

A SECONDARY SEXUAL CHARACTER OF THE SPERM WHALE

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In the Cetacea body length is commonly known as a secondary sexual character. In the sperm whale the male grows larger than the female. The distance between the center of genital aperture and anus shows also a sexual difference. Other secondary sexual characters of the Cetacea are known on the shape of the snout of the fin whale (Nemoto, 1962) and on the tooth of some Odontoceti.

A peculiar feature of the skin, a callus, on the tip of dorsal fin of the sperm whale was noticed in the summer season of 1964. We are convinced now that this is one of the secondary sexual characters of the sperm whale, and report it here.

Many thanks are due to Dr. Keiji Nasu of the Whales Research Institute, who kindly collected the data and samples of the skin of dorsal fin. We are much indebted to Dr. Shyojiro Inoue of the Tokyo Medical and Dental University, who discussed our materials and gave us valuable suggestions on endocrinology.

MATERIALS AND METHOD

Materials were obtained mainly from the whales captured in September and October 1964 and 1965 by the Japanese coastal whaling. In addition to them, 19 whales captured in September 1965 under a special permission of the Japanese government for the scientific purposes and a female calf captured accidentally by a set net were also used here.

The condition of the callus on the dorsal fin was recorded in the following three categories, namely "present", "absent" and "indistinct". The "indistinct" includes the intermediate stage of the former two categories, where the condition of skin on the top of dorsal fin is not quite smooth but shows a faint callus.

Together with this observation, mammary gland, number of corpora luteum and corpora albicantia, weight of testes and fetus were observed, and the sexual condition of the animals was decided.

GENERAL CHARACTER OF THE CALLUS

The callus is found on the dorsal fin of most of adult females and some of young males. It situates usually on the area around the top of dorsal fin, but in some animals it situates on the anterior or posterior edge. The outline of the callus is nearly oval or round, but it has a wide variation in size and shape. The shape and the situation of the callus are shown in Text-Fig. 1 and PLATE 1, Figs. 1-3.

Differing from the smooth epidermis on the most parts of the body, the surface of the callus shows a roughness, which feature resembles to the surface of the small

callosities of the right whale but the former is not so rough and hard as the latter. The colour of the callus is paler than the other part of skin.

The vertical section of the callus is shown in PLATE 1, Fig. 4. The depth of epidermis of the callus is very irregular and is nearly 17 mm at the thickest part and 5 mm at the thinnest part. The dermal papillae are more developed than those on the other part of skin but do not seem to differ much from the latter. The base of epidermis shows a wave form generally coinciding to that of the surface of callus, but the structure of the dermis and blubber does not show any difference from that of the dorsal fin without callus. And so, we can not think that the callus is a product of diseased skin.

RELATION TO AGE AND SEXUAL CHARACTERS

Table 1 shows the change of the frequency of the occurrence of callus in different age classes. The age was determined by the number of laminations in maxillary tooth which are considered to be accumulated annually (Ohsumi *et al.*, 1963).

In the males callus seems to occur in some young animals, but entirely disappears in all males older than 9 years old. The sexual maturity of the sperm whales is attained at the age of 9 or 10 laminations in both sexes (Nishiwaki *et al.*, 1958). The age of the disappearance of callus in males nearly coincides with the age at sexual maturity. In the females, the occurrence of the callus does not show clear relation with the age of whales. However, callus does not seem to appear in the calf.

The relation between the frequency of callus and sexual conditions is shown in Table 2. In the males, maturity is classified by the weight of larger testis, namely the testes which weighs 0.4 kg or less is classified into immature, 0.5 kg-0.9 kg into mature-1 which is supposed to include the puberty, and 1.0 kg or more into mature-2 respectively. In the females, puberty includes those which have experienced ovulation but have no experience of pregnancy. The primiparous or multiparous was distinguished by the total number of ovulations and the state of mam-

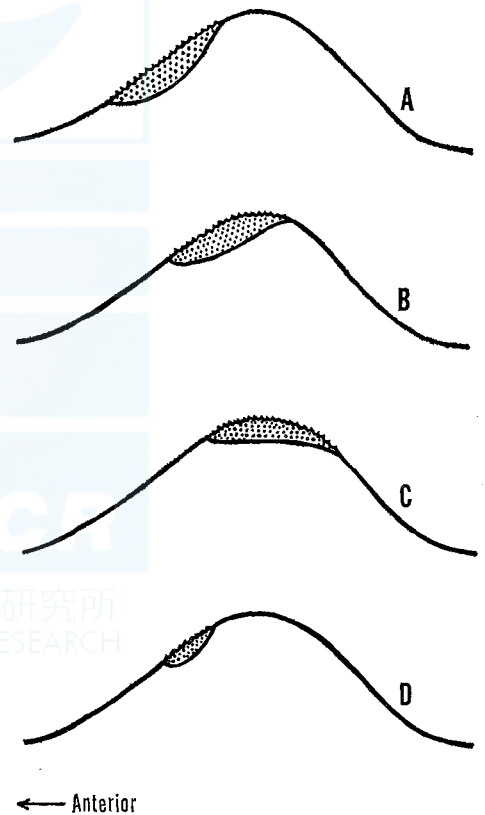


Fig. 1. Schematic figure of some variations in the position and size of callus (dotted area) on the dorsal fin of the sperm whale (lateral view.)

mary gland or whether it has experienced lactation or not. Some indistinguishable females are not included in Table 2.

TABLE 1. FREQUENCY OCCURRENCE OF THE CALLUS IN AGE CLASSES

Age	0	4	7	8	9	10	11	12	13	14	15-24	25-34	35-	Total	
Male	absent	—	—	—	1	2	1	1	1	4	1	9	1	2	23
	indistinct	1	1	—	—	—	—	—	—	—	—	—	—	—	2
	present	—	—	—	—	2	2	—	—	—	—	—	—	—	4
Female	absent	1	—	2	1	4	2	2	—	—	—	3	—	1	16
	indistinct	—	—	—	—	—	2	—	—	2	—	—	—	3	7
	present	—	—	—	3	—	—	3	—	2	2	17	4	4	35

TABLE 2. OCCURRENCE OF CALLUS ON THE DORSAL FIN OF SPERM WHALE

Sex	Maturity	Callus on the dorsal fin			Total
		absent	indistinct	present	
Male	Immature	5	2	3	10
	Mature-1	9	—	1	10
	Mature-2	12	—	—	12
	Total	26	2	4	32
Female	Immature	4	1	1	6
	Puberty	7	—	2	9
	Primiparous	3	—	3	6
	Multiparous	6	7	42	55
	Total	20	8	48	76

Mature-1 ; Larger tests weighs 0.5 kg-0.9 kg.

Mature-2 ; Larger tests weighs 1.0 kg or more.

Out of 22 mature males, the callus was observed only in one case which is a newly matured male or in the stage of “ mature-1 ”. On the other hand, some of the immature males have callus. Although the scarcity of immature samples does not allow to conclude the frequency of the occurrence, the immature males with callus seems not to be so rare. The callus observed in the immature period will disappear after or near the attainment of sexual maturity, and probably the male sex-hormone inhibits the manifestation of the callus.

TABLE 3. FREQUENCY OF CALLUS IN SEXUAL CONDITIONS OF MATURE FEMALE

Callus	Resting	Pregnant	Lactating	Lact. and preg.	Total
absent	3	3	2	1	9
indistinct	1	2	2	—	5
present	3	11	21	4	39
Total	7	16	25	5	53

Callus occurs on the female whales at every sexual conditions. Table 3 also shows the frequency occurrence of the callus in various sexual conditions of mature females. Fig. 2. is obtained from Tables 2 and 3, and it does not include 5 females

which are pregnant and lactating simultaneously. This figure shows that, in the females, the manifestation of callus begins in the immature. Its frequency increases in pregnant and lactating whales, and decreases again in resting whales. There is an immature female with callus, which is suggested to attain soon the puberty. And in the mature females, the formation of callus seems to have some relations with the sexual cycle, although there is no evidence that the manifestation or disappearance of callus is controlled directly by some endocrinological factors. When it is assumed, next supposition is possible. Chuzhakina (1961) concluded, after histological observation, that corpus luteum tissue of the pregnant sperm whale begins to degenerate when the fetal length attains to 199 cm. So the secretion of the progesterone can be supposed to decrease in the latter half of the pregnancy as in the case of some mammals. On the other hand, secretion of estrogen, though which is

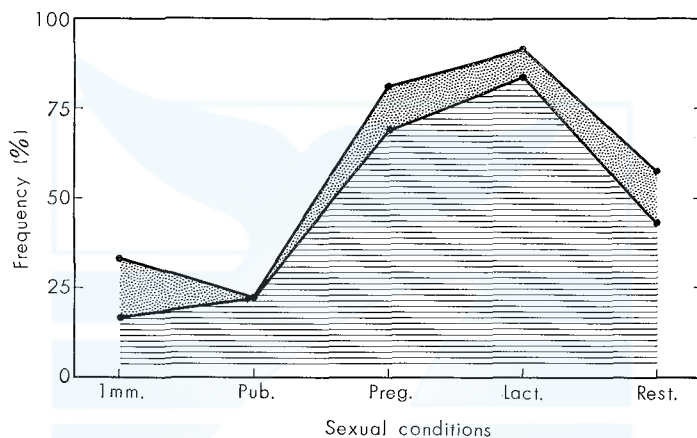


Fig. 2. Frequency occurrence of the callus in various sexual conditions in females. Whales lactating and pregnant simultaneously are excluded. White: absent, Dot: indistinct, Horizontal line: present.

not studied in the sperm whales, is known in many mammals to increase gradually until just before the parturition, and it is also secreted in the immature and mature mammals of both sexes in various degree. As mentioned above, callus is found on the immature animals in both sexes and on the mature females, so we prefer to think that estrogen has charge of the manifestation of callus and that androgen inhibits it.

We have rare chances to observe the dorsal fin of 7 fetuses (3 males and 4 females, body lengths 51–108 cm) but callus was not found on them. And there was no callus on the dorsal fin of a new born female calf of which body length was 426 cm. We must get more materials on the fetal and calf stage of the sperm whale, and it is one of the subject to investigate the age when the callus appears on the dorsal fin.

Callus on the dorsal fin in the sperm whale is different from callosities on the mouth parts of the right whale, because in the latter whale they appear already in fetal stage, and they are found in every one.

SUMMARY

A secondary sexual character of the sperm whale is reported based on the materials obtained from the Japanese coastal waters.

1. A callus is formed on the skin near the top of the dorsal fin of some sperm whales.

2. The shape of callus is nearly round or oval, and it is distinguished externally from the usual skin by paler colour and unevenness. Internally, it is characterized by a well developed thick epidermis.

3. The callus is not observed on the fully mature males, but observed on some immature one.

In the females, it occurs more often on pregnant and lactating whales than on the immature, pubertal and resting whales.

4. It is presumed that male sexual hormone inhibits the manifestation of the callus, and some female sexual hormone, probably estrogen, stimulates it.

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EXPLANANATION OF PLATE

- Fig. 1. Lateral view of dorsal fin without callus, adult male.
Fig. 2. Lateral view of dorsal fin with callus, adult female.
Fig. 3. Dorsal view of dorsal fin with callus, adult female.
Fig. 4. Section of skin of the dorsal fin through callus, adult female.



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