Condor, 82:392–397

BREEDING BIOLOGY OF CURVE-BILLED THRASHERS AND LONG-BILLED THRASHERS IN SOUTHERN TEXAS

DAVID H. FISCHER

ABSTRACT.—Curve-billed Thrashers and Long-billed Thrashers were studied in Live Oak County, Texas, during the summers of 1977 and 1978. Curve-billed Thrashers nested and foraged mostly within open habitats, although they also nested in dense chaparral if clearings were nearby. Long-billed Thrashers nested and foraged exclusively within dense chaparral. Curve-billed Thrashers often nested in exposed sites whereas Long-billed Thrashers always nested in shelter. Curve-billed Thrashers constructed deeper nests, incubated their eggs for less time each day, and brooded their young for many more days than did Long-billed Thrashers. Curve-billed Thrashers had greater reproductive success (37%) than did Long-billed Thrashers (26%). This difference was attributed to the frequent use of *Yucca* for nest support by Curve-billed Thrashers. Nest success was not significantly affected by nest height, brood size, or the date when the nest was initiated. Snakes were the primary predators of thrasher eggs and nestlings.

The roles of the sexes of Curve-billed Thrashers were examined during the breeding cycle. Females incubated and fed the nestlings significantly more often than males. Only females brooded the young. Male participation varied greatly among pairs and between nesting attempts.

The Curve-billed Thrasher (*Toxostoma curvirostre*) and Long-billed Thrasher (*T. longirostre*) are common sympatric species of the brushlands (chaparral) of southern Texas. The life histories of each, however, have received little attention. Most available information is largely qualitative and much is based on the records of early oologists or faunal surveys of the Rio Grande Valley (Merrill 1878, Sennett 1878, Benners 1887, Smith 1910, Bent 1948, Friedmann 1925). I report here a more detailed study of the breeding biology of Curve-billed and Long-billed thrashers with emphasis on habitat selection, nesting behavior, and nesting success.

STUDY AREAS AND METHODS

I studied the thrashers during the spring and summer of 1977 and 1978 near Dinero, Live Oak County, Texas. Two rectangular study areas were selected and analyzed according to vegetation with 25 randomly-located line intercepts (30.5 m; Canfield 1941). Botanical nomenclature follows Jones (1975).

Plot A (30.3 ha) supported a dense, often impenetrable chaparral (185.1% cover), comprised mostly of shrubs (123.3%). The dominant shrubs were colima (*Zanthoxylum fagara*), blackbrush acacia (*Acacia rigidula*), agarito (*Berberis trifoliata*), brasil (*Condalia hookeri*), granjeno (*Celtis pallida*), and mesquite (*Prosopis glandulosa*). The remaining cover was formed by trees (19.6%), forbs (25.3%), and grasses (16.9%). Two sides of Plot A were bordered by additional chaparral and two by cleared pastures.

Plot B (69 ha) was cleared several years before my study. Shrubs contributed only 7.6% and trees 2.4% of the total 104.9% cover. Forbs, especially gerardia (*Gerardia heterophyla*), broom snakeweed (*Xanthocephalum sarothrae*), and golden aster (*Heterotheca latifolia*), provided 73.6% of the vegetative cover. The remaining 21.3% cover was formed by grass.

To quantify foraging site characteristics, I collected 100 standard observations each of terrestrially foraging Curve-billed and Long-billed thrashers. Each observation consisted of: distance to the nearest edge (if foraging within cover) or cover (if foraging in the open), height to the First Foliar of the vegetation, detritus cover, and overstory cover.

Thrashers were captured with mist-nets. Each bird was individually marked with a color-coded 2 × 4 cm Saflag leg streamer.

I found the 76 Curve-billed Thrasher nests and 14 Long-billed Thrasher nests by systematically searching each plot twice weekly. I measured the nest height, width and depth, cup width and depth, and nest weight. The plant species used for nest support was also recorded.

I observed nests from a portable blind usually on consecutive days from sunrise to 13:30 or from 13:30 to dusk. Nest attentiveness data (during incubation) were collected from nests of four Curve-billed Thrashers and one Long-billed Thrasher for 70.5 h and 13.5 h, respectively. Frequency of feeding and brooding data were collected from seven Curve-billed nests (total 116.2 h) and two Long-billed Thrasher nests (43.5 h).

RESULTS AND DISCUSSION

NESTING HABITAT AND FORAGING SITES

The two species of thrashers nested in different habitats. I found 56 Curve-billed Thrasher nests throughout Plot B and 20 nests in Plot A. All of the nests within Plot A were situated within 5 m of the boundaries adjoining cleared fields. Long-billed

TABLE 1. Plant species used for nest support by Curve-billed and Long-billed thrashers.

Plant species	No. nests Plot A	No. nests Plot B	Average height ±SD (cm)	Range	Percent raided
			Curve-billed Thrasher		
Yucca treculeana	3	23	166.6 ± 36.9	124–215	23
Y. constricta	0	4	127.0 ± 21.4	105–177	0
Zanthoxylum fagara	8	5	162.5 ± 47.5	94–210	54
Celtis pallida	2	1	196.0 ± 52.3	131–252	33
Quercus virginia	0	10	271.8 ± 134.2	173–600	40
Acacia rigidula	1	5	110.0 ± 56.9	86–134	66
A. farnesiana	0	5	262.0 ± 45.8	143–383	20
Bumelia celastrina	3	1	158.5 ± 21.8	142–383	100
Other[a]	3	2	139.8 ± 53.2	91–193	100
			Long-billed Thrasher		
Z. fagara	11	0	148.3 ± 28.3	126–205	50
Other[a]	3	0	137.3 ± 15.9	124–155	100

[a] See Fischer (1979) for a complete listing.

Thrasher nests were found only within Plot A and all were 10 m or more from the nearest clearing. These results concur with those of Smith (1910) and Oberholser (1974) that Curve-billed Thrashers nest in open habitats whereas Long-billed Thrashers nest within dense growth.

Both species searched for animal prey (arthropods and gastropods) primarily on the ground. Curve-billed Thrashers foraged only in cleared habitats where foraging sites were typified by an absence of detritus, 57 ± SD 13.1% (range 10.3–85.6) forb-grass cover, no overstory cover, and an average distance of 6.1 ± 4.2 m (range 0–8.3) to the nearest shrub or tree cover. The pairs nesting in Plot A flew to the adjacent pastures to forage.

Long-billed Thrashers foraged only within dense chaparral. Foraging sites were characterized as having an overstory height of 2.8 ± 1.1 m (range 1.4–5.3) and 100% detritus cover, as well as being 1.8 ± 1.2 m (range 0.5–4.4) from the nearest opening. Both thrashers also ate berries of granjeno, brasil, anacua (*Ehretia anacua*), and hackberry (*Celtis laevigata*). Curve-billed Thrashers entered the chaparral to obtain berries, but I never saw encounters between the two species.

CHRONOLOGY OF EGG LAYING

Curve-billed Thrashers laid eggs over a 121-day period (16 April to 20 July) in 1977 and 74 days (13 April to 28 June) in 1978. I cannot explain the annual difference in nesting season length because weather conditions, predation pressures, and productivity were similar in both years. In an area farther south—the Rio Grande Valley of Texas—the breeding season is longer, extending from March to August (Sennett 1878, Bent 1948). In my study, Long-billed Thrashers laid eggs over a 45-day period (24 April to 8 June) in 1978, which is similar to the period reported by Bent (1948) from the Rio Grande Valley.

NEST-SITE SELECTION

Both species of thrashers nested in a variety of spiny shrubs and trees (Table 1). In Plot B, 48% (23) of all Curve-billed Thrasher nests were placed in yuccas. In Plot A, where yuccas were scarce, 40% (8) of the nests were situated in colima. Curve-billed Thrasher nests were often conspicuous and visible for considerable distances. The 76 nests of Curve-billed Thrashers averaged 177.8 ± 69.8 cm (range 96–600) above the ground. Long-billed Thrashers nested (11, 78%) in colima thickets. Their nests were well hidden from view and sheltered by a dense overstory of leaves. Long-billed Thrasher nests averaged 157 ± 29.9 cm (range 124–205) above the ground, a value similar to the mean height of 167 cm reported by Sennett (1878).

Average measurements of 13 Curve-billed Thrasher nests were: total width, 22.7 ± 2.2 cm; cup width, 10.7 ± 0.8 cm; total depth, 17.4 ± 2.1 cm; cup depth, 9.8 ± 1.1 cm; weight, 147.1 ± 41.7 g. The average total width (19.6 ± 1.2 cm) and cup width (10.7 ± 0.7 cm) of four Long-billed Thrasher nests were similar to Curve-billed Thrasher nest measurements. However, total depth (13.0 ± 0.8 cm), cup depth (6.0 ± 1.6 cm), and weight (93.8 ± 20.1 g) were significantly less (t = 3.9, 5.9, 2.8, respectively, df = 15, $P < 0.05$) than corresponding measurements from Curve-billed Thrasher nests. As Curve-billed Thrasher nests were often only partially sheltered from sunlight, a deeper nest may better protect the nest contents and attending adult from direct sunlight. Only the bill tip and tail of an incubating Curve-billed Thrasher were visible above the rim of the nest. However, Long-billed Thrashers were clearly visible with much of the body situated above the rim of the nest.

SITE FIDELITY

Site fidelity was determined for Curve-billed Thrashers only. Marked birds were paired throughout the year and remained in the same areas used for nesting. Six of nine marked pairs present in 1978 nested within 30 m of where they nested in 1977. In three instances, nests from 1977 were used for the support of new nests in 1978. One female remated with an unmarked male approximately 100 m from her 1977 nest site. Her 1977 mate disappeared from the study area during the winter and probably died. The other two pairs of marked thrashers nested 60 m and 75 m from their 1977 nest sites.

None of the 23 nestlings banded in 1977 was present on the study areas in 1978. This suggests that the nestlings dispersed far from where they hatched.

EGGS AND INCUBATION

Both species laid their eggs early in the morning at one-day intervals. The average clutch size for 67 Curve-billed Thrasher nests was 3.8 ± 0.5 (range 3–5). Four-egg clutches were the most common with 62.5% of the 24 nests in 1977 and 77.5% of the 43 nests in 1978 of this size. Three-egg clutches increased in frequency with the month of the season, but the increase was not significant ($\chi^2 = 3.02$, $df = 3$, $P > 0.05$). Similarly, Ricklefs (1965) found no correlation between clutch size and month of the breeding season of Curve-billed Thrashers in Arizona. The modal clutch size of three eggs for Curve-billed Thrashers in Arizona (Clark 1904, Gilman 1909, Bent 1948, Hensley 1959) was lower than what I found in southern Texas. The average clutch for seven Long-billed Thrasher nests was 3.4 ± 0.8 (range 2–4).

The average incubation period was 14 ± 1.3 days (range 12–15, n = 18) for Curve-billed Thrashers and 14 ± 0.6 days (range 13–14, n = 3) for Long-billed Thrashers. During the final two days of incubation, Curve-billed Thrashers incubated an average of 68.2% of the day, whereas, Long-billed Thrashers incubated a greater proportion of the day (96.1%). Both sexes of both thrashers incubated; however, I obtained parental contribution data from Curve-billed Thrasher nests only. Females contributed 68 ± 13.4% (range 50.3–81.8) of the total incubation time, significantly more (Paired t-test, $t = 8.11$, $df = 2$, $P < 0.05$) than males. In addition, female incubation bouts ($\bar{x} = 20.5 \pm 16.9$ min, range 2–67) were significantly longer ($t = 3.8$, $df = 102$, $P < 0.01$) than those of males ($\bar{x} = 10.8 \pm 8.4$ min, range 2–49). Only females incubated at night.

The combined male-female attentiveness periods of an unmarked pair of Long-billed Thrashers (65.4 ± 27.0 min/bout, range 18.6–109.7) were significantly greater ($t = 6.72$, $df = 31$, $P < 0.01$) than the combined attentive periods of Curve-billed Thrashers (14.3 ± 12.7 min/bout, range 2.2–67.0).

HATCHING

Thrasher eggs hatched throughout the day. In 19 of 33 (58%) Curve-billed and 2 of 6 (33%) Long-billed thrasher broods of known age, from one to three young were 24 h older than the youngest nestling of the brood. A 36-h age difference was present in one Curve-billed Thrasher brood. Ricklefs (1965) suggested that asynchronous hatching among Curve-billed Thrashers adjusted the brood size to correspond with food availability: only the oldest nestlings can compete for food when food availability is low. No nestlings died of starvation in the present study.

BROODING AND FEEDING OF THE NESTLINGS

Brooding of nestling Curve-billed Thrashers was performed solely by the female. The sex of brooding Long-billed Thrashers was unknown. Curve-billed Thrashers brooded at least 13 days whereas Long-billed Thrashers brooded only 2 days. The disparity in brooding was probably a function of nest placement, because Curve-billed Thrashers nested in exposed situations with much sunlight. Long-billed Thrasher nests were always shaded by shrubs and trees.

Female Curve-billed Thrashers fed the young an average of 62.7 ± 16.7% (range 49.2–89.2) of the time, significantly more often ($\chi^2 = 202.34$, $df = 6$, $P < 0.01$) than males. Male participation varied not only among pairs, but also with nesting attempt. The male of one pair contributed 41.4% of the feedings at its first nest of the season, but only 10.7% of the feedings at its second nest. The male was frequently seen near the

TABLE 2. Feeding rates in relation to brood size and age of nestling Curve-billed and Long-billed thrashers.

Nest	No. young	Age of young (days)	Trips/h	Trips/ young	Time observed (h)
		Curve-billed Thrasher			
1	2	8–9	8.3	4.2	13.5
1	2	12–3	10.7	5.4	14.5
2	2	10–11	12.1	6.0	14.5
3	3	3–4	8.3	2.8	14.5
4	3	3–4	7.8	2.6	14.5
5	3	8–9	12.3	4.1	14.5
5	3	12–13	21.0	7.0	14.5
6	4	1–2	8.3	2.1	9.7
7	4	9–10	14.5	3.6	6.0
		Long-billed Thrasher			
1	4	1–2	10.9	2.7	14.5
1	4	7–8	14.0	3.5	14.5
2	2	7–8	7.8	3.9	14.5

second nest and he did not appear to be attending the fledglings from the first nest.

Feeding rates and nestling age were positively correlated ($r = 0.51$, $df = 128$, $P < 0.01$). As the nestlings aged, feeding rates increased greatly from a minimum of 2.1 feedings$\cdot$h$^{-1}\cdot$young^{-1} one day after hatching to a maximum of 7.0 feedings$\cdot$h$^{-1}\cdot$young^{-1} 12 days after hatching (Table 2).

Both sexes of both species removed fecal sacs from the nest. These were eaten for the first three days; thereafter, they were removed and deposited on the ground.

The nestling period of 23 Curve-billed Thrasher and 3 Long-billed Thrasher broods averaged 14 ± 1.3 days (range 11–16) and 13 ± 1.0 days (range 12–14), respectively. Rand (1941) reported an 18-day nestling period for Curve-billed Thrashers in Arizona, suggesting a slower development. The young of both species typically fledged prior to attaining the ability of flight.

FACTORS AFFECTING PRODUCTIVITY

For comparative purposes, I report nesting success as the percentage of eggs that produced fledged young in Table 3 and as suggested by Mayfield (1961) in Table 4. The methods yielded similar success percentages (43.8% and 37% for Curve-billed Thrashers and 30.0% and 26% for Long-billed Thrashers). These values are considerably less than the 46% success (Mayfield technique) reported for Sage Thrashers (*Oreoscoptes montanus*; Reynolds and Rich 1978), but greater than the 24.2% success of Curve-billed Thrashers in Arizona (Ricklefs 1977).

Predation was the single most important factor contributing to thrasher nest failure (Table 3). It accounted for 40.2% and 55.0% of the loss of eggs and young of Curve-billed and Long-billed thrashers, respectively. Predation rates during the incubation and nestling periods were compared as suggested by Dow (1978), and found not to differ significantly for either species (Curve-billed Thrasher, $\chi^2 = 0.04$, $df = 1$, $P > 0.05$; Long-billed Thrasher, $\chi^2 = 0.002$, $df = 1$, $P > 0.05$). In contrast, Sage Thrasher nests were raided significantly more often during the nestling period (Reynolds and Rich 1978).

Skutch (1949) suggested that smaller broods may be more successful than larger broods because there is less activity about the nest site. A greater percentage of two-young broods (77%) of Curve-billed Thrashers was successful when compared with

TABLE 3. Nesting success and causes of mortality in 67 Curve-billed Thrasher nests and 6 Long-billed Thrasher nests.

	Curve-billed Thrasher			Long-billed Thrasher		
	No.	Percent individuals	Percent losses	No.	Percent individuals	Percent losses
Eggs laid	194	—	—	20	—	—
Losses of eggs due to:						
Predation	32	16.5	57.2	5	25.0	65.8
Desertion	9	4.6	16.0	0	0.0	0
Failure to hatch	13	6.7	23.3	3	13.0	34.2
Unknown agent	2	1.0	3.5	0	0.0	0
Young hatched	138	71.1	—	12	60.0	—
Losses of young:						
Due to predation	46	23.7	87.1	6	30.0	100
During hatching period	4	2.0	7.3	0	0.0	0
After hatching period	3	1.5	5.5	0	0.0	0
Number fledged	85	43.8	—	6	30.0	—

TABLE 4. Reproductive success of Curve-billed and Long-billed thrashers (1977 and 1978 combined).

	Curve-billed Thrasher	Long-billed Thrasher
Nest-days observed:		
Incubation period	424	51
Nestling period	461	52
Nest success:		
Incubation period	0.67	0.57
Nestling period	0.63	0.55
Egg success	0.60	0.57
Hatching rate	0.87	0.80
Nestling success	0.63	0.56
Probability of egg producing a fledged young	0.37	0.26

TABLE 5. Nest predation of Curve-billed Thrasher nests in relation to nest height.

Nest height (cm)	Total nests	No. (and percent) raided by snakes	No. (and percent) raided by ants	Percent successful
76–125	8	4 (50.0)	0	50.0
126–175	21	10 (47.6)	0	52.8
176–225	18	6 (33.3)	2 (11.1)	65.6
>226	9	4 (44.4)	0	65.6

three-young (71%) and four-young (61%) broods. However, this trend was not significant ($\chi^2 = 2.17$, $df = 2$, $P > 0.05$).

No significant differences ($\chi^2 = 0.09$, $df = 3$, $P > 0.05$) in predation occurred between nests of different height categories (Table 5). Some snakes, especially coachwhips (*Masticophis flagellum*) and striped whipsnakes (*M. taeniatus*), readily ascended shrubs when alarmed. These snakes presumably climb through shrubs while hunting and thereby quickly learn the presence or absence of nests at any height.

Nests placed in yuccas were significantly more successful than nests situated elsewhere ($\chi^2 = 8.49$, $df = 1$, $P < 0.01$). Both species of yuccas afforded considerable protection with their long, spine-tipped leaf blades and the lack of side-branching near the ground. The greater nesting success of Curve-billed Thrashers was largely a result of their frequent use of yuccas (39.5% of all nests). Yuccas were scarce in Plot A and were apparently not used by Long-billed Thrashers. Curve-billed and Long-billed thrasher nests placed in colima, the major nesting substrate of Long-billed Thrashers, incurred nearly equal amounts of predation (54% and 50%, respectively).

The first predation in the 1978 season did not occur until 14 days after nest initiation. Subsequently, predation intensity did not differ significantly among months ($\chi^2 = 2.17$, $df = 3$, $P > 0.05$). Apparently, a delay existed before predators discovered a seasonally available prey, or some predators (e.g., snakes) were not as active early in the season.

Since nests were never damaged and shell fragments were absent when nests were plundered, snakes were considered the primary nest predators. Potential nest-raiding species encountered during the study were coachwhips, striped whipsnakes, Texas patchnosed snakes (*Salvadora grahamiae*), bullsnakes (*Pituophis melanoleucus*), common kingsnakes (*Lampropeltis getulus*), and western diamondbacked rattlesnakes (*Crotalus atrox*). Two Curve-billed Thrasher broods were apparently killed and partially consumed by ants (Formicidae). Two common potential avian predators were Roadrunners (*Geococcyx californianus*) and Harris' Hawks (*Parabuteo unicinctus*). Once, I observed a Harris' Hawk capture a newly fledged Curve-billed Thrasher.

In addition to predation, eggs or nestlings were lost without the loss of an entire nest. Such losses accounted for 1.0% of the eggs and 1.5% of the young of Curve-billed Thrashers (Table 3). Failure to hatch accounted for 6.7% of Curve-billed and 13.0% of Long-billed thrasher eggs. Both values are greater than the average (5.1%) reported for six other passerines (Ricklefs 1969).

Nest desertion was rare: two nests (3.0% of 67) containing a combined total of nine Curve-billed Thrasher eggs were abandoned. No Long-billed Thrasher nests were deserted.

Although Bronzed Cowbirds (*Molothrus aeneus*) and Brown-headed Cowbirds (*M. ater*) were abundant on the study plots, parasitism of thrasher nests was not noted. The habitat of Curve-billed Thrashers was relatively open and pairs were seldom out of view of their nests. Cowbirds of both species (plus most other birds) were chased by the thrashers whenever they approached thrasher nests. It is also possible that these thrashers, like the Brown Thrasher (*Toxostoma rufum*), are "egg-rejectors" and remove cowbird eggs soon after their deposition (Rothstein 1971).

All of the marked pairs of Curve-billed Thrashers produced or attempted to produce two broods each season. One pair, however, required three nesting attempts to fledge a single brood.

ACKNOWLEDGMENTS

This paper is based upon a Master's thesis submitted to Texas A&M University. Financial support was provided by the Rob and Bessie Welder Wildlife Foundation, Sinton, Texas. I thank E. G. Bolen and K. A. Arnold for their advice and encouragement throughout the project. I also thank G. D. Schnell and L. B. Best for reviewing the manuscript. This is Welder Wildlife Foundation Contribution #250.

LITERATURE CITED

BENNERS, G. B. 1887. A collecting trip in Texas. Ornithologist and Oologist 12:49–52.

BENT, A. C. 1948. Life histories of North American nuthatches, wrens, thrashers, and their allies. U.S. Natl. Mus. Bull. 195:351–402.

CANFIELD, R. H. 1941. Application of the line intercept method in sampling range vegetation. J. For. 39:388–394.

CLARK, S. H. 1904. Curve-billed and Palmer's thrashers. Auk 21:214–217.

DOW, D. D. 1978. A test of significance for Mayfield's method of calculating nest success. Wilson Bull. 90:291–295.

FISCHER, D. H. 1979. Comparative ecology of the thrashers, *Toxostoma*, of South Texas. M.S. thesis, Texas A&M University, College Station.

FRIEDMANN, H. 1925. Notes on the birds observed in the lower Rio Grande Valley of Texas during May, 1924. Auk 42:537–554.

GILMAN, M. F. 1909. Among the thrashers of Arizona. Condor 11:49–54.

HENSLEY, M. M. 1959. Notes on the nesting of selected species of birds of the Sonoran Desert. Wilson Bull. 71:86–92.

JONES, F. B. 1975. Flora of the Texas Coastal Bend. Rob and Bessie Welder Wildlife Foundation, Sinton, Texas. Contrib. 6, Ser. B.

MAYFIELD, H. F. 1961. Nesting success calculated from exposure. Wilson Bull. 73:89–101.

MERRILL, J. C. 1878. Notes on the ornithology of southern Texas, being a list of the birds observed in the vicinity of Fort Brown, Texas, from February, 1876, to June, 1878. Proc. U.S. Natl. Mus. 1:118–173.

OBERHOLSER, H. C. 1974. The birdlife of Texas. Univ. Texas Press, Austin.

RAND, A. L. 1941. Growth and development of Curve-billed Thrashers. Bull. Am. Mus. Nat. Hist. 78:213–242.

REYNOLDS, T. D., AND T. D. RICH. 1978. Reproductive ecology of the Sage Thrasher (*Oreoscoptes montanus*) on the Snake River Plain in south-central Idaho. Auk 95:580–582.

RICKLEFS, R. E. 1965. Brood reduction in the Curve-billed Thrasher. Condor 67:505–510.

RICKLEFS, R. E. 1969. An analysis of nesting mortality in birds. Smithson. Contrib. Zool. No. 9.

RICKLEFS, R. E. 1977. Components of avian breeding productivity. Auk 94:86–96.

ROTHSTEIN, S. I. 1971. Observation and experiment in the analysis of interactions between brood parasites and their host. Am. Nat. 105:71–74.

SENNETT, G. B. 1878. Notes on the ornithology of the lower Rio Grande of Texas. Bull. U.S. Geol. Geogr. Surv. 4:1–66.

SKUTCH, A. F. 1949. Do tropical birds rear as many young as they can nourish? Ibis 91:430–455.

SMITH, A. F. 1910. Miscellaneous bird notes from the lower Rio Grande. Condor 12:93–103.

Department of Range and Wildlife Management, Texas Tech University, Lubbock, Texas 79409. Accepted for publication 9 August 1979.

Condor 82:397

RECENT PUBLICATIONS

Nomina Anatomica Avium/An Annotated Anatomical Dictionary of Birds.—Edited by Julian J. Baumel, with Anthony S. King, Alfred M. Lucas, James E. Breazile, and Howard E. Evans. 1979. Academic Press, London. 638 p. $64.50. The study of avian anatomy has been handicapped by a nomenclature that is unstandardized, multilingual, and based on mammalian, indeed human, anatomy. Here, for the first time, is a comprehensive list of terms that attempts to overcome those defects. It has been laboriously compiled over several years by a truly international committee of more than 80 specialists. The terms—carefully selected and put in Latin—are listed according to external topographic anatomy or organ systems. Macroscopic and mesoscopic structure are emphasized, but a number of microscopic structures of the viscera and sense organs are included. The lists are copiously annotated to explain structure, homology, synonymy, and differences among species; the notes contain many new and hitherto unpublished observations. The terms are further clarified with many anatomical drawings, some of them original and others taken from the literature. A long bibliography gives the authority for the anatomical facts and the selection of the names; incidentally, it provides a comprehensive introduction to the scattered literature of this field. In sum, this book can be a valuable reference for information as well as terminology. It should nevertheless be used with caution because the anatomy of birds is much less well known than that of humans and domestic mammals. Many structures have not been examined by more than a few anatomists or in more than a few species. With this caveat, one hopes that the terms given here will be accepted wherever possible.

Die Vogelarten der Erde. 5. Lieferung.—Hans E. Wolters. [1980]. Verlag Paul Parey, Hamburg. 80 p. Paper. Subscription DM 38. Source: Verlag Paul Parey, Spitalerstrasse 12, 2000 Hamburg 1, Germany. This is the fifth part of a systematic list of birds of the world (previously noted in Condor 78:149, 79:138, 80:456, and 81:416). It contains many families of Old World and New World oscines, arranged in the author's sequence to show his interpretation of phylogenetic relationships. One or two more sections are yet to come.