

Diurnal Time-activity Budgets for Ring-necked Ducks Wintering in Central Florida

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Abstract: Ring-necked duck (*Aythya collaris*) activities were monitored from mid-November 1979 to late February 1980 on a retired phosphate settling impoundment in central Florida. Time-activity budgets of males and females were similar. Activities of wintering ring-necked ducks were directed at putting on fat reserves prior to reproduction. Birds invested most of their time feeding and resting; courtship and aggression were rarely observed. Maintenance of high feeding levels and minimization of time spent in energetically costly activities such as courtship and aggression probably facilitated fat deposition. Differences in ring-necked duck activity rhythms between habitats point to the need for further research in additional habitats and long-term monitoring of activities within important habitats.

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It is becoming increasingly clear that events over winter and during migration have an important impact on waterfowl survival and reproduction. Many ducks and geese use nutrient reserves accumulated on wintering and spring staging areas to meet subsequent costs of reproduction (Korschgen 1977, Ankney and MacInnes 1978, Raveling 1979, Krapu 1981, Hohman 1984). Heitmeyer and Fredrickson (1981) have correlated annual fluctuations in mallard (*Anas platyrhynchos*) recruitment with changes in the quality of mallard wintering habitat. The importance of foods to wintering birds has long been recognized, and food habits have been a focus of wintering waterfowl research. Time-activity budgets have been largely ignored, though knowledge of behavioral patterns is important in understanding habitat utilization and self-maintenance and productive requirements in birds (Titman 1981). The aim of this study was to determine time allocated to different daily activities by ring-necked ducks wintering in central Florida.

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This work was undertaken as part of a larger study examining changes in body weight and body composition, feeding ecology, and habitat utilization of ring-necked ducks wintering in Florida. This research was supported in part by a U.S. Department of Interior, Migratory Bird and Habitat Research Laboratory contract (14-16-009-79-019) awarded to Milton W. Weller, Department of Fisheries and Wildlife, University of Minnesota. The author thanks F. Montalbano, Florida Game and Fresh Water Fish Commission, who shared his study area, and the Borden-Teneroc and Agrico Chemical companies which granted permission to work on their property. Analyses were performed using computer software written by T. S. Taylor. J. Dixon assisted with data entry. The author is grateful to F. Montalbano, T. S. Taylor, and M. W. Weller for critical review of the manuscript.

Methods

Ring-necked duck activities were monitored from mid-November 1979 to late February 1980 on a retired phosphate settling impoundment in central Florida. A detailed description of the study area was provided by Montalbano et al. (1978) and Montalbano et al. (1979), who used the same site for their waterfowl food habits studies. Most of the 219-ha impoundment was covered by a dense stand of emergents: cattail (*Typha* sp.) and primrose willow (*Ludwigia* sp.). Ring-necked duck activities were confined to the open water area, which made up less than 10% of the impoundment. The open water ranged in depth from 0 m to 1.8 m (Montalbano et al. 1978) and was heavily vegetated with matted growths of hydrilla (*Hydrilla verticillata*). Public access to the study area was restricted and hunting prohibited. Except for infrequent patrols of the property by security personnel, birds were not disturbed by humans.

The study area was visited monthly for 2-day observation periods. The diked perimeter of the phosphate settling impoundment provided an excellent vantage from which to observe bird activities. Birds were observed from a parked truck using a 15–60× spotting telescope. Ring-necked duck activity was recorded by sex using the individual instantaneous scan technique (Altmann 1974). Scans of the open water area were made at 5-minute intervals. When more than 75 to 100 birds were present, a complete scan of the open water area within the specified interval was not possible, and partial scans (proceeding systematically left to right in 50 to 100 bird increments) were initiated. Observations were made between 0700 and 1800 hours while light conditions permitted reliable sexual identification.

Ring-necked duck activities were put into the following behavioral categories: Feeding—behavior associated with food search, capture, and handling; Resting—birds inactive with head positioned low on chest, bill setting on breast, or sleeping with eyes closed, bill tucked into scapular feathers; Comfort—all behavior associated with body maintenance (= “care of body surface

and related activities," McKinney 1965); Locomotion—birds swimming or flying; Agonistic—aggressive behavior ranging from threats and avoidance to bill thrusts, chasing and fighting; Courtship—behavior associated with mating; and Alert—birds active, heads held off their shoulders, but not performing any of the above activities.

Percent time spent at various activities was calculated for each scan. Male and female time-activity budgets were compared using Mann-Whitney *U*-tests (Conover 1980). Morning (≤ 1200 hours) and afternoon (> 1200 hours) observations also were compared using Mann-Whitney *U*-tests. Comparison of monthly time-activity budgets was accomplished using Kruskal-Wallis rank sums multiple comparisons tests. Significance level was set at $P = 0.05$.

Results

Ring-necked duck time-activity budgets were constructed from approximately 70 hours of observation. The size of the study population varied among months from approximately 50 birds in February to nearly 500 birds in December. Males were twice as numerous as females on the study area. No evidence of roosting flights was seen in the study population.

There were no significant differences in the seasonal time allocation patterns of male and female ring-necked ducks. Time-activity budgets for both sexes varied among months (Fig. 1). Percent time feeding increased significantly during winter with February birds spending $> 50\%$ of daylight hours feeding. Correspondingly, resting time declined from November (mean = 43 [median = 42%]) to February (14 [10%]). Other seasonal changes were less substantial. Birds spent significantly more time alert (13 [7%]), and less time in locomotory (14 [11%]) and comfort (13 [11%]) activities in December than in other months. In spite of high bird densities, agonistic behavior was rare ($< 1\%$) in all months. Only 3 instances of courtship activity were recorded; no copulations or attempted copulations were observed. Birds tended to be more active (i.e., alert, feeding, and swimming) in the morning than in the afternoon ($P < 0.05$).

Discussion

Activities of wintering waterfowl are ultimately tied to species reproductive strategies. Energetic costs of reproduction for ducks and geese are large relative to those of other major groups of birds (King 1973, Ricklefs 1974). Birds have a substantial capability for storage and utilization of energy reserves, primarily in the form of lipids (Blem 1976). Such reserves play a prominent role in ring-necked duck reproduction (Hohman 1984), as well as that of many other waterfowl species (Korschgen 1977, Ankney and MacInnes 1978, Raveling 1979, Krapu 1981). Ring-necked ducks in south Florida put

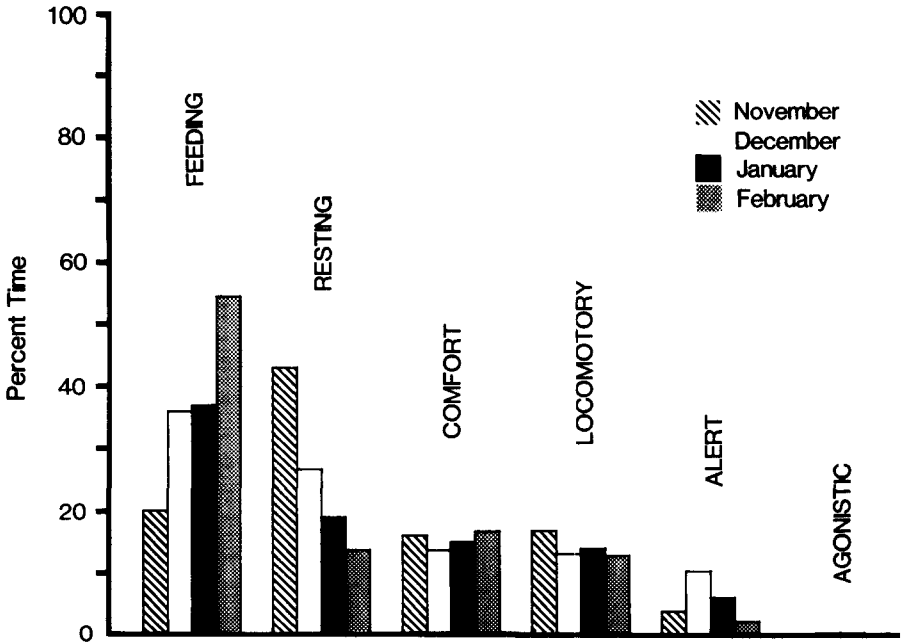


Figure 1. Monthly time-activity budgets of ring-necked ducks using a phosphate settling impoundment in central Florida.

on body fat and showed a constant weight gain over winter (T. S. Taylor, unpubl. data). This species, which nests in wetlands with low primary production, uses fat stores accumulated on wintering and staging areas to meet subsequent costs of reproduction (Hohman 1984). Feeding and resting were the principal activities of ring-necked ducks wintering in South Carolina (Alexander 1980) and central Florida (this study). Further, birds in both localities exhibited low levels of alert, courtship, and agonistic behavior. Maintenance of high feeding levels and minimization of time spent in energetically costly activities such as courtship and aggression probably facilitated fat deposition.

Similarities in the time-activity budgets of males and females reflect a common need for fat deposition before reproduction. Females incur substantial costs of egg production. Moreover, females may require additional energy reserves after laying when attentiveness to the clutch or brood restrict foraging time. Males reduce feeding and expend fat reserves during courtship and while attending prelaying/laying mates. Female ring-necked ducks in South Carolina spent less time feeding and more time resting than males (Alexander 1980). Sexual differences recorded in South Carolina may have resulted from comparatively high levels of intraspecific (intersexual) aggression and male dominance over females. Male and female time-activity budgets were similar in

wintering pochards (*Aythya ferina*) (Klima 1966) and gadwall (*Anas strepera*) (Paulus 1980).

Ring-necked duck time-activity budgets varied among months. Increases in feeding time and reductions in resting time from mid-November to late February were especially notable. Time-activity budgets of green-winged teal (*Anas crecca*) and gadwall (Paulus 1980) also changed over winter; however, Pedroli (1982) found tufted duck (*Aythya fuligula*) activity rhythms to be approximately constant throughout the winter. Shifts in time allocated to different activities have been attributed to changes in photoperiod, temperature, disturbance levels, food quantity, and food quality. Factors affecting activity rhythms, however, were not assessed in this study.

Ring-necked ducks using phosphate settling impoundments in central Florida spent more time feeding than birds in natural wetlands in South Carolina. Whereas Florida birds fed 20% to 50% of the day, ring-necked ducks wintering in South Carolina averaged only 20% to 21% feeding time (Alexander 1980). Discrepancies in feeding time were probably related to differences in feeding modes and diets of the birds in the 2 localities. Central Florida ring-necks fed almost exclusively on the terminal buds of hydrilla (Montalbano et al. 1978, T. S. Taylor, unpubl. data). Hydrilla appeared to be extremely abundant in the phosphate settling impoundment. In South Carolina, ring-neck birds fed in association with canvasbacks (*Aythya valisineria*) on banana water lily tubers (*Nymphaea mexicana*). Alexander (1980) suggested that feeding with canvasbacks provided ring-necked ducks with better access to buried tubers. This feeding mode, however, is probably rare in wintering ring-necked duck populations.

Daily estimates of time spent feeding provided in this study are conservative. Diving birds (out-of-sight) are commonly missed using the instantaneous scan technique which is biased in favor of visible, inactive behavior (e.g., resting). Birds may also feed at night. Although nocturnal feeding was not directly observed, ring-necked ducks are known to feed nocturnally at other points in the annual cycle (Thornburg 1973, Hohman 1984). Nocturnal feeding is common in other wintering *Aythya* species; wintering tufted ducks feed exclusively at night (Pedroli 1982). Pedroli (1982) speculated that nocturnal feeding was only possible because *Aythya* species eat plant material and sedentary animal material.

While birds tended to spend more time feeding in the morning than in the afternoon and evening, ring-necked ducks using the phosphate settling impoundment fed intermittently throughout the day (polyphasic). In contrast, Florida birds using northern Everglades habitat (Loxahatchee National Wildlife Refuge (NWR), Boynton Beach, Fla.) appeared to be monophasic with a single, afternoon feeding bout. This was suggested by: 1) the low incidence of foods in esophagi of hunter-killed birds (>1,250 specimens examined) taken before 1200 hours, and 2) the high frequency of food occurrence (>80%) in specimens collected at dusk. Diets of Loxahatchee birds were

dominated (>98% aggregate percent dry weight) by fragrant water lily seeds (*Nymphaea odorata*) (T. S. Taylor, unpubl. data). The large food volumes found in esophagi of collected specimens and the presence of immature seeds and miscellaneous flower head fragments strongly suggested that ring-necks were feeding on fragrant water lily flower heads prior to seed dispersal. Birds probably located submersed flower heads visually, which would have precluded nocturnal feeding. Afternoon hunting was prohibited on Loxahatchee NWR. Hunting disturbance, therefore, may have been responsible for the feeding pattern exhibited by ring-necked ducks on Loxahatchee NWR. Indeed, Thornburg (1973), studying migrating diving ducks on Keokuk Pool, Mississippi River, attributed shifts from diurnal to nocturnal feeding to human diurnal disturbances on feeding areas.

Time-activity budgets are useful indicators of body-maintenance and productive (i.e., growth and reproduction) requirements in birds. Moreover, knowledge of behavioral patterns is essential for assessment of habitat use. Differences in activity rhythms of ring-necked ducks wintering in South Carolina (Alexander 1980) and Florida (this study) point to the need for further behavioral research in additional wintering habitats and long-term monitoring of activities within important habitats.

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