

Although Bond (Birds of the West Indies, Houghton Mifflin, Co., 1961) lists the species as a vagrant to the West Indies, he notes that the list includes species which may be very rare winter residents or transients. In view of the increasing number of observations of Lincoln's Sparrows in the West Indies it seems not unlikely that the species winters regularly in small numbers in the highlands of Jamaica.

I wish to thank James Bond for criticizing the manuscript, and C. Bernard Lewis and Geoffrey Carleton as well as Bond for providing me with the details on their observations or specimens.—MICHAEL GOCHFELD, *RFD 1 Lexington Avenue, Mohegan Lake, New York 10547, 2 December 1967.*

**Appendicular myology of passerine birds.**—In recent years a notable renewed interest in the anatomy and taxonomy of passerine birds has occurred. However, the literature contains no concise statement of our present knowledge of the presence or absence of appendicular muscles among the many families of the Passeriformes (e.g., George and Berger, 1966, did not include such a summary). This summary of our current knowledge of the differences found among representatives of passerine families is presented in order to facilitate the work of students and in order to emphasize how little still is known about the appendicular myology of passerine birds.

*The wing muscles:*

The distal head of *M. extensor indicis longus*, the biceps slip, and *Mm. latissimus dorsi pars metapatagialis*, *anconaeus coracoideus*, *entepicondyloulnaris*, *extensor pollicis brevis*, and *flexor pollicis* are absent in all passerine birds thus far examined.

*M. latissimus dorsi pars posterior* is absent in *Fregilupus varius* (Sturnidae?), *Artamella viridis* (Vangidae), *Agelaius phoeniceus* (Icteridae), *Dendroica kirtlandii* (Parulidae), and in all members of the Ploceidae and Fringillidae thus far investigated (George and Berger, 1966:293). By contrast, *pars posterior* has been found in *Procnias nudicollis* (Cotingidae), *Paradisaea rubra* (Paradisaeidae), in *Sturnus* and *Aplonis* (Sturnidae), and in all genera of the Corvidae studied (Berger, 1956a, b, 1957; Hudson and Lanzillotti, 1955). A fully-developed *M. latissimus dorsi pars metapatagialis* has not been reported in any genus of passerine bird.

*M. coracobrachialis anterior* definitely is absent in *Agelaius phoeniceus* and in *Dendroica kirtlandii*. The muscle apparently is present, although weakly developed, in all other passerine birds studied. Histological examination may be necessary to determine the presence or absence of this muscle in small passerine birds.

*M. abductor indicis* is absent in *Dendroica kirtlandii*, *Agelaius phoeniceus*, *Spizella arborea*, and, according to Swinebroad (1954), in *Passer domesticus*, *Richmondia cardinalis*, *Zonotrichia albicollis*, and *Melospiza melodia*. The muscle is present but vestigial in development in other passerine birds (George and Berger, 1966:376).

*M. ulnometacarpalis dorsalis* (flexor metacarpi posterior) is absent in *Dendroica kirtlandii*, *Agelaius phoeniceus*, and *Spizella arborea*. The muscle is weakly developed in other passerine birds.

*M. pectoralis proapatagialis brevis* apparently is represented by an aponeurosis or tendinous band in all passerine birds studied. *M. pectoralis proapatagialis longus* consists of a fleshy belly in *Sturnus*, *Aplonis*, *Fregilupus*, and *Dendroica* (in *Dendroica*, however, the belly is vestigial and inconstant in occurrence); so far as we know, the muscle is represented by a tendon or aponeurosis in other passerine birds.

*M. tensor patagii brevis* is much larger than *M. tensor patagii longus* in passerine birds. In most of these the two muscles are independent throughout their course, but the two muscles share at least part of a common origin in certain genera: e.g., Corvidae,

*Fregilupus*, *Sturnus*, *Aplonis*, *Artamella*, and *Agelaius*. The statement in George and Berger (1966:318) that the two tensor patagii muscles are represented by a single belly in *Spizella arborea* should be verified.

A tendinous scapular anchor extends between the posterior margin of the posterior head of *M. deltoideus major* and the blade of the scapula in *Procnias*, the Corvidae, *Sturnus*, *Aplonis*, *Artamella*, and *Dendroica*. The scapular anchor apparently is absent in other passerine species studied, although an investigator unaware of this structure might easily remove it inadvertently in the course of dissection.

*M. deltoideus minor* consists of a single belly (pars dorsalis) in most birds, but there are two bellies in *Agelaius phoeniceus* (George and Berger, 1966:325). This appears to be the only passerine species thus far investigated in which two bellies have been reported.

It seems likely that a common pattern of insertion of *M. biceps brachii* exists in most, if not all, passerine birds: that is, the common tendon of the muscle bifurcates, with the bulk of the tendon inserting on the ulna but with a small tendon inserting on the radius.

*Dendroica kirtlandii* and *Agelaius phoeniceus* appear to differ from other passerine species studied in detail in possessing a double origin of *M. pronator profundus*: that is, a typical tendinous origin from the distal end of the humerus and, in addition, an unusual fleshy head from the humeroulnar pulley. Swinebroad's description of the origin of this muscle in *Passer domesticus* and several fringillid genera, however, suggests that a similar pattern of origin may be found in these birds.

*Dendroica kirtlandii* appears to differ from other passerine species studied in that *M. ulnometacarpalis ventralis* has both a proximal and a distal head (not merely a V-shaped origin as in *Agelaius phoeniceus*, George and Berger, 1966:356).

In most species of passerine birds studied, *M. extensor pollicis longus* has a single head arising from the ulna only. In *Paradisaea rubra*, however, the single head arises only from the radius (Berger, 1956b). Two heads and two independent tendons of insertion are found in *Artamella viridis*; the two heads arise, respectively, from the radius and the ulna (Berger, 1957).

#### *The hind limb muscles:*

The leg-muscle formula for all passerine birds thus far studied is ACEFXY (George and Berger, 1966:236). The following formulae muscles, therefore, are absent in all passerine birds studied: piriformis pars iliofemoralis (B), gluteus medius et minimus (D), popliteus (G), ambiens (Am), and also the vinculum (V) between the tendons of insertion of *Mm. flexor perforatus digiti III* and *flexor perforans et perforatus digiti III*.

*M. sartorius* has two heads of origin in *Fregilupus varius* and in *Paradisaea rubra*. The muscle arises by a single head in all other passerine species thus far studied.

The postacetabular portion of *M. iliotibialis* is absent in the Tyrannidae and the Hirundinidae (Hudson, 1937). In all other passerine birds studied, *M. iliotibialis* consists of preacetabular, acetabular, and postacetabular portions.

An investigation is needed on the presence or absence of a deep distal head of *M. femorotibialis externus* among passerine birds. The deep distal head has been described for *Sturnus*, *Aplonis*, *Fregilupus*, *Artamella*, *Agelaius*, and *Dendroica* (Berger, 1957; George and Berger, 1966:394-395). A distal head was not described in the passerine species studied by Hudson (1937) or Stallcup (1954).

*M. femorotibialis internus* consists of two independent bellies and tendons of insertion in *Dendroica kirtlandii*, *Agelaius phoeniceus*, and *Fregilupus varius*. *Paradisaea*

*rubra* has a single belly but two tendons of insertion. *Artamella viridis*, *Sturnus vulgaris*, and *Aplonis tabuensis* have a single belly and tendon of insertion. Hudson (1937) and Stallcup (1954) refer to slight divisions (into two parts) of the belly of *M. femorotibialis internus* in *Corvus*, *Pipilo*, and certain other passerine genera.

*M. obturator externus* consists of two independent bellies in *Procnias*, *Paradisaea*, *Artamella*, *Fregilupus*, *Sturnus*, *Aplonis*, *Vireo*, *Seiurus*, *Dendroica*, *Icterus*, *Agelaius*, *Molothrus*, *Piranga*, and several genera of fringillids studied by Stallcup (1954). Hudson (1937:27-28) also refers to two heads, "which unite before inserting," in *Tyrannus* and *Corvus*. Stallcup pointed out that *M. obturator externus* consists of a single head in *Passer*, *Estrilda*, *Poephila*, *Hesperiphona*, *Carpodacus*, *Pinicola*, *Leucosticte*, *Spinus*, and *Loxia* (that is, in ploceids and cardueline finches).

Additional comparative studies on the structure of *M. gastrocnemius pars interna* among passerine birds are needed. Stallcup referred to an "undivided" *pars interna* in ploceids and cardueline finches and to a "bipartite" structure in the other species he dissected. Whether or not an origin from the patellar ligament represents Stallcup's "bipartite" condition I do not know.

The tendon of *M. extensor digitorum longus* apparently passes under a bony bridge (supratendinal bridge or intermalleolar loop) near the distal end of the tibiotarsus in all passerine birds. The tendon also passes through a bony canal on the proximal end of the tarsometatarsus in *Procnias*, *Tyrannus*, *Corvus*, *Paradisaea*, *Artamella*, *Dendroica*, *Agelaius*, and apparently in all species studied by Stallcup (1954). The tendon of *M. extensor digitorum longus* is held in place by a ligament (rather than a bony canal) on the proximal end of the tarsometatarsus in *Fregilupus*, *Sturnus*, and *Aplonis* (Berger, 1957). Whether the bony canal or the ligament on the tarsometatarsus are constant characters for each species or whether they are, in part, a function of age is not known.

Hudson (1937:43) reported that *M. flexor perforatus digiti IV* arises by two heads (a typical head from the intercondyloid region of the femur, plus a lateral head) in *Tyrannus*. So far as can be determined from the literature, this muscle has a single origin from only the intercondyloid region in all other passerine birds.

There appears to be considerable interspecific variation (of unknown taxonomic significance) in the precise relationships between the origin of *M. flexor perforatus digiti II* and other toe muscles (see Hudson, 1937; Stallcup, 1954; George and Berger, 1966:440).

The tendon of insertion of *M. flexor perforatus digiti II* is *not* perforated by the tendons of *M. flexor perforans et perforatus digiti II* or *M. flexor digitorum longus* in *Paradisaea rubra*, *Fregilupus varius*, *Sturnus vulgaris*, *Aplonis tabuensis*, *Artamella viridis*, *Dendroica kirtlandii*, and *Agelaius phoeniceus*. The tendon of *M. flexor perforatus digiti II* presumably is perforated by both of the two deeper tendons in the species studied by Hudson and Stallcup.

George and Berger (1966:444) pointed out that *Vireo olivaceus* is the only passerine species known to have a *M. flexor hallucis longus* arising by a single head (from the intercondyloid area of the femur). *Dendroica kirtlandii* and *Agelaius phoeniceus* are the only known passerine species in which the muscle arises by three distinct heads. The muscle has two heads in all other species studied.

*M. flexor digitorum longus* arises from the femur and the tibiotarsus in *Tyrannus*, *Corvus*, and *Paradisaea*. A femoral origin has not been described in other passerine birds.

*M. flexor hallucis brevis* is absent in *Fregilupus*, *Sturnus*, *Aplonis*, and *Dendroica*. *M. flexor hallucis brevis* is present in the Corvidae, *Tyrannus*, *Paradisaea*, *Artamella*, *Agelaius*, and, presumably, in all of the genera studied by Stallcup (1954).

*M. extensor brevis digiti IV* apparently has been described for only one species of passerine bird, *Procnias nudicollis* (Cotingidae; George and Berger, 1966:462).

The remaining short toe muscles are so tiny in most passerine birds that a thorough study involving histological techniques is needed. Not enough detailed and accurate information is in the literature to justify a tabulation of the occurrence of the muscles. Hudson (1937:75) considered *M. abductor digiti IV* to be rudimentary in *Tyrannus* and *Corvus*, as did Berger (1957) for *Fregilupus*. Stallcup (1954:174) commented that the muscle was "extremely small, delicate and difficult to demonstrate." Stallcup also described *M. lumbricalis* as being "semitendinous throughout its length." No other author has identified *M. lumbricalis* in passerine birds.

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23 February 1968.