FIG. 503. — Picking cotton in southern United States.

FIG. 504. — A pineapple field in the Hawaiian Islands.

CHAPTER XVIII.

DISTRIBUTION OF ANIMALS.

227. Influence of Surroundings. — Plants and animals are alike in being dependent for life on their surroundings. Like plants, all animals, even those on the sea bottom, need air to breathe ; all require water for their blood and tissues ; and for all it is necessary that the temperature shall be neither too high nor too low. Temperatures near the boiling point, or long continued below the freezing point, are fatal to animal tissues. Many, especially the lower animals, are able to survive a period of freezing ; others protect themselves by a coat of fur, feathers, or fat ; and some, such as bears, lie dormant in a protected place during the cold season.

Most water and many land animals are cold-blooded; that is, their temperature changes with their surroundings. They require so little air that many of them obtain all they need from the water. Other animals, the birds and mammals, are warm-blooded, the warmth being due to slow combustion caused within their bodies by the oxygen they breathe (p. 229). Such animals require much oxygen and, even if they live in water, as the whales do, must rise to the air to obtain it. Those that live in water, or in cold climates, need to protect themselves by a warm covering in order to keep the warmth in their blood.

Animals differ from plants in the way in which they secure food. While some remain fixed in one place, depending on supplies brought to them, as plants do, most animals seek their food. They need carbon and mineral substances, but are unable to secure them directly from air and earth. They depend upon plants to perform this work, and the basis of animal food is, therefore, plant life. Even the food of flesh-eating animals may be

traced back to the plant kingdom. Thus plants are of vital importance to animals.

Unlike plants, animals do not absolutely require sunlight, since they do not need it to transform air, water, and mineral matter to food, as plants do. Consequently, animals are able to live even in the darkness of the deep sea.

Like plants, animals are strikingly adapted to their surroundings; if they were not, they would perish. Some spend most of their time in the air; some live part or all of the time in water; some dwell in trees; some have homes on the land surface; and some dwell at least part of the time underground. Flying, climbing, swimming, and running are developed to aid either in securing food or in escaping enemies. For these purposes there are many modifications in the shape of the body, — for example, wings for flying; long arms, claws, and tails for climbing; fins and boat-shaped bodies for swimming; long legs for running.

Gravity influences the form and structure of the body. Since man stands upright, two legs only are required; but four legs are necessary to sustain a body that extends parallel to the ground. Strong bones, or other structures, are needed to support the body on land; but in water, which is denser, bones, where present, are much lighter. To maintain themselves in the air, flying birds have more feathers and lighter bones than running birds, and in most cases their bodies are smaller.

Summary. — *All animals must have air for breathing, water for blood and tissues, and a temperature neither too high nor too low. There are both warm and cold blooded animals, and all are dependent on the plant kingdom for food. Animals are, in many ways, adapted to their surroundings; and there are many modifications fitting them to secure food and escape enemies. Gravity influences the form and structure of the body in many ways.*

228. Animal Life, or Fauna,[1] of the Arctic. — No animals

[1] A fauna is the assemblage of animals occupying a region. Thus we may speak of a Greenland fauna, an Alaskan fauna, etc.

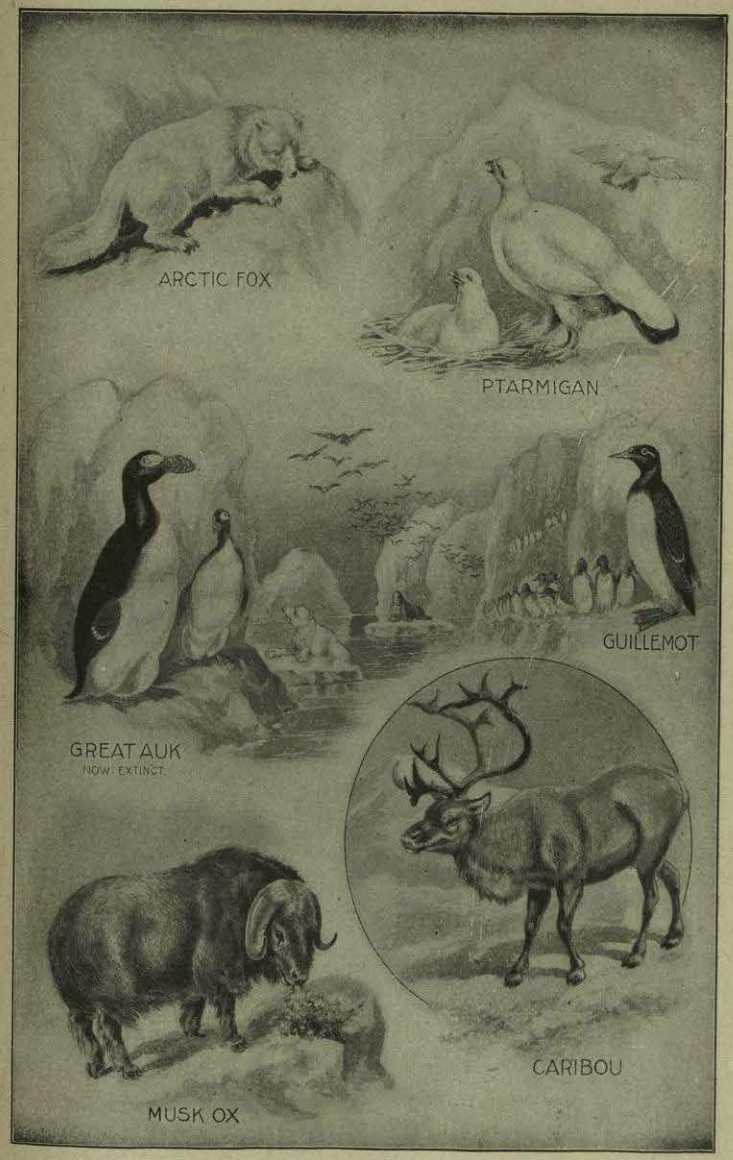

FIG. 505. — A group of Arctic animals.

FIG. 506. — Polar bear and Arctic seal. The legs of the seal are changed to finlike appendages, used for swimming and for climbing upon the ice.

FIG. 507. — Walrus. The legs have been modified for swimming and for climbing upon the ice.

FIG. 508. — Arctic whale. The legs have almost disappeared, and the tail is used for swimming. In the mouth of this whale is a large amount of valuable whalebone, on the edges of which are fringes which strain from the water the small animalcula upon which the whale lives.

live in the ice-covered interior of Greenland ; but in and near the Arctic Ocean there is much life, especially in summer. There are many kinds of fishes and other sea animals, and a great variety of sea birds feeding on them. When the freezing of the sea and land cuts off their food supply, most of the birds are forced to go southward ; wild geese, for instance, which spend the summer on the tundras of northern America, fly as far south as Mexico. Other species go no farther south than Labrador and Newfoundland. During the summer, birds congregate in great numbers in their breeding places and, when frightened from their nests on the cliffs, rise into the air in clouds.

On the land there are crows, ptarmigans, and some smaller birds; also hares, foxes, reindeer (called caribou in America), and musk ox (Fig. 505). There are practically no reptiles, for the great cold is unfavorable to such cold-blooded animals; but there are numerous insects, of which the mosquito is especially abundant.

A number of mammals live part or all of the time in the sea. The polar bear spends most of his time on the sea ice, seeking the seal for food (Fig. 506). There are walruses (Fig. 507) and a number of species of seal, — warm-blooded, air-breathing mammals, which now and then leave the sea for a short time and take to the ice or shore. Whales also live in the Arctic (Fig. 508), but, though air-breathing, they never leave the water.

The warm-blooded animals are well adapted to life in the severe Arctic climate. They are well protected, the birds with warm feathers and down, which keep out wind, water, and cold, the mammals with fur or fat, or both. In winter, when most needed, the fur is thickest. Eider down and the fur of the fur seal of Bering Sea are highly valued for their warmth and beauty.

Many Arctic animals, like the fox, hare, and polar bear, are white like the snow and ice around them, thus escaping notice, both from their foes and their prey. The ptarmigan becomes white

in winter; but its summer plumage resembles the vegetation amid which it feeds. The baby seal, which spends its first days on the ice, is also white; but as it grows older, and takes to the water, its color changes to more nearly resemble the water.

Summary. — *In the Arctic region there are many sea birds, which move southward in winter when the freezing of sea and land cuts off their food supply. On the land there are a few birds and mammals, numerous insects, but practically no reptiles. A number of mammals live part or all of the time in the sea. Warm-blooded Arctic animals are protected from the cold by fur, feathers, and fat, and are often white like the surrounding snow and ice.*

229. Temperate Fauna. — In the temperate zones animal life is more varied, and differs greatly from place to place. Certain species, like the bison (Fig. 518) and antelope, have become especially adapted to life on open plains; others, like the moose and squirrel, to the forest; others, like the mountain sheep and chamois, to high mountains; others, like the jack rabbit, coyote, and camel, to arid lands. Some, like the blindfish, live in caves, losing their eyes because they are not needed in the darkness. Still others, like the earthworm, woodchuck, prairie dog, and mole, burrow in the soil, spending part or all of their lives underground. Some, like the owl and wild cat, sleep by day and hunt by night; but the majority rest when it is dark.

An enumeration of all the animals of the temperate zones would be a long list, for there is much variety among mammals, birds, reptiles, insects, and other groups. Among the birds are hawks, eagles, owls, humming birds, thrushes, and a large number of singing birds; and along the coast there are many sea birds, including gulls, terns, ducks, and snipe. Among mammals are the bear, fox, wolf, deer, antelope, elk, moose, wild cat, squirrel, and hare, besides others mentioned above (Figs. 509, 510). One peculiar animal of the United States is the opossum, which belongs to the same division of the animal kingdom as the kangaroo.

Many animals of the temperate zone are protected by a coat of

FIG. 509. — A group of cold temperate American animals.

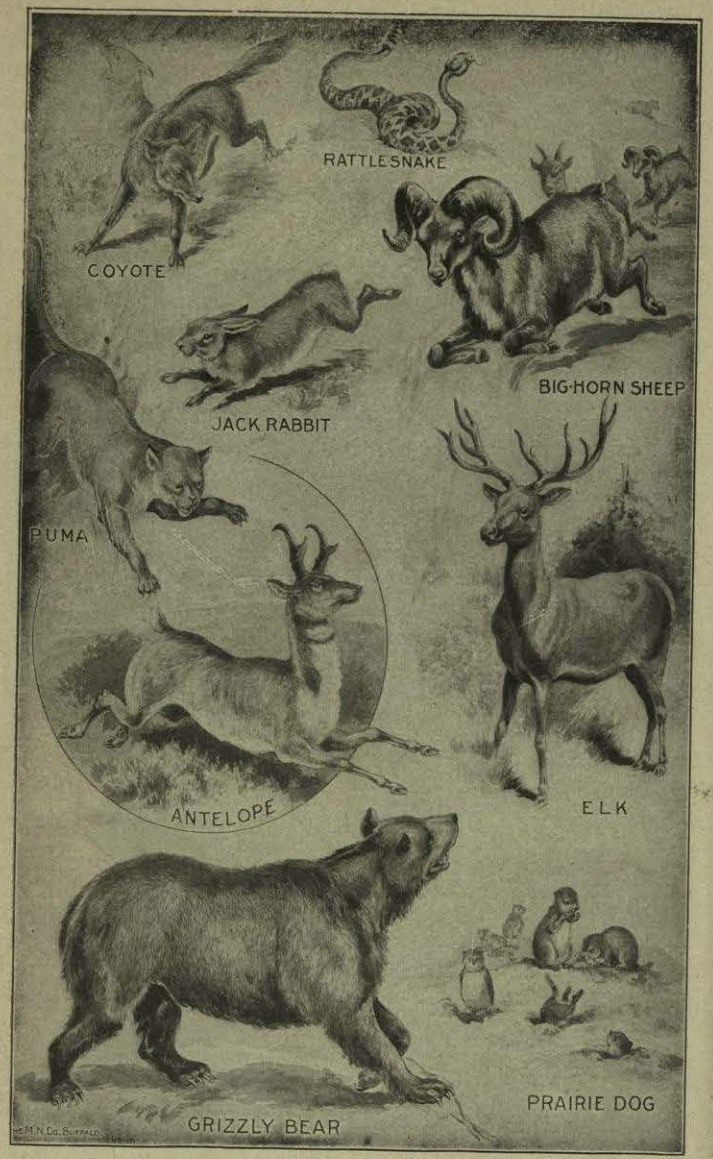

FIG. 510. — A group of animals of western United States, found in the mountains or on the arid plains and plateaus.

fur, highly prized by man. Fur-bearing animals of value, including mink, otter, sable, and beaver, are found especially in the cold north, where they are still hunted. The beaver (Fig. 509), a very interesting animal, cuts down trees and bushes with which to build dams to make ponds and swamps in which its plant food grows. His sharp teeth and flat tail are especially adapted to this work.

Summary. — *Animal life in the temperate zone is abundant and varied, different species being adapted to life on the prairies, in the forest, on mountains, in arid lands, in caves, and underground. Many mammals have fur of value to man.*

230. Tropical Fauna. — Since plants are the basis for animal food, animal life thrives where plants abound. Hence, animals are abundant in the tropical forest. Innumerable insects, feeding on pollen, honey, leaves, bark, wood, or decaying vegetation, some in trees and some on the ground, furnish food for countless birds. The insects include many beautiful butterflies; also the interesting white ants, or termites, which build great structures of earth in which to dwell.

The birds, including parrots, paroquets, humming birds, and birds of paradise, number thousands of species. There are also many reptiles, including turtles, alligators, lizards, and snakes. Among the snakes are venomous species, and huge boa constrictors, which, hanging from the trees, resemble thick vines. One of the lizards, the iguana, attains a length of several feet. The mammals include the lion, tiger, hippopotamus, rhinoceros, giraffe, and elephant of the Old World (Figs. 511, 512), and the jaguar, puma, tapir, armadillo, and sloth of the New (Fig. 514). There are also monkeys, orang-outangs, gorillas, antelope, deer, zebras, and many other mammals.

Summary. — *The abundance of plants in the tropical zone permits the existence of a great variety of insects, birds, reptiles, and mammals.*

231. Desert Fauna. — A complete list of the desert animals would be much shorter than that of a humid forest

region. There is a great contrast between the abundance and variety of life in the African forest and its paucity in the Sahara desert. There is also a decided contrast between the abundant and varied life in an Arkansas forest and the limited fauna of the desert portion of southwestern United States. There the chief animals are the antelope, puma, coyote, jack rabbit, cotton-tail rabbit, rattlesnake (Fig. 510), horned toad, and a limited number of birds and insects.

Animals need to be peculiarly adapted for life on a desert; and their number and variety are limited by the small amount of water and plant food. Some, like the snakes, require little water, aside from what they secure from the animals they eat; others are supplied with water from the roots or stems of the desert plants upon which they feed; and still others live near springs, or go long distances to them. The camel (Fig. 512) is wonderfully adapted to desert life. It is able to make long journeys on the desert because of the store of water which it carries in its water pouch; its broad, flat feet are admirably suited for travel over sandy surfaces; and its nostrils may be closed to keep out sand which the wind blows about.

Summary. — *The dryness of the climate, and the scarcity of plant food, limit animal life in the desert; but some species, like the camel, are peculiarly adapted to such a life.*

232. Fresh-water Fauna. — Rivers and lakes have varied faunas, including especially fishes, insects, and lower invertebrates, or animals without a backbone. Among fishes many are of value for food, and some, such as salmon and shad, come from the sea into fresh water to lay their eggs. A number of birds and mammals, such as the duck, beaver, muskrat, mink, hippopotamus, and manatee or sea cow (Fig. 514), spend part or all of their time in fresh water, feeding on water plants and animals. Many insects and amphibia (toads, frogs, salamanders, etc.) breed in water, coming to dry land during a later stage. Numerous reptiles, including crocodiles, alligators, turtles, and some snakes, live in fresh water.

FIG. 511. — A group of African tropical animals.

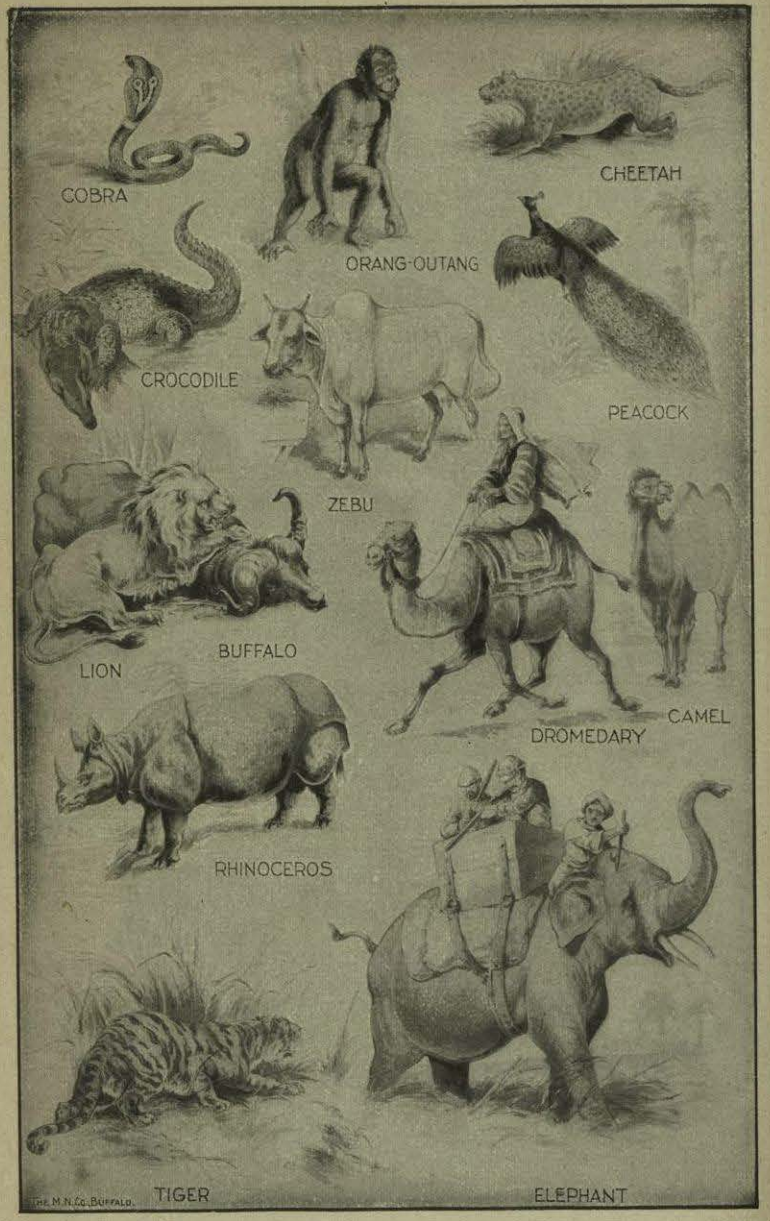

FIG. 512. — A group of southern Asiatic animals.

There are many differences in fresh-water life. For example, the faunas of muddy water, sandy bottoms, swampy ponds, quiet water, and flowing rivers are quite different. Cold water supports less abundant and varied faunas than warm; and salt lakes have very few animals. The Dead Sea receives its name because of the general absence of life, contrasting strikingly with the fauna of the neighboring fresh-water Sea of Galilee.

When arms of the sea are inclosed and changed to fresh water, most of the marine animals die, though some species may survive; also marine animals that enter fresh water may be prevented from returning to the sea. The landlocked salmon is a sea fish that has adapted itself to permanent life in fresh water.

Summary. — *Lower invertebrates, insects, fish, birds, mammals, amphibia, and reptiles are adapted to life in fresh water; and faunas vary with surrounding conditions.*

233. Homes of Animals. — As a whole, invertebrate animals are peculiarly suited to life in water. Insects are the principal exception, though spiders, snails, and other invertebrates are also land dwellers. While most insects live on land, many live in fresh water, and a few in the sea; and some, such as the mosquito, spend the early part of their life in the water.

Reptiles and amphibia are inhabitants of both land and fresh water, though some, like the turtle, live in the sea.

While some birds, such as the penguin, ostrich, emu, and rhea, are unable to fly, most birds are especially fitted to live partly in the air and partly in trees or on the ground. Many, like the duck and penguin, spend much of their time in the water.

Mammals are mainly land dwellers; but the limbs of the bat have been changed for use in flight, and of the seal, walrus, sea cow, and others for use in swimming. Not a few, like the monkey, sloth, opossum, wild cat, and jaguar, spend most of their lives in trees.

Summary. — *Invertebrates are typically water dwellers, though some groups, especially most of the insects, live on the land. Reptiles and amphibia are land and water dwellers; birds, typical air dwellers, are also found in the water and on the ground; mammals, typical land dwellers, are also found in the air and water.*

234. Spread of Animals. — As in the case of plants, there is a tendency for animals to spread. To insure this, more young are born than can possibly live, some dying for lack of food, others being killed by enemies. It is during the young stage that animals are least able to protect themselves, and those animals, like fishes, which do not protect their young, must lay thousands of eggs in order that one of their offspring may reach maturity.

It is a great step in advance when the young are protected and fed by the parents, as among birds and mammals, or among bees and some other insects. Then, since they receive protection during the critical stage of youth, fewer offspring are necessary. Those animals that take the best care of their offspring are the highest.

The tendency to spread has taken animals to all parts of the earth; and evolution, or the tendency to change so as to become better adapted to surroundings, has caused them to vary. It is because of evolution that the European reindeer and American caribou, though of the same stock, are slightly different. The African elephant is a different species from that of Asia, though from the same original source; and the mammoth and mastodon, living in a cold climate, had a hairy coat, quite unlike the elephants of warm regions.

Ocean dwellers (p. 195) are among the most widespread of animals. They swim, or are drifted, here and there; and their surroundings are so uniform that there is little reason for change. Because they can fly, insects, birds, and bats are among the most widely distributed of land animals. Those animals that walk or crawl move more slowly, meet more enemies, and find more barriers to overcome, such as rivers, mountains, deserts, and sea. For these reasons the large mammals and running birds are usually confined to limited areas. Yet some, especially the fierce carnivorous animals, cover a wide range; the tiger, for example, lives in the hot jungle, on open plains, and on cool mountain slopes.

Summary. — *Many animals make provision for the spread of the species by the production of numerous offspring; but higher animals protect their young so that fewer offspring are necessary. Animals have migrated to all parts of the earth, fitting themselves by evolution to their surroundings. Ocean and flying animals are most widely distributed, while land dwellers move more slowly and are often confined to very limited areas.*

235. Barriers to the Spread of Animals. — The spread of animals is interfered with by the same barriers as in the case of plants. Water is the greatest barrier, but it is overcome by flying animals and by those small forms that may be drifted, clinging to logs. The tropical forest is a barrier to a desert animal, and the desert to one that needs water every day. Nor can animals accustomed to a warm climate or to life on plains, easily cross to the other side of a cold, rugged mountain range. Thus very different faunas may exist on opposite sides of such barriers, though some species, especially those that fly, will be the same on both sides.

Summary. — *The same barriers — water, desert, and mountain — affect both animals and plants; they are most easily overcome by flying animals.*

236. Island Faunas. — The influence of the ocean as a barrier is well illustrated by the Bermuda Islands, which lie about 600 miles east of the Carolina coast, the nearest land. They have never been connected with the continent, and yet the animals and plants are quite like those of the mainland. The flora includes the cedar and other northern plants, and cactus, palmetto, oleander, and other southern forms.

The fauna consists principally of insects and birds, including ground doves, redbirds, bluebirds, and catbirds, like those on the mainland. A small West Indian lizard is also found; and there are bats, the only native mammals.

The lizards, and some of the insects, were probably drifted there by ocean currents; the birds, bats, and many insects,

flew across or were drifted by the wind. Every year birds from the mainland are seen in Bermuda, some resting during migration, others driven out to sea by winds.

It is not at all uncommon, far from land, to see small birds resting on the spars and decks of vessels; and even the tiny humming bird has found its way as far as Bermuda. Doubtless the small land birds, driven out to sea during storms, find resting places on logs and clusters of floating seaweed; but many must perish.

Similar conditions exist in the Azores, off the European coast, and the Galapagos Islands, west of South America. The word *Azores* means hawk, and *Galapagos*, turtle, the names being given because these animals were common when the islands were discovered. Animals have crossed the ocean barrier to even the most remote islands, like the Hawaiian Islands in the mid-Pacific.

Summary. — *The Bermuda and other islands, even the most remote, have plant and animal life from the mainland, showing that the ocean barrier can be crossed. Every year, birds stop on the Bermudas during migration, or because drifted out to sea by storms.*

237. Australian Fauna. — The fauna and flora of Australia are both peculiar. Among the birds are the emu and cassowary, two running birds; also parrots, lyre birds, and other peculiar kinds. The mammals include several species of *marsupials*, the very peculiar *monotremes*, and a few other species (Fig. 513). The monotremes, the lowest order of mammals, are represented by the remarkable duck-billed platypus (Fig. 513), which, unlike other mammals, lays eggs. The marsupials, another low order of mammals, to which the opossum belongs, include the kangaroo. These animals carry their young in a pouch, and, instead of walking, hop about by means of their long hind legs and stout tail. Although higher forms of mammals inhabit southern Asia and the East Indies, they have not found their way to Australia.

The explanation of this peculiar life is as follows. Fossils in the rocks prove that, far back in time, monotremes and marsupials

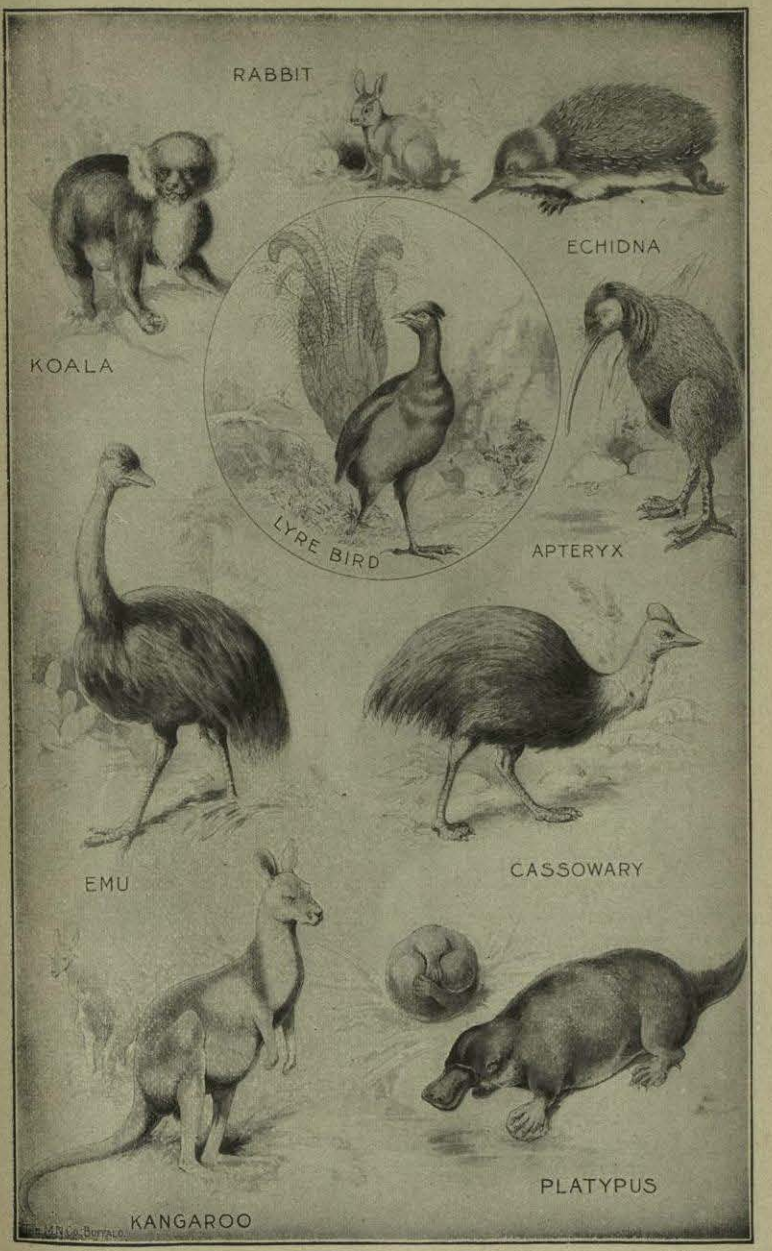

FIG. 513. — A group of Australian animals.

FIG. 514. — A group of South American animals.

were widespread. Australia was then so connected with other continents that these animals were able to migrate there. Fiercer animals have developed in the other continents and have killed off the monotremes and most of the marsupials; but they have been prevented from reaching Australia because sinking of the land has cut off its connection with other continents. Therefore, animals that belong to the geological yesterday are to-day living in Australia, though unfit to survive in other lands. They remain there only because the ocean protects them from the invasion of stronger species. Even dogs, introduced by man, and now running wild, are playing havoc among the defenseless marsupials.

Summary. — *The Australian fauna is peculiar, because the ocean barrier has prevented stronger species, developed on other continents, from entering and destroying the defenseless animals that came long ago, before these stronger species had been evolved, and when Australia was united with other lands.*

238. South American Fauna. — South American animals are also peculiar, though less so than those of Australia. The huge condor (Fig. 514), the largest of flying birds, lives there; also the rhea, a running bird, sometimes called the American ostrich; the llama and its allies; various species of monkey; the sloth; the ant-eater; the armadillo; the tapir; and other strange forms (Fig. 514). The fact that these peculiar animals exist in South America, while only part of them extend up into southern North America, leads to the belief that South America has also been cut off from other lands, though not for so long a time, nor so continuously, as Australia.

Summary. — *The peculiar fauna of South America also indicates a former separation from other lands, but not so long or so continuous as in the case of Australia.*

239. Faunas of Other Continents. — There is much closer resemblance between the life on other continents. In the north temperate zone there is such resemblance as to lead to the belief that there has been even better connection in the past than at present. For example, hairy elephants (mammoths and mastodons), now extinct, lived in Siberia, Europe, and North America; and among

living animals, there are close resemblances throughout the whole region. The faunas of Africa and southern Asia are also quite alike (Figs. 511, 512), indicating close connection.

Summary.— *There is close resemblance between the faunas of northern Asia, Europe, and America; also Africa and southern Asia, indicating former land connection.*

240. Zones of Animal Life.— The distribution of animals, described above, has led to the division of the earth into several zones, *realms and regions* (Fig. 515), each differing in important respects from the others. The differences between these zones are due to two principal facts: (1) that barriers — mountain, desert, and ocean — have checked the spread of animals; and (2) that evolution has developed animals of different kinds on opposite sides of a barrier. The boundaries of these zones are not sharply marked, nor are the zones absolutely unlike; for some species will find their way across even the greatest barrier.

Summary. — *Barriers and evolution have caused such differences among animals that several zones of animal life are recognized.*

241. Influence of Man. — Man has been a very important agent in causing changes among animals. In most parts of the world he has come in as an enemy, either seeking animals for his food or killing them because they destroy it. As a result, he has caused such a decrease among large wild animals that, in parts of America and Europe, very few remain.

Some species, like the bison, have been almost exterminated (Fig. 518). Others have completely disappeared, for example, the mammoth and mastodon, with whose final extinction savage man doubtless had something to do. The dodo, a large running bird in the island of Mauritius, and the great auk (Fig. 505), once so common along the northeastern coast of America, have also been exterminated. The eggs of the auk were eaten in large numbers, and the bird itself, which was unable to fly, was easily captured. A single specimen of the auk or its egg would now bring a very high price, for most large museums have none.

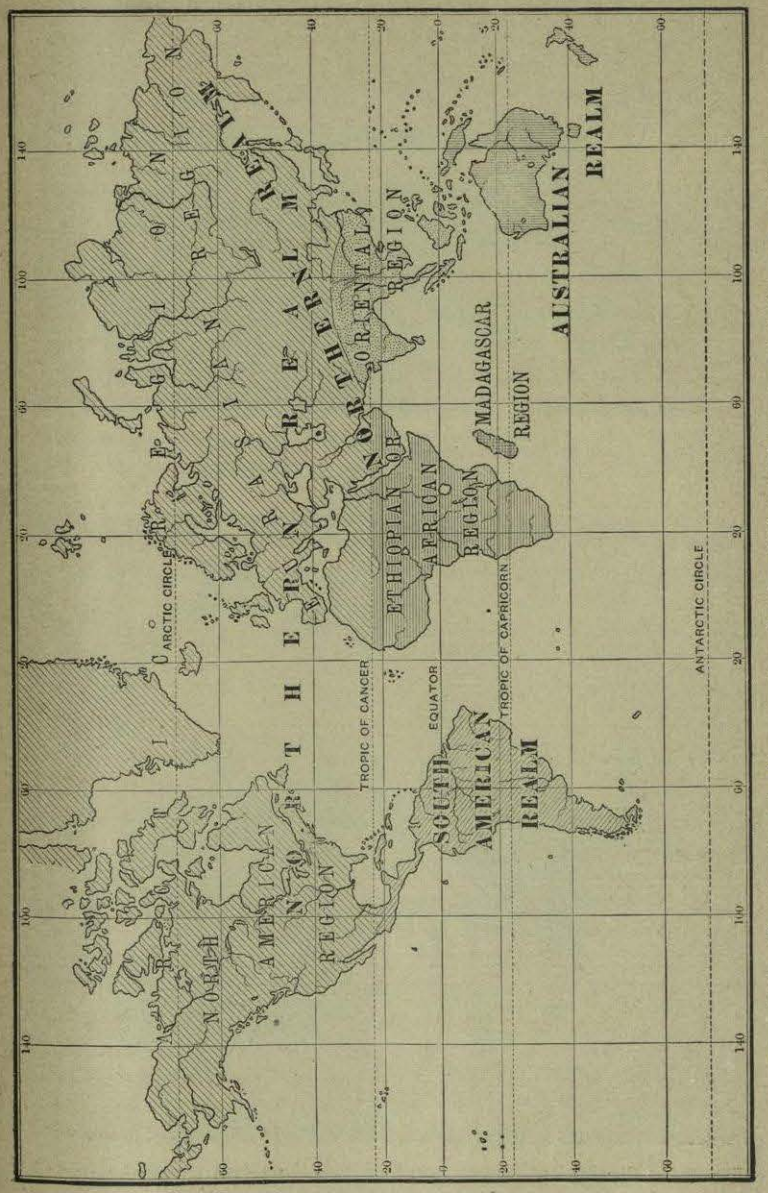

FIG. 515.— Map showing the three *realms* of animal life and the main subdivisions, or *regions*.

FIG. 516. — Sheep in the Scottish Highlands. A thick coat of wool fits these animals to endure the cold of a northern winter.

FIG. 517. — Shetland ponies, so protected by a heavy coat of hair that they thrive in the raw climate of the Shetland Islands.

On the other hand, some species thrive under the influence of man. For example, rats and mice have been carried all over the world and have so greatly increased as to become a pest; the English sparrow, introduced into America from Europe, has also become a nuisance; and so has the rabbit, introduced into Australia. The rabbit destroys the food needed for domesticated animals, and the Australian governments have been obliged to take up the question of checking its further spread. Such domesticated animals as sheep, horses, and cattle, have had their range so extended that they are now found in all quarters of the earth.

There is a limit to man's power in spreading animals. The camel and ostrich might be transplanted to southern California, but they cannot be made to thrive in New England; the elephant or tiger could not be introduced successfully into the Arctic; nor the polar bear into the tropics. Yet, with care, man has been able to transplant some animals into all kinds of climates.

Summary. — *Man has exterminated some species, especially the larger and more defenseless kinds, and has greatly reduced the numbers of many others. Under his influence, other animals have had their range greatly increased; but there is a limit to man's power of introducing animals into climates for which they are not naturally fitted.*

242. Domestic Animals. — Man has been very successful in adapting animals to his needs; and, by so doing, he has greatly increased his own prosperity. To have a horse or buffalo to help in his work, or sheep or hens for food, adds greatly to a man's resources. He can do more work and make more progress; and the most advanced races are those with the greatest number and variety of domestic animals.

Some animals resist efforts at domestication; it seems scarcely possible, for example, to domesticate the lion. Yet it is remarkable how large a number of animals man uses. The reindeer of northern Europe (Fig. 546) is used as a draft animal and for food supply. Eskimo dogs (Fig. 525), which are little better than half-tamed wolves, are of great service in hunting and in drawing sledges over the ice. In the highlands of central Asia the yak is domesticated; the buffalo

(Fig. 520) and elephant (Figs. 512, 521) in southern Asia, and the camel (Fig. 519) in the arid belts of Africa and Asia. Cats, dogs, horses, cattle, sheep, goats, and pigs are domesticated all over the world. Among domesticated birds are hens, turkeys, ducks, geese, and doves.

As in the case of plants, the origin of many of these is not known; they date back thousands of years, long before the first records of history. It is a striking fact that the New World has supplied only two domesticated animals, the llama of South America (Fig. 514) and the turkey. If it had not been almost exterminated, the bison probably could have been domesticated. On several ranches in the West there are now small herds of bison from which it is yet possible that this animal may be domesticated.

Summary. — *While some animals resist domestication, man has succeeded in adapting many mammals and birds to his use, either for food or as work animals. Of these, the New World has supplied only two, the llama and turkey, though the bison may yet be added.*

Topical Outline and Review Questions.

Topical Outline. — 227. **Influence of Surroundings.** — Air; water; heat; cold; cold-blooded animals; warm-blooded animals; cause of warmth; protection; dependence on plants; sunlight; mode of life; means of securing food and escaping enemies; influence of gravity.

228. **Animal Life, or Fauna, of the Arctic.** — Animals in and near the sea; sea birds; southward migration; land birds; mammals; reptiles; insects; mammals in the sea; protection from cold; white color.

229. **Temperate Fauna.** — (*a*) Mode of life: open plains; forest; mountains; arid regions; caverns; underground; nocturnal animals. (*b*) Common animals: variety; birds; mammals; opossum; fur-bearing animals; beaver.

230. **Tropical Fauna.** — Plants; insects; birds; reptiles; mammals.

231. **Desert Fauna.** — Contrast with humid regions; fauna of southwestern United States; limit of food; source of water; the camel.

232. **Fresh-water Faunas.** — Kinds; illustrations; difference in surroundings; temperature; salt lakes; marine animals in fresh water.

233. **Homes of Animals.** — Invertebrates; insects; reptiles and amphibia; birds; mammals.

234. **Spread of Animals.** — Reason for large number of young; unpro-

Fig. 518. — A herd of bison. These animals formerly roamed over the prairies and plains of the West in enormous herds.

Fig. 519. — A caravan on the desert of Persia.

FIG. 520. — Asiatic buffalo, used as a work animal in southern and western Asia, eastern Europe, and northeastern Africa.

FIG. 521. — The elephant, being used for drawing cocoanuts from a cocoanut grove in southern Asia.

tected young; protection of young; evolution; reindeer; elephants; distribution of ocean animals; of air dwellers; of land animals.

235. **Barriers to the Spread of Animals.** — Water; forest; desert; mountain; animals that easily pass barriers.

236. **Island Faunas.** — (*a*) Bermudas: position; plants; animals. (*b*) Means of reaching islands: currents; flight; wind; birds at sea. (*c*) Other islands: Azores; Galapagos; Hawaiian Islands.

237. **Australian Fauna.** — (*a*) The animals: birds; monotremes; marsupials. (*b*) Explanation: former distribution; development of fierce enemies; separation of Australia; protection by ocean barrier.

238. **South American Fauna.** — Peculiar animals; explanation.

239. **Faunas of Other Continents.** — Resemblance in northern lands; in Africa and southern Asia; explanation.

240. **Zones of Animal Life.** — The zones; names; cause; boundaries.

241. **Influence of Man.** — (*a*) Man as an enemy: cause for destruction; general result; bison; mammoth and mastodon; dodo; auk. (*b*) Influence in spreading animals: rats and mice; English sparrow; rabbit; domestic animals. (*c*) Limit to influence; examples.

242. **Domestic Animals.** — Importance; instances of domesticated mammals; birds; New World animals; bison.

REVIEW QUESTIONS. — 227. What is the dependence of animals on air, water, and temperature? By what means is cold endured? What is the difference in the blood of animals? Why are animals dependent on plants for food? Why are they not dependent on sunlight? In what positions do animals live? How are they fitted to secure food and escape enemies? State the influence of gravity on the body.

228. What is the nature of Arctic bird life? What is the condition of life on land? What warm-blooded animals live in the sea? How are Arctic animals protected from the cold? What about their color?

229. Under what different conditions do temperate animals live? Name some of the common birds. Mammals. Fur-bearing mammals.

230. Why are animals so abundant in the tropical zone? What is the condition of insect life there? Birds? Reptiles? Mammals?

231. Contrast desert and tropical forest faunas. What animals are found in the desert of southwestern United States? Why are there so few? How do they secure water? How is the camel adapted to desert life?

232. What kinds of animals live in fresh water? How do the faunas differ? How may marine animals come to live in fresh water?

233. In what situations do invertebrates live? The higher groups?

234. In what way is the spread of animals made certain? Give illustrations of evolution. What kinds of animals are most widespread? Why? What about land animals?

235. What barriers are there to the spread of animals? What kinds of animals most easily overcome them?

236. What is the nature of the Bermuda plant and animal life? How has this life reached the islands? What is the condition in other islands?

237. What are the peculiarities of life in Australia? Explain this.

238. What does the South American fauna indicate?

239. What is indicated by the faunas of other continents?

240. What are the reasons for the zones of life? Name the realms. Name the regions of the northern realm (Fig. 515).

241. Why is man an enemy of many animals? Give illustrations of his influence in extermination. In increasing the range of animals. How is his power limited in this respect?

242. Of what advantage are domestic animals? Give instances of domestic animals in various parts of the world. What domestic animals has the New World supplied? What about the bison?

SUGGESTIONS. — No special suggestions are made for this chapter, largely because of the difficulty of offering suggestions adapted to large numbers of schools. Yet a teacher especially interested in this phase of the subject will find opportunity for illustrative work, — with books, pictures, specimens, and museums, if in a city; in the field, if in the country.

Reference Books. — WALLACE, *Island Life*, Macmillan Co., New York, 1892, $1.75; *Geographic Distribution of Animals*, Harper Bros., New York, 1876, $10.00; HEILPRIN, *Distribution of Animals*, Appleton & Co., New York, 1886, $2.00; BEDDARD, *Zoögeography*, Macmillan Co., New York, 1895, $1.50; LYDEKKER, *Geographical History of Mammals*, Macmillan Co., New York, 1896, $2.60; LE CONTE, *Evolution*, Appleton & Co., New York, 1891, $1.50; JORDAN, *Factors in Organic Evolution*, Ginn & Co., Boston, 1894, $1.25.

CHAPTER XIX.

MAN AND NATURE.

DEVELOPMENT OF MANKIND.

243. Early Man. — The origin of man is not known, although scientists generally agree that he has developed, by the process of evolution, from some high form of animal. This belief is based upon the close resemblance between the body of man and ape, and receives support from the fact that, in habits and mode of living, some savages are little above animals. But even the least civilized men have powers that no animal possesses, while civilized man is so far above the highest animals that some people believe it impossible that he is the descendant of an animal.

Whatever man's origin, it is certain that in his early stages he lived the life of a savage. When the Roman Empire was developing, the Germans and English were rude savages; and still earlier, the inhabitants of the Italian peninsula were in the same condition. To-day, both in the Old and New World, there are races that have not yet risen above savagery.

Summary. — *Man's ancestry is unknown; but it is generally believed that he has been evolved from some high form of animal. It is certain that early man was a savage.*

244. Dependence of Man on Nature. — Even the most civilized men are dependent on nature, as animals and plants are. Man must have air to breathe, water to drink, and food to eat. Furthermore, his sight depends on sunlight, and his speech and hearing on sound waves, transmitted through the