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## BILATERAL OVARIES IN RAPTORIAL BIRDS, WITH NOTES ON KIDNEY STRUCTURE

F. L. FITZPATRICK

### OVARIES

Zoölogical text-books generally state that right and left ovaries develop in the embryonic bird, but that only the left ovary persists in the majority of adults. Elliott Coues,<sup>1</sup> among the earlier writers, has vouched for this statement, and adds that:

“A bird’s oviduct is the strict morphological homologue of the mammal’s fallopian tube, uterus and vagina — more accurately, of one fallopian tube, one half of a uterus, and one half of a vagina; for the uterus and vagina of a mammal result from the union of both Mullerian ducts; whereas in a bird only one — the left usually — is normally developed.”

Hans Kummerlöwe<sup>2</sup> has added very comprehensive information on the foregoing subject, with special reference to the house sparrow (*Passer domesticus*) and the pigeon (*Columba livia domestica*).

The interest of the writer has not been centered on species which may be said to follow the rule of development, but rather the species that are exceptional, and exhibit bilateral development of the ovaries in the adult condition; also in separating those species which exhibit adult bilateral development of the ovaries from those species which do not. Incidentally, certain anatomical details have been noted, which are at variance with existing descriptions and drawings of corresponding structures in other species.

Thomson<sup>3</sup> cites the work of Max Kollman (1919), who reported bilateral ovaries in four cases of the sparrow hawk (*Accipiter nisus*),<sup>4</sup> one case of the gos-hawk (*Astur palumbarius*), and one case of the kestrel (*Tinnunculus tinnunculus*). Kollman states that the right oviduct remained vestigial in these cases. Thomson also cites Chappellier who reported a “duck” having bilateral development of both ovaries and oviducts.

<sup>1</sup> Coues, Elliot. Key to North American birds: 221 and 226. 1903.

<sup>2</sup> Kummerlöwe, Hans. Vergleichende untersuchungen über das gonadensystem weiblicher vögel. Zeitschr. für Mikr.-anatom. Forschung. 21. Bd. 1./3. Heft. and 22. Bd. 1./3. Heft. 1930.

<sup>3</sup> Thomson, J. A. The biology of birds: 245. 1923.

<sup>4</sup> Kollman, Max. Die oviducte der raptorialen vögel. J. Ornith. 67. 1919.

Snyder<sup>5</sup> has recently reported bilateral development of the ovaries in one specimen of the marsh hawk (*Circus hudsonicus*), and quotes Dr. Alexander Wetmore as saying that — “this condition is known to be of regular occurrence in some forms of Hawks, particularly the female Sharp-shinned Hawk among American species.”

The writer recently reported bilateral development of the ovaries in two specimens of Cooper's hawk (*Accipiter cooperi*).<sup>6</sup> In each of these cases the right oviduct had become vestigial previous to the adult stage.

More recently two specimens of the female red-tailed hawk (*Buteo b. borealis*) have been examined. In one case there was clearly but one ovary, the left. In the case of the second specimen, however, there was a definite vestige of a right ovary, consisting of twenty-three follicles. It was at once suspected that this might be an immature bird; that the vestigial right ovary might be characteristically present after hatching and be lost at a later stage in development. But a re-examination of the bird skin proved beyond a doubt that the specimen was in adult plumage. There remain the possibilities that the vestigial right ovary persists to be lost *during* adult life, or that its presence or absence may vary with the individual.

A number of individuals from other species have been examined in an effort to locate instances where bilateral ovaries occur in the adult. The following exhibited clear cases of unilateral development:

- One great horned owl (*Bubo v. virginianus*).
- One red-shouldered hawk (*Buteo l. lineatus*).
- One screech owl (*Otus asio*).
- Two snowy owls (*Nyctea nyctea*).
- One turkey vulture (*Cathartes aura septentrionalis*).

It seems apparent that bilateral ovaries are characteristic adult structures in some species of raptorial birds. Since the evolutionary tendency has no doubt been from bilateral development to unilateral development, we have here an indication as to which species have diverged most from the ancestral type. Further data is in the process of compilation and should be interesting in relation to this problem.

It also is interesting to note that two species as similar in external appearance as *A. cooperi* and *A. velox* are reported to agree

<sup>5</sup> Snyder, L. L. Double ovaries in *Circus hudsonicus*. Auk, N.S. 45:98. 1928.

<sup>6</sup> Fitzpatrick, F. L. Bilateral ovaries in Cooper's hawk, with notes on kidney structure. Anat. Rec. 46, 4: 381. 1930.

in the possession of bilateral ovaries. Internal structures are notoriously less prone to change than external structures. Therefore, they usually are regarded as being more reliable criteria for the establishment of taxonomic relationships. It appears that in the above case external structure and internal structure tell the same story, the latter insofar as the urinogenital system is concerned. It might be questioned whether or not this is true in all cases.

#### KIDNEY STRUCTURE AND CIRCULATORY CONNECTIONS

In a previous article some comment relative to variation in kidney structure was made. It was set forth that the lobes of the raptorial bird's kidney are characteristically unequal in size, the anterior lobe being the largest. This situation obtains in all species examined to date, and the typical situation among hawks and owls appears to be represented by a three-lobed kidney. In *Cathartes aura septentrionalis*, however, the kidney has a four-lobed structure, or perhaps it might be said that the middle or posterior lobes are re-divided.

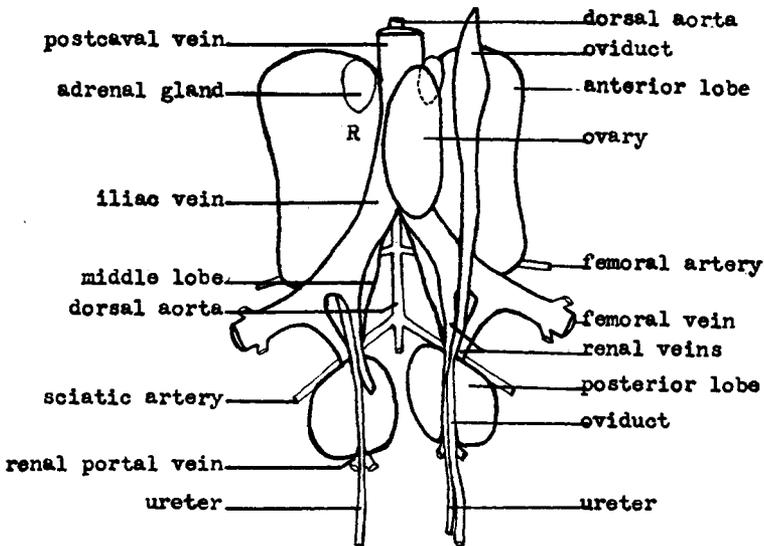


Fig. 1. Urinogenital organs and circulatory connections in the snowy owl (*Nyctea nyctea*), ventral aspect. The renal arteries (one pair) are given off at the level marked by the letter R; they extend directly into the anterior lobes of the kidneys.

The accompanying illustration of the urinogenital organs and the circulatory connections in the snowy owl (*Nyctea nyctea*) is selected because it is more or less typical of the majority of cases. Each kidney is composed of three lobes, the anterior lobe being much the largest. Ureters appear on the ventral surfaces of the

kidneys and extend posteriorly to the urodaeum. The left ovary and the left oviduct are present, the latter connecting with the urodaeum. The dorsal aorta gives off three pairs of branches at the level of the kidneys. The renal arteries are not shown in the drawing but their position is indicated. The femoral arteries pass behind the kidneys, and the sciatic arteries pass between the middle lobes and the posterior lobes of the kidneys. Renal portal veins establish connections on the dorsal surfaces of the posterior lobes (kidneys). On each side two large renal veins join the femoral vein and smaller branches to form the iliac veins. The latter receive some connections from the anterior lobes of the kidneys. These connections are not illustrated in the drawing; they also would no doubt qualify as renal veins.

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