FURTHER COMMENTS ON *MESOPLODON GINKGODENS*

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ABSTRACT

We examined two similar specimens of toothed whale recently stranded in Sagami Bay, near Tokyo, and confirmed them both to be *Mesoplodon ginkgodens*.

A comparison between these and the Oiso (type) specimen showed no distinct differences. The external measurements and osteological studies confirmed our belief in the authenticity of the type specimen.

As a result of examining the Ito specimen, we concluded that even an old male of this species has very few scars on his skin, this must be related to the incompletely erupted teeth in this species, fighting can not remain much scars.

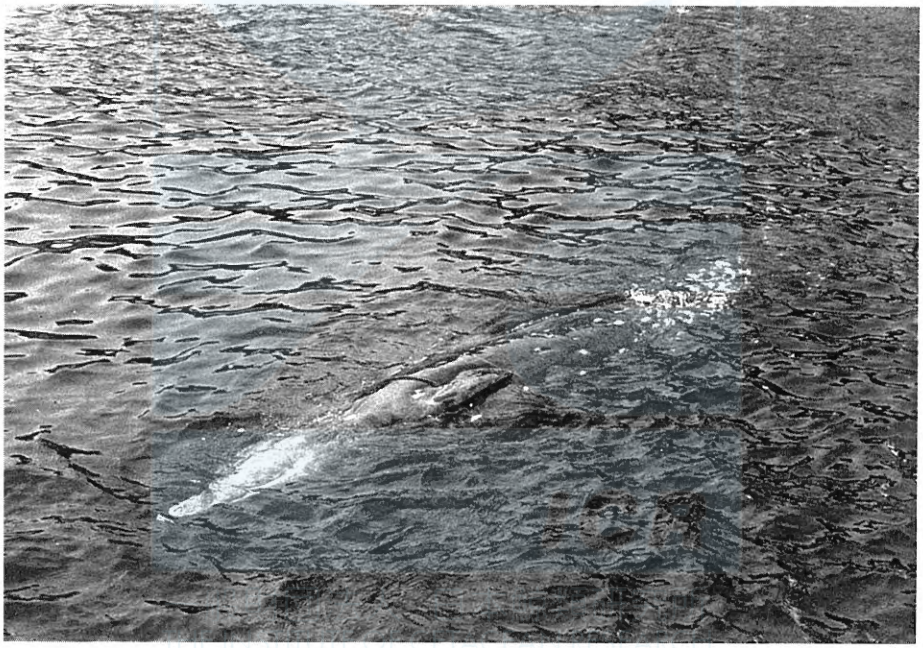

Fig. 1. Ito specimen, *M. ginkgodens* is moored at the Ito fish market. Photo by N. Oguro.

INTRODUCTION

Mesoplodon ginkgodens was first described and named by Nishiwaki and Kamiya in 1958. Some scientists have expressed doubt on the Oiso specimen of being a male *M. ginkgodens*, since most of its teeth were buried in the gum, which recalls the condition

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of female *M. stejnegeri*. Moreover, from the photograph taken by an onlooker at the time of stranding, the animal bore few scars on the body surface. The intact body was only witnessed by local people and fishermen.

We are presenting here the results of our examination of two animals identified to be *M. ginkgodens*, one of which was washed ashore at Kamakura in 1968 and the other near Ito in 1971.

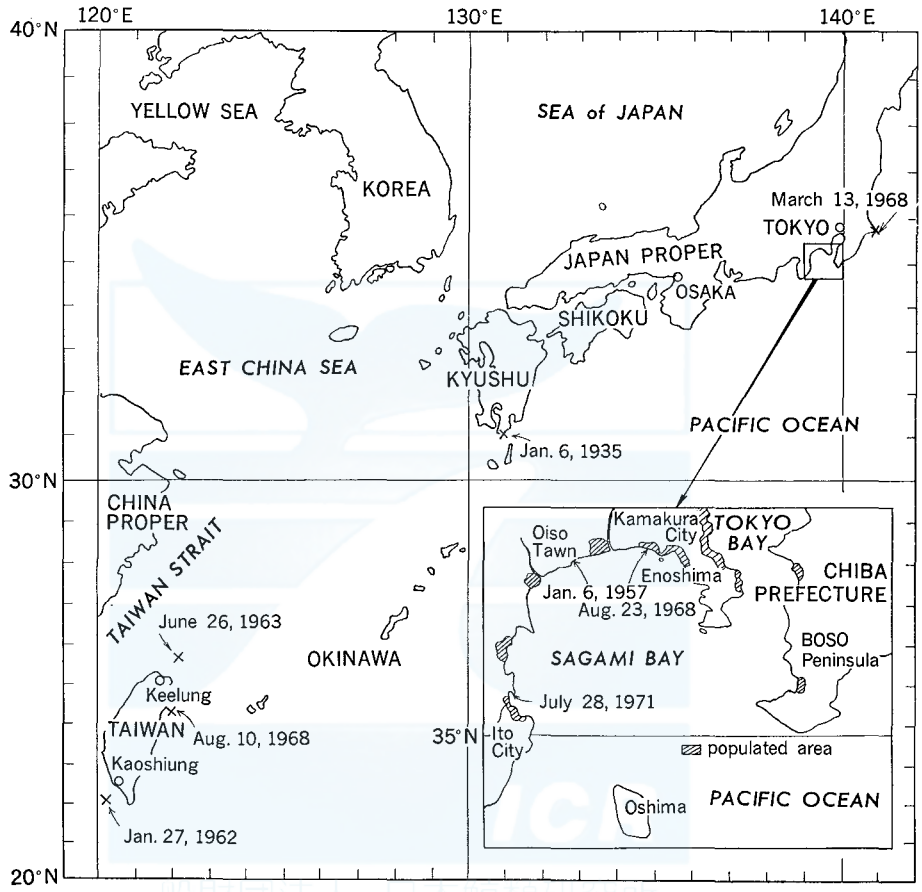

Fig. 2. The stranded or captured positions of *Mesoplodon ginkgodens*.

Besides, there was one more specimen of *M. ginkgodens* occured at Choshi City, Chiba Prefecture. A newspaper reported a strange whale stranded on the beach on March 13, 1968. We rushed at the spot but Mr. Mitsuyoshi Aoki of the Tokai University had collected it already. Two of us were allowed to study on it together and we identified it to be a *M. ginkgodens*. On this specimen, however, will be published in other paper. Therefore we only add in Fig. 2 the location and the date of stranding.

In addition, we have three informations on the specimens of *M. ginkgodens* from Taiwan waters. Mr. Hung-chia Yang of the Taiwan Fisheries Research Institute

collected them. One of them appears in " Geiken Tsushin " (Yang, 1964) and other two will be published by him in near future. He kindly communicated to us.

The occurrence of eight isolated individuals of *M. ginkgodens* stranded on the coast of Japan and captured in Taiwan waters, among them, six were found within recent 10 years, suggests that this species may not be so rare in the western part of the North Pacific as has been supposed. Since groups of this animal have not been reported, the social structure of this species is still obscure; possibly they often travel solitarily.

The locality of those eight specimens are shown in the map in Fig. 2.

MATERIALS

One of our specimens (TK 242) was stranded on the beach at Kamakura, Kanagawa Prefecture, in Aug. 23, 1968. Since local people mistook it for a specimen of the commonly eaten *Ziphius cavirostris*, the flesh had been removed, and the skeleton together with the intact head had eventually been discarded on the beach. Quite by chance, Dr. Masayuki Nakajima of the Enoshima Marineland came across the skeleton. He made some external measurements at once and reported it to us. The body length was estimated by reconstructing the vertebrae, and the external measurements of the head were taken. Afterwards we also examined the bones osteologically.

The other specimen (TK 366) was washed ashore near Ito City, Shizuoka Prefecture, in July 28, 1971. It was found by a fisherman, taken to Ito fish market and sold. Mr. Akio Tamura of the Ito Aquarium happened to see it, however, and since he immediately recognised it to be *M. ginkgodens*, he rang one of us up. We measured the external body proportions, dissected it, and weighed its inner organs, and afterwards examined the skeleton osteologically.

EXTERNAL APPEARANCE

Since we received the Ito specimen intact, we were able to examine the external aspect of the body in detail and photographed it. However, as in the case of the Kamakura specimen, the information we could obtain from Dr. M. Nakajima was that the animal was a male.

As we mentioned before, the lack of scarring on the body surface of the Oiso specimen was one of the reasons that there had been some doubt as to its male identity. However, the Ito specimen, which was certainly a male, also bore very few scars. It may be that *M. ginkgodens* males are so little scarred on account of their incompletely erupted teeth. Their fighting can not remain much scars on their skin. On the ventral surface of the Ito specimen there were many scars from parasitic infections, but most of these had healed.

The external body measurements of both specimens are compared with those of the Oiso (type) specimen in Table 1. The comparison indicates no differences of any taxonomic significance among the three specimens. In both the new specimens the dorsal fin shows definite undulations (Fig. 3), and the tail fluke has no notch but

TABLE 1. EXTERNAL MEASUREMENTS OF *MESOPLODON GINKGODENS*

		Oiso specimen		Kamakura specimen		Ito specimen	
		cm	%	cm	%	cm	%
1.	Body length	472.0	100	470	100	477.0	100
2.	Head, occipital condyles to the tip of snout	80.0	16.9	—	—	—	—
3.	—, greatest width (opposite to the eyes)	43.0	9.1	—	—	—	—
4.	Projection of the lower jew beyond the snout	2.5	0.5	1.0	0.2	1.3	0.3
5.	Tip of the lower jaw to the teeth	20.5	4.3	21.5	4.8	23.9	5.0
6.	Tip of the lower jaw to the apex of teeth	40.0	8.5	37.0	7.9	—	—
7.	Tip of the lower jaw to the center of eye	51.0	10.8	51.0	10.9	57.4	12.0
8.	Tip of the lower jaw to the blowhole	49.0	10.4	48.0	10.2	53.8	11.3
9.	Breadth of the blowhole	8.0	1.7	—	—	—	—
10.	Distance between apices of both teeth	11.5	2.4	—	—	11.9	2.5
11.	Flipper, axilla to the tip	33.0	7.0	32.0	6.8	41.2	8.6
12.	Flipper, anterior insertion to the tip	51.0	10.8	50.0	10.6	54.0	11.3
13.	Flipper, greatest width	13.0	2.8	14.0	3.0	15.4	3.2
14.	Tail flukes, total spread	112.0	23.7	—	—	119	24.9
15.	Tail flukes, middle point of the hinder margin to the tip (average)	57.5	12.2	—	—	—	—
16.	Height of dorsal fin	—	—	19.0	4.4	21.4	4.8
17.	Length from tail notch to tip of dorsal fin	—	—	—	—	158	33.1
18.	,, to anus	—	—	—	—	139	29.1
19.	,, to umbilicus	—	—	—	—	218	45.7

Fig. 3. Dorsal fin of *M. ginkgodens*, Ito specimen.

Fig. 4. Tailflukes of *M. ginkgodens*, Ito specimen.

its posterior is a little swollen (Fig. 4). The Oiso specimen also lacked the tail fluke notch. The left flipper of the Ito specimen was photographed and its phalangeal bones are shown in Fig. 5.

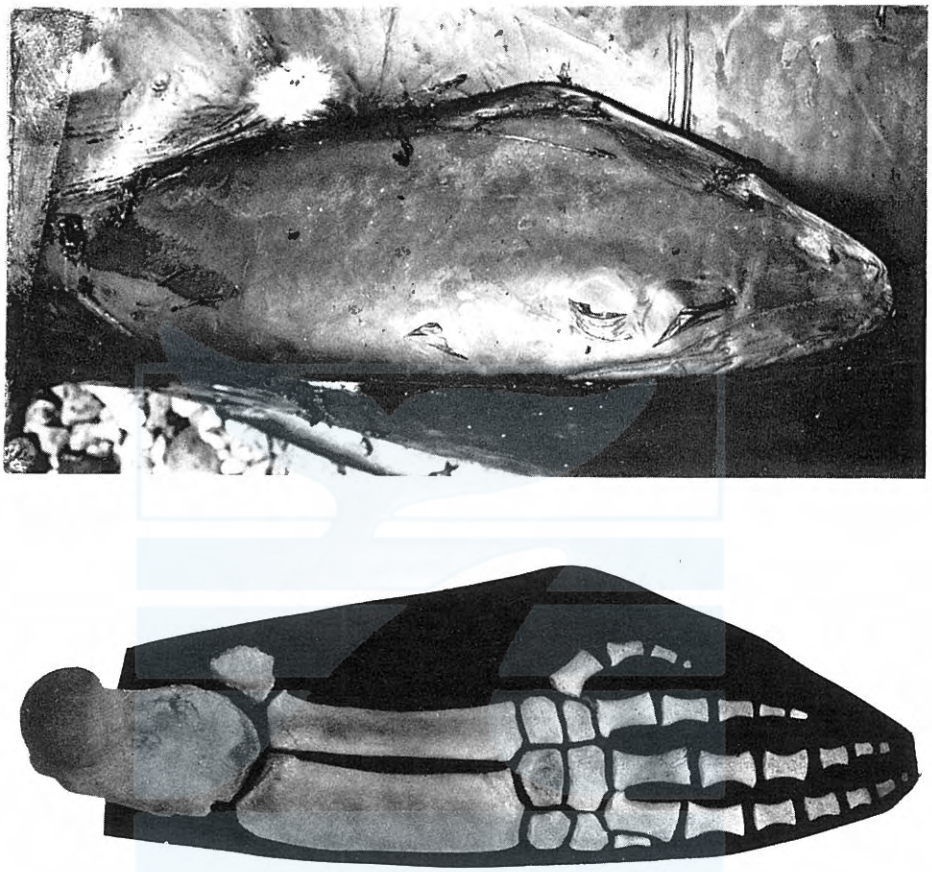

Fig. 5. Left flipper and phalangeal bones of *M. ginkgodens*, Ito specimen.

INNER ORGANS

Fig. 6 is a photograph of the left side view of exposed inner organs in the body cavity of Ito specimen. We found no unusual feature in them, in general, as organs of a toothed whale. But a considerable hypertrophy is seen in the spleen. We can not tell whether it is a normal size or a pathologic phenomenon caused by stranded stress. Although this species is a close relative of *Ziphius cavirostris* which has the stomach with multiple compartments, the stomach seen in this specimen was of dolphin type. The kydney is located comparatively posteriorly and the heart is larger in proportion than to those in other toothed whales.

Weight of each organ is indicated in Table 2.

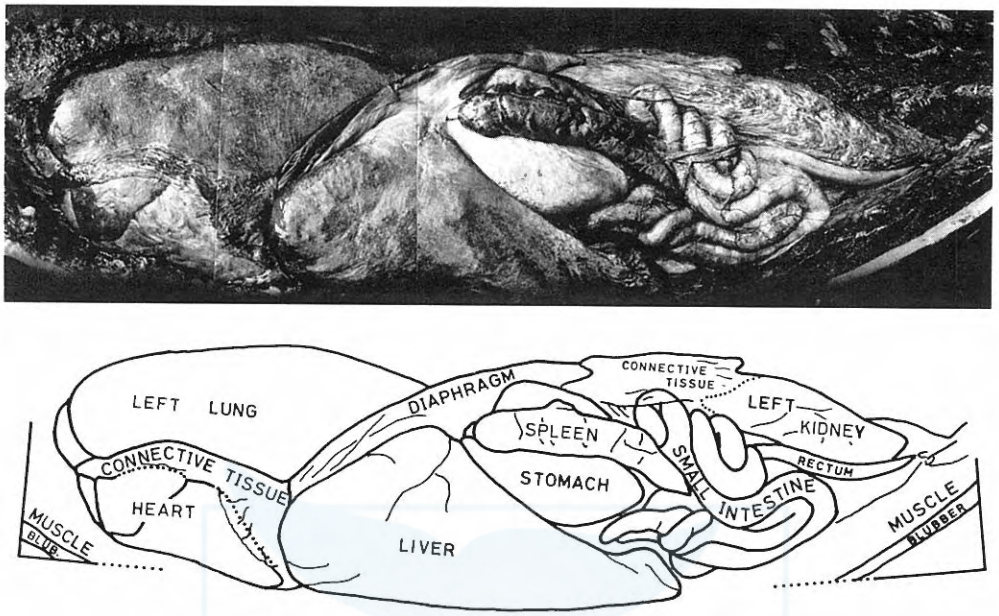

Fig. 6. Inner organs of *M. ginkgodens*, Ito specimen, showing their shape and position.

TABLE 2. WEIGHT OF INTERNAL ORGANS OF *MESOPLODON GINKGODENS*, ITO SPECIMEN (in Kg)

Lung	R.	10.80	Pancreas and Omentum		2.15
	L.	10.70	Corpus suprarenale	L.	0.010
Heart		5.60	Kidney	R.	8.40
Trachea and Esophagus		1.90		L.	7.20
Stomach[1)]		7.40	Urinary bladder		0.130
Intestine[2)]		11.10	Diaphragm		2.40
Mesenterium		1.78	Testis	R.	0.130
Liver		12.20		L.	0.140
Spleen		1.01	Others		2.29

1) Include stomach contents, 2) 16 m in length.

The testis weights of the Ito specimen were 140g (left) and 130g (right). These weights are unusually small compared with those from other whales of similar size. However, we are not yet able to tell if the condition of this animal was typical or pathological. The periferal tissue in the testis was in the puberty stage, mature tissue and sperm being found only around the ampulla of the vas deferens. Unfortunately there have been no previous descriptions of the *Mesoplodon* testis with which to compare our findings.

OSTEOLOGICAL EXAMINATION

Table 3 compares the skull dimensions of the three specimens in order to detect any differences between the Oiso (type) specimen and the other two. However, apart

TABLE 3. SKULL DIMENSIONS OF *MESOPLODON GINKGODENS*

			Oiso specimen		Kamakura specimen		Ito specimen	
			mm	percentage to the length	mm	percentage to the length	mm	percentage to the length
1.	Total (condylo-basal) length		779	100	716	100	762	100
2.	Length of rostrum (median)		476	61.1*	426	59.6	456	60.2
3.	Breadth of rostrum at base		208	26.7*	201	28.1	215	28.2
4.	Breadth of rostrum at middle		64	8.2	63	8.8	59	7.8
5.	Depth of rostrum at middle		54	6.9	—	—	47	6.2
6.	Breadth of premaxillae at middle of rostrum		47	6.0	—	—	47	6.2
7.	Breadth of premaxillae opposite premaxillary foramina		69	8.9	56	7.8	77	10.2
8.	Length of nasal suture line		48	6.2*	48	6.7	54	7.0
9.	Distance from tip of rostrum to anterior end of vomer visible on palate		160	20.5	140	19.6	207	27.3
10.	*Distance from tip of rostrum to* anterior margin of superior nares		578	74.2	499	69.7	547	72.2
11.	Greatest breadth across zygomatic processes of squamosal		357	45.7*	350	48.9	363	47.9
12.	Breadth across posterior margins of temporal fossae		218	28.0	200	27.9	227	29.8
13.	Length of tympanic bone	L.	41	5.3	41	5.7	45	5.9
		R.	42	5.4	43	6.0	46	6.1
14.	Breadth of occipital condyles		126	16.2	111	15.5	117	15.4
15.	Breadth of foramen magnum		47	6.0	38	5.3	40	5.3
16.	Height, vertex to inferior border of pterygoids		293	37.6	277	38.7	303	40.0
17.	Length of mandible	L.	666	85.5	621	86.7	640	84.5
		R.	672	86.3	621	86.7	642	84.7
18.	Length of symphysis		184	23.6	162	22.6	179	23.6
19.	Distance from anterior end of mandible to anterior end of alveolus	L.	180	23.1	193	27.0	211	27.9
		R.	183	23.5	199	27.8	213	28.1
20.	Distance from anterior end of mandible to posterior end of alveolus	L.	277	35.6	226	31.6	302	39.9
		R.	282	36.2	229	32.0	300	39.6
21.	Depth between angle and coronoid process	L.	121	15.5	110	15.4	114	15.0
		R.	122	15.7	111	15.5	115	15.2
22.	Length of tooth	L.	91	11.2	—	—	81	10.7
		R.	92	11.6	66	9.2	79	10.4
23.	Breadth of tooth at cervix (antero-posterior)	L.	99	12.7	—	—	83	11.0
		R.	99	12.7	56	7.8	77	10.2
24.	Breadth of tooth (transverse)	L.	16	2.1	11	1.5	16	2.1
		R.	16	2.1	11	1.5	16	2.1

* The figures have been changed from formerly published data (Nishiwaki and Kamiya, 1958).

TABLE 4. DIMENSIONS OF THE VERTEBRAE

Number of vertebrae		Kamakura specimen			Ito specimen				
		(1)	(2)	(3)	(1)	(2)	(3)	(4)	(5)
C.	1st						135		
	2nd*	53	131	183	33	124	118	42	52
	3rd						110		
	4th	16	100	82	14	95	92	42	39
	5th	16	104	88	14	106	92	41	42
	6th	17	104	95	15	120	88	43	43
	7th	19	136	128	20	158	124	47	47
D.	1st	25	183	156	26	198	159	48	57
	2nd	38	237	166	32	244	169	51	56
	3rd	50	262	163	49	266	171	53	53
	4th	58	271	158	57	279	164	52	53
	5th	65	281	157	62	280	164	53	51
	6th	71	290	156	67	283	162	54	47
	7th	78	303	154	73	295	156	50	44
	8th	85	313	109	79	299	154	49	40
	9th	89	321	197	85	306	175	48	34
	10th	95	322	266	92	319	233	46	32
L.	1st	101	334	289	97	327	275	45	32
	2nd	104	348	293	102	337	277	43	32
	3rd	108	360	296	107	355	286	42	32
	4th	111	366	296	111	361	291	43	32
	5th	115	375	291	115	367	294	42	31
	6th	118	372	283	119	372	294	43	31
	7th	123	377	276	124	379	294	40	29
	8th	131	379	266	129	390	293	34	23
	9th	134	379	261	134	395	286	30	24
	10th	138	368	261	138	395	277	30	22
	11th	142	354	262	142	386	272	28	21
Ca.	1st	140	346	257	143	381	269	23	18
	2nd	133	325	241	142	362	257	18	15
	3rd	127	307	223	130	341	235	15	14
	4th	122	287	204	123	313	218	14	14
	5th	116	257	181	115	281	196	12	12
	6th	109	232	147	107	247	169	11	10
	7th	106	203	121	100	224	143	10	8
	8th	101	172	98	95	190	117	10	9
	9th	94	148	(83)	90	166	97	7	7
	10th	89	119	(78)	83	141	82	6	6
	11th	75	(86)	(78)	69	113	76	3	4
	12th	54	(75)	(75)	50	78	76	—	—
	13th	44	(60)	(70)	40	61	70	—	—
	14th	39	(50)	(55)	37	51	62	—	—
	15th	37	(45)	(51)	36	48	54	—	—
	16th	36	(37)	(46)	35	43	50	—	—
	17th	32	(30)	(43)	32	33	44	—	—

Continued . . .

TABLE 4. Continued.

Number of vertebrae	Kamakura specimen			Ito specimen				
	(1)	(2)	(3)	(1)	(2)	(3)	(4)	(5)
18th	28	25	37	29	28	36	—	—
19th	24	19	29	24	22	30	—	—
20th	22	16	26		17	26	—	—
*				34				
21th	8	8	11		10	12	—	—

(1)=Length of body at center
(2)=Total height at anterior
(3)=Breadth between ends of transverse processes
(4)=Greatest height of neural canal
(5)=Greatest breadth of neural canal

C7+D10+L11+Ca21=49
* fused

from some minor individual differences, there was no distinct disparity.

There are various controversial criteria for defining the rostrum base. We chose to adopt the method of Moore (1963) who has carried out the most detailed examination of the *Mesoplodon* skull to date. The measurements of the Oiso specimen according to this method are a little different from those we published originally (Nishiwaki and Kamiya, 1958). The figures in Table 3 which have been changed accordingly are indicated by an asterisk.

The vertebral dimensions of two new specimens are shown in Table 4.

The rib collections from the Oiso and Kamakura specimens were not complete, but we presumed the complete number of the thoracic vertebrae to be ten from the shape and condition of the remaining ribs and attached vertebral bones. The rib measurements of Ito specimen are shown in Table 5. The Ito specimen was the first one which we collected with a complete rib cage, and many of its ribs on both sides had been broken and healed, as seen in the Plate VIII.

The number of lumbar vertebrae were 10 in the Oiso skeleton and 11 in the other two. This difference may only be due to difficulties in identifying the chevron bones, which are sometimes very small or not ossified, and then missed when the

TABLE 5. DIMENSIONS OF RIBS OF *MESOPLODON GINKGODENS*, ITO SPECIMEN (in mm).

Number of rib	Straight length		Along visceral border		Breadth at middle	
	Left	Right	Left	Right	Left	Right
1	320	313	435	445	54	54
2	449	453	580	587	44	43
3	518	535	678	682	34	33
4	567	583	732	743	31	31
5	587	592	745	741	29	30
6	589	595	745	746	30	29
7	602	618	742	746	30	30
8	606	614	705	695	28	28
9	559	578	648	638	27	26
10	508	506	568	545	18	18

bones are collected. Distinguishing between the lumbar and caudal vertebrae was therefore difficult.

The vertebral formula was same in the new specimens shown as follows:

$$C\ 7+D\ 10+L\ 11+Ca\ 21=49$$

In the vertebral column of Kamakura specimen, between No. 3 thoracic and No. 3 caudal vertebrae, their centrum and epiphyses have not ankylosed. On the other hand, all those in the Ito specimen have ankylosed as well as in the Oiso (type) specimen.

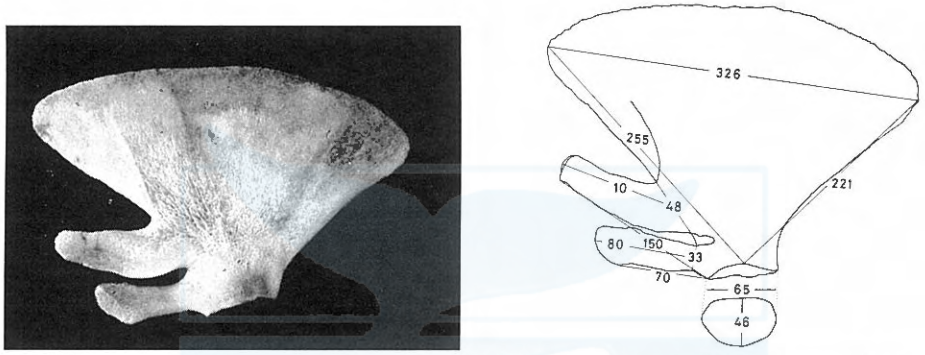

Fig. 7. Scapula of *M. ginkgodens*, Ito specimen and the measurements of Kamakura specimen.

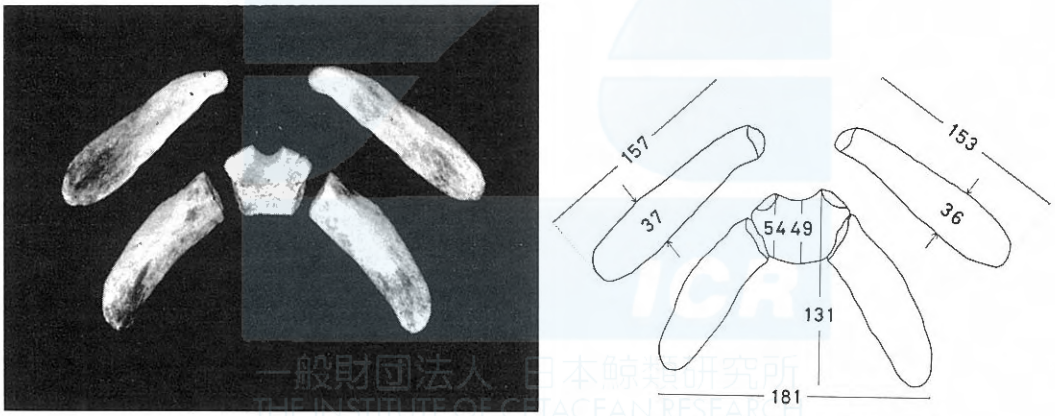

Fig. 8. Hyoid bones of *M. ginkgodens*, photograph of Kamakura specimen and measurements of Ito specimen.

The photographs of scapula, hyoids and pelvic bones of Ito specimen and the drawings and dimensions of scapula, hyoids and sternum bones of Kamakura specimen are shown in Fig. 7 through 10.

The dimensions of the chevron bones (Fig. 11) are indicated in Table 6.

Plate V shows the dorsal view of the mandible and teeth from each specimen, and Plate VI compares the inner-lateral and ventral root views of the right side tooth from each specimen. Although the absolute ages cannot be determined from the

teeth alone, the Kamakura specimen was certainly the youngest, but the elder two were indistinguishable. In the three specimens all but the apices of the teeth were buried under the gum.

The number of phalanges in both flippers of Ito specimen is shown by following formula.

I: 1, II: 7, III: 6, IV: 5, V: 4

Because of the partial decomposition, the reliable count was not obtained in Kamakura specimen.

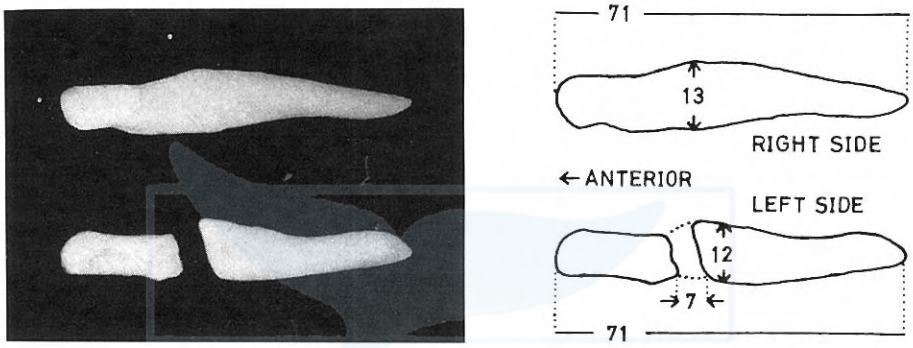

Fig. 9. Pelvic bones of *M. ginkgodens*, Ito specimen.

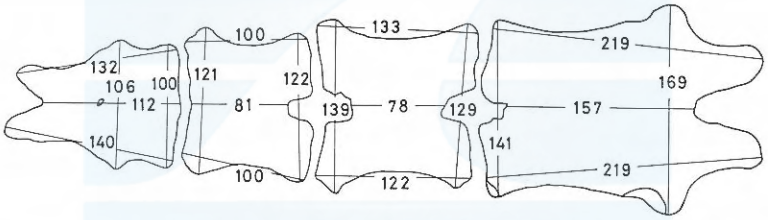

Fig. 10. Dimensions of sternal bones of *M. ginkgodens*, Ito specimen.

Fig. 11. Chevron bones of *M. gingodens*, Kamakura specimen.

We have discussed in an earlier paper (Nishimura and Nishiwaki, 1964) on the confusion over the four species of *Mesoplodon* in the North Pacific, *M. ginkgodens*, *M. densirostris*, *M. stejnegeri* and *M. carlhubbsi*. The Ayukawa speciemn (Nishiwaki and

TABLE 6. DIMENSIONS OF CHEVRON BONES OF *MESOPLODON GINKGODENS*, ITO SPECIMEN (in mm).

Number of chevron		Greatest length (antero-posterior)	Greatest breadth	Greatest height (supero-inferior)
1	R	54	—	49
	L	57	—	51
2		79	55	118
3		92	49	132
4		102	49	116
5		89	49	97
6		83	49	80
7		88	51	62
8		74	45	42
9		60	37	29
10	R	24	—	19
	L	24	—	14
11	R	18	—	10

Kamiya, 1969) attributed to *M. stejnegeri* was ascribed to *M. carlhubbsi* by Moore (1963) on the basis of several skull features including the controversial maxillary crest. The Akita speciemn (Nishiwaki, 1962) originally considered to be a *M. bowdoini*, was reidentified to be *M. stejnegeri* by Moore (1963), using similar criteria and viewing from the point of distributed area. While we are in agreement with the result of his identification, we consider that there will still remain some question on the validity of the morphology of maxillary crest as the specific character.

SUMMARY

1. We examined two similar specimen of toothed whale stranded in Sagami Bay, one of which was at Kamakura in 1968 and the other near Ito in 1971.

2. Their external proportions were little different from those of the Oiso (type) specimen.

3. There were no distinct osteological differences between these two and the Oiso (type) specimen.

4. The vertebral formula of the two specimens is as follows:

C 7+D 10+L 11+Ca 21=49

5. The phalangeal formula for Ito specimen is as follows:

I: 1, II: 7, III: 6, IV: 5, V: 4

6. We considered the two specimens to be *M. ginkgodens*.

7. The Oiso specimen (NSMT-M8744) is kept in the National Museum, while the Kamakura (TK 242) and Ito specimens (TK 366) are kept in the Taiji whale museum and the Ocean Research Institute of the University of Tokyo respectively.

ACKNOWLEDGEMENT

We wish to express our sincere gratitude to Dr. Masayuki Nakajima of the Enoshima Marineland and Mr. Akio Tamura of the Ito Aquarium who keenly noticed the rarely occurred individuals of *M. ginkgodens* and informed us.

We acknowledge the kindness of Mr. Hung-chia Yang of the Taiwan Fisheries Research Institute who informed us the catch position of the Taiwan specimens of *M. ginkgodens*.

Our sincere thanks are also due to Mr. Mitsuyoshi Aoki of the Tokai University who informed us the data of the Chōshi specimen.

We indebted deeply to Dr. Yoshinori Imaizumi of the National Science Museum for his contribution toward our re-examination on Oiso (type) specimen in the Museum.

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EXPLANATION OF THE PLATES

PLATE I

1. Right lateral aspect of *Mesoplodon ginkgodens*, Ito specimen.
2. Ventral aspect of *Mesoplodon ginkgodens*, Ito specimen.
3. Left side head of *Mesoplodon ginkgodens*, Ito specimen
4. Dorsal view of the snout of *Mesoplodon ginkgodens*, Ito specimen, showing the apices of teeth.

PLATE II

Dorsal view of the skulls of *Mesoplodon ginkgodens*, Oiso (Type), Kamakura and Ito specimens (top to bottom).

PLATE III

Ventral view of the skulls of *Mesoplodon ginkgodens*, Oiso (Type), Kamakura and Ito specimens (top to bottom).

PLATE IV

Lateral view of the skulls of *Mesoplodon ginkgodens*, Oiso (Type), Kamakura and Ito specimens (top to bottom).

PLATE V

Dorsal view of mandibles of *Mesoplodon ginkgodens*, Oiso (Type), Kamakura and Ito specimens (top to bottom).

PLATE VI

Left lateral view of vertebral column of *Mesoplodon ginkgodens*, Kamakura specimen, cervicals and thoracics, lumbars and caudals (top to bottom).

PLATE VII

Left leteral view of vertebral column of *Mesoplodon ginkgodens*, Ito specimen, cervicals and thoracics, lumbars and caudals (top to bottom).

PLATE VIII

Ventral view of rib cage with sternums of *Mesoplodon ginkgodens*, Kamakura specimen.

PLATE IX

Dorsal view of rib cage of *Mesoplodon ginkgodens*, Ito specimen.

PLATE X

Inner-lateral view and ventral view of right side tooth of *Mesoplodon ginkgodens*, Oiso (Type), Kamakura and Ito specimens (top to bottom).