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NESTING CHARACTERISTICS OF HOODED MERGANSERS, WOOD DUCKS, EUROPEAN STARLINGS AND TREE SWALLOWS IN WISCONSIN

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Abstract.—Nest initiation dates and typical characteristics were recorded and summarized from 300 nests of four species of cavity-nesting birds in central Wisconsin. Hooded Mergansers (*Mergus cucullatus*) were the earliest nesters, followed by Wood Ducks (*Aix sponsa*), European Starlings (*Sturnus vulgaris*) and Tree Swallows (*Tachycineta bicolor*). Egg laying began on 25 March, 13 April, 23 April and 12 May, respectively. Modal nest initiation dates were 10 April for Hooded Mergansers, 30 April for Wood Ducks, 1 May for Starlings and 24 May for Tree Swallows. Composition of nest material and egg-shell color and thickness can be used to distinguish nest sites of these species before and after hatch.

CARACTERÍSTICAS DE ANIDAMIENTO DE *MERGUS CUCULLATUS, AIX SPONSA, STURNUS VULGARIS* Y *TACHYCINETA BICOLOR* EN WISCONSIN

Sinopsis.—Se tomaron datos de 300 nidos sobre la fecha de iniciación del nido y las características típicas de estos en cuatro especies de aves que anidan en cavidades. El estudio se llevó a cabo en la parte central de Wisconsin. *Mergus cucullatus* fue la especie que anidó más temprano seguida de *Aix sponsa, Sturnus vulgaris* y *Tachycineta bicolor.* La puesta comenzó en marzo 25, abril 3, abril 23 y mayo 12, respectivamente. La fecha modal de iniciación de puesta fue el 10 de abril para *Mergus.* 30 de abril para *Aix,* 1 de mayo para *Sturnus* y 24 de mayo para *Tachycineta.* La composición del nido y el color y grosor de los huevos puede ser utilizado para diferenciar entre las especies previo y posterior al eclosionamiento.

Hardwood forest maturation in the eastern United States (United States Forest Service 1982) has led to expansion in Wood Duck populations (Serie and Chasko 1990, Soulliere 1990a) and probably other cavity-nesting species during the past several decades. Research on reproductive characteristics of birds nesting in tree cavities remains difficult however, because these nest sites are generally inaccessible. Precise nesting chronology of Wisconsin cavity-nesting birds is not well documented, and nest initiation dates can vary widely with latitude (Kessel 1957, Soulliere 1990b). The reclusive Hooded Merganser lacks even general published information about nesting habits throughout most of its breeding range.

Where nest-house programs have been established, species-use information is typically collected after the nesting season. The procedure can lack accuracy because nest-site examiners (including wildlife-agency personnel) are unable to distinguish nest remains of various species, and multiple species may use nest sites during a single season, confounding identification of occupants (Soulliere 1985). Dramatic fluctuation in spe-

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cies use-rates of a large nest-house program in central Wisconsin was a concern to the Wisconsin Department of Natural Resources (WDNR), but believed attributable to inexperienced "house checkers" (A. G. Geiger, WDNR, pers. comm.). In this study, we documented nest initiation dates and distinguishing nest characteristics for primary users of this Wisconsin nest-house program: Hooded Mergansers, Wood Ducks, European Starlings and Tree Swallows. This information can be applied by wildlife managers and researchers studying these species and amateur wildlife enthusiasts interested in nesting dates and accurate record keeping for nest-house programs.

STUDY AREA AND METHODS

The Mead Wildlife Area is a 109 km^2 floodplain with associated forested and open uplands located 35 km northwest of Stevens Point, Wisconsin (44°35'N, 89°50'W; see Soulliere 1988 for a detailed study area description). We monitored 300 nest houses erected between 1961 and 1982 along 25 km of the Little Eau Pleine River. Houses were originally placed for Wood Ducks and included four designs (Soulliere et al. 1992). Each nest site was cleaned during late winter and refilled with 10–15 cm of sawdust to imitate a tree cavity. Houses were inspected 2–4 times between early April and late June, 1983 and 1984. A record of nesting activity and contents was maintained for each house. Species use was identified by adults and eggs. Nest initiation (the day the first egg was laid) was determined by at least one of the following: direct observation, egg count during the laying period, back-dating from the clutch completion date or back-dating from the hatch date. We assumed that each species found using nest sites laid one egg per day, with the exception of Hooded Mergansers, which lay an egg every other day. Incubation periods used for calculations (Terres 1980) were 30 d (Hooded Mergansers and Wood Ducks), 12 d (Starlings), and 14 d (Tree Swallows). Duck eggs were also candled (Weller 1956) during the incubation period to determine embryonic development stage, which confirmed nest initiation dates.

RESULTS AND DISCUSSION

We determined nest initiation dates for 300 nests of four species during 1983 and 1984. Nesting chronology was similar each year and data sets were pooled. Hooded Mergansers began egg laying on 25 March, followed by Wood Ducks on 13 April, Starlings on 23 April and Tree Swallows on 12 May (Table 1). Unlike other occupants, Starlings probably had two clutches per nesting season (Kessel 1957). They also began nest construction and roosted in nest sites weeks before egg laying. On one occasion during winter maintenance, two starlings were found inside a nest house with bills and feet "locked" together, apparently fighting for the site. Typically, male starlings take possession of a potential nest site, also using it for roosting, well before the nesting season (Kessel 1957).

Not all nest-house contents were identified or quantified, but the most obvious and regular nest characteristics were recorded for each species.

TABLE 1. Nest initiation dates and typical nest characteristics of some cavity-nesting birds in central Wisconsin, 1983–1984.

Species	*n*	Mean	Mode	Earliest	Latest	Distinguishing nest characteristics post-hatch
Hooded Merganser	47	19 April	10 April	25 March	19 May	Down, often mixed with sawdust; sometimes sparse vegetation such as reed canarygrass lining nest; eggshells white (possibly stained off-white), 0.47–0.63 mm in thickness.
Wood Duck	41	1 May	30 April	13 April	29 May	Down, often mixed with sawdust; eggshells off-white, 0.20–0.30 mm in thickness.
European Starling	172	8 May	1 May	23 April	18 June	Densely packed grass, 5–15 cm in depth: sparse feathers, dirty in appearance, mixed into grass nest: bowl in center or toward edge of nest; eggshells normally removed.
Tree Swallow	40	24 May	24 May	12 May	12 June	Loosely placed grass, 2–5 cm in depth: clean feathers mixed into grass and completely lining nest bowl; bowl placed toward side of cavity; eggshells normally removed.
Total[a]	300	13 May	1 May	25 March	18 June	Nest remains may be combined or "stacked," indicating multiple occupancy during the same nesting season.

[a] Total mean and mode nest initiation dates are not weighted for differences in species sample sizes.

Hooded Merganser nests contained oval-to-round, white eggs with down deposited by the end of the egg laying period. About one-half of the Hooded Merganser nests had ≥1 long (>30 cm) pieces of dead reed canary grass (*Phalaris arundinacea*), a plant abundantly available on the study area. During the egg laying period, we found eggs buried in sawdust beneath the reed canary grass. During incubation, eggs were normally on top of sawdust and grass and covered with down. As Hooded Mergansers laid only one egg every other day, other species (e.g., Starlings) may have deposited grass between female merganser visits during the egg-laying process.

Wood Duck eggs were elliptical ovate and off-white in color. Females placed down in nest sites toward the completion of egg laying. Down often became well mixed with sawdust after hatch. Vacated nests of both Wood Ducks and Hooded Mergansers consisted of down, eggshell fragments, egg linings and/or unhatched eggs (see Bellrose 1980 for additional duck-egg characteristics). Nests of duck species could be distinguished by examining eggs or measuring the thickness of eggshell fragments. Hooded Merganser eggshells are twice the thickness of Wood Duck eggs (Soulliere 1987).

Starling nests were made of tightly packed, mixed dead grasses covering the floor of the nest site 5–15 cm deep: 10–15 cm deep in compartments 24–25 cm in diameter, 5–10 cm deep in nest sites 27–28 cm in diameter (see Soulliere et al. 1992 for other nest site dimensions). Well-defined bowls with sky blue eggs were normally in the center of starling nests. Sparsely placed, matted (unclean) feathers were often mixed into the grass-nest material. Duck feathers were most frequently used and were readily available near nest sites. Tree swallows constructed nests of loosely packed, dead grass 2–5 cm deep. Their "delicate" nest bowls were located toward the perimeter of grass nests and were lined with fluffy, clean feathers, normally duck feathers. Tree Swallow eggs were light pink.

Nest initiation dates found in Wisconsin should be comparable to other states with similar latitude and climate. Identifying the nests of species we studied can be done pre- or post-hatch using characters described. Whereas nest houses have little significance in Wood Duck population maintenance in Wisconsin (Soulliere 1986), they provided an opportunity to assess nesting characteristics of some wildlife species otherwise difficult to study.

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