THE HYOID BONES OF TWO KINDS OF HARBOUR SEALS IN THE ADJACENT WATERS OF HOKKAIDO

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ABSTRACT

The hyoid bones of the harbour seal in the adjacent waters of Hokkaido were examined, and remarkable differences were found between those of the ice-breeding and the land-breeding harbour seals. The land-breeding harbour seal completely lost their tympanohyals. Moreover their stylohyals were quite small and their proportional length was about one tenth of that of the ice-breeding seal. However, in the epihyals the land-breeding seal possessed the longer bones than the ice-breeding seal.

INTRODUCTION

The hyoid bones have been considered to be a systematic character in the whales (Omura, 1964), however, in the seal careful consideration has never been given to the hyoid bones. In the adjacent waters of Hokkaido, there were found two kinds of harbour seals; the ice-breeding harbour seal and the land-breeding harbour seal (Inukai, 1942; Belkin, 1964; Naito and Nishiwaki, 1972 a, b, etc.). The morphological studies on these harbour seals were performed in Hokkaido from 1969 to 1971. In these studies, I found the incomplete hyoid bones in the land-breeding seal while the normal hoid bones were found in the ice-breeding seal, and the outline of this difference between them was already reported quite briefly (Naito and Nishiwaki, 1972b). In the present paper some measurements of the hyoid bones of these seals were examined. But further studies on this problem are required to clarify the systematic or taxonomical problems of the North Pacific harbour seals.

Concerning the scientific name of the above harbour seals, I had already used "*Phoca vitulina largha*" for the ice-breeding seal and "*Phoca kurilensis*" for the land-breeding seal in my previous papers, however, in the present paper I do not use these names, for systematical studies on the North Pacific harbour seals have been advancing in recent years and taxonomical reconsideration on these seals seems to be required (Fay and Burns, private communication).

MATERIALS AND METHODS

The ice-breeding seals were caught at the Okhotsk coast of Kitami district and the Shiretoko Peninsula where the sealing on this kind of seal is active, and the land-

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breeding seal was caught at the Pacific coast of the Nemuro Peninsula where this kind of seal is dominant. Thirty three hyoid bones of the ice-breeding seal and 10 hyoid bones of the land-breeding seal were collected as materials. Since samples are quite short in the land-breeding seal, it was difficult to compare the hyoid bones between above two kinds of seals by the same age and the same sex.

The hyoid bones were taken off from the tongue. Then each bone of the hyoid was separated and measured. The cartilagionous tympanohyals taken off from the tympanic bullae were not measured, for their length and shape were much changed after drying.

GENERAL DESCRIPTION AND MEASUREMENTS

It is usually thought that the hyoid bones of the harbour seals are consisted of eleven bones such as one basihyal, 2 thyrohyals, 2 keratohyals, 2 epihhyals, 2 stylohyals and 2 tympanohyals (Plate I, II). All of these hyoid bones are seemed to be normally found in the pinnipeds. I had examined and found the same composition of the hyoid bones in the ribbon seal and ringed seal collected from the Sea of Okhotsk, and also in the steller sea lion and the south American sea lion Otaria byronia. Each of the hyoid bones of these animals were found to be well developed. However, the hyoid bones of the land-breding harbour seal in the present work appeared to be quite different from those of above mentioned animals.

The cartilagionous tympanohyals which connect with the tympanic bullae in

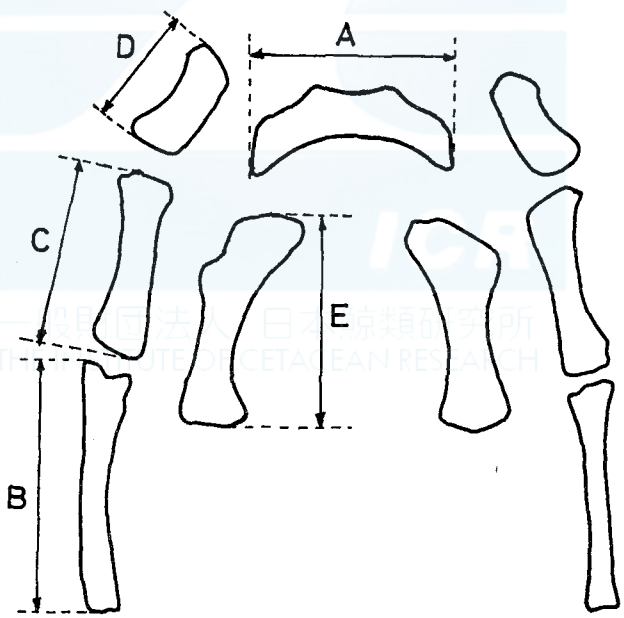

Fig. 1. The positions of the measurements. L, length of basihyal; B, length of stylohyal; C, length of epihyal; D, length of heratohyal; E, length of thyrohyal.

above animals were almost undeveloped and hard to find out in the land-breeding harbour seal. Therefore one end of the stylohyals were free in the tongue with the other end connecting with the epihyals. While in the ice-breeding harbour seal, these tympanohyals were well developed and were completely connected with the posterior part of tympanic bullae crossing over the surface of it from anterior part.

The second remarkable difference between the ice-breeding and the land-breeding harbour seals was found in the stylohyals. The stylohyals of the ice-breeding seal were thin and slender but well developed in its length. Most of these bones were almost round and straight but some were found to be slightly curved, and the epihyal side of these bones was thickened while the other side was less thickened. In the land-breeding harbour seal these stylohyals were incomparablly different from those of the ice-breeding one. They were quite small like a minute fragment, and it seemed to be easily failed to be found out in the young seal, while these bones were solid and firm like other hyoid bones in the adult seal. The forms of these bones were full of variety, and they differ much even between left and right bones.

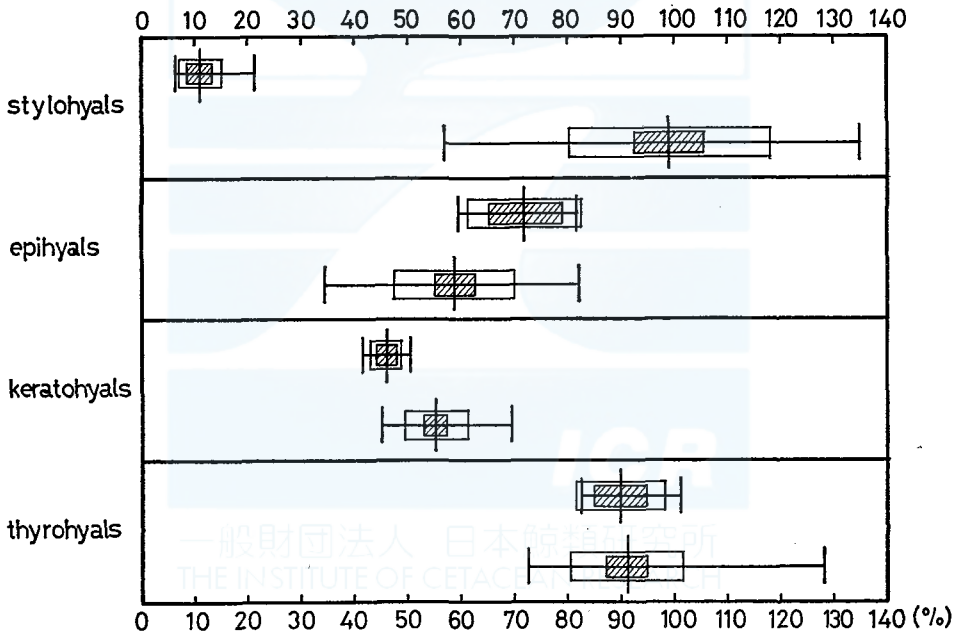

Fig. 2. Proportional length of each bone of the hyoid against the basihyal length. The horizontal line, range; vertical line, mean; outer box, standard deviation; inner box, standart error. Upper, land-breeding harbourseal; lower, ice-breeding harbour seal

Other hyoid bones did not show much obvious differences in above two kinds of harbour seals. In the land-breeding seal, however, the epihyals, keratohyals and thyrohyals showed massive and firm more than those of the ice-breeding seal.

Concerning the shapes of epihyals and keratohyals, they showed a little difference between above two kinds of seals. The epihyals of the ice-breeding seal were thin in center part and thick in both ends while those of the land-breeding seal were tapered, thick in the keratohyal side and thin in the stylohyal side. The keratohyals of the ice-breeding seal were also thick in both ends and thin in center, but those of the land-breeding seal were very short and no constricted or narrow parts were found.

The measurements were made on each hyoid bone (Fig. 1), and the proportional length of stylohyals, epihyals, keratohyals and thyrohyals was calculated in percentage against the basihayals. The average length of left and right bone was used for calculation. The artithmetic mean, standard variation and standard error were also calculated for the sake of comparison. The calculated results were shown in figure 2. As shown in this figure, the most obvious difference was found in the stylohyals. The proportional length of the land-breeding harbour seal was about one tenth of that of the ice-breeding harbour seal. The proportional length of epihyals was larger in the land-breeding seal than in the ice-breeding seal. In the keratohyals, the ice-breeding seal was larger. In the thyrohyals, both seals showed almost same proportional length, and as a matter of fact the shape of these bones showed better resemblance than others.

DISCUSSION

There were definite differences in the hyoid bones between the ice-breeding and the land-breeding harbour seals in Hokkaido. The land-breeding seal possessed a minute stylohyals and no tympanohyals while the ice-breeding seal possessed well developed these bones. It is of interest to consider above differences from the point of view of systematics of the North Pacific harbour seals.

In the North Pacific, there seems to be three kinds of harbour seals; the ice-breeding seal in the Bering Sea and the Sea of Okhotsk, the land-breeding seal in the Pacific coast of North America from Alaska to as far south as Mexico, and also land-breeding seal from the Aleutian Islands to as far west as the Kuril Islands and Hokkaido. The systematics of above three kinds of seals are still uncertain. Especially the systematic relation between above two kinds of land-breeding seals is quite unknown. Newby informed me in his private communication that the land-breeding harbour seal in Washington possessed the normal hyoid bones. Fay and Burns also informed me in their private communication that the incomplete hyoid bones were found in the harbour seal in Alaska where above three kinds of harbour seals seem to be common. However, we have quite short data to discuss the systematics of the North Pacific harbour seals by means of the hyoid bones.

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REFERENCES

BELKIN, A. N., 1964. A new species of seal—*Phoca insularis n. sp.*–from the Kuril Islands. *Dokl. Akad. Nauk. SSSR*, 158: 1217–1219. (in Russian).

INUKAI, T., 1942. Hair seals in our northern waters (I). *Shokubutsu Dobutsu*, 10 (10): 927–932. (in Japanese).

NAITO, Y., and M. NISHIWAKI, 1972a. The growth of two species of the harbour seal in the adjacent waters of Hokkaido. *Sci. Rep. Whales Res. Inst.*, 24: 127–144.

NAITO, Y., and M. NISHIWAKI, 1972b. Ecology and morphology of *Phoca vitulina largha* and *Phoca kurilensis* in the southern Sea of Okhotsk and north east of Hokkaido. *Symposium on the Biology of the seal.*, University of Guelph, Ontario Canada. (in press).

OMURA, H., 1964. A systematic study of the hyoid bones in the whales. *Sci. Rep. Whales Res. Inst.*, 18: 149–170.

APPENDIX

MEASUREMENTS OF HYOID BONES

(upper, right; lower, left; in mm)

The ice-breeding seal:

Body length	Age	Sex	Basihyals	Thyrohyals	Keratohyals	Epihyals	Stylohyals
155	8	F	24.7	23.3 22.2	17.0 16.8	13.1 13.4	26.4 26.1
140	7	F	22.1	21.5 19.4	11.7 12.6	14.6 11.3	24.2 25.1
166	11	M	24.6	23.3 24.2	14.7 13.7	15.5 16.1	28.2 27.6
153	18	F	23.7	20.8 —	16.0 —	14.1 14.8	23.7 23.2
111	0	F	17.2	— 15.3	10.5 9.6	9.1 —	17.8 18.1
149	3	M	25.0	20.9 21.0	13.9 12.8	15.6 13.8	26.0 26.6
142	4	F	23.6	20.6 20.2	11.1 10.6	13.0 12.2	24.8 24.7
—	—	M	22.9	23.1 —	13.3 12.0	15.8 —	29.9 28.5
162	12	F	22.4	22.7 22.1	11.3 12.1	14.5 15.0	27.8 28.0
149	6	F	22.2	16.8+ 29.3	13.7 13.3	14.4 15.2	13.7 13.1
162	20	F	23.6	25.2 25.1	16.8 16.1	14.0 15.0	28.9 28.5
176	22	M	26.5	22.3 22.6	15.6 13.7	15.9 16.0	27.2 28.9
139	7	F	22.3	20.8 21.9	12.2 12.0	16.8 16.9	26.3 —
110	1	M	16.3	20.9 —	11.0 —	7.2 —	17.0 17.6
—	1	M	20.0	15.1 15.2	10.5 10.1	7.9 8.1	14.9 15.2
91	6	M	17.8	12.8 13.1	9.0 8.9	7.4 8.6	13.5 14.0
132	3	M	22.2	20.1 20.0	10.8 10.8	14.1 13.2	22.9 22.4
152	4	F	25.1	23.0 23.3	11.5 11.3	15.2 —	25.5 25.5
127	1	M	20.4	17.2 —	10.0 10.1	12.0 12.0	18.9 20.0
—	18	M	27.0	27.8 27.5	13.5 14.8	17.9 19.5	27.1 28.1
139	2	M	24.5	18.5 19.0	11.8 11.8	13.8 15.0	22.5 21.7
155	18	F	22.5	19.2 18.2	13.3 14.0	15.1 14.5	24.0 23.5
126	1	F	20.8	— 19.2	11.8 14.0	11.7 11.8	14.5 15.3
155	26	M	26.1	22.1 —	14.5 14.0	18.0 19.1	27.0 26.8
94	0	F	18.2	14.8 15.0	10.0 11.0	8.1 6.7	17.1 17.8

Continued . . .

APPENDIX Continued.

Body length	Age	Sex	Basihyals	Thyrohyals	Keratohyals	Epihyals	Stylohyals
149	2	F	20.5	21.3 21.9	11.1 11.5	15.0 14.5	27.9 27.4
136	2	M	22.8	18.8 18.9	12.1 12.2	10.1 11.3	21.2 21.1
108	1	F	20.5	17.2 17.8	10.2 9.9	10.8 11.1	19.0 18.9
114	0	F	21.2	17.2 17.2	11.1 10.1	11.8 13.2	11.1 17.1
163	18	M	23.8	26.5 26.5	15.1 12.1	19.5 19.6	28.6 29.0
88	0	M	16.7	13.9 13.0	— 7.9	— 6.2	— 14.3
97	0	M	17.5	14.2 13.3	9.5 11.2	6.6 5.7	16.0 16.2
169	25	F	25.3	26.9 26.5	13.6 14.0	17.6 18.1	29.3 26.1
The land-breeding seal:							
152	3	M	24.9	21.3 20.6	12.0 12.0	17.2 17.5	2.2 2.3
178	7	M	28.3	27.3 27.8	13.8 14.0	23.1 23.7	6.1 6.0
140	4	F	22.1	19.8 19.5	10.5 10.5	16.5 16.3	2.1 1.8
104	0	M	15.0	13.8 13.3	6.9 6.9	9.0 8.9	1.5 1.6
149	3	F	24.8	22.3 22.2	10.1 10.7	16.8 16.7	2.1 2.2
104	0	M	17.5	15.1 14.3	7.7 7.9	12.1 11.6	2.1 —
168	7	F	23.9	24.5 23.9	12.1 —	19.4 19.8	2.4 2.4
144	3	M	22.8	19.0 19.1	10.1 10.5	15.4 15.2	1.9 1.5
151	4	F	26.1	23.1 23.1	11.9 11.5	19.0 18.1	2.5 2.0

EXPLANATION OF PLATES

PLATE I. Hyoid bones of the ice-breeding harbour seal. The tympanohyals are cut off. (upper, adult; lower, pup)

PLATE II. Hyoid bones of the land-breeding harbour seal. (upper, adult; lower, pup)