

THE EXPEDITION TO FUNK ISLAND, WITH OBSERVATIONS UPON THE HISTORY AND ANATOMY OF THE GRÉAT AUK.

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NOTE.—In 1885 the writer suggested to Professor Baird the desirability of visiting Funk Island for the purpose of obtaining remains of the Great Auk, but in view of the attendant expense and many difficulties to be surmounted, the project was not then carried out.

In 1887 Professor Baird decided to send the U. S. Fish Commission schooner *Grampus* to northeastern Newfoundland and Labrador to investigate the truth of the many reports of the abundance of mackerel in the adjacent waters, and since the route proposed would take the vessel to the vicinity of Funk Island, the writer was detailed to accompany the expedition.

The *Grampus* left Gloucester, Massachusetts, on July 2, and returned to Wood's Holl, Massachusetts, on September 2, having visited the following places: the Magdalen Islands, Bird Rocks, St. Johns, Newfoundland; Funk Island, Penguin Islands, off Cape Freels; Seldom-Come-Ry, Fogo Island; Toulanguet, Canada Bay, Black Bay, Labrador; Mingan Islands, and Percé, Canada.

So far as possible collections were made at these localities, and while in many the fauna was extremely scanty, the material obtained was extremely valuable.

The collection of bones of the Great Auk obtained at Funk Island equaled in extent all other existing collections combined, and the opportunity was afforded for thoroughly exploring this interesting spot for the first time.

Professor Baird never knew of the complete success of the expedition, and the sad intelligence of his death reached the party at Port Hawkesbury, Nova Scotia, while on its return.

A.—THE BIRD ROCKS AND FUNK ISLAND IN 1887.

It is now about fifty years since the Great Auk succumbed to the incessant persecution of man, disappeared almost simultaneously from the shores of Europe and America, and became extinct.

Found along the coast of Newfoundland by the early explorers, the countless myriads of this flightless fowl had been hunted to the death with the murderous instincts and disregard for the morrow so characteristic of the white race.

While from a strictly utilitarian stand-point there may be no reason to mourn for the Great Auk, the naturalist can but regret its wanton destruction and deplore the loss of so interesting a bird.

As the buffalo contributed to the opening of the great West, and the Rhytina aided in the exploration of the northwest coast, the Great Auk played its part in settling Newfoundland, and we may derive what consolation we can from Richard Whitbourne's *dictum* that "God made the innocency of so poor a creature to become such an admirable instrument for the sustentation of man."

The early navigators, the French fishermen and the English colonists, each availed themselves to the utmost of the store of this sea-fowl which a (to the unfeathered bipeds) kindly Providence had placed at their disposal.

For many years the birds were used for provision, both fresh and salted, and probably for bait by the fishermen, but great as was the drain made on the birds for these purposes it seems unlikely that this alone would have caused their extermination in so short a time, as the Great Auk was not such a delicacy that unusual efforts would have been made to obtain it.

The trade in feathers must probably be debited with having caused the destruction of the species, for although there seem to be no data showing when or why the demand for Auk feathers arose, there are references to it in various works on Newfoundland, which seem to be corroborated by the hundreds of thousands of Auks whose bodies were left to molder on the heights of Funk Island.

Cartier, who visited this spot in 1534, makes mention of the bird under the name of Apponath, and in the chronicles of voyages from 1536 onward, it is frequently spoken of under the title of Penguin.*

There is reason to believe that the Garefowl was abundant at Penguin Islands, off Cape la Hune, on the southern coast of Newfoundland, and although it is difficult to certainly identify this as the Island of Penguins mentioned by Master Robert Hore, there is in this case something in a name.

Names, however, are by no means to be relied upon unless supported by other evidence, and there is great difficulty in definitely locating many of the places mentioned in the early chronicles.

A spot might receive several names from several different parties, or, as in the present instance, several places might be christened alike. Again, it has frequently happened in Newfoundland that French and Portuguese names have been so altered by the English colonists as to be quite unrecognizable. Thus Cape Race of to-day was originally Cappa Razza, the flat cape; Cappa Speranza hides its identity under the commonplace name of Cape Spear, and Bai d' Espoir is hopelessly lost as Bay Despair.

However abundant the Great Auk may have been elsewhere, Funk Island seems to have been its chief breeding place, and here it doubt-

* The name Penguin was *first* applied to the Great Auk; its application to members of the *Spheniscidæ* came afterwards.

The name Apponath, according to Cartier, was applied by the natives to a species of bird, supposably the Great Auk, that he found in great abundance at the Island of Birds (Funk Island).

These natives were very likely the Beothucs, although, making due allowance for the twists a word receives in being adopted into a new language, the term Apponath may have come from the Eskimo word *agpa*, an Auk.

The Eskimo for the Great Auk was *isarokitsok*, he that has little wings; for little auk, *agparak*.

less lingered long after it had become extirpated in other and more accessible localities. Lying 32 miles out in the Atlantic, environed by rocks and shoals, where the sea breaks heavily during storms, the vicinity of Funk Island is by no means attractive to the modern navigator, and of late years has been seldom visited except by sealers, parties of eggers, and occasional fishermen.

The sailors of old and the hardy colonists seem to have habitually resorted to this spot for supplies, partly because there were no charts to warn them of hidden perils, and partly for the reason that supplies must be had at any risk.*

Therefore the work of slaying the Great Auks went steadily on until the last of the species had disappeared from the face of the earth, and the place to which it resorted for untold ages knew it no more.

With few exceptions naturalists seem not to have been aware of the fact that the Great Auk was being exterminated until the catastrophe had actually taken place, and fewer still appear to have thought of the calamity as occurring in America as well as in Europe.

Audubon, who, by the way, wrote of the bird at second hand, says in his work (published between 1839 and 1844) that the Great Auk is rare or accidental on the coast of Newfoundland, and is said by fishermen, who kill the young for bait, to breed on a rock off the southeast coast of that island.

This speaks of the bird as rare, giving no hint that it was then looked upon as extinct, but in the "Gloucester Telegraph" for August 7, 1839, is an article from the "Salem Register" signed "A Fisherman," in which the Great Auk is spoken of as being already exterminated.

This paragraph which is interesting in that it adds one more cause for the extermination of the bird to those already known, is as follows :

All the mackerel-men who arrive report the scarcity of this fish, and at the same time I notice an improvement in taking them with nets at Cape Cod and other places.

If this speculation is to go on without being checked or regulated by the Government, will not these fish be as scarce on the coast as penguins are, which were so plenty before the Revolutionary War that our fishermen could take them with their gaffs? But during the war some mercenary and cruel individuals used to visit the islands on the eastern coast where were the haunts of these birds for breeding, and take them for the sake of the fat, which they procured and then let the birds go.†

This proceeding destroyed the whole race.

The Rev. William Wilson, who resided in Newfoundland as a missionary from 1820 to 1834, and who once preached a sermon against the

* The writer has no intention of picturing the difficulty of landing on Funk Island in too dark colors. It is simply a question of striking a favorable time, and while the dweller on the coast can choose his time, the chance visitor must trust to luck, and luck is ever an uncertain element. At the time of our visit landing on "The Bench" was a simple matter, although at any other point a boat would have been dashed to pieces in the surf; a little later another collector lost a fortnight in trying to land, and then gave it up.

† Of late years the penguins of the Antarctic Seas have been killed by sealers and tried out for oil.

wanton slaughter of the bird,* wrote of the Great Auk in 1864 that "Half a century ago the penguin was very plenty. * * * The penguin is now but seldom seen; such destruction of the bird was made for the sake of its feathers that it is now all but extinct.†

The exact derivation of the word penguin and the date at which it came into use is uncertain, although it occurs in the "Voyage of M. Hore and divers other gentlemen to Newfoundland and Cape Breton in the yeere 1536." Professor Newton (than whom there can be no better authority) considers it probable that penguin is derived from *pinwing*, a name still somewhat used in Newfoundland, and that this term was bestowed on the Great Auk by the English fishermen from the fact that the bird was as flightless as if pinwinged, in more modern parlance pinioned. This operation consists in bending down the outer joint of the wing, as in plucked chickens, or in locking the wings together across the back.

Professor Steenstrup, on the other hand, believes the word to be of Welch origin, from *pen*, white, and *gwin*, head; and although the head of Great Auk is not white, yet there is a large white spot just in front of the eye of sufficient size to warrant the appellation.

The French *pingouin* is of later date than penguin and was probably derived from the English word, and though the supposition that both came from the Spanish *pingue*, fat, meets with no favor from either Professor Newton or Professor Steenstrup, it is after all not without some slight show of reason.

The fishermen of Normandy, Brittany, and the Basque provinces were the earliest to resort to Newfoundland, and these were on the ground as early as 1504, only seven years after the discovery of the island by Cabot. In 1517 there were forty Portuguese, French, and Spanish vessels engaged in the cod fishery; and in 1578, according to Hakluyt, three hundred and fifty Spanish and French vessels and only fifty English.

Thus it would appear that there was some chance of the Great Auk having received its original name from the Spanish or French fishermen although the English-speaking race has ever possessed the happy faculty of forcing its language upon all with whom it comes in contact.

That the Great Auk was well known at an early date is shown by Anthonie Parkhurst's statement, written in 1578, that "the Frenchmen who fish neere the grand baie,‡ doe bring small store of flesh with them, but victuall themselves with these birds" (penguins).

The extermination of the Great Auk took place so suddenly that a comparatively small number of skins, skeletons, and eggs were preserved in museums, and in America, where the garefowl had been most abundant, scarce a specimen existed.

*Given on the authority of Mr. George A. Boardman.

†Newfoundland and its missionaries, by Rev. William Wilson. Cambridge, 1866.

‡Probably the Gulf of St. Lawrence, as our own fishermen still speak of this as "The Bay."

The U. S. National Museum possessed a stuffed specimen and an egg, but in going over the osteological collection a single humerus of the Great Auk was all that could be found, and even this was from a New England shell heap. In the spring of 1885 the writer suggested the great desirability of securing, if possible, other bones of this extinct bird, which could doubtless be found on Funk Island, where Professor Milne had secured a number during a brief visit in 1874. This suggestion met with the approval of Professor Baird, but some correspondence with the Rev. M. Harvey, of St. John's, Newfoundland, made evident the fact that in order to insure the success of an expedition to Funk Island some naturalist should accompany the party, and that such a trip would entail the expenditure of considerable time and money.

So the matter rested until the year of 1887, when it became apparent that the work of the U. S. Fish Commission would make it desirable for the schooner *Grampus* to visit the coast of Newfoundland and Labrador, and the question of visiting Funk Island was referred to Captain Collins.

The undertaking met with the approval of Captain Collins, who by indorsing the enterprise at the outset, and by cordial co-operation throughout the resulting trip, ensured the complete success of the expedition.

It was my good fortune to be detailed to accompany the *Grampus*, primarily to collect remains of the Great Auk, and also to secure as much other anatomical material as might be obtainable.

As the proposed route would take the vessel to some localities where little collecting had been done, Mr. William Palmer was also detailed for the trip. He devoted himself especially to the birds and his interesting observations appear elsewhere.

A more harmonious party probably never cruised together, and to this, and to the fact that the rig and equipment of the *Grampus* fitted her perfectly for the work in hand, may be attributed the success of the voyage.

The middle of June was the date set for sailing, but owing to circumstances the *Grampus* did not leave Gloucester until July 2, a delay, however, that proved to be for the best, as the summer of 1887 was unusually backward in the Gulf of St. Lawrence.

The Bird Rocks of the Gulf of St. Lawrence was the first place set down for a visit, but as wind and sea were then too high for landing July 8 was passed at Grindstone Island, of the Magdalen group, where a few birds were collected.

The only mammal seen was a young seal (*Phoca vitulina*), and it is difficult to realize that the Magdalen Islands were once the seat of a flourishing walrus fishery, and that thousands of these huge beasts were annually slaughtered along their barren shores.

Molineux Shuldham, writing in 1775, speaks of the walrus as being found on the Magdalens, St. John's Island, and Anticosti, and the

animal was occasionally seen in the gulf during the first part of the present century.

A little after noon on July 9 we came to anchor off the Bird Rocks, a spot full of interest both to the naturalist and historian, for these little islets were resorted to for supplies by the old navigators, and we find them several times mentioned in Hakluyt's *Voyages*, first, so far as I am aware, by Jacques Cartier in June, 1534.

Cartier's account runs thus:

The next day being the 25 of the moneth, the weather was also stormie, darke, and windy, but yet we sailed a part of the day toward west-northwest, and in the evening wee pnt ourselves athwart untill the second quarter; when, as we departed, then did we by our compasse know that we were northwest by west about seven leagues and an halfe from the Cape of S. John, and as wee were about to hoise saile the wind turned into the northwest, wherefore wee went southeast about 15 leagues, and came to three ilands, two of which are as steepe and upright as any wall, so that it was not possible to climbe them, and betweene them there is a little rocke.

These ilands were as full of birds as any field or medow is of grasse, which there do make their nestes, and in the greatest of them there was a great and infinite number of those that we call Margaulx, that are white and bigger than any geesé, which were severed in one part. In the other were onely Godetz, but toward the shoare there were of those Godetz and great Apponatz like to those of that iland that we above have mentioned. We went downe to the lowest part of the least iland where we killed above a thousand of those Godetz and Apponatz. We put into our boates so many of them as we pleased, for in lesse than one houre we might have filled thirtie such boats of them.

We named them the Ilands of Margaulx.*

Charles Leigh's account of his visit in 1597 is as follows:

The 14 (of June) we came to the two Islands of Birds, some 23 leagues from Mene-go, where there were such abundance of birds as is almost incredible to report. And upon the lesse of these Islands of Birds we saw great store of morses or sea-oxen, which were a sleepe upon the rocks, but when we approached nere unto them with our boate they cast themselves into the sea and pursued us with such furie as that we were glad to flee from them. The 16 we arrived at Brian's Island, which lyeth 5 leagues west from the Island of Birds.†

And a little further on we find him telling us that—

The greatest of these islands is about a mile in compasse. The second is little lesse. The third is a very little one, like a small rocke. At the second of these three lay on the shore in the sunshine about thirty or forty sea-oxen or morses, which, when our boat came nere them, presently made into the sea, and swam after the boat.‡

That Cartier's "Isles des Margaulx" are the Bird Rocks of to-day seems unquestionable, although no locality at all can be found by following the courses and distances given as having been sailed on June 24 and 25, 1534.

But by following Cartier northward from Buena Vista, through the Strait of Belle Isle, and thence southward, we learn from the latitudes

* Hakluyt's "Collection of Voyages." London, 1600, Vol. III, p. 205.

† Hakluyt, Vol. III, p. 242.

‡ Hakluyt, Vol. III, p. 249. This has the appearance of being a revision of the first account, written either much later or by a better scholar than the writer of the description on p. 242.

now and then given that on June 25 he must have been somewhere in the vicinity of the Bird Rocks.

It is also difficult to resist the temptation of suggesting that there has been a mistake in translating Cartier's log, and that "15 leagues southeast" should be 15 leagues southwest. This is certainly a somewhat radical change, but the difference between *sudest* and *sudouest* is not very great to the eye, and the translator might easily have gone astray there.

Moreover why Cartier should have run dead before the wind to the eastward when he seems to have been trying to work to the westward, and could have held his own simply by keeping the wind abeam, is rather strange.

Finally, if he was seven and a half leagues north-west by west from some point on the west coast of Newfoundland, a run of 15 leagues southeast would have carried him plump ashore, owing to the great amount of westerly variation.

In this connection I desire to express my indebtedness to the courtesy of Commander J. R. Bartlett, Chief of the Hydrographic Office, and to Mr. G. W. Littlehales, of the Division of Chart Construction, for very kindly supplying me with the necessary data for solving this problem.

Fortunately, too, there is a reference to the island of Brion, giving its distance and direction from the Iles des Margaulx, and this is alone sufficient to identify the spot, as they harmonize with existing facts.

Brion Island, like Blanc Sablon and Chateau Bay (the Bay of Castles in Hakluyt), has luckily retained its name unchanged, while so many other places have either been re-named or had their original appellations anglicized out of existence.

Further confirmation is found in the Margaulx themselves, these birds, "which bite even as dogs," being gannets, whose descendants, in spite of centuries of persecution, may still be found breeding where their ancestors did before them. Ordinarily the presence or absence of any given species of bird might seem of small value as a factor in the identification of a locality, but the gannet is extremely critical in the choice of a breeding place, and extremely pertinacious in clinging to it when once selected.

Once established, nothing short of complete destruction appears to drive them away, and unless carefully protected this curiously conservative spirit will eventually result in extermination.

Thus, while there are many points along the coast from Maine to Labrador where the Gannets might breed, they are found, so far as I have been able to ascertain, only at three places, an island in the Bay of Fundy, the Bird Rocks and Bonaventure Island at Percé, Canada, the colony at Mingan being too small and too nearly exterminated to be taken into consideration.*

* Dr. Stejneger tells me that the same thing occurs in Europe, where the Gannets cross the North Sea to breed on the Scottish coast, although there are numerous favorable localities on the coast of Norway.

That Cartier's description of the islands does not quite accord with their present appearance is not to be wondered at.

The material of which they are composed is a soft, decomposing red sandstone that succumbs so easily to the incessant attacks of the sea that Dr. Bryant's description of them in 1860 does not hold good to-day. If, then, the Bird Rocks have undergone visible changes in twenty-five years, it is easy to imagine how great are the alterations they may have undergone during three and a half centuries.

Dr. Bryant, in 1861, wrote as follows:*

These (the Bird Rocks) are two in number, called the Great Bird or Gannet Rock, and the Little or North Bird; they are about three-quarters of a mile apart, the water between them very shoal, showing that, at no very distant epoch, they formed a single island. * * * The North Bird is much the smallest and though the base is more accessible, the summit can not, I believe, be reached; at least I was unable to do so; it is the most irregular in its outline, presenting many enormous, detached fragments, and is divided in one place into two separate islands at high water, the northerly one several times higher than broad, so as to present the appearance of a huge rocky pillar.

Gannet Rock is a quarter of a mile in its longest diameter from SW. to NE. The highest point of the rock is at the northerly end, where, according to the chart, it is 140 feet high, and from which it gradually slopes to the southerly end, where it is from 80 to 100.

The sides are nearly vertical, the summit in many places overhanging. There are two beaches at its base on the southerly and westerly sides, the most westerly one comparatively smooth and composed of rounded stones.

The easterly one, on the contrary, is very rough and covered by irregular blocks, many of large size and still angular, showing that they have but recently fallen from the cliffs above.

This beach is very difficult to land on, but the other presents no great difficulty in ordinary weather; the top of the rock can not, however, be reached from either of them. The only spot from which at present the ascent can be made is the rocky point between the two beaches.

It was on this point, by the way, that Audubon's son landed June 14, 1833.

The Great Rock has apparently altered but little during the past twenty-five years, but such changes as have taken place have tended to improve the character of the southerly beach, which has been selected by the keeper of the light-house for the customary landing place. Two long ladders, bolted to the rock and leading to the summit have been erected.

The westerly beach is, however, the most accessible, and it is here that the heavy light-house supplies are landed, a large hoisting apparatus having been placed at the top of the overhanging cliff.

If the Great Rock is but little changed, its lesser relative has suffered greatly, sea and frost, rain and ice having wrought sad havoc with it, splitting great fragments from the sides so that a landing once effected it is now an easy matter to reach the top.

* Remarks on some birds that breed in the Gulf of St. Lawrence, by Henry Bryant M. D. Proc. Bos. Soc. Nat. Hist., Vol. VIII, 1861-'62, pp. 65-75.

Landing can hardly be called easy in any but the finest of weather, but on the afternoon of our visit we were favored with a calm, and succeeded in beaching our boat on the southerly side without difficulty, possibly on the same spot where nearly three centuries before Charles Leigh found a herd of huge walruses basking in the sun.

The Little Rock is about 75 yards long and perhaps 50 feet in height. It is divided into two portions by a wide cleft, that seems from the condition of the fallen rocks to be of comparatively recent origin, and it is only a question of time when there shall be two islets instead of one.

Twenty-five yards from the eastern point lies the little rocky pillar mentioned by Dr. Bryant, but this is now separated from the Little Rock even at low tide, although if one does not mind cold water and slippery rocks, it is then an easy matter to wade across the connecting ledge.

About midway between the Great and Little Rocks is a shoal which may possibly mark the site of the little rock mentioned by Cartier, although the islet, that for lack of a name may be called the Pillar, agrees sufficiently well with the description.

It has been considered probable that the Great Auk once bred here, and that this was the bird Cartier calls the Great Apponatz. True, a few may have strayed here from the colony at Penguin Island, off Cape la Hune,* but this, from the clannish habits of the bird, seems doubtful. Besides the area available for breeding purposes is limited to a narrow strip on the northeastern point, and a still more restricted portion on the southern side, these being the only places accessible to a flightless bird like the Garefowl.

Mr. Grieve suggests in a recent letter that in former times the space at the base of the Little Rock was much more extended than at present, since Cartier's crew "killed above a thousand of these Godetz and Apponatz" "on the lowest part of the least island."

This supposition may well be correct, yet careful observation of the rock and the depth of water immediately about it leads to the conclusion that the changes it may have undergone have been the result of the fall of fragments from the overhanging sides rather than the wearing away of the base.

Charles Leigh makes no mention of Penguins at the time of his visit in 1597, although it seems probable that he would have done so had they been there.

On the other hand, the Bird Rocks agree in location with the "Island of Penguin," mentioned by Silvestre Wyet, shipmaster of Bristol, in 1594, "which lyeth south from the easternmost part of Naticoteci (Anticosti) some twelve leagues. From the island of Penguin we shaped our course for Cape de Rey and had sight of the Island of Cape Briton."

*The presence of the Great Auk at the Cape la Hune, Penguin Islands, is very largely presumptive, positive evidence to that effect being lacking.

They may be the islands mentioned by M. Hore, or they may not.

If the Godetz and Appouatz were Murres and Razor-bills it would have required but a comparatively small extent of cliff for their accommodation, for at this early date every available inch of room must have been occupied.

The top of the Little Rock was covered with a thin deposit of guano, marked with many shallow, saucer-like depressions where the Gannets had made their nests, but not a single egg of this species was to be seen, and the few eggs of the Murre and Razor-bill that were subsequently found had evidently been overlooked by the fishermen who resort to this rock for supplies, and who had made a clean sweep of everything within reach.

A few Kittywakes had literally reared their young on the southern side, and under the overhanging cliff on the northwest a small number of Murres, Razor-bills, and Puffins were breeding.

Careful search brought to light a few eggs and nestlings, some of these latter so carefully concealed among the bowlders that but for their incessant peeping they would have been passed by.

The top of the pillar was closely packed with breeding Gannets, while a few were sprinkled along the sides. As this rock is somewhat difficult of access these birds, together with a small colony of Murres and Razor-bills, probably succeeded in raising their young. From this spot three young Gannets were obtained, these being the first of the season, according to Mr. Turbid, the light-keeper, who most kindly gave us all the aid and information in his power.

The Great Rock is the real breeding place of the birds, Gannets, Murres, Puffins, and Razor-bills being both abundant and tame, in spite of the fact that they are subjected to continual persecution. The birds do not seem to be divided into colonies according to species, Gannets and Murres being found in juxtaposition, and although the Gannets prefer the upper ledges, yet their distribution is to a great extent regulated by the width of the rocky shelves, the Murres taking possession where there is not sufficient room to accommodate their larger companions. There is, however, a tendency of birds of a feather to flock together in little groups of a dozen or two, and at a distance the cliffs appear seamed with white, owing to the long lines of perching Gannets.

The top of the Great Rock is now entirely deserted by all birds except the little Leach's Petrels, who burrow in security among the fragments of stone that everywhere show through the shallow soil.

It is evident from the accounts of previous visitors that the interesting colony at the Bird Rocks has become sadly diminished in numbers. At the time of Cartier's visit, every inch of available space seems to have been occupied by breeding birds, and in 1597 Charles Leigh said "the three islands of birds are sandy red, but with the multitude of birds upon them they looke white. The birds sit there as thicke as stones lie in a paved street."

At the time of Audubon's visit in 1833 he compared the effect of the birds, seen from a distance hovering over the summit, to a heavy fall of snow.

The Gannets were then largely used for bait by the fishermen of Bryon Island, no less than forty boats being supplied from the Bird Rocks, and Audubon relates how a party of six killed with clubs five hundred and forty birds in less than an hour.

In 1860 Dr. Bryant estimated the number of Gannets breeding on the *summit* of the Great Rock alone at 50,000 *pairs*, the total number at 75,000 pairs, although these figures are very likely too high.

In 1872, owing to the erection of the light-house, the colony on top of the rock had become reduced to 5,000, and in 1881 Mr. Wm. Brewster found that the Gannets had been entirely driven from the summit, although the Little Rock was still densely populated. He places the total Gannet population of the rocks at 50,000, which is still an extraordinary and impressive number, although much less than the figures of previous observers.

In 1887, only six years later, not a single Gannet bred on the Little Rock, although perhaps a hundred and fifty may have found nesting places on the Pillar, while according to M. Turbid not more than ten thousand dwelt on the ledges of the Great Rock.

Besides the Bird Rocks the only large colony of Gannets in the Gulf of St. Lawrence is at Bonaventure Island, on the Canadian coast, where, on the lofty and vertical cliffs of the eastern side (250 feet high), these birds breed in a state of semi-security. Dr. Bryant inadvertently locates this colony at Percé, or Arch Rock, but although this curious and inaccessible islet is only a mile or so distant, and the birds breeding on its summit are perfectly safe, not a single Gannet is to be found among them.

Here, too, the number of Gannets has greatly diminished, and when later on we visited Bonaventure Captain Collins expressed surprise at the marked decrease in their numbers. That this colony ever compared in extent with that at the Bird Rock is very doubtful, although Dr. Bryant states that it is "perhaps even more remarkable."

A few Gannets were found at Perroquet Island of the Mingan group, in spite of the incessant persecution of the Indians who regularly make a clean sweep there. In 1860 Dr. Bryant predicted that the locality would soon be deserted, but in 1881 Mr. Brewster found several hundred birds still there, although shortly after his visit the Indians took every egg.

No Gannets were seen east of Mingan, and none on the eastern coast of Newfoundland, although in the time of Cartier there seems to have been a colony of these birds on Funk Island, where, if one may credit the testimony of fishermen, they were still breeding thirty years ago.

The same decrease of Gannets seems to be taking place elsewhere, and Professor Newton tells me that at Lundy Island in the Bristol Chan-

nel, the only British locality where this bird is found, there were in 1887 but a dozen pairs left.

The decrease of Gannets at the Bird Rocks is the most perceptible owing to their size, but the smaller birds have doubtless suffered in the same proportion. Scarce a day passes during fine weather without a visit from fishermen * in search of eggs or Murres, these latter being used for food and making a not unpalatable stew.

Many barrels of eggs are gathered during the season, and altogether the birds lead rather a precarious existence. Still a large portion of the Great Rock is practically inaccessible, and unless the feather hunters afflict this interesting spot with their presence the birds may continue to breed here in diminished numbers for long years to come.

The extermination of birds is largely a question of sentiment, but these sea-fowl exist in such numbers that they play a not unimportant part in supplying food to the residents of the gulf and coast of Labrador, and hence their extirpation is to be doubly deplored.

There is a law regulating the taking of eggs, and if this were observed, or could be strictly enforced, a large number of eggs could be gathered annually while at the same time the number of birds would steadily increase. But in a region so thinly peopled as the coasts of Labrador and the gulf, game laws are difficult to enforce and each party of fishermen acts on the principle that it is useless to leave what the next visitor will be sure to take.

Mr. Turbid, however, who has resided on the Great Rock as light-keeper since 1880, states that latterly the birds are on the increase and that in the last eight years the Murres have doubled in numbers, the Gannets increased one-third, and the other birds from one quarter to one-third. Mr. Turbid also told us that the Murres were becoming used to the fog-gun, which at the time of Mr. Brewster's visit was, indirectly, a source of great destruction.

At each discharge the frightened Murres fly from the rock in clouds, nearly every setting bird taking its egg into the air between its thighs and dropping it after flying a few yards. This was repeatedly observed during our visit, and more than once a perfect shower of eggs fell into the water around our boat. So seriously had the Murre suffered from this cause that many of the ledges on the side of the rock where the gun was fired had been swept almost clear of eggs.†

It was the intention to have visited the Cape la Hune Penguin Islands, but rough weather made this impracticable, and from the Bird Rocks the *Grampus* went direct to St. John's, Newfoundland. Here we had the pleasure of meeting the Rev. M. Harvey, who most kindly gave us all the aid in his power, and here Capt. Duncan Baxter joined the vessel as Newfoundland pilot, although he also rendered most efficient aid as a collector.

* We found a party on the Little Rock at the time of our visit, and later in the day another boat's crew landed on the westerly beach of the Great Rock.

†Brewster, Proc. Bost. Soc. Nat. Hist., Vol. xxii, p. 410.

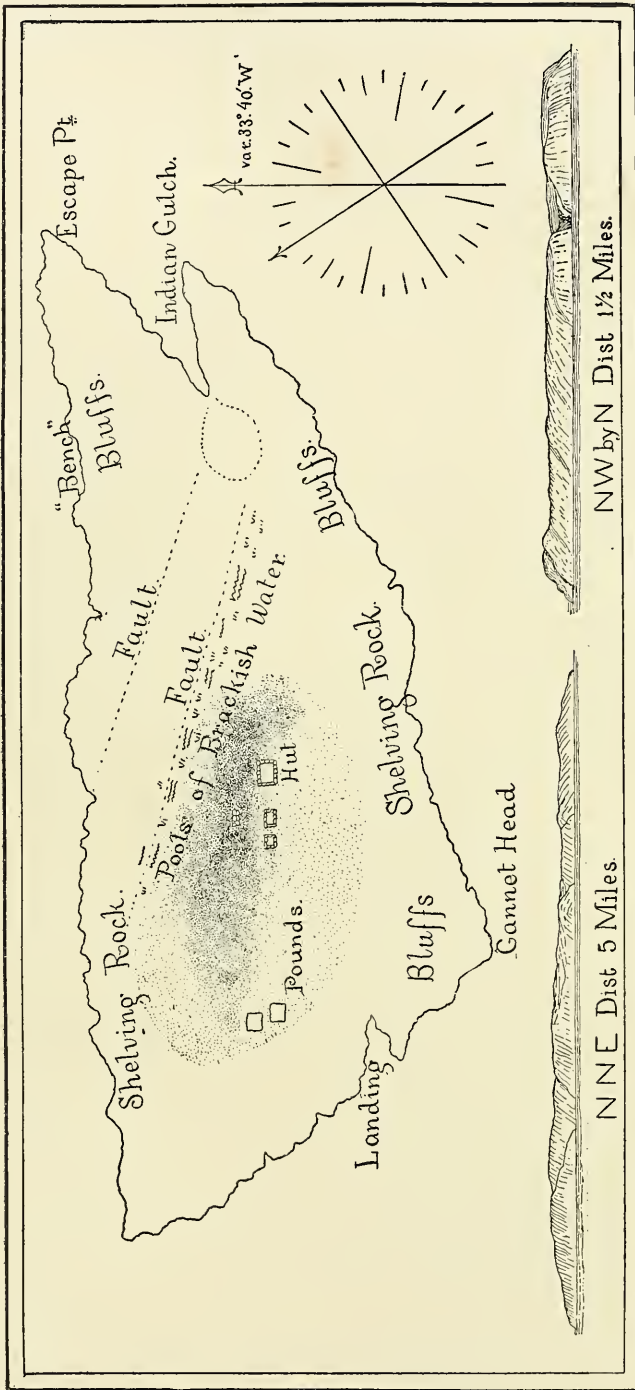
EXPLANATION OF PLATE LXXI.

SKETCH MAP OF FUNK ISLAND.

Outline from British Admiralty Chart; details by F. A. Lucas; elevations by Capt. J. W. Collins.

The shaded portion indicates the location of remains of the Great Auk; intensity of shade denoting corresponding abundance of bones.

To an observer on the island, the eastern and western points seem more rounded than given on the chart.



SKETCH MAP OF FUNK ISLAND.

During our stay at St. John's we met several fishermen who had visited Funk Island on eggging expeditions, but beyond ascertaining the position of the best landing little knowledge was gained, nothing concerning the character of the soil, or the chances for and against securing remains of the Great Auk.

Leaving St. John's on the morning of July 21, we sailed northward toward Cape Bonavista, a headland that still bears its original appellation, following almost exactly the track pursued by Cartier's vessels more than three centuries ago.

Daybreak on the morning of the 22d found us in sight of Funk Island, but the wind was so light that not until noon were we near enough for a boat to be lowered and a start made for the shore.

But two collectors had visited Funk Island before us, Peter Stuvitz in 1841 and Prof. J. W. Milne in 1874, both of whom had been compelled to cut short their stay and hasten back to their vessels on account of threatening weather. Warned by their experience, it had been decided to take ashore in the first boat a camping outfit and provisions for several days, so that in the not impossible event of a fog or fresh breeze springing up we could remain on the island and proceed with work while the *Grampus* sought safer quarters.

Accordingly the dory set out with a load large enough and varied enough to have started a small country store. Besides tent and tent poles, a huge firkin of provisions, and three breakers of water there were digging utensils of various descriptions, a gun and plenty of ammunition, buckets, baskets, rope, anchor, and a general wilderness of rubber boots, coats, and southwesters.

We were not, however, compelled to avail ourselves of these elaborate preparations, for the weather continued so fair that at night we returned to the *Grampus*, and although after sunset the wind freshened and next morning the weather looked decidedly threatening, the squalls passed over and gave place to light southerly breezes.

Viewing the island from a distance it had seemed possible with the faint air then stirring to beach a boat on the southerly slope; but closer approach transformed the narrow line of foam and gently shelving rock into the wash of a heavy swell on a steep and slippery slope of granite, whereon landing was quite out of the question.

The best landing is at a spot termed "The Bench," lying a hundred yards or so to the west of the northeastern or Escape Point, and toward this portion of the island, where from time immemorial man had landed to despoil the feathered inhabitants, we directed our course.

The Bench is a narrow path, hewn by nature in the side of a low, almost vertical cliff, leading at high tide from the water's edge to perhaps 20 feet above it.

At the widest this path is 4 feet across, but from that it tapers either way to nothing, terminating at the upper end in a fissure just wide enough to accommodate one's foot, the rough granite furnishing a very good substitute for a hand-rail.

Below "the bench" the rock descends almost vertically to a depth of 120 feet beneath the sea, this combination of deep water and smooth, perpendicular rock offering no obstacle to chafe the sea into breaking, so that with southerly winds, as at the time of our visit, the swell merely rises and falls along the wall of rock.

With northerly winds this landing of course is impracticable, and boats then seek a more precarious spot near Gannet Head, on the southwest, where Stuvitz seems to have landed in 1841.

Once on "the bench" it is an easy matter to reach the summit of the island, either by scrambling directly up the face of the rock or by an easier but more circuitous path, if path it can be called, leading from the fissure in which "the bench" ends.

While the height of Funk Island is put down on the chart at 46 feet, it certainly looks to be much higher, whether seen from the deck of a vessel or viewed from the eastern bluffs.

The entire eastern end of the island is very precipitous, as is also the southwestern extremity, but on the northwest and along a lesser portion of the southern side the rock slopes gradually into the sea, and it was here that the Great Auk scrambled through the breakers to meet its fate.

The greatest length of the island from east-northeast to west-southwest is about half a mile, its breadth a quarter, these distances being set down in the sailing directions as 800 and 400 yards.

Lying respectively 600 and 1,200 yards off the western point are two small, rounded islets, so low that they must be completely washed over in rough weather, and consequently untenable as breeding places.

Two faults, deepened by time into shallow valleys, divide the island into three ridges running nearly east and west. The northern and central of these are bare rock, for the most part smoothed and rounded by rain and ice, although here and there the decomposition of the felspar has formed curious, overhanging ledges, especially toward the eastern end.

In these depressions are numerous pools of brackish water, the more extensive—interspersed with patches that may be dignified by the name of marsh—lying along the line of the southernmost fault, which terminates in a small, natural amphitheater, floored with pebbles.

Growing amidst these pebbles were patches of a blue-flowering weed, around which white butterflies (*Pieris*) were sufficiently numerous to indicate that they were regular inhabitants of the island.

Indian Gulch, the eastern termination of the northern fault, opens into this amphitheater from the sea by a narrow cleft, into which the swell rushes in a seething torrent of foam, emphasizing the remark of the sailing directions that "at all times the scend of the sea would make it unsafe for a boat in such narrow waters."

A large portion of the southern and most extensive swell of rock is

thickly covered with vegetation*, this, the former breeding ground of the Great Auk, being mapped out in vivid green by the plants nourished by the decomposed bodies and slowly decomposing bones of the long extinct bird.

It would seem that the Auk inhabited every accessible foot of ground, the inability of the bird to fly restricting it of necessity to such portions of the island as could be reached after a landing had been effected on the northerly or southerly slope.

Any abrupt rise of smooth rock, although comparatively low, would interpose an insurmountable barrier to further progress, and from the character of the rock and total absence of bones, it does not seem that the Auk ever passed beyond the southernmost line of fault, or even reached the eastern part of the island.

Here the Auk bred in peace for ages, undisturbed by man† until that fateful day in June, 1534, when Cartier's crews inaugurated the slaughter that terminated only with the existence of the Great Auk.

Here to day the bones of myriads of Garefowl lie buried in the shallow soil formed above their moldered bodies, and here, in this vast Aline cemetery, are thickly scattered slabs of weathered granite, like so many crumbling tombstones marking the resting places of the departed Auks.

It is rather curious that these blocks of stone should be found on this part of the island, just where they would be most needed by man, but for some reason the rock seems to weather into slabs more on the southern rise than elsewhere. It is also an interesting coincidence, to say the least, that Robert Hore and another of the old navigators speak of Penguin Island as "very full of rocks and stones," although their accounts seem to refer to Cape la Huene, Penguin Islands, rather than to Funk Island.

* The following plants have been recorded from Funk Island.

* *Poa annua* L. Common in wet places.

* *Glyceria maritima* Wahl. Common in wet places.

* *Senecia vulgaris* L. Common in wet places.

† *Plantago maritima*. Along ponds.

* *Ranunculus hyperboreus* Rotlb.

* *Stellaria media*.

* *Cochlearia officinalis* L. Among pebbles at head of Indian Gulch.

† *Cochlearia fenestrata*.

* *Calopleurum guclini* Led.

† *Haloscias scoticum*.

† *Rumex*.

* *Chenopodium album* ?

* *Bynum knowltoni*; sp. nov.

Those preceded by an asterisk (*) were collected by Mr. William Palmer, and those preceded by the dagger (†) were noted by Professor Milne.

It is a little curious that but a single species was observed by both naturalists, the more that Professor Milne was on the island but half an hour and Mr. Palmer parts of two days.

† A paddle and remains of canoes are said to have been found here, as well as stone arrow heads, and this would indicate visits from the Indians. Professor Milne considers this doubtful, owing to the indifferent seagoing qualities of the Beothuc canoes. There seems, too, no reason why they should incur the risk of visiting this island so far at sea when plenty of sea fowl could be obtained nearer home. Still, if the remains actually were found, they could scarcely have come here by accident.

On the summit of the island, and not far from the center, are the ruins of a stone hut, built of the abundant slabs, and visible for a considerable distance. This hut is said by Professor Milne to have been the residence of the party who resided on the island for a short time in 1863 for the purpose of procuring guano. But according to another account it was built for the accommodation of a sealing crew who, some years ago, was placed on the island to pass the winter and obtain the first chance at the seals who come down on the floe-ice in the spring. The entire crew, with the exception of the cook, were lost while out sealing, and the sole survivor rescued in an almost insane condition.

The strongest point in favor of the more poetic version is found in the fact that the guano party were on the island but a few days in summer, and they would scarcely have taken the trouble to build so substantial a dwelling.

In 1863* Mr. Thomas N. Molloy, now United States consul at St. John's, fitted out the expedition to seek for guano at Funk Island, Captains Burke and Glyndon being at the head of the enterprise. They landed on the island, taking with them a large skiff, while their schooner returned to the harbor of Seldom Come By, Fogo Island.

In all 35 tons of guano were secured, four laborers obtaining 20 tons in ten days. Five tons were sold at auction in St. John's for \$19 per ton and the remainder consigned to a Boston house, by whom it was in turn sent to Baltimore and Washington.

Just where the guano came from it is difficult to say, for there is now no trace of it on Funk Island, except in the shape of a strong smell on the bare rocks of the eastern part, resorted to by Murres and Razor-bills.

The climate is not favorable to the formation of guano deposits, such as are found in dry tropical regions, and on Funk Island the rain must long ago have washed out the soluble constituents of the old "soil" of that part of the island formerly inhabited by the Great Auk.

The soil consists of two distinct layers, the lower portion, formed during the occupancy of the Auk, being from 3 inches to 1 foot in thickness and consisting largely of fragments of egg shells, although next to bed rock are numerous angular pebbles of various sizes.

The black dust from the decayed, overlying vegetation and abundant patches of charcoal has filtered into the lower stratum, but so numerous are the fragments of egg-shells that the deposit has a yellowish gray color.

The upper layer of soil, also from 3 inches to 1 foot thick, has formed since the extermination of the Auk, principally by the growth and decay of vegetation nourished by their bodies.

In fact it is possible, from the character of the plant growth above, to tell something of the probable abundance of Auk remains below; thickness of the one indicating corresponding plenty of the other.

* Mr. Molloy gave the date as 1866, but as the "mummies" were certainly obtained in 1863, this may have been a slip of the pen.

So little could be ascertained regarding the soil of Funk Island, that we came provided even with a pickaxe, while we were told that we might be compelled to dig through several feet of turf in order to reach the bones of the Garefowl. The most thoroughly useful tools proved to be two clam hoes, with which rapid progress could be made through the matted roots and scanty soil.

Peter Stuvitz, who visited Funk Island in 1844, wrote that—

On the southwestern side a little vegetation is found and sufficient soil to support an extremely scanty flora; but it is there that I discovered remains of bones in great number, and it is probable that the thin layer of vegetable mould which is met with in that locality is due to the destruction of the animals to which they belonged.

The skeletons lie in a compact mass in the earth, and according to the depth at which they are found one can estimate the time necessary for the formation of the layer of mold above them. Moreover, this layer of earth was usually very thin, and in places the bones were not covered at all.

During the last forty or fifty years the thickness of the layer of earth formed is consequently not appreciable, for a slaughter of these birds sufficiently extensive for the accumulation of such heaps of bones must antedate that epoch.

On this side are found the stone inclosures called pounds, in which the hunters concealed themselves to slay the birds.*

This description is very accurate and is as true to-day as when it was written, except that the layer of soil is thicker, and vegetation more abundant. Two of the pounds near the western landing place, whose position is indicated on the accompanying map, still remain untouched and although the stones lie prostrate, not one is wanting. Remains of other pounds, more or less overgrown by weeds, are to be seen here and there along the central ridge of the island, and hard by the ruins of the hut recently mentioned are the traces of two other small structures partly hidden by the vegetation.

Concerning these there seems to be no tradition, but it is not at all improbable that they were the dwellings of the old-time destroyers of the Auk, for there is no reason why parties should not have passed the entire breeding season on the island in order to prosecute their work without interruption, and Cartwright says that this was done.

By placing the huts along the crest of the island they would be free from surface drainage during rains, while the "compounds" would naturally be located near the huts for convenience, and away from the water to avoid unnecessary fright to the landing birds.

The most abundant deposits of bones are found in the vicinity of the ruined hut, partially in the upper stratum of soil, where the bones of thousands of birds are mixed together in inextricable confusion.

In the upper layer of soil, too, lie the patches of charcoal and charred fragments of bones, showing where the kettles once swung in which the birds were parboiled to render plucking them an easy operation.

Tradition says that the bodies of the Great Auks were so fat that

* This is undoubtedly an error, for all other accounts agree in stating that the pounds were used for confining the birds until they should be needed.

they could be used for fuel, and while this seems a little doubtful it may yet be true, or partially so.

It certainly would have been a great convenience to the Auk exterminators to be thus relieved of the difficulty of bringing fire-wood from the mainland, more than 30 miles distant.

Close by the two best preserved pounds we upturned the sod over a circle 10 or 12 feet in diameter, beneath which was a compact layer of charcoal and bones, while not far away another excavation told as plainly as words that here was one of the last abiding places of the Auk.

Barely 2 inches of turf covered the shallow soil in which lay embedded a few fresh-looking bones of the Great Auk, mixed with others of its lesser relative, the Murre. Evidently at the time of this deposit the Great Auk was on the wane and its numbers were no longer sufficient to meet the demands of the feather hunters, who promptly supplied the deficiency with those of the bird most easily secured.

The Great Auk, by the way, is not the only bird which has been extirpated on Funk Island, for the Gannet lives in name alone, although Cartier found it abundant, and men still living remember to have seen the bird. Thanks to the efforts of the egggers, the numbers of birds of all species, with the possible exception of the Puffins, have been greatly lessened during the past twenty-five years.

Stuvitz in 1844 called Funk Island "a mountain of birds," and was above all surprised at the abundance of the Arctic and Common Tern, while in 1874 Professor Milne wrote that "although it was the 20th of July, we were almost everywhere in danger of placing our feet upon eggs."

We found the Arctic Terns still very numerous, and the shrill cries of the large flock that circled round our heads were so loud and incessant as to be positively annoying.

Their young, and eggs in an advanced stage of incubation were scattered here and there from one end of the island to the other, but not a single specimen of the Common Tern was noticed.

The number of Murres and Razor-bills was comparatively insignificant, and the few eggs of these species that were seen were placed in the most secluded spots attainable.

The Razor-bill in particular seems to be learning wisdom by bitter experience, and, as we first noticed at the Bird Rocks, hides its egg whenever practicable in some nook or cranny, or under an overhanging ledge where it will be safe from all intruders.

The Puffins, however, who find security in their burrows, exist in great numbers, and to them, at least, the extermination of the Great Auk has proved a decided advantage by providing soil in which to dig their habitations.

The entrance to each burrow is surrounded by small collections of Great Auk bones which these little resurrectionists have brought to

light, and the intermingled condition of the buried remains is in no small degree due to the labors of the busy Puffins.

During the day, perching upon the ruins of the hut, or standing on the blocks of granite, they watched our labors with mingled interest and suspicion, while towards sunset, returning from distant fishing expeditions they gathered along the bluffs in battalions, flanked by companies of Murres and Razor-bills.

The Puffins were the first to assure us of the success of the expedition, for the many specimens of the unmistakable humerus of the Great Auk contained in their little osteological collections were certain evidence of the quantities of bones that lay beneath the soil. The *modus operandi* in digging was to skim off the superficial layer of turf and with a few strokes of the hoe bring up some samples of bones. If, on inspection, the quality of the bones was found to be good, careful excavation with hoe and fingers followed, but if, as often happened, the exhumed bones were brown and weatherworn, another spot was tried at once.

Quantity was a secondary consideration, for where the remains were most abundant they were usually in a poor state of preservation, the more scattered specimens being the best.

On the northerly slope a stroke of the hoe made anywhere would bring to light at least a score of bones, but on the west, and more especially on the south, the deposits rapidly thinned out, although no spot was tried where Auk bones were not found, and it is no exaggeration to say that millions of Garefowl gave up their lives on these few acres of barren rock.

Professor Milne seems to have had some doubt of all the bones he discovered being those of the Great Auk, for he remarks: "at nearly every trial bones were found, but there was nothing that could be identified as ever having belonged to the bird for which I searched."

For the benefit of future visitors to Funk Island it may be said that bones, other than those of the Great Auk, are of very rare occurrence, so much so that two barrels of earth and bones, gathered haphazard, contained less than a handful belonging to any other bird.

Contrary to what might be supposed the more recent bones are in the worst state of preservation, for owing to their protection from the sun and the fact that they are kept damp for the greater part of the time, those found in the lower stratum of soil are in much better condition than those nearer the surface.

The majority of the bones are weather-worn, others are stained but perfect, while now and then a bone may be found looking as fresh and white as if the bird to which it belonged had been killed but a year or so ago.

Some of the best preserved bones lay at the entrance of Puffin burrows and had evidently been brought to light in the course of their spring house-cleaning, but it proved a futile task to follow the course of the hole in the hope of finding others equally good.

The skull usually breaks across at the articulation of the nasals with the frontals and many a time did we work carefully around the point of some projecting beak only to find that the back of the skull was entirely lacking. The sternum and pelvis are very rarely found in good condition, the thinness of these bones, and their immediate contact with the viscera having caused their rapid decay so that although we disinterred hundreds we succeeded in obtaining but a single perfect specimen of each.

It would seem that these alpine remains are rapidly deteriorating, although so few visits have been made to Funk Island with the view of procuring bones that it is difficult to make comparisons, while at the same time the element of luck must, to a large extent, enter into the finding of buried bones.

In 1863 three "mummies," or dried bodies of Great Auks, were secured by the party in search of guano, and in 1874 Professor Milne obtained in half an hour bones representing fifty individuals, from which four more or less complete skeletons were constructed.

In 1887 our party passed portions of two busy days in exhuming thousands of bones, and yet this great number will "make up" not more than a dozen skeletons, and these not absolutely perfect, while no entire specimen was found, although in the hope of coming upon a "mummy" holes were dug in many places quite to the bed rock. Neither did we secure more than a single membranous lining of the egg of the Great Auk, although Professor Milne in less than half an hour found "the inner linings of a few eggs."

The mixed condition of the remains has already been alluded to, and so completely are the bones intermingled, that after many endeavors to obtain those of a single individual, the attempt was abandoned in despair, heads and feet, sterna and pelves being intimately associated with one another, and not more than six, or at the most eight, consecutive vertebræ being found together.

An idea of the great abundance of bones may be gathered from the fact that while many humeri were thrown aside while digging the collection was found to contain over fourteen hundred specimens of this bone.

Every part of the skeleton was secured, including even the small ethmo turbinals, although in spite of careful search but one or two of the first rib and third phalanx of the wing were found.

The number of bones from young birds is extremely small, but this all but total lack of them is readily accounted for by the fact that after the merciless slaughter of the Auks had fairly commenced, few, if any, eggs were allowed to hatch.

There was a small number of diseased bones present, the result of injuries, and one of these, a broken and re-united ulna, had apparently been shattered by a shot. Comparatively few of the crania show any evidence of their original owner having met with a violent death, but

this is largely due to the selection of the best specimens that offered; any that were obviously poor being passed by.

Professor Milne remarks that "the fact that there remains no evidence of cuts or blows leads to the supposition that these birds may have died peacefully" but some of the crania *do* show the marks of cuts and blows, and, moreover, there is plenty of local history or tradition to show exactly how these birds were done to the death.

It should also be borne in mind that birds seldom die peacefully, for nature rarely accords this boon to her subjects, and when they do meet their end, they seem to have a habit of making away with their skeletons: it would be more accurate to say have their skeletons made away with, for dead birds do not often go to waste, but usually find their way into the stomach of some hungry animal, possibly of the same race.

Dr. Stejneger tells me that during his stay at the Commander Islands many sea birds were washed ashore during or after gales, but unless one was on the beach before daylight the bodies were destroyed by foxes. Even in the immense guano deposits of the Chinch Islands, where every circumstance is favorable to the preservation of inhumed specimens, bird remains are of comparatively rare occurrence, while in localities where the climate is subject to extremes of heat and cold, rain and sunshine, they go to pieces rapidly.

It was not without regret that we prepared to leave so interesting a spot as Funk Island, but having successfully accomplished our mission of collecting bones of the Great Auk, no good reason remained for a longer stay when many miles of our proposed route yet remained to be traversed. Accordingly we gathered up our various impedimenta, the boat was brought alongside "the bench" for the last time, and laden with the spoils of our two days' labor we returned to the *Grampus*, which lay at anchor a mile to the eastward of Escape Point.

Fortune continued to smile on us, and as the threatening weather of the morning had given way to calm, so now that we were ready to leave a fair breeze sprang up that carried us rapidly toward the mainland.

Funk Island grew lower and lower in the distance, and as the sun was nearing the western horizon we bade the home of the Great Auk a long farewell.

It was the intention to visit, if possible, any localities whose names indicated that the Great Auk might once have been found there, especially Penguin Islands on the south coast, and Penguin Islands near Cape Freels. A brisk southwester drove us by the former place at a very lively pace, while with the visit to Funk Island still in prospect, it was not deemed advisable to lose any time in waiting for the wind and sea to go down, so this portion of the trip was abandoned.

On the eastern coast, however, the weather was more favorable; so after leaving Funk Island, the *Grampus* ran over to the well-named harbor of Seldom Come By, and the next morning started for Penguin

Islands, which lie about 3 miles from shore and 10 miles northwest of Cape Freels.

Passing Peckford Reef, the Schoolmarm, and Scrub Rocks (nature is very liberal with rocks and reefs in this part of the world), the *Grampus* anchored at noon off two low, grassy islets, whose appearance was not at all suggestive of an Alcine breeding place. Nor did careful examination reveal any traces of former habitation by the Great Auk, and if the bird once dwelt here, he left nothing behind to indicate the fact, for not a bone, nor even a speck of eggshell could be found.

This is in marked contrast with the condition of affairs at Funk Island, where, aside from the bones that the upturned sod shows everywhere present, the soil itself, thickly sprinkled with crumbled egg shells, bears mute testimony to long years of occupancy by the Great Auk.

Still one of these islets *may* be that certain flat island where Captain Richard Whitbourne tells us men "drave the Penguins on a board into their boats by hundreds at a time," although it must be said that this and similar stories have rather an apochryphal ring to them. Certainly so easy a method of loading a boat with Garefowl, as that of putting out a gang plank and driving them aboard like sheep, was not of common occurrence at Funk Island, where the slope of the rock and wash of the sea would render such a thing impossible.

Although at the time of our visit it was remarkably calm, yet the boat rose and fell along the cliff 4 or 5 feet at every heave of the swell, while on the sloping rock, even to leeward, the sea came rolling in in a manner fit to test the seaworthiness of a Great Auk, to say nothing of a small boat.

Whoever may have been the former residents of Penguin Islands, to-day their most numerous inhabitants are field mice (*Arvicola riparia*), which, if one may judge by the abundance of their burrows, exist in almost incredible numbers, while well worn connecting paths cover the ground in places with a veritable network.

A little investigation showed that many of the deserted burrows, possibly some recent ones also, had been taken possession of by breeding petrels (*Oceanodroma leucorhoa*) which were thus saved the trouble of digging their own nesting places.

A few Puffins (*Fratercula arctica*) are also found on the island, but they seemed to have been no more successful than ourselves in finding bones, for none lay scattered about the entrance to their holes.

Taking into consideration the general character of the islets, the thickness of the turf that covers them, their nearness to shore and the absence of remains of the Great Auk, it seems at least doubtful if the bird ever dwelt here, although the absence of remains is, it must be said, negative evidence of but small value.

If the Great Auk once bred in this vicinity, Offer Wadham, 9 miles farther seaward, is much more likely to have been its habitat, but it may be questioned if the bird was found there in historic times.

There can be little doubt that the extent of the breeding range of the Great Auk has been as a rule much overestimated, and the writer's own belief is that, like the Gannet, the Garefowl was confined to a very few localities. This is known to have been the case in Europe, and, while the fact is more difficult to prove in regard to America, it must be borne in mind that all definite accounts of the Great Auk in the New World point to, at the most, three or four localities, although during its migrations the bird occurred along the Atlantic coast from Newfoundland to Virginia.

Had it been otherwise, and had the Great Auk, as is so often stated, bred at numerous localities along the coasts of Newfoundland and Labrador, the bird in limited numbers would probably be alive to-day.

The circumstance that the bird, with suicidal persistence, resorted to a few chosen breeding places, and that it was there found in great numbers, rendered its destruction not only possible but probable, and when the white man first set foot in America, the extinction of the Great Auk became merely a question of time.

The only thing that has kept the Gannet from sharing the fate of the Garefowl is the inaccessible nature of its nesting places, and even this may not save him much longer, while the Razor-bill and Murre, in spite of their wide range and similar choice of steep cliffs whereon to raise their young, have sadly fallen off in numbers.

This decrease is due to the fact that the eggs of these birds are taken at all seasons when they are to be had, and although the law may check the practice it can not put a stop to it, so that the sea-fowl are gradually lessening in number. Still it is scarcely probable that any of the smaller Auks will suffer the fate of their great relative whose flightlessness foreordained its extermination, and whose sole chance for safety lay in the choice of unknown or inaccessible breeding grounds.

B.—SKELETAL VARIATION OF THE GREAT AUK.

The material collected by the *Grampus* comprised 2 cubic feet of earth brought away as nearly as possible undisturbed, in order to show the bones *in situ*, a barrel of Auk remains gathered along the crest of the island, and nearly another barrel of select material, containing the best preserved bones that could be found.

The disposition so far made of this material is as follows: a perfect skeleton has been placed in the exhibition series of the U. S. National Museum, one has been presented to the Museum of Comparative Zoölogy, Cambridge, Massachusetts, and another to the American Museum of Natural History, New York.*

One specimen, sent in exchange to a well-known London dealer in natural history material, has found its way to the Museum of Science

* It is of course understood that these skeletons are "made up" from bones of various individuals.

and Art, Edinburgh, and another has been sent in exchange to the Australian Museum, Sydney, New South Wales. Two skeletons are retained for the reserve series, U. S. National Museum, and three or four less complete can still be made up from the bones remaining, while there is besides a large number of individual bones, good, bad, and indifferent, left for study.

This wealth of material has offered an unusual opportunity for the study of individual variation, and it is hoped that the following notes may be of some interest in connection with that most interesting problem.

Unfortunately the conditions under which the remains were found limited all comparisons to individual bones, the inextricably mixed state of the skeletons precluding all possibility of comparing them with one another in their entirety.

Variations are of degree or of kind, due to modifications of development or of structure, and the importance of any departure from a given type depends very largely on the answer to the question to which of these two categories does the variation belong. Moreover, in considering the variations of any one species the variations of the group to which that species belongs must be taken into consideration also, as well as the liability to modification of each and every part.

Differences of size, unless excessive, are of little value, provided the parts preserve their relative proportions, and in judging of differences in proportion the age of the individual must be taken into account. This fact was very strongly impressed upon the writer many years ago by the study of an extensive series of skulls of the Orang, representing individuals of all ages, and Mr. J. A. Allen has noted similar differences, due to age, in skulls of the spider monkey.

The examination of some considerable series of skeletons of various animals has confirmed my belief in the existence of a large amount of individual variation, while at the same time creating an equal belief that, as a rule, the difference between specific and individual variation is readily recognizable.

In the present case the amount of variation is no more than might be expected to be found in any large bird were an equal series of bones examined. The skulls in particular present a striking similarity not only in shape but in size, and of seventeen crania ten have exactly the same parietal breadth, while the largest differs from the smallest by little more than 6^{mm}, a difference that must be considered trivial when the size of the skull is taken into account. Moreover, this variation is due to two skulls, one of which is unusually large, while the other is equally small.

By far the largest skull on record is one collected by Professor Milne and now in the museum of the University of Cambridge, England. The measurements of this specimen appear in the table given farther on.

The shape of the foramen magnum and the number of perforations

in the depressions for the supraorbital glands are of no value whatever, nor is the varying outline of the region bounded by the supraorbital, temporal, and crotaphyte fossæ of much more importance, since these are all characters largely influenced by age.

Mr. G. K. Gilbert's address on special processes of research suggested that the graphic method might be employed to good advantage in showing the relative sizes and range of variation in the crania, and also in some of the other bones, as well as the correspondence in size between bones from the right and left sides.

	43	44	45	46	47	48	49	50	51
150	•					••			○
151									
152			•			•	○		○
153					••				
154									
155						○• ○•			
156									
157						••			
158					•	○• ○•			
159			••						
160						•• ••	○ ○		
161									
162						••			
163									
164									
165							○	•	

Diagram showing the length and breadth of sixteen skulls of the Great Auk. The vertical columns give the length, the horizontal columns the breadth, in millimeters. Black dots indicate parietal breadth; circles indicate frontal breadth.

The table giving the relative measurements of crania shows that, as might have been expected, the length is subject to greater positive variation than either the frontal or parietal breadth, although the comparative variation of these parts is greater than the linear variation. The table shows very clearly too that the frontal and parietal width of the greater number of crania is the same—48^{mm}, and that the frontal width is slightly in excess of the parietal.

The amount of linear variation is 15^{mm}, the frontal 7^{mm}, and the parietal 8^{mm}.

The vertebræ differ considerably among themselves in size, but for reasons already given it is impossible to determine the amount of variation in the vertebral column taken in its entirety.

The odontoid notch of the atlas presents great diversity of shape, appearing in two cases as a mere slit, while in three out of fifteen specimens ossification has bridged over the notch and converted it into a foramen so that the atlas presents very much the appearance of having belonged to one of the higher altrices.

The shape and size of the neural canal varies, but it is always wider than high. The centrum of the axis is subject to much variation in size and shape, and the various processes are equally diversified. In very rare instances the vertebral artery sends a branch upward through a minute foramen at the base of the metapophysis, but ordinarily there is only a notch present at this spot. The sixth to ninth cervicals, inclusive, have many features in common and these resemblances render it extremely difficult to distinguish them from one another when, as in the present instance, a large number are mixed together, since, for example, the sixth vertebra of a large bird is almost the exact counterpart of the seventh of a smaller specimen. In fact, but for Professor Owen's memoir on the Great Auk, the "making up" of skeletons would have been extremely difficult owing to the amount of individual variation.

The tenth cervical, however, was shown by Professor Owen's paper to have a very characteristic shape, being distinguished by a broad hypapophysis directed forward, and this furnished one point of departure for the arrangement of the vertebral column.

In the dorsal region there are differences in the development of the hypapophyses, but these seem as might be supposed, to be correlated with differences in the size and strength of individuals.

The length, strength, and curvature of dorsal and sternal ribs is of course variable, and the number of epipleural appendages seems to have been by no means constant.

It may be said that comparatively few epipleurals could be found, as these little bones are so thin that they readily decompose.

The skeleton described by Professor Owen seems to have been that of a very old bird, and epipleurals were present on the second pair of cervical ribs, this, in the light of the material in hand, being of extremely rare occurrence.

A most interesting and instructive variation is of frequent occurrence in the "sacrum" which is composed of fourteen vertebræ, the first bearing the eighth, and ordinarily the last, pair of ribs. But it often happens that the second sacral also shows articulations, indicating the presence of a ninth pair of ribs, and it is interesting to note that when this extra pair of ribs is present there is usually found to be a rudimentary pair of parapophyses developed on the first true sacral, as if the rib creating force had been felt still further down the line of vertebræ.

Twenty-three out of one hundred and forty-four sacra had an extra,

ninth, pair of ribs, and one had an extra rib on one side only. In one case the ninth pair of ribs was completely fused with the sacrum, showing not the slightest trace of former articulation, although the eighth pair was free. Twenty-three sacra also, but not those just noted, were composed of fifteen vertebræ, owing to the inclusion of the seventh dorsal by ankylosis. Of course the number of caudals included in the sacral mass may be one less or one more, this depending largely on the age of the individual; but the normal "sacrum" is composed of five pre-sacrals, three true sacrals, and six uro-sacrals.

The Great Auk has the characteristic alpine sternum, and this is subject to the same variations found in other members of the family, the xiphoidal extremity being entire, perforate or notched.

These differences are largely due to age, notches becoming transformed into foramina, and foramina being obliterated by the extension of ossification into the membrane filling the vacuities. The same thing may be seen to some extent in the Loons, and the character of the xiphoid extremity of the sternum has by no means the same value among the generalized water birds that it has among the more specialized Passeres.

The extra ribs furnish another case in point, for although variation in the number of ribs is liable to occur among mammals, and is not infrequent in passerine birds, such variation would naturally be oftener found in more generalized forms.

The greater the number of similar skeletal parts and the more generalized the form the greater would seem the tendency to variation. Thus among the Urodele Batrachia the number of presacral vertebræ is not specifically constant, and so frequent are variations in the post-sacral region that total number of vertebræ is almost of no importance even as a specific character.

Fishes might seem to offer an exception to this for in the families *Serranidae*, *Sparidae* and *Carangidae* the number of abdominal and caudal vertebræ is not only remarkably constant for the species, but even for the family. But these fishes have a comparatively small number of vertebral segments (generally ten to fourteen), while in other members of the same superfamily, groups in which the number of vertebræ is greater, the amount of variation is greater. And the specialized Acanthopterygians mentioned stand in relation to other fishes much as the Passeres do to other birds.* Occasionally eight pairs of ribs were connected with the costal margin of the sternum, the normal number thus attached being seven.

It would be interesting to know if the sterna with eight pairs of costal facets belonged to the birds, with nine pairs of ribs, but this question can not be answered, although from one or two similar instances that have come under my notice among other birds it is quite probable that this was the case.

* For the above facts pertaining to fishes I am indebted to Dr. Theo. Gill.

The following table gives the result of the examination of thirty-one sterna, although it should be said that in some cases one costal border was wholly or partially lacking. Still as only one case occurs among the entire sterna in which the number of ribs attached to each side varied, the fact is comparatively unimportant.

Sterna with six pairs of articular facets	1
Sterna with seven pairs of articular facets	23
Sterna with eight pairs of articular facets.....	6
Sterna with seven facets on one side and eight on the other	1
Total number of sterna examined.....	31

Of the sterna with eight pairs of articular facets two had evidently borne a hæmapophysis attached to the second, posterior cervical rib. While the coracoid presents considerable variety in the amount of development of the epicoracoid as well as in the shape and extent of the sternal articular surface, it is always unmistakable in its general contour, and the same may be said of nearly all the bones of the Great Auk.

The greater number of humeri are from 103 to 108 ^{mm} in length, and it is interesting to note that the mean of three hundred humeri agrees very nicely with these figures, being 105.75 ^{mm}.

This bone, perhaps the most characteristic of the entire skeleton, seems to vary less in its proportions than any of the other long bones, not presenting such perceptible differences in diameter as are found in either the femur or tibia.

It is a little singular that the greatest amount of linear variation—taking into consideration the length of the bone—should be found in the femur, while it also shows very considerable differences of proportion, some femora being much more slender than others of the same length, the longest not always being the strongest.

The same differences of length and proportions found in the femur obtain to a lesser degree in the tibia, and also in the tarsus. This last bone occasionally develops a small tubercle on the postero-internal edge, about where the first metatarsal arises in four-toed birds, a peculiarity noticed by Professor Milne.

Thirteen out of one hundred and forty-two tarsi have this tubercle, and although it ordinarily appears to form an integral part of the tarsus there are some specimens which indicate that in young birds it may have been free, so that the tubercle probably represents a rudimentary first metatarsal.

This and the frequent presence of an extra pair of ribs would seem to be reversionary characters, hinting at some ancestral form with more digits and more ribs than the Great Auk.

The measurements of so considerable a number of bones from opposite sides may be looked upon as throwing some light on the question of correspondence in size between bones from the right and left sides,

although naturally the results are by no means so satisfactory as if each pair of bones came from one individual.

The bones measured were taken at hap-hazard, care being taken only to select such as were in good condition and whose measurements would not be lessened by any wearing away of their extremities. In the three following tables the vertical columns show the number of individuals, the horizontal giving the extreme length of the bone, in a straight line, in millimeters. The unbroken line represents bones from the right side, the interrupted line those from the left. In all cases an equal number of bones were taken from either side.

In all cases the perpendicular column indicates number of individuals, the horizontal column length in millimeters.

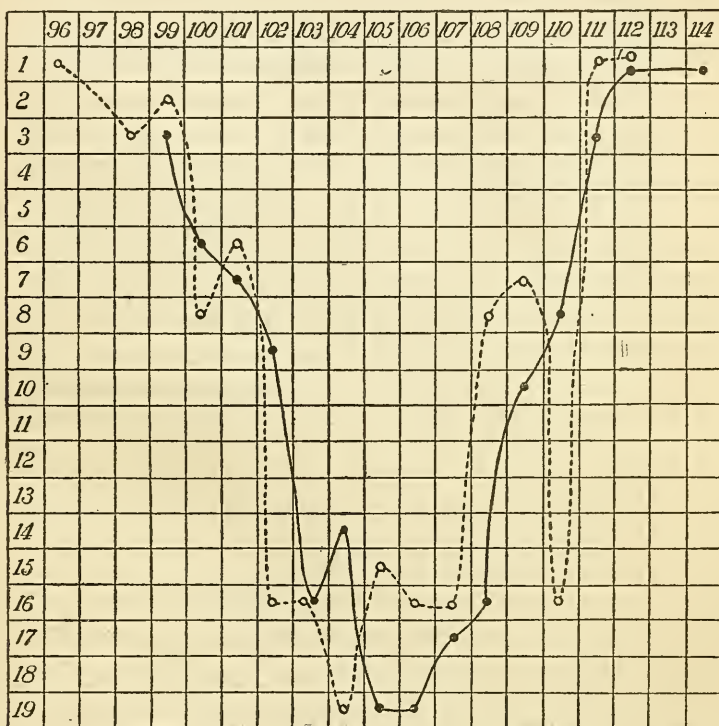


Diagram showing the measurements of three hundred humeri of the Great Auk, and the relation between those of the right and left side.

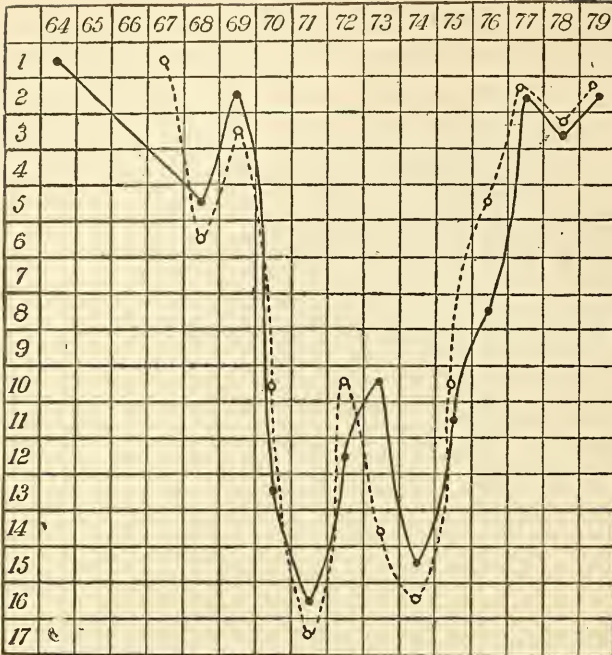


Diagram showing the measurements of two hundred femora of the Great Auk, and the relations between those of the right and left sides.

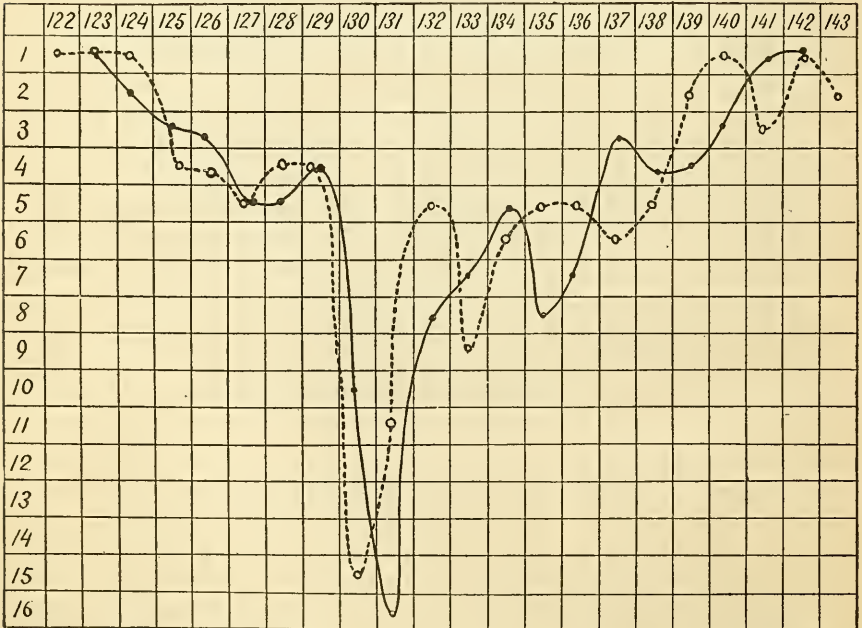


Diagram showing the measurements of two hundred tibiae of the Great Auk, and the relations between those of the right and left sides.

It is singular that the closest correspondence between the curves representing right and left sides should be exhibited by the diagrams giving the measurements of the femur, the most variable bone—while the least harmony is found among the humeri, bones which differ least among themselves.

This discrepancy is caused by an unusually large number of left humeri having a length of 110^{mm}, but on the whole the curves follow one another very closely, the maximum point being reached with great unanimity, and the sizes of the bones decreasing or increasing quite regularly from that.

From the examination of this large amount of material it would seem that considerable variation may exist in the size of individuals, that the number of ribs may be slightly inconstant and that a certain amount of variation may be found in the development of the various processes of the vertebræ. On the other hand the skull, sternum, and pelvis afford very substantial comparative characters.

In regard to the question of size, it can be said that there is nothing, as in the case of *Didine* remains, to indicate sexual difference in this particular, for between the largest and the smallest bones may be found all intermediate grades.

This, however, is what might have been expected, for the *Alcidae* present but slight sexual variations in size, while Professor Newton has pointed out a good reason for the slight amount of proportional variation in the fact that the bones represent individuals from the same epoch and locality, and not those separated from one another by long intervals of time or space.

Measurements, in millimeters, of Crania of the Great Auk.

	Cam- bridge,	18220.	18117.	18120.	18231.	18232.	18233.
Greatest length between perpendiculars...	165	150	152	152	158	155	162
Greatest parietal breadth above articula- tion of quadrate	50	48	45	48	48	48	48
Greatest post frontal breadth.....	49	51	49	51	48	48	48
Height from basi-sphenoid to frontal	32	32	33	32	32	33	33
Height of culmen immediately in front of nasal opening.....	25	22	22	22	23	23	23
Length from posterior end of occipital ridge to root of intermaxillary	62	61	58	61	58	61	61
Length of mandible	142	137	135	144	139	142	139
Length of mandibular symphysis	27	24	26	23	23	25	23

Measurements, in millimeters, of Crania of the Great Auk—Continued.

	A.	B.	C.	D.	E.	F.	G.	H.	I.
Greatest length between perpendiculars . . .	150	160	160	158	160	159	153	155	157
Greatest parietal breadth above articulation of quadrate	43	48	48	47	48	45	47	48	48
Greatest post frontal breadth	48	51	51	48	51	45	48	48	51
Highest from basi-sphenoid to frontal	30	33	34	33	33	32	.....	33	32
Height of culmen immediately in front of nasal opening	23	25	26	22	23	22	23	22	24
Length from posterior end of occipital ridge to root of intermaxillary	54	63	61	62	61	60	61	69	63
Length of mandible	135	139	144	142	141	146	145	.....	.....
Length of mandibular symphysis	23	24	25	23	23	23	23	.....	.....

Measurements, in millimeters, of Sterna of Great Auk.

	A.	B.	C.	D.	E.	18117.
Length from manubrium to xiphoid extremity	211	193	196	204	206	196
Width across first pair of costal articulations	69	62	66	64	64	64
Width across seventh pair of costal articulations	48	47	49	45	.....	45
Xiphoid border, entire, notched, or perforate	1 perforation	2 notches	Entire.	2 perforations	Entire.	1 notch.
Least width	45	43	46	43	.....	45
Greatest posterior width	58	56	54	.....	.....	58
Depth from manubrium to keel	Broken	54	58	53	58	56

C.—LIST OF BOOKS AND PAPERS RELATING TO THE GREAT AUK

Although it is believed that no paper of importance has been omitted from this list, it is by no means a complete bibliography of the literature pertaining to the Great Auk.

The numerous incomplete lists of specimens have been designedly left out, as well as the republications of many articles and some short notes that contributed nothing to the subject.

Some short notes are cited from their bearing on particular points in the history of the Great Auk, and the earlier allusions to the Garefowl in America are included, owing to the general interest attached to them.

I am greatly indebted to Mr. Stejneger for assistance in preparing this portion of the paper, and have drawn upon the bibliography of Dr. Coues and from the monograph of Mr. Grieve, which contains a host of valuable references to the earlier notices of the Great Auk.

The edition of Hakluyt cited is that of 1600.

1534. Cartier, Jaques. The first relation of Jaques Carthier of S. Malo, of the new land called New France, newly discovered in the year of our Lord 1534.

<Hakluyt. Collection of voyages, vol. III, pp. 201-212.

Contains (p. 202) the earliest known reference to the Great Auk in America, and an account of Cartier's visit to Funk Island. Page 205 describes the Bird Rocks and again speaks of the Apponatz.

1535. Cartier, Jaques. A shorte and briefe narration of the navigations made by the commandment of the King of France to the ilands of Canada, Hochelaga, Saguenay, and divers others which now are called New France, with the particular customs and maners of the inhabitants therein.
Hakluyt pp. 212-232.
Cartier's second voyage. On the 7th of July the ships stopped at Funk Island (the island of birds) for provisions, this being the part of Newfoundland they first reached. "The Iland of Birds * * * lyeth from the maine land 14 leagues, * * * it "hath the pole elevated 49 degrees and 40 minutes."
1536. Hore, Robert. The voyage of M. Hore and divers other gentlemen, to Newfoundland and Cape Briton in the yere 1536 and in the 28th yere of King Henry the 8.
Hakluyt, 129-131.
On page 130 is a reference to the island of Penguin, which from the course steered from Cape Breton would seem to be Penguin Islands, off Cape la Hune.
1578. Parkhurst, Antonie. A letter written to M. Richard Hakluyt, of the middle Temple, containing a report of the true state and commodities of Newfoundland, by M. Antonie Parkhurst, gentleman, 1578.
Hakluyt, 132-134.
On page 133 speaks of "one island named Penguin, where we may drive them [Great Auks], on a planke into our ship as many as shall lade her." This is almost the exact language used by Whitbourne, and it looks as if it had been taken by him from Parkhurst. Parkhurst seems to have been engaged in the fishing business, and gives a very careful account of the composition of the Newfoundland fishing fleet, showing that in his time the English were greatly in the minority.
1583. Haies, Edward. A report of the voyage and successe thereof, attempted in the yere of our Lord 1583, by Sir Humfrey Gilbert, knight. * * * Written by M. Edward Haies, gentleman, and principall actour in the same voyage.
* * *
- Hakluyt, pp. 143-161.
Records on page 149, passing Funk Island, and mentions the Great Auk and the use of the salted birds by the French fishermen.
1583. Parmenius, Steven. Letter to Richard Hakluyt concerning the voyage of Sir Humphrey Gilbert.
Hakluyt, pp. 162-163.
Parmenius was among those lost with Gilbert on the *Delight*. He writes (p. 162), that on the 1st of August they came to "an island which your men call Penguin, because of the multitude of birdes of the same name." Curiously enough he states that they saw no birds.
1593. Fisher, Richard. The voyage of the ship called the *Marigold* of M. Hill of Redriffe unto Cape Briton and beyond to the latitude of 44 degrees and an half; 1593. Written by Richard Fisher, Master Hilles man, of Redriffe.
Hakluyt, pp. 191-193.
Speaks (p. 192) of the Pengwyns as seen at Cape Briton.
1622. Whitbourne, Richard. A discourse and discovery of Newfoundland, etc., written by Captain Richard Whitbourne, of Exmouth, in the county of Devon * * * Imprinted at London by Felix Kinston, 1622.
1672. Josselyn, John. New England's rarities discovered in birds, beasts, fishes, serpents, and plants of that country, etc. By John Josselyn, gent. London, 1672.
Mentions "The wobble, an ill-favored fowl, having no long feathers in their pinions, which is the reason why they cannot fly."

1785. Cartwright, George. Journal of Transactions and Events during a residence of nearly sixteen years on the Coast of Labrador.
Vol. III, page 55. "The birds which the people bring from thence (Funk Island) they salt and eat in lieu of salted pork." * * * The poor inhabitants of Fogo Island make voyages there to load with birds and eggs. When the water is smooth they make their shallop fast to the shore, lay their gang-boards from the gunwale of the boat to the rocks, and then drive as many penguins on board as she will hold, for the wings of these birds being remarkably short they cannot fly. But it has been customary of late years for several crews of men to live all summer on that island, for the sole purpose of killing birds for their feathers; the destruction which they have made is incredible. If a stop is not soon put to that practice, the whole breed will be diminished to almost nothing, particularly the penguins, for this is now the only island they have left to breed upon." This long quotation is given for the many interesting points it contains.
1822. Faber. Prodomus der isländischen Ornithologie, Kopenhagen. 1822.
States that when visiting the Westman Islands in August, 1821, he was told that it had been twenty years since a Great Auk had been seen there.
- 1827-'38. Audubon, J. J. The Birds of America; from original drawings, London, 1827-'38. Plate 341. Ornithological Biography, vol. IV, p. 316.
While Audubon never saw the bird alive, his figure is undoubtedly the best published. The Great Auk was a stout, thick-necked bird, built much on the plan of the Razorbill, yet nearly all plates represent it as a sort of cross between a Murre and a Loon, with a small head, slender neck, and unduly obese body. Audubon's figure was probably made from an English specimen, and his knowledge of the bird's habits and habitat was derived from hearsay.
1837. Blyth, E. On the Osteology of the Great Auk (*Alca impennis*) in comparison with that of Sphenisci.
<P. Z. S., v. 837, pp. 122, 123.
1842. Bonnycastle, Richard. Newfoundland in 1842.
Vol. I, page 232, says that "the large Auk or Penguin (*Alca impennis* L.) which not fifty years ago was a sure sea-mark on the edge of and inside the banks, has totally disappeared from the ruthless trade in its eggs and skin."
1854. Lloyd, L. The Great Auk (*Alca impennis*) still found in Iceland.
<Edinb. New Philos. Journ., lvi, 1854, pp. 260-262.
Extract from his Scandinavi an Adventures, II, page 495.
- 1856-57. Steenstrup, J. Et Bidrag til Geirfuglens, *Alca impennis* Lin., Naturhistorie, og særligt til Kundskaben om dens tidligere Udbredningskreds.
<Vidensk. Meddel. Naturhist. Foren. Kjöbenhavn, for Aaret 1855, Nr. 3-7, 1856-'57, pp. 33-116, Kart og Tavle.
In this paper nearly all the known facts in regard to the Great Auk were brought together for the first time. Stuvitz's visit to Funk Island is quoted at some length and evidence brought forward to show that the Great Auk was not a dweller within the Arctic circle. There are two German and one French translation of this important paper, the most available being the French version in Bull. Soc. Ornith. Suisse, II, 1 e. pte., 1868, pp. 5-70.
- 1859? Charlton, E. On the Great Auk (*Alca impennis*).
<Trans. Tyneside Nat. Field Club, IV, 1859 (?), pp. 113 *et seq.* Reprinted in Zoologist, 1860, pp. 6883-6888.
Largely a compilation. Interesting as stating that the dried bodies of Auk and Guillemots are used for fuel on the Westmann Islands.
1860. McClintock, F. J. The Great Auk (*Alca impennis*).
<Zoologist, XVIII, 1860, 6981.
Notes that the Great Auk has not been met with by any of the modern Arctic expeditions.

1861. Newton, Alfred. Abstract of Mr. J. Wolley's Researches in Iceland, respecting the Gare-fowl, or Great Auk (*Alca impennis*, Linn).
 <Ibis, III, 1861, pp. 374-399. Reprinted in Zoologist, xx, 1862, pp. 8108-8130.
 An important paper, containing many bibliographical references. Shows the Great Auk to be extinct in Iceland, and that the bird never was so abundant there as had been supposed. Gives a very full account of the last specimens taken and their disposition.
1862. Preyer, W. Ueber *Plantus impennis* Brünn.
 <Journal für Ornithologie, x, 1862, pp. 110-124, 337-356.
 Systematic position, bibliography and synonymy, geographical distribution, past and present, and much historical matter.
1863. Newton, A. Remarks on the Exhibition of a Natural Mummy of *Alca Impennis*.
 <P. Z. S., 1862, pp. 435-438.
 This was one of the specimens obtained from Funk Island at the time the guano was removed.
1865. Field, E. Letter from the Right Rev. the Bishop of Newfoundland concerning the mummy of the Great Auk (*Alca impennis*) found on the Funk Islands.
 <Trans. Nova Scotia Inst. Nat. Sci., I, pt. III, 1865, p. 145.
 Notes that three "mummies" were found, one of which went to Prof. A. Newton, another to Prof. L. Agassiz, the third to J. M. Jones, president of the institution. This third specimen was presented by Mr. Jones to the British Museum.
1865. Owen, R. Description of the skeleton of the Great Auk, or Gare-Fowl (*Alca impennis*, L.).
 <Trans. Zool. Soc., London, Vol. v., pt. IV., 1865 (read 1864), pp. 317-335, pl. LI LIH, and a small map.
 A detailed description of the skeleton of the Great Auk, from one of the three "mummied" specimens obtained at Funk Island in 1863. The paper is only to a slight extent comparative, other *Alcidae* being very little touched upon, although some space is devoted to showing that the Great Auk was not related to the Penguins (*Spheniscidae*).
1865. Newton, Alfred. The Gare-fowl and its Historians.
 <Nat. Hist. Rev., Oct., 1865, pp. 467-488.
 A valuable summary of the history of the bird, giving many bibliographical references. The writer considers that the Great Auk may still exist.
1868. Wyman, Jeffries. Note on the occurrence of bones of the Great Auk in a shell heap on Goose Island, Casco Bay, Maine.
 This shell heap was shown by Prof. E. S. Morse to be of great antiquity.
1868. Gurney, J. H., jr., The Great Auk (*Alca impennis*).
 <Zoologist, 2d ser., III, 1858, pp. 1442-1453.
 A critical review of the reported occurrence of the Great Auk in Scottish and British localities. Some of the reports are shown to rest on very slight foundation, and the fallibility of second hand testimony is clearly demonstrated.
1869. Gurney, J. H., jr. Notes on the Great Auk (*Alca impennis*).
 <Zoologist, 2d ser., IV, 1869, pp. 1639-1643.
 Contains description of winter plumage, and notices that not one of the specimens extant is in that dress.
1869. Orton, J. The Great Auk (*Alca impennis*).
 <Am. Nat., III, 1869, pp. 539-542.
 Contains but a single correct statement, that the Great Auk is extinct.
1869. Reeks, Henry. Notes on the Zoology of Newfoundland.
 <Zoologist, 2d ser., IV, 1869, pp. 1849-1858.
 Mainly remarks on the specimens taken from Funk Island in 1863.

1872. Collett, Robert. Remarks on the Ornithology of Northern Norway. Forhandl. Vidensk. Selsk. Christiania, 1872, pp. 182-309, with a map. Also reprinted separately, pp. 123.
Notes that the former occurrence of the Great Auk in Norway is very doubtful, descriptions of *Harelda glacialis* having been mistakenly referred to the Gare-fowl.
1872. Deane, R. Great Auk (*Alca impennis*). <Am. Nat. vi, 1872, pp. 368-369.
Note of a specimen said to have been found dead near St. Augustin, Labrador, and sold for \$200. Sent to France to be mounted for an Austrian museum (Fide A. Lechevallier). If such a specimen were really found it seems to have utterly disappeared.
1872. Gurney, J. H., jr. Great Auk (*Alca impennis*) at Disco. <Zoologist, 2d ser., vii, 1872, pp. 3064-3065.
Note on reported occurrences of Great Auks at Disco, Greenland.
1875. Milne, John. Relics of the Great Auk on Funk Island. Reprinted from The Field of March 27, and April 3 and 10, 1875.
An account of the author's visit to Funk Island in 1874, with a résumé of various facts pertaining to the Great Auk.
1876. Allen, J. A. The Extinction of the Great Auk (*Alca impennis*) at the Funk Islands. <Am. Nat., x., No. 1, Jan., 1876, p. 48.
Notes the destruction of the birds for their feathers and the use of the bodies for fuel.
1878. Newton, A. <Article Birds, Ency. Brit., ninth edition, vol III, pp. 734-735.
A brief account of the extermination of the Great Auk.
1879. Newton, A. Gare-fowl. <Encyclopædia Britannica, ninth edition, x, pp. 78-80.
A necessarily brief history of the Great Auk, with list of more important papers pertaining to the subject.
1883. Cory, C. B. The Beautiful and Curious Birds of the World. Boston, 1883.
Plate V, with accompanying text.
The figure is three-quarters life size, but like most figures represents the bird with too large a body and too slender a neck.
1884. Blasius, Dr. Wilhelm. Ueber die letzten Vorkommnisse des Riesen-Alks (*Alca impennis*) und die in Braunschweig und an anderen Orten befindlichen Exemplare dieser Art. Ver. f. Naturw. z. Braunschweig, III, Jahresber. f. 1881-'2-'3, pp. 89-114.
A concise resumé of the literature concerning the Great Auk, followed by a detailed account of the specimens contained in the Brunswick Museum.
1884. Blasius, Dr. Wilhelm. Zur Geschichte der Ueberreste von *Alca impennis* Linn. <Cabanis' Journal für Ornithologie, Januar, 1884, pp. 58-176.
A detailed list of all known specimens of the Great Auk, alphabetically arranged, preceded by a brief resumé of the literature on the subject.
1884. Collett, Robert. Ueber *Alca impennis* in Norwegen. <Mitth. Ornith. Ver. Wien, 1884, pp. 65-69, 87-89.
Notes that the Great Auk has probably been seen but once in Norway. Special reference to Stuvitz's visit to Funk Island, and description of his specimens preserved in Christiania. More or less complete skulls of thirty-eight individuals, and many separate bones.
1885. Grieve, Symington. The Great Auk or Garefowl (*Alca impennis* Linn), Its History, Archaeology, and Remains, by Symington Grieve, Edinburgh, London; Thomas C. Jack, 45 Ludgate Hill, Edinburgh; Grange Publishing Works, 1885, xii, pp. 142, 58 (Appendix). Four plates, several cuts in the text, and a map showing the distribution of the Great Auk.

1885. Grieve, Symington—Continued.

A most important contribution to the history of the Garefowl, containing a very full account of what is known concerning its habits, habitat, and history. A list is given of all known specimens, skins, skeletons, and eggs, and there are a very large number of references to the literature of the subject.

1886. S [tejneger], L. Grieve on the Great Auk or Garefowl.

<Auk, III, April, 1886, pp. 262-265.

A review of Grieve's monograph. It is shown that there is but one specimen in the Am. Mus. Nat. Hist., New York, and but one "mummy" in the Mus. Comp. Zool., Cambridge.

1888. Lucas, Frederic A. Great Auk Notes.

<The Auk, July, 1888.

Notes on some of the supposed breeding places of the Great Auk, criticisms on the published figures of the bird, etc. The writer considers that the Great Auk was much more restricted in habitat than is usually supposed, and looks upon its occurrence at the Bird Rocks, Gulf of St. Lawrence, as doubtful.

1888. Lucas, Frederic A. The Home of the Great Auk.

<Popular Science Monthly, August 1888, pp. 456-464.

A description of Funk Island, the visit of the *Grampus* party, and their collections.

1888. Grieve, Symington. Recent notes on the Great Auk or Garefowl (*Alca impennis* Linn.).

<Transactions of the Edinburgh Field Naturalists and Microscopical Society. The presidential address of the twentieth session of the society.

Contains the most recent information in regard to the Great Auk, with many references to the work and collections of the *Grampus* expedition. Changes in the disposition of Auk remains made since the publication of the writer's monograph on the Great Auk are recorded and a few slight errors therein contained are corrected.

H. Mis. 142, pt. 2—34



EXPLANATION OF PLATE LXXII.

THE GREAT AUK.

ABOUT ONE-QUARTER NATURAL SIZE.

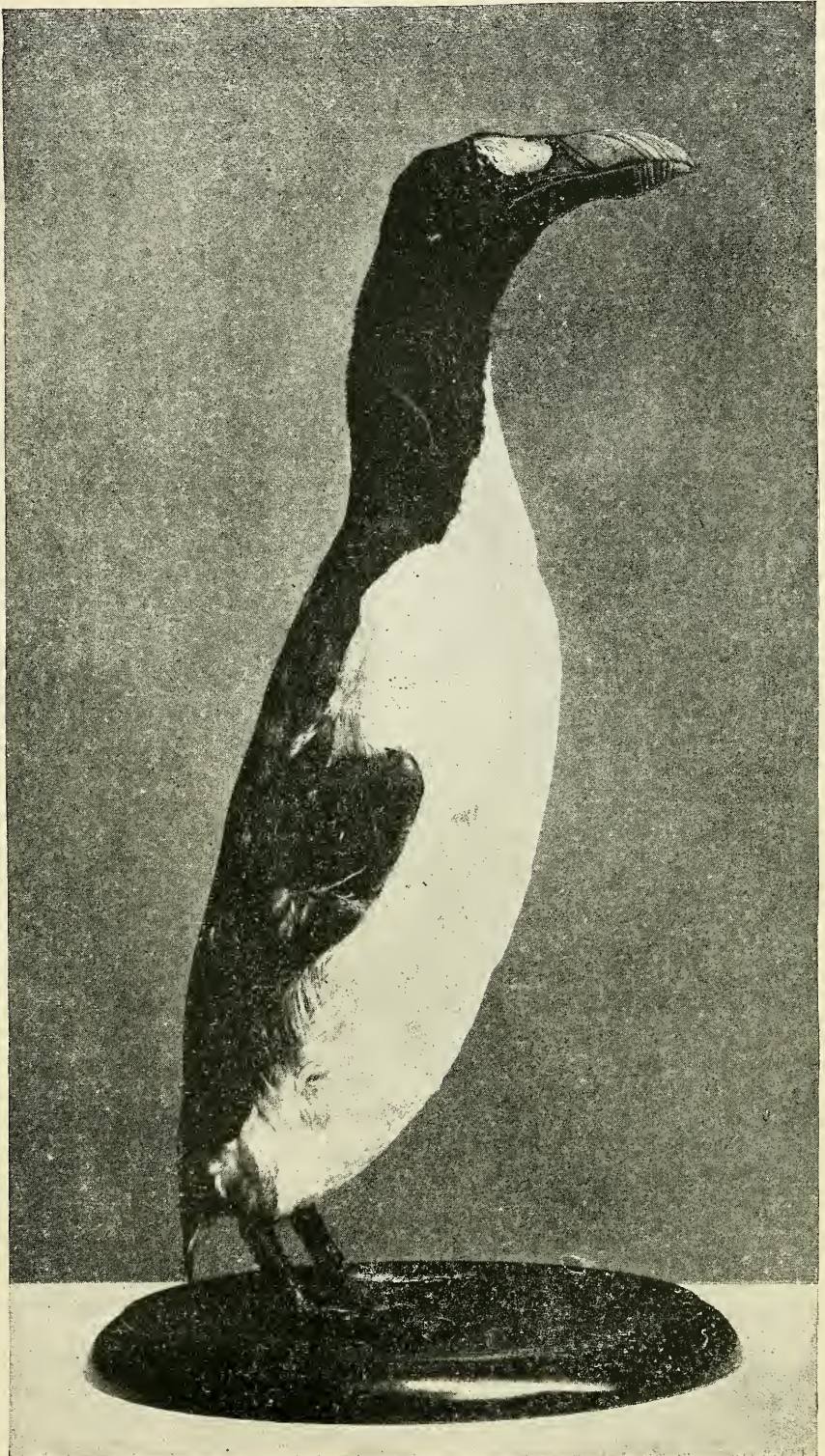
From the specimen in the U. S. National Museum, No. 57338.

Wilhelm Schluter, of Halle, Germany, from whom this Auk was procured, gives its history as follows: It was obtained by Mr. Salmin, of Hamburg, from Iceland; by him sold to a merchant of Hamburg, who sold it to Mr. Goetz, of Dresden, who in turn parted with it to Mr. Schluter.

In the U. S. National Museum catalogue of birds it is recorded as ♂ ad. Eldey, June, 1834.

Since the photograph was taken from which the accompanying plate was made the specimen has been remounted in a different attitude and shortened between two and three inches. It is still, like nearly all mounted skins, considerably too long, but could not be shortened any more without cutting the skin, a proceeding that, under the circumstances, was deemed inadmissible.

Before remounting a full-sized figure of the specimen was made.



THE GREAT AUK.

EXPLANATION OF PLATE LXXIII.

EGG OF THE GREAT AUK.

ABOUT FOUR-FIFTHS NATURAL SIZE.

From the original in the collection of the U. S. National Museum, No. 15141.

The specimen measures 125^{mm} by 74^{mm}. This egg was obtained from the Academy of Natural Sciences, Philadelphia, Pa., and was originally in the collection of O. des Murs.

It is the egg figured on Plate I, *Revue et Magazin de Zoologie*, 1863, and the one to which des Murs refers in the text as having been broken and restored. That des Murs had *three* eggs of the Great Auk is extremely improbable, as he states that he never even saw more than the two in his possession, and the reference to three is either a slip of the pen or of memory.

The egg seems to have been washed since it was figured, and the freshness of the markings thereby impaired.



EGG OF THE GREAT AUK.