Fossil Vertebrae of Humpback Whale from Alluvial Deposits in Yokohama City

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ABSTRACT

In July 1964, two fossil specimens of vertebra of humpback whale were found in a gravelly sand bed at a locality of -8.5m level, during the foundation work for construction of a new building of the Kanagawa Prefectural Office. Significance of the discovery and the characteristics of the specimens are given in this paper.

INTERODUCTION

The construction of the Kanagawa Prefectural 'Office building was commenced in December 1962 by the Kashima Construction Co., Ltd. During the foundation work, on 7th and 10th of July, 1963 fossil vertebrae of a largesized whale were collected from a sand-gravel bed at about 8.5m below the ground surface (Fig. 1). The writers, having been informed of the discovery, visited the locality without delay and observed the mode of occurrence of the fossils. As the foundation work was in progress a thoroughgoing examination was impossible, but the writer were able to get an outline of the situation. The excavated two specimens were kept at the Construction Office for a while but were later donated to the Kanagawa Prefectural Museum as reference material.

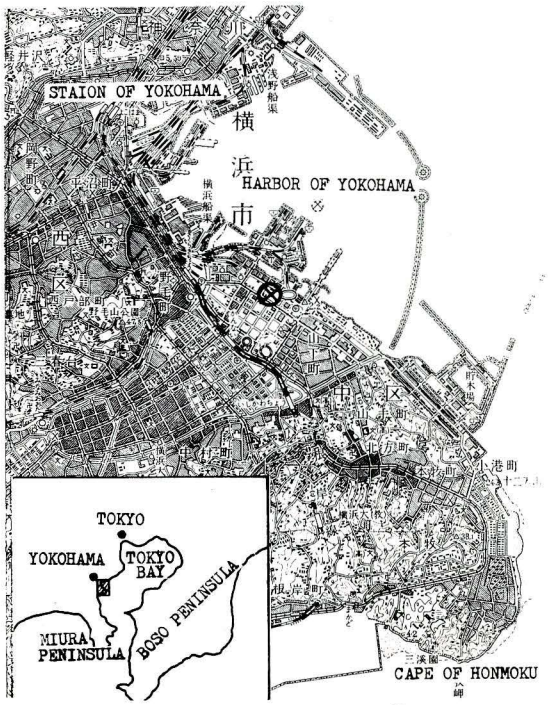

Fig. 1. Map of a part of Yokohama City and fossil locality(⊗). 1/3,0000.

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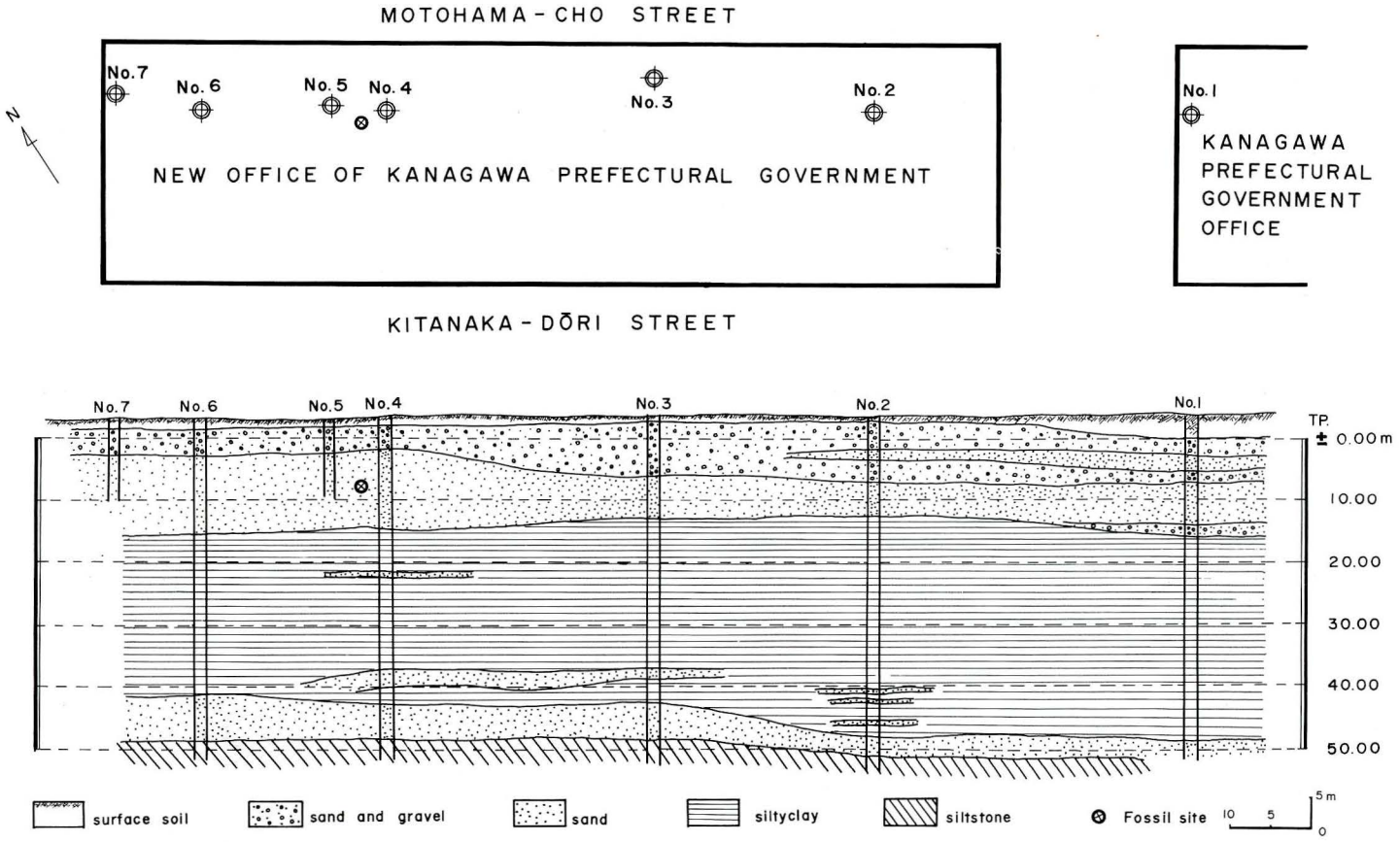
It is known well that whales are often washed ashore, and such an event is occasionally reported in newspapers. It is also known that dolphins, porpoises and whales used to come Tokyo Bay till quite recently when the population of Tokyo and adjacent urban districts was not so large as in the present time and the river water of the Ara-kawa, Sumida-gawa and Tone-gawa was still clear. Accordingly, discovery of Cetacean bones in the areas around the ancient Tokyo Bay is not unusual at all. However, very few of such facts were definitely recorded (TOKUNAGA, 1930), and in this respect the above-mentioned fossil vertebrae of whale may serve as an important reference for the future study of geology and paleontology of Pleistocene and younger ages. This is the reason that the writers present a brief report here on the discovered specimens. In a separate paper HASEGAWA (1967) described one vertebra of a kind of bone whale-whale that was discovered at Kurihama, Yokosuka City, during the foundation work of a steam-power plant of the Tokyo Denryoku K. K. The age of the fossil is probably early Alluvium.

GEOLOGY

According to the data of borings (No. 1～No.7) the geology of the area around the fossil locality is as follows (a cross section is shown in Fig. 1): The surface soil (muddy bed or reclaimed part) is underlain by a sand-and-gravel bed (5～15m thick) which gradually thickens eastward, that is, from the upland toward the sea. At the base this bed interfingers locally with the underlying bluish-gray sand bed (±10m thick), which contains fossil shells, and then gradually grades into the latter. The sand bed is somewhat thicker in the west. The fossil whale was collected from the middle part (marked with ⊗) of this bed near Boring No. 4. In this part the bed should rather be called a sandy gravel bed. It contains two logs of driftwood (40cm in diameter, 3m in length). It also contains numerous molluscan fossils and sporadic cobbles of a fist size. Beneath the sandy gravel bed comes a clayey silt bed (25～30m thick) which also yields molluscs, though their difference from those in the overlying sandy gravel bed has not been studied yet. Toward the base the silt bed begins to contain lenses of gravelly sand locally, and from about -40m it becomes a sand bed again (±10m thick). This sand bed is unconformable with the underlying consolidated bluish-gray silt bed of Tertiary age.

In the lowland on which Yokohama City stands the Pleistocene beds are lacking, and the alluvium rests directly on the Tertiary formation. Thickness of the alluvium is about 50m, the upper part of which is composed generally of sand and gravel, while the lower part consists chiefly of silt.

The sandy gravel bed that yielded whale bones and the overlying sand and gravel bed correspond to the upper sand-and-gravel bed of the alluvium in the report of the Construction Division, Reconstruction Bureau (1929), to the Sakuragichô formation of Kazuyoshi IDA et al. (1961), and to the upper sand-and-gravel bed of Shôgo TAKAHASHI (1964). The sand-and-gravel bed contains water-worn pebbles to cobbles of green tuff, black shale, diorite and andesite, many of them being a fist size. The supply source of these pebbles is not known yet, but most of the pebbles must have been transported by the old Arakawa



Text-fig.2. Sites of boring and section of the area of the report.

and Tsurumi—gawa Rivers, and part of them may have been redeposited from the Hodogaya and Byobugaura formations that are distributed in the neighborhood.

From the sandy gravel bed which yielded the whale bones, the following molluscan fossils were collected: *Serpulorbis imbricata* (DUNKER), *Batillaria multiformis* (LISCHKE), *Neverita (Glossaulax) dydyma* (RODING), *Rapana bezoar* (LINNE), *Anomia lischkei* DAUTZENBERG et FISHER, *Ostrea (Crassostrea) gigas* THUNBERG, *Lucinoma* sp., *Dosinia (Phacosoma) japonica* (REEVE), *Tapes japonica* (DESHAYES), *Macoma tokyoensis* MAKIYAMA, *Macoma sectior* OYAMA, *Mya (Arenomya) japonica* JAY, etc.

Most of the shells of this assemblage are inhabitants of inner bay of tidal zone, or sandy to muddy bottom just below the tidal zone, but a considerable number of them may be allochthonous.

The state of the deposits has revealed the above-mentioned points, but the writers could not find anything that would indicate the mode of burial of the whale before its death. The fact that the obtained specimens were only two vertebrae seems to suggest that the whale remains were transported after the skeleton was broken into pieces, and the distance of transportation was rather short because preservation of bones is relatively good. Since the surface of the bones show traces of apposition of bryozoan and oyster, it may have taken a long time for the remains to be buried. It is most likely therefore, that a whale was washed ashore or drifted upon a shaol and, after its death, the body was dissembled into pieces to be carried away by the coastal current and deposited with the sediments.

DESCRIPTION

Megaptera cf. novaeanglidae (BOROWSKI)

(PL. 1; figs 1a～f, 2a～f)

Materials. Two dorsal vertebrae, Nos. 1895 and 1894, Geological Branch, Kanagawa Prefectural Museum, Yokohama.

Compared specimen. Recent species of humpback whale, M. 8457 of the Department of Zoology, National Science Museum, Tokyo, Japan. In 1962 this specimen donated by the Government of Ryûkyû.

Horizon. Early Alluvium, Sakuragichô Formation.

Locality. Site of the New Building of Kanagawa Prefectural Government Office, Minami-naka-dori, Naka-ku, Yokohama.

Description of materials. Two dorsal vertebrae seem to have been isolated from the head of one humpback whale, because they are similar in the degree of fossilization and preservation, as well as in the size and shape.

Seventh dorsal, KPMG 1895: Nearly complete vertebra. The epiphyseal cartilages are not clear by the ankylosis. This vertebra is comparatively slender. In size and shape the anterior face of the centrum is about the same as the posterior face. The lateral and ventral sides are nearly round in outline, but the dorsal side is concave ventrally. The antero posterior length is one half of the width of posterior face of the entrum. Lateral and ven-

tral surfaces of the centrum are depressed and curved concavely from anterior to posterior margins. Comparatively large transverse process are attached to latero-dorsal corners of the centrum. Both ends strongly curved upwardly, and more projected anteriorly than the anterior face of the centrum. Posterior margins are fairly straight, and anterior margins curved and projected anteriorly. Width and thickness of the distal end of transverse processes are larger than those of the proximal parts. The lateroventral part of the transverse process forms a large facet which is inclined to anterior for articulation with capitulum of rib (figs. 1a and 1f). Vertebral foramen (neural canal) is reverse heart-shaped in outline. The prezygapophysial facets (fig. 1e) are deep concavities which extend backward, not beyond the antrior basal edge of the neural spine. Narrowing of the gap between the prezygapophysial facets is quite pronounced, the distance between the anterior margins of opposite articular facets is 75 mm. The transverse diameter (145 mm.) is greater than the vertical diameter at the anterior side of the neural canal (120 mm.) of the neural canal anteriorly. A deep groove extending from the tip of neural canal is developed on the posterior edge of neural spine, the length is one-third of the neural spine. Relatively narrow and thick neural spine projected upward and backward, the lateral face is flattend; the posterior edge is fairly worn out. The sharrow and crescent shaped postzygapophysial facets on the posterior edge of neural arch are very small. The distance between inner margins of the articular facets is 50 mm..

Eighth or ninth dorsal. KPMG 1894: Half of the neural spine is broken, the other part is almost complete. This and seventh are similar in shape. This dorsal vertebra is larger than the seventh dorsal, and the neural canal is smaller than the one in the 7th dorsal. Transverse process is curved more upwardly than the seventh dorsal, and the anterior margin of the process are not projected from the anterior face of centrum (figs. 2b and f). Prezygapophysial facets and postzygapophysial facets are undeveloped.

Measurements of the vertebrae (in mm.)

	KPMG 1895	KPMG 1894
Greatest vertical height of vertebra, ventral face of centrum to tip of neural spine.	585	470+
Vertical height of neural spine, dorsal surface of neural canal to tip of neural spine.	297+	205+
Greatest longitudinal length of centrum.	150	165
Greatest vertical diameter of anterior face of centrum.	205	212
Greatest transverse diameter of anterior face of centrum.	265	268
Greatest vertical diameter of posterior face of centrum.	210	215

Greatest transverse diameter of posterior face of centrum.	270	280
Greatest vertical diameter of neural canal a anterior side.	120	125
Greatest transverse diameter of neural canal of the anterior side.	145	125
Greatest distance between anterior and posterior edges with of neural spine at middle part.	143 33	145+ 45
Distance across vertebra between both ends of transverse process.	730	790
Maximum antero-posterior distance of transverse process.	123	136 & 148
Maximum thickness of transverse process.	61 & 63	63 & 68
Greatest distance between anterior margins of prezygapophysial facets.	75	——
Greatest distance between inner margins of postzygapophysial facets.	50	——

REMARKS

Osteological study of whales is fairly advanced, but not so much as to enable an exact identification on the basis of one or two vertebrae, and discussion on the level of species is particularly difficult. In the morphological characteristics, the vertebrae reported here are closely similar to those of the recent *Megaptera novaeanglidae* (BOROWSKI). However, considering a possibility of variation and the similarity between different species, the writers report the specimens tentatively as *M.* cf. *novaeanglidae* (BOROWSKI).

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横浜市内沖積層産のザトウクジラ脊椎骨化石について

長谷川善和・松島義章

摘要：

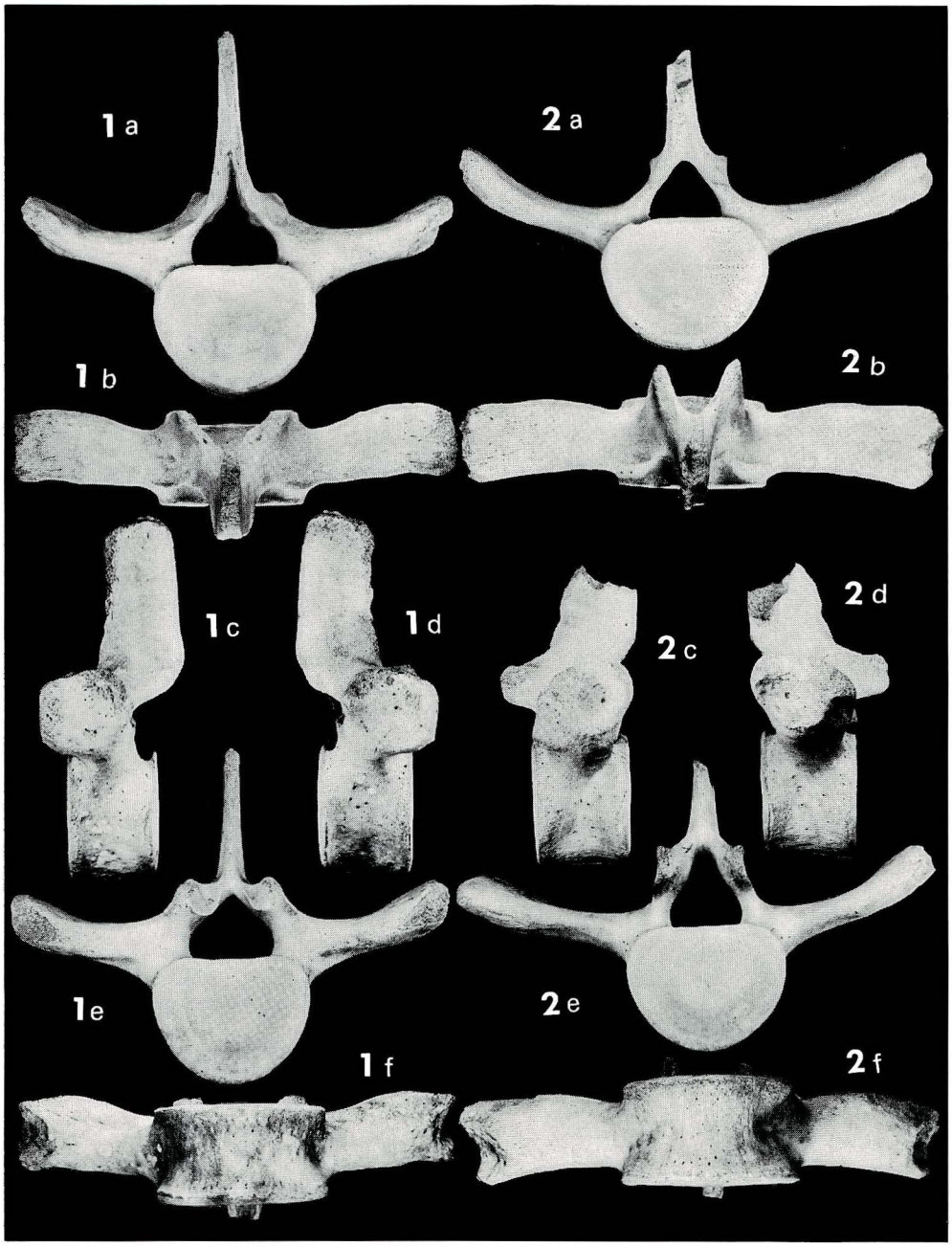
昭和39年7月、神奈川県庁の新庁舎建設基礎工事の際に、－8.5 m地点の礫混り砂層中から鬚鯨類の脊椎骨化石2点が産出した。大きさ、形態等の特徴から現生種標本に比較して、それぞれザトウクジラの第7番および、8番または9番目にあたるものとした。鯨類の骨学的研究はかなりすすんではいるが、脊椎骨の1乃至2個をもって種決定するところまでは行っていない。したがって種名はザトウクジラに比較されるものとしておく。古東京湾の出来事を推定する一資料として記録にとどめた。

EXPLANATION OF PLATE

Megaptera cf. novaeangliae (BOROWSKI)

Figures 1-2. Views of seventh and eighth or ninth dorsal vertebra, KPMG 1895 and 1894:

a, posterior view;
b, dorsal view;
c, right lateral view;
d, left lateral view;
e, anterior view;
f, ventral view.


1a
2a
1b
2b
1c
1d
2c
2d
1e
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2f