BODY AND ORGAN WEIGHT OF STRIPED AND SPOTTED DOLPHINS OFF THE PACIFIC COAST OF JAPAN

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ABSTRACT

Weights of body and thirteen organs of striped and spotted dolphins off the Pacific coast of Japan are presented in relation to age, body length and body weight. Sexual dimorphism is observed on body weight, and muscle, bone and spleen weight indicating that males have larger weight than females. Actual weights of organs attain the plateau at about 15 years, at 8 to 10 years, or at 2 years of age. Growth of organs expressed by the relative organ weight is classified into three types: (1) the ratio increases in the prenatal stage, then decreases in the juvenile stage, (2) the ratio increases in both stages, (3) the ratio decreases in the former stage, then increases in the latter. Growth coefficients of five organs (muscle, bone, kidney, pancreas and stomach) are larger in the postnatal stage than in the prenatal stage, while in other eight organs (viscera, blubber, brain, heart, lungs, liver, intestine and spleen) the growth pattern is reverse. The striped dolphin has heavier heart and longer intestine than the spotted dolphin of the same region. Present results were compared between published records of some cetaceans.

INTRODUCTION

Informations on organ weight are valuable for understanding of growth and physiological condition of the animals. Especially, in the study of the accumulation of organochlorines and heavy metals in the striped dolphin, *Stenella coeruleoalba* (Meyen, 1833), and the spotted dolphin, *Stenella attenuata* (Gray, 1846), being conducted by our project team, these informations are expected to be useful for estimating the amount of residues deposited in the organs from the data of concentration.

The weight of various organs of *Stenella* has been reported by several scientists. Organ weight of striped dolphins in the Mediterranean Sea was obtained from 12 juvenile or subadult dolphins (range: 147–196 cm in body length) (Gihr and Pilleri, 1969). Perrin and Roberts (1972) reported organ weight of 68 eastern Pacific spotted dolphins (range: 78–218 cm), and 14 eastern Pacific spinner dolphins (range: 105–177 cm). However, they did not analyze the relationship of organ weight and age, but the relationship of organ weight and body weight. The analysis of the former relationship is considered to throw a light on the further under-

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standing of growth of the species.

The present study was undertaken to describe and analyze the growth of organs in the striped and spotted dolphins, and to compare the growth pattern of the species with that of other cetaceans.

MATERIALS AND METHODS

Specimens used in the present study were obtained from 11 schools of *S. coeruleoalba* and 5 schools of *S. attenuata* caught at Kawana (34°56′N, 139°09′E), Futo (34°56′N, 139°09′E) or Taiji (33°35′N, 135°57′E) on the Pacific coast of Japan. The date covers 5 fishing seasons from 1968 to 1979 (Table 1).

Striped dolphins collected from 2 schools at Taiji on 18 December, 1978 (Date of the driving: 17 December, 1978) and 5 December, 1979 (Date of the driving: 4 December, 1979) were stored frozen at −20°C or less for about three months, and then their organs were accurately weighed in the laboratory. Organs under

TABLE 1. LIST OF THE SPECIMENS USED IN THE PRESENT STUDY

Date of examination	Locality	Number of specimens			
		Fetus	Female	Male	Total
Stenella coeruleoalba					
18 XI '68	Kawana	— (17)	— (—)	— (—)	— (17)
18 X '70	Kawana	— (—)	2 (1)	6 (3)	8 (4)
22 X '70	Futo	3 (1)	— (—)	— (—)	3 (1)
25 X '70	Kawana	— (—)	— (—)	1 (—)	1 (—)
25 XI '70	Kawana	— (—)	7 (6)	1 (1)	8 (7)
26 XI '70	Kawana	— (2)	— (—)	— (—)	— (2)
27 XI '70	Kawana	— (2)	— (—)	— (—)	— (2)
30 XI '70	Futo	— (9)	— (—)	— (—)	— (9)
2 XII '70	Kawana	— (4)	2 (3)	1 (2)	3 (7)
3 XII '70	Kawana	— (2)	— (—)	— (—)	— (2)
10 XII '70	Kawana	— (—)	1 (1)	— (—)	1 (1)
15 XII '71	Kawana	— (23)	1 (—)	12 (—)	13 (23)
19 XII '78	Taiji	11 (11)	11 (11)	9 (9)	31 (13)
6 XII '79	Taiji	4 (4)	8 (8)	1 (1)	13 (13)
15 XII '79	Taiji	1 (1)	— (—)	— (—)	1 (1)
unknown	Kawana	— (9)	— (—)	— (—)	— (9)
Total		19 (83)	32 (30)	31 (16)	82 (129)
Stenella attenuata					
22 X '70	Kawana	— (—)	8 (4)	2 (1)	10 (5)
25 X '70	Kawana	— (12)	— (—)	— (—)	— (12)
31 X '70	Futo	— (1)	— (—)	— (—)	— (1)
6 XI '70	Futo	— (3)	7 (—)	3 (—)	10 (3)
10 XI '70	Kawana	— (—)	23 (19)	12 (11)	35 (30)
12 XI '70	Kawana	— (7)	— (—)	— (—)	— (7)
16 XI '70	Futo	— (37)	— (—)	— (—)	— (37)
Total		— (60)	38 (23)	17 (12)	55 (95)

Figures in parentheses indicate the number of individuals which were measured of their body weight only.

1 kg, those from 1 to 10 kg and those over 10 kg were measured in 0.1 g, 1 g and 10 g unit, respectively. In striped and spotted dolphins collected at Kawana and Futo between 1968 and 1971, lungs, liver and intestine were weighed in 10 g unit with spring scale in the field, and the other organs examined were weighed to 0.1 g in the laboratory within 24 hours after death. Body weight of the dolphins of the former case was measured in laboratory in 100 g unit before the dissection, and in the latter case it was obtained by combining the following two values; the body weight excluding viscera weighed by fishermen to the nearest 1 kg and the viscera weight obtained by Miyazaki as mentioned above. In both cases, the body weight of pregnant females having fetus was measured excluding the fetal and placental weight. Few females with corpus luteum and having no fetus are tentatively dealt as pregnant.

On 5 December 1979 only four pregnant females were collected at Taiji, and they show the extraordinary values of viscera, bone, heart and lungs weight compared with the females of the same sexual condition of the other fishing seasons. The difference is statistically significant ($p<0.001$). Although true reason of this difference is not clear, it will be reasonable to ignore these extraordinary data. In this report, these data are presented in Appendix Tables and text figures, but they are excluded from the following analyses.

Muscle was weighed after chipping it from bone as much as possible, but some fragments of muscle were not able to be completely separated from bone. Thus, the muscle weight presented here shows slightly lower value than the real weight while the bone weight slightly higher than the real. Brain weight was measured after opening the skull. Stomach was weighed after separating four compartments and removing their contents, while intestine was weighed without removing the content because of difficulty of removing them.

The fetal age calculated from the fetal growth curve of Miyazaki (1977) is used in plotting the organ or body weight data in text figures. However, for the description and analyses of growth pattern the fetal stage is divided into three stages, the early (0–20 cm in body length), the middle (20–60 cm) and the late (60 cm–) fetal stages.

Based on Kasuya's method (1976) of age determination developed for the striped and the spotted dolphins, age was determined by counting the growth layers in dentine for the animals younger than 11 years and those in cementum for older animals. In the young animal of 177 cm or less in body length, age was estimated from age-body length relationship of *S. coeruleoalba* of Miyazaki (1977). The striped dolphins having the left testis exceeding 15.5 g were defined as the mature individual.

Weights of 13 organs (muscle, blubber, bone, viscera, heart, lungs, liver, kidney, pancreas, stomach, intestine, spleen and brain) of *S. coeruleoalba* were analyzed against age, body weight and body length However, in *S. attenuata* the latter eight organs were analyzed only in relation to the body weight and body length. The relationship of organ weight and body weight were calculated for the equation $\text{Log}\,Y=a+b\,\text{Log}\,X$ by the least squares method, where Y represents organ weight in g, X, body weight in g, and b, Huxley's (1932) " growth coefficient ". The growth coefficients of the relationship between organ weight and body weight were obtained excluding pregnant females. This equation was also used for the relationship between body weight (Y in g) and body length (X in cm). All the correlations examined in this study were statistically significant ($p<0.001$). All the data analyzed in this study are shown in Appendix Tables 1, 2 and 3.

RESULTS

Body weight

Body weights of 83 fetal and 29 postnatal striped dolphins are plotted on age (Fig. 1). The growth in the first two years is rapid. The body weights at the age of 1 year (49 kg) and 2 years (61 kg) are about 4 and 5 times as much as the value of 12 kg at birth, respectively. Since the body weight of the pregnant females is not significantly different from that of the non-pregnant adult females ($0.2<p<0.3$), the body weights of these females are not dealt separately in this section. As shown in Fig. 1, body weight of striped dolphins attains the plateau at the age of 15 years. The asymptotic body weights calculated as the mean of four males and 10 females

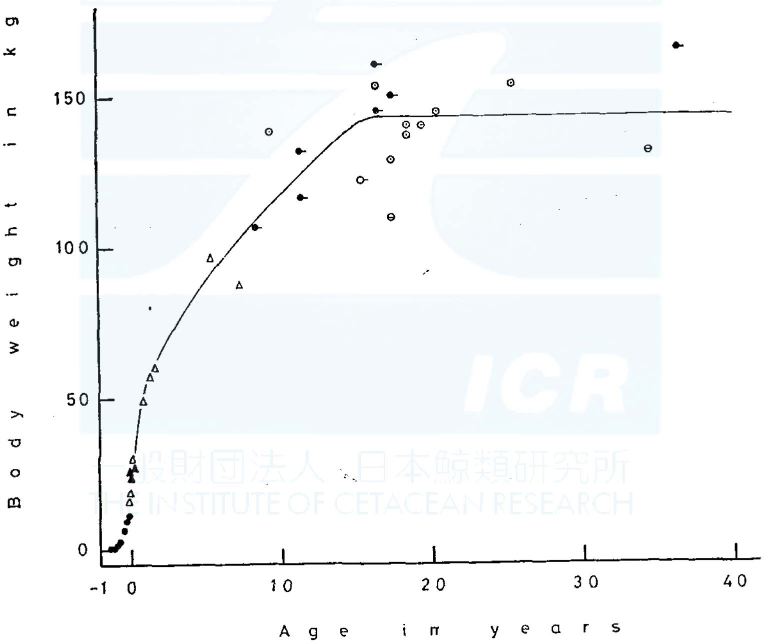

Fig. 1. The relationship between body weight and age in the striped dolphin off the Pacific coast of Japan. Closed circle with bar indicates mature male, open circle with dot pregnant female, open circle with external bar resting female, open circle with internal bar lactating female, closed triangle immature male, open triangle immature female, and closed circle the mean of fetuses in each 10 cm of body length interval.

over 15 years of age are 157.5 kg and 135.9 kg, respectively. The difference between sexes is significant ($p<0.02$).

The relationships between body weight and body length given in Table 2 are obtained from 83 fetal and 46 postnatal striped dolphins (16 males and 30 females), and 60 fetal and 35 postnatal spotted dolphins (12 males and 23 females). As the relationship of body weight and body length in the striped dolphins can be expressed by two equations (Fig. 2), the two regression lines are calculated for 9 fetuses below 7 cm of body length and for 74 fetuses of 7 cm or more. The value b for the former stage is 1.563 and is certainly lower than 2.779 of the value for the latter stage. The value of b of all the postnatal females is 2.910 and is close to 2.975 of the postnatal males. These two values are higher than above two values of fetuses.

All fetuses of the spotted dolphins presented here range from 6.5 to 29.5 cm in body length. The body weight-body length relationship of the species in this range can be shown by a single equation (Fig. 3). The value of growth coefficient b of these fetuses is 2.859, and is higher than any of the two values calculated for the fetal striped dolphins (Table 3). Since body weight of the postnatal spot-

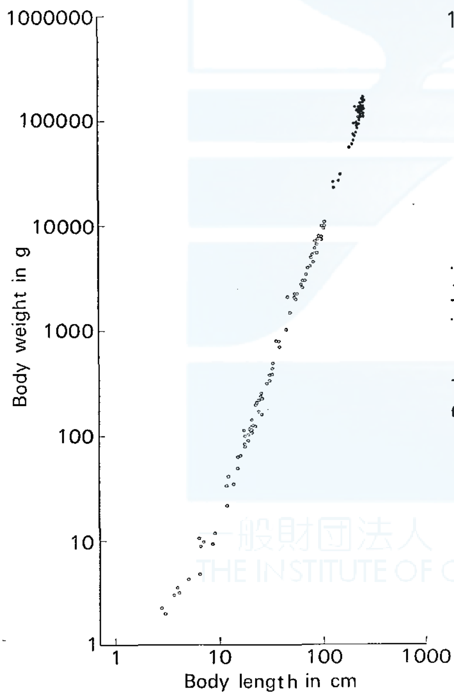

Fig. 2.

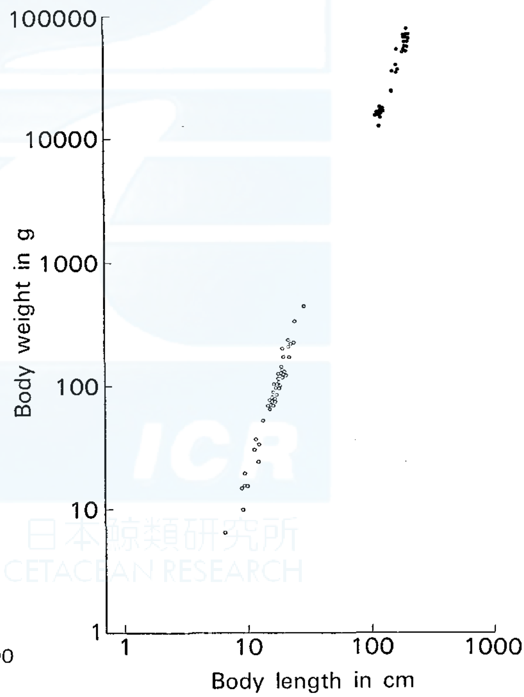

Fig. 3.

Fig. 2. The relationship between body weight and body length in the striped dolphin off the Pacific coast of Japan. Open circle indicates fetuses and closed circle postnatal animals.

Fig. 3. The relationship between body weight and body length in the spotted dolphin off the Pacific coast of Japan. Open circle indicates fetuses and closed circle postnatal animals.

TABLE 2. RELATIONSHIP BETWEEN BODY WEIGHT (G) AND BODY LENGTH (CM) IN *STENELLA COERULEOALBA* AND *STENELLA ATTENUATA*

	S. coeruleoalba				*S. attenuata*			
	a	b	r	Sample size	a	b	r	Sample size
Fetal samples								
Samples less than 7 cm	−0.402	1.563	0.906	9				
Samples of 7 cm and more	−1.507	2.779	0.997	74				
Samples in total	−1.214	2.602	0.995	83	−1.575	2.859	0.962	60
Postnatal samples								
Samples of male	−1.856	2.975	0.980	16				
Samples of female	−1.737	2.910	0.986	30				
Samples collected in 1970–1977	−1.709	2.897	0.943	17				
Samples collected in 1978 & 1979	−1.796	2.943	0.994	29				
Samples in total	−1.767	2.927	0.983	46	−1.900	2.928	0.981	35
Fetal and Postnatal samples								
Fetuses of 7 cm and more, and postnatal samples in total	−1.612	2.853	0.999	120				
Both fetal and postnatal samples in total	−1.391	2.742	0.997	129	−1.368	2.690	0.997	95

Values of a, b, and correlation coefficient r in linear regression equation $\log Y = a + b \log X$, where Y=body weight (g) and X=body length (cm).

ted dolphins was measured with the loss of some blood and fluid, the growth coefficient of the species has to be compared with the corresponding value of the striped dolphins obtained by the same method (1970–1977 data). The value b in the former species is 2.928 and is close to the value of 2.897 in the latter species. These values are slightly higher than 2.859 of the prenatal spotted dolphins. This suggests that, in both species, the growth coefficient of the postnatal dolphins may be slightly higher than that of the prenatal stage.

Organ weight

When the sum of the proportional weights is compared with the body weight measured before dissection, the values of 42 striped dolphins collected in 1978 and 1979 come between 85.9 and 100% (Appendix Table 1). The mean of the loss through the dissection is only 3.4%, and is negligible.

As shown in this section, the adult males exceed the adult females in the weight of muscle, bone and spleen. In the weight of all the 13 organs examined in this study, the mean value of the pregnant females show no significant difference from the corresponding values of the non-pregnant adult females (at $p=0.05$). Among major four components (muscle, blubber, bone and viscera), the muscle has the highest growth coefficient value, and is followed by blubber, viscera and bone (Table 3).

Muscle: Muscle weight is plotted on age for 41 striped dolphins (13 fetuses, and 10 male and 18 female postnatals) (Fig. 4). The increase of muscle weight in the

TABLE 3. RELATIONSHIP BETWEEN ORGAN WEIGHTS AND BODY WEIGHT FOR *STENELLA COERULEOALBA* AND *STENELLA ATTENUATA*

Organs	Stage	*S. coeruleoalba*				*S. attenuata*			
		a	b	r	Sample size	a	b	r	Sample size
Heart	prenatal	−2.2644	1.0833	0.9782	17				
	postnatal	−1.6983	0.9177	0.9454	31	−1.8788	0.9213	0.9714	34
	total	−1.8665	0.9565	0.9858	48				
Lungs	prenatal	−1.3167	1.0104	0.9948	17				
	postnatal	−0.0264	0.6543	0.8838	34	−0.6814	0.7849	0.9117	38
	total	−0.5534	0.7691	0.9752	51				
Liver	prenatal	−1.5375	0.9765	0.9873	16				
	postnatal	−1.1591	0.8693	0.9427	34	−0.3599	0.7316	0.9358	38
	total	−1.2612	0.8922	0.9896	50				
Left kidney	prenatal	−2.2526	0.9819	0.9817	17				
	postnatal	−2.8761	1.0501	0.9742	32	−2.7986	1.0744	0.9780	15
	total	−1.8665	0.8495	0.9832	49				
Pancreas	prenatal	−3.6990	1.1311	0.4609	5				
	postnatal	—	1.5107	0.8800	29	−3.5229	1.1668	0.9531	27
	total	−3.3979	1.3027	0.9331	34				
First stomach	prenatal	−2.7932	1.0023	0.9883	14				
	postnatal	−5.0000	1.5634	0.9673	29	−4.2218	1.4174	0.9027	28
	total	−3.7447	1.2605	0.9833	43				
Second stomach	prenatal	−2.8601	0.9890	0.9857	14				
	postnatal	−3.4559	1.1566	0.9512	29	−3.3098	1.1681	0.9802	28
	total	−3.3768	1.1373	0.9885	43				
Intestine	prenatal	−2.6536	1.2375	0.9959	15				
	postnatal	−1.5538	0.9825	0.9452	34	−1.4629	0.9851	0.9616	38
	total	−2.3161	1.1396	0.9927	49				
Spleen	prenatal	−3.8861	1.1374	0.8160	12				
	postnatal	−1.1532	0.5267	0.5528	34	−0.7820	0.4590	0.5702	28
	total	−2.7645	0.8538	0.8791	46				
Brain	prenatal	−1.9508	1.1488	0.9965	15				
	postnatal	1.8742	0.2140	0.8279	22				
	total	−0.6894	0.7528	0.9420	37				
Muscle	prenatal	−1.1032	1.1296	0.9963	13				
	postnatal	−1.0747	1.1585	0.9966	21				
	total	−1.3338	1.2076	0.9980	34				
Blubber	prenatal	−1.6247	1.2718	0.9990	13				
	postnatal	0.0487	0.8419	0.9923	21				
	total	−0.9170	1.0474	0.9908	34				
Bone	prenatal	0.1726	0.7843	0.9820	14				
	postnatal	−0.3801	0.8996	0.9742	21				
	total	0.1226	0.7971	0.9921	35				
Viscera	prenatal	−1.2337	1.1050	0.9961	14				
	postnatal	−0.3234	0.8653	0.9853	21				
	total	−0.8263	0.9733	0.9946	35				

Values of a, b, and correlation coefficient r is linear regression equation $\text{Log } Y = a + b \text{ Log } X$, where Y=organ weight (g) and X=body weight (g).

first two years is rapid, and slows between the age of 3 and 15 years. After the age of 15 years, the weight attains the plateau. In this age range, the mean weight of males is 87,375 g (n: 4, range: 78,460–91,430 g) and is larger than 74,624 g (n: 10, range: 58,910–86,000 g) of females. The sexual difference of the mean weights is significant ($0.01<p<0.02$).

The ratio of muscle to body weight for 41 striped dolphins is plotted on age (Fig. 5). This ratio is positively correlated with age in the fetal stage. Then, it increases faster from birth to the age of 2 years when the value attains around 50%. After this age the ratio for 20 striped dolphins remains nearly constant within the range of 49.8 to 59.8% (mean: 54.5%).

Blubber: Blubber weight is plotted against age for 42 striped dolphins (14 fetuses, and 10 male and 18 female postnatals) (Fig. 6). Increase of blubber weight stops around the age of 15 years. The mean weight of 14 striped dolphins over this age is 24,663 g (17,090–31,390 g). In this age range there is no significant sexual

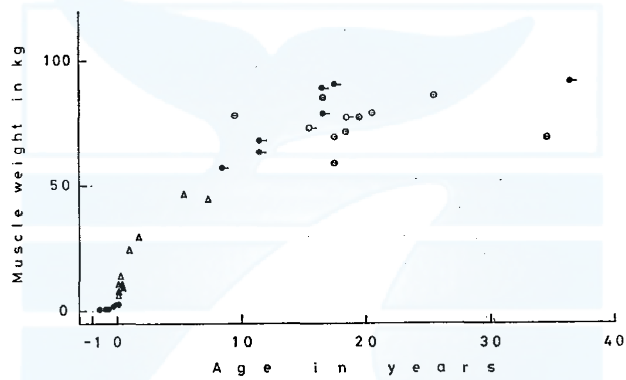

Fig. 4. The relationship between muscle weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 1.

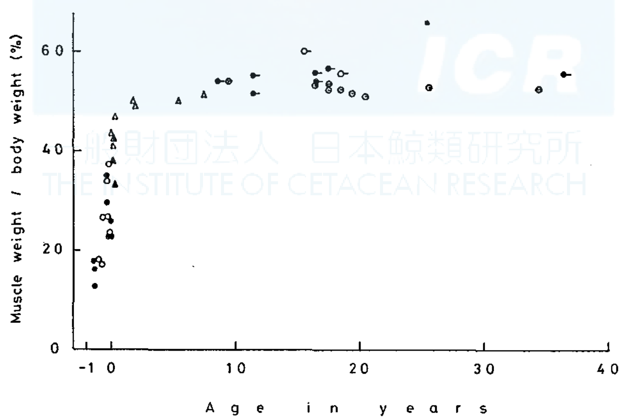

Fig. 5. The relationship between the relative muscle weight and age in the striped dolphin off the Pacific coast of Japan. Closed circle indicates male fetus and open circle female fetus. For other marks see Fig. 1.

difference in the mean blubber weight ($0.8<p<0.9$).

The ratio of blubber to body weight for 41 striped dolphins is plotted on age (Fig. 7). The rapid increase of the ratio starts at the middle fetal stage and attains the maximum value on the nearterm fetus. Then, it is followed by a rapid decrease in the neonatal stage. After the age of 2 years the ratio of 20 striped dolphins becomes constant within the range of 14.0 to 19.2% (mean: 17.3%).

Bone: Bone weight is plotted on age for 42 striped dolphins (14 fetuses, and 10 male and 18 female postnatals) (Fig. 8). Rapid increase is observed in the first two years after birth. The weight increases up to the age of around 15 years and attains the plateau at this age. In the age range above 15 years, the mean bone weight of 4 males is 18,620 g (range: 17,900–19,650 g) and is significantly larger than 14,502 g (11,300–16,800 g) of 10 females ($p<0.001$).

The ratio of bone to body weight for 42 striped dolphins is plotted against age (Fig. 9). The ratio decreases rapidly from the middle to the late fetal stage, then

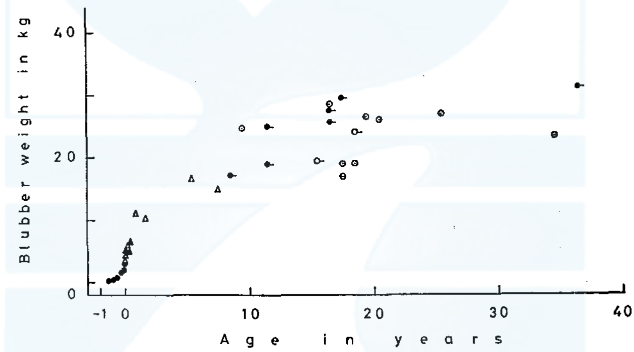

Fig. 6. The relationship between blubber weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 1.

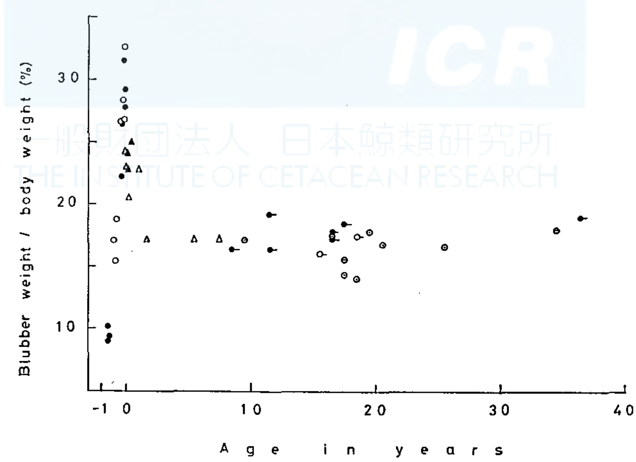

Fig. 7. The relationship between the relative blubber weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 5.

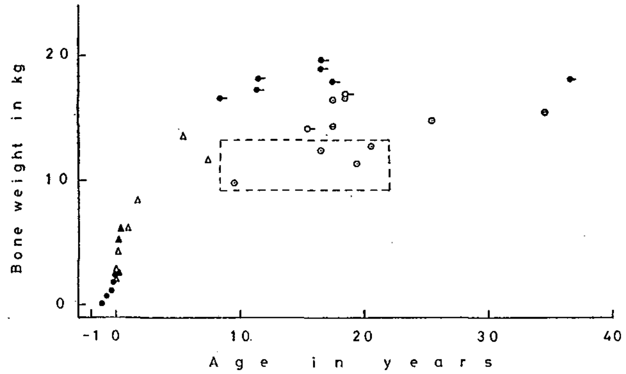

Fig. 8. The relationship between bone weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 1. The pregnant females surrounded by dotted line were collected on 5 December 1979.

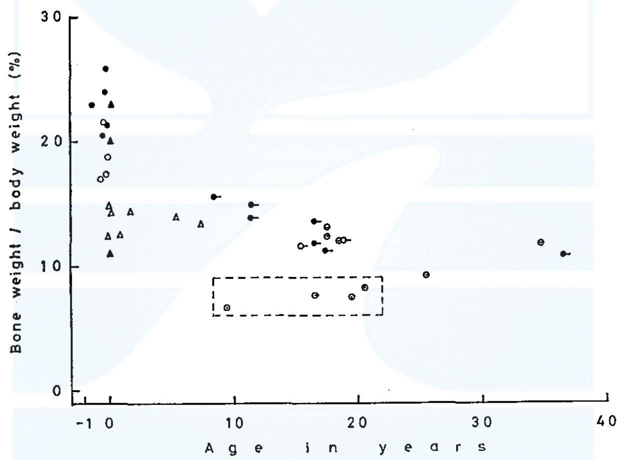

Fig. 9. The relationship between the relative bone weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Figs 5 and 8.

it decreases at slower rate until the age of 2 years. After this age, the ratio of 16 striped dolphins becomes constant within the range of 9.7 to 15.6% (mean: 12.7%).

Viscera: Fig. 10 shows the relationship between viscera weight and age of 42 striped dolphins (14 fetuses, and 10 male and 18 female postnatals). The weight increases till the age of around 15 years, and then becomes constant. In the age range above 15 years, the mean weight of 11 striped dolphins is 13,764 g (range: 11,120–17,180 g).

The ratio of viscera to body weight for 42 striped dolphins rapidly increases from the middle to the late fetal stage, and sharply decreases after birth (Fig. 11). After the age of 2 years, the ratio continues to decrease at slower rate in the range of 7.8 to 13.1% (n: 16, mean: 9.8%).

Brain: Brain weight is plotted on age for 46 striped dolphins (17 fetuses, and 10

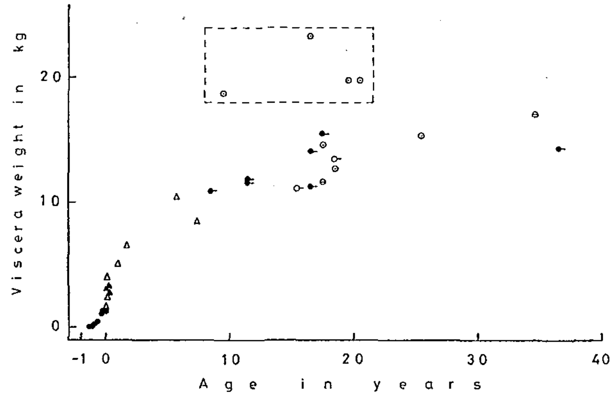

Fig. 10. The relationship between viscera weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Figs 1 and 8.

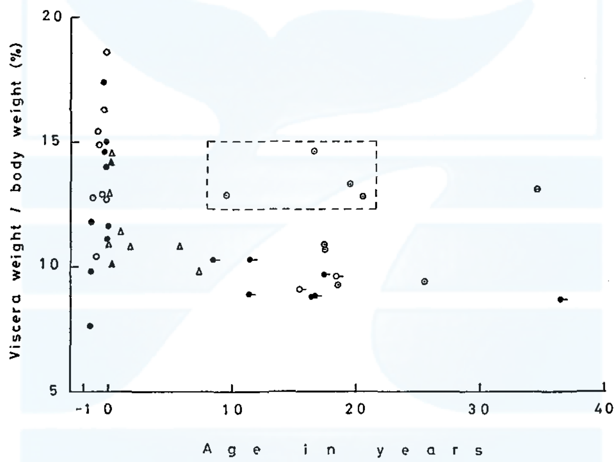

Fig. 11. The relationship between the relative viscera weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Figs 5 and 8.

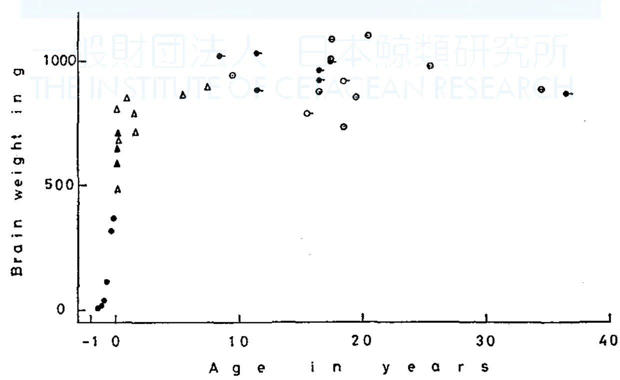

Fig. 12. The relationship between brain weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 1.

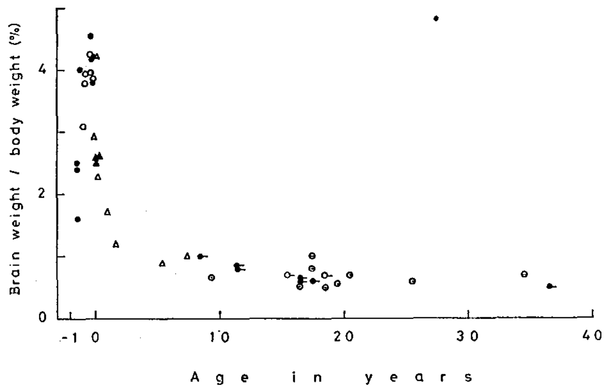

Fig. 13. The relationship between the relative brain weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 5.

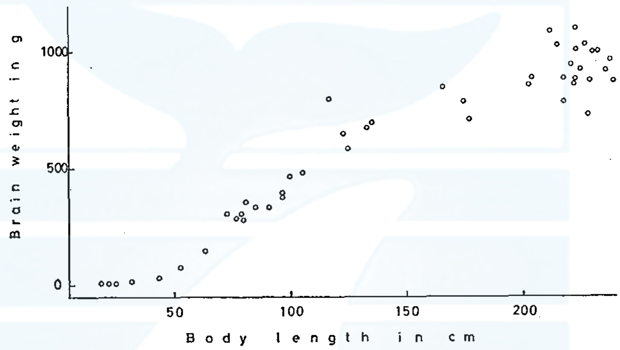

Fig. 14. The relationship between brain weight and body length in the striped dolphin off the Pacific coast of Japan.

male and 19 female postnatals) (Fig. 12). The weight rapidly increases from the middle fetal stage to the age of 2 years, then it increases at slower rate until the age of 8 years. In the animals over 8 years of age, the weight becomes constant within the range of 731 to 1,097 g (n: 18, mean: 935 g). The mean brain weight of adult animals shows no significant sexual difference ($0.5<p<0.6$).

The ratio of brain to body weight for 42 striped dolphins is plotted against age (Fig. 13). The ratio rapidly increases from the middle to the late fetal stage, but sharply decreases from birth to the age of 2 years. Then the ratio stays almost constant within the range of 0.53 to 1.01% (n: 20, mean: 0.72%).

The value of the growth coefficient calculated for 15 prenatal striped dolphins is 1.1488. This is contrasted with the low value of 0.2140 of 22 postnatal individuals of the same species (Table 3).

Figure 14 shows the relationship between brain weight and body length for 46 striped dolphins. The brain weight increases lineally from 45 to 140 cm in body length, then the increase becomes at lower rate and finally stops after body length of 210 cm, where the species attain sexual maturity.

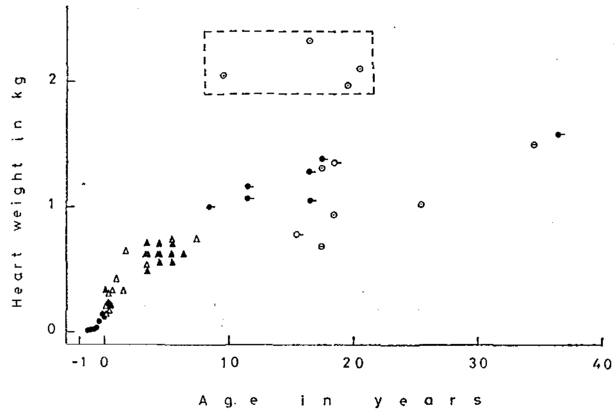

Fig. 15. The relationship between heart weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Figs 1 and 8.

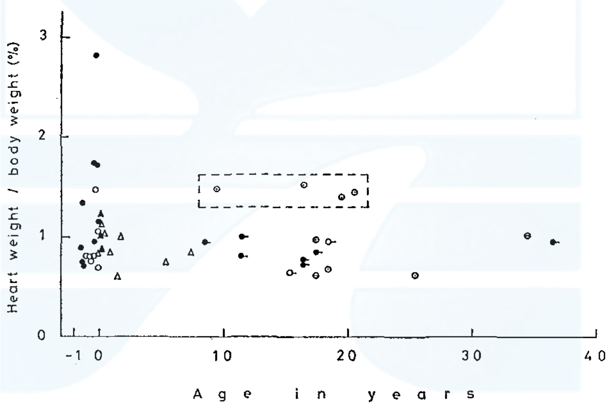

Fig. 16. The relationship between the relative heart weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Figs 5 and 8.

Heart: Heart weight is plotted on age for 64 striped dolphins (19 fetuses, and 23 male and 22 female postnatals). The weight increases rapidly from birth to the age of 2 years, then increases slowly till 15 years of age. After this age, the weight attains the plateau (Fig. 15) with the mean weight of 1,170 g (n: 11, range: 683–1,580 g). In this age range there is no significant sexual difference in the mean heart weight ($0.2<p<0.3$).

The ratio of heart to body weight is plotted against age for 45 striped dolphins (Fig. 16). The ratio increases from the middle to the late fetal stage, but sharply decreases from birth to the age of 2 years when it attains the value of about 0.9%. In the animals over 2 years of age, the ratio of 11 striped dolphins remains nearly constant within the range of 0.62 to 1.15% (mean: 0.845%).

The relative growth coefficient for 31 postnatal striped dolphins is 0.92 and is same with 0.92 for 34 postnatal spotted dolphins. However, these values are lower than 1.08 of 17 prenatal striped dolphins (Table 3).

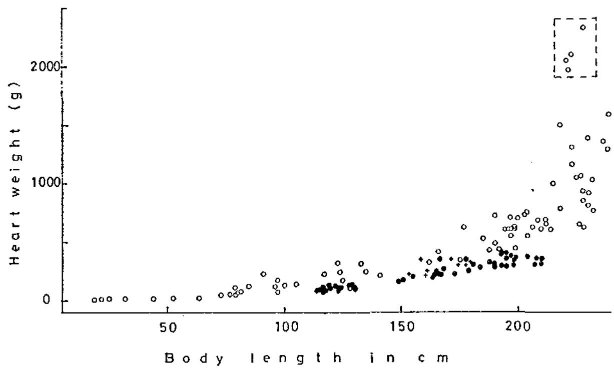

Fig. 17. The relationship between heart weight and body length in the populations of *Stenella*. Open circle indicates the striped dolphin off the Pacific coast of Japan, closed circle the spotted dolphin off the Pacific coast of Japan and double crosses the striped dolphin in the Mediterranean Sea. For marks see Fig. 8.

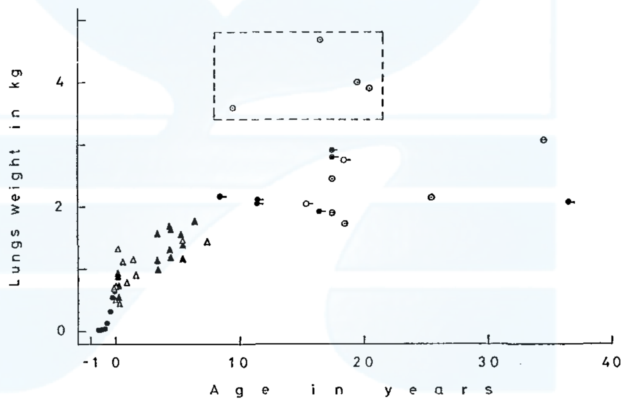

Fig. 18. The relationship between lungs weight and age in the striped dolphin. For marks see Figs 1 and 8.

Comparison of the heart weight-body length relationship between two species of *Stenella* indicates that the striped dolphins off the Pacific coast of Japan have heavier heart than the spotted dolphins of the same body length in the same area (Fig. 17). Heart weight of the striped dolphins from Japanese areas shows a large individual variation at body lengths of 220 cm or more, where the species attains sexual maturity. The weight of the striped dolphins in the Mediterranean Sea (Gihr and Pilleri, 1969) was distributed in the individual variation of the species from Japanese areas (Fig. 17).

Lung: The weight of lungs is plotted on age for 64 striped dolphins (19 fetuses, and 23 male and 22 female postnatals) (Fig. 18). The increase of the weight is rapid in the first two years, and stops at the age of about 15 years. After this age, the mean weight of lungs of 11 striped dolphins is 2,347 g (range: 1,722–3,070 g). In this age range there is no significant sexual difference in the mean weight of

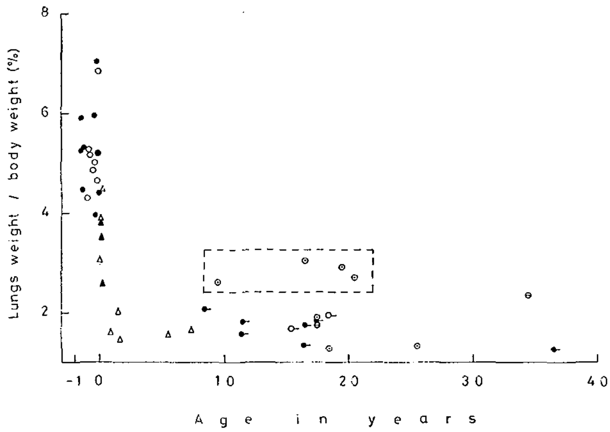

Fig. 19. The relationship between the relative lungs weight and age in the western Pacific striped dolphin. For marks see Figs 5 and 8.

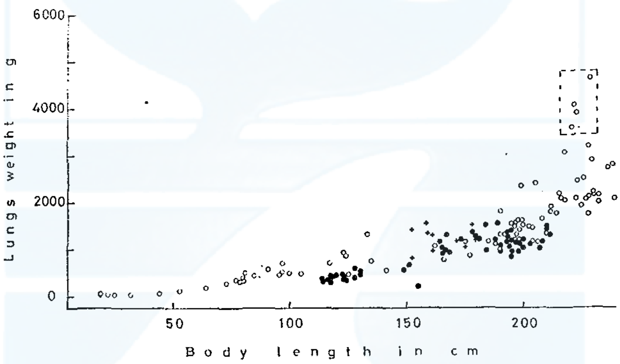

Fig. 20. The relationship between lungs weight and body length in the populations of *Stenella*. For marks see Figs 8 and 17.

lungs ($0.6<p<0.7$).

The ratio of lungs to body weight is plotted against age for 45 striped dolphins (Fig. 19). The ratio increases from the middle to the late fetal stage, then it decreases sharply until the age of 2 years. After this age the ratio stays nearly constant within the range of 1.26 to 2.35% (n: 16, mean: 1.69%).

Table 3 shows the relative growth coefficient of the weight of lungs. The value of 0.654 obtained from 34 postnatal striped dolphins is obviously lower than 1.01 of 17 prenatals of the same species, and is also slightly lower than 0.785 of 38 postnatal spotted dolphins.

The relationship between the weight of lungs and body length in the two species of *Stenella* is shown in Fig. 20. The weight of lungs of striped dolphins off the Pacific coast of Japan appears to be different neither from the same species in the Mediterranean Sea nor the spotted dolphins in the Japanese waters.

Liver: Based on 63 striped dolphins (18 fetuses, and 23 male and 22 female postnatals), the relationship between liver weight and age is shown in Fig. 21. The

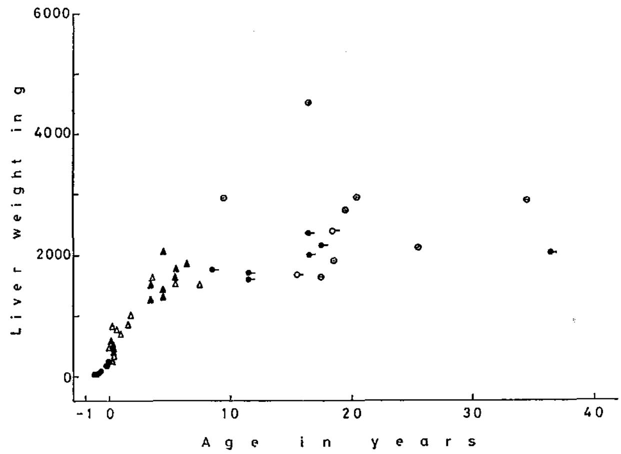

Fig. 21. The relationship between liver weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 1.

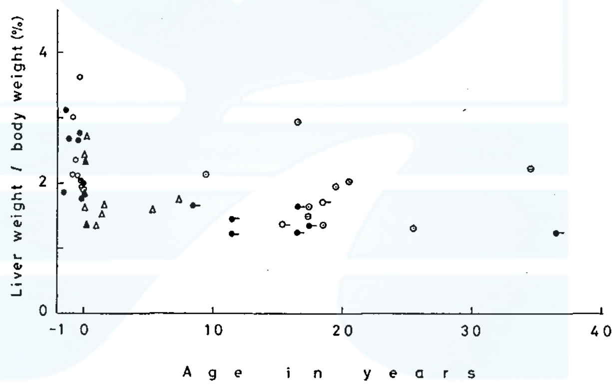

Fig. 22. The relationship between the relative liver weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 5.

weight increases rapidly in the first two years, then the increase becomes slower until the age of 15 years. After this age the weight attains the plateau with the mean of 2,399 g (n: 14, range: 1,650–4,510 g). In the animals of this age range, there is no significant sexual difference in the mean liver weight ($0.5<p<0.6$).

The ratio of liver to body weight is plotted on age for 44 striped dolphins (Fig. 22). The ratio increases from the middle to the late fetal stage, then decreases sharply until the age of 2 years. After this age the ratio stays nearly constant within the range of 1.22 to 2.94% (n: 20, mean: 1.67%).

The growth coefficient of liver weight is shown in Table 3. The value for 34 postnatal striped dolphins is 0.869. This is lower than 0.997 for 16 prenatal individuals of the same species, but is higher than 0.732 for 38 postnatal spotted dolphins.

The relationship between liver weight and body length of the two species of

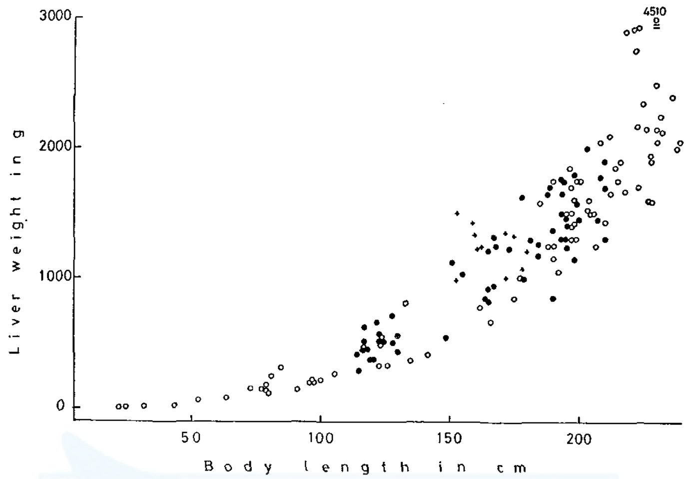

Fig. 23. The relationship between liver weight and body length in the populations of *Stenella*. For marks see Fig. 17.

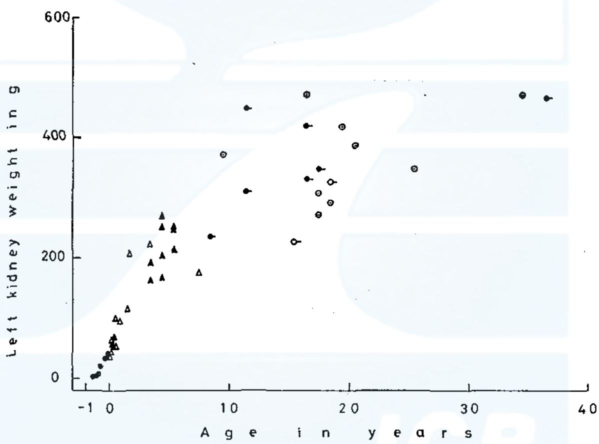

Fig. 24. The relationship between the left kidney weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 1.

Stenella is shown in Fig. 23. The liver weight of the striped dolphins off the Pacific coast of Japan appears to be almost similar to the same species in the Mediterranean Sea and the spotted dolphins in the Japanese waters.

Kidney: Since the mean weight of kidneys of the striped dolphins shows no significant bilateral asymmetry ($p>0.9$), only the left kidney is plotted in the present study on age for 61 striped dolphins (19 fetuses, and 20 male and 22 female postnatals) (Fig. 24). The weight continues to increase till 15 years of the age, and then attains the plateau. The mean weight of the left kidneys of 14 striped dolphins over 15 years of age is 362 g (range: 216–475 g). In this age range, the sexual difference of the mean left kidney weight is not significant ($0.7<p<0.8$).

The ratio of kidneys to body weight increases from the early to the middle

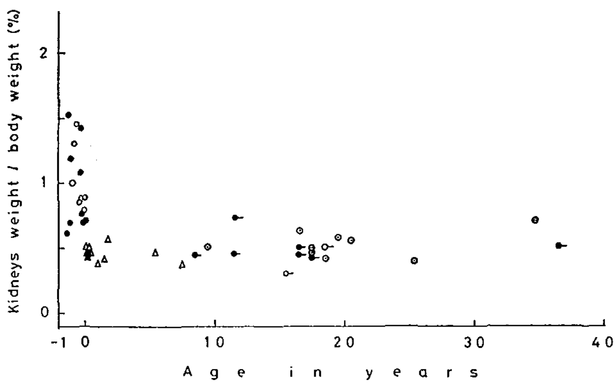

Fig. 25. The relationship between the relative kidneys weight and age in the striped dolphin. For marks see Fig. 5.

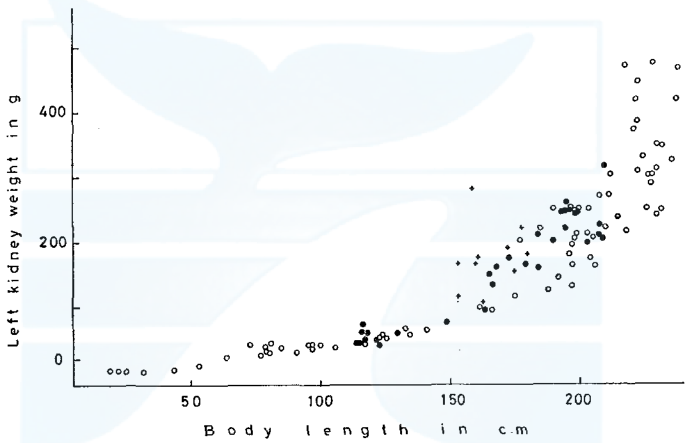

Fig. 26. The relationship between the left kidney weight and body length in the populations of *Stenella*. For marks see Fig. 17.

fetal stage, but after the latter stage it sharply decreases until the age of around 2 years (Fig. 25). After this age the ratio becomes constant within the range of 0.31 to 0.74% (n: 20, mean: 0.50%).

Table 3 shows the growth coefficient of the left kidney weight. The value of 1.05 for 32 postnatal striped dolphins is close to that of 1.07 for 15 postnatal spotted dolphins. However, these values are slightly higher than 0.982 of the corresponding value of 17 prenatal striped dolphins.

The relationship of the left kidney weight to body length of the two species of *Stenella* is shown in Fig. 26. The kidney weight of striped dolphins off the Pacific coast of Japan is almost similar to the same species in the Mediterranean Sea and the spotted dolphins in the Japanese waters.

Pancreas: Pancreas weight is plotted on age for 36 striped dolphins (22 male and 14 female postnatals) (Fig. 27). The weight increases rapidly to the age of 8

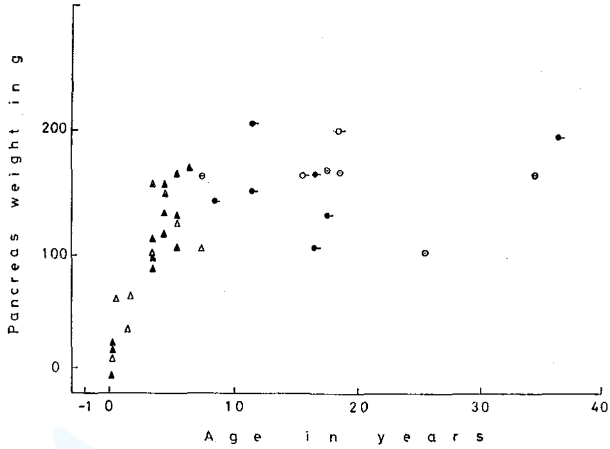

Fig. 27. The relationship between pancreas weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 1.

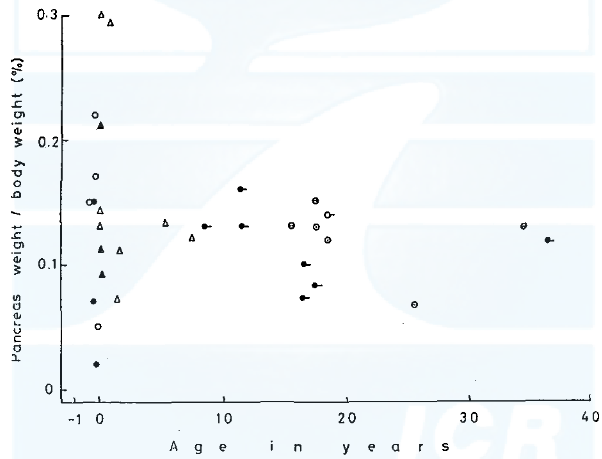

Fig. 28. The relationship between the relative pancreas weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 5.

years, and the increase becomes slow between the age of 8 and 15 years. After the age of 15 years, the weight attains the plateau, and gives the mean weight of 157 g (n: 11, range: 102–200 g). In the animals of this age range, the mean weights of pancreas show no significant sexual difference ($0.5<p<0.6$).

The ratio of pancreas to body weight is plotted on age for 32 striped dolphins (Fig. 28). Although the ratio shows larger individual variation in both the newborn calves and in the adult animals, it becomes constant after 2 years of the age. The ratio ranges from 0.067 to 0.16% (n: 16, mean: 0.12%).

The growth coefficient of pancreas weight is shown in Table 3. The coefficient 1.56 calculated for 29 postnatal striped dolphins is higher than any of 1.13

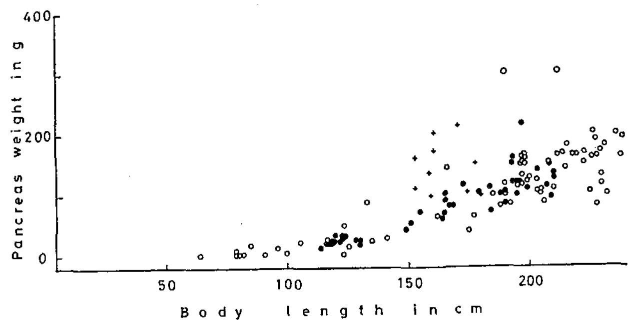

Fig. 29. The relationship between pancreas weight and body length in the populations of *Stenella*. For marks see Fig. 17.

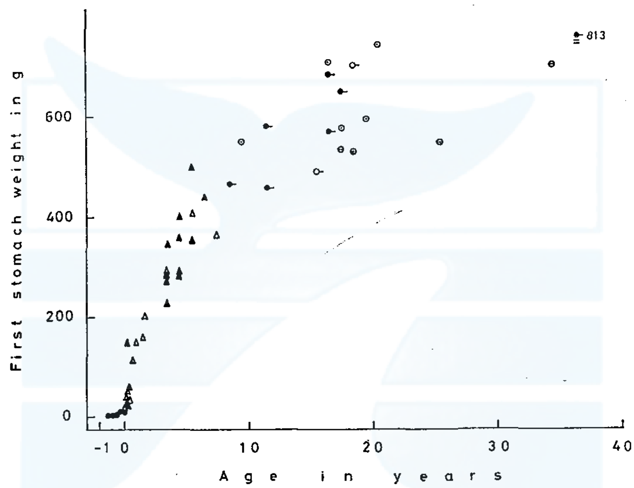

Fig. 30. The relationship between the first stomach weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 1.

for 5 prenatal of the same species or 1.17 for 27 postnatal spotted dolphins.

Figure 29 shows the relationship between pancreas weight and body length. This indicates that the striped dolphins off the Pacific coast of Japan have almost same pancreas weight to the spotted dolphins in the same area. The pancreas weight of the striped dolphins in the Mediterranean Sea shows considerably higher value than those of the striped and the spotted dolphins off the Pacific coast of Japan.

Stomach: Although each compartment of stomach cannot be recognized in the fetus below 3 cm in body length, the differentiation of the first and the second stomach was observed in the fetus over 12 cm in body length. On the other hand, the differentiation of the third and the fourth stomach was able to be observed at about the body length of 60 cm, or about 4—5 months after the differentiation of the first and the second stomach.

Weights of the first and the second stomach are plotted on age for 55 striped

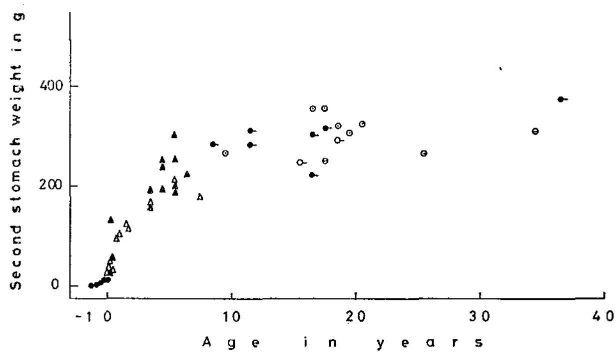

Fig. 31. The relationship between the second stomach weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 1.

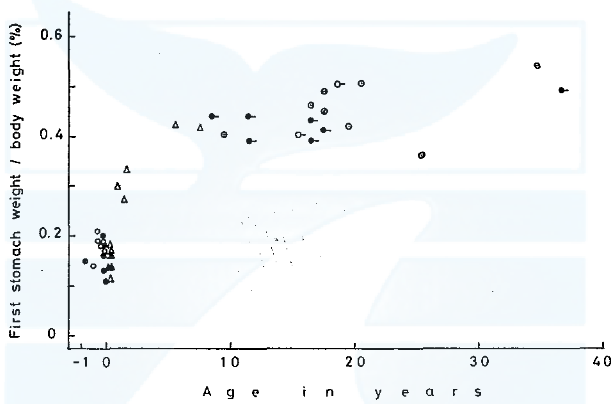

Fig. 32. The relationship between the relative first stomach weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 1.

dolphins (10 fetuses, and 23 male and 22 female postnatals) (Figs. 30 and 31). The weight of the first stomach increases rapidly from birth to the age of 15 years, then attains the plateau. On the other hand, the rapid growth of the second stomach lasts only till the age of 8 years, then it slows until the cessation of the growth at the age of 15 years. In 14 striped dolphins above 15 years, the mean weights of the first and the second stomach are 633 g (range: 491—813 g) and 302 g (220—375 g), respectively. The sexual difference of the mean weight of the first or the second stomach is not statistically significant ($p>0.2$). Comparison of the first stomach with the second stomach of the striped dolphins shows that the age when the weight of the first stomach starts to exceed that of the second stomach is around 2 years, and this age is close to the age at the completion of weaning in the species (Miyazaki, 1977).

In the 23 adult striped dolphins, the mean weight of the third stomach is 106 g (range 56—194 g), and is 1.6 times as large as that of the fourth stomach (mean: 67.8 g, range: 23—145 g).

Figures 32 and 33 show the relationship between the relative weight of the

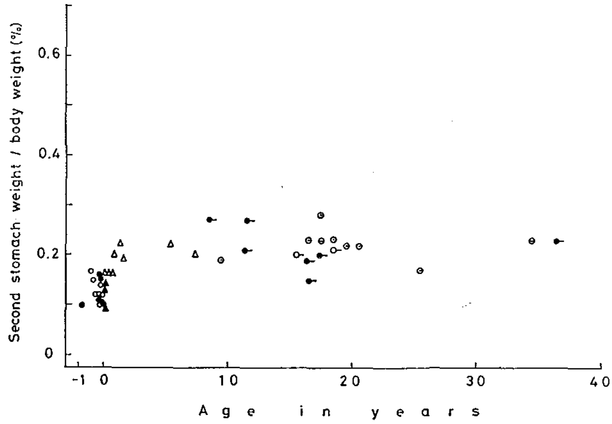

Fig. 33. The relationship between the relative second stomach weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 5.

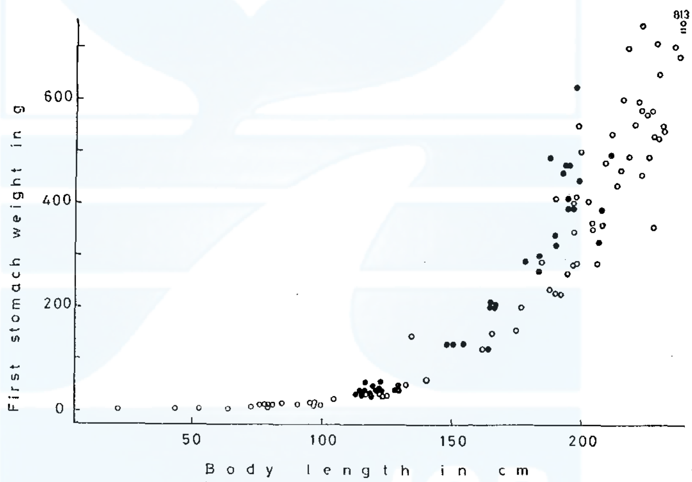

Fig. 34. The relationship between the first stomach weight and body length in the populations of *Stenella*. For marks see Fig. 17.

first or second stomach and the age. The values of both compartments decrease slightly from the middle to the late fetal stage, and show the rapid increase after birth. The relative weight of the first stomach becomes constant after 8 years of the age within the range of 0.36 to 0.54% of body weight (n: 17, mean: 0.44%). On the other hand the value of second stomach remains nearly constant after the age of 2 years within the range of 0.15 to 0.28% of body weight (n: 20, mean: 0.22%).

Table 3 shows the relative growth coefficient of stomach. In case of 14 prenatal striped dolphins, the growth coefficient of the first stomach is 1.00 and close to 0.989 of the corresponding value of the second stomach. However, in 29 postnatal individuals of the species the value of the first stomach 1.56 is higher than

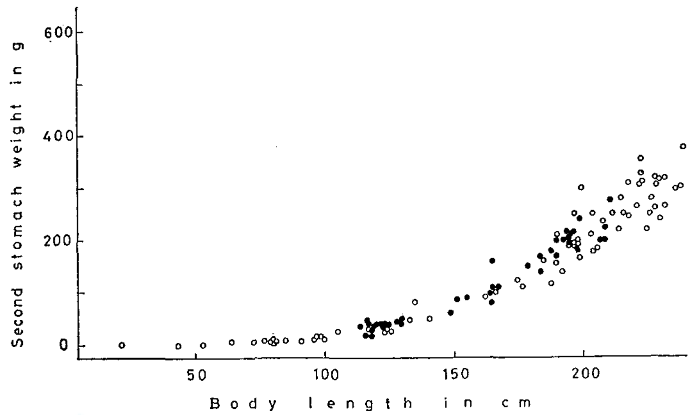

Fig. 35. The relationship between the second stomach weight and body length in the populations of *Stenella*. For marks see Fig. 17.

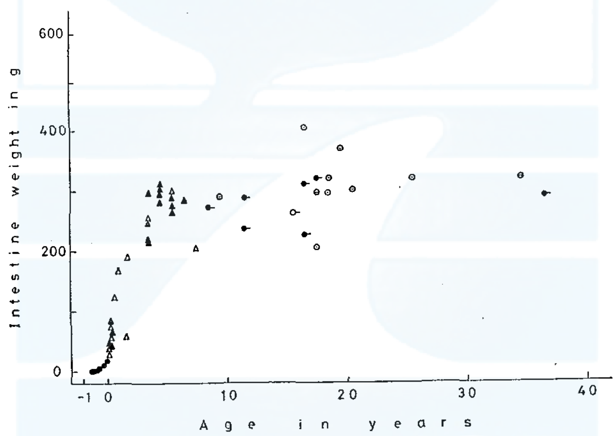

Fig. 36. The relationship between intestine weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 1.

1.16 of the second stomach. This means that the relative growth of the first stomach is almost same to the second stomach in the prenatal stage, but in the postnatal stage the first stomach grows faster than the second stomach.

Figures 34 and 35 indicate that the stomach weight of the striped dolphins off the Pacific coast of Japan is almost similar to the same species in the Mediterranean sea and the spotted dolphins in Japanese waters.

Intestine: Intestine weight is plotted on age for 61 striped dolphins (17 fetuses, and 23 male and 21 female postnatals) (Fig. 36). The weight increases rapidly from birth to the age of 8 years, then it becomes constant within the range of 2,020 to 4,040 g (n: 18, mean: 2,956 g). There is no sexual difference of mean intestine weight in these individuals above 8 years ($0.2<p<0.3$).

Figure 37 shows the relationship between intestine length and age of 26 striped

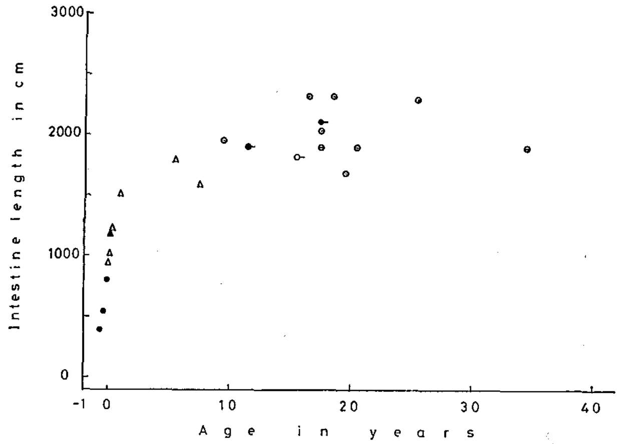

Fig. 37. The relationship between intestine length and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 1.

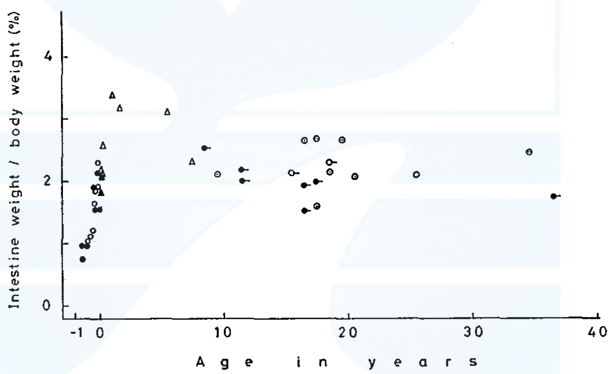

Fig. 38. The relationship between the relative intestine weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 5.

dolphins (7 fetuses, and 3 male and 16 female postnatals). Intestine length increases rapidly from the middle fetal stage to the age of 2 years, then at a slower rate until 15 years when the increase stops. The mean intestine length of 10 individuals over 15 years of age is 2,2026 cm (range: 1,687—2,325 cm).

The ratio of intestine weight to body weight is plotted on age for 41 striped dolphins (Fig. 38). It increases rapidly from the middle fetal stage to the age of 2 years, then decreases until the age of about 10 years. After this age, the ratio becomes constant within the range of 1.56 to 2.69% (n: 16, mean: 2.14%).

Table 3 shows the relative growth coefficients of intestine weight. The value 0.983 of 34 postnatal striped dolphins is close to 0.985 of 38 postnatal spotted dolphins, but they are smaller than 1.24 of 15 prenatal striped dolphins.

The relationships between intestine weight and body length of striped and spotted dolphins off the Pacific coast of Japan are shown in Fig. 39. No difference is expected between two species.

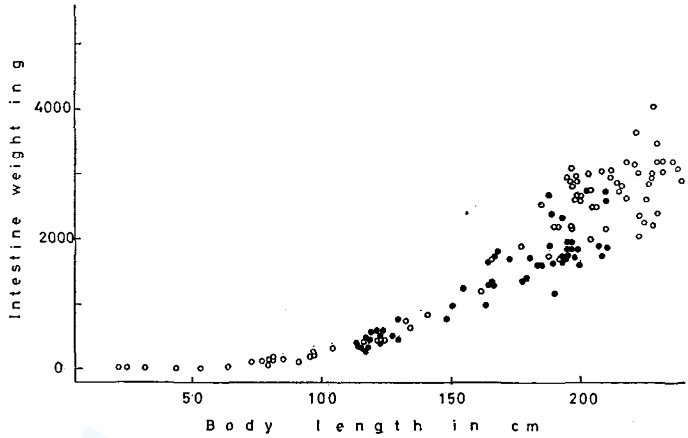

Fig. 39. The relationship between intestine weight and body length in the populations of *Stenella*. For marks see Fig. 17.

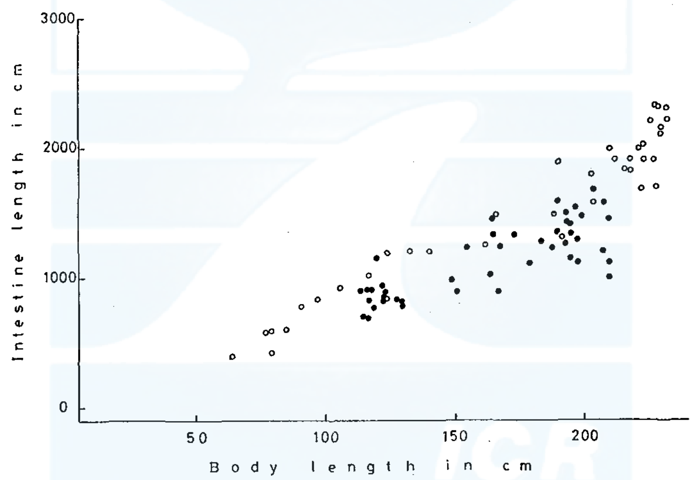

Fig. 40. The relationship between intestine length and body length in the populations of *Stenella*. For marks see Fig. 17.

Figure 40 shows the relationship between intestine length and body length. There is no available data in the early fetal stage. In the striped dolphins off the Pacific coast of Japan, the intestine length increases lineally from the middle fetal stage to the body length of about 120 cm, where some of individuals start to feed the solid food (Miyazaki, 1977). The length increases at lower rate between 120 and 190 cm in body length. After this stage it grows at higher rate. Comparison of intestine length between spotted and striped dolphins of the same body length off the Pacific coast of Japan shows that the latter species has longer intestine than the former species.

Spleen: Spleen weight is plotted on age for 58 striped dolphins (14 fetuses, and

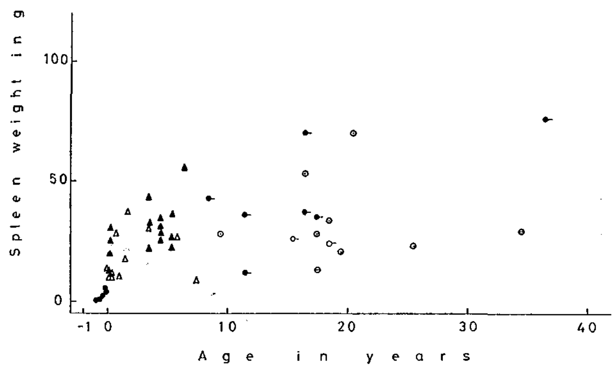

Fig. 41. The relationship between spleen weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 1.

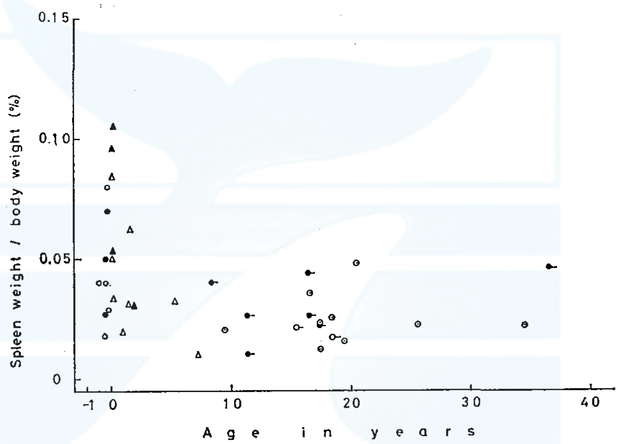

Fig. 42. The relationship between the relative spleen weight and age in the striped dolphin off the Pacific coast of Japan. For marks see Fig. 5.

22 male and 22 female postnatals) (Fig. 41). The weight increases rapidly for about 2 years after birth, then it becomes difficult to find any trend owing to large individual variation. In the 62 postnatal striped dolphins, the mean weight of spleens of 30 males is 43.9 g (range: 12—110 g) and is significantly larger than that of 26.7 g (8.2—69.8 g) for 32 females ($p<0.01$).

The ratio of spleen to body weight is plotted against age for 38 striped dolphins (Fig. 42). It increases rapidly from the middle fetal stage to the neonatal stage, and before reaching at the age of 2 years it sharply decreases to the value of the former stage. After this age the ratio becomes constant within the range of 0.009 to 0.048% (n: 20, mean: 0.026%).

The relative growth coefficients of spleen are shown in Table 3. In 12 prenatal striped dolphins the coefficient is 1.14 and higher than 0.527 of 34 postnatals of the same species. The latter figure is slightly higher than 0.459 of 28 postnatal spotted dolphins. The increase of spleen weight, both in striped and spotted dol-

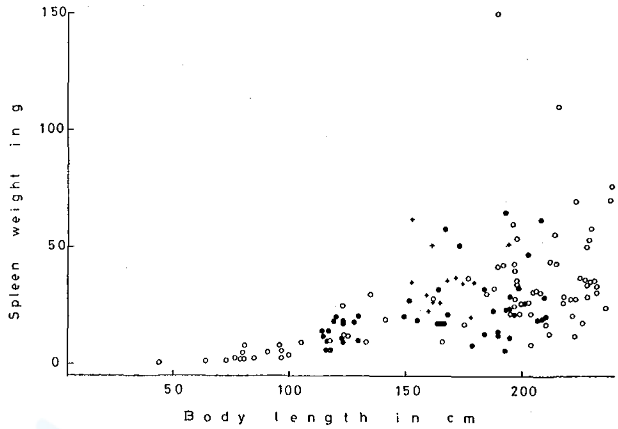

Fig. 43. The relationship between spleen weight and body length in the three populations of *Stenella*. For marks see Fig. 17.

phins, stops at the length of 150 cm. The individual variation of the weight is large (Fig. 43). In the striped dolphins off the Pacific coast of Japan the mean spleen weight of males is significantly larger than that of females in the body length of 150 cm or more ($p<0.001$). However, in the spotted dolphins of the same area there is no significant sexual dimorphism in the spleen weight ($0.1<p<0.2$).

DISCUSSION

The organs of the striped dolphins are classified into the following three groups based on the age when actual weight of organ attains the plateau. (1): Organs that attain plateau around 15 years of age: muscle, blubber, bone, viscera, heart, lungs, liver, kidney, pancreas and stomach. (2): Organs that attain plateau around 8 or 10 years of age: brain and intestine. (3): Organs that attain plateau at the neonatal stage: spleen. According to Kasuya (1976) and Miyazaki (1977), the mean age at the attainment of sexual maturity in the striped dolphins is about 9 years. Then, it can be said that the age when the growth of brain or intestine stops seems to coincide with this age. From the feature of the mean growth curve, Kasuya (1976) reported that the age at the attainment of asymptotic length of the species is about 17 years in females and about 21 years in males. The osteological study by Itō and Miyazaki (unpublished) showed that the physically mature striped dolphin starts to appear at the age of 16 years. Accordingly, it is reasonable to expect that the mean age at the attainment of physical maturity might come to the range of 16 to 20 years of age. Therefore, growth of the above ten organs of Group (1) is considered to stop nearly at the attainment of physical maturity. Among 13 organs examined here, spleen appears to be an exceptional organ of which growth stops in the neonatal stage. Based on the growth pattern of the relative organ weight in the prenatal and juvenile stages, the organs can be classified into the following three types. As there are few available data for the early fetal stage, the growth pattern of the stage is not considered.

Type I: The ratio increases sharply from the middle to the late fetal stage. After birth it decreases rapidly until the age of about 2 years, then becomes constant. Ten organs (blubber, bone, viscera, brain, heart, lungs, liver, kidney, pancreas and spleen) belong to this Type. Among them, bone, viscera and brain show slight decrease after about 2 years.

Type II: The ratio increases in the fetal stage and continues to increase in the juvenile stage. This type includes muscle and intestine. The ratio of muscle attains the plateau at the age of 15 years. In the case of intestine the ratio attains the plateau after slight decrease between 2 and 10 years.

Type III: The ratio decreases from the middle fetal stage to birth, then increases in the juvenile stage. This type is represented by the first and the second stomach. The relative organ weights of the first and of the second stomach attain the plateau at the age of about 15 and 2 years, respectively.

Figure 44 shows the least squares regressions of the relationship between body weight and body length of three species of *Stenella*. As the body weight of the spotted dolphins off the Pacific coast of Japan was measured with the loss of some blood and fluid, they were excluded from the following discussion. For *S. graffmani*=*S. attenuata* (*fide* Perrin, 1975) and *S. longirostris*, the equation of this relationship was calculated from data of Perrin and Robert (1972) by means of the least squares method (Log Y=a+b Log X, Y: body weight in g, X: body length in

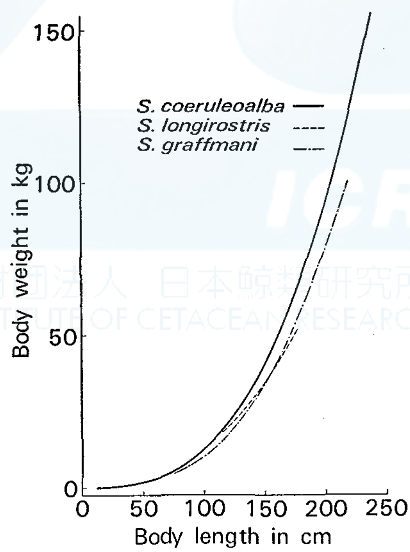

Fig. 44. Comparison of the relationship of body weight to body length in the populations of *Stenella*. These lines are obtained from the equation calculated on the relationship (see text).

cm). The relationships indicate that *S. coeruleoalba* off the Pacific coast of Japan has larger body weight than any of *S. attenuata* or *S. longirostris* in the eastern Pacific.

The growth coefficients of 13 organs are shown in Table 3. The coefficients of muscle, bone, kidney, pancreas and stomach is higher in the postnatal stage than in the prenatal stage. This means that these five organs grow faster in relation to the increase of the body weight in the former stage than in the latter stage. On the other hand, other 8 organs (blubber, viscera, brain, heart, lungs, liver, intestine and spleen) show reverse growth pattern. The growth pattern of brain obtained in this study appears to be similar to the result of Pirlot and Kamiya (1975).

Table 4 shows the relative growth coefficients of some organs of three species of *Stenella*. The significant difference of growth coefficient between populations was tested at p=0.05 only for the organs represented by 30 or more data. The above analysed on heart, lungs and liver are appropriate for the three populations of the dolphins, because the data of the western Pacific spotted and striped dolphins and of the spotted dolphins in the eastern Pacific cover a wide range of the growth stage. The growth coefficient of the heart for the spotted dolphins off the Pacific coast of Japan is close to that of the striped dolphins of the same areas, but the coefficient of the former species is significantly higher than that of the spotted dolphins in the eastern Pacific. The difference of the coefficients of liver between above two populations of the spotted dolphins is significantly larger than that between the striped and spotted dolphins in the same region. In case of lungs, there is no significant difference of the coefficient between the above three populations of two species of *Stenella*. From these informations it is suggested that the growth coefficient of organs may not be always the diagnostic character for the species, and in some cases the difference of the coefficients between populations of the same species is larger than their difference between species.

TABLE 4. THE GROWTH COEFFICIENT AND ITS 95% CONFIDENCE RANGE ON THE RELATIONSHIP BETWEEN ORGAN WEIGHT AND BODY WEIGHT IN *STENELLA*.[1]

Organs	*S. coeruleoalba*		*S. attenuata*		*S. longirostris*
	Mediterranean[2]	W. Pacific[3]	W. Pacific[4]	E. Pacific[5]	E. Pacific[6]
Heart	1.014 (7)	0.957(48) ±0.024	0.921(34) ±0.081	0.769(47) ±0.026	0.820(13)
Lungs	0,640 (7)	0.769(51) ±0.050	0.785(38) ±0.121	0.880(35) ±0.037	0.947 (4)
Liver	0.684 (7)	0.892(50) ±0.040	0.732(38) ±0.094	1.129(60) ±0.041	0.608(13)
Left kidney	0.960 (7)	0.850(49)	1.074(15)	—	—
Pancreas	0.438 (7)	1.303(34)	1.167(27)	—	—
Spleen	0.798 (7)	0.854(46)	0.460(28)	♂1.010(36) ♀1.057(24)	—
Brain	0.569(10)	0.753(37)	—	—	—

1): Figures in parentheses indicate the number of specimens
2): Gihr and Pilleri (1969). 3) and 4): Present data. 5) and 6): Perrin and Roberts (1972).

TABLE 5. MEAN WEIGHT OF BLUBBER, MUSCLE, BONE AND VISCERA IN SOME CETACEANS EXPRESSED OF BODY WEIGHT. FIGURES OTHER THAN *S. COERULEOALBA* WERE CITED FROM BRYDEN (1972).

Species	Blubber	Muscle	Bone	Viscera
P. catodon	34	35	11	8
B. musculus	27	40	16	11
B. physalus	24	45	17	10
B. borealis	22	62	15	9
E. sieboldi	40	30	14	13
*S. coeruleoalba**	17.3	54.5	12.7	9.8
	(14.1-19.2)	(49.8-59.8)	(9.7-15.0)	(7.8-15.1)

* Body weight was measured before dissection.
Figures in parentheses indicate range.

TABLE 6. THE WEIGHT OF ORGANS EXPRESSED AS A PERCENTAGE OF BODY WEIGHT IN SOME CETACEANS. FIGURES OTHER THAN *S. COERULEOALBA* WERE CITED FROM BRYDEN (1972).

Species	Brain	Heart	Lungs	Liver	Kidneys	Pancreas	Spleen	Stomach	Intestine
P. catodon	0.021	0.3	0.9	1.6	0.5	0.07	0.01	0.8	1.6
D. leucas	0.78	0.6	3.7	1.5	0.4	—	0.03	—	—
T. truncatus	1.45	1.0	2.9	2.2	1.1	—	0.09	—	—
P. phocoena	1.22	0.8	3.5	3.2	0.8	0.16	0.02	—	—
B. musculus	0.011	0.5	0.8	1.2	0.4	—	0.02	0.5	1.4
B. physalus	0.014	0.7	0.8	1.0	0.4	—	—	0.6	1.9
B. borealis	—	0.4	0.8	1.3	0.4	—	—	1.0	2.5
E. sieboldi	0.004	0.5	0.5	0.9	0.4	—	0.02	0.4	1.6
S. coeruleoalba	0.72	0.85	1.69	1.67	0.50	0.12	0.026	0.70	2.16
	(0.53-1.01)	(0.62-1.15)	(1.26-2.35)	(1.22-2.94)	(0.31-0.74)	(0.067-0.16)	(0.009-0.048)	(0.62-0.94)	(1.56-2.69

Figures in parentheses indicate range.

Table 5 shows the mean weight of blubber, muscle, bone and viscera in some cetaceans expressed as a percentage of body weight. The value of *S. coeruleoalba* was calculated as the mean of organs at the attainment of plateau. The proportional weight of blubber in the striped dolphins is remarkably lower than in the sperm whale and baleen whales. In case of muscle, the striped dolphin shows higher value than the sperm whale and baleen whales except for *Balaenoptera borealis*. The value of bone or viscera for *S. coeruleoalba* is distributed within the interspecies variation of five species.

The mean weight of brain and 8 visceral organs in some cetaceans expressed as a percentage of body weight is shown in Table 6. The values of the striped dolphins were obtained from the animals whose organ ratio attained plateau. The proportional values of brain for Delphinidae are considerably higher than those of the sperm whale and baleen whales. The values of eight visceral organs (stomach, intestine, liver, pancreas, lungs, kidney, spleen and heart) of the striped dolphin fall in the range of the corresponding values of eight species shown in Table 6. The values of liver or lungs on 4 species of Delphinidae are higher than the corresponding values of the sperm whale and baleen whales.

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APPENDIX TABLE 1. ORGAN WEIGHTS OF

Date of kill	Field no.	Body length (cm)	(1) Body weight (g)	Sex	Life stage or Reproductive condition	Age**	Brain (g) (%)
19 XII '78	23	19	114	♂	Fetus		2.8 (2.5)
19 XII '78	24	22	202	♂	Fetus		4.8 (2.4)
19 XII '78	25	25	164	♂	Fetus		2.7 (1.6)
19 XII '78	26	32	453	♂	Fetus		18 (4.0)
19 XII '78	21	44	1030	♀	Fetus		32 (3.1)
19 XII '78	22	53	2000	♀	Fetus		75 (3.8)
15 XII '78	5	64	3700	♀	Fetus		146 (4.0)
6 XII '79	14	77	6860	♀	Fetus		290 (4.2)
6 XII '79	11	79	6780	♂	Fetus		310 (4.6)
6 XII '79	12	85	8550	♀	Fetus		336 (3.9)
19 XII '78	27	91	7940	♂	Fetus		335 (4.2)
6 XII '79	13	97	10150	♀	Fetus		393 (3.9)
19 XII '78	28	97	9800	♂	Fetus		376 (3.8)
19 XII '78	29	100	11000	♂	Fetus		466 (4.2)
19 XII '78	12	123	26000	♂	Immature	0.21	640 (2.5)
6 XII '79	3	124	23000	♂	Immature	0.22	579 (2.5)
19 XII '78	13	135	26700	♂	Immature	0.33	700 (2.6)
19 XII '78	14	215	106300	♂	Mature	8.5	1020 (1.0)
19 XII '78	15	223	116000	♂	Mature	11.5	880 (0.8)
19 XII '78	16	225	145000	♂	Mature	16.5	920 (0.6)
19 XII '78	17	227	131500	♂	Mature	11.5	1030 (0.8)
19 XII '78	18	230	159700	♂	Mature	17.5	990 (0.6)
19 XII '78	19	238	160500	♂	Mature	16.5	960 (0.6)
19 XII '78	20	239	164800	♂	Mature	36.5	890 (0.5)
6 XII '79	1	105.5	16100	♀	Immature	0.05	471 (2.9)
6 XII '79	2	117	18700	♀	Immature	0.16	798 (4.3)
6 XII '79	4	133	29400	♀	Immature	0.31	674 (2.3)
6 XII '79	6	166	49100	♀	Immature	1.0	849 (1.7)
19 XII '78	2	177	60000	♀	Immature	1.75	710 (1.2)
19 XII '78	3	203	96300	♀	Immature	5.5	860 (0.9)
19 XII '78	4	204	87000	♀	Immature	7.5	880 (1.0)
19 XII '78	5	212	109500	♀	Lactating	17.5	1090 (1.0)
19 XII '78	6	218	122000	♀	Resting	15.5	790 (0.7)
19 XII '78	7	218	130800	♀	Lactating	34.5	890 (0.7)
6 XII '79	7	221	138200*	♀	Pregnant	9.5	942 (0.7)
6 XII '79	8	222	140250*	♀	Pregnant	19.5	851 (0.6)
19 XII '78	8	223	128000*	♀	Pregnant	17.5	1010 (0.8)
6 XII '79	9	223	144700*	♀	Pregnant	20.5	1100 (0.8)
19 XII '78	9	228	136800*	♀	Pregnant	18.5	730 (0.5)
6 XII '79	10	229	153340*	♀	Pregnant	16.5	876 (0.6)
19 XII '78	10	232	153200*	♀	Pregnant	25.5	980 (0.6)
19 XII '78	11	236	140000	♀	Resting	18.5	920 (0.7)

* excluding fetus weight.
** determined from body length in the young animals of 177 cm or less, and from the number of den-
*** including eyes, larynx, tongue, bladder and so on.

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(2) Viscera (g) (%)	(3) Muscle (g) (%)	(4) Blubber (g) (%)	(5) Bone (g) (%)	(6)*** Others (g) (%)	$\frac{(2)+(3)+(4)+(5)+(6)}{(1)}\times 100$
8.7 (7.6)	20.2 (17.7)	10.3 (9.0)	61.1 (53.4)	1.1 (1.0)	91.2
19.8 (9.8)	25.7 (12.7)	20.6 (10.2)	108 (53.4)	1.7 (0.8)	89.3
19.4 (11.8)	26.0 (15.9)	15.4 (9.4)	90 (54.9)	1.2 (0.7)	94.3
57.8 (12.8)	(—225.3 (49.7)—)		104 (23.0)	6.2 (1.4)	90.9
107 (10.4)	187 (18.2)	176 (17.1)	456 (44.3)	4.5 (0.5)	93.6
307 (15.4)	335 (16.8)	309 (15.5)	860 (43.0)	15 (0.8)	95.3
551 (14.9)	975 (26.4)	694 (18.8)	632 (17.1)	178 (4.8)	85.9
883 (12.9)	2320 (33.8)	1820 (26.5)	1200 (17.5)	99 (1.4)	96.4
1180 (17.4)	1990 (29.4)	1720 (26.4)	1390 (20.5)	70 (1.0)	99.3
1390 (16.3)	2260 (26.4)	2430 (28.4)	1850 (21.6)	71 (0.8)	97.5
1194 (15.0)	1817 (22.9)	2504 (31.5)	1903 (24.0)	106 (1.3)	98.9
1890 (18.6)	2320 (22.9)	3320 (32.7)	1910 (18.8)	102 (1.0)	97.9
1368 (14.0)	2232 (22.8)	2720 (27.8)	2534 (25.9)	121 (1.2)	95.5
1225 (11.1)	2823 (25.7)	3213 (29.2)	2340 (21.3)	289 (2.6)	94.1
3030 (11.7)	9670 (37.2)	5910 (22.7)	5200 (20.0)	590 (2.3)	96.4
3260 (14.2)	9780 (42.5)	5530 (24.0)	2540 (11.0)	180 (0.8)	95.0
2700 (10.1)	8890 (33.3)	6680 (25.0)	6140 (23.0)	740 (2.8)	96.8
10960 (10.3)	57560 (54.1)	17400 (16.4)	16600 (15.6)	1550 (1.5)	97.9
11960 (10.3)	63890 (55.1)	19030 (16.4)	17300 (14.9)	1480 (1.3)	98.8
11300 (7.8)	78460 (54.1)	25810 (17.8)	19650 (13.6)	5790 (4.0)	97.9
11700 (8.9)	67940 (51.7)	25260 (19.2)	18200 (13.8)	4170 (3.2)	97.6
15560 (9.7)	90430 (56.6)	29510 (18.5)	17900 (11.2)	2970 (1.9)	98.5
14180 (8.8)	89180 (55.6)	27600 (17.2)	18910 (11.8)	7400 (4.6)	98.6
14350 (8.7)	91430 (55.5)	31390 (19.0)	18020 (10.9)	5170 (3.1)	97.7
1760 (10.9)	7050 (43.8)	3920 (24.3)	2010 (12.5)	115 (0.7)	95.1
2410 (12.9)	7770 (41.6)	4290 (22.9)	2780 (14.9)	176 (0.9)	97.5
4250 (14.5)	13800 (46.9)	6050 (20.6)	4230 (14.4)	427 (1.5)	100
5580 (11.4)	24100 (49.1)	11200 (22.8)	6120 (12.5)	935 (1.9)	99.4
6480 (10.8)	29930 (49.9)	10300 (17.2)	8520 (14.2)	1640 (2.7)	96.0
10400 (10.8)	47970 (49.8)	16560 (17.2)	13520 (14.0)	4330 (4.5)	97.2
8550 (9.8)	44540 (51.2)	15000 (17.2)	11670 (13.4)	3410 (3.9)	96.5
11680 (10.7)	58910 (53.8)	17090 (15.6)	14320 (13.1)	2360 (2.2)	96.4
11120 (9.1)	72910 (59.8)	19550 (16.0)	14100 (11.6)	1740 (1.4)	98.6
17180 (13.1)	68830 (52.6)	23590 (18.0)	15500 (11.9)	2110 (1.6)	98.0
18700 (13.5)	78300 (56.7)	24800 (17.9)	9800 (7.1)	3390 (2.5)	98.4
19800 (14.1)	77000 (54.9)	26500 (18.9)	11300 (8.1)	3010 (2.1)	98.7
14540 (11.4)	69580 (54.4)	19160 (15.0)	16500 (12.9)	3790 (3.0)	97.5
19800 (13.7)	78800 (54.5)	26100 (18.0)	12700 (8.8)	4470 (3.1)	98.9
12700 (9.3)	71600 (52.3)	19200 (14.0)	16600 (12.1)	10130 (7.4)	95.6
23400 (15.3)	85000 (55.4)	28200 (18.4)	12400 (8.1)	2730 (1.8)	99.6
15300 (10.0)	86000 (56.1)	27100 (17.7)	14800 (9.7)	7060 (4.6)	98.7
13490 (9.6)	77610 (55.4)	24480 (17.5)	16800 (12.0)	4290 (3.1)	98.3

tinal and/or cemental layers in the animals of 185 cm or more.

APPENDIX TABLE 2. BODY LENGTH, BODY WEIGHT AND ORGAN

Date of kill	Field no.	Body length (cm)	Body weight (kg)	Sex	Life stage or Reproductive condition	Age**	Heart	Lungs	Liver
19 XII '78	23	19	0.114	♂	Fetus	—	1.0	6.0	—
19 XII '78	24	22	0.202	♂	Fetus	—	1.5	9.0	3.8
19 XII '78	25	25	0.164	♂	Fetus	—	2.2	9.7	5.1
19 XII '78	26	32	0.453	♂	Fetus	—	3.2	24	12
19 XII '78	21	44	1.03	♀	Fetus	—	8.3	44	22
19 XII '78	22	53	2.00	♀	Fetus	—	16.0	103	60
15 XII '79	5	64	3.70	♀	Fetus	—	28.2	194.5	86.8
21 X '70	214	73	—	♂	Fetus	—	44	250	158
6 XII '79	14	77	6.86	♀	Fetus[e]	—	55	334	145
6 XII '79	11	79	6.78	♂	Fetus[a]	—	117	268	180
19 XII '78	31	79.5	4.63	♂	Fetus[c]	—	44	276	128
21 X '70	181	80	—	♀	Fetus	—	63	390	116
21 X '70	219	81	7.10	♂	Fetus	—	68	476	240
6 XII '79	12	85	8.55	♀	Fetus[b]	—	126	432	311
19 XII '78	27	91	7.94	♂	Fetus	—	224	558	140
19 XII '79	30	96	10.0	♀	Fetus[f]	—	105	466	193
6 XII '79	13	97	10.15	♀	Fetus[d]	—	69.5	692	197
19 XII '78	28	97	9.8	♂	Fetus	—	169	507	202
19 XII '78	29	100	11.0	♂	Fetus	—	127	482	219
19 XII '78	12	123	26.0	♂	Immature	0.21	314	917	487
6 XII '79	3	124	23.0	♂	Immature	0.22	237	876	542
19 XII '78	13	135	26.7	♂	Immature	0.33	236	706	369
2 XII '70	614	141.5	31.0	♂	Immature	0.38	210	586	410
13 X '70	E 2	190	—	♂	Immature	—	—	1300	1150
14 XII '71	110	190	—	♂	Immature	3.5	480	1000	1250
25 XI '70	342	192	—	♂	Immature	—	435	1300	1050
14 XII '71	107	195	—	♂	Immature	3.5	600	1550	1500
13 X '70	131	196	—	♂	Immature	—	600	1500	1850
14 XII '71	29	197	—	♂	Immature	4.5	600	1300	1300
14 XII '71	111	197	—	♂	Immature	4.5	550	1200	1400
14 XII '71	3	197	—	♂	Immature	3.5	700	1550	1500
13 X '70	E 5	198	—	♂	Immature	—	—	1600	1300
14 XII '71	1	198	—	♂	Immature	4.5	620	1620	1420
14 XII '71	47	198	—	♂	Immature	5.5	600	1400	1600
14 XII '71	114	200	—	♂	Immature	5.5	700	1500	1750
14 XII '71	112	204	—	♂	Immature	5.5	550	1150	1600
14 XII '71	28	206	—	♂	Immature	3.5	620	1150	1250
14 XII '71	113	208	—	♂	Immature	4.5	680	1650	2050
13 X '70	E 4	212	—	♂	Immature	—	650	1800	2100
14 XII '71	116	214	—	♂	Immature	6.5	600	1750	1850
19 XII '78	14	215	106.3	♂	Mature	8.5	1000	2180	1750
24 X '70	222	216	—	♂	Mature	—	—	2100	1900
19 XII '78	15	223	116	♂	Mature	11.5	1160	2106	1700
19 XII '78	16	225	145	♂	Mature	16.5	1050	1936	2350
19 XII '78	17	227	133.5	♂	Mature	11.5	1060	2058	1600

WEIGHTS OF 82 SPECIMENS OF *STENELLA COERULEOALBA*

Weights of internal organs (g)

Kidney		Pancreas	Stomach				Intestine	Spleen	Brain (g)	Intestine length (cm)
left	right		I	II	III	IV				
0.4	0.3	—	—	—	—	—	—	—	2.8	—
1.8	1.3	—	0.3	0.2	—	—	1.9	—	4.8	—
0.5	0.6	—	—	—	—	—	1.2	—	2.7	—
2.6	2.8	—	(———1.9———)				4.3	—	18	—
5.1	5.1	—	1.4	1.8	—	—	11	0.4	32	—
13	13	—	4.1	3.0	—	—	23	—	75	—
26.4	27.2	5.4	7.0	4.5	2.4	0.9	45.9	0.7	145.7	397
40	40	—	8.7	6.3	(—6.0—)		116	1.8	310	—
28.7	29.8	—	12.5	8.5	3.1	2.6	112	2.8	289.7	580
37.8	35.2	10.3	12.0	7.5	2.4	1.1	131	1.9	309.9	595
32	34	3.2	9.2	7.3	2.7	0.6	73	2.2	—	425
30	32	5.0	11.8	11.0	(—3.2—)		160	5.0	280	—
45	44	6.0	12.2	9.4	(—2.4—)		194	8.0	355	—
37.3	37.6	18.9	15.5	8.5	3.2	2.6	159	2.5	335.9	603
30	30	1.8	13	8.1	3.9	2.1	122	5.3	335	—
43	45	17	17	12	7.4	3.0	195	8.0	—	780
40.3	39.5	—	16.6	14.2	3.4	2.7	233	2.3	393.2	835
34	34	—	13	15	3.4	1.6	210	5.5	376	—
40	39	5.3	12	11	6.0	1.7	—	3.8	466	—
53	59	2.9	33	34	20	6.9	475	25	643	—
54.9	52.1	49.4	29.3	31.2	9.3	8.8	485	12.3	579.4	1190
57	62	24	144	132	121	11	623	30	699	—
65	65	28.6	60	50	42	13.3	850	19.2	—	1200
250	250	300	(———500———)				2200	150	—	—
—	—	98.3	226.5	156.7	86	27	2200	—	—	—
145	140	85	225	140	43.3	29	1750	42.5	—	1310
—	—	112.3	267.6	190.9	61.9	41.9	2950	21.4	—	—
180	—	150	(———650———)				2900	60	—	—
164.6	174.1	116	281.8	192.7	76.7	45.8	2800	25.2	—	—
250	250	131.7	400	250	85.8	25.5	3100	28.0	—	—
191.4	198.2	155.2	343.4	190.7	80	35.4	2150	43	—	—
—	—	158	(———700———)				2600	54	—	—
201.6	217.0	148.5	286.6	190.6	87.4	35.5	2950	34.2	—	—
247.3	217.3	163.8	413.1	201	69	33.3	2900	35.5	—	—
250	250	128.7	500	300	69.7	32.4	2650	26.0	—	—
250	250	105.2	350	250	48.8	17	2750	21.6	—	—
161.3	163.5	88.6	285.4	186.8	93.2	33.3	2500	31.5	—	—
269.1	279.4	155.8	358.4	234.6	71	35	3050	30.8	—	—
302	298	300	(———950———)				3100	44	—	—
—	—	168.8	437.2	220.8	55.8	34.8	2850	55.4	—	—
235	250	143	466	282	57	47	2720	43	1024	—
—	—	180	600	250	120	70	2820	110	—	1835
447	408	151	458	310	56	38	2360	12	881	—
331	317	106	571	220	120	23	2260	37	922	—
309	303	205	580	282	70	62	2870	36	1031	1900

Continued . . .

APPENDIX TABLE 2.

Date of kill	Field no.	Body length (cm)	Body weight (kg)	Sex	Life stage or Reproductive condition	Age**	Heart	Lungs	Liver
13 X '70	130	228	—	♂	Mature	—	850	2100	1600
13 X '70	135	230	—	♂	Mature	—	800	2150	2500
19 XII '78	18	230	159.7	♂	Mature	17.5	1380	2920	2150
19 XII '78	19	238	160.5	♂	Mature	16.5	1280	2800	2000
19 XII '78	20	239	164.8	♂	Mature	36.5	1580	2081	2050
6 XII '79	1	105.5	16.1	♀	Immature	0.05	130	491	260
6 XII '79	2	117	18.7	♀	Immature	0.16	208	715	463
2 XII '70	613	125.5	23.0	♀	Immature	0.24	165	470	330
6 XII '79	4	133	29.4	♀	Immature	0.31	302	1304	809
25 XI '70	344	162	—	♀	Immature	0.68	325	1050	780
6 XII '79	6	166	49.1	♀	Immature	1.0	410	790	667
19 XII '78	1	175	57.0	♀	Immature	1.58	340	1153	852
19 XII '78	2	177	60.0	♀	Immature	1.75	627	877	1010
14 XI '71	2	185	64.0	♀	Immature	3.5	520	1150	1580
25 XI '70	339	188	66.0	♀	Immature	—	420	1100	1250
25 XI '70	340	190	77.0	♀	Immature	—	725	1800	1750
13 X '70	E3	197	—	♀	Immature	—	—	1200	1700
10 XII '70	616	199	77.9	♀	Immature	—	430	2350	1750
19 XII '78	3	203	96.3	♀	Immature	5.5	732	1489	1530
19 XII '78	4	204	87.0	♀	Immature	7.5	734	1443	1500
13 X '70	E1	205	—	♀	Immature	—	—	2400	1500
2 XII '70	651	210	95.0	♀	Immature	—	610	1330	1430
19 XII '78	5	212	109.5	♀	Lactating	17.5	683	1902	1650
19 XII '78	7	218	130.8	♀	Lactating	34.5	1500	3070	2900
19 XII '78	6	218	122	♀	Resting	15.5	778	2030	1670
6 XII '79	7	221	138.2*	♀	Pregnant[a]	9.5	2050	3600	2940
6 XII '79	8	222	140.2*	♀	Pregnant[b]	19.5	1970	4060	2760
19 XII '78	8	223	128.4*	♀	Pregnant[c]	17.5	1310	2460	2170
6 XII '79	9	223	144.7*	♀	Pregnant[d]	20.5	2100	3910	2950
25 XI '70	345	226	119.8*	♀	Pregnant	—	650	2500	2150
25 XI '70	343	228	116.2*	♀	Pregnant	—	615	3200	1950
19 XII '78	9	228	136.8*	♀	Pregnant	18.5	934	1722	1900
6 XII '79	10	229	153.3*	♀	Pregnant[e]	16.5	2330	4680	4510
25 XI '70	346	230	114.9*	♀	Pregnant	—	910	2200	2050
19 XII '78	10	232	153.2*	♀	Pregnant[f]	25.5	1020	2148	2130
25 XI '70	341	232	126.4	♀	Mature	—	760	2000	2250
19 XII '78	11	236	140	♀	Resting	18.5	1350	2750	2400

Fetuses a, b, c, d, e, f were obtained from pregnant females a, b, c, d, e, f respectively.
* excluding fetus weight.

Continued.

Weights of internal organs (g)										Brain (g)	Intestine length (cm)
Kidney		Pan-creas	Stomach				Intes-tine	Spleen			
left	right		I	II	III	IV					
308	—	190	(——1000——)				3000	50		—	—
312	358	177	(——800——)				3500	58		—	—
348	356	132	650	314	179	54	3200	35		992	2110
419	402	165	685	302	142	63	3100	70		962	—
464	396	195	813	375	126	50	2900	76		866	—
37.8	41.1	20.7	18.4	26.4	10.8	5.8	347	13.5		471.2	941
44.1	44.3	26.4	33.6	30.1	13.0	9.1	408	9.4		797.5	1015
52.4	50.4	16.6	28.2	27.7	22.9	4.1	470	12.1		—	—
66.2	67.2	88.7	50.6	46.4	14.4	10.3	758	9.7		673.7	1200
100	—	65	118	90	33.2	33	1200	28.2		—	1254
94.1	93.1	144	148	99.1	69.3	57.1	1680	9.3		848.6	1492
115	118	40	156	123	48	27	—	17		784	—
203	135	66	200	112	44	28	1900	37		709	—
220	220	99.7	288.1	159.5	53.9	30.4	2550	30.2		—	—
125	150	80	235	115	45	31.2	1750	32.2		—	1487
—	—	115	410	210	75	40.4	2600	41.9		—	1890
134	158	160	(——600——)				2200	40		—	—
210	200	120	550	165	48	40	2650	21.4		—	—
212	234	126	405	210	70	64	3000	26		856	1787
174	159	104	363	176	49	33	2000	8.2		884	1580
205	194	108	(——600——)				2500	31		—	—
225	240	110	—	—	—	—	2155	17		—	1988
271	264	163	534	251	90	40	2950	13		1086	1900
471	465	164	703	310	74	51	3200	29		887	1900
216	155	164	491	246	74	48	2620	26		788	1820
372	344	—	551	264	86.6	145	2910	28		942.1	1952
417	413	—	595	306	194	96.6	3690	20.6		851	1687
307	321	168	578	355	85	60	2020	28		1005	2017
387	415	—	744	323	181	107	3010	69.8		1099	1900
250	240	160	490	250	70	37.3	2650	17.8		—	2212
—	—	82	355	260	65	42	2200	29		—	1692
291	287	166	531	319	84	92	2950	33.7		731	2325
475	502	—	709	354	98.9	116	4040	53.2		875.7	2302
240	250	115	525	240	52	37.8	2400	35.4		—	2150
348	313	102	549	264	87	47	3200	33		977	2300
250	265	180	540	318	95	50	3050	30.9		—	2208
326	391	200	704	291	98	81	3200	24		917	—

** determined from body length in the young animals of 177 cm or less, and from the number of dentinal and/or cemental layers in the animals of 185 cm or more.

APPENDIX TABLE 3. BODY LENGTH, BODY WEIGHT AND ORGAN

Date of kill	Field no.	Body length (cm)	Body weight (kg)	Sex	Life stage or Reproductive condition	Heart	Lungs	Liver
10 XI '70	362	114	15.6	♂	Immature	—	310	410
6 XI '70	167	115	—	♂	Immature	86	320	297
10 XI '70	360	117	16.0	♂	Immature	75	335	630
10 XI '70	359	119	15.6	♂	Immature	105	390	375
10 XI '70	364	123	15.8	♂	Immature	100	400	570
10 XI '70	355	122	17.2	♂	Immature	115	440	660
6 XI '70	170	128	—	♂	Immature	106	400	500
10 XI '70	368	149	24.8	♂	Immature	160	550	540
10 XI '70	393	151	34.7	♂	Immature	170	660	1125
10 XI '70	347	165	39.8	♂	Immature	245	900	920
10 XI '70	48	165	—	♂	Immature	220	1300	1220
10 XI '70	352	167	54.0	♂	Immature	350	1300	1320
6 XI '70	171	173	—	♂	Immature	235	1200	1230
10 XI '70	244	184	—	♂	Immature	300	1500	1270
22 X '70	2	193	75.7	♂	Mature	390	1370	1780
10 XI '70	389	198	80.3	♂	Mature	340	1120	1150
10 XI '70	228	209	—	♂	Mature	340	—	—
22 X '70	33	116	—	♀	Immature	80	320	450
10 XI '70	361	117	12.6	♀	Immature	100	340	510
22 X '70	32	118	—	♀	Immature	170	730	1040
22 X '70	47	120	—	♀	Immature	100	420	380
10 XI '70	354	123	17.1	♀	Immature	100	370	515
10 XI '70	358	123	14.8	♀	Immature	90	300	500
10 XI '70	357	130	16.9	♀	Immature	100	440	435
22 X '70	42	130	19.6	♀	Immature	110	500	560
22 X '70	34	155	—	♀	Immature	200	200	1030
10 XI '70	232	164	—	♀	Immature	192	660	840
10 XI '70	312	165	35.0	♀	Immature	220	1000	820
10 XI '70	509	167	36.6	♀	Immature	205	980	950
6 XI '70	169	168	—	♀	Immature	269	930	1250
10 XI '70	370	178	50.9	♀	Immature	350	1350	1630
10 XI '70	236	179	—	♀	Immature	250	1280	1000
10 XI '70	280	181	53.8	♀	Immature	300	1200	1300
22 X '70	65	184	53.0*	♀	Pregnant	280	950	1190
10 XI '70	242	188	—	♀	Mature	320	1200	1650
10 XI '70	282	189	70.1	♀	Mature	—	1550	1700
10 XI '70	245	190	53.2	♀	Mature	280	970	850
22 X '70	25	190	57.1	♀	Lactating	310	1060	1370
6 XI '70	165	193	—	♀	Mature	300	1150	1650
10 XI '70	250	193	61.8	♀	Mature	400	1250	1300
10 XI '70	234	194	—	♀	Mature	360	1050	1750
22 X '70	18	195	62.1	♀	Lactating	290	960	1460
10 XI '70	350	195	67.8	♀	Mature	350	580	1500
10 XI '70	349	195	56.3	♀	Mature	400	1200	1300
10 XI '70	309	195	68.4	♀	Mature	—	1400	1250

WEIGHTS OF 55 SPECIMENS OF *STENELLA ATTENUATA*

Weights of internal organs (g)

Kidney		Pancreas	Stomach				Intestine	Spleen	Intestine length (cm)
left	right		I	II	III	IV			
—	45	12.4	32.7	36.1	12.4	11.3	410	13.8	—
46	56	—	34.6	45.8	9.2	6.2	370	12	700
72	50	26.8	55	40	10.1	9	445	14	820
—	—	25.5	37.6	36.2	12.6	—	465	18.3	775
—	—	25	38.8	39.2	8.6	6.4	410	9.4	845
50	—	25.3	37.8	42	16.2	—	595	18.4	930
—	—	27	40.3	45.8	16.3	6.5	500	18	826
75	75	41.2	130	60	26	—	790	20.4	975
—	—	56.3	130	85	19.5	—	980	26.9	888
150	135	100	200	160	40.4	23.6	1650	17.2	1329
—	—	90	210	80	30	30	1340	17	1453
—	—	—	—	—	—	—	1750	—	—
176	170	117	(——1700——)				1700	51	1330
160	—	72	270	170	40	29.5	1600	32.8	1280
—	—	150	460	200	60	40	1660	65	1486
—	240	—	625	180	50	34	1720	33.2	1117
205	240	95	480	225	55	28.6	—	19.7	—
60	60	20.5	29	19	6	4	320	6	900
48	50	21.2	28	28.6	8.4	7.0	270	10	688
60	60	70	29	19	6	4	420	38	900
—	—	34.5	49.5	41.8	13.5	6.8	550	20	1161
40	60	33.7	54.6	41.2	19.1	—	580	17.3	880
—	—	29.5	44.2	32.8	14.0	—	575	11.1	820
—	60	17	50	50	11.1	10.1	480	20.8	778
—	—	25	40	40	10	10	460	10	790
—	—	70	130	90	38.2	23	1270	18.9	1235
95	90	60	120	98	70	13.3	1000	32	1020
—	—	70	200	110	36.1	21.1	1300	17.2	—
135	135	80	205	110	25.7	21	1300	58	895
160	155	80	(——700——)				1800	21	1240
—	—	—	—	—	—	—	1350	—	—
165	168	105	288	150	26.8	31.4	1400	8	1117
—	—	—	—	—	—	—	1700	—	—
210	190	110	300	140	39.4	31.6	1600	12.8	—
—	—	100	490	180	50	40	1920	23	1232
—	—	—	—	—	—	—	2400	—	—
—	200	100	320	170	44.8	28.8	1180	12.3	1350
—	—	87	340	200	43.3	31	1640	13.8	1593
—	—	160	(——1000——)				—	6	—
—	—	—	—	—	—	—	1750	—	—
245	255	120	475	215	55	24.9	1700	23.7	1422
260	310	120	390	210	40	30	1960	29	1418
245	255	120	457	215	55	24.9	1750	23.7	1337
—	—	—	—	—	—	—	1880	—	—
220	235	100	410	200	65	36.2	1850	11.4	1145

Continued . . .

APPENDIX TABLE 3.

Date of kill	Field no.	Body length (cm)	Body weight (kg)	Sex	Life stage or Reproductive condition	Heart	Lungs	Liver
10 XI '70	279	197	67.8	♀	Mature	385	1250	1400
6 XI '70	166	198	—	♀	Pregnant	295	950	1800
10 XI '70	391	199	71.0	♀	Mature	365	1200	1580
10 XI '70	348	200	61.5	♀	Mature	—	1020	1450
6 XI '70	163	203	—	♀	Mature	370	1100	2000
10 XI '70	507	207	56.3	♀	Mature	300	1000	1450
10 XI '70	508	208	72.0	♀	Mature	360	1150	1780
6 XI '70	164	210	—	♀	Pregnant	362	1400	1700
6 XI '70	168	210	—	♀	Pregnant	302	1300	1300
6 XI '70	172	210	—	♀	Mature	—	1500	1900

* excluding fetus weight.

Continued.

Weights of internal organs (g)

Kidney		Pancreas	Stomach				Intestine	Spleen	Intestine length (cm)
left	right		I	II	III	IV			
245	225	215	390	190	41.4	43.4	1950	20.9	1548
—	—	—	—	—	—	—	2700	—	1290
245	250	110	445	240	75	37	1850	25.3	1466
—	—	—	—	—	—	—	1600	—	—
—	196	140	(———850———)				2750	47	1665
210	190	115	325	200	50	34.9	1900	19.2	1200
—	225	145	390	200	—	10.4	1750	62	1586
—	—	—	495	275	50	24	2750	20	1000
—	—	136	(———700———)				1850	26	1118
316	280	128	(———1000———)				2650	29	1450