

A SYSTEMATIC STUDY OF THE MAIN ARTERIES IN THE
REGION OF THE HEART. AVES XVI.
CHARADRIIFORMES, PART 2¹

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Recent continued studies on the arteries in the neck and thorax of seven species of Charadriiformes were made possible by the loan of alcoholic specimens from the anatomical collections of the Chicago Natural History Museum and the U. S. National Museum.

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Except where otherwise indicated, single specimens were dissected and diagrams of the arterial arrangement-patterns prepared.

MATERIALS

Suborder CHARADRII

Family Charadriidae

Belonopterus chilensis lampronotus (Wagler) (CNHM #106097).

Suborder LARI

Family Laridae

Rissa tridactyla pollicaris Ridgway (USNM #81523).

Suborder ALCAE

Family Alcidae

Uria aalge inornata Salomonsen (USNM #81379).

Synthliborhampus antiquus (Gmelin) (USNM Nos. 81608, 81707, 18317 to 18321 incl.)

Synthliborhampus wumizusume (Temminck) (USNM #87266 & 87267).

Aethia cristatella (Pallas) (USNM #18313).

Cyclorhynchus psittacula (Pallas) (USNM #18314 & 18315).

OBSERVATIONS

The arterial arrangement-pattern of *Belonopterus chilensis lampronotus* is almost identical with that of *Charadrius vociferus vociferus* (Oxyechus v. vociferus) (Glenny, 1947) except that the origin of the sterno-tracheal artery could be determined in *Belonopterus* where it arises as a branch of the coracoid major artery; no vestigial right ligamentum botalli could be accurately located; origin of the left vertebral artery was separate from, but close to the base of, the superficial cervical artery (comes nervi vagi) which gives rise to an accessory oesophageal artery.

Rissa tridactyla pollicaris is similar to *Larus argentatus* (Glenny, 1947) in basic arrangement, but differs in the following respects: the right ligamentum botalli is short, the proximal portion becoming completely atrophied; the sterno-tracheal artery arises as a branch of the coracoid major artery; the superficial cervical arteries (comes nervi vagi) arise separately (not in common with the vertebrales) from the common carotid arteries.

Uria aalge inornata follows the basic ordinal pattern of the Charadriiformes (Glenny, 1948). The superficial cervical and vertebral arteries arise separately

¹Contributions from the Blue Sea Lake Biological Laboratory, Messines, P. Q., Canada.

from the common carotid arteries. An accessory oesophageal artery arises as a branch of the left common carotid. The ligamentum aortae is present, although the right ligamentum botalli appears to be entirely lacking.

Except for the accessory oesophageal artery, which appears to be absent, the arrangement-pattern of *Synthliborhamphus wumizusume* is like that of *Uria aalge inornata* (above).

Basically, *Synthliborhamphus antiquus* is like that of *S. wumizusume* and *Uria aalge inornata*, except that in one type (bicarotidinae) (USNM #18317 & 18318) an accessory superficial cervical artery was observed to arise in common with the left vertebral artery (Glenny, 1952). The ligamentum botalli appeared to be completely lacking in this species. A second type of arrangement (laevo-carotidinae) (fig. 2, Glenny, 1952) was observed in five specimens (USNM #s 81608, 81707, 18319-18321). In these specimens, the basic ordinal pattern—as seen in *S. wumizusume*—was characteristic except for the very singular fact that the right internal carotid trunk was lacking. The embryonic connection of the right third aortic arch with the anterior dorsal radix of the right side had become lost, and the ventral portion of this arch became functionally modified as an accessory vertebral artery—passing dorsally and anteriorly just anterior to the normal vertebral artery (in the region of the brachial plexus). Such a functional modification differs somewhat from that, of this same structure, in *Tockus alboterminatus alboterminatus* (Buttikofer) (*Lophoceros melanoleucos alboterminatus*) (Glenny, 1943) wherein the vessel in question comes to serve the ventro-cervical muscles at the base of the hypapophysial canal.

Cyclorrhynchus psittacula differs from the Alcidae included in this study in that the vertebral and superficial cervical arteries have a common origin from the common carotid artery, an accessory oesophageal artery arises as a branch of the left common carotid, a coracoid minor artery is found in addition to and just lateral to the coracoid major artery, only the proximal portion of the right ligamentum botalli could be found as it maintains its proximal connection with the pulmonary artery, and finally the left radix aortae was found to be patent and functional (several small twigs were observed branching from the radix in much the same manner as was reported in *Ceryle alcyon*) (Glenny, 1939, 1943) with a terminal ligamentous portion attached to the left pulmonary artery.

The arterial arrangement-pattern in *Aethia cristatella* is very similar to that of *Cyclorrhynchus psittacula* except that the common origin of the superficial cervical and vertebral arteries is not so pronounced or may be separate, and the ligamentum botalli is lacking. Both the coracoid major and minor arteries were present.

DISCUSSION

While the Charadriiformes are fundamentally bicarotid as pointed out by Garrod (1873), Beddard (1898), and Glenny (1947, 1948), it may be observed that this condition may be altered in cases such as has been observed in *Synthliborhamphus antiquus*.

Bremer (1928) has shown that the normal loss of the left fourth aortic arch in the chick is due chiefly to mechanical forces. It may well be reasoned that some of the functional modifications, along with the atrophy or complete loss of certain of the embryonic vessels or their derivatives may be due in large part to some, as yet unexplained, mechanical force or forces. These may be inherent characters which have become reasonably well established within a strain which might develop under conditions of "breeding-site isolation" such as may occur in the Aleutians and other islands along the coast of Alaska. Such may be the case in the instance of *Synthliborhamphus antiquus* as reported in this paper.

In general, the Alcidae show a high degree of similarity in their arterial arrangement-patterns. Furthermore, while some differences are found in the

several suborders and families, the basic ordinal arrangement holds, except in very special instances.

Atrophic gradients appear to function at different levels in different species, and the level of atrophy of any vessel is not to be regarded as characteristic of either a suborder or family, but rather more as a specific characteristic.

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