ANIMALS RECENTLY EXTINCT OR THREATENED WITH EXTERMINATION, AS REPRESENTED IN THE COLLECTIONS OF THE U. S. NATIONAL MUSEUM.

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It is not, perhaps, generally realized how extensive and how rapid are the changes that are taking place in almost the entire fauna of the world through the agency of man. Of course changes have perpetually taken place in the past through the operation of natural causes, and race after race of animals has disappeared from the globe, but there is this wide difference between the methods of nature and man; that the extermination of species by nature is ordinarily slow, and the place of one is taken by another, while the destruction wrought by man is rapid, and the gaps he creates remain unfilled.

Some of the more obvious causes of extermination are to be found in the systematic killing of animals for their various products, the destruction caused by domesticated animals introduced into new countries, and the bringing of wild land under cultivation. These are the more simple and apparent destructive forces at work, and those that most directly affect the larger animals, smaller creatures being influenced by smaller causes. Thus the erection of telegraph wires, especially in sparsely wooded regions, has proved very destructive to birds, and a more deadly though more restricted source of danger is found in lofty electric lights, against which the birds dash themselves during their nocturnal migrations. The extinction of the Rytina and Great Auk, the almost complete extirpation of the Bison, and the reduced numbers of the Walrus are good examples of destruction wrought directly by the hand of man, while in addition to such cases are the still more numerous instances of the very perceptible decrease of animals once abundant. Species used for food or otherwise of economic value suffer most, fashion affects some, some are necessarily destroyed for the protection of man and his domesticated animals, and others are killed merely for sport. It has taken comparatively few years to so reduce the untold millions of the

Passenger Pigeon that the bird is now unknown in localities where it once abounded. Year by year the Halibut is growing scarcer and scarcer, and year by year the Lobster canneries find an increasing difficulty in obtaining necessary supplies, while there is already a dearth of Oysters in the once seemingly inexhaustible waters of Chesapeake Bay. The Atlantic Salmon is practically kept from extermination in the waters of the United States by the efforts of the U. S. Fish Commission, and the same is true of the Shad in many localities, while much attention is being paid to the artificial cultivation of Cod in order to preserve the inshore fisheries.*

One reason for this growing depletion is to be found in the common and fatal fallacy that because some animals exist in large numbers, the supply is unlimited and the species needs no protection, a belief that is usually acted upon until the species is verging on extinction. Unfortunately, too, those most directly interested in the preservation of game—using the term in the widest sense—are usually the most bitter opponents of any protective measures, especially if the change will produce even a temporary inconvenience. The proposed reduction in number and change in location of nets in a certain Canadian Salmon stream met with vigorous protests from the fishermen; yet, a few years after the passage and enforcement of laws making the alterations, the catch of fish had increased tenfold. Cases exactly similar to this may be met with everywhere, and any attempt to enforce a close season, allow fish free access to their spawning beds, or to protect them when there, is almost certain to meet with strenuous opposition from local pot hunters and fishermen. The Michigan pigeon-catchers insist that it does no harm to take Pigeons in the nesting season, provided traps or guns are not used *too* near the breeding places; the Potomac fishermen complain bitterly because they are not allowed the privilege of preventing all Shad and Herring from ascending to the spawning ground; and the lobster catchers and dealers object to laws prohibiting the capture and sale of Lobsters under a certain size. All this is short sighted in the last degree, and yet as previously stated, those who should be found on the side of the law are only too often arrayed against it. Fashion is principally concerned in the destruction of fur-bearing mammals and birds for millinery purposes, although alligators, crocodiles, and of late various reptiles have come into vogue for the manufacture of fancy leather, and the demand for "novelties" seems on the increase. In 1885 Peccaries were so abundant in the counties of Medina, Uvalde, and Zavalla, Texas, that their well-worn trails were everywhere to be seen, while

*During the winter of 1889–'90 about 130,000,000 eggs of Cod, Haddock, and Pollack were brought to the hatcheries of Gloucester and Wood's Holl. Previous labors of the Fish Commission are already bringing about visible results and young cod are now plentiful where they were previously scarce or even unknown.

A somewhat amusing incident was the sending of young Cod from Plymouth, Massachusetts, to Gloucester for identification, the Plymouth fisherman having forgotten what they looked like.

their favorite haunts could be readily picked out by the peculiar musky odor characteristic of these little animals. Shortly after this date, hog-skin goods being in favor, a price of fifty cents each was offered for Peccary hides, with the result that by 1890 the Peccaries had become practically exterminated.

A yearly record of the sales of some London firms would indicate quite clearly the whims of fashion, some of the present tendencies being shown by the fact that 30,000 monkey skins and 250,000 Australian "opossums" were disposed of at a single sale. Birds are auctioned off in still more extraordinary numbers and among the items of one sale were 6,000 Birds of Paradise, 5,000 Impeyan Pheasants, 360,000 assorted skins from India, and 400,000 Hummingbirds, the number of birds disposed of at this one auction exceeding that contained in all the collections, public and private, of the United States, while one dealer in 1887 sold no less than 2,000,000 bird-skins. The fashionable seal-skin sacque demands a yearly slaughter of about 185,000 fur seals, but these figures seem small when compared with those representing the catch of the plebeian hair-seals, 875,000 of these being annually killed for oil and leather.

At the principal localities where the northern Fur Seal occurs the killing is regulated by law and there is little danger of the animal being exterminated, but the southern species has been so recklessly hunted at its breeding-places on the coast of South America and in the Antarctic seas that a southern sealing voyage is now very much in the nature of a lottery, and few or no animals are now to be taken at localities that formerly yielded thousands of skins.

To supply the world with ivory for a year necessitates the death of 100,000 elephants, and if these were placed in single file they would make a procession over 180 miles long. If, however, Stanley is correct, the death of the elephant is but a portion of the price paid for ivory, of which every pound weight has cost the life of a "man, woman or child," while "every twenty tusks have been obtained at the price of a district, with all its peoples, villages and plantations."

The extermination of the buffalo over large areas of country was partly a matter of necessity in order that the land might be rendered available for stock-raising; the wolf and coyote are poisoned for the preservation of sheep, and for a like cause the Tasmanian thylacine has been hunted to the verge of extinction. Following this necessary destruction comes the unnecessary or unpremeditated but unavoidable loss caused by the domesticated animals which have replaced the original possessors of the soil. Such for example is the more or less complete extirpation of rattlesnakes that follows the introduction of hogs, and although this is a consummation most devoutly to be wished for, it is none the less a case in point.

The sentimental importation of birds by colonists is another piece of mischief, and is proving very detrimental to the interesting avi-fauna of New Zealand and the Sandwich Islands, where, as in our own country, the English sparrow is largely instrumental in crowding out native

species. The direct harm done is best seen where the smaller species, such as goats, dogs, cats, and hogs have been introduced into small islands destitute of carnivorous mammals, and where most of the birds are tame and many species ground dwellers. One of the most interesting birds now being rapidly destroyed by imported animals is the New Zealand kiwi, which is preyed upon by dogs, and especially by cats, whose small size enables them to pursue the kiwi through the dense bush of its favorite haunts, while the nocturnal habits of both bring them out in search of food at the same time. Very rarely an animal seems to learn wisdom by experience and escape destruction by change of habit, but such instances are rare, although among them is the case of the Samoan tooth-billed pigeon (*Didunculus strigirostris*) which formerly bred on or near the ground, and was so greatly reduced in numbers by cats as to be threatened with extermination. Eventually the bird took to nesting and roosting in trees and has since been gradually on the increase.

Among the larger and more striking animals whose threatened extinction is largely due to the rifle of the sportsman, is the true zebra, now confined to a small area in South Africa; and the giraffe is rapidly disappearing from the same cause. The decrease of our own large game is well known: our only parrot, the Carolina parrakeet, will probably be extirpated in Florida by visitors, and the eastern pinnated grouse is restricted to the island of Nantucket, although long ago laws were framed for the protection of the "Heathen," as the compositor caused the bill to read. The clearing and cultivation of land operates directly and indirectly in a variety of ways, and is by no means an unmitigated evil to the wild animals affected by it, being fatal to some and directly beneficial to others. The larger, more dangerous, or more gregarious quadrupeds are naturally the first to disappear, but smaller animals on the contrary, and especially birds, profit by the destruction of their natural enemies and the food furnished by cultivated fields and become more numerous.

Thus in western Kansas the jack-rabbits are on the increase owing to the fact that the bounty on coyotes is two dollars while the price of a rabbit's scalp is only five cents, a difference of value that has resulted in the rapid decrease of the rabbits' natural check, the coyote. Western Kansas, too, affords another, and most excellent illustration of the direct influence of population upon the decrease or increase of the larger animals. Up to 1884 the region just mentioned was very sparsely settled, antelope were comparatively abundant and mule deer were frequently to be seen. During 1885 and 1886, under the mistaken impression that western Kansas was suitable for farming purposes, there came a tide of immigration from the east, and before the rising wave of increasing population the mule deer disappeared entirely and the antelope became extremely scarce. The country, so far as farming was concerned, having been tried and found wanting, an ebb tide of emi-

gration took place, and as the farms were abandoned by man, their former occupants again took possession, and by 1888 and 1890 antelope became not uncommon, while the mule deer appeared in localities where none had been seen for years. The felling of forests, burning over of land, and draining of swamps are the grosser factors of agriculture, and produce some of the more evident changes, but other far-reaching though indirect results follow the alterations thus made in physical character and food supply. A good example of local extermination is to be seen in the Virgin Islands, where the land mollusks were completely destroyed by the practice of burning over the land, and only dead shells remain to show their former abundance in that locality. Drainage and extended cultivation have driven many birds from Great Britain in spite of efforts to retain them, including the wild goose, crane, and bustard, while clearing away forests about the headwaters of streams has an important bearing on the decrease of trout, whose favorite spawning-grounds are thereby dried up. Other fish are destroyed, driven out, or prevented from entering streams by the pollution of water caused by sewerage and factories, by the erection of impassable dams, and, in some cases, by the sediment caused by hydraulic mining on a large scale. In fact, almost every accompaniment of civilization has some effect on wild animals. Telegraph wires kill thousands of birds on the prairies and electric lights are equally destructive in cities, and so in various ways the ranks of the wild animals are becoming rapidly thinned out. Although regret at the impending or actual extermination of a species is often purely a matter of sentiment, there is no lack of instances where the strictest utilitarian is quite as much interested as the naturalist in the preservation of a species from destruction. The pity of it is that in so many cases a small amount of protection would not only preserve for the naturalist the animals he wishes to study, but furnish the "practical" man with an additional source of wealth.

The following papers are based on some of the specimens contained in the collections of the U. S. National Museum, and their object is to note a few of the more important or interesting animals that have recently become extinct, or whose extermination seems imminent, and to show the cause of their destruction. This, in nearly every instance, is reckless slaughter by man, and although species have occasionally become extinct in recent times from natural causes, such cases are the exception and not the rule. Of necessity these accounts have been gathered from various sources, the most important of which are given, but it may be said that although so largely compilations, they contain in a condensed form information that is widely scattered, and often not readily accessible.* In many cases the works referred to contain very full bibliographies of the animals under consideration.

* I am indebted to Dr. Leonhard Stejneger for the article on the Mamo, and to Drs. Buchner and Radde for information concerning European bison.—F. A. L.

THE WEST INDIAN SEAL.

(*Monachus tropicalis.*)

Toward the end of August, 1494, the flotilla of Columbus, who was cruising among the West India Islands in the vain endeavor of finding a passage to the mythical province of Cipango, became scattered, and in the hope of catching sight of the missing caravels, the admiral came to anchor off the coast of Hayti, and sailors were sent to climb the rocky islet of Alta Vela and scan the horizon for sails. On their return the sailors came upon a band of "sea wolves" asleep on the sands, and true to the instincts of the white race immediately proceeded to kill them, which they did to the number of eight. The "sea wolves" thus rudely made acquainted with the advent of civilization were specimens of the West Indian seal (*Monachus tropicalis*), this species and its congener of the old world (*Monachus albiventer*) being the only members of the family of earless seals that dwell in warm latitudes.

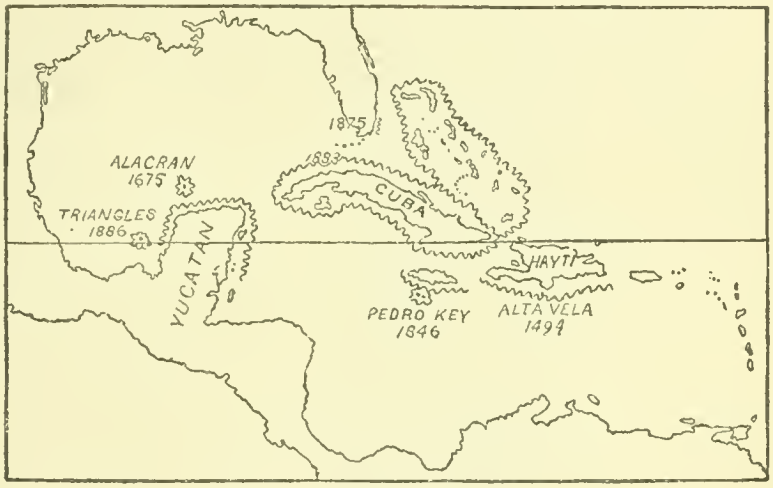
The general color of the West Indian seal is umber brown, tinged with gray from the light color of the tips of the hairs. The color becomes lighter on the sides and the under surface is, in adult individuals, more or less yellowish white. The newly born young are glossy black, and the coloration varies slightly with age. As in color, so also in its osteology, the West Indian seal presents a few features suggestive of the otaries, or eared seals, while curiously enough there is an additional suggestion of that family in the animal's movements when on land. As is well known, the earless seals depend almost entirely on their fore limbs and abdominal muscles for terrestrial locomotion, the hind flippers either trailing behind or being held stiffly extended and clear of the ground. On the other hand the otaries use all four feet in walking, the body being arched so as to completely clear the ground, while the hind feet are directed outward and slightly forward. Progress is effected by drawing the hind feet up to the fore feet and thrusting these forward by straightening the body so that the seal moves slowly ahead, not unlike a gigantic inch-worm. Now while the West Indian seal does not stand on all fours, the hind feet are brought forward by curving the body upward, when straightening itself the creature pitches ahead on its breast, advancing about a foot by the operation. The teeth of this seal are very powerful and seem quite as well adapted for crushing shells as for capturing fish, though unfortunately the stomachs of all that have been examined were empty and failed to throw any light on the favorite food of the animal. Like other seals the West Indian seal can go for a long time without food, and one in the possession of a Mr. Hill died only after a prolonged fast of four months, and even then the animal was very fat. We learn from Mr. Elliott that at the fur-seal rookeries of Alaska the males go three and occasionally four months without eating, although in their case they become much emaciated. The West Indian seal is a striking ex-

THE WEST INDIAN SEAL.

Monachus tropicalis.

(Cat. No. 13950, U. S. N. M. Cuba, 1883.)

ample of how little knowledge we may have of an animal whose existence has been known for centuries, and whose habitat is neither inaccessible nor far from the habitations of civilized man. Thus, though the discovery of this seal is almost coeval with the discovery of America, up to 1880 but a single specimen had fallen into the hands of naturalists, although for many years the animal must have been common in various portions of the Caribbean Sea and Gulf of Mexico, its range being from the Bahamas to the Gulf of Campeche. This very abundance was, however, the cause of its destruction, for the opportunity of prosecuting the seal fishery in a region where it could be carried on with comparatively little danger and throughout the entire year was too good to be neglected.



MAP 1.—Distribution of the West Indian Seal. (The irregular lines show the former range of the animal. The figures refer to the year in which seals are known to have been taken at the localities indicated.)

In 1675 Dampier notices a seal-fishery in operation at the Alacrane Islands, north of Yucatan, saying that: "Here are many seals; they come up to sun themselves only on two or three of the Islands * * * the Spaniards do often come hither to make Oyl of their Fat; upon which account it has been visited by English-men from *Jamaica*, particularly by Capt. Long: who, having the command of a small bark, came hither purposely to make Seal-Oyl, and anchored on the North side of one of the sandy Islands, the most convenient Place, for his design." Later on Captain Long discovered that although his anchorage might be conveniently located, it nevertheless possessed certain undesirable drawbacks, for one of the fierce "northers" that sweep across the Gulf of Mexico, came up and blew his bark ashore. He was, however, fortunate enough to get the vessel off, and having repaired her "went merrily away for Trist" with a full cargo of "Oyl." Sir Hans Sloane, founder of the British Museum, who visited the Bahamas in 1687–'88, wrote that these "Islands are filled with seals; sometimes fishers will catch one hundred in a night. They try, or melt them, and bring off their oil for lamps to the islands." By 1843 the seal seems to have

been pretty thoroughly exterminated and to have become mainly confined to the Pedro Kays, some low rocky islets lying about 60 miles south of Jamaica, and it was from this locality that, in the spring of 1846, the specimen was secured which was presented by Gosse to the British Museum, and, as above stated, long remained unique. The West Indian seal has been reported from time to time as occurring at Salt Key Bank, in the Bahamas, on the coast of Yucatan, and two were even taken on the coast of Florida about 1875, but not until 1883 did a second specimen find its way into a museum. This, an immature female, was taken near Havana, and through the courtesy of Professor Poey secured for the U. S. National Museum, and after a lapse of three hundred and seventy years its position among seals exactly defined (Plate XCV). In 1886 Mr. Henry L. Ward visited the Triangles, three little islets 108 miles northwesterly from Yucatan, and there found, as he had hoped, a colony of seals, from which he secured some forty specimens before a rising norther forced the party to run back to Campeche. Just how plentiful the seals are now Mr. Ward does not tell us, but at some time they must have been abundant, since the writer's father, who was at the Triangles in 1856, found quantities of skeletons and spoiled hides, indicating the recent existence of a flourishing seal fishery. Whether the West Indian seal is doomed to destruction or not is a little uncertain, for so far as food, climate, and suitable breeding places are concerned, everything is favorable to its existence, and in time it may, like the southern right whale, to some extent fill up its now decimated ranks. On the other hand, when a species has been reduced below a certain point it seems, like a stone rolling down-hill, to pursue its downward course with continually accelerated speed until the bottom is reached and the species exists no more.

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THE CALIFORNIA SEA-ELEPHANT.

(*Macrorhinus angustirostris.*)

The California sea-elephant so nearly resembles that of the antarctic seas that one general description can easily serve for both. The sea-elephant is aptly so called, both on account of its size and because the male is furnished with a proboscis, which though short is suggestive of its namesake of the land. It is the largest of the seals, greatly exceeding the walrus, for an old male sea-elephant reaches a length of 15 to

THE CALIFORNIA SEA ELEPHANT.

Macrorhinus angustirostris.

(Cat. No. 13811, U. S. N. M. San Cristobal Bay, Lower California.)

16 feet, or counting from tip of proboscis to the end of the outstretched hind flippers, a length of 20 to 22 feet. When in good condition the animal is very fat, old males attaining a circumference of 15 to 18 feet, and one of the last-mentioned size has yielded as much as 210 gallons of oil. The female sea-elephant is much smaller than the male, not exceeding 9 or 10 feet in length; the female, moreover, is destitute of a proboscis, as are also all young, this being the mark of a full grown male. The color is gray, with a blackish or olive cast, darkest on the back.*

Considering the former abundance of these animals on the California coast, very little has been recorded of their habits or habitat, but the sea-elephant appears to have ranged along the coast of California and Lower California from about latitude 25° to 35°, although in early days it may have considerably exceeded these limits. As just noted above, the other species of sea-elephant is a southern animal of wide distribution, and the nearest it approaches to the isolated northern species is on the western coast of South America. It may be that the gap now existing between these points was once filled up, and that since the disappearance of the animals at intermediate localities the northern species has become differentiated from the southern. Or, again, the California species may have originated from a few stragglers who wandered north and being undisturbed increased and multiplied. Prior to 1852 sea-elephants were extremely abundant in the vicinity of Cerros Island, where the sealers erected rough stone huts in order to prosecute their labors to the best advantage. The animals were accustomed to crawl out on certain favorite beaches, and in spite of their bulky forms and slow mode of progress ascended the ravines for a distance of half a mile or so, congregating in herds of several hundred. In such situations they fell an easy prey to the hunters whose methods are well described by Captain Scammon:

> The sailors get between the herd and the water; then raising all possible noise by shouting and at the same time flourishing clubs, guns, and lances, the party advance slowly toward the rookery, when the animals will retreat, appearing in a state of great alarm. Occasionally an overgrown male will give battle or attempt to escape, but a musket-ball through the brain dispatches it, or some one checks its progress by thrusting a lance into the roof of its mouth, which causes it to settle on its haunches, when two men with heavy oaken clubs give the creature repeated blows about the head until it is stunned or killed. After securing those that are disposed to show resistance, the party rush on the main body. The onslaught creates such a panic among these peculiar creatures that, losing all control of their actions, they climb, roll, and tumble over each other, when prevented from further retreat by the projecting cliffs. We recollect in one instance, where sixty-five were captured, that several were found showing no signs of having been either clubbed or laneed, but were smothered by numbers of their kind heaped upon them.

*It is a difficult matter to accurately describe the color of seals, as under varying conditions they appear quite differently. When alive the hair is close to the body and is either wet or greasy, appearing from this cause much darker than it really is. Mounted specimens are frequently stained by grease so that the pelage has a yellowish cast. For these reasons authors disagree considerably in their descriptions of the color of these animals.

By 1860, sea-elephants had become so scarce that their pursuit was no longer profitable, and from that time up to 1880 so few stragglers were seen about Guadaloupe and San Benita Islands that the animal was currently regarded as extinct. In 1880 the schooner *San Diego* killed thirty sea-elephants at the Elephant Beach, San Cristobal Bay, on the main-land of Lower California, 50 miles south of Cerros Island. In 1882 forty were killed, and six young ones brought alive to San Francisco, one of which found its way to the National Museum by way of the Philadelphia Zoo. (Plate XCVI.) In 1883 one hundred and ten sea-elephants over a year old were taken, at least fourteen being bulls of large size. In 1884 ninety-three animals were taken by the sloop *Liberty*, a few females and young being left undisturbed, which were unfortunately all killed later in the season by the crew of the *City of San Diego*. In October of the same year Mr. Townsend, with the schooner *Laura*, visited the locality in the interests of the U. S. National Museum; but although three young were seen they were spared in the hope that their presence might induce larger animals to haul out later on. Continuing the search southward the *Laura* visited all localities in Lower California formerly inhabited by the sea-elephant, and finding none, returned to San Cristobal in December and took fifteen whose skins and skeletons made their way to the National Museum at Washington. It is quite possible that this is the end of the California sea-elephant although a few may still exist to be slaughtered later on. It is greatly to be deplored that this animal should have been exterminated, when it could so easily have been preserved by each year sparing the young and a few adults. But it is a curious fact that those most interested in the preservation of any animal are not only indifferent on that point, but are the most strenuous opponents of any measure to effect such a result, and even were it not too late to endeavor to protect the sea-elephants it is not to be supposed that they could be saved from ultimate destruction.

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THE ATLANTIC AND PACIFIC WALRUSES.

The walrus is too well known to require even a passing description, but it may be said that although very similar in appearance the walrus of the Atlantic and that of the Pacific are distinct species, respectively known as *Odobænus rosmarus* and *Odobænus obesus*. The scarred and wrinkled appearance, so characteristic of these animals, is well exhibited by the head of the Pacific walrus shown on Plate XCVII. Al-

HEAD OF PACIFIC WALRUS.

Odobænus obesus.

(Cat. No. 18713. U. S. N. M. Walrus Island, Pribylov group, Alaska.)

though not as yet verging on extinction, the ranks of both species have been sadly decimated, and the animals have been completely extirpated in localities where they once abounded. In Europe the walrus has occasionally been met with on the coast of Scotland, and was formerly plentiful on many of the islands adjacent to the northern coast of the continent, and even along the continent itself, reaching eastward to the Lena River, in Asia. In America the Atlantic walrus formerly ranged from Nova Scotia northward to about 80 degrees, being abundant in the Gulf of St. Lawrence and occurring on Sable Island and the eastern coast of Newfoundland. The walrus was known in Europe as early as 870 to 890, and appears to have been an object of the chase on the coast of Finmark in 980, while by 1600 it was the object of a regular fishery by the English and others. In the early part of 1600 Cherie, or Bear Island, lying about 280 miles to the northward of North Cape, Norway, was the scene of operation, and many a ship load—ships were small in those days it should be remembered—of oil and ivory was obtained at this locality. The walruses were accustomed to haul out on shore, and by getting between them and the water immense numbers were killed in a short time, the bodies of those first slain being used as a barrier to obstruct the retreat of the survivors. On one occasion six or seven hundred were killed in six hours, and on another nine hundred to a thousand in less than seven hours. Naturally this abundance did not long continue, and in eight years the animals had become scarce and shy, while soon after they were completely extirpated in this locality. Farther and farther to the north, to Spitzbergen and the shores of Greenland, the hunters pursued the rapidly-diminishing herds of walruses, until the pursuit in itself became no longer profitable, and, as at present, the walrus fishery was carried on merely as an adjunct to the whale fishery. So early as 1534 Cartier mentions meeting with walruses in the vicinity of the Magdalen Islands, and it probably was not long before a regular "fishery" for these animals was established on the Island of Ramea, very probably one of the Magdalen group. In 1581 the French ship *Bonaventure*, at l'Ile Blance "slewe and killed to the number of fifteene hundred Morses or Sea Oxen, accounting small and great," and in 1593 the ship *Marigold*, in company with another vessel, sailed from Falmouth for the express purpose of hunting the walrus. The *Marigold* seems to have been well equipped, for among the crew of thirty were three coopers and two butchers, but owing to delay on the part of her consort the season was lost. An English company located on Sable Island, and at about the same time a French company was established at Miscou, Bay Chaleur. The English company soon came to grief, but its French rival did a flourishing business as long as the walruses lasted, killing so many that years after the company and its headquarters of New Rochelle had passed away, the bones of the slaughtered animals remained in such quantities as to form artificial beaches. In those days walrus ivory seems to have been in fashion, for a note in Hakluyt tells us that

"The teeth of the sayd fishes, whereof I have seen a dry fat full at once, are a foote and sometimes more in length; and have been sold in England to the combe and knife makers at 8 groats and 3 shillings the pound weight whereas the best Ivory is solde for halfe the money." The Pacific walrus never had so extensive range as its relative of the Atlantic, reaching in scattered numbers to about 55 degrees north, on the American coast and 60 degrees on the Asiatic coast, and extending thence northwards to the limit of ice. Point Barrow on the east and Cape Schelatskoi (157° 30′ east longitude) on the west seem to be the natural boundaries of the Pacific walrus, the species being unusually abundant at Bristol Bay, Alaska. The existence of the Pacific walrus was made known not far from 1640 or 1645, but it did not become a regular object of pursuit until about 1860, its immunity being due to the fact that whaling was far more profitable than the pursuit of the walrus. As the whale decreased in numbers the whalemen directed their attention more and more to the walruses, and between 1870 and 1880 there was brought to market 1,996,000 gallons of oil and 398,868 pounds of walrus ivory, these amounts representing the destruction of not far from 100,000 animals. Although far inferior to elephant ivory the demand for walrus tusks is nevertheless great, and while the price per pound was, in 1879, but 40 or 45 cents, it was worth in 1880 $1 to $1.25 per pound, and in 1883 $4 to $4.50. Being rather a stupid animal, and with due caution readily approached when on the ice, under favorable conditions the walrus is slaughtered in much the same manner as the bison was killed by skin hunters. In making a shot, as it is technically termed, a man provided with one or two rifles and an abundance of ammunition approaches the herd from leeward, and picking off the more wakeful or more suspicious animals first, proceeds to kill the walruses until so many have been secured as can be handled or until the herd becomes alarmed and takes to the water. The Pacific walrus is in greater danger of extermination than its congener of the Atlantic, owing to the fact that the range of the species is restricted, while its haunts are regularly resorted to by the North Pacific whaling fleet, whose crews, as previously stated, devote considerable time to the chase of the walrus, and have reduced the numbers of this huge animal about one-half during the last ten years.

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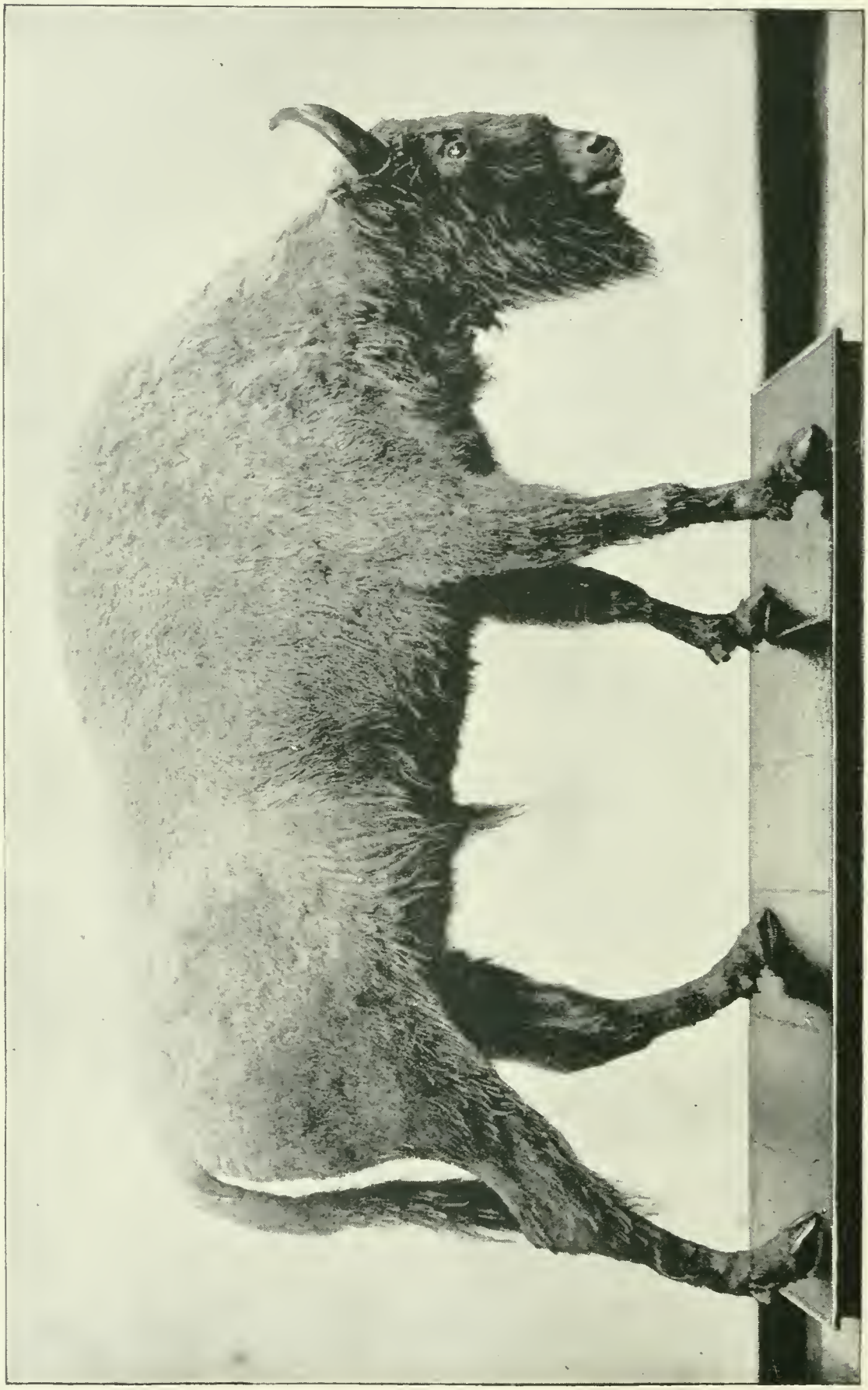


THE EUROPEAN BISON.

THE EUROPEAN BISON.

(*Bison bonassus.*)

The European bison, or zubr* (*Bison bonassus*), bears a very close resemblance to its American relative, but is a little taller, not so heavily built at the fore quarters, and lacks the shaggy hair about the head and neck that gives the American bison so fierce an appearance. Although never existing in such enormous numbers as the American bison, the zubr in early days seems to have very generally inhabited the forests of Central Europe. Cæsar found the animal in Germany and Belgium, and some were brought to Rome, where they were slaughtered in gladiatorial exhibitions of the Coliseum.

The American and European bison were quite different in their habits, although this was largely due to the physical characteristics of the regions respectively inhabited by the two species, the American species preferring the open plains, where it associated in immense herds, feeding upon grass, while the European species was a forest dweller, found in small bands and living very largely on the bark and twigs of young trees. The difference in habits between the two animals is well shown by the fact that the European bison was not found on the steppes of southern Russia, although this region in many respects resembles the plains of the western and southwestern United States. At present the European bison is restricted to part of Lithuania and the more inaccessible portion of the Caucasus, this latter region being the only locality where the animal is found in a state of entire freedom. The Lithuanian herd, which has enjoyed imperial protection for many years, dwells in the Bjelowesche forest of the province of Grodno; is watched over by a large number of keepers, and is fed during the winter, while in the Caucasus the zubr is protected by the rugged nature of the region it inhabits and also by an order of the Grand Duke Michael, issued in 1860, forbidding the slaughter of the animal. The specific identity of the Lithuanian and Caucasian bison is still in dispute, but that there is at least a subspecific distinction between them seems probable, from the fact that the Caucasian animal is less thickly haired than the Lithuanian, although living at a greater altitude and exposed to a greater degree of cold.

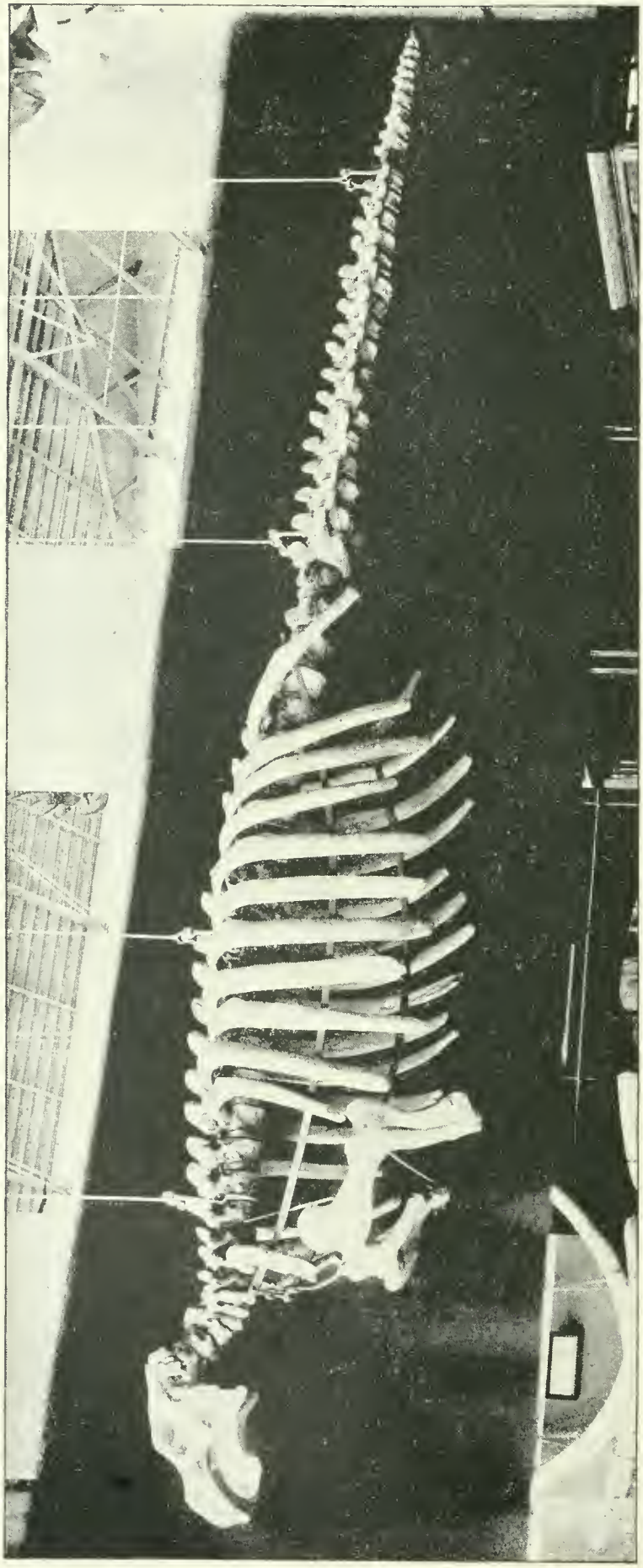
Up to 1500 the European bison seems to have been common in Poland, where it was looked upon as royal game, and hunted in right royal manner by the King and nobility, as many as two thousand or three thousand beaters being employed to drive the game. In 1534 the animal was still so numerous in the vicinity of Girgau, Transylvania, that

* This species is commonly but improperly called the aurochs, but, as Professor Alfred Newton says, "the aurochs (=ox of yore), Latinized by Cæsar in the form of *urus*, is, or was, the *Bos primigenius*, or *Bos urus*, of scientific nomenclature.

"It is wholly by mistake that in its extinction as a wild animal its ancient name was transferred to the bison, or zubr."

peasants passing through the woods were occasionally trampled to death by startled bison, and hunts were undertaken by the nobles in order to reduce the numbers of the animals. In spite of this local abundance, it is probable that about this time the bison was in a great measure restricted to Lithuania, and although so late as 1555 one was killed in Prussia, it is almost certain that this was merely a straggler from the main herd. In 1752 a grand hunt was organized by the Polish King Augustus III, and in one day sixty bison were killed, besides a considerable quantity of other large game, the Queen, who participated, killing twenty bison, and finding time in the intervals of sport to do some light reading. This achievement was deemed worthy of commemoration by a monument, although the manner in which the battue was conducted renders the performance less remarkable than might appear at first sight. Two huge, strongly built, converging fences were erected, and just by the exit, at the apex of the gigantic V thus formed, was a platform on which the royal party sat at ease and shot the game as it emerged from the trap into which it had been driven by a small army of beaters. For some time after the above event little seems to have been recorded concerning the zubr, so that Desmarest, writing in 1822, says that if any remain in Lithuania they must be very few in number.* There were, however, over five hundred bison in Lithuania at that time, for in 1820 there was that number, this being a considerable increase since 1815, when there was estimated to be only three hundred. About this time active measures must have been taken for the protection of the Lithuanian herds, for in 1830 "owing to the better enforcement of the laws" it comprised seven hundred individuals. In 1831 a local revolt occurred, the game laws were set at naught, and the number of bison reduced to six hundred and thirty-seven. Order having been restored the bison began to recuperate, and according to the official enumeration at the end of each decade, there were in 1840, seven hundred and eighty, in 1850, one thousand three hundred and ninety, and in 1860, seventeen hundred. Political troubles, however, were the bane of the bison, and just as the prosperity of the Lithuanian herd seemed assured, the Polish uprising of 1863 took place; many bands of insurgents sought refuge in the forests; the bison were left to take care of themselves; and were so rapidly killed off, that the next official count showed only eight hundred and forty-seven. For a short time after peace was restored, the herd increased to a slight extent, but later on it began to decrease, the enumeration of 1880 showing but six hundred, a number that has since been lessened, the herd being still upon the wane. The cause of this decrease is not quite apparent, and although it has been ascribed to inbreeding, it would seem as if some other reason must be sought for, since the wild cattle at Chillingham, England, are still extant, although

*Dictionaire Universelle d'Histoire Naturelle.



STELLER'S SEA COW.

Rytina gigas.

(Cat. No. 2966, U. S. N. M. Bering Island. Collected by Dr. L. Stejneger.)

from the smallness of the herd they have of necessity been very largely inbred.* That inbreeding has something to do with the decrease of the bison is indicated by the observed fact that many of the females bring forth calves after having been infertile for several successive years, but although it has been suggested that this might be helped by the introduction of animals from the Caucasus, the remedy would be difficult of application as well as expensive. As the herd is, or at least was, divided into ten or twelve bands, each confined to a different part of the forest, perhaps some improvement might be effected by judiciously crossing the members of these various groups. The present rate of decrease is slow, and the Lithuanian herd will exist for many years, even if the loss is not prevented. As for the Caucasian bison, protected as it is by nature as well as by man, it may endure for centuries to come, and improbable as it once may have seemed, be in existence long years after the American bison has ceased to live even in tradition.

THE RYTINA OR ARCTIC SEA-COW.

(*Rytina gigas.*)

The extinct Arctic sea-cow or rytina, an animal nearly related to the existing Manatee and Dugong, played somewhat the same part in the exploration of the northwest coast of America that the buffalo did in the settlement of the western plains. In the autumn of 1741 Bering, returning from a voyage of discovery to the coast of Alaska, was shipwrecked on the island now bearing his name, this being the larger of two islands lying about 100 miles from the coast of Kamchatka, and known as the Commander Islands. The survivors of the expedition, who were forced to remain on Bering Island for the ensuing ten months, are frequently, though erroneously, said to have subsisted to a great extent on the flesh of the huge sirenian discovered by them, and described subsequently under the name of *Manatus gigas*. As a matter of fact, the first rytina taken by Bering's party was not killed until the 12th of July following the wreck, seal, otters, and later on, fur seals, furnishing a supply of meat.

For our knowledge of the external appearance of the rytina, its habits, and the localities it was wont to frequent, we are indebted to G. W. Steller, the surgeon of Bering's command, and an enthusiastic naturalist, who carried on his researches in spite of the privations attending a wreck, the inclemency of the weather, and the ravages of disease. As the Caribbean seal, described on a preceding page, presents the anomaly of a member of an arctic family living in the tropics, the ry-

*The Chillingham cattle are, in fact, subject to disease due to inbreeding, but this is scarcely to be wondered at, for the herd was once reduced to a single individual, a cow with calf, which proved to be a bull, and from this pair the present herd was built up.

tina offers, or rather offered, the spectacle of a creature whose relations are confined to the tropics residing in a subarctic region. In point of size the rytina far exceeded its relatives, attaining a length of from 24 to 30 feet and an aldermanic circumference of 19 or 20, weighing according to Steller's estimates 8,000 pounds. The head was very small in proportion to the body, the jaws toothless, being provided in lieu of teeth with a thick, horny pad, very similar to that covering the anterior portion of the lower jaw of the dugong. Owing to the peculiar structure of the epidermis, an exaggeration of the condition found in the manatee and elephant, the skin was so thick, rough, and wrinkled that, being dark colored, its appearance was compared by Steller to the bark of a tree. Although in places the epidermis was an inch in thickness, and so extremely hard as to necessitate the use of an axe in order to cut it, the dermis was only one-sixth of an inch thick. The rytina was gregarious, and found in herds about the mouths of streams, where it lived on seaweeds, especially on the large abundant laminarias. It was stupid, sluggish and comparatively help-

MAP 2.—Bering Island, from a map by Dr. L. Stejneger, showing the principal streams. A. Ary Island near which Pallas's cormorant is last known to have been taken. B. Spot where Bering's party wintered.

less, being unable to protect itself by diving, and occasionally washed ashore by the breakers. Inability to dive forced the rytina to seek its food in shallow water, and since the storms and ice of winter often rendered it a difficult matter to approach the shore at that season, spring usually found the animal much reduced in flesh.

Soon after the return of the survivors of Bering's party to Kamchatka, expeditions were fitted out for the purpose of wintering on the Commander Islands and hunting fur-bearing animals, the great northern sea-cow offering an abundant supply of fresh meat, a great desideratum in those days, when scurvy was one of the greatest and most common dangers encountered by navigators. The first expeditions were followed by others, the rytina being relied upon to furnish the bulk of the provisions, and vessels sailing for the northwest coast of America were also accustomed to stop at Bering Island for the purpose of laying in a supply of salted sea-cow. At that date there were no cattle in Kamchatka to furnish either fresh or salted provisions, so that the rytina was a veritable godsend to the fur-hunters who improved their opportunities to the utmost. As Dr. Stejneger has shown, it is a matter of record that between 1743 and 1763 nineteen parties of from thirty to fifty each wintered on Bering Island, while others are known to have wintered on Copper Island, and still others simply touched there for supplies. During their stay these parties lived on fresh rytina, while a large part of their occupation consisted in killing and salting down the animal for future use. Small wonder is it that a helpless creature of restricted range and slow reproduction should have succumbed rapidly to the systematic attacks of man. This slaughter of the sea-cows must have resulted in their extermination, even had it been carried on with the utmost care, but the end was hastened by the method of capture employed by the small parties of hunters who were scattered along the northern and eastern shores, and were compelled to attack and kill the huge beast single-handed. Ordinarily the rytina was taken by the harpoon from an eight-oared boat, the animal after a short struggle being towed ashore and dispatched, but the fox hunters used to cautiously approach the creature while lying in shallow water and endeavor to mortally wound it with a lance thrust. It naturally happened that comparatively few would be killed outright, the majority escaping to deep water, there to die of their wounds, and later on to drift ashore, where the body would be found by the hunters. Some, of course, would never reach the shore, while others would be recovered after such a lapse of time as to be unfit for food, the more that the rytina spoiled so rapidly that if not properly cared for within twenty-four hours after death the flesh was worthless. By 1754, only nine years after the discovery of the island, the sea-cow had become extirpated on Copper Island, and by 1763 was probably nearly exterminated on Bering Island, as from that time on records of visits to the place are rare. According to the careful estimates of Dr. Stejneger there were not more than fifteen hundred to two thousand rytinas about the island at the time of its discovery, there being hardly more than fifteen suitable feeding places, so that the work of extermination was not difficult. The last individual of the race was killed in 1767 or 1768, and although Professor Nordenskjöld imagined he had discovered evidence that a

specimen had been seen so late as 1854, the animal at that time seen by the natives appears in the light of all testimony on the subject, to have been a narwhal. Up to 1883 two skeletons, one in the Imperial Museum of St. Petersburg, and one in the collection of the Imperial Academy of Helsingfors, and two ribs in the British Museum, were all the remains of the rytina preserved in scientific institutions. At that date Dr. Stejneger visited Bering Island, influenced largely by the hope of securing specimens of this extinct sea-cow for the U. S. National Museum. This hope was fully realized, for in the course of a stay of two years, a considerable series of more or less complete skulls was obtained, besides many vertebræ, ribs, and other bones. These were buried at various depths in the sand, and were discovered by probing with an iron rod, rytina bones being readily distinguished by their greater density from those of cetaceans, that are found in the same locality.

Many bones were found at so considerable a distance from the water's edge as to suggest that the land had risen since the extinction of the rytina, a probability that was changed to a certainty by the discovery of a nearly complete skeleton far inland.

This interesting find is thus recorded by Dr. Stejneger in the Proceedings of the Geographical Society of Bremen:

Toward noon it was reported to me that the skeleton of a sea-cow had been found. Conceive my agitation, and the haste with which the spades were seized. We had to walk some distance, and when I reached the spot, I found the report confirmed. From the bank of the brook which ran from the south several ribs protruded. The brook had slowly eaten its way into the hillock of sand, and thus by degrees exposed and washed away the bones. When we began to dig, we saw at once that it was the tail end which was missing. The distance from the sea was about 500 feet, and the skeleton lay about 10 to 12 feet above high-water mark. It was imbedded in a hillock of sand, which belonged to one of the inner rows of dunes. The hillock was about 12 feet high, and the skeleton, which was lying upon its back with the head toward the west, was situated at about an equal distance from the base and the grass, covered upper surface of the hill. The sand was wet and fine, of the same kind which is still thrown up daily by the sea at the not far distant beach and showed alternating brown and blue layers. Near the bones the sand sometimes was blackish, iridescent, which was due to the fact that the bones were in a very advanced state of decomposition. This became evident to me after the first few strokes of the spade. Indeed, the skeleton as such was worthless. The separate bones had not cohesion enough to allow of their being lifted without injury, their own weight being too heavy. Even the ribs, which otherwise are of ivory-like consistency and density, had rotted throughout, and some of the bones were so soft that they felt like "green butter soap" to the touch. In order, however, to ascertain all the circumstances precisely, I continued the excavation until all the fragments had been brought to light. Altogether there were found fourteen dorsal vertebræ with the ribs belonging to them, the cervical vertebræ, the skull, the breast bone, two shoulder bones, two upper arm bones, but only one forearm. All the bones were in their natural position, with the exception of the breastbone, which lay outside of the skeleton, near the right fore-limb, while the left fore-limb, consisting only of shoulder blade and humerus, lay inside the thorax. Although none of the bones were of any use to us, nevertheless I did not look upon our labor as lost, since they enabled me to determine, in the first place, the conditions under which many of these skeletons had been destroyed, and secondly that the island had risen, since these remnants had been buried under the sand of the former shore.

Although the skeleton just referred to was unfortunately of no use as a specimen, sufficient bones were obtained to render possible the "making up" of a fairly complete skeleton. (Plate XCIX.) Unfortunately there is one point which even the extensive series of bones collected by Dr. Stejneger fails to determine, and that is the question as to whether or not the rytina had any bones in the hand. Steller, who was an exceedingly pains-taking and accurate observer, expressly states that there were none, and none have as yet been found; while, on the other hand, the bones of the fore-arm possess well defined articular surfaces showing that bones were at least present in the wrist.

With the exception of a rib from Attu no remains of rytina have as yet been found at any localities save Bering and Copper Islands, but it is probable that these were the last retreat of the survivors of a once numerous race, and that they were discovered in time for man to complete the extermination of a species that, from unknown causes, had long been on the wane.

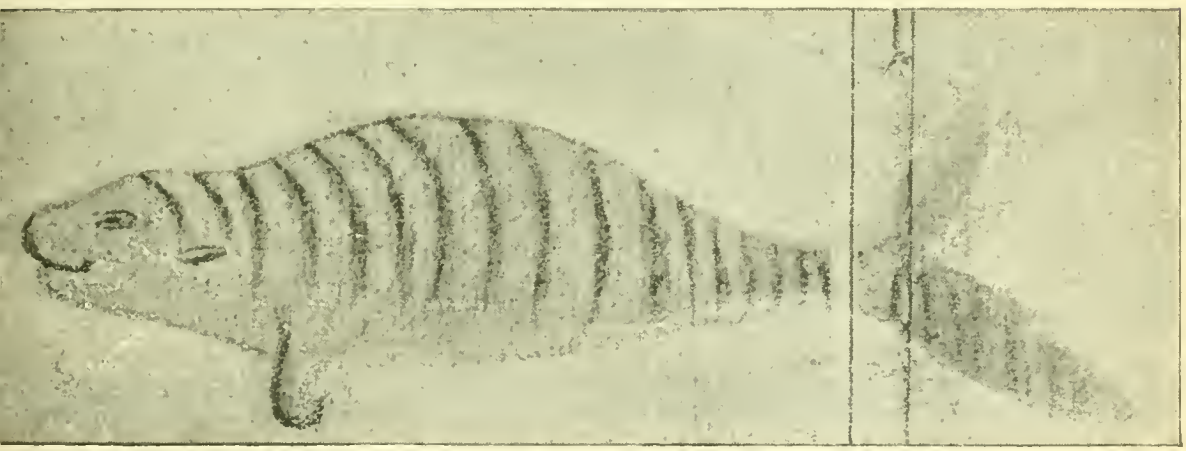


FIG. 21.

STELLER'S SEA COW.

Facsimile of figure on chart compiled by Lieutenant Waxell, navigator of Bering's party.

AUTHORITIES.

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THE MAMO.

(*Drepanis pacifica* Gmel.)

It has long been expected that *Drepanis pacifica*, one of the most beautiful and peculiar birds restricted in its range to the Sandwich Islands, will have to be counted among the species which have become extinct in recent times. And now that Mr. Scott Wilson has returned from a thorough ornithological survey of the archipelago without hav-

ing obtained anything but a stuffed specimen from a local collection formed many years ago, it is almost certain that the "Pacific Sickle-bill" has disappeared from among the living, and that the few specimens in the museums, perhaps less than half a dozen, are all that is left of a species that once was common in the "Eden of the Pacific." Mr. Scott Wilson is also the first one to suggest the probable cause of its extinction, for he saw some of the celebrated feather wreaths, or "leis," of the natives composed of yellow feathers taken from this bird, and from the fact that the Hawaiian name of the bird, "*Mamo*," is the same as that of the costly war-cloaks, he concludes that the robes in olden times were chiefly wrought of the beautiful golden-yellow feathers from its back, which are much deeper in color, as they are larger and longer, than the axillary tufts of the O-o. In order to understand how probable this explanation of the final extermination of the bird is, we shall have to briefly describe these ornamental capes and cloaks. In former times the kings, chiefs, and noble Hawaiians, whenever they appeared in public on special occasions, in peace or war, donned the royal flowing capes or cloaks made of gay birds' feathers fastened to a groundwork of coarse netting, which seem to have had the same significance and to have been as eagerly coveted and highly revered as the ermine and purple in feudal Europe. Smaller ornaments, "leis," or feather-wreaths were used as neck-laces by the ladies. Perhaps the most magnificent of these robes was that of Kamehameha I, the great conqueror who united all the islands under his scepter. Mr. Scott Wilson gives the following description of it:

> The fabrication of the great yellow war-cloak of Kamehameha I had been going on through the reign of eight preceding monarchs. The groundwork is of coarse netting, to which are attached, with skill now impossible to be applied, the delicate feathers, those on the border being reverted. Its length is 4 feet, and it has a spread of 11½ feet at the bottom, the whole having the appearance of a mantle of gold.*

As only a few feathers on each bird were used, it may be imagined how many thousand birds it required to furnish the feathers of a single robe, and it is a greater wonder that there were enough birds than that the species of the brighter color became extinct. Small bunches of these feathers were received by the kings as a poll-tax from the lower classes of the people, but these were not enough, so the chiefs used to have "a regular staff of bird-catchers who were expert in this vocation. They made use of the sticky juice of the bread-fruit, called in Hawaiian 'pihah,' and the tenacious gum of the fragrant 'olapa,' a common tree in some parts of the forests, smearing the stuff about the branches of a flower-covered 'ohai.'" It is asserted that the O-o (*Moho*

* The cloak deposited in the U. S. National Museum by Mr. R. O. Aulick is of precisely the same size as this, but is a trifle over one-half composed of red feathers. It was formerly the property of the powerful chief Kekuaskalami, who, on the abolition of idolatry in 1819, rebelled, with the intention of restoring the ancient religion. The rebellion was unsuccessful and Kekuaskalami killed. The cloak was presented to Commodore J. H. Aulick by King Kamehameha III in 1841.

THE CALIFORNIA VULTURE.

Pseudogryphus californianus.

(Cat. No. 103375, U. S. N. M. Jolon, Southern California.)

nobilis), a black honeysucker, with a tuft of elongated yellow feathers under the wing, was caught alive, the feathers pulled out, and the bird then let loose, but as the body feathers of the Mamo (*Drepanis pacifica*) were the only ones to be used it had probably to be killed, and this may be the very reason why the former is still a comparatively common bird on the island, while the latter has become extinct. The Mamo was a honeysucker remarkable for its long and curved bill, which earned for it the name "Sickle-bill," *Drepanis*. As already mentioned, it is very rare in museums—we can at present only recall four specimens—and a good description is yet a desideratum. In default of a better we reproduce the original, which was made by Latham a little over a hundred years ago from specimens brought home by Captain Cook's expedition, during which the Hawaiian Islands were discovered.

Length, 8 inches; bill, 1¾ inches, stout at the base, and very much hooked; color of it brown, with a pale base; the upper parts of the body are black, except the lower part of the back, the rump, and upper tail coverts, which are of a fine deep yellow, the under parts of the body dusky; the shoulders, inner ridge of the wing, and part of the inner wing coverts are of the same yellow; the bastard wing yellowish-white at the end; the under wing coverts snow white; the sides of the vent, the vent itself, and the thighs are yellow; the tail and quills black; the legs black-brown.

This is not the only Hawaiian bird which has become extinct within historical times. A similar fate has probably also befallen *Chætoptila angustipluma* (Peale), of which probably not more than one specimen exists besides the type which is in the U. S. National Museum, and the small tailless Rail (*Pennula ecaudata*) which is nearly as rare. But still worse, many more of the feathered tribes found only in those wonderful islands seem to be near extinction, partly because of the destruction of the forest, partly on account of the introduction of hardier and more aggressive species, such as the detested English sparrow. So gloomy is the prospect that Mr. Scott Wilson exclaims: "It would not be rash to say that ere another century has elapsed but few native species will remain."

THE CALIFORNIA VULTURE.

(*Pseudogryphus californianus.*)

The California Vulture disputes with the Condor the claim of being the largest of the New World vultures, for, while the Condor is a little the more strongly built the California Vulture has a little the greatest spread of wing, large specimens having an alar extent of a little more than 10 feet. It is more plainly clad than the Condor, the general color being brownish-black, slightly glossy above, while the conspicuous ruff of soft white feathers that encircles the neck of the great Vulture of the Andes is lacking in its northern relative. The tips of the greater wing coverts are whitish, forming a line across the closed wing, and a broad band of white extends along the under side of the wing,

forming a conspicuous mark when the bird sails overhead. Plate C. This vulture formerly ranged from the Colorado to the Columbia Rivers, between the Sierra Nevadas and the sea, and is said to have been in the habit of ascending the Columbia for a distance of 500 miles in order to feast upon the abundant dead salmon cast up on the banks. While this section of country is the regular habitat of the California Vulture, individuals have been reported from Arizona, or even so far outside these limits as southwestern Utah, though these last may be regarded as stragglers. A few hundred miles more or less would, of course, be nothing to a bird of such powers of flight that it seems to float in the air with as much ease as a fish floats in water, for it would seem as if nature having assigned the vultures to do scavenger's duty had made some amends by giving them a strong and graceful flight. Like the other members of the family, the California Vulture feeds chiefly on carrion; in spite of its size and strength rarely attacking living animals, unless they have been so severely wounded as to be unable to walk, and while several have been known to combine forces and attack and kill young calves, this is very exceptional.

The strength of these birds is shown by the fact that four of them were able to drag the carcass of a young bear, weighing 100 pounds, for a distance of 200 yards, but owing to the structure of their feet and the weakness of the beak and claws their powers of offence are by no means commensurate with their size. The bird seems never to have been very abundant, and although Dr. Newbury speaks of it as common in the Sacramento Valley in 1856, he does not mention it as occurring in flocks. On the Columbia not more than two or three would be seen at a time, and although Dr. Canfield has seen as many as a hundred and fifty gathered around a dead antelope, it is probable that in this case they had assembled from over a great area—brought together by the actions of the bird who first discovered the dead animal. Soaring as they do at great heights these birds command a view over a territory many miles in extent, their keen eyes not only searching the ground below, but keeping a sharp lookout on the behavior of any of their fellows that chance to be within sight. No sooner does one bird spy a prospective dinner than another, still farther away, is apprised of the fact by his actions, and in a like manner, number two informs a third, so that the good news is rapidly spread, and throughout a vast area the vultures come hurrying to one point. It is thus that Canon Tristram accounts for the vast congregation of vultures at Sevastopol during the Crimean war, supposing that in this manner "may have collected the whole race from the Caucasus and Asia Minor."

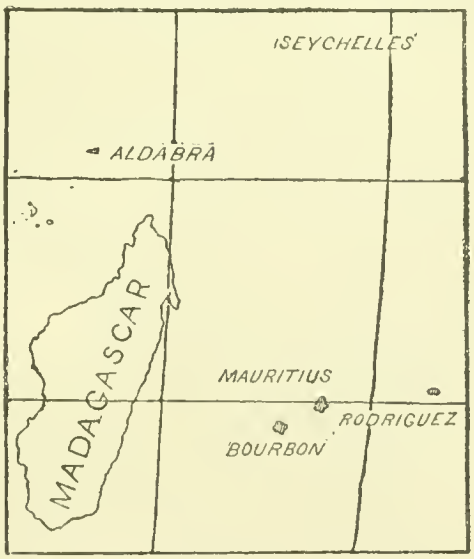
The threatened extermination of the California Vulture is indirectly, rather than directly, due to the agency of man, for its suspicious nature has ever rendered this bird difficult to capture, while the breeding places are in out of the way and often inaccessible localities, and although the Mexican miners of Lower California are said to kill the bird

on every possible opportunity in order that they may use the quills as receptacles for gold dust, the destruction thus caused would naturally be but small. The free use of strychnine in ridding the cattle ranches of wolves and coyotes has caused the disappearance of this bird, which has been poisoned by feeding on the carcasses prepared for the four-footed scavengers. The California Vulture is now extremely rare, and in spite of many efforts to obtain specimens of this interesting bird few have been taken of late years, those few coming from southern California, which now seems to be the chief habitat of this Vulture.

THE DODO AND THE SOLITAIRE.

(*Didus ineptus and Pezophaps solitaria.*)

What the brahma is among domestic fowls the dodo was to a far greater extent among the order of pigeons, a grotesque, aberrant, and gigantic member of the group. The first mention of the dodo* is in an account of the voyage of the Dutch Admiral Jacob Cornelius Van Neck to Mauritius in 1598. The dodo is there called Walckvogel, or disgusting fowl, partly on account of the toughness of portions of its flesh and partly because even the best portions of the dodo were poor in comparison with the tender meat of the abundant doves. This curious bird was found only in Mauritius. Another closely related species, the



MAP 3.—Distribution of didine birds.

Solitaire of Legnat (*Pezophaps solitaria*) was found in Rodriguez, and probably a third member of the family at Bourbon, this last species being known only from the description of travelers, for not even a bone of it has ever come under the ken of naturalists. This peculiar distribution of didine birds is analagous to that of the Galapagos tortoises, although not quite so extraordinary, since the islands of Mauritius, Reunion, and Rodriguez are much farther apart than are those of the Galapagos Archipelago, and the chance of animals being accidentally transported from one to another consequently much less. Mauri-

* From the Portuguese Doúdo, a simpleton.

tius, Rodriguez, and Reunion had also their respective species of large tortoises, but these too went the way of the dodo and its kindred, and only bones remain to tell the story of their former abundance. De Bry, the chronicler of Van Neck's voyage, says the Walckvögel were "bigger than our swans, with large heads, half of which is covered with skin like a hood. These birds want wings, in place of which are three or four blackish feathers. The tail consists of a few slender curved feathers of a gray color."

FIG. 22.

Facsimile of Piso's figure of the Dodo.*

* This figure was probably made from one of Savary's paintings, and is found on page 70 of an appendix to a work by Guliemus Piso.

The title is as follows: Guliemi Pisonis Medici Amstelædamensis de Indiæ Utriusque Re Naturali et Medica, Libri Quatnordecim: Quorum contenta pagina sequens exhibet Amstelædami Apud Ludovicum et Danielen Elzeverios. AD CIↃ IↃCLVIII. Jacobi Bontii Medici Civitatis Bataviæ Novæ in Iava Ordinarii Historiæ Naturalis et Medicæ Indiæ Orientalis. Libri Sex. Liber quintus, Caput XVII, p. 70 De Dronte, aliis Dod-aers.

For a better idea of the appearance of the dodo we are indebted to the pictures of Roelandt Savary and his nephew John, Dutch artists of the first half of the 17th century, from whose paintings* we gather that the dodo was a heavy-bodied, short-legged bird, with a disproportionately large head, and huge, formidable-looking hooked bill. The body was sparingly clad in loose feathers, the wing feathers alone being stiff, the tail resembling a small feather duster. The general color, as noted by De Bry, was gray, or blackish, but the breast seems to have been brown, and the wings and tail yellowish, or dirty white. The bird, so Cause tells us, laid a single egg "the size of a half-penny roll, in a nest made of herbs heaped together," the somewhat indefinite size ascribed to the egg being qualified later on by comparison with that of the great white pelican (*Pelecanus onocrotalus*), which it was said to resemble in size. Not being acquainted with mankind the birds of Mauritius, like those of other uninhabited islands, were at first extremely tame, but the dodo seems to have been not only unsuspicious but stupid into the bargain, a fact that rendered its extermination all the easier. It appears to have been customary upon the discovery of any new and edible animal, to give thanks to Providence and straightway proceed to slaughter the creature, but in the case of the dodo the thanks were omitted, although the exterminating process was at once begun.

Although the discoverers of the bird seem to have thought poorly of its gastronomic qualities, and indeed it would hardly compare favorably with doves, tortoises, turtles, and the abundant fishes of Mauritius, the next vessel to reach this isle of plenty made sad havoc with the unfortunate dodos. This was the ship of one William Van West Zannen, who stopped there in 1601, and seems to have made things very lively for all living creatures. He writes that "The dodos, with their round sterns (for they were well fattened), were also obliged to turn tail; everything that could move was in a bustle; the fish which had lived in peace for many a year were pursued into the deepest water pool." One day Zannen's crew took twenty-four dodos, on another twenty, "so large and heavy that they could not eat any two of them for dinner." The abundance of game is shown by the fact that five men not only captured twenty dodos in a day, but also some thirty other birds,† and with a good supply salted down, Van Zannen sailed away. Other Dutch ships followed in Van Zannen's wake, feasted on tortoise and dodo, and, salting down a store, departed, leaving the ranks of the dodos sadly depleted. The last notice of the living Dodo occurs in a

* These were made from birds brought alive to Holland.

† This day's work seems to have inspired the chronicler's muse, for he records it in a four-line poem, translated by Dr. Strickland:

"For food the seamen hunt the flesh of feathered fowl.
They tap the palms, the round-sterned dodos they destroy:
The parrot's life they spare, that he may scream and howl,
And thus his fellows to imprisonment decoy."

"A coppey of Mr. Benj. Harry's Journall when he was chief mate of the Shippe Berkley Castle," which shows that he was in Mauritius in 1681 and saw "dodos, whose flesh is very hard." In 1693, a little less than a century after its discovery, the bird seems to have become extinct, for Leguat, the careful describer of the solitaire, makes no mention of the dodo, and moreover remarks that ducks, coots, and turtles of all kinds were then become rare. While man began the work of extirpation it is quite likely that his allies, cats, dogs, and pigs, completed the task, for wherever these animals have been introduced and run wild they have wrought sad havoc among the feathered race by destroying their eggs and young.* The cat and dog are said to be largely responsible for the rapid decrease of the New Zealand kiwi, and when this curious nocturnal bird passes out of existence it will, in great part, be due to the attacks of those two animals. Shortly after the dodo became extinct the Dutch, who had so far been the occupants of Mauritius, left the island and in 1715 the French took possession, only to give place to the English in 1810, one result of these various changes being that all knowledge of the quaint and curious bird was so utterly lost as not even to live in tradition, while the few specimens preserved in museums were so little known that some naturalists became skeptical as to the previous existence of such a bird as the dodo.

The publications of Duncan, Broderip, and Strickland, however, speedily dissipated the slight haze of doubt, and in 1866 Mr. George Clark, of Mauritius, succeeded in obtaining a considerable series of bones, a portion of which served Mr. Owen for his memoir on the osteology of the dodo. These bones were procured from the mud at the bottom of a small marsh, known as the Mare aux Songes,† lying about a quarter of a mile from the sea. (Plate CI.) At the beginning of the present century this marsh, as well as the land immediately about it, was still covered with large trees whose fruits had doubtless formerly served the Dodo for food, and in this spot the bird seems to have lived and died in peace, for none of the bones are cut or gnawed, and here it left its remains for the benefit of future naturalists. Curiously enough this is the only place in Mauritius where bones of the Dodo have been brought to light, although various other localities have been tried in the hope of coming upon relics of this interesting bird.

The Solitaire (*Pezophaps solitaria*), while presenting a general likeness to the Dodo, was somewhat more lightly built, and had decidedly longer legs and neck and a smaller beak. For a knowledge of the external appearance and habits of the Solitaire we are entirely dependent on the account of Francois Leguat, who in 1691 founded a colony at Rodriguez, which endured only for the brief space of two years, owing to the

* Dr. Strickland considers runaway slaves to have been the principal agents in the work of destruction, for, hiding in caves and forests, they would have found in these flightless birds just the prey they would have liked.

† *I. e. Marais aux Songes*, songe being the local name of *Cœlidium esculentum*.

TIBIAS.

1. TIBIA OF SOLITAIRE (*Pezophaps solitarius*). (Cat. No. 18246, U. S. N. M.)
2. TIBIA OF DODO (*Didus ineptus*). (Cat. No. 18243, U. S. N. M.)
3. DOMESTIC TURKEY (*Meleagris gallopavo*).

fact that Leguat seems to have not thought of providing wives for his colonists. While Leguat's description has been quoted and requoted, there is no other source from which information may be drawn, and it must once more be used.

He writes:

Of all the birds in the island the most remarkable is that which goes by the name of the Solitary, because it is very seldom seen in Company, tho' there are abundance of them.

The feathers of the Males are of a brown grey Colour; the Feet and Beak are like a Turkey's, but a little more crooked. They have scarce any Tail, but their Hind-part covered with Feathers is roundish, like the Crupper of a Horse; they are taller than turkeys. Their neck is straight and a little longer in proportion than a Turkey's when it lifts up his Head. Its Eye is black and lively, and its Head without comb or cop. They never fly, their Wings are too little to support the weight of their Bodies; they serve only to beat themselves, and flutter when they call one another.

They will whirl about for twenty or thirty times together on the same side, during the space of four or five minutes. The motion of their Wings makes then a noise very like that of a Rattle; and one may hear it two hundred paces off. The Bone of their Wing grows greater toward the Extremity, and forms a little round mass under the Feathers, as big as a Musket Ball. That and its beak are the chief Defense of this Bird. 'Tis very hard to catch it in the Woods, but easy in open Places, because we run faster than they, and sometimes we approach them without much Trouble. From *March* to *September* they are extremely fat, and taste admirably well, especially while they are young. Some of the Males weigh forty-five Pounds.

'Though these Birds will sometimes very familiarly come up near enough to one, when we do not run after them, yet they will never grow Tame. As soon as they are caught they shed Tears without Crying and refuse all manner of Sustenance till they die.

When these Birds build their Nests, they choose a clean Place, gather together some Palm-Leaves for that purpose and heap them up a foot and a half high from the Ground, on which they sit. They never lay but one Egg, which is much bigger than that of a Goose. The Male and Female both cover it in their turns, and the young which is not able to provide for itself in several Months, is not hatch'd till at seven Weeks' end. All the while they are sitting upon it they will not suffer any other Bird of their Species to come within two hundred Yards round of the Place; But what is very singular, is, the Males will never drive away the Females, only when he perceives one he makes a noise with his Wings to call the Female, and she drives the unwelcome Stranger away, not leaving it till 'tis without her Bounds. The Female does the same as to the Males, and he drives them away. We have observ'd this several Times, and I affirm it to be true.

The Combats between them on this occasion last sometimes pretty long, because the Stranger only turns about, and do's not fly directly from the Nest. However the other do not forsake it till they have quite driven it out of their Limits. After these Birds have raised their young One, and left it to itself, they are always together, which the other Birds are not, and tho' they happen to mingle with other Birds of the same Species, these two Companions never disunite. We have often remarked that some Days after the young one leaves the Nest, a Company of thirty or forty brings another young one to it, and the new fledg'd Bird, with its Father and Mother joyning with the Band, march to some bye Place We frequently followed them, and found that afterwards the old ones went each their way alone, or in Couples, and left the two young ones together, which we call'd a *Marriage*.

This Particularity has something in it which looks a little Fabulous, nevertheless, what I say is sincere Truth, and what I have more than once observ'd with care and Pleasure.

Through the efforts of Professor Alfred Newton and his brother Edward a large collection of bones of the Solitaire was obtained from Rodriguez in 1866, these remains forming the basis for a very complete account of the osteology of the bird. These bones were procured from caves, but owing to the impossibility of securing intelligent supervision, little can be said concerning their probable age, except that all seem to long antedate the settlement of the island. It is interesting to note that the wing bones corroborate Legnat's description of the Solitaire, for they show the presence of a rounded callosity at the angle of the wing, just about the size of an old fashioned musket ball.

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THE LABRADOR DUCK.

(*Camptolaimus labradorius.*)

The Labrador Duck was one of the many sea ducks which, during their southern migration, furnished considerable sport to gunners along the coast. In size and appearance it was not unlike the familiar Old Wife, or Quandy (*Harelda glacialis*), to which, indeed, it is nearly related. The body and primaries of the male are black, the rest of the wing, head and neck white, with a black collar and longitudinal stripe on the crown. (Plate CII.) The female is plumbeous gray, slightly darker on the under side. This duck ranged southward in winter to the coast of New Jersey and Chesapeake Bay, its summer habitat and breeding ground being, according to Audubon, southern Labrador. It is by no means impossible, however, that the empty nests ascribed to the Labrador Duck may have been those of the Eider (*Somateria Dresseri*), as they were found on the breeding grounds of that species, and are said to have resembled them in shape and size. While the Labrador Duck seems to never have been very common, it was not sufficiently rare to attract the notice of collectors, and hence a very small number of specimens, about thirty-six, are in existence. Considerable interest is attached to two of these specimens in the U. S. National Museum, as they were collected by no less a person than Daniel Webster, and figured by Audubon. Webster was an enthusiastic sportsman, and his home at Marshfield, close by Brant Rock, was one of the best localities for sea shooting on the coast of Massachusetts. The ducks in question, however, came from Vineyard Island. The bird, so Audubon tells us, was frequently for sale in the markets of New York and Baltimore, and, according to the same authority, a "bird stuffer" of Camden, New

THE LABRADOR DUCK. (Male.)

Camptolaimus labradorius.

(Cat. No. 61800, U. S. N. M. Collected by Daniel Webster and figured by Audubon.)

Jersey, used to take them like fishes on a long line baited with mussels. When interest in ornithology became more general, and collectors and collections multiplied, it soon became evident that the Labrador Duck was extremely rare, and it is now believed to have become entirely extinct, no example having been taken since December, 1878. It is a little difficult to understand why the Labrador Duck should have disappeared, for the bird was possessed of good powers of flight, bred in comparatively unfrequented localities at the north, and, as just stated, was not especially sought after. Some epidemic may have swept off the greater part of the race, but this is purely supposititious, as nothing of the kind is known to have occurred. That epidemics do occur among birds is shown by Dr. Stejneger's account of the Pelagic Cormorant (*Phalacrocorax pelagicus*) of the Commander Islands, thousands upon thousands of which died during the winter of 1876–'77, so that masses of dead birds covered the beach all around the islands. As this bird formed an important article of food during the time of year when the fur seal is not slain, fears were entertained by the residents of the island that the bird might become extinct, like Pallas Cormorant. But although the birds were scarce during the summer of 1877, their numbers have since increased, although they have never attained their former abundance. A possible cause for the original depletion may have been the taking of eggs by the Indians, for the Eider, which breeds along the southern coast of Labrador, suffers severely from their depredations. A small dog is trained to hunt through the bushes near the water's edge, the favorite nesting place of the Eider, while his master silently paddles along close to the shore to note just where a bird is driven from the nest, and in this manner many eggs are taken. Now if the Labrador Ducks bred over a comparatively small extent of country, near the summer camp of a band of Indians, their original decrease would be readily accounted for. Dr. Stejneger has so clearly shown (Stand. Nat. Hist., Vol. IV. Birds, p. 151) how the extinction of this or other species might have come about that the account is here quoted in full:

It seems to be a fact that when a migratory species has reached a certain low number of individuals, the rapidity with which it goes towards extinction is considerably increased.

Two circumstances may tend toward this result. We know that when birds on their migrations get astray, having lost their route and comrades, they are nearly always doomed to destruction, that fate not only overtaking single individuals, but also large flocks to the last member.

If the safety of the wanderers, therefore, greatly depends upon their keeping their correct route, the safety decreases disproportionately the scarcer the species become, since, if the route is poorly frequented, the younger and inexperienced travelers have less chance of following the right track, and more chance of getting lost, and consequently destroyed. The fewer the individuals, the more disconnected become the breeding localities, the more difficult for the birds to find each other and form flocks in the fall. Finally the number will be reduced to a few colonies, and the species, consequently in danger of extinction, and a casualty, which, under ordinary circumstances, would only affect a fraction of the members, now may easily prove fatal to the remainder of the species.

We need only suppose that during one unfortunate year nearly all the broods were destroyed by inundations, fires, or frost, to perceive what difficulty the few birds left in the autumn would have in wending their way without getting astray.

We know that the proportion of birds returning in spring is comparatively small, and the flocks are considerably thinned down.

Under the circumstances presumed, there will hardly be birds left to form flocks. But birds used to migrate in flocks do not like or can not travel alone; hence they are forced to follow flocks of allied species, which may take them to localities far from their home. In that way a few scattered pairs may survive, and breed here and there, a number of years after the rest are destroyed, and such are probably those few Labrador Ducks which have been captured occasionally during the last twenty years or more.

There is a possibility that a few such pairs may be in existence, but, however hardy, their fate is sealed, and perhaps not a single one will get into the hands of a naturalist.

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THE GREAT AUK.

(*Alca impennis.*)

The Great Auk, or Garefowl (*Alca impennis*), was the largest member of the Auk family, distinguished not only by its size, but by its flightlessness, enjoying the proud distinction of being the sole bird in the northern hemisphere incapable of flight. The name by which the Great Auk was originally and commonly known in America was Penguin, and the southern birds, now known by that title, did not receive this appellation until many years after. Garefowl is of Scandinavian origin, and comes to us by way of western Scotland.

In color the Great Auk much resembled its lesser relative, the Razorbill, the head, neck, and back being black, and the under parts white. A peculiar mark of the bird was a large white spot in front of the eye, one old writer with a greater love of the marvelous than of truthfulness stating that this spot was found on the right side only. The wings, although far too small to sustain the bird in the air, formed an admirable pair of oars, the Great Auk being a most expert swimmer and diver, and performing even longer migrations than many of its relatives that were endowed with the power of flight. (Plate CIII.) Many, possibly all, of the Auk family use their wings quite as much as their feet for propulsion under water, and they may literally be said to fly beneath the sea as well as over it. It has been noted that the inability of the Great Auk to fly was due to lack of development of the bones of the forearm and hand, the humerus being proportionately as long as in other Auks. This modification of structure was directly correlated with the aquatic habits of the Garefowl, for the resistance of water being vastly greater than that of air, a wing especially adapted for subaquatic flight would

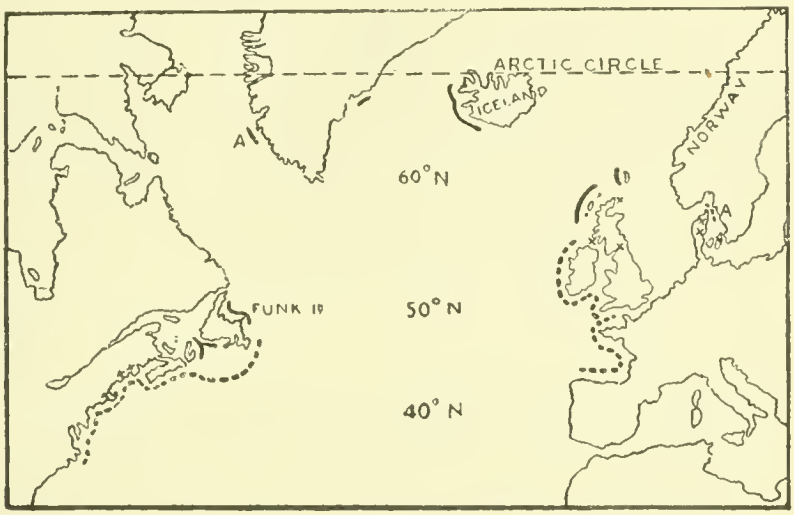
THE GREAT AUK.

Alca impennis.

(Cat. No. 57338, U. S. N. M. Eldey Island, off the coast of Iceland.)

demand less surface and more power than a wing formed for aerial locomotion. In the case of the Great Auk this demand was met by shortening the outer portion of the wing, while other birds that use their wings in diving obtain as far as possible the same result by only partially opening their wings.

The Great Auk was confined to the North Atlantic, ranging on the European side from Iceland to the Bay of Biscay, and on the American from Greenland to Virginia, these localities marking the extreme limits of the bird's migrations.



MAP 4.—Distribution of the Great Auk. The heavy, black line shows the summer habitat, and the interrupted line the winter range of the species. A, localities where specimens have been taken, but where the occurrence of the bird was probably accidental. X, places where remains of the Great Auk have been found in shell heaps.

Greenland was the habitat of the Garefowl to a very limited extent, and the same may be said of the coast of Norway, while the southern limits given above were reached only during the winter migrations of the bird. The positively known breeding-places were few in number, those where the bird bred abundantly, being the Garefowl Skerries off the coast of Iceland and Funk Island on the Newfoundland coast. These islands, or more properly islets, were very similar in their general character, being isolated rocks, lying at some distance from shore and difficult of access. Of course the reason for this similarity is apparent. The Great Auk and its eggs formed desirable articles of food, and since the bird was helpless on land, it was easily captured, whence it came to pass at an early date that the bird was exterminated at all localities easy of access. Another and more important factor in the extermination of the Auk, especially in America, is to be found in the gregarious habits of the bird and its predilection for certain breeding-places. This habit of the Garefowl is shown by other birds which are restricted in their breeding habitat without any apparent reason, although there may be some unknown cause in the nature of food-supply that might account for it. A good example of this is found in the Gannet, which, although a bird of powerful flight, breeds at only three localities on the eastern coast of America, and in Europe crosses the North Sea to nest in Scot-

land, when localities seemingly quite as favorable exist along the shores of Norway. There were apparently plenty of suitable breeding-grounds for the Great Auk in Maine and Labrador, but had the bird bred in small colonies at localities scattered along this wide expanse of territory, it would have been in existence to-day.

The most important European breeding place of the Garefowl was an islet 25 miles off Reykjanes, Iceland, where, for many years, it led a somewhat precarious existence, several times seeming to have been so reduced in numbers that expeditions in search of birds and eggs were not worth the risk. Still the bird would have existed in this locality many years longer than it did, but for volcanic disturbances in March, 1830, during which the Geirfuglasker sank beneath the sea compelling the existing Garefowl to seek new-breeding places. Most of them appear to have moved to an islet by the name of Eldey, and this being near the coast and more accessible, the few remaining Great Auks were in the course of fourteen years all killed, the last pair being taken about the 3d of June, 1844, this being the last authentic record of the Great Auk in Europe. It was from this locality that most of the skins now extant were obtained, only one mounted specimen being recorded from American localities, although nearly all skeletons have come from Newfoundland. The history of the Great Auk in America may be said to date from 1534, when, on May 21, two boat's crews from Cartier's vessels landed on Funk Island, and, as we are told, "In lesse than halfe an hour we filled two boats full of them, as if they had bene stones. So that besides them which we did eat fresh, every ship did powder and salt five or sixe barrels of them." The Great Auk having thus been apprized of the advent of civilization in the regular manner, continued to be utilized by all subsequent visitors. The French fishermen depended very largely on the Great Auks to supply them with provisions; passing ships touched at Funk Island for supplies; the early colonists barreled them up for winter use, and the great abundance of the birds was set forth among other inducements to encourage emigration to Newfoundland. The immense numbers of the Auks may be inferred from the fact that they withstood these drains for more than two centuries, although laying but a single egg, and consequently increasing but slowly under the most favorable circumstances. Finally some one conceived the idea of killing the Garefowl for their feathers, and this sealed its fate. When and where the scheme originated, and how long the slaughter lasted, we know not, for the matter is rather one of general report than of recorded fact, although in this instance circumstantial evidence bears witness to the truth of Cartwright's statement that it was customary for several crews of men to pass the summer on Funk Island solely to slay the Great Auks for their feathers. That the birds were slain by millions; that their bodies were left to molder where they were killed; that stone pens were erected; and that for some purpose frequent and long continued fires were built

on Funk Island, is indisputable. This locality has been but thrice visited by naturalists, the last time in the summer of 1887, by a party from the U. S. National Museum, who, by the aid of the U. S. Fish Commission, were enabled to obtain much information in regard to this interesting spot, and to make very extensive collections of remains of the Great Auk. Just when the Great Auk ceased to exist in America is unknown, for there were few naturalists on this side of the water when the Garefowl was being done to the death; but the extinction took place not far from 1840, almost coincidently with the extermination of the bird in Europe. Few birds have received more attention than has the Great Auk since it became extinct, and it has been the subject of numerous papers, both popular and scientific, while its remains bring extravagant prices whenever chance brings them into the market. The last skeleton sold brought $600, the last skin $650, while an egg brought $1,250, and then was resold for the round sum of $1,500.

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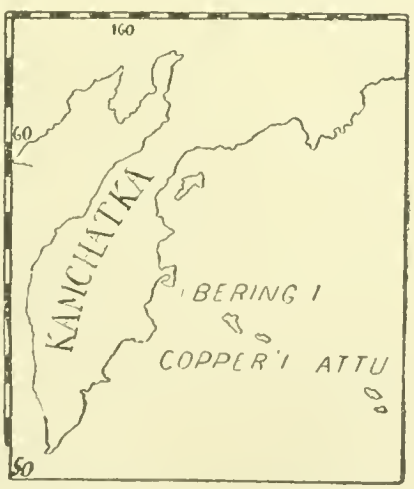
PALLAS' CORMORANT.

(*Phalacrocorax perspicillatus.*)

Pallas' Cormorant was the largest of its family, and with rich plumage and crests, presented a striking appearance. Above and below it was of a deep, lustrous green with blue gloss on the neck, and rich purplish



MAP 5.—The distribution of Pallas' Cormorant.

on the scapulars. Long, slender, straw-colored feathers were interspersed through the plumage of the neck, and the shafts of the tail feathers were white.

The specific name of *perspicillatus*, spectacled, was bestowed upon the bird of Pallas on account of the broad ring of bare, white skin surrounding the eyes. So far as is known, the bird was found only on Bering Island, where it was discovered by Steller in 1741, at the time of Bering's unfortunate shipwreck, when the bird was largely used for food by the survivors.

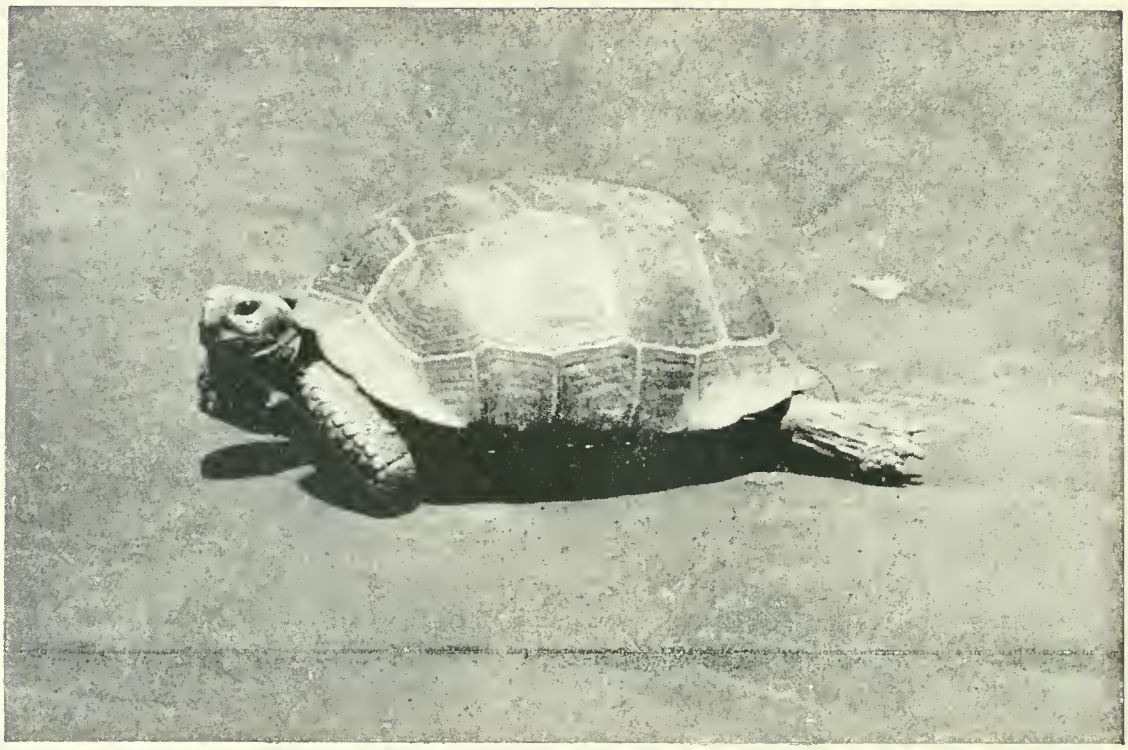
The known history of Pallas' Cormorant is extremely brief, and has been so well recorded by Dr. Stejneger in the Proceedings of the U. S. National Museum for 1888, that one can not possibly do better than to quote his account. Omitting the technical portion, it is as follows:

It seems as if the very causes which terminated the existance of the Great Auk worked the same result in Pallas' Cormorant, and it is even probable that if the latter at some early period, also inhabited the other Aleutian Islands, as is most likely, volcanic eruptions may have played a rôle in this drama as well as in that of the Great Auk. True, the latter was entirely deprived of its power of flight, but it is evident both from the measurements of the skins as well as of those of the bones, given below, that the wings of the cormorant were disproportionately small. Steller speaks of its great bulk of body and its weight, which varied between 12 and 14 pounds, so that one single bird was sufficient for three starving men of the shipwrecked crew.

With this bulk it combined an unusual "stoliditas," but it is pretty clear that this stupidity, which made them such an easy prey, was due more to their slowness of locomotion on land and in the air than to any special temperament or dullness of intellect. The natives of Bering Island inform me that the meat of this species was particularly palatable compared with that of its congeners, and that, consequently, during the long winter, when other fresh meat than that of the cormorants was obtainable, it was used as food in preference to any other. In brief, all the circumstances combined to make short work at exterminating this bird at its last refuge, for there is no evidence that it has ever been found during historical times in any other locality than Bering Island. The result was that Pallas' cormorant, which was found by Steller and his shipwrecked comrades on that desolate island in 1741, and which at that time—that is, before man ever visited its rocky shores—occurred there in great numbers, "*frequentissimi*," as Steller says, became extinct in about one hundred years from its discovery. The history of this bird forms an interesting parallel to that of the great northern sea-cow (*Rytina gigas*).

Up to 1837 or 1839 Steller seems to have been the only naturalist who had seen this bird, for, although naming it in his Zoographia, all Pallas knew of the species was derived from Steller's observations, whose description he merely quotes. It is, then, safe to conclude that it was not among the many water birds collected by Billing's expedition, which brought such rich spoils home from the Kuriles and the Aleutian Island, but which did not touch at Bering Island. In the above mentioned year Captain Belcher, with the *Sulphur*, visited Sitka, and was there presented by Kuprianoff, the Russian governor, with one of the specimens of this bird in his possession. This specimen is evidently the one now in the British Museum, while the others went to the St. Petersburg Academy, from which one was again secured by the Leyden Museum. Although obtained from the governor in Sitka, there is nothing to indicate whence came the specimens; but inasmuch as Bering Island at that time belonged to the administrative district of Sitka, at which port all the furs were received from that island before being shipped to Europe; all vessels from Bering Island consequently first stopping at Sitka, there is every probability that the specimens in question were collected on that island.

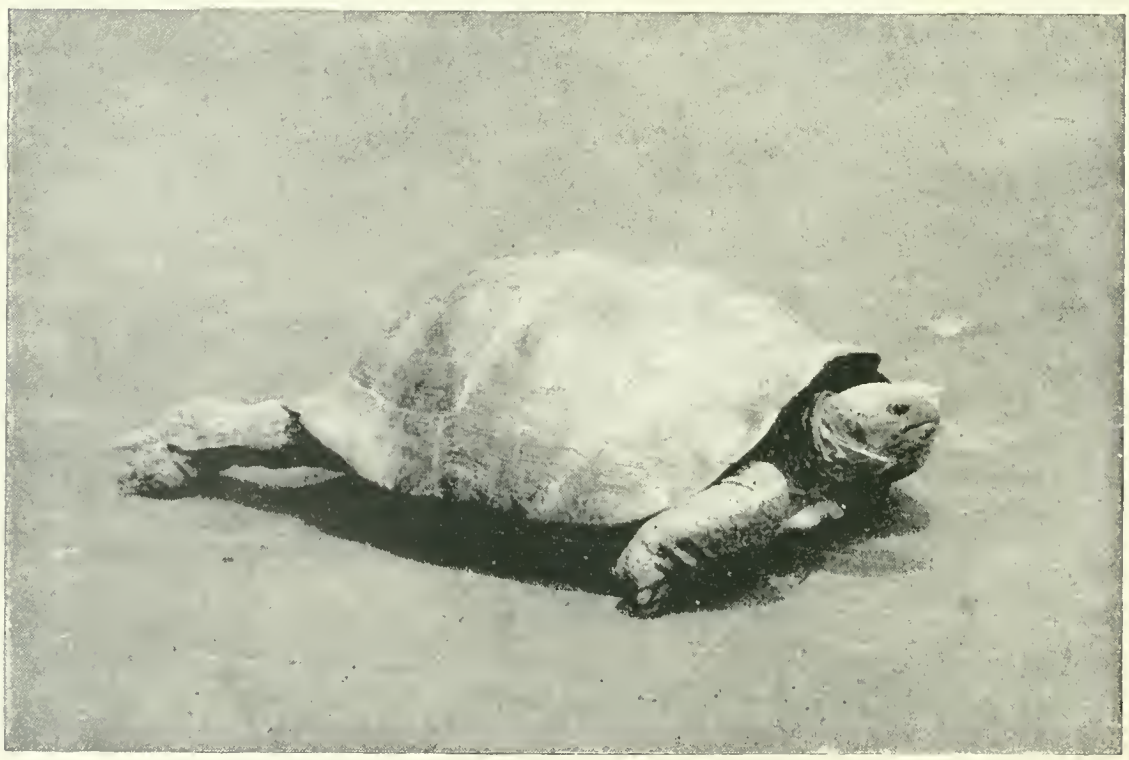
During my circumnavigation of Bering Island I landed on September 1, 1882, at Pestshanij Mys near the northwestern extremity of the island. Ascending the steep



GALAPAGOS TORTOISE.

Testudo nigrita

(Duncan Island.? From living specimen in the National Zoological Park Collected by the U S Fish Commission steamer *Albatross*, in 1888.)



GALAPAGOS TORTOISE.

Testudo elephantopus

(Albemarle Island. From living specimen in the National Zoological Park. Collected by the U. S. Fish Commission steamer *Albatross*, in 1888.)

coast escarpment which is here about 35 feet high, I found near the edge of the terrasse a rather extensive deposit of bones of various mammals and birds arranged in thin layers of sand and sod alternating. The average thickness of the deposit was about 2 feet, and the present area covered in the neighborhood of 600 square feet, though it was evident that it was formerly of much greater extent, the ocean having encroached upon the land and carried away great portions of the terrasse. The bones were in fairly good condition, some of the smaller and delicate ones even excellently well preserved, and none of them showed signs of violence. There were bones of the Arctic Fox, the Sea Otter, the Sea Lion, and other species of seals, as well as various kinds of water birds. Among the latter a particularly large pelvis of a *Phalacrocorax* at once attracted my attention, and as I had had Pallas' Cormorant on my mind since I started from Washington, I was not slow in concluding that I had to do with the bones of this bird. Had I had time to dig out the whole deposit I should probably have obtained more bones, but with the above suspicion I did as much digging and collected as many bird bones as the circumstances would allow.

The bones thus obtained, twenty-three in number, are the only portions of the skeleton known to science, all that now exists of Pallas' Cormorant being four mounted specimens and a handful of bones. There is a slight possibility that Pallas' Cormorant may yet be found about some of the small, uninhabited islands towards the western end of the Aleutian chain, but this is merely a possibility and nothing more.

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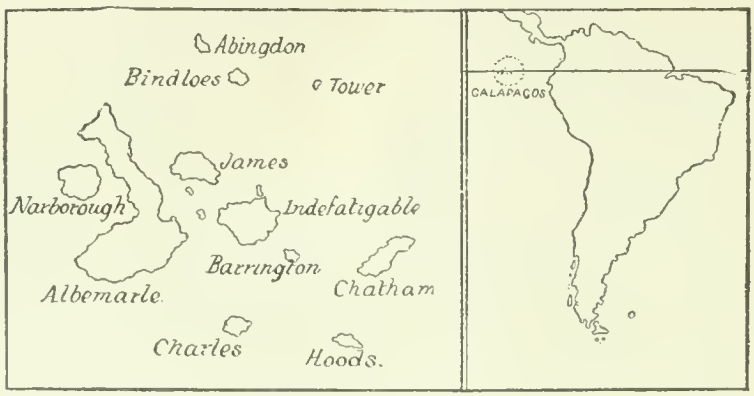
THE GALAPAGOS AND MASCARENE TORTOISES.

The Galapagos Archipelago, which comprises fifteen small islands, lying directly on the equator, was so christened by the Spaniards of the sixteenth century on account of the abundance of great, black tortoises (*galapago*) found there. (Plate CIV.) These turtles, of which there are several closely related species inhabiting various islands of the group, are typical land-tortoises of the genus *Testudo*, characterized by a high, arched carapace, and club feet. The nearest relatives of the Galapagos tortoises are found in the island of Aldabra, to the north and west of Madagascar, and in the Seychelles (see map 3), whither they were introduced from Aldabra. There were—the past tense is painful—closely allied species inhabiting the Mascarene Islands, but these were long since "eaten off the face of the earth by gluttonous man" and the place thereof knoweth them no more. The same fate is impending over the Galapagos tortoises, and sooner or later they will live only in the name of their former abiding place.

The Galapagos tortoises and their allies present a doubly interesting instance of the peculiar geographical distribution of animals. Not only are they as a group confined to small islands remote from one another and from the continent, but, with one exception, each species of tortoise is restricted to a single island.

In the case of the Mascarene tortoises this is not so singular, as Mauritius, Bourbon, and Rodriguez are some distance apart; but the Galapagos tortoises inhabit islands most of which are in sight of one another, and some separated by only 8 or 10 miles of sea.



MAP 6.—The distribution of Galapagos Tortoises.

The exception noted above to the rule that a given island possesses but a single species of tortoise, is Albemarle Island, which has two, but in this instance the island is divided by lava streams whose broken irregular surfaces present impassible barriers to such creatures as tortoises. It is unfortunate, in view of the interest attached to the subject, that the exact locality of many of the tortoises brought from the Galapagos Islands should be unknown, the more that unless the problem of their distribution is soon settled it never can be. Dr. Gunther enumerates six species, the first two of which are certainly known to have come from the islands assigned to them, two are in a measure conjectural, and two are unknown. Three, probably four, species are in the collection of the U. S. National Museum, but in this case a little uncertainty hangs over the exact locality they came from, owing to the fact that several were obtained at Chatham Island, whither they were brought from other islands of the archipelago. One very large individual, however, was obtained at Abingdon Island, where the tortoises are probably extinct, the weathered skeleton having fortunately been preserved in a tolerably complete condition. The Galapagos tortoises are vegetable feeders, living largely on succulent cactus, which serves the double purpose of food and drink. They are very fond of water, and although seeming to thrive on the smaller islands which are without springs, make long pilgrimages to reach the wells on the upper portions of the large islands. Although the tortoises travel day and night while on these journeys, owing to their proverbially slow rate of speed (three or four miles an hour) it requires two or three days to make the trip. Regular roads, similar to those that would be made by a low-bodied cart, branch out from the springs in every direction, leading from them to the coast, and it was by following up these well-traveled paths that the Spaniards first discovered the watering places. These tortoises are currently reported to be totally deaf, and Porter

records that they took no notice even of the report of a gun, while Darwin states that they seemed quite unaware of any approach from the rear, but would draw in their extremities with a loud hiss as soon as they saw him. Dampier, who visited the Galapagos group in 1680, was perhaps the first to publish an account of the tortoises that supplied him with fresh provisions, as they did many a mariner after him, these creatures being indeed ideal live stock for sailors' purposes, requiring little care and no food, yet existing on this diet for three or four months. Dampier does not tell us from what islands he obtained his tortoises, but in his time they must have been abundant throughout the entire Archipelago. Occasional mention is made of the Galapagos tortoises by vessels which stopped there for provisions and water, and many more touched there without putting their visits on record. In 1813 Porter, of the celebrated *Essex*, who visited the islands for the purpose of waylaying British whaling vessels, obtained tortoises abundantly on Hoods, Marlborough, James, Charles, and Indefatigable Islands, but although only shells and bones were seen on Chatham Island, the tortoises must still have been numerous there, since they still exist in that locality. Porter was the first to note the fact that differences existed between the tortoises from the various islands. In 1835, during the now famous voyage of the *Beagle*, Darwin found the tortoises still numerous on Chatham, Charles, and James Islands, although he notes that the numbers had been much reduced, owing to quantities taken by the whalers and by parties from the mainland, who visited the islands for the purpose of salting tortoise meat and making oil from the fat. H. M. S. *Herald* in 1846 reported the tortoises extinct on Charles Island, and in 1875 Captain Cookson says that only a few individuals were left on Chatham Island, and that they were much lessened in numbers on Hood, James, and Indefatigable Islands, although plentiful in Albemarle and Abingdon. Small wonder that the ranks of these slow-growing, slower-paced reptiles should be getting thinned out, when we read that vessels have taken away as many as seven hundred at one time, and that the crew of a frigate captured two hundred in a single day. Of course these figures are exceptional, yet prior to 1870 as many as forty or fifty whalers annually visited the islands, stopping there some time and carrying away a hundred or so of tortoises when they departed, the number thus taken from Charles Island alone being estimated at 6,000, the total number from all the islands reaching several millions.

In 1829 the Government of Ecuador established a penal colony on Charles Island, whose members relied principally upon the tortoises to keep them in fresh meat and the orchilla* gatherers, who visit the

* The Spanish name for the orchilla weed (*Roccella tinctoria*), a widely distributed species of lichen, from which a purple dye is obtained.

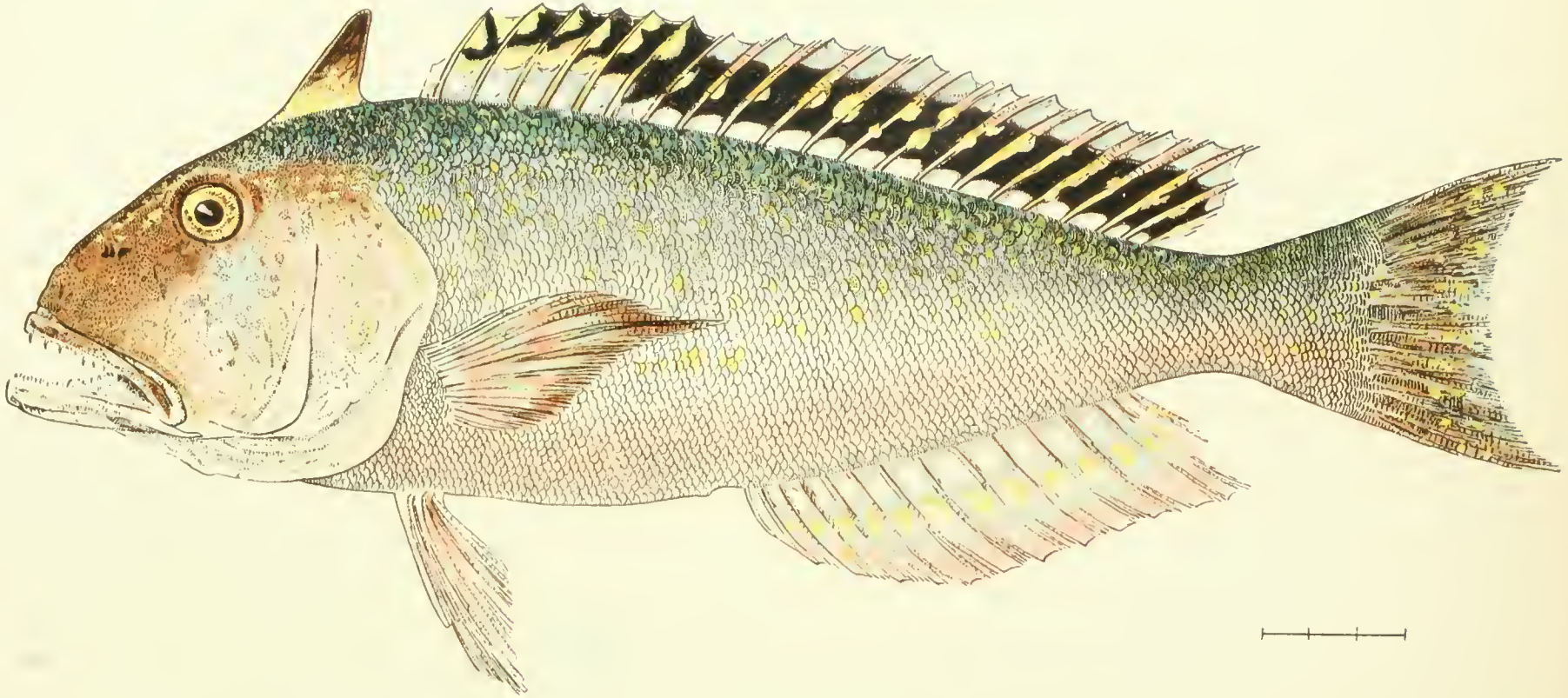
The lichen formed a portion of the food of the tortoises, and it is rather interesting that, having first aided in their increase, it should later on prove an important factor in their destruction.

islands annually, count upon these animals to furnish them with a large proportion of their supplies.

The manufacture of tortoise oil must be credited with having caused the destruction of large numbers of tortoises, and as late as 1875 Captain Cookson found a party of seven engaged in its preparation on Albemarle Island. In twelve months they had made 3,000 gallons, a quantity that probably represented an equal number of tortoises, for though 5 or 6 gallons have been obtained from unusually large and fat animals, the average yield is about 1 gallon. Dogs, too, introduced by the colonists, have played their customary rôle in the extirpating process, chiefly by destroying the young tortoises, which they watch for and devour as soon as hatched, but also by killing animals of considerable size. With so many enemies, no means of defense, and no power of escape by flight, it is surprising that any tortoises should to-day exist, and the fact that they are not yet exterminated shows how wonderfully abundant they must have been when the islands were discovered.

In 1888 the U. S. Fish Commission steamer *Albatross* succeeded in obtaining a limited number of tortoises, but they were comparatively small, mostly mere infants of 10 or 20 pounds weight, although one specimen weighing about 40 pounds was secured. This is a sad falling off from former days, for in Darwin's time individuals weighing 200 pounds were not uncommon, while the governor of the penal colony told Darwin that he had seen tortoises so large that it required six or eight men to lift one from the ground, a statement not at all incredible, since a tortoise from Aldabra turned the scales at 870 pounds. The decline in weight is due to the fact that the tortoises are killed while they are still young and before they have had time to attain any considerable size. Turtles live to a great age (the specimen from Aldabra was known to be over eighty) and like other reptiles continue to grow throughout life, so that great size is an indication of corresponding age. A tortoise obtained by Captain Cookson, estimated by an old tortoise hunter to be four years old, weighed only 9 ounces, so that the rate of growth would seem to be more rapid in old rather than in young individuals.

Probably no more large tortoises will come from the Galapagos group, and though the race may linger for some time longer, it will ultimately become extinct. The story of the Mascarene tortoises is soon told. Van Neck, the discoverer of the Dodo, found them abundant in Mauritius at the time of his visit in 1598, and he tells us that some were of such immense size that six men could be seated in one shell. In 1618 Bontekoe, on a trip to Bourbon, took twenty-four tortoises beneath a single tree, a statement which shows how numerous they then were. Rodriguez must, however, have been the headquarters of these animals, for Leguat says: "There are such plenty of land turtles in this isle that sometimes you see two or three thousand of them in a drove, so that you may go above a hundred paces on their backs."



THE TILE-FISH.

Lopholatilus chamœleonticeps, Goode & Bean. (p. 360.)

Drawing by H. L. Todd, from No. 22899 U. S. National Museum, collected 80 miles south by east of No Man's Land, Mass., by Captain Kirby.

In 1761 vessels were employed in transplanting tortoises from Rodriguez to the Dutch colony at Mauritius, where they were used in the hospital and in exchange for various commodities with the Dutch East Indiamen who frequently touched there. In the early part of the present century the race seems to have become extinct, and save the few bones rescued from the marshes of Mauritius and the caves of Rodriguez, nothing is left to show that these large and formerly abundant tortoises ever existed.

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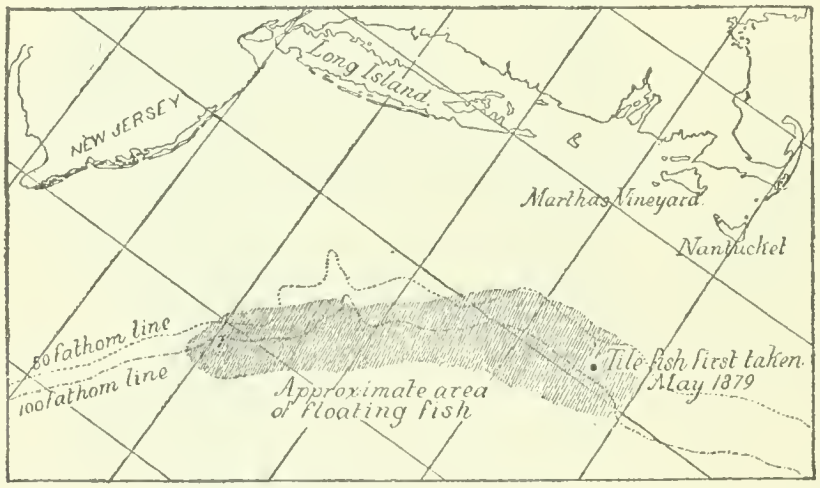
THE TILE FISH.

(*Lopholatilus chameleonticeps.*)

The tile fish is the largest member of a small family of fishes (the *Latilidæ*), most of which are inhabitants of tropical or subtropical waters, although the tile fish itself ranged northwards to the latitude of Philadelphia. The tile fish was rather brilliantly colored, being pale-violet above and whitish below, with numerous markings of pale yellow. (Plate CV.) In size it varied from five to forty pounds, and it was an inhabitant of moderately deep water, being found at a depth of from ninety to one hundred and twenty-five fathoms. Up to 1879 the tile fish was unknown, and its discovery may be said to have been accidental. In May, 1879, Captain Kirby, of the schooner *Wm. H. Hutchings*, while trawling* for cod to the southward of Nantucket, took 5,000 pounds of a fish not only new to him but new to science. The greater part of the fish taken on the first haul of the trawls were thrown away, but as the samples that had been kept proved, on being cooked, to be most excellent eating, those subsequently taken were salted down, and when taken to Gloucester a portion was smoked. In July, 1879, more tile fish were taken—this time on hand lines—by Captain Dempsey, of the schooner *Clara F. Friend*, while trying for cod, but as there were no indications of the latter being present, Captain Dempsey, who naturally preferred to deal with fish with which he was acquainted, proceeded to other grounds. In 1880 and 1881, while engaged in exploring the

*Among American fishermen a trawl is a line from half a mile to three miles long, having hooks at intervals of a few feet. In England a trawl is a net dragged along the bottom, the mouth being kept extended by a long beam.

sea-bottom of the southern coast of New England, the United States Fish Commission steamer *Fish Hawk* took tile fish on several occasions at depths of from 70 to 134 fathoms. The indications of the apparent abundance of a new and edible fish of large size made Professor Baird desirous of obtaining fuller knowledge of its habits and habitat, in the hope that it might readily be taken in large numbers and prove an important addition to the list of food fishes. Unfortunately the fish commission had not yet built the schooner *Grampus*, so, having no vessel especially adapted for fishery research and prepared to encounter all weather, it was necessary to charter a fishing-smack for the work. Unfortunately, too, bad or threatening weather seemed to have been chartered with the smack, and only a brief and unsatisfactory trial could be made on the tile fish-ground, so that research was of necessity postponed until 1882. In the months of March and April, 1882, vessels arriving at Philadelphia, New York, and Boston reported having passed large numbers of dead or dying fish scattered over an area of many miles, and from descriptions and the occasional specimens brought in, it was evident that the great majority of these were tile fish. Naturally these fish were not evenly distributed over all the area in which they were seen, some observers reporting them as scattering, and others as at times so numerous that there would be as many as fifty on the



MAP 7.—Showing destruction of tile fish. From a map prepared by Capt. J. W. Collins.

space of a rod square. As one account after another came in it became apparent that a vast destruction of fish had taken place, for vessels reported having sailed for 40, 50, and 60 miles through floating fish; and in one case the schooner *Navarino* plowed for no less than 150 miles through waters dotted as far as the eye could reach with dying fishes. From careful computations made by Capt. J. W. Collins, it seems that an area of from 5,000 to 7,500 square statute miles were so thickly covered with dead or dying fish that their numbers must have exceeded the enormous number of one billion. As there were no signs of any disease, and no parasites found on the fish brought in for examination, their death could not have been brought about by either of these causes;

and many conjectures were made as to the reason of this wholesale destruction of deep-water fishes, such as would ordinarily be unaffected by conditions prevailing at the surface, submarine volcanoes, heat, cold, and poisonous gases being variously brought forward to account for the loss of life.

Professor Verrill has noted the occurrence of a strip of water, having a temperature of 48° to 50° Far., lying on the border of the Gulf-Stream slope, sandwiched in between the Arctic current on the one hand and the cold depths of the sea on the other. During 1880 and 1881 Professor Verrill dredged along the Gulf-Stream slope, obtaining in this warm belt, as he terms it, many species of invertebrates characteristic of more southern localities. In 1882 the same species were scarce or totally absent from places where they had previously been abundant, and this taken in connection with the occurrence of heavy northerly gales and the presence of much inshore ice at the north, leaves little doubt that some unusual lowering of temperature in the warm belt brought immediate death to many of its inhabitants. This is the more probable, as it is a well-known fact that sudden increase of cold will bring many fish to the surface in a benumbed or dying condition, and there are no indications of any shock or earthquake having occurred at the time the dead fish were first noticed. Whether the entire race of tile fish has become extinct, or whether they will later on be discovered on grounds to the southward of the localities where they were formerly found, it is impossible to say. Certain it is that none have been taken since the spring of 1882, although in the autumn of that year Captain Collins made careful trials in their former habitat with a view of ascertaining if any remained there. It is no less singular that so large and plentiful a fish should have remained so long unknown than that it should disappear almost as soon as it was discovered. Should the tile fish appear no more, it will be one of the few animals exterminated in modern times, for whose extinction man is in no ways accountable.

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