PREY PREFERENCES IN THE SHARP-SHINNED HAWK: THE ROLES OF SEX, EXPERIENCE, AND MOTIVATION

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SHARP-SHINNED HAWKS (*Accipter striatus*) show considerable sexual dimorphism in size. In our sample 899 males had a mean weight of 100.00 g and 1,009 females a mean individual weight of 170.0 g. Evidence from stomach contents indicates differences in the prey taken by each sex (Storer, 1966). This paper offers experimental evidence for sex and age differences in prey selection and also suggests that hunger plays a role in the reaction to prey.

TECHNIQUES

In the autumns of 1953 through 1964 we operated a series of hawk traps at the Cedar Grove Ornithological Station, located on the western shore of Lake Michigan about 60 km north of Milwaukee, Wisconsin. Migrating hawks were offered a choice of prey: domestic pigeons (*Columba livia,* mean weight 270 g), Starlings (*Sturnus vulgaris,* 60 g), and House Sparrows (*Passer domesticus,* 24 g). We used two types of traps: bow nets, which caught hawks that actually struck the lure bird, and dhogazzas, vertically suspended nets which caught hawks that did not strike but passed within less than 2 m of the lures. A detailed description of our techniques can be found in Bub (1968). Each of our five lures was equipped with a bow net. One of the two pigeon lures lacked dhogazzas; the remaining pigeon, the two sparrows, and the one Starling each were backed by two dhogazzas placed at right angles to each other. The pigeon dhogazzas were so placed that the operator had to manipulate the lure carefully to insure the capture of attacking hawks, and many hawks passed low over pigeons without being taken. Although the position of the lure bird had much less influence on the catching capability of sparrow and Starling dhogazzas, many birds passed within 2 m of the lure bird without being caught. In addition, almost 10 per cent of those birds that encountered dhogazzas escaped before they could be retrieved. Thus the incidence of passes is higher than this paper reports. A trap that has just caught a hawk is at least momentarily nonfunctional, and sometimes this made a given type of lure temporarily unavailable, which in turn probably increased the number of attacks on pigeons and Starlings. All these forms of bias were randomly distributed in our sizable sample of data and, we believe, had no effect on this paper's conclusions. However caution is advised in using the data for analyses beyond those presented here. Chi-square and Student's t were used where appropriate; the 95 per cent level was the criterion for significance.

RESULTS

Sex differences in prey selection.—Traps baited with Starlings caught a significantly larger proportion of juvenal females than males (Figure 1). Traps baited with sparrows caught proportionally more juvenal males than females. Both sexes stooped at pigeons with equal frequency. Surprisingly, adults showed no sex differences in prey selection. Of the birds

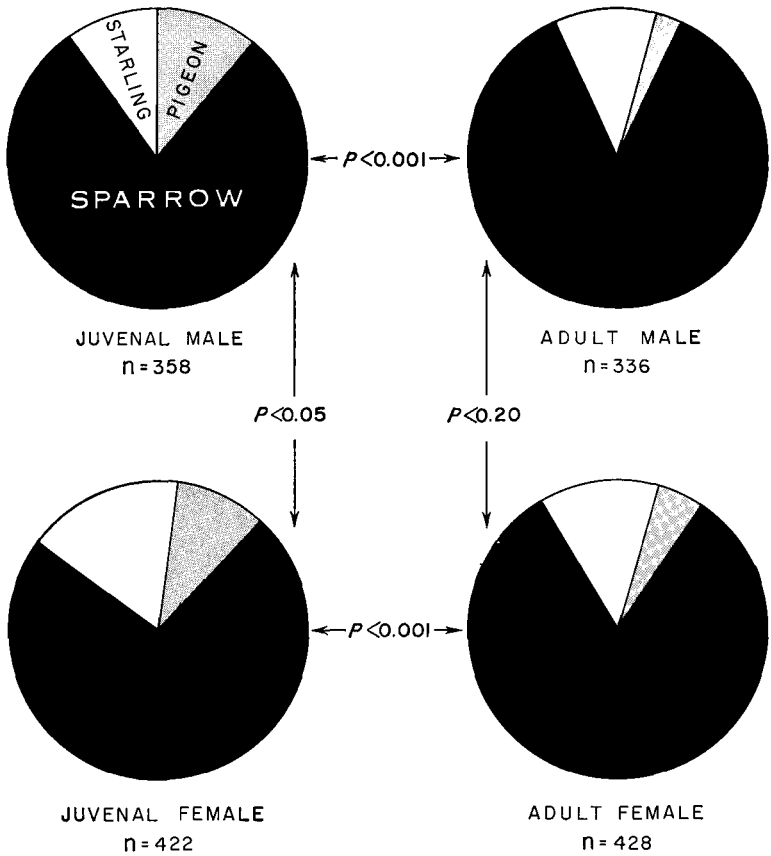

Figure 1. Proportions of attacks initiated against sparrow, pigeon, and Starling. The values of *P* indicate the probability that the two data classes connected by the arrows are similar.

that were caught in the traps baited with a sparrow or Starling, a significantly larger proportion of females actually struck the lure birds, while a greater proportion of the males passed low over the sparrows or Starlings and were taken in dhogazzas rather than bow nets (Figure 2). No Sharp-shinned Hawk actually struck the pigeon; all catches in the traps baited with pigeons were in dhogazzas.

Age differences in prey selection.—Traps baited with sparrows took a significantly greater proportion of the adult hawks trapped than juvenal hawks (Figure 1). Conversely traps baited with pigeons took fewer adults than juvenals. Adults and juvenals attacked Starlings with about equal frequency. Proportionately more juvenals than adults struck Starlings,

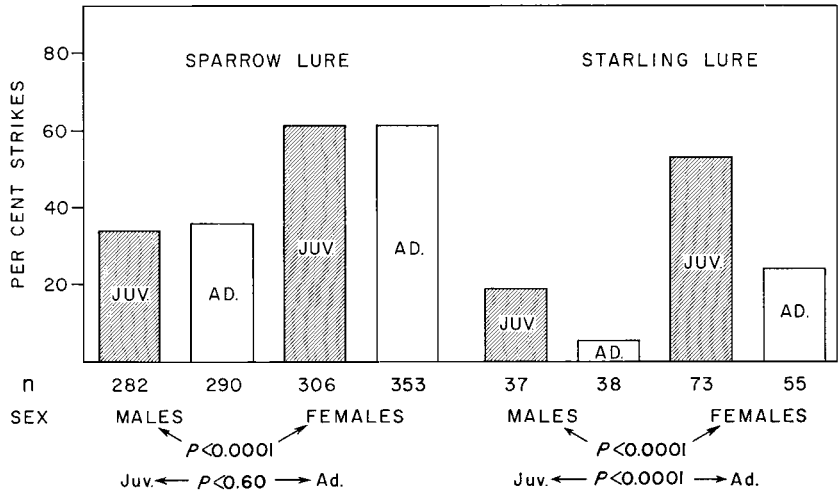

Figure 2. Per cent of attacks that culminated in striking the lure bird. Values of *P* as in Figure 1.

but this difference is significant only in the case of females (Figure 2). Adults and juvenals struck sparrows with similar frequency.

Strikes vs. passes: a difference in motivation?—One possible explanation for the fact that some hawks struck the lure birds while others merely passed low overhead is that these hawks differed in motivation to catch prey. We might expect this motivation to be a function of hunger and this in turn a function of the body weight or the recency of the previous meal. After a sizable meal, a hawk carries food in its esophagus for several hours; the presence of food in the esophagus can be detected by palpation. In three of the four sex and age classes, a greater (but not statistically significant) proportion of the hawks that struck sparrows had food in their esophagi than those that passed low over sparrows (Figure 3). In the case of the adult males however, a significantly higher proportion of the hawks that passed low over sparrows had esophageal contents than those that struck sparrows. The incidence of food in the esophagi of birds that struck Starlings was similar to that of birds that passed low over Starlings.

Hawks that struck sparrows had a mean weight that was 0.2–1.7 g lower than that of hawks that passed low over sparrows (Figure 4). The differences in weight between birds that struck and those that passed low over Starlings were even greater than those of hawks that attacked sparrows. Only one of all the differences is statistically significant: adult males that struck Starlings.

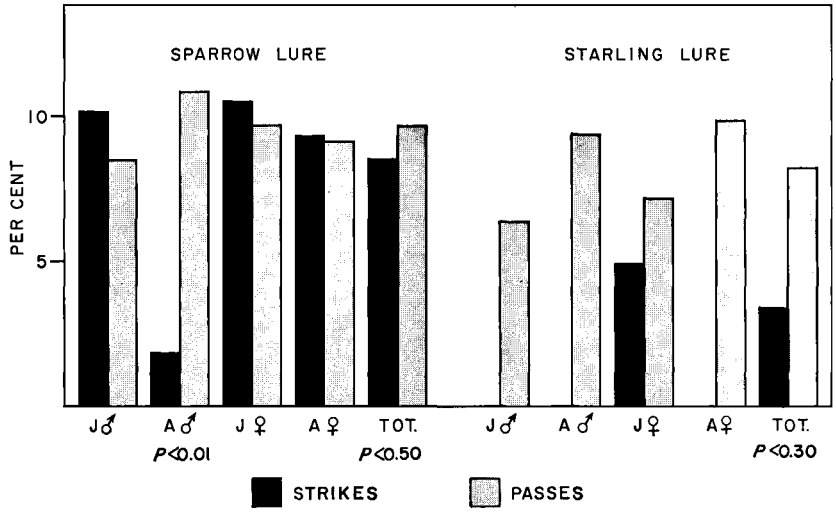

Figure 3. Per cent of hawks that had food in their esophagi. *P* values indicate the probability that no difference exists between those birds that struck the lure and those that passed over it.

The differences in weight between hawks that struck and those that passed low over the lure birds apparently are not due to differences in size of the hawks. The mean length of the wing chord of hawks that struck lure birds was greater than that of those that merely passed over the lure in five of the eight classes of data shown in Figure 4. None of

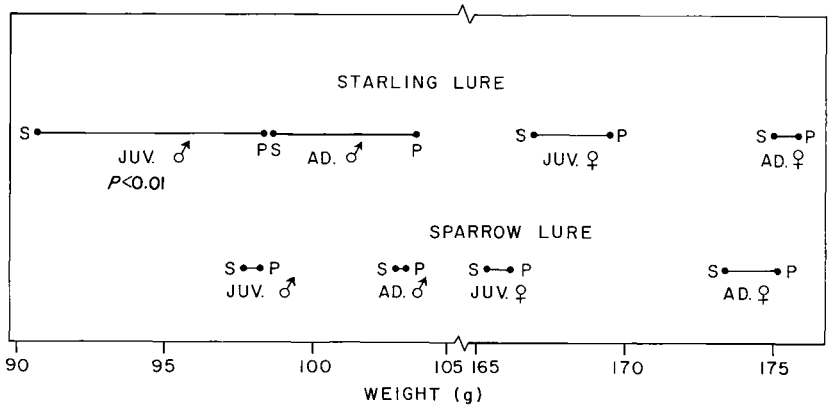

Figure 4. Mean weight of hawks. The points indicate the mean; the lines connect the means for strikes and passes for that age and sex class. Values of *P* are as in Figure 3.

the differences was statistically significant, but this indicates that the hawks that struck were no smaller than those that passed over the lures, although the former were somewhat lighter in weight than the latter. Juvenal males that struck Starlings were significantly lower in weight than those that struck sparrows. In the remaining three sex and age classes the differences between weights of birds that attacked Starlings were not significantly different from those that attacked sparrows. It is interesting to note in this comparison that the females showed an inexplicably opposite trend to that of the males.

DISCUSSION

Although the data are significantly different in only a few of several cases, an inverse correlation is apparent between hawk weight and the tendency to actually strike prey. This suggests that hunger influences a hawk's tendency to kill, which is contrary to Lorenz's (1937, 1966) generalization that the killing instinct of predators is unitary and driven independently of hunger. Experimental data of Leyhausen (1956, 1965) from the domestic cat (*Felis catus*) and Räber (1950) from two species of owls (*Strix aluco* and *Asio otus*) appear to corroborate Lorenz's hypothesis, but our data suggest that the generalization be viewed with caution.

Of the 124 prey items Storer (1966) lists as taken by male Sharp-shinned Hawks, 85 per cent were of the size of a House Sparrow or smaller, while 39 per cent of 125 prey items taken by females were larger than a sparrow. It is not unexpected that more juvenal males attacked our sparrows and fewer attacked our Starlings than did juvenal females, but we were surprised to find no difference in prey preference between the sexes in the adults. Taken alone, this questions the validity of Storer's hypothesis that size dimorphism in this species serves to reduce competition between the sexes. However proportionately fewer males of both age groups struck Starlings than did females, suggesting that the actual catch of prey would be more consonant with Storer's hypothesis. Sparrows as well as Starlings are large prey for male Sharp-shinned Hawks and, not unexpectedly, proportionately fewer males than females struck lure birds.

It is interesting that age appears to influence reaction to prey at least as strongly as sex and size of hawk. Adult hawks have of course had more experience in the capture of prey, suggesting that learning plays an important role in the development of prey preferences. Adults initiate fewer attacks on birds that are grossly too large for suitable prey (pigeons) than do juvenals, but experience does not seem to alter the incidence of attack on moderately large prey (Starlings). Experience apparently reduces greatly the actual strikes on moderately large prey. The juvenal

hawks trapped at Cedar Grove probably had been hunting their own food for about 6 to 8 weeks. This estimate is based on the assumption that Sharp-shinned Hawks are dependent on their parents for approximately 10 weeks, including embryonic life, and the egg dates given in Bent (1937). Some individuals may have had only 2 to 3 weeks of independence when they arrived at Cedar Grove; others may have been hunting independently for as long as 3 months. The additional year or more of experience apparently permits adults to avoid encounters with large and potentially difficult prey and to select appropriate prey more efficiently than juvenals.

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SUMMARY

Migrating Sharp-shinned Hawks were offered a choice of domestic pigeons, Starlings, or House Sparrows. Males showed a stronger preference for smaller prey than did females. Adults were less likely to attack inappropriately large prey than juvenals. Hawks that actually struck prey were lighter in weight than those that passed immediately overhead, suggesting that hunger influences the hawk's tendency to attack.

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