

A SYSTEMATIC STUDY OF THE MAIN ARTERIES IN THE  
REGION OF THE HEART—AVES XIV  
GRUIFORMES, PART 1<sup>1</sup>

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INTRODUCTION

As in other previous papers on this subject, the writer has presented the basic arrangement-patterns, as well as the more important family and individual variations, of the main arteries in the neck and thorax of birds, in so far as this was possible within the limitation of numbers of species and specimens of any single species and time in which to make adequate observations on any group of birds—along with the difficulties encountered in obtaining many species of birds.

The present paper is limited to a consideration of the main cervical and thoracic arteries in three species of the Gruiformes.

MATERIALS

Three specimens of *Fulica americana* and single specimens of *Grus antigone* and *Anthropoides paradisea* were dissected and diagrams of the main arteries of the neck and thorax prepared.

Specimens were made available for this study by the Division of Birds, Royal Ontario Museum of Zoology, Toronto, Canada.

OBSERVATIONS

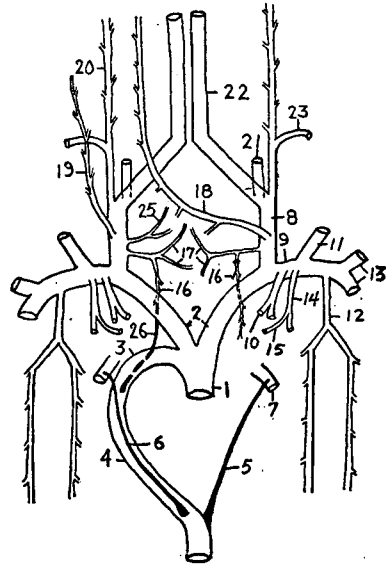
The basic ordinal pattern of the Gruiformes is characteristically "aves bicarotidinae normales" (Garrod, 1873). The right systemic arch (3) arises from the aortic root (1) at the point where the innominate arteries (2) bifurcate and pass anteriorly and diagonally to the left and right before dividing to form the common carotid (8) and subclavian (9) arteries. The subclavian artery then gives rise to the coracoid major (10), axillary (11), intercostal (12), and two pectoral (13) arteries in order. The common carotid gives rise to the ductus shawi (16), superficial cervical (20), vertebral (21), and internal carotid (trunk) (22) arteries. The accessory ascending oesophageal artery (18) arises variously from the common carotid and internal carotid arteries.

In the two species of Gruidae which were examined, the intercostal artery divides into ventral and lateral branches, whereas in *Fulica americana* only one vessel could be observed.

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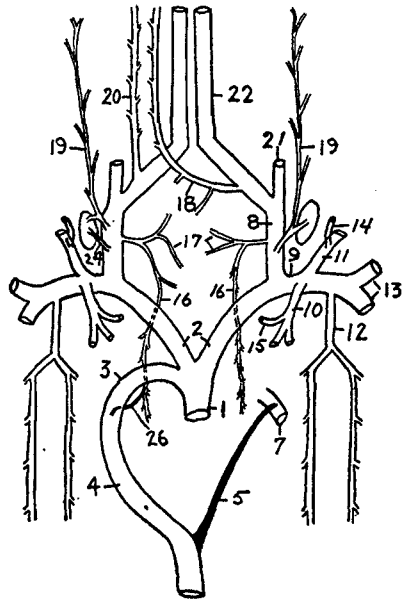
In *Grus antigone* (Text-figure 1), the subclavian artery gives rise to the coracoid major (10), coracoid minor (14), axillary (11), intercostal (12), and two pectoral (13) arteries in order. The sterno-tracheal artery (15) arises as a branch of the coracoid minor. The intercostal artery bifurcates to form lateral and ventral branches. The left and right ductus shawi (16) are short and reduced. The posterior portion of the right ductus shawi remains, in the single specimen which was studied, as the ligamentum caroticum (26) and maintains its proximal connection with the right radix aortae (4) at the base of the right systemic arch (3). This may be only an individual variation similar to that observed by Finn (1891) in *Dafila spinicauda* and *Nycticorax violaceus*, or it may indicate a family tendency as shown by Glennly (1943). Syringo-tracheal arteries (17) arise from the ductus shawi. The accessory ascending oesophageal artery (18) arises from the left common carotid artery and passes anteriorly and diagonally to the right side of the neck until it comes to lie next to the oesophagus. The right common carotid gives rise to a small accessory superficial cervical artery (19) before forming the normal superficial cervical (20), vertebral (21), and internal carotid (trunk) (22) arteries. The scapular arteries (23) arise from the superficial cervicals, of which the right vessel comes to serve as an ascending oesophageal artery. Both the ligamentum aortae (5) and right ligamentum botalli (6) are present and prominent.



TEXT-FIGURE 1.—*Grus antigone*.

In *Anthropoides paradisea* (Text-figure 2.) the subclavian artery gives rise to the coracoid major (10), axillary (11), intercostal (12), and two pectoral (13) arteries. The sterno-tracheal artery (15) arises as a branch of the coracoid major; the coracoid minor (14) is a branch of the axillary; and the intercostal (12) divides into ventral and lateral branches. The common carotids give rise to the ductus shawi (16), small accessory superficial cervical (19), vertebral (21), normal superficial cervical (20), and internal carotid (trunk) (22) arteries. The left superficial cervical artery could not be observed in the specimen

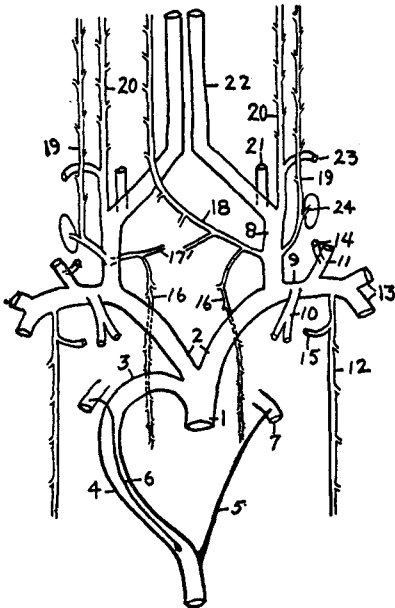
studied, while the right vessel came to serve as the primary ascending oesophageal artery. The accessory ascending oesophageal artery (18) arises as a branch of the left internal carotid (trunk). The thyroid arteries arise variously from the common carotid and accessory superficial cervical (19) arteries. The ductus shawi (16) sends off a syringotracheal branch (17) before passing posteriorly. The right ductus shawi appeared to maintain a very short ligamentum caroticum (26) which was attached to the right radix aortae (4). The ligamentum aortae (5) is present and prominent while the ligamentum botalli appears to have undergone complete atrophy or to



TEXT-FIGURE 2.—*Anthropoides paradisea*.

have fused with the right radix aortae.

In *Fulica americana* (Text-figure 3.) the coracoid major (10), axillary (11), intercostal (12), and two pectoral (13) arteries arise in order from the subclavian artery. The coracoid minor (14) arises as a branch of the axillary, while the sterno-tracheal artery (15) arises from the intercostal artery. The common carotid (8) gives rise to the ductus shawi (16) which sends off a syringotracheal branch (17), an accessory superficial cervical artery (19) which sends off a short thyroid artery (24), the superficial cervical artery (20) which gives rise to a scapular artery (23), the vertebral artery (21), and the in



TEXT-FIGURE 3.—*Fulica americana*.

ternal carotid (trunk) artery (22) in order. The accessory ascending oesophageal (18) arises as a branch of the left ductus shawi. Both the ligamentum aortae (5) and the ligamentum botalli (6) are present and prominent.

#### DISCUSSION

From the above observations, one may observe certain fundamentally common ordinal characteristics in the arterial pattern; but, at the same time, it will be noted that there are several individual variations in arrangement. The significance of these variations, however, cannot be evaluated at the present time due largely to the lack of adequate materials from which to draw conclusions and with which to make more complete comparisons.

#### ABSTRACT

Three species of birds, representing two families of Gruiformes, were dissected and diagrams of the arrangements of the main arteries in the neck and thorax prepared. Essential differences, as well as similarities, were noted. The presence of an incomplete ligamentum caroticum was noted in two species of the Gruidae. An accessory ascending oesophageal artery was found in each of the three species. The ligamentum aortae was present in each of the species included in the study.

#### REFERENCES CITED

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#### KEY TO TEXT-FIGURES

VENTRAL VIEW OF THE MAIN ARTERIES IN THE NECK AND THORAX OF: Figure 1.—*Grus antigone*. Figure 2.—*Anthropoides paradisea*. Figure 3.—*Fulica americana*.

1, Aortic root; 2, innominate arteries; 3, right systemic arch; 4, right radix aortae; 5, ligamentum aortae; 6, ligamentum botalli; 7, pulmonary artery; 8, common carotid artery; 9, subclavian artery; 10, coracoid major artery; 11, axillary artery; 12, intercostal artery; 13, pectoral arteries; 14, coracoid minor artery; 15, sterno-tracheal artery; 16, ductus shawi; 17, syringo-tracheal arteries; 18, accessory ascending oesophageal artery; 19, accessory superficial cervical artery; 20, (normal) superficial cervical artery; 21, vertebral artery; 22, internal carotid (trunk) artery; 23, scapular artery; 24, thyroid artery; 25, meso-oesophageal artery (ductus visscheri); 26, ligamentum caroticum.

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