birds taken during the hunting season in the United States and Canada, where he reported percentages of Canvasbacks, Redheads, and Lesser Scaup containing lead shot to be 13, 20, and 10 per cent, respectively.

One juvenile Canvasback's gizzard contained a bent, much-eroded nail. The nail had neither caused apparent damage to the gizzard nor impaired the bird's health. Olney and Beer (Wildfowl Trust Ann. Rept., 12:169–170, [208], 1961) report five ducks that either became sick or were killed after various ingested metal objects pierced the digestive tracts.

Support during during field studies and preparation of the manuscript was given, in parts, by the Department of Wildlife Ecology, University of Wisconsin, Madison, Wisconsin, the Delta Waterfowl Research Station, Delta, Manitoba, and the Bureau of Sport Fisheries and Wildlife.—JAMES C. BARTONEK, *Northern Prairie Wildlife Research Center, Bureau of Sport Fisheries and Wildlife, Jamestown, North Dakota 58401,* *14 February 1968.*

Time frequency between successive drumming performances of Ruffed Grouse.—Drumming counts have been and continue to be used in two ways: by game biologists to census Ruffed Grouse (*Bonasa umbellus*) intensively on small areas where observers tally individual birds, and extensively where the frequency of drumming at several listening stations during predetermined time intervals constitutes a population index. The latter method is usually used during a roadside census.

Petraborg, et al. (J. Wildl. Mgmt. 17:292, 1953) while attempting to establish criteria for running roadside drumming counts timed the intervals between successive drums of individual males, apparently to the nearest one-half minute, and concluded the mean to be slightly over 4 minutes. These same workers also noted that " . . . in the morning drumming begins shortly after 4 A M, reaches a maximum between 5 and 6 A M, then levels out to a plateau between 5 and 10 A M. After 11 A M drumming falls sharply to approximately zero." A minor drumming activity period in late afternoon was also noted.

During an approximate 3-week period in the spring of 1961 I noted the time of day, to the second, that Ruffed Grouse started individual drumming performances on 4-160-acre study units of the Gratiot-Saginaw State Game Area, Michigan.

In early April I found an active drummer and for several mornings well before daybreak, I set up a tape recorder within about 30 yards of the drumming log, turned the device on, and departed to work elsewhere. The time of start was recorded and when I later monitored the tapes, the precise time of drumming and therefore the time interval between drums was recorded. While engaged in locating other drumming sites, I simply noted the precise time that individual performances began.

Altogether, I was able to record 415 time intervals between successive drums of 11 individual male Ruffed Grouse that spring. In no instance did I record the last drum of the morning for any bird. The data presented here represent drumming during the early morning period only, and represent the behavior of a composite of cocks located throughout the habitat being studied. These data are pooled for all mornings and represent a variety of climatic conditions, although I did no field work on very windy or rainy mornings.

The mean interval between drumming performances was 4.05 ± 0.28 minutes (confidence limits are expressed as 2 standard errors of the mean).

I subdivided the morning period into 10, 15-minute intervals related to sunrise time as follows: 1 hour or more before sunrise; between 1 hour and 45 minutes before

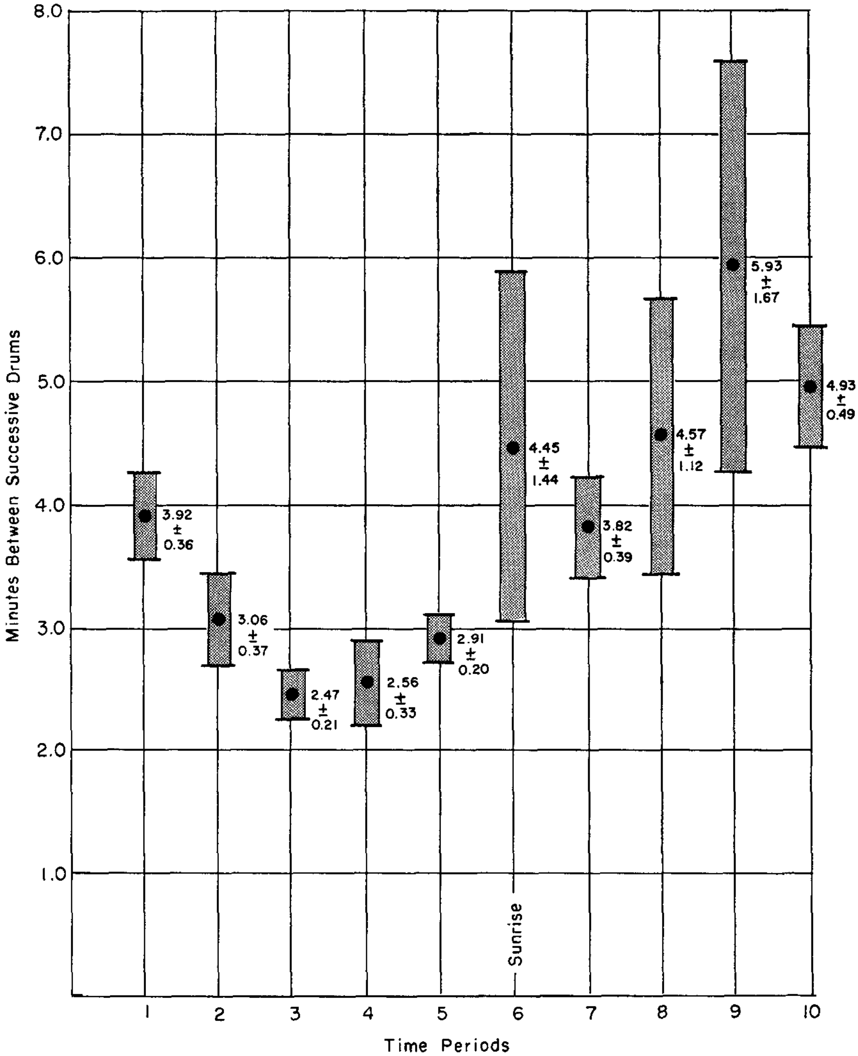

FIG. 1. Time interval between 415 successive morning drums of 11 Ruffed Grouse by 10 arbitrary time periods. (Bars depict means and 2 standard errors of the mean).

sunrise; between 45 and 30 minutes before sunrise; etc. The frequency of drumming by time intervals is graphically presented in Figure 1.

The first drumming in the morning generally begins some time prior to an hour before sunrise. These data indicate that intensity increases (or conversely the interval between successive drums decreases) and appears to peak about 30 minutes before sunrise. Thereafter, intensity tapers off quite rapidly. Significant differences in drumming frequencies between successive 15-minute intervals were not apparent except between the first three intervals. The wide confidence limits for certain of the 15-minute time intervals viz. sunrise to 15 minutes post sunrise, are due to a relatively few very long intervals between drums. During the early morning period prior to sunrise, birds at established drumming sites probably actively drum.

Apparently, birds established on drumming sites actively drum at regular frequencies during the period prior to sunrise. Most variation occurs after sunrise.

In intensive studies on small study areas where individual birds are located through repeated daily checks, the intensity of drumming is not a critical factor, although longer time intervals between drums make it easier to miss birds. On the other hand, when making roadside or other extensive counts in which the number of drums heard per unit time is the parameter used, it is obvious that surveys should be started an hour before sunrise.

The relationships between drumming behavior, population density and climatic conditions need much more study.

This study is a contribution from Pittman-Robertson Project W-117-R, Michigan.—WALTER L. PALMER, *Rose Lake Wildlife Research Station, Michigan Department of Conservation, Route 1, East Lansing, Mich. 48823, 17 February 1968.*

Increase in Herring Gull colony in Cape May, New Jersey.—Ornithologists have been interested in the southward movements of the Herring Gull (*Larus argentatus*) along the east coast of the U.S. (Hailman, Auk, 80:375, 1963; Bull, Birds of the New York area, Harper & Row, 1964). The interest stems from the question of what conflicts might occur when the Herring Gull establishes a new colony in an area where another species of Laridae has been nesting. If the two species compete for the same resources, we should expect by the competitive exclusion principle to see a local demise of one.

A profile of a typical coastal marsh in Cape May, New Jersey is given in Figure 1. The vegetation is mostly *Spartina alterniflora* (included also are: *S. patens*, *Salicornia* sp., and *Distichlis spiccata*). In some places the Army Corps of Engineers dredged the intercoastal waterway pumping large quantities of sand and fill onto *Spartina* marshes. The resulting higher marsh table engenders subsequent succession of the vegetation to the woody bush *Iva* sp. (W. Bourn and C. Cottam, Research Report 19, Fish and Wildlife Service, 1950; E. Rosenwinkel, Bull. New Jersey Acad. Sci. 9:1–20, 1964).

For three summers (1964–1966) we studied the ecology and habitat responses of breeding Laughing Gulls (*Larus atricilla*) on Ring Island (39° 03′ N, 74° 47′ W), Cape May, New Jersey. The Laughing Gull colony is situated on the marsh covered by *S. alterniflora* and not on the higher fill areas. In 1964 we noted a few Herring Gulls circling over a stand of *Iva* on an island adjacent to Ring Island, but did not investigate. On 1 June 1965 we visited the stand of *Iva* and counted 17 Herring Gull nests. On 15 and 16 June a northeast storm hit the coast. Three study areas in the Laughing Gull colony containing 79, 36, and 516 nests lost respectively 100, 95 and 60 per cent of their nests. At the same time all the nests in the Herring Gull colony remained intact. The storm tide did not inundate the higher fill area as it did the lower *Spartina* marsh. Clearly, in a storm the Herring Gulls of this colony fared better than the neighboring Laughing Gulls. On 3 June 1966 we again visited the Herring Gulls and counted 42 nests. While recording their contents, we noted a higher proportion of clutches with three eggs (at the time about 10 per cent of the eggs had already hatched) compared to those of the Laughing Gulls ($\chi^2 = 5.51$; $P < 0.05$).