tween those areas and Florida. The fact that no reports occurred between northern Indiana–southern Michigan and Florida during fall migration (0 of 62) while several (5 of 53) occurred during spring migration, suggests marked cranes migrating in spring are more likely to encounter adversities than when flying south in the fall. Williams and Phillips (1972) reported 1 spring observation and 2 fall observations between north Florida and the Great Lakes region.

The tendency for cranes summering in northern Michigan, northern Wisconsin, Minnesota, and Manitoba to winter principally in south-central Florida and cranes summering in Michigan (mostly the southern part of the state) and Wisconsin to winter primarily in north and central Florida, needs further study, especially the influences local habitat conditions have on wintering range in Florida.

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Olfactory guidance of Leach's Storm Petrel to the breeding island.—This report presents the first experimental evidence for olfactory navigation in Leach's Storm Petrel (*Oceanodroma leucorhoa*) during the terminal approach to a breeding island. Colonies of this species are found on 5 islands of the 200 km^2 Grand Manan Archipelago in the Bay of Fundy. Nest burrows in the larger colonies on Outer Wood, Hay, and Kent Islands are predominantly found under a thick canopy of spruce (*Picea* spp.), balsam fir (*Abies balsamea*), and mountain ash (*Sorbus americana*).

Like most other small procellariiforms, Leach's Storm Petrels typically arrive and depart from their colonies only in darkness, generally between 22:30–23:00 and 04:00–04:30 during the summer months at Kent Island. Visual cues alone seem insufficient for the birds to find and distinguish among the islands since arrival is not retarded under heavy cloud cover or in thick fog. Gannet Rock light, 2 km south of Kent Island, might be a useful reference to the general vicinity when visibility is not unduly impaired by fog. Sound cues likewise seem inadequate for use by the petrels. Thousands of Herring Gulls (*Larus argentatus*) nest on Kent Island, but their vocalizations, normally few and muted after dark, virtually cease on murky, foggy nights. Because gull colonies are also found on other islands of the archipelago, gull noises alone would not serve to distinguish a particular island in any case.

One potential navigational cue of value to the birds might be the distinctive, musky odor of petrels which is apparent to the human nose at considerable distance. Bang (Acta Anat. 65:391–415, 1966), Stager (Am. Zool. 7:415–419, 1967) and others have

TABLE 1

INFLUENCE OF WIND DIRECTION ON APPROACH DIRECTION OF LEACH'S STORM PETRELS TO THE EAST AND WEST COASTS OF THE BREEDING ISLAND

Date	Time after sunset of first call		Number of birds seen within 15 min after the first call	
	Upwind approach	Downwind approach	Upwind approach	Downwind approach
5 July 1970	–	94 min	–	0
12 July	111 min	–	10	–
19 July	103 min	–	49	–
23 July	–	103 min	–	0
4 August	–	105 min	–	0
			59	0

put forward the previously untested hypothesis that procellariiforms may use the odor of their breeding islands to locate them after dark. If Leach's Storm Petrels follow a wind-borne odor trail to Kent Island as they do to cod liver oil at sea (Grubb, Nature 237:404–405, 1972), one should be able to predict their direction of approach each night in terms of wind direction.

Use of an Image Intensifier Scope (Varo, Inc., Garland, Texas) allowed me to monitor incoming birds visually. This instrument creates an image by magnifying ambient light intensities electronically, thus avoiding phototaxic complications. As darkness approached, I placed the tripod-mounted scope upwind or downwind (randomly assigned) on either the east or the west side of the island's north end petrel breeding colony. After the instrument had been focused at 100–150 m and aimed out to sea in line with the wind, it was elevated so the ocean surface approximated a chord of 1.5 radii across the lower image field. For 15 min after the first call from a petrel in flight, I tallied birds coming to the island.

Differences in numbers of petrels flying to the colony up- or downwind were dramatic (Table 1; $\chi^2 = 88.5$, $P < 0.01$). In 2 trials totalling 30 min, 59 birds were watched coming to the colony from the leeward side (upwind), while none was seen flying with the wind toward the colony in 3 trials totalling 45 min.

The petrels approached, singly or in groups of 2 or 3, at estimated altitudes of 20–25 m, much higher than the average 1–2 m heights of birds foraging at sea. Incoming birds maintained these elevations until near the shoreline, then descended to tree top level (8–10 m) while passing in over the colony. Possibly due to the headwind, their rather direct approaches seemed to lack the gliding component displayed when foraging at sea. Limitations on Intensifier Scope sensitivity precluded observation under foggy or cloudy conditions.

Procellariiforms characteristically commute great distances between nesting colonies and feeding grounds. Breeding Slender-billed Shearwaters (*Puffinus tenuirostris*: Green, Emu 65:226, 1966) and Manx Shearwaters (*P. puffinus*; Lockley, Shearwaters. Doubleday, Garden City, New York, 1961) are known to feed over 800 km from their

nests. Homing experiments (Griffin, Auk 57:61–74, 1940; Billings, Auk 85:36–43, 1968) disclose that Leach's Storm Petrels have the ability to return to Kent Island from release points hundreds or thousands of kilometers away. These release points must be far beyond the range of colony odor. Navigation must be based on senses other than olfaction, therefore, until the petrels get within the general vicinity of their breeding island. The use of olfactory cues, suggested by the upwind approach patterns to Kent Island, probably operates only within a few tens or perhaps hundreds of kilometers of the breeding site.

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Effects of highways on Red-winged Blackbird and Horned Lark populations.—Human disturbances that alter the distributions of wildlife populations through habitat modification are widespread. One example is highways, which directly affect wildlife populations in the right-of-way area, but may also have important effects in adjacent areas.

We conducted bird censuses along county roads and interstate highways in central Illinois during 1976 to test the efficacy of several census techniques. Transects perpendicular to the road, 100 m wide and 500 m long, were divided into 100 × 100 m blocks. Clusters of transects were located at random along interstate and county roads in Champaign County, Illinois. All transects discussed here were in fall-plowed fields planted to row crops (mostly corn and soybeans). Censuses were completed before crops matured. Census protocols included 4 and 8 min random walk and 4 min straight walk counts. For random walk counts the observer spent 4 or 8 min in each plot and walked throughout the plot as seemed appropriate to obtain a count of the birds. The observer walked the center line of the transect, spending 4 min in each plot, for straight walk counts. Transects did not include any pavement or gravel shoulder areas.

Census data are partitioned into 2 periods: late winter–early spring (10 Feb.–11 Apr.) and late spring (25 May–20 June). Census times were distributed from 30 min before to 4 h after sunrise. Eighty-six bird counts (62 early, 24 late) were made on 18 different county road transects and 69 (61 early, 8 late) were made on 15 different interstate highway transects. The same census technique was used on all plots within a transect on a given day and separate records were kept of each of the 5 1-ha blocks along the transect. Thus, comparisons of data from blocks at different distances from the highway yield some insight into the effect of highways on bird distributions.

Although data were collected on a number of species, only Horned Larks (*Eremophila alpestris*) and Red-winged Blackbirds (*Agelaius phoeniceus*) were common enough to