On the Sexual Maturity of the Antarctic Male Sperm Whale (*Physeter catodon* L.)

By

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Introduction

Since all the sperm whales that have every been caught in the Antarctic whaling ground were males, and many of them were large-sized, it has been generally believed that the sperm whales found in these waters are old lone bulls which were driven away from their harem. As shown in Figure 1, the modal length of the male sperm whales caught in these waters is 50 ft., and is much longer than that

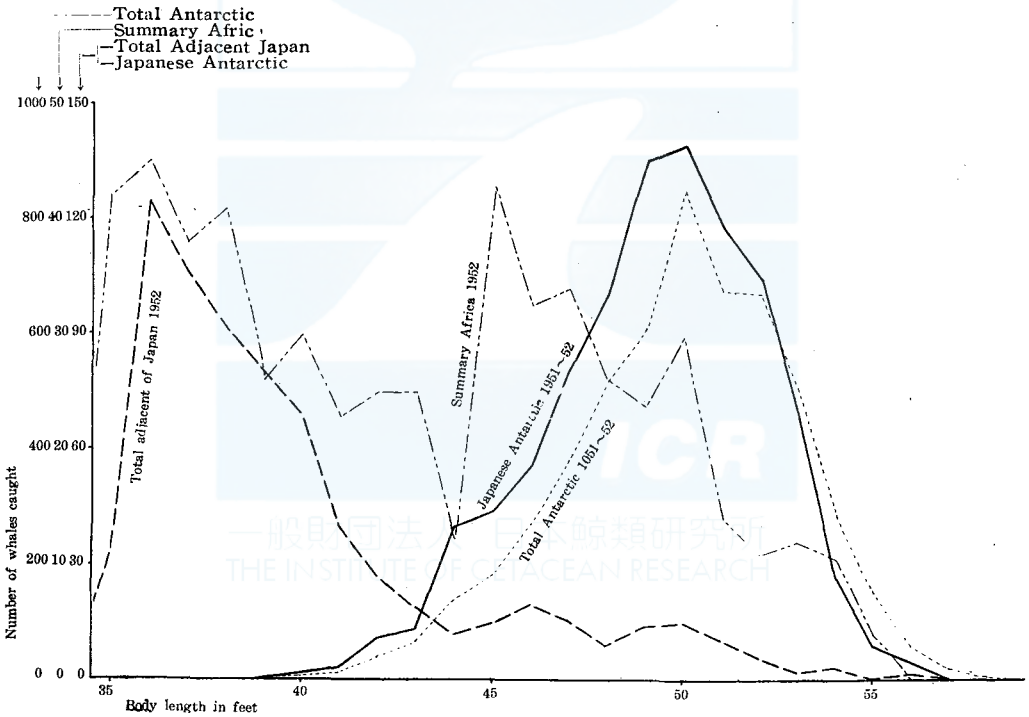

Fig. 1 The Size Distribution of the Male Sperm Whale

of the catch in the adjacent waters of Japan, 36 ft.

In comparison, two modes are recogenized, at 36 and 45 ft., in the length frequency curve for the male sperm whales caught in the African waters (Fig. 1). Probably, these two modes represent respectively the sexually immature and the sexually mature group within the single

population of male sperm whales, from which the catch was drawn. Since these two modes coincide considerably with the aforementioned modes for the male sperm whale catches in the Antarctic and the Japanese waters, one may be inclined to postulate that male sperm whales in the latter two regions belong to a single population, the Antarctic catch representing the sexually mature group and the Japanese catch, the immature group.

Recent studies, however, have revealed that sexually mature male sperm whales are found in the adjacent waters of Japan, as well as sexually immature males. In addition, preliminary investigation indicated that some of the male sperm whales caught in the Antarctic whaling ground gave relatively small testis weight, and were probably sexually immature. For the purpose of ascertaining this point, the present study was undertaken, in which were studied 961 sperm whales—all were males—caught by the Tonan Maru Fleet of the Nippon Suisan Co., Ltd., the Nisshin Maru Fleet of the Taiyo Fishing Co., Ltd. and the Baikal Maru Fleet of the Kyokuyo Whaling Co., Ltd. in the Antarctic season 1951–52.

I would like to express my sincere thanks to the above mentioned three whaling companies and to the government inspectors and biologists named below, for their immense cooperation in collecting the material and data for this study.

Government Instructor: Mr. H. Sakiura, Mr. Y. Teraoka, Mr. Y. Nozawa, Mr. R. Ohyama and Mr. H. Kawamura.

Government Biologist: Mr. Z. Kakuwa, Mr. T. Kawakami and Mr. K. Iguchi.

My thanks are also due to Mrs. S. Nogami who rendered much assistance in the preparation of histological preparats.

Material and Method

The material for this study are the aforementioned 961 male sperm whales caught during the Antarctic season 1951–52. Histological examination was made on pairs of testes of those 164 males whose body lengths were under 40 ft. or whose smaller testis weighed less than 4.0 kg. From the depth of about 1 cm. of the middle part of such testes, a small sample piece (about 1 cm. cube) was cut out after the testes were weighed on board. These pieces were immediately fixed in the alcohol-formalin mixture (9 parts of 60% alcohol and 1 part of 10% formalin).

Fixed sample pieces were transported to the laboratory, where they were cut into sections in the paraffin method, double-stained with

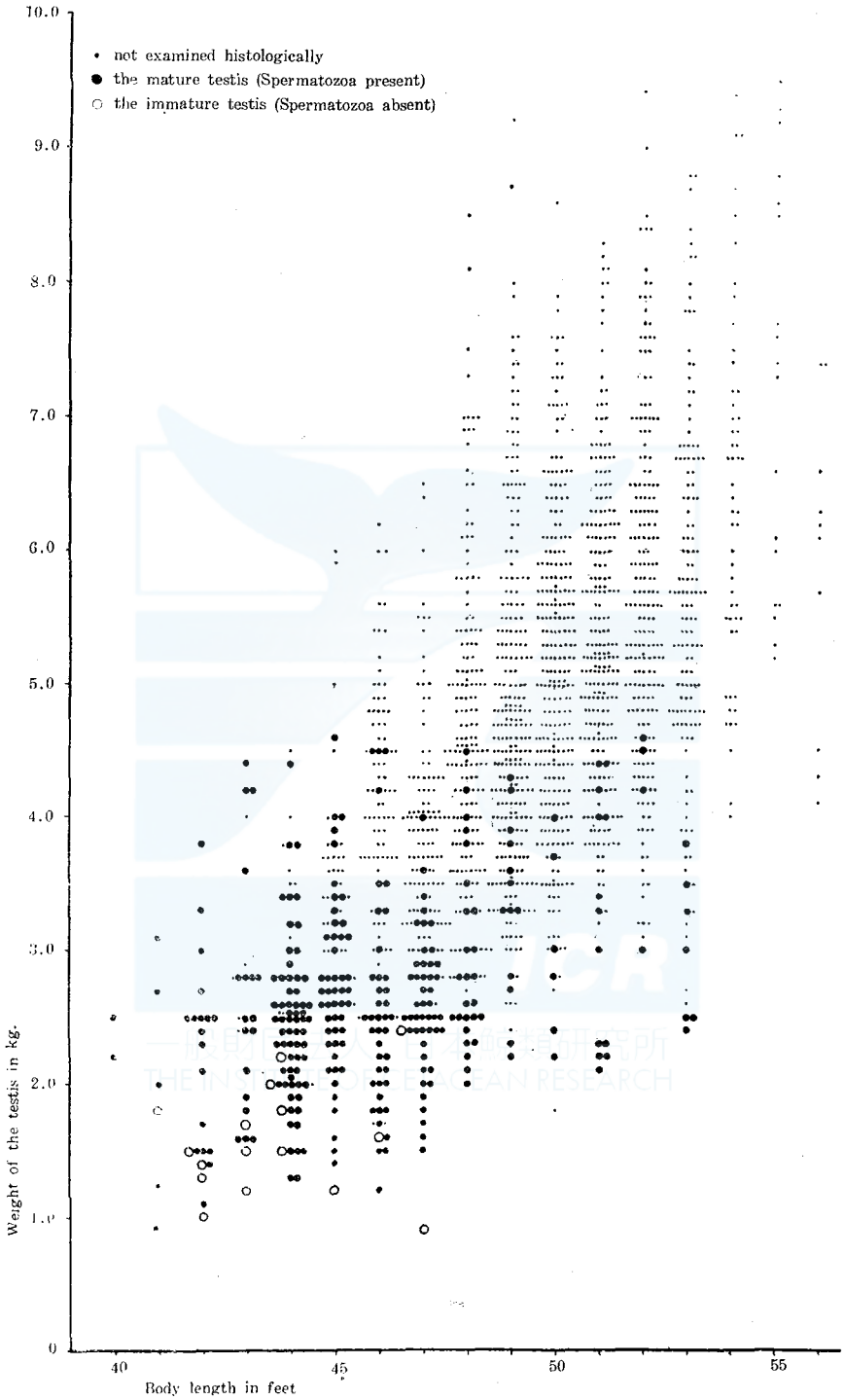

Fig. 2 The Weight of Examined Testes against the Body Length of Whales.

haematoxylin and eosin, and subjected to microscopic examination.

Careful observation was made to determine whether spermatozoa were present or not.

Table I. Number of the whales caught and those whose testes were examined histologically, by fleets.

Fleet	Whales caught (Number)	Whales whose testes were examined	
		(Number)	(Percentage)
Tonan-maru	362	37	
Nisshin-maru	377	73	
Baikal-maru	222	54	
Total	961	164	17.1%

Testis Weight at Spermatozoa Formation

Based on the result of the microscopic examination, those testes in which spermatozoa were found are classified as mature and those in which no spermatozoa were detected are classified as immature, irrespective of the presence of well developed spermatocytes.

In Figure 2 is plotted the weight of histologically examined testes against the length of whales, and discrimination is made between mature and immature testes.

In Figure 3 is shown the percentage that mature testes occurred for each 0.1 kg. testis-weight class. The graph indicates that 75% of the testes were mature at the weight of 1.5 kg. I regard this figure as the average testis weight of the male sperm whale of the Antarctic waters at the attainment of sexual maturity.

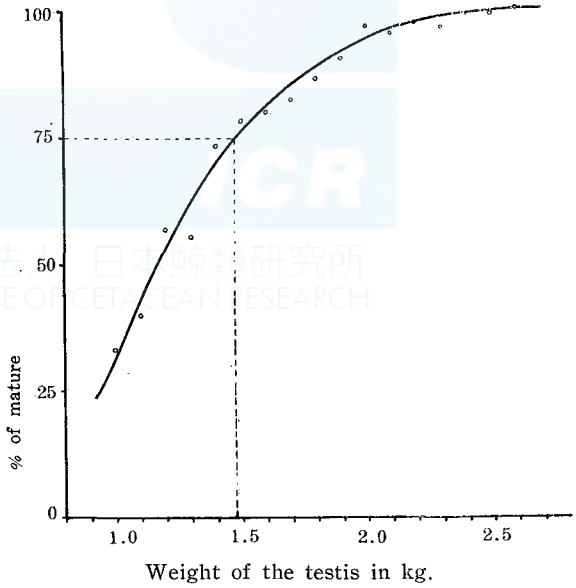

Fig. 3 The Percentage of Mature Testes occurred for each 0.1 kg. Testis-weight Class.

Comparison of the Weights of the Right and the Left Testis

In the whalebone whale species, such tendency is not known that the testis on a definite side of the body is heavier than that on the other side; in other words, the right testis is heavier in as many individuals as the left testis. Accordingly, the testes weight—right and left testis combined at the attainment of sexual maturity is reasonably estimated in these whales as twice of the testis weight at spermatozoa formation, which is determined by the method indicated in Figure 3. From the testes weight at sexual maturity thus estimated and the length-testes weight relationship, the length at sexual maturity can be determined.

In the sperm whale, however, the left testis is heavier than the right one in the majority of the cases, as indicated in Table 2. This

Table 2. Number of the male sperm whale caught in the Antarctic season 1951–52 as classified according to the relative weight of the right and left testis.

Name of fleet	Left testis heavier	Both testes equal in weight	Right testis heavier	Uuknown because single lost	Total
Tonan-maru	212	27	122	1	362
Nissin-maru	220	55	100	2	377
Baikal-maru	110	21	64	27	222
Total	542 56.4%	103 10.7%	286 29.8%	30 3.1%	961 100%

tendency, probably related with the bilateral asymmetry which is seen in the blow hole and other organs of this species, preclude us from accepting twice of the testis weight at spermatozoa formation (1.5 kg.) as the testes weight at sexual maturity.

Body Length at Sexual Maturity

For the reason mentioned in the preceding section, the length of the sperm whale at sexual maturity was estimated in the following way.

Based on the abovementioned result, testes weighing 1.5 kg. or more are considered as mature, and the percentage of the testes weighing 1.5 kg. or more is calculated for each length class of the whale. The result is represented by the broken curve in Figure 4.

As another approach, the percentage of the testes containing spermatozoa is calculated similarly, and the result is shown in Figure 4 as the solid curve.

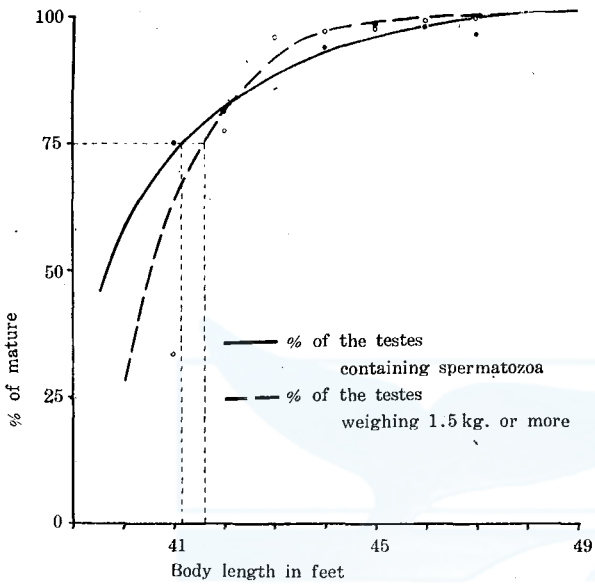

Fig. 4 The Body Length of the Antarctic Male Sperm Whale at Sexual Maturity.

In either curve of Figure 4, the body length at which 75% of the testes are mature is 41–42 ft.

Conclusion

From the foregoing evidences and discussions, it is estimated that, in the male sperm whale of the Antarctic waters, the testis matures, (i.e. spermatozoa are formed) at the average weight of 1.5 kg., and the body length at sexual maturity is 41 ft.

The abovementioned body length is greater than the body length at which the male sperm whale of the adjacent waters of Japan attain sexual maturity, which is certainly below 38 ft. and probably between 35 and 37 ft. It may be then that the body length of the male sperm whale at sexual maturity differs in the northern and the southern hemishpere, as is the case in whalebone whales.

Calculation based on the foregoing results indicates that 0.5% of the male sperm whales caught in the Antarctic waters in the 1951–52 season were sexually immature.

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