

CHAPTER VI.

Geographical Distribution of Animals—Buffon on the specific distinctness of the quadrupeds of the old and new world—Different regions of indigenous mammalia—Quadrupeds in islands—Range of the Cetacea—Dissemination of quadrupeds—their powers of swimming—Migratory instincts—Drifting of quadrupeds on ice-floes—On floating islands of drift timber—Migrations of Cetacea—Habitations of Birds—Their migrations and facilities of diffusion—Distribution of Reptiles and their powers of dissemination.

ALTHOUGH in speculating on “philosophical possibilities,” said Buffon, the same temperature might have been expected, all other circumstances being equal, to produce the same beings in different parts of the globe, both in the animal and vegetable kingdoms, yet it is an undoubted fact, that when America was discovered, its indigenous quadrupeds were all dissimilar from those previously known in the old world. The elephant, the rhinoceros, the hippopotamus, the cameopard, the camel, the dromedary, the buffalo, the horse, the ass, the lion, the tiger, the apes, the baboons, and a number of other mammalia, where nowhere to be met with on the new continent; while in the old, the American species, of the same great class, were nowhere to be seen—the tapir, the lama, the pecari, the jaguar, the cougar, the agouti, the paca, the coati, and the sloth.

These phenomena, although few in number relatively to the whole animate creation, were so striking and so positive in their nature, that the French naturalist caught sight at once of a general law in the geographical distribution of organic beings, namely, the limitation of groups of distinct species to regions separated from the rest of the globe by certain natural barriers. It was, therefore, in a truly philosophical spirit that, relying on the clearness of the evidence obtained respecting the larger quadrupeds, he ventured to call in question the identifications announced by some contemporary naturalists, of species of

animals said to be common to the southern extremities of America and Africa*.

The migration of quadrupeds from one part of the globe to the other, observes one of our ablest writers, is prevented by uncongenial climates and the branches of the ocean which intersect continents. "Hence by a reference to the geographical site of countries, we may divide the earth into a certain number of regions fitted to become the abodes of particular groups of animals, and we shall find, on inquiry, that each of these provinces, thus conjecturally marked out, is actually inhabited by a distinct nation of quadrupeds †."

Where the continents of the old and new world approximate to each other towards the north, the narrow straits which separate them are frozen over in winter, and the distance is further lessened by intervening islands. Thus a passage from one continent to another becomes practicable to such quadrupeds as are fitted to endure the intense cold of the arctic circle. Accordingly, the whole arctic region has become one of the provinces of the animal kingdom, and contains many species common to both the great continents. But the temperate regions of America, which are separated by a wide extent of ocean from those of Europe and Asia, contain each a distinct nation of indigenous quadrupeds. There are three groups of *tropical* mammalia belonging severally to America, Africa, and continental India, each inhabiting lands separated from each other by the ocean.

In Peru and Chili, says Humboldt, the region of the grasses, which is at an elevation of from twelve thousand three hundred to fifteen thousand four hundred feet, is inhabited by crowds of lama, guanaco, and alpaca. These quadrupeds, which here represent the genus camel of the ancient continent,

* Buffon, vol. v.—On the Virginian Opossum.

† Prichard's Phys. Hist. of Mankind, vol. i. p. 54. In some of the preliminary chapters will be found a sketch of the leading facts illustrative of the geographical distribution of animals, drawn up with the author's usual clearness and ability.

have not extended themselves either to Brazil or Mexico, because, during their journey, they must necessarily have descended into regions that were too hot for them*.

New Holland is well known to contain a most singular and characteristic assemblage of mammiferous animals, consisting of more than forty species of the marsupial family, of which no congeners even occur elsewhere, with the exception of a few American opossums. This exclusive occupation of the Australian continent by the kangaroos and other tribes of pouched animals, although it has justly excited great attention, is a fact, nevertheless, in strict accordance with the general laws of the distribution of species; since, in other parts of the globe, we find peculiarities of form, structure, and habit, in birds, reptiles, insects, or plants, confined entirely to one hemisphere, or one continent, and sometimes to much narrower limits.

The southern region of Africa, where that continent extends into the temperate zone, constitutes another separate zoological province, surrounded as it is on three sides by the ocean, and cut off from the countries of milder climate, in the northern hemisphere, by the intervening torrid zone. In many instances, this region contains the same genera which are found in temperate climates to the northward of the line; but then the southern are different from the northern species. Thus in the south we find the quagga and the zebra: in the north, the horse, the ass, and the jiggetai of Asia.

The south of Africa is spread out into fine level plains from the tropic to the Cape; in this region, says Pennant, besides the horse genus, of which five species have been found, there are also peculiar species of rhinoceros, the hog, and the hyrax, among pachydermatous races; and amongst the ruminating, the giraffe, the Cape buffalo, and a variety of remarkable antelopes, as the springbok, the oryx, the gnou, the leucophoë, the pygarga, and several others †.

* Description of the Equatorial Regions.

† Pennant's Hist. of Quadrupeds, cited by Prichard, Phys. Hist. of Mankind, vol. i. p. 66.

The Indian archipelago presents peculiar phenomena in regard to its indigenous mammalia, which, in their generic character, recede in some respects from that of the animals of the Indian continent, and approximate to the African. The Sunda isles contain a hippopotamus, which is wanting in the rivers of Asia; Sumatra, a peculiar species of tapir, and a rhinoceros resembling the African more than the Indian species, but specifically distinguishable from both*.

Beyond the Indian archipelago is an extensive region, including New Guinea, New Britain, and New Ireland, together with the archipelago of Solomon's islands, the New Hebrides, and Louisiade, and the more remote groups of isles in the great southern ocean, which may be considered as forming one zoological province. Although these remarkable countries are extremely fertile in their vegetable productions, they are almost wholly destitute of native warm-blooded quadrupeds, except a few species of bats, and some domesticated animals in the possession of the natives †.

Quadrupeds found on islands situated near the continents, generally form a part of the stock of animals belonging to the adjacent main land; "but small islands remote from continents are in general altogether destitute of land quadrupeds, except such as appear to have been conveyed to them by men. Kerguelen's Land, Juan Fernandez, the Gallapagos, and the Isles de Lobos, are examples of this fact. Among all the groups of fertile islands in the Pacific ocean, no quadrupeds have been found, except dogs, hogs, rats, and a few bats. The bats have been found in New Zealand and the more westerly groups; they may probably have made their way along the chain of islands which extend from the shores of New Guinea far into the southern Pacific. The hogs and the dogs appear to have been conveyed by the natives from New Guinea. The Indian isles, near New Guinea, abound in oxen, buffaloes, goats, deer, hogs, dogs, cats, and rats; but none of them are said to have

* Prichard, *Phys. Hist. of Mankind*, p. 66; Cuvier, *Ann. du Museum*, tom. vii.

† Prichard, *ibid.*, p. 56.

reached New Guinea, except the hog and the dog. The New Guinea hog is of the Chinese variety, and was probably brought from some of the neighbouring isles, being the animal most in request among savages. It has run wild in New Guinea. Thence it has been conveyed to the New Hebrides, the Tonga and Society isles, and to the Marquesas ; but it is still wanting in the more easterly islands, and, to the southward, in New Caledonia.

“ Dogs may be traced from New Guinea to the New Hebrides and Fiji isles ; but they are wanting in the Tonga isles, though found among the Society and Sandwich islanders, by some of whom they are used for food : to the southward they have been conveyed to New Caledonia and New Zealand. In Easter Island, the most remotely situated in this ocean, there are no domestic animals except fowls and rats, which are eaten by the natives : these animals are found in most of the islands ; the fowls are probably from New Guinea. Rats are to be found even on some desert islands, whither they may have been conveyed by canoes which have occasionally approached the shores. It is known, also, that rats occasionally swim in large numbers to considerable distances *.”

It is natural to suppose that the geographical range of the different species of cetacea should be less correctly ascertained than that of the terrestrial mammals. It is, however, well known, that the whales which are obtained by our fishers in the South Seas, are distinct from those of the North ; and the same dissimilarity has been found in all the other marine animals of the same class, so far as they have yet been studied by naturalists.

Let us now inquire what facilities the various land quadrupeds enjoy of spreading themselves over the surface of the earth. In the first place, as their numbers multiply, all of them, whether they feed on plants, or prey on other animals, are disposed to scatter themselves gradually over as wide an area as is accessible to them. But before they have extended their

* Prichard, *Phys. Hist. of Mankind*, vol. i., p. 75.

migrations over a large space, they are usually arrested either by the sea, or a zone of uncongenial climate, or some lofty and unbroken chain of mountains, or a tract already occupied by a hostile and more powerful species.

Rivers and narrow friths can seldom interfere with their progress, for the greater part of them swim well, and few are without this power when urged by danger and pressing want. Thus, amongst beasts of prey, the tiger is seen swimming about among the islands and creeks in the delta of the Ganges, and the jaguar traverses with ease the largest streams in South America*. The bear, also, and the bison, stem the current of the Mississippi. The popular error, that the common swine cannot escape by swimming when thrown into the water, has been contradicted by several curious and well-authenticated instances during the recent floods in Scotland. One pig, only six months old, after having been carried down from Garmouth to the bar at the mouth of the Spey, a distance of a quarter of a mile, swam four miles eastward to Port Gordon and landed safe. Three others, of the same age and litter, swam at the same time five miles to the west, and landed at Blackhill †.

In an adult and wild state, these animals would doubtless have been more strong and active, and might, when hard pressed, have performed a much longer voyage. Hence islands remote from the continent may obtain inhabitants by casualties which, like the late storms in Morayshire, may only occur once in many centuries, or thousands of years, under all the same circumstances. It is obvious that powerful tides, winds, and currents, may sometimes carry along quadrupeds capable, in like manner, of preserving themselves for hours in the sea to very considerable distances, and in this way, perhaps, the tapir (*Tapir Indicus*) may have become common to Sumatra and the Malayan peninsula.

To the elephant in particular, the power of crossing rivers is essential in a wild state, for the quantity of food which a herd

* Buffon, vol. v. p. 204.

† Sir T. D. Lauder, Bart. on the Floods in Morayshire, August, 1829, p. 302, second edition.

of these animals consumes renders it necessary that they should be constantly moving from place to place. The elephant crosses the stream in two ways. If the bed of the river be hard, and the water not of too great a depth, he fords it. But when he crosses great rivers, such as the Ganges and the Niger, the elephant swims deep, so deep that the end of his trunk only is out of the water*; for it is a matter of indifference to him whether his body be completely immersed, provided he can bring the tip of his trunk to the surface, so as to breathe the external air.

Animals of the deer kind frequently take to the water, especially in the rutting season, when the stags are seen swimming for several leagues at a time, from island to island, in search of the does, especially in the Canadian lakes; and in some countries where there are islands near the sea-shore, they fearlessly enter the sea and swim to them. In hunting excursions, in North America, the elk of that country is frequently pursued for great distances through the water.

The large herbivorous animals, which are gregarious, can never remain long in a confined region, as they consume so much vegetable food. The immense herds of bisons which often, in the great valley of the Mississippi, blacken the surface near the banks of that river and its tributaries, are continually shifting their quarters, followed by wolves which prowl about in their rear. "It is no exaggeration," says Mr. James, "to assert, that in one place, on the banks of the Platte, at least ten thousand bisons burst on our sight in an instant. In the morning we again sought the living picture, but upon all the plain, which last evening was so teeming with noble animals, not one remained †."

Besides the disposition common to the individuals of every species slowly to extend their range in search of food, in proportion as their numbers augment, a migratory instinct often develops itself in an extraordinary manner, when, after an

* Lib. Entert. Know., Quadrupeds, vol. ii. p. 63.

† Expedition from Pittsburgh to the Rocky Mountains, vol. ii. p. 153.

unusually prolific season, or upon a sudden scarcity of provisions, great multitudes are threatened by famine. We shall enumerate several illustrations of these migrations, because they may put us upon our guard against attributing a high antiquity to a particular species merely because it is diffused over a great space; they show clearly how soon, in a state of nature, a newly-created species might spread itself, in every direction, from a single point.

In very severe winters, great numbers of the black bears of America migrate from Canada into the United States; but in milder seasons, when they have been well fed, they remain and hybernate in the north*. The rein-deer, which in Scandinavia can scarcely exist to the south of the sixty-fifth parallel, descends, in consequence of the greater coldness of the climate, to the fiftieth degree, in Chinese Tartary, and often roves into a country of more southern latitude than any part of England.

In Lapland, and other high latitudes, the common squirrels, whenever they are compelled, by want of provisions, to quit their usual abodes, migrate in amazing numbers, and travel directly forwards, allowing neither rocks, forests, nor the broadest waters, to turn them from their course. Great numbers are often drowned in attempting to pass friths and rivers. In like manner the small Norway rat sometimes pursues its migrations in a straight line across rivers and lakes; and Pennant informs us, that when, in Kamtschatka, the rats become too numerous, they gather together in the spring, and proceed in great bodies westward, swimming over rivers, lakes, and arms of the sea. Many are drowned or destroyed by water-fowl or fish. As soon as they have crossed the river Penchim, at the head of the gulf of the same name, they turn southward, and reach the rivers Judoma and Ochot by the middle of July, a district surprisingly distant from their point of departure.

The lemings, also, of Scandinavia, often pour down in myriads from the northern mountains and devastate the coun-

* Richardson's Fauna Boreali-Americana, p. 16.

try. They generally move in lines which are about three feet from each other, and exactly parallel, and they direct their march from the north-west to the south-east, going directly forward through rivers and lakes, and when they meet with stacks of hay or corn, gnawing their way through them instead of passing round*.

Vast troops of the wild ass, or *onager* of the ancients, which inhabit the mountainous deserts of Great Tartary, feed, during the summer, in the tracts east and north of Lake Aral. In the autumn they collect in herds of hundreds, and even thousands, and direct their course towards the north of India, and often to Persia, to enjoy a warm retreat during winter †. Bands of two or three hundred quaggas, a species of wild ass, are sometimes seen to migrate from the tropical plains of southern Africa to the vicinity of the Malaleveen river. During their migrations they are followed by lions, who slaughter them night by night ‡.

The migratory swarms of the springbok, or Cape antelope, afford another illustration of the rapidity with which a species, under certain circumstances, may be diffused over a continent. When the stagnant pools of the immense deserts south of the Orange river dry up, which often happens after intervals of three or four years, myriads of these animals desert the parched soil, and pour down like a deluge on the cultivated regions nearer the Cape. The havoc committed by them resembles that of the African locusts; and so crowded are the herds, that “the lion has been seen to walk in the midst of the compressed phalanx with only as much room between him and his victims as the fears of those immediately around could procure by pressing outwards §.”

Dr. Horsfield mentions a singular fact in regard to the geo-

* Phil. Trans., vol. ii. p. 872.

† Wood's Zoography, vol. i. p. 11.

‡ On the authority of Mr. Campbell. Library of Entert. Know., Menageries, vol. i. p. 152.

§ Cuvier's Animal Kingdom, by Griffiths, vol. ii. p. 109. Library of Entert. Know., Menageries, vol. i. p. 366.

graphical distribution of the *Mydaus meliceps*, a kind of polecat inhabiting Java. This animal is "confined exclusively to those mountains which have an elevation of more than seven thousand feet above the level of the ocean : on these it occurs with the same regularity as many plants. The long-extended surface of Java, abounding with conical points which exceed this elevation, affords many places favourable for its resort. On ascending these mountains, the traveller scarcely fails to meet with this animal, which, from its peculiarities, is universally known to the inhabitants of these elevated tracts, while to those of the plains it is as strange as an animal from a foreign country. In my visits to the mountainous districts, I uniformly met with it, and, as far as the information of the natives can be relied on, it is found on all the mountains *."

Now, if we were asked to conjecture how the *Mydaus* arrived at the elevated regions of each of these isolated mountains, we should say that before the isle was peopled by man, by whom their numbers are now thinned, they may occasionally have multiplied so as to be forced to collect together and migrate ; in which case, notwithstanding the slowness of their motions, some few would succeed in reaching another mountain, some twenty, or even, perhaps, fifty miles distant : for although the climate of the hot intervening plains would be unfavourable to them, they might support it for a time, and would find there abundance of insects on which they feed. Volcanic eruptions, which at different times have covered the summits of some of these lofty cones with steril sand and ashes, may have occasionally contributed to force on these migrations.

The power of the terrestrial mammalia to cross the sea is very limited, and we have already stated that the same species is scarcely ever common to districts widely separated by the ocean. If there be some exceptions to this rule they generally admit of explanation, for there are natural means whereby some animals may be floated across the water, and the sea sometimes wears a passage through a neck of land, leaving individuals

* Zoological Researches in Java, No. 2.

of a species on each side of the new channel. Polar bears are known to have been frequently drifted on the ice from Greenland to Iceland; they can also swim to considerable distances, for Captain Parry, on the return of his ships through Barrow's Strait, met with a bear swimming in the water about midway between the shores, which were about forty miles apart, and where no ice was in sight*. "Near the east coast of Greenland," observes Scoresby, "they have been seen on the ice in such quantities, that they were compared to flocks of sheep on a common—and they are often found on field-ice, above two hundred miles from the shore †." Wolves, in the arctic regions, often venture upon the ice near the shore, for the purpose of preying upon young seals which they surprise when asleep. When these ice-floes get detached, the wolves are often carried out to sea, and though some may be drifted to islands or continents, the greater part of them perish, and have been often heard in this situation howling dreadfully, as they die by famine ‡.

During the short summer which visits Melville Island, various plants push forth their leaves and flowers the moment the snow is off the ground, and form a carpet spangled with the most lively colours. These secluded spots are reached annually by herds of musk-oxen and rein-deer, which travel immense distances over dreary and desolate regions, to graze undisturbed on these luxuriant pastures §. The rein-deer often pass along in the same manner, by the chain of the Aleutian Islands, from Behring's Straits to Kamtschatka, subsisting on the moss found in these islands during their passage ||.

Within the tropics there are no ice-floes; but, as if to compensate for that mode of transportation, there are floating isles of matted trees, which are often borne along through considerable spaces. These are sometimes seen sailing at the distance of fifty or one hundred miles from the mouth of the

* Append. to Parry's Second Voyage, years 1819–20.

† Account of the Arctic Regions, vol. i. p. 518.

‡ Turton, in a note to Goldsmith's Nat. Hist., vol. iii. p. 43.

§ Supplement to Parry's First Voyage of Disc., p. 189.

|| Godman's American Nat. Hist., vol. i. p. 22.

Ganges, with living trees standing erect upon them. The Amazon, the Congo, and the Orinoco, also produce these verdant rafts, which are formed in the manner already described when speaking of the great raft of the Atchafalaya, an arm of the Mississippi, where a natural bridge of timber, ten miles long, and more than two hundred yards wide, has existed for more than forty years, supporting a luxurious vegetation, and rising and sinking with the water which flows beneath it *. That this enormous mass will one day break up and send down a multitude of floating islands to the gulf of Mexico, is the hope and well-founded expectation of the inhabitants of Louisiana.

On these green isles of the Mississippi, observes Malte-Brun †, young trees take root, and the pisliar and nenuphar display their yellow flowers; there serpents, birds, and the cayman alligator, come to repose, and all are sometimes carried to the sea, and engulfed in its waters.

In a memoir lately published, a naval officer informs us, that as he returned from China by the eastern passage, he fell in, among the Moluccas, with several small floating islands of this kind, covered with mangrove-trees interwoven with under-wood. The trees and shrubs retained their verdure, receiving nourishment from a stratum of soil which formed a white beach round the margin of each raft, where it was exposed to the washing of the waves and the rays of the sun ‡. The occurrence of soil in such situations may easily be explained, for all the natural bridges of timber which occasionally connect the islands of the Ganges, Mississippi, and other rivers, with their banks, are exposed to floods of water, densely charged with sediment.

Captain W. H. Smyth informs me, that when cruizing in the Cornwallis amidst the Philippine Islands, he has more than once seen, after those dreadful hurricanes called typhoons, floating islands of wood, with trees growing upon them, and that ships have sometimes been in imminent peril, in consequence of mistaking them for terra-firma.

* See ante, vol. i. p. 188.

† System of Geography, vol. v. p. 157.

‡ United Service Journal, No. 24, p. 697.

It is highly interesting to trace, in imagination, the effects of the passage of these rafts from the mouth of a large river to some archipelago, such as those in the South Pacific, raised from the deep, in comparatively modern times, by the operations of the volcano and the earthquake, and the joint labours of coral animals and testacea. If a storm arise, and the frail vessel be wrecked, still many a bird and insect may succeed in gaining, by flight, some island of the newly-formed group, while the seeds and berries of herbs and shrubs, which fall into the waves, may be thrown upon the strand. But if the surface of the deep be calm, and the rafts are carried along by a current, or wafted by some slight breath of air fanning the foliage of the green trees, it may arrive, after a passage of several weeks, at the bay of an island, into which its plants and animals may be poured out as from an ark, and thus a colony of several hundred new species may at once be naturalized.

We may remind the reader, that we merely advert to the transportation of these rafts as of extremely rare and accidental occurrence; but it may account, in tropical countries, for some of the rare exceptions to the general law, of the confined range of species.

Many of the cetacea, the whales of the northern seas for example, are found to desert one tract of the sea, and to visit another very distant, when they are urged by want of food or danger. The seals also retire from the coasts of Greenland in July, return again in September, and depart again in March, to return in June. They proceed in great droves northwards, directing their course where the sea is most free from ice, and are observed to be extremely fat when they set out on this expedition, and very lean when they come home again*.

Some naturalists have wondered that the sea-calves, dolphins, and other marine mammalia of the Mediterranean and Euxine should be identical with those found in the Caspian; and among other fanciful theories, they have suggested that they may dive through subterranean conduits, and thus pass from

* Krantz, vol. i. p. 129, cited by Goldsmith, Nat. Hist., vol. iii. p. 260.

one sea into the other. But as the occurrence of wolves and other noxious animals, on both sides the British channel, was adduced by Desmarest, as one of many arguments to prove that England and France were once united, so the correspondence of the aquatic species of the inland seas of Asia with those of the Black Sea, tends to confirm the hypothesis for which there are abundance of independent geological data, that those seas were connected together by straits at no remote period of the earth's history.

Geographical Distribution and Migrations of Birds.

We shall now offer a few observations on some of the other divisions of the animal kingdom. Birds, notwithstanding their great locomotive powers, form no exception to the general rules already laid down, but, in this class as in plants and terrestrial quadrupeds, different groups of species are circumscribed within definite limits. We find, for example, one assemblage in the Brazils, another in the same latitudes in central Africa, another in India, and a fourth in New Holland. But some species again are so local, that in the same archipelago, a single island frequently contains a species found in no other spot on the whole earth; as is exemplified in some of the parrot tribes. In this extensive family, which are, with few exceptions, inhabitants of tropical regions, the American group has not one in common with the African, nor either of these with the parrots of India*.

Another illustration is afforded by that minute and beautiful tribe, the humming-birds. The whole of them are, in the first place, peculiar to the new world; but there, although some have a considerable range, as the *Trochilus flammifrons* which is common to Lima, the island of Juan Fernandez and the Straits of Magellan†, other species are peculiar to some of

* Prichard, vol. i. p. 47.

† Captain King, during his late survey, found this bird at the Straits of Magellan, in the month of May, the depth of winter, sucking the flowers of the large species of fuchsia, then in bloom in the midst of a shower of snow.

the West-India islands, and have not been found elsewhere in the western hemisphere. The ornithology of our own country affords a no less striking exemplification of the same law, for the common grouse (*Tetrao scoticus*) occurs nowhere in the known world except in the British isles.

Some species of the vulture tribe are said to be true cosmopolites, and the common wild goose, *Anas anser*, Linn., if we may believe some ornithologists, is a general inhabitant of the globe, being met with from Lapland to the Cape of Good Hope, frequent in Arabia, Persia, China, and Japan, and in the American continent, from Hudson's Bay to South Carolina*. An extraordinary range has also been attributed to the nightingale, which extends from western Europe to Persia, and still farther. In a work entitled *Specchio Comparativo* †, by Charles Bonaparte, many species of birds are enumerated as common to Rome and Philadelphia; the greater part of these are migratory, but some of them, such as the long-eared owl, *Strix otus*, are permanent in both countries.

In parallel zones of the northern and southern hemispheres, a great general correspondence of form is observable, both in the aquatic and terrestrial birds, but there is rarely any specific identity; and this phenomenon is truly remarkable, when we recollect the readiness with which some birds, not gifted with great powers of flight, shift their quarters to different regions, and the facility with which others, possessing great strength of wing, perform their aerial voyages. Some migrate periodically from high latitudes, to avoid the cold of winter, and the accompaniments of cold,—scarcity of insects and vegetable food; others, it is said, for some particular kinds of nutriment required for rearing their young: for this purpose, they often traverse the ocean for thousands of miles, and re-cross it at other periods, with equal security.

Periodical migrations, no less regular, are mentioned by

* Bewick's Birds, vol. ii. p. 294, who cites Latham.

† Pisa, 1827 (not sold).

Humboldt, of many American water-fowl, from one part of the tropics to another in a zone where there is the same temperature throughout the year. Immense flights of ducks leave the valley of the Orinoco, when the increasing depth of its waters and the flooding of its shores prevent them from catching fish, insects, and aquatic worms. They then betake themselves to the Rio Negro and Amazon, having passed from the eighth and third degrees of north latitude, to the first and fourth of south latitude, directing their course south south-east. In September, when the Orinoco decreases and re-enters into its channel, these birds return northwards*.

The insectivorous swallows which visit our island would perish during winter, if they did not annually repair to warmer climes. It is supposed, that in these aerial excursions the average rapidity of their flight is not less than fifty miles an hour, so that when aided by the wind they soon reach warmer latitudes. Spallanzani calculated that the swallow can fly at the rate of ninety-two miles an hour, and conceived that the rapidity of the swift might be three times greater †. The rate of flight of the eider-duck (*Anas mollissima*) has been ascertained to be ninety miles an hour; and that of hawks and several other tribes, to be one hundred and fifty miles.

When we reflect how easily different species, in a great lapse of ages, may be each overtaken by gales and hurricanes, and, abandoning themselves to the tempest, be scattered at random through various regions of the earth's surface, where the temperature of the atmosphere, the vegetation, and the animal productions, might be suited to their wants, we shall be prepared to find some species capriciously distributed, and to be sometimes unable to determine the native countries of each. Captain Smyth informs me, that when engaged in his survey of the Mediterranean, he encountered a gale in the gulf of Lyons, at the distance of between twenty and thirty leagues from the coast of France, which bore along many land birds

* Voyage aux Régions Equinoxiales, tome vii. p. 429.

† Fleming, Phil. Zool., vol. ii. p. 43.

of various species, some of which alighted on the ship, while others were thrown with violence against the sails. In this manner islands become tenanted by species of birds inhabiting the nearest main land.

Geographical Distribution and Dissemination of Reptiles.

A few facts respecting the third great class of vertebrated animals, will suffice to show that the plan of nature, in regard to their location on the globe, is perfectly analogous to that already exemplified in other parts of the organic creation, and has probably been determined by similar causes.

Of the great saurians, the gavials which inhabit the Ganges differ from the cayman of America, or the crocodile of the Nile. The monitor of New Holland is specifically distinct from the Indian species; these latter again from the African, and all from their congeners in the new world. So in regard to snakes; we find the boa of America, represented by the python, a different though nearly allied genus, in India. America is the country of the rattle-snake, Africa of the cerastes, and Asia of the hooded snake or cobra di capello. There is a legend that St. Patrick expelled all reptiles from Ireland, and certain it is that none of the three species of snakes common in England, nor the toad, have been observed there by naturalists. They have our common frog, and our water-newt, and according to Ray (Quad. 264.) the green lizard (*Lacerta viridis*). Schultes the botanist observed, a few years since, in his tour in England, that there were two great islands in Europe of which the floras were unknown, Sardinia and Ireland; we believe he might also have added the fauna of the latter country.

The range of the large reptiles is, in general, quite as limited as that of some orders of the terrestrial mammalia. The great saurians sometimes cross a considerable tract, in order to pass from one river to another; but their motions by land are generally slower than those of quadrupeds. By water, however, they may transport themselves to distant situations more easily. The larger alligator of the Ganges sometimes descends beyond the brackish water of the Delta into the sea, and in such cases

it might chance to be drifted away by a current, and survive till it reached a shore at some distance ; but such casualties are probably very rare*.

Turtles migrate in large droves from one part of the ocean to another during the ovipositing season. Dr. Fleming† mentions that an individual of the hawk's bill turtle (*Chelonia imbricata*) so common in the American seas has been taken at Papa Stour, one of the West Zetland islands ; and according to Sibbald, " the same animal came into Orkney." Another was taken in 1774, in the Severn, according to Turton. Two instances also of the occurrence of the leathern tortoise (*C. coriacea*), on the coast of Cornwall, in 1756, are mentioned by Borlase. These animals of more southern seas can only be considered as stragglers attracted to our shores during uncommonly warm seasons by an abundant supply of food, or driven by storms to high latitudes.

Some of the smaller reptiles lay their eggs on aquatic plants ; and these must often be borne rapidly by rivers, and conveyed to distant regions, in a manner similar to the dispersion of seeds before adverted to. But that the larger ophidians may be themselves transported across the seas is evident from the following most interesting account of the arrival of one at the island of St. Vincent. It is worthy of being recorded, says the Rev. L. Guilding‡, " that a noble specimen of the *Boa constrictor* was lately conveyed to us by the currents, twisted round the trunk of a large sound cedar tree, which had probably been washed out of the bank by the floods of some great South American river, while its huge folds hung on the branches, as it waited for its prey. The monster was fortunately destroyed after killing a few sheep, and his skeleton now hangs before me in my study, putting me in mind how much reason I might have had to fear in my future rambles through the forests of St. Vincent, had this formidable reptile been a pregnant female, and escaped to a safe retreat."

* Malte-Brun says (Syst. of Geog. vol. viii. p. 193), that a crocodile is still preserved at Lyons that was taken from the *Rhone*, about two centuries ago ; but no particulars are given.

† Brit. Animals, p. 149 ; who cites Sibbald.

‡ Zool. Journ. vol. iii. p. 406. Dec. 1827.