

# Article XVIII.—THE NORTH ATLANTIC RIGHT WHALE AND ITS NEAR ALLIES.

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PLATES XIX–XXIV.

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## I. INTRODUCTION.

No indigenous mammal of our fauna has occupied a more important place in commercial history than the Right Whale of the North Atlantic, nor is there any other whose history extends so far into the past. Its

economic products — oil and whalebone — added greatly for many centuries to the comfort and welfare of the civilized world. Its pursuit served as a training school for seamen, since its capture required skill, courage, and endurance, and entailed much hardship and personal risk. Its history is thus interwoven with the seafaring annals of the maritime nations of Europe from the tenth to the end of the seventeenth century, and with those of this country from the earliest settlement of the Atlantic coast to near the close of the eighteenth century, when incessant pursuit had accomplished its commercial extinction. It was not, however, till nearly a hundred years later that specimens of the animal were available to naturalists for examination, and it received proper recognition in modern zoölogy. From the standpoint of to-day it is possible to trace its history for nearly a thousand years, but exact knowledge of its distinctive characteristics and relationships is of recent date.

The literature relating to its history is exceptionally voluminous, but prior to 1860 is mostly of a commercial and more or less statistical character; there are, however, from the earliest times, references to its habits, external characters, and places of occurrence, and its gradual extirpation as a species of economic importance is easily traced. Its zoölogical status was first announced by the Danish naturalist Eschricht in 1860, from examination of a specimen captured at San Sebastian, Spain, but the death of this author soon after prevented his making known the details of its structure, which were first briefly indicated by Cope, in 1865, from a specimen taken in Delaware Bay. From these dates began its modern technical history, the bibliography of which numbers scores of titles. In the following pages an attempt is made to summarize this voluminous literature, relating to an almost extinct member of our New York fauna.

The North Atlantic Right Whale is at present represented in the museums of Europe by only three skeletons, all taken in European waters, and all representing more or less immature individuals. In this country it is represented by skeletons in several of the principal museums, all taken during the last fifty years, at various points on the Atlantic coast of the United States, from Cape Cod to Charleston. The mounted specimen in this Museum was one of the first to be installed for exhibition, and the first to be figured and described in detail.<sup>1</sup> Last year the Museum collection was further enriched by two others captured on the southern coast of Long Island.<sup>2</sup>

The early history of the North Atlantic Right Whale, at least in outline, is an oft-told tale. It was first disentangled from that of other species by

<sup>1</sup> By the late Dr. J. B. Holder, then Curator of Zoölogy, in the first volume of the *Museum Bulletin*, in 1883.

<sup>2</sup> Since the above was written the younger of these two specimens has been sent to the University Museum of Zoölogy, Cambridge, England, in exchange for other material.

Eschricht in 1861 (as noted beyond), in a memoir that is a classic in cetological literature. Since this date many important details have been added by other writers, in various languages, especially in relation to the early Basque whale-fishery carried on for centuries along the western coast of Europe, based on this species. There are also many recent records of its capture or occurrence in both European and American waters, indicating that it is again slowly on the increase in some of its old-time haunts. There is, however, no connected and adequate summary, comprising its technical as well as non-technical history, at present extant, but numberless references, partial histories, and original contributions of widely varying importance. Most of these are cited *passim* in the following pages, with more or less descriptive or critical comment.

The North Atlantic Right Whale is now well known in comparison with its congeners of other oceanic areas. Its North Pacific representative, which has figured in literature for a century, and has been pursued by American and other whalers for three fourths of a century, is still zoologically almost unknown; it is represented in museums by only a few blades of whalebone, and its general history rests mainly upon Scammon's account<sup>1</sup> of it and his figures of its external form. The most that can be said of it is that it apparently differs widely not only from the Arctic, Bowhead, or Greenland Whale, but from the right whales of the North Atlantic and southern seas. The right whales of the southern hemisphere are entirely unrepresented in the museums of this country, and, with the exception of one of the species (*Eubalæna australis*), are also almost wanting in European museums. There is, furthermore, not a skeleton, and only one or two more or less imperfect skulls, of the common Greenland Whale in the museums of America, which has been pursued for its commercial products by American whalers for centuries. During the last few years this Museum, largely through the liberality of Mr. George S. Bowdoin of New York City, has made a good beginning toward securing a collection of skeletons and other material to illustrate this great order of marine mammals; and in view of the urgent need of prosecuting this work with vigor, it is hoped that the means will be forthcoming for greatly increasing the world's knowledge of these little known animals.

PERSONAL NOTE.— Nearly thirty years ago — 1880–1882 — the present writer undertook the preparation of a work on the Cetacea and Sirenia of North America, to be published as a volume of the quarto Reports of the United States Geological and Geographical Survey of the Territories, then under the direction of the late Dr. F. V. Hayden. As a preliminary step in this work, the compilation of an annotated

<sup>1</sup> C. M. Scammon. *The Marine Mammals of the North-western Coast of North America*, described and figured. 4to, San Francisco, 1874.

bibliography of the Cetacea and Sirenia was undertaken, to cover the period from Albertus Magnus to the end of the year 1880. The first third, extending from 1495 to the end of the year 1840, and comprising about one thousand titles, was published in 1882<sup>1</sup>; the rest (more than two thousand titles, comprising the most important part from the systematic standpoint) remains still in manuscript. The preparation of the text of the monograph (on the same general plan as the author's previously published volume on the Pinnipedia<sup>2</sup>) was well advanced, several species of the Baleen or Whalebone Whales being practically completed. Twelve quarto plates, relating to the osteology of the Baleen Whales, had been lithographed from drawings carefully made under the author's supervision by Mr. James Henry Blake of Cambridge, Mass. At this point the work was suddenly interrupted by the author's serious illness, resulting in a prolonged period of invalidism. During this interval the "Hayden Survey" ceased to exist, and the reorganized Geological Survey, made no provision for the completion of the unfinished zoological work begun under the Hayden Survey. Later other interests engaged the author's attention, and nothing further was done on the proposed monograph of the Cetacea and Sirenia.

In the meantime several important contributions<sup>3</sup> have been made to the history of the North American Cetacea, relating especially to the field covered by the nearly completed portions of my monograph as left in 1882. Yet my work of 1882 has been only in part duplicated.

The recent acquisition by this Museum of considerable cetological material has led me to examine this long-stored manuscript and its illustrations, and the present article is primarily based thereon, with such revision and additions as the lapse of more than a quarter of a century has rendered necessary. It is published in the present connection with the approval of the Secretary of the United States Department of the Interior, under the auspices of which it was originally undertaken.

## II. HISTORICAL.

Although the earliest references to the North Atlantic Right Whale are somewhat vague, its history can unquestionably be traced back to the ninth and tenth centuries, at which period it is known to have been the basis of whale-fisheries prosecuted by the Basques and Norwegians. According to Markham's researches,<sup>4</sup> the Basque whale-fishery "was a well established trade in the twelfth century; so that," he concludes, "it probably existed at least two centuries earlier." He found that as early as 1150 whalebone was one of the articles of merchandise subject to warehouse duties at San Sebastian; and that in 1203, 1204, and 1237, the same regu-

<sup>1</sup> Preliminary List of Works and Papers relating to the Mammalian Orders Cete and Sirenia. By Joel Asaph Allen. Bull. U. S. Geol. and Geogr. Survey of the Territories (Hayden), Vol. VI, No. 3, pp. 399-562. Published August 30, 1882. 1013 titles, 1495-1840.

<sup>2</sup> History of North American Pinnipeds, a Monograph of the Walruses, Sea-Lions, Sea-Bears, and Seals of North America. U. S. Geol. and Geogr. Survey of the Territories (Hayden). Misc. Publ. No. 12, 1880, 8vo, pp. xvi + 785.

<sup>3</sup> Especially Dr. J. B. Holder's paper on the Right Whale of the North Atlantic, published in the first volume of this 'Bulletin,' and Frederick W. True's the 'Whalebone Whales of the Western North Atlantic,' published in 1904.

<sup>4</sup> On the Whale-Fishery of the Basque Provinces of Spain. By Clements R. Markham. Proc. Zool. Soc. London, 1881, pp. 969-976.



lations were imposed in other cities of the Basque Provinces. It is further recorded, he tells us, that "in accordance with custom," the "King should have a slice of each whale" taken, etc., which he regards as a further indication of the antiquity of the fishery. He also cites documents in which is recorded a list of the whales killed by the boats of the single port of Lequeitio from 1517 to 1661, and also similar records kept at other ports, which indicate that the whales were already declining in numbers off the Basque coast. He says: "It is clear that the whales, close along the coast, became very scarce in the middle of the seventeenth century, when entries at Lequeitio cease, and the Basque sailors then began to seek the means of exercising their special craft by making long voyages, even to the Arctic regions. Such voyages were occasionally made at a still earlier period. It is stated by Madoz that a pilot of Zarauz named Martin de Echeveste was the first Spaniard who visited the banks of Newfoundland, and that, according to a memoir written by his son, he made 28 voyages from 1545 to 1595, the year of his death."<sup>1</sup>

EARLY RECOGNIZED BY WHALEMEN AS DISTINCT FROM THE GREEN-  
LAND WHALE.

At about this time (1596) the Arctic, Bowhead, or Greenland Whale, first became known to Europeans, and soon, on account of its easier capture, greater yield of oil and whalebone, and especially its greater abundance, this species became the chief basis of the Northern Whale-fishery, prosecuted with so much industry for the next three centuries. In consequence of its discovery we obtain our first definite information respecting the distinctive characters of the Right Whale of temperate waters, after it had practically reached commercial extinction. Previous records fail to give any satisfactory clue to its distinguishing features, and it is only through these early comparisons of the two species that we first become aware of their differences; it was two centuries and a half later before they were properly set forth through the study of actual specimens by competent naturalists. That the two species were recognized by the whalers of the early part of the seventeenth century as two distinct kinds of whale is evident from the earliest comparative references to them, as shown by the following transcripts, which possess exceptional historic as well as scientific interest.

We first meet with tangible evidence of the recognition of whalebone whales in the "Commission for Thomas Edge, . . . appointed to go as . . . Factor in the Ship called the *Mary Margaret*, . . . for the killing of Whale

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<sup>1</sup> Markham, *l. c.*, pp. 972, 973.

and Morses upon the coast of *Greenland* [*i. e.*, Spitzbergen], or any other place in the North Ocean," issued by the Muscovie Company of London March 31, 1611. These instructions about whales are believed to have been based on information derived from Biscay whalers. "The first sort of Whales" is the Greenland Whale, here briefly described under the name "Bearded Whale." "The second sort of Whale," say these instructions, "is called *Sarda*, of the same colour and fashion as the former, but somewhat lesse, and the finnes not above one fathom long, and yieldeth in Oyle, according to his bignesse, sometimes eightie, sometimes a hundred Hogsheads." The "Bearded Whale" is said in the same connection to yield "betweene one hundred and one hundred and twentie Hogsheads of Oyle."<sup>1</sup>

In Edge's account of his "ten seuerall Voyages" (1611-1622), he gives "The Description of the seuerall sorts of Whales, with the manner of killing them," in which this same "second sort of Whale" is thus described: "The second sorte of Whale is called *Sarda*, of the same colour as the former [the Greenland or "Bearded" Whale, here called "Grand-bay Whale," "from *Grand-bay* in Newfoundland, as hauing there beene first killed"], but somewhat lesser, and the Finnes [baleen] likewise lesser, and yields in Oyle according to his bignesse, sometimes seuentie hogsheads, or eightie hogsheads. This Whale hath naturally growing upon his backe, white things like vnto Barnacles."<sup>2</sup> The "Grand-bay Whale" is here said to yield "about one hundred hogsheads of Oyle, and some fiew hundred Finnes." The "*Sarda*" is characterized as being smaller, with shorter baleen, and as yielding much less oil than the Greenland Whale, and as having "white things" growing on its back, the last, as will appear later, a distinction of much importance.

Martens, writing some fifty-two years later, briefly alludes to this species in the same comparative way. He says (I here quote an early English translation): "The *Whales of the North Cape* (they are so called, because they are caught between *Spitzbergen* and *Norway*) being not so big, therefore do not yield so much Fat as those of *Spitzbergen*, for those of the *North Cape* you shall not fill above ten, twenty, or thirty Cardels of Fat; the middling sort of those of *Spitzbergen* yield commonly seventy, eighty or ninety, and they are about fifty or sixty foot long."<sup>3</sup>

Zorgdrager devotes a chapter<sup>4</sup> to the Nordkaper, besides making passing allusions to it elsewhere. He gives us little information, however, about its

<sup>1</sup> Purchas, his Pilgrims, III, 1625, p. 710.

<sup>2</sup> Purchas, his Pilgrims, III, 1625, p. 471.

<sup>3</sup> An Account of several Late Voyages and Discoveries. London, 1711, [pt. ii.] p. 151. For the original see Martens's *Spitzbergische oder Groenlandische Reise-Beschreibung*, gethan im Jahr 1671. Hamburg, 1675, p. 106.

<sup>4</sup> Bloeyende Opkomst der Aloude en Hedendaagsche Groenlandische Visschery. Amsterdam, 1720, pp. 91-98.

distinctive characters, although recognizing it as a distinct species from the "Eilandsche Vissch" or Greenland Whale. He speaks of it as a southern whale, rarely or never appearing within the range of the Greenland Whale. He quotes several statements from Martens, and among others this: that in the stomach of a small whale called "Noordkaper," taken near Hetland, was found a barrel of herrings.<sup>1</sup> In substance his account of its size and yield of oil is not different from those given by Edge and Martens. On the hearsay statement that it feeds upon fish he ventures the opinion that the reason it frequents the coasts of Iceland and Norway is on account of the abundance there of the small fish that form its prey.

Egede, in his 'Description of Greenland' (originally published in Danish in 1741), adds little that is new to its history. His account is in substance Martens's and Zorgdrager's combined, and probably reflects the knowledge of the species then current among whalers. He says these whales are "called North Capers, from their place of abode, which is about the North Cape of Norway, though they also frequent the coasts of Iceland, Greenland, and sundry other seas, going in search of their prey, which is herring and other small fish, that resort in abundance to those coasts. It has been observed that some of these North Cape whales have had more than a tun of herrings in their belly.<sup>2</sup> This kind of whales has this in common with the former called fin-whale [which he has just described], in that it is very swift and quick in its motion and keeps off from the shore in the main sea, as fearing to become a prey to its enemies, if it should venture too near the shore. His fat is tougher and harder than that of the Great-bay Whale; neither are his bards or bones so long and valuable, for which reason he is neglected."<sup>3</sup>

Anderson, in his 'Nachrichten von Island,' published in 1747, adds also little to the history of the Nordkaper beyond a grotesque account of the way the Icelanders capture it, which Harrebow pronounced purely a fabrication.

In regard to the "Sletbag" of the Icelanders, Eschricht and Reinhardt believe that they are able to trace its history back to the "celebrated 'Kongespeil' (Mirror of Royalty) of the 12th century," and quote from it passages which seem to refer to it, as well as others from later Icelandic writings. In commenting on the information derived from these sources they say "We learn . . . that this 'Sletbag' of the old Icelanders was really a whalebone whale (and therefore as a whalebone whale with a finless back, a

<sup>1</sup> This statement is of special interest as being the origin of the report, repeated by scores of subsequent writers, including the early systematists, that the Nordkaper is a fish-eating species. Martens, however, gave the information at second-hand, as his words, here following, distinctly show: "Ich habe von andern vernommen, dass bey Heitland ein kleiner Wallfisch gefangen, ins gemein Nord-Kaper genandt, der hat mehr als ein Tonne Hering bey sich gehabt."

— Spitzbergeisch eoder Groenlandische Reise-Beschreibung, p. 107.

<sup>2</sup> He evidently here alludes to Martens's report about the Heitland whale already quoted.

<sup>3</sup> Description of Greenland, 2d London ed., 1818, p. 73.

right-whale), but we learn also, on the unequivocal authority of contemporary persons, on the one hand, that this was the whale at that time most commonly caught near the coast of Iceland, especially by French and Spanish whalers, who in the seventeenth century and still long afterwards every summer used to carry on a lucrative whale-fishery in the Icelandic sea, and on the other hand, that this 'Sletbag' was an animal very different from the North or Greenland whale." They later quote from an Icelandic manuscript supposed to have been written about the middle of the eighteenth century a passage about the Sletbag, and finally summarize the matter as follows: "At all events, so much seems finally proved by these statements of ancient and more modern dates, that the Icelanders have at all times agreed in regarding the 'Sletbag' as an animal quite different from the North whale, or the Greenland whale, being, in fact, a right-whale of inferior size, and with much shorter whalebone; and, at the same time, it is proved beyond all possibility of doubt, that this 'Sletbag' of the Icelanders was the very one that was hunted by the Basques in the summer, in the sea near Iceland, during the long period of at least two centuries." <sup>1</sup>

Respecting the occurrence of the Sarda or North-caper about Newfoundland and southward, the annals of the New England whale-fishery afford items of information of special interest. In Paul Dudley's well-known account of the New England Whales and Whale-fishery, written doubtless as early as 1724 and published in 1726,<sup>2</sup> we have a rather detailed account of what he calls "The Right Whale," which runs as follows: "But here I would have it noted, that the following Account respects only such Whales, as are found on the Coast of *New England*.

"And of these there are divers Sorts or Kinds. As first, The Right, or Whalebone Whale is a large Fish, measuring sixty or seventy Feet in Length, and very bulky, having no Scales, but a soft fine smooth Skin, no Fins, but only one on each Side, from five to eight Feet long, which they are not observed to use, but only in turning themselves, unless while young, and carried by the Dam on the Flukes of their Tails; when with those Fins they clasp about her Small, and so hold themselves on. This Fish, when first brought forth, is about twenty Feet long, and of little Worth, but then the Dam is very fat. At a year old, when they are called Short-heads, they are very fat, and yield to fifty Barrels of Oil, but by that Time the Dam is very poor, and term'd a Dry-skin, and won't yield more than thirty Barrels of Oil tho' of large Bulk. At two Years old, they are called Stunts, being stunted after weaning, and will then yield generally from twenty four to twenty eight Barrels. After this, they are term'd Scull-fish, their Age not being known,

<sup>1</sup> Memoirs on Recent Cetacea, pp. 32-33.

<sup>2</sup> Phil. Trans., XXXIII, 1724-1725 (1726), pp. 256-269.

but only guess'd at by the Length of the Bone in their Mouths. The Whale-bone, so called, grows in the upper Jaw on each Side, and is sometimes six or seven Feet in Length. A good large Whale has yielded a thousand Weight of Bone. 'Tis thought by some, that the hairy Part of the Whale-bone, and which is next to the Tongue, serves in the Nature of a Strainer of their Food. . . . The Entrails of this Whale are made and situated much like those of an Ox, and their Scalps are sometimes found covered with Thousands of Sea-lice. One of these Whales has yielded one hundred and thirty Barrels of Oil, and near twenty out of the Tongue" (*l. c.*, pp. 256, 257).

William Douglas, in his 'Summary, Historical and Political, . . . of the British Settlements in North America' (London, 1760), gives an account of the New England Whale-fishery, in the course of which he says: ". . . The New-England true whale is the same with the European North-cape whales, are not easily killed, being agile and very wild; the Dutch do not fish them. . . . Upon the coast of New England, whales go northward from the middle of March to the middle of May" (*op. cit.*, pp. 297, 298). In another connection he again refers to the subject, incidentally comparing the New England "true" Whale with the northern or Greenland Whale, but evidently not distinguishing them as two species; yet his comparison serves, taken in connection with the passages above-quoted, to throw into relief the differences between the two. It also shows that a little allowance for exaggeration is to be made in reference to the length given for the "bone" of the New England "true" Whale. He says: "The New England whalers distinguish ten or twelve different species of the whale-kind; the most beneficial is the black whale, whale-bone whale, or true whale, as they call it; in Davis's-straits, in N. lat. 70 D. and upwards they are very large; some yield 150 puncheons, being 400 or 500 barrels of oil, and bone of eighteen feet and upwards; they are a heavy loggy fish, and so do not fight, as the New-England whalers express it; they are easily struck and fastened, but not above one third of them are recovered; by sinking and bewildering themselves under the ice, two thirds of them are lost irrecoverably; the whale-bone whales killed upon the coast of New England, Terra de Labrador, and entrance of Davis-straits, are smaller; do yield not exceeding 120 to 130 barrels of oil, and of nine feet bone 140 lb. wt. they are wilder more agile and do fight" (*op. cit.*, p. 56).

Hector St. John's 'Letters from an American Farmer' (London, 1782), contain an account of the Nantucket whale-fishery, in which he gives, "the names and the principal characteristics of the various species of whales known to these people." He says "the river St. Lawrence whale" is the only one with which he was well acquainted, which he describes as "seventy-five feet long, sixteen deep, twelve in the length of its bone, which commonly

weighs 3000 lb. twenty in the breadth of their tails and produces 180 barrels of oil." He afterwards, in his enumeration of the species, includes "The right whale, or seven feet bone, common on the coasts of this country, about sixty feet long" (*op. cit.*, pp. 167, 169).

It thus appears that the Right Whale of the eastern coast of the United States was regarded by whalers as not only distinct specifically from the Greenland Whale, but also as identical with the whale of the North Cape. It seems, indeed, to have been generally known among New England whalers, down to the last part of the nineteenth century, as the "North-caper," as I have learned from Provincetown whalers formerly engaged in the pursuit of whales in the Gulf of St. Lawrence. Their "North-caper" (also called "Black Whale") was not only smaller, yielding less oil and much shorter bone, but had a "bonnet" infested with parasitic cirripeds, and was migratory, passing north in spring and south in autumn.

Eschricht and Reinhardt,<sup>1</sup> in speaking of the species now under consideration, present the following summary of the results of their investigation of its early history: "Much as we could wish, on reviewing the above-mentioned statements derived from very different authors, that the historical evidence about the whale mentioned by the name of 'Sletbag,' 'Sarde,' or 'Nordkaper,' had contained a more complete description of it, yet it must be admitted that they are sufficient to prove our former assertion, that the ancient Icelanders as well as the whalers of different nations really used to distinguish between this whale and the Greenland whale, and that this distinction was in all respects well founded. As certain characteristics of the 'Sletbag,' we are already enabled to point out the following:

"1. That it was much more active than the Greenland whale, much quicker, and more violent in its movements, and accordingly both more difficult and more dangerous to catch.

"2. That it was smaller (it being, however, impossible to give an exact statement of its length), and had much less blubber.

"3. That its head was shorter, and that its whale-bone was, comparatively speaking, much thicker, but scarcely more than half as long as that of the Greenland whale, being however still much longer than that of even the very largest fin-whale, although the 'Sletbag' itself probably scarcely attained to half the length of the last-named.

"4. That it was regularly infested with a cirriped belonging to the genus *Coronula*, and that it belonged to the temperate North Atlantic as exclusively as the Greenland whale belonged to the icy Polar sea, so that it

<sup>1</sup> The extracts here following are from the English translation of their 'Om Nordhvalen' (1861) published by the Ray Society in 1866, in 'Recent Memoirs on the Cetacea,' pp. 39-41.

must be considered as equally exceptional when either of these species strayed into the range of the other, and, moreover, that in its native sea it was to be found farthest towards south in the winter (namely, in the Bay of Biscay and near the coast of North America, down to Cape Cod [and even to the Carolinas]), while in the summer it roved about in the sea round Iceland, and between this island and the most northerly part of Norway [and also about Newfoundland].

"The existence of such a North Atlantic right-whale may be said to be so certain, that it is much more surprising that it ever should have been omitted in the zoological system than that it has now, as we hope, regained its former place in it. The reasons why Scoresby, and afterwards Cuvier, would not acknowledge it as a separate species,<sup>1</sup> were, besides an insufficient knowledge of the historical evidence relating to it, partly the fact of the former's not having seen anything of it on his many whaling expeditions, and partly the great resemblance to the Greenland whale, so evidently seen in the only picture given of the 'Nordkaper.' Neither of these reasons will, however, on a closer consideration, seem particularly weighty. . . . We may also say that the drawings of the 'Nordkaper,'<sup>2</sup> which, as we have mentioned, are published by Lacépède, have been thought far too much of, when they have been called the only evidence of any authenticity of the existence of this whale,<sup>3</sup> and when it has been inferred, from the circumstance of their exhibiting scarcely any difference from the genuine Greenland whale,<sup>4</sup> that the 'Nordkaper' must be identical with this animal. In order to make such an inference we ought to have ascertained beforehand whether these drawings do really represent the 'Nordkaper' properly so called, and whether this name, so frequently misused, has not been misapplied in this instance too; but here we have no means of arriving at a certain conclusion. Lacépède tells us that he obtained the drawings from Sir Joseph Banks three months before the publication of the 'Histoire Naturelle des Cétacés' (1804), with the information that they were drawn in Greenland by Bachstrom in the year 1779.<sup>5</sup> But in Baffin's Bay the 'Nordkaper' is as rare as in the sea near Spitzbergen. According to what we have stated above,

<sup>1</sup> "In the first edition of the 'Regne Animal,' (1817), Cuvier still believed in the existence of the 'Nordkaper' (*Balena glacialis* Kl.) (l. c. vol. i, p. 286). It was not till in the 'Recherches sur les ossements fossiles,' and in the essay: 'Sur la détermination des diverses espèces de Baleines vivantes' (in 'Ann. d. Sc. nat.' T. ii, 1824), that it was abandoned, and it is easily to be seen that this alteration in Cuvier's opinions was, to a great extent, occasioned by the statements of Scoresby."

<sup>2</sup> "Lacépède Hist. nat. des Cétacés, pl. 3."

<sup>3</sup> "Le seul document muni de quelque authenticité que l'on ait cru pouvoir y rapporter." Cuvier, 'Recherches sur l. oss. foss.' 4me Ed. T. viii, p. 256."

<sup>4</sup> "Scoresby, Acc. vol. i, p. 448, note. Cuvier, l. c. p. 257."

<sup>5</sup> "Hist. nat. d. Cétacés, p. 108." 'Ce Cétacé' (le Nordkaper) vit dans la partie de l'Océan atlantique septentrional située entre le Spitzberg, la Norvège et l'Islande. Il habite aussi dans les mers du Groenland, où un individu de cette espèce a été dessiné, en 1779, par Mr. Bachstrom, dont le travail, remis dans le temps à Sir Joseph Banks, m'a été envoyé, il y a trois mois, pas cet illustre, &c."

only single individuals, at many years' intervals, have strayed thither, and it is not very probable that Mr. Bachstrom really had an opportunity of seeing one."<sup>1</sup>

These authors go on to state that Scoresby, knowing that the Greenland Whale, "made for seas filled with ice," was not likely to "have appeared regularly far down in the Atlantic along the coasts of France and Spain," attempted to explain the accounts of the old Basque whale-fishery on the ground that it was based on the capture of Fin-whales. Cuvier, well aware that such an explanation was inadmissible, "accordingly did not fall into Scoresby's error, but, following his authority in supposing the 'Nordkaper' and the 'Greenland whale' to be the same animal, he was led into the mistake of rejecting what was right in Scoresby's reasoning, and of setting forth the older theory that the whale has been gradually driven up into the Arctic Sea, in all its crudity."<sup>2</sup> [Here follow quotations from Cuvier's writings on this point, giving his reasoning in the matter.]

#### RECOGNIZED AS A DISTINCT SPECIES BY THE 18th CENTURY SYSTEMATISTS.

The Nordkaper was introduced into systematic zoölogy by Klein, in 1741,<sup>3</sup> under the name *Balæna glacialis*, but evidently as a composite species, having in part reference to the true Greenland Whale. He makes of it three varieties, viz: *a, australis* = "Eisfisch," Zörgdrager; *b, occidentalis* = "Zud-Eisfisch,"<sup>4</sup> Zörgdrager; *c, borealis* = "Nordkaper," Zörgdrager. The last can alone certainly refer to the Nordkaper, and his account of it is, in full, as follows: "*C. Borealis*; Nordkaper, *Ejusdem* [*i. e.*, Zörgdrager]. Vescuntur & esca Balænæ veræ & Harengis &c. Adeps earum majoris est consistentiæ; ideo non adeo sollicite qværantur. Figuram Borealis vid Eph. N. C. G. Dec. II, An. VII, Obs. XXI, Optamus meliorum." Klein's *Balæna glacialis, c. borealis*, is therefore the Nordkaper of Zörgdrager, which has been already considered.

Brisson, in 1756, gave<sup>5</sup> it a far better introduction under the name *Balæna islandica*, or "La Baleine d'Islande." Although he cites only Klein (as above) and Harrebow's Anderson, he presents its characters, as

<sup>1</sup> "Lacépède does not say who Mr. Bachstrom was; nor have we been able to find any other traces of such a person. He can scarcely have had any appointment in the Danish factories, and in the list of the missionaries of the brethren in Greenland, given by Crantz, the name of Bachstrom is not found. He was most probably on board a whaling ship, as the words of Lacépède would seem to imply."

<sup>2</sup> Om Nordhvalen (K. Danske Vidensk. Selsk. Skr., 5 Raekke, Naturvidensk. og Math. Afd., V, 1861, pp. 463, 464); Recent Memoirs on the Cetacea, 1866, pp. 39-41.

<sup>3</sup> Hist. pisc. nat., Miss. ii, 1741, p. 12.

<sup>4</sup> On Zörgdrager's "Ziudys-Vissch," see Eschricht and Reinhardt, Om Nordhvalen, p. 463; Recent Mem. on Cetacea, pp. 25, 26.

<sup>5</sup> Reg. anim., p. 350.



then known, with brevity and precision, as follows: "Elle ressemble par sa figure à la précédente ["la Baleine ordinaire de Groenland"]: elle en diffère seulement parce qu'elle a la tête & les lames de corne, qui garnissent la mâchoire supérieure, beaucoup plus petites, & le corps plus mince. Sa peau est lisse, & d'un noir que tire un peu sur le blanchâtre. Elle se nourrit de *Harengs*. On la trouve sur les côtes de Norwege & d'Islande" (*op. cit.*, pp. 350, 351).

By Linné, Gmelin, Erxleben, Donndorf, and most other systematists of the eighteenth century, the Nordkaper is either treated as identical with the Greenland Whale or as merely a variety of it, or else (as in the case of Erxleben) as a species not satisfactorily determined.

Bonnaterre, however, in his 'Cetologie,' published in 1789, again gave it full specific rank, adopting for it the not very appropriate name *Balæna glacialis*. He cites as authorities Anderson, Brisson, Horrebow, and Klein. The characters given are, however, substantially those mentioned by Brisson. He adds that "il est tres-dangereux de harponner cet animal, à cause de son extrême agilité." We have here set forth all the traits and characters of the animal as it was known prior to the middle of the nineteenth century, except that its habitat is given merely as the "mers du Nord, près des côtes de Norwege & d'Islande." It is properly introduced under a binomial Latin designation, appropriate enough as its habitat was then understood. It, however, only visits its northern habitat during its summer migration, and is not, strictly speaking, an animal of the glacial seas to the extent the name *glacialis* might be supposed to imply.

Lacépède, in 1804, retained<sup>1</sup> it as a species under the name *Balæna nordkaper* and gave supposed figures of it, after drawings by Bachstrom, but which, as Eschricht and Reinhardt believe, really relate to *Balæna mysticetus* (see *antea*, p. 287). The characters given are derived from preceding authors, and his account (aside from the figures) relates to the true Nordkaper.

As already detailed in the words of Eschricht and Reinhardt (see *antea*, p. 287), Cuvier rejected the species altogether in his memoir 'Sur la détermination des diverses espèces de Baleines vivantes,'<sup>2</sup> influenced apparently by the theory that the Greenland Whale formerly ranged far to the southward and had been driven to seek safety from the persecutions of whalers in the icy seas of the north, and by Scoresby's opinion that the Nordkaper did not exist as a species distinct from the Greenland Whale. Cuvier's well-known rigid criticisms of the literature of cetology led him into error in other cases as well as in this, he rejecting species that were not based on

<sup>1</sup> Hist. nat. des Cétacées, pp. 103-110, pll. ii, iii.

<sup>2</sup> Ann. des Sci. nat., II, 1824, pp. 27-41; Ossem. foss., V, 1823, pp. 359-388.

what he deemed tangible characters. At the same time, he succeeded in placing the general subject on a much higher scientific plane, although in the vast amount of rubbish he swept away were some vestiges of truth. He showed, from osteological considerations, that the Greenland Whale was specifically distinct from at least one of the Right Whales of the southern hemisphere — the Baleine du Cap, afterwards named *Balæna australis*, and to which for many years were referred by numerous authors all the Right Whales of the southern waters.

#### NINETEENTH CENTURY RESEARCHES AND OPINIONS.

It is hardly necessary to follow in detail the history of the species through the long list of systematic writers down to recent times, who, according to personal predilections, recognized it as specifically distinct or as referable to the Greenland Whale, since nothing of importance was added to its history down to the capture of the young example in the port of San Sebastian in 1854. This was fortunately figured by Dr. Monedero,<sup>1</sup> and the skeleton was later acquired by Eschricht for the University Museum at Copenhagen. In 1858, Eschricht received, through his friend Professor Geffroy of Paris, a copy of Dr. Monedero's lithographed sketch of the animal, in which he recognized at once a species very different from the Greenland Whale. He immediately hastened to Pampeluna, where the skeleton had been preserved, and secured it for future study at Copenhagen, to which place it was at once transported. On his return from Pampeluna Eschricht visited Paris, and laid before the French Academy his celebrated memoir 'Sur une nouvelle méthode de l'étude des Cétacés,'<sup>2</sup> in which he says: "Il devient donc plus que probable que les Baleines franches qui jadis furent l'objet d'une pêche dans le golfe Biscayen et dans le partie septentrionale de l'Atlantique, ont appartenu à une espèce différente de toutes les autres" (*l. c.*, p. 60), and promised later to communicate the results of his investigations of its skeleton. He here mentions, however, no distinctive characters, nor does he refer to it by any particular name, either scientific or vernacular.

In 1860, he favored the French Academy with a communication entitled 'Sur les baleines franches du golfe de Biscaye,'<sup>3</sup> but we vainly look here for what the title so encouragingly leads us to hope for. No details regarding

<sup>1</sup> Copia al naturel del Ballenato muerto en la playa de S. Sebastian, el 17 de Enero de 1854, hecha por las indicaciones y direccion del Dr Monedero. The figure (the only authentic one of the species extant prior to 1879) is reproduced in Gervais and Van Beneden's "Ostéographie de Cétacés," livr. 3, 1868, pl. vii.

<sup>2</sup> Compt. rend. de l'Acad. des Sci., XLVII, 1858, pp. 51-60.

<sup>3</sup> Compt. rend. de l'Acad. des Sci., L, 1860, pp. 924-929.

its structure are presented, but the statement is made that it is distinguishable by striking differences both from the Greenland Right Whale and the Baleine du Cap. His last public reference to the subject appears to have been in the memoir 'Om Nordhvalen,' published in 1861, in which he promised the special results of his examination of the young skeleton in a future essay; "here it may be sufficient to state, that he has succeeded in establishing the fact, that the Nordkaper, though belonging to the group of South Sea whales, is really, as we had supposed, an independent species perfectly different from the Cape whale."<sup>1</sup>

Van Beneden has also stated that Eschricht contemplated giving a description of this skeleton in a new work which was to have been published at Paris but which was suspended by his death when only a few sheets had been printed.<sup>2</sup> Van Beneden gives the following extract from a letter from Eschricht dated the 23d of June, 1861: "Je joindrai à la seconde livraison, pour les baleines franches (*Leibalaena*), mes recherches sur la baleine de Biscaye et sur la japonica, dont j'ai reçu un fœtus très-maltraité."<sup>3</sup> In the same connection Van Beneden states that Professor Reinhardt "s'est engagé à publier la description de ce squelette unique, qui se trouve au musée de l'université de Copenhagen." This skeleton remained undescribed, however, till 1879, when it was described by Gasco,<sup>4</sup> as noted more fully on a later page of this paper. In the meantime, however, it had become the basis of the name *Balaena biscayensis*.

*Origin of the name Balaena biscayensis.*—The name *Balaena biscayensis* has figured prominently since 1864 in the literature of cetology, and has been almost universally accredited to Eschricht. In none of Eschricht's published writings, however, is the term used, nor any name approaching it nearer than "Baleine franche de Biscaye."<sup>5</sup>

The first occurrence of the name is in Dr. J. E. Gray's paper entitled 'On the Cetacea which have been observed in the Seas surrounding the British Islands,' published in 1864,<sup>6</sup> in which occurs: "The Right Whale of the Bay of Biscay (*B. biscayensis*) is regarded as a different species from the *B. mysticetus* by Eschricht and Van Beneden" (*l. c.*, p. 201), without citation of their papers, or any additional comment. A few months later, in a paper entitled 'Notes on the Whalebone Whales; with a Synopsis of the Species,'<sup>7</sup> he more formally introduced it, as follows:

<sup>1</sup> Eschricht and Reinhardt, Recent Memoirs on Cetacea, p. 46.

<sup>2</sup> Milne Edwards, in 1864 (*Ann. des Sci. nat.*, 5<sup>e</sup> sér., I, 1864, pp. 201-224), published, after Eschricht's death, from the proofsheets, this part of the proposed work, under the title 'Recherches sur la distribution des Cétacés dans les mers boreales,' which includes "I.—Introduction" (*l. c.*, pp. 201-204); "II.—La côte occidentale du Groenland" (pp. 205-224). In this there is no reference to the specimen taken in the Gulf of Biscay, nor even to the Nordkaper.

<sup>3</sup> *Osteogr. des cétacés*, livr. 4, 1868, p. 98.

<sup>4</sup> Il balenotto catturato nel 1854 a San Sebastiano (Spagna) (*Balaena biscayensis*, Eschricht) per la prima volta descritto. F. Gasco. *An. Mus. Civ. Stor. Nat. Genova*, XIV, 1879, pp. 573-608.

<sup>5</sup> *Compt. rend. de l'Acad. des Sci.*, L, 1860, p. 924.

<sup>6</sup> *Proc. Zool. Soc. London*, 1864 pp. 195-248. (Read May 24, 1864.)

<sup>7</sup> *Ann. and Mag. Nat. Hist.*, 3 ser., XIV, Nov, 1864, pp. 345-353.

"2. *Balæna Biscayensis*, Esch. & Van. Ben.

"*Hab.* The Bay of Biscay. I have seen no remains of this Whale" (*l. c.*, p. 348).

Slightly later it was used by Prof. W. H. Flower, who, in his 'Notes on the Skeletons of Whales in the principal Museums of Holland and Belgium,' etc.,<sup>1</sup> in speaking of Gray's genus *Eubalæna*, says: "Type species, *E. australis* (Desm.) Probably several other species, including *Balæna biscayensis*, Eschr.; but these are not yet well determined" (*l. c.*, p. 391).

In 1866, in his 'Catalogue of Seals and Whales in the British Museum' (p. 89) Gray introduced this species still more formally, as follows:

"2. *Balæna Biscayensis*.

"Baleine de Biscaye, *Van Beneden, Bull. Acad. Roy. Belgique*, [(2) XII,] 1861, 462.

"*Balæna Biscayensis* Gray, *P. Z. S.* 1864, 200 [= 201].

"Baleine franche du golfe de Biscaye, *Eschricht, Comptes Rendus*, 1860; *Actes de la Soc. Linn. de Bordeaux*, t. 13, 4<sup>e</sup> livr. [*lege* t. XXII].

"*Balæna* (*Eubalæna*) *Biscayensis*, *Flower, P. Z. S.* 1864, 391.

"*Inhab.* Bay of Biscay, St. Sebastian. A female and its young, Jan. 1860 [*lege* 1854]. Skeleton at the Museum of Pampeluna [*lege* Copenhagen]."

This is followed by a quotation of two lines (as given above) from his 1864 paper; by a reference (4 lines) to what Cuvier stated about the occurrence of the Greenland Right Whale in the Gulf of Gascony, etc.; by six lines from Flower's above-cited paper, and ten lines from Eschricht, followed by a few lines of comment.

On an earlier page of the 'Catalogue' (p. 84), he also refers to "the whale which Eschricht has described under the name *Balæna Biscayensis*"; and later still, in 1870, in his "Observations on the Whales described in the 'Ostéographie des Cétacés' of MM. Van Beneden and Gervais," he mentions<sup>2</sup> the San Sebastian whale as "the specimen which has been named *Balæna Biscayensis* by Eschricht," or as "*Balæna Biscayensis*, Eschricht," etc.

Thus was introduced the name *Balæna biscayensis* into the literature of zoölogy. It was first employed by Gray in 1864, on two occasions, and again in 1866, when he gave references and synonyms; but he now ascribed its origin to Eschricht, and later abandoned it as lacking proper basis.

Eschricht was the first modern author to recognize the Right Whale of the North Atlantic as different from the Greenland Right Whale, and not only as different from it, but as having no close relationship to it, he stating it to be, on the other hand, nearly related to *Balæna australis* of the south-

<sup>1</sup> Proc. Zool. Soc. London, 1864, pp. 384-420. (Read Nov. 8, 1864).

<sup>2</sup> Ann. and Mag. Nat. Hist., 4th ser., VI, Sept. 1870, pp. 197-199, 200.

ern seas. He failed, however, to designate it technically, which was first done by Gray, who simply gave to Eschricht's vernacular designation a Latin rendering. Yet, from 1864 down to the present time, the name *Balæna biscayensis* has, with the exception of a single author (E. D. Cope, as will be noted later), been universally ascribed to Eschricht, who never even used it. In fact, it was not proposed till after Eschricht's death, which occurred February 22, 1863.

*Balæna cisarctica* COPE.—The *Balæna cisarctica* was described by Prof. E. D. Cope in 1865,<sup>1</sup> from a specimen taken in Delaware Bay, opposite the city of Philadelphia, three years previously. Professor Cope refers to it as "a half grown individual," the skeleton of which, without the intervertebral cartilages, had a length of "thirty-one and a half feet," and gives a brief account of its leading osteological features. He says of it: "This species may readily occur on the European coasts, and is, no doubt, allied to, or the same as, the species pursued by the Biscay whalers, which Eschricht says is related to the *australis*. This does not appear to have been described, though catalogued without reference by Gray and Flower, under the name *biscayensis*. The species above described may be called *Balæna cisarctica*; its skeleton will be more fully illustrated in a future publication." He says further that it is the "Black Whale" of the whalers of the eastern coast of the United States.

Its identity with the so-called *B. biscayensis* has always been accepted by all leading writers on the Cetacea, except Gray and Fischer. Later investigation has shown that there is no reason for doubting that Cope's assumption that they are specifically the same was well founded. Indeed, his reason for calling it *Balæna cisarctica* was the fact that he evidently considered the earlier name, *Balæna biscayensis*, as practically a *nomen nudum*, and not that he considered this earlier name to represent a different species. He also, it should be noted, correctly attributed the name to Gray instead of to Eschricht, to whom, as already stated, all other writers have invariably ascribed it.

*Eschricht, Gray, and Van Beneden, 1861–1871.*—Three prominent names dominated the literature of cetology during a large part of the middle of the nineteenth century — D. F. Eschricht of Copenhagen, John Edward Gray of the British Museum, and J. P. Van Beneden of Belgium — so far at least as the present species, the so-called *Balæna biscayensis* "Eschricht," is concerned. Its type is the specimen captured in the harbor of San Sebastian,

<sup>1</sup> Note on a Species of Whale occurring on the Coasts of the United States. *Proc. Acad. Nat. Sci. Philadelphia*, 1865, pp. 168, 169. There is also a further reference to the species, *op. cit.*, pp. 180, 181. This and other papers on North American Cetacea were republished in 1866 under the title 'Contribution to the History of the Cetacea, especially of the Eastern American Coasts,' Philadelphia, 1866, pp. 1–15, in which the description of the present species occurs at pp. 1–3.

Spain, in January, 1854, which, however, though figured soon after by Monedero, remained practically undescribed till 1879. Its skeleton was secured in 1858 for the Museum of the University of Copenhagen by Eschricht, when its examination by him confirmed him in his previous opinion, based on an exhaustive study of the literature bearing on the Greenland Right Whale and the Right Whale of the North Atlantic, that these two animals were not only distinct species, but that the latter was much more nearly related to the Right Whales of the southern seas than to those of the Arctic seas. His statement of its affinities was immediately accepted by all cetologists except Gray, who, after introducing the name *Balæna biscayensis* into scientific literature, apparently by inadvertence, later took the ground that it "as a zoological species rests on very slender grounds," and considered it as "not proved that the Greenland Whale had not [formerly] a more extended distribution than at present," and had been driven by the whalers from the temperate parts of the North Atlantic to the icy seas. Van Beneden, on the contrary, accepted the species; and this and other differences of opinion between him and Gray led to a series of controversial papers which form an interesting and instructive episode in the history of the present subject.

Early in the year 1868, Professor Van Beneden published a paper on 'Les baleines et leur distribution géographique,'<sup>1</sup> with a map illustrating the distribution of the five species recognized by him as "Baleines proprement dites," or those having neither a fin nor a "bosse" on the back and without gular folds. Among these species is "2 La *Balæna biscayensis*" (pp. 15, 16). Its early history, in relation to its former distribution, is briefly stated, and its supposed range is indicated on his accompanying map of the distribution of the Right Whales. Unfortunately the map is incomplete, failing to show certain areas well known to be frequented by Right Whales, and somewhat erroneous as regards the ranges of some of them, as was promptly shown by Gray in a paper 'On the Geographical Distribution of the Balænidæ or Right Whales.'<sup>2</sup> Gray, however, while pointing out the faults of Van Beneden, committed others peculiarly his own, especially in relation to the San Sebastian specimen, of which he says: "Mr. Flower informs me that this skeleton belongs to my genus *Cuvierius*,<sup>3</sup> which has brittle whalebone, with a large coarse fringe (which easily splits into strips), and a bifid first rib"; and later on refers to it as "*Balæna (Hunterius) biscayensis*." He also says: "It is very doubtful if this is the Whale found

<sup>1</sup> Bull. de l'Acad. roy. de Belgique, 2me sér., XXV, No. 1, 1868, pp. 9-21, avec une carte.

<sup>2</sup> Ann. and Mag. Nat. Hist., 4th ser., Vol. 1, April, 1868, pp. 242-247.

<sup>3</sup> On this point cf. Flower, Proc. Zool. Soc. London, 1864, p. 391, where he refers it to Gray's genus *Eubalæna*. As *Cuvierius* is a Fin-Whale, this may have been a *lapsus penæ* for *Eubalæna*, but the immediate context does not appear to warrant this supposition. Furthermore, Gray in 1870 (Ann. and Mag. Nat. Hist., 4th ser., VI, 1870, p. 200), stated his belief that "*Balæna biscayensis*, Eschricht," is "a *Cuvierius* with a double-headed first rib."

on the coast of North America, as it ought to be according to Van Beneden's chart. The only reliable account of the Whale of that coast is to be found in Dudley's paper in the 'Philosophical Transactions' (xxxiii, p. 258), who says the 'Scrag-Whale' (*B. gibbosa*, Erxleben) has white whalebone, 'that won't split,' which seems to show that it was a true *Balæna*, which is separated from *Eubalæna* on account of the toughness, flexibility, and unsplitability of its whalebone; and, indeed, Dudley says the Scrag-Whale 'is nearest the Right Whale (*B. mysticetus*) in figure and quantity of oil.'" It seems unaccountable that Gray should in this connection ignore altogether the Right Whale Dudley described<sup>1</sup> as *the* Right Whale of the New England coast and take up his "Scrag-Whale" for comparison in the present connection — a species which has never been satisfactorily identified, and is not now recognized as a valid species.<sup>2</sup> But Gray's reasoning from such false premises need not be further followed. He further quotes from Cope to the effect that Cope's *Balæna cisarctica* has the first rib "single-headed," and that this species is therefore referable to his genus *Eubalæna*, while *B. biscayensis* is not thus referable.

At about this date appeared Van Beneden's account of *Balæna biscayensis* in Van Beneden and Gervais's notable work, the 'Ostéographie des Cétacés,'<sup>3</sup> in which he gave a résumé of its early history, derived mainly from Eschricht and Reinhardt's 'Om Nordhvalen,' and referred to the San Sebastian whale and Cope's *Balæna cisarctica*, which latter he believed to be identical with the so-called *Balæna biscayensis*. He adds little that is new, beyond a description and figure of a tympanic bone of *B. cisarctica*, loaned him by Cope. Various subfossil remains of Right Whales, which he also figures, he considers referable to *B. biscayensis*. These are (1) two lumbar vertebræ from the coast of Ostende; (2) a mass of cervical vertebræ from the Lyme Regis of England; (3) another mass of cervical vertebræ from the isle of Sainte-Marguerite, figured and described by Lacépède as those of a Rorqual (*Balenoptera*), and later determined by Cuvier to be those of some species of *Balæna*; (4) a fragment of a rib unearthed at Furnes.

In 1870, Dr. Gray published a review of this work, under the title, "Observations on the Whales described in the 'Ostéographie des Cétacés' of MM. Van Beneden and Gervais,"<sup>4</sup> in which he criticised the general

<sup>1</sup> See *antea*, pp. 284, 285, where Dudley's account is given in full.

<sup>2</sup> The name Scrag Whale appears to have been long current among whalers for a whale occurring on the eastern coast of the United States. The first original reference to the species, after Dudley's, appears to be that furnished me in 1869 by the Hon. N. E. Atwood of Provincetown, Mass., an experienced whaler and naturalist, for my 'Catalogue of the Mammals of Massachusetts' (Bull. Mus. Comp. Zool., I, 1869, p. 203). He says: "A species of whale known by this name [Scrag Whale], nearly allied to if not identical with the right whale, is sometimes taken here. . . . The most prominent feature is that on its dorsal ridge, near the tail, there are a number of small projections or bunches, having some resemblance to the teeth of a saw. It has no dorsal fin or hump on its back." He further speaks of it as "rare."

<sup>3</sup> Livr. 4, 1868, pp. 90-110, pl. vii.

<sup>4</sup> Ann. and Mag. Nat. Hist., 4th ser., VI, Sept. 1870, pp. 193-204.

character of the work, as well as numerous special points, in the course of which he again took up the subject of *Balæna biscayensis*.<sup>1</sup> He here resumes his criticism of Van Beneden's former essay and map, already noticed, on the distribution of the Right Whales, in which connection (pp. 196-200) he takes occasion to give the history of *Balæna biscayensis*. After stating that it, "as a zoölogical species, rests on very slender grounds," and alluding to the whale-fisheries formerly prosecuted "in the Bay of Biscay and in the British Channel," he states: . . . "but it is not proved that the Greenland whale had not a more extended distribution than at present, after it has been the object of capture for so many years, and, on the other hand, that the specimens that wandered far away from the usual habitat of the species would not become smaller, less fat, or more active than the others, which were better fed. The same argument may explain the difference observed by whalers in the size and form of the whales caught on the coast of Iceland and the coast of Greenland. At the same time I would not deny that the whales of this latter place may not be a different species; but as yet we have not sufficient materials for separating and characterizing them" (*l. c.*, p. 197). This would seem to imply that he ignored the existence of the species he had himself formerly recognized provisionally under the name *Balæna biscayensis*. He then alludes to the San Sebastian specimen taken "in 1834" (*lege*, 1854), which he says "has been named *Balæna biscayensis* by Eschricht," and states that "he [Eschricht] thinks that he observed in the development of the various parts of the skeleton a difference from that which he had observed in the skeletons of *Balæna mysticetus*. But we must recollect that this was to support a theory that the latter whale was exclusively confined to the Polar seas and that the Right Whale of the North Atlantic must be different" (*l. c.*, p. 197).

Apropos of this statement, the criticism he had visited upon the supposed author of the "Mysticètes" of the 'Ostéographie des Cétacés' may well be recalled in the present connection, namely: that there is shown "a very limited knowledge of the subject." It is also regrettable that he did not exhibit "a more philosophic spirit," and manifest a little deference to so high an authority in cetology as Eschricht. His criticism of the *Balæna biscayensis* of the 'Ostéographie,' which, he states, is founded on what appears to him "to be very incongruous materials," is not, however, without point, and his claim that "the only ground on which they are united is that

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<sup>1</sup> The authorship of the portion of the work which had at this time appeared not having been distinctly announced, Dr. Gray innocently assumed that the author of the part relating to the "Mysticètes" was Gervais, and poured upon him his vials of criticism, made the more sweeping by including in a general way "previous short essays" of this author on the Cetacea, which are referred to as showing a very limited knowledge of the subject. The mistake in respect to authorship, was, however, soon exposed by its avowed author, Van Beneden, as will be presently detailed.



all the specimens were procured from the North Atlantic, together with the preconceived idea that only one whale can inhabit that region," is doubtless to some degree true. After discussing in detail these several fragments, he gives it as his opinion "that there is not at present any material to make out what the *Balæna biscayensis* of Eschricht is, and, that the *Balæna biscayensis* of these authors [Van Beneden and Gervais] is made up of the bones of various whales" (*l. c.*, p. 199).

After further reference to "M. Van Beneden's theory of whales inhabiting 'bands across the different oceans,'" he proceeds to enumerate the following five species of "whales of the North Atlantic, including the Mediterranean Sea":

"1. *Balæna biscayensis*, Eschricht, which, I believe, is a *Cuvierus* with a double-headed first rib [and therefore a Fin-whale, Dr. Monedero's figure of the San Sebastian specimen, and Eschricht's standing as a cetologist to the contrary notwithstanding].

"2. *Balæna biscayensis*, Van Beneden and Gervais — as distinct from *B. biscayensis* of Eschricht, resting on the mass of cervical vertebræ figured by Lacépède [Dr. Monedero's figure, copied by Van Beneden and Gervais, being again ignored.]<sup>1</sup> Whether this is a distinct species or only a variety of *Balæna mysticetus*, there cannot be the slightest doubt of its being distinct from the following.

"3. *Balæna britannica*, Gray, established on the mass of cervical vertebræ which is in the British Museum, . . . dredged off the coast of Lyme Regis. . . ."

His Nos. 4 and 5 are respectively *Balæna cisarctica* Cope and *Agaphelus gibbosus* Cope (*l. c.*, p. 200), which latter Cope himself afterwards retracted as invalid.

The whales of other seas are reviewed in the course of Dr. Gray's paper, and his critical comment on the way in which some of them are treated, and others ignored, in the work under notice are generally judicious. In the present case, however, enough has been quoted from Dr. Gray's papers touching *Balæna biscayensis* to show that his course in reference to it is, to say the least, strangely inconsistent and unwarranted.

Van Beneden in his reply<sup>2</sup> to Dr. Gray, gave reasons for certain omissions on his map, and for the extension of the range of the Greenland Whale over certain areas, for which he was criticised by Gray. Apropos of the thirteen pairs of ribs in the San Sebastian whale, with the first rib on each side bifid or double-headed, and of fourteen pairs of single-headed ribs in Cope's type of *B. cisarctica*, upon which difference Gray placed great importance, he states that he differs from Gray in respect to the significance of such differences, and proceeds to show that they may be merely individual, and

<sup>1</sup> On a preceding page (p. 198), in referring to these same vertebræ he says: "At any rate, it [the species they represent] ought to be called *Balæna mediterranea* rather than *biscayensis*, unless", etc.

<sup>2</sup> La première côte des cétacés, à propos de la notice du docteur J.-E. Gray, sur la distribution des baleines. Bull. Acad. roy. de Belgique, 2<sup>e</sup> sér., T. XXVI, 1868, pp. 7-17, pl. i, ii.

cites examples of this differentiation in other Cetaceans, two of which he illustrates in his accompanying plates.<sup>1</sup> He expresses himself as in perfect accord with Gray when he says that much more material is necessary before we can pronounce definitely upon the geographic distribution of these animals; but that he does not agree with him in considering the species mentioned by him as well established. In view of the great variation due to sex and age, and often to asymmetry, he well says: "On comprendra donc pourquoi diverses baleines qui figurent dans des catalogues n'ont pas été indiquées dans notre notice."

*Contributions and opinions of Paul Fischer, 1871-1881.*—In 1871, 1872, and 1881, Prof. Paul Fischer made contributions to the history of the Baleine des Basques. He stated in the first of these papers<sup>2</sup> that he was convinced that the Basque Whale is distinct not only from the Right Whales of the southern hemisphere, but also from *Balæna cisarctica*. The second<sup>3</sup> contains interesting information relative to the history of the Basque Whale-fishery, and a chronological list of the 'Baleines franches' stranded or captured on the coasts of France and the Gulf of Gascony. He refers to Dr. Monedero's drawing of the San Sebastian example as "extrêmement précieux parce qu'il constitue la seule représentation authentique de la Baleine des Basques," and gives a description of its external characters and a table of measurements—a new and important contribution to the history of the species—with also a detailed account of its capture, from the 'Gazette de Biarritz' of August and September, 1859. He then discusses the question "Existe-t-il plusieurs Baleines franches dans l'océan Atlantique septentrional?" In his 'Résumé' he says: "Les Baleines franches des régions tempérées du Nord Atlantique ont reçu plusieurs noms, suivant les localités où on les a pêchées ou recueillies:

1° *Balæna Biscayensis*, dans le golfe de Gascogne;

2° *Nordkaper*, en Norwége et Island;

<sup>1</sup> In this connection attention may be called to a paper published three years later by William Turner, entitled 'On the so-called Two-headed Ribs in Whales and in Man' (Journ. Anat. and Phys., V, May, 1871, pp. 348-361, figs. 1-3), in which he says: "This anatomical peculiarity has been regarded by some systematic zoologists, more especially by Dr. J. E. Gray of the British Museum, as a character of so much importance that it has been made a basis for classification. Dr. Gray has separated those skeletons of the whalebone whales in which this condition of the first rib has been seen from the species with which they might in other respects have been associated, and erected them, not merely into distinct species, but even into new genera" (l. c., p. 348). In illustration of this he cites Gray's genera *Sibbaldus* and *Hunterus*. After reviewing the "facts and opinions which have been collected and advanced by previous writers," and adding "some new facts and observations" of his own, he presented a series of propositions which he considered as firmly established, in part as follows: "1st. In the cetacea cervical ribs are not unfrequently developed in connection with the 7th vertebra. 2nd. The cervical ribs may remain free, or may become permanently blended with the 1st thoracic rib. . . . 4th. The bifurcated form of the rib is due, not to the subdivision of a single bone into two parts, but to the fusion of two bones into one mass, the vertebral extremity of which continues to exhibit its fundamental duplex character" (l. c., p. 354).

<sup>2</sup> Sur la baleine des Basques (*Balæna Biscayensis*). Compt. rend. Acad. Sci. Paris, LXXII, 1871, pp. 298-300.

<sup>3</sup> Documents pour servir à l'histoire de la baleine des Basques (*Balæna Biscayensis*). Ann. des Sci. nat., 5<sup>e</sup> sér., XV, 1872, art. No. 3, pp. 1-20.

3° Baleines de Sardes ou Sardes, au banc de Terre-Neuve;

4° *Balæna cisarctica*, sur les côtes E. de l'Amérique du Nord;

5° *Hunterius Svedenborgi*, subfossile de Gothland;

6° *Balæna Lamanoni*, subfossile de Paris. [To which he should have added *Balæna britannica* Gray, Lyme Regis.]

"Ces désignations," he continues, "s'appliquent-elles à une seule espèce? Je ne le pense pas, malgré l'opinion de leur identité présentée par M. Van Beneden." After a brief discussion of their characters he reaches the conclusion that there are at least two species of Right Whales in the temperate regions of the North Atlantic, neither of which has any relation to the Greenland Right Whale, *Balæna mysticetus*.

Ten years later, in 1881, in another memoir on the Cetacea of the southwest coast of France,<sup>1</sup> he again discussed the number of species and relations of the whales of the Nordkaper group, "propres à l'Atlantique du Nord, ou récemment fossilisées en Europe," of which he enumerates 12 that have received names. All the living species are now referred to *Balæna biscayensis*, but he believes that *Balæna cisarctica* (to which he refers the Sarde), should, until better known, be regarded as at least a distinct subspecies from *B. biscayensis*. The fossil species he regards as not sufficiently known to be classified. Among the additional information of interest relating to the Basque Whale may be noted the publication of Segnette's original description ("en mauvais latin") and measurements of an individual stranded on Ile de Ré, in February, 1680.

As Fischer's papers have been summarized at length and critically reviewed by True,<sup>2</sup> it is unnecessary to give them further space in the present connection.

*Balæna tarentina* CAPELLINI.—On the 9th of February, 1877, a Right Whale was taken in the Gulf of Taranto, in the Mediterranean, the first specimen known to have been taken in Mediterranean waters. The specimen, a young female 12 meters in length, was described and figured by Professor G. Capellini<sup>3</sup> of Bologna under the name *Balæna tarentina*. It was compared with Dr. Monedero's figure of the San Sebastian whale, from which it differed in the form of the head and pectoral fins. The skeleton passed into the possession of the University of Naples, and later in the same year became the subject of a paper by Dr. Francesco Gasco.

*Gasco, 1877-1879.*—Dr. Gasco,<sup>4</sup> in his memoir on this specimen, states: "A careful examination of the osteological characters, soon showed me that

<sup>1</sup> Cétacés du Sud-Ouest de la France. Actes Soc. Linn. de Bordeaux, XXXV, 1881, pp. 5-220, pll. i-viii. Also separate.

<sup>2</sup> The Whalebone Whales of the Western North Atlantic, 1904, pp. 264-267.

<sup>3</sup> Della Balena di Taranto, confrontata con quella della Nuove Zelanda e con talune fossili del Belgio e della Toscana. Mem. R. Accad. Sci. Bologna (3), VIII, 1877, pp. 3-32, pll. i-iii. Also separate, 1877, pp. 1-34, pll. i-iii.

<sup>4</sup> Intorno alla balena presa in Taranto nel Febbrajo, 1877. Atti Roy. Accad. Sci. Napoli, VII, No. 16, 1878, pp. 1-47, pll. i-ix. Also separate, same date and collation.

the whale of Tarento was identical with that captured in 1862 in Delaware Bay opposite Philadelphia, and upon which Mr. E. [D.] Cope published a very brief osteological report in the year 1865. Both the Tarento whale and that of Philadelphia belong to the species *Balæna biscayensis*, Eschricht, which for several centuries was pursued with avidity, and, I was going to say, exterminated, throughout the temperate region of the North Atlantic, first by the Basques, and then successively by the Saintongeois, the Normans, the Dutch (who called it Nordkaper), the Danes, Norwegians, English, and Americans."<sup>1</sup>

In 1879, Dr. Gasco gave also a detailed description of the skeleton of the San Sebastian Whale,<sup>2</sup> just a quarter of a century after the capture of the animal, and after it had rested twenty-one years in the Museum of Copenhagen. Of the thirty-six pages occupied by this memoir ten are devoted to a historical summary of the so-called "*Balæna biscayensis*, Eschricht," six to the history and external characters of the San Sebastian specimen, and the remaining twenty to its osteology. Dr. Gasco gave the number of pairs of ribs as thirteen (not fifteen as stated by Gray and Fischer), and described the bifidity of the first rib as very slight, the sinus amounting to 55 mm. in the left and only 15 mm. in the right. This slight bifidity, he conjectured, might at a later stage of life, have become much lessened or have wholly disappeared. He affirmed the unquestionable specific identity of the San Sebastian and Taranto whales, and quotes a statement made to him verbally by Professor Cope, after the latter had seen the Taranto specimen, to the effect that this agreed exactly with the Philadelphia specimen described by him under the name *Balæna cisarctica*. Although there was previously every probability in favor of this conclusion, this may be reasonably taken as negatively settling the conjectures of the specific diversity of *B. biscayensis* and *B. cisarctica* raised by Gray and Fisher. Also that the bifidity of the first rib, which had for a decade figured so prominently in the references to this specimen, and had been accorded so much importance in the writings of Gray, Fischer, and others, is in all probability only an individual peculiarity, such as is often met with in the skeletons of many well-known animals.\*

*Holder, 1883.*—In 1883, the late Dr. J. B. Holder, curator of Zoölogy at this Museum, published an important contribution to the technical

<sup>1</sup> From a summary of his conclusions, entitled 'La *Balæna (Maclearius) australiensis* du Musée de Paris, comparée à la *Balæna biscayensis* de l'Université de Naples,' published in Compt. rend. Acad. Sci. Paris, LXXXVII, Sept. 9, 1878, pp. 410-412, as translated and republished in Ann. and Mag. Nat. Hist., 5th ser., II, Dec., 1878, pp. 495-497.

Van Beneden, in commenting on a letter received by him from Capellini, 'Un mot sur une Baleine capturée dans la Méditerranée, in Bull. Acad. roy. de Belgique, 2<sup>e</sup> sér., XLIII, 1877, pp. 741-745), also referred Capellini's *Balæna tarentina* to *B. biscayensis*.

<sup>2</sup> Il Balenotta catturato nel 1854 a San Sebastiano (Spagna) (*Balæna biscayensis*, Eschricht) per la prima volta descritto dal Dr. Francesco Gasco, Professore di Zoologia e Anatomia comparata nella R. Università di Genova. Ann. del Mus. civ. di stor. nat. di Genova, XIV, 1879, pp. 573-608.

<sup>3</sup> Cf. footnote on p. 298.

history of the North Atlantic Right Whale, based on American specimens. This paper<sup>1</sup> includes, first, a summary of the late Prof. E. D. Cope's account of the osteological characters of the type of his *Balæna cisarctica*, published in 1865, based on a young specimen from Delaware Bay. This is followed by an account of the capture, January 7, 1880, of a specimen in the harbor of Charleston, S. C., also a young example, with a brief description and measurements of the skeleton, preserved in the Charleston Museum, contributed, with a drawing of the skull, by the late Dr. G. E. Manigault, then curator of the Charleston Museum. There is next a short account of the external characters of a specimen captured off the coast of New Jersey in the spring of 1882, with measurements and a figure (side view of animal) drawn by Dr. Holder, with details of the head and tail, taken from photographs made by the well-known animal artist, D. C. Beard.<sup>2</sup> Then follows a detailed account of the osteology of the skeleton in this Museum, taken on the south shore of Long Island, N. Y., probably prior to 1875, with a figure of the skeleton. Following this are several pages of doubtfully pertinent references to whales formerly seen in the Gulf of St. Lawrence.<sup>3</sup>

These specimens are all referred to *Balæna cisarctica* Cope, the identity of which with "*B. biscayensis* Eschricht" the author considers as "now pretty well established." Its relations to other species are considered, following which is a concise summary of the history of the Right Whales of the North Atlantic (pp. 120-133), chiefly in respect to their synonymy and relationships. This paper, although somewhat crude, is the foundation of our scientific knowledge of the Right Whale of the North Atlantic coast of North America.

*Flower, 1864-1891.*—A publication which has had much influence with British zoologists is the late Sir William Henry Flower's 'List of the Specimens of Cetacea in the Zoological Department of the British Museum,' published in 1885.<sup>4</sup> His views, as here expressed, differ widely from those held by him in 1864-1869 respecting the number of genera and species of Right Whales. Instead of the recognition of two genera (*Balæna* and *Eubalæna*) and several species, as in 1864,<sup>5</sup> only two are recognized, both of which are referred to the genus *Balæna*, namely, (1) *B. mysticetus* Linn., and (2)

<sup>1</sup> The Atlantic Right Whales: A Contribution, embracing an examination of I. The exterior characters and osteology of a cisarctic Right Whale — male. II. The exterior characters of a cisarctic Right Whale — female. III. The exterior characters of a cisarctic Right Whale — sex not known. To which is added a concise résumé of historical mention relating to the present and allied species, By Joseph Bassett Holder. Bull. Amer. Mus. Nat. Hist., I, No. 4, pp. 99-137, pll. x-xiii. May, 1883.

<sup>2</sup> In this connection attention may be called to the sketches of a whale captured February 23, 1897, at Amagansett, Long Island, N. Y., made by Mr. Beard and published in his 'Dan Beard's Animal Book' (New York, Moffat, Yard & Co., 1907), p. 213 (animal, in profile and front-views, etc.), p. 219 (diagrams of animal), and p. 222 (photograph of parasites, from life).

<sup>3</sup> Cf. Allen, Science, 1st ser., I, pp. 598, 599, June 29, 1883. Also Holder and Allen, *ibid.*, II, pp. 132-134, and 266, 267.

<sup>4</sup> 8vo, pp. vi + 36.

<sup>5</sup> Proc. Zool. Soc. London, 1864, pp. 389-391; Trans. Zool. Soc. London, VI, 1869, p. 115.

*B. australis* Desm. To the latter are apparently referred not only all of the existing species of Right Whales except the Arctic or Greenland Right Whale, but several fossil species, including Gray's *Macleayius britannicus*<sup>1</sup> or, as called later, *Halibalæna britannica*,<sup>2</sup> from the Lyme Regis of England. This extreme conservatism also characterized his notice of this group of animals in 1891,<sup>3</sup> where of *Balæna australis* it is said: "This form inhabits the temperate seas of both northern and southern hemispheres, and is divided into several so-called species according to their geographical distribution: — *B. biscayensis* of the North Atlantic, *B. japonica* of the North Pacific, *B. australis* of the South Atlantic, and *B. antipodarum* and *B. novæ-zelandiæ* of the South Pacific" (*l. c.*, p. 239). This view is perhaps naturally reflected in the writings of later British compilers of popular works on natural history, although in opposition to the opinion of all modern cetological authorities.

*Contributions of Guldberg, 1884-1893.*—In 1884, G. A. Guldberg published a note<sup>4</sup> on the former distribution and migrations of "*Balæna biscayensis* Eschricht," announcing the discovery by him of its bones on the shores of Finmark, left there by the Dutch whalers of the sixteenth century, and of evidence of its reappearance in numbers along the coast of Norway; and also a more extended paper on the same subject,<sup>5</sup> in which part of a skull and various other bones, found on a small island off the coast of Finmark, are described. A further contribution was made by this author in 1891,<sup>6</sup> giving an account of specimens captured during the nineteenth century, including new records for Norway (1889) and Iceland (1890, 1891), and measurements, etc., based on this new material. An article of twenty pages by the same author also appeared in 1893,<sup>7</sup> containing about eight pages of historical observations, followed by descriptions and figures (the latter from photographs received from Captain M. Berg) of the external characters (*pl. i*), and an account of its osteology, including the pelvic bones and pelvic limb (*pl. ii*), based on Iceland specimens. *Eubalæna* is recognized as generically distinct from *Balæna*, with four species: (1) *E. biscayensis*, of the North Atlantic; (2) *E. australis*, of the South Atlantic; (3) *E. japonica*, of the North Pacific; and (4) *E. antipodarum*, of the South Pacific (*l. c.*, p. 18).

*Van Beneden, 1885.*—In 1885, Van Beneden, in a paper on the Cetacea

<sup>1</sup> Ann. and Mag. Nat. Hist., 4th ser., VI, 1870, p. 204.

<sup>2</sup> Gray, Proc. Zool. Soc. London, 1873, pp. 140-142, fig. 5.

<sup>3</sup> Mammals, Living and Extinct. By William Henry Flower and Richard Lydekker. 8vo. London, 1891.

<sup>4</sup> Nature, XXX, 1884, pp. 148, 149.

<sup>5</sup> Sur la présence, aux temps anciens et modernes, de la Baleine de Biscaye (ou Nordkaper) sur les côtes de Norwège. Bull. Acad. roy. de Belgique, 3<sup>e</sup> sér., VII, 1884, pp. 374-402.

<sup>6</sup> Bidrag til nøiere kunskaab om Atlanterhavets rethval, *Eubalæna biscayensis*, Eschricht. Christiania Vidensk.-Selsk. Forhandl., 1891, No. 8, pp. 1-14.

<sup>7</sup> Zur Kenntniss des Nordkapers. (*Eubalæna biscayensis* Eschr.). Zool. Jahrb., Abth. für Syst., VII, May 20, 1893, pp. 1-20, pls. i and ii.

of the European seas,<sup>1</sup> recorded the capture of a specimen of the Basque Whale on the coast of Spain, between Guettaria and Zaraus, February 3, 1878.

*Graells, 1889.*—In 1889 appeared an important paper by M. P. Graells, on the whales of the Atlantic coast of Spain,<sup>2</sup> which contains much new matter of historical interest relating to "*Balæna biscayensis* Eschricht," to which the paper mainly relates. It contains measurements and figures of the Guettaria specimen, mentioned above, now for the first time described. The figures accompanying this paper are not only inartistic, but the author states that they are inaccurate, which may explain the discrepancies between them and Gasco's based on photographs.<sup>3</sup>

*Jouan, 1890.*—In 1890, Henri Jouan published an account of the whales, seen or captured on the coast of France,<sup>4</sup> which contains a list of the occurrences of the Basque Whale on the French and neighboring coasts for about two centuries. These are: (1) an adult female, stranded or captured on Isle de Ré in 1680,—not preserved but measurements were taken and made available by Fischer in 1881 (republished from Segnette); (2) a female and young in the harbor of San Sebastian, Jan. 14, 1854—the young one captured and its skeleton later transferred to Copenhagen and studied by Eschricht, but first fully described by Gasco in 1879; (3) a specimen reported as taken at San Sebastian Jan. 11, 1878; (4) a young female taken near Taranto, in the Mediterranean, Feb. 9, 1877, the skeleton of which was preserved, and described by Capallini as *Balæna tarentina*, and re-described later by Gasco and referred by him to *B. biscayensis*; (5) a specimen embayed early in November, 1881, near Fontarabie, in the western end of the Mediterranean, and though attacked by fishermen finally escaped to the open sea; (6) a specimen, supposed to represent this species, seen but not taken, Dec. 24, 1887, near San Sebastian; (7) two seen and one taken by fishermen near Algiers, in the western part of the Mediterranean, in February or March, 1888; to which should apparently be added (8) the Guettaria specimen, taken Feb. 3, 1878, and its skeleton preserved in a museum at San Sebastian and described by Graells in 1889. These eight supposed instances resulted in the preservation of three skeletons and the external measurements of another specimen.

*Ridewood, on the structure of the 'Bonnet,' 1901.*—A paper by W. G. Ridewood, published in 1901,<sup>5</sup> on the structure and origin of the 'bonnet'

<sup>1</sup> Les Cétacés des Mers d'Europe. Bull. Acad. roy. de Belgique, 3<sup>e</sup> sér., X, 1885, pp. 707–732.

<sup>2</sup> Las Ballenas en las Costas oceanicas de Espana. Mem. Real. Acad. de Cienc. de Madrid, XIII, pt. 3, 1889, pp. 1–115, pl. i–ix.

<sup>3</sup> Cf. True Whalebone Whales of the Western North Atlantic, p. 252.

<sup>4</sup> Apparition des Cétacés sur les côtes de France. Bull. Soc. Linn. de Normandie, 4<sup>e</sup> sér., IV, 1890, pp. 137–164.

<sup>5</sup> On the Structure of the Horny Excrescence, known as the "Bonnet," of the Southern Right Whale (*Balæna australis*). Proc. Zool. Soc. London, 1901, pp. 44–47, pl. vi.

in the "Southern Right Whale," is chiefly of interest as a histological contribution, based on a specimen of uncertain origin, by perhaps a good histologist, but one strangely ignorant of the well-known function of this structure, as the nidus of parasitic crustaceans, by which its growth is promoted, if not originally caused, instead of being due to the failure of the cornified layers of the skin "to rub off at their normal rate, but remain and accumulate to produce a hard mass, projecting above the general surface of the epidermis as a kind of corn" (!).

*True, 1904.*—A most important recent contribution to the history of the North Atlantic Right Whale is contained in True's 'Whalebone Whales of the Western North Atlantic.'<sup>1</sup> The references, however, to its general history are somewhat scattered, occurring *passim* under the following captions: 'Chapter I. The earliest references to Whalebone Whales in American Waters' (pp. 6-33). 'Chapter II, A chronological account of important contributions to the natural history of North American Whalebone Whales' (pp. 34-77). In these chapters the North Atlantic Right Whale is mentioned informally, or incidentally, in connection with other species of Whalebone Whales, in copious extracts from original sources, for the most part in chronological sequence. In 'Chapter III. A review of Cope's and Scammom's Species' (pp. 78-106), an account is given (pp. 79, 80) of Cope's *Balæna cisarctica*, based on the type specimen in the museum of the Philadelphia Academy of Natural Sciences. Chapter VIII (pp. 244-268) is devoted entirely to 'The North Atlantic Right Whale, *Balæna glacialis* Bonnaterrre.' In Chapter X, a concise description of *Balæna glacialis* occupies fifteen lines on p. 298. Five plates (42 to 46, inclusive), from photographs, are devoted to illustrations of this species, and include the skull of a Long Island specimen (dorsal, lateral, and ventral views, pll. 42 and 43); two views of the skull of the Charleston specimen (pll. 43 and 45); a side view of the type skeleton of *Balæna cisarctica* Cope (pl. 44); the left scapula of four different skeletons (pl. 45); head and side view of a specimen in the flesh, taken at Provincetown, Mass., and two sternums (pl. 46). The text figures illustrate the nasal bones of the type of *B. cisarctica* (fig. 84, p. 252); the sternums of the Taranto, of an Iceland, and of a Long Island specimen,<sup>2</sup> showing wide differences of form (fig. 85-87, p. 258); six scapulæ, representing five American specimens and the Taranto specimen (figs. 88-93, p. 259).

<sup>1</sup> The Whalebone Whales of the Western North Atlantic, compared with those occurring in European Waters, with some observations on the species of the North Pacific. By Frederick W. True, Head Curator, Department of Biology, United States National Museum. Smithsonian Contributions to Knowledge, Vol. XXXIII, 1904.—4to, pp. vii + 332, pll. 1-1, and 97 text figures.

<sup>2</sup> The sternum of the Long Island specimen is a restoration, wrongly modeled from the sternum of a Rorqual.



The text contains an exhaustive summary of all the published accounts of the external and osteological characters of all the then known specimens, both European and American, and much original matter relating to several American examples not previously described. Under the headings, 'size,' 'external proportions,' 'color,' and 'osteological characters,' detailed comparisons are made between European and American specimens, with numerous tables of comparative measurements of the total length in the flesh, of the skeleton, skull, and various individual bones. His conclusions are summarized in ten propositions, with the final statement: "While there are many points regarding the Nordcaper that need to be further investigated, there is at present, so far as can be ascertained from the material available, no valid reason for separating the American from the European specimens as distinct species" (p. 262). He then devotes several pages (pp. 262-267) to a consideration of the "opinions regarding the identity of the Right Whales of the Eastern and Western Atlantic" advanced by cetologists, or the relationship of *Balæna biscayensis* to *B. cisarctica*, from Zörgdrager and Martens down to Van Beneden, Holder, Guldberg, and other late writers. He fails, however, to notice the attitude of Flower on the question of the relation of the North Atlantic Right Whale to the Right Whales of the North Pacific and the southern hemisphere, although his opinion has dominated later British authors who have written of these whales. In his Chapter XI, 'Whalebone Whales of the Eastern North Pacific Ocean,' True treats briefly of the Right Whales of the Northwest Coast, under the name "*Balæna sieboldii* Gray (?)," basing his notice, in lack of additional material, on Scammon's account of it, and closes by quoting, without comment, Van Beneden's strongly expressed conviction that the Right Whale of the North Pacific is a distinct species from that of the North Atlantic.

*Andrews, 1908.*—Only one other contribution to the history of the North Atlantic Right Whale will be mentioned in the present connection,—a notice by Roy C. Andrews of two specimens<sup>1</sup> captured on the coast of Long Island, New York, February 22, 1907, and secured for this Museum, through the liberality of Mr. Geo. S. Bowdoin of this city. As the preparation of these specimens for shipment to the Museum was made under the superintendence of Mr. Andrews, he fortunately had opportunity to take notes and measurements of the animals while in the flesh, and later to study the skeletons of both animals at the Museum. His paper, as the title indicates, relates to the external and internal anatomy of these specimens, which were both females, one of them an old and very large individual, the other about two thirds grown. In addition to detailed measurements of the exter-

<sup>1</sup> Notes on the External and Internal Anatomy of *Balæna glacialis* Bonn. Bull. Amer. Mus. Nat. Hist., Vol. XXIV, 1908, pp. 171-182, figs. 1-6.

nal parts, and of the skull and various other portions of the skeleton, much information is given regarding the vertebral column, pectoral limb, sternum, scapula, vertebræ, etc., which parts are illustrated by text figures. There is also a figure of a model<sup>1</sup> of the adult specimen, carefully made from the animal by James L. Clark, animal modeler at this Museum, which is doubtless the most accurate representation of the external form of this species yet published.

### III.—RELATIONSHIPS AND NOMENCLATURE.

*Relationships.*—As already shown (*antea*, pp. 281–288) the whalers of the early part of the seventeenth century recognized the Arctic or Greenland Right Whale, when they first met with it in the Spitzbergen seas, as a very different animal from the Right Whale that for several centuries had been the foundation of the whale-fishery of the temperate North Atlantic, and it was on the basis their crude comparisons of the two species in the annals of their craft that they were recognized as distinct by the systematists of the eighteenth century. Later, however, Cuvier united them as a single species, owing to the absence of specimens of the more southern form, and influenced largely by the opinion of Scoresby (see *antea*, p. 289), whose personal knowledge of the subject was confined to the Right Whale of the Arctic seas. Eschricht, from his study of the literature became convinced that the North Atlantic and the Greenland animals not only differed widely in their general conformation, but occupied distinct geographic areas. He had not then seen a specimen of the North Atlantic species, and when he later had opportunity to study the now famous San Sebastian specimen, he was able to announce that it not only represented a species distinct from the Greenland Whale, but one that was not at all nearly related to it, it much more closely resembling *Balæna australis* of the southern hemisphere. Unfortunately the publication of his memoir on this specimen was prevented by his death, and the osteological characters of the species remained undescribed till nearly twenty years later, when a second representative of it was captured in the Mediterranean, and its external and osteological characters were described and illustrated by Capellini in 1877 and by Gasco in 1878. In the meantime, however, it had received wide recognition in the literature of zoölogy under the name *Balæna biscayensis*.

In 1864, J. E. Gray<sup>2</sup> proposed to separate the Right Whales into two generic groups, retaining in *Balæna* only *B. mysticetus* Linn., and founding

<sup>1</sup> The scale given in the title to this illustration, "1 inch to 1 foot," relates to the model and not to the animal. The model is about  $\frac{1}{4}$  natural size (linear).

<sup>2</sup> Proc. Zoöl. Soc. London, 1864, pp. 199–201.

his new genus *Eubalæna* on *B. australis* Desm. He was unable to satisfactorily identify *B. biscayensis*, which later he regarded it as having no "zoölogical basis," and still later referred it to his genus *Hunterus*, after having also considered it as probably not separable from *B. mysticetus*.

These two groups have been recognized by various authors as well founded, as by Flower (in 1864 and 1869), Van Beneden, and Guldberg, and by the latter adopted as a full genus. They may be diagnostically contrasted as follows:<sup>1</sup>

*Balæna*.—Head and body enormously thick in proportion to the length, with the head forming about one third of the total length; skull greatly arched, thus affording space for the long baleen, which differs much in texture as well as length from that of the whales of the *Eubalæna* group.

*Eubalæna*.—Head and body relatively long and slender, with the head forming about one fourth of the total length; skull much less arched, and the baleen about one half shorter than in *Balæna*, and also much thicker, not so smooth, and with a coarser fringe.

The total length is nearly the same in both *B. mysticetus* and *E. glacialis* (= *Balæna biscayensis* auct.), but the bulk of the former is enormously greater than in the latter, especially of the head, which results in great difference in external proportions, and in the structural details of the skull. The other Right Whales (excepting of course the genera *Neobalæna* and *Rhachianectes*) closely resemble the North Atlantic species, but the North Pacific Right Whale is apparently larger with longer baleen.

### ***Eubalæna* Gray.**

*Eubalæna* GRAY, P. Z. S., 1864, 201, 589; Ann. and Mag. Nat. Hist. (3), XIV, 1864, 348; Cat. Seals and Whales, 1866, 91; Synop. Whales and Dolphins, 1868, 1; Suppl. Cat. Seals and Whales, 1871, 42.—FLOWER, P. Z. S., 1864, 390; Trans. Zool. Soc. London, VI, 1869, 115.—VAN BENEDEN & GERVAIS, Ostéogr. des Cétacés, livr. 4, 1868, 114 (in text).—LILLJEBORG, Nov. Acta Reg. Soc. Sc. Upsala (3), VI, 1867, 14.—GULDBERG, Christiania Vidensk.-Selsk. Forhandl., 1891, No. 8, 12; Zool. Jahrb., Abth. f. Syst., VII, 1893, 18.

Monotypic, with *Balæna australis* Desmoulins as type.

Four species of *Eubalæna* are commonly admitted by cetologists, and seem to be fairly well founded. Two occur in the northern hemisphere and two (possibly three) in the southern hemisphere. Those of the northern

<sup>1</sup> In this connection reference may be made to the four genera proposed by Eschricht in 1849 (Kong. Danske Vidensk. Selsk. Skr., 5th ser., naturv. og math. Afd., I, 1849, p. 108) for the species of whalebone whales as then known, all of which he placed in a comprehensive group *Balæna*, dividing it into two primary divisions, *Liobalæna* (Right Whales), and *Ogmecbalæna* (Humpback and Finback Whales). The latter he further divided into *Kyphobalæna* (Humpbacks = *Megaptera* Gray, 1846), and *Pterobalæna* (Finbacks = *Balænoptera* Lacépède, 1804). His *Liobalæna* was, as here defined, the same as the *Balæna* sensu stricta of authors, and, no type being designated, must be regarded as a synonym of *Balæna*.

hemisphere are separated from those of the southern hemisphere by a broad belt of tropical and subtropical waters, covering not less than fifty degrees of latitude; the species of the two hemispheres are not only restricted to temperate latitudes, but are also absent from the Arctic and Antarctic seas. On the other hand, the home of *B. mysticetus* is the icy waters of the Arctic regions, it moving southward in winter on the closing of its summer haunts by compact ice; it has also no representative in the Antarctic seas. The species of *Eubalæna* are likewise migratory, moving toward warmer latitudes with the approach of winter, and seeking colder latitudes with the return of the warmer season.

It is, indeed, physically impossible for the Right Whales of the north temperate zone to visit the south temperate zone, or those of the latter to visit the former. As shown by Lieut. H. M. Maury,<sup>1</sup> on evidence that has never been refuted nor seriously contested, the torrid zone is "forbidden ground" for the right whale; "...and that it is physically as impossible for him to cross the equator as it would be to cross a sea of flame. In short, these researches show that there is a belt from two to three thousand miles in breadth, and reaching from one side of the ocean to the other, in which the right whales are never found" (*l. c.*, p. 253). As this condition has continued for ages, it is seemingly unnecessary to institute a detailed comparison between the Right Whale of the North Atlantic and its congeners of the southern seas. Yet a comparatively recent English authority of note (Flower, see *antea*, p. 301) has lumped them altogether as one species under the name *Balæna australis*. This strange conservatism is still maintained by British authors, as Lydekker,<sup>2</sup> Beddard<sup>3</sup> and Millais,<sup>4</sup> in their recent popular accounts of these animals, in spite of the fact that all modern zoögeographic knowledge of the conditions which govern the geographic distribution of animals is utterly opposed to such a conclusion. The case is somewhat different with the Right Whale of the North Pacific, in respect to its relation to its congener of the North Atlantic. They have their ranges separated, not by tropical waters, but in part by the icy barrier of the Arctic seas, and in part by immense continental areas; there is also evidence of well-marked diversity in size and other characters, although the North Pacific species is scientifically very little known.

*Nomenclature.*—As already shown (*antea*, p. 288), the Right Whale of the North Atlantic was provided with names by the early systematists, as by Klein (1741), who called it *Balæna glacialis*, *c. borealis*, and by Brisson (1756), who named it *Balæna islandica*, but as both of these authors are

<sup>1</sup> Sailing Directions, 7th ed., 1855, p. 253.

<sup>2</sup> Royal Natural History, Vol. III, sect. 5, 1895, p. 12.

<sup>3</sup> A Book of Whales, 1900, p. 133.

<sup>4</sup> Mammals of Great Britain and Ireland, Vol. III, 1906, pp. 224–231.

pre-Linnæan, their names are not open to consideration. Bonnaterre, in 1789, named it *Balæna glacialis*; his name, based on the Nordkaper of previous authors, is shown by his description and references to be clearly applicable to the present species. Lacépède, in 1804, renamed it *Balæna nordcaper*, with primarily the same basis. Many years later (1864), J. E. Gray applied the name *Balæna biscayensis* to the San Sebastian specimen, apparently inadvertently, through giving a Latin rendering of Eschricht's 'Baleine de Basques,' since he ascribed it to Eschricht, and the species has passed, as already shown at length (*antea*, p. 291), into literature as "*Balæna biscayensis* Eschricht." The following year, Cope described an American specimen of what is considered to be the same species under the name *Balæna cisarctica*, in the belief that *B. biscayensis* had not been properly founded. In 1877, another synonym, *Balæna tarentina*, was added by Capellini, on the basis of a straggler taken in the Bay of Taranto in the Mediterranean. Other late names have been based on fossil fragments believed to be also referable to the same species. These, owing to their late origin, do not require consideration as possible substitutes for *B. glacialis* Lacépède.

In this connection it is necessary to consider briefly the question of the possible specific distinctness of the Right Whales of the two sides of the North Atlantic. Unfortunately the skeletons of only three specimens from the European coasts have ever been secured, all young animals (the Iceland specimens are of course not pertinent), and no American example has been available in Europe for direct comparison with any of them. It has been generally conceded, however, for many years that no satisfactory differences are apparent on which it is safe to separate specifically the American and European examples. Mr. True, in his 'Whalebone Whales of the Western North Atlantic,' published in 1904, has most carefully brought together all available data bearing on this question, which he has presented and discussed with great fairness. His conclusions confirm those of previous investigators, and for the present there seems to be no alternative but to give them full acceptance, namely, that "there is at present . . . no valid reason for separating the American from the European specimens as distinct species" (*l. c.*, p. 262). To him also belongs the credit of reviving the name *Balæna glacialis* of Bonnaterre as the correct name for the species.<sup>1</sup>

From this point of view the synonymy and principal references to this species may be given as follows:

<sup>1</sup> I had reached the same conclusion in 1881, as shown by the following transcript of the closing lines of my discussion of the nomenclature of the species: "If the practice of substituting the earliest names that can be identified in the light of present knowledge for others of later date that have become familiar through long use, now so rife, is to be followed, there is no question as to the tenability of Bonnaterre's name, which, sooner or later, some one will revive, in view of which we reluctantly now adopt it." — *MS.*

***Eubalæna glacialis* Bonnaterre.**

## NORTH ATLANTIC RIGHT WHALE.

- Sarda* EDGE, Purchas his Pilgrims, III, 1625, 471, 710.—FISCHER, Actes Soc. Linn. de Bordeaux, XXXV, 1881, 41–45.
- Sletbag* (of the Icelanders), *cf.* ESCHRICHT & REINHARDT, Ray Society Memoirs on Recent Cetacea, 1866, 32–33.
- Die Nord-Kaper Wallfisch* MARTENS, Spitzb. oder Groenland. Reise-Beschreib., 1675, 106.
- Whale of the North Cape* MARTENS, Account of several late Voy. and Disc., London, 1711, [pt. ii], 151.
- Noortkaper ZORGDRAGER*, Bloeyende Opkomst der Aloude Hedendaagsche Groenl. Visschery, 1720, 91.
- Right or Whalebone Whale* DUDLEY, Phil. Trans., XXXIII, 1726, 256.
- Nordkapper* EGEDE, Det Gamle Gronlands Nye Perlust., etc., 1741, 40.—ANDERSON, Nachrichten von Island, Grönland, und der Strasse Davis, 1746.—FISCHER, Actes Soc. Linn. de Bordeaux, XXXV, 1881, 36–40.
- Nord-Caper* CRANZ, Hist. Groenland, 1765, 145.
- Baleine d'Islande* BRISSON, Reg. anim., 1756, 350.
- Black Whale; True Whale; Whalebone Whale*, Early New England Whalers (*cf.* DOUGLASS, Summary, Hist. and Polit., Brit. Settlem., I, 1760, 56).
- Seven feet bone Whale* ST. JOHN DE CREVECŒUR, Letters from an American Farmer, 1782, 169.
- Atlantic Right Whale* SOUTHWELL, Seals and Whales of British Seas, 1881, 61–69.
- North Atlantic Right Whale* ALLEN, Science (1), I, 1883, 598, 599; II, 1883, 134, 267 (review of Holder's paper).
- Balæna glacialis*, c. *borealis* KLEIN, Hist. Pisc. Nat., Miss. ii, 1741, 12 (ex Zorgdrager). *Cf.* FISCHER, Actes Soc. Linn. de Bordeaux, XXXV, 1881, 40.
- Balæna islandica* BRISSON, Reg. anim., 1756, 350 (ex Klein, Anderson, etc.).—TIEDEMANN, Zool., 1808, 571.—DEWHURST, Nat. Hist. Cetacea, 1834, 86–91.
- Balæna mysticetus islandica* KERR, Anim. Kingd., I, 1792, 357.
- Balæna glacialis* BONNATERRE, Cetologie, 1789, 3 (ex Klein, Brisson, Anderson, etc.).—VIREY, Nouv. Dict. Sci. nat., III, 1816, 183–185.—CUVIER, Règne anim., I, 1817, 286.—[MILLAR], Encyc. Brit., 5th ed., V, 1817, 330.—DESMAREST, Mamm., 1822, 527.—DESMOLINS, Dict. class. d'Hist. nat., II, 1822, 161.—HARLAN, Faun. Amer., 1825, 297.—LESSON, Man. de Mamm., 1827, 425.—ALLEN, 1881, MSS.—TRUE, Whalebone Whales West. N. Atlantic, 1904, 245–268, 298, pll. xlii–xlvi (summary of present knowledge, with comparison of all European and American descriptions, and much new material described and figured).—ANDREWS, Bull. Amer. Mus. Nat. Hist., XXIV, 171–182, figs. 1–6 (new material described and figured).
- Balæna glacialis*  $\beta$ . GMELIN, Syst. Nat., I, 1788, 223 (ex Brisson, Klein, etc.).—G[ERADIN], Dict. Sci. Nat., III, 1816, 438.
- Balæna nordcaper* LACÉPÈDE, Hist. nat. des Cétacés, 1804, 103–110 (part), based on Klein, Anderson, Brisson, etc.).—SONNINI, Buffon's Hist. nat., nouv. éd., Cétacés, 180–188 (part).
- Balæna mysticetus* (not of Linnæus), most authors prior to 1860 (in part).—GRAY, Cat. Seals and Whales, 1866, 81–88 (in part).

*Baleine franche du golfe de Biscaye* ESCHRICHT, Compt. rend. Acad. Sci. Paris, L. 1860, 224.

*Baleine de Biscaye* ESCHRICHT, in Van Beneden & Gervais, Ostéogr. des Cétacés, livr. 4, 1868, 98.

*Balæna biscayensis* GRAY, P. Z. S., 1864, 201 (an incidental reference to the "Right Whale of the Bay of Biscay, Eschricht"); Cat. Seals and Whales, 1866, 89 (ex Eschricht, as above, without description); Ann. and Mag. Nat. Hist. (4), I, 1868, 244; *ibid.*, VI, 1870, 200, 391.—FLOWER, P. Z. S., 1864, 394 (also referred to *Eubalæna*, the specific name being ascribed to Eschricht).—VAN BENEDEN, Bull. Acad. roy. de Belgique (2), XXV, 1868, 15, 16; Ostéogr. des Cétacés, livr. 4, 1868, 90–110, pl. vii (at least mainly); Bull. Acad. roy. de Belgique (2), XXVI, 1868, 7–17 (passim); *ibid.* (2), XLIII, 1877, 741–745; *ibid.* (2), XLIX, 1880, 313–315; *ibid.* (3), IV, 1882, 407–414; *ibid.* (3), X, 1885, 212–214 (occurrence on coast of United States), 709, 710 (and Norway).—FISCHER, Compt. rend. Acad. Sci. Paris, LXXII, 1871, 298–300 (historical and systematic); Ann. des Sci. nat. (5), XV, 1872, 1–20 (chiefly historical); Actes Soc. Linn. de Bordeaux, XXXV, 1881, 5–220, pll. i–viii (historical and systematic).—GASCO, Atti roy. Accad. Sci. Napoli, VII, 1878, 1–47, pll. i–ix (descrip. of Taranto specimen); Compt. rend. Acad. Sci. Paris, LXXXVII, 1878, 410–412 (on various bones from coast of Finmark); Ann. and Mag. Nat. Hist. (5), II, Dec. 1878, 495–497 (translation of the last); Ann. Mus. civ. di stor. nat. Genova, XIV, 1879, 573–608 (first account of osteol. of San Sebastian specimen).—MARKHAM, P. Z. S., 1881, 969–976 (early Basque whale-fishery); Nature, XXV, 1882, 365–368.—GIGLIOLI, Nature, XXV, 1882, 505 (reference to the Taranto specimen).—HOLDER, Bull. Amer. Mus. Nat. Hist., I, No. 4, May, 1883, 117–120, pll. x–xiii (hist. and syst.); GULDBERG, Bull. Acad. roy. de Belgique (3), VII, 1884, 374–402 (chiefly historical); Nature, XXX, 1884, 148, 149.—SOUTHWELL, Proc. Nat. Hist. Soc. Glasgow, V (1880–1883), 1884, 66–69; Trans. Norfolk and Norwich Nat. Soc., III (1879–1884), 1884, 228–230 (supposed occurrence on coast of Scotland).—NEWTON, Quart. Journ. Geol. Soc. London, XLII, 1866, 316–324, pl. xi (fossil in Norfolk "forrest bed."—GRAELLS, Mem. R. Acad. Cienc. Madrid, XIII, pt. 3, 1889, 86–88 (passim, pp. 1–110), pll. i–ix.—JOUAN, Bull. Soc. Linn. Normandie (4), IV, 1890, 141–144 (recent captures in European waters).

*Eubalæna biscayensis* FLOWER, P. Z. S., 1864, 391.—GULDBERG, Christiania Vidensk.-Selsk. Forhandl., 1891, 1–14; Zool. Jahrb., Abth. f. Syst., VII, 1893, 1–20, pll. i, ii (extern. and osteol. characters, etc., based on Iceland specimens).

*Balæna (Hunterius) biscayensis* GRAY, Ann. and Mag. Nat. Hist. (4), I, April, 1866, 244.

*Balæna cisarctica* COPE, Proc. Acad. Nat. Sci. Phila., 1865, 168 (prelim. description), 273; Contr. Hist. Cetacea, 1866, 2 (same); in ALLEN, Bull. Mus. Comp. Zoöl., I, No. 8, 1869, 202 (covers notes by N. E. Atwood on its occurrence in Mass.); Proc. Acad. Nat. Sci. Phila., 1868, 194; *ibid.*, 1874, 89 (Raritan Bay, N. J.).—GRAY, Ann. and Mag. Nat. Hist. (4), I, April, 1868, 244 (referred to his genus *Eubalæna*); *ibid.* (4), VII, Sept. 1870, 200.—VAN BENEDEN, Ostéog. des Cétacés, livr. 4, 1868, pl. vii (tympanic bone of type described and figured); Bull. Acad. roy. de Belgique (2), XXVI, 1868, 15 (referred to *B. biscayensis*).—FISCHER, Compt. rend. Acad. Sci. Paris, LXXII, 1871, 298–300; Ann. des Sci. Nat. (5), XV, 1872, art. 3, 1–20 (history and specific relations); Actes Soc. Linn.

- de Bordeaux, XXXV, 1881, 10-55 (history, migrations, relationship).— Gasco, Compt. rend. Acad. Sci. Paris, LXXXVII, 1878, 412 (referred to *B. biscayensis*); Ann. and Mag. Nat. Hist. (5), II, Dec. 1878, 497; Ann. Mus. civ. Genova, XIV, 1879, 582.— HOLDER, Bull. Amer. Mus. Nat. Hist., I, No. 8, May, 1883, 99-139, pll. x-xiii (extern. and osteol. characters, histor. observations, etc.; first figures of American specimens).
- Eubalæna cisarctica* GRAY, Ann. and Mag. Nat. Hist. (4), VI, 1870, 391.
- Balæna britannica* GRAY, Ann. and Mag. Nat. Hist. (4), VI, Sept., 1870, 200 (fossil cervical vertebræ from Lyme Regis, Engl.).
- Balæna tarentino* CAPELLINI, Mem. R. Accad. Sci. Bologna (3), VIII, 1877, 3-32, pll. i-iii (first description of Taranto specimen).— DORAN, Ann. and Mag. Nat. Hist. (4), XX, 1877, 328 (ex Capellini).— GASCO, Atti R. Accad. Sci. Napoli, VII, No. 16, 1878, 1-47 (Taranto specimen, redescribed and referred to *B. biscayensis*, as done by all subsequent writers).

#### IV.— GEOGRAPHICAL DISTRIBUTION, MIGRATIONS, AND COMMERCIAL EXTINCTION.

It being conceded by leading cetologists that the Right Whale of the western North Atlantic is not specifically separable by any external or osteological characters from the Right Whale of the eastern North Atlantic. the limits of its range may be given in general terms as extending (formerly at least) over practically the whole North Atlantic,— from the coast of Florida and the Bermudas on the western side to the entrance to Davis Strait, the southern and southwestern coast of Greenland, and the waters about Iceland; and on the eastern side from the coast of Spain and (casually at least) the Mediterranean Sea northward to the seas between Norway and Spitzbergen; in other words, approximately that part of the North Atlantic between the January isotherms of 10° and 50° Fahrenheit, it occupying the northern part of this area in summer, and the southern part in winter. Its summer range thus slightly overlaps the winter range of the Greenland Right Whale, which is also migratory, being driven from its summer resort in the Polar seas by the winter ice; but it is not probable that both ever occupy the same area at the same time.<sup>1</sup>

The early annals of the Whale Fishery show that this whale was hunted in winter in the Bay of Biscay, and in summer was killed in large numbers in the waters between Spitzbergen and the North Cape. Also that at a later period the Basque, Norwegian, Dutch, and other whalers hunted it in summer in the seas about Iceland, and off the southeastern coast of Greenland, in the Straits of Belle Isle, and in the Gulf of St. Lawrence; and that in

Mr. A. Howard Clark says: "Resolution Island, at the entrance to Cumberland Inlet, is a good ground for both bowhead and right whales during April and May," but on what authority is not stated (cf. 'History and Present Condition of the Fishery,' in Fisheries and Fishery Industries of the United States, Section V, Vol. II, 1877, p. 18).



winter they were taken in Massachusetts Bay, off the coast of Long Island, in Delaware Bay, and along the coast of North Carolina. There is, however, scant evidence that they were ever numerous off Florida or around the Bermudas.

It is this species which formed the chief basis of the Basque Whale fishery "from time immemorial,"<sup>1</sup> and of that of all the seafaring nations of the thirteenth to the seventeenth centuries. The pursuit was so persistent that it became exterminated on the Atlantic coast of Europe by the end of this period, and a like fate later overtook it on the western side of the Atlantic.

As early as the middle of the sixteenth century the Basque whalers were engaged in its capture in the Gulf of St. Lawrence, where, and in the neighboring waters, they maintained an extensive whale-fishery during the following century, when this region became common ground for the whaling fleets of various nationalities; and it had here also become almost exterminated when the Bowhead or Greenland Right Whale became in turn the principal basis of this long continued industry.

The first settlers in New England and the Middle States found this species abundant on their arrival to these shores, and were not slow to avail themselves of so valuable an asset. During the middle of the seventeenth century whaling was established at Cape Cod, at Martha's Vineyard, at Nantucket, on Long Island, and in Delaware Bay, the whales being pursued at first in boats from the shore, and later in small vessels in the open sea. By the middle of the eighteenth century it had become so reduced in numbers that its pursuit was no longer profitable, and the whalers from these ports repaired to distant seas, and other species became their prey. A small remnant, however, remained, and a few are still captured nearly every year at different points along the eastern coast of North America, as in the entrance to Davis Strait, and from Cape Cod southward to the Carolinas,<sup>2</sup> and at much rarer intervals near Iceland and in European waters.

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<sup>1</sup> Cf. Clements R. Markham 'On the Whale Fishery of the Basque Provinces of Spain,' *Proc. Zool. Soc. London*, 1881, pp. 969-976; *Nature*, XXV, 1882, pp. 365-368, Feb. 16, 1882. See previous reference to Markham under 'General History' (*antea*, p. 280).

<sup>2</sup> A. Howard Clark, writing twenty years ago, stated that this species was "taken during the summer months off the southern end of Greenland and to a limited extent in the lower part of Davis Strait, near Resolution Island. Along the eastern coast of the United States they are occasionally captured by shore whalers, especially at the whaling stations of North Carolina. During the winter months, whalers find them on the Hatteras Ground, in the Gulf of Mexico, and the Caribbean Sea. At no particular place in the North Atlantic are they now abundant, though they were formerly taken in great numbers close to the New England shore, and eastward of the Newfoundland fishing-banks" (*Fisheries and Fishing Industries of the United States*, Sect. V. Vol. II, 1887, pp. 15-16).

No authority is given for the statement that "whalers find them . . . in the Gulf of Mexico, and the Caribbean Sea," and in the face of explicit statements that it is not found there, its occurrence in these waters seems highly doubtful. Later in the same paper Mr. Clark himself quotes from an article in the 'London Field' (*l. c.*, p. 214) a passage from Alleyne S. Archer, based on fourteen years' experience in the whale fishery at Barbadoes, stating that "Right whales and sperm whales are never seen in these waters [Caribbean Sea], but the latter are often taken amongst the Leeward Islands."

According to Markham<sup>1</sup> and other authorities, the Basque shore whale-fishery, as already stated, was a well-established industry as early as the twelfth century, and probably by the tenth, and was pursued so persistently that by the middle of the seventeenth century the whales had become so scarce off the coast of Spain and France that these pioneers in the whaling industry had long before this date begun to make long voyages in its pursuit, transferring their activities to the seas about Iceland and Newfoundland, to which they began to make voyages in the last half of the sixteenth century. It was also hunted between Norway and Spitzbergen so incessantly by the Norwegian, Dutch and German whalers during the sixteenth and seventeenth centuries that it had also here become scarce, and its pursuit practically abandoned for that of the Greenland Whale. By the middle of the eighteenth century it is a matter of record<sup>2</sup> that the New England whalers repaired to the Newfoundland whaling grounds in pursuit of whales, owing to the great decrease in numbers of the present species along the Atlantic coast of the United States.

The pursuit of this species along the coast of New England and the Middle States began in a small way with the earliest settlement of the country by Europeans, at first in boats along the shore, and later in small vessels in the open sea, as is shown by the following excerpts from various authorities. A few whales, in addition to stranded or drift whales, were taken in Massachusetts Bay as early as 1631, and whaling began to be prosecuted at Martha's Vineyard in 1652, and at Nantucket in 1672; it was first established at Southampton, on Long Island, in 1644, and at Easthampton in 1651, and had become quite active by 1688, and was subjected to legal regulation in 1672. The whaling season began early in November and ended usually by the middle or toward the last of March, although whales were sometimes seen as early as the middle of October and as late as April. From 1720 on, whaling was carried on in small vessels in the open sea, as well as in boats from the shore. By 1750, the whales had become so few that pursuit of them as an industry was practically abandoned, but they have been taken at various points along the coast from Massachusetts Bay to North Carolina, at intervals, from this date till the present time, by boats from the shore, particularly from the southern side of Long Island and on the coast of North Carolina, one or two, and sometimes more, being taken in a single season, but usually only at intervals of several years.

Respecting its former abundance along the New England coast, the following passages are of interest.

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<sup>1</sup> A. Howard Clark, *l. c.*, pp. 969-976.

<sup>2</sup> *Cf.*, especially, Alexander Starbuck's 'History of the American Whale Fishery from its earliest inception to the year 1876.' Report of the U. S. Commissioner of Fish and Fisheries, Part IV, 1875-1876 (1878), pp. 1-768, pl. 1-vi.

In Mourt's 'A brief Relation of the Discovery and Plantation of New England,' published originally in 1622,<sup>1</sup> we find enumerated among the advantages offered by Plymouth as a place of settlement the following: "Thirdly, Cape Cod was like to be a place of good fishing; for we saw daily great whales of the best kind for oil and bone, come close aboard our ship, and in fair weather swim and play about us; there was once one, when the sun shone warm, came and lay above water, as if she had been dead, for a good while together, within half a musket-shot of the ship. . . ." This was, of course, early in the month of December, 1620, and the species referred to could not have been other than that here under consideration.

Zaccheus Macy, in his account of Nantucket,<sup>2</sup> dated "Nantucket, 15th of 5th month, 1792," alludes briefly to the whale-fishery, in which he says: "The whale fishery began at Nantucket in the year 1690. One Ichabod Paddock came from Cape Cod to instruct the people in the art of killing whales, in boats from the shore. This business flourished till about the year 1760, when the whales appeared generally to have deserted the coast. . . . In the year 1718, the inhabitants began to pursue whales on the ocean, in small sloops and schooners, from thirty to forty-five tons. The blubber was brought home in large square pieces, and *tried* or boiled in try-houses. In a few years, vessels from sixty to eighty tons were employed and the oil boiled out in try works at sea. When the late war began with Great Britain we had a fleet of about one hundred and forty sail, consisting of large sloops, schooners, and brigs. But when the war ended, we were reduced to about thirty old hulks. Our voyages are now long and distant. . . ." (*l. c.*, p. 157).

William Douglass, in his 'Summary, Historical and Political, . . . of the British Settlements in North America' (London, 1760), in speaking of the New England Whale-fishery (Vol. I, pp. 296-298) says: "Whales, that is the true or bone whales go southward (they are passengers according to the seasons) towards winter, and return northward in the spring. Formerly, in New-England Cape-cod embayed them, but being much disturbed (they seem to have some degree of reason) they keep a good offing. . . .

"New-England whaling at present is by whaling sloops or schooners with two whale-boats and thirteen men; each boat has an harpooner, a steersman, and four rowers; the whale-boats do not use taughts, but nooses for their oars, upon account of expedition; because only by letting go their oars, without loosing of them, they keep expeditiously long side of the whale. The best place of striking a whale is in her belly, about one-third from her gills; the fast is a rope of about twenty-five fathom; then a

<sup>1</sup> Here quoted from Massachusetts Hist. Coll., 2d ser., Vol. IX, p. 36.

<sup>2</sup> A short Journal of the first settlement of the island of Nantucket, with some of the most remarkable things that have happened since, to the present time. Coll. Massachusetts Hist. Soc., III, 1794, pp. 155-161.

drudge or stop-water, a plank of about two feet square, with a stick through its center; to the further end of this stick, is fastened a tow-rope, called the drudge rope, of about fifteen fathom; they lance, after having fastened her by the harpoon, till dead.

"The New England whalers reckon so many ct. wt. bone, as bone is feet long: for instance, sevenfoot bone gives 700 wt. bone: New England bone scarce ever exceeds nine feet; and 100 barrels of oil is supposed to yield 1000 wt. of bone: whales killed in deep water, if they sink, never rise again. . . ."

Hector St. John, in his account of the island of Nantucket,<sup>1</sup> gives incidentally a brief notice of the origin of whaling from that island. He says: "The first proprietors of this island, or rather of this town, began their career of industry with a single whale-boat, with which they went to fish for cod; the small distance from their shores at which they caught it enabled them soon to increase their business, and those early successes, first led them to conceive that they might likewise catch the whales, which hitherto sported undisturbed on their banks. After many trials and several miscarriages, they succeeded; thus they proceeded, step by step; the profits of one successful enterprise helped them to purchase and prepare better materials for a more extensive one: as they were attended with little costs, their profits grew greater. The south sides of the island from east to west, were divided into four equal parts, and each part assigned to a company of six, which though thus separated, still carried on their business in common. In the middle of the distances they erected a mast, provided with a sufficient number of rounds, and near it they built a temporary hut, where five of the associates lived, whilst the sixth from his high station carefully looked toward the sea, in order to observe the spouting of the whales. It may appear strange to you, that so slender a vessel as an *American whale-boat*, containing six diminutive beings, should dare to pursue and attack, in its native element, the largest and strongest fish that nature hath created. Yet by the exertion of an admirable dexterity, improved by a long practice, in which these people are become superior to any other whalemens; by knowing the temper of the whale after her first movement, and by many other useful observations; they seldom failed to harpoon it, and bring the huge leviathan on the shores. Thus they went on until the profits they made, enabled them to purchase larger vessels, and to pursue them farther, when the whales quitted their coasts; . . ."

Not only, in early times, were many whales taken along the shores of Nantucket and Martha's Vineyard, but also along the southern shore of

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<sup>1</sup> Letters from An American Farmer, ed. of 1782, pp. 153-154.

Long Island, particularly at the eastern end of the island, being at first pursued in open boats from the shore, as along the coast of New England. Southold and East Hampton were for a time especially noted for this enterprise. Hubbard, in his 'History of New England,' speaks of Southold as the place "where the inhabitants of late [about 1680] have fallen upon the killing of whales, that frequent the south side of the island in the latter part of the winter, wherein they have a notable kind of dexterity; and the trade that ariseth therefrom hath been very beneficial to all that end of the island." Again he says: "Upon the south side of Long Island, in the winter, lie store of whales and grampuses, which the inhabitants begin with small boats to make a trade of catching, to their no small benefit."<sup>1</sup>

Somewhat earlier than this Samuel Mavericke, in a letter to Col. Richard Niccolls, dated "New Yorke, July 5th 1669" wrote in relation to Whales, as follows: "On ye East end of Long Island there were 12 or 13 whales taken before ye end of March, and what since wee heare not: here are dayly some seen in the very harbour, sometimes within Nutt Island. Out of the Pinnacle the other week they struck two, but lost both, the iron broke in one, the other broke the warpe. The Governour hath encouraged some to follow this designe. Two shallops made for itt, but as yett wee doe not heare of any they have gotten."<sup>2</sup>

Further respecting the capture of whales on Long Island we have the following from Lord Cornbury's report to the Board of Trade, dated "New York, July the 1st 1708": "We have all sorts of Trades here, and some of every sort that work well; . . . The quantity of Train Oyl made in Long Island is uncertain, some years they have much more fish than others, for example last year they made four thousand Barrils of Oyl, and this last Season they have not made above Six hundred; About the middle of October they begin to look out for fish, the Season lasts all November, December, January, February and part of March; a Yearling will make about forty Barrils of Oyl, a Stunt or whale two years old will make sometimes fifty, sometimes Sixty Barrils of Oyl, and the largest whale that I have heard of in these Parts, Yilded one hundred and ten barrels of Oyl, and twelve hundred Weight of Bone, . . . "<sup>3</sup>

During subsequent years, down to as late as 1718, there were frequent disputes between the captors of whales and the rights of the crown to a share of the spoils, but there is no definite information as to the number of whales taken, at which time Robert Hunter, in his report of date July 7 of that year to the "Lords of Trade," stated, the "licences for Whale Fishing" "has not

<sup>1</sup> Hubbard's History of New England, in Massachusetts Hist. Coll., 2d ser., Vol. VI, 1815, pp. 668, 669, 673.

<sup>2</sup> Doc. relative to Col. Hist. New York, Vol., III, p. 183.

<sup>3</sup> *Ibid.*, Vol. V, pp. 59, 60.

any time amounted to 20 Sterling p<sup>r</sup> annum, that fish having in a manner left this coast."<sup>1</sup> Later, however, acts were passed to encourage whale-fishing.<sup>2</sup>

Thompson, in his 'History of Long Island' (edition of 1839, p. 221) says, in writing of Southampton: "The whaling business upon this part of the island has existed, in some form or other, for a great length of time, and may be said to be almost coeval with the settlement of the country by the white people. Both individuals and companies at an early period were engaged in the pursuit of whales along the south shore, in boats built expressly for the purpose, and kept ready at convenient stations upon the beach. In the year 1760, three sloops, owned by Joseph Conckling, John Foster, and a few others, called the *Goodluck*, *Dolphin*, and *Success*, cruised for whales in latitude 36° north. Whales at that period were more abundant along-shore than at present, although some are yet taken by boats at East and Southampton almost every year. The whales when secured were drawn upon the shore, cut in pieces, and conveyed a distance to be boiled out. This process was so offensive, that the town meeting of Easthampton, in 1690, prohibited the practice within a certain distance of any habitation." In the second edition of the work, published in 1843, the author adds: "In the Long Island Herald, published here, of the date of April 12, 1792, it is stated, that *twelve stout whales* were killed during the spring off the southside of the island."<sup>3</sup>

The Province of West New Jersey passed 'An Act relating to Fishing,' in October, 1693. The act relates wholly to the capture of whales in Delaware Bay, and implies that the whale fishing of Delaware Bay was of considerable importance, the act beginning as follows: "Whereas the Whalery in *Delaware Bay* has been in so great a Measure invaded by Strangers and Foreigners, that the greatest Part of Oyl and Bone, recovered and got by that imploy hath been Exported out of the Province, to the great detriment thereof; to obviate which mischief, BE IT ENACTED . . . that all Persons not residing within the Precincts of this Province, or the Province of *Pennsylvania*, who shall kill or bring on shore any Whale, or Whales within *Delaware Bay*, or elsewhere within the Boundaries of this Government, shall pay one full and entire Tenth of all the Oyl and Bone made out of the said Whale, or Whales, unto the present Governor of this Province for the Time being."<sup>4</sup>

Ricketson says, in his 'History of New Bedford' (p. 56), published in 1858: "The attention of the early settlers of New England was early called to the whale-fishery . . . As early as 1690 they had reached the banks of New Foundland in their pursuit of whales. But the voyages of the early whale-

<sup>1</sup> Doc. relative to Col. Hist. New York, Vol. V, p. 510.

<sup>2</sup> *Ibid.*, Vol. V, pp. 583, 782, Vol. VI, p. 160.

<sup>3</sup> Hist. of Long Island, 2d ed., Vol. I, p. 349.

<sup>4</sup> Leaming and Spicer's Grants Concessions, and Original Constitution of the Province of New Jersey, etc. (no date), pp. 519, 520.

men of Nantucket and New Bedford were upon the coast, and for several years did not reach beyond the capes of Virginia and Cape Hatteras. The 'Right Whale,' *balæna mysticetus*, was the only species known to the first adventurers."

Says Pitkin:<sup>1</sup> "The whale fishery first attracted the attention of the Americans in 1690, and originated in boats from the shore. In 1715, six sloops, of thirty-eight tons burden each, were employed in this fishery, from that [Nantucket] island. For many years their adventures were confined to the American coast, but as whales grew scarce here, they were extended to the Western Islands, and to the Brazils, and at length to the North and South Seas<sup>2</sup>. . . . In 1731, the Americans had about thirteen hundred tons of shipping employed in this fishery along their coast. About the year 1750, the whale left the American coast."

Crapo, in his 'Historical Address,' delivered on the occasion of the 'Centennial in New Bedford,' July 4, 1876, has given (pp. 64, 65) extracts from the records of the town of New Bedford,<sup>3</sup> under dates November 11, 1652, April 13, 1653, April 15, 1690, February 19, 1692, and "1792-3," which show that whales at that time were occasionally stranded or captured along the shores of Martha's Vineyard. Under the last-mentioned date three whales killed in February 1793, are referred to as "great whales, betwixt six and seven and eight foot bone."

An extract from the 'Nantucket Inquirer' (newspaper) states: "In the year 1680 [1690?] a Mr. Paddock from Cape Cod came to Nantucket to instruct the English how to whale in boats from the shore, which business continued good till 1760, when it became poor by the scarcity of whales. In the spring of 1726, there were *eighty-six* whales caught here. One Mr. Loper previous to this was engaged in the business, but not to any amount worthy of record." (Crapo, *l. c.*, p. 67.)

These extracts could be greatly extended, but those already given are sufficient to show how important a rôle this species of whale played in the early maritime history of the New England and Middle States; also its former abundance, and how a century of pursuit for its commercial products reduced it to commercial extinction.<sup>4</sup>

<sup>1</sup> Statis. View Comm. United States, etc., 1816, pp. 42, 43.

<sup>2</sup> "See Collections of the Massachusetts Historical Society," [Vol. not stated].

<sup>3</sup> Accredited to Richard A. Pease's valuable 'Historical Sketches of Martha's Vineyard' (probably in the 'Vineyard Gazette,' which I have been unable to see).

<sup>4</sup> Since the above extracts were compiled (in 1881) from the original sources, some of them have appeared in later works on the American Whale-fishery, where many more of similar import may be found. See especially, Alexander Starbuck's 'History of the American Whale Fishery from its earliest Inception to the year 1876' (Report of the Commissioner of Fish and Fisheries for 1875-1876, Part IV, 1878, pp. 1-763); A. Howard Clark's 'History and present conditions of the [Whale] Fishery (Fisheries and Fishery Industries of the United States, Sect. V, Vol. II, 1887, pp. 1-218); J. B. Holder's 'The Atlantic Right Whale' (Bull. Amer. Mus. Nat. Hist., I, 1883, pp. 99-137); Frederick W. True's 'The Whalebone Whales of the North Atlantic' (Smiths. Contr. to Knowl., Vol. XXXIII, 1904).

## V. EXTERNAL AND OSTEOLOGICAL CHARACTERS.

Thanks to the valuable contributions of Cope (1865), Holder (1883), True (1904), and Andrews (1908), the external and osteological characters of the Right Whale of the Atlantic coast of North America, are now well known — better even than those of its representative on the Atlantic coast of Europe, as made known by Capellini, Gasco, and Graells, on the basis of three immature specimens captured, respectively, at San Sebastian and Guittare, Spain, and in the Bay of Taranto, Italy. Guldberg has also described both young and adult specimens from Iceland.

Ten skeletons of American specimens are preserved in American Museums (and none elsewhere<sup>1</sup>), of six of which Mr. True was able to give notes and measurements in 1904. There is still another in the Museum of Comparative Zoölogy at Harvard University, here for the first time described, and the two recently acquired by this Museum. External measurements of three others, of which no part appears to have been preserved, are also given by Mr. True. The present location, place and date of capture, of these skeletons is as follows, in geographic sequence from north to south.

*Skeletons in Museums.*

Provincetown, Mass.	April, 1864	Mus. Comp. Zoölogy, Cambridge, Mass.
Long Island, N. Y.	—	Field Mus., Chicago, Ill.
Amagansett, L. I., N. Y.	1888	U. S. Nat. Mus., Washington, D. C.
Long Island, N. Y.	1875 ?	Amer. Mus. Nat. Hist., New York.
Amagansett, L. I., N. Y.	Feb. 22, 1907	" " " " " "
" " " " " "	" " " " " "	" " " " " "
Delaware Bay.	1862	Mus. Acad. Nat. Sci. Philadelphia, Pa.
Beaufort, N. C.	1874	State Mus., Raleigh, N. C.
Cape Lookoui, N. C.	Feb. 15, 1898	Mus. University of Iowa. <sup>2</sup>
Charleston, S. C.	Jan. 7, 1880	Charleston College Mus., Charleston, S. C.

The two Long Island specimens recently acquired by this Museum have already been sufficiently described (*antea*, pp. 171–182, figs. 1–6), so that it remains merely to add some account of the Provincetown specimen, with illustrations<sup>3</sup> of some of the more important parts of the skeleton, and to briefly summarize the external characters as made known by other writers.

<sup>1</sup> Since this was written the younger of the two Long Island specimens, secured by this Museum in 1907, has been sent to the University Museum, Cambridge, England, in exchange for other material.

<sup>2</sup> Not "Wisc. Acad. Sci." (which has no Museum), as given by True, 'Whalebone Whales,' etc., p. 246.

<sup>3</sup> These illustrations are reproduced from unpublished lithographic plates made by T. Sinclair & Son, Philadelphia, in 1881, for a monograph of the North American Cetacea then in course of preparation by the writer for the United States Geological Survey of the Territories, under the late Dr. F. V. Hayden, Director, as already explained (*antea*, p. 280). They are published here with the kind approval of the Hon. James R. Garfield, Secretary of the Department of the Interior. The drawings were made under my supervision by the well-known



*Size.*—The largest American specimen thus far recorded is the adult female taken at Amagansett, Long Island, February 22, 1907, which, according to the measurements taken by the whalers and given to Mr. Andrews, was 56 feet 7 inches from the tip of the snout to the end of the flukes, or 54 feet from the tip of the snout to the notch of the flukes, as measured by Mr. Andrews himself. A much younger female, taken at the same time and place, was about one fourth less in linear measurements, with a disproportionately much shorter head. The next largest American specimens are two taken on the coast of North Carolina, respectively an adult female and an adult male, which measured (total length), according to Brimley, respectively 53 feet and 50 feet.<sup>1</sup> Nearly all of the other American specimens of which measurements have been recorded were obviously immature. According to Guldberg, the largest of six Ice'and specimens had a total length of 51 feet 8 inches; the next largest, 47 feet 7 inches. As already said, all of the extant European specimens are young, and hence not comparable with adults. The largest European specimen of which measurements have been recorded is the Ré Island example, captured in 1680, and reported variously as adult and young, with a total length of 50 feet 7 inches. The length of adults of this species may be regarded, therefore, as ranging from about 48 to 54 feet. Measurements based on the skeleton seem to average, in a full-grown specimen, about 5 feet less than the total length in the flesh. Something depends upon how the external measurements are taken, as differences of method may considerably vary the results, and especially the ratio of the length of the head to the total length. It is evident, however, that the length of the head is disproportionately less in young animals than in adults.

*Color.*—According to the published descriptions of this whale, the color is usually a uniform "ivory black," "deep black," or "blue black," but, as in other whales that are ordinarily wholly black, they are subject to white mottling, especially on the pectoral limbs, the flukes, and lower surface of the body, which, in rare instances, may be largely white. Mr. H. H. Brimley in a paper on 'Whale Fishing in North Carolina'<sup>2</sup> thus describes the coloration of specimens taken on the coast of North Carolina: "Its color is a dense shining ivory black above, while below the color and appearance is that of the purest polished ivory white, the white often extend-

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natural history draftsman James Henry Blake, of Cambridge, Mass., and are not only artistic but possess the utmost accuracy. For the use of the material I am indebted to Mr. Alexander Agassiz, for so many years Director of the Museum of Comparative Zoölogy. The specimen from which they were taken was captured at Provincetown, Mass., in April, 1864, by Captain N. E. Atwood and Capt. R. Soper, and secured by Professor Louis Agassiz for the Museum through the Gray Fund.

<sup>1</sup> Cf. True, *l. c.*, p. 246.

<sup>2</sup> Bulletin of the North Carolina Department of Agriculture, Vol. XIV, No. 7, April, 1894, pp. 4-8, with illustrations.

ing some distance up the sides. Sometimes it is pied below and the amount of white is very variable, and sometimes, again, pure black specimens are killed, showing no white at all. The line between the color is always sharply defined, although the dividing line is very irregular. There is no shading through the skin to the pink blubber, whether the color be black or white. The white-bellied whales yield the most oil and they usually have a patch of white on the tip of each fluke, so that if only the flukes are seen as the whale goes down the fishermen can often tell whether or not it is a white-belly that they are pursuing" (*l. c.*, p. 7). Mr. Andrews (*antea*, pp. 172, 174) refers to white spots on one of the Amagansett whales observed by him, and quotes Captain J. B. Edwards, an old whaler of Amagansett, as stating: "I have seen several Right Whales with white markings or spots on the sides, and some with the breast and throat nearly all white." Guldberg refers also to the occurrence of white spots on the Iceland specimens captured by Captain Berg. Hence it is evident that specimens of this species showing more or less white are not peculiar to any particular locality; that the amount of white present may vary in amount from a few small spots to large areas, occupying considerable portions of the ventral surface; and that, when present, they are not superficial but involve the whole thickness of the skin down to the pink blubber.

#### PROVINCETOWN SPECIMEN.

This, when studied, was a partly disarticulated skeleton, sex not recorded, of a specimen secured at Provincetown, Mass., for the Museum of Comparative Zoölogy in April, 1864.<sup>1</sup> According to Captain Atwood,<sup>2</sup> one of its captors, it yielded 80 barrels of oil, and the whalebone was sold for \$1,000. The length in the flesh is said to have been 48 feet.<sup>3</sup> The skull is shown in profile (Plate XIX), from above (Plate XX), and from behind (Plate XXI, fig. A). The principal dimensions are as follows:

#### *Measurements of the Skull.*

	mm.
Total length, axial, from occip. condyles to tip of intermax. . . . .	3650
"    "    following curvature . . . . .	4500

<sup>1</sup> Van Beneden, in referring to this specimen (Bull. Acad. Roy. de Belgique (2), XXX, 1870, p. 385) erroneously conjectured it was captured in summer.

<sup>2</sup> Cf. Allen, Bull. Mus. Com. Zool. I., No. 8, 1869, p. 202.

<sup>3</sup> On the authority of Prof. W. H. Niles of the Massachusetts Institute of Technology, who was in charge of the preparation of the skeleton, he then being a student at the Museum of Comparative Zoölogy. According to information recently received from my friend Mr. James Henry Blake, this whale was captured in Massachusetts Bay, near the Plymouth shore, and towed into Provincetown harbor. The skeleton remained many years at the Museum before it was mounted (in 1888) and placed on exhibition. The original whalebone was sold, as stated above, for \$1000 at the time the specimen was captured, and that now attached to the skull is a clever restoration, hardly distinguishable on casual inspection from the original. Mr. Blake gives the length of the animal in the flesh as 47 feet, and the yield of oil as 83 barrels and 14 gallons. Some of the whalebone was seven feet in length.

	mm.
Occipito-frontal suture to post. border of occip. condyle . . . . .	740
Fronto-nasal suture to " " " " . . . . .	880
Anterior border of nasals to post. border of occip. condyle . . . . .	1160
Length of nasals, along outer border . . . . .	350
" " " " inner " . . . . .	250
Breadth of nasals anteriorly . . . . .	330
" " " " posteriorly . . . . .	330
Length of maxillary, axial . . . . .	2780
" " " " following curve of sup. external border . . . . .	3150
Length of intermaxillary, axial . . . . .	2810
" " " " along dorsal convexity . . . . .	3260
Breadth of skull at orbital processes of frontal . . . . .	2500
" " " " at zygomatic processes . . . . .	2325
" " " " at mastoid processes . . . . .	1590
Greatest breadth of occipital bone . . . . .	1090
Transverse breadth of occipital condyles . . . . .	240
Antero-posterior breadth " " . . . . .	285
Transverse diameter of neural canal . . . . .	145
Antero-posterior diameter of neural canal . . . . .	136
Length of mandible, axial . . . . .	3270
" " " " along external curvature . . . . .	4000
Greatest depth . . . . .	430
Transverse diameter of condyle . . . . .	360
Vertical " " " " . . . . .	370

The principal dimensions of this skull, in comparison with those of seven other adult skulls of this species — three from the coast of the United States and four from Iceland — embracing all known that are comparable with it as to age, are as follows:

*Comparative Measurements of Eight adult Skulls of Eubalæna glacialis (Bonn.).*

	America.				Iceland.				
Total length (straight)	4140 <sup>1</sup>	3861 <sup>2</sup>	3810 <sup>3</sup>	3650 <sup>4</sup>	3920 <sup>5</sup>	3910 <sup>6</sup>	3830 <sup>7</sup>	3380 <sup>8</sup>	mm.
Orbital breadth	2591	2553 <sup>9</sup>	2362 <sup>9</sup>	2500	2550	2460	2500	2150	"
Lower jaw (straight)	3912	3478 <sup>9</sup>	3334 <sup>9</sup>	3270	3820	3900	3820	3190	"
" " (along curv.)	4318	3861 <sup>9</sup>	4077 <sup>9</sup>	4000	4033	—	4030	3480	"

<sup>1</sup> Amagansett, Long Island, N. Y., Feb. 22, 1907; in American Museum of Natural History, New York City. Female. Measurements from R. C. Andrews, Bull. Amer. Mus. Nat. Hist., XXIV, 1908, p. 178.

<sup>2</sup> Cape Lookout, N. C., March 20, 1894; in State Museum, Raleigh, N. C. Male. Measurements from F. W. True, Whalebone Whales of the Western North Atlantic, 1904, p. 253.

<sup>3</sup> Long Island, New York; in Field Museum, Chicago, Ill. Measurements from True, *l. c.*

<sup>4</sup> Provincetown, Mass., April, 1864; in Museum Comparative Zoology, Cambridge, Mass. Measurements original.

<sup>5</sup> Iceland, 1891; in University Museum, Christiania. Male. Measurements from Guldberg, Zool. Jahrb., Abth. f. Syst., VII, 1894, 14.

<sup>6</sup> Iceland, 1891; in University Museum, Christiania. Male. Measurements from Guldberg, *l. c.*, p. 10.

<sup>7</sup> Iceland, 1890; in University Museum, Christiania. Measurements from Guldberg, *l. c.*, p. 10.

<sup>8</sup> Iceland, 1891; in Bergen Museum. Measurements from Guldberg, *l. c.*, p. 13.

<sup>9</sup> Calculated on the basis of Mr. True's table of percentages.

Although practically adult, it is slightly exceeded in size by all of the others except one of the Iceland examples.

*Vertebral Column.*—The vertebral formula in this species seems subject to slight variation, as is the rule with most animals, through variation in the number of lumbar or caudals, which Mr. Andrews has found to vary in two specimens taken at the same time and place on Long Island. The total number seems to range from 55 to 57, with the average at 56, which is the number in the Provincetown specimen, namely: C. 7, D. 14, L. 11, Ca. 24 = 56.

*Cervical Vertebrae.*—The cervical vertebrae (Plate XXII, Figs. D–H) differ in several notable particulars from any of those thus far figured as belonging to the genus *Eubalæna*, and are especially interesting as presenting a wonderful degree of bilateral asymmetry. Viewed in profile the spinous processes are united above from the 1st to the 5th inclusive, the 6th and 7th alone being free, both as regards each other and those preceding them. Of the transverse processes, those of the first cervical only are wholly free on both sides, those of the others being united at their extremities into groups which may be indicated as follows: left side, 1, 2, 3–4, 5–6–7; right side, 1, 2–3, 4–5–6–7. In the first cervical the transverse processes have no inferior lamellæ, but they are developed from the 2d, 3d, and 4th on the left side, and from the 2d and 3d on the right. Those of the 2d and 3d on each side are united basally; that of the 3d is much smaller and is free throughout its length.

In viewing the cervical vertebrae from below, the 1st and 7th are seen to be separated from the others by well-marked sutures, but there is no trace of sutures, at least medially, between the other cervicals.

The transverse processes of the atlas are rather short but very broad and thick; that of the left side much heavier than that of the right, the whole left half of the atlas being in fact very much more developed than the right, as is distinctly seen in Plate XXII, Fig. E. The transverse processes of the axis are rather longer than in the atlas, but many times more slender; those of the succeeding vertebrae decrease in length and size to the 6th; the 7th is rather heavier than the 6th.

A striking feature in the present example is the slight degree of ankylosis between the atlas and the axis, which have actually coalesced at only three points, namely: by a small portion of the centra at the base of the transverse processes, and by the union of the neural spines.

The cervical vertebrae of the type of *B. cisarctica* Cope are shown on the same plate (Plate XXII, Figs. A–C) for comparison. They represent a much younger and smaller specimen, with many differences in the details of ankylosis.

*Measurements of the Cervical Vertebrae.*<sup>1</sup>

	mm.
Transverse breadth of atlas . . . . .	655
Vertical breadth of atlas . . . . .	455
Transverse breadth of articular surface . . . . .	370
Transverse breadth of articular surface of right half . . . . .	170
Vertical breadth of articular surface of left half . . . . .	270
Depth of articular concavity . . . . .	90
Transverse diameter of 2d cervical . . . . .	645
“ “ “ 7th “ . . . . .	560
“ “ “ centrum of 7th cervical . . . . .	270
Vertical diameter of 7th cervical . . . . .	230
Length of centra (2d-7th) superiorly . . . . .	150
“ “ “ (1st-7th) superiorly . . . . .	200
“ “ “ (1st-7th) inferiorly . . . . .	240
Length of crest formed by neural spines . . . . .	360
Length of neural spine of 1st cervical . . . . .	110
Length of neural spine of 7th cervical . . . . .	90
Transverse breadth of neural canal anteriorly . . . . .	155
“ “ “ “ “ posteriorly . . . . .	193
Vertical diameter of neural canal anteriorly . . . . .	140
“ “ “ “ “ posteriorly . . . . .	150

*Measurements of other Vertebrae.*

	6th D. mm.	6th L. mm.	6th Ca. mm.
Vertical diameter of centrum, anteriorly . . . . .	220	265	310
Greatest transv. diameter of centrum, ant. . . . .	250	300	320
Length of centrum, ventral border . . . . .	100	155	170
Height of vertebra to top of spine . . . . .	560	675	580
Greatest breadth of transv. processes . . . . .	585	1120	600
Transv. diameter of neural canal . . . . .	190	130	76
Vertical “ “ “ “ . . . . .	110	135	75

*Measurements of First Pair of Ribs.*

	Right mm.	Left mm.
Length in straight line . . . . .	1235	1120
“ along convexity . . . . .	1410	1260
Breadth at distal end . . . . .	325	240

*Scapula.*—The scapula is symmetrically fan-shaped, the superior border regularly rounded. Viewed from above the superior or suprascapula border is slightly sinuous, being feebly sigmoidal. The cartilaginous portion is wanting. The glenoid border presents an oval outline, with the antero-posterior diameter one-fifth greater than the transverse. The acromion process

<sup>1</sup> Without the epiphyses.

is flat, rather narrow and long, slightly broadest at base, the average width being rather more than one-half the length. The coracoid is undeveloped. The point of greatest contraction of the blade is just below the acromion process; from this point it abruptly expands to form the broad, deeply hollowed glenoid fossa. The blade is slightly concavo-convex, the surface smooth. The following are the principal measurements: Greatest length, 1011 mm.; extreme breadth, 830 mm.; length of suprascapular border, following the curvature, 1270 mm.; circumference just below the acromion process, 710; transverse breadth of glenoid fossa, 240; antero-posterior breadth of same, 310; length of acromion process, 200; greatest breadth of same (at base), 130; thickness of suprascapula border, 60-75 mm. (Plate XXIV, Fig. A.)

The scapula varies in size and somewhat in form in different individuals, and even in the same animal, as shown by the following table.

	mm.		mm.	
Height,	1020	breadth,	1250	Iceland (Guldberg).
"	1080	"	1220	" "
"	965	"	1200	right } Amaganset (Andrews)
"	953	"	1143	left }
"	830	"	1011	Provincetown (Allen).

*Pectoral Limb.*—The bones of the right pectoral limb (Plate XXIV, Fig. B) were still (when studied) held in place by cartilage, except the 5th digit, the phalanges of which, however, were still ligamentously connected. Only the terminal phalanx of the 3d and 4th digits were wanting. The distal epiphysis of ulna and radius are ununited, while the proximal are firmly ankylosed, as are both epiphyses of the humerus. The *humerus* is a short, thick bone, deeply constricted around the middle, expanding distally for articulation with the bones of the forearm, and becoming greatly enlarged at the proximal end. The following are its principal measurements:

	mm.
Extreme length . . . . .	520
Greatest transverse diameter proximally . . . . .	375
" " " of head . . . . .	325
" " " distally . . . . .	300
Antero-posterior diameter of head . . . . .	300
Least circumference of shaft at middle . . . . .	600

The *radius* is broad and flat distally, the transverse breadth of the distal border equalling seven tenths of the total length of the shaft; proximally it is much less expanded and much thicker. The point of least breadth is at one fourth the whole length from the proximal end. The following are the principal measurements:

	mm.
Extreme length (near the anterior border) . . . . .	555
Transverse diameter of proximal end . . . . .	240
Antero-posterior diameter of proximal end . . . . .	155
Transverse diameter of distal end . . . . .	350
Antero-posterior diameter of distal end . . . . .	165
Least transverse diameter of shaft . . . . .	185

The *ulna*, like the radius, is fan-shaped in its distal two thirds, and greatly thickened proximally. The length of the distal border is rather more than one half of the total length of the bone. Its principal measurements are as follows:

	mm.
Extreme length . . . . .	480
Transverse diameter of distal end . . . . .	280
Least transverse diameter . . . . .	110
Antero-posterior diameter of distal end . . . . .	90

The *carpal bones* are wholly concealed in the hardened cartilage.

The *digits*, five in number, decrease in length in the following order: III, II, IV, V, I. Digit III, has 6 phalanges; digit II, 5; digit IV, 4; digit V, 3; digit I, 2.<sup>1</sup> (Plate XXIV, Fig. B.) In respect to the relative length of the digits, the number of phalanges in each, and the relative length of digit III, in comparison to the whole limb, the manus in the present species closely resembles that of *Balæna mysticetus*. The number of phalanges in the several digits appears to be variable, as is known to be the case in other cetaceans.

*Measurements of Bones of the Manus.*

	Digits.				
	I	II	III	IV	V
	mm.	mm.	mm.	mm.	mm.
Length of 1st phalanx . . . . .	120	170	160	160	150
“ “ 2d “ . . . . .	?90	155	160	140	130
“ “ 3d “ . . . . .		125	160	108	95
“ “ 4th “ . . . . .		95	120	?60	
“ “ 5th “ . . . . .		55	85		
“ “ 6th “ . . . . .			?60		
Total length <sup>2</sup> . . . . .	?255	730	?910	?520	430

The total length of the pectoral limb, measured from the most proximal point of the head of the humerus to the tip of the longest digit, falls, in the

<sup>1</sup> True (*l.c.*, p. 261) has given a different formula for this specimen, but on what authority is not stated. My examination, however, was made when all the parts were *in situ*, and were thus drawn (see Plate XXIV, Fig. B). Mr. True refers to the impracticability of attempting to give reliable formulæ from mounted specimens in American Museums, and it may be added in corroboration of this statement that the mounted specimen in this Museum, of which the digital formula is given by True, proves on examination to have nearly all of the metacarpals and phalanges restored in wood!

<sup>2</sup> Includes the dried cartilage between the nodes as well as that terminating the digit.

dried state, a little short of two meters (1970), of which the upper and fore-arm bones constitute one half; probably in life the carpus and manus would together equal the upper and fore-arm segments.

*Sternum*.—The sternum (Plate XXIII, Fig. A) is an irregularly oval buckler, convex externally, flat internally, and consequently much thicker in the middle than toward the edges. The upper border is greatly rounded, the lower more pointed. Its greatest diameter is 250 mm., its length 320 mm.

In form this sternum is quite different from any hitherto figured, but most nearly approaches that of the Chicago Field Museum specimen (True *l. c.*, pl. 46, fig. 3), and the Taranto, Italy, specimen (True, *l. c.*, text fig. 85, p. 258). It is very unlike the figure that purports to represent this specimen given by True (*l. c.*, pl. 46, fig. 4). The sternum of the first American Museum specimen figured by True (*l. c.*, text fig. 87, p. 258) is a restoration in wood, doubtless modeled after that of a fin-whale, supplied by the preparator. There is obviously, however, great individual variation in the form of the sternum in this species. The five known examples differ markedly from each other, but the tendency is toward a more or less heart-shaped form, as in the specimen figured by Andrews (*cf. antea*, p. 181), and in the Iceland specimen figured by Guldberg (*l. c.*, pl. ii, fig. 4).

*Pelvic Bones*.—Only one of these, the left, is preserved. It was heavily enveloped in dried cartilaginous tissue and is evidently complete. On carefully removing this tissue from the ossified portion, it was found to be a soft porous bone, 220 mm. in length and 70 mm. in greatest width. As shown in Plate XXIII, Fig. I, the lower border is strongly arched. The anterior two-thirds is greatly expanded, rising into a high, obtusely rounded convexity, having an inward curvature. The posterior third is cylindrical. The point of the greatest expansion is a little anterior to the middle of the bone. If there were originally connected with it vestiges of a pelvic limb, these parts must have been overlooked or lost. This seems, however, improbable, as the preparation of the skeleton was made under most intelligent supervision; the investing cartilage, which was in tact when these parts were studied, would also seemingly have shown trace of connection with appendages, if they had been as well developed as those shown in Guldberg's plate (*l. c.*, pl. ii, figs. 5-7), had any such existed. The pelvic element described by Guldberg has twice the linear dimensions and a much greater mass than in the Provincetown specimen, with an attached femur 125 mm. long, and having a thickness of 72 to 88 mm.

In the Amagansett whale, described by Mr. Andrews (*antea*, pp. 171-182), the pelvic bones are well developed, crescent-shaped, and abruptly expanded in front of the middle, thence tapering rapidly anteriorly, and extending posteriorly as a somewhat flattened, cylindrical bone, becoming



thickened at the posterior extremity. The right pelvic bone, measured along the curvature of the dorsal margin, has a length of 450 mm.; the left one a length 435 mm. Each pelvic bone had attached to it a vestigial femur,—a flattened bone, 135 mm. long, 58 mm. wide, and 10 to 28 mm. thick, parallel-sided for about half the length, with one entire side straight, the other sloping at an obtuse angle. Unfortunately they were separated from the pelvic bones before their position and manner of attachment was noted. One of the pelvic bones with its vestigial femur is shown in the accompanying text figure.

The pelvic bone and femur in *Eubalæna glacialis* greatly resembles

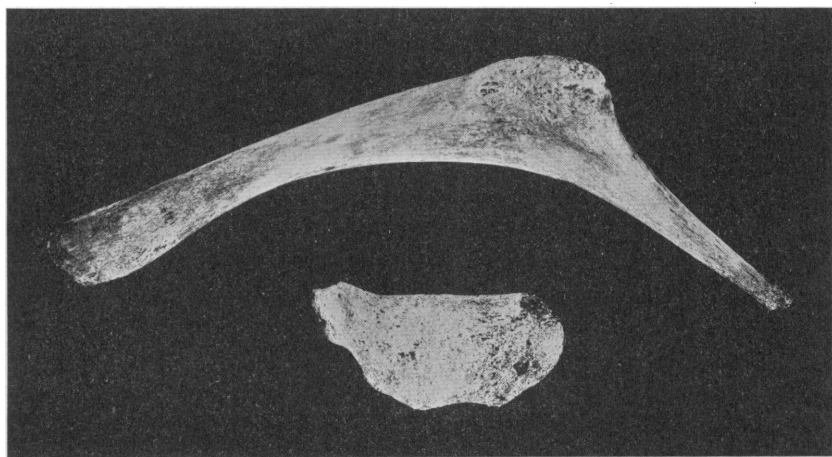
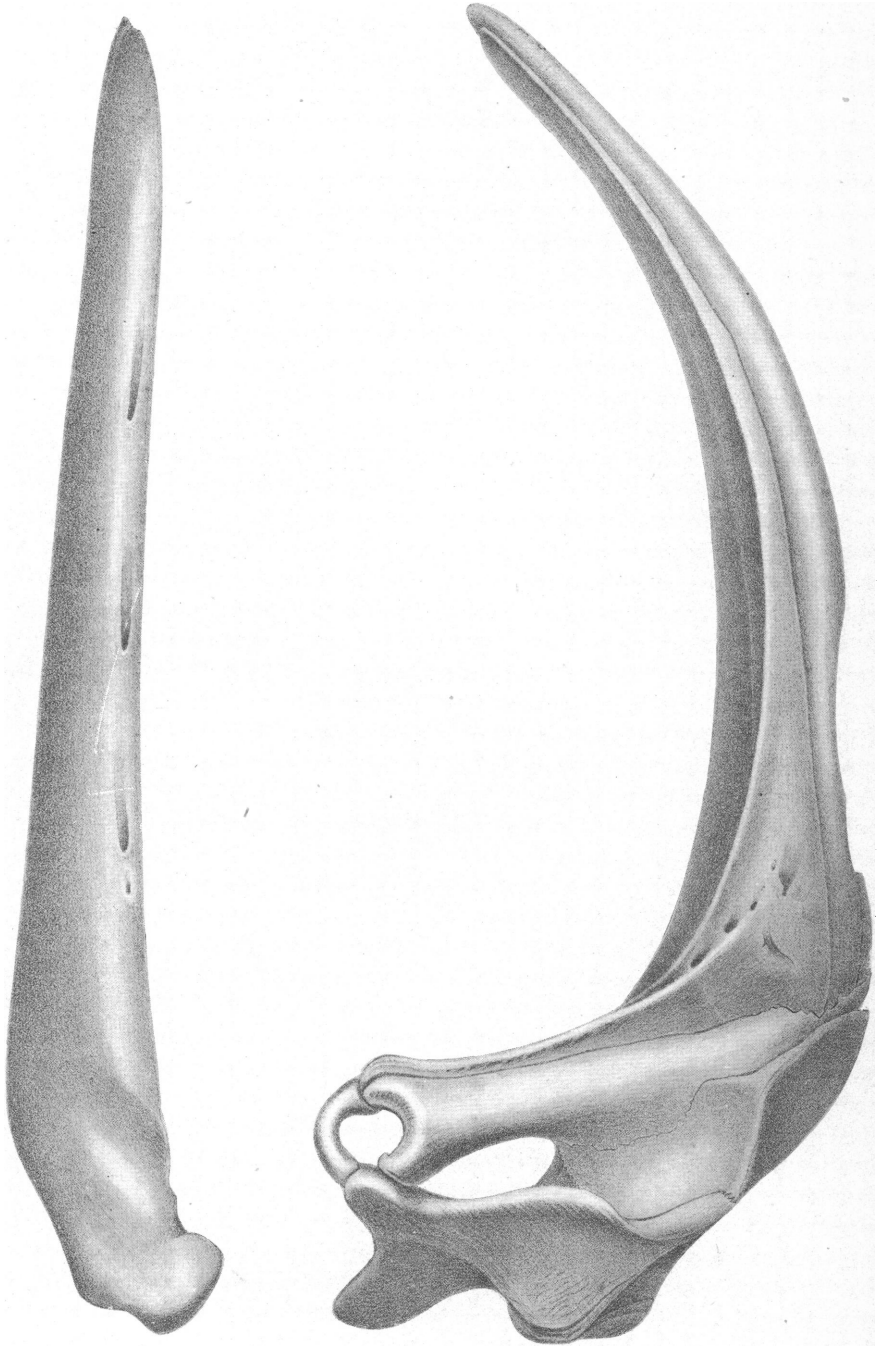


Fig. 1. Right pelvic bone, inner view, and vestigial femur of the large Amagansett Whale.

these bones in *Balæna mysticetus*, as described and figured by Struthers.<sup>1</sup> In each species there is evidently a wide range of individual variation in respect to the size and form of these bones, as shown in the eleven specimens of *B. mysticetus* described by Struthers, and by the several specimens of *E. glacialis* described and figured by Guldberg, and the two described in the present paper. These variations affect the curvature and thickness, as well as the general size, of the pelvic bone and the size and form of the femur, which possibly may in some cases be wanting, as was probably the case in the Provincetown specimen above described.

<sup>1</sup> On the Bones, Articulations, and Muscles of the Rudimentary Hind-Limb of the Greenland Right Whale (*Balæna mysticetus*). By John Struthers, M. D. Journ. Anat. and Phys., XV, 1881, pp. 141-176, 301-321, pl. xiv-xvii.

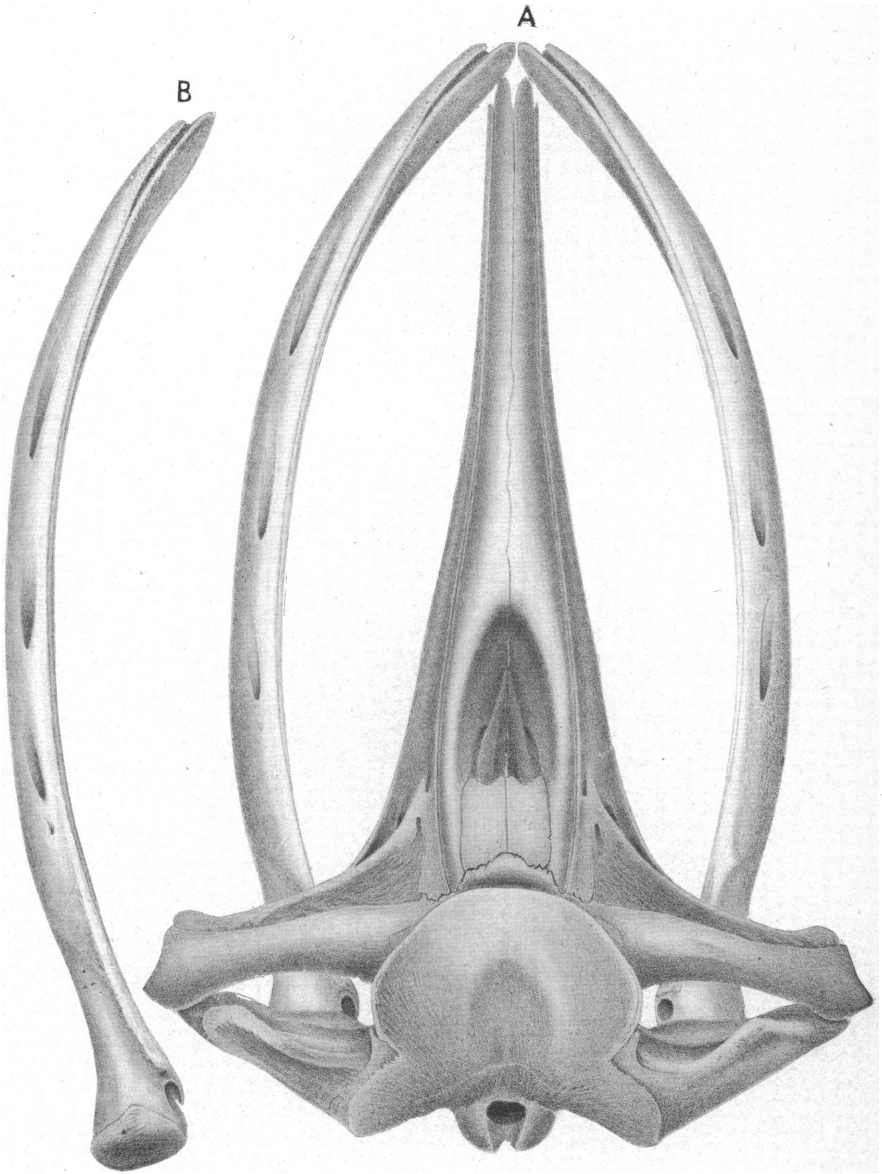




*EUBALÆNA GLACIALIS* (BONN.).

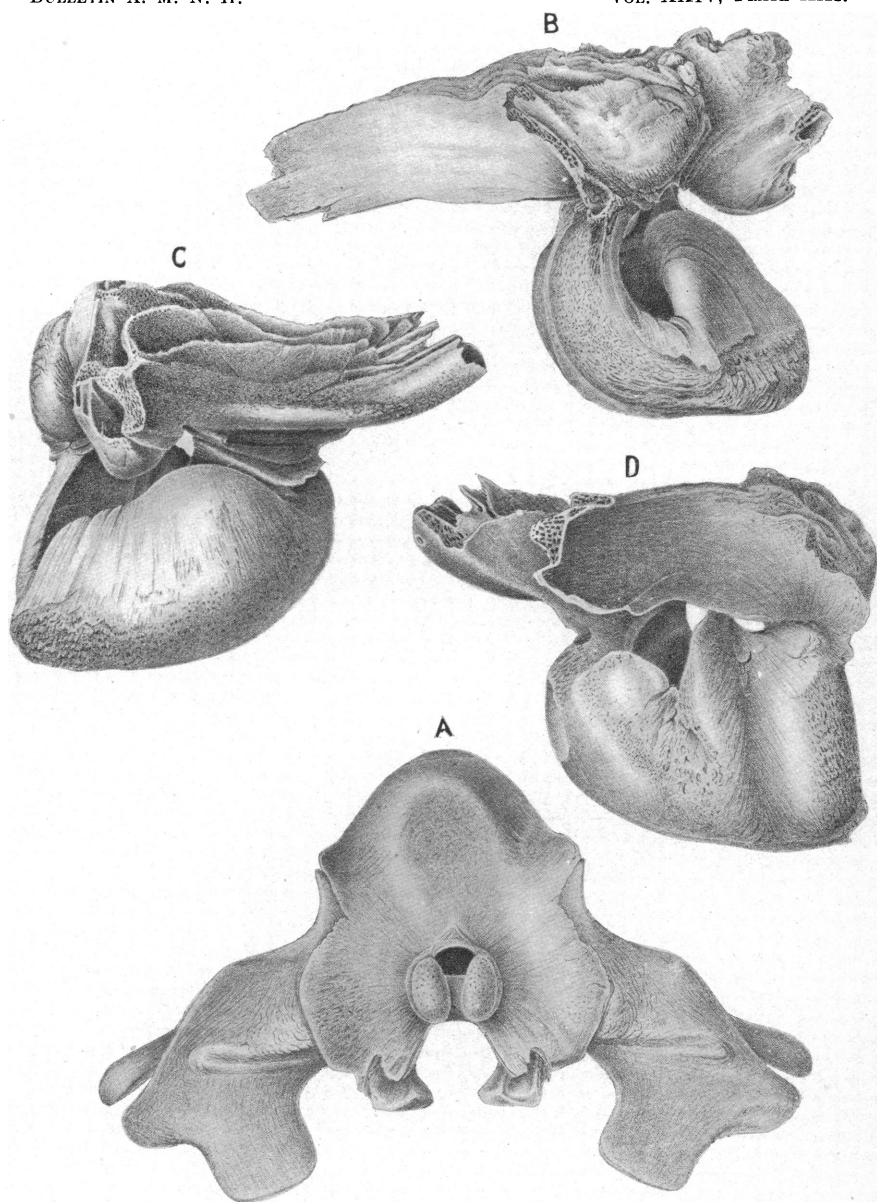
Skull and lower jaw, in profile.





EUBALÆNA GLACIALIS (BONN.).  
Skull and lower jaw, from above.



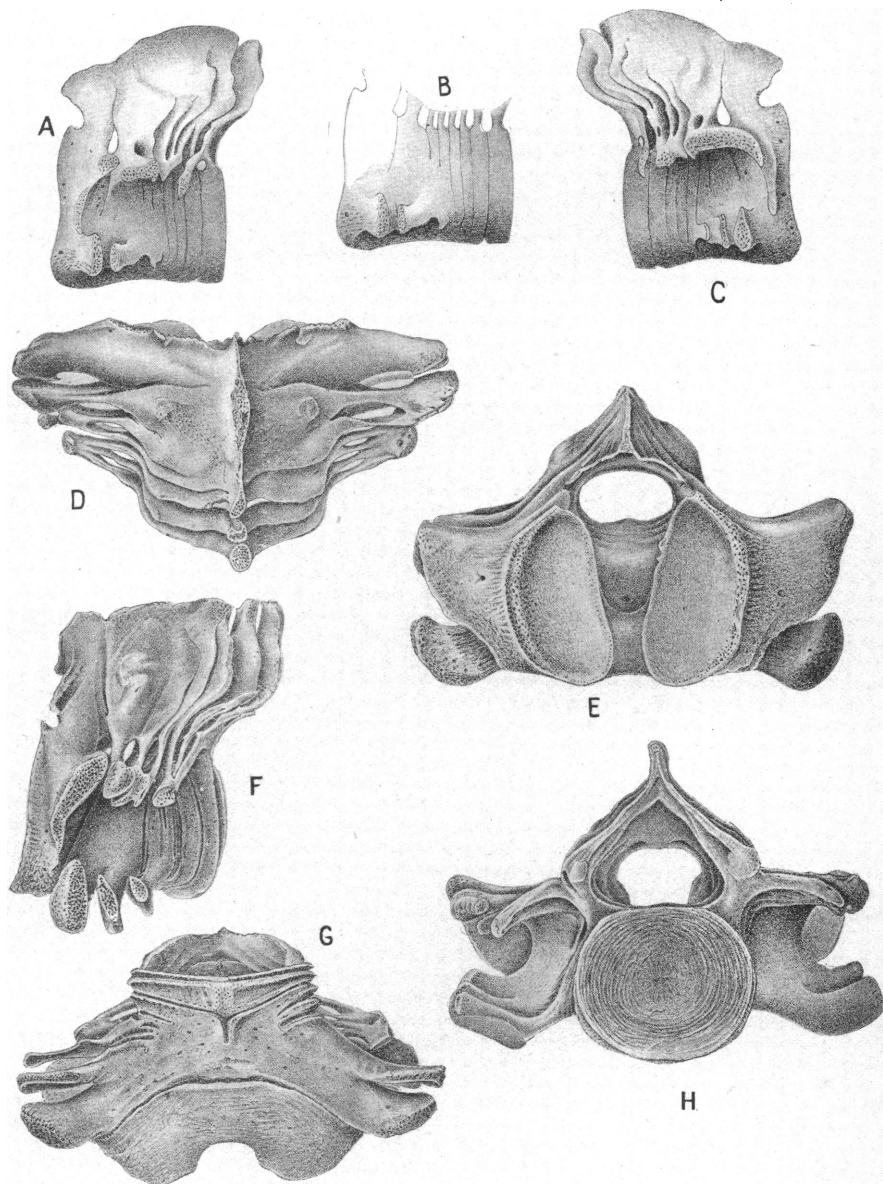


*EUBALÆNA GLACIALIS* (BONN.).

A, occipital view of skull; B, C, D, anterior, exterior, and interior views of the right ear-bone.



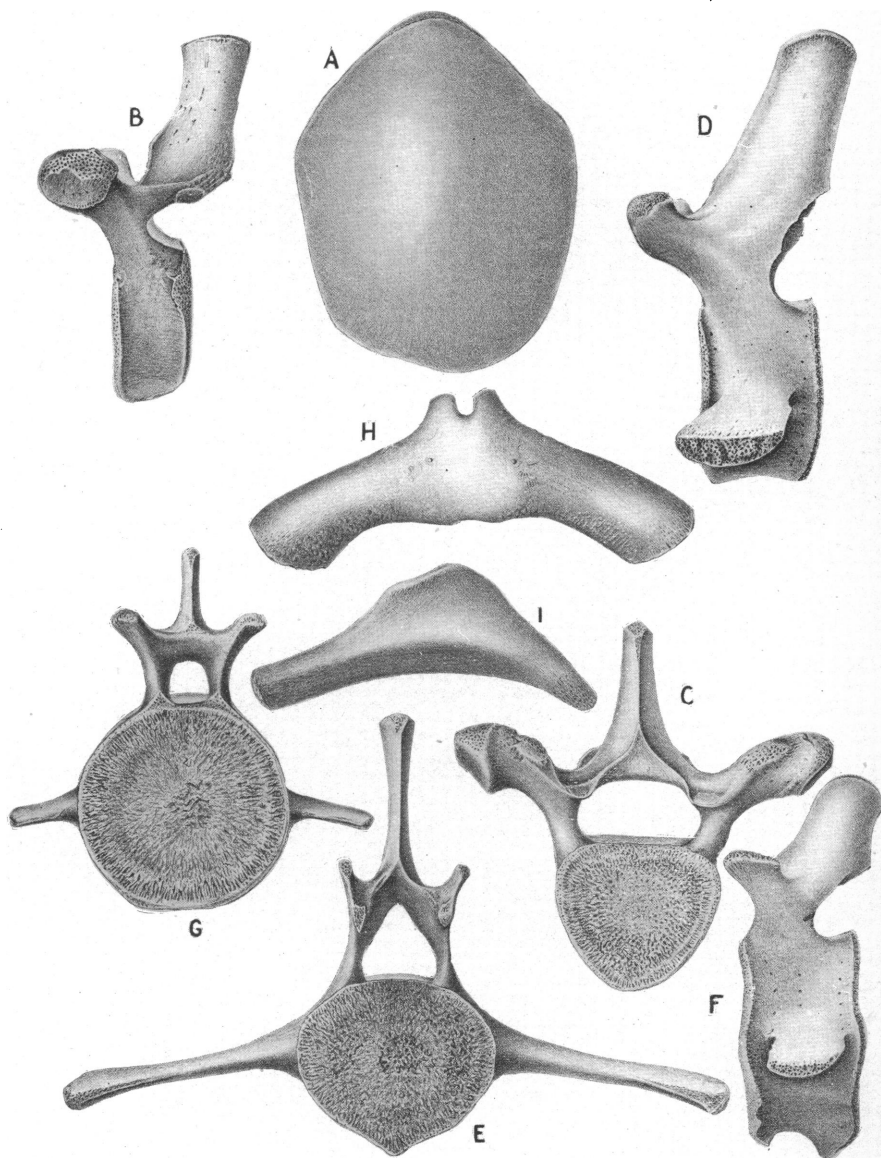




EUBALÆNA GLACIALIS (BONN.).

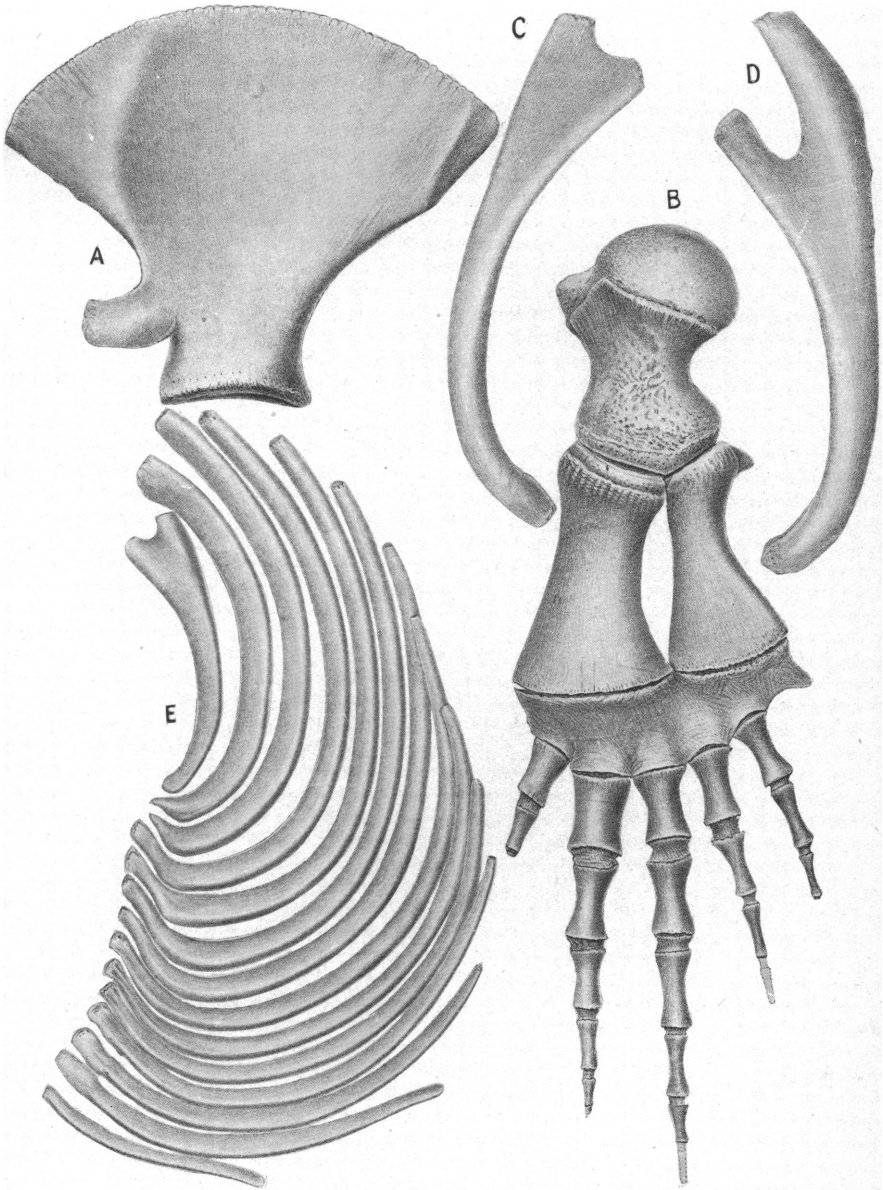
Cervical vertebræ: A-C, from type of *Balæna cisarctica* Cope (A, left side; B, right side; C, centra, from left side). D-H, Provincetown specimen (D, from above; E, from front; F, left side; G, from below; H, from behind).



*EUBALENA GLACIALIS* (BONN.).

A, sternum, front view; B and C, sixth dorsal vertebra, side and front views; D and E, sixth lumbar, side and front views; F and G, sixth caudal, side and front views; H, hyoid bone; I, pelvic bone.





*EUBALENA GLACIALIS* (BONN.).

A, scapula; B, left pectoral limb; C, first rib, left side; D, first rib, right side;  
E, ribs of right side.

