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Article XIII.— DESCRIPTION OF A NEW SPECIES OF *MESOPLODON* FROM CANTERBURY PROVINCE, NEW ZEALAND.

By Roy C. Andrews.

Plate XIII.

Mesoplodon bowdoini sp. nov.

Among the Cetacean specimens in the American Museum of Natural History, is the skeleton of a *Mesoplodon* (No. 35027) apparently representing a species hitherto undescribed. It was collected at New Brighton Beach, Canterbury Province, New Zealand, in 1904. The sutures of the skull are all closed and the terminal epiphyses of the vertebral bodies are completely ankylosed, in most cases their lines of union being indistinguishable. The mesethmoid or "mesorostral" cartilage is also densely ossified throughout its entire extent. Therefore, the specimen must be adult. The sex is unknown, but I believe it to be a male.

This specimen is evidently closely related to *M. bidens*, and the allied *M. europæus*, its skull agreeing fairly well in general proportions with those species as figured by Van Beneden and Gervais in their "Ostéographie des Cétacés."[1] Measurements of the skull are given in the appended table, and also the ratio of the length of the different parts to its total length; with these are compared the corresponding ratios for the skulls of *M. bidens* and *M. europæus* based on the above-mentioned figures given by Van Beneden and Gervais.

Measurements of Skull.

	M. bowdoini.		*M. europæus.*	*M. bidens.*
	mm.	%	%	%
Extreme length of cranium	715	100	100	100
Length of rostrum (from line between bottoms of *real* max. notches)	428	59.8	60.4	62.5

[1] Ostéographie des Cétacés, plates XXVI and XXIV.

	M. bowdoini.		*M. europæus.*	*M. bidens.*
	mm.	%	%	%
Height from vertex to lower border of pterygoids	311	43.6	35.2[1]	37.5
Length from tip of rostrum to posterior free margin of pterygoids (median) . .	563	79.0	——	——
Length from tip of rostrum to crest over anterior nares	490	68.5	78.0	75.0
Breadth between centers of orbits	325	45.4	44.4	40.8
" " zygomatic processes of squamosal	335	46.8	48.4	42.5
Breadth between temporal fossæ	208	29.0	——	——
" " post-orbital processes of frontals (greatest)	345	48.2	48.8	42.9
Breadth of rostrum at base between bottoms of *real* max. notches	193	26.9	28.8	31.2
Breadth of rostrum at middle	52	7.2	9.2	7.5?
Depth of rostrum at middle	73	10.2	6.8	5.8
Greatest breadth of anterior nares . . .	65	9.0	——	——
" " " premaxillæ proximally .	167	23.3	23.2	18.7
" " " " in front of nares	112	15.6	14.8	15.0
Greatest length of temporal fossa	120	16.7	14.0	12.5
" depth " " "	80	11.1	10.0	9.1
Height from middle of orbital rim to top of max. crests	53	7.4	——	——
Breadth of orbit (antero-posterior) . . .	95	13.2	12.0	15.4
Length of tympanic bulla	51	7.1	——	12.0
Breadth " " "	41	5.7	——	9.1
Length of mandible	628	87.8	88.0	87.5
" " symphysis (superior)	146	20.4	18.0	25.0
Depth of mandible at angles	127	17.7	15.2	14.1
" " " " coronoid	115	16.0	12.0	15.0
Distance from condyles to posterior margin of tooth	395	55.2	72.0	55.2
Least depth of mandible behind tooth . .	65	9.0	8.0	7.5
Length exposed portion of tooth (anterior)	90	12.5	4.0	8.7
" " " " " (posterior)	69	9.6	6.0	5.4
Ant.-posterior breadth base of tooth (intern.)	75	10.4	——	——

SKULL. *Superior View.*— There are three maxillary foramina approximately level with the foramen in the premaxillæ. The rostrum contracts gradually toward its distal end. Proximally it passes into the cranium by a widened base formed by the lateral expansion of the maxillaries. These

[1] Posterior margin of pterygoids probably broken.

maxillary flanges extend forward along the lateral surfaces of the rostrum for only its proximal fourth. The edges of the maxillæ overlying the orbital processes of the frontals are greatly thickened in our specimen, forming two prominent convex ridges or crests which curve inward anteriorly to meet the outer borders of the maxillary tuberosities. The posterior extension of these tuberosities forms on either side a second ridge, running parallel to the first, but much shorter, thicker and more rounded at the crest. Our specimen somewhat resembles *M. hectori* in this respect, and disagrees with *M. bidens* and *M. europæus.* The antorbital notches are double and deep. Posteriorly the premaxillæ rise almost perpendicularly on either side of the anterior nares; their proximal ends are strongly everted, completely overhanging the opening. Both are directed obliquely backward; the right and larger of the two has a deep sinus running across it transversely, ending in a vertical foramen between it and the maxilla. The sinus on the left side is indistinct. From the right premaxillary foramen a groove extends forward and upward, almost reaching the suture between the mesorostral and premaxillary ossifications; on the left side this groove is wanting. Immediately in front of the foramina, the premaxillæ begin to assume a nearly vertical position, continuing thus to the end of the rostrum. The nasal bones are sunk between the proximal ends of the premaxillaries, the right nasal alone, because of its greater development, reaching the vertex. The densely ossified mesorostral bone appears between the edges of the premaxillæ on the superior surface of the rostrum, throughout its extent, the exposed portion being widest at the rostral base; here it is 22 mm. in breadth. It ends proximally in a thin ridge of bone directed upward. The mesorostral has two shallow grooves on its superior basal surface, and a well defined median groove at its distal end.

Posterior View.— The supraoccipital is flatter and directed more strongly forward than in either *M. bidens* or *M. europæus.* Superiorly it is concave in the median line, and lies considerably below the level of the edges of the frontals. The foramen magnum is widely elliptical, and slightly uneven along the superior margin. Vertically, its greatest diameter is 50 mm.; in lateral diameter it measures 55 mm. The occipital condyles are 75 mm. in greatest length, and 40 mm. wide.

Lateral View.— The massive rostrum of our specimen is shorter proportionately, more compressed laterally, and is thicker in the vertical diameter than in either *M. bidens* or *M. europæus.* It is deepest slightly in advance of the anterior insertion of the pterygoids; at this point it is 95 mm. thick. Its superior surface in the middle third is concave, and the distal portion is depressed. The basirostral groove is absent; in its place a sharp ridge extends on either side from the pseudo-maxillary notch forward on the lateral surface of the rostrum for one quarter of its length. Anterior to this ridge a shallow, irregular groove runs toward the distal end, uniting at the extreme tip of the rostrum with a short, deep, alveolus-like pit or depression. The malar shows only a small portion of its expanded, anterior end in the bottom of the real antorbital notch.

The temporal fossæ of our specimen are roughly pear-shaped and extended postero-superiorly. In *M. bidens* and *M. europæus* these fossæ lie nearly opposite the occipital condyles; in our specimen they are above them.

Inferior View.— A strong median ridge, probably the vomer, appears on the inferior surface of the proximal third of the rostrum. On either side of this ridge is a deep groove, 60 mm. in length, which gradually disappears. The palatal bones show on the inner or inferior side of the pterygoids as narrow strips, reaching almost to the tips of the latter. On the external or superior surface, the palatines appear again and are much wider than below. Here they do not extend as far forward as on the inferior surface, leaving the pointed anterior ends of the pterygoids, superiorly, for a distance of 45 mm., in contact with the maxillaries. In *M. bidens* the palatines completely surround the pterygoids, and in *M. europæus* nearly so. The pterygoids of our specimen are badly broken and the inferior free portion of the left has been restored. However, in the right the original shape of the bone is preserved. Its exterior surface is deeply concave and the free lateral margin curves outward posteriorly.

The zygomatic processes of the squamosals extend far forward and are overlapped by the postorbital processes of the frontals.

Ear Bones.— A comparison of the ear bones of our specimen with those of a young example of *M. grayi* shows a very close resemblance. The groove between the posterior lobes of the tympanic, however, is somewhat deeper and shorter than in the latter individual. The inner surface of the tympanic, where it passes into the bulla, is decidedly narrower in our specimen, than in the corresponding bone of *M. bidens*, as figured by Van Beneden and Gervais; also the bullate portion of the periotic seems to be larger than in *M. bidens*.

Mandible.— The mandible of our specimen is more massive throughout, in proportion to the skull, than in either *M. bidens* or *M. europæus*. Externally the proximal half of each ramus is smooth and convex. The superior margin curves upward and outward to form the walls of an irregular alveolus in which the base of the tooth is firmly implanted. The internal alveolar wall rises in a strong convex process half way up the sides of the tooth; externally this process is wanting and the margin is irregularly concave. The ramus is *not* swollen at the insertion of the tooth. The tooth itself is situated one third the distance from the apex of the mandible to the condyles; its anterior margin is 15 mm. *posterior* to the beginning of the symphysis, and is directed outward. The tooth is laterally compressed, convex posteriorly, and slightly concave anteriorly; its surface is rugose. Its greatest height is 90 mm. and greatest width 75 mm. The small enamel-covered

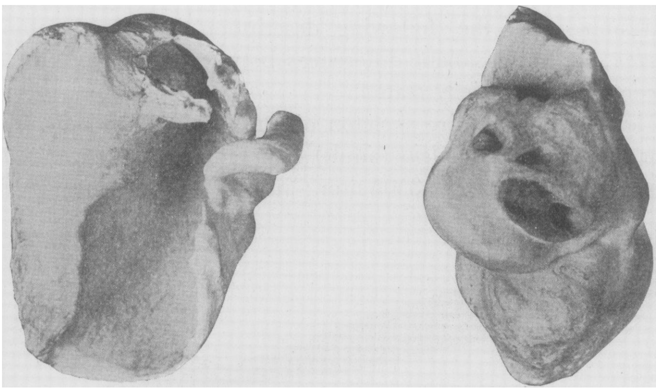


Fig. 1. *Mesoplodon bowdoini.* Tympanic and periotic bones.

tip appears as if emerging from out the wide, flat base and is directed forward and outward. The apex of the right tooth is considerably worn. A shallow but clearly defined dental groove extends from the anterior base of the tooth nearly to the end of the symphysis; behind the tooth it is indistinct. For a distance of 40 mm. from the tooth the external alveolar margin projects above the internal edge. The symphysis curves slightly upward, is

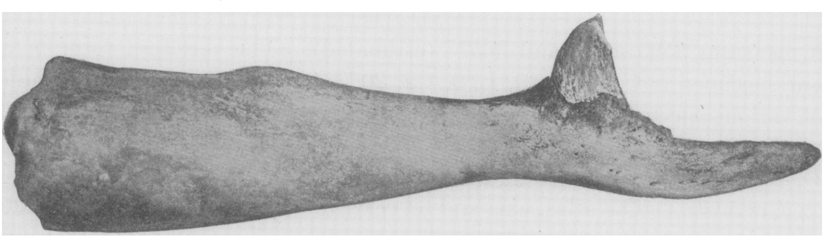


Fig. 2. *Mesoplodon bowdoini.* Side view right ramus.

grooved superiorly in the median line and carinate inferiorly; above, the rami are ankylosed for 145 mm.; below for 93 mm. The symphysis is a little less than one quarter the length of the mandible.

Hyoid Bones.— The basihyal and two thyrohyals are united into one bone. The thyrohyals measure 130 mm. in length and 50 mm. in greatest breadth. They are curved, their free ends standing 183 mm. apart. The basihyal is 80 mm. in greatest diameter; the anterior edge is formed by two processes or tubercles having a notch 5 mm. in depth between them. The stylohyals are 170 mm. in length and 33 mm. in greatest diameter. They have a distinct head, are flattened for half their extent, and then become prismoid.

VERTEBRÆ.— In the following description of the skeleton of our *Mesoplodon*, the most salient differences between it and various examples of *M. bidens* will be briefly stated.

The length of the entire skeleton of our specimen as mounted is 166¼ inches or 4222 mm.; *M. bidens* (adult) 4350 mm.[1] The length of the vertebral column is 138 inches or 3505 mm.; in two ~~adult~~ examples of *M. bidens*

Fig. 3. *Mesoplodon bowdoini.* Top view of mandible.

it measures 3580 mm.[1] and 3657[2] (estimated). The vertebral formula of our specimen is C. 7, D. 10, L. 9, Ca. 20[3]=46. Turner gives the formulæ of various specimens of *M. bidens* as follows:[2] C. 7, D. 10, L. 11, Ca. 11,[4] Shetland specimen. C. 7, D. 10, L. 10, Ca. 19, Brussels specimen. C. 7, D. 10, L. 9, Ca. 20, Göteborg specimen.

Cervicals.— The atlas, axis and 3d cervical are ankylosed; the atlas and axis by both their centra and neural arches, forming a solid bone; the third vertebra by its centrum alone, the arch being free. The atlas has no diapophyses. The inferior transverse processes (parapophyses) are massive (the largest of the series) and extend downward and backward. On the crest of the atlas and axis two short conical spines project directly upward;

[1] M. P. Fischer, Compt. Rend. Acad. Sci. Paris, Vol. CXIV, p. 1284.
[2] Turner Jour. Anat. and Phys., Vol. XVI, p. 466.
[3] Terminal caudal probably missing.
[4] Incomplete.

they are parallel, 13 mm. in height, their apices standing 25 mm. apart. The diapophyses of the axis are short, thick, and extend outward and downward distally. Its parapophyses are long and united at the distal ends with those of the atlas, enclosing an elliptical foramen on either side. In *M. bidens* no foramen is enclosed. The diapophyses of the 3d, 4th, 5th and 6th cervicals are thin plates. Those of the 3d extend slightly backward, of the 4th outward, and of the 5th and 6th forward. From the 3d to the 6th they become shorter and rise in position on the arch. Their parapophyses all project downward and become shorter and thicker in passing backward. The laminæ of the arches of these vertebræ are slender, *united mesially*, and directed forward; they have no distinct spines. In *M. bidens* (excepting where the 3d is ankylosed), the laminæ of the arches of the 3d, 4th and 5th cervicals seem never to be united in the median line. The diapophyses of the 7th vertebra are the longest of the series and project strongly forward. Its parapophyses are merely tubercles above which, on the centrum of the vertebra, are the articular facets for the heads of the 1st ribs. The neural spine is 25 mm. high and leans forward.

In the Shetland *M. bidens* (Turner) the antero-posterior diameter of the series of cervical vertebræ was 139 mm.; the greatest height of the atlas was 127 mm. and its greatest breadth 139 mm.

Dimensions of Cervical Vertebræ.

	mm.
Antero-posterior length of bodies of 7 cervicals (inferiorly) as mounted . . .	145
Antero-posterior length of centra of ankylosed 1st, 2d and 3d vertebræ (inferiorly)	58

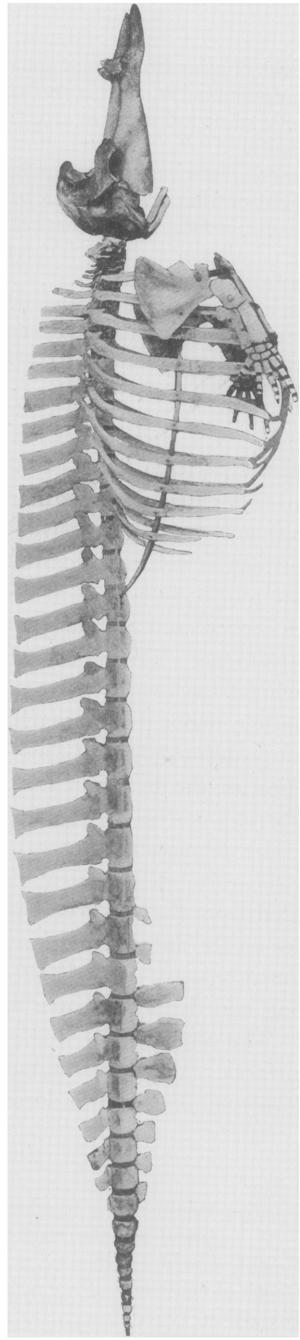


Fig. 4. *Mesoplodon bowdoini* Skeleton.

	mm.
Height of atlas from tip of spine to lower edge of body	133
Greatest breadth of atlas (between ends of parapophyses)	200
Depth of neural canal of atlas	60
Breadth " " " " "	57
Breadth between outer border of articular surfaces for occipital condyles	115
Height of 6th cervical (spine to lower edge of body)	122
Breadth of 6th cervical (between ends of diapophyses)	93
" " centrum of 6th cervical	56
Depth of 6th cervical	53
Height of 7th cervical (spine to lower edge of body)	143
Breadth of 7th cervical (between ends of diapophyses)	124
" " centrum of 7th cervical	58
Depth of 7th cervical	52

Dorsal Vertebræ.— The ten dorsal vertebræ do not present important differences from those of other Ziphoids. Their centra are concave above and elongated in the antero-posterior direction as the lumbar region is approached. Zygapophyses are developed on the arches from the 6th to the 14th vertebræ inclusive. The neural spine of the first dorsal is acuminate and inclined forward. The spines of the 2d, 3d, 4th and 5th dorsals are *vertical* and obliquely truncated distally, excepting that of the 3d which is rounded. The spines of the remaining units of the thoracic series are inclined backward, truncated at their apices, and become broader as the lumbar region is approached. The first seven dorsals bear tubercles on the posterior edges of their centra at the base of the arches for the articulation of the heads of the ribs. Metapophyses appear as well developed tubercles on the transverse processes of the 2d dorsal and gradually increase in size in passing backward. On the 8th unit of the dorsal series, which is the vertebra of transition, the metapophyses are large and widely separated from the transverse processes; the latter appear only as small tubercles on the anterior margins of the centrum at the base of the arch; the 8th dorsal bears no rib. In the 9th dorsal the transverse processes are 65 mm. long and deeply concave distally.

The centra of the first eight vertebræ of the series have rounded inferior surfaces. An inferior median carina begins on the 9th and is strongly developed on the 10th dorsal.

Dimensions of Dorsal Vertebræ.	1st	10th
	mm.	mm.
Greatest height (spine to edge of body)	214	315
" breadth (between ends of diapophyses)	140	260
Height of neural spine	90	202
Depth of centrum	51	54
Breadth of centrum	54	70
Antero-posterior length of centrum	30	87

Lumbar Vertebræ.— There are nine lumbar units. Their bodies are elongated antero-posteriorly and increase in vertical diameter as the caudals are approached. They all possess a strong inferior median carina which gradually decreases in size in passing backward. Their centra, below the transverse process on either side of the median keel, are compressed. The neural spines of the lumbars are high and broad, much compressed laterally, and slope backward; they are truncated and expanded at their distal ends. The spine of the 8th lumbar measures 245 mm. and is the highest in the vertebral column. Their broad lamelliform metapophyses project forward and upward from the anterior edges of the arches, and remain at about the same height throughout the series. The transverse processes extend from the anterior half of the bodies outward and somewhat forward; distally they are truncated. Their length exceeds the width of the centra in all the lumbar units.

Measurements of Lumbar Vertebræ.

	First mm.	Last mm.
Greatest height (spine to edge of body)	340	377
" breadth (between ends of dia.)	320	260
Depth of centrum	58	71
Breadth of "	73	83
Length of centrum (antero-posterior)	90	123
Height of neural spine	205	253

Caudals.— There are 20 caudal vertebræ. The first eleven have articular surfaces for the attachment of chevrons and laterally compressed centra. The twelfth is the vertebra of transition. The second series of depressed caudals (those lying within the lateral expansion of the "flukes") begins with the 13th vertebra. The neural spines are broad, inclined backward and thicken laterally as they decrease in height. Their metapophyses become correspondingly smaller, appearing as tubercles only upon the spine of the 9th caudal. The transverse processes extend directly outward from the bodies of the vertebræ, and are broad in the beginning of the caudal region; in passing backward they become smaller. The posterior margins of the transverse processes of the 4th and 5th caudals are grooved; all the succeeding vertebræ have their transverse processes or the sides of their centra pierced by a vertical foramen. Beginning on the 4th caudal on either side, two longitudinal ridges appear; one on the centrum above the transverse processes, and the other on the lateral surface of the arch forming the posterior extension, superiorly, of the metapophysis. As the spines shorten in passing backward, these ridges approach each other forming a lateral groove or canal.

On the first caudal the inferior median carina is divided posteriorly to form articular facets for the attachment of the first chevron. All the remaining chevron-bearing caudals are channelled longitudinally below. The first caudal vertebra of the Shetland *M. bidens* (Turner) was 355 mm. in greatest height and 254 mm. in greatest width.

The following table shows a very considerable difference between our specimen and two examples of *M. bidens* in the points at which the spines and transverse processes disappear in the caudal vertebræ.

	M. bowdoini.	Turner. *M. bidens.*	Fischer. *M. bidens.*
Last vertebra bearing a neural spine is	No. 36	39	38
" " " " transverse process is . .	No. 33	37	34
First vertebra with transverse process perforated by a vertical arterial foramen is	No. 32 [1]	—	—

Dimensions of First Caudal Vertebra.

	mm.
Greatest height (spine to edge of body)	366
" breadth (between ends of diapophyses)	257
Depth of centrum	76
Breadth of centrum	85
Length of centrum (antero-posterior)	124
Height of neural spine	230
Length transverse processes	80

Chevrons.— There are 9 chevrons present — probably the series originally numbered 11. The 1st chevron is small, and consists of a pair of wing-like laminæ, acuminate and free distally. The laminæ forming the 2d chevron are united at their truncated distal ends, but have no hæmal spine. The spine of the 3d chevron is long.

Measurements.

	1st mm.	2d mm.	3d mm.	4th mm.	5th mm.
Greatest length of chevron	65	60	160	162	133
" width of chevron	40	70	82	109	100
Length of hæmal spine	—	—	115	100	72
Width " " " distally	—	—	70	97	98

Ribs.— There are 10 ribs present. The 1st to the 7th inclusive articulate both by the tubercle and head, and the 8th by its head alone to the facet on the posterior margin of the centrum of the 7th dorsal. Therefore the 8th dorsal bears no rib. The 9th and 10th ribs articulate by their tubercles to the transverse processes of their respective vertebræ; they have no necks or heads.

[1] Right side only.

The first rib possesses well defined articular surfaces, is compressed laterally and is the broadest of the series. The proximal half is strongly curved, and from the tubercle for one third the length of the rib, its posterior, or superior, margin is everted.

The following six ribs are compressed at the necks and below the tubercles on the inner sides, then for one fourth their length assume a prismoid shape; afterward they become nearly flat with but a slight median ridge on the inner side. In passing backward the prismoid portion of the ribs becomes longer and the distal ends contract.

Greatest Length of each Rib (straight).

	mm.
First	283
Second	415
Third	510
Fourth	550
Fifth	564
Sixth	575
Seventh	560
Eighth	540
Ninth	505
Tenth	335[1]

STERNUM.— The sternum consists of four segments connected by cartilage. In the middle of both the anterior and posterior margins of each segment is a deep notch, which in the complete sternum forms three irregular fenestra.

The terminal segment, or xiphisternum, has an oval foramen in its center, and seems to be composed of two ankylosed portions. A distinct median carina is present on the external, or inferior, surface of each segment, most strongly developed in the first of the series. There are five surfaces on each side of the sternum for the costal articulations. The first is on the side of the 1st segment; the second between the 1st and 2d segments; the third between the 2d and 3d; the fourth between the 3d and 4th and the fifth on the side of the terminal segment.

Measurements of Sternum.

				mm.
Greatest length of complete sternum				545
	1st mm.	2d mm.	3d mm.	4th mm.
Greatest length of segments	208	115	97	140
" breadth of segments	188	140	115	85
Depth of anterior median notch	33			

[1] Distal end has been restored.

Pectoral Limb.— The scapula is fan-shaped. The prescapular fossa is concave, and the spine well marked. The acromion is broad, laterally compressed, concave on its inner side and projects *strongly upward*; its superior margin overlaps the coracoid border and is opposite the middle of the prescapular fossa. In this respect the scapula of our specimen differs from that of any other member of the genus which I have seen figured. The coracoid is long, slender, and expanded distally where it assumes a prismoid form. The humerus is short and thick. Its proximal or upper extremity is divided into a head and external tuberosity, separated by a well marked bicipital groove; the distal extremity articulates with the

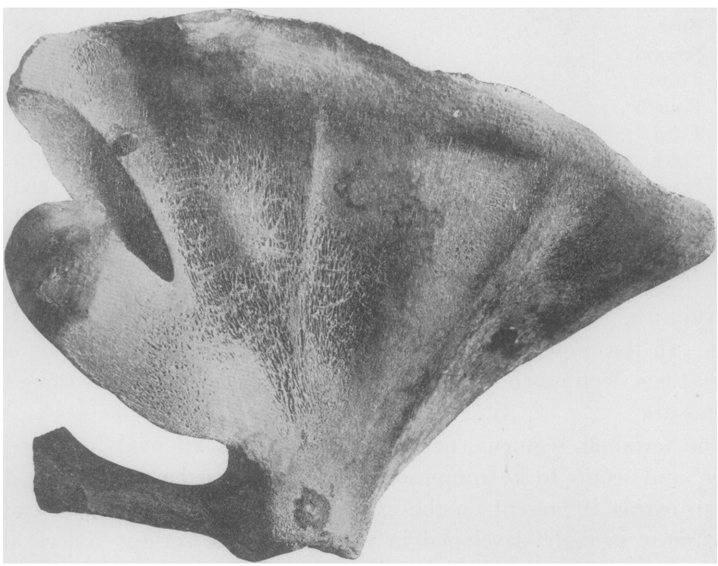


Fig. 5. *Mesoplodon bowdoini.* Left scapula.

radius and ulna by two transverse surfaces. The radius is straight, slightly convex externally and somewhat widened at its distal end; proximally it is obliquely truncated. The shaft of the ulna is slightly contracted in its middle; a cross section is an ellipse. The olecranon process is large, thick and fan-shaped. The carpus, as mounted, presents six ossifications. Those of the proximal row probably correspond to the scaphoid, lunar and cuneiform; the three of the distal row representing the trapezoid, magnum and unciform.

The metacarpals are five in number. The formula for the phalanges, as mounted, is: I_0, II_4, III_3, IV_3, V_2.

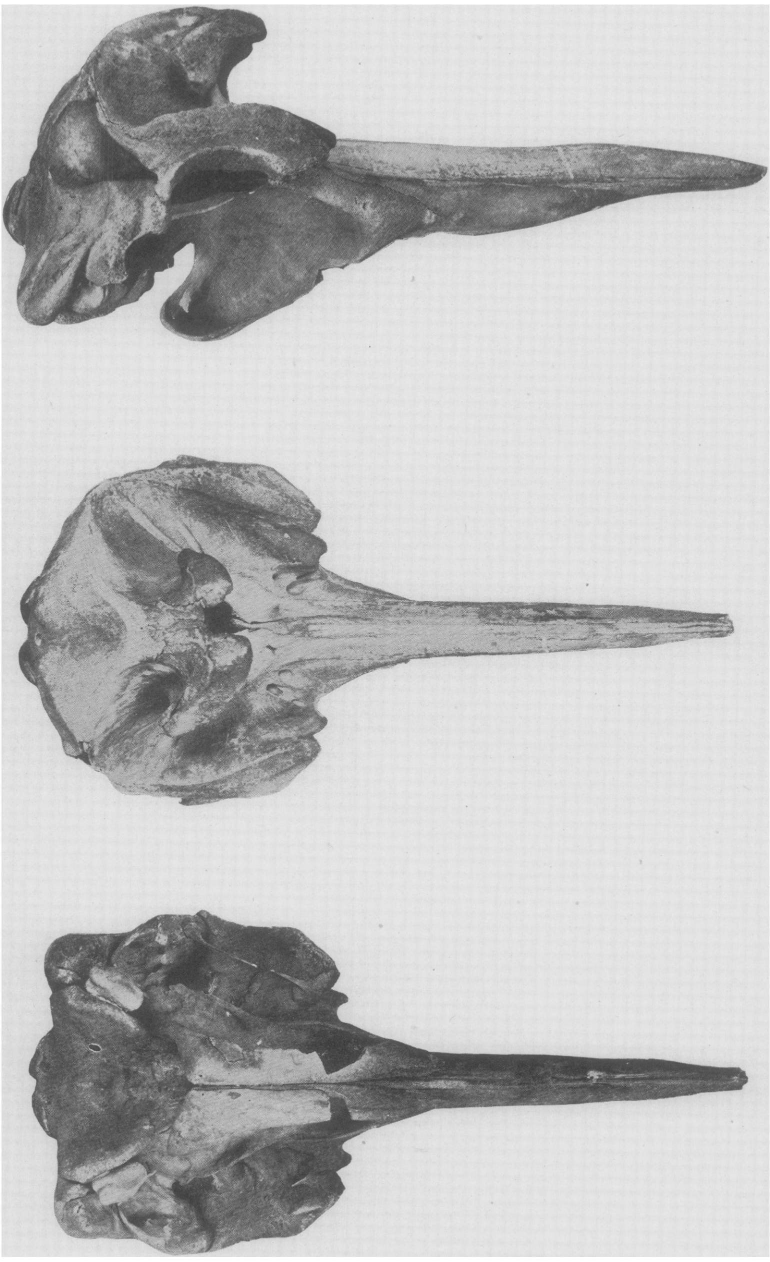
Measurements of Pectoral Limb.

	M. bowdoini. mm.	*M. bidens.*[1] mm.
Height of scapula	210	203
Breadth " "	320	311
Length " acromion (median line)	110	101
Breadth " "	55	48
Length " coracoid	91	88
Breadth " glenoid fossa	60	—
Length " humerus (greatest)	123	145
Breadth " " "	73	—
Length " radius (median)	139	—
Breadth " " proximally	44	—
" " " distally	55	—
Length " ulna (median)	130	—
Breadth " " distally	40	—
Length " olecranon process	33	—

Conclusions.— From the preceding description it is obvious that many important differences exist between the specimen here described and *M. bidens,* its nearest ally. It would, perhaps, be possible to account for many of the cranial differences on the grounds of an excessive development in the bones, produced by age, but such a theory could hardly apply to the scapular modifications. Moreover, under such conditions one would expect to find a corresponding increase in size, yet our specimen does not equal the *average* length of *M. bidens,* which is about fifteen feet. Nevertheless, the range of individual variation known to exist in all of the members of this genus is so great that any determination made between closely allied species, without a considerable amount of material for comparison, must be more or less provisional. Yet, it seems improbable to me that the cranial and skeletal differences which this specimen presents, can come within the scope of age or sexual variations. Therefore, I propose to designate it as *Mesoplodon bowdoini* in honor of Mr. George S. Bowdoin, one of the Trustees of the American Museum of Natural History, through whose generosity the enlargement of the collection of Cetaceans in this Museum has been made possible.

In conclusion, I wish to acknowledge my indebtedness to Dr. F. W. True, for the use of notes and measurements, made upon the specimen.

[1] Turner, Shetland specimen.



MESOPLODON BOWDOINI sp. nov.