

Zoological Nomenclature we select *Bradypterus* as the correct original spelling of the generic name that Swainson erected for his species *platyurus* (= *Sylvia baboecala* Vieillot, 1817), since this is the form almost universally used, and despite its inappropriateness and publication in an index.

We are obliged to Mr. R. V. Melville, Secretary to the International Commission on Zoological Nomenclature, for advice on how to proceed in this case.

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The interorbital septum in cardueline finches

by R. L. Zusi

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The Carduelinae (*sensu* Howell, Paynter & Rand *in* Peters 1968) are a well-defined group of finches that differ from other finches in various aspects of their anatomy and behaviour (for discussion and references see Mayr *et al.* 1956, Ziswiler 1965, Ackermann 1967). Some of the genera presently included in the Carduelinae have been little studied and are placed in that subfamily because of their external similarity to better-known carduelines, or because of their geographical distribution. This paper deals with the interorbital septum of the skull as a clue to the relationships of some controversial genera. Because the septum can be seen in most museum skins by removal of cotton from the eye or by radiographs, it can be studied in species for which anatomical specimens are not available.

The conformation of the interorbital septum in species known to be cardueline differs consistently from that in conical-billed species known to be non-cardueline. To evaluate species of controversial affinity I have assumed that those with the cardueline type of septum belong in that subfamily, or within another group derived from the Carduelinae. Use of a single character for tentative taxonomic conclusions is here justified by the apparent consistency of the character and by the lack of other strong evidence for some species.

For this study I have examined skeletons of heavy-billed or broad-billed forms in a wide variety of passerine families and subfamilies, including the Thraupinae, Tersiinae, and Icteridae, and most of the genera (from Peters 1962, 1968, 1970) of the following (the number of genera *not* studied is given after each taxon): Emberizinae (-17), Catamblyrhynchinae (-0), Cardinalinae (-2), Drepanididae (-5), Fringillinae (-0), Carduelinae (-0), Estrildidae (-9), Viduinae (-0), Bupalornithinae (-0), Passerinae (-2), Ploceinae (-1). I use the word "finch" broadly to include conical-billed members of these groups.

The interorbital septum is the median partition lying between the eyes, extending from the brain case forward to the ectethmoid bones. In most finches there is a fenestra in the anterior cranial wall above each optic foramen. When the bony septum is complete, these cranial fenestrae are

restricted to the cranial wall and there is no opening in the septum; this is the condition found in all Carduelinae and in some members of the Emberizinae, Cardinalinae, Drepanididae, Estrildidae and Ploceidae. In the Fringillinae, Icteridae, Thraupinae, and some members of the other groups (except Carduelinae) the bony septum is incomplete because of forward intrusion of

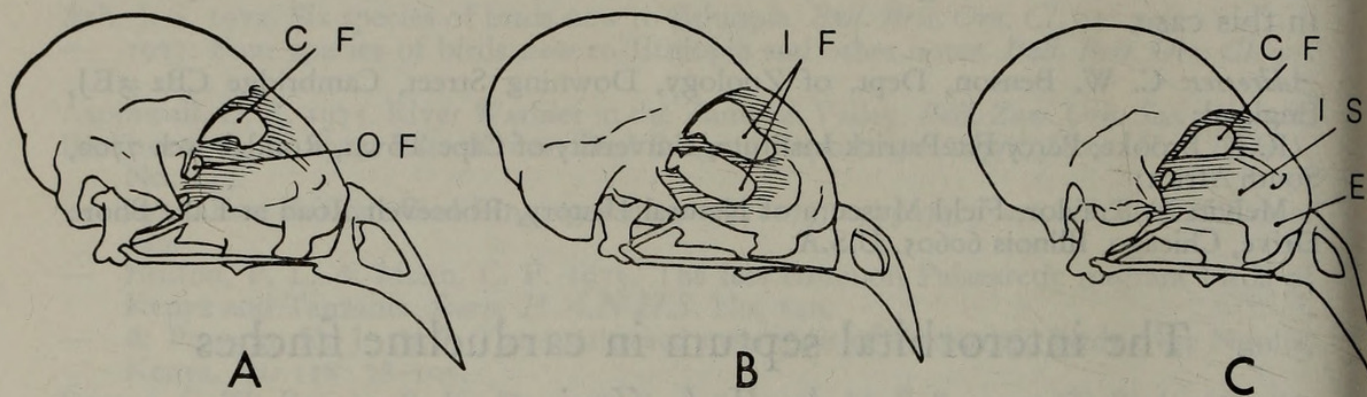


Figure 1. Skulls of finches showing differences in interorbital septa. A, *Passer domesticus*; B, *Spizella pusilla*; C, *Carduelis tristis*. CF, cranial fenestra; E, ectethmoid; IF, interorbital fenestra; OF, optic foramen; IS, interorbital septum.

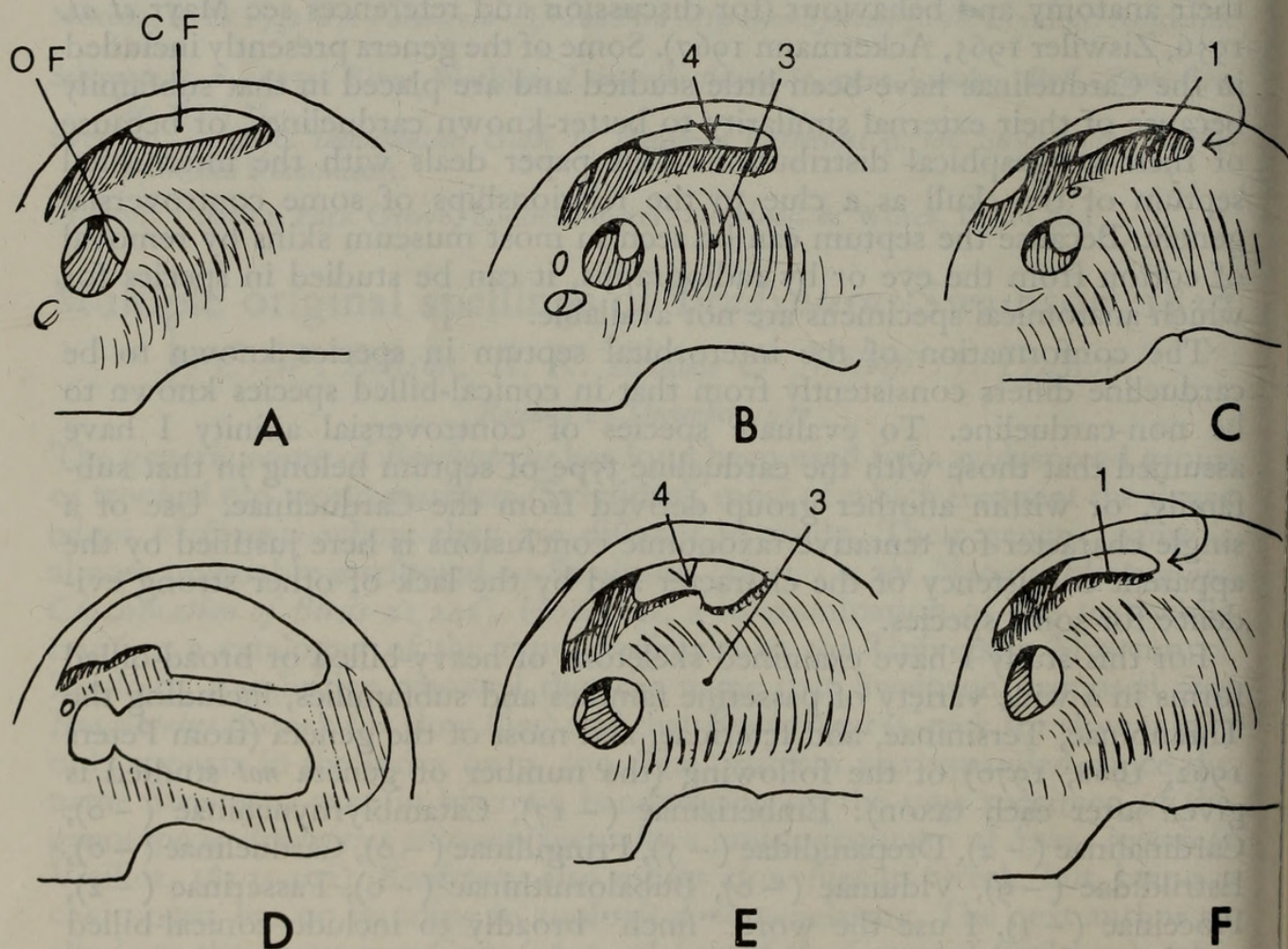


Figure 2. Anterodorsolateral views of interorbital septa of various finches drawn to similar size. A, *Carduelis tristis*; B, *Carpodacus purpureus*; C, *Coccothraustes vespertinus*; D, *Spizella pusilla*; E, *Passer domesticus*; F, *Cardinalis cardinalis*. Each skull above is of similar actual size to the skull directly below. Numbers 1, 3 and 4 illustrate features described in text. GF, cranial fenestra; OF, optic foramen.

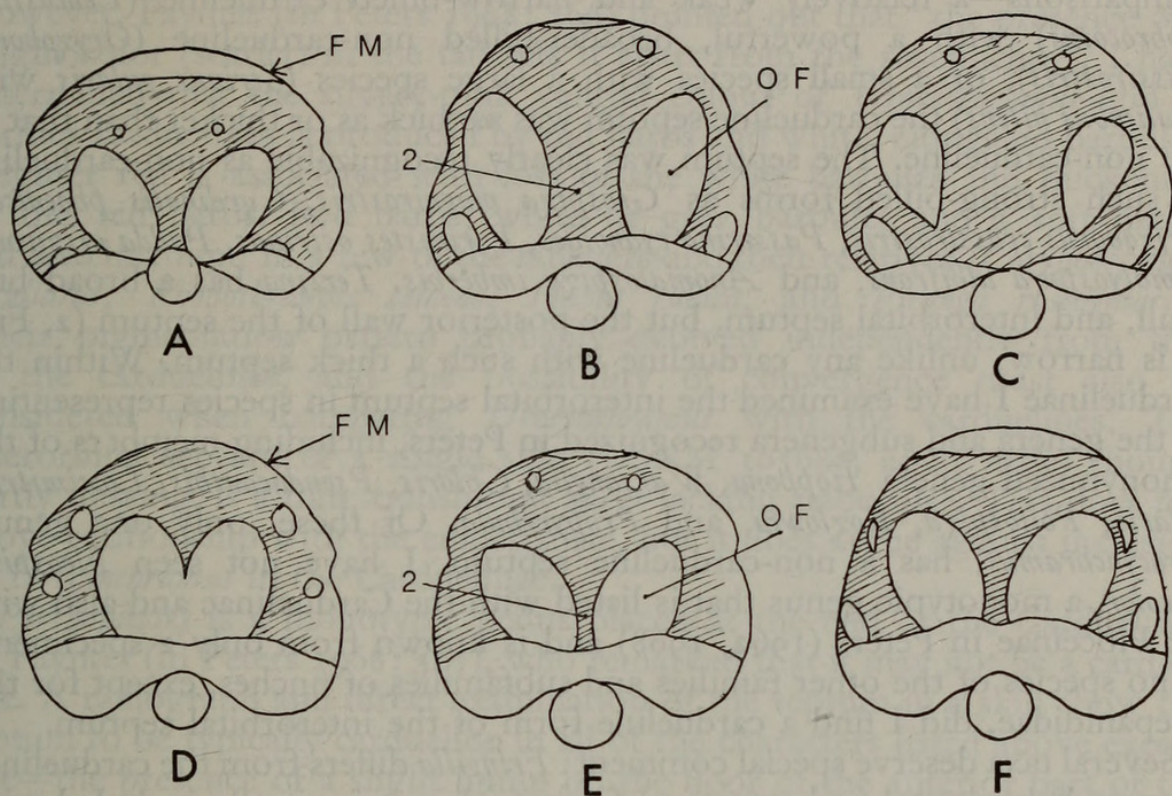


Figure 3. Posterior edge of interorbital septum as seen through foramen magnum. A through F as in Fig. 2. Number 2 illustrates feature described in text. FM, edge of foramen magnum; OF, optic foramen.

the cranial openings onto the septum, forming interorbital fenestrae (Fig. 1), or because of the presence of an isolated interorbital fenestra. The septum in the Carduelinae is thicker than that of the non-cardueline of comparable cranial size. The following characteristics associated with the thicker septum can be used to distinguish the Carduelinae from other finches with a complete septum: (1) the anterior cranial wall (between the olfactory nerves) and the floor of the anterior part of the cranial cavity are broad and flat (somewhat ridged in larger species)—in non-carduelines they are narrow and ridge-like (Fig. 2), (2) the posterior edge of the septum between the optic foramina (visible through the foramen magnum) is usually broad—in non-carduelines it is usually narrow or knife-like (Fig. 3), (3) the septum is double-walled, hollow, and supported by internal bony trabeculae throughout—in non-carduelines it is usually thin in the middle where it becomes a single bony partition without internal cavity or trabeculae (Fig. 2), (4) the ventral border of the cranial fenestrae is usually straight from side view—in non-carduelines it often has a hump or dorsal projection (Fig. 2). Of these features only the first and third are entirely consistent throughout the carduelines, but all are found in many carduelines.

The structure of the interorbital septum reflects several other attributes of the skull and it may show convergent or parallel similarities in various finches. It tends to be thicker in birds capable of strong biting and in birds with broad bills. In order to avoid spurious taxonomic comparisons based on similar adaptations I compared birds of similar size and similar bill and cranial proportions. In all such comparisons I had no difficulty distinguishing the carduelines by the septum alone, or in placing birds of uncertain relationship into cardueline or non-cardueline categories. Even in "unfair"

comparisons—a relatively weak and narrow-billed cardueline (*Leucosticte tephrocotus*) with a powerful, broader-billed non-cardueline (*Oryzoborus crassirostris*), or a small species with a large species (*Serinus gularis* with *Malimbus nitens*) the cardueline septum was as thick as or thicker than that of the non-cardueline. The septum was clearly recognizable as non-cardueline in such strong-billed forms as *Geospiza magnirostris*, *Cardinalis phoenicea*, *Oryzoborus crassirostris*, *Passerina cyanoidea*, *Pyrinestes ostrinus*, *Padda orizivora*, *Amblyospiza albifrons*, and *Anomalospiza imberbis*. *Tersina* has a broad bill, skull, and interorbital septum, but the posterior wall of the septum (2, Fig. 3) is narrow, unlike any cardueline with such a thick septum. Within the Carduelinae I have examined the interorbital septum in species representing all the genera and subgenera recognized in Peters, including members of the synonymized genera *Eophona*, *Warsanglia*, *Chloris*, *Pseudacanthis*, *Loximitris*, *Alario*, *Poliospiza*, *Kozłowia*, and *Propyrrhula*. Of these, only one genus, *Urocynchramus*, has a non-cardueline septum. I have not seen *Neospiza concolor*, a monotypic genus that is listed with the Carduelinae and also with the Ploceinae in Peters (1962, 1968) and is known from only 2 specimens. In no species of the other families and subfamilies of finches, except for the Drepanididae, did I find a cardueline form of the interorbital septum.

Several taxa deserve special comment: *Fringilla* differs from the carduelines in some behavioural and structural features, but it is usually included with them in the Fringillidae because of similarity in other attributes (for example, see Mayr *et al.* 1956, Ackermann 1967, Foelix 1970, Ziswiler 1967). *Fringilla* has a non-cardueline septum resembling that of the Emberizinae and it differs from the Carduelinae in other skull features discussed by Tordoff (1954). A discussion of its relationships lies beyond the scope of this paper.

H. Mendelssohn has suggested (Morony *et al.* 1975, and *in litt.*) that *Petronia brachydactyla*, usually placed in the Passerinae, should be transferred to the Carduelinae in the monotypic genus *Carpospiza* based on features of its nest, eggs, and young. I found the interorbital septum of a skin to resemble that of *Petronia petronia* and to differ from the Carduelinae in features 1 and 3.

Poliospiza was said by Tordoff (1954) to be related to the Passerinae based on a single skeleton in the collections of the Smithsonian Institution (USNM 347376). This skeleton was misidentified; it proves to represent a species of *Vidua*. I found skeletons of several species of *Poliospiza* to have typical cardueline septa and other skeletal features.

Chaunoproctus ferreorostris, the extinct Bonin Island finch, was suggested by Sushkin (1924) from external appearance to belong with the cardinalines. Taka-Tsukasa & Hachisuka (1925) by contrast, emphasized its close resemblance to *Pinicola subhimachalus*. Mayr & Amadon (1951) thought it closest to *Carpodacus*, and Ridgway (1901) earlier called it “a crass-billed *Carpodacus*”. A radiograph of a skin (AMNH 306354) revealed a septum much like that of other large-billed carduelines in its distribution of trabeculae and unlike the heaviest-billed non-carduelines.

Urocynchramus pylzowi was described by Sushkin (1927) as “a typical bunting [Emberizinae] in all characters of external anatomy, structure of the horny palate included, but with long tenth primary”. Vaurie (1956) felt that the shape of its bill did not necessarily indicate relationship with the emberizines; he thought that its rosy pigmentation was evidence for relationship with the rosefinches of the Carduelinae, and he placed it next to *Uragus*.

However, Paynter (in Peters 1968: 266) pointed out that "the presence of a bright color (scarlet) in the tail sets it apart from the rosefinches". I have determined that the silvery-pink ventral colour of *Urocynchramus* and of various carduelines is produced by red barbs and white, elongated barbules. Brighter red is associated with loss of the white barbules and thickening of the red barbs. Red barbs, white or grey barbules and a soft patina can also be found in a few of the tanagers and their relatives (*Coryphospingus cucullatus*, *Rhodothraupis celaeno*, *Habia rubica*, and *Piranga roseogularis*). Their pigmentation pattern probably evolved independently from that of the carduelines, and the possibility of convergence must also be considered when comparing *Urocynchramus* with the carduelines. The interorbital septum of a single skin (USNM 305680, adult male) though partly missing, is a thin, translucent sheet lacking trabeculae. This does not prove relationship with the emberizinae, but it does argue against inclusion of *Urocynchramus* in the Carduelinae.

Pyrrhoptes is a monotypic genus placed at the end of the Carduelinae by Paynter (in Peters 1968: 305), who remarked that it may not be a cardueline. A radiograph and direct examination of the septum in a skin show the septum to be typically cardueline in all of the characters listed above except one—the presence of a slight hump on the floor of the anterior part of the cranial cavity, in which it resembles *Uragus* and some species of *Carpodacus*.

Sushkin's separation of species long thought to be closely related into unrelated groups—*Leucosticte* (Carduelinae) and *Montifringilla* (Ploceidae)—as discussed and confirmed by Tordoff (1954), is further borne out by the interorbital septa of these genera.

Nesospiza acunhae and *N. wilkinsi* of the Tristan da Cunha island group were considered to be near *Serinus* by Mayr & Amadon (1951) but were thought closest to American emberizines by others (see Rand 1955). The interorbital septa of these birds are not cardueline in form.

Sushkin (1929) suggested a cardueline origin for the Drepanididae on the basis of a variety of skull features (not including the interorbital septum). Amadon (1950) argued, largely from tongue structure, that the Drepanididae were derived from a coerebid or other New World 9-primaried group. Beecher (1953) believed that a generalized tanager stock gave rise to the Drepanididae, but pointed out that the jaw muscle patterns of *Carpodacus* and some Hawaiian honeycreepers were almost identical. The interorbital septa of *Psittirostra*, *Vestiaria coccinea*, *Palmeria*, *Pseudonestor*, and *Hemignathus* are typically cardueline; those of *Loxops* and *Himatione* differ in being thinner in the middle than those of carduelines, sometimes with a central fenestra in the septum. The thinner septa of these slender-billed genera were probably derived from an ancestor with a thicker, cardueline form of the septum because they retain the cardueline shape of the anterior cranial opening, a broader floor of that opening than is found in other slender-billed non-carduelines, and an unbroken vertical posterior edge of the septum between the optic foramina. Thus the interorbital septum adds to a growing body of evidence for a cardueline progenitor of the Drepanididae (see Bock 1972, Richards & Bock 1973, Raikow 1977) and supports Raikow's (1977) suggestion that the founder species had a finch-like bill.

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An analysis of avian stomach contents from southern Africa

by W. R. J. Dean

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The standard reference books on African birds give generalised statements about the diet of most birds, but for few of them are the arthropod orders and families eaten identified.

From June 1972 to July 1973 a number of birds were collected in South



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