219. THE DISCOVERY OF NEW MIocene FAUNA IN THE NORTHERN PART OF NISHITAGAWA COAL-FIELD, YAMAGATA PREFECTURE, JAPAN."

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In the Nishitagawa district of Yamagata Prefecture along the coast of Japan Sea, the coal-bearing Tertiary deposits with abundant pyroclastic materials and extrusive rocks develop on the basement of grano-diorite. As already reported by the senior writer, at the western side of the mountain range the Tertiary deposits can be divided into two formations—the Sanze as the lower and the Kamo as the upper; and the Kamigo formation which is very tufaceous and thought to be an equivalent of the Sanze formation is distributing at the eastern side.

As it has been reported that the Miocene flora had occurred in this area, here we report the occurrences of several molluscan fossils, being collected from the tufaceous siltstone of the Oyama member of the Kamigo formation. Main localities of them are following two, namely the bank of Kaminoike and the road-cutting near the Kagayama Park, Oyama-machi. The similar molluscan fossils are found in the similar rocks at Hirohama, Kamigo-mura. (Fig. 1)

This fossil fauna contains several new species and abundantly many specimens belonging to the family Tellinidae, but most of them are ill-preserved. The shelly materials scarcely reserved on the moulds and the hinge part usually unobserved.
Table 1. List of Molluscan Fossils

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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<td>x</td>
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Chicoreus (*Rhizophorinurex*) liganouranus (NOMURA)
Striarea (*Estellarc*) utsukihensis (HATAI & NISHIYAMA)
*Joannisia* aff. *takeyamai* OTUKA
*Clementia* papyracea GRAY
*Cyclina* mitsukii OYAMA (MS)
*Chione* (*Lenkana*) cfr. *yayensis* (NOMURA & HATAI)
*Paphia* sp.
*Sanguinolera* (*Soleiellina*) sp.
*Apolymeris* (*Leperimelis*) nipponica OYAMA (MS)
*Apolymeris* (*Leperimelis*) tokaii sp. nov.
*Angulus* (*Moeella*) aff. *donacinus* (LINNE)
*Angulus* (*Moeella*) *kagiyamensis* sp. nov.
*Angulus* (*Moeella*) sp.
*Angulus* (*Fubulina?*) sp.
*Angulus* (*Tellinidae*) timoresensis (LAMARCK) var.
*Tellina* (*Scissulina*) cfr. *dispars* CONRAD
*Glaucome* sp.
*Culina* *otukai* sp. nov.
*Culina* *oyamensis* sp. nov.

Horizon and locality:

**Oyama** member of Kamigō formation
A: Kagayama park, Oyama-machi, Yamagata Prefecture,
B: Kaminoike.
C: Ōhira, Kamigō-mura

**Yatsuo** group
D: Kakebata formation in Toyama Prefecture.
E: Kashio formation.

The total number of distinguished forms and their respective localities are given in the list. (Table 1)

At present it has never been reported on the Miocene fauna comparable with the Oyama fauna in this area. But the fossils of the Yatsuo group in Toyama Prefecture includes several forms identical to those of the Oyama member. The Kakebata and Kashio formations of the Yatsuo group yield abundant molluscs, among which those from the lower member of the Kakebata formation show the nearest resemblance to the Oyama fauna in the present field. Between the both faunas 6 species are common. They are as following:

Chicoreus (*Rhizophorinurex*) liganouranus (NOMURA)
Striarea (*Estellarc*) utsukihensis (HATAI & NISHIYAMA)
*Cyclina* mitsukii OYAMA (MS)
*Clementia* papyracea GRAY
*Apolymeris* (*Leperimelis*) nipponica OYAMA (MS)
*Angulus* (*Tellinidae*) timoresensis LAMARCK var.

Otherwise, *Clementia* papyracea, *Chicoreus* liganouranus and *Joannisia* *takeyamai* are common to the middle-lower
Miocene fauna, for instance, Tsukiyoshi, Tsuyama, Shigama and Kadonosawa faunas. In the present field, the Oyama member containing these molluscs is overlain by the Zenpo member, from which many plant fossils, such as Comptoniphylleum Naumannii NATH., Liguadunbar formosana HANCE, Cyclobalanopsis Mandralisci (GAUDIN), Zelkova Ungeri (ERR.) and others are yielded. The geological age of the flora is considered to be middle-lower Miocene. The Kakebata member, whose fauna is comparable only to the Oyama fauna for the present, also contains Miagypsinia and Operculina, or locally Comptoniphylleum and Liguadunbar.

From the above-mentioned facts the writers intend to consider the geological age of the Oyama fauna to be “lower Miocene”.

The writers wish to express their gratitude to the late Prof. Y. OTUKA, Dr. F. TAKAI, Dr. K. OYAMA and Dr. R. SAITO, for their kind directions and many suggestions in this study.

Description of the noteworthy Species

**Family Muricidae**

*Chicoreus (Rzophorimurex) tiganournus (NOMURA)*

Pl. 19, fig. 1


Height ca. 20 mm., Diameter 19 mm.

Remarks: This species is not so well preserved and the aperture and canal are lacking, but is rather identical to NOMURA’s species from the Shigama bed in the vicinity of Shigama bay.

**Family Arcidae**

*Striarca (Estellacer) uetsukionensis (HATA and NISHIYAMA)*

Pl. 19, fig. 2

1943. *Barbatia (Barbatia) uetsukionensis*, HATA and NISHIYAMA: Jour. Paleont. 23, p. 89, pl. 23, figs. 6, 7.

Length 16 mm., Height 6.5 mm., Thickness 3 mm.

Remarks: A few outer moulds of this species, found at Oyama-machi, do not preserve ligamental area which is transversely striated, but the general shape is quite identical to OYAMA’s well-preserved specimens gained from the Kakebata formation of the Yatsuo group.

**Family Unglinidae**

*Joanisiella aff. takeyamai OTUKA*

Pl. 19, fig. 3


Description: Shell small, ineilateral or nearly equilateral, ovoidal or circular in shape, rather inflated; beak small, more or less prominent; postero-dorsal margin slightly convex, posterior end roundly truncated, antero-dorsal margin concave, anterior end narrowly rounded, ventral margin moderately round; surface ornamented with fine concentric striae separated by concentric interspaces which are irregular in breadth; ligamental area never marked.

<table>
<thead>
<tr>
<th>Length</th>
<th>Height</th>
<th>Thickness</th>
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<tbody>
<tr>
<td>15.5 mm.</td>
<td>14.0 mm.</td>
<td>5.5 mm. (fig. 3)</td>
</tr>
<tr>
<td>10.5</td>
<td>9.5</td>
<td>—</td>
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<tr>
<td>18.0</td>
<td>16.0</td>
<td>6.0</td>
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</table>

Remarks: The most allied species to this specimen is *J. takeyamai* OTUKA having been described from the Uetsuki-
Tsuyama group of the Shobara basin in Chugoku, western Japan.

Family Veneridae

*Clemencia papyracea* Gray

Pl. 19, figs. 4, 5.


1880. *Clemencia papyracea*, K. Martin: Die Tertiärschichten auf Java. Th. I, S. 99, Tab. XVIII, Fig. 6.

1940. *Clemencia papyracea*, Oyama & Saka: Res. Inst. Nat. Resour. vol. 1, No. 2, pp. 137-144, pl. 15, fig. 15 a, b; 16

Length Height Thickness $H/L$

<p>| | | | |</p>
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<tbody>
<tr>
<td>52mm</td>
<td>41mm</td>
<td>21.5mm</td>
<td>0.706 (fig. 5)</td>
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<tr>
<td>28</td>
<td>22</td>
<td>12.9</td>
<td>0.785 (fig. 4)</td>
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Remarks: A few specimens are obtained. Their general shape and ornament on the surface are identical to those of *C. papyracea*. The species is reported to live in a warm or tropical water, south of Formosa.

*Cylina mitsuchi* Oyama (MS)

Pl. 19, figs. 6a, b. 7

Length Height Thickness $H/L$

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<tbody>
<tr>
<td>32mm</td>
<td>39mm</td>
<td>22mm</td>
<td>1:2</td>
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Remarks: Our specimen is identical fairly well to Oyama's specimen. *Cylina sinensis* Gmelin is the most allied species to this, but the latter is distinctly higher and more strongly inflated than the former.

*Chione* (Leukoma) cfr. tayaensis

(Nomura & Hatai)


Description: Shell small, triangular, with marked radiating riblets, crossing these riblets there are distant concentrically raised lamellae; anterior extremity round, posterior end subangulate; antero-dorsal margin slightly excavated, postero-dorsal margin more or less convex; ligamental area not so long but well marked; hinge and pallial line not observed.

Length Height $H/L$

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<tbody>
<tr>
<td>8.5</td>
<td>6.5</td>
<td>0.76</td>
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</table>

Remarks: This species is closely allied to *Chione tayaensis* in the above described characters, but on account of its ill-preservation, it can not be yet perfectly identified.

*Paphia* sp.

Pl. 19, fig. 8

Description: Shell large, oval, elongated, compressed vertically; surface ornamented with very distinct concentric ribs which become wider posteriorly and narrower anteriorly; beak not prominent, antero-dorsal margin slightly concave, anterior extremity produced, narrowed, or rounded; antero-ventral margin a little arcuated with a curve at an obtuse angle a little anteriorly below the beak; posterior extremity not preserved; pallial line not observed.

Length Height Thickness

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<tbody>
<tr>
<td>55mm</td>
<td>(at least) 37mm</td>
<td>5mm</td>
</tr>
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</table>

Remarks: The characteristics having been observed in this specimen, are the general outline, especially concaved antero-dorsal margin and distinct concentric ribs. As the fossil species of the genus comparable to the present material is never found, it seems to be probably a new species of *Paphia*. But on account of its ill-preservation we give no specific name to it.

*Sanguinolaria* (Solestellina) sp.

Pl. 19, fig. 9

Description: Shell elongated, closed, a little longer posteriorly; surface sculptured with concentric irregular wrinkles and striae with irregular, radial, slightly flexures; rather convex at the umbonal
New Miocene Fauna in the Northern Part of Nishitagawa Coal-field

area, umbo more or less produced, situated a little anteriorly near the middle; antero-dorsal margin slightly convex, postero-dorsal margin concave, ventral margin slightly arcuated. Hinge teeth and inside of the valve not observed.

Length Height H/L
42mm. 18.0 0.423 (fig. 9, right valve)
21 9.5 0.432 (left valve)

Remarks: The present specimen is closely similar to Soleliella adamsi Deshayes, but it is more round at the anterior end and has not marked wrinkles on the surface than the latter. Soleliella mineensis Yonoyama is easily distinguishable from the present specimen by its height.

Family Tellinidae

Apolynemis (Leporimelis) nipponica
Oyama (MS)
Pl. 19, figs. 10 a, b

Length Height Thickness H/L
43mm. 33mm. 8mm. 0.786 (fig. 10)
23 17 3 0.738
40 30 5 0.770
26 28 - 0.778
34 27 - 0.750

Remarks: The present specimens are fairly well identified to the type-specimen from the Yatsuo group. This species is one of the most characteristic and common fossils in the present field.

Apolynemis (Leporimelis) takati
sp. nov.
Pl. 19, fig. 11

Description: Shell large, high, subtriangular or subquadrangle, nearly equilateral, strongly inflated in the anterior half part; beak prominent, incurved, nearly mesial. Ornamentation of the surface and radial folding are quite as well as Apolynemis nipponica. Antero-dorsal margin slightly convex, moderately long; anterior end rounded; postero-dorsal margin short, posterior end obtusely truncated (or rounded); ventral margin not well observed, but more or less straight with a contraction near the posterior end. Surface ornamented with numerous fine concentric striae and wrinkles which become obscure near the posterior end. Ligament narrow but distinctly marked, hinge not well observed.

Length Height Thickness H/L
ca. 40mm ca. 34mm. - ca. 0.820 (fig. 11)
32 28 5 0.873
38 35 - 0.847

Remarks: This species is comparatively common in our field and very similar to Apolynemis (Leporimelis) nipponica, but rather higher and more inflated than the latter.

Angulus (Moerella) aff. donacinus (Linne)
Pl. 19, fig. 12

Comp.
1767. Tellina donacina. LINNE: Syst. Nat. ed. 12, p. 1128. No. 59
1847. Tellina donacina, Sowerby: Thes. Conch. vol. 1, p. 232, pl. LVII, fig. 12; pl. LXVI, figs. 5a, b.

Description: Shell small, elongate, rather compressed, moderately convex, subtrapezoidal, inequilateral, anterior end round; postero-dorsal margin also nearly straight but short, posterior end obtusely angulated; ventral margin slightly arcuated; surface ornamented with fine concentric striae, and an obtuse radial ridge observed from beak to postero-ventral edge. Ligamental area, hinge teeth and pallial line not observed.

Length 17mm., Height 9mm.
Remarks: Linne's species, *Angulus (Moerella) donacinus* is the nearest approach to this specimen in the above described characters, but the latter is too ill-preserved to be perfectly determined. This species is ranging from Miocene to recent and the living one found in Britain and the other part of Europe.

*Angulus (Moerella) kagayamensis*

**Description:** Shell ovally elongated, dorsal slopes rather straight, ventral margin nearly straight but slightly convex; anterior side shorter, obtusely angulated; beak pointed incurved; lunular region distinct, anteriorly situated, observed along the whole length of the antero-dorsal margin; surface ornamented with fine concentric striae, even concentric undulation and fine radial striae, presenting a faint crosswork fabric near the ventral margin; an obsolete radial flexure seen from beak to posterior end of ventral margin; pallial sinus deeply elongate, elliptical and attains anterior one-third of the length.

<table>
<thead>
<tr>
<th>Length</th>
<th>Height</th>
<th>H/L</th>
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<tbody>
<tr>
<td>27mm.</td>
<td>19mm.</td>
<td>0.703</td>
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</table>

Remarks: The present specimen is similar to *Tellina (Moerella) aldrechi* Dall in the general outline, but in the latter a flexure runs from beak to postero-ventral corner, postero-dorsal margin concave, posterior end truncated, and rather smaller in height. *Tellina (Moerella) hendersoni* Dall is more broadly rounded in anterior and posteriorly longer than the present new species. This species also resembles *Tellina (Moerella) jedoensis* Lischke which is figured by Y. Oruka from the Miocene formation of Shobara, but differs in that the anterior and posterior extremities are more round, and antero-dorsal margin is slightly more convex.

*Angulus (Moerella) sp.*

**Pl. 19, figs. 14, 21.**

**Description:** Shell oval, inequilateral, ventral margin more or less convex, antero-dorsal margin nearly straight or straight, posterior side shorter, its extremity subangulate below; beak pointed, not much incurved; surface ornamented with numerous fine concentric striae and in a specimen faint radial ones are found; ligament large, fold obsolete, teeth and pallial sinus not distinctly observed.

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<tr>
<th>Length</th>
<th>Height</th>
<th>H/L</th>
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<tbody>
<tr>
<td>18 10</td>
<td>8 55</td>
<td>0.606</td>
</tr>
</tbody>
</table>

Remarks: The most allied species to this specimen is *Tellina lata* Gmelin, but the latter is distinct from the former by the more roundness of the antero-dorsal margin and anterior end.

*Angulus (Fabulina?) sp.*

**Pl. 19, figs. 15.**

**Description:** Shell suborbicular, slightly triangular, subequilateral, more or less ventricose; ventral margin arcuate; antero-dorsal and postero-dorsal margins nearly straightly convex, the both adjacent to the prominent beak, and the former shorter and less sloping than the latter; anterior side rounded, posterior side rather angular; surface ornamented with numerous very fine closely concentric striae; fold and flexure obsolete (only a faint sign of flexure seen at anterior area), lunule and escutcheon sharp, lateral teeth not observed.

<table>
<thead>
<tr>
<th>Length</th>
<th>Height</th>
<th>H/L</th>
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</thead>
<tbody>
<tr>
<td>9.5mm.</td>
<td>8mm.</td>
<td>0.812</td>
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</table>

Remarks: The present specimen is rather characteristic to *Angulus* in the outline of anterior half, which is slightly convex in antero-dorsal margin, and ro-
unded in anterior end. But its posterior side is different from that of subgenera *Moerella* and *Tellinides*, and rather close to *Fabulina*.

*Angulus (Tellinides) timorensis* (LAMARK) var. 
Pl. 19, figs. 16a, b, 17

Comp. 
1847. *Tellina timorensis*, PHILIPP.: Abbild. Tellina. Tab. IV, fig. 2 
1920. *Tellina (Tellinides) timorensis*, TESCH.: Palaeontologie von Timor, 8. s. 105 Tab. CXI., fig. 278 
1941. *T. (Tellinides) timorensis*, KURODA: Catal. Moll. Taiwan. pl. XII. fig. 87

Length Height Thickness H/L  
43mm. 30mm. 12(6)mm. 0.697 (fig. 17)  
39 28 0.718

Remarks: In the present field this species is rather abundant, and almost identical to *Angulus (Tellinides) timorensis* a living species of Indian Archipelago, Philippine and etc. in the general shape and ornamentation of surface. *Psammobia vesperlimna* CHEMNITZ is almost similar in its outline, but *Psammobia* has a wider ligament and conspicuous gaping.

*Tellina (Scissulina) cfr. dispar* CONRAD 
Pl. 19, fig. 18

Comp. 

Description: Shell small, ovate, slightly elongate, subequatorial, subventricose; beak pointed, rather incurved, situated at the midlength of the shell; anterodorsal margin short, not much sloping; anterior extremity rounded; posterodorsal margin nearly straight; posterior edge obtusely angulate; ventral margin slightly convex; fold and flexure obsolete; surface ornamented with numerous fine concentric striae; ligamental area narrow but sharp; two lateral teeth long.

<table>
<thead>
<tr>
<th>Length</th>
<th>Height</th>
<th>H/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.5mm</td>
<td>8mm.</td>
<td>0.592</td>
</tr>
<tr>
<td>15.0</td>
<td>10</td>
<td>0.696</td>
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</table>

Remarks: The present specimens are closely similar to *Tellina (Scissulina) dispar* in their outlines, but the former is rather shorter and more rounded.

As the right valve is not found, the subgeneric character of the oblique striae on shell surface is not ascertained.

*Cultellus otukai* sp. nov. 
Pl. 19, fig. 19

Description: Shell thin, long; surface ornamented with fine concentric wrinkles; posteriorly elongate, terminal margin subtruncated (nearly square), situated near the anterior one-fifth, a little gaping at both ends; teeth not observed.

<table>
<thead>
<tr>
<th>Length</th>
<th>Height</th>
<th>H/L</th>
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<tbody>
<tr>
<td>44mm.</td>
<td>15mm.</td>
<td>0.340 (fig. 19, right valve)</td>
</tr>
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</table>

Remarks: The present species is most allied to *Cultellus hanleyi* DUNKER, but the latter is longer. This species is named in honor of the late Prof. Y. Otuka of Geological Institute of Tokyo University.

*Cultellus oyamensis* sp. nov. 
Pl. 19, fig. 20

Description: Shell elongate, compressed, a little gaping at each end, rather straight; surface ornamented with fine concentric striae and irregular wrinkles; posterior side narrow and elongate, rounded at the end; dorsal margin straight, ventral margin slightly contracted near the midlength; anterior side short, attenuated at the end; umbo very small, not prominent; ligament narrow but well marked near the umbo.
Kenzo OGASAWARA and Toshimasa TANAI

Length  Height  H/L
45mm.   12mm.  0.266

Remarks: This species is more narrow-bladed than the preceding new species.

References
MARTIN, K. (1880). Die Tertiärschichten mufava. Th. 1
— (1952), The fossil flora from the Nishitagawa Coal-field, Japan. II. (MS)

Explanation of Plate 19.

Fig. 1. Chicoreus (Rhizophorimex) fuganouranus (NOMURA)
Fig. 2. Striarcan (Estellacur) natsukienensis (HATAI & NISHIYAMA)
Fig. 3. Joannisiella aff. itayumai OTUKA
Figs. 4, 5. Clementina papyracea GRAY
Figs. 6a, 7. Cyclina cfr. mitsuchii OYAMA
Fig. 8. Paphia sp.
Fig. 9. Sanguinolaria (Solestellina) sp.
Figs. 10a, b. Apomyetis (Leporimeis) nipponica OYAMA
Fig. 11. Apomyetis (Leporimex) takai OGASAWARA & TANAI
Fig. 12. Anicylus (Murellia) aff. donicus (LINNE)
Fig. 13. Angulus (Moerellia) kagayamensis OGASAWARA & TANAI
Figs. 14, 21. Angulus (Moerellia) sp.
Fig. 15. Angulus (Pabulina?) sp.
Figs. 16, 17. Angulus (Tellinides) timorensis (LAMARCK) var.
Fig. 18. Tellina (Seissulina) cfr. dispers CONRAD
Fig. 19. Cullenius otukai OGASAWARA & TANAI
Fig. 20. Cullenius oyamensis OGASAWARA & TANAI