

## Two Stages of the Middle Miocene in Japan

by

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I have given a short note\* on stratigraphy of Kurami group in Shizuoka-ken and a statement that this group takes a part of the Togarian stage or the Japonic Middle Miocene. The Kurami group itself is not a very good representative of this stage, for it has but a little fossil in it. Sequence of beds and their lithologic character has been described; the knowledge may be helpful to get a general view of the Togarian groups in all.

The Kurami group is made up of three chief subdivisions: the Amenomiya, Matsuba and the Masago formations. The middle subdivision or the Matsuba formation is much pyroclastic in material making a very thick accumulation over 500 m., while the lower and upper formations are made of unmixed terrigenous sediments. The outline stratigraphy is as follows:

- III. Masago formation: chiefly mudstone, homogeneous, with a great number of unregular calcareous nodules..... more than 50 m.
- II. Matsuba formation: pyroclastic and indurated.
  - (c) Upper Matsuba beds: light green tuffaceous siltstones and mudstones in unregular alternation.....more than 170 m.
  - (b) Middle Matsuba beds: very much like the Upper Matsuba, but with 3 distinct sandstones: Awagatake sandstones, 'no. 1. at the base and no. 3 at the top of the beds. The sandstones are dark green coarse-grained and tuffaceous, more resistant to erosion .....more than 180 m.
  - (a) Lower Matsuba beds: made of tuffaceous siltstone, with marine mollusks but not very frequent, for example *Yoldia* and *Tellina* .....80 m.

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\* Tertiary stratigraphy and structure in the Lower Ooigawa Area. Memorial Lectures given in the Honour of Commemoration of Prof. H. Yabe's 60th Birthday, pp. 1-13, 1941.

## I. Amenomiya formation.

- (b) Towata mudstone: blue grey mudstone with ill-marked bedding, several thin beds of siltstone in lower part, changing downward to the sandstone.....160 m.
- (a) Amenomiya sandstone: light grey homogeneous medium-grained sandstone with *Cultellus izumoensis*, *Turritella s-hatai* etc. The top is finer and the very base is conglomerate—Haramishi conglomerate. The conglomerate is thicker to the west .....80 to 200 m.

As has been made a statement\* before about the Togarian age of the Kurami group, it has the very special fossils of that age though poor in number and it comes after the type Ooigawa which is characterized with *Lepidocyclina nipponica*, *L. angulosa* and *L. perornata*. The green pyroclastic substance of the Matsuba is very much like that of the Green Tuff group of the north. The existence of the Kurami in Fuji zone—south part of Yamanashi-ken—has been made clear by K. Fujita of our school. Though the place is not far from the south limit of the Green Tuff in Nagano-ken, we do not see any direct connection between these two groups.

The Kurami in Kakegawa area of Shizuoka-ken is covered by argillaceous beds named Saigô group with a well-marked unconformity. The Saigô is chiefly made of a quite simple unit—the Saigô mudstone about a hundred meter in thickness; but the base is changeable; to the east it is forming a bed of breccia which is covered by beds of sandstone and shale in alternation. These lower parts are grouped together under a name Tozawa beds. The sandstones of the Tozawa beds in Kurami-mura and Saigô-mura have in them *Lepidocyclina makiyamai* Morishima n. sp. together with *Miogypsina Kotoi* Hanzawa. This discovery is very important. The detail in paleontology will be given later by MORISHIMA, but he is of opinion that the Tozawa is the top-most one of the lepidocycline horizons in Japan and that it is about equal to  $f_3$  of East Indies.

If the opinion is able to be supported, the Japonic Middle Miocene has to be divided into two stages. As the Kurami is a representative of the first division, then the Saigô is able to be taken as the type of the second to which a new stage name Tozawan will be given.

At first I had a thought that the Saigô is a part of the Sagara

\* The Neogenic stratigraphy of the Japan Islands. *Proc. 6th Pac. Sci. Cong.*, p. 643, 1939.

group which is a good example of the Yuian stage or the Japonic Upper Miocene, because it is seemed to be a westward extension of the Tamari mudstone which is the upper Sagara. Unfortunately covered by alluvial deposits, relation between the Saigo and Tamari is not seen in the field. The Tamari is keeping a great number of *Sagarites* a monoaxonid sponge and certain forms of Foraminifera which are poor or not at all present in the Saigō mudstone.

In the north part of this country, there is the so-called Black Shale formation which is to our common knowledge covering the Togarian Green Tuff with a more or less well-marked unconformity. The very base of this formation is mostly a bed of sandstone frequently with *Miogypsina*. But the chief part of the Black Shale is a dark grey sapropelite more or less made harder by siliceous substance. The beds coming next to the true Black Shale is also dark grey muds. The latter is thought to be the main mother rock of oil. Though this second formation has in it *Sagarites chitani* very much, it was used to be given attention as a part of the Black Shale. In this way, we may see that there are two different formations of the Black Shale, one be equal to the Tozawa while the other is a part of the Yuian rocks wide in distribution.

Probably *Lepidocyclina japonica* is a guide fossil of the Togarian age. This form, however, has not been discovered in other rock of that age than the lower part of the Kaburagawa group of Gumma-ken. In connection with the last statement, other facts before us give an idea of the stage order of the Miocene. The general idea will be outlined with the table coming under\* :

Miocene	{	Yuian (G) .....no greater Foraminifera, but for some operculines.
		Tozawan (F <sub>3</sub> )... <i>Lepidocyclina makiyamai</i> , <i>Miogypsina kotoi</i> .
		Togarian (F <sub>2</sub> )... <i>Lepidocyclina japonica</i> , <i>Miogypsina kotoi</i> .
		Ooigawan (F <sub>1</sub> )... <i>Lepidocyclina nipponica</i> , <i>Miogypsina kotoi</i> .

Before ending this short note, I have to make an addition that in fact the Togarian was a time of igneous activity judging by the material of the rock and that evidence of the final stage of this action may be seen as a number of small bodies of basic intrusion in the Kurami and older rocks. The Tozawan age, however, was very quiet. The basal

\* Letter nomination of Japonic Cenozoic stages according to IKEBE, KANAHAIRA and FUJIWARA.

breccia is frequently monogenetic being simply made of serpentine or other igneous rocks which are found under the unconformable base.

Farther discussion of details in the Miocene stratigraphy of this country will be made in another occasion.