NOTES AND COMMENTS

INHERITANCE OF SKELETAL POLYMORPHISM IN *MICROTUS CALIFORNICUS*

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Received 8.ii.74

SUMMARY

Three non-continuous skeletal variants were studied in skulls from a captive colony of the California vole. Such variation is heritable in at least one of these traits and may be in the others. Skeletal variants can therefore be used as a measure of genetical differences between local populations. This conclusion supports previous work on inbred lines of house mice which has demonstrated that both developmental and genetic factors affect skeletal variation.

1. INTRODUCTION

NON-CONTINUOUS skeletal variation has been described in both natural and laboratory populations of rodents. Grüneberg studied the origin of these variants in highly inbred strains of mice (*Mus musculus*) and found that both genetic and developmental factors are involved (1952 and later papers). Berry (1963, 1964) and Berry and Searle (1963) studied the occurrence of more than 50 skeletal variants in natural populations of *Mus musculus* and found significant differences in frequencies of these variants between geographically isolated populations. He also found (1963) that geographic separation was more closely correlated with the variation in frequency of the traits than was the food of the population. The purpose of this paper is to report evidence of the inheritance of similar skeletal polymorphism in wild voles.

2. MATERIALS AND METHODS

The study specimens were skulls of *Microtus californicus* of known pedigree. Six individuals had been removed from Brooks Island in northern San Francisco Bay, California, and had been bred in uniform laboratory conditions (Lidicker, 1963). I examined a number of these skulls to determine which variants occurred frequently enough to be useful in a genetic analysis. I found three suitable variants, all of which are the presence or absence of specific foramina. They seemed particularly suitable because there are clear-cut differences with a minimum of "intermediate" forms. The variants were: (1) pre-orbital foramina, present or absent; (2) maxillary foramina, present or absent; (3) sphenoid foramina, present or absent. The first two variants correspond to those described by Berry and Searle (1963). The third variant may exist in variable locations on the sphenoid bones and may correspond to the variant Berry called the foramina

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sphenoidale laterale ventrale. Since all three foramina are bilaterally symmetrical, I had six traits for each individual, denoted 1L (trait 1 left side), 1R (trait 1 right side), etc. Each individual was classified as either present (+) or absent (-) for each trait.

3. RESULTS AND DISCUSSION

Table 1 shows the proportion of progeny possessing the + trait for each combination of parental phenotypes. In four of the traits the progeny of the + by + cross had the highest occurrence of the + trait. The χ^2 test was

TABLE 1
*The proportion of young of each parental type possessing the trait;
numbers in parentheses are sample sizes*

Parental types	1L	1R	2L	2R	3L	3R
++	0.83 (35)	0.82 (56)	0.82 (67)	0.81 (129)	0.44 (81)	0.54 (61)
+-	0.53 (100)	0.64 (89)	0.75 (89)	0.85 (27)	0.54 (13)	0.37 (35)
--	0.33 (21)	0.64 (11)	— (0)	— (0)	0.53 (40)	0.40 (38)
χ^2	15.1**	5.8*	1.0	0.3	0.9	3.3
Degrees of freedom	2	2	1	1	2	2

** $P < 0.01$.

* $P < 0.10$.

used to test the null hypothesis that the offspring of affected and unaffected parents were equally likely to possess the trait. The χ^2 values in table 1 show that for traits 1L and 1R the offspring of affected individuals are more likely to possess the trait.

Parental and offspring phenotypes are not significantly related for traits 2L and 3R, even though they show the highest proportion of + in the progeny of + by + crosses. 2R and 3L show no association between phenotype of parent and progeny. The failure to demonstrate significant heritability for these traits may be due to either; (1) lack of genetic control over these traits, or (2) a lack of genetic variability in the founding population. All individuals removed from Brooks Island were + for trait 2R so there was little genetic variability for this trait.

From these data it is clear that there is some association between phenotype of parent and offspring for at least the pre-orbital foramina. Since this study was conducted on a population derived from a limited gene pool (limited in that only six animals were removed from the population to found the laboratory stock), and the original source of the Brooks Island population was only seven individuals (Lidicker and Anderson, 1962) I would expect to find many more suitable variants in a mainland population. These data support Berry's (1963, 1964) conclusion that these traits can be used to genetically characterise populations. The second potential use of these traits lies in use as genetic markers. It is clear that none of the traits examined were single locus Mendelian type traits, and thus they are not useful for the calculation of gene frequencies, but differences in the frequencies of several traits would suggest low gene flow between populations.

Acknowledgments.—I would like to thank Dr W. Z. Lidicker, Jr., for the use of the specimens and many useful comments on the manuscript. Dr R. J. Berry, Dr C. J. Krebs, and Randall Peterman criticised the manuscript.

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CHANGES IN THE BEHAVIOUR OF INDIVIDUAL MEMBERS OF A *DROSOPHILA* POPULATION MAINTAINED BY RANDOM MATING

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Received 15.ii.74

SUMMARY

It has been inferred from the genetical architecture of spontaneous locomotor activity in *Drosophila melanogaster* that natural selection has favoured a relatively high level of activity. To test this inference, a population was set up from a cross between two inbred lines, and maintained by random mating. Successive samples taken from the population showed an increase of the activity level of individual flies. This result confirms the prediction made from the genetical architecture, provides further justification for the behavioural measures, and indicates that a high level of activity is advantageous to the organism.

1. INTRODUCTION

In an earlier paper (Angus, 1974a), it was suggested that the genetical architecture for spontaneous locomotor activity in *Drosophila* males implied a history of natural selection for a relatively high level of this trait. The present experiment was designed to test this inference. It was intended to study the changes, if any, in the activity of individuals of a population during an extended period of maintenance by random mating in competitive conditions, thus determining whether natural selection acts in the predicted manner in these circumstances.

2. METHODS

A population was initiated from the F_2 of a cross between two inbred lines, Edinburgh and 6C/L. The two lines were crossed reciprocally, and approximately 500 of each sex of each reciprocal F_2 were placed in a