FRASER'S DOLPHIN, *LAGENODELPHIS HOSEI* IN THE WESTERN NORTH PACIFIC

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ABSTRACT

During whale marking cruise from 20 January to 19 March 1976, 4 schools of *Lagenodelphis hosei* were sighted and two specimens were collected in the western tropical Pacific. The coloration and other external characters, skeletal measurements, and life history data of those two specimens are reported. Suggested distribution of the species is also noted in brief.

INTRODUCTION

The Fraser's dolphin (*Lagenodelphis hosei*) was named by F. C. Fraser in 1956. His examination was made on a skeleton collected by C. Hose in 1895 on a sea beach in Sarawak (Fraser 1956). Until 1972 there is no further records of the species. Perrin *et al.* (1973) reported external and skeletal characters of the specimens they collected from the eastern Pacific, south Africa, and Australia. Tobayama *et al.* (1973) described the external and skeletal characteristics, as well as the stomach content of the specimen collected from the western North Pacific. In this paper are reported the sighting and catch records of Fraser's dolphins, and the external and skeletal characteristics of two specimens captured in the western North Pacific.

MATERIALS AND METHODS

From 20 January to 19 March 1976, whale marking and sighting cruise was made by the *Miwa-maru* (199.68 grosstons, maximum speed 11 knot) in the western tropical Pacific. This cruise was conducted by Far Seas Fisheries Research Laboratory. In this survey four schools of Fraser's dolphin were sighted (Table 1) and two specimens of the species were collected (Table 2). These two specimens were photographed and examined alive or immediately after the death on board. They were frozen and brought to the laboratory. The skeletons of the two specimens were prepared for osteological study and measured there. Sexual organs were collected from both specimens and fixed in 10% formalin solution on board. The testes (TK 452) were histologically examined and the ovaries (TK 451) were

TABLE 1. RECORDS OF SPORADIC CATCH OF *LAGENODELPHIS HOSEI*

No.	Date	Position	Body length (cm)	Body weight (kg)	Sex	Sexual condition	Author	Comments
1	— — 1895	Sea beach in Sarawak	—	—	—	physically mature	Fraser, 1956	Holotype BMNH, 1895.5.9.1 collected in British Museum
2	31 X 1969	Kaohsiung (22°37′N, 120°17′E)	—	—	—	calf	Tobayama *et al.* 1973	HCY 69/10 (TKO 310) collected in Ocean Research Institute, Univ. of Tokyo
3	27 I 1971	05°00′N, 95°45′W	226	—	♂	unknown	Perrin *et al.* 1973	LK 22
4	27 I 1971	05°00′N, 95°45′W	110.2	19.3	♂	calf	Perrin *et al.* 1973	LR 23 (USNM 39079) collected in US National Museum
5	17 II 1971	30°47′S, 30°58′E	236	164	♀	pregnant	Perrin *et al.* 1973	PBB 71/3 (SAM 36322) collected in South Africa Museum
6	19 II 1971	30°09′S, 32°20′E	264	209	♂	physically mature	Perrin *et al.* 1973	PBB 71/4 (SAM 36323) collected in South Africa Museum
7	1 III 1971	30°10′S, 153°10′E	226	—	♀	adult	Perrin *et al.* 1973	
8	17 II 1972	29°33′S, 32°12′S	225.9	130	♀	subadult	Perrin *et al.* 1973	PBB 72/2 (PEM 1517/93) collected in Port Elizabeth Museum
9	20 V 1972	05°00′N, 122°22′W	—	—	—	—	Perrin *et al.* 1973	Three more dolphins (all females) were captured in a set net on yellow fin tuna
10	25 V 1972	Kamogawa (35°06′N, 140°06′E)	235	129	♂	physically mature	Tobayama *et al.* 1973	KSW 72/5 (TKO 3—) collected in Ocean Research Institute, Univ. of Tokyo
11	23 I 1976	23°15′N, 138°27′E	231	—	♀	immature	Present data	TK 451, collected in Ocean Research Institute, Univ. of Tokyo
12	1 II 1976	01°33′N, 142°04′E	183.5	—	♂	immature	Present data	TK 452, collected in Ocean Research Institute, Univ. of Tokyo

TABLE 2. SIGHTING RECORDS OF *LAGENODELPHIS HOSEI*

No.	Date	Position	Time	Surface temperature (°C)	School size	Author	Comments
1	11 V11 1966	0°, 165°W	—	—	400	Perrin *et al.* 1973	—
2	23 1 1976	23°15′N, 138°27′E	10:00	22.9	200–300	Present data	One specimen (TK 451) collected from this school
3	1 11 1976	01°33′N, 142°04′E	13:10	30.0	40–50	Present data	One specimen (TK 452) collected from this school
4	2 11 1976	03°00′N, 141°55′E	10:30	29.5	40–50	Present data	—
5	20 11 1976	01°43′N, 164°53′E	12:10	28.7	400–500	Present data	—

examined in detail at the laboratory.

CATCH AND SIGHTING RECORDS

Catch records of twelve Fraser's dolphins ever reported are shown in Table 1. From this table it can be said that the female *L. hosei* may attain sexual maturity at around 225–235 cm in body length. The data that the specimen TK 451 may situate in the early stage of ovulation (see page 236) appears to support above result. The five sighting records of *L. hosei* (Table 2) show that the species is gregarious and is distributed in warmer waters. Summing up all catch and sighting records of Fraser's dolphins, the species were found between 40°N and 40°S in the Pacific and Indian Oceans (Fig. 1). This result supports the suggestion of Perrin *et al.* (1973) that the species may continuously distribute in tropical high-seas of the Pacific and Indian Oceans.

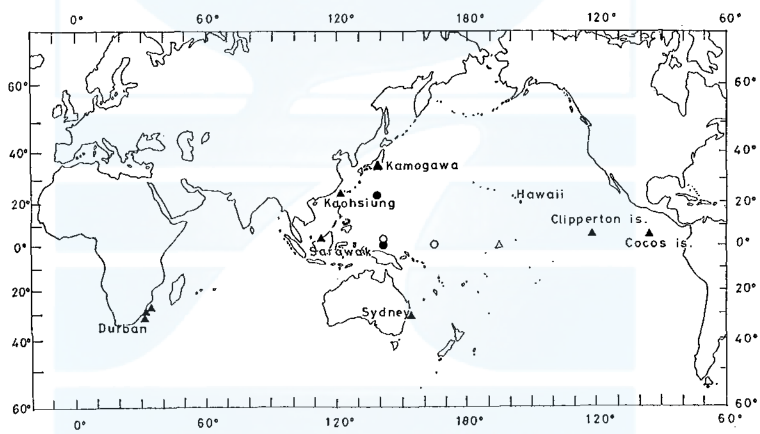

Fig. 1. Recorded occurrences of *Lagenodelphis hosei*. Circles represent new records. Triangles are previously published records. Black symbols are specimen localities; white ones are sighted localities.

COLORATION

A single greyish yellow lateral stripe which extends from above the eye to the genital area is very characteristic in Fraser's dolphin. This stripe is broader and darker in one specimen TK 451 than in another specimen TK 452. The width of this stripe in the specimen TK 451 was 5.5 cm on the midway between the eye and the genital area. The flipper stripe has double structure. In the specimen TK 451 the upper stripe is 4.0 cm in width on the midway and the lower is 3.5 cm. Eye patch, eye stripe, blowhole stripe, lip patch, and beak blaze, termed by Mitchell (1970), were observed in two animals TK 451 and TK 452, and these color was darker in the specimen TK 451 than in the specimen TK 452. Accord-

TABLE 3. EXTERNAL MEASUREMENTS OF

	Measurement	Eastern Pacific specimens LR 22 —	LR 23 (USNM396079)	South PBB 7 1/4 (SAM36322)
1	Total length	226 cm (100%)	110.2 cm (100%)	236 cm (100%)
2	Tip of upper jaw to centre of eye	—	17.7(16.1)	33(14.0)
3	Tip of upper jaw to apex of melon	4.5(2.0)	1.8(1.6)	4.5(1.9)
4	Length of gape	—	14.3(13.0)	27.5(11.7)
5	Tip of upper jaw to external auditory meatus	—	21.1(19.1)	—
6	Centre of eye to angle of gape	—	4.0(3.6)	5.5(2.3)
7	Centre of eye to centre of blowhole	—	11.0(10.0)	21(8.9)
8	Tip of upper jaw to blowhole	—	16.5(15.0)	33.5(14.2)
9	Tip of upper jaw to anterior insertion of flipper	—	24.5(22.2)	46(19.5)
10	Tip of upper jaw to tip of dorsal fin	—	61.0(55.4)	133(56.4)
11	Tip of upper jaw to umbilicus	—	51.5(46.7)	110(46.6)
12	Tip of upper jaw to centre of genital aperture	—	71.3(64.7)	165(69.9)
13	Tip of upper jaw to centre of anus	—	78.8(71.5)	175(74.2)
14	Projection of lower jaw beyond upper	—	0	0.3
15	Girth at axilla	—	61.7(56.0)	110(46.6)
16	Maximum girth	—	—	132(55.9)
17	Girth at anus	—	37.9(34.4)	70(29.7)
18	Width of blowhole	—	2.0	2.5
19	Length of flipper, to anterior insertion	25.1(11.1)	15.2(13.8)	27(11.4)
20	Length of flipper, to axilla	18.8(8.3)	10.5(9.3)	19.5(8.3)
21	Width of flipper	6.6(2.9)	4.8(4.4)	8(3.4)
22	Height of dorsal fin	17.8(7.9)	7.6(6.9)	17(7.2)
23	Span of flukes, tip to tip	49.5(21.9)	22.8(20.7)	57(24.1)
24	Width of fluke, from notch to neraest point on anterior border	—	7.7(7.0)	13(5.5)

ing to Perrin *et al.* (1973) a light patch in the center of the dorsal fin was observed in the large eastern Pacific specimen (male, 226 cm in body length), but this patch was not observed in our two specimens. There were four definite black spots on the beak, and these spots were bilaterally symmetrical on the midway of the beak. The dorsum above the lateral stripe is dark greyish black, and the dorasl fin and both sides of the flippers and tail flukes are similarly coloured. Ventrum is white tinged with pink. This colour is very conspicuous in the leaping dolphin. Ventral views of the genital areas of the two specimens TK 451 and TK 425 reveal the sexual dimorphism in coloration (Plates IV and V).

BODY PROPORTION

Body proportion of nine specimens are given in Table 3. The ratio of the length of head region to body length appears to decrease with growth and to be larger in the female than in the male, as may be seen from Table 3. The measurements concerning the positions of umbilicus and genital aperture show the sexual dimorphism. In the male, umbilicus situated slightly anteriorly than in the female. The distance between umbilicus and genial aperture is larger in the female than

NINE SPECIMENS OF *LAGENODELPHIS HOSEI*

African specimens		Australian specimen	Western Pacific specimens		
PBB 7 1/4 (SAM36323)	PBB 7 2/2 (PEM1517/93)		KSW 7 2/5 (TDO3—)	(TK 451)	(TK 452)
264 cm (100%)	225.9 cm (100%)	226 cm (100%)	235 cm (100%)	231 cm (100%)	183.5 cm (100%)
33(12.5)	33.1(14.7)	29.5(13.1)	28.0(11.9)	31.0(13.4)	28.5(15.5)
3(1.1)	4.8(2.1)	3.5(1.5)	3.0(1.3)	2.6(1.1)	4.0(2.2)
27(10.2)	28.0(12.4)	24(10.6)	24.0(10.2)	27.0(11.7)	23.0(12.5)
39(14.8)	38.2(16.9)	34.5(15.3)	33.5(14.2)	37.5(16.2)	33.5(18.3)
6(2.3)	6.0(2.7)	4.4(1.9)	—	—	—
23(8.7)	19.7(8.7)	17.6(7.8)	—	—	—
28(10.6)	30.9(13.7)	28.6(12.7)	31.0(13.2)	32.0(13.9)	27.0(14.7)
43(16.3)	45.8(20.3)	42.0(18.6)	41.0(17.4)	—	40.5(22.1)
132(50.0)	118.4(52.4)	—	103.3(43.9)	127.0(55.0)	93.5(51.0)
116(43.9)	106.9(47.3)	—	108.0(45.9)	109.0(47.2)	88.0(48.0)
170(64.4)	157.2(69.6)	—	156.5(66.5)	159.0(68.8)	21.0(65.9)
189(71.6)	187.7(83.0)	—	169.5(72.1)	165.0(71.4)	133.5(72.8)
1	0.6	0.4	1.0	0.8	0.5
—	106.9(47.3)	—	106.9(45.4)	—	—
—	116.5(51.6)	—	116.3(49.5)	124.0(53.7)	94.0(51.2)
92(34.8)	70.0(31.0)	—	74.2(31.5)	70.5(30.5)	51.5(28.1)
4	2.5	2.4	2.5	—	—
28.8(10.9)	26.7(11.8)	25.5(11.3)	L26.0(11.1)	29.0(12.6)	23.5(12.8)
21.5(8.1)	20.0(8.9)	17.3(7.7)	L17.5(7.4)	21.0(9.1)	16.5(9.0)
9.4(3.6)	8.3(3.7)	8.1(3.6)	L8.4(3.6)	9.0(3.9)	8.0(4.4)
22(8.3)	15.9(7.0)	15.0(6.6)	17.5(7.4)	17.0(7.4)	11.5(6.3)
59(22.3)	50.9(22.5)	47.0(20.8)	53.0(22.6)	53.0(22.9)	38.0(20.7)
14.2(5.4)	13.4(5.9)	12.6(5.6)	L15.2(6.5)	—	—

in the male, but the distance between genital aperture and anus is reverse. The size of flipper corresponding to body length seems to decrease with growth, and to be larger in the female than in the male. On the other hand, the height of dorsal fin appears to become higher with growth, and to be higher in the male than in the female corresponding to body length.

LIFE HISTORY DATA

Several teeth collected from the centre of tooth row of two specimens TK 451 and TK 452 were prepared by the method of Kasuya (1976), and examined under the microscope (×40 to× 400) using low intensity transmitted light. The numbers of laminations observed were as follows: Specimen TK 451, 11 in the dentine and 11 in the cementum; Specimen TK 452, 4 in the dentine and 4 in the cementum.

The stomach of the animal TK 451 contained the fishes, the shrimps, and the squids, but that of the animal TK 452 had nothing.

During the preparation for the skull in the specimen TK 451 several tens nematodes were observed in ear cavity, but in the specimen TK 452 no nematodes was found.

The testis weights of the specimen TK 452 were 8.6 g in the left and 8.6 g in the right. Histological examination of the left testis showed no spermatozoa in the tissue. Therefore the male TK 452 was determined to be immature. In the specimen TK 451 no corpora was observed in both ovaries. The weights of ovaries were 3.0 g in the left and 1.3 g in the right. The largest Graafian follicle was observed in the left ovary and its size was 3 mm in diameter. As the left ovary of the specimen was heavier than the right and the diameter of Graafian follicle of the left ovary became bigger, the immature female TK 451 seemed to be in the stage of approaching first ovulation.

OSTEOLOGY

Skull: The dimensions of the seven skulls of Fraser's dolphin are given in Table 4. The widths of the snout and skull seem to be broader in the male than in the female, as may be seen from Table 4. The premaxillae of the two specimens TK 451 and TK 452 are not fused. In both specimens it is characteristic that rostrum is flat, and the width of premaxillae is almost not variable throughout the rostrum length.

Axial skeleton: The vertebral formulae of the specimens TK 451 and TK

TABLE 4. SKELETAL MEASUREMENTS AND MERISTICS

Measurement or count	Sarawak specimen (holotype BMNH 1895.5.9.1)	South African PBB 7 1/3 (SAM 36322) ♀ 236
Condylobasal length	413 mm (100%)	429 mm (100%)
Length of rostrum	226(54.7)	240(55.9)
Width of rostrum at base	121(28.3) (53.5% of rost. ln.)	119(27.7) (49.6% of rost. ln.)
Width of rostrum at midlength	71(17.2)	71(16.6)
Width of rostrum 60 mm anterior to antorbital notches	85(20.5)	86(20.0)
Least supraorbital width	202(48.8)	202(47.1)
Preorbital width	207(50.1)	207(48.3)
Postorbital width	230(55.7)	229(53.4)
Zygomatic width	225(54.5)	225(52.4)
Parietal width	170(41.2)	161(37.5)
Maximum width of premaxillae	82(19.9)	78(18.2)
Length of upper left tooth row	194(46.9)	193(45.0)
Length of lower left tooth row	193(46.7)	198(46.2)
Length of left ramus	350(84.7)	367(85.5)
Coronoid height of left ramus	70(16.9)	65(15.2)
Length of symphysis	36(8.7)	37(8.6)
Number of teeth	ca. $\left\{\frac{43 \mid 44}{40 \mid 42}\right.$	$\frac{40 \mid 42}{39 \mid 39}$
Total number of vertebrae	80 ± 2	78
Vertebral formula	C7D15L21C37±2	C7D16L21C34

452 are C7 (first 2 fused)+D15+L21+Ca35=78, and C7 (first 2 fused)+D15+L20+Ca36=78, respectively. The atlas and axis are fused together in both specimens. All epiphyses of cervical vertebrae are fused to their centra in both specimens, but epiphyses of vertebrae from D1 to Ca16 in the specimen TK 451 and from D1 to Ca19 in the specimen TK 452 are not fused. Figure 3 shows the change of the greatest height, the greatest breadth, and the length of vertebrae in three specimens. The greatest height appears to reach the maximum at around lumbar 7–9, and becomes larger in all the vertebrae with body length. The greatest breadth seems to attain at the maximum in around the last dorasl, and increases in dorsal, lumbar and anterior part of caudal vertebrae with body length. The lengths of dorsal, lumbar, and caudal vertebrae increase with body length but those of cervical do not. The length of vertebrae appears to attain at maximum around dorsal 8–13, and have the second peak in the around middle part of caudal vertebrae. The atlas shows higher value than the other cervical bones in both the greatest height and breadth. Both height and breadth of centrum increase with serial number, and appear to reach the maximum around at caudal 24 and 18, respectively (Fig. 3).

In the specimen TK 451 there are 15 pairs of ribs. The first four pairs of ribs possess two heads (Table 5). As the ribs of the specimen TK 452 were broken it is impossible to describe here.

OF SEVEN SPECIMENS OF *LAGENODELPHIS HOSEI*

specimens	Western Pacific specimens			
PBB 7 1/4 (SAM 36323) ♂ 264	KSW 7 2/5 (TKO 3—) ♂ 235	HCY 6 9/10 (TKO 310) —	(TK 451) ♀ 231	(TK 452) ♂ 183.5
440 mm (100%)	423 mm (100%)	415 mm (100%)	430 mm (100%)	386 mm (100%)
241(54.8)	235(55.5)	232(56.1)	240(55.8)	212(54.9)
130(29.5)	128(30.2)	113(27.0)	131(30.5)	106(27.5)
(53.9% of rost. ln.)	(54.5% of rost. ln.)	(48.7% of rost. ln.)	(54.6% of rost. ln.)	(50.0% of rost. ln.)
80(18.2)	77(18.2)	62(14.9)	78(18.1)	59(15.3)
101(23.0)	91(21.5)	78(18.8)	91(21.2)	71(18.4)
218(49.5)	209(49.4)	195(47.0)	208(48.4)	179(46.4)
223(50.7)	213(50.3)	197(47.5)	214(49.8)	184(47.7)
247(56.1)	234(55.3)	210(50.0)	237(55.1)	204(52.8)
240(54.5)	229(54.1)	broken	230(53.5)	199(51.6)
177(40.2)	190(44.9)	161(38.8)	203(47.2)	172(44.6)
83(18.9)	70(16.5)	74(17.8)	83(19.3)	67(17.4)
213(48.4)	199(47.0)	203(48.9)	201(46.7)	185(47.9)
207(47.0)	192(45.3)	208(50.1)	212(49.3)	185(47.9)
375(85.2)	broken	357(86.0)	373(86.7)	331(85.8)
71(16.1)	70(16.5)	65(15.6)	69(16.0)	60(15.5)
31(7.0)	32(7.5)	41(9.9)	—	—
42 42	40 42	41 39	39 39	39 39
41 40	37+ 40	41 42	41 41	40 40
78±1	81		78	78
C7D16L+C55±1	C7D15L20C39		C7D15L21C35	C7D15L20C36

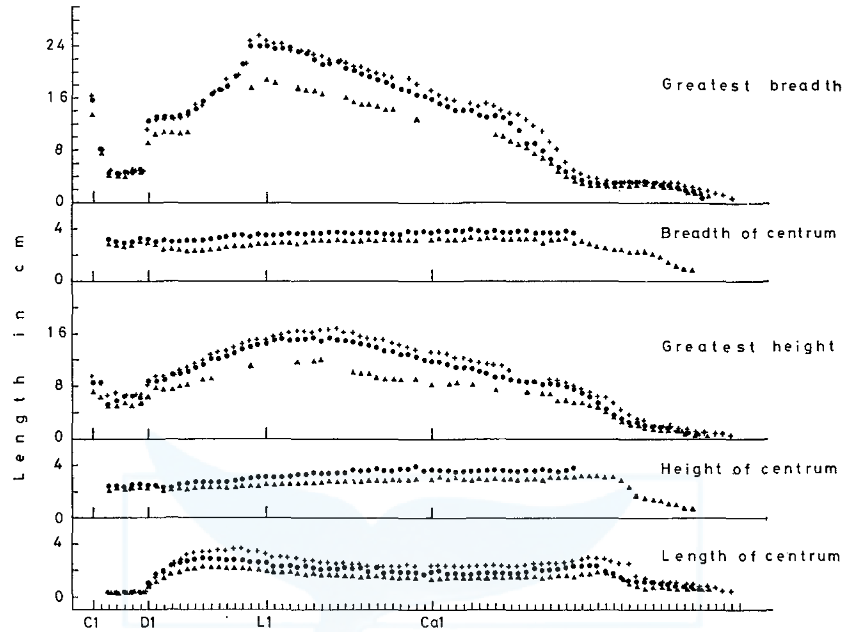

Fig. 2. Comparison of size of each vertebra in three specimens of *Lagenodelphis hosei*. Closed circle indicates the specimen (TK 451), closed triangle the specimen (TK 452), and double crosses the Kamogawa specimen (cited from Tobayama *et al.* 1973).

TABLE 5. DIMENSIONS OF LEFT RIBS OF *LAGENODELPHIS HOSEI*

Specimen TK 451			Specimen TK 452		
No. of ribs	Straight length (mm)	Breadth at middle (mm)	No. of ribs	Straight length (mm)	Breadth at middle (mm)
1	132*	22	1	124*	17
2	188*	18	2	164*	13
3	241*	14	3	—	12
4	276*	13	4	212*	11
5	296	13	5	—	11
6	308	12	6	222	11
7	312	12	7	212	10
8	315	11	8	222	10
9	313	11	9	—	9
10	306	11	10	—	8
11	300	11	11	—	10
12	291	12	12	—	8
13	285	11	13	—	7
14	280	9	14	—	5
15	252	5	15	—	—

* Ribs with two heads

TABLE 6. DIMENSION OF OTHER BONES OF *LAGENODELPHIS HOSEI* (in mm)

	Specimen TK 451	Specimen TK 452
ATLAS		
Greatest width of articulating surface	86	79
Height (from internal anterodorsal margin of neural canal to bottom of anterior face of body)	54	52
Length of lateral process (from margin of anterior articulaing surface to farthest point at end of process)	36	28
Greatest length of neural spine	31	23
STERNUM		
Greatest width of manubrium	115	68
Length of manubrium along midline	74	59
Depth of anterior notch of manubrium	43	29
SCAPULA		
Height (from posterior margin of glenoid fossa to coracovertebral angle)	141	97
Length (from posterior margin of glenoid fossa to glenovertebral angle)	139	85
Greatest length of coracoid process (from anterior margin of glenoid fossa)	43	26
Greatest width of coracoid process	31	21
Greatest width of metacromion process (from apex of ventral curvature to vertebral apex)	47	32

The measurements of atlas, sternum, and scapulae are shown in Table 6.

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APPENDIX TABLE MEASUREMENTS OF VERTEBRAE OF *LAGENODELPHIS HOSEI* (in mm)

SPECIMEN TK451

Serial no.	Vertebral no.	Greatest breadth	Greatest height	Centrum			Neural canal		Degree of* fusion of epiphyses
				Breadth	Height	Length	Breadth	Height	
1	C 1	15.9	8.6	—	—	—	3.9	3.4	A
2	2	8.1	8.6	—	—	—	3.1	—	A
3	3	4.5	5.3	3.2	2.4	0.2	2.5	2.8	A
4	4	4.4	5.7	3.0	2.4	0.3	2.4	2.6	A
5	5	4.7	6.4	2.9	2.3	0.3	2.5	2.4	A
6	6	4.7	6.4	3.0	2.5	0.3	2.7	2.4	A
7	7	5.1	6.2	3.2	2.5	0.3	2.9	2.3	A
8	D 1	12.2	8.8	3.2	2.4	1.1	3.9	2.3	C
9	2	13.1	8.8	3.0	2.4	1.7	3.8	2.6	C
10	3	13.0	9.0	3.1	2.3	2.0	3.8	3.0	C
11	4	12.9	9.8	3.0	2.3	2.4	3.8	3.2	C
12	5	13.3	9.9	3.0	2.5	2.6	3.7	3.4	C
13	6	13.9	10.3	3.1	2.6	2.7	3.7	3.4	C
14	7	14.6	10.9	3.1	2.7	2.8	3.5	3.3	C
15	8	15.6	11.4	3.1	2.7	2.9	3.1	3.2	C
16	9	16.5	12.1	3.2	2.7	2.9	2.8	3.0	C
17	10	17.1	12.2	3.3	2.7	2.9	2.5	2.9	C
18	11	17.8	12.7	3.4	2.7	2.8	2.4	2.9	C
19	12	19.4	13.2	3.5	2.8	2.8	2.4	2.8	C
20	13	21.1	13.7	3.5	2.9	2.8	2.2	2.6	C
21	14	23.7	14.0	3.4	3.0	2.6	2.0	2.6	C
22	15	23.7	14.4	3.6	3.1	2.6	1.8	2.6	C
23	L 1	23.7	14.7	3.5	3.1	2.6	1.9	2.5	C
24	2	23.4	15.1	3.5	3.1	2.3	1.8	2.6	C
25	3	23.4	15.2	3.5	3.1	2.3	1.7	2.6	C
26	4	23.7	15.0	3.6	3.2	2.4	1.8	2.6	C
27	5	22.9	15.2	3.6	3.3	2.3	1.7	2.6	C
28	6	22.4	15.2	3.6	3.3	2.3	1.6	2.7	C
29	7	21.8	15.3	3.6	3.4	2.2	1.5	2.6	C
30	8	21.1	14.9	3.6	3.4	2.0	1.4	2.5	C
31	9	21.2	15.3	3.7	3.4	2.1	1.4	2.7	C
32	10	21.7	15.0	3.7	3.4	2.1	1.4	2.7	C
33	11	20.6	14.8	3.7	3.4	2.2	1.3	2.3	C
34	12	20.0	14.6	3.6	3.6	2.1	1.3	2.4	C
35	13	19.5	14.4	3.7	3.6	2.2	1.2	2.5	C
36	14	19.2	14.1	3.6	3.6	1.9	1.2	2.5	C
37	15	18.6	13.9	3.7	3.7	2.2	1.2	2.5	C
38	16	18.2	13.6	3.6	3.6	1.8	1.2	2.2	C
39	17	17.7	13.3	3.6	3.6	1.9	1.1	2.1	C
40	18	17.4	13.0	3.6	3.7	1.9	1.1	2.1	C
41	19	17.0	12.9	3.8	3.7	1.8	1.1	2.1	C
42	20	16.5	12.4	3.7	3.9	1.8	1.0	2.1	C

Continued . . .

* A indicates complete fusion of epiphyses, C no fusion of epiphyses, B intermidiate stage between A and C.

APPENDIX TABLE Continued.

Serial no.	Vertebral no.	Greatest breadth	Greatest height	Centrum			Neural canal		Degree of* fusion of epiphyses
				Breadth	Height	Length	Breadth	Height	
43	21	16.1	12.0	3.8	3.6	1.6	1.0	2.0	C
44	Ca 1	15.8	11.9	3.7	3.7	1.9	0.8	1.9	C
45	2	15.1	11.8	3.8	3.6	2.0	0.8	1.9	C
46	3	14.7	11.4	3.8	3.6	1.7	0.8	1.8	C
47	4	14.1	10.9	3.9	3.5	1.8	0.8	1.8	C
48	5	14.0	10.7	3.8	3.5	1.7	0.7	1.6	C
49	6	14.0	10.7	3.9	3.5	1.7	0.7	1.6	C
50	7	13.2	10.3	3.8	3.6	1.8	0.7	1.5	C
51	8	12.9	10.0	3.7	3.6	1.8	0.6	1.3	C
52	9	13.1	9.5	3.8	3.6	1.8	0.5	1.2	C
53	10	12.9	9.4	3.7	3.6	1.8	0.5	1.2	C
54	11	12.1	9.1	3.7	3.6	1.8	0.5	1.1	C
55	12	11.0	8.9	3.8	3.5	1.8	0.4	1.0	C
56	13	8.9	8.6	3.8	3.6	1.9	0.4	1.0	C
57	14	8.8	8.5	3.7	3.6	2.2	0.3	1.0	C
58	15	7.7	8.3	3.7	3.7	2.0	0.3	0.8	C
59	16	6.5	8.3	3.7	3.6	2.1	0.3	0.8	C
60	17	5.3	8.1	3.7	3.5	2.1	0.3	0.7	B
61	18	4.3	7.8	3.8	3.6	2.2	0.3	0.6	B
62	19	3.9	7.4	3.7	3.8	2.3	—	—	B
63	20	3.2	6.9	—	—	2.3	—	—	B
64	21	3.0	6.2	—	—	2.3	—	—	A
65	22	2.9	5.5	—	—	2.3	—	—	A
66	23	2.9	4.5	—	—	1.9	—	—	A
67	24	3.0	3.6	—	—	1.7	—	—	A
68	25	3.1	3.2	—	—	1.4	—	—	A
69	26	3.3	2.5	—	—	1.2	—	—	A
70	27	3.3	2.4	—	—	1.1	—	—	A
71	28	3.3	2.0	—	—	1.1	—	—	A
72	29	3.0	1.9	—	—	1.1	—	—	A
73	30	2.8	1.7	—	—	1.0	—	—	A
74	31	2.5	1.5	—	—	0.9	—	—	A
75	32	2.2	1.2	—	—	0.8	—	—	A
76	33	2.0	1.0	—	—	0.7	—	—	A
77	34	1.6	0.7	—	—	0.7	—	—	A
78	35	0.7	0.5	—	—	0.7	—	—	A
SPECIMEN TK452									
1	C 1	13.6	7.3	—	—	—	3.8	3.3	A
2	2	7.5	6.3	—	—	—	2.9	2.7	A
3	3	4.1	5.3	2.8	2.0	0.3	2.4	2.7	A
4	4	4.1	5.1	2.8	2.2	0.3	2.3	2.6	A
5	5	3.9	5.5	2.6	2.2	0.3	2.4	2.5	A
6	6	5.1	5.2	2.8	2.2	0.4	3.1	2.2	A
7	7	4.4	5.7	3.1	2.3	0.3	2.7	2.3	A
8	D 1	9.1	6.1	2.9	2.3	0.8	3.7	2.4	C
9	2	10.3	7.8	2.8	2.4	1.1	3.7	2.2	C

Continued...

APPENDIX TABLE Continued.

Serial no.	Vertebral no.	Greatest breadth	Greatest height	Centrum			Neural canal		Degree of* fusion of epiphyses
				Breadth	Height	Length	Breadth	Height	
10	3	10.6	7.5	2.4	2.1	1.4	3.6	2.5	C
11	4	10.5	7.5	2.4	2.1	1.7	3.5	2.7	C
12	5	10.5	7.9	2.3	2.1	1.8	3.4	2.9	C
13	6	10.7	8.2	2.3	2.1	2.0	3.4	2.9	C
14	7	—	—	2.3	2.2	2.1	3.3	3.0	C
15	8	—	9.0	2.3	2.3	2.2	3.1	2.9	C
16	9	—	9.3	2.4	2.3	2.2	2.8	2.9	C
17	10	—	—	2.4	2.3	2.2	2.5	2.7	C
18	11	—	—	2.6	2.3	2.1	2.2	2.9	C
19	12	—	—	2.6	2.3	2.1	2.0	2.7	C
20	13	—	—	2.6	2.4	2.1	1.9	2.7	C
21	14	17.6	11.0	2.7	2.4	2.0	1.8	2.7	C
22	15	—	—	2.8	2.4	2.0	1.7	2.7	C
23	L 1	18.4	—	2.8	2.5	1.9	1.6	2.6	C
24	2	18.2	—	2.8	2.5	1.8	1.6	2.8	C
25	3	—	—	2.9	2.5	1.8	1.4	2.7	C
26	4	—	—	2.9	2.6	1.9	1.5	2.6	C
27	5	17.3	11.7	2.9	2.6	1.7	1.4	2.7	C
28	6	17.2	—	2.9	2.6	1.6	1.3	2.6	C
29	7	17.0	11.8	3.0	2.6	1.7	1.3	2.7	C
30	8	16.5	11.8	3.0	2.6	1.6	1.2	2.5	C
31	9	—	—	3.0	2.7	1.6	1.1	—	C
32	10	—	—	3.1	2.7	1.6	1.1	2.5	C
33	11	15.9	—	3.0	2.7	1.5	1.1	2.5	C
34	12	15.2	10.0	3.0	2.7	1.5	1.0	2.3	C
35	13	14.8	9.7	3.0	2.7	1.4	0.9	2.2	C
36	14	14.8	9.9	3.1	2.8	1.5	1.1	2.3	C
37	15	14.5	9.3	3.0	2.8	1.5	0.9	2.3	C
38	16	14.0	9.2	3.0	2.8	1.4	0.8	2.0	C
39	17	14.0	9.2	3.1	2.9	1.4	0.8	2.1	C
40	18	—	9.1	3.1	2.9	1.4	0.8	2.0	C
41	19	—	—	3.1	2.9	1.4	0.7	2.1	C
42	20	12.4	9.2	3.1	2.9	1.4	0.7	1.9	C
43	Ca 1	—	8.2	3.1	2.9	1.3	0.6	1.9	C
44	2	—	—	3.2	3.0	1.3	0.7	1.7	C
45	3	—	8.3	3.1	2.9	1.4	0.6	1.6	C
46	4	—	8.4	3.1	3.0	1.4	0.6	1.6	C
47	5	—	—	3.1	2.8	1.4	0.6	1.4	C
48	6	—	8.1	3.2	2.8	1.3	0.6	1.5	C
49	7	—	—	3.1	2.9	1.3	0.6	1.5	C
50	8	—	—	3.2	2.8	1.3	0.5	1.2	C
51	9	10.0	7.5	3.2	2.9	1.4	0.5	1.2	C
52	10	9.9	—	3.1	2.8	1.3	0.5	1.1	C
53	11	9.4	—	3.1	2.9	1.4	0.4	0.9	C
54	12	8.8	—	3.1	2.8	1.4	0.3	0.8	C
55	13	8.2	7.0	3.1	2.9	1.4	0.3	0.7	C
56	14	7.5	—	3.1	2.9	1.4	0.3	0.7	C

Continued . . .

APPENDIX TABLE Continued.

Serial no.	Vertebral no.	Greatest breadth	Greatest height	Centrum			Neural canal		Degree of* fusion of epiphyses
				Breadth	Height	Length	Breadth	Height	
57	15	6.8	6.5	2.8	2.8	1.3	0.3	0.7	C
58	16	5.9	6.5	3.1	3.0	1.4	0.2	0.6	C
59	17	4.9	5.9	3.1	3.0	1.5	0.2	0.5	C
60	18	3.9	5.9	3.1	3.0	1.5	0.2	0.4	C
61	19	3.4	5.6	2.8	3.0	1.4	0.2	0.4	C
62	20	3.2	5.5	3.0	3.0	1.6	0.2	0.4	B
63	21	2.8	5.0	2.8	3.1	1.6	0.2	0.4	B
64	22	2.6	4.4	2.6	3.1	1.8	0.1	0.2	B
65	23	2.5	4.0	2.5	3.0	1.8	0.2	0.2	B
66	24	2.5	3.5	2.4	3.0	1.5	0.1	0.1	B
67	25	2.4	2.9	2.4	2.8	1.4	—	—	A
68	26	2.4	2.5	2.2	2.3	1.0	—	—	A
69	27	2.5	2.1	2.2	1.6	0.7	—	—	A
70	28	2.6	1.6	2.2	1.4	0.5	—	—	A
71	29	2.5	1.4	2.0	1.3	0.6	—	—	A
72	30	2.6	1.3	1.8	1.2	0.7	—	—	A
73	31	2.3	1.3	1.4	1.0	0.6	—	—	A
74	32	2.0	1.1	1.1	0.9	0.6	—	—	A
75	33	1.8	1.0	0.9	0.7	0.6	—	—	A
76	34	1.6	0.8	0.8	0.6	0.7	—	—	A
77	35	1.6	0.8	—	—	0.6	—	—	A
78	36	1.2	0.5	—	—	0.5	—	—	A

EXPLANATION OF PLATES

PLATE I

Fig. 1. Dorsal view of skull of specimen TK 451.
Fig. 2. Ventral view of skull of specimen TK 451.
Fig. 3. Lateral view of skull of specimen TK 451.
Fig. 4. Posterior view of skull of specimen TK 451.

PLATE II

Fig. 1. Dorsal view of skull of specimen TK 452.
Fig. 2. Ventral view of skull of specimen TK 452.
Fig. 3. Lateral view of skull of specimen TK 452.
Fig. 4. Posterior view of skull of specimen TK 452.

PLATE III

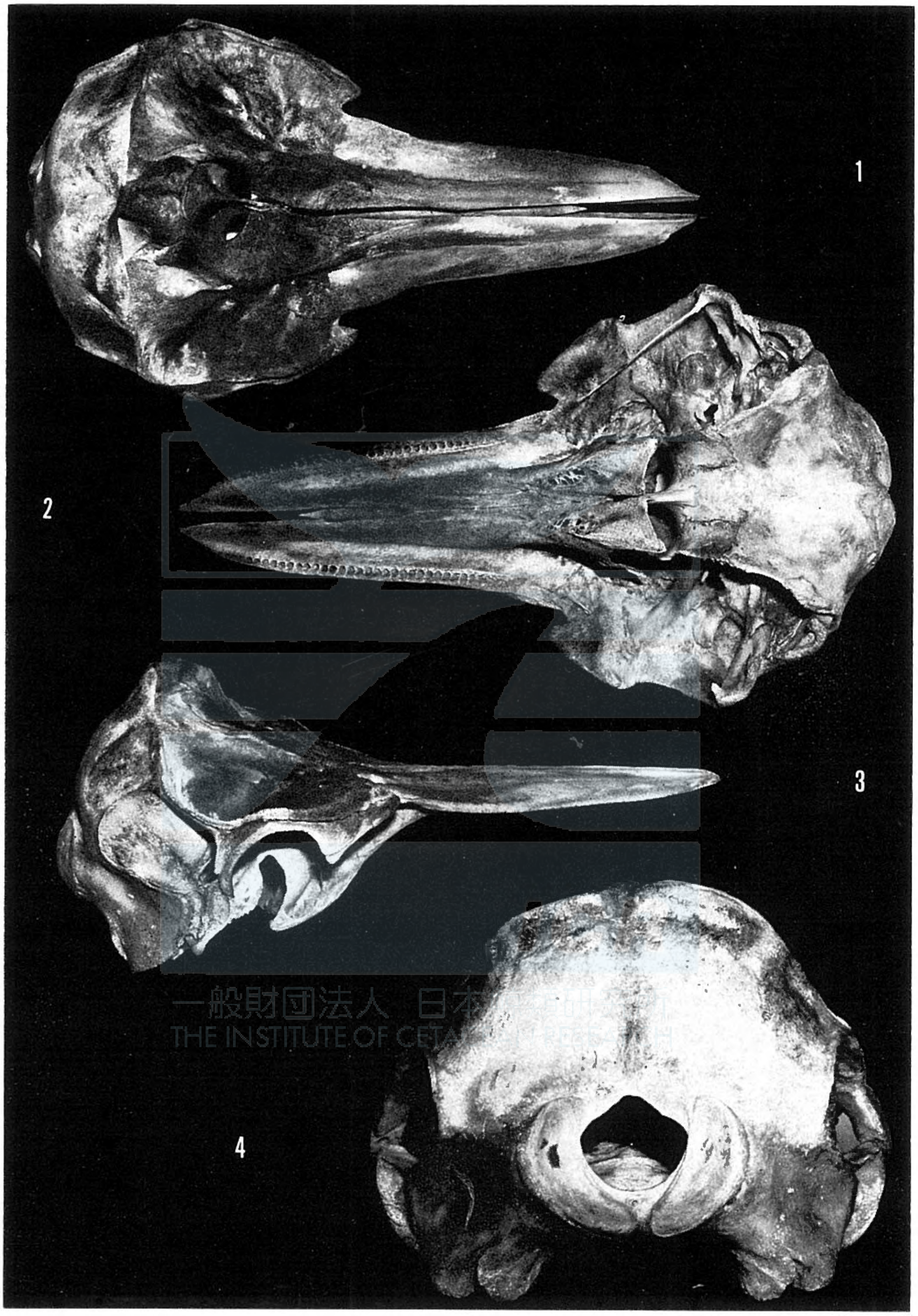
Fig. 1. Lateral view of specimen TK 452.
Fig. 2. Ventral view of specimen TK 452.
Fig. 3. Dorsal view of specimen TK 452.
Fig. 4. Anterior view of the cephalic region of specimen TK 452.
Fig. 5. Lateral view of the cephalic region of specimen TK 452.

PLATE IV

Fig. 1. Ventral view of the cephalic region of specimen TK 452.
Fig. 2. Ventral view of the genital region of specimen TK 452.
Fig. 3. Lateral view of the dorsal fin of specimen TK 452.
Fig. 4. Dorsal view of the cephalic region of specimen TK 452.
Fig. 5. Dorsal view of the caudal region of specimen TK 452.

PLATE V

Fig. 1. Lateral view of specimen TK 451.
Fig. 2. Lateral view of the cephalic region of specimen TK 451.
Fig. 3. Ventral view of the genital region of specimen TK 451.
Fig. 4. A part of the school of *Lagenodelphis hosei* sighted at 03°00′N, 141°55′E, on 2 February 1976.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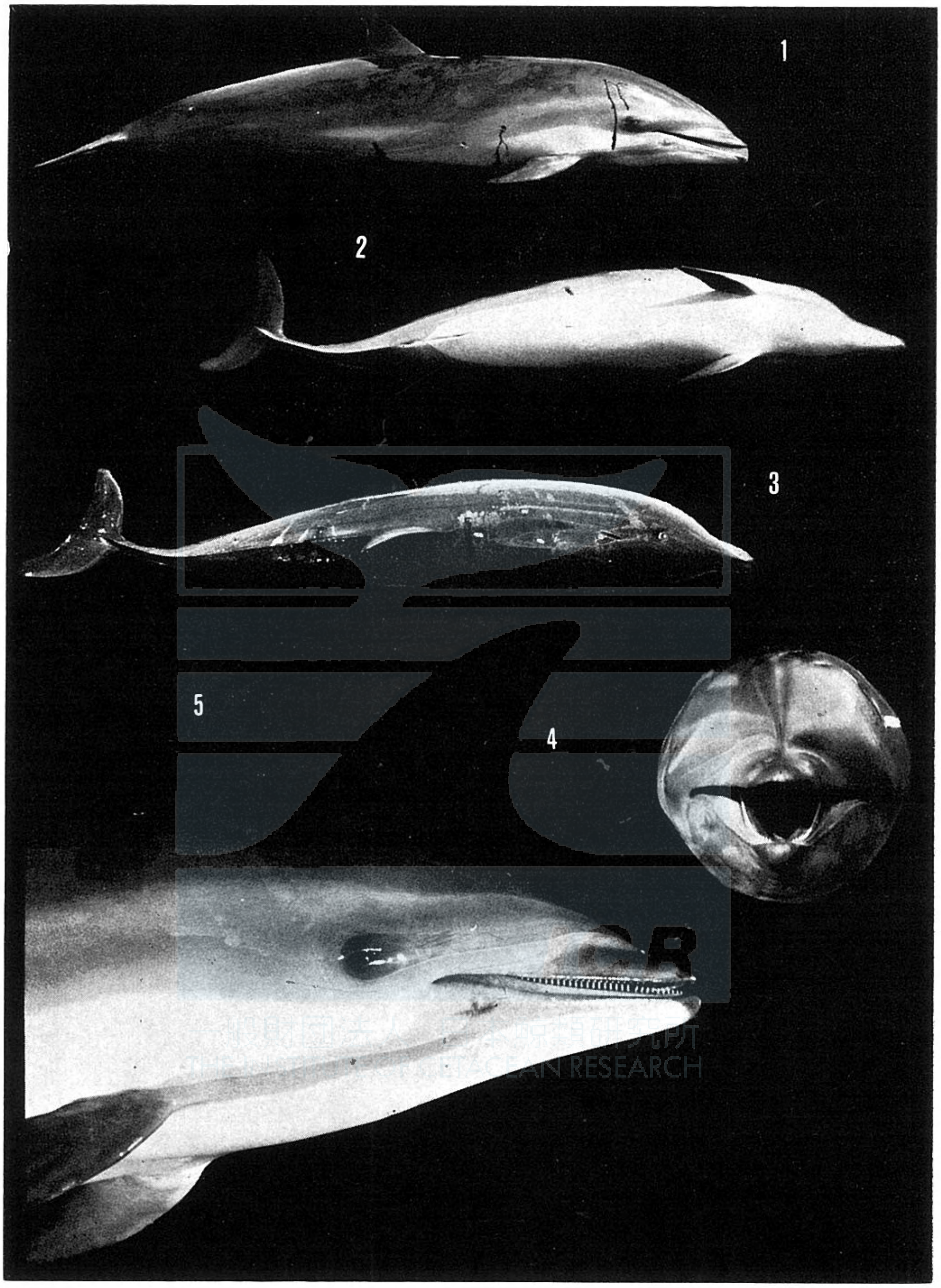
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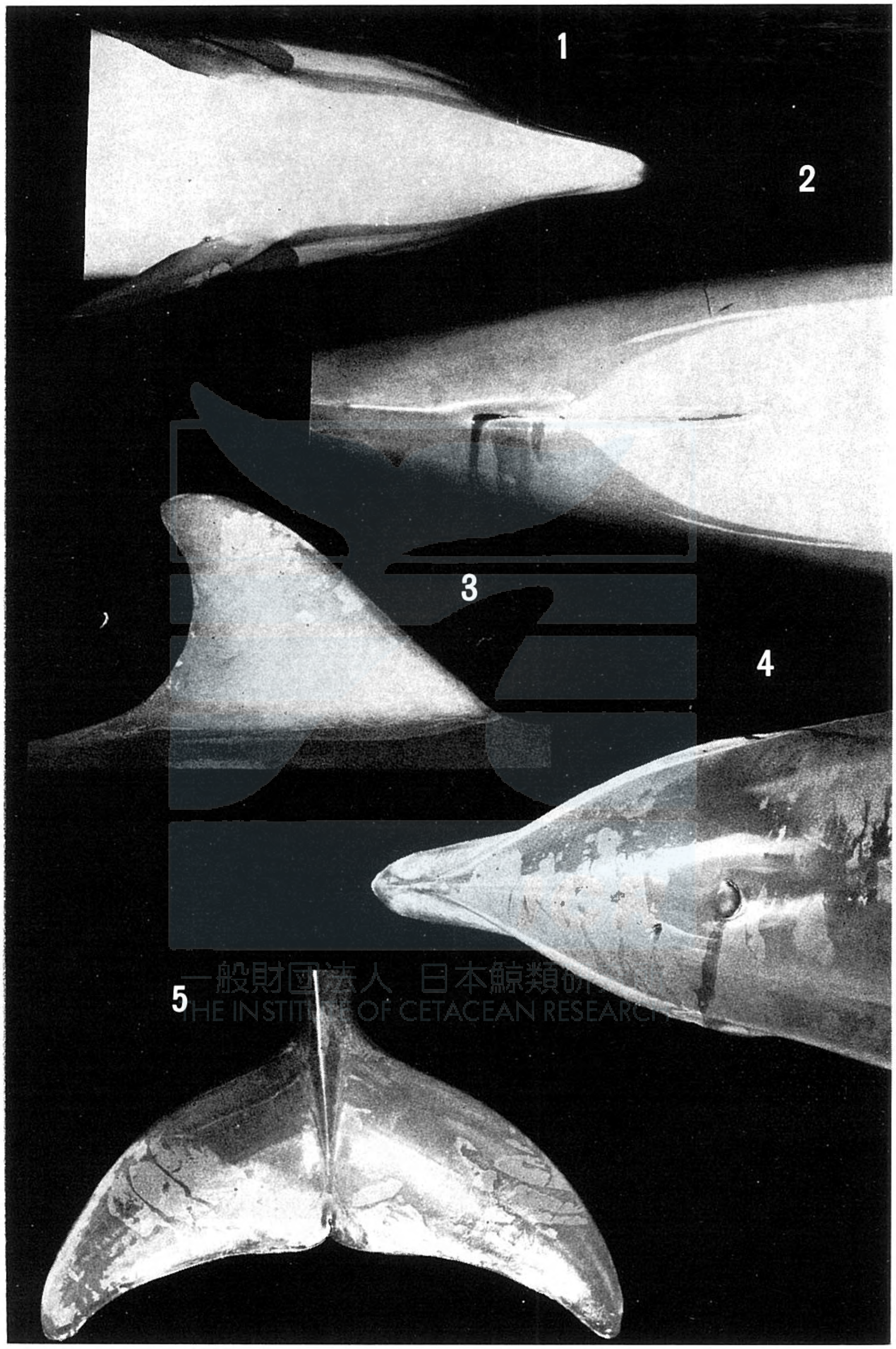
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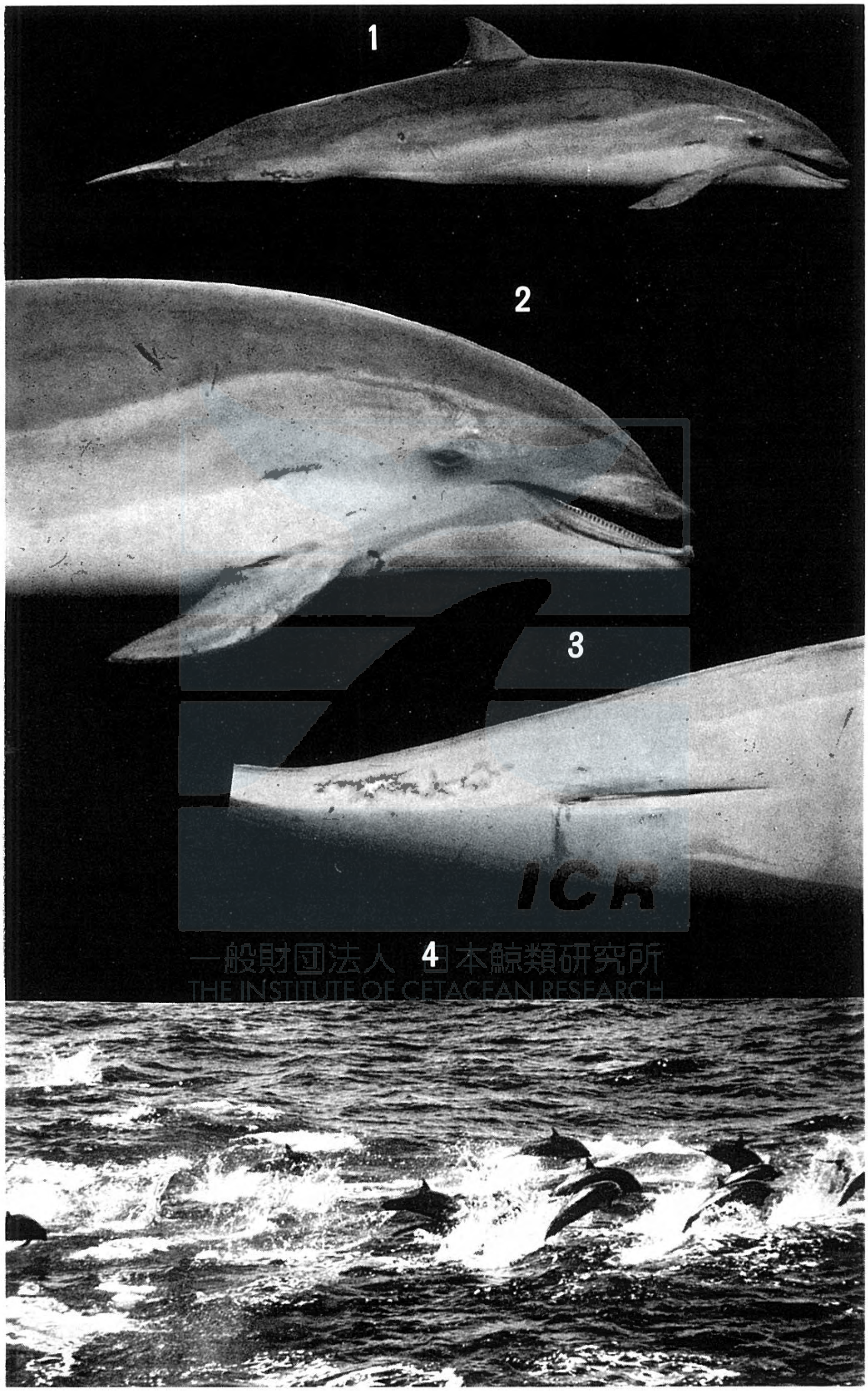
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