made mid-way through its breeding season. It is possible that this was a renesting attempt. Yellow Warbler nests resemble Least Flycatcher nests (Bent, U.S. Natl. Mus. Bull. 179, 1942); thus the stimulus of a familiar nest structure may have enhanced this opportunistic behavior. As the breeding season progresses, it may be more advantageous to occupy an existing nest and to channel the energy saved into egg production rather than expending it on building another nest.

This behavior may also indicate the initial stages of nest parasitism. Davis (Auk 57: 179–218, 1940) defines a nest parasite as one which builds no nest of its own but rather raises its young in old nests of other birds. The use of deserted or old nests may not illicit competition for the nest site with the original owner thereby allowing egg-laying to occur with minimal disturbance.

This work was funded by grants from the National Research Council of Canada and the University of Manitoba Research Board to S. G. Sealy, whom I thank for assistance in preparing this note. This is paper number 34 of the University of Manitoba Field Station (Delta Marsh).—J. PAUL GOOSSEN, *Dept. of Zoology, Univ. of Manitoba, Winnipeg R3T 2N2.* *Accepted 26 Mar. 1976.*

Pintail reproduction hampered by snowfall and agriculture.—The reproductive strategy of the Pintail (*Anas acuta*) shows several adaptations to the semi-arid variable climate of the prairie pothole region of north central North America where the species is a common breeder. By nesting early and using temporary and seasonal water areas replenished by snow melt waters or early spring rains, the species has successfully occupied broad areas containing limited permanent and semi-permanent water. The Pintail is prone to select new breeding grounds during periods of drought. Smith (J. Wildl. Manage. 34:943–946, 1970) has shown that part of the population moves northward from the prairies and parklands when widespread drought conditions occur there. Though well-suited for the natural prairie pothole environment, this reproductive strategy makes the Pintail vulnerable to spring snowstorms and modern agricultural practices. In recent years, high cereal grain prices have caused most of the prime Pintail breeding areas of eastern North Dakota to be placed under annual cultivation. Because the Pintail is prone to nest on cultivated lands, it is particularly vulnerable to spring farming operations. The magnitude of direct nest loss attributable to agriculture varies with the chronology of planting operations, size of the nesting population, and timing of nesting. These factors are affected by precipitation patterns. A recent study indicated few Pintail and other duck nests survive when nests are initiated on cropland prior to spring planting operations (K. Higgins, J. Wildl. Manage. in press). Field observations of Pintail hens and examination of reproductive tracts of sampled specimens during the spring of 1970 in eastern North Dakota provided an opportunity to identify nesting patterns and to study their relationship to precipitation, including snowfall, and to agricultural operations.

Pintails began arriving in substantial numbers in Stutsman County, North Dakota, on 4 April. Pair dispersal was initially slowed by a lack of water in shallow wetland basins, but in mid-April water conditions improved dramatically following a wet snowfall on 12 and 13 April and additional precipitation on the 15th. Pintail pairs soon occupied the newly flooded habitat and egg laying was in progress by 18 April at the onset of a 10 cm snowfall. Precipitation at Jamestown, North Dakota during April 1970 totaled 5.77 cm (U. S. Dept. Commerce, Climatological Data 79:43–57, 1970).

I collected 5 paired hens (P-45, P-47, P-49, P-50, and P-51) in Stutsman, Barnes, and LaMoure counties from 18 to 23 April while the ground was covered with snow. Examination of the reproductive tracts of the sampled hens indicated all had continued to lay despite apparent disruption of nesting by snow cover. P-45 was collected shortly after the onset of snowfall on 18 April and was nearing completion of its clutch at that time based on number and stage of regression of ruptured follicles. The bird had laid on the date of collection, had an egg in the oviduct, and had 1 enlarged follicle weighing 10.0 g still to be ovulated. P-47 was collected during heavy snowfall on 19 April. Five recently ovulated ovarian follicles, an egg in the oviduct, and normal follicle gradation indicated continued laying activity. Ovary weight was 32.6 g. P-49 had laid 1 egg and its ovary weighed 33.8 g; the largest follicle weighed 15.8 g. Ovulation had not occurred on 20 April but appeared imminent. A series of 6 recently ruptured follicles and an egg in the oviduct indicated P-50 was continuing to lay on 22 April although no enlarged ovarian follicles remained to be ovulated. The ovary of P-51 contained a series of recently ovulated follicles and an enlarged follicle (6.3 g). Three larger follicles had collapsed and were regressing, presumably because of weather-related factors. Continued laying activity by these hens in areas of heavy snow cover suggests eggs were either being dumped or new nest sites chosen. I doubt that many hens relocated their nests the morning of 19 April considering that snowfall began in late afternoon of 18 April and formed a uniform mantle several centimeters deep by the following morning; heavy snowfall continued through the 19th.

Relatively mild temperatures presumably were a major factor contributing to the continuance of laying despite snow cover. Dane and Pearson (Pp. 258–267 *in* Proceedings Snow and Ice in Relation to Wildlife and Recreation Symposium, Iowa Cooperative Wildlife Research Unit, Iowa State Univ., Ames, 1971) indicated that following a snowstorm on 1 May 1967 in North Dakota, all Mallard (*Anas platyrhynchos*) and Pintail pairs in the severe storm area abandoned their territories but some Mallards continued laying in the less intense storm areas. The 1967 storm was accompanied by high winds and temperatures fell to –9°C in the severe storm area causing ice formation of sufficient strength to carry a man (Dane and Pearson, op. cit.). Following the 1970 snowfall, the lowest temperature recorded at Jamestown was –5°C on 22 April. During the 1967 storm, –9°C readings lasted for 3 days whereas in 1970 the temperature dipped to –5°C for only 1 night. Because many wetlands remained at least partially open, invertebrates continued to be available and were fed upon by hens. The 5 hens collected during the snowfall period were feeding and esophagi of 4 contained invertebrates (earthworms or snails, and/or dipteran larvae). Earthworms were obtained from newly flooded shallow wetlands. Invertebrates are the dietary staple of Pintail hens during the period of egg formation (Krapu, Auk 91:278–290, 1974).

The fact that food remained available at certain wetland sites during the period snow covered the ground in 1970 may have contributed to continued laying activity. Nalbandov (Reproductive Physiology, 2nd ed., W. H. Freeman, San Francisco, 1964) indicated that withdrawal of food triggers follicular resorption in laying hens. Some interruption of laying apparently did result from the storm. In addition to ovarian follicular regression noted in P-51 taken towards the end of the snowfall period, ovaries of 2 of 5 hens collected from 24 April through 30 April had enlarged collapsed follicles indicating interruption of a previous nesting attempt. Three of these hens were laying, 1 was about to initiate laying, and 1 showed no evidence of recovery. Heavy nest loss and/or inhibition of nesting as a result of the 18–20 April snowfall presumably contributed substantially to the high transect pair:lone male ratio of 23:19 on 29 April in comparison to a pair:

lone male ratio of 8:24 on that date in 1969 (C. Dane, pers. comm.). Favorable weather conditions prevailed throughout late April 1969.

Following an unusually wet and cold period in late April 1970, a second major nesting effort began on about 1 May and lasted for approximately 10 days. Of 10 hens collected from 3 to 9 May all had ovulated on the date of collection. The Pintail pair:lone male ratios along a transect near Jamestown on 29 April, 5 May, and 12 May were 23:19, 12:17, and 4:20, respectively (C. Dane, pers. comm.). These data also suggest that a major portion of the hens had completed clutches and had initiated incubation by mid-May. Mild weather accompanied this laying effort.

Evidence of substantial nest destruction appeared during late May 1970. Agricultural operations commenced on about 10 May and a massive planting effort was underway by mid-May. Sightings of hens increased on the Drift Prairie as agricultural operations progressed. I obtained a measure of the magnitude of nest losses from data collected during the annual breeding ground survey conducted by the North Dakota Game and Fish Department. Two transects (6 and 7) totaling 643.7 linear km and encompassing an area of 259.1 km^2 occur in the intensively cultivated Drift Prairie of eastern North Dakota. Surveys were conducted on 18–19 May 1969 and 18–21 May 1970. Data from the 2 transects were combined resulting in pair:lone male ratios of 105:364 (1969) and 165:352 (1970) (C. Schroeder, pers. comm.) indicating a marked difference in the proportion of non-incubating hens between years presumably caused by differing nest destruction rates. Favorable weather conditions during the spring of 1969 reduced potential for heavy losses of incubated clutches from planting operations late in the nesting season. In 1970, 11 paired Pintail hens were sampled on the Drift Prairie from 20 to 27 May and all had brood patches suggesting nesting attempts had progressed into incubation. Behavior and activity patterns of these hens suggested nesting attempts had been terminated. Estimates derived by projecting these transect data to the entire Drift Prairie area of North Dakota and interpreting reproductive status on the basis of sampled birds suggest that approximately 43,725 hens had lost one or more nests on the Drift Prairie and were approaching a nesting failure for the season when censused in late May 1970; 15,900 more hens than during a similar period in 1969. The impact of nest loss during years of delayed planting is intensified because of the reduced probability that hens will renest following nest destruction late in the breeding season. Deteriorating water conditions in late May 1970 probably also diminished renesting prospects.

In summary, because most of the prime breeding area of the Pintail in eastern North Dakota is now under annual cultivation, prolonged periods of precipitation in spring that in pristine times either enhanced Pintail reproduction or, as with snowfall, acted only as a temporary setback, now delay agricultural operations and set the stage for destruction of nests over millions of hectares in a few weeks. The problem is magnified from past agricultural periods because few fields are now left idle each spring for a sufficient period to allow clutches to hatch. The Pintail will renest when suitable habitat conditions exist so is capable of partially compensating for these losses.

Agriculture poses an additional threat to the Pintail through destruction of wetland habitat. The degree of success of efforts to preserve a substantial part of the remaining temporary and seasonal wetland habitat of the prairie pothole region will be a major factor determining whether prairie-nesting Pintail populations comparable to those of recent years will continue to exist there. Protection from drainage has been afforded sizable blocks of shallow wetland basins at widely scattered locations in North Dakota through perpetual easements under the Small Wetlands Program administered by the U. S. Fish and Wildlife Service. This continuing effort is an important step toward

maintaining the extensive shallow wetland base required by Pintail breeding in the prairie pothole region.

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Ticks as a factor in the 1975 nesting failure of Texas Brown Pelicans.—Fewer than 100 Brown Pelicans (*Pelecanus occidentalis*) remain on the Texas Coast from a population that once numbered 5000 birds. Only a small proportion of these have nested in recent years and most attempts have not been successful (King et al., Southwest. Nat. 21: in press). Pesticides were responsible for mortality of Louisiana pelicans in 1975 (Winn, Audubon Mag. 77:127–129, 1975), but nest failure in Texas was attributed to natural causes. Seven pairs of Brown Pelicans nested on a low-lying island near Aransas National Wildlife Refuge in April, but all deserted their nests before the eggs hatched. The cause of desertion was either storm tides that nearly inundated the island, or more likely, an infestation of nest parasites. A later nesting attempt at Pelican Island in Corpus Christi Bay ultimately produced 9 young.

Adults were first seen building nests near Aransas Refuge on 14 April. On 24 April, 6 nests containing 16 eggs were still active. A 7th had failed, probably due to wave action that partially buried the nest and its single egg. Eight days later, all nests were found deserted. When the eggs were collected on 7 May, an unusually heavy infestation of ticks was noted in and around the nests. On 25 May, 3 nests were collected which yielded a total of 2389 adult and nymphal ticks. Many thousand larvae were also present.

All ticks were identified as *Ornithodoros capensis* by personnel of Naval Medical Research Unit-3 (NAMRU-3) Cairo, Egypt, and United States Public Health Service, Rocky Mountain Laboratory, Hamilton, Montana. *O. capensis* is a common argasid tick infesting many species of aquatic birds in tropical, subtropical, and south temperate climates (Kohls et al., Ann. Entomol. Soc. Am. 58:331–364, 1965; Hoogstraal, *in* Viruses and Invertebrates, A. J. Gibbs (ed.), American Elsevier Publishing Co. Inc., New York, 1973; Hoogstraal et al., J. Med. Entomol. 12:703–704, 1976). Although *O. capensis* is found in many areas of the Old World, its occurrence in continental United States has been reported only once. Twelve specimens were taken from a Roseate Spoonbill (*Ajaia ajaja*) collected on an unnamed island off the coast of Texas in 1940 (Kohls et al., op. cit.). Closely related specimens in the *O. capensis* group, but not true *O. capensis*, have been recorded in Oregon (Clifford et al., J. Med. Entomol. 7:438–445, 1970), California (Radovsky et al., J. Parasitol. 53:890–892, 1967), and Florida (Kohls et al., Ann. Entomol. Soc. Am. 58:331–364, 1965).

Infestations of *O. capensis* have caused nest desertion and perhaps the death of nestlings through the transmission of a lethal arbovirus in some sea-bird colonies. Converse et al., (Am. J. Trop. Med. Hyg. 24:1010–1018, 1975) and Feare (Ibis 118:112–115, 1976) documented the abandonment of 5000 Sooty Tern (*Sterna fuscata*) nests containing eggs and young in a colony of 400,000 pairs on Bird Island in the Seychelles. They found numerous ticks in the deserted portion of the colony but few or none in adjacent areas where reproduction was normal. Not only did the ticks cause desertion, they remained so abundant the following year that the terns did not reoccupy the area. Marshall (Wilson Bull. 54:25–31, 1942) reported nest abandonment of incubating Common Terns (*Sterna*