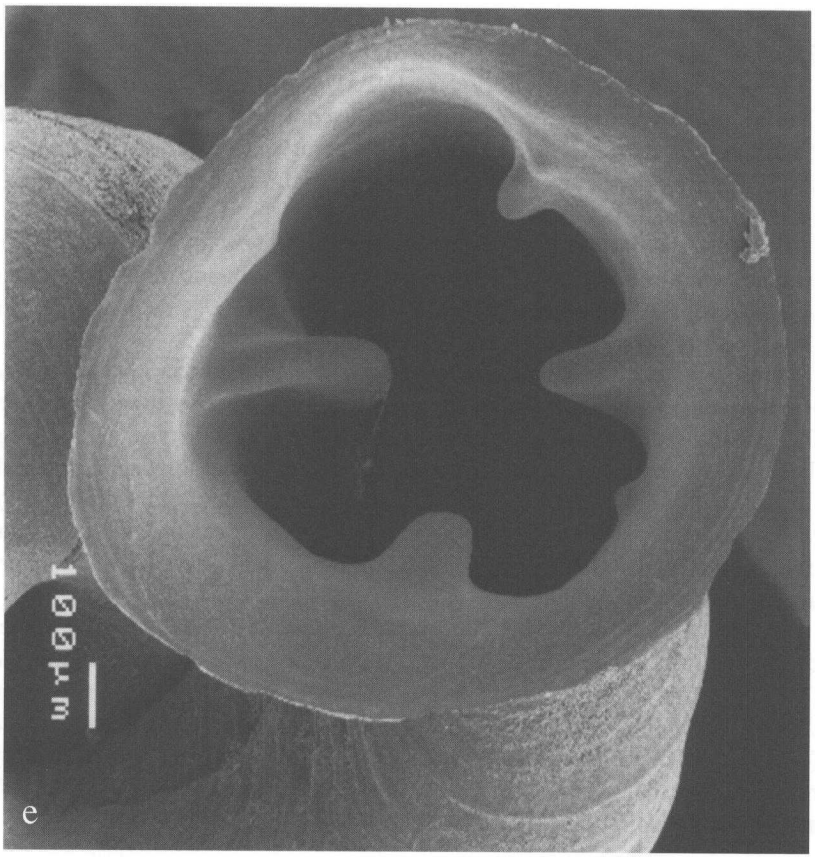

FIG. 3 (continued). *Aulacospira lampangensis*. **e**, Aperture showing expanded peristome and dentition.

TABLE 2. Holotype and paratype dimensions (in mm) of *Aulacospira lampangensis* n. sp.

Types	Height	Width	Height of aperture
Holotype	1.5	2.1	1.1
Paratype number			
1	1.5	2.1	1.1
2	1.5	2.1	1.1
3	1.5	2.1	1.1
4	1.5	2.1	1.1
5	1.4	2.1	1.1
6	1.4	2.1	1.1
7	1.4	2.1	1.1

Etymology. The specific epithet *lampangensis* is from the name of Lampang Province, the place where we collected the specimens.

Type material. The holotype (CUIZM, Ver 082) is deposited in the Chulalongkorn University, Zoological Museum, together with eight shell paratypes (CUIZM, Ver 083). Other shell paratypes (CUIZM, Ver 084; six shells) will be deposited in the University Michigan Museum of Zoology (UMMZ), Ann Arbor (leg. S. Panha).

Geographic distribution and habitat. *Aulacospira lampangensis* seems to be limited to northern Thailand. It lives on limestone walls with some vegetation. *Hypselostoma khaowongensis* Panha 1997 was also found in this habitat.

Diagnosis. Shell very small, narrowly umbilicate, *depressed,* with *rounded whorls,* and a free trumpet-shaped, downwardly projecting tuba. Shell surface sculptured with uneven oblique growth lines; spiral striae are lacking. The nuclear whorls are sculptured with a pattern of granulose wrinkles, which then merge into a pattern of dense, shallow pits. The aperture contains *up to five barriers:* columellar and parietal lamellae, upper and lower palatal plicae, and a basal plica. The parietal, columellar and lower palatal barriers are the most prominent.

Remarks. The shell of *Aulacospira lampangensis* has a degree of depression similar to that of *A. porrecta* Quadras & Möllendorff, *A. scalatella* (Möllendorff), and *A. hololoma* (Möllendorff); it is more depressed than that of *A. azpeitiae* Hidalgo, and less depressed than that of *A. mucronata* (Möllendorff). The tuba of *A. lampangensis* is longer and more downwardly reflected than that of any of the Philippine species. *Aulacospira lampangensis* also lacks the spiral striation reported for the Philippine species.

DISCUSSION

Previously, *Aulacospira* was known from seven species, all restricted to the Philippines. So it was a surprise to find two representatives of this genus so far removed from the group's previously known distribution, with no species having been found in intervening or contiguous areas in the west, east, north or south of Thailand, areas which previously had been so much better collected than Thailand, even for small micro snails. Also, within Thailand, the isolated and widely separated occurrences of the two known species is an anomaly, and indicates an ancient group with a few relict, outlying distributions.

The Philippine *Aulacospira* species range in shape from the very depressed *A. mucronata* to the moderately spired *A.* (*Pseudostreptaxis*) *azpeitiae*. The apertural barriers found in the genus vary from *A. mucronata,* which is com-

pletely without barriers, to *A. (P.) azpeitiae,* which has six lamellae and plicae. The apertural barriers found in the other Philippine species vary from one to four: *A. hololoma* and *A. porrecta* have one barrier each, and *A. rhombostoma* and *A. scalatella* each have four barriers. All of the *Aulacospira* species are very small, but the two Thai species are the smallest, being only 2.0 and 2.1 mm in diameter. The Philippine species range in diameter from, 2.9 mm to 4.0 mm, the larger species being about twice the size of their Thai counterparts.

All but one of the Philippine species have apertural barriers, but the barriers are decadent in several species. The two Thai *Aulacospir*a species have apertural barriers, well developed in *A. lampangensis,* but poorly developed in *A. smaesarnensis.* Both geographic groups have species with and without spirally sulcate last whorls, but only the Philippine group exhibits spirally striate shell surface sculpture.

It will be interesting to see if future collecting in remote areas of Southeast Asia produces additional species of this very interesting genus of microsnails.

ACKNOWLEDGMENTS

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THE PUPILLID GENUS *PARABOYSIDIA* IN THAILAND (PULMONATA: STYLOMMATOPHORA)

Somsak Panha[1,2] and John B. Burch[2,3,4]

ABSTRACT

The gastrocoptine pupillid genus *Paraboysidia* Pilsbry was known in Thailand previously by a single species, *P. tamphathai* Panha & Burch. We now report five additional species for the country. ***Paraboysidia muaklekensis* n.sp.** has a high-spired, conical shell with (in peripheral view) a slightly concave spire. The terminal part of the ultimate whorl is deflected. The aperture has six barriers (angular, columellar and parietal lamellae, and three palatal plicae), all of which are set back in from the peristome. The coil of the last whorl is tilted upward. ***Paraboysidia nabhitabhatai* n.sp.** has a high-spired, conical shell, with a relatively blunt apex, and rounded whorls. The aperture is adnate, with seven well developed barriers (angular, two columellar, and a parietal lamellae, and three palatal plicae). The shell is sculptured with five, close-set spiral striae. ***Paraboysidia tarutao* n.sp.** has a high-spired, conical shell, the last whorl of which has an angular periphery caused by a carina. The aperture has eight, mostly prominent, barriers (angular, two columellar, and two parietal lamellae, and a basal and two palatal plicae). The peristome is broadly reflected. There is a carina around the umbilicus. The shell is marked with subobsolete spiral sculpture. ***Paraboysidia pangmapaensis* n.sp.** has a conical shell with a shouldered last whorl. The aperture has up to 11 barriers (two angular, three columellar, and one parietal lamellae, and one basal and four palatal plicae), some of the plicae end in sharp hooks. The aperture is adnate. The shell is sculptured with relatively widely spaced spiral striae. ***Paraboysidia phupaman* n.sp.** has a shell with three prominent spiral carinae. The last part of the body whorl is separated into a very short tuba, ending with a flaring peristome. The aperture has six barriers (angular, columellar and parietal lamellae, and one basal and two palatal plicae), set back into the aperture. The umbilicus is wide and deep. Spiral striae are lacking.

Key words: *Paraboysidia muaklekensis, P. nabhitabhatai, P. pangmapaensis, P. phupaman, P. tarutao,* Pulmonata, Stylommatophora, Pupillidae, Thailand.

INTRODUCTION

Paraboysidia Pilsbry is a genus of very small pupilloid pulmonate snails whose known distribution extends from Myanmar and southern China south through the Malay Peninsula to Java. One of the chief distinguishing characteristics of the genus is the separate angular and parietal lamellae in the shell aperture, distinguishing its species from *Boysidia,* in which the two lamellae are fused and concrescent. Also, the columellar lamellae of *Paraboysidia* enter into the deeper

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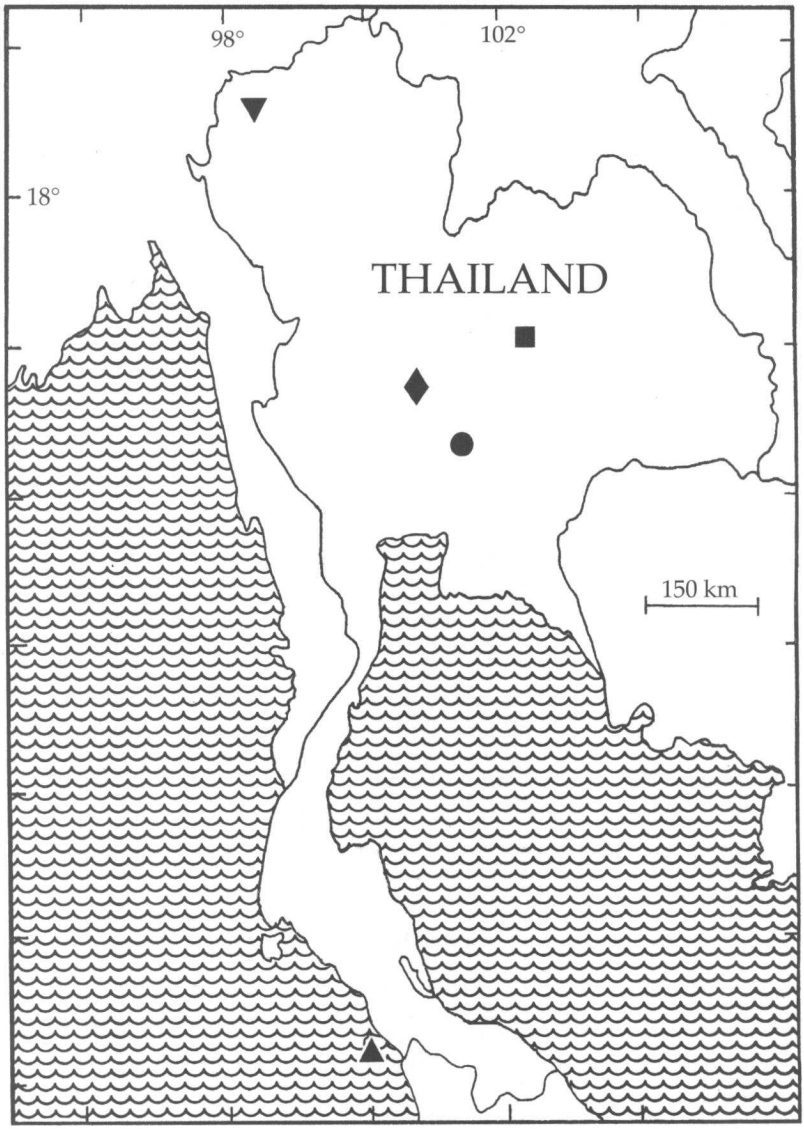

FIG. 1. Map showing type localities. *Paraboysidia muaklekensis* (●), *P. nabhitabhatai* (■), *P. tarutao* (▲), *P. pangmapaensis* (▼), and *P. phupaman* (◆).

aperture more or less horizontally rather than obliquely as in *Boysidia* (Pilsbry, 1917).

Although Thailand lies in the center of *Paraboysidia*'s geographic distribu-

tion, until our previous report (Panha & Burch, 2000), no members of the genus were known from Thailand. With our current paper, we are reporting five more species for the country.

Paraboysidia muaklekensis n. sp.
(Fig. 2)

Description of holotype. Shell 1.9 mm in length, 1.5 mm in width, with 5 ¾ whorls, and a high, conical, slightly concave spire, with impressed sutures. The shell is rather narrowly umbilicate. The periphery of the last whorl is rather evenly rounded. The coil of the last whorl is tilted upward slightly, then descends at the aperture. The last whorl near the aperture is detached, and a little deflected. There is an obsolete mid-whorl sulcus that begins near the end of the ultimate whorl and causes an indentation in the peristome. The peristome is complete, expanded, separated from the last whorl. The teleoconch sculpture consists of minute, wavy, low, transverse ridges. The apertural teeth are not prominent, and none are at the edge of the peristome, but deeper set, especially the palatal plicae. The parietal and angular lamellae are rather low and well separated. The columellar lamella is short and stout. The upper palatal plica is the best developed and the closest to the peristome. The middle palatal and infrapalatal plicae are thinner and more deeply set in the aperture. The dimensions of holotype and paratypes are shown in Table 1.

Type locality. Tepitak mountain, Muaklek District, Saraburi Province, 14°36'57"N, 101°15'50"E, 700 meters elevation (CUIZM, Ver 020), Thailand, 1997 (leg. S. Panha).

Etymology. The specific epithet *muaklekensis* is from the name of Muaklek District, Saraburi Province.

TABLE 1. Holotype and paratype dimensions of *Paraboysidia muaklekensis*.

Type	Dimensions (mm)		
	Height	Width	Height of aperture
Holotype	1.9	1.5	0.7
Paratype number			
1	2.0	1.5	0.7
2	2.0	1.5	0.7
3	1.9	1.5	0.7
4	1.8	1.4	0.6
5	1.8	1.4	0.6
6	1.8	1.4	0.6
7	1.8	1.4	0.6

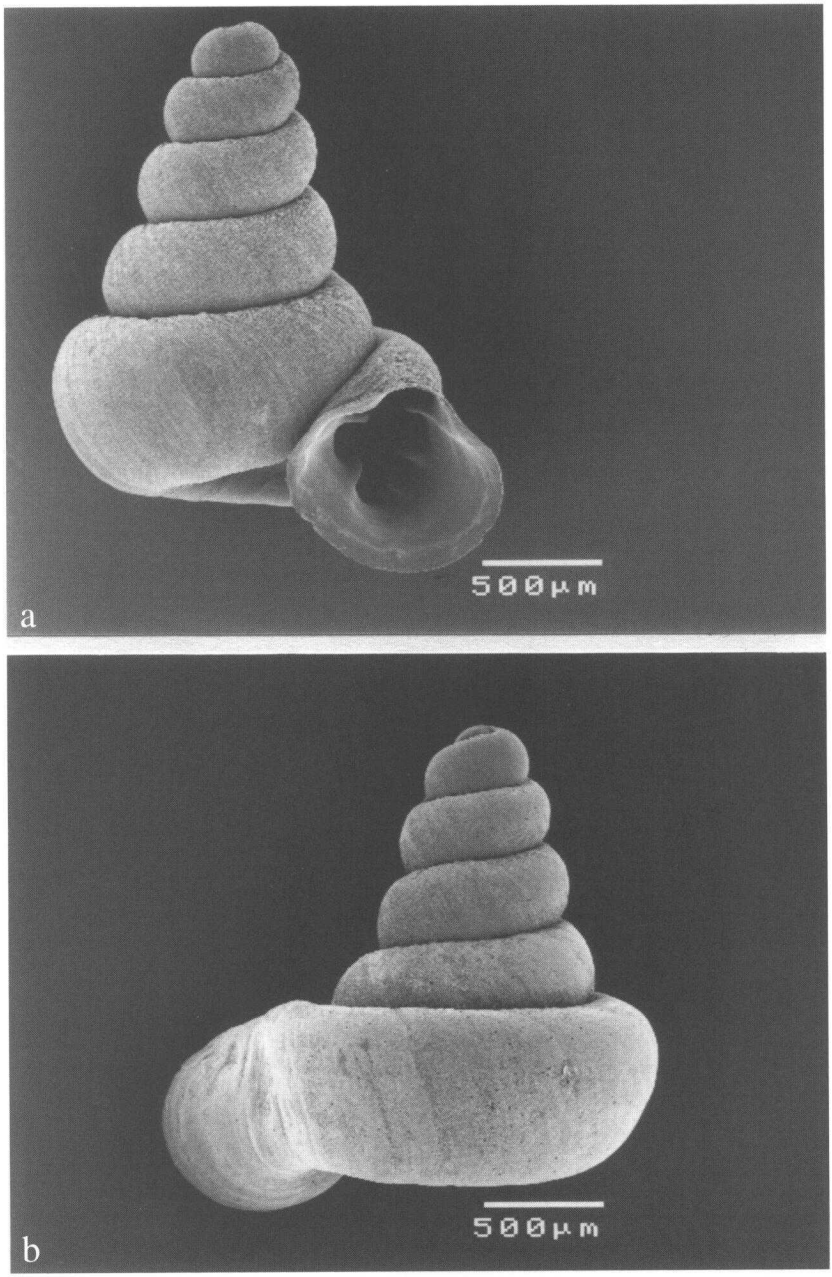

FIG. 2. *Paraboysidia muaklekensis*, holotype. **a**, Apertural view; **b**, abapertural view.

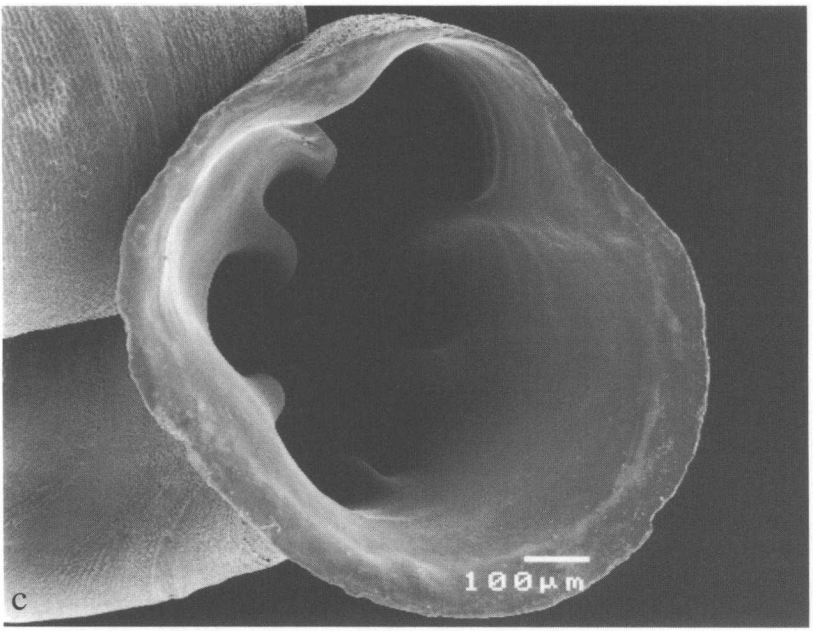

FIG. 2 (Continued). *Paraboysidia muaklekensis,* holotype. **c**, Enlargement of the aperture.

Type material. The holotype (CUIZM, Ver 020) is deposited in the Chulalongkorn University Zoological Museum together with seven paratype shells (CUIZM, Ver 021). Another five paratype shells will be deposited in the University of Michigan Museum of Zoology (UMMZ), Ann Arbor.

Geographic distribution and habitat. *Paraboysidia muaklekensis* seems to be limited to central Thailand. Our specimens were found in soil samples at the same habitat as *Hypselostoma khaowongensis* Panha and *Gyliotrachela saraburiensis* Panha.

Diagnosis. Shell conical, with a slightly concave spire. Terminal part of the ultimate whorl deflected. Aperture with six barriers, set back in from the peristome. The coil of the last whorl is tilted upward.

***Paraboysidia nabhitabhatai* n. sp.**

(Fig. 3)

Description of holotype. Shell 1.7 mm in length, 1.3 mm in width, with 4 ¾ whorls, and a high, conical, straight-sided spire, with impressed sutures. The shell is narrowly umbilicate. The periphery of the last whorl is rather evenly rounded. The peristome is complete, but adnate to the last whorl. The teleoconch

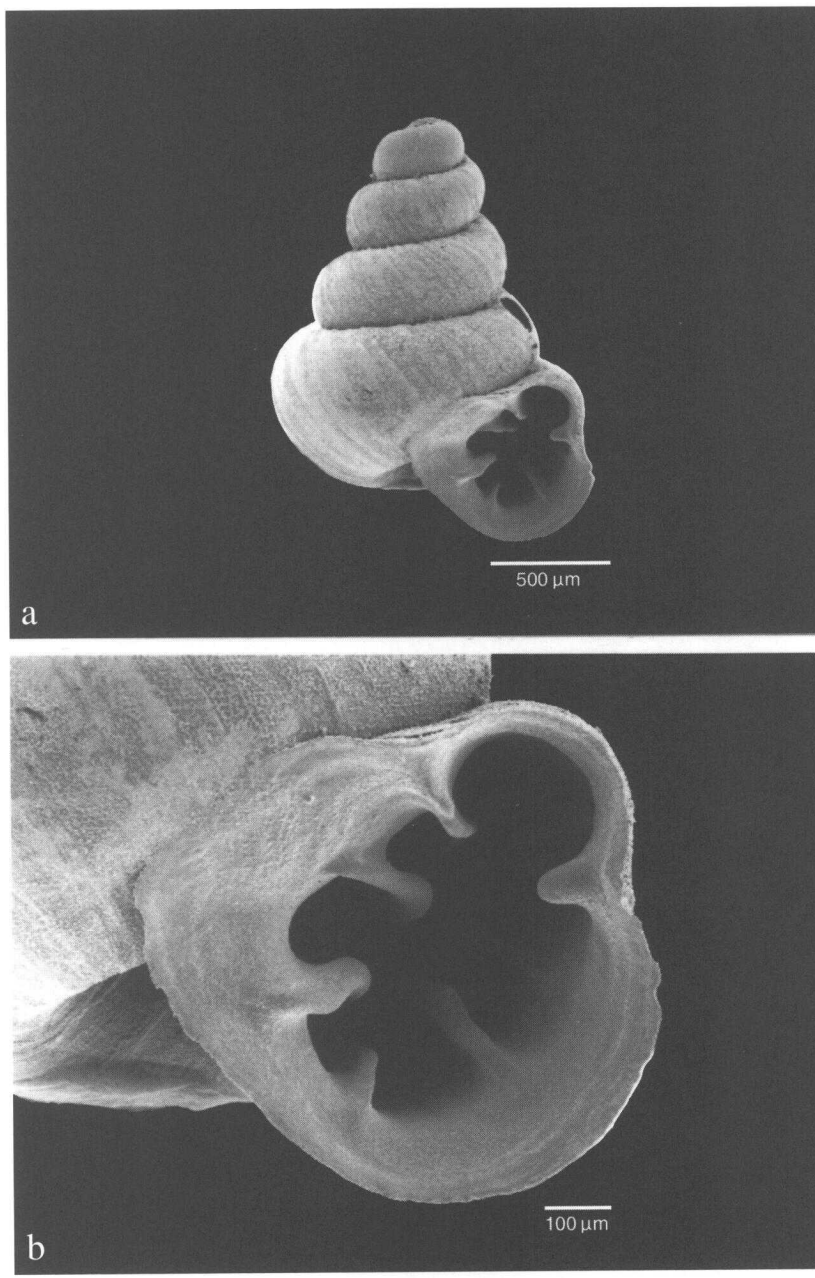

FIG. 3. *Paraboysidia nabhitabhatai*, holotype. **a**, Apertural view; **b**, abapertural view.

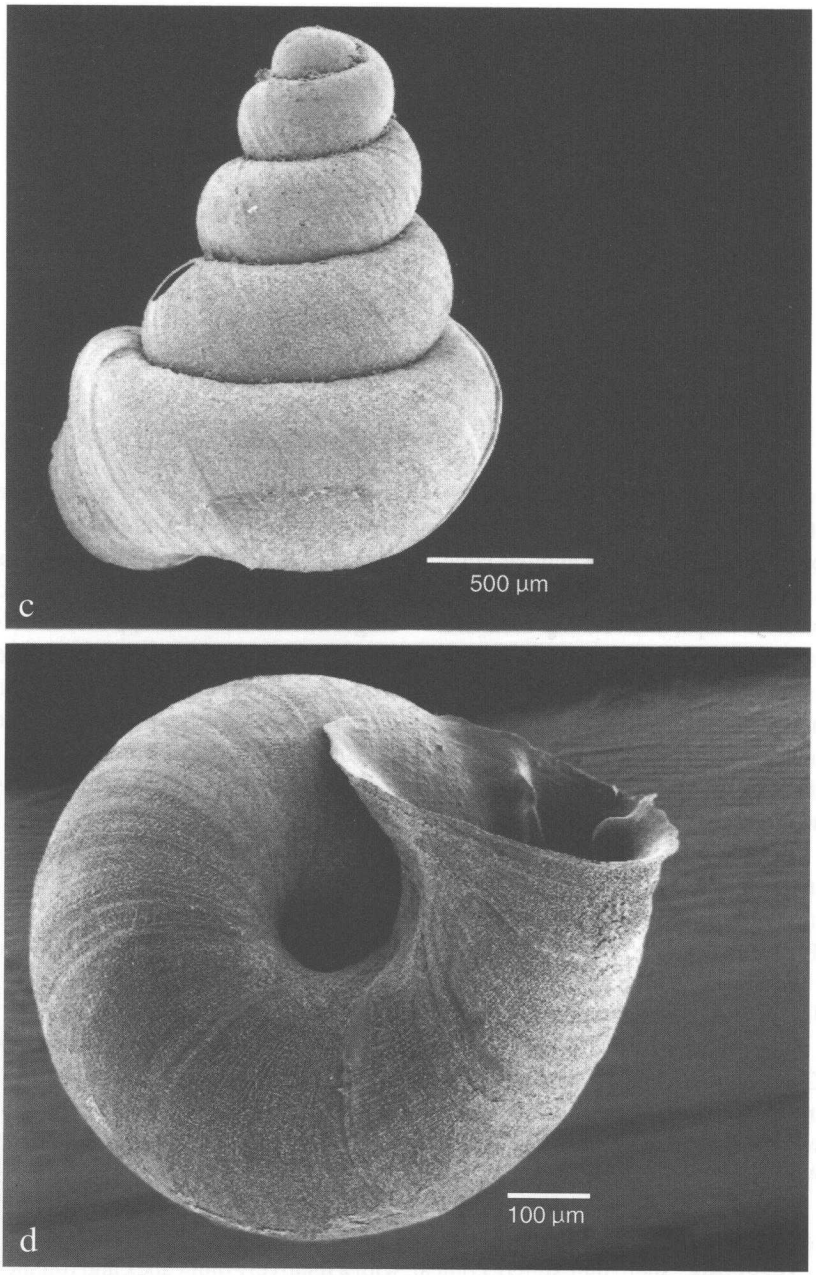

FIG. 3 (Continued). *Paraboysidia nabhitabhatai*, holotype. **c**, Umbilical view; **d**, enlargement of the aperture.

TABLE 2. Holotype and paratype dimensions of *Paraboysidia nabhitabhatai*.

Type	Dimensions (mm)		
	Height	Width	Height of aperture
Holotype	1.7	1.3	0.7
Paratype number			
1	1.8	1.3	0.7
2	1.8	1.3	0.7
3	1.7	1.3	0.7
4	1.7	1.3	0.7
5	1.7	1.3	0.7
6	1.6	1.2	0.7
7	1.6	1.2	0.7
8	1.6	1.2	0.7

sculpture consists of fine, irregular growth lines and fine, close-set, spiral striae (threads). The aperture contains seven barriers, most of which are well developed. The parietal and angular lamellae are spaced. The larger parietal tooth is slightly twisted. The angular lamella is situated at the edge of the peristome, and has two cusps, a lower cusp in front and a larger one behind. The upper columellar lamella is somewhat sinuous, and is the largest barrier of the aperture. The subcolumellar lamella is smaller and directed upward (i.e., posteriorly). The upper palatal plica is short and stout, and sits at the edge of the peristome. The middle palatal plica is thinner and deep-set within the aperture. The lower palatal plica is long and well developed. The dimensions of holotype and paratypes are shown in Table 2.

Type locality. Phadevada, Phukhieo Wildlife Sanctuary, Chaiyapumi Province, 16°3'20" N, 101°34'14" E, 110 meters elevation (CUIZM, Ver 064), Thailand, 1998 (collected by S. Panha, P. Dumrongrojwatana, C. sucharit and S. Tumpeesuwan).

Etymology. The specific epithet *nabhitabhatai* is used after the name of Mr. Jarujin Nabhitabhat who help us to study in Phukhieo Wildlife Sanctuary.

Type material. The holotype (CUIZM, Ver 064) is deposited in the Chulalongkorn University Zoological Museum together with eight paratype specimens (CUIZM, Ver 065). Another five paratype specimens (CUIZM, Ver 066) will be deposited in the University of Michigan Museum of Zoology (UMMZ), Ann Arbor.

Geographic distribution and habitat. *Paraboysidia nabhitabhatai* seems to be limited to northeastern Thailand. They were found on limestone walls.

Diagnosis. Shell high-spired, conical, with a relatively blunt apex and rounded whorls. Aperture adnate, with seven well developed barriers. Shell sculptured with five, close-set spiral striae.

***Paraboysidia tarutao* n. sp.**
(Fig. 4)

Description of holotype. Shell 2.9 mm in length, 2.0 mm in width, with 4 ¾ whorls, and a high, conical, straight-sided spire, with impressed sutures. The shell is rather narrowly umbilicate. The periphery of the last whorl is angular, caused by the silhouette of an abtuse, mid-whorl carina. The peristome is complete, slightly separated from the last whorl. An obtuse carina begins on the last whorl. A sulcus at the edge of the umbilicus also begins on the last whorl. The teleoconch sculpture consists of irregular growth lines. There are eight barriers in the shell aperture, the best developed of which are the parietal and columellar lamellae, and the upper and lower palatal plicae. The angular lamella is near the edge of the peristome. The parietal lamella, has a small bump in front of it, and, like the rest of the barriers, is deeper within the the aperture. The infraparietal lamella and the basal plica are smaller barriers. The subcolumellar lamella is very small, little more than a bump. The dimensions of the holotype and paratypes are shown in Table 3.

Type locality. Tarutoa National Park, Satul Province, Thailand, 6°41'58' N, 99°38'48' E, 70 meters elevation (CUIZM, Ver 061), Thailand 1998 (collected by S. Panha).

Etymology. The specific epithet *tarutao* is used after the name of Tarutao National Park, the locality of the snail.

TABLE 3. Holotype and paratype dimensions of *Paraboysidia tarutao*.

Type	Dimensions (mm)		
	Height	Width	Height of aperture
Holotype	2.9	2.0	1.2
Paratype number			
1	2.9	2.0	1.2
2	2.9	2.0	1.2
3	2.9	1.9	1.2
4	2.9	1.9	1.2
5	2.9	1.9	1.2
6	2.8	1.9	1.2
7	2.7	1.9	1.2
8	2.7	1.9	1.2
9	2.7	1.9	1.2
10	2.7	1.9	1.2
11	2.7	1.9	1.2
12	2.7	1.9	1.2
13	2.7	1.9	1.2
14	2.7	1.9	1.2

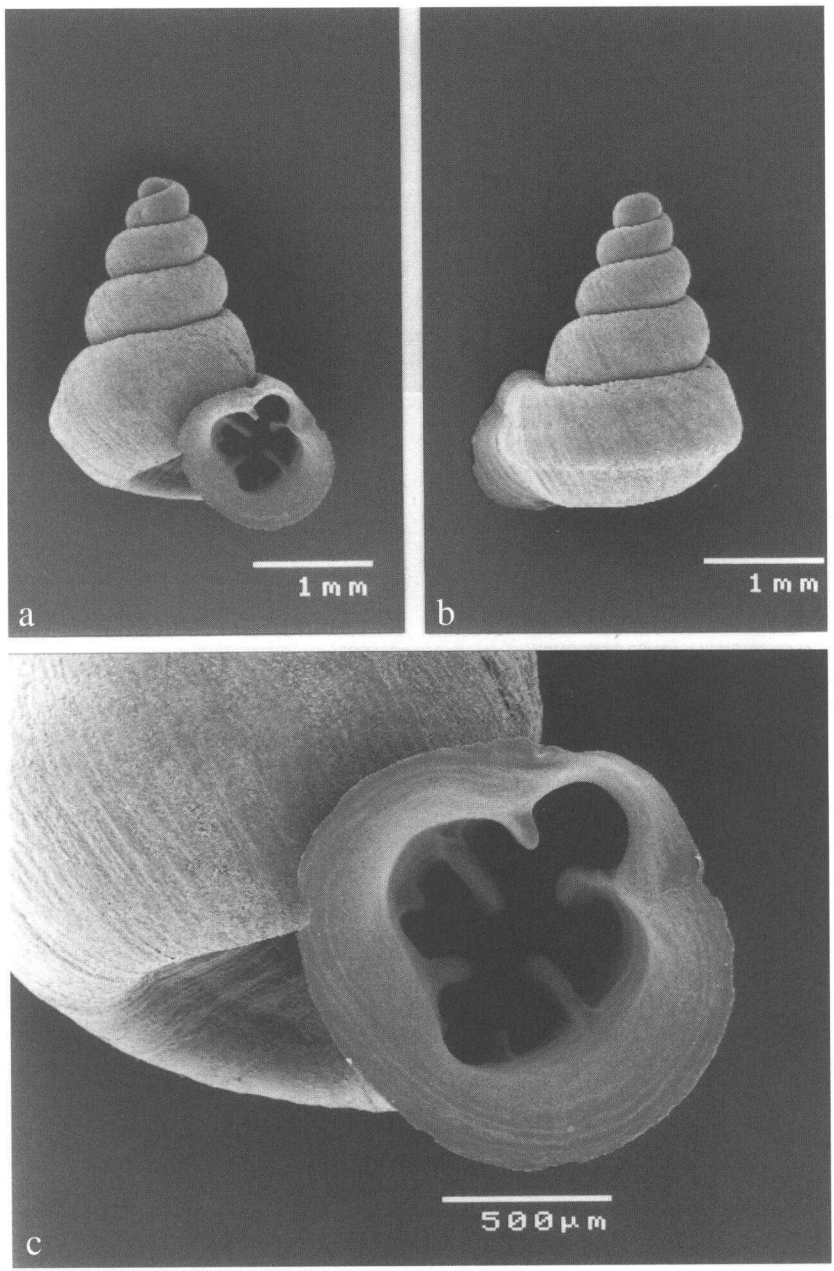

FIG. 4. *Paraboysidia tarutao,* holotype. **a**, Apertural view; **b**, abapertural view; **c**, enlargement of the aperture.

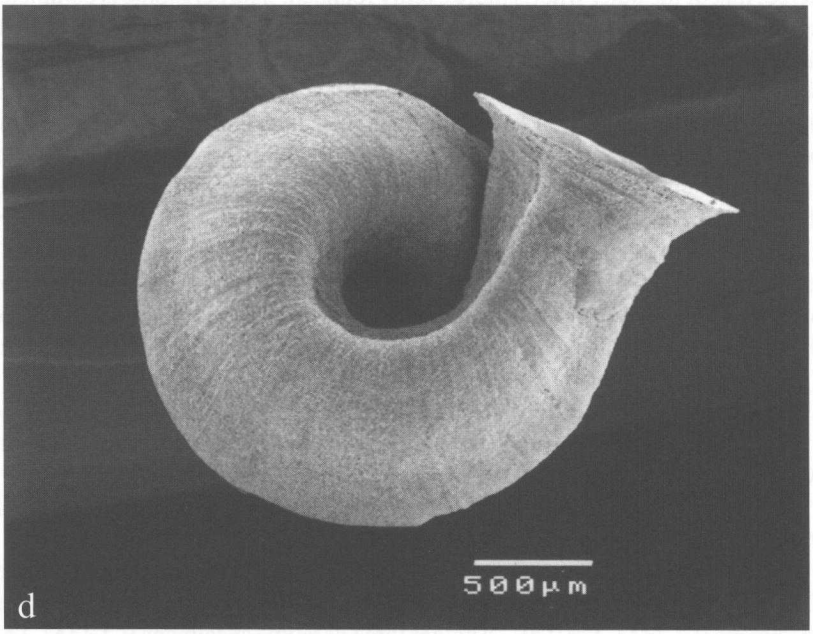

FIG. 4 (Continued). *Paraboysidia tarutao*, holotype. **d**, Umbilical view.

Type material. The holotype (CUIZM, Ver 061) is deposited in the Chulalongkorn University Zoological Museum together with 14 paratype specimens (CUIZM, Ver 062). Another six paratype specimens (CUIZM, Ver 063) will be deposited in the University of Michigan Museum of Zoology (UMMZ), Ann Arbor.

Geographic distribution and habitat. *Paraboysidia tarutao* seems to be limited to southern Thailand. They were found on limestone walls at the same habitat of *Gyliotrachela khaochongensis* Panha.

Diagnosis. Shell conical, the last whorl with an angular periphery caused by an obtuse carina. Aperture with up to eight barriers, four or five of which are prominent. Peristome broadly reflected. Carina around the umbilicus. Shell with subobsolute spiral sculpture.

Paraboysidia pangmapaensis n. sp.
(Fig. 5)

Description of holotype. Shell 1.7 mm in length, 1.1 mm in width, with 4 ½ whorls, and a high, conical, straight-sided spire, with impressed sutures. The shell is narrowly umbilicate. The periphery of the last whorl is moderately shoul-

dered, that of the other whorls more evenly rounded. The peristome is complete, appressed to the last whorl. The teleoconch sculpture consists of fine growth lines and spaced spiral striae (threads). The coil of the last whorl is very slightly tilter upward. There are 11 barriers in the shell aperture, the largest of which is the slightly twisted parietal lamella. An angular lamella sits at the edge of the peristome and has in front of it a bump. Deeper within the aperture is a second angular lamella. There are three columellar lamellae, of which the middle one is the largest. The subcolumellar lamella is small and deeper within the aperture. There are three deep-set, hooked, palatal plicae, and, at the edge of the peristome, an outer bifid, unhooked, palatal plica. The basal plica is also in the form of a hook and, like the deeper palatal plicae, have the sharp point of the hook directed outwardly. The dimensions of the holotype and paratypes are shown in Table 4.

Type locality. Lod Cave, Pang Ma Pa District, Mae Hong Son Province, 19°29'36" N, 98°17'18" E and 19°34'03" N, 98°16'41" E, 800 meters elevation (CUIZM, Ver 028), Thailand 1997 (leg. S. Panha).

Etymology. The specific epithet *pangmapaensis* is used after the name of Pang Ma Pa District, the locality of the snail.

Type material. The holotype (CUIZM, Ver 028) is deposited in the Chulalongkorn University Zoological Museum together with seven paratype specimens (CUIZM, Ver 029). Another three paratype specimens (CUIZM, Ver 030) will be deposited in the University of Michigan Museum of Zoology (UMMZ), Ann Arbor.

Geographic distribution and habitat. *Paraboysidia pangmapaensis* seems to be limited to northern Thailand. The specimens were collected on limestone hills outside of the cave.

TABLE 4. Holotype and paratype dimensions of *Paraboysidia pangmapaensis*.

Type	Dimensions (mm)		
	Height	Width	Height of aperture
Holotype	1.7	1.1	0.7
Paratype number			
1	1.8	1.1	0.7
2	1.7	1.1	0.7
3	1.7	1.1	0.7
4	1.7	1.1	0.7
5	1.6	1.0	0.7
6	1.6	1.0	0.7
7	1.6	1.0	0.7

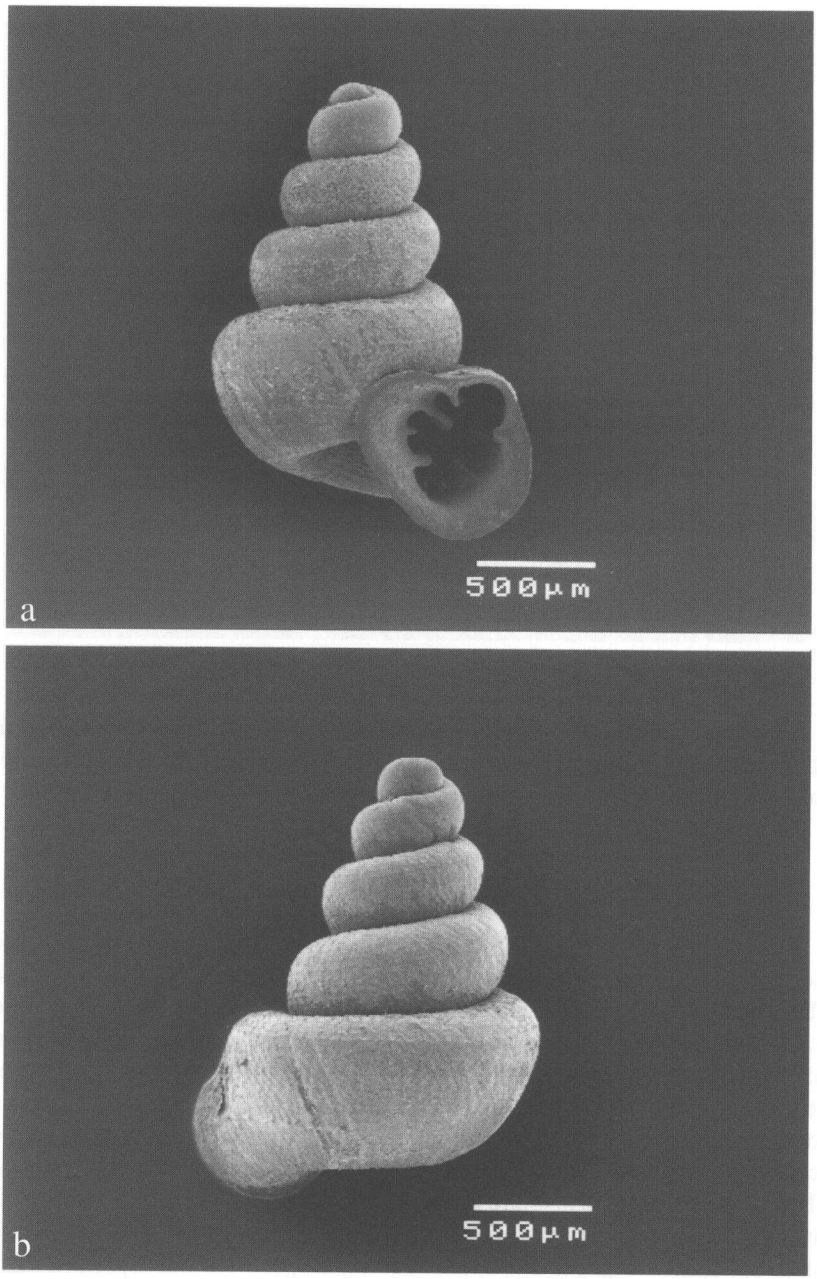

FIG. 5. *Paraboysidia pangmapaensis,* holotype. **a**, Apertural view; **b**, abapertural view.

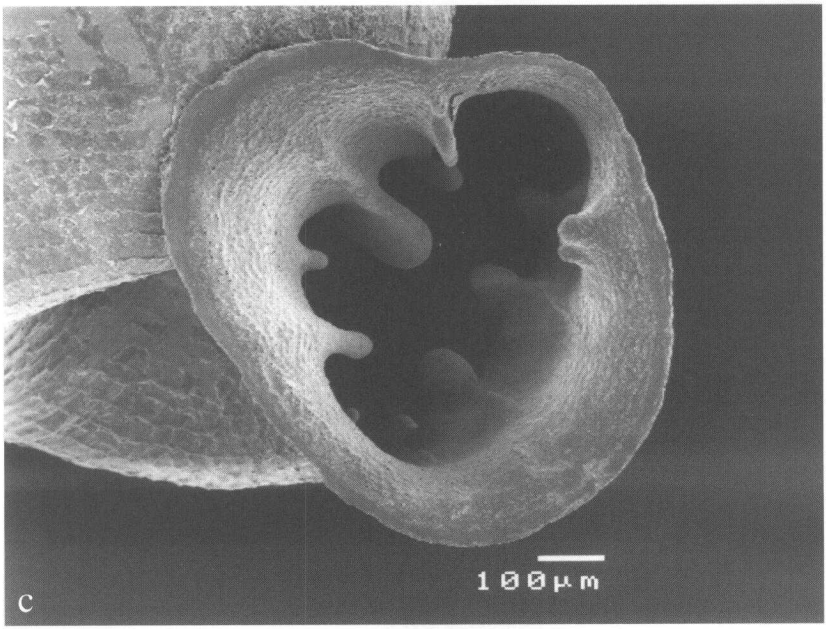

FIG. 5 (Continued). *Paraboysidia pangmapaensis,* holotype. **c**, Umbilical view.

Diagnosis. Shell conical, with a shouldered last whorl. Aperture with up to 11 barriers, some of which end in sharp hooks. Aperture adnate. Shell sculptured with relatively widely spaced spiral striae.

***Paraboysidia phupaman* n. sp.**
(Fig. 6)

Description of holotype. Shell 3.5 mm in length, 2.6 mm in width, with 4 ¾ whorls, and a high, conical spire, with angular whorls and impressed sutures. The shell is moderately umbilicate. The periphery of the last whorl is modified by the silhouette of the three carina. The peristome is complete, separated from the last whorl. The whorls are marked by three well-defined carinae, an upper carina bordered on the upper side by a sulcus, and median carina, and a carina bordering the umbilicus. The teleoconch sculpture consists of irregular, rather coarse growth lines. The coil of the end of the last whorl is tilted upward slightly. The last whorl near the aperture is detached, and a little deflected. There are six barriers in the shell aperture: parietal, angular and columellar lamellae, two palatal plicae, and a basal plica. All barriers are set deeper within the aperture. The dimensions of the holotype and paratypes are shown in Table 5.

Type locality. Phupaman Mountain, Petchaboon Province, Thailand,

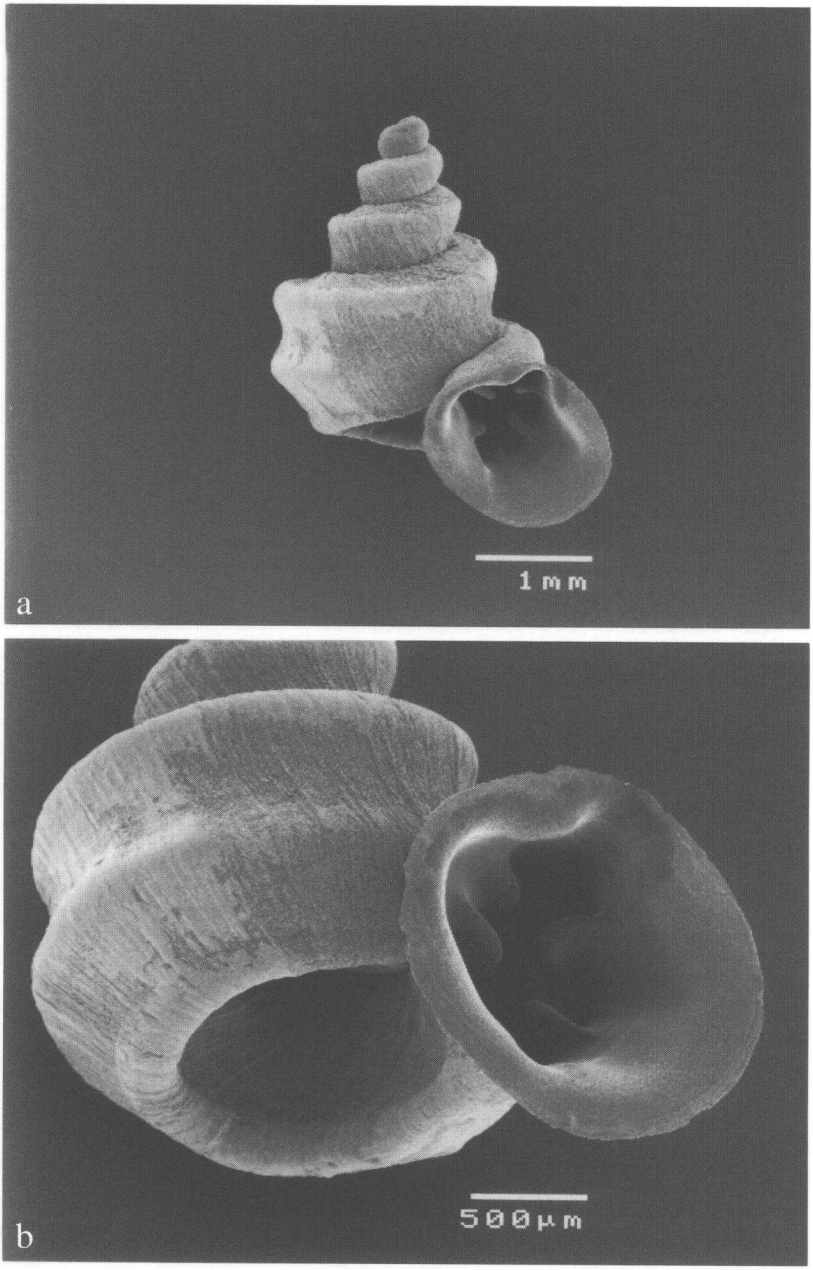

FIG. 6. *Paraboysidia phupaman*, holotype. **a**, Apertural view; **b**, abapertural view.

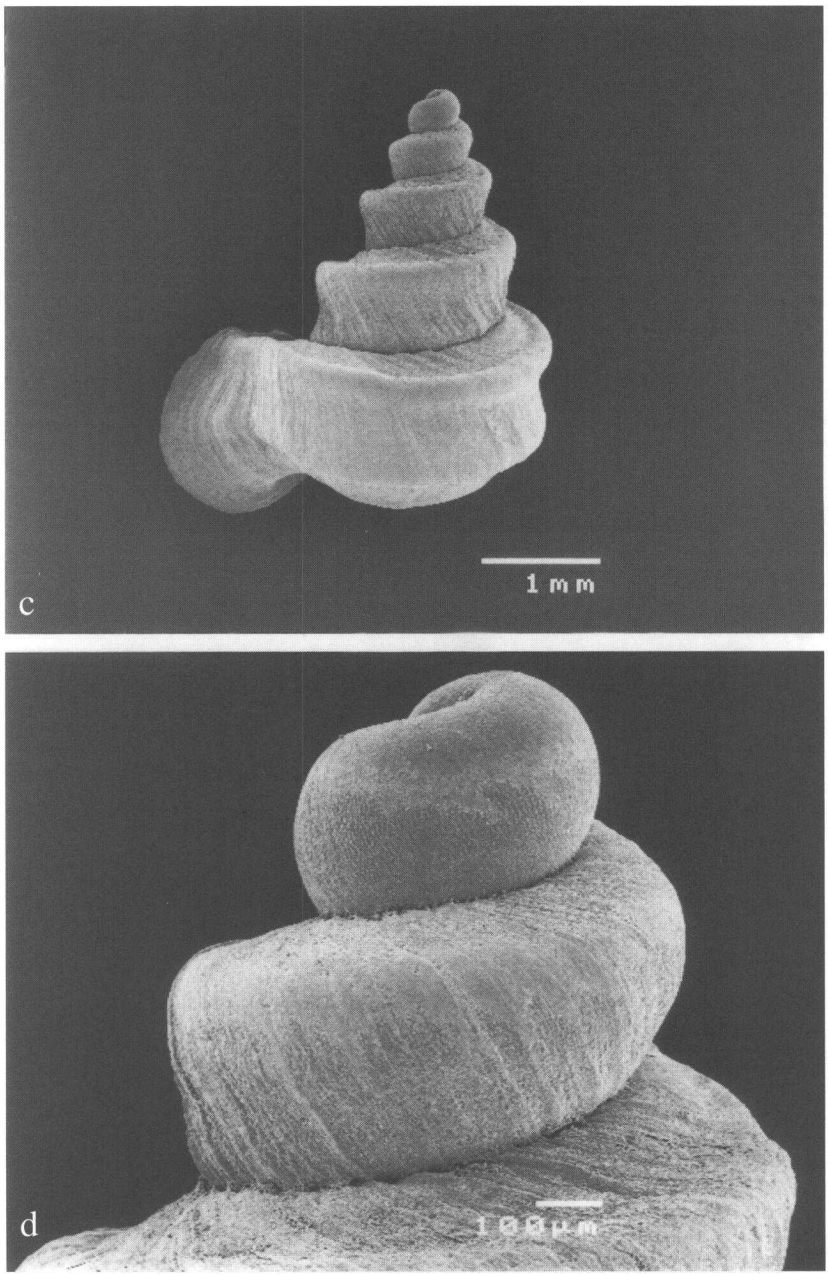

FIG. 6 (Continued). *Paraboysidia phupaman,* holotype. **c**, Enlargement of the aperture and umbilicus; **d**, enlargement of the apex.

TABLE 5. Holotype and paratype dimensions of *Paraboysidia phupaman*.

Type	Dimensions (mm)		
	Height	Width	Height of aperture
Holotype	3.5	3.6	1.6
Paratype number			
1	3.5	3.6	1.6
2	3.5	3.6	1.6
3	3.5	3.6	1.6
4	3.4	3.6	1.6
5	3.4	3.6	1.6
6	3.4	3.6	1.6

16°39'52" N, 101°54'17" E, 60 meters elevation (CUIZM, Ver 085), Thailand 1998 (collected by S. Panha *et al.*).

Etymology. The specific epithet *phupaman* is used after the name of Phupaman Mountain, the locality of the snail.

Type material. The holotype (CUIZM, Ver 085) is deposited in the Chulalongkorn University Zoological Museum together with 22 paratype specimens (CUIZM, Ver 086). Another 10 paratype specimens (CUIZM, Ver 087) will be deposited in the University of Michigan Museum of Zoology (UMMZ), Ann Arbor.

Geographic distribution and habitat. *Paraboysidia phupaman* seems to be limited to northeastern Thailand. Our specimens were found on limestone walls. *Hypselostoma khaowongensis* Panha was also found in this habitat.

Diagnosis. Shell with three prominent spiral carinae. The last part of the body whorl is separated into a very short tuba, ending with a flaring peristome. Aperture with six barriers, set back into the aperture. Umbilicus wide and deep. The shell lacks spiral striae.

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Erratum

In our previous paper on *Paraboysidia* (Panha & Burch, 2000), on page 112, third paragraph, line six, "*Boysidia*" should be "*Paraboysidia*."

Walkerana, P. O. Box 2701, Ann Arbor, Michigan 48106, U.S.A.

Walkerana, 2001, 12(28): 95-96

RHINOCOCHLIS NASUTA (METCALFE 1851), ONE OF THE WORLD'S MOST BEAUTIFUL AND RARE LAND SNAILS

Somsak Panha[1] and Leh Moi Ung[2]

The beautiful green tree snail, *Rhinocochlis nasuta* (Metcalfe 1851), of Sarawak, Borneo, is a rare species (*e.g.*, see Abbott, 1989). The genus *Rhinocochlis* is a member of the pulmonate land snail family Ariophantidae (Thiele, 1931; Zilch, 1959), the genus being named by Thiele (*loc cit.*, p. 633) for a pair of Recent species of Borneo. Thiele listed as an included species of the genus only *Helix masuta* Metcalfe, which, therefore, is the type species by monotypy. The shell diameter given by Thiele was 30-36 mm. Other characteristics of the shell are: sinistral, depressed, thin, lens-shaped, strongly keeled, narrowly umbilicate, and sculptured with oblique growth lines.

Recently (in June, 1998) we did a brief malacological survey in a limestone area of about 0.5 km^2 in the Serian District, Kuching, Sarawak, Malaysia. We found a healthy population (46 individuals) of *Rhinocochlis nasuta* on many different kinds of trees in the area. We found the snails to be very active after a rain.

We measured the shells of the live specimens and then released the snails. Variation in size classes of shells of living snails are recorded in Table 1. Many empty shells were also found.

Initially there was some confusion regarding identification because empty shells look so different from shells with live animals. As previously reported, the green appearance of *Rhinocochlis nasuta* is from the green pigmentation of the exterior of the live animal and is not due to pigmentation of the shell or its periostracum. The actual shell color of the thin, almost transparent shell is brown.

Finding live snails confirmed that this species is not yet extinct, and hopefully it will have a chance to survive in the future.

TABLE 1. Size distribution of *Rhionocochlis nasuta* found at Serian, District Sarawak in June 1998.

Size classes (cm)	Number of individuals
0.5 - 1	14
1 - 2	23
2 - 3	9

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FIG. 1 [facing page]. Two views of *Rhinocochlis nasuta* found in June 1998 in a limestone area in Serian District, Sarawak.

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ON THE GENUS NAME *GONIOBASIS* (*ELIMIA* – GASTROPODA: PLEUROCERIDAE) AND OTHER RECENT NOMENCLATURAL INCONSISTENCIES

John B. Burch[1]

A system of names is essential for communicating about the myriad kinds of biological organisms on Earth. As the science of classifying animals and plants grew in the years proceeding 1758 (Linnaeus' *Systema Naturae* ...), and even in the several centuries before that, it became obvious that consistency in the names applied to organisms was necessary in avoiding confusion among people interested in natural history, and others. As the number of taxonomists grew, more distant lands were visited, and more and more species were discovered and described, there was a heightened concern about reducing or, preferably, avoiding nomencatural confusion. These concerns led to the initiation of several international groups whose purposes were to stablize biological taxonomic nomenclature. For animals, the culmination in 1895 of these efforts was the establishment of the International Commission on Zoological Nomenclature, and the ensuing proposal, formation and publication of Rules governing the use of scientific names for animals. "The object of the Rules is to provide a system under which the name of each taxon is unique and distinctive. A primary purpose is to insure the stability and universal acceptance of names" (Follett, 1955). At various intervals, as the need arises, these Rules are revised and are, of course, available to the general public. The latest revision (4th edition) of these Rules was published two years ago (International Commission on Zoological Nomenclature, 1999).

While preparing a freshwater snail identification manual for the United States Environmental Protection Agency (Burch 1978, 1979, 1982a), I made a special effort regarding correctness of nomenclature, realizing that the nomenclature that I presented would be the standard for much of North American malacology for at least the next several decades. Therefore, to see normal rules of zoological nomenclature so openly flaunted for apparently no valid reason in several recent publications, and especially one by a well known book publishing company (see Dillon, 2000b), caused me consternation. Dillon says, "Burch [1982b] resurrected the genus nomen *Elimia* (H. & A. Adams 1854) as a prior synonym of *Goniobasis* at that time, on the basis of Pilsbry & Rhoads' (1896) type designation. However, Pilsbry subsequently reversed himself, observing that *Elimia*

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was described from a composite group (Walker, 1918, 149)." Since these statements by Dillon are inaccurate, and relate to his inadvisable (and incorrect) change in current nomenclature that would include some apparently endangered and threatened species, I wish to discuss the nomenclatural considerations, including some of their history.

Pilsbry & Rhodes (1896) listed *Elimia* H. & A. Adams 1854, and designated its type species as *Melania acutocarinata* Lea 1841, although they used the name *Goniobasis* for the three species they included in their paper. "The familiar generic name [*Goniobasis*] is used here for convenience, but it must be replaced eventually by *Elimia* H. & A. Adams." In a few subsequent publications, Pilsbry also used the *nomen* "*Goniobasis*" each time again presumably only as a nomenclatural convenience, Pilsbry still not wishing to go into the nomenclatural morass of pleurocerid nomenclature. These papers (which were mostly faunal survey accounts) is the only justification that I can find for Walker's (1918) statement that "Dr. Pilsbry has more recently decided that *Goniobasis* should be restored to its former position as a generic term, on the ground that *Elimia* was a composit group." I can uncover no mention in any of Pilsbry's publications that he reversed himself about the validity of H. & A. Adams' name *Elimia*. In none of Pilsbry's publications after 1896 did he go into the nomenclatural problem of *Elimia* and *Goniobasis*. (Although he published many papers on various other groups of mollusks, Pilsbry was, of course, primarily a land snail taxonomist, an activity that took the majority of his professional energies during the most active phase of his long and illustrious malacological career.) The fact that H. & A. Adams' original concept of their genus included some species that were later removed to other genera is not a valid reason for rejecting the name *Elimia,* as Pilsbry certainly knew (and Dillon should know). If such were a valid reason for rejecting a genus name, then a great many molluscan genus names in use today would have fallen by the wayside.

Previous uses of the name *Elimia* prior to Burch (1982b, as cited by Dillon) can be found in, for example, Stewart (1926), Henderson (1935), H.B. Baker (1964), Taylor (1966, 1975), and, previous to 1982, by myself (Burch, 1978, 1979, Burch & Tottenham, 1980). In spite of Dillon's statement, I did not "resurrect" the name *Elimia*. It was already resurrected. (I told Dillon this some years ago, and on inquiring as to why he still insisted on using the name *Goniobasis,* I got the reply, "Because I [he] like the name *Goniobasis*"!) Significantly, prior to Dillon's (2000b) book, *Elimia* was the generic designation used by Turgeon *et al.* (1988; revised in 1998), a publication that has become a standard reference for scientific and vernacular names of North American mollusks.

Hannibal (1912), in designating *Melania olivula* Conrad as the type species of *Goniobasis,* was aware of Pilsbry & Rhoads' earlier type species designation for

Goniobasis, but that did not keep Hannibal from designating another, different, type species for the genus himself!

Since *Elimia* H. & A. Adams 1854 has clear priority over *Goniobasis* Lea 1862, an appeal could have been made by me (or someone else) to the International Commission on Zoological Nomenclature in an attempt to conserve the name *Goniobasis*. But having knowledge of—and in fact participating in—the long battle to get the genus name *Pleurocera* conserved to fit its common usage convinced me that such an endeavor to save the use of the junior synonym *Goniobasis* would be futile, and in any event would take an inordinate amount of time, and certainly try the patience of malacologists (for the case of *Pleurocera,* see Pilsbry, 1917, 1951; Walker, 1917; Hemming, 1951; Bartsch, 1951; Woodward, 1951; Chapman, 1951; Winckworth, 1951; Rehder, 1951, 1978; Van Cleave, 1951; Melville, 1960, 1976, 1979; Morrison, 1960, 1979; Clench & Turner, 1960; Rosewater, 1960, 1976, 1979; van der Schalie, 1960; Stein, 1978, 1979; Clarke, 1978, 1979; Taylor, 1978; Davis, 1979; Burch, 1980; Starobogatov, 1980; International Commission on Zoological Nomenclature, 1981).

Incidentally, in discussing the *Goniobasis* nomenclatural problem, it should be mentioned that "*Melania*" (see Dillon, 2000b, pp. 104, 389, 393)—a genus name with which so many of the North American and Asian pleurocerid and thiarid species were first described—is a name that was relegated to synonymy years ago. *Melania* Lamarck 1799 is a junior synonym of *Thiara* Röding 1798. "*Melania scabra*" (Dillon, 2000b, p. 389), listed also as "*Melanoides scabra*" (Dillon, *ibid.,* p. 110), is now generally assigned to the genus *Thiara*.

Since this brief response to Dillon's (1989, 2000a) emphasis on, and continued use (Dillon & Reed, 2002) of, a junior synonym (*Goniobasis*) and the use of this nomenclaturally improper name in a book (Dillon, 2000b) that will come to the notice of many non-taxonomists interested in ecology of non-marine mollusks, I will say some more about Dillon's predilection for nomenclatural confusion. In the text of his book in many places identical species are referred to under two or three different generic names, *i.e.,* in some places one genus name is used, while in other places a different genus name is used for the same species. Examples for three basommatophoran families follow.

"*Austropeplea ollula*" (Dillon, 2000b, pp. 234, 371) is the same species as "*Lymnaea ollula*" (*ibid.,* pp. 298, 299, 372). "*Galba palustris*" (p. 395) is the same species as "*Lymnaea palustris*" (pp. 249, 250, 346, 386). "*Galba truncatula*" (p. 395) is the same species as "*Lymnaea truncatula*" (pp. 71, 83, 156, 245, 249, 346, 359). "*Lymnaea auricularia*" (pp. 74, 207, 249, 263, 264, 382) is the same species as "*Radix auricularia*" (pp. 234, 285, 395). (Incidentally, in the *Radix* generic group, the specific epithet *peregra* [pp. 71, 84, 85, 95, 122, 123, 141, 143, 144, 156, 163, 166, 196, 197, 199, 205, 206, 207, 210, 249, 250, 262, 264, 303, 306, 329, 372, 373, 374, 377, 382, 389, 393, 395] is some-

times spelled *pereger* by Dillon [pp. 60, 61, 71, 72, 73, 74, 76, 346, 389]; sometimes both spellings occur on the same page [pp. 71, 389]). "*Lymnaea columella*" (p. 75, 76, 404) is the same species as "*Pseudosuccinea columella*" (pp. 84, 164, 168, 179, 215, 226, 295, 357, 358, 361, 363, 373). "*Lymnaea elodes*" (pp. 73, 122, 123, 130, 146, 147, 148, 149, 150, 184, 185, 193, 195, 208, 209, 289, 369, 384) is the same species as "*Stagnicola elodes*" (pp. 72, 294, 361, 362, 363). "*Physa marmorata*" (p. 180) is the same species as "*Aplexa marmorata*" (p. 306). "*Anisus albus*" (p. 386) and "*Gyraulus albus*" (p. 262, 395) are the same species as "*Planorbis albus*" (pp. 321, 346, 389, 420, 421). "*Anisus complanatus*" (p. 382) is the same species as "*Planorbis complanatus*" (p. 346). "*Anisus contortus*" (pp. 381, 382) and "*Bathyomphalus contortus*" (pp. 395, 408) are the same species as "*Planorbis contortus*" (pp. 65, 66, 78, 321, 346, 377, 389, 420). "*Anisus crista*" (pp. 140, 359, 382) and "*Armiger crista*" (pp. 140, 359, 382) are the same species as "*Planorbis crista*" (pp. 321, 344, 346, 421). "*Anisus vortex*" (p. 395) is the same species as "*Planorbis vortex*" (pp. 372, 373, 374, 377, 389). Further, "*Helisoma antrosa*" [Conrad 1834] (pp. 384, 386, 387, 388), a junior synonym, is the same species as "*Helisoma anceps*" [Menke 1830] (pp. 61, 62, 262, 291, 308, 318, 361, 385, 404) (see Pilsbry, 1950).

Do all of these alternative names for the same species cause confusion to the reader not steeped in basommatophoran taxonomy? Of course they do.

In other cases, where there may still be some disagreement about the use of a particular genus name over that of another genus name, and a choice is made of one name over the other, then the text should be consistent in which name is used. For example, if the name combination "*Planorbella scalare*" (Dillon, 2000b p. 282) is used, then the same genus name (in this case "*Planorbella*") should be used for the epithet "*duryi*" (*ibid.*, pp. ix, 175, 176, 179, 214, 215, 225, 226, 260, 261, 330), not the genus name "*Helisoma*" as used by Dillon (or *vice versa*). If the taxonomic scheme is for using the genus name "*Lymnaea*" in a more restricted sense, as shown in table 1.2 (p. 3) ["A classification of some of the gastropod genera more commonly mentioned in the text in the present work"], then the name "*Lymnaea*" should be used only with the "*Lymnaea stagnalis* group," not in an inconsistent hodgepodge way with members of other groups of lymnaeids (as done on pp. 60, 61, 71, 72, 73, 74, 75, 76, 083, 084, 085, 095, 120, 122, 123, 141, 143, 144, 146, 147, 148, 149, 150, 156, 162, 163, 165, 166, 176, 177, 178, 180, 184, 185, 188, 192, 193, 195, 196, 197, 199, 205, 206, 207, 208, 209, 210, 222, 245, 249, 250, 251, 262, 264, 298, 299, 300, 303, 306, 308, 318, 321, 329, 336, 345, 346, 359, 369, 372, 373, 374, 377, 382, 383, 384, 386, 389, 393, 395, 404, 417, 418, 419). If the generic group name "*Fossaria*" is being used for the species group of small lymnaeids, *e.g.*, as "*Fossaria modicella*" (p. 361), then "*Lymnaea*" should not be used as the genus name for other species of that group, as with "*Lymnaea*" *bulimoides* (pp. 76, 249), "*L.*" *cubensis* (p. 188),

"*L.*" *humilis* (p. 404), and "*L.*" *truncatula* (pp. 71, 83, 156, 245, 249, 346, 359). (In table 1.2, p. 3, the dubious name "*Galba*" is given by Dillon instead for this group of small lymnaeids (but "*Galba*" is mentioned again only twice in the book [both times in fig. 9.6 on p. 395, as "*G. truncatula*" [= *Fossaria truncatula*] and "*G.*" *palustris* [= *Stagnicola palustris*]; the name *Galba* is not listed in the index.) Similarily, if "*Austropeplea*" is used as the genus name for *A.* "*ollula*" (pp. 234, 371), then the same genus name (*Austropeplea*) should be used with the epithet "*tomentosa,*" rather than "*Lymnaea*" (pp. 71, 74, 75, 249, 250, 251). (The epithet *tomentosa* is consistently misspelled by Dillon as "*tormentosa*"—perhaps a Freudian slip; maybe Dillon *is* "tormented" by zoological nomenclature.)

With continued increase in knowledge about the morphology and relationships of species, it is desirable from time to time to update systematic schemes and nomenclature as the need arises. This causes some taxon name changes, which may be irritating to non-taxonomists because of the inconvenience of changing old, pat concepts and adopting new, perhaps unfamiliar, names. Such taxonomic/nomenclatural changes will become less common in the future as the taxonomies of various groups become stabilized. There has been a long history of the necessity of subdividing more inclusive taxa into smaller taxa in a taxonomy that reflects better knowledge of characteristics and relationships. So, some taxonomic/nomenclatural changes will be expected from time to time, and for anyone writing a treatise using individual taxa, especially in a comparative way, there is the need to understand the taxonomy/nomenclature of the taxa of pertinence and to derive a consistent, up-to-date, taxon terminology. Otherwise confusion results which will interfer with the understanding of the subject being labored. Unfortunately, Dillon provides no such courtesy for his readers.

Since Dillon did not get his manuscript checked by a freshwater malacologist for taxonomic and nomenclatural consistency, then the publisher, Cambridge University Press, was derelict in not doing so during the review process (*if* the book manuscript was indeed reviewed).

Those unsure about binomial word combinations to use with North American (north of Mexico) non-marine mollusk species should consult Turgeon *et al.* (1998).

A book on the ecology of freshwater mollusks should be a welcome addition to the biological literature, and undoubtedly Dillon's will be popular in the burgeoning field of non-marine aquatic malacology. That the book is marred by inconsistent and inadvisable zoological nomenclature is unfortunate. Hopefully Dillon was more accurate in his review of the ecology of freshwater mollusks than he was in their taxonomic nomenclature.

Before closing, it should be pointed out that my discussion above is about zoological nomenclature, not about taxonomy.

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