somewhat from year to year, even as adults. First-year males, of course, grow between their first and second years; in 7 males measured both as first-year males in 1975 and as adults in 1976, the average increase was 7.0 mm, which was significantly greater than zero ($t = 22.15, P < 0.001$). There was a high correlation between the measurements taken of individuals in their first year and again as adults ($r = 0.929, P < 0.01$) so the size of a first-year male is a good indicator of its future size as an adult. The 44 adult males measured both years increased an average of 1.0 mm between years, which is also significant ($t = 4.48, P < 0.001$). Thus, if survivorship increases with age among the adults for reasons unrelated to size, the increase in size with age among adults may prevent us from discerning a trend within age classes towards greater mortality in large birds. However, survivorship does not generally change with age among adult birds (Deevy 1947, Ricklefs 1974). The low rate of growth among adult males coupled with their high mortality rate means that only a small proportion of the variation in adult sizes could be age-related. Furthermore, changes in survivorship with age could not explain the lack of size-related mortality in the first-year age class. Thus we can probably accept the result that selection as measured by annual survival rates exerts neither a strong stabilizing nor a strong directional effect on size.

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ADDITIONAL DATA ON BODY SIZE AS A DIFFERENCE RELATED TO NICHE

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Ecologists often assume that animals are able to coexist partly because of differences in body size (Wilson 1975). The role of body size in competition is unclear and two contradictory concepts exist in the literature: (1) differences in body size promote differences in niches (Brown and Wilson 1956, Hutchinson 1959, Schoener 1965, 1974); and (2) differences in body size form a competitive gradient such that the larger species can exclude the smaller species (Brooks and Dodson 1965, Galbraith 1967). Studies of the effects of body size on the outcome of aggressive interactions have concluded that the larger animal usually wins (e.g., Morse 1974, Kalinoski 1975, Verner 1975). Larger predators eat food unavailable to smaller competitors, but the reverse is often not true; asymmetry in resource use gives larger animals a competitive advantage (Wilson 1975).

Most studies on resource use examine food as the limiting resource in the relationship between body size and competition. Yet animals compete for other resources, such as space for nesting. In this report, we present data on the relationship between body size and nesting space in several mixed-species colonies of herons, egrets and ibises to test the applicability of Wilson's (1975) concept to nesting space (i.e., that larger animals use a wider range of resources than smaller species).

METHODS AND RESULTS

We examined 13 colonies in the United States, Mexico, and Argentina from 1972 to 1975, containing 10 species of herons, egrets and ibises (Table 1). Colonies (75 to 2,562 nesting pairs) occurred in vegetation ranging from *Phragmites, Scirpus, Iva, Rhus,* and *Myrica* (with a maximum height of 150 cm), to *Baccharis, Tamarix,* and *Smilax* (150–300 cm in height), and to *Rhizophora, Avicennia, Languncularia* and *Prunus* (700–1,200 cm). Further descriptions of the colonies are in Burger (1978).

At each colony Burger gathered data during the first two weeks of egg-laying, including the range of vegetation heights and avian species composition. Recorded at each nest were the height of the vegetation and the height of the nest rim above the ground. We computed the mean nest height for each species and compared the standard deviations of nest height for each
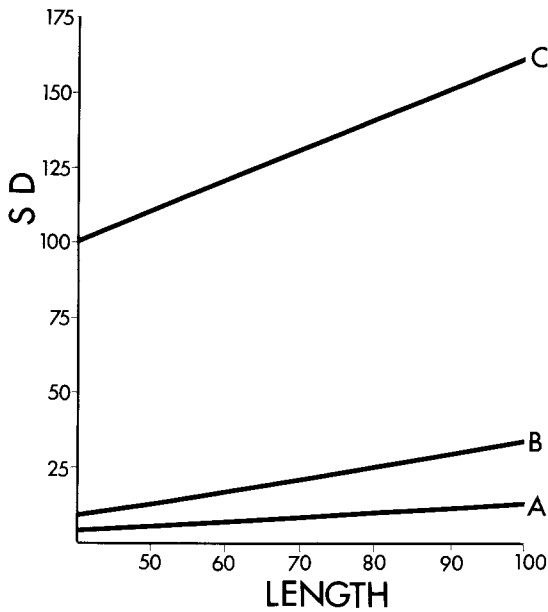
FIGURE 1. Regression lines for standard deviations of nest heights as a function of heronries with maximum vegetation height of less than (A) 150 cm, (B) 150–300 cm and (C) 600–1,200 cm. Increasing size refers to relative size, ranking species within each colony.

species as a measure of nesting space. Other data on nest site selection can be found in Burger (1978). For each colony we arranged the species by body length; those species in the top half of the ordered list were

defined as "large," and those in the bottom half "small." Therefore, among colonies, "large" species were not necessarily the same size. For example, in colony 1 (see Table 1), Great Egrets and Roseate Spoonbills are the large species and Snowy Egrets and White-faced Ibises are the small species; whereas, in colony 5, Louisiana Herons and Snowy Egrets are the large species, and the White-faced Ibis is the small species.

Species were aligned vertically in an order which correlated with body lengths, i.e., larger species nested higher, and smaller species nested lower (Burger 1978). Naturally, nest heights correlated with vegetation heights. These data can be organized to test Wilson's (1975) suggestion that larger species use a wider range of the resource than smaller species.

In general, within each of the 13 colonies examined, the large species had larger standard deviations for nest heights than the small species (Table 1). The standard deviations were analyzed statistically using a general linear models procedure. As the variability of standard deviations depends upon the magnitude of standard deviations as well as the sample sizes, a weighting technique was used in order to meet statistical assumptions (see Draper and Smith 1966).

The preliminary analysis indicated that the size of the bird contributed significantly to the variability of the standard deviations ($F = 15.97$, $P < 0.001$). Significant statistical differences existed among the colonies with respect to mean standard deviations ($F = 7.48$, $P < 0.001$).

Each colony was then classified according to vegetation height. Class A contained heronries located in vegetation up to 150 cm, class B those in vegetation 150–300 cm, and class C those in vegetation of 600–1,200 cm. Within each class the relationship between the standard deviation and the size of the bird was established after differences among colonies were re-

TABLE 1. Bird lengths and standard deviations of mean height above ground for nests of herons, egrets, and ibises.

Species	Body length (cm)[a]	Argentina		Texas			New York			New Jersey			Mexico	
		1	2	3	4	5	6	7	8	9	10	11	12	13
Great Blue Heron (*Ardea herodias*)	95			27	37	23								
Great Egret (*Casmerodius albus*)	80	21	7	25	26				40	127	11			23
Roseate Spoonbill (*Ajaia ajaja*)	70	18	8	22	20									
Little Blue Heron (*Florida caerulea*)	55								32				25	24
Louisiana Heron (*Hydranassa tricolor*)	55					13					13		20	19
Yellow-crowned Night Heron (*Nyctanassa violacea*)	52											120		
Snowy Egret (*Egretta thula*)	50	9	9	17	24	10		29	29	101	6	120	18	
Black-crowned Night Heron (*Nycticorax nycticorax*)	50						14	20	23	95				
White-faced Ibis (*Plegadis chihi*)	47	3	6			8.5								
Glossy Ibis (*Plegadis falcinellus*)	47						8	7	20		5	98		
Green Heron (*Butorides striatus*)													6	8
No. species		4	4	4	4	4	2	3	5	3	4	3	5	3
Vegetation height class		A	A	B	B	B	A	B	B	C	A	C	B	B

[a] From Robbins et al. (1966).

moved. For each class the regression lines relating standard deviation to size of species are shown in Figure 1. The correlation coefficients relating standard deviation with size of bird, after colony differences are removed, were: class A, $r = 0.47$ (n.s., $P < 0.10$); class B, $r = 0.72$ ($P < 0.01$); and class C, $r = 0.88$ ($P < 0.05$). Thus for 13 mixed-species heronries with differing heights of vegetation, species size was positively correlated with the standard deviation of nest height. Additionally, species nesting in taller trees used more space.

CONCLUSIONS

In the mixed-species heronries examined, mean nest height and standard deviations of nest height correlated positively with body size. Larger species nested higher and used more of the available vertical space than did smaller species. Although this difference relates to body size, it does not relate to the ability to acquire the resource but probably to the ability to defend that resource. Potentially, all species can nest at all heights. In the absence of larger species, smaller species nest higher in the vegetation. However, when larger species are present, they cause the smaller species to nest lower in the vegetation (Burger 1978). It seems that in competitive interactions, smaller species cannot defend as large a vertical space when large species are present. Hence, pressure from larger species compresses the range of nest heights used by smaller species. Our data support Wilson's (1975) contention that larger species use a greater range of a resource than smaller species; we extend this idea to include nesting space as a resource.

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GREAT HORNED OWL PREDATION ON A SHORT-EARED OWL

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The Great Horned Owl (*Bubo virginianus*) and the Short-eared Owl (*Asio flammeus*) coexist in many regions of North America, but direct observations of Great Horned Owl predation on Short-eared Owls are rare. Killpack (1951) and Wolhuter (1968) reported carcasses of Short-eared Owls in Great Horned Owl nests during the breeding seasons in Utah and Kansas, respectively. However, neither witnessed the act of predation, or related it to the ecology of the area involved.

At 23:04 on 14 July 1978, while driving along the north shore road of the Delta Marsh in Manitoba, Canada, we saw a Great Horned Owl perched on top of a freshly killed adult Short-eared Owl. Down feathers on the head and neck of the Great Horned Owl indicated that it was a juvenile. The Short-eared Owl was bleeding from deep talon cuts in the thoracic and lumbar regions and was still warm. The Short-eared Owl may have been hunting small mammals along the dirt road when it was attacked from the air by the Great Horned Owl. Earlier in the week, other students of the Delta Waterfowl Research Station had seen Short-eared Owls hunting along the road.

The road runs between the wooded southern shore of Lake Manitoba and the Delta Marsh. The woods, composed of several species of deciduous trees, provide suitable nesting habitat for the Great Horned Owls which are permanent residents. One pair of Great Horned Owls reared young in this area in April 1978 (Peter Ward, pers. comm.). On the other side of the road the marsh vegetation is suitable habitat for the Short-eared Owl, which often nests there (Clark 1975).