top of the supporting vegetation. The 19 successful nests averaged 0.97 m above the water and 0.51 m below the top of the supporting vegetation. Successful nests were significantly lower than unsuccessful nests ($t = 2.40$, $p < 0.05$), but no differences were found in the distances from the top of the supporting vegetation ($t = 0.28$, $P > 0.05$).

These differences in success at different nesting heights are contrary to the findings of Meanley and Webb (1963) who studied the nesting of Red-winged Blackbirds in the tidal marshes of Maryland and found that nest success increased with height above ground or water: 45% for <0.6 m, 55% for 0.6–1.2 m, and 62% for >1.2 m. They attributed the reduced success rate of lower nests to easier accessibility by predators.

In our study, poor nest success is attributed to abandonment of nests after disturbance, avian predation, or weather damage. Higher nest success in the lower vegetation might be due to the relative lack of ground-dwelling mammalian and reptilian predators and to the increased stem density of the lower vegetation. The increased stem density could provide better concealment from avian predators and protection from weather.

Nesting preference.—In the study area, the relative abundance of potential nesting substrate species (expressed as amount of available edge) was common buttonbush, 11.2 km; southern wild rice (*Zizaniopsis miliacea*), 3.4 km; black willow (*Salix nigra*), 3.3 km; Carolina ash, 1.8 km; water elm (*Planera aquatica*), 0.4 km; water tupelo (*Nyssa aquatica*), 0.2 km; and red maple (*Acer rubrum*), 0.1 km. Nests were found in common buttonbush (131), southern wild rice (3), and black willow (2). A very highly significant ($\chi^2 = 131.51$, $P < 0.001$) preference was found for Red-winged Blackbirds nesting in common buttonbush.

Common buttonbush was a more important Red-winged Blackbird nesting substrate species than southern wild rice because the basic woody nest-supporting structure of common buttonbush was present when the birds started nesting and southern wild rice was too short to support nests. Common buttonbush also had a shrubbier form, lower height, and provided more concealment to nests than other woody species present.

There were insufficient nesting attempts in other species of woody vegetation to determine if differences in nesting success existed between them and common buttonbush. We believe that the almost exclusive selection of common buttonbush as a nesting substrate indicates that it provides the best nesting conditions in this swamp habitat.—BRENT ORTEGO AND ROBERT B. HAMILTON, *School of Forestry and Wildlife Management, Louisiana State Univ., Baton Rouge, 70803.* *Accepted 29 Apr. 1977.*

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Extreme nesting dates for the Mourning Dove in central Illinois.—The Mourning Dove (*Zenaida macroura*) is known for producing multiple broods over a prolonged nesting season. Nice (Auk 40:37–58, 1923) observed active nests in Oklahoma from late March into early October and cited reports of rare nesting from late January into December in Texas and California. In the central states, based upon a 3-year study in Iowa involving 3878 dove nestings, McClure (Trans. N. Am. Wildl. Conf. 15:335–346, 1950) calculated an average breeding season of 159 days from 4 April to 10 October. He further recorded extreme dates of 23 March to 15 October in Iowa and 8 April to 23 September in Nebraska. Bent (U.S. Natl. Mus. Bull. 162:416, 1932) listed "Indiana to Iowa" egg dates of 4 April to 1 September for this species. In a detailed analysis of 1950–58 dove nesting phenology in conifer plantings in northern and central Illinois, Hanson and Kossack (Ill. Dep. Cons. Tech. Bull. 2, 1963) cited no specific nesting extremes but reported a breeding season from late March into September with only 1.6% of 1042 nests initiated after 4 August. The latest nesting activity of doves recorded for Illinois was a fledgling in Quincy on 10 November described by Angus as "so young that it was almost too small to leave the nest" (Bird-Lore 36:172, 1934). My data on 4 nests in the vicinity of Charleston in east-central Illinois indicate that nesting sometimes extends from middle March into early November.

On 20 October 1973 at the outskirts of Charleston (39°30'N, 88°10'W), I flushed an adult Mourning Dove from its nest containing 1 egg. The nest, 2.1 m high in a hawthorn (*Crataegus* sp.), was fully exposed due to nearly complete leaf fall. The adult was seen incubating on 3 later dates, but on 2 November it flushed with a broken wing display disclosing a small chick. The adult was noted brooding the next 4 days but on 8 November the first snowfall of the season deposited 1.9–2.5 cm by 17:00 followed by an overnight low of –5.6°C. At 07:00 on 9 November I found the adult absent and the young dove frozen in the nest, surrounded but not covered over by snow. Based upon aging criteria of Hanson and Kossack (1963), a body length of 43 mm and lack of primary quills on 2 November indicated an age of 1 day. This estimate combined with a 14-day incubation period established the probable laying date as 18 or 19 October. Measurements of the dead nestling were more typical of a 6 or 7-day-old squab suggesting some stunted development.

A second active dove nest approximately 47 m from the first was found on 30 October 1973 by Mrs. Wayne D. Coleman. This nest was 4 m high in a bare cherry (*Prunus* sp.) and contained 2 large squabs. On 1 November, 1 bird fledged soon after dawn and by noon the nest was empty. As I approached the nest site at 16:30, both fledglings flushed from the ground below and flew strongly some 10 m to elevated perches where I observed them to be well feathered except for short tails. I last saw the 2 near the site on 9 November.

A third late autumn nest was reported to me by Richard D. Andrews from his farm 9.6 km SE of Charleston. On 27 October 1973, he flushed an adult Mourning Dove from a nest in a honey locust (*Gleditsia triacanthos*) revealing 1 egg and 1 young dove covered with "big pin feathers." On 4 November this nest was empty except for numerous droppings.

Presumably initiated by increasing photoperiod or ameliorating climate, the breeding season for this multi-brooded species might well be extended by exceptionally mild autumn temperatures. At the Charleston weather station the 1973 mean monthly temperatures of 21.5°C in September and 16.6°C in October were 2.4 and 2.7°C above normal. The first official freeze occurred on 3 November compared to an average 16 October date. In Springfield, Illinois, the heating-degree-day total for July through October, 1973 was 35% warmer than the 30-year mean (U.S. Dep. Commerce, Climatological Data, 1973).

On 6 March 1974, a Mourning Dove carrying a stick into a grove of Austrian pines (*Pinus nigra*) on the Eastern Illinois University campus in Charleston provided my earliest nesting evidence for central Illinois. Actual nesting was not further observed but on 11 April 1975 in the same pine grove I discovered 2 dove fledglings I judged to be at least 2 days out of the nest. With a 14-day incubation plus 9–12 days to fledging (Hanson and Kossack 1963), these birds must have hatched from eggs laid before 18 March. These combined observations indicate a maximum nesting season of at least 230 days for this species in central Illinois.

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vey in the preparation of this manuscript.—L. BARRIE HUNT, *Dept. of Zoology, Eastern Illinois Univ., Charleston 61920.* *Accepted 31 July 1977.*

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A volumetric analysis of Sharp-tailed Grouse sperm in relation to dancing ground size and organization.—Although the lek, or dancing ground display and mating behavior of *Pedioecetes phasianellus* has been described by several authors (reviewed in Hjorth, Viltrevy 7:184–596, 1970), histological and physiological correlates of lek behavior have received less attention (Trobec and Oring, Am. Midl. Nat. 87:531–536, 1972). Since most matings are known to occur near the center of the dancing ground (Hjorth op. cit.), the present study was designed to investigate the hypothesis that levels of testicular sperm are greater in males located centrally compared with males located at the periphery of dancing grounds. The additional possibility that levels of sperm are lower for males on smaller grounds (<10 males) was also examined.

Sixty-four males were collected from grounds of known size in central Manitoba. Whenever possible, 4 males were collected each week, 2 from a large and 2 from a small dancing ground, during 2 successive breeding seasons. For small grounds, a random sampling technique was used to determine which male was to be collected. For large grounds (10 or more males present), 1 male whose territory was near the center, and 1 from the periphery, were collected each week. Within 10 min of collection, a gonad was removed, the volume measured by water displacement in a graduated cylinder, and tissue samples fixed in Bouin's solution. Subsequent sections 7 μ thick were stained by Masson's trichome technique (Culling, Handbook of Histopathological Techniques, 1963, Butterworths, London). For quantitative assessment of sperm, the method of Chalkley (J. Cancer Inst. 4:47–53, 1943) was used. Structures lying under the tips of 4 pointers located in the eyepiece of a microscope were recorded as "hits." The procedure was repeated by moving the stage a short distance along a zigzag course through the section, for a total of 175 times per testis. The relative frequency of "hits" on any particular cell type, including sperm, was taken as the relative volume occupied by cells of that type. For statistical comparison between the different groups of males sampled, we used a sign test (χ^2) based on comparisons between pairs of birds collected during the same week from different positions within large dancing grounds (central versus peripheral) or between large and small dancing grounds (small versus central, and small versus peripheral).

All birds collected during the breeding season appeared to be physiologically capable of breeding. No differences ($P > .05$) were present in overall testis volume among the three groups of males. Differences were, however, present in the relative volume of sperm present in the testes (Fig. 1). For both years combined, males located centrally on large dancing grounds possessed a significantly greater mean level of sperm than did the peripheral birds on the same grounds ($P < .001$; $\chi^2 = 16.0$). The volume of sperm for males from small grounds was also significantly greater than that of peripheral males from large grounds ($P < .01$; $\chi^2 = 9.0$). Differences between males from small grounds and central birds from large grounds, although present in both years (Fig. 1) were not significant ($P > .05$; $\chi^2 = 1.2$).

Although the relationships between central and peripheral birds from large dancing grounds and birds from small grounds tended to be similar for both years in which collections were made, levels of spermatozoa reached peak levels appreciably later in the