GENERAL NOTES

Flight distance in the Great Blue Heron.—Flight distance, as defined by Hediger (1950. "Wild Animals in Captivity," p. 32), is that distance at which an animal will take flight when approached by a supposed enemy. Flushing distance means the same. While Hediger recognizes variation between species, within species, and among individuals of a species, he maintains that a definite, specific flight distance exists within fixed limits.

Measurement of flight distance depends on two basic factors: (1) it must be possible to see the animal at distances greater than the outer limit and (2) reasonable evidence must exist to indicate that the animal is aware of the approaching object before the outer limit is reached. The Great Blue Heron (*Ardea herodias*) is a species which is large enough to be seen from considerable distances, and it usually exhibits head movements which give evidence of an awareness of approach. For example, birds which are fishing will have the head tilted downward; when disturbed the head is moved to a more horizontal position, after which the flight reaction occurs if approach is continued.

Observations were made on flight distance of the Great Blue Herons at Lake Itasca, Minnesota, during the period June 25 to July 12, 1957. The principal aim of the study was to determine the limits of flight distance for this species. Another objective was to determine whether variation of flight distance within the limits could be related to such factors as speed of approach and elevation of birds with reference to water level.

Observations were made from a rowboat equipped with an outboard motor. Herons at the shore line were located from open water with the aid of binoculars. An approach run was made on each bird by steering directly toward it on a line perpendicular to the shore line. During the last part of each run a rangefinder was used to determine boat-to-bird distance at the moment of flight.

Most of the approach runs were made using oars. Rowing was held to a constant speed and every attempt was made to limit unnecessary motion. Other runs were made with the 12-horsepower motor set at slow, medium or fast speed. The majority of birds approached were standing in or near the water and were apparently feeding, but some were perched on trees at heights up to 40 feet. Whenever it was possible to see the new location of a bird after flushing, the boat was returned to open water and another approach was made. This procedure was repeated on each bird as often as possible in order to collect data on the flight distance of specific individuals.

Flight distances ranged from 13 to 166 yards, indicating a considerable amount of variability. In fact, it seemed doubtful that flight distance had any promise as a quantitative basis for the study of behavior of the Great Blue Heron if these observations were a valid representation of the fixed limits for the species. However, it was apparent that some observations were of doubtful validity. Flight distances greater than 140 yards were more than three standard deviations from the mean, which may indicate that some birds were exhibiting the flight reaction in relation to factors other than the approach of the boat. Even the smallest values may have occasionally been in error, since preoccupation with other factors might have permitted closer than normal approach. One heron, which was being harrassed by two Redwinged Blackbirds (*Agelaius phoeniceus*), did not fly until the boat was within 10 yards. That the detection of the approach was late seemed supported by the fact that the heron was in an awkward position and did not successfully initiate flight on the first attempt because of inadequate preparatory motions.

An increase of flight distance was indicated by mean values obtained on four successive sampling dates. Table 1 contains this information, with data confined to approaches made at rowing speed toward birds less than 10 feet above the water. It was impossible to guess whether the increase, if real, was related to seasonal factors or to repeated

testing. There was no way of knowing whether the same birds were being observed on the different dates.

Speed of approach made no apparent difference in mean flight distance of birds near water level. However, an increase did occur in relation to birds at positions 10 or more feet above water. At every speed except rowing, increased height was related to greater mean values for flight distance, and apparently was effective in aiding birds to detect increased speed. From this it would appear that increased confidence did not accompany movement to greater heights, but that height did increase perception, possibly in connection with advantage of angle.

All comparisons of mean flight distance were considered tenuous because possible differences were cancelled out by variance within each sampling condition. Unless variability could be assigned to some factor or combination of factors, the use of flight distance as a quantitative basis for further investigation of the behavior of this species did not seem valid.

An indication of one source of variability was obtained from those measurements made by successive approaches on the same subject. During the study period, 25 subjects were approached at least twice in succession. Some estimate of the nature of variability for individuals was possible from the fact that the average range for flight distance was 40 feet. Seven of the 25 birds did not vary at all from one approach to the next. A standard analysis of variance indicated that differences between individuals were significant (1 per cent level). This could be taken as evidence that variation of flight

TABLE 1

FLIGHT DISTANCE IN YARDS UNDER VARIOUS CONDITIONS

Date	Boat Speed	Elevation of Bird	Number of Observations	Mean Distance	Distance Range	S.D.
June 25	rowing	0	5	24	23– 33	5.5
June 26	rowing	0	14	35	23– 66	17.5
June 29	rowing	0	47	44	16– 66	15.9
July 12	rowing	0	5	63	25–166	22.9
	rowing	low*	79	42	16–166	21.9
		high*	48	40	13–100	19.9
	slow motor	low	28	47	20–100	24.0
		high	20	62	15–133	37.3
	medium motor	low	2	41	30– 50	—
		high	11	73	41–100	23.6
	fast motor	low	6	47	33– 60	20.2
		high	2	58	33– 83	—

*low is less than 3 yards; high is 3 or more yards.

distance for individuals was less than first thought, and further that much of the variability noted during the study was due to differences between individuals. It follows that any future work should be confined to birds individually marked for recognition.

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—HOWARD D. ORR, *St. Olaf College*, AND THEODORE W. SUDIA, *University of Minnesota, March 27, 1959.*