

# Plates for Joel Asaph Allen's Unpublished Monograph on the Mammalian Orders Cete and Sirenia and a Record of the Search for the Manuscript

*James G. Mead and Rosemary G. Dagit*

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## ABSTRACT

In 1882 Joel Asaph Allen published his "Preliminary List of Works and Papers Relating to the Mammalian Orders Cete and Sirenia" as a *Bulletin of the United States Geological and Geographical Survey of the Territories*. That list, consisting of 1013 bibliographic records in chronological order from 1495 to 1840, was said to be one-third of the actual bibliography of a monograph on cetacean and sirenians on which Allen was working. Extensive archival searching has produced only the unpublished plates of the work. We have concluded that the monograph does not reside in any of the logical archival repositories.

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## Introduction

Joel Asaph Allen is perhaps best known for his work with the American Ornithological Union while curator at the American Museum of Natural History. Less well known, but by no means less significant, is his work on mammals. In 1882, "The Preliminary List of Works and Papers Relating to the Mammalian Orders of Cete and Sirenia" was published in the *Bulletin of the United States Geological and Geographical Survey of the Territories*, volume 6. This annotated bibliography contains 1013 titles extending from 1495 to 1840. Allen had received a copy of the galley proofs of the remaining titles, covering the years 1840 to approximately 1880. Because of a number of factors to be explained in this paper, that portion of the work was never published. The purpose of this research paper was to try to locate the missing portion of that work.

INSTITUTIONAL ABBREVIATIONS.—The following institutional abbreviations are used:

AMNH American Museum of Natural History, New York

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GPO Government Printing Office, Washington, D.C.  
MCZ Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts  
USGS United States Geological Survey  
USNM Collections of the National Museum of Natural History, including those of the former United States National Museum, Washington, D.C.

ACKNOWLEDGMENTS.—None of this would have been possible without the generous help of the archival community. In particular we want to express our thanks to the following: Carol Spawn, Academy of Natural Sciences, Philadelphia; Steve Cartlett, American Philosophical Society; Christine Rageri, College of Physicians, Philadelphia; Linda Stanley, Historical Society of Philadelphia/The Library Company; Head Librarian, MCZ; William Cox, Smithsonian Institution Archives; Mary Rabbitt, Historian, George Goodwin, Head Librarian, and Cliff Nelson, Invertebrate Paleontologist, USGS; Michele Pacifico, USGS Records, and Edward Shamel, GPO Records, United States National Archives; James Dallet, Archivist, University of Pennsylvania Archives, Philadelphia; and all of the following at the AMNH: Pam Haas, Main Archivist; Mary Lecroy, Science Assistant, Ornithology; Marie Lawrence, Mammals Librarian; Charlotte Holton, Osborn Librarian.

## History of Allen's Work

Joel Asaph Allen was born in Springfield, Massachusetts, on 19 July 1838 (Allen, 1916). He entered the Wilbraham Academy as a student in 1858 and started his academic publishing career with a series of articles on the birds of New England, which appeared in the *New England Farmer* starting on 11 August 1860. He entered the Lawrence Scientific School at Harvard in February 1862 under the tutelage of Louis Agassiz at the Museum of Comparative Zoology. Allen distinguished himself as a general naturalist, although his tendencies lay in the studies of birds and mammals, with which he was to be-

come an expert in later years. He went with Agassiz to Brazil in 1865 and, with few interruptions, was employed as an assistant to Agassiz at the MCZ until he resigned that post to take up a curatorship at the American Museum of Natural History in New York in May of 1885. One of these interruptions was his assistantship to Spencer Fullerton Baird, then Assistant Secretary of the Smithsonian Institution, to lead an expedition to the Yellowstone Territory in 1873.

#### INVOLVEMENT WITH UNITED STATES GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES

Extended research into the Hayden Survey of the Territories and the history of the United States Geological Survey, as well as Allen's life, was necessary. In his autobiography Allen (1916:32) stated that he was a "special collaborator" with the Hayden Survey from 1876 to 1882. He was primarily headquartered at the MCZ. He also received payment "for services rendered as naturalist" for four months, February–May 1879. During his association with the Survey, he published a monograph on North American Rodentia with Elliott Coues as coauthor in 1877. Allen corresponded frequently with Spencer Baird at the Smithsonian concerning specimen exchange and acquisition. In May 1876, he wrote asking for permission from Baird to give Hayden a chance to publish his work on North American mammals. This correspondence suggests that the Smithsonian had some interest in the work but does not indicate how Allen became associated with the Hayden publications. January of 1877 found Allen "hard at work on the Sciuridae for Hayden" (archival reference H) and asking to use the Smithsonian collection to finish his pinniped work.

Allen continued to work on the "History of North American Pinnipeds, a Monograph of the Walruses, Sea-Lions, Sea-Bears and Seals of North America," which finally appeared as number 12 of the *Miscellaneous Publications of the Geological and Geographical Survey* in 1880. Records exist indicating payment and correspondence connected with proofing both copy and plates.

In May 1880, Allen wrote to Baird discussing his current work on cetaceans (letter from Allen to Baird dated 11 May 1880; archival reference E). As of September 1881, he had completed the bibliography (some of which was in the hands of the printer) and designed eight original plates to illustrate the monograph text (letter from Allen to Baird dated 26 September 1881; archival reference F). T. Sinclair and Sons produced the plates, a total of 12, which were drawn by James Henry Blake.

In 1881, Baird wrote to Allen (archival reference F) asking if he had received the cetacean proofs that Baird forwarded from the public printer. Allen replied in the affirmative. It is not clear why the proofs were originally sent to Baird (archival reference I).

#### ILLNESS

Allen came down with a "serious attack of pleurisy" (Allen, 1916:32) in December of 1881. Allen's poor health took him to Colorado for several months and there is correspondence from both Hayden and Coues asking him to publish the edited portion of the bibliography and to finish the remainder when he regained his health. Following the publication of part of the work, correspondence continued, including a letter from Alexander Agassiz to Baird concerning a missing manatee plate from Allen's work (Smithsonian Archives RU 30, box 1).

It was clear that Allen's illness strongly affected his working ability. In his autobiography (Allen, 1916:33) he noted that on returning to Cambridge in September of 1882 (after spending the summer in Colorado Springs on the advice of his physicians) he learned that his medical difficulties were caused by a "nervous breakdown." Considering the state of psychiatry in 1882, that diagnosis could encompass a number of disorders. He continued to work part-time at the MCZ until the spring of 1885.

#### CURATORSHIP AT THE AMERICAN MUSEUM OF NATURAL HISTORY

In 1885 the financial affairs of the Museum of Comparative Zoology took a downward turn (Allen, 1916:33). At that time three opportunities presented themselves: (1) Allen could continue to work at the MCZ but at the risk of the position's being terminated because of lack of money; (2) he could accept a position on the United States Geological Survey; or (3) he could accept a curatorship that had been offered to him by the American Museum of Natural History. He chose the last alternative, and in his autobiography he indicated that this was with the blessing of Agassiz (Allen, 1916:33).

This assertion of Agassiz's approval is in contrast to the sentiments Agassiz expressed in a note appended to Allen's letter of resignation (25 April 1885; archival reference G) from his post at the MCZ. In that note Agassiz indicated that he had allowed Allen to remain on full salary for the past three years while he recovered from his illness with the expectation that Allen would resume his post at the MCZ.

A note written by Allen in 1908 in his "North Atlantic Right Whale and its near Allies" (pp. 279–280) indicates that, following the reorganization of the USGS, there was no money to publish the remaining zoological work begun under Hayden. He also indicates that although ill health was initially the impediment to finishing the work, other interests later took precedence. The AMNH had obtained considerable material of the North Atlantic right whale through the efforts of Roy Chapman Andrews and the shore whalers of southern Long Island (Andrews, 1908). This prompted Allen to publish the right whale section of his monograph (Allen, 1908).

DEMISE OF THE UNITED STATES GEOLOGICAL AND  
GEOGRAPHICAL SURVEY OF THE TERRITORIES

The United States Geological and Geographical Survey of the Territories, led by F.V. Hayden, was charged with exploring and assessing the geological and agricultural prospects of the areas now known as Colorado, Wyoming, North and South Dakota, Nebraska, and Michigan (Nelson et al., 1981). The results of the survey were published in several forms, as annual reports, bulletins, maps, and miscellaneous publications. Hayden was personally involved in the printing of most works and corresponded frequently with both the authors and the printers. Thomas Sinclair and Sons, in Philadelphia, did almost all of the plates associated with the survey publications.

On 30 June 1879, the Hayden Survey of the Territories was officially merged with the Powell and King Surveys into the United States Geological Survey, with Clarence King as director (Records of the 45th Congress; see Appendix). The politics surrounding the merger were quite unpleasant, and Hayden was disappointed at not being named director. He did, however, stay on as a geologist. Congress designated \$20,000 to finish the publications begun under Hayden.

In 1886, Hayden retired from the USGS and moved to Philadelphia, where he died on 22 December 1897. His wife, Emma Woodruff Hayden, lived until 1934 but did not deposit his personal papers with any institution. Edward Woodruff Johnson, her nephew, was beneficiary in her will. There remained a close friendship between the Hayden/Woodruff families and the Allen family, as shown by a gift of Allen's personal copy of his autobiography from his wife, Susan Allen, to one of the Woodruffs. This copy is currently in the library of the AMNH. It is possible that the manuscript has been preserved in the Woodruff family papers, but to eliminate this possibility would require extensive genealogical work and contacting collateral descendants.

To establish the preceding chain of events, we carefully examined the records of the USGS. All incoming and outgoing correspondence of the Hayden Survey as well as the new Geological Survey under King were examined for the years 1874–1882. Few references to Allen exist. The only letters from him are in support of Hayden's appointment as director or in reference to the rodent or pinniped works. No mention was made of the cetacean work. Hayden wrote and received many letters from both the public printer and T. Sinclair and Sons, none of which mention Allen. Records of the USGS (Record Group 57) show accounts and appointments. Hayden's appointment as geologist is included as well as his notes acknowledging receipt of his paycheck. Most of these records are on microfilm. The loose papers yet to be photographed also were examined and yielded nothing more. No mention was made of Allen's being commissioned or receiving payment for his work on cetaceans. Perhaps this explains why the funds specified by Congress for printing the remaining Hayden works did not include Allen's bibliography. The publication records of the Hayden Survey indicated that all printing was done through the

Government Printing Office, so the archival material in Record Group 157, containing all GPO records, also were examined. This included incoming and outgoing correspondence and records of orders for printing. The public printers during the years 1880–1882 were John D. Defrees and S.P. Rounds. The chief clerk, involved in most correspondence, was A.F. Childs. In the large volume of correspondence between T. Sinclair and Sons and the GPO, no letters pertain to Allen's work.

Among the records of Orders for Executive Printing, however, is a reference to an order for 3000 copies of "Bulletin Vol. VI, no. 3," dated 3 October 1881. A later entry (17 July 1882) mentions an order for 200 copies of "Hayden's bull. vol. 6, no. 3 (Allen)." This could be the author's reprint request. Each order at the GPO was given its own folder, called a "white jacket," which contained all the information pertaining to that job. Unfortunately these have all been destroyed.

Dr. Elliott Coues, an Army surgeon, took over as "acting director of the ex-Survey" (letter from Coues to Leidy dated 15 July 1879). He also was named Honorary Curator of Mammals at the Smithsonian and seemed to use that office to discharge his duties as editor of the Hayden Survey publications. There are several references by Coues concerning proofs being sent to both Allen and a proof reader, Mr. Young (letter from Coues to Leidy dated 20 January 1879). He maintained a consistent correspondence with both LeConte and Leidy, as well as with Allen. Coues and Allen had coauthored a monograph on North American rodents for the Survey and were close personal friends.

All correspondence for 1880–1882 was checked and, other than the above notes, there was no mention of the Allen manuscript. No letters to or from Allen were found. Coues seems to be the major correspondent concerning Hayden's reports but mentions only volumes 13 and 14. Hayden remained involved until 1880, mostly working on the copy and prints for the 1878 annual report and final report, volume 8. There was some problem with timing and funding and Sinclair was asked to hold up work on the plates until Hayden came forth with the copy. The time lags and sequences of printing the survey material were quite erratic. It is somewhat curious that Allen is not mentioned at all, as the pinniped work came out in 1880 and the first part of the cetacean bibliography in 1882.

Some correspondence refers to proofs but there is only one letter specifically addressing the cetacean bibliography (archival reference D). It also is curious to note that Coues does not appear on the USGS payroll but continued to use the United States Geological and Geographical Survey of the Territories letterhead for related correspondence until at least 1882.

It is not clear how the payment of authors or engravers was handled. One reference (letter from Coues to LeConte dated 19 November 1879) indicates that Coues sent the bills and originals to Hayden. A letter from Hayden to LeConte in February 1879 said that he was not able to pay for a commissioned article at that time. A later letter from Hayden to the director of the USGS in December 1879 indicates that he was trying to finally



settle survey accounts with the treasury department. There were no other ledger accounts except Hayden's salary after 1880.

#### ARCHIVAL SOURCES CONSULTED

None of the archival sources yielded the actual manuscript or contained more than limited references to it. It seems curious that, during a time noted for frequent correspondence between colleagues, Allen is not better represented in the papers of Leidy, LeConte, Hayden, or Baird. The material in the National Archives pertaining to the USGS and the GPO has been carefully searched and all relevant facts have been discussed above. It is not worth looking there any further. All Philadelphia sources have been covered with the exception of Edward Woodruff Johnson, a descendant of Hayden, who may still be alive and possibly in possession of some of Hayden's personal papers. Letters to other archival holdings of Hayden's papers have revealed little. Tracing the plates through Thomas Sinclair and Sons provided information indicating that any letter copy was done by the GPO.

#### Plates for the Allen Monograph

While the senior author (Mead) was a student at Yale University in the mid-1960s, he developed a rapport with the staff of the MCZ in Cambridge. Mead was collecting loose lithographic plates that Othniel Charles Marsh, of the Yale Peabody Museum, had produced. Mead followed a lead given him by William D. Sill, a student in Vertebrate Paleontology at the MCZ, and approached the librarian of that museum, who was rumored to have several sets of loose lithographic plates for sale. This turned out to be the case and Mead bought one set. When he opened it he was delighted to find that it contained several Marsh plates that he did not have plus some other miscellaneous plates. It was common practice in the late nineteenth century for authors of monographs to have the plates printed separately from the text and to make extra copies of them to give to colleagues. It was not until Mead was going through the miscellaneous plates in the mid-1970s that he discovered a complete set of the plates for Allen's monograph on the Cetecea. The plates were printed as quarto illustrations, indicating that Allen had planned a quarto monograph and not an octavo, as was the case with his monograph on pinnipeds. They are reproduced herein (with the exception of Plate VIII, which was not found), and as complete a description of them as possible is given in the plate legends. The legends include the scientific names as they appear on the original plates, with the currently recognized names in brackets.

#### CONCLUSIONS

Some facts definitely have been established: (1) The monograph was assigned to be volume 6, part 3 of the *Bulletin of the United States Geological and Geographical Survey of the Territories* (Hayden Survey). The first part of the Bibliography was published under this reference. (2) Printing of the bulletin was done by the GPO. It is unclear who printed the reprint of Allen's partial bibliography, but most probably it, too, was printed in Washington, D.C. Reference was found to a law against printing anything at government expense except by the GPO. (3) Both Baird and Allen had access to the galley proofs at one time. Probably Coues and Hayden maintained copies also. Anything sent back to the GPO was either printed or destroyed. (4) A copy of the proofs was still in Allen's possession as late as 1916, as he mentions it in his autobiography and bibliography.

Most of Allen's personal papers are located at the AMNH. The main archives have two scrapbooks as well as miscellaneous correspondence, none of which pertains to the cetacean bibliography. Some manuscripts have been cataloged in the main library, but Allen's is not among them. The Ornithology Department has several file drawers full of Allen's correspondence. These were searched thoroughly, but unsuccessfully, for the manuscript and for letters to Coues, Hayden, Baird, and Thomas Sinclair and Sons. The archives of the Ornithology Department has a large collection of letters between Allen and Coues. It was here that mention was made of the bibliography and of Allen's health problems. The Osborn Library in Vertebrate Paleontology has copies of the plates but no manuscript.

The Mammalogy Department archives have recently been reorganized and, although the actual manuscript was not found, several interesting facts appeared. In 1921, all of Allen's books were purchased by the department for \$200. Cleveland Allen wrote in the 1930s asking for permission to look at his father's letters and papers. Dr. Frederick Lucas petitioned to have another of Allen's papers published posthumously. There also was a request from the South Dakota State College library for letters between Coues and Allen. It is certainly worth checking with them for further leads.

The authors would like to note that they have found Allen's published bibliography (Allen, 1882) so useful that they have put it into computer-readable format and used the extensive annotations to keyword it. It is available on-line as a part of the Smithsonian Institution Research Information System (SIRIS).

## Appendix

### Archival References

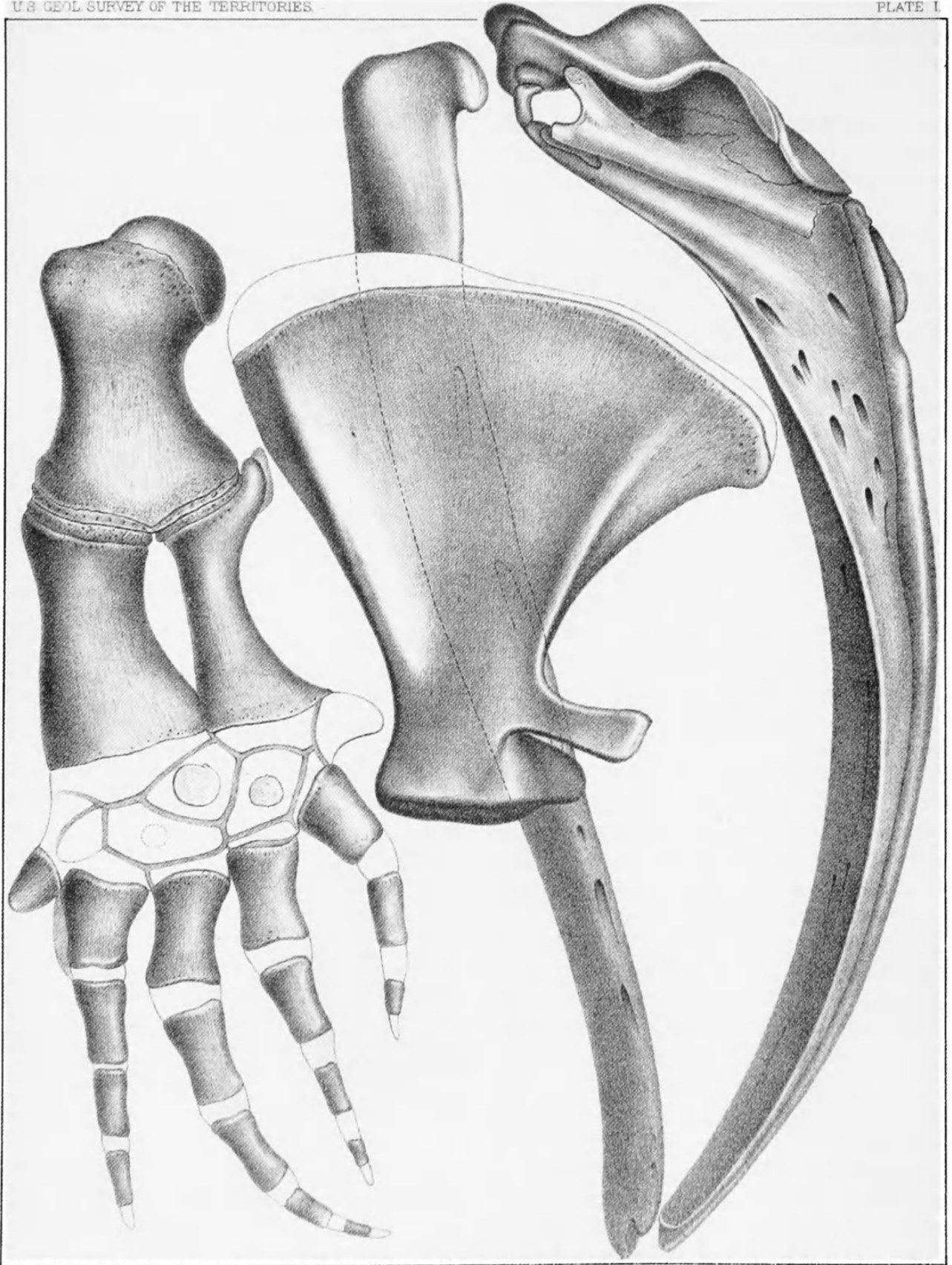
- A. Geological Survey, Records of the 45th Congress, Session III, Chapter 182, 1879, pages 394–395.
- B. Letter from Elliott Coues to Joseph Leidy, dated 15 July 1879, in the Leidy Collection of the Hayden Papers (567), Academy of Natural Sciences, Philadelphia.
- C. Letter from Elliot Coues to Joseph Leidy, dated 20 January 1879, in the Leidy Collection of the Hayden Papers (567), Academy of Natural Sciences, Philadelphia.
- D. Letter from Elliott Coues to John LeConte, dated 19 November 1879, in the Elliott Coues Papers, American Philosophical Society, Philadelphia.
- E. Letter from Joel Allen to Spencer Baird, dated 11 May 1880, in the records of the Office of the Secretary (Spencer F. Baird), 1879–1882 (Smithsonian Archives, RU 28, box 14).
- F. Letter from Joel Allen to Spencer Baird, dated 26 September 1881, in the records of the Office of the Secretary (Spencer F. Baird), 1879–1882 (Smithsonian Archives, RU 28, box 28, folder 19).
- G. Letter from Joel Asaph Allen to Louis Agassiz, dated 25 April 1885, resigning Allen's position at the Museum of Comparative Zoology; with a note in Agassiz's hand expressing dismay at the letter (Special Collections, MCZ, bag 33.10.1).
- H. Letter from Joel Asaph Allen in Cambridge, Massachusetts, to Spencer Fullerton Baird, Assistant Secretary of the Smithsonian Institution, dated 9 January 1877, in the records of the office of the Assistant Secretary (Smithsonian Archives, RU 52, box 38, folder 192).
- I. Letter from Spencer Fullerton Baird to Joel Asaph Allen, dated 14 December 1881, about the proofs that Baird received from the public printer and was forwarding to Allen (Smithsonian Archives, RU 33, file 115b-480).

### Literature Cited

- Allen, J.A.
1880. History of North American Pinnipeds: A Monograph of the Walruses, Sea-lions, Sea-bears and Seals of North America. *United States Geological and Geographical Survey of the Territories, F. V. Hayden, Geologist-in-Charge, Miscellaneous Publications*, 12: xvi + 785 pages, 60 woodcuts.
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U.S. GEOL. SURVEY OF THE TERRITORIES.

PLATE I



J. H. Blake del.

T. H. Swan &amp; Son, Lith. Philad.

## BALAENA MYSTICETUS

PLATE I.—*Balaena mysticetus*: Right lateral view of skull and mandible; lateral view of right scapula; medial view of right flipper. Specimen unknown.



J. H. Blake del.

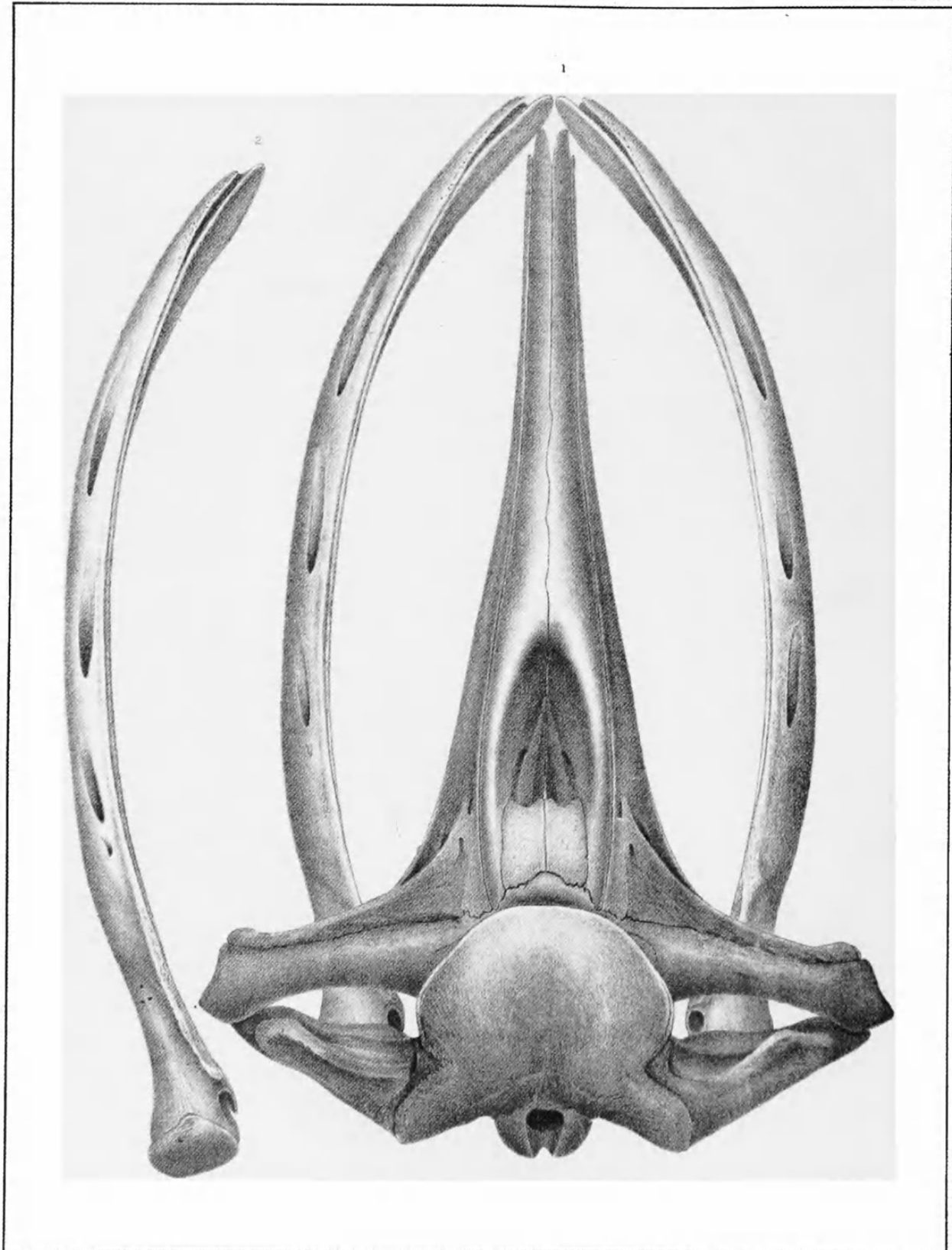
Published by the U.S. Geol. Surv., Wash., D.C.

BALAENA CISARCTICA

PLATE II.—*Balaena cisarctica* [*Eubalaena glacialis*]: Left lateral view of skull and mandible. Skull in MCZ, taken in April 1864 at Provincetown, Massachusetts. Reproduced as Plate XIX in Allen, 1908.

U.S. GEOL. SURVEY OF THE TERRITORIES

PLATE III.



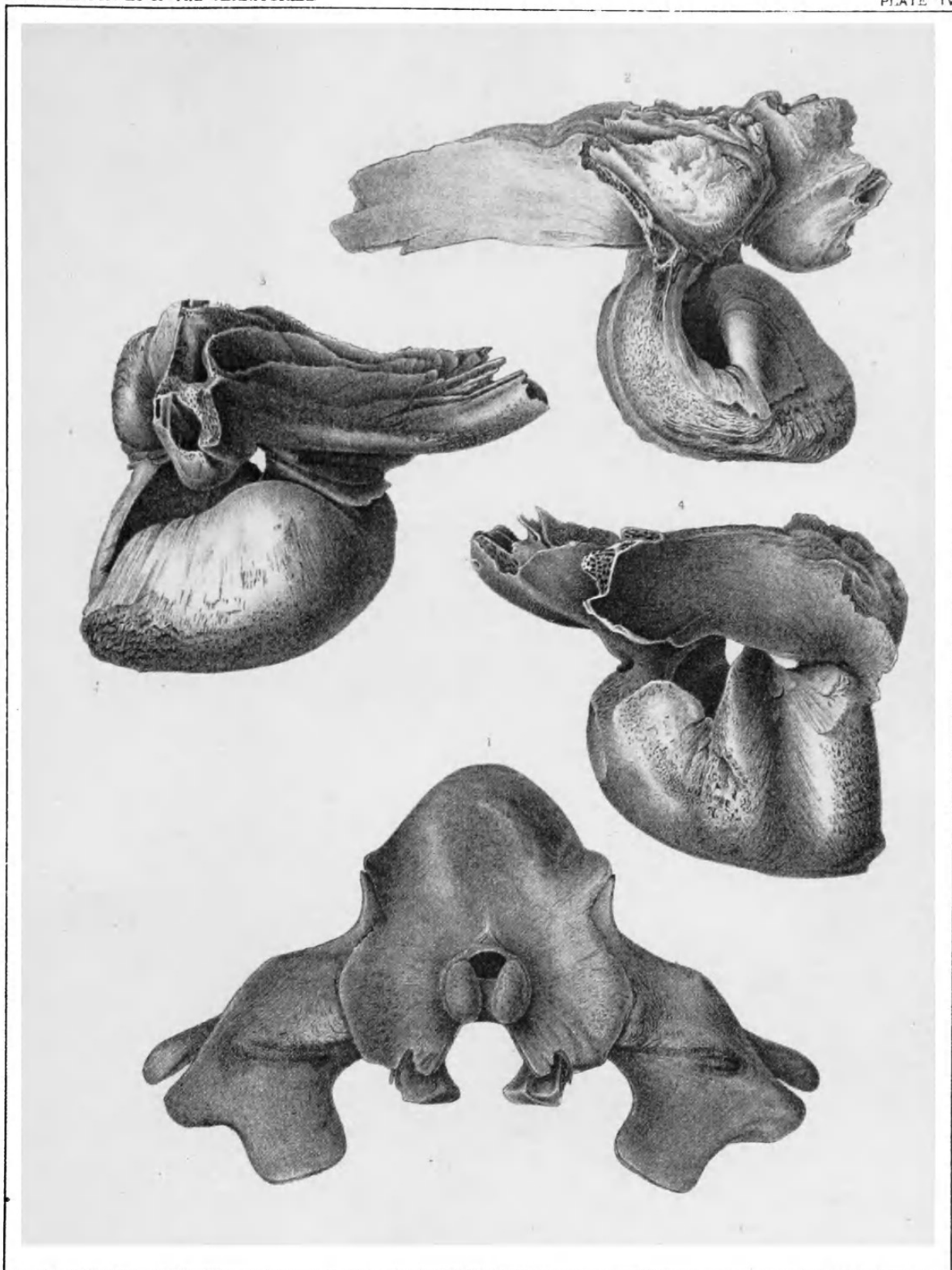
H. Blake del.

T. Sinclair &amp; Son. Lith. Phila. Pa.

## BALAENA CISARCTICA

PLATE III.—*Balaena cisarctica* [*Eubalaena glacialis*]: 1, dorsal view of skull and mandibles; 2, dorsal view of left mandible. Skull in MCZ, taken in April 1864 at Provincetown, Massachusetts. Reproduced as Plate XX in Allen, 1908.



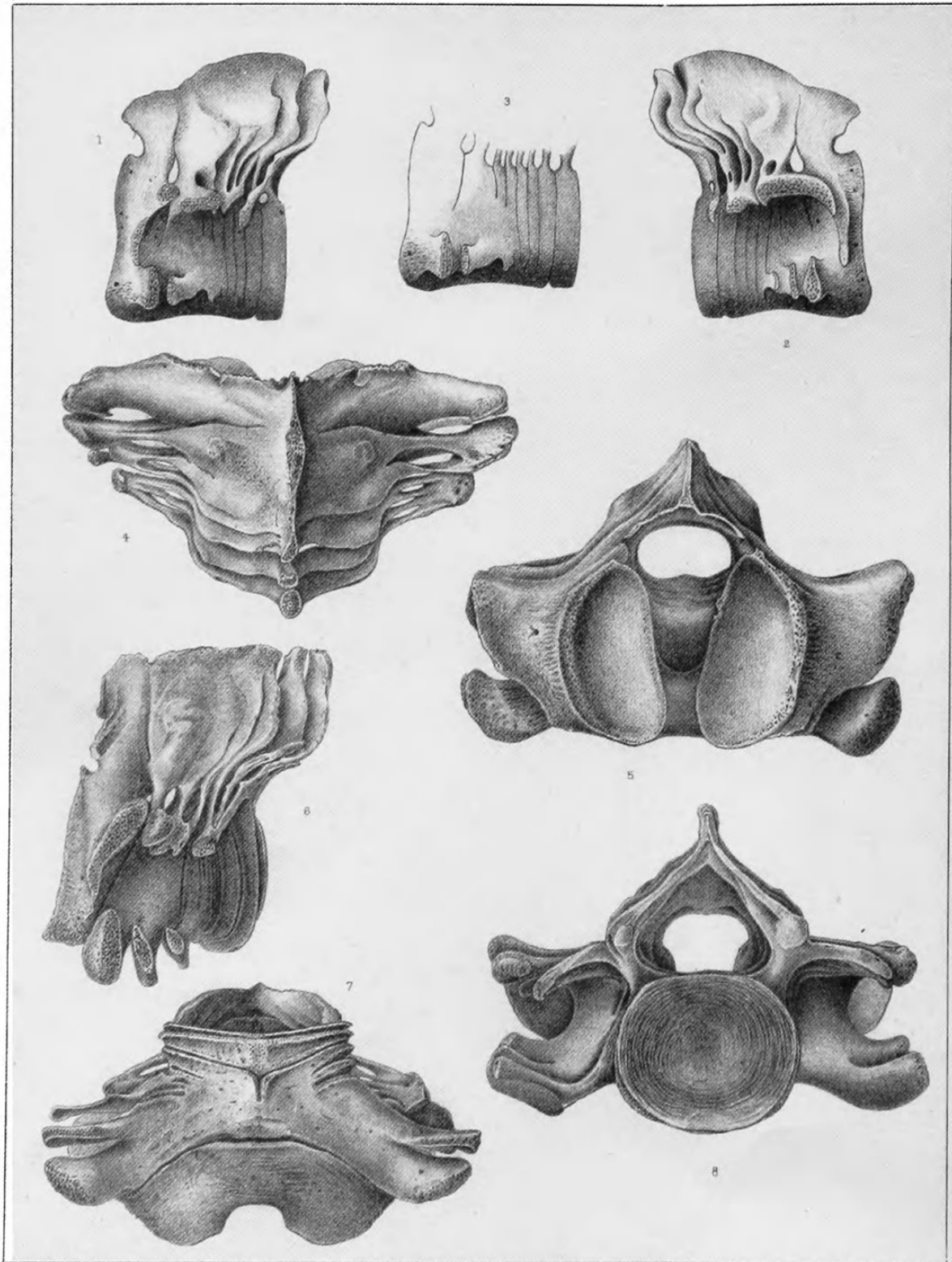


J. H. Blake del.

T. S. Sclater &amp; S. S. Lill. Philada.

## BALAENA CISARCTICA

PLATE IV.—*Balaena cisarctica* [*Eubalaena glacialis*]: 1, posterior view of skull and mandibles; 2, anterior view of right tympanoperiotic; 3, medial view of right tympanoperiotic; 4, lateral view of right tympanoperiotic. Skull in MCZ, taken in April 1864 at Provincetown, Massachusetts. Reproduced as Plate XXI in Allen, 1908.

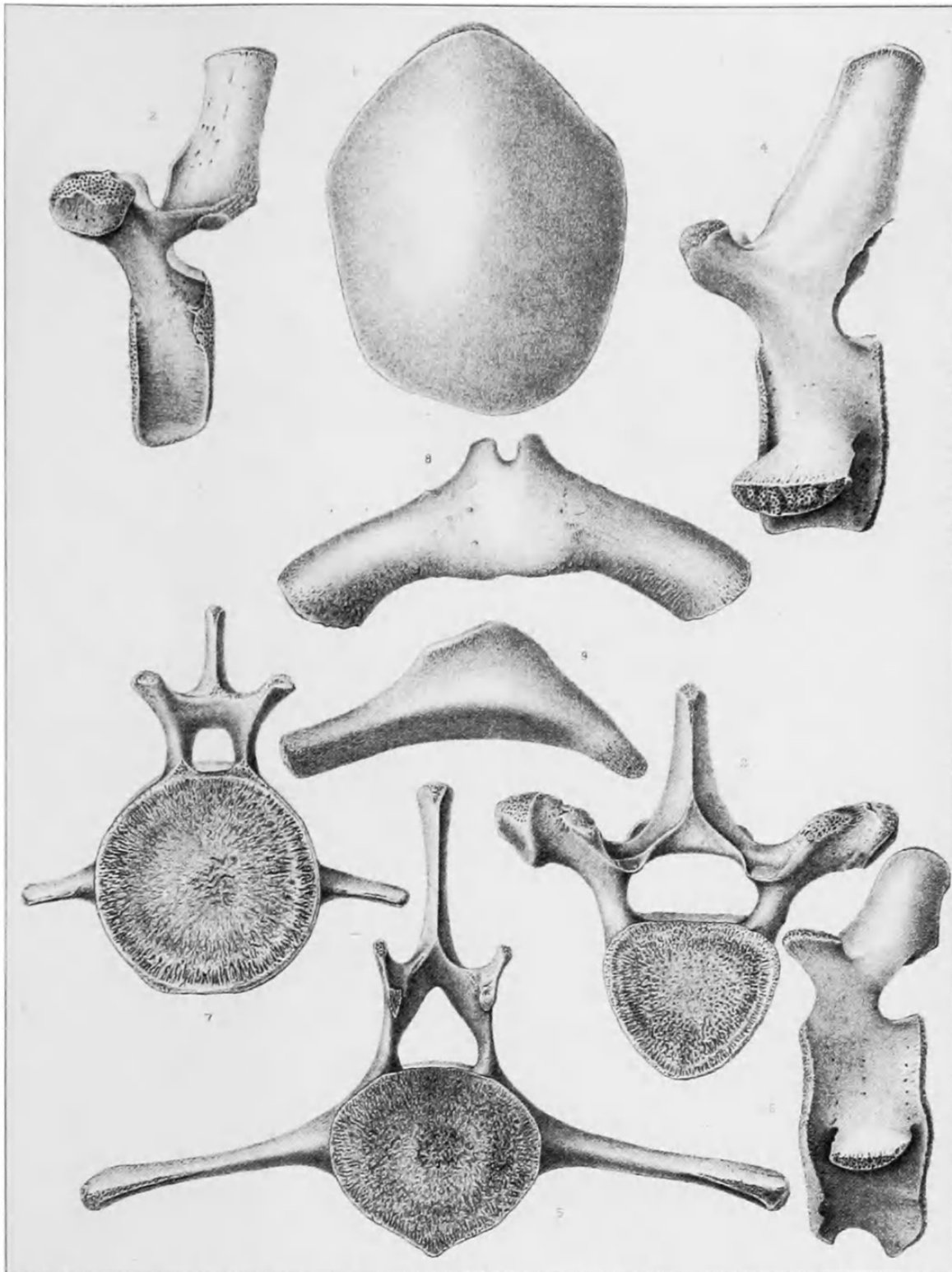


J. H. Blake del.

T. Sinclair &amp; Son. Lith. Philada.

## BALAENA CISARCTICA

PLATE V.—*Balaena cisarctica* [*Eubalaena glacialis*]: 1, left lateral view of the cervical vertebrae; 2, left lateral view of the cervical vertebrae with dorsal processes hidden; 3, right lateral view of the cervical vertebrae; 4, dorsal view of the cervical vertebrae; 5, anterior view of the cervical vertebrae; 6, left lateral view of the cervical vertebrae; 7, ventral view of the cervical vertebrae; 8, posterior view of the cervical vertebrae. 1–3, Holotype of *Balaena cisarctica* (USNM 301637); 4–8, specimen in MCZ, taken in April 1864 at Provincetown, Massachusetts. Reproduced as Plate XXII in Allen, 1908.



T. H. Blake del.

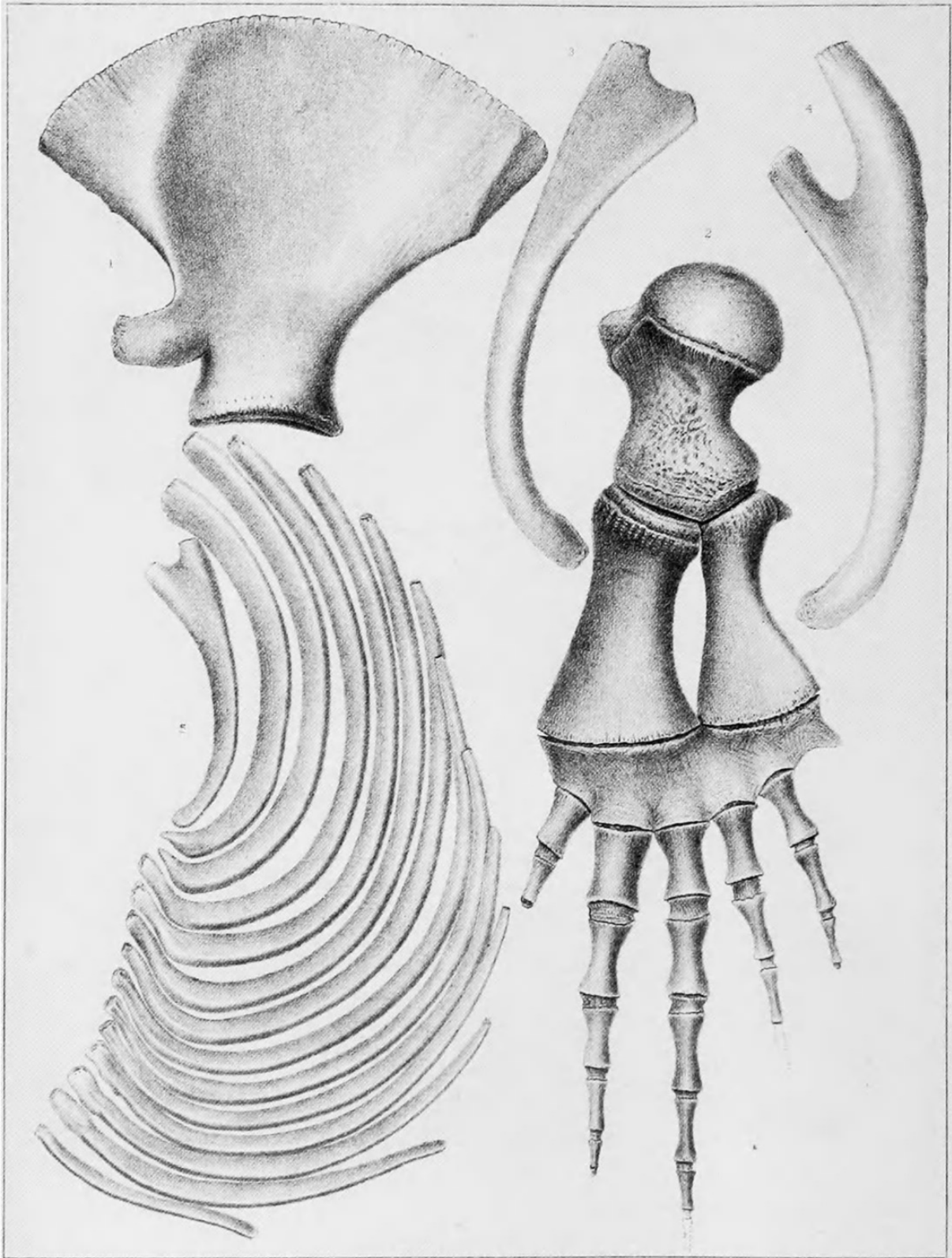
Fac. Sci. Univ. Mich.

BALAEŅA CISARCTICA

PLATE VI.—*Balaena cisarctica* [*Eubalaena glacialis*]: 1, ventral view of sternum; 2, left lateral view of sixth thoracic vertebra; 3, anterior view of sixth thoracic vertebra; 4, left lateral view of sixth lumbar vertebra; 5, anterior view of sixth lumbar vertebra; 6, left lateral view of sixth caudal vertebra; 7, anterior view of sixth caudal vertebra; 8, ventral(?) view of the fused basihyal and thyrohyal; 9, external view of left pelvic vestige, anterior to the right, ventral to the top. Specimen in MCZ, taken in April 1864 at Provincetown, Massachusetts. Reproduced as Plate XXIII in Allen, 1908.

SOUTH-WESTERN TERRITORIES

PLATE VII



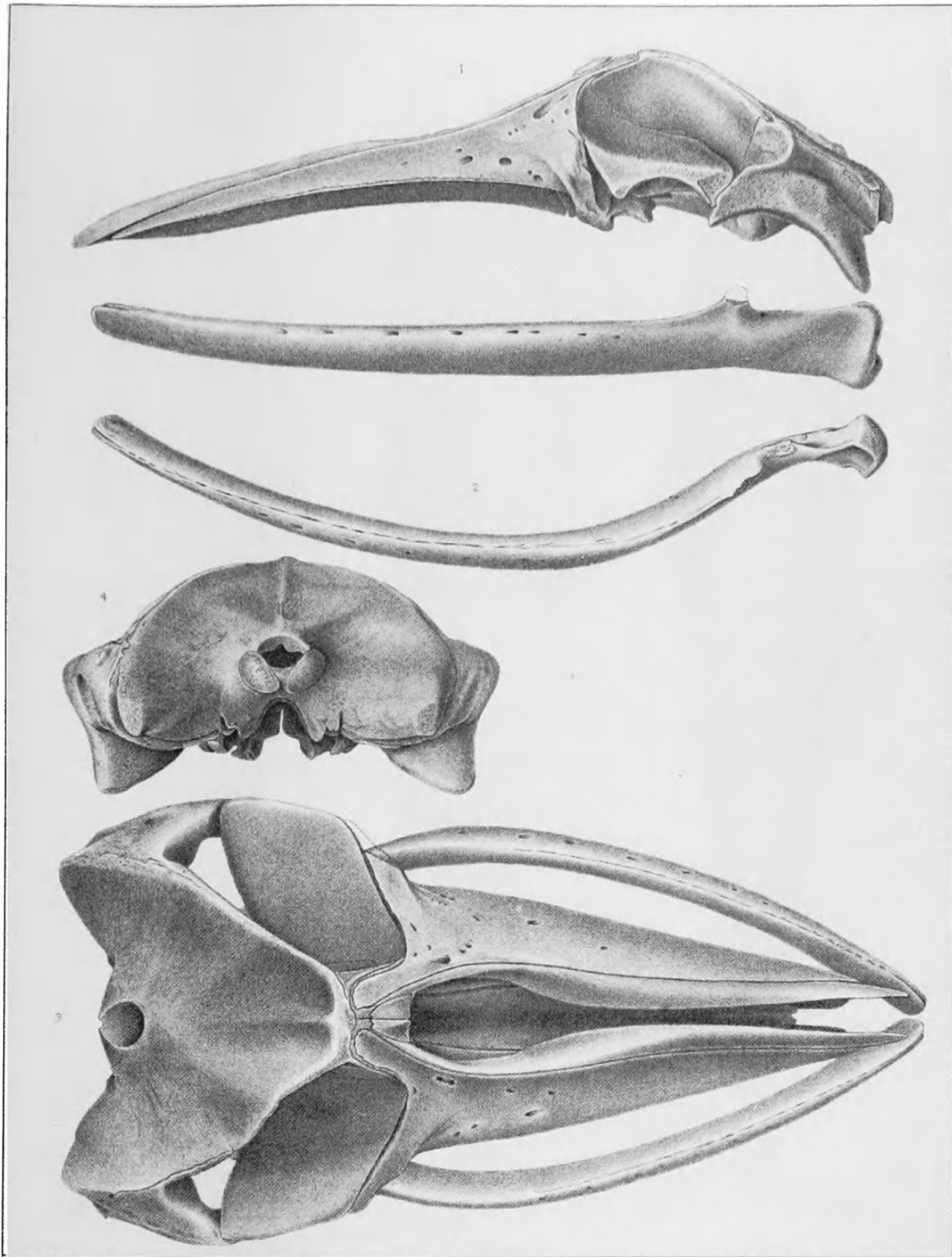
J. H. Blake del.

T. Fisher &amp; Son, Lith. Philad.

## BALAENA CISARCTICA

PLATE VII.—*Balaena cisarctica* [*Eubalaena glacialis*]: 1, lateral view of left scapula, anterior to the right; 2, lateral view of left flipper; 3, posterior view of the left first rib; 4, anterior view of the right first rib, ventral at top; 5, posterior view of right ribs, ventral at top. Specimen in MCZ, taken in April 1864 at Provincetown, Massachusetts. Reproduced as Plate XXIV in Allen, 1908.





J. H. Blake, delin.

T. Ferriss & S. J. Van Dine, lith.

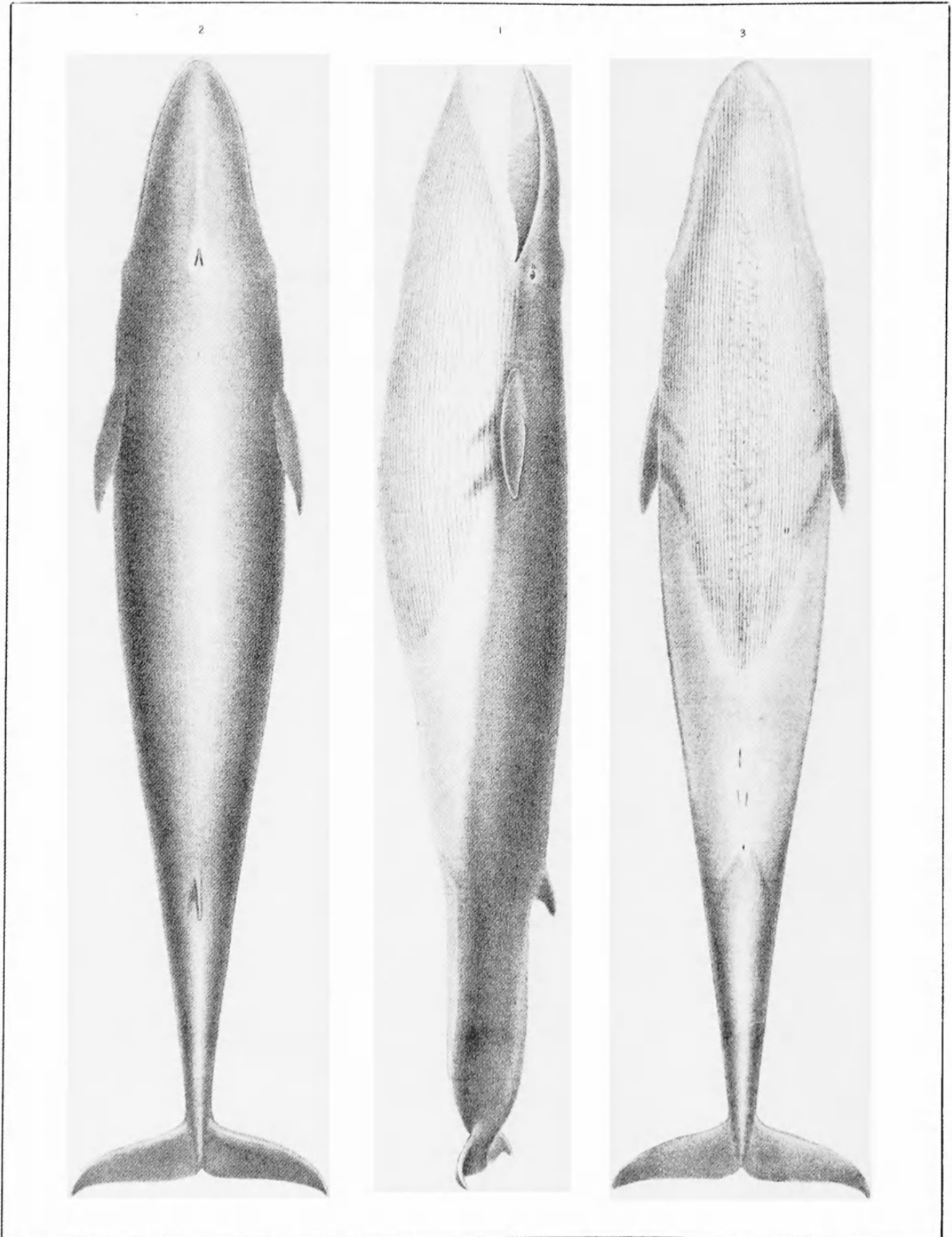
BALAELOPTERA ROSTRATA.

[PLATE VIII.—(Not found.) The missing manatee plate referred to in letter to Agassiz from Allen dated 9 June 1886, which was enclosed in a letter from Agassiz to Baird (Smithsonian Archives RU 30, box 1).]

PLATE IX.—*Balaenoptera rostrata* [*Balaenoptera acutorostrata*]: 1, left lateral view of skull and mandible; 2, dorsal view of mandible; 3, dorsal view of skull and mandibles; 4, posterior view of skull. Specimen unknown.

U.S. GEOL. SURVEY OF THE TERRITORIES.

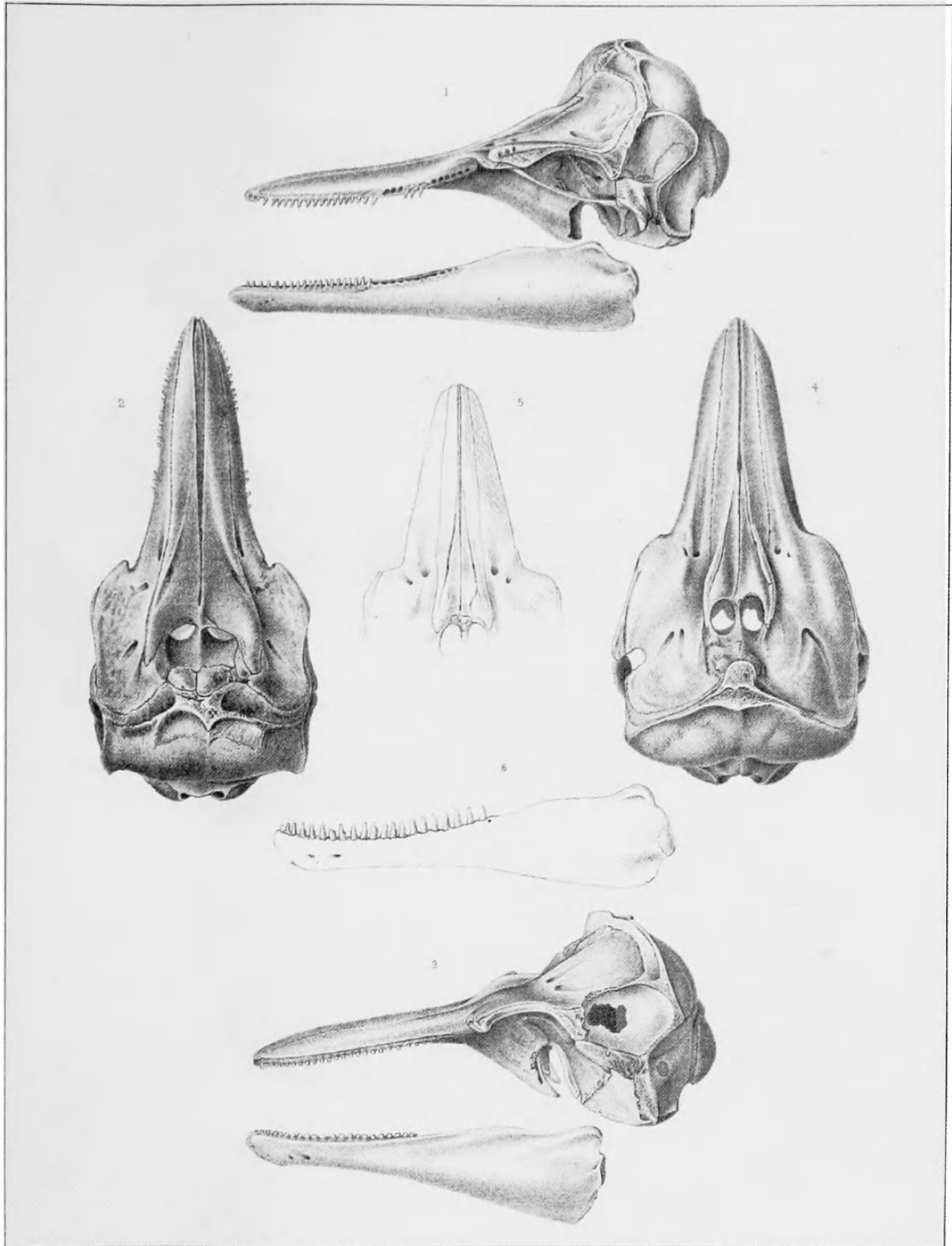
PLATE X.



J. H. Blake, delin.

T. S. Arthur &amp; Sons, Lith.

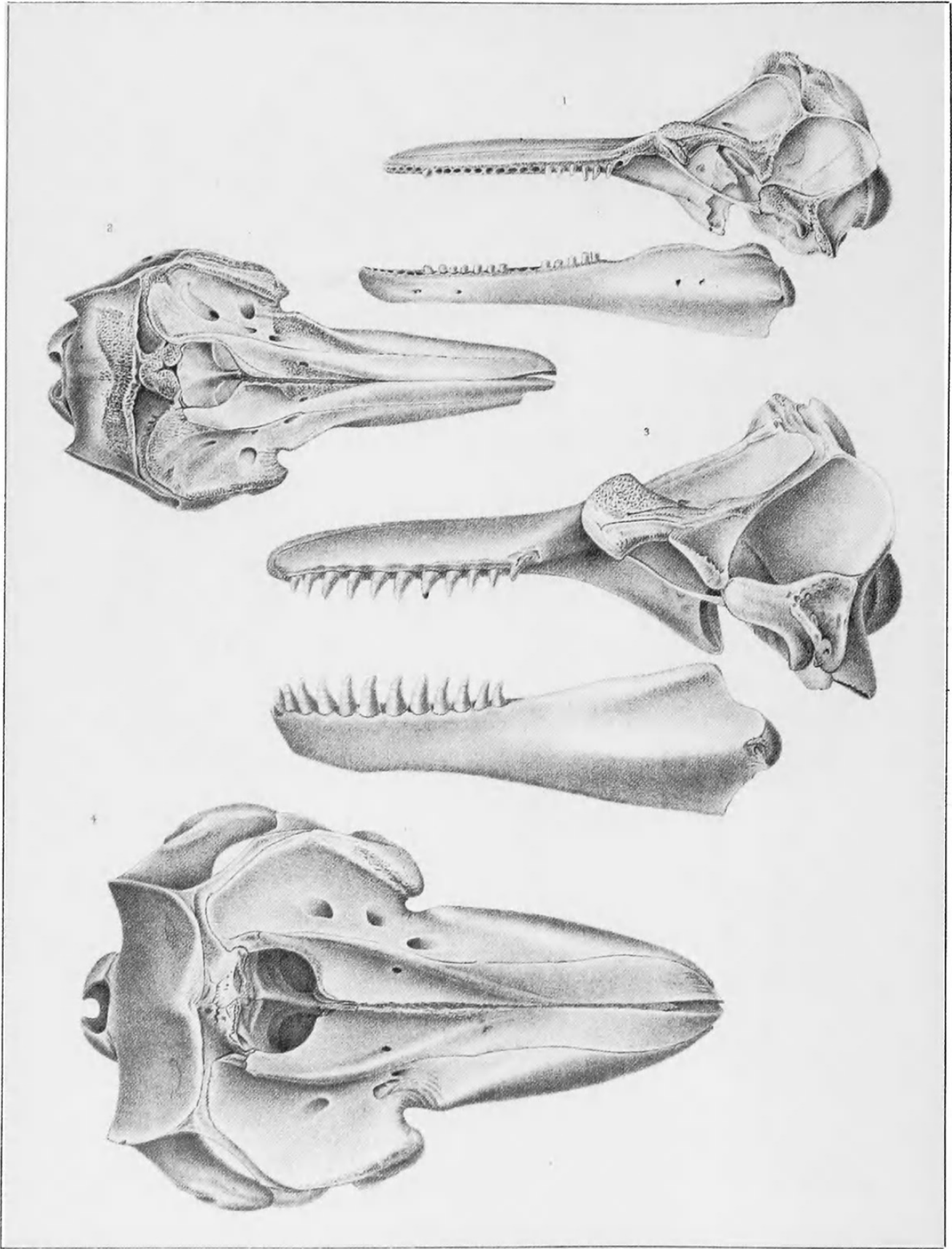
PLATE X.—[*Balaenoptera physalus*], external view of whole animal: 1, left lateral view; 2, dorsal view; 3, ventral view. Specimen unknown.



J. H. Emery: Johns.

J. H. Emery: Johns.

PLATE XI.—1, 2 [*Lagenorhynchus acutus*]: 1, left lateral view of skull and mandible; 2, dorsal view of skull. 3–5 [*Phocoena phocoena*]: 3, left lateral view of skull and mandible; 4, dorsal view of skull; 5, dorsal view of rostrum. 6 [*Tursiops truncatus*]: left lateral view of mandible. Specimens unknown.



J. B. Peck, 4 in.

J. B. Peck, 5 in. 2 in. 10 in.

PLATE XII.—1, 2 [*Tursiops truncatus*]: 1, left lateral view of skull and mandible; 2, dorsal view of skull. 3, 4 [*Orcinus orca*]: 3, left lateral view of skull and mandible; 4, dorsal view of skull. Specimens unknown.





Mead, James G. and Dagit, Rosemary G. 2002. "Plates for Joseph Asaph Allen's Unpublished Monograph on the Mammalian Orders Cete and Sirenia and a Record of the Search for the Manuscript." *Cenozoic mammals of land and sea : tributes to the career of Clayton E. Ray* 93, 357–372.

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