

THE FIRST OCCURRENCE OF A PORPOISE
(*ELECTRA ELECTRA*) IN JAPAN

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INTRODUCTION

A small toothed whale was found by a fisherman in the shallows of Hiratsuka Beach, Sagami Bay on 12th Aug. 1963 (Fig. 1). It was still alive and some strength was



Fig. 1. The animal was caught, lay dawn on the HIRATSUKA Beach.

still left in it's body. Fishermen took nearly an hour to catch it. When Nakajima hurried to arrive the Hiratsuka Fish Market, the porpoise had already been dismembered. The head, the fins and the bones were little short of complete and

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were obtainable. The author also observed the skin, meat and internal organs. At first glance he recognized the shape of the head and the white lips were similar to *Feresa attenuata*. Based on the above characteristics the porpoise was considered to be of the *Feresa* species, but continuously comparative differences were found in the shape of the flippers and moreover an evident difference was found in the teeth in that they were smaller and more in number than with *Feresa attenuata*. As these points were unusual, the porpoise was examined eagerly in detail.

EXTERNAL CHARACTERS

The authors could not see the whole shape of the porpoise body, but connected each part of the body, vertebrae and other portions available to rebuild the full length and make measurement. It was 260 cm. The porpoise was a male, the reproductive aperture is shown in Fig. 2.

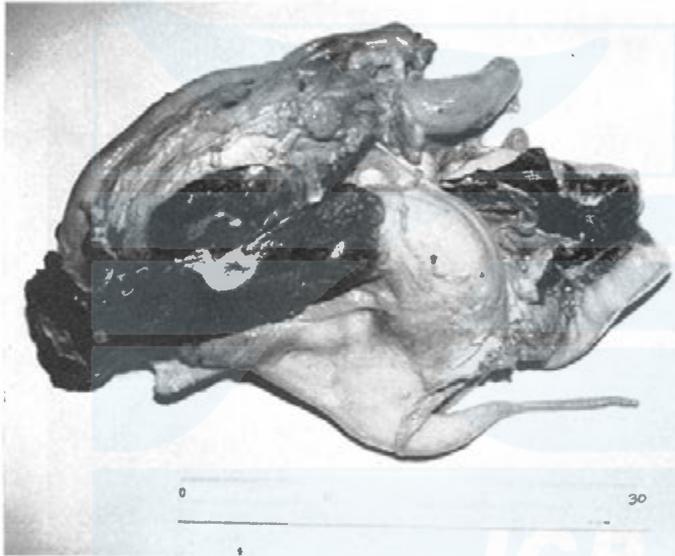


Fig. 2. Genital aperture: the glans penis was markedly slender, long and cylindrical.

The body color was mostly dark grey and a slightly lightened toward the belly. The skin of both lips and the skin around the anus and the genital areas was unpigmented and other such patches were scattered just anterior to the navel. Scars that are usually left by parasite infection or biting, were not found on the skin.

Shape of the forehead was round and beakless in profile like the false killer whale (*Pseudorca crassidens*), but in the front view both cheeks were pressed from the side, so the shape of the snout in dorsal view was fairly sharpened. Observed in profile, the eyes were positioned nearly on the center. The mouth-line extended from the front to below the eyes. The skin of both upper and lower lips was white as is the condition with *Feresa attenuata*.

TABLE 1. EXTERNAL MEASUREMENT OF THE HIRATSUKA SPECIMEN

	mm	%
Total length, from snout to notch of flukes	260	100.0
<i>Head</i>		
From tip of snout to tip of lower jaw	10	0.4
Lower jaw, from tip to angle of gape	270	10.4
From tip of snout to blowhole	345	13.3
From tip of snout to eye	335	12.9
From center of eye to earhole	75	2.9
From tip of snout to blowhole, along upper curve of head	465	17.9
<i>Flipper</i>		
Radial length*	53.0	20.4
Ulnar length*	41.0	15.8
Greatest width*	16.0	6.2
Width at base*	17.0	6.5
<i>Dorsal fin</i>		
Length at base	40.0	15.4
Height	25.0	9.6
<i>Tail flukes</i>		
From tip to frontal incertion*	44.5	17.1
Breadth at base*	20.0	7.7
From tip to notch*	36.0	13.8
Total spread	65.5	25.6

* All measurements are made in straight line.

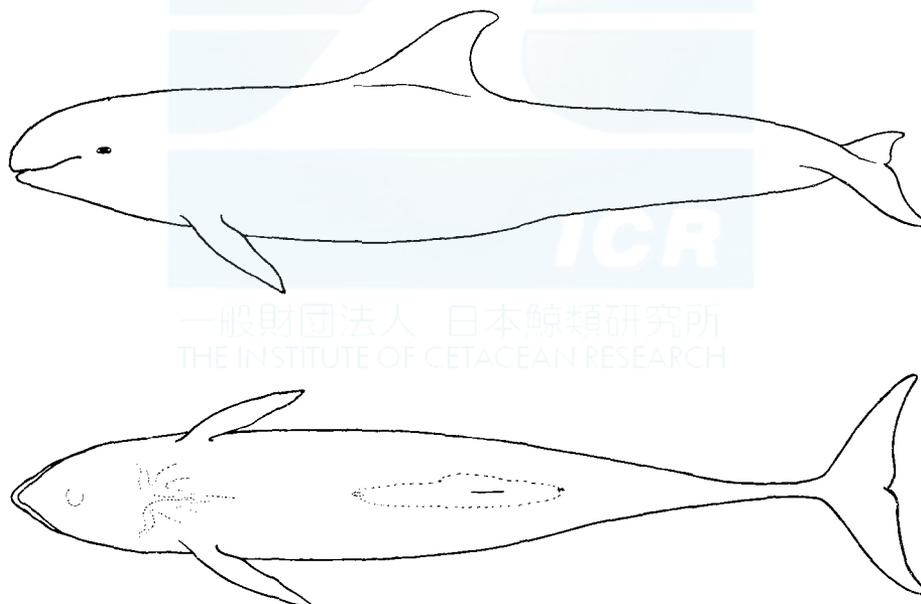


Fig. 3. A restoration picture of HIRATSUKA Specimen.

As shown in Fig. 4, the dorsal fin was triangular, bend backward and sharp at the tip. The flippers were rather long, and were fairly similar in shape to the false killer whale (*Pseudorca crassidens*). The flippers are shown in Plate III. The tail-flukes were pretty large, almost 1/4 the body length (Fig. 5).

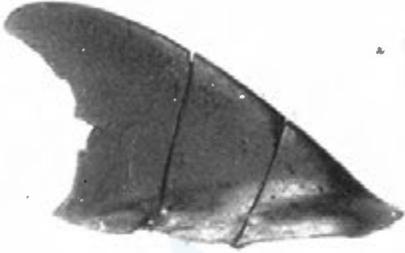


Fig. 4. Dorsal fin, right side.



Fig. 5. Tail flukes, dorsal view.

There was no wedge shaped cut nor grooves on the throat. Between both flippers an anchor shape pale in color was seen. *Feresa attenuata* has a groove on the center of the belly which runs from the anus through navel and reaches to the chest, but no groove was found on the porpoise belly. Also with *Feresa attenuata*, a little posterior of the anus, there is a swelling on the tail, but no swelling existed on this porpoise. As Plate II shows, the dental formula was $\frac{24}{24} | \frac{25}{24}$. The upper right tooth row was the most numerous in number and the tip tooth of the upper left tooth row was left in the gum. The second to the ninth tooth of both upper tooth row and also the teeth of both lower tooth rows were worn out, especially the posterior part of the each tooth row were extremely worn.

The penis was rather slender from the tip to the middle and then became beg toward the root.

Fig. 3 is a restoration picture which was drawn from the above mentioned photographs and the measurement data. In this figure, the position of the dorsal fin and the flipper were presumed, therefore, it can not be said to be quite the exact position.

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OSTEOLOGY

Dimensions of the skull are shown in Table 2. Compared with the data on *Feresa*, the two of them resembled each other quite well in shape, but the snout of the present specimen was longer the dental formula of greater number. The dental formula might be important. The authors, considering this point, made comparison with the dimensions of other skulls which had about the same dental formula. Those skulls were of the genus *Trusiops* and *Lagenorhynchus*. There were some

differences among *Trusiops* and the present specimen. But the skull dimensions of *Lagenorhynchus electra* were quite alike.

The length breadth ratio of the rostrum was 1.8 on the present specimen. This value is bigger than *Feresa attenuata*, smaller than *Trusiops* species and *Lagenorhynchus* species except *L. electra*.

The length breadth ratio of the skull was 1.75 on the present specimen. This is bigger than *Feresa attenuata*, smaller than *Trusiops* species and very similar to *Lagenorhynchus* species.

The mandibular symphysis was ankylosed.

Vertebral formula of the present specimen is as follows.

C 7+D 14+L 17+Ca 44 = 82. The total number of vertebrae were 67—70 on *Feresa attenuata*, 61—66 on *Trusiops* species. These were less than the present specimen. *Lagenorhynchus electra* has 80—84 vertebrae and this characteristic fits the present specimen. All of the epiphyses of vertebrae were ankylosed to their centrum. The present specimen therefore had already reached physical maturity and was a respectably old animal.



Fig. 6. Ventral view of the dorsal vertebral column, showing the spinal branch on the transvers processes.

The anterior three cervical vertebrae were fused. Number of ribs was 14 on both side, the anterior six were double headed ribs. The seventh dorsal vertebra had a spinal branch on both tips of the transvers processes. The one on the left side was 15 mm long and projected toward the centrum of the sixth dorsal vertebra like a hook. The one on the right side was only 3 mm long and was connected by the cartilage to a small piece of bone. This small bone also pointed toward

TABLE 2. SKULL DIMENSIONS OF THE HIRATSUKA SPECIMEN COMPARED WITH DATA OF *LAGENORHYNCHUS ELECTRA* AND *FERESA ATTENUATA*

	Hiratsuka mm	Specimen %	Range of <i>L. electra</i> from True (1889)	Range of <i>Feresa</i> <i>attenuata</i> Ito specimen
1 Total length (condylo-basal)	477	100.0	425-472 mm	356-390 mm
2 Length of rostrum (median)	265	55.6	53.3-54.8%	44.7-49.2%
3 Breadth of rostrum at base	145	30.4	27.5-34.8	27.7-31.8
4 Breadth of rostrum at middle	120	25.2	17.4-23.0	21.3-25.1
5 Thickness of rostrum at middle	28	5.9		
6 Premaxillary breadth at middle of rostrum	61	12.8	12.1-13.3	15.0-17.7
7 Greatest breadth of premaxilla	101	21.2	17.9-22.8	23.4-26.2
8 Greatest breadth of superior nares	65	13.6		
9 Distances from tip of rostrum to bottom of maxillary notches	260	54.5		
10 . . . anterior end of vomer	55	11.5		
11 . . . anterior margin of superior nares	331	69.4	66.1-69.0	56.9-63.2
12 . . . posterior end of vomer on cranial basis (median)	383	80.3		
13 Breadth across middle of orbits	257	53.9		53.7-60.7
14 Greatest breadth across supra-orbital plates of maxillae	254	53.3		
15 Greatest breadth across post-orbital processes	273	57.2	51.5-58.0	58.4-66.9
16 Breadth across posterior margins of temporal fossae	180	37.7	35.5-41.1	38.4-55.0
17 Length of temporal fossae	*94	19.7	17.6-21.6	L22.2-26.9 R22.0-27.9
18 Depth of temporal fossae	*60	12.6	11.4-14.9	L17.2-19.4 R17.6-23.7
19 Length of maxillary tooth row	L188 R182	39.4 38.2	37.3-40.0	L27.6-39.4 R28.7-33.3
20 Breadth of foramen magnum	43	9.0		
21 Height of foramen magnum	40	8.4		
22 Breadth of occipital condyles	108	22.6		
23 Length of mandibular rami	*385	80.9	81.2-81.7	L72.2-79.4 R72.2-79.9
24 Length of mandible (median)	370	77.6		
25 Distance from tip of mandible to coronoid process	*358	75.1		
26 Length of symphysis	32	6.7	7.1-9.4	8.7-10.1
27 Length of mandibular tooth row	L184 R182	38.6 38.2	36.0-38.6	L31.5-37.5 R33.1-38.4
28 Depth between angle of mandible and coronoid process	*98	20.5	13.3-19.5	L20.8-23.8 R20.8-24.1
29 Breadth across mandibular condyles	245	51.4		
30 Height of skull	193	40.4		47.2-53.4
31 Diameter of largest tooth and Number of alveoli	6	1.2 24 25 24 24	0.9-1.1 21-25 22-25 19-23 19-24	9-10 8-10 11-13 11-13
32 Length of bulla tympano-perioticum	*34			
33 Greatest breadth of bulla across proximal volucral end and sigmoid process	*28			
34 Total depth of tympano-perioticum at middle	*26			

* . . . equal on both sides

TABLE 3. DIMENTIONS OF VERTEBRAE (mm)

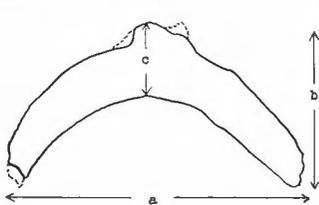
No.		a	b	c	d	e	f	g
Cervical	1.	43	—	103	91	144	—	48
	4.	6	35	41	64	54	26	37
	7.	9	35	45	64	77	25	47
Thoracic	1.	14	32	38	77	105	26	46
	7.	34	37	35	107	121	38	35
	14.	37	39	38	127	200	31	24
Lumbar	1.	35	39	40	131	200	29	24
	9.	30	43	43	158	185	29	17
	17.	22	45	45	128	145	26	12
Caudal	1.	22	45	45	122	140	24	11
	22.	22	42	44	83	56	6	6
	44.	6	5	9	5	—	—	—

- a—Length of body at frontal end
- b—Height of body at frontal end
- c—Breadth of body at frontal end
- d—Total height from anterior bottom
- e—Bilateral breadth of transvers processes
- f—Greatest height of neural canal
- g—Greatest breadth of neural canal



Fig. 7. Dorsal view of the hyoid bones, thickness of stylohyal are very thin.

TABLE 4. DIMENSIONS OF BASIHYAL, THYROHYALES AND STYLOHYALS (mm)



- a—160
- b—110
- c— 50

The greatest length, breadth and depth of stylohyals

- Left : ?, 22, 13
- Right : 96, 22, 13

TABLE 5. DIMENSIONS OF RIBS (mm)

No	Length				Breadth at middle	
	Left		Right		Left	Right
	c	s	c	s		
1.	270	181	270	181	26	26
5.*	484	373	475	364	11	12
14.	179	174	266	246	6	8
Sternal ribs (No. 1-9)**						
1.		108	108		19	19
8.*		162	164		7	6
9.		46	100		4	6

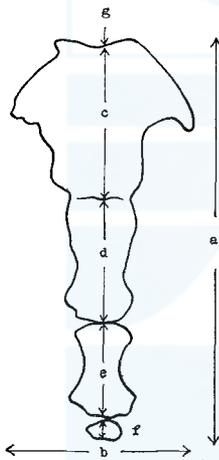
c—curvilinear length along the outer border

s—streight length

*—max. size

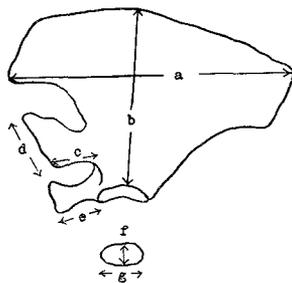
**—almost streight

TABLE 6. DIMENSIONS OF STERNUM (mm)



a—Total length	244
b—Greatest breadth of manubrium	109
c—Length of manubrium	94
d—Length of 2nd sternbra	75
e—Length of 3rd sternbra	57
f—Length of 4th sternbra	18
g—Depth of median (anterior) notch of manubrium	6

TABLE 7. DIMENSIONS OF SCAPULAE (mm)



	Left	Right
a. Length along vertebral border	227	230
b. Length of glenoid cavity	39	39
c. Breadth of glenoid cavity	30	30
d. Length of acromion, along medial border	43	43
e. Length of coracoid, from supraglenoid edge to tip	41	42
f. Greatest breadth of acromion	58	55
g. Breadth of articular surface	32	31
h. Height of articular surface	40	40

the centrum of the sixth dorsal vertebra. The function of these structures might be due to the differences of the single headed and the double headed rib junctions. This vertebra characteristic could also be seen on *Feresa attenuata*.

The number of the sternal ribs were nine pairs and five pairs were connected to the sternum. The sternum consisted of four pieces. The first piece of the sternum ankylosed with the second, on the third one there is a valleculla and in center of it a hole was opened.

TABLE 8. DIMENSIONS OF HUMERUS, RADIUS AND ULNA (mm)

		Left	Right
Humerus,	Greatest length	87	87
	Breadth at distal end	55	55
Radius,	Length at middle	120	120
	Breadth at distal end	62	62
Ulna,	Length at middle	95	97
	Breadth at distal end	38	38

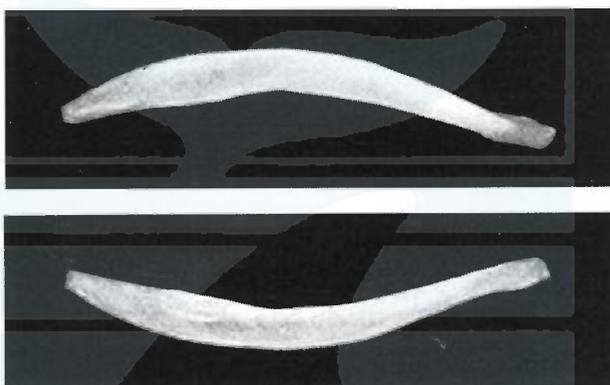
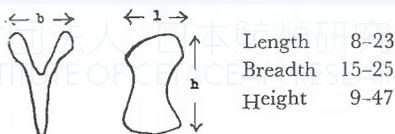


Fig. 8. Left pelvic bone.
upper ... dorsal view
lower ... ventra view
head is right side

TABLE 9 DIMENSIONS OF CHEVRONS
(Range in mm)



The posterior ends of the thylohyals were very thin. There were no important characteristics on the scapulae except their posterior edges were a little straighter than with *Feresa attenuata*.

The phalangeal formula in the flippers was 1: 3, II: 9, III: 7, IV: 4, V: 3. This formula resembles the formula of *Feresa attenuata*.

The right side pelvic bone was lost due to dismemberment and only the left

TABLE 10. COMPARISON OF OSTEOLOGICAL CHARACTERISTICS

	Hiratsuka specimen	<i>Lagenorhynchus</i>	<i>Tursiops</i>	<i>Feresa</i>
Body length in feet	9	9	12	8
Vertebral formula	C7(3)+D14(6)+ L17+Ca44=82	C7(2)+D14~15(6)+ L18~22+Ca38~41=73~92	C7(2)+D12~14(5)+ L17~19+Ca26~29=61~66	C7(3)+D12~13(5~7)+ L15~17+Ca32~34=66~70
Dental formula	24 25 24 24	22~45 22~45	18~26 18~26	8~12 10~13
Phalangeal formula	I, II, III, IV, V 3 9 7 4 3	I, II, III, IV, V 1~2, 10, 6, 2~3, 2	I, II, III, VI, V, 1~2, 7~9, 5~8, 2~3, 1~2	I, II, III, IV, V 2~3, 8~10, 7~8, 3~5, 2~3
Length / breadth { skull / rostrum	1.75	1.74	2.04	1.59
	1.83	2.02	2.32	1.57

side was collected. Its length was 169 mm, the length along the side of it was 175 mm and the greatest breadth was 17 mm.

The number of the chevron bones were thirty, the anterior three and the last one in the column were separated in two parts.

OTHER OBSERVATIONS

1. Internal organs

Internal organs had already been boiled for feed before Nakajima arrived. He was obliged to observe the boiled organ and found no special differences from other small cetaceans.

2. Parasites

In the stomach some nematodes were found. Near the vesical region there were some cysts 20–25 mm diameter. In one cyst a nematode was found, which was 150 mm long and 1 mm in section. In the air sinus of the skull, many nematodes were found. Those were about 30 mm long and 0.5 mm thick. 70 of them were in the left side and 120 were in the right side.

These nematodes were the same type (species) of that had been collected from *Feresa attenuata* which had caught in Futo, 1963.

They were different type of parasite from *Grampus griseus* that are fat, long and with screwed root into the tissue of the air sinus. Once in a certain specimen of *Feresa attenuata*, both type of them were found together.

3. Rete mirabile

Shape and conditions of the right side of the rete mirabile were not so different from other species of small cetaceans, and its area of spread was 380 mm × 1000 mm on each side.

TAXONOMICAL POSITION OF THE PRESENT SPECIMEN

At first sight Nakajima thought this porpoise might be a *Feresa attenuata*, but he wondered soon after the counting the teeth. The number of teeth was almost twice as many as in *Feresa attenuata*. So he thought that the porpoise might be a new species or even a new genus.

On the suggestion of Dr. T. Ogawa, the authors examined the data of *Lagenorhynchus electra* in detail as mentioned above. Finally the authors decided that the present specimen belonged to *Lagenorhynchus electra* as published by Gray.

In the external characteristics, the porpoises that belong to *Lagenorhynchus* species have a beak though it is very short. Usually a vallecule can be seen between the beak and the forehead. There has been in the past only a little data presented regarding the external appearances of the species of *Lagenorhynchus*.

The classification has generally been decided on the basis of bones, especially the skulls. It is felt that the external characteristics, the size of the bodies, the external appearance and the colorations, are also important for the study of the classification.

L. electra and *L. albirostris* have especially large sized skulls among the species of *Lagenorhynchus*.

The authors considered the above mentioned matters, are reluctant to include this species *electra* in the genus *Lagenorhynchus*.

Dr. Kennes S. Norris of the University of California, Los Angeles found a stranded newborn porpoise on August 1964 at Oahu beach, Hawaii. Photographs of the living animal and skull were sent to Dr. Norris at the Oceanic Institute in Hawaii, and he compared them with a stranded newborn specimen. He concluded that our specimen and his were certainly in the same genus and probably conspecific; and that both seem to represent what Gray (1846) called *Lagenorhynchus electra*. We both concur that the animal is not a member of the genus *Lagenorhynchus*, but is a presently unrecognized genus. The rules of priority, therefore, require that Gray's (1868) name *Electra electra* be applied to the form.

SUMMARY

1. A small toothed whale was caught on 12th August 1963 at Hiratsuka Beach, Sagami Bay, Japan. The porpoise was a male 260 cm long.
2. It had no external beak and quite resembled *Feresa attenuata* in external appearance.
3. Vertebral formula: C 7+D 14+L 17+Ca 44 = 82
Phalangeal formula: I: 3, II: 9, III: 7, IV: 4, V: 3.
Dental formula: $\frac{24}{24} \mid \frac{25}{24}$ (alveolar number)
Length breadth ratio of the skull: 1.75
Length breadth ratio of the beak: 1.80
4. According to the discussion the present specimen was determined as *Lagenorhynchus electra*.
5. Based on the external characteristics, this species *electra* should not be assigned to the genus *Lagenorhynchus*, but it might belong to the genus *Electra* which was presented by Gray (1868).
6. This is the first occurrence of *Electra electra* Gray (1846) in Japan.

ACKNOWLEDGEMENT

The authors are indebted to the members of the Hiratsuka Fish Market for their kind presenting of the specimen, and thanks are also due to Messrs. of the members of the Enoshima Marineland for their collaboration in examination of the specimen.

Dr. T. Ogawa gave a very important suggestion on this study. The authors would like to express their sincere thanks to him and should be shown their respects to his comprehensive knowledge in the taxonomic field of cetaceans.

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EXPLANATION OF PLATES

PLATE I

Dorsal, lateral and ventral views (top to bottom) of head of the HIRATSUKA specimen.

PLATE II

Upper and lower tooth rows are shown in dissected mouth. Teeth are shown in the lowest figure, middle of upper and lower line is the center of the mouth, upper line of teeth is upper tooth row.

PLATE III

Dorsal views of the flippers and their X-ray photographs.

PLATE IV

Dorsal, ventral and lateral views of skull.

PLATE V

Upper figure is posterior view of skull. Left one of middle figures is dorsal view and right one is ventral view of mandible. Lower figure is lateral view of mandible.

PLATE VI

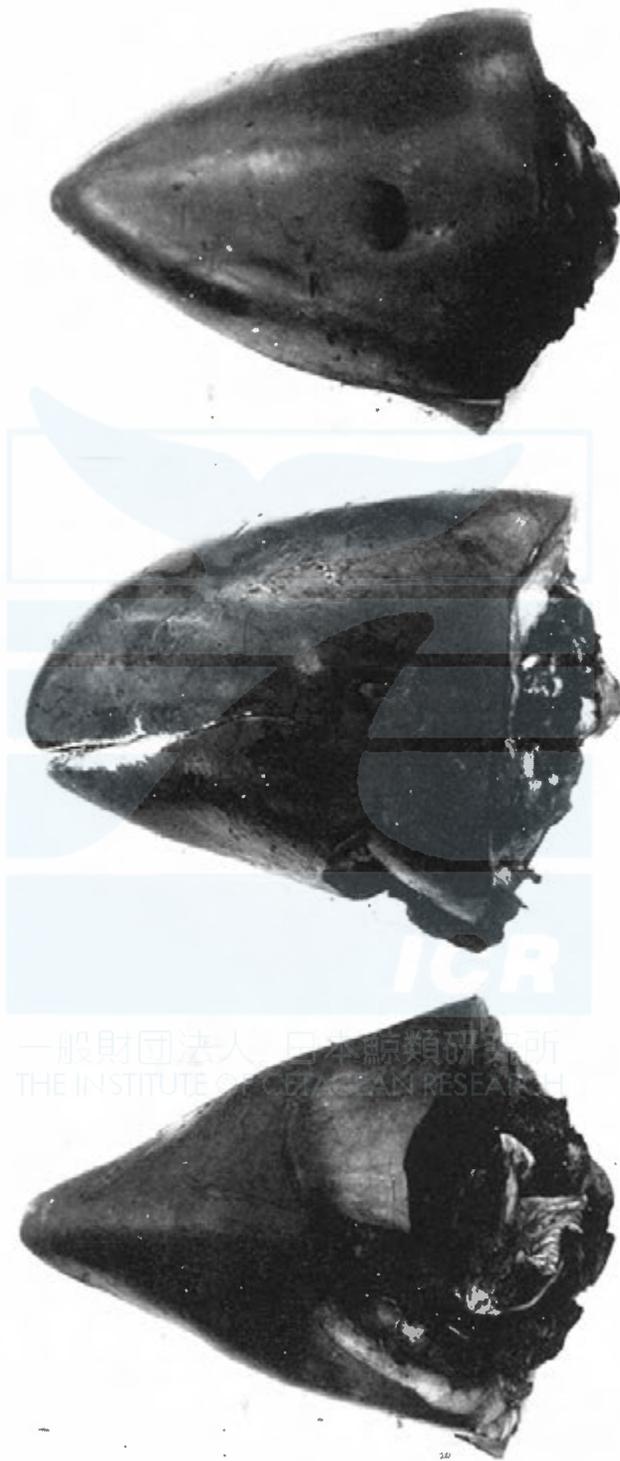
Lateral view of vertebral column : cervicals and dorsals, lumbar, caudals 1-24, caudals 24-44 and chevron bones (top to bottom).

PLATE VII

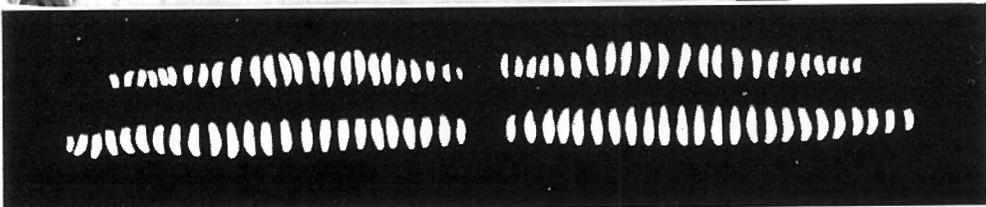
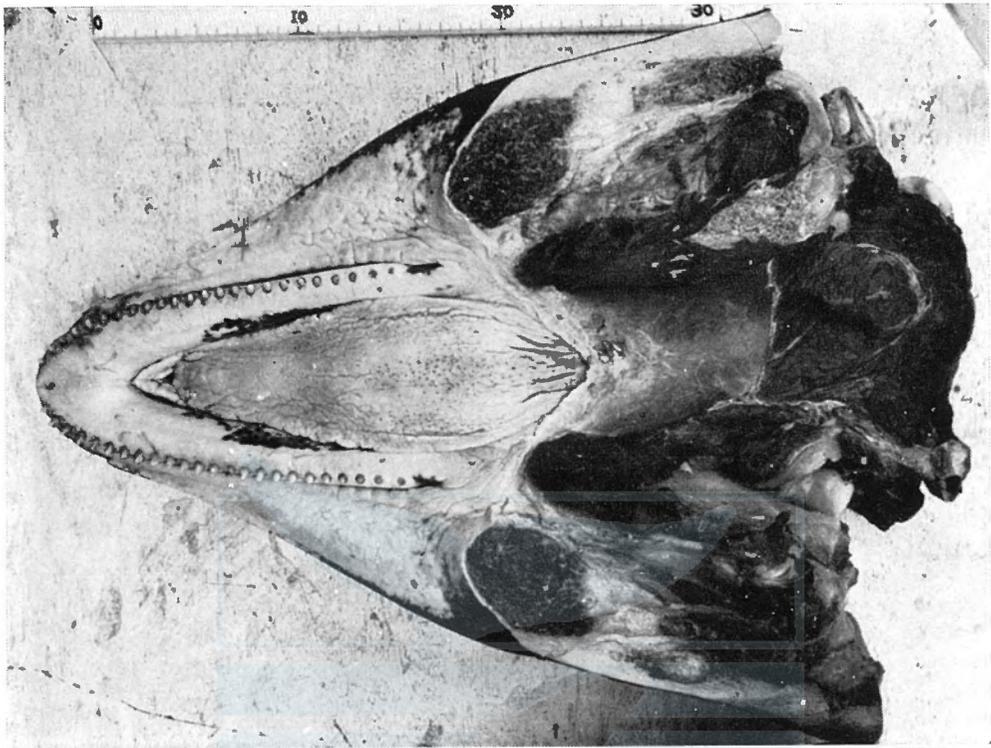
Ventral views of sternum, sternal ribs and vertebral ribs are shown in center figure. Side figures are lateral views of scapulae, right scapula is shown in left figure.

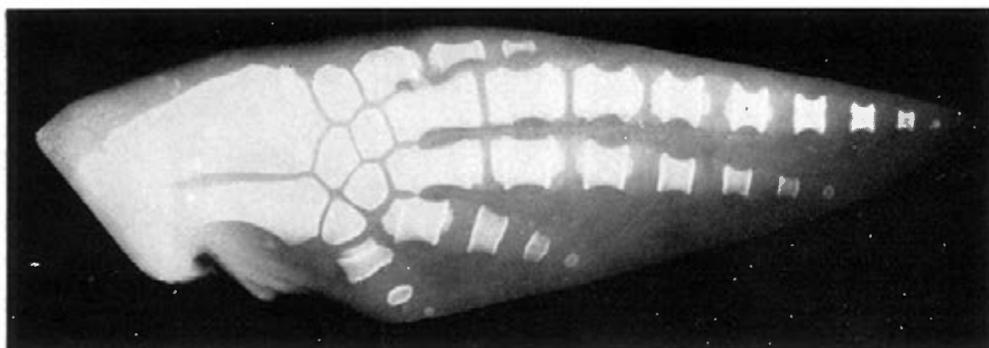
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