LA JEUNESSE, H. V. 1923. Dwarf Cowbirds nesting in Alameda County, California. Condor, 35: 31–32.

MILLER, A. H. 1935. Further comments on the cowbirds of the San Francisco Bay Region. Condor, 37: 217–218.

RALPH, C. J., AND C. A. PEARSON. 1971. Correlation of age, size of territory, plumage, and breeding success in White-crowned Sparrows. Condor, 73: 77–80.

LUIS FELIPE BAPTISTA, *Museum of Vertebrate Zoology and Department of Zoology, University of California, Berkeley, California 94720.* Accepted 28 Sep. 71.

Two bird specimens showing abnormalities of the quadrate.—Many functional studies of skull kinetics in birds have considered such safety factors as protraction or retraction stops and distribution of muscle stresses, but I know of no reported cases of injury resulting from mechanical failure of elements of the kinetic apparatus. This paper describes two deformities that appear to have arisen in this way.

The first came to my notice while examining skulls of Ardeidae in the collection of the British Museum (Natural History). The specimen is one of a Rufescent Tiger-Heron, *Tigrisoma lineatum*, Registered No. 1865.12.8.39, purchased from the Zoological Society. The deformity is shown by the orbital process of the right quadrate (Figure 1). The distal half of the process (normally straight) is bent downward at an angle of about 50° to the rest. Its orientation is also somewhat changed, so that its medial edge is tilted nearer to the vertical plane than in the normal left quadrate. In size and form, the bent portion is similar to its normal equivalent on the left, but somewhat thinner where it meets the unaltered proximal half. The only other indication of injury to the skull is a shallow depression on the dorsal surface of the upper jaw near the anterior end of the bony nostrils. The depression crosses the jaw obliquely, being more distal on the left, and the bony nostrils are of slightly different shape on the two sides. Apart from this irregularity and the deformed right quadrate, the skull, jaws, and indeed the rest of the skeleton appear normal.

The second case is particularly surprising because it involves total breakage. The specimen is a Black-necked Araçari, *Pteroglossus aracari*, preserved in alcohol, Registration No. 1898.9.30.1. The abnormality (Figure 2) was discovered in the

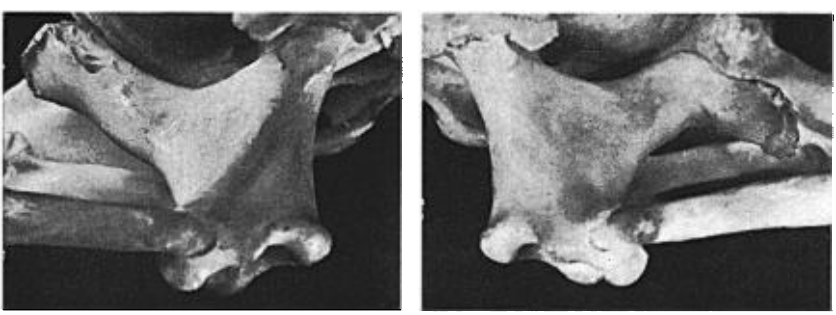

Figure. 1. Dorsolateral view of normal (left) and deformed quadrates of *Tigrisoma lineatum*. The slight damage at the tip of the left orbital process is an artifact of preparation.

course of examinations of jaw musculature, and was at once evident from the extraordinary condition of the left M. pseudotemporalis profundus. This muscle is normally attached at one end to most of the dorsal surface of the orbital process and part of the body of the quadrate; and at the other to a wide area on the medial surface of the lower jaw. It acts both as a jaw adductor and a palate retractor. On the deformed side in this specimen M. pseudotemporalis profundus instead consisted of several portions, as follows: (a) A fleshy lump near the area of attachment to the lower jaw, in which was embedded a small nodule of bone. (b) A narrow band of fibers running alongside the medial edge of M. adductor mandibulae externus, and fused with it posteriorly. (c) A median band of fibers running to an aponeurosis situated roughly in the region normally occupied by the distal tip of the orbital process of the quadrate. This aponeurosis had branches attached to M. pterygoideus dorsalis medialis, M. protractor, and to a much abbreviated orbital process concealed under M. pseudotemporalis superficialis.

Further dissection showed that the greater part of the orbital process was missing. The nodule of bone embedded in the anterior part of the muscle thus

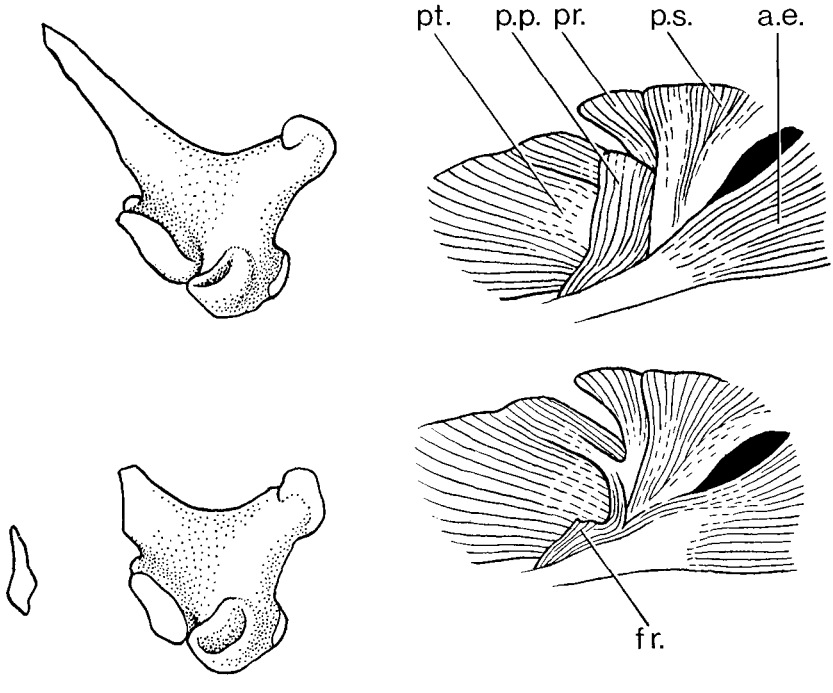

Figure 2. Top: normal (right) quadrate and jaw musculature; bottom: deformed (left) quadrate and musculature of *Pteroglossus aracari*. Right sides are drawn reversed for comparison. Bony fragment found within left M. pseudotemporalis profundus is shown beside the left quadrate. Key: a.e., M. adductor mandibulae externus; fr., site of bony fragment; p.p., M. pseudotemporalis profundus; pr., M. protractor; p.s., M. pseudotemporalis superficialis; pt., M. pterygoideus.

presumably represented the detached portion; it was smaller in size than the missing piece, some resorption having evidently taken place. The jaw musculature and quadrate from each side are illustrated in Figure 2. The rest of the skull and its musculature are entirely normal and undamaged, but the rhamphotheca of the bill is faulted near the tip, suggesting damage to the bill at some time in the past.

In the Tiger Bittern, the deformity clearly arose after the bird had attained full size, as the displaced part of the right quadrate is similar in size to its undamaged equivalent on the left. The sharp angle in the misshapen orbital process suggests that the cause of this abnormality was a single incident resulting in a fracture that subsequently healed in a deformed shape, rather than a bend developed over a period of time.

The abnormality in the araçari from its drastic nature, almost certainly relates to a single incident. This again probably occurred after full size had been reached, as the left quadrate was normal in size and shape apart from the absence of the orbital process. This bird was also fully healed, and both the araçari and Tiger Bittern must have lived for some time after their injuries.

In both specimens, there is a complete absence of any damage in the orbital region other than that to the quadrate (and its musculature in the araçari). This appears to rule out the possibility of any external force acting directly on the orbital process. In both cases, the only possible agency that seems capable of causing these injuries is M. pseudotemporalis profundus itself. In *Tigrisoma* and *Pteroglossus*, as in the great majority of birds, the orbital process is well-developed, and because of its length, the medial fibers of M. pseudotemporalis profundus must frequently exert a considerable bending moment at its tip. This stress may normally be reduced by the synergic action of M. protractor, part of which, in most birds, is attached to the medial surface of the orbital process. The action of the more lateral fibers of M. pseudotemporalis profundus and of M. adductor posterior (attached to the quadrate body) would also help to distribute stresses along the orbital process. In any case, breakage could not occur during the closing of the jaws, but only as a result of isometric contraction, which would normally be used to grip an object held in the jaws.

The precise nature of the events causing the injury is a matter for speculation and may well have been different in the two cases. One possibility is that an object slipped from the grasp of the bill while a very strong grip was being applied. In these circumstances, a strong contraction of M. pseudotemporalis profundus might for a moment be insufficiently compensated by other forces. The fact that in each case the orbital process failed on only one side may indicate that asymmetrical forces were involved; perhaps the grip of the bill was combined with a twisting action of the whole head. This is also suggested by the oblique form of the depression on the upper jaw of the Tiger Bittern, which may have been due to an injury simultaneous with that to the quadrate. The damage to the rhamphotheca of the araçari is more or less symmetrical, but may also have occurred at the time the quadrate was damaged.

The fact that both birds were presented by the Zoological Society (and hence almost certainly captive individuals) raises the question whether a defect in calcium metabolism of dietary origin may have been involved. However the rest of the skeletons show no sign of any other abnormalities that might suggest this. The occurrence of a rather similar injury to the hyoid skeleton of a wild Lapwing, *Vanellus vanellus* (Burton, Bull. Brit. Ornithol. Club, 89: 134, 1969) indicates that

such mishaps need not be confined to aviary birds. As these deformities could be discovered only by dissection, many others must go undetected, and injuries of this type may be commoner than might at first be supposed.—P. J. K. BURTON, *Bird Section, British Museum (Natural History), London, England.* Accepted 12 Oct. 71.

Palm Warbler in Guerrero and comments on Audubon's Warbler in Costa Rica.—Outside of the Yucatan Peninsula and its adjacent islands, the Palm Warbler (*Dendroica palmarum*) is known in Mexico only as a vagrant to Baja California (Moore, *in* Miller et al., Pacific Coast Avifauna 33: 255, 1957) and Oaxaca (Lowery and Monroe, *in* Check-list of birds of the world, vol. 14 [R. A. Paynter, Jr., Ed.], Cambridge, Massachusetts, Mus. Comp. Zool., 1968, p. 32). An additional occurrence is of a female (DMNH 8133) taken at Iguala, Guerrero, on 28 November 1948, by the late W. W. Brown. The specimen, apparently an immature, lacks all but traces of yellow on the venter (exclusive of the crissum) and is therefore assigned to the nominate race.

The only specimens of Audubon's Warbler (*Dendroica coronata auduboni*) reported south of Honduras are those detailed from Costa Rica by Slud (Bull. Amer. Mus. Nat. Hist., 128: 323, 1964). F. C. Lincoln supplied the records to Slud from files of the United States Fish and Wildlife Service. According to Chandler S. Robbins (pers. comm.), there are two cards in those files listing dates and Costa Rican localities for A.O.U. species number 656 (Audubon's Warbler), each stamped that the data were taken from the catalog of the United States National Museum, and each with Lincoln's penciled notation, "*Dendroica auduboni.*" The data on the cards are as follows: San Jose, Costa Rica, 22 August and 22 September 1864; Barranca, Costa Rica, 15 and 30 March; 20, 29, and 30 September; and 4 October 1865.

I have searched the United States National Museum vainly for Costa Rican specimens of Audubon's Warbler or any of the related Myrtle Warbler (*D. c. coronata*) with the above data. My examination of appropriate catalog volumes also has been negative, as no reference is made to either of the above forms in the listing of Costa Rican material taken in 1864 and 1865. From these findings I surmise that some clerical error was made in transcribing data for the Fish and Wildlife files, but the exact determination of what transpired is not a simple matter.

The United States National Museum catalog volumes containing the 1864 and 1865 Costa Rican specimens show many blanks in the identification of specimens, and no single species is listed with all eight of the above dates and localities. Among warblers there is one species listed for two of them, that being the following *Dendroica blackburniae* (=*fusca*) collected by F. Carmiol: USNM 35223, ♀ San Jose, 22 August 1864 (exchanged cf. catolog); USNM 41294, ♂ Barranca, 29 September 1865 (in collection in 1971).

On the basis of these two specimens, one is tempted to assume that all of the purported *D. c. auduboni* from Costa Rica are actually *D. fusca.* However, there are no other *D. fusca* in the United States National Museum collection with the data supplied by Lincoln, so that assumption may not be correct. In fact, in the absence of additional *D. fusca* material some may be tempted to believe that the records do indeed refer to *D. c. auduboni* and that the specimens have all been lost or exchanged. There are a number of reasons for not accepting this premise, including the fact Ridgway and other earlier workers do not cite the purported