

## 51. *Marine Pleistocene Terraces near Kusiro, Hokkaidô.*

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(Read Sept. 18, 1934—Received Sept. 20, 1934)

It is well known that many coastal terraces<sup>1)</sup> develop at several heights along the shore of Hokkaidô. A. Watanabe<sup>2)</sup> has already studied these terraces and divided Hokkaidô into many topographic provinces. Since the authorities of the Hokkaidô Imperial University have recently begun a thorough survey of the geology of Hokkaidô, our knowledge of this region will before very long be greatly advanced. Unfortunately, however, the nature of the deposits composing these terraces has scarcely been studied so far. Prof. Nagao<sup>3)</sup> reported this year in the Journal of the Geological Society of Tokyo, the occurrence of many fossil mollusca from the Pleistocene terrace deposits at the mouth of the Isikari (石狩) river.

The topography of Kusiro (釧路) consists of a low, flat, marshy plain and flat-topped dissected terraces and hills.

The low flat marshy plain is the Kusiro plain, which originated from the flood plains of the rivers Kusiro, Seturi (雪裡), and Kyûakan (舊阿寒). The Kusiro plain is so flat that the height of a point 35 km. distant from the sea shore on this plain is less than 10 m. above sea level.

Lake Takkomu (達古武), Touro (塘路), and Sirarutoru (シラルトル) are three of the many lakes distributed on this plain.

Lake Harutori (春採), east of Kusiro city, is an example of these lakes, that are submerged valleys dissecting the terrace. Its overflow is prevented by coastal sand dune.

Atukesi (厚岸) bay and lake Atukesi, about 40~50 km. east of Kusiro city, are, judging from its coastal outlines, topographies of drowned coasts. The coast line is irregular and oyster island (in process of formation from oyster shells)<sup>4)</sup> is situated in lake Atukesi. But the heads

1) B. S. LYMAN, "General Rep. Geol. Yesso," (1877), 14~15, (in English).

K. JIMBÔ, "General Geol. Sketch Hokkaido," (1892), 56~57, (in English).

2) A. WATANABE, *Geogr. Rev., Japan*, 7 (1931) 901~919, (in Japanese).

3) T. NAGAO, *Jour. Geol. Soc., Tokyo*, 41 (1934), (in Japanese).

4) Or this process may be an evidence of recent upheaval of land.

of all these bays and lakes seem to be gradually filling with waste, while some, like the Kusiro plain, have formed into broad marshy plains. The marshy plain near Itoizawa (糸魚澤) station extends 8 km. from the shore of the lake.

Kusiro plain may be one that has passed the topographic stage of such bays and lakes as those of Atakesi, the formation of which former was accelerated by the quick deposition of Kusiro and other rivers. Needless to say, this is an Alluvial plain, the writer's "A" plain, whence it may be inferred, as Lyman<sup>5)</sup> has done, that this region, which was drowned during early Holocene, formed an irregular coast line of the drowned coast type, and had filled with waste since that stage, as in the case of the sea shore of the Japanese main island.<sup>6)</sup>

The eastern part of Kusiro city lies on a flat-topped terrace about 40 m. above sea level, between Kusiro river and lake Harutori.

The writer calls this the "Harutori" terrace.

The Harutori terrace is a dissected terrace that extends from Kusiro city of Mataitoki (又飯時) through Okotunai (オコツナイ), Osotunai (瀬津内), and Katurakoi (桂戀). The northeast margin of this southern part of the low relief surface that is called here "Nemuro" (根室) hill, (or the Plateau land of Nemuro as called by the late K. Jimbô<sup>7)</sup>) extending from Kuttyaro (屈斜路) to Kusiro and Nemuro.

Harutori terrace which is formed on Palaeogene coal-bearing beds and other older formations, consists of sand and gravel beds. On the southern side of Higasikusiro station, are exposed horizontal sand and gravel beds resting on the bed rock. Along the railway road, thick sand and gravel beds are exposed on a cutting on the Kusiro-Rinkô railway, between the Harutori and Higasikusiro stations. These terrace forming beds the writer calls the "Harutori" terrace deposits.

In this exposure, a greyish mud bed (D) about 8 m. thick, occupies the lowest horizon. Above this mud bed, a coarse sand and gravel bearing oyster bed (C), about 10 m. thick, is exposed, it being overlain by a white pumiceous sand bed (B), about 10 m. thick. The uppermost horizon of this exposure is a light-brownish sand bed (A), about 4 m. thick, that merges into surface soil.

5) LYMAN, *op. cit.*, p. 11.

6) Y. OTUKA, *Proc. Imp. Acad., Japan*, 10 (1934), 274~277, (in English).

7) K. JIMBÔ, *op. cit.*, p. 56.

Plateau land of Nemuro must be divided into two, Ottisi terrace and plateau land of Kusiro, the former of which may be contemporaneous with Harutori terrace.

Fig. 1 shows the topographic division near Kusi-ro city. Fig. 2 is a schematic sketch of this exposure.

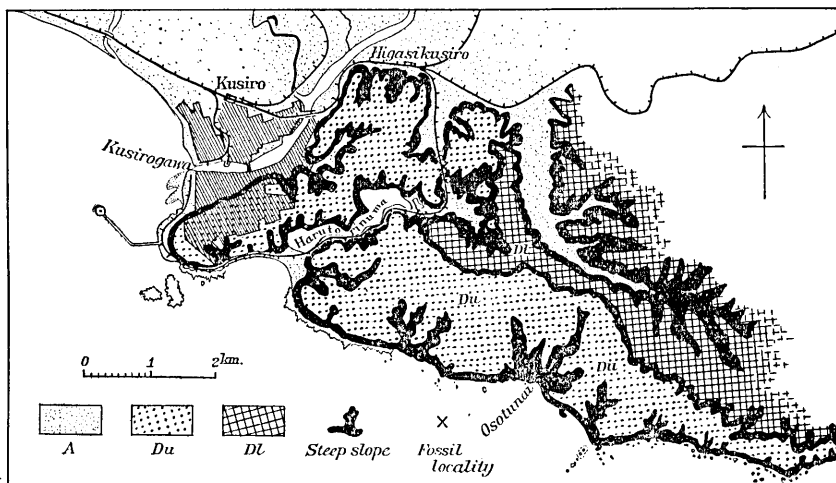


Fig. 1. Topographic division near Kusi-ro.

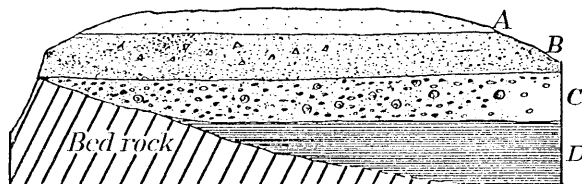


Fig. 2. Schematic profile of the Harutori terrace.

The following fossils were found in the mud bed (D).

*Alvania sadoensis* (Yokoyama)...1 specimen.

*Discorbis rosacea* (d'Orbigny)...many specimens.

The oyster sand and gravel bed (C) contains the following fossil mollusca and foraminifera :

*Cellana heroldi* (Dunker),

*Patelloida pallida* (Gmelin),

*Turbo* sp.,

*Alvania sadoensis* (Yokoyama),

*Homalopoma amussitata* (Gould),

*Nucella lima* (Martyn),

*Mitrella varians*? (Dunker),

*Glycymeris yessoensis* (Sowerby),

*Navicula ocellata* (Reeve),

*Ostrea gigas* Thunberg...very abundant,

*Chlamys irregularis* (Sowerby),  
*Paphia* (*Ruditapes*) *philippinarum* (Adams et Reeve),  
*Protothaca jedoensis* (Lischke),  
*Macoma inquinata* (Deshayes),  
*Spisula sachalinensis* (Schrenck),  
*Aloidis venusta* (Gould),  
*Quinqueloculina vulgaris* d'Orbigny,  
*Quinqueloculina pygmaea* ? Reuss,  
*Discorbis rosacea* (d'Orbigny),  
*Elphidium* sp. (macellum ?),  
*Cibicides lobatulus* (Walker et Jacob).

All these fossil mollusca and foraminifera are now living in the sea near Kusiuro. Of these, *Discorbis rosacea* (d'Orbigny) has been reported from Alaska.<sup>8)</sup>

Near the Harutori coal mine, terrace beds thinly cover the bed rock with unconformity. This irregularity in the thickness of the terrace beds suggests that the surface of the bed rock was a dissected land surface before these terrace deposits had formed. It may therefore be reasonable to conclude that the surface of Nemuro hill was originally dissected and that its coastal region (near Kusiuro and Harutori) had subsided to form the drowned valleys, while the Harutori terrace beds had settled in the drowned valley to form the horizontal terrace surface.

So far as the writer knows, the pumiceous sand bed of the Harutori terrace deposits extends along the river Kusiuro to the town of Touro.<sup>9)</sup>

The tectonic history of the region near Kusiuro as inferred from these topographical and stratigraphical facts agrees well with the history since the early Pleistocene which the writer observed in connection with the Pacific coast of southwest Japan.<sup>10)</sup> Consequently the geologic age of the marine beds of the Harutori terrace beds may be lower Pleistocene, the writer's "dl." If this inference be correct, Nemuro hill would be contemporaneous with the writer's D1 terrace, e. g., the Tama hill near Tôkyô city.

Some time before this, the writer<sup>11)</sup> noted the occurrence of marine Pleistocene deposits and terraces, about 15 m. above sea-level, near the

8) J. M. FLINT, *Rep. U. S. National Museum*, (1897), 327, Pl. LXXII, Fig. 3.

9) The late K. JIMBÔ reported that these pumiceous beds extend to Nemuro.

M. KADOKURA, *Mineral Survey Rep., Imp. Geol. Surv., Japan*, 25, (1918).

Y. IZUKA, *Mineral Survey Rep., Imp. Geol. Surv., Japan*, 31, (1920).

T. SUZUKI, *Mineral Survey Rep., Imp. Geol. Surv., Japan*, 37, (1930).

10) Y. OTUKA, "The Japanese Quaternary," *Iwanami Koza*, (in Japanese).

11) Y. OTUKA, *Proc. Imp. Acad.*, 9 (1933), 635~638, (in English).

town of Kesennuma (氣仙沼), situated on the eastern shore of Northeast Japan, the so-called Japanese "rias" coast. These two incompatible topographic features, the "rias" coast which is due to subsidence of land and the 15 m. terrace which is an upheaval of land must be considered in their time relationships. The formation of the terrace dates to the Pleistocene, while the formation of the recent "rias" coast may date to early Holocene.

The areas in which the Du terrace is broadly developed on the Japanese Pacific region are the coastal region of Miyazaki (宮崎) prefecture, the coastal region of the prefectures of Aiti (愛知) and Siduoka (静岡), the Kwantô (關東) and the Zyôban (常磐) regions. While bed rock of the narrowly distributed or entirely missing Du terrace consists of Mesozoic, Palaeozoic, or Igneous rock, the writer's so-called hard rocks.

The distribution area, therefore, of the Du terrace is related in some way to the hardness of the bed rock, as the writer<sup>12)</sup> already noticed in connection with the irregularity of the coastal outline of Japan. That is to say, the formation of Du terrace in the region of soft rock occurred earlier than that on the hard rock region, and that the Du terrace which was distributed widely in the soft region was distributed only narrowly in the hard rock region. The distribution area of the Du terrace moreover is not directly related to the only local crustal movement, seeing that evidences of upheaval were observed in the drowned coasts of Kii and Kesennuma. It would therefore not be unreasonable to conclude that the regional crustal movements that formed the Du terrace may shift the strand line of the Pacific coast of Hokkaidô.

Now the earlier Pleistocene sea that invaded the Pacific coast of the main island of Japan also invaded the same coast of Hokkaidô, as a result of which the Du terrace, as above stated, is distributed along the Pacific coast of Japan regardless of whether the coastal outline is smooth or irregular. And since some of them contain marine fossils, it may be inferred that both the Pacific coast of the Japanese main land and that of Hokkaidô experienced similar regional crustal movements or marine invasions. The fact that the mean heights of these Du terraces differ with region in which they are found may be an evidence of differential local crustal movement combined with the regional crustal movement above mentioned.

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12) Y. OTUKA, *Geogr. Rev., Japan*, 9 (1933), 819~843, (in Japanese).

## 51. 北海道釧路附近の段丘

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北海道釧路附近の地形は釧路平地・春採段丘・根室丘陵とに分けられる。

釧路平地の一部を占める湖沼群はこの釧路平地が釧路東部厚岸附近の如き沈降地形の状態を經過して、今日に至れることを示してゐる。

春採段丘面は海成層の堆積面をも共有してゐる。

沖積世から逆に推定した釧路附近の地史は日本本島海岸で推定されるものと一致する。故に春採段丘は筆者の Du, 春採海成層は筆者の dl に該當する。日本太平洋岸の洪積世初期海進は北海道に於ても認められる。

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