

The Effect of Host Beak Condition on the Size of *Menacanthus Stramineus* Populations of Domestic Chickens¹

N. SANDRA BROWN

Biological Science Center, Boston University, Boston Massachusetts² 02215

(Received for publication May 12, 1971)

ABSTRACT The numbers of *Menacanthus stramineus* on chickens (*Gallus gallus*) whose upper mandibles had been shortened, were significantly different ($P < .01$) from those on controls, and appeared to be related to the degree of deformity. Three of four comparisons of the numbers of *M. stramineus* on males and females showed no significant difference ($P > .01$) indicating a similar degree of preening effectiveness.

POULTRY SCIENCE 51: 162-164, 1972

DURING a study of the relation of nutrition to ectoparasite levels of rats and chickens, Kartman (1949) observed that chickens whose upper mandibles had been shortened had, on the average, a higher degree of infestation with *Menacanthus stramineus* than untreated coop mates and suggested the importance of host preening activity in the host-ectoparasite complex. Wild birds with beak deformities have also been shown to have heavier louse infestations (Worth, 1940; Johnson and Long, 1959). The present study was performed to determine the statistical significance of the relationship between deformed beaks and louse population size.

MATERIALS AND METHODS

One-day old, White Rock chicks from the same hatch were used. They were fed farina and water for the first week; thereafter commercial chick food and chicken grain were supplied. A 12 hour light-12 hour dark cycle was maintained. The sex of the chicks was determined at the hatchery and checked by necropsy at the end of the experiments.

¹This work was supported, in part, by summer grants from the National Science Foundation and the Boston University Graduate School.

²Present Address: Biology Department, Simmons College, 300 The Fenway, Boston, Massachusetts 02115.

Groups of chickens were chosen by lot, and half were debeaked. Debeaking involved cutting about 0.5 cm. off the distal tip of the upper mandible.

All the lice in the first experiment and samples from the second were collected. The lice collected from one chicken were placed in 50 ml. of mineral oil, shaken, and 2 ml. of this mixture were poured on a glass counting slide and viewed under a dissecting microscope. The total was then multiplied by 25. The procedure was repeated, and the average taken as the final count.

Life cycle data of *M. stramineus*, as determined by Stockdale and Raun (1965), served as a basis for setting the numbers of days that lice were left on the chickens.

RESULTS

Experiment 1. Twenty seven chickens were used in experiment 1. Debeaking of eight males and eight females was done at 18 days of age. Fifty lice were applied to 31 day old chickens, and the chickens were killed at 64 days of age.

Calculation of the Kruskal-Wallis one-way analysis of variance gave an H value of 20.93, indicating that samples were drawn from different populations ($P < .001$), and the Mann-Whitney U test could be applied.

Debeaked chickens of both sexes had significantly larger numbers of lice ($P < .01$)

TABLE 1.—Counts of *M. stramineus* from male and female, beaked and debeaked chickens infested at 31 days old and killed at 64 days old

| Number of Chickens | Sex | Beak Condition | Body Weight Mean (g.) ± Standard Error | No. of Lice Median (Range) | U* | P |
|--------------------|-----|----------------|--|----------------------------|----|-------|
| 8 | M | debeaked | 605.3 ± 25.5 | 1584 (1160-2235) | 0 | < .01 |
| 6 | M | beaked | 689.6 ± 55.5 | 5 (2-19) | 0 | < .01 |
| 5 | F | beaked | 824.7 ± 50.6 | 56 (21-113) | 0 | < .01 |
| 8 | F | debeaked | 614.2 ± 48.3 | 1598 (1071-2291) | 26 | > .01 |
| 8 | M | debeaked | 605.3 ± 25.5 | 1584 (1160-2235) | | |

* Statistic of the Mann-Whitney test.

than controls (Table 1). No statistically significant difference was found between the infestations on male and female debeaked chickens, but one did exist for male and female controls ($P < .01$).

Experiment 2. The object of this experiment was to determine if any correlation exists between the amount of upper mandible overhang in debeaked chickens and the size of the louse populations.

Eight, one-day old cockerels and six, one-day old pullets were debeaked and infested with 25 lice each. Twelve male and female chicks were infested but not debeaked. All the chicks were killed at 40 days of age.

The results of this experiment substantiate the conclusion drawn from the first experiment concerning the increased susceptibility to chicken body lice brought about

by debeaking. The H statistic of the Kruskal-Wallis one-way analysis of variance was 15.69, ($P < .01$). The difference between both male and female, beaked and debeaked chickens was significant at the .01 level (Table 2).

Rank correlation coefficients were determined using beak measurements and total numbers of lice found on each chicken. Beak measurements were given as plus or minus numbers whose values reflected the extent of upper mandible overhang. A value of -1, for example, indicated that the upper mandible was 1 mm. shorter than the lower one.

Spearman rank correlation coefficients (r_s) and their probabilities for debeaked males and debeaked females were .67 ($P = .042$), and .68 ($P = .068$), respectively. Although the probability level for de-

TABLE 2.—Counts of *M. stramineus* from male and female, beaked and debeaked chickens infested at 1 day old and killed at 40 days old

| Number of Chickens | Sex | Beak Condition | Body Weight Mean (g.) ± Standard Error | No. of Lice Median (Range) | U* | P |
|--------------------|-----|----------------|--|----------------------------|----|-------|
| 8 | M | debeaked | 365.9 ± 13.3 | 1050 (42-1550) | 0 | < .01 |
| 7 | M | beaked | 381.4 ± 15.8 | 35 (14-59) | 9 | > .10 |
| 5 | F | beaked | 436.2 ± 23.3 | 55 (34-127) | 0 | < .01 |
| 6 | F | debeaked | 325.2 ± 24.3 | 1025 (600-1350) | 22 | > .01 |
| 8 | M | debeaked | 365.9 ± 13.3 | 1050 (42-1550) | | |

* Statistic of the Mann-Whitney test.

beaked females is larger than the .05 usually accepted, the small variation from this level coupled with the .042 level determined for debeaked males seems to indicate that the numbers of lice found on chickens may be related to the amount of upper mandible overhang.

No significant difference in louse numbers was found for either beaked or debeaked male and female chickens.

DISCUSSION

The results of the present study substantiate Kartman's observation that debeaked chickens have a higher degree of infestation with *M. stramineus* than untreated birds and suggest that the levels of infestation are related to the degree of beak deformity, as indicated by the amount of upper mandible overhang, since those chickens with more severely deformed beaks generally harbored more lice than those less severely deformed. However, since there are reports of wild birds with deformed beaks, as well as apparently healthy and non-deformed birds (Ash, 1960) harboring large numbers of ectoparasites, other factors may be involved.

The sex of the host does not appear to be a significant factor influencing *M. stramineus* numbers in these experiments. Only

one of four comparisons of numbers of lice on male and female chickens showed a significant difference, and the numbers collected, 5 and 56 for males and females respectively, may reflect an inadequacy of the collection method at low levels of infestation and/or the difference in body weight (689.6 g. for the males and 824.7 g. for the females). These results may indicate that the effectiveness of preening in males and females is similar.

ACKNOWLEDGEMENTS

The author would like to thank Dr. Stewart Duncan for numerous suggestions during the researching of this project and the preparation of the manuscript.

REFERENCES

- Ash, J. S., 1960. A study of the Mallophaga of birds with particular reference to their ecology. *Ibis*, 102: 93-110.
- Johnson, J. C., Jr., and C. A. Long, 1959. Common Grackle heavily infested with Mallophaga. *Wilson Bull.* 72: 107.
- Kartman, L., 1949. Preliminary observations on the relation of nutrition to pediculosis of rats and chickens. *J. Parasitol.* 35: 367-374.
- Stockdale, H. J., and E. S. Raun, 1965. Biology of the chicken body louse, *Menacanthus stramineus*. *Ann. Entomol. Soc. Amer.* 58: 802-805.
- Worth, C. B., 1940. A note on the dissemination of Mallophaga. *Bird-Banding*, 11: 23-24.

THE EFFECT OF HOST BEAK CONDITION ON THE
SIZE OF *MENACANTHUS STRAMINEUS*
POPULATIONS OF DOMESTIC
CHICKENS

BY
N. S. BROWN

Reprinted from *POULTRY SCIENCE*: Vol. LI, No. 1
January, 1972