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THE ROLE OF THE RUNT: A TAXONOMIC PROBLEM

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When one undertakes to appraise the characters which define a geographic form, differences in size and color confront him. He writes: "After making due allowances for individual variation" and then proceeds by more or less certain methods to define what he conceives to be the average of the species. Mathematically this average usually falls about midway between the largest and the smallest, and by less precise means a mid-ground in color values is found.

Genetically speaking, it is assumed that Nature allows a certain leeway in the development of her various patterns: is, in a sense, careless within certain limits, while holding fairly well to a course by which large progeny follow large parents and dark progeny follow dark parents.

Can we depend on this concept? Does it interpret Nature's genetic formula? Do not most of the individuals we study represent what is left after Nature's own destructive agencies have exacted their toll? Nature seems to be forever tossing the proverbial monkey wrench into her own phylogenetic machinery. With appalling cunning she provides the very obstacles which defeat normal development in the individual. And it is normal development, and not subnormal development, which must furnish our basis for appraisal of the type, if we would attain stability.

Let us examine some of Nature's obstacles to normal development in the bird: Under date of June 23, 1924, my note book contains the following entry: "When I removed the three nestling Linnets from nest 27 today, just after noon, I saw two maggots drop to the ground from one of the birds. These I captured and took with the birds to my laboratory for observation. A few minutes later I carefully took down the nest box with the nest intact and brought it in. When I gently raised one side of the nest, I could see a living mass of maggots on the bottom of the box."

The young Linnets were too weak to stand. Deposited on the table, their heads drooped till their beaks rested on the board, while their eyes closed. Respiration was labored. They were almost in a coma, and showed no excitement when I handled them.

Why? Because their bodies had furnished nourishment for 197 blood-sucking

maggots. Curious to see if nestlings thus weakened could survive, I banded them, gave them a clean nest, and returned them to their original nest site. One nestling, at least, survived to maturity and was still alive three years later.

Plath (Condor, XXI, 1919, pp. 30-38) and others have assembled a considerable list of small birds subjected to this blood-thirsty ectoparasite. My observations lead me to think that, in certain species, at least, parasitism of this type is almost universal, though by no means always fatal.

Another fly maggot commonly found in the southwest imbeds itself beneath the skin of nestling birds. Robins are frequent victims. I have seen the heads and necks of a brood a mass of sores, from which big maggots were emerging, no doubt sensing the fright of the nestlings and hurrying to escape. This parasite occurs in the Transition Zone of our mountains and it occurs in the hot deserts of Arizona.

Mites and ants take their toll. Hummingbirds are particularly subject to mites, and many nests of other species teem with them.

Then there is heat and cold and rain. All these, in excess, oppress growing birds, and are a factor in their survival. In the hot lower canyons of a desert range I have known the eggs of a robin to hatch a day or two apart. Only the first hatchling survived. Chill groundfogs in early May often destroy the newly-hatched first broods of quail on our coastal slopes.

These are discouraging realities from the bird's standpoint. Add to them the drain on vitality forced on the individuals of the species who must try again and again before a brood is safely brought to maturity. What must be the significance of all these hardships in terms of genetics? Is the individual, which in its growing period was subjected to one or another of these hardships or to many of them, the creature which Nature started it out to be? Has it been able to acquire full size or full color?

If adverse conditions limit size and weaken pigmentation, size and color are measures of morphological success. Probably aridity, *per se*, does not make desert forms smaller and paler, but the hardships which it imposes compel smaller size and weaker pigmentation. Applied to the individual bird, may not largeness and depth of color reflect the degree of immunity from parasites or from other adverse conditions?

When a human population is undernourished, its youths mature undersized. When the range is subjected to drouth, the market gets undersized steers. When maggots are starved, undersized imagoes emerge. Is it too much to assume that underfed birds mature undersized? Or that nestlings whose energy is sapped by nest parasites undertake life deficient in physical development?

In any given series, therefore, there may be every morphological gradation, from the individual which has grown up under the most favorable conditions, to the one which has barely survived the exactions of parasites, or of starvation, or of heat or of cold. Is it strange that one finds wide individual variation?

Which of these individuals, then, is the true representative of the species? Is it the individual which conforms to an average derived from the adventitious impresses of these morphological pitfalls? Or is it the individual that has developed under the most favorable conditions which Nature offers? Is not the individual with the largest size and the heaviest pigment the true gage of phylogenetic possibility? Is not the best that the form can produce the true measure of phylogenetic fact?

I submit, that the concept of the average is a futile valuation. To assess true

values we must base our comparisons on the best that Nature has produced. The runt, and all his subnormal brothers, are pathological relicts and are not representative of the form. Do I make my point clear? It is the largest and deepest pigmented individual of the series which indicates the stage to which evolution has carried the genetic possibilities of the form. It is the largest and deepest pigmented individual in the series, which gives the clearest picture of what the germ plasm of the species intended to produce.

Altadena, California, March, 31, 1929.