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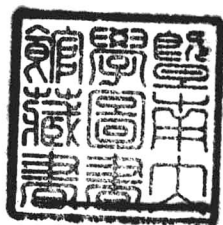
# **ANATOMY of the WOOD RAT**

**COMPARATIVE ANATOMY OF THE  
SUBGENERA OF THE AMERICAN  
WOOD RAT (GENUS NEOTOMA)**

BY

**A. BRAZIER HOWELL**

*U. S. Biological Survey*



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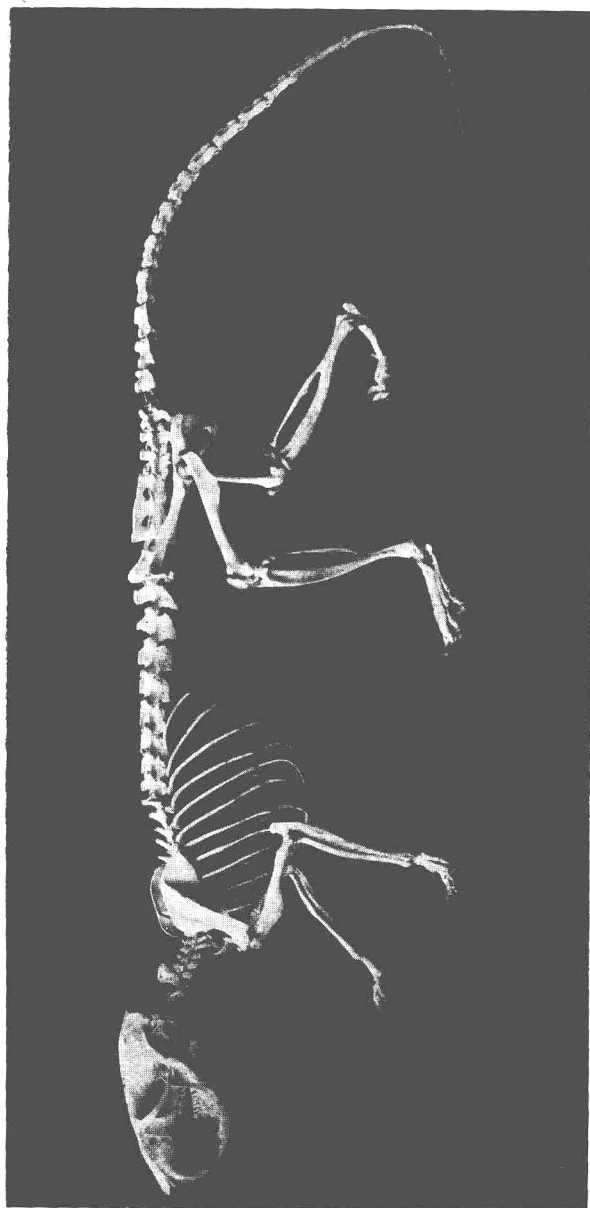
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MOUNTED SKELETON OF MALE WOOD RAT (TYPE OF *Neotoma* (*Homodontomys*) *fuscipes fuscipes*, No. 22026,  
U. S. NATIONAL MUSEUM)

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# CONTENTS

## CHAPTER I

INTRODUCTION.....	1
Foreword.....	1
Material and acknowledgments.....	3
Illustrations.....	4

## CHAPTER II

SYSTEMATIC POSITION OF <i>Neotoma</i> AND ITS SUBGENERA.....	6
--	---

## CHAPTER III

HABITS OF THE THREE SUBGENERA STUDIED.....	8
--	---

## CHAPTER IV

EXTERNAL FEATURES.....	11
------------------------	----

## CHAPTER V

MYOLOGY.....	22
Prefatory note.....	22
Muscles of the head.....	24
Muscles of the body.....	32
Muscles of the anterior limb.....	58
Muscles of the posterior limb.....	69

## CHAPTER VI

ALIMENTARY TRACT AND ADJACENT GLANDS.....	90
---	----

## CHAPTER VII

UROGENITAL SYSTEM.....	100
------------------------	-----

## CHAPTER VIII

OSTEOLOGY.....	110
Skull.....	111
Hyoid.....	123
Vertebral column.....	124
Thorax.....	133

Extremities.....	135
Pectoral girdle.....	135
Anterior limb.....	141
Pelvic girdle.....	154
Posterior limb.....	159

## CHAPTER IX

DISCUSSION.....	173
Discussion of muscle action and limb motion.....	173
Discussion of subgeneric variation.....	198
BIBLIOGRAPHY.....	217

## CHAPTER I

### INTRODUCTION

#### FOREWORD

The internal anatomy of all but a few mammals has been woefully neglected. Anatomists have heretofore shown a strong propensity to seek out material representing the rarer and more spectacular mammals and to neglect species of a more generalized nature available in abundance. For example, the anatomy of such curiosities as the aye-aye (*Cheiromys*) and the marsupial mole (*Chrysochloris*) is far better known than that of a single one of our more common North American small mammals. Then too, our knowledge of the systematic position of most groups and genera has reached a deadlock, broadly speaking, since cranial and external characters usually employed in their phylogenetic arrangement are mostly well known. Additional work is often productive only of a better arrangement of the species and subspecies within a group or genus. Thus the emplacement of the latter in the system may be largely artificial, and such mistakes as may have occurred can be rectified only after there has been secured a more thorough knowledge of the gross anatomy.

A handicap to the study of the anatomy, especially the myology, of such mammals as rodents is the lack of a comprehensive text book. Even so common a laboratory subject as the white rat has never been thus treated. Existing literature of this nature is either scattered and fragmentary or so poorly illustrated that none but an experienced anatomist can work with it to proper advantage. In addition, the average systematic mammalogist is loath to expend the time and effort necessary to homologize his subject with the

anatomy of the cat or of man, which is now necessary if one is to have confidence in his results.

The object in undertaking the present investigation was to gain a comprehensive understanding, from a practical viewpoint, of certain portions of the gross anatomy of a medium-sized, generalized, cricetine rodent. Attention has been paid to correlating the groups of limb muscles and to the effects of their functions and stresses upon the bones of the skeleton. This work was done in order that it might constitute a basis upon which the writer might investigate to better advantage the convergence exhibited by mammals of diverse affinities toward types highly specialized for certain definite modes of life. The present paper constitutes part one of this program. It was made comparative in order that it might be of greater technical value, and that we might learn more regarding the anatomical variation to be expected within those closely-related groups of mammals which we term subgenera. Since illustrations are prerequisite to anatomical work of a satisfactory character, a series of these has been prepared which it is hoped will prove entirely adequate.

It would have been highly desirable to have investigated at least the more critical points in the anatomy of every species and a number of subspecies of the genus *Neotoma*. It is practically certain that a new phylogenetic arrangement considerably better than the one now in use could thus be obtained. It is not unlikely that there exist anatomical differences between some of the more distinct species of the subgenus *Neotoma* that might serve to differentiate these subgenerically. It would take years, however, to secure the material necessary for such an undertaking. It should therefore be emphasized that the present program can not definitely settle the subgeneric standing of the different groups of wood rats. Comparisons are used solely to ascertain and indicate anatomical differences that may be

expected to occur between three representative species of their respective subgenera.

It seems hardly necessary to call attention to the fact that this contribution can lay no claim to completeness. During its preparation many problems were encountered, each of which would well repay months of investigation. But a definite program was laid out and followed, and the work is as comprehensive as was deemed necessary for the special purpose for which it was prepared.

For reasons explained hereafter, *Homodontomys* has been arbitrarily selected as the basic type with which to compare first *Neotoma*, and then *Teonoma*.

In the various osteological measurements and percentages, care has been taken to have the individual specimens always follow in the same sequence.

#### MATERIAL AND ACKNOWLEDGMENTS

The present investigation was made at the U. S. National Museum under the auspices of the Bureau of Biological Survey of the U. S. Department of Agriculture, and the writer is indebted for the use of facilities and material, consisting of a great quantity of skins and skulls, belonging to both of these. It is also a pleasure to acknowledge indebtedness for the securing or loan of material to the Museum of Vertebrate Zoology through its director, Doctor Joseph Grinnell, and to Messrs. Donald R. Dickey and Laurence M. Huey. For advice he is also under obligation to Doctor Ernst Huber of the Johns Hopkins Medical School.

Specimens of superior quality preserved in formalin, representing *Homodontomys* (race *macrotis*) and *Neotoma* (race *albigula*) were collected in surplus quantity either by the writer or under his direction, and three individuals of *Teonoma* (race *cinerea*) by the writer. Upon several occasions subsequent to the start of the investigation individuals of the *Homodontomys* were trapped for special observation of fresh material.

A considerable proportion of the skeletons available were in such condition as to be of limited value for the purposes in hand, although most of them were excellent. The skeletons available consisted of the following:

	<i>Skeletons</i>
<i>Neotoma (Homodontomys) fuscipes fuscipes</i> .....	9
“ “ “ <i>macrotis</i> .....	1
“ ( <i>Neotoma</i> ) <i>albigula albigula</i> .....	4
“ “ <i>desertorum</i> .....	2
“ “ <i>floridana rubida</i> .....	2
“ “ <i>intermedia intermedia</i> .....	1
“ “ <i>lepida stephensi</i> .....	2
“ “ <i>pennsylvanica pennsylvanica</i> .....	1
“ ( <i>Teonoma</i> ) <i>cinerea cinerea</i> .....	5
“ “ “ <i>occidentalis</i> .....	1
“ “ “ <i>oreolestes</i> .....	1

#### ILLUSTRATIONS

Any work on anatomy is well nigh useless without illustrations. In this is it especially true that an illustration may be more illuminating than a dozen pages of text. In such work it is almost imperative that the investigator prepare his own drawings in order to show exactly what he wishes.

It has been the purpose of the writer to illustrate every detail of the portions of the anatomy treated that he considered at all worth while, without carrying this to a useless extreme. An effort has also been made to have the illustrations self-explanatory to as large a degree as possible.

In making the drawings, the writer used a camera lucida while tracing with a pencil the salient features, after which corrections were made, and the figure finished with ink. No effort was made to correct the distortion by the foreshortening inevitable in the use of the camera lucida, and which at times may have been accentuated without realizing it. For this, as well as other reasons, the drawings must be considered semi-diagrammatic. Thus, for clarity, the curved surfaces of the specimen are somewhat flattened in the



drawings, so that the same detail of a side muscle is usually shown in both the dorsal and ventral aspect of the subject. Similarly, faint details are intensified—a muscle that may present a paper-thin edge to view is represented as thicker, *et cetera*.

In the bilaterally symmetrical drawings of muscles which are bisected by a solid line, the detail to the left of the latter is represented as being the more superficial and to the right as deeper.

From the viewpoint of an experienced anatomist, some of the drawings of muscles are shown in too much detail, and a more finished effect would have been obtained by illustrating only muscles of one or two particular groups in each figure. From the standpoint of the systematic mammalogist who may wish to do some slight work in myology, however, it is preferable to illustrate the muscles so as to show their positions in respect to as many of their neighbors as possible.

In those drawings showing muscle attachments upon the bone, blue represents the origins of the muscles and red the insertions. These, too, must be considered as semi-diagrammatic, for many times the insertion of a muscle is tissue-thin, and for distinctness these must always be shown as much thicker; so that distortion in the true positions of the muscles often follows.

Fascial origins and insertions are usually represented as being at the side of, rather than upon, the bone. Finally, attention must be called to the fact that it is often quite impossible to decide the precise limits of a fascial origin or insertion.

In those drawings which are chiefly concerned with the muscles, the names of the latter, abbreviated as little as practicable, are presented in lower case letters, while other terms, as for bones or glands, are printed in capital letters.

In the myological drawings the intermuscular penetration and emergence of some of the chief nerves is shown, these being represented as cut.