sionally is indicated by the increasingly disheveled appearance of their plumages as nesting progresses. Males can enter adroitly also, but do so mainly in the midnestling period. Once the young are large enough, both parents feed them from the outside. A remarkable adaptation for a hole-nesting bird, possibly related to the stickiness of the entrance, is that a nestling, once fed, may back around and deliver a fecal sac where the parent can reach in for it without entering the cavity.

When young are about to fledge, the floor of the passageway is covered with litter. I have noticed this both in the wild and with a breeding pair of captive hand-raised Red-breasted Nuthatches. The litter may protect the young from the pitch on leaving.

Nuthatches (*Sittidae*) as a group have a variety of stratagems for altering or protecting nest entrances as described by Löhrl (Z. Tierpsychol., 15: 191, 1958) for the European species (*S. europaea*) and by Kilham (Auk, 85: 477, 1968; 88: 175, 1971) for the White-breasted Nuthatch (*S. carolinensis*) which sweeps with the bodies of crushed insects. The Red-breasted Nuthatch appears to be unique in bringing pitch from balsams and other conifers. That a female nuthatch could become fatally stuck to her own nest entrance suggests that the pitch makes an effective bird lime and hence might be protective against avian as well as small mammalian nest hole competitors. The White-footed Mouse (*Peromyscus* sp.), which nests in holes in stubs, might be among the latter.—Lawrence Kilham, *Department of Microbiology, Dartmouth Medical School, Hanover, New Hampshire 03755.* Accepted 6 Jul. 71.

The juvenal plumage and relationships of *Lophostrix cristata*.—In September 1970 we received a young owl from William Huffman, a taxidermist in Pontiac, Michigan. He in turn had obtained it from an animal dealer in whose hands it had died. Its original source is unknown. The bird was thawed, washed, and prepared as a study skin (UMMZ 216,603) and proved to be *Lophostrix cristata*. So far as I can determine, the juvenal plumage of this little-known neotropical owl has not been previously described. The plumage of the head and body of this specimen consists of long, lax white feathers. The rufous and black face patch and black rictal bristles are fully developed like those of the adult, but the ear tufts are short and largely white. The remiges are nearly full grown and similar to those of an adult in the light phase, but the wing coverts are white distally and barred basally (Figure 1). The rectrices are very short and not erupted from their sheaths. A second specimen (UMMZ 101,968) collected at Escuintla, Chiapas, Mexico, December 1938, by G. Gomez, has nearly molted out of this plumage. Only a few white feathers remain on the crown, back, breast, and flanks; the rest of the plumage is that of an adult in the light phase. A male in the dark phase (UMMZ 97,557) collected at Obaldía, Panama, 20 June 1931, by H. Wedel had several white feathers on the breast but is otherwise very dark like a second specimen of *L. c. wedeli* from the same locality. Penard and Penard (1908: 461) described the young of this species as like the adult but more reddish in color and less beautifully marked. The specimens in the University of Michigan Museum of Zoology show that the color phase is evident at least before the last of the juvenal plumage is lost. Thus Penard and Penard apparently described a light-phase bird no longer in juvenal plumage.

In the dark face patch and rictal bristles, the white body plumage, and mixed pattern of the wing coverts, the young of *Lophostrix* resembles that of *Pulsatrix perspicillata* as represented by a specimen (UMMZ 74,908) from Paraguay and as described by Wetmore (1968: 163). In juvenal plumage the young of most, if not all, species of *Otus* and *Bubo,* between which *Lophostrix* is usually placed (e.g. Peters, 1940; Wetmore, 1968; Meyer de Schauensee, 1970) are barred and do not have dark

face patches. While adults of *Lophostrix* differ considerably from those of *Pulsatrix perspicillata* in having long ear tufts, conspicuous white spots on the wing coverts, and vermiculations over most of their plumage, the two species resemble each other in their dark face patches, conspicuous light superciliary stripes, rather similarly barred tails, and at least a tendency toward a broad band across the breast. In addition, occasional specimens of *Pulsatrix perspicillata* have some vermiculations on the wing coverts and small white spots on these feathers. These similarities in plumage prompted me to examine the morphology of these and other genera of owls for further clues to the relationships of *Lophostrix*.

The Strigidae have long been divided into two subfamilies on the basis of the morphology of the external ear openings and associated structures. Peters (1938) summarized the history of this division and later (1940) presented his classification of the owls. In his order of genera, he placed *Lophostrix* (with *Jubula* and two other genera) between *Otus* and *Bubo*, and he placed *Pulsatrix* after *Bubo* and the fishing owls and before *Nyctea*. Most authors since that time have followed this sequence (e.g. Wetmore, 1968; Meyer de Schauensee, 1970). On the basis of osteology, Ford (1967) divided the Strigidae into three subfamilies, the Striginae, Surniinae, and Asioninae, and he divided the Striginae into the tribes Otini (including *Otus, Lophostrix* and *Jubula*), Buboninae (including *Bubo, Ketupa,* and *Nyctea*), and Strigini (including *Strix* and *Pulsatrix*). Ford (1967: 42) lists 12 characters of the skull defining the Otini; 8 of these are shared by the Strigini and 2 more by *Pulsatrix* but not by the other genera of Strigini. Two characters, the size of the postorbital process (small in the Otini, large in the Strigini) and the nature of the interorbital septum (a thin plate in the Otini and thick and spongy in most Strigini) remain. The condition of the inter-

Figure 1. The juvenal plumages of *Lophostrix cristata* (above) and of *Pulsatrix perspicillata.*

orbital septum varies within the genus *Otus*. That in *Lophostrix* is like the thickest in *Otus* and approaches the condition in *Pulsatrix*. Thus the major difference between the skulls of *Lophostrix* and *Pulsatrix* is the size of the postorbital process. As can be seen from Ford's figures (pp. 114, 122), the skull of *Pulsatrix* is relatively broader and higher in the forehead than that of *Lophostrix*. The shape of the bill and nostril is quite similar in the two.

As Ford (1967: 60) points out, the coracoids of both *Lophostrix* and *Pulsatrix* can be distinguished from those of other owls by pecularities of the furcular facets. The coracoids of both are broad basally and have long, broad sternocoracoidal processes, *Lophostrix* being the more extreme in both characters. According to Ford (p. 62), all owls with pneumatic scapulae have the pneumatic foramen on the lateral face of the acromion, except *Lophostrix,* in which it is on the ventral side below the glenoid facet, and *Pulsatrix,* in which it is on the medial edge of the ventral surface of the neck. He also mentions (p. 64) the large ventral manubrial spine on the sternum of *Lophostrix*. In addition, both *Lophostrix* and *Pulsatrix* have broad tips to the posterior lateral processes of the sternum, a condition found in few other owls.

The anterior intermuscular line of the femur lies near the midline of the anterior face of the bone in *Bubo* and *Nyctea* but more laterally in *Otus, Strix,* and most other owl genera. *Pulsatrix* appears unique in having this line more medial than in *Bubo,* whereas in *Lophostrix* this line lies even more laterally than in *Strix*. The femur of *Pulsatrix* also appears unique among owls in having a large pneumatic foramen at the proximolateral corner of the anterior face of the bone. The differences in the pneumatic foramina in the scapula and femur appear constant, but until extensive study of such foramina is made, it will be difficult to evaluate characters associated with them.

The relative lengths of the femur, tibiotarsus, and tarsometatarsus expressed as percentages of the sum of the lengths of these bones is nearly identical in the one skeleton of *Lophostrix* and the two of *Pulsatrix* I have examined, but the samples are too small to show the range of variation within the two genera. The leg bones are considerably stouter in *Pulsatrix;* and as reported by Ford (1967: 67), *Lophostrix,* like *Otus flammeolus* and *Pyrrhoglaux*, lacks the complete bony loop over the anterior metatarsal groove, which is present in *Pulsatrix* and other owls. These characters of the leg skeleton in which *Lophostrix* and *Pulsatrix* differ are probably associated with feeding habits: according to Wetmore (1968: 161, 166), *Lophostrix* feeds on large insects and *Pulsatrix,* primarily on vertebrates.

In conclusion, certain similarities in juvenal and adult plumages and in the skeleton suggest that *Lophostrix* may be most closely related to *Pulsatrix*. As both genera are well-characterized osteologically and in plumage, they should not be merged.

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Notes on *Metopothrix aurantiacus*.—The Orange-fronted Softtail, *Metopothrix aurantiacus*, of upper Amazonia has occupied an uneasy place in the ovenbirds, Furnariidae. Recently Feduccia (J. Grad. Res. Center, Southern Methodist Univ., 38: 61, 1970) has shown that on the basis of cranial characters, *Metopothrix* is definitely a furnariid, probably belonging in the subfamily Synallaxinae. Field Museum now has a specimen in juvenal plumage, previously undescribed, and three adults from Yarinacocha, Peru. Through the kindness of Kenneth Parkes of the Carnegie Museum and Rodolphe Meyer de Schauensee of the Academy of Natural Sciences I have been able to examine 12 other specimens from Colombia, Ecuador, and western Brazil. These include a second juvenal and an immature bird in postjuvenal molt. With this comparative wealth of material, it is possible to describe the early molts and plumages, and to discuss geographical variation.

Description of juvenal.—Upperparts dull olive, somewhat darker and duller than adult; forehead and forecrown, which are bright yellow in the adult, have the feathers yellowish at the base, appearing paler than the remainder of the upperparts. Underparts and sides of head dull olive-buff, each feather finely tipped with dusky, giving a dirty appearance, but showing as very fine barring on close examination. Wings and tail as in the adult, but greater wing coverts edged with olive buff instead of whitish olive. Eyes dark brown, beak black and flesh, feet yellow with gray scutes.

The ovenbird juvenal plumage has no single identifying characteristic, such as the spotting in the thrushes, Turdidae. Probably in most species the juvenal plumage foreshadows that of the adult as it does in *Metopothrix*. The fine barring on the underparts occurs as a juvenal character in a number of species in both the synallaxine and philydorine ovenbirds, for example in *Sylviothorhynchus desmursii*, *Leptasthenura aegithaloides*, *Asthenes pyrrholeuca*, *Hylocryptus rectirostris*, *Pseudoseisura lophotes*, and *Philydor dimidiatus*. I have not been able to find any record of barring in juvenal Pipridae, the family in which *aurantiacus* was first described and to which it is sometimes considered related.

The Field Museum juvenal, a male taken 16 September 1969, is fully grown, but with some sheath remaining at the base of the central rectrices, and a few pinfeathers on crown and throat. A juvenal taken 17 December 1947 at Umbria, Putumayo, Colombia, is older, with the juvenal plumage worn and postjuvenal molt beginning. It has scattered adult feathers on the body, including a few yellow ones on chin and forehead. A young male from Hyutanahan, Rio Purús, taken 30 January 1922, is just completing postjuvenal molt into a plumage indistinguishable from the adult. The postjuvenal molt is incomplete, being confined to the body and possibly the tail. None of the young birds show any sign of wing molt. The Hyutanahan male is molting its tail, but in an irregular fashion; the 4th and 5th right rectrices are growing, one is missing on the left side, and the rest are worn. One cannot be sure if the tail is regularly renewed during the postjuvenal molt.

Among adults during the annual molt, the primaries usually molt in the normal