Nature, Wildlife, and the Habitat with a Discussion on Fire and Other Influences

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"O Earth our creator in ages past
our hope for years to come
our shelter from the stormy blast
and our eternal home" (V. A. and M. 105).
[I have substituted "Earth" for God.
P. E. G.]

INTRODUCTION

Ecologists early divided themselves into plant and animal ecologists, and when some bold spirit began talking of human ecology he was promptly excommunicated. But within the last 10 years there has been a decided tendency to fusion. The plant ecologist has become increasingly aware of the biotic factor, and the animal ecologist has learned that geology and vegetational cover must be well understood. The "human factor" may now be studied without scientific ostracism, but the young researcher might still be advised to avoid the term human ecology. Quite rightly too; there is but one ecology, and at this moment in history, the subject of

the members of men and animals considered together is ripe for investigation. Nevertheless I am ready to hazard a definition of human ecology as something more than an attitude of mind, as being that part of the science which deals with his animate habitat, of the influence of the habitat as a whole on social structure and behaviour, and of social system on the animal habitat." (Fraser Darling, 1961).

The artificial term "wildlife" is used by modern "civilized" man to dissociate himself from those parts of his natural environment which he has not been able to tame, domesticate or cultivate to his own advantage.

However, as Fraser Darling says, this refusal by man to accept kinship with, and responsibility to, the "wild" organism in his own habitat appears to be changing to a more enlightened and coordinated approach to ecology, conservation and the proper use of natural resources in some parts of the world except the "underdeveloped" countries where exploding human population growth far exceeds the benefits of modern scientific enlightenment and technology.

Archaeological evidence has revealed successive lines of "hominids" or man-like creatures which have appeared and vanished in the past two million years, culminating in the present organism we call *Homo sapiens*. Yet many other living things, such as fishes, reptiles, ungulates, and even some primates, which existed before "man-like" animals appeared on Earth, have survived almost unchanged up to the present time.

This means that past successions of "man's" relatives were annihilated by superior forms of their own genus until only one species remained, modern man or *Homo sapiens* L.

In fact man, in his paranoid arrogance, has perpetrated the greatest blasphemy of all time by stating in the Bible, "So God created Man in his own image" (Genesis Chapter I Verse 27).

If there be a God, the universe is so vast and incomprehensible that He could not be a man! However, there is a God all around us which man has refused to accept but he abuses and exploits her forgetting that she of all dieties is our own true God. In as much as Nature created us so will she destroy us if we refuse to accept her.

The lesson to be drawn here is that *man's greatest enemy is his own*

kind and upon an understanding of this fact depends his chances of survival in the future.

It is true that man is now the most dynamic biological factor which has ever disrupted the balance of nature. He has ceased to be an integral part of his natural environment and has become a controlling or "limiting factor" disturbing by one means or another the natural balance of other living things, which he calls "wildlife" (P.E. Glover, 1961). For all that, his existence still depends on the laws of Nature. So it is imperative that man must now turn his thoughts to the conservation and use of the habitat he considers as "wild" and outside his own environment. To do this, man must accept unequivocally Nature and her ecology which is an integral part of his home, the earth.

Man still has a tendency to apply the term "wildlife" to "wild" animals only, particularly the mammals, but this word really covers both plants and animals as they are all living beings intimately interdependent upon each other for their vary existence (Clements and Shelford, 1939).

Definitions

Before dealing with specific ecological complexes some examples of terms which will be used later are given to describe existing "non-human" communities of living things.

The Biotic Community:—is a "community of animals and plants as a whole" (Phillips, 1950). In this paper it is referred to as "the community" or "a community", meaning congregations of interdependent plants and animals including micro-organisims.

The Ecosystem:—The term "ecosystem" was first coined by Tansley in 1935 (in Odum, 1959). Today it means "an ecological system formed by the interaction of co-acting organisms and their environment" (Kenneth, 1963). But because this term can include small communities such as ponds as well as large expanses of country, we in East Africa, prefer to use the term "ecological unit" for major plant-animal formations.

The "Biome" or Ecological Unit:—Clements and Shelford (1939) use the word *biome* for a plant-animal formation which is the basic community unit. This idea is a logical outcome of the treatment of

a biological community as a complex organism with characteristic development and structure. In fact, it is what is known in East Africa as an ecological unit "where the plant-animal formation is composed of a plant matrix with the total number of included animals of which the larger and more influent species may range over the entire area of the biome including its subdivisions and developmental stages"—for example, elephants in the Serengeti, Mara or Tsavo ecological units. In other words, an ecological unit is a region which, except for man's influence, consists of an integrated set of ecological factors more or less in balance and capable of indefinite perpetuation without habitat deterioration.

Failure to understand the concept of an ecological unit, hence one of the great tragedies of Africa perpetrated mainly by its ex-colonial rulers, is the fact that few, if any, of the national parks or game reserves were originally demarcated as ecological units, not even the Serengeti National Park or Tsavo, which is probably the largest and most varied wildlife sanctuary in the world. This fact may prove disastrous in the future as human population pressure increases on the borders of these parks and reserves, which being parts not wholes, can hardly continue to be viable ecological units whilst their boundaries are becoming increasingly limited by growing human occupation.

"Coaction" of the Inter-relations Of organisms:—Clements and Shelford (1939) describe animals as active agents or "coactors" within the ecosystem and classify them as "herbivores", "carnivores" or "omnivores". Plants they call "passive members" or "coactees" because they supply food and shelter for the animal coactors.

Primary Productivity of a community or part of it, is the rate at which solar energy is stored by chemosynthetic means such as photosynthesis in producer organisms like plants which can be used as food by other forms of life like animals.

Secondary productivity is the rate of energy storage at consumer or decomposer levels such as assimilation and respiration where food materials are converted to different tissues in the consumer organism.

The Food Chain:—Odum (1959) refers to the transfer of energy from its source, the sun, through plants, and a series of other organisms which with repeated eating and being eaten, form the food

chain whose available energy is converted into the biomass or live weight, including stored food.

Liebig's "Law" of the Minimum:—In 1840, Liebig had the idea that a living organism is no stronger than the weakest link in its ecological chain of requirements and that the growth of a plant, is dependent on the maximum quantity of foodstuff available to it.

Shelford's "Law" of Tolerance:—Shelford, in 1913, in support of Liebig's theory, thought that living creatures have an ecological minimum and maximum, with a range in between which represents the limits of tolerance.

Limiting Factors:—Odum (1959) goes one better, however, and indicates that by combining the concepts of the minimum and tolerance, a more general and useful term "limiting factors" is arrived at, since the presence and success of an organism or a group of organisms depends on a complex of conditions and any factor which approaches or exceeds the limits of tolerance of a particular organism is said to be a limiting factor.

This concept is very important, for different organisms have different limiting factors and a set of conditions suitable for one creature may be quite intolerable for another. Yet over the aeons of time Nature has created a wide spectrum of plant and animal species able to live harmoniously in the same habitat so long as the sets of requirements for each one's particular niche are available so that each species helps the other to maintain a more elastic equilibrium than any one species could do alone.

Animal Populations:—Pearl (in Allee, et al., 1949) defines a population as a "group of living individuals set in a frame that is limited and defined in respect of both time and space".

Population Density:—Odum (1959) describes population density as "population size in relation to some unit of space" and says it is generally assayed and expressed as "the number of individuals or the population biomass per unit area of volume . . . .". Examples of significant population density records include: 1. An aerial census taken in 1963 in the Serengeti National Park which revealed that within the larger ecological unit that includes the park proper and the surrounding country into which some animals migrate at certain times of the year, there were more than 20 species of large herbivores

and 10 species of big carnivores and scavengers. Among the herbivores, there were 330,000 wildebeest, 150,000 zebra (*Equus burchelli*), approximately 40,000 Grant's gazelle (*Gazella granti*), 600,000 Thomson's gazelle (*Gazella thomsoni*), 20,000 topi (*Damaliscus korrigum*), 20,000 buffalo (*Syncerus caffer*), 10,000 giraffe (*Giraffa camelopardalis*), 10,000 impala (*Aepyceros melampus*), 5,000 eland (*Taurotragus oryx*) and 5,000 hartebeest (*Alcelaphus buselaphus*).

Population Structure:—According to Odum (1959), individuals in a population may be distributed in three broad patterns: (1) random; (2) uniform (more regular than random); and (3) clumped (irregular, non-random) but he omits discussion of male and female segregation such as occurs in some antelopes, e.g. impala.

Cole (in Odum, 1959) described intrapopulation dispersion as follows: "Some of the most persistent difficulties encountered in ecological field work stem from the fact that population of living organisms are rarely distributed at random over the space available to them. Nor is random distribution, implying that the individual organisms are scattered by chance, to be expected in most biological material. When plants reproduce vegetatively or by means of seeds, there is a tendency for the offspring to be concentrated near the parent plant. The same is true of animals which produce their young in litters and especially of the many forms which deposit masses of eggs, thus temporarily leading to a heavy concentration of individuals within a small area. Most animals show some tendency towards active congregation. Even the sexual attraction which brings pairs of animals together, is a departure from the theoretical conditions necessary to produce a randomly distributed population, while the social instincts which induce the formation of flocks in birds, herds in mammals and colonies in social insects, depart so radically from random processes that no one would expect the density of ants or deer to exhibit any uniformity over a wide area."

Observations for a number of years in national parks and game reserves in East Africa, have shown that each species of animal has its own particular group structure—for example:

1) J. Glover (1963) described the results of aerial counts of individual herds of elephants in the Tsavo National Park in Kenya, which permitted a study of populations and frequency distributions

in herd sizes. In all, 1,135 herds were counted, of which 128 were solitary animals. The greatest number of herds were small in size, more than three-quarters were in groups of 15 or less; over one-third were in groups of five or less and 11 percent were solitary animals. The evidence provided by ground observation and aerial photographs suggested that very small units were mainly adult males, whereas larger groups consisted of females and young. The greatest number of herds, made up of 5–15 animals per herd, were family units composed of adult females and young in all stages of growth. At certain times of the year, particularly during the early rainy season, large congregations of elephants, up to 2,000 or more, may be seen from the air; these are obviously aggregations of family units but the true significance of their behaviour is not yet known.

2) Klingel (1967) studied the social structure of zebra, their population dynamics and feeding habits in the Ngorongoro Crater for 2 years. He found that they also exist in stable family groups consisting on the average of one stallion, one to five mares and several foals, totalling up to 13 animals. Unattached stallions join bachelor herds but these are not very stable. Adolescent members leave the family when they are between 1 and 2½ years old, depending on their sex; females staying longest, particularly if their mothers have younger foals.

3) Küme (in P. E. Glover, 1965) observed the wild dogs in Serengeti National Park and noted that there were indications that their young were dependent on the holes and burrows of other animals in the early stages of their lives. The extent of the hunting range of the pack appeared to be directly related to the abundance of the main food species, which were Thomson's gazelle and Grant's gazelle, but young wildebeest formed an important part of their diet at certain times of the year. Also the communal use of food supply through the mechanism of disgorging made possible a division of labour between adult members of the pack. These facts were confirmed by Estes and Goddard (1967).

Behaviour Patterns form a link in and an explanation for many groupings in a community, hence the value of studying the processes of begging and greeting among wild dogs and marking out territory by antelopes and other animals.

4) Ritchie (1963) described the group structure of the black rhinoceros *(Diceros bicornis)* which usually occur singly, or in pairs or three's. The pair consists of a female and a calf or a male and a female. The party of three is normally a cow with one well-grown calf and a smaller calf. A solitary animal is most probably a male or an almost full-grown calf which has just left its mother. A cow is never accompanied by a bull when she has a very small calf and the calf always follows its mother. Occasionally a party of four or more may be seen together.

Male and Female Segregation: — There is a definite tendency among many of the larger animals to segregate into male and female groups which is particularly evident in antelopes such as the Uganda kob *(Adenota kob thomasii)*, Thomson's and Grant's gazelle and especially impala where a group of females and young is attended by one adult male and nearby is a herd of adolescent and fully grown males which are constantly driven away by the dominant male if any of them attempt to come too close to the female herd (Schenkel 1966).

Territory:—The possession of territory is an attribute of many animals and has more than one purpose.

1) L. H. Brown (1963), in his observations on East African birds of prey, refers to the territorial requirements of these birds as "home ranges", here he means feeding territories.

2) Territorial activity is also strongly exhibited in many ungulates and is particularly well demonstrated in Thomson's gazelle, whose social behaviour was studied by Estes (1964) in the Ngorongoro Crater and more recently by Walther in the Serengeti National Park. Thomson's gazelle and other ungulates like the dikdik are equipped with pre-orbital glands on the face containing a dark, waxy substance which is used to demarcate the areas they occupy by repeatedly rubbing these glands on the tips of sticks or stiff stalks of grass until a small blob of waxy material accumulates there, indicating that each animal must have a distinctive scent. Some animals use faecal middens or urinate on certain objects for the same purpose.

3) Kruuk (1966) studied the clan system and feeding habits of the spotted hyaena (*Crocuta crocuta*) on the Serengeti plains and in

the Ngorongoro Crater. By immobilising and marking these creatures as well as attracting them to the Land Rover by playing the tape-recorded sound of hyaenas around a kill at night, he calculated that there were approximately 420 adult hyaenas inhabiting the floor of the crater. All the females stayed in the general area in which they were marked, and the recoveries of marked animals revealed eight home ranges in the crater. The separate ranges were occupied by 10–100 hyaenas; the groups of hyaenas living in each range he called clans. Males adhered less strictly to the clan-range, as some marked males were seen in different areas. These animals usually feed in their own ranges but if a prey was chased and killed outside it, the neighbouring clan in whose territory the kill had taken place, were observed to chase the invading members off their kill and any strange individual intruding in the range of a clan "was met with much aggression."

4) Lions are territorial animals and Küme (in P. E. Glover, 1965), who studied them for a short while in the Serengeti National Park, found that they were more nocturnal than hunting dogs and he suggested that their population might be limited by competition for pride territory. This was proved later by Schaller (1969).

Grazing and browsing:—Among the herbivores in a natural habitat, there are two main types of feeding—which are grazing and browsing. Some animals, such as buffaloes and hippopotami, are predominantly grass eaters and others like rhinoceros and giraffe are predominantly browsers eating the shoots and twigs of non-grasses such as shrubs and even trees. The presence of giraffe can often be detected by the browse patterns visible on trees and other woody vegetation.

Some other animals are both grazers and browsers, and the elephant is one of these.

Predation:—One of nature's ways of controlling populations, especially among the herbivores, is by predation and hyaenas, lions, leopards, cheetah, hunting dogs, jackals, and man, the arch predator, take a toll of ungulate animals particularly the young or sick, in most national parks.

Elephant and hippopotamus are not much affected by predation except man because of their size. It is therefore not a natural limiting

factor to them but a man made one as it can be with the smaller animals.

Overpopulation:—Among the larger animals like elephant, excessive population pressure can bring about deterioration of the habitat, resulting in the wholesale destruction of trees as has happened in the Murchison and Tsavo National Parks; and is perhaps happening in the Serengeti.

In parts of the Queen Elizabeth National Park in Uganda, overpopulation of hippopotamus caused serious reduction in grass cover and widespread soil erosion.

The Serengeti elephant problem appears to be well on the way but total destruction of the trees in the habitat has not yet occurred.

The basic causes of overpopulation of elephants would appear to be increasing pressure by man on the perimeters of the parks and game reserves as a result of expanding agricultural and poaching activities, or both. At the same time, within the parks the animals are protected so that they can multiply unchecked, but very few parks or game reserves are true ecological units so that they cannot support ever-increasing animal populations without habitat deterioration.

So far, the only practical way of controlling overpopulation of any particular species, and the damage it causes, might be to reduce the number of animals by cropping them, if we possess enough knowledge of the population dynamics of the species concerned which we do not!*

The most urgent problem facing national parks and game reserves, in East Africa, is the formulation of simple practical management plans to conserve the widest spectrum of species and at the same time protect the habitat from the depredations of uncontrolled fires and overpopulation of potentially destructive species.

But the greatest danger of all lies in the increasing population pressure of semi-agricultural people and poachers on the boundaries of game reserves and parks which are not self-contained units.

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* If a National Park is very large such as Tsavo in Kenya where there is a heavy population of elephants, the indications are that a re-adjustment of habitat, numbers and species is taking place naturally.

THE MAU-MARA-SERENGETI ECOLOGICAL UNIT

The following brief description is intended to depict what might still be termed an ecological unit in East Africa but, alas, only small portions of it are protected as game or forest reserves and it is unlikely to last much longer as it is now (1961).

The ecosystem of the rangeland of the Loita plains of Kenya's Masailand is composed of open grassland dissected by wooded watercourses of the Mara River system extending southwards into the Serengeti National Park in Tanzania. To the north, the plains reach to the forested foothills of the Mau range; to the east, they are bounded by evergreen scrub and their western boundary is marked by the Siria escarpment where the Mara River follows the line of the foot of the escarpment backed by the Trans-Mara region of forests and glades reaching right up to Kilgoris on the Kisii border. The wooded Loita hills lie on the south side.

The Loita Plains Ecosystem:—These plains are grazed by Thomson's gazelle, Grant's gazelle, kongoni (*Alcelaphus buselaphus cokei*) and by large migratory herds of wildebeest, zebra and topi. There are also ostriches (*Struthio camelus*), secretary birds (*Sagitarius serpentarius*), several species of vulture, falcons, kites, eagles, buzzards, as well as bustards, greater and lesser, plovers, larks, etc., which are associated with these plains as well as many other birds including seasonal migrants like the European stork (*Cinconia cinconia*) and Abdim's stork (*Sphenorhynchus abdimii*).

Except for small fringing areas to the south and west, inhabited by tsetse flies, the whole of the plains are heavily grazed throughout the year by Masai cattle, sheep, and goats.

Grassland and Vegetation Patterns:—On the Loita and adjoining grassy plains, there are vegetation patterns forming numerous lines of rings running at right angles to the contour and a "peacock feather-like" appearance at the headwaters of drainage lines when viewed from the air. The rings occur at the rate of about three per acre and are all based on low termite mounds or foci of termite activity (Glover, et al., 1964).

The vegetation communities in the patterns form roughly concentric zones. The outermost is a ring or crescent of tall grass

(Pennisetum schimperi) depending on the position of the pattern on the contour. The innermost zone on slightly raised mounds, up to two feet (0.6 m) high, is usually composed of *Achyropsis greenwayi*, a tough, straggling, much-branched, low shrub often associated with a ring of creeping grass (*Cynodon dactylon*). In some parts of the plains *Justicia elliotii* occupies a similar position and appearance to *A. greenwayi* in the patterns.

In the rings at the top of the slope, the area between the central and outer tall grass zones is occupied by a community of short grasses and other small herbaceous plants, such as *Microchloa kunthii*, *Sporobolus* spp. and *Cycniopsis* sp, a pink-flowered root parasite, etc. On the slope, however, this zone becomes elongated and occupies that portion forming the narrower end or "tail" of the pattern, pointing down the slope. It looks whitish or light in colour from the air and on the photographs.

The termites responsible for the patterns on the Loita plains are a species of *Odontotermes*, but these patterns are also inhabited by a variety of animals, such as antbears (*Orycteropus afer*), which dig large holes in the central mounds to get at the termites, mongooses (*Mungos mungos*), bat-eared foxes (*Otocyon magalotis*), hunting dogs (*Lycaon pictus*), spotted hyaenas (*Crocuta crocuta*), jackals (*Canis mesomelas*), warthogs (*Phacochoerus aethiopicus*), porcupines (*Hystrix galeata*), many other rodents, such as rats and mice, and some small insectivores like shrews. Other animals associated with the vegetation patterns are birds, reptiles, and a great variety of insects.

These vegetation patterns are good examples of micro-ecosystems within a larger community.

The watercourse community:—The wooded watercourses of the Mara River system dissecting the plains are a further example of smaller ecosystems within a larger one. Here flat-topped acacias, such as *A. xanthophloea* and *A. kirkii* occur, sometimes forming a closed canopy with a dense thicket under-storey consisting of a variety of smaller trees, shrubs and herbs.

This community is the home of bushbuck (*Tragelaphus scriptus*), Harvey's red duiker (*Cephalophus harveyi*) and reedbuck (*Redunca*

redunca) which may be seen singly or in pairs in swamp and reeds on the edges of the watercourses.

Marginal Habitats are the edges or interzones (ecotones) between the riverine community and the plains. Examples of animals to be found there are lions (*Panthera leo*), which lie up in the shade of the drainage line thicket during the day ("lion-bush", Fraser Darling, 1960) and hunt on the plains in the evening or whenever they are hungry. Leopards (*Panthera pardus*) live here too and can sometimes be seen reclining on an overhanging branch in the heat of the day but they also live in denser vegetation like that of the forest and in the hills. Waterbuck *(Kobus defassa)* can frequently be seen in the open on the edge of riverine thicket but they seldom stray very far from water. Buffalo (*Syncerus caffer*), sometimes found in large herds in the open plains but never very far from water, are fond of taking shelter in dense thicket and papyrus swamps, especially the old bulls. Giraffe (*Giraffa camelopardalis*) are usually seen in families up to fifty or more at a time. They can be found in the open plains when migrating from one place to another but their preferred habitat is open woodland or wooded grassland where there are plenty of shrubs and trees to browse.

Evergreen Scrub:—Another type of habitat bordering the plains, is evergreen scrub which usually occurs on the footslopes of stony hills or in rough, broken or undulating country difficult for fire to penetrate. Here again, animals adapted to this type of environment occur; many of them have been listed before as marginal dwellers but impala especially live on the thicket edge, often on the footslopes of the hills; dikdik (*Rhynchotragus kirkii*) may be seen singly or in pairs scuttling away into cover. Rhinoceros may also be seen singly or in two's and three's, probably constituting a small family group but rhinoceros seem to be becoming scarce in this region.

Riparian Forest:—Mention must now be made of the larger riverine habitat associated with permanent water, such as that along the Mara River itself. In places on the river where there are meanders and oxbows there are wide patches of riverine forest with large or tall trees like *Ficus* spp., *Mimusops bagshawei*, and *Diospyros abyssinica* fringing the river banks. Here again, elephant, buffalo, water-

buck, etc. abound. In the water itself are fishes such as *Tilapia* sp., cat fish (*Clarias* sp.), and *Barbus* sp., as well as amphibians like crocodiles (*Crocodylus niloticus*), monitor lizards (*Varanus niloticus*), frogs *Xenopus laevus, Rana* spp., and toads (*Bufo* spp.). Hippos (*Hippopotamus amphibius*) keep to the water in the daytime but graze along the river banks at night. One other amphibious animal, the clawless otter *(Aonyx capensi)* is occasionally seen during the day swimming in the water or lying on the sand-banks of the river (Astley Maberly, 1965).

Some other animals inhabiting riverine vegetation not so far mentioned are monkeys (*Cercopithecus mitis*), galagos (*Galago crassicaudatus*), tree hyraxes (*Dendrohyrax brucei*), squirrels (*Paraxerus ochraceus*), etc.

In addition, there are birds like: fish eagles (*Cuncuma vocifer*), cormorants, Egyptian geese (*Alopochen aegyptiacus*), a number of ducks, many of which are migrants, and a host of smaller water fowl. A number of other birds inhabit the surrounding vegetation, a few of which are: coucals (*Centropus monachus*), turacos (*Turaco* spp.), parrots (*Poicephalus meyeri*) and a variety of smaller types like sparrows, weavers, doves and pigeons, white eyes, barbets, woodpeckers, bulbuls, etc.

The Hillside Community:—Another habitat often contiguous to the plains is the rocky hillside type, consisting of open grassland, wooded grassland with *Combretum molle* and other fire-resistant plant species, and dense bushlands with large candelabra *Euphorbia* sp. and tree *Aloes* sp. There may be precipitous rock faces and overhanging rock shelters included in this community, which is the home of a wide range of animal species, one of the most interesting being the klipspringer (*Oreotragus oreotragus*), a small antelope with a rough coat resembling a chamois and almost cylindrical hooves, a special adaptation for jumping from rock to rock.

Other animals living in the hillside community are baboons (*Papio anubis*). They sleep in rocky, precipitous places at night to avoid sudden attack from leopards, which are numerous, as baboons are their favoured prey. Rock hyraxes (*Procavia johnstoni*) also live in the cracks and crevices in the rocks and bask in the sun on top of large boulders during the day. Their faeces and urine are flushed

off the rocks by rain and help to replace some of the fertility of the habitat (Turner and Watson, 1965). A specialized vegetation community is built up around the base of the rocks and boulders in which *Combretum molle* is often dominant. This community is resistent to fire because of the protection of the surrounding terrain.

Other inhabitants of the hillside community are snakes, such as cobras, puff adders and pythons. They prey on hyraxes and other small animals when available. Where the rocky precipices are particularly high and unscalable, vultures, eagles, and other birds of prey make their nests. The Nyanza swift (*Apus niansae*) nests and breeds in cliffs, sometimes in association with the mottled swift, *Apus aequatorialis* (Williams, 1963).

The windward or unprotected parts of the hillsides are usually swept by perennial fires and clearly defined vegetation fire patterns can be seen on them.

The Mau forest ecosystem:—To the north and northwest of the Loita plains lies the great Mau forest, ranging in altitude from 6,000-10,000 feet above sea level with a variation in average annual rainfall of from 30 inches in the drier southern parts to 80 inches in the wetter northern regions.

Some of the emergent trees in the forest grow taller than 100 feet. In the higher regions of this community, there is montane moorland where there are typical alpine plants such as giant lobelias (*L. gibberoa* and *L. aberdarica*), *Helichrysum* spp., *Senecio* spp., giant heather (*Rica arborea*), and trees like *Hagenia abyssinica* which fringe the moorland.

In the wetter zones of the forest, tall trees, *Macaranga kilimandscharica*, *Prunus africana*, *Albizia gummifera*, *Podocarpus milanjianus*, etc. are to be found. Towards the drier parts, *Juniperus procera* and *Olea africana* become local dominants and along its southern edge, the forest gives way to evergreen bushland and derived *Tarchonanthus camphoratus* scrub.

There is a great variety of animal life in the forest community and some species occur there which are not common or are not found elsewhere within the ecological unit. Notable among these are the bongo (*Boocercus eurycerus*), the yellow backed duiker (*Cephalophus silvicultur*), and colobus monkeys (*Colobus polykomos*) but

these monkeys also occur in the forests of the Mara area and Trans-Mara.

The Semi-desert Ecosystem:—Passing from the Loita-Mara regions eastwards into the Rift Valley, semi-desert conditions prevail and plants and animals adapted to these drier parts appear. The average annual rainfall for Magadi is about 15 inches and that of the Mara-Loita area, between 30 and 40 inches per annum.

In the south-eastern and southern part of the Rift Valley are many wild plants especially adapted to withstand drought, such as the Commiphorae, some *Acacias* like *A. mellifera* and *A. nubica* and a number of succulent or xerophytic types.

In this community are also animals suited to drier conditions, three of them being the lesser kudu (*Tragelaphus imberbis*) and the gerenuk (*Litocranius walleri*), which has a long neck specially adapted for browsing, and the oryx (*Oryx beisa*), which occurs occasionally in herds of up to fifty at a time, but it is now seen only in the southern-most parts of the Rift Valley near the borders of Tanzania.

Fire:—In all the communities described so far, fire is a major controlling or limiting factor in the habitat, equal only in its effect to climate, topography, and soil. In the Loita area, the Masai herdsmen burn the grass whenever possible, sometimes three times a year. This has a profund effect on the constitution of the grassland, the dwindling natural bushland and the nature of the soil surface on the plains, including the communities within the vegetation patterns. Relict trees and shrubs scattered over parts of the plains and patches of thicket on severely eroded soil indicate that the grasslands are fire-induced, supported by grazing and would revert to bushland if these factors were removed.

Destruction of the Habitat:—Evidence of this process is already present in the Mara area where the combination of elephant damage and perennial fire is reducing the thicket and woodland and increasing the extent of the grassland.

In some places even giraffe are destroying the trees, particularly in the open woodlands where there is nothing else to browse and some plants, such as *Balanites aegyptiaca*, are showing a high mortality.

The object of the foregoing account of an ecological unit is to convey some idea to the reader of the variety and complexity of the interdependent living creatures, both plant and animal, which occur within such a large natural habitat and to indicate how apparently self-supporting, smaller communities can exist within a larger habitat, yet to change the interaction of the different factors inside these interdependent ecosystems means degradation and finally destruction of the entire natural habitat.

This, unfortunately, is what is happening today at an accelerating pace, because man has acquired the ability to alter the "wild" habitat to suit his own apparent needs and he has now become a limiting factor, forgetting that it is his own habitat with which he is tampering and not thinking or caring what the ultimate result may be!

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