

# A SYSTEMATIC STUDY OF THE MAIN ARTERIES IN THE REGION OF THE HEART—AVES IX.

## COLIIFORMES—PART 1<sup>1</sup>

FRED H. GLENNY<sup>2</sup>

1148 Linden Avenue, Akron 10, Ohio

In several recent studies on birds, the writer has been able to present the significant basic ordinal and important family arrangement-patterns of the main arteries in the neck and thoracic regions. The present paper deals with the arrangement of these arteries in the Coliiformes.

It is significant that, although only three species of Colies are represented in this study, Sclater (1924) recognizes but one genus and six species for the order. The Colies are, therefore, an extremely small group of birds which are found exclusively in Africa.

The taxonomic position of this order of birds has been a subject of much interest. At one time they were placed among the passerine Fringillidae, and later were grouped in the older order Coraciiformes. Wetmore (1940), however, gives them ordinal rank, which, based upon several anatomical evidences, is entirely justifiable.

The information thus far presented in this and previous papers may subsequently afford some clue to possible avian phyletic and genetic relationships, and may later come to be used, in part, as an aid in taxonomic treatises.

### MATERIALS<sup>3</sup>

Single specimens of the Speckled Mousebird *Colius striatus* Gmelin (No. 227154), the Red-faced Mousebird *Colius indicus* Latham (No. 290394), and the Blue-naped Mousebird *Colius macrourus* (Linné) (No. 290606) were dissected and diagrams of the main cervical and thoracic arteries prepared.

The materials for this study were from the collection of alcoholic specimens of the United States National Museum.

### OBSERVATIONS

The arrangement-pattern of the arteries of the neck and thorax is the same for each of the three species of Colies represented in this study.

The innominate arteries (2) arise from the aortic root (1) and pass anteriorly and diagonally toward the base of the neck where they divide to form the common carotid artery and the subclavian artery. The latter gives rise to the coracoid major artery (15), which arises from the ventral face of the subclavian artery between the common carotid and axillary arteries, the intercostal artery (14), which arises from the posterior face of the subclavian just behind the coracoid major, the axillary artery (12), which arises from the anterior face of the subclavian between the common carotid and the anterior pectoral arteries, and finally the two pectoral arteries (13) in order. The coracoid minor artery (11) arises from the axillary artery. The subclavian arteries and branches present a bilaterally symmetrical arrangement.

The common carotid derivatives are not bilaterally symmetrical in their arrangement and must, therefore, be treated separately.

<sup>1</sup>Contribution from the Department of Zoology, University of Toronto, Toronto, Ontario, Canada.

<sup>2</sup>Formerly Assistant, Department of Zoology, Univ. of Toronto. Now on Active Service with the Army of the United States.

<sup>3</sup>Numbers after the species are the U. S. National Museum catalogue numbers of specimens used for this study.

The right common carotid (10) gives rise to the right ductus shawi (16) which sends off branches to the trachea (19), syrinx (18), bronchi, and oesophagus; the superficial cervical artery (29), which sends off a scapular artery (24) and other branches to the cervical lymph glands and musculature; a vertebral artery (27); and a secondary or accessory ascending-oesophageal artery (26) from the base of which a short basi-oesophageal artery (28) frequently springs.

The left common carotid artery sends off a tracheo-oesophageal artery (17) from which springs the left ductus shawi (16) which sends off branches to the same organs and other structures as does the right vessel; the cervico-vertebral artery (21) divides into the vertebral (22) and superficial cervical (23) arteries (the latter sends off a scapular artery (24) to the left shoulder region); and the internal carotid (trunk) artery (25) which enters the hypapophysial canal and passes anteriorly to the head where it sends off branches to the left and right sides of the head. Each of these vessels then divides into the complimentary internal and external carotid branches (Glenny, 1943).

The ligamentum aortae (7) is present in each of the three species and is attached anteriorly to the left pulmonary artery (6). The ligamentum botalli (8) is present as a small vestige, but is much reduced and tends to fuse distally with the right radix aortae (4). In *Colius indicus*, at least, the right ligamentum botalli maintains a thread-like proximal attachment to the right pulmonary artery.

#### DISCUSSION

It should be pointed out that the Coliiformes are laevo-carotidinae as are the Trogoniformes (Glenny, 1943), certain Coraciiformes (Meropidae, Upupidae, and Phoeniculidae) (Glenny, 1943), the Piciformes (Glenny, 1943) and the Passeriformes (Glenny, 1942). In arrangement-pattern, these forms closely resemble one another, and differ in only minor respects.

Lowe (1939) points out that except for certain minor structural differences the Swifts and Humming-Birds closely resemble the Perching Birds which he would place in a subordinal position in the larger order Passeriformes. At the same time he would place the Pici, Eurylaimi, Cypseli and Trochili as other suborders in the Passeriformes. He also suggests that perhaps some of the Coraciiformes (Wetmore, 1940) might likewise be placed in this larger order.

Based upon my own studies, I am inclined to agree with Lowe, if we are to try to establish probable relationships of larger orders of birds, rather than accord ordinal rank to all groups which do not have all of the important characteristics of extant forms.

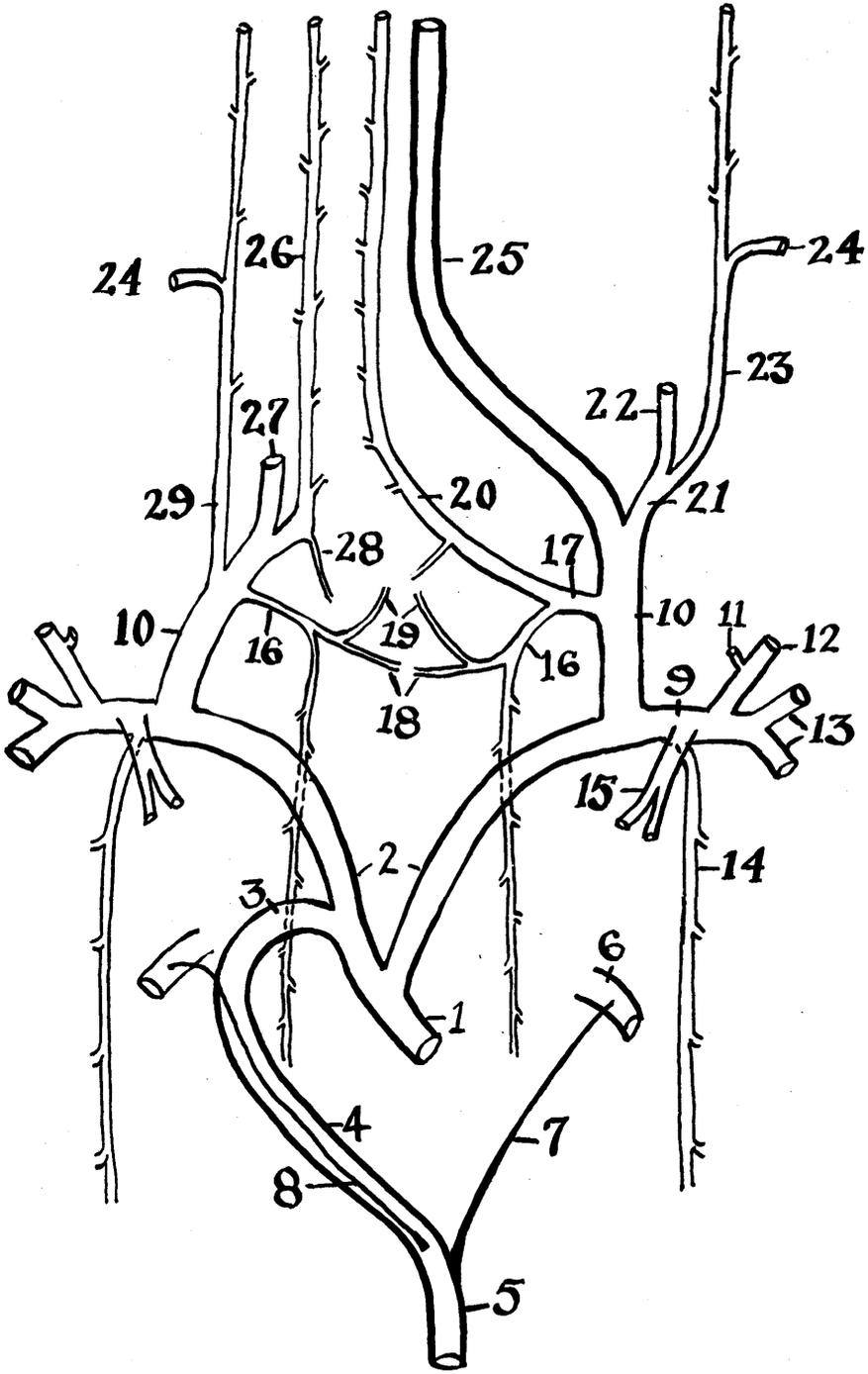
---

#### EXPLANATION OF PLATE

Figure 1. Diagrammatic representation of the main arteries in the neck and thorax of *Colius striatus* Gmelin. Ventral view.

#### KEY TO ABBREVIATIONS

- |                                |   |
|--------------------------------|---|
| 1. Aortic root.                | 17. Tracheo-oesophageal artery.   |
| 2. Innominate arteries.        | 18. Syrinx artery.  |
| 3. Systemic (4th aortic) arch. | 19. Tracheal artery.  |
| 4. Right radix aortae.         | 20. Primary ascending-oesophageal artery.   |
| 5. Dorsal aorta.               | 21. Cervico-vertebral artery.   |
| 6. Pulmonary artery.           | 22. Left vertebral artery.  |
| 7. Left ligamentum aortae.     | 23. Left superficial cervical artery.   |
| 8. Right ligamentum botalli.   | 24. Scapular artery.  |
| 9. Subclavian artery.          | 25. Internal carotid (trunk) artery.  |
| 10. Common carotid artery.     | 26. Secondary or accessory ascending-oesophageal artery (right internal carotid <i>trunk</i> artery). |
| 11. Coracoid minor artery.     | 27. Right vertebral artery.   |
| 12. Axillary artery.           | 28. Basi-cervical artery.   |
| 13. Pectoral arteries.         | 29. Right superficial cervical artery.  |
| 14. Intercostal artery.        |   |
| 15. Coracoid major artery.     |   |
| 16. Ductus shawii.             |   |



While it may be thought by some that there is great variation in soft structures such as arteries, and therefore, these structures cannot be used satisfactorily as evidences of trends in evolution, my experience in this work cannot substantiate such claims. In fact, by a thorough study of the arterial system in the neck and thorax, from early embryonic stages through to the mature adult, one can grasp the main and significant trends of development. This is likewise true of the development-patterns of other structures such as the bony or skeletal system, and of the musculature. Although virtually nothing with reference to growth curves (of bones, etc.) in birds has been done, such work as has been carried out recently would seem to confirm our concept of ordinal developmental-patterns. Such findings are necessary to aid in the final establishment of ordinal and family relationships.

If we are to accept a poly-reptilian concept of avian evolution, we must regard the origin of such birds as the Rhea, Ostrich, Emu, and Cassowary as different from that of the Tinamous, Galliformes, and Anseriformes, and at the same time we should postulate a different origin for the Penguins. In the same vein, we may further conceive of the other birds as being divided into at least two or more groups, present-day forms of which probably had somewhat different reptilo-avian ancestors. Of this latter group, the present-day representatives of the Coliiformes, Trogoniformes, certain Coraciiformes, Piciformes, and Passeriformes<sup>4</sup> along with Cypseli and Trochili<sup>5</sup> may have sprung from a common stock since all of these show distinctive characteristics (several of which are held in common). Individual lines of evolution and development have taken place so that ultimately they have assumed their own distinctive characteristics which are the reasons for according them ordinal rank by our present taxonomists.

It is, therefore, my opinion that if the present orders of birds are to be reclassified, based upon natural relationships, in an effort to establish primitive relationships, the above general group should be presented as the last main order.

#### ACKNOWLEDGMENTS

The writer wishes to express his gratitude to Dr. Alexander Wetmore, Assistant Secretary, Smithsonian Institution, and Dr. Herbert Friedmann, Curator of Birds, United States National Museum, for their helpfulness and cooperation in making available these and other materials for study, and to Dr. E. Horne Craigie, Department of Zoology, University of Toronto, and Dr. A. L. Rand, Curator of Birds, National Museum of Canada, for their suggestions and criticisms during the progress of these studies and in the preparation of this paper.

#### REFERENCES

- Glenny, Fred H. 1942. A Systematic Study of the Main Arteries in the Region of the Heart—Aves III. The Fringillidae, Part 1. Columbus, Ohio Journal of Science, 42 (2): 84-90.  
 1943. A Systematic Study of the Main Arteries in the Region of the Heart—Aves VI. Trogoniformes, Part 1. Lancaster, The Auk, 60: 235-239. (1943).  
 A Systematic Study of the Main Arteries in the Region of the Heart—Aves. Piciformes. London, Proceedings of the Zoological Society, Ser. B, 113: 179-192. 1943.  
 A Systematic Study of the Main Arteries in the Region of the Heart—Aves VII. Coraciiformes, Part 1. Ottawa, Transactions of the Royal Society of Canada, 3rd Ser., Sec. V, 37: 35-53, 1943.
- Lowe, Percy R. 1939. IV. On the Systematic Position of the Swifts (Suborder *Cypseli*) and the Humming-Birds (Suborder *Trochili*), with special reference to their Relation to the Order *Passeriformes*. London: Trans. Zool. Soc., Vol. XXIV, Part 4: 307-348. (Plates I-IV).
- Sclater, Wm. L. 1924. Systema Avium Aethiopicarum. London, British Ornithologist's Union, pp. 265-268.
- Wetmore, A. 1940. A systematic classification of the birds of the world. Smithsonian Inst. Pub., Misc. Collections, 99 (7): 1-11.

<sup>4</sup>Wetmore, A., 1940.

<sup>5</sup>Lowe, P. R., 1939.