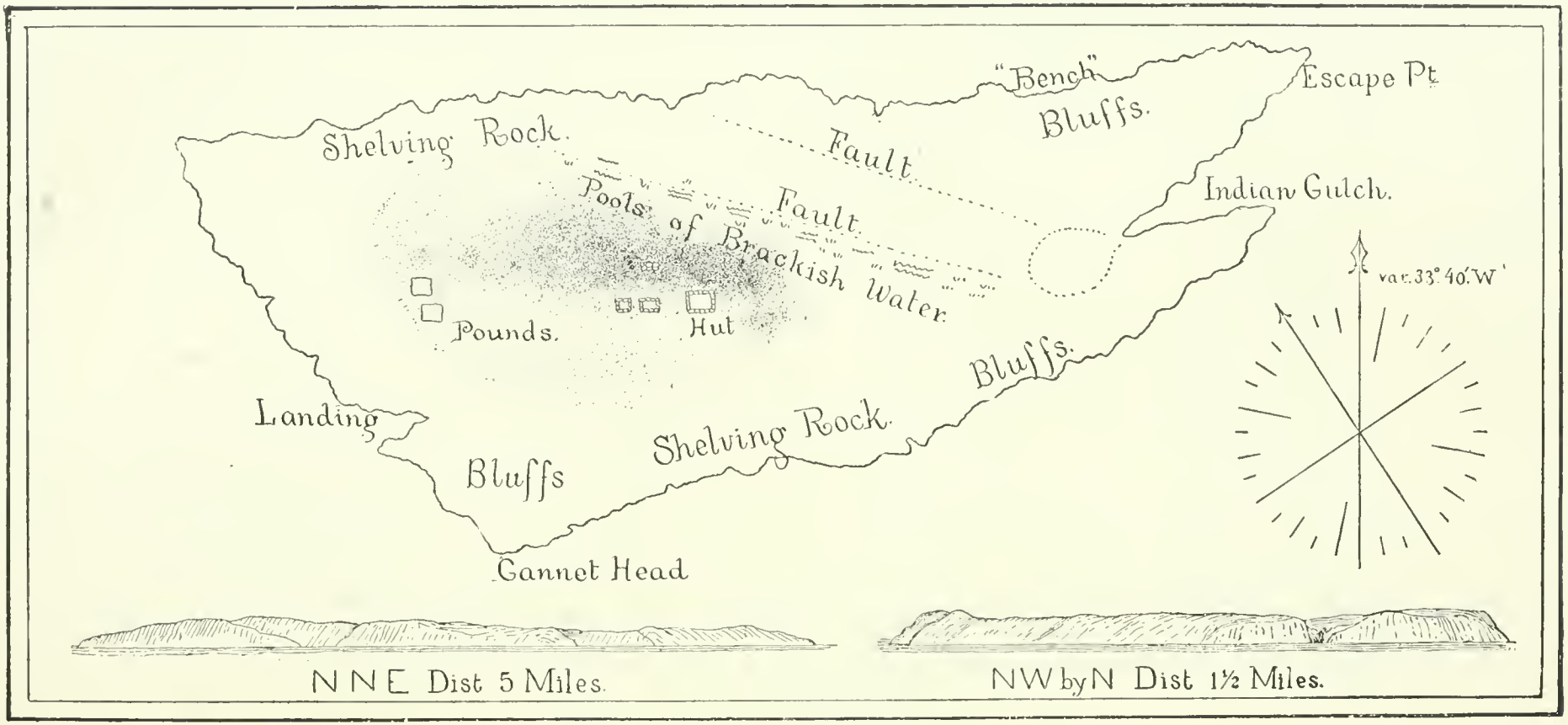


SKETCH MAP OF FUNK ISLAND.

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

# EXPLORATIONS IN NEWFOUNDLAND AND LABRADOR IN 1887, MADE IN CONNECTION WITH THE CRUISE OF THE U. S. FISH COMMISSION SCHOONER GRAMPUS.*

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In the spring of 1887 the writer was detailed by Professor Baird to accompany the U. S. Fish Commission schooner *Grampus* on a cruise to northeastern Newfoundland and the Gulf of St. Lawrence, primarily to obtain, if possible, bones of the Great Auk; secondarily to collect such other specimens as might be obtainable. Two years earlier Professor Baird had approved a proposed plan of visiting Funk Island, off Cape Freels, Newfoundland, a former breeding place of the Great Auk, in the hope of finding remains of that extinct bird, but the many difficulties in the way precluded carrying this plan into effect until the building of the *Grampus* and her projected trip made it feasible. From a scientific standpoint it was extremely desirable to secure bones of the Great Auk, since up to 1887 there were but nine skeletons of that species preserved in museums, only one being in the United States, while the U. S. National Museum possessed but a single bone. Even viewed commercially, a collection of Auk bones would be of considerable value, since the small number of existing specimens had caused them to bring a high price whenever brought into the market.†

It was eminently fitting that a search for remains of the Great Auk should be undertaken in connection with fishery researches, since this bird once formed an important factor in the prosecution of the early

* This report is supplementary to the paper by Mr. Lucas, entitled "The Expedition to Funk Island, with Observations upon the History and Anatomy of the Great Auk," in the Report of the National Museum for 1888. It was at first intended for publication in the Report of the U. S. Fish Commission. Certain statements concerning the Great Auk in Mr. Lucas's previous paper are repeated in this report, but it is believed that they are essential in this connection for the proper understanding of the narrative. For fuller details concerning the Great Auk and its extinction, the reader is referred to the Report of the National Museum for 1888, and for detailed notes on the birds collected see report of William Palmer, in Proceedings U. S. National Museum, vol. XIII, pp. 249–265.

† In this connection it may be of interest to state that one of the skeletons collected by the *Grampus* expedition and exchanged for natural history specimens with a London dealer, was sold by him to the Museum of Science and Arts, Edinburgh, for £120, or about $600.

Newfoundland fisheries. The very earliest reference to the Great Auk in America occurs in the account of Cartier's first voyage, in 1534, wherein the chronicler records a visit to Funk Island for the purpose of procuring birds for fresh provisions, and, under the name of Great Apponatz, tells of the capture of a boat-load of this flightless fowl. From that time onward, so long as the species existed, fishermen and colonists availed themselves of the prodigious store of Great Auks which, after the manner of mankind, they assumed that Providence had provided for their special benefit. The extent to which the Great Auk was used 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" (the Great Auks). Granting that this exaggerates the facts in the case, it seems evident that the birds were very largely employed for provisions, and since, in 1578, there were about one hundred and fifty French vessels, aggregating about 7,000 tons, employed in the cod fishery, the destruction of Great Auks must have been immense.

Captain Richard Whitbourne, who was sent in 1615 to establish order in Newfoundland, on his return wrote a book, which was freely distributed in order to encourage emigration to that country, and in this we find the abundance of Great Auks held forth among other inducements. Says the narrator: "These Penguins* are as bigge as geese and flye not, for they have but a little short wing, and they multiply so infinitely upon a certain flat iland that men drive them from thence upon a board into their boats by hundreds at a time, as if God had made the innocency of so poore a creature to become such an admirable instrument for the sustentation of man."

In more recent times we are told that the merchants of Bonavista and other localities used to sell salted Auks by the hundred weight for provisions, and Audubon says that the young were used for bait.†

Undoubtedly the drain made upon the numbers of the Great Auk for the purposes just mentioned would have ultimately caused its extermination, but the direct cause for its rapid extinction was the killing of the birds for the sake of the feathers. This destruction was rendered all the more rapid and profitable from the fact that the breeding grounds of the Great Auk, like those of the Gannet, were extremely restricted, so that during the breeding season the entire race was to be found assembled at two or three localities. Whatever may have been the case in prehistoric times, there are no allusions to the Great Auk in the accounts of early navigators that even hint at its occurrence in

*The name Penguin was originally applied to the Great Auk, and not to the southern bird now bearing the appellation, and was the name by which the Great Auk was commonly known in America.

†These two statements are taken from works on the Great Auk, and the authority for the first is not given. Still, there seems no room to doubt the truth of either. On the other hand, no reference occurs anywhere to the use of the eggs of the Auk, although they must have been taken by the boat load.

half a dozen places, while it yet remains to be shown that in the last century of its existence the bird bred at any other locality than Funk Island. The feather-hunters probably went to Funk Island in the spring and resided there until the sea-birds had finished breeding, systematically killing all the Great Auks they could; and this was kept up until, like the Rytina, the Great Auk had been slaughtered out of existence. The extermination took place about 1840, and at that date American ornithology was in its infancy, so that not a single specimen of the Great Auk was preserved out of all the millions that were slain, and there are in existence only two stuffed specimens of the Great Auk from America. Fortunately, the conditions under which the Auks were killed were such as to preserve their skeletons, and the greater part of the bones now preserved in museums are from Funk Island, a source from which others may doubtless be procured.

At the time the *Grampus* expedition was planned, little could be ascertained in regard to the exact conditions under which bones of the Great Auk had been found at Funk Island, neither could anything be learned respecting the character of the island, beyond the fact that it was a mere isolated rock. The voyage, as planned, was from Gloucester to the Gulf of St. Lawrence, and thence to the east coast of Newfoundland, stopping *en route* at St. John's and Funk Island. From Funk Island the *Grampus* was to proceed northwards along the coast of Newfoundland, and through the Strait of Belle Isle to Mingan, stopping at those localities where it might seem desirable to gather information, collect specimens, or which stress of weather made it necessary to visit. From Mingan we were to return to Canso and thence home. It was expected that there would be no opportunity for collecting until we reached the vicinity of the Bird Rocks, but on account of bad weather the *Grampus* lay by for a day at the Magdalen Islands, and a small collection was made of its somewhat scanty avifauna, for although birds are quite abundant there, the number of species is small.*

Only a single mammal was seen, viz., a small Harbor Seal (*Phoca vitulina*), scarcely suggesting the fact that these islands were once the seat of a flourishing Walrus fishery, and that thousands of these huge beasts were formerly taken annually, as well as large numbers of Harp Seals.

The first reference to walruses in this locality occurs in the account of Cartier's first voyage, in 1534, where, in speaking of Brion's Island, he says that "About the said island are very great beastes, as great as oxen, which have two great teeth in their mouths like unto elephant's teeth, and live also in the sea."

The writer has been unable to positively identify the Brion's Island of Cartier, part of his description applying very well to Bryon Island of to-day and part applying equally well to Grindstone Island, the

* Dr. Louis B. Bishop, whom we met at the Magdalenes, has published in the "Auk" for July, 1889, a list of sixty-six species observed by him, and notes that he did not find several species noticed by Mr. Cory in 1878.

northernmost of the Magdalenes. In spite of the distances, courses, and descriptions so carefully recorded in the log-books of the early navigators, it is quite impossible to recognize the small places at which they stopped, and very difficult to definitely locate any. It is also a little puzzling, at first, to see why Cartier and his immediate followers should have gone around Newfoundland to enter the Gulf of St. Lawrence, but bearing in mind that at that time Newfoundland was supposed to be a portion of the American continent, it is easy to see the reason for the course pursued. Vessels made Cape Bonavista for a land-fall, and thence ran north to Carpunt (some place on the Labrador coast), at the entrance of the Strait of Belle Isle.

Proceeding down the strait, Chateau Bay and Blanc Sablon were often visited, two places that still bear the appellations originally bestowed upon them, and from there the course was to the southwards until the Islands of Birds, Brion's Island, and Ramea were successively reached. Ramea is another stumbling-block, and from the manner in which it is described may have been either the Magdalenes or Prince Edward's Island, Charles Leigh's account seeming to point to Amherst Island, the southernmost of the Magdalenes, this supposition being the more probable from the fact that the Isle of Ramea was a famous place for walruses.

It is now many years since a walrus has been taken in the gulf at all, much longer since one was killed on the Magdalenes, and since the disappearance of the walrus, the sources of prosperity so much dwelt upon by the early voyagers have one by one dwindled away.*

The goodly fir-trees have become scrubby spruce, the great cods have become few and far between, the herring industry is comparatively unimportant, and a few short years have sufficed to seriously reduce the lobster fishery. All this means want and distress for the population of these islands, which, never too well off at best, has several times been saved from starvation by government aid, and once during the last twenty-five years forced to eat their very dogs.

While lying at Grindstone Island we first made the acquaintance of the Gannets, whose headquarters are the Bird Rocks, and had a good opportunity to watch them fishing. The birds are usually associated in small, straggling flocks, and with outstretched necks and eyes ever on the lookout for fish, they fly at a height of from 75 to 100 feet above the water, or occasionally somewhat more. The height at which the Gan-

* The following glowing description by Charles Leigh occurs in Haklnyt, edition of 1600, p. 201:

"Concerning the nature and fruitfulnesse of Brion's Island, Isle Blanche, and of Ramea, they do by nature yield exceeding plenty of wood, great store of wild corne like barley, strawberries, gooseberries, mulberries, white roses, and store of wilde peason. Also, about the sayd islands the sea yieldeth great abundance of fish of divers sorts. And the sayd islands also seeme tō proffer, throngh the labour of man, plenty of all kinde of our graine, of roots, of hempe, and other necessary commodities."

net flies above the water is proportioned to the depth at which the fish are swimming beneath, and Captain Collins tells me that when fish are swimming near the surface the Gannet flies very low and darts obliquely instead of vertically upon his prey. Should any finny game be seen within range, down goes the Gannet headlong, the nearly closed wings being used to guide the living arrow in its downward flight. Just above the surface the wings are firmly closed, and a small splash of spray shows where the winged fisher cleaves the water to transfix his prey. Disappearing for a few seconds the bird reappears, rests for a moment on the water, long enough to swallow his catch, and then rises in pursuit of other game. The appetite of the Gannet is limited only by the capacity of its stomach, and a successful fisher may frequently be seen resting on the water, too heavily laden to rise without disgorging a part of its cargo, which it sometimes must do to escape from the pathway of an approaching vessel.

The Guillemot (*Cepphus columba*) breeds in the caves of Entry Island, and a few old birds were seen off Grindstone Island.

On the 9th of July the *Grampus* ran over to the Bird Rocks, and extensive collections were made of the various birds from whose abundance these little rocky islets took their name. They are described in the account of Cartier's first voyage, and from the occasional references that occur in Hakluyt seem to have been visited now and then for supplies of birds and eggs, a practice still followed by the fishermen of to-day. Many birds and eggs are taken annually, and although egging is prohibited by law after a certain date, game laws are easier enacted than enforced, and many eggs are gathered out of season and many breeding birds killed. The principal species of birds inhabiting the Bird Rocks are the Gannet (*Sula bassana*); Razorbill (*Alca torda*); Common Murre (*Uria troile*); Brunnich's Murre (*Uria lomvia*); and Puffin (*Fratercula arctica*). Besides these a few Kittiwake Gulls (*Rissa tridactyla*) are found there, and Leach's Petrel (*Oceanodroma leucorrhoa*) breeds in rat-like burrows on the summit of the Great Rock. The Gannet has bred here from time immemorial, and the abundance of these great white birds, "which bite even as dogs," led Cartier to christen these rocks the "Isles des Margaulx," or Islands of Gannets.

Cartier's account is as follows:

* * * We came to these islands, 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 islands 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 wee call Margaulx, which are white and bigger than any geese, 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 island that we above have mentioned. We went downe to the lowest part of the least island, 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.

In 1597 Charles Leigh wrote that "the three Islands of Birds are sandy red, but with the multitude of birds upon them they looke white," and even as late as the time of Audubon, the Gannets were so numerous that the tops of the rocks seemed covered with snow. At that time they were largely used for bait by the fishermen of Bryon Island, some forty boats being supplied from this source, and some idea of their abundance may be gathered from the fact that Audubon's captain told him that on one occasion his boat's crew, in less than one hour, killed six hundred and forty birds with no better weapons than sticks. Up to 1860, however, the Gannets were sufficiently numerous not only to cover the summits of the rocks, but many of the ledges along the sides, and Dr. Bryant estimates that 50,000 pairs were then breeding on the top of the Great Rock alone, although these figures require to be discounted a little. In 1870 a writ of ejectment was served on the bird tenantry occupying the summit of the Great Rock, by the erection of a lighthouse, and by 1872 the Gannets breeding there were reduced to 5,000. In 1881 Mr. Brewster found the birds on the Great Rock confined to the ledges along the sides, although the Little Rock was still densely populated, and the total number of Gannets was estimated at 50,000. In 1887 not a Gannet was raised on the Little Rock, although a few were breeding on the little pillar of rock adjacent to it, and M. Turbid placed the number of Gannets at 10,000, considering this an increase over previous years. The Murres, Razorbills, and Puffins have probably suffered somewhat less than their more conspicuous comrades, although even among them the decrease must have been very great. Still, their smaller size and consequent ability to breed in crevices of the rock and on ledges too narrow to accommodate a bulky Gannet has been of great service to them, while the Razorbill also seems to be learning by experience the desirability of putting an egg out of sight whenever practicable. The Puffins find safety in their burrowing habits, and breed quite extensively in the decomposed sandstone at the northeastern portion of the Great Rock, as well as under the overhanging, inaccessible ledges of the northern side of the Little Rock. The little rocky pillar mentioned above is well occupied by birds of various species, while owing to the difficulty of scaling this islet, the little colony is fairly secure. From its size, the precipitous nature of the sides, and the fact that only one landing lies contiguous to the breeding birds, the Great Bird Rock must ever remain the stronghold of this interesting colony of sea-fowl. The Little Rock, although formerly said to be difficult, or even impossible to scale, is now easily climbed, owing to the falling of portions of rock, and as there are two places where landing is comparatively easy, the spot is much resorted to by fishermen, and the birds in consequence lead a very precarious existence.

There is no regular division of the feathered inhabitants of the Bird Rocks into large colonies according to species, the separation being

rather by size, Gannets occupying the highest and broadest ledges, and Murres and Razorbills taking what is left. There is, of course, something of a tendency for little groups of the same species to nest together, but Brunnichs and the Common Murre may be seen occupying the same ledge. While the erection of the light-house on the Great Rock did not directly affect the Murres and Razorbills as it did the Gannets, it nevertheless led to the decrease of the smaller birds in a very curious manner. In foggy weather a cannon is fired every half hour to warn passing vessels of the hidden danger, and this gun, being placed near the northern cliff, is in proximity to the favorite breeding-places of the Murres and Razorbills. The effect produced upon the birds is well described by Mr. Brewster, who says:

> At each discharge the frightened Murres fly from the rock in clouds, nearly every sitting 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 Murres 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.

This was in 1881, but now M. Turbid says that the birds have become somewhat accustomed to the sound, so that the destruction from this cause is comparatively small, and we noticed that very few birds would fly at the report of a shot-gun, although fired close by them.

At the time of our visit young birds of the various species breeding at the Bird Rocks were common, with the exception of Gannets and Leach's Petrels. The Gannets are the last of the young birds to make their appearance, the three that we obtained from the pillar near the Little Rock being the first of the season. The difficulty of securing Leach's Petrels renders any exact statement regarding them impossible, and it can only be said that all of the five eggs obtained contained embryos.

The following table, kindly furnished by M. Turbid, shows the date of arrival of the various species, the time of their becoming common, and the date at which the first young were noticed.

| | First seen. | Common. | Young seen. |
|---|---|---|---|
| Kittiwake | Mar. 11 | Apr. 9 | June 21 |
| Murre | Mar. 12 | Apr. 10 | June 24 |
| Gannet | Apr. 5 | Apr. 27 | July 7 |
| Razorbill | Apr. 18 | Apr. 25 | July 5 |
| Puffin | May 7 | May 8 | July 1 |
| Leach's Petrel | May 10 | May 13 | (?) |

From this table it appears that the Puffins and Petrels arrive in a body, while the other birds straggle along over a period of three or four weeks.

It was the intention, wind and weather permitting, to have touched at Penguin Islands, off Cape la Hune, as the name indicated the possi-

ble former presence of the Great Auk. Weather, however, is a very uncertain quantity in or about the Gulf of St. Lawrence, and owing to fresh breezes and heavy sea this part of the programme was unavoidably omitted. These Penguin Islands seem to agree in location with the island of Penguin mentioned by M. Hore, who says that "they came to part of the West Indies about Cape Briton, shaping their course thence northeastwards until they came to the island of Penguin, which is very full of rocks and stones." At the same time "about Cape Briton" is extremely vague, and the location of the island is a mere matter of conjecture, the case not being helped by a marginal note to the effect that the island is in latitude 30 degrees.

Only two Shearwaters (*Puffinus major*) were collected between the Magdalens and St. John's, Newfoundland, although large flocks of these birds were seen near Cape Race in company with the Sooty Shearwater (*Puffinus obscurus*). From the intimate association of the two birds it seemed quite possible that they were merely two phases of plumage of the same species, but although every effort was made to obtain a series, both by chasing with dories and sailing upon them with the schooner, the birds were so extremely wild that only two were obtained, both *Puffinus major*.

A three days' stop was made in St. John's, during which time we endeavored to obtain as much information as possible concerning Funk Island. Unfortunately the few who had visited the place were bent on other errands than collecting Auk bones, and almost the sole fact we gathered was that the best landing was on the northerly side.

On July 21 the *Grampus* left for Funk Island, steering northward past Cape Bonavista, as Jacques Cartier had done three centuries and a half before. Funk Island lies 31½ miles north by east from Cape Freels, and 25 miles east-southeast from Offer Wadham Island, the locality being seldom resorted to except by sealers in early spring and occasional fishing boats during the summer. At a distance of 600 and 1,200 yards to the north of the island, respectively, are two low rocks, while within a radius of two miles are numerous shoal-patches, so that Funk Island and its vicinity have small attractions for the navigator. To add to the dangers of approach, there is no lighthouse, a thing much needed. The morning of the 22d found us with a light breeze and smooth sea about eight miles distant from Funk Island, but so moderate was the weather that it was a little after noon before we were abreast of the eastern end, where, at the distance of about a mile, it was proposed to anchor. Everything had long been in readiness for a start shoreward, and a short time before coming to anchor, a dory containing Mr. Palmer and myself, provided with a simple camping outfit and provisions for several days, was sent to effect a landing. Owing to the fickleness of the weather and frequent occurrence of fogs in this vicinity, our plans had been so laid that should occasion require, we might remain on the island and prosecute the work of searching for remains of the Great Auk while

the *Grampus* sought a more pleasant berth than the immediate vicinity of Funk Island. The locality is bad, not only from the presence of numerous rocks and shoals and from the fact that owing to the irregularities of the bottom, the sea in rough weather breaks badly when the depth of water is considerable, but also on account of icebergs, which are unpleasant neighbors in a fog. The uncertainty in the way of collecting at Funk Island is well shown by the fact that while the islet has been a regular resort of fishermen from the time of its discovery, the only two collectors who visited the spot, Stuvitz, in 1841, and Milne, in 1873, were obliged to leave hastily on account of threatening weather, while another party also, desiring to visit the island in 1887, was unable to effect a landing. The light breeze blowing at the time of our visit was from the southward, the most favorable direction, since it brought the best landing place to leeward. This landing is on the northerly side, a few hundred yards to the westward of the eastern point, and consists of a step of stone about four feet wide, sloping gently upward from the water's edge. Above and below, this step runs out to nothing, although at the upper end it terminates in a fissure large enough to accommodate one's foot, the rough rock affording good hold for the foot or hand. The rock is here almost perpendicular, so that one may stand on the "bench," as this landing is termed, and toss a lead into 20 fathoms of water, this depth and steepness of rock offering no resistance to the swell which, when this side is to leeward, rises and falls along the rock without breaking. Although, as stated, the wind was light at the time of our visit, the boat rose and fell along the rock 4 or 5 feet at every heave of the sea, while on the south side of the island, where at a distance it had seemed quite possible to beach a boat safely, the swell proved to be rolling in so heavily that a landing would have been quite out of the question, and the same was the case on the northwestern end. On the southwestern side of Funk Island, near Gannet Point, is another landing place, but this is resorted to only when a northerly wind makes landing at the "bench" impracticable.

Professor Milne, who visited Funk Island July 20, 1873, found a great abundance of birds, especially Terns and Murres, but although the Arctic Terns were abundant in 1887, eggs and young lying scattered over the ground, the Murres were extremely scarce, and the same may be said of the Razorbill, these birds having been practically exterminated by the eggers, who several years ago used to obtain many loads of eggs here. The eggs of the Arctic Tern being small and those of the Puffin extremely difficult to secure, egging as an occupation is no longer profitable, but the number of birds is now so small that the visits of the Fogo fisherman will probably prevent any increase of the edible species.

Cartier mentions the Gannet as being found here, and the most likely breeding spot for this bird bears the name of Gannet Head, but no trace of this species was to be seen, nor is it mentioned by Milne.

The Arctic Terns were a veritable nuisance, hovering in a cloud over our heads, screaming harshly, and swooping down almost on our heads, demonstrations largely due to the presence of their nests. It was curious to witness the behavior of the young Terns, who, at our approach, would either squat close to the ground or else creep up to some tuft of grass or cranny of the rock, into which they would thrust their heads and apparently seem to consider themselves as out of sight.

Puffins are very numerous; their burrows honeycomb the northern slope, where the soil is deepest, and their quaint proprietors, perched upon blocks of stone, gravely inspected all our movements. Not until toward sunset, however, was the real abundance of Puffins manifest, but at that time they came flocking home from distant fishing-grounds, gathering along the precipitous eastern part of the island in great numbers.

The height of Funk Island is given as 46 feet, but it certainly seems much higher, whether viewed from the sea or from the highest part of the islet. It is about half a mile long, possibly a little more, and about a quarter of a mile wide, the greatest length being from east-southeast to west-northwest. The eastern and southwestern portions are precipitous, but on the north and northwest the rock slopes into the sea, and here the Great Auks must have landed, choosing their side according to the wind, but having a rough time of it at best. The rock itself is a coarse-grained feldspathic granite, traversed by two faults, which divide the island into three portions of unequal extent. The northeastern is bare rock, the central portion has a little vegetation here and there, while a great part of the southwestern swell, which comprises the larger part of the island, is covered with vegetation and plentifully strewn with blocks of granite weathered off from the bed-rock. The process of weathering can be seen very well on parts of the middle division of the island and at the eastern end, where the rock in places forms curious thin ledges that in time will break into slabs. Along the line of the southernmost fault is a considerable depression, into which considerable water drains, forming pools of brackish water and little patches of marsh. The western portion alone was inhabited by the Great Auk, this only being accessible to the flightless fowl, which was prevented by the character of the rock from either landing on the eastern end or reaching it after having landed elsewhere.

The former breeding-grounds of *Alca impennis* are pretty well mapped out by vegetation which has sprung up since the extermination of the Great Auk, and the density of which bears a direct relation to the abundance of buried remains. (Plate CVI.)

The soil has been formed partly during the occupancy of the Auk and partly since its extinction, the older portion consisting very largely of fragments of egg-shells mixed with granite pebbles. This stratum is from two inches to nearly a foot in thickness, and is overlaid by a stratum of decomposed Auks and decayed vegetation, above which is a thin turf of matted roots.

Bones are found at all depths, but are most abundant, although poorest in preservation, near the surface. The final cause for the extermination of the Great Auk, as previously stated, is said to have been the trade in feathers, and the birds are said to have been scalded, plucked, and thrown aside, their bodies being so fat that they could be used as fuel. Whether this last statement is or is not correct may be uncertain, but the others are borne out by the condition of the remains. These are most numerous along the crest of the island, where the upturned sod reveals vast numbers of bones, interspersed here and there with patches of charcoal, showing where the kettles swung in which the birds were scalded. The parboiling was done along this ridge for the reason that it was away from the sea, and thus would not alarm the birds when landing, while at the same time the drainage pools near at hand would supply water for the kettles. From this point to the westward the bones decrease in numbers, few being found on the southerly slope of the island, although even here a deep stroke of the hoe never failed to bring to light a bone or two.

Remains of the stone inclosures, "compounds" they were called, into which the Auks were driven like so many sheep, and where they were kept until wanted, are still to be seen, the most complete lying near the western point. These inclosures were readily made by standing on edge some of the numerous granite slabs, which seem to have been placed by nature just where they were most needed by the bird-hunters. Almost in the center of the island are the ruins of three small huts, two nearly leveled to the ground, the third, with its walls several feet high, forming a conspicuous land-mark on the crest of the island. Tradition is silent concerning the two older structures, but the third and best preserved is variously stated to have been built for the accommodation of a sealing crew, placed here to winter some years ago, and to have been erected by a party of guano-seekers in 1863. It is now difficult to say which is the correct statement, but as for the others, it seems quite probable that they were put up years ago by the exterminators of the Auk.

That the feather-hunters must have plied their trade with great vigor is shown by the millions of bones scattered over an area of many acres, and there is no doubt in the writer's mind but that parties passed the entire season here in order to prosecute their work to the best advantage. The sea would supply them with fresh fish, the island with eggs and birds, occasional visits from the mainland would furnish such other provisions as might be needed, such as water and wood, so that the work of destruction sped merrily on to its end.

Professor Milne doubted if all the bones he saw were those of the Great Auk, but his doubts were without foundation, for it requires careful searching to obtain remains of any other bird. Besides a large number of carefully-selected bones, a barrel full of indiscriminately chosen remains was brought away, and yet in all this mass of material there

was less than a handful belonging to any other species than the Great Auk. In one spot, indeed, we did come upon a small number of bones of the Murre mixed with a few of the Great Auk, the inference being, from the thinness of the deposits and fresh look of the bones, that they represented a comparatively recent date, when the Auks were becoming scarce and other birds were being killed to supply the deficiency.

An occasional fragment of egg-lining was met with, and one nearly perfect, but we came upon no trace of any complete body of an Auk, two or three of which were secured by the guano-seekers in 1863. The large extent of ground covered by the remains prevented as careful an examination as would have been possible in a more restricted area, although the first desire of our party was to obtain as good a series of bones as was practicable. The most useful digging-implements with which we were provided were clam-hoes, and by peeling off the sod here and there with one of these, an idea was obtained as to the general disposition of remains in various parts of the island.

On the northerly slope the Puffins had pretty well explored the ground, and around their numerous burrows lay little collections of bones, among them an occasional bone in a most excellent state of preservation, although the larger part were badly weathered. These scattered bones were a most welcome sight to us as we passed from the bare rock to the turf-clad portion of the island, for the many unmistakable humeri of the Great Auk were an assurance that our search was not likely to prove a failure.

On the evening of the 22d we returned to the *Grampus*, as the weather promised to be fair on the morrow, and early on the morning of the 23d again landed and proceeded with the work of collecting, snatching a little time from our labor to make a hurried circuit of the island. Had the enterprise been a commercial one, we might have remained much longer, but as the main zoölogical object of the voyage had been secured in the shape of a fine collection of Auk bones, and as much remained to be done in connection with fishery researches, we left late on the afternoon of July 23 for Seldom-Come-By, Fogo Island.

About 16 miles to the westward of Cape Freels the chart shows two small dots bearing the legend "Penguin Islands," and although the main object of the voyage, so far as remains of the Great Auk were concerned, had been successfully accomplished, it was none the less desirable to add if possible to the existing store of information in regard to that extinct bird. These islands are not far from Seldom-Come-By, and as the wind was fair, the *Grampus* accordingly ran over to them on the morning of July 24. The appearance of the islets was not encouraging, as they were low, flat, thickly covered with grass, and by no means suggestive of suitable breeding places for the Great Auk, which seems to have preferred, or rather been restricted to, bare, isolated rocks at some distance from any habitable spot. The turf proved to be extremely thick and tough, indicating long-continued growth of veg-

etation, and although holes were dug in many places quite to bed-rock, no bones were thus discovered, nor were any seen at any point of the island. The Great Auk, it is true, may once have bred here, but from the character of the islands this is extremely doubtful, while the proximity of the mainland would have made them at all times easy of access and rendered the extermination of the bird an easy matter. To-day the principal inhabitants of Penguin Islands are Field Mice (*Arvicola riparia*), whose burrows are to be seen on every hand, while paths running from one hole to another cover the ground in places with a perfect network. A little exploration of the more populous districts showed that beneath the surface was a veritable labyrinth of intercommunicating burrows, some old and some new. In some instances Petrels (*Oceanodroma leucorrhoa*) were found to have taken possession of deserted habitations of the Field Mice, much as the Burrowing Owl occupies the dwellings of the Prairie Dog, and from the great abundance of burrows it is probable that a considerable number of these little birds breed here. The eggs found were perfectly fresh, and as those collected at the Bird Rocks on July 9, contained well-advanced embryos, it would seem probable that this Petrel raises two broods a year. Although the Petrels were breeding here, none were seen about the islands, nor were any seen around the Bird Rocks, where they were breeding on the summit, so that if the males assist in the work of incubation, they must keep well away from the land until after dark. A few nests of the Arctic Tern were scattered over one end of the island, the eggs being in an advanced stage of incubation; one or two Puffins were seen, and a Sandpiper or two, but on the whole the results obtained were of a negative character.

On July 29 we arrived at Canada Bay, where there is a small fishing-hamlet, and where we were led to hope that seals might be found, a hope that was, however, doomed to disappointment, for very few seals were seen at Canada Bay, and these were the ever present Harbor Seal. Cetaceans were quite abundant, the Dolphin (*Delphinus delphis*), Porpoise (*Tursiops tursio*), and Puffing Pig (*Phocæna communis*) being frequently seen, *Tursiops* running up the Bras d'Or branch of the bay for a mile or so; but, in spite of their abundance, all these species were extremely shy, and it was found impossible to approach within striking or shooting distance of any of them. Small Finback Whales were also seen occasionally, one of which was accustomed to visit the harbor toward sunset, making his appearance with great regularity. Both land and sea birds were almost entirely lacking, although Mr. Palmer succeeded in obtaining a pair of the rare Welch's Ptarmigan (*Lagopus welchi*) during an excursion to the Cloud Hills, which lie on the western side of the bay. On this trip comparatively recent signs of Caribou were also noticed. Two small trout-streams empty into the western side of Canada Bay, the course of each being interrupted by vertical falls, above which no trout were to be obtained. Trout caught in the

lower part of the larger brook showed very clearly the effect of salt water, being slightly silvery, although, owing to the very small size of the brook, no "sea-trout" were taken. In the Greenland lakes trout are said to feed largely on larvæ of the mosquito, and from the abundance of this insect, as well as the black fly, at Canada Bay, it was very likely to be the case there also. An occasional salmon was seen leaping in the inner harbor, but fish of all kinds were scarce, and cod almost totally absent, so great being the dearth of food that dried caplin was a common article of diet.

After lying fog-bound for four days the *Grampus* left Canada Bay on August 3, and on the morning of the 4th was off Cape Bauld, a locality where, according to reports gathered at Toulinguet, the Penguin (Great Auk) was still occasionally seen. While no reliance was placed on these rumors, as a matter of duty inquiries were made of the crews of several fishing-boats, the result being, as was anticipated, that nothing was known of the bird in that vicinity.

Rounding the northern point of Newfoundland, we entered the Strait of Belle Isle, and on August 4, owing to stress of weather, the *Grampus* put in to Black Bay, on the Labrador coast. Little or no collecting was done here, owing to the fact that there was nothing to be collected, animals of all kinds being very scarce, although the usual Harbor Seal was present and a few Ravens were seen, but these were too wary to be taken. The Black River, which empties into Black Bay, is a salmon-stream of some importance, the fishing privilege being rented by Mr. William Ellworthy. Sea-trout are said to be abundant in the pool at the mouth of Black River, but owing to the overcast sky and low temperature at the time of our visit, they remained in deep water, and only one or two young salmon were taken here. Very small brook-trout abound in a tributary of Black River, and in one pool a number of large trout were taken, the most noteworthy fact in regard to them being that, while all were living under similar conditions, two were brilliantly colored, while the remainder were extremely dull, like the trout taken later on at Mingan.

August 11 found the *Grampus* at Mingan, where it was hoped we might be able to secure specimens of the great Gray Seal (*Halichœrus gryphus*), or, as it is locally known, the Horse-head. This, the largest of the North Atlantic seals, is by no means common in museums, and appears not to be very abundant at any locality, playing but a small part in the seal fisheries. According to Dr. C. Hart Merriam, to whom we are indebted for information as to the whereabouts of the Gray Seal, the Mingan group is the only locality in the Gulf of St. Lawrence where this animal is found, with the possible exception of Anticosti. The Gray Seal occurs on the south side of Harbor Island, on Mingan Island, and at the Perroquets, these last being the most frequented. Like other members of the seal family, it is fond of crawling out upon the rocks, especially on sunny days, when it will lie basking in the sun-

shine for hours at a time. The seals do not come on shore at any convenient spot, but at a limited number of chosen localities, and these vary according to the force and direction of the wind. Except in very light breezes the lee-side of the island is selected, not entirely on account of the difficulty of effecting a landing on the windward side, but also because the seal relies very largely upon its acute senses of smell and hearing to warn it of approaching danger from the land. The chosen landing-places are where a shelf of rock, raised but little above the level of the sea, descends vertically for several feet beneath, thus enabling the seal to plunge head first into the water and disappear at once from sight. Before landing, the animal will swim back and forth several times with head raised and eye, ear, and nose on the alert to detect any sign of danger, the wary nature of the creature being well shown by the fact that almost immediately after emerging from the water, the animal turns completely around so as to lie with the head seaward and in readiness for an instant dive. The fairer the day and the lighter the breeze, the more readily the seals come ashore, while during rough weather they not only do not land so often but are more watchful when they do come out. The time for hauling out varies with the state of the tide, and as nearly all the places where the right conditions, as noted above, obtain, are covered at high water, it is between the middle of the ebb and middle of the flood that the seals come ashore.

The hearing of this seal is extremely acute, as we had a most excellent opportunity of ascertaining during the first of our attempts to secure a specimen. A party had been landed on Mingan Island, and while Mr. Palmer was engaged in searching for birds and botanical specimens, Captain Collins and myself were looking for seals. The wind at the time was blowing rather freshly from seaward, and a number of Gray Seals were discovered hauled out on the lee-side at a spot so situated that there was unfortunately no cover nearer than 150 yards, and even this was accessible only by crossing a patch of shingle some 50 yards wide and in full sight of the seals. Lying flat upon our stomachs we began slowly and painfully wriggling across this open space, the seals apparently taking no notice of our actions. About half the distance had been traversed when the distant report of the small collecting-gun, sounding no louder than a faint crack of a whip, caused the entire group of seals to plunge into the water as promptly as if they had been waiting for some preconcerted signal. Upon coming to the surface at a safe distance from shore the seals swam back and forth looking for the cause of the disturbance and diving whenever the pop of the collecting-gun reached their ears. No enemy being visible and everything becoming quiet, they once more returned to shore, clambering out with more ease than one might suppose such creatures would exhibit. No use is made of the hind flippers when on land, progression being effected by the front limbs and the abdominal

muscles, the hinder portion of the body being bent slightly upward, the hind-legs sticking out stiffly in the rear.

These seals are occasionally taken by the Indians for the oil and skin, the animals being either shot while lying on the rocks, or while swimming in water sufficiently shallow for the body to be recovered by means of a long gaff. As a rule one Indian is provided with a seal-skin suit, cap included, and his part of the game is to crawl about the rocks imitating the motions and cry of a seal, while Indian number two is concealed near at hand with a birch-bark canoe in readiness. No shot is fired unless there is almost a certainty of either killing or mortally wounding a seal where it can be secured, a wounded animal being gaffed and towed ashore.

The Harp Seal (*Phoca grœnlandica*) also occurs at Mingan, and animals were seen that probably belonged to this species, although, as none could be taken, it is impossible to speak positively in regard to the matter. The Harbor Seal (*Phoca vitulina*) is common about all the islands and in the channel between Harbor Island and the mainland. A small Pike Whale (*Balœnoptera rostrata*) was accustomed to cruise through the channel with tolerable regularity, but no other cetaceans were seen in the vicinity, although fish were said to be abundant, and Caplin were seen in small schools. An effort was made to kill this whale with a bomb lance while it was busily engaged in pursuing a school of lant, but although the animal at first seemed to pay no attention to the boat, yet upon being fired at, although missed, the whale immediately left, showing his senses of sight and hearing to be very acute. The course of the whale could be quite readily traced, the point at which he was about to make his appearance being indicated by a circle of wildly leaping little fish, the nose of their pursuer emerging a second or two later. Several times the animal rose almost vertically, about a third of his length appearing above the water, and on these occasions the conspicuous white bars across the flippers served to identify the species.

The birds were moving southwards, and although young Eider Ducks (*Somateria Dresseri*) in the down were taken, the Black Duck (*Anas obscura*) and white-winged Coot (*Melanetta velvetina*) were seen flying southwards in considerable numbers. The Eider is said to breed hereabouts in the bushes near the shore, but the only young specimens seen were taken, as just stated, at Mingan Island, and had probably been raised there. Large flocks of Bonaparte's Sandpiper (*Actodromas fusicollis*) were gathered around the tide-pools on the northern end of Mingan Islands and a few Curlew were observed, these being extremely shy. Gulls (*Larus argentatus smithsonianus*) were abundant, and are said to breed on Mingan, although the only young birds taken were obtained from nests under the evergreens of Harbor Island. The Gannet formerly bred in small numbers at the Perroquets, but the continual taking of their eggs by the Indians residing near by, has nearly extirpated

them, and but few were seen, none being breeding birds. Puffins (*Fratercula arctica*), with well-advanced young, and Murres (*Uria troile*, were found at the Perroquets, and Guillemots (*Cepphus grylle*), in spotted plumage, near Mingan. The Canada Grouse (*Dendragapus canadensis*) was occasionally seen at Mingan. These birds were extremely tame, and when flushed from the ground frequently alighted in low spruces, where they would allow themselves to be approached as near as twenty or fifteen feet.

The Mingan River is a noted salmon stream, while its tributary, the Manitou, abounds in trout, salmon being prevented by a fall from ascending this stream for more than 3 miles. The so-called Sea Trout is usually plentiful at the mouth of the Mingan from half flood to half ebb, and many large ones, averaging about two pounds each, are taken in gill-nets by the few Indians residing here. Owing to rough weather and heavy rains few fish were taken during our stay, those at the mouth of the river being the silvery sea-trout, and those up the stream the dull-colored variety.

The unfavorable weather prevented our obtaining any of the desired seals, and on August 20th the *Grampus* proceeded to Percé, reaching that place next morning. Percé is a place of considerable interest to the naturalist from the fact that Percé Rock is the abode of a large rookery of Cormorants (*Phalacrocorax dilophus*), while the precipitous seaward side of Bonaventure Island is occupied by Gannets, this being the third of their breeding-places on the Atlantic coast, and, next to the Bird Rocks, the most extensive. Dr. Bryant in 1860 estimated the number of Gannets breeding at Bonaventure to be 250,000, but this must be considered as entirely too high. Whatever the number may once have been, at the date of our visit it would not apparently exceed 3,000, although this is merely a guess, time being insufficient to make a careful estimate by counting various sections of the colony. Although the cliffs on the seaward side of Bonaventure Island are 250 feet in height and nearly vertical, it is said that a considerable number of eggs are obtained from the uppermost ledges, some of which may be reached directly from the summit and others by the aid of ropes. The conservatism of the Gannet is well shown by the fact that although Percé Island is only a mile away, and its summit perfectly inaccessible, not a Gannet breeds there. Favored by a light inshore wind, we were able to approach sufficiently near the base of the cliff to secure four young Gannets, by shooting them where the character of the ledge was such that a bird when killed would fall into the sea.

On the 9th of July we had obtained at the Bird Rocks, Gannets from one to four days old, very small and almost naked. Here, forty-three days later, the young were very far from being able to fly, and although they had attained a weight of five pounds were still covered with long, soft down, the wings being so feebly developed that it would evidently be some time before they could leave the nest. The instinct

to keep still must be strong in the little Gannets, for often but a few inches lie between them and destruction, some of the rocky shelves being so narrow as to cause one to wonder how eggs and young escape being swept off by wind and rain.

Percé or Arch Rock, is a vertical mass of rock, 288 feet high, and apparently inaccessible, although some years ago an enterprising fisherman succeeded in reaching the summit,* then as now occupied by birds. The greater part of these are Cormorants (*Phalacrocorax dilophus*), but a few Gulls (*Larus argentatus*) mingle with them, and two Blue Herons (*Ardea herodias*) were also seen. The Cormorants are said to feed largely on the refuse of the fish dressed for drying by the Percé fishermen, but numbers may be seen in the morning starting out for more distant fishing grounds. It was to intercept some of these birds, and to collect any others that were to be obtained, that early in the morning we started for Arch Island, where long before daybreak the gulls had begun their clamor. The gull is ever complaining about something, and at almost any hour of the night the querulous cry of some wakeful bird may be heard. At the Mingan Islands the gulls and terns had been a decided nuisance, following us everywhere in a clamorous crowd, by cry and action pointing out our whereabouts to the ever suspicious seals. Now we found them circling around the island, along whose lofty summit the cormorants were arrayed in straggling groups of three or four, craning their long necks over the edge of the cliff. Some were already returning from fishing trips, while others were starting out for their morning work, winging their way with out-stretched necks and heavy wing-beats, their black forms sharply outlined against the morning sky. Fishing-boats were putting off from shore, their black hulls, and red, tanned sails adding to the picturesqueness of the scene, while the bold, red summit of Percé Mountain shone brilliantly over all. In the rôle of collector, however, the birds had prior claims to our attention, and before breakfast several cormorants and guillemots (*Cepphus grylle*) were secured, these last being the first adults of the species taken since leaving the Magdalens. The little guillemots are wonderfully expert swimmers and divers, and in rough water their small size frequently enables them to elude pursuit, even when they do not take wing. On this occasion, however, the water was smooth, the birds could be readily discerned whenever they rose to the surface, and pursuers and pursued were more on an equality than is usually the case.

Although a few petrels and phalaropes (*Phalaropus fulicarius*) were taken on the homeward voyage, the work of collecting practically ended with our morning excursion at Percé. Naturally the most valuable portion of the collection consisted of the remains of the Great Auk, which, as indicated by the humeri, represented over seven hundred individuals. The humerus, however, is by far the most abundant bone, some

* See "St. Nicholas" for — 1889, p. —

portions of the skeleton, like the breast-bone and pelvis, very rarely being found in a good state of preservation. Still it may be said that the collection made by the *Grampus* party equals, or exceeds, the combined sum of all other Great Auk remains preserved in museums, for besides the large number of individual bones, about ten complete, or nearly complete, skeletons have been made up, one of which has been presented to the Museum of Comparative Zoölogy at Cambridge, Massachusetts, and one to the American Museum of Natural History in New York City.

Next in importance to the bones of the Great Auk were the pair of Welch's ptarmigans, secured by Mr. Palmer, these being the second pair ever taken, and the only birds in summer plumage. The rest of the material needs no special mention, although the numerous eggs, embryos, nestlings, skins, and skeletons form a very valuable addition to the collection of the U. S. National Museum, and their importance is enhanced by the fact that all the specimens were carefully prepared.

It is very evident, upon comparing our own observations with the accounts of previous observers, that the sea-birds have greatly decreased in numbers, even during the last decade. The gannets have suffered the most; the murres and razorbills next; while the puffins, on the contrary, may even have increased in numbers, owing to the fact that their burrowing habit makes the task of obtaining their eggs too difficult to be profitable. While regret at the diminishing number of the sea birds is partly a matter of sentiment, and the naturalist in particular can but deplore their loss, there is, however, a practical side to the question, although the relations between fish, birds, and men are so complicated that little can be stated positively in regard to the loss or gain due to the birds. Naturally the sea-fowl do not have the same economic importance as in the early days of the Newfoundland fisheries, although they are still used for bait and food, many being killed by the fishermen for this latter purpose, and large quantities of eggs are gathered annually. In this manner the birds are of direct value to fishermen, while indirectly they are of much service in pointing out the presence of fish.

On the English coast the actions of gannets often show the position of schools of herring, while on our own shores they frequently indicate the appearance of schools of mackerel. Gulls and terns, shearwaters and auks feed largely upon capelin and lant; and as these small fishes are preyed upon by schools of cod, their presence is frequently an indication that larger fish are not far off; and if the feathered fishermen are compelled to seek their prey at a distance, the chances are that their human competitors will be obliged to do so also. In this connection it may be worth while to note that when at Funk Island the puffins were apparently doing their fishing at some distance from the island, and that two fishing-boats from Fogo tried for cod in the vicinity without success. The question of the quantity of fish eaten by sea-birds is one, which must also be taken into consideration; and while at first sight it

might seem that the destruction of fish-eating birds could be only favorable to the fish, it may be said that until much more is known regarding the food of the birds, the exact relations existing between birds and fish can not be determined. The gannet is charged with devouring large quantities of fish, and while the charge is undoubtedly true, it would seem better for the present to protect the bird than to run any risk of exterminating a species which on both sides of the water has decreased from 20 to 50 per cent. during the last twenty years. So nicely are the economies of nature often adjusted, that interference with them often leads to wholly unexpected results; and it may well be that in destroying fishes that feed upon the spawn of larger species, the sea-birds far more than offset the harm they may do by devouring the young of food-fishes.

Although the many favors received during the voyage have been duly credited in the report of Captain Collins, I would yet like to add my own acknowledgments for the many favors received during the voyage, especially to the Rev. M. Harvey, and to Commander Wakeham.

In conclusion, I desire to thank Captain Collins, not only for his indorsement of the plan at the outset, and for his personal aid and interest in every detail of the varied work of collecting, but for the many courtesies received at his hands during the two months' cruise of the *Grampus*.