circled about 20 m. Again, the harrier descended on the spot and the pheasant repeated the same aggressive behavior. The harrier veered off and flew out of view. I went to the site and flushed three 2-week-old pheasant chicks. The chicks flew into an area of small shrubs and trees 4 m to the west, and several moments later, I heard chicks and the hen calling from the area.

On 14 August 1983 at 0915, I watched a harrier hunting along a shelterbelt between a grass field and a sunflower field. When the harrier was about 50 m from me, it dove to ground level in the grass field. Several half-grown pheasant chicks flushed into the shelterbelt. The harrier flew up, circled, and dove on the same location. A hen pheasant flew at the harrier in a manner similar to the first observation and apparently forced the harrier to veer off. Several more chicks flushed into the shelterbelt as the harrier circled again before flying out of view.

I saw no successful predation of adult pheasants in several attempts by female harriers. However, I have observed predation by harriers on pheasant chicks as have Breckenridge (Condor 37:268–276, 1935) and Errington and Breckenridge (Am. Midl. Nat. 17:831–848, 1936). Aggressive behavior by male pheasants towards a Northern Harrier was reported by Weigand (Auk 84:114, 1967). He observed a female harrier feeding on an immature hen pheasant. The harrier was pursued by 3 male pheasants and forced to drag its prey into a grass field.

It appears that the threat by harriers to adult pheasants is small enough to make active defense of the chicks a viable alternative to other types of escape behavior.

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Habitat Selection by Roof-nesting Killdeer.—Roof-nesting by Killdeer (*Charadrius vociferus*) was first reported by Pickwell (1925), and since 1937 has been reported from areas throughout the Killdeer's range (Fisk 1978).

Killdeer chicks must leave the roof within 2 days to obtain food (Davis 1943); they normally jump from the roof while being called to by their parents on the ground (Demaree 1975). There are, however, 2 potential hazards associated with this behavior: (1) chicks that hatch on roofs that have parapet walls on all sides are unable to leave the roof and subsequently starve (Wass 1974, Fisk 1978, Dexter 1978; see Dexter 1979 for a supposed exception), and (2) chicks can be killed by the fall (Demaree 1975). Thus, there is selection against Killdeer that nest on parapet-walled roofs, and on roofs that are too high.

We undertook this research to determine if nesting Killdeer (1) avoid roofs with parapet walls, (2) choose roofs that are lower, on average, than a random sample of roofs, and (3) prefer flat roofs or a particular type of roof substrate.

Methods.—In February, 1980, Hopkins, a representative of a company that sells roofing materials, enlisted the support of management personnel of his company (Tremco, Ltd.). That being obtained, Hopkins presented our proposal to other Tremco representatives at their annual convention. We mailed a synopsis of the proposed research, an information sheet about Killdeer, and data cards to 39 Tremco representatives in April; there was at least one representative in each Canadian province. We asked each to fill out a data card for each nest that he found during the course of roof inspections. The data cards required the following information: (1) Date nest found; (2) height of roof above ground in meters; (3) bitumen type—tar (a coal derivative) or asphalt (a petroleum derivative); (4) roof surface—aggregate (e.g., pea gravel, crushed rock) or other (e.g., smooth, mineral, slag); (5) perimeter detail—gravel stop, raised eave, or parapet wall; (6) drainage—flat to slight pitch (<3°) or moderate to steep pitch.

We contacted representatives who returned data cards and asked them about the characteristics of all roofs visited during May and June, 1980 (the period when 94% of

TABLE 1. Comparison of characteristics of roofs, with and without Killdeer nests, visited in May and June, 1980, in Canada.

Variable	Number of roofs		χ^2	P
	With nest	Without nest		
Perimeter				
Parapet walls	1	116		
Other	33	702	3.48	$0.1 > P > 0.05$
Height (m)				
3–10	29	682		
>10–15	5	72		
15+	0	64	3.93	$0.25 > P > 0.1$
Surface				
Gravel	29	734		
Other	5	84	0.69	>0.25
Pitch				
Flat or slight	34	779		
Moderate or steep	0	39	1.70	$0.25 > P > 0.1$
Bitumen				
Asphalt	28	658		
Tar	6	160	0.08	>0.75

nests were found); we compared these data with those from roofs which had Killdeer nests.

Results and discussion.—The number of nests and roofs visited by the 11 respondents, per province, were: New Brunswick—1 nest/47 roofs = 2%; Quebec—5 nests/65 roofs = 8%; Ontario—20 nests/572 roofs = 4%; Manitoba—6 nests/108 roofs = 6%; Saskatchewan—2 nests/60 roofs = 3%. Although the overall frequency is low (34/852 = 4%), that rate, if prevalent throughout the Killdeer's range, means that many thousands of pairs nest on roofs.

We were unable to reject the null hypothesis that Killdeer choose roofs at random, with respect to those visited by Tremco representatives, for any of the 5 variables that we measured (Table 1). The data suggest that Killdeer do avoid roofs with parapet walls on all sides ($.1 > P > .05$) but 1 nest was found on such a roof. The outcome of that nest provides further evidence for why Killdeer should avoid such roofs: the newly hatched young were subsequently found dead on the roof. We received no other reports of mortality, but several representatives reported seeing young Killdeer jumping from roofs.

Killdeer may avoid roofs higher than 15 m, but as Tremco representatives apparently do so also, our results were nonsignificant. The average height of roofs used by nesting Killdeers, 7.1 m, was similar to that, 6.8 m, of the roof from which a chick was seen, by Demaree (1975), to jump and die upon impact. That chick, however, landed on concrete paving and Killdeer chicks jumping onto grass, for example, can probably survive jumps from greater heights.

No nests were found on roofs with moderate or steep pitch, but few such roofs were visited. The first report of a Killdeer nest on a roof (Pickwell 1925) was of one on the "gently sloping roof of a race-track grandstand." As roof nests are "often flooded out" (Fisk 1978), roofs with slight to moderate pitch may be better nesting habitat than are flat ones. Killdeers chose roofs for nesting independently of the type of bitumen on the roof (Table 1).

Most previous reports of roof-nesting Killdeer were of ones nesting on gravel roofs, but there is one report of a nest on a "slag" covered roof (Fisk 1978). Five of the 34 nests,

for which we have data, were on slag roofs and there is no suggestion from our data that Killdeer select gravel for nesting; it seems unlikely that Killdeer would nest on a roof with a smooth surface, but such roofs are relatively rare (Hopkins, pers. obs.), and it would take much more data to find that out.

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LITERATURE CITED

DAVIS, E. D. 1943. A study of wild and hand reared Killdeers. Wilson Bull. 55:223–233.
DEMAREE, S. R. 1975. Observations on roof-nesting Killdeers. Condor 77:487–488.
DEXTER, R. W. 1978. Killdeer nests on rooftop. Inland Bird Banding News 50:134.
———. 1979. Another Killdeer nesting on a rooftop—an exceptional case. Inland Bird Banding Newsletter 1:1.
FISK, E. J. 1978. The growing use of roofs by nesting birds. Bird-Banding 49:135–141.
PICKWELL, G. 1925. The nesting of the Killdeer. Auk 42:485.
WASS, M. L. 1974. Killdeer nesting on graveled roofs. Am. Birds 28:983–984.

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Breeding Age of the Tule White-fronted Goose.—Based on knowledge of the mid-continent white-front (Barry, T. W., Geese of the Anderson River delta, Northwest Territories, Canada, Ph.D. thesis, Univ. of Alberta, Edmonton, 1966), the Tule White-fronted Goose (*Anser albifrons gambelli*) is thought to reach breeding maturity at 3 years. To the best of our knowledge, this assumption exists even though data supporting breeding age in wild, nearctic white-fronts have not been published. This note documents breeding age in Tule White-fronted Geese.

In 1980, 253 Tule White-fronted Geese were banded and collared during molt in Cook Inlet, Alaska. A second-year male and female collared in a group of 162 birds (92 second-year and 70 after-second-year birds) were observed 18 times between 1980 and 1982, 11 times on the breeding grounds, 4 times on the wintering grounds of central California, and 3 times at staging areas in southern Oregon. These birds were observed together in all 3 areas in 1981, and on the nesting grounds in Cook Inlet in 1982.

The pair did not nest in 1981. But during the spring of 1982, the pairs' behavior suggested that they might nest and on 7 June, their nest was discovered. The clutch of 2 partially-covered eggs was floated and estimated to be about 2 weeks into incubation. The poorly constructed nest in low, flooded vegetation, and small clutch were typical of geese nesting for the first time.

These observations suggest that Tule White-fronted Geese may establish pair bonds by the time they are one-year-old and substantiates the assumption that they can breed at 3 years of age.—BRUCE CAMPBELL AND ENID GOODWIN, *Division of Game, Alaska Department of Fish and Game, Anchorage, Alaska 99502.* Received 8 May 1984; accepted 30 Jan. 1985.

Foods of Wintering Brant in Eastern North America.—Brant (*Branta bernicla*) winter along the Atlantic coast from Massachusetts to North Carolina (Kirby and Obrecht 1982). Their populations have undergone dramatic fluctuations (Cottam et al. 1944, Kirby