MESOPLODON STEJNEGERI FROM THE COAST OF JAPAN

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INTRODUCTION

The name of Ayukawa is well known in Japan, as a place, where many whales of large and small size are landed and treated. On August 26th, 1958, a small strange whale was seen in a whaling company at Ayukawa. Only one pair of square topped teeth was found at the middle of the lower jaw. The teeth were very wide and flat, so the upper jaw was narrowed. This news was brought to Mr. Yoshinori Kimura, who is a strenuous co-operator in our research group on whales, and soon he went to the whaling company for the purpose of observing the object. He arrived at the whaling company, however, after the dissection had been finished. He could neither examine nor take photograph of the whale ; so, he collected as much as possible the remains of the whale body. Fortunately the almost complete skeleton remained. It was buried in the sand of the Kugunari beach.

At that time, the gunner of that catcher boat wished to have the curious teeth for souvenir. Mr. Y. Kimura had a tooth of the same species which had been collected in there bone-yard, so he asked the gunner to exchange it with the newly taken teeth and it was agreed. Considering the situation above mentioned, this is not the first time of the catch of this species. It is presumable that this species might be taken by the whalers for *Ziphius cavirostris*, which is not a rare whale in Japan.

About three months later, the senior author visited the whaling station of Ayukawa with Dr. H. Omura, Messrs. T. Ichihara and K. Nasu of the Whales Research Institute and exhumed the buried remains with Mr. Y. Kimura. The skeleton had been macerated to the perfection and it was transported to the Whales Research Institute of Tokyo for further study. The whale in question was captured on August 25th, by a catcher boat, about 65 miles SE off Ayukawa (37°27′ N. 142°30′ E.). It was a male and measured about 5.3 m, in length, has black coloured skin on the whole body except on the jaws.

Mesoplodon had hitherto been reported from many districts of the

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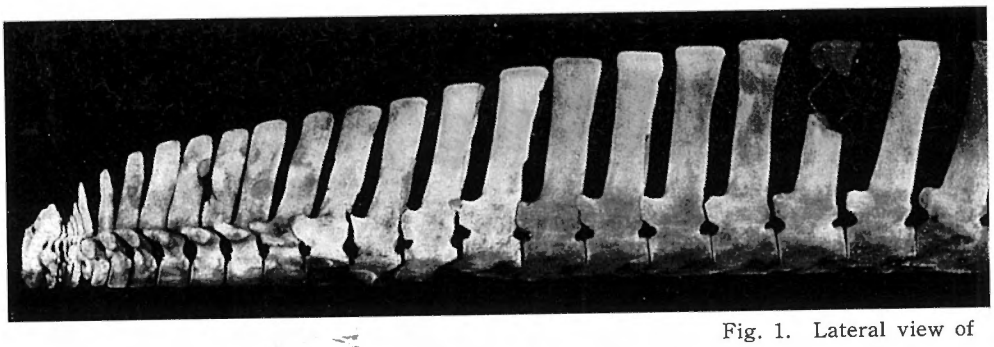


Fig. 1. Lateral view of

world. In Japan, there have been two precedents, one was reported by Professor T. Ogawa (1938) and the other was reported by us last year. Therefore, this specimen seems to be the third one so far as scientifically reported, and represents perhaps the most southern catch of *M. stejnegeri* in the world.

ACKNOWLEDGEMENT

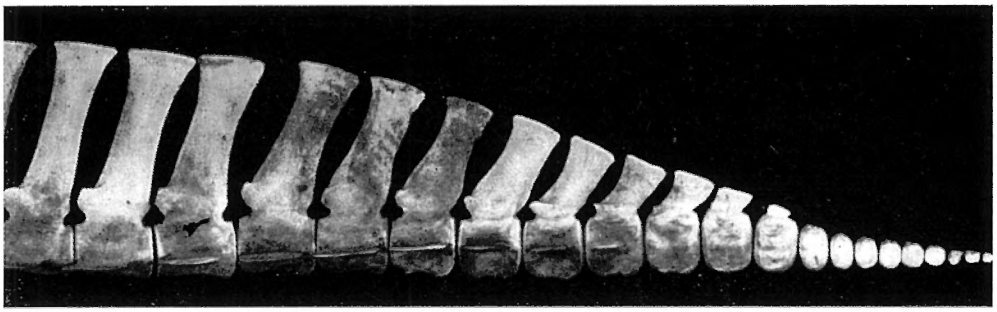
The authors should like to thank to Mr. Yoshinori Kimura and to the personnels of the Whales Museum of Ayukawa for their kindness in allowing us to have the opportunity of studying this precious material. The authors are much indebted also to Professor T. Ogawa, Director of the anatomical department of Tokyo University for his guidance and to Dr. H. Omura and his staff Messrs. T. Ichihara and K. Nasu for their collaboration in examination of the skeleton.

NOTES ON THE EXTERIOR

The external appearance of this specimen is very poorly known, only several sheets of photographs were taken by Mr. Tokinori Watanabe of Nippon Medical College. These photographs are concerned to about the head part only, but are serviced as coloured transparencies. So it is shown as colour print in the Plate I, because seeing is better than reading.

OSTEOLOGY

Skull. Measurements of the present specimen are shown in Table 1 and the two skull measurements from precedent reports are shown in Table 2 for the purpose of comparison. The photographs of the skull in lateral, dorsal and ventral views are shown Plate II. The most noticeable character of the skull is that the peculiar shaped large teeth are seen



vertebral column. C7+D11+L9+Ca19=46

at the mandible behind the symphysis and the lateral basirostral grooves are clearly present.

Vertebrae. The total number of the vertebrae amounts to 46, with the formula of C: 7, D: 11, L: 9, Ca: 19. The first and second cervical vertebrae are ankylosed together at the bodies as well as at the neural arches.

The vertebral bones show some deficit; namely the transverse processes of the 7th cervical vertebra, the 11th dorsal vertebra and the spinous processes of the 5th and 6th lumbar vertebrae are missing. Unfortunately, 17th caudal vertebrae was bitten by a dog. We have to apologize for the latter accident. The first caudal vertebra is determined by existence of the first chevron. The first chevron was found only in the left joint region, because the other parts of it was cutted off at the dissection. All the chevrons are 9 in number and were collected except the second chevron.

In all the vertebrae the epiphyses are fused to the diaphyses, which tells evidently the physical maturity of the present specimen.

Ribs. The ribs were collected in perfection. They are shown in Fig. 3 and Table 6. Two headed ribs are seven, the eighth and nineth are lengthened but the most posterior two ribs are very shortened.

Pectoral limb. The scapulae are nearly symmetrically fan-shaped as in other species of *Mesoplodon.* The humerus, radius and ulna are not conspicuously different from the correspondent bones in other species of *Mesoplodon* and the proximal and distal epiphyses of those bones are all ankylosed. The phalangeal formula including the metacarpals is as follows; I: 1, II: 5, III: 5, IV: 4, V: 3. This formula is equal on both sides. The authors suggested at that occasion that it is necessary to take the Röntogen photographs for studying the bones of the pectoral limbs in fresh condition, but in reality Röntogen photograph of the present specimen was not taken.

Measurements of the bones of the pectoral limb are given in Tables

TABLE 1. SKULL DIMENSIONS OF THE AYUKAWA SPECIMEN

		mm	percentage to the length	percentage to the breadth
1.	Total (condylo-basal) length	800	100.0	201.5
2.	Length of rostrum (median)	491	61.4	123.7
3.	Breadth of rostrum at base	158	19.8	39.8
4.	Breadth of rostrum at middle	61	7.6	15.4
5.	Breadth of rostrum at the position just above the teeth	41	5.1	10.3
6.	Breadth of rostrum at the highest point of anterior palatine suture	82	10.3	20.7
7.	Breadth of rostrum between the antorbital notches	200	25.0	50.4
8.	Depth of rostrum at middle	101	12.6	25.4
9.	Depth of rostrum at the position just above the teeth	88	11.0	22.2
10.	Depth of rostrum at the highest point of anterior palatine suture	89	11.1	22.4
11.	Length of premaxilla*	656	82.0	165.2
12.	Breadth of premaxillae at middle of rostrum	47	5.9	11.8
13.	Breadth of premaxillae at expanded proximal ends	178	22.3	44.8
14.	Breadth of premaxillae in front of anterior nares	129	16.1	32.5
15.	Breadth of premaxillae opposite premaxillary foramina	89	11.1	22.4
16.	Breadth of premaxillae opposite maxillary foramina	78	9.8	19.6
17.	Greatest breadth of premaxillae opposite anterior nares	178	22.3	44.8
18.	Least breadth of premaxillae opposite anterior nares	129	16.1	32.5
19.	Least distance between the postero-dorsal margins of the maxillary foramina	107	13.4	27.0
20.	Least distance between the postero-dorsal margins of the premaxillary foramina	46	5.8	11.6
21.	Least distance between the maxillary foramina and premaxillary foramina	L: 23 R: 29	2.9 3.6	5.8 7.3
22.	Distance from posterior border of maxillary foramina to anterior extremity of maxillary protuberance*	90	11.3	22.3
23.	Length of nasal suture line	52	6.5	13.1
24.	Greatest breadth of nasals	82	10.3	20.7
25.	Greatest breadth of superior nares	65	8.1	16.4
26.	Diameter of orifice of posterior nares immdeiately behind pterygoid processes	121	15.1	30.5
27.	Distance from tip of rostrum to bottom of maxillary notches	L: 499 R: 496	62.4 62.0	125.7 124.9
28.	—— anterior end of vomer	18	2.3	4.5
29.	—— anterior margin of superior nares	581	72.6	146.3
30.	—— nasal vertex	603	75.4	151.9
31.	—— medial suture line of posterior end of pterygoides	603	75.4	151.9
32.	—— line joining antero-lateral processes of maxillaries	480	60.0	120.9

TABLE 1. SKULL DIMENSIONS OF THE AYUKAWA SPECIMEN (Cont.)

			mm	percentage to the length	percentage to the breadth
33.	——— occipito-frontal vertex		666	83.3	167.8
34.	——— posterior median end of maxillae on palate		466	58.3	117.4
35.	——— bottom of tubal notch (median)		473	59.1	119.1
36.	——— most anterior point of the palatines		389	48.6	98.0
37.	Length of vomer visible on palate		225	28.1	56.7
38.	Breadth across middle of orbits		371	46.4	93.5
39.	Diameter of orbit (antero-posterior)	L:	98	12.3	24.7
		R:	101	12.6	25.4
40.	Greatest breadth across supra-orbital plates of maxillae		359	44.9	90.4
41.	Greatest breadth across post-orbital processes		397	49.6	100.0
42.	Breadth across zygomatic processes		379	47.4	95.5
43.	Breadth across posterior margins of temporal fossae		203	25.4	51.1
44.	Greatest breadth of cranium at parietal region in temporal fosseae		218	27.3	54.9
45.	Length of temporal fossae	L:	105	13.1	26.4
		R:	107	13.4	27.0
46.	Depth of temporal fossae*		75	9.4	18.9
47.	Length of tympanic bone	L:	45	5.6	11.3
		R:	46	5.8	11.6
48.	Greatest breadth of tympanic bone	L:	33(+)	4.1	8.3
		R:	35	4.4	8.8
49.	Breadth of occipital condyles		121	15.1	30.5
50.	Breadth of foramen magnum		44	5.5	11.1
51.	Length of occipital condyle*		78	9.8	19.6
52.	Height, vertex to inferior border of pterygoids		342	42.8	86.1
53.	Length of mandible (median)		683	85.4	172.0
54.	Length of mandibular ramus	L:	690	86.3	173.8
		R:	699	87.4	176.1
55.	Distance from anterior end of mandible to coronoid process	L:	685	85.6	172.5
		R:	687	85.9	173.0
56.	Length of symphysis		176	22.0	44.3
57.	Distance from anterior end of mandible to anterior end of alveolus	L:	131	16.4	33.0
		R:	129	16.1	32.5
58.	Distance from anterior end of mandible to posterior end of alveolus	L:	226	28.3	56.9
		R:	230	28.8	57.9
59.	Depth of mandible at posterior margin of tooth*		80	10.0	20.2
60.	Depth between angle and coronoid process	L:	130(+)	16.3	32.7
		R:	132	16.5	33.2
61.	Minimum depth of mandible between tooth and coronoid process	L:	69	8.6	17.4
		R:	66	8.3	16.6
62.	Breadth across mandibular condyles*		363	45.4	91.4
63.	Greatest height of mandible at coronoid process*		131	16.4	33.0
64.	Length of tooth	L:	163	20.4	41.1
		R:	166	20.8	41.8
65.	Breadth of tooth (antero-posterior at crown)	L:	91	11.4	22.9
		R:	89	11.1	22.4
66.	Breadth of tooth (transverse)*		14	1.8	3.5

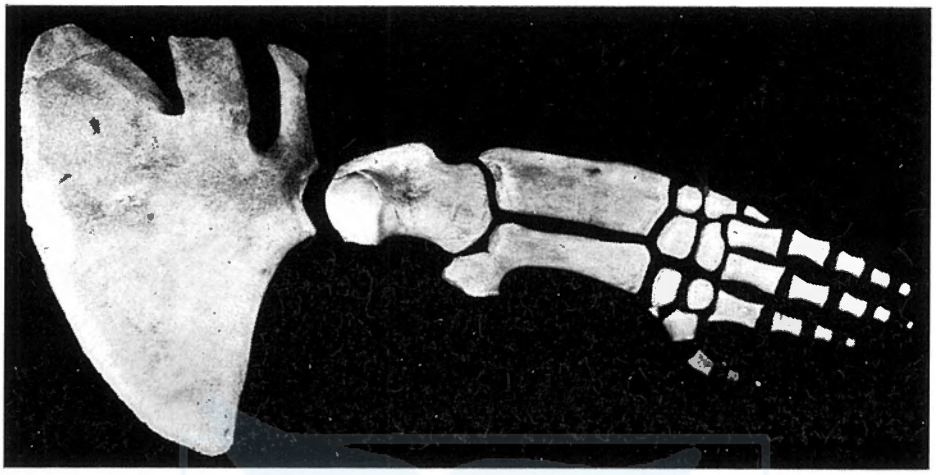
* equal on both sides

Fig. 2. Dorsal view of pectral limb

TABLE 2. SKULL PROPORTIONS IN PER CENT OF TOTAL SKULL LENGTH

Measurements	U.S.N.M.[1] No. 21112 (Young) Sex ?		U.S.N.M.[1] No. 143132 (Adult) Sex ?		Ayukawa specimen (Adult) ♂
	mm.	per cent	mm.	per cent	per cent
Total length	633[2]	100.0	715	100.0	100.0
Length of rostrum	325[2]	51.3	413	57.7	61.4
Breadth between centers of orbits	279	44.1	309	43.2	46.4
Breadth between zygomatic processes	278	43.9	310	43.3	47.4
Breadth between temporal fossae	212	33.5	228	31.9	25.4
Breadth of rostrum at base (between maxillary notches)	158[3]	25.0	172	24.1	19.8
Breadth of rostrum at middle	44	7.0	40	6.0	7.6
Depth of rostrum at middle	42	6.6	52	7.3	12.6
Greatest breadth of anterio nares	54	8.5	56	7.8	8.1
Greatest breadth of premaxillae proximally	118	18.6	130	18.2	22.3
Greatest breadth of premaxillae in front of nares	109	17.2	108	15.1	16.1
Length of temporal fossa	86	13.6	92	12.9	13.1
Depth of temporal fossa	46	7.3	63	8.8	9.4
Antero-posterior length of orbit	82	13.0	96	13.4	12.6
Breadth of foramen magnum	39	6.2	38	5.3	5.5
Length of manible	—	—	610	85.3	85.4
Length of symphysis	—	—	138	19.3	22.0
Distance from anterior end of mandible to alveolus	—	—	166	23.3	22.7

1) Cited from True, F. W. (1910): Trans. Zool. Sco. London, X, part 11.
2) Tip of rostrum lacking.
3) The skull is much worn around the left notch and the measurements is only approximate.



with scapula attached.

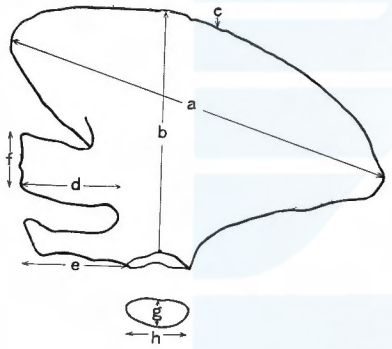


TABLE 3. DIMENSIONS OF SCAPULAE (mm)

		Left	Right
a.	Length along vertebral border	474	470
b.	Length of glenoid cavity	41	43
c.	Breadth of glenoid cavity	422	412
d.	Length of acromion, along medial border	125	105
e.	Length of coracoid, from supraglenoid edge to tip	96	95
f.	Greatest breadth of acromion	50	57
g.	Breadth of articular surface	49	49
h.	Height of articular surface	66	67

TABLE 4. DIMENSIONS OF HUMERUS, RADIUS AND ULNA (mm)

	Measurements	Left	Right
Humerus	Greatest length	146	146
	Breadth at proximal end	65	65
	Breadth at distal end	78	79
Radius	Length at middle	173	173
	Breadth at proximal end	47	48
	Breadth at distal end	57	60
Ulna	Length at middle	147	144
	Breadth at proximal end	43	43
	Breadth at distal end	44	44

TABLE 5. DIMENSIONS OF THE VERTEBRAE (mm)

Number of vertebrae	Length of body at center	Height of body at front end	Breadth of body at front end	Total height from anterior bottom	Breadth of transverse processes	Greatest height of neural canal	Greatest breadth of neural canal
C 1st	24	44	119	141	209	41	54
2nd					186	41	50
3rd	6	58	74	115	157	39	44
4th	5	56	73	108	126	42	41
5th	5	54	74	117	129	48	42
6th	8	56	72	143	137	46	45
7th	15	55	75	183	154[1]	48	45
D 1st	22	57	69	235	164	52	50
2nd	35	54	68	274	167	55	48
3rd	48	54	65	288	171	60	51
4th	58	49	65	299	168	60	48
5th	66	52	67	310	168	61	46
6th	72	54	70	327	163	62	40
7th	79	56	75	341	156	56	38
8th	88	58	81	352	195	52	31
9th	93	60	84	368	247	47	29
10th	100	63	85	387	290	48	29
11th	107	68	86	405	300[1]	40	28
L 1st	111	72	88	421	317	40	28
2nd	114	75	89	434	313	39	27
3rd	117	77	91	441	315	39	28
4th	123	80	93	458	314	37	28
5th	137	89	97	—[1]	310	32	18
6th	130	85	95	464[1]	315	33	20
7th	143	93	98	461	309	24	18
8th	148	96	99	456	304	16	14
9th	149	96	100	439	301	10	11
Ca 1st	145	101	104	428	273	13	13
2nd	140	101	107	399	251	10	10
3rd	132	100	110	373	238	9	11
4th	124	100	112	341	224	3	8
5th	121	102	113	310	197	—	7
6th	116	103	113	274	155	—	7
7th	111	103	110	227	123	—	6
8th	104	102	100	192	106	—	6
9th	92	100	92	158	94	—	3
10th	77	96	89	123	91	—	2
11th	52	84	80	85	85	—	—
12th	43	63	69	68	76	—	—
13th	42	56	63	61	69	—	—
14th	40	46	59	53	65	—	—
15th	38	42	50	46	59	—	—
16th	34	37	44	40	52	—	—
17th	—	—	—	—	—	—	—
18th	27	25	30	26	32	—	—
19th	20	16	25	20	27	—	—

1) It has some deficit.

3 and 4 and the photographs are shown in Fig. 2.

Sternum and Hyoid bone. The sternum consists of four segments. But the third and fourth one was ankylosed conjointly. Dimension of several parts are shown in Table 7. Photograph and some dimensions of the hyoid bone are shown in Fig. 5 and Table 8. The basihyal and thyrohyals are ankylosed loosely.

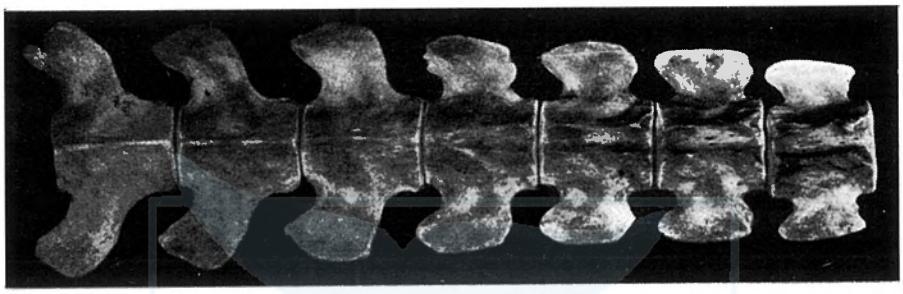


Fig. 3. Ventral view of vertebrae, showing the first caudal region.

Fig. 4. Lateral view of chevron bones, left is anterior.

TABLE 6. DIMENSIONS OF CHEVRON BONES (mm)

Number of chevron	Greatest length (antero-posterior)	Greatest breadth (transverse)	Greatest height (supero-inferior)
1[1)]	—	—	—
2[2)]	—	—	—
3	75	64	114
4	92	62	169
5	101	63	119
6	89	64	97
7	87	61	72
8	78	54	53
9	58	46	35

1) Not given, for it is broken.
2) Missed.

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TABLE 7. DIMENSIONS OF THE RIBS (mm)

Rib No.	Straight length		Curvilinear length[1)]		Breadth at middle		Depth at middle	
	Left	Right	Left	Right	Left	Right	Left	Right
1st	350	327	295	320	57	59	22	23
2nd	557	552	585	587	46	48	17	19
3rd	620	633	715	715	34	34	20	20
4th	659	670	780	785	32	32	18	17
5th	665	667	720	810	32	31	17	17
6th	578	661	800	810	29	29	16	16
7th	579	698	790	790	30	28	19	21
8th	605	646	660	690	29	27	20	22
9th	562	610	600	625	30	26	19	22
10th	195	228	195	240	36	31	10	12
11th	187	112	190	120	19	17	7	5

1) Along the vertebral border
2) It has some deficit

Fig. 5. Medial view of left and right sides vertebral ribs.

TABLE 8. DIMENSIONS OF STERNUM (mm)

	1st element	2nd element	3rd element	4th element	5th element
Greatest length	252	142		215	
Greatest breadth of anterior part	175	125	123	96	69
Greatest breadth of posterior part	140	138	115		
Greatest thickness at middle	25	21	16	14	10

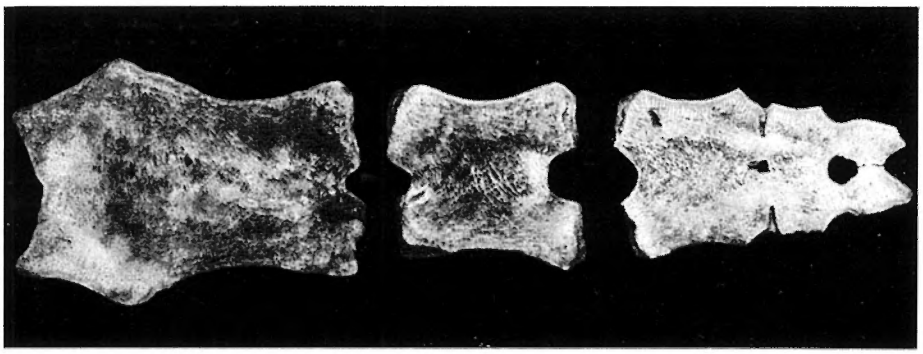
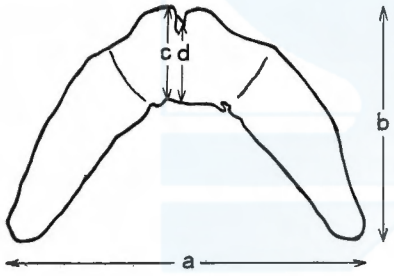


Fig. 6. Sternum. Third and fourth segments was ankylosed.

TABLE 9. DIMENSIONS OF BASIHYAL, THYROHYALS AND STYLOHYALS (mm)



a–198
b–135
c– 59
d– 50

Stylohyals	Greatest length	Greatest breadth	Greatest depth
L :	167	41	28
R :	169	41	26

Fig. 7. Hyoid bones. Basihyal and thyrohyals were ankylosed.

Bone of pelvic region. It was collected on one side only, and it is difficult to decide which side it belonged to and which end of the bone is the anterior. Its photograph is shown in Fig. 8.

Addendum. The salivary gland of this whale is being studied at Department of Pathology, Nippon Medical College.

Fig. 8. Bone of pelvic region.

Fig. 9. Lateral view of skull, showing the lateral basirostral groove clearly visible.

DISCUSSION

As shown in the precedent report of the authors (1958), four distinctive characters are especially to consider in classifying the species of *Mesoplodon*. The first is the relative position of the premaxillary and maxillary foramina. In the present specimen the premaxillary foramina are situated in the same level or slightly caudal to the maxillary foramina. The second is the presence or absence of the lateral basirostral groove, and this groove is clearly found in the present specimen (Fig. 9). The third is the position, where the teeth are situated in the mandible. In the present specimen the teeth are situated at the caudal end of the symphysis. The fourth character is the shape of the teeth, especially

the ratio between the transverse thickness and the antero-posterior breadth at the place of insertion into the mandibular alveole. This ratio gives an important key for classifying the species more in details. The teeth are large flat and square topped in the present specimen. The ratio of thickness to antero-posterior breadth of the teeth is 1:6.5 on the left tooth, 1:6.4 on the right tooth. This ratio is higher than in any other *Mesoplodon* species. From the above mentioned results applying the keys upon the species of *Mesoplodon* reported by Raven (1937) and by the authors (1958), the present specimen might be classified as *Mesoplodon stejnegeri*.

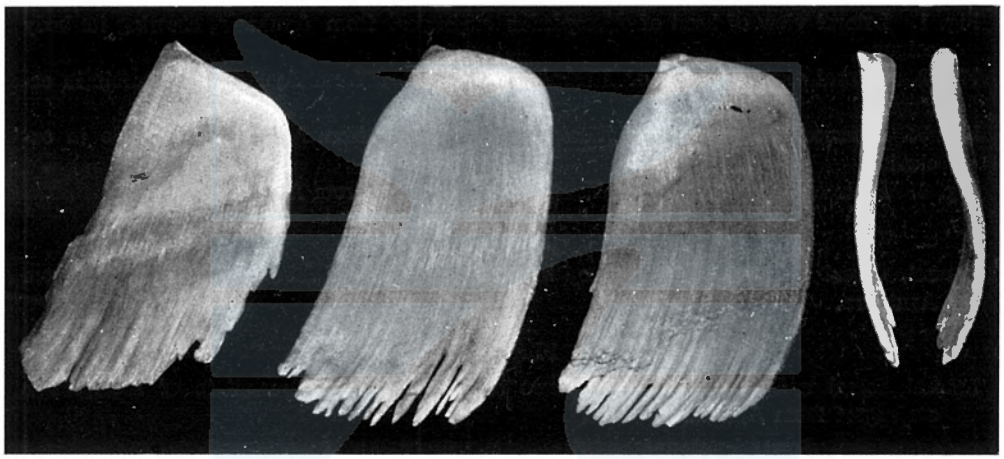


Fig. 10. Shape of the teeth. Left; *M. stejnegeri* from Aleutian waters. Middle two; outer surface of left tooth and inner surface of right tooth of *M. stejnegeri* from Ayukawa. Right two; frontal view of the teeth of *M. stejnegeri* from Ayukawa.

SUMMARY

An adult male beaked whale that belongs to the genus *Mesoplodon* was captured on August 25th, 1958, off Ayukawa in Japan.

The external characters of the whale body could not be observed, but the skeleton was almost perfectly collected and is preserved in the Whales Museum of Ayukawa. From the osteological examination the present specimen may sufficiently be classified as *Mesoplodon stejnegeri*.

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EXPLANATION OF THE PLATES

PLATE I

Fig. 1. Lateral view of head of *Mesoplodon stejnegeri* from Ayukawa, showing its body colour.
Fig. 2. Lateral view of skull of *Mesoplodon stejnegeri* from Ayukawa, mandible in occlusion.
Fig. 3. Anterior view of skull of *Mesoplodon stejnegeri* from Ayukawa, mandible in occlusion.
Fig. 4. Posterior view of skull of *Mesoplodon stejnegeri* from Ayukawa.

PLATE II

Lateral, dorsal and ventral views (top to bottom) of skull of *Mesoplodon stejnegeri* from Ayukawa.

PLATE III

Lateral, dorsal and reversed lateral views (top to bottom) of mandible of *Mesoplodon stejnegeri* from Ayukawa.

PLATE IV

Fig. 1 and 2. Lateral and caudal views of cervical vertebrae of *Mesoplodon stejnegeri* from Ayukawa.
Fig. 3 and 4. Cranial and caudal views of each cervical vertebrae of *Mesoplodon stejnegeri* from Ayukawa; from left to right, 1~2, 3, 4, 5, 6, 7th of cervicals.
Fig. 5. Lateral view of skeleton of *Mesoplodon stejnegeri* from Ayukawa, which was set uped by Mr. Y. Kimura.

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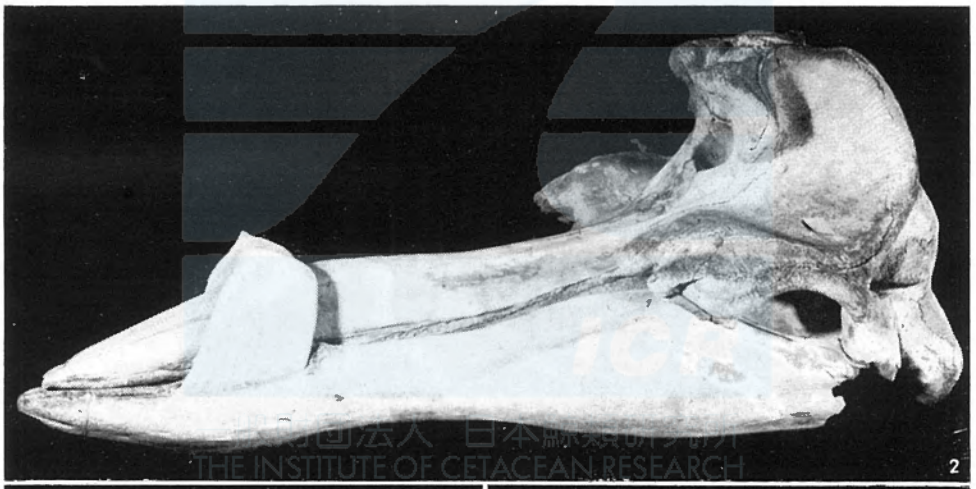

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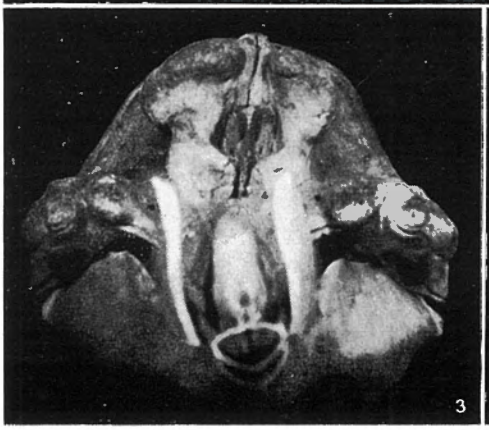

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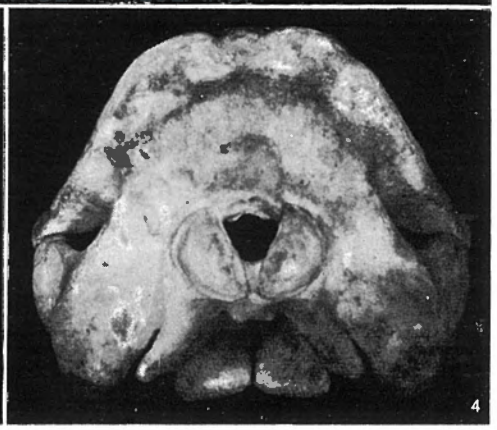

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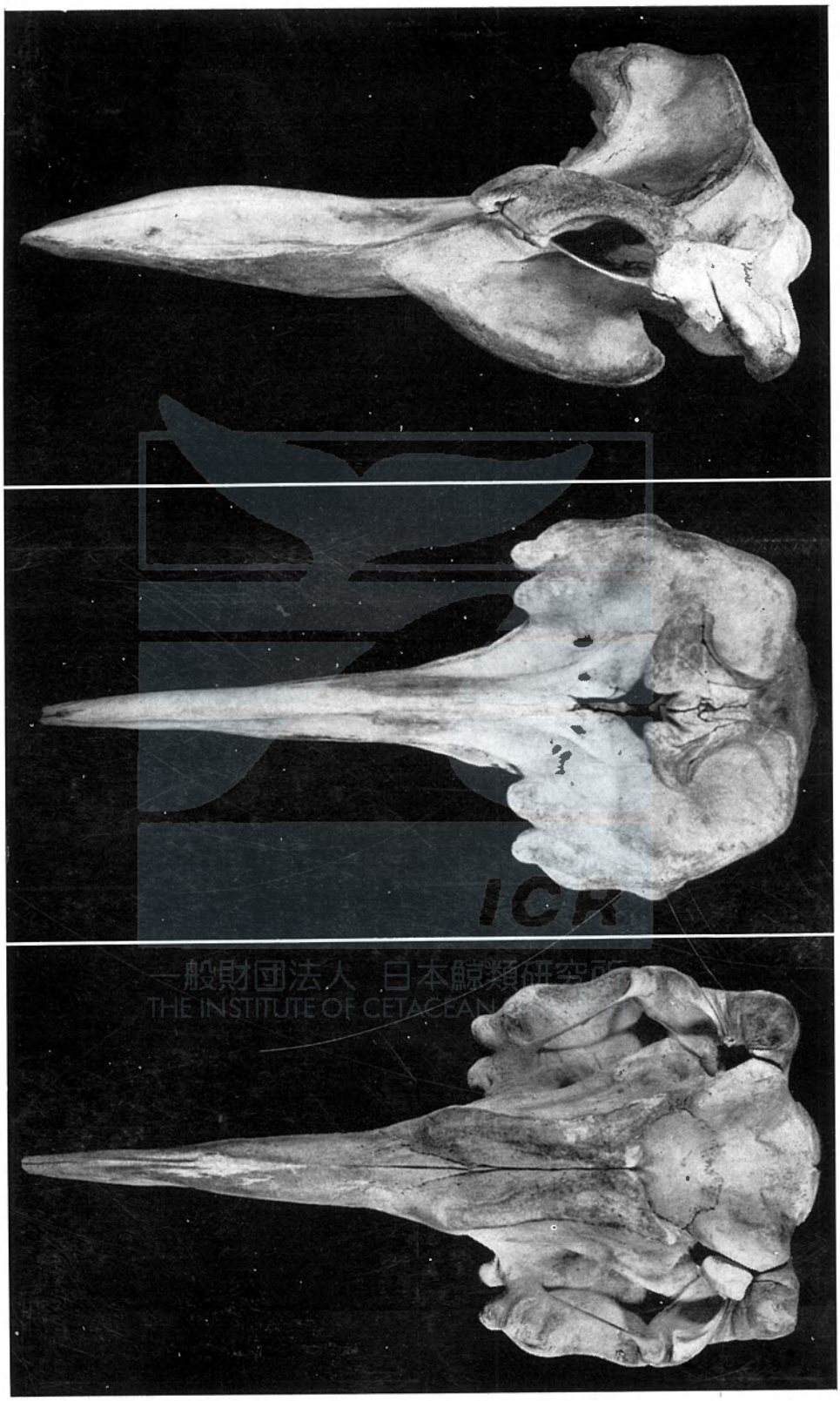

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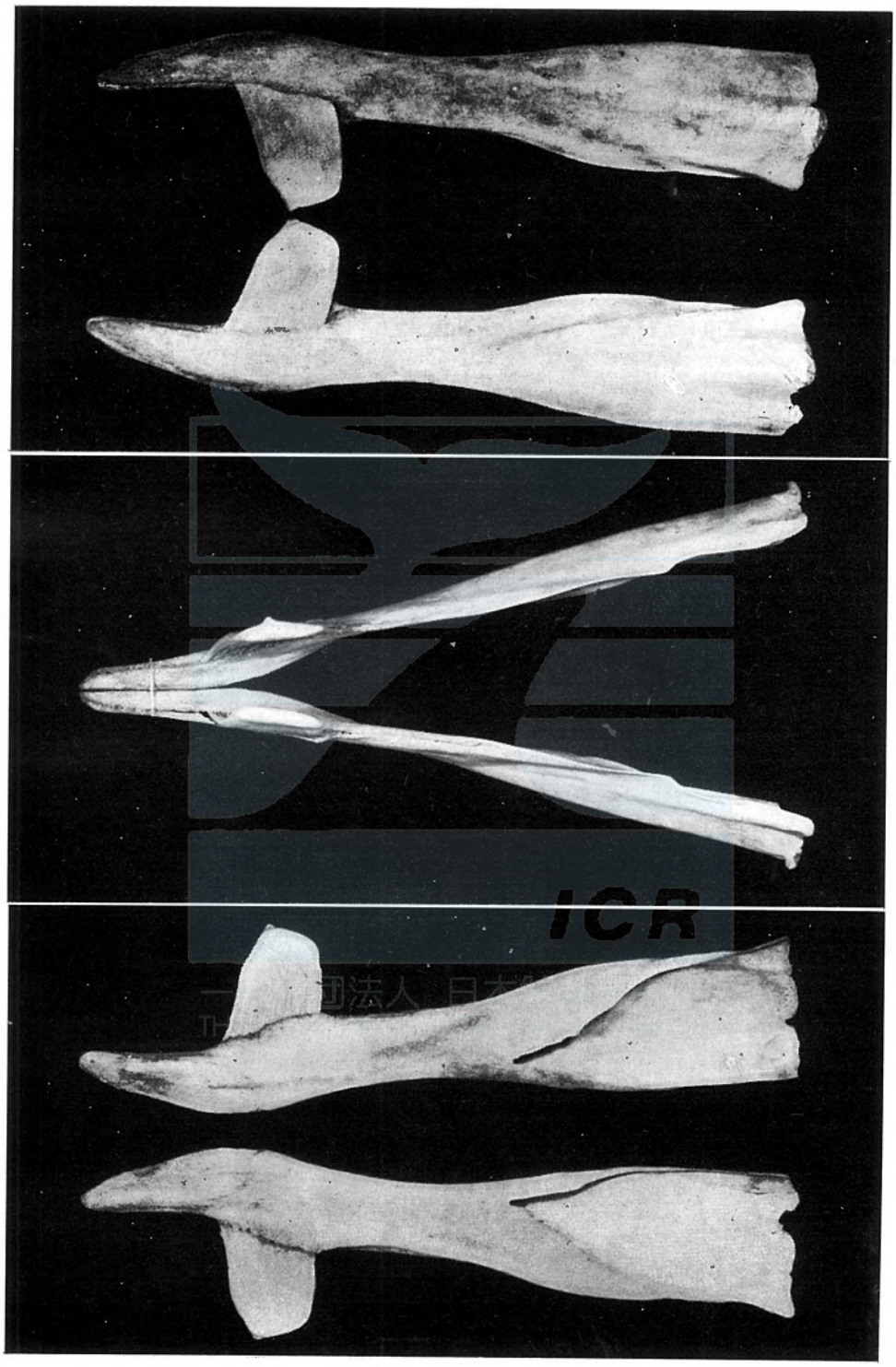

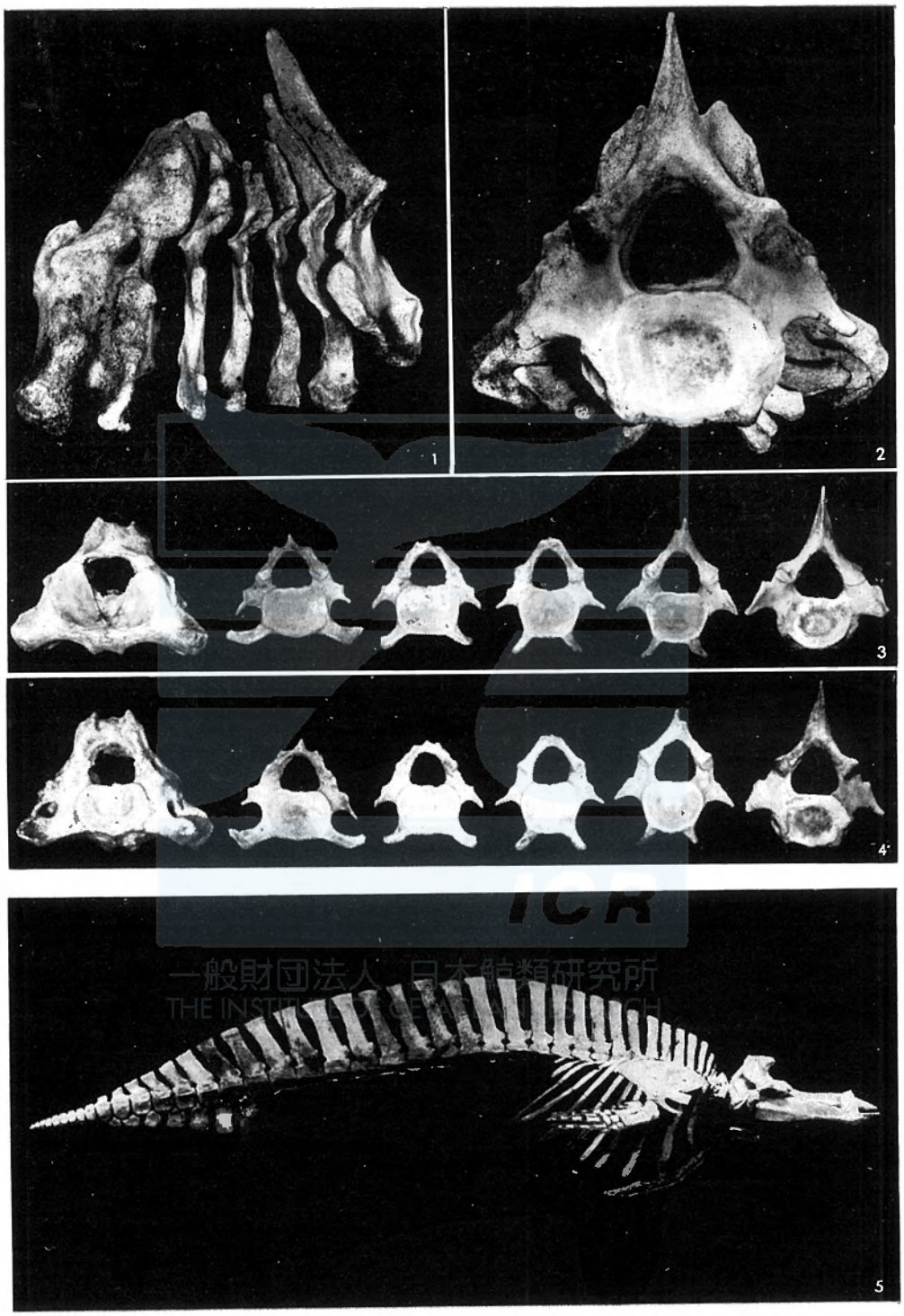

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