

MAN, PREDATORY ANIMALS AND THE BALANCE OF NATURE

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The balance of nature is a phenomenon much written about, but of which few people seem to have a clear idea. There are four essential elements in the balance of nature: water, soil, flora and fauna. The latter group also includes man. Each of these components is of fundamental importance for the three others. The balance, as a whole, is immediately influenced by a change in any one of these groups.

The factor which most often disturbs this state of equilibrium is man. His actions can be of a more destructive character than sudden natural catastrophes. The latter may, it is true, cause an immediate upheaval, but it is usually of relatively short duration, and a new state of equilibrium is comparatively quickly attained by nature, herself, based, perhaps, on other presumptions than formerly. On the other hand, man's repeated, and often unnecessary interference, through his stubbornness, press down the scale still deeper, and thereby block nature's spontaneous attempts to restore the biological equilibrium on which man, too, is dependent.

Man as a species has existed only a very short time in a geological sense. Nevertheless, he has changed our planet far more than all other animal species together have succeeded in doing during millions of years. No other animal species but man has, so far as we know, succeeded singly in exterminating so thoroughly other species. During past ages, evolution has eliminated a great number of animal species while others have evolved. The eliminating factor was formerly, however, always a byproduct of changes in the environment, chiefly climatic. But when man appeared on the scene, one animal species after another was exterminated by this new species, and this process is still going on. It is, however, not certain that it will always work out to our advantage in the future.

The perspective backwards into dizzy eons of time is necessary before one can fully realize that the conditions, which man today so energetically seeks to remould, constitute a law of equilibrium, which has reigned for the millions of years, we consider that life has existed on our earth.

One may say: But man, himself, is an animal, a

biological creature, whose activities, therefore, must also be considered a natural occurrence, a manifestation of the dynamics of a species. This may be so, but at the same time, it must be emphasized that man, by reason of his intellectual endowment, expressed in terms of technical progress, has reached a state of development, which causes him to forget his origin and his dependence on biological environment, in the belief that he is above nature's dynamic population laws. That is, in all certainty, a disastrous mistake, for if, for example, the world's population increases as heretofore, the scale balance under these strained circumstances will sooner or later recoil with the force of a catapult in the form of a new nature environment barrier, after such former decimation factors as hunger and disease have been eliminated.

We see, therefore, that although a great number of animal predators exist on our earth, they have not been able to upset nature's equilibrium through great ages. Man, alone, has been able to do that. Nothing seems to indicate that any essential change has occurred in modern times. In any discussion, therefore, as to the significance of predators in animal communities of today, man will, no matter where one turns, always be the central figure.

If the discussion is limited to Sweden, the retroactive time factor will also be limited. This country as a fauna territory is extremely young, quite recently in a geological sense freed from the latest glaciation. It is not more than about 15,000 years since the first strip of Sweden's soil was liberated from ice masses, and 5,000 years later the first human beings appeared on Swedish soil.

Man has now been active in Sweden for 10,000 years. It is curiously enough first during the present century that this species has upset nature's equilibrium with explosive ruthlessness.

That is the background of the present situation for carnivorous mammals and birds of prey in Sweden. They are compelled to satisfy their vital biological needs, of which food and shelter are the most important, in entirely changed environments, or else be pressed back to tracts, less favorable for the respective species.

When mentioned earlier in this essay on the balance of nature, reference has been made to the long period balance. In reality, the pendulum is always in "micro-vibration", in response to greater or smaller changes in the environment. Conditions are thus always instable but even as regards disturbance of balance of short duration, the principle holds true of an automatic restoration of equilibrium. The carnivorous mammals and birds come on the scene at this point but their role is not always so easily understood, and their positive or negative significance has often been exaggerated.

Nature, to all appearances, produces a superabundance of life forms, but the mortality is great, and in reality, only a minority of individuals of one species reach reproductive age, compared with the number born or hatched. The reproduction of every animal has through a selective process, during thousands of years, been adapted to the best purpose in a biological sense for the survival of the species but not for the individual. The reproduction superfluity of a species thereby benefits many other species, and constitutes an important factor for maintaining the equilibrium in an animal community.

A rule is that the predatory animal in a reproductive sense is inferior in numbers to the category or categories on which it preys. If the prey species, voles or mice, for example, show an extremely high density of population, the predatory animals, foxes, weasels, birds of prey, owls and others can, however, respond to this abundance with larger litters than usual, which process in its turn contributes to a re-establishment of the former group's lower and more normal population. However, there is much evidence in favour of the view that the peak of the population curve of small rodents sooner or later is reduced, even without the effect of predatory animals, although more slowly.

The effect of the predators on their prey animals is, to all appearances, of a simple nature. The predators kill and devour the other animals. Man has observed this, and, on the basis of this material, comprehensive conclusions were formerly drawn. If the animal killed was useful for man, the predator was at once labelled a "noxious animal", and in consequence man has through hundreds of years attempted to decimate the predators. This procedure has sometimes been successful, sometimes not, but as a rule the trouble taken in both cases has been in vain, for the positive effect on the animals considered "useful" to man seems to have been slight or non-existent.

Practically all investigations into the effect of

predators on natural populations of prey animals show that they neither in the long, nor the short run have any effect on their mean frequency. It is, therefore, usually meaningless for man by bounties and propaganda to encourage the decimation of carnivorous mammals and birds with the object of affording greater scope for the prey animals, which man may deem useful.

Certainly predators can temporarily, and/or locally, press down populations of their prey species within a certain district. But it seldom or never occurs, save when man comes into the picture, that decimation goes so far as to lead to extermination. If it is a question of predators, which specialize on a certain prey species (or group of species), the predation frequency with respect to that particular species generally becomes synchronized with the supply of this animal. It seems, however, as if the mortality percentage of the prey species is no higher when its frequency curve is at a peak than when it is at low level. During high fertility periods, the predation, in the first place, strikes the superfluous individuals which as regards territorial species—and to this category belong nearly all our small rodents—find it more difficult to find both shelter and food, caused by intraspecific competition.

Should the predation include other prey species than those, on which the predator is specialized, [and this sometimes happens by chance] the effect on the population figures of the prey species will be slight or none. However, there are examples when a predator's special prey is rapidly reduced numerically, or perhaps even temporarily disappears from the territory, so that the predator is forced methodically to turn over to another kind of prey. The choice can then fall on a species more vulnerable to predation than the normal prey animal, and the effect may then be considerable locally.

A question of dissension between hunters and nature conservationists has been, and still is, how the role played by predatory mammals and birds should be interpreted. It must be said of the conservationists, however, that although they not infrequently, especially in former times, brought up emotional and biased arguments in debate, they never, as the hunters, sank so low as to stamp as absolute truth antiquated conceptions, which seem to come from ancient traditional legends about predatory animals.

As we have just observed, the conservationists are not without fault, either. This group has been inclined to ascribe to the predators too great importance as a check on harmful animals among

rodents as well as insects. It cannot be denied that a great number of predatory mammals and birds devour rodents injurious to man. The same police role has anthropomorphically been ascribed to insect-eating small birds. It is certainly correct that enormous amounts of insects are consumed by a pair of birds with brood but this insectivorous food has only in rather few cases been analysed in all its component parts. All insects are by no means harmful. On the contrary many parasitical species are useful from a human viewpoint. Further, many spiders, also food for birds, devour insects themselves.

Small birds are often charming creatures in the eyes of man. But we should not, therefore, be led astray to make saints of them all, but rather in an un sentimental and objective manner estimate their biological role. We can, nevertheless, be tolerant enough to want to protect them.

Even in our own era we may still hear the nineteenth century conception with respect to predatory animals that kill *or* be killed is nature's law. The struggle between different animal categories, or between individuals of the same species, is usually of an indirect nature. Kill *and* be killed is an expression which comes closer to reality, for the majority of animals must kill other living organisms—either plants, or other animals—to be able to live themselves. Their struggle is to *find* food and to escape *becoming* food. A wild animal seldom dies of old age. Instead, the animals form links in a nutrition chain, or predation chain, which in our country is often topped off by man. For example: a fly is devoured by a spider, the spider by a frog, the frog by a shrew, the shrew by a weasel, the weasel by the eagle owl, and the eagle owl, protected by law, is shot by a human being.

The nutrition chains may be simple or complicated, varying constantly, dependent upon seasonal and environmental conditions and upon the biology of the animals concerned. As a general rule we also here meet with an equilibrium principle, for all the links in the chain are not only dependent upon each other but also constitute an important building stone, which, if removed, may cause the collapse of the whole pyramid. But nature soon builds up a new one, always with great quantities of various life forms as a broad base, and frequently with a predatory animal species at the top.

The reproductive rhythm of the fauna during the year is often characterized by frequency peaks, at the

close of the reproductive period. Starvation, disease, predators, wanderings, accidents etc. later gradually decimate the number of individuals to reasonable proportions, which the vegetative environment can support. One might say that the populations, broadly speaking, are selfregulating.

A natural limited geographic area can only harbour a certain amount of plants, whose density, power of growth and individuality are determined by the environment, i.e. space, soil, water, light, competition with other plants and the relations—positive or negative—with the animals. It is the same with the animals. There is thus an intimate relation not only among the animals themselves, but also between the animals and the vegetation.

Since nearly all organisms produce more offspring than the home territory can harbour, and are needed for the survival of the species, the surplus must play an important biological role. Otherwise the whole process would be meaningless, and that nature never is. The importance of the surplus of a species is to serve as food for other species. It is accordingly the surplus which is decimated by the predatory animals, and where these are not present, starvation, disease and other natural interferences, see to it that this surplus, nevertheless, disappears so that the number of animals is limited to a level which the environment can support. This milieu resistance is a fundamental rule met with everywhere in nature from sea to lake, from plain to forest. It is also valid for man.

The predatory animals are in the front line among the consuming or decimating environmental factors. They constitute the first state of preparedness, although not the most important. Starvation comes later, and it is in this case a synonym for interspecific as well as intraspecific competition. Diseases in a broader sense, as a rule, break down the population numbers first when the other two reducing factors are unable to absorb the surplus rapidly enough. In no wise will this surplus in all years become so large that all the components of the milieu resistance are mobilized. As a rule, the predators can master the situation.

That is the schematic picture of what happens in nature.

With destructive weapons, an advancing cultivation of the soil, and hitherto accelerated increase of human populations man has become a revolutionist in nature. It is man alone that changes the balance.