330. LIASSIC VOLSELLA, MYTILUS AND SOME OTHER DYSODONT SPECIES IN JAPAN*

(Studies on the Liassic Pelecypods in Japan, 6)

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The Mytilidae and Ostreidae are fairly common in the Liassic Kuruma group. Kobayashi (1935) reported the occurrence of Mytilus and Arcomytilus from the group, but they remain undescribed. Lately the writer added a large amount of fossils to the Kuruma-Shizu- kawa collection including some Volselfa and Pteria (s.1) in the Lower Hettangian Geratrigonia hosourensjs bed of the Shizu- kawa group. In the present paper are described the following species:

Volselfa bakerelloides HAYAMI, new species.
Volselfa sp. indet.
Arcomytilus dairensis KOBAYASHI and HAYAMI, new species.
Arcomytilus sp. indet.
Mytilus (Falcimytilus) stricapillatus HAYAMI, new species.
Mytilus (Falcimytilus) stricapillatus HAYAMI, subsp.
Mytilus (Falcimytilus) heranus HAYAMI, new species.

* Received April 5, 1957; read June 15, 1957.

Family Mytilidae FLEMING

The classification of the family is principally based on the anatomy which is, however, inapplicable to fossils. In consequence the classificatory criteria are inevitably restricted to the hinge-structure, ligament-structure, umbonal septum, external outline, umbonal position and surface ornamentation.

The earliest of this family is Volselfa in the Devonian. Since then, the genus persisted through the long geological ages without any striking modification. It is most reasonable to regard the genus to be the trunk of the Mytilidae, whence Mytilus and many other related...
genera have branched off. *Mytilus* has been produced from *Volsella* by the shifting of the umbo from subterminal to terminal.

Living *Mytilus* has some umbonal teeth and weak anterior adductor, while the hinge-area is edentulous in *Volsella*. Nevertheless it is not always easy to distinguish these two as for Jurassic forms, because many forms are found to be intermediate between *Volsella* and *Mytilus* with regard to outline and umbonal position. Therefore, the former is considered by some authorities as a subgenus of the latter.

Cox (1937) established *Falcimytilus* as a subgenus of *Mytilus* for some Jurassic species with terminal umbones and edentulous hinge areas. He is of opinion that true *Mytilus* is absent in the pre-Jurassic, although there are many so-called *Mytilus* species in the Triassic and several in the Permian. But it is possibly a little prior to Lias that *Falcimytilus* was derived at first from *Volsella*, if considered that *Mytilus* (Falcimytilus) nasai Kobayashi and Ichikawa and its varieties (1950; Ichikawa, 1954) are known from the Carnic in the Kochigatani series in Japan. Putting aside this problem, *Falcimytilus* is really closer to *Volsella* than *Mytilus* s. str. in the edentulous hinge, although it agrees better with *Mytilus* s. str. in the terminal umbo. As suggested by Cox (1940), the subgenus may include most Jurassic species of *Mytilus*, because no Jurassic species has umbonal teeth. The present five Liassic forms are probably included in its category.

*Arcomytilus* Agassiz (1842) is characterized by the modioliform outline and radial markings on the surface. Cox (1937, 1940) considered it as a subgenus of *Brachidontes* Swainson (1840). In *Brachidontes* s. str., however, the shell is ovate and the anterior area more expanded than in *Arcomytilus*. As mentioned by Cox, dysodont teeth are frequently observable in Recent *Brachidontes* but absent in *Arcomytilus*, although Agassiz mistook the marginal impression of radial ribs for them. In the Middle and Upper Jurassic there are many radially ribbed species of *Arcomytilus*. Some of them have modioliform or even mytiliform outlines and nearly terminal umbones. Radial markings are commonly met with also in *Septifer*, *Musculus* and *Crenella*. But *Arcomytilus* differs essentially from *Septifer* in the absence of the umbonal septum for adherence of the anterior adductor, and from two others in the trigonal outline.

Although certain phylogenetical relationship may exist between *Arcomytilus* and *Brachidontes*, the writer thinks plausible to regard *Arcomytilus* to be a distinct genus derived from the main trunk of the *Mytilidae* comprising *Volsella* and some related genera.

So far as the writer is aware, *Arcomytilus* is scarcely known from the Lias. The two forms in this paper which have explicit radial ornaments may be its old representatives, but the materials are too poor to give their descriptions in detail.

**Genus Volsella Scopoli, 1777.**

(= *Modiolus* Lamarck, 1799; *Modiolus* Lamarck, 1801; *Eumodiola* Hering, 1900)

*Type species:*—*Mytilus modiolus* Linne, Recent.

*Volsella bakevelloides* Hayami, new species.

Plate 23, Figures 1-3.
Liassic *Volsella, Mytilus* and some other Dysodont Species in Japan

**Description:**—Shell medium, equivalve, modioliform, elongated postero-ventrally, non-carinated, strongly inflated, slightly to fairly longer than high; test thin; hinge-margin slightly convex, fairly long, occupying about two-thirds of shell-length; posterior margin gently arcuate; anteroventral one of shell-body almost straight, but sinuated at its junction with anterior margin in front of developed anterior area; umbonal angle between hinge-margin and anteroventral one about 45 degrees; anterior area wide, well inflated, clearly defined from shell-body by a shallow groove, somewhat similar to anterior wing in *Bakevellia*, rounded at the extremity; anterior slope of shell-surface steep, nearly vertical; the greatest convexity lying close to antero-ventral margin, and posterior area comparatively flattened; whole surface marked with more or less regular coarse concentric lines. Internally, ligament probably subinternal, occupying greater part of hinge-line, supported by an internal ridge which is narrow and subparallel to hinge-line, running behind umbonal area to postero-dorsal corner; umbonal septum absent; hinge edentulous; adductors unknown.

**Measurement in mm.**

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Height</th>
<th>Thickness</th>
</tr>
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<tbody>
<tr>
<td>Holotype (MM 2719) Right valve</td>
<td>44.0</td>
<td>39.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Paratype (MM 2720) Left valve</td>
<td>30.5</td>
<td>29.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Paratype (MM 2721) Left internal mould</td>
<td>42.0</td>
<td>39.0</td>
<td>7.5</td>
</tr>
</tbody>
</table>

**Observation and Comparison:**—The holotype (Fig. 1) is a well preserved specimen, showing the complete outline of right valve. In the paratype (Fig. 3) umbonal and dysodont teeth are absent. Internally, the anterior area seems not so well defined as externally. The small paratype (Fig. 2) is fairly different in outline from the holotype; its umbonal angle much larger. Seeing the occurrence from the same fossil bed and the similar surface-markings, however, such differences are considered individuality.

This species, though its outline is variable to this extent, is safely referable to *Volsella* by the edentulous hinge and developed anterior area. *Volsella* persisted from Devonian to Recent without any striking evolution, and there are a great number of comparable species to this. If compared with most Upper Triassic and Jurassic species, this is characterized by a well defined and inflated anterior area and strong concentric line on the shell-surface which are fairly regular at the intervals and widely spaced.

*Modiolus imbricatus* (Sowerby) (1818, Vol. 3: Morris and Lyckett, 1853; Lorisol, 1883; Cox, 1935, 1940) is a well known Middle Jurassic species with a wide distribution. It has a more expanded and flattened anterior area, weaker concentric lines and a smaller umbonal angle than the present species. *Mytilus jurensis* Roemer (Cox, 1935, pl. 15, figs. 15-17) from British Somaliland seems to vary to some extent in the development of anterior area, and Cox (1937, 1940) regarded it as an intermediate form between *Volsella* and *Mytilus*. Among the Somaliland specimens the one in figure 16 is fairly similar to this species in the outline and surface-markings, but the anterior area of *jurensis* is generally not so well developed. *Mytilus arbenzi Renz* (1935) from the Upper Jurassic *Mytilus-*Schi-
chtten" of Alps differs from this also in the less developed anterior area, although the concentrics and general outline are very similar to those of the holotype. Modiola hoffmanni Nilsson and M. lusotanica in Boehm (1903) from the Lias in Portugal may be related forms to this. But the concentrics are more delicate than in the present species.

**Occurrence**:—All specimen procured from a black shale of lower Hettangian Niranohama formation of Shizukawa group at Niranohama in Utatsumura, Miyagi Prefecture (Province of Rikuzen).

_Volssella_ sp. indet.

Plate 23, Figure 4.

Only a fragmentary left valve (MM 2722) is at hand. This form is considerably similar to the preceding species in the modioliform outline and development of anterior area. But the concentric lines are by far weak than in _bakerelloides_, and there are numerous fine radial riblets on the antero-ventral slope of shell-body.

**Occurrence**:—Black shale of Domerietoarcian Shinatani formation of Kuruma group at the upper stream of Tera-dani in Daira, Asahi-machi, Toyama Pref.

**Genus Arcomytilus** Agassiz, 1842.

_Type species_:—Mytilus pectinatus Sowerby (1821), Upper Jurassic.

_Arcomytilus dairensis_ Kobayashi

and Hayami, new species.

Plate 23, Figures 5 and 6.

_Description_:—Shell small, mytiliform, well inflated, much longer than high (holotype, MM 2734, 25.0 mm. long; 18.5 mm. high; 5.0 mm. thick); test thin; umbo terminal and sharply pointed with an umbonal angle of about 50 degrees; hinge-margin nearly straight, short, passing gradually into evenly arcuate posterior margin; anterior margin almost straight; anterior carination weak, marginal, leaving no anterior area; surface ornamented with many radial ribs which are fairly prominent in central area and crossed by conspicuously wide-spaced concentric lines of growth; nothing is known of internal structure.

_Observation and Comparison_:—Only two imperfect left valves are given. If compared with ever-described species of _Arcomytilus_ from Middle and Upper Jurassic, its anterior area is undeveloped and its umbo very terminal. The radial ribs are comparatively weak in the posterior area of the holotype and neither bifurcated nor divaricated.

**Occurrence**:—Procured at the lower stream of Daira River in Asahi-machi, Toyama Pref., but its exact horizon is uncertain.

_Arcomytilus_ sp. indet.

Plate 23, Figure 7.

Only a small right valve is before hand. Shell subtrigonal, modioliform with a developed anterior area, much longer than high (MM 2736, 19.5 mm. long; 12.0 mm. high); hinge-margin fairly convex; anterior area rounded, elongated along anterior margin of shell-body, defined from it by a shallow groove; umbo not terminal, located at about a fifth of hinge-line from the anterior end; anterior carination very weak; surface ornamented with roughly spaced radial ribs which become fairly strong in ventral area.
The radial ornaments of this form reminded one of *Arcomytitus*, although the anterior area is similar to that of *Volsella*. Its specific identification is deferred until sufficient materials will be procured.

**Occurrence:** — Sandstone of Domerio-Toarcian Shinatani formation at Shinatani in Omi-machi, Niigata Pref.

*Genus Mytilus* LINNÉ, 1758.

**Type species:** — *Mytilus edulis* LINNÉ (1758), Recent.

*Subgenus Falcimylilus* COX, 1937.

**Type species:** — *Mytilus suprajurensis* COX (1935), Upper Jurassic.

*Mytilus (Falcimylilus) striacapillatus* HAYAMI, new species.

Plate 23. Figures 8-11

**Description:** — Shell large, equivalet, sickle-shaped, weakly carinated, moderately convex, more or less longer than high; test thick for genus; hinge-margin slightly sinuated, forming an apical angle of about 50 degrees with hinge-line; umbo terminal; anterior area very narrow, ill-defined; weak carina running close to anterior margin, incurving behind beak; anterior slope in front of carination very steep and nearly vertical, while posterior area is comparatively flattened; surface marked with fine concentric lines of growth and numerous dense radial capillae which are persistently perpendicular to growth-lines and fairly prominent in early stage. Internally, a narrow ridge for adherence of ligament elongated close and subparallel to hinge-margin; umbonal and dysodont teeth absent.

<table>
<thead>
<tr>
<th>Measurement in mm.</th>
<th>Length</th>
<th>Height</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holotype (MM 2726) Bivalved specimen</td>
<td>72.5</td>
<td>68.5</td>
<td>29.0</td>
</tr>
<tr>
<td>Paratype (MM 2727) Right internal mould</td>
<td>75.5</td>
<td>74.5</td>
<td>?</td>
</tr>
<tr>
<td>Paratype (MM 2728) Left valve</td>
<td>24.0</td>
<td>19.5</td>
<td>3.5</td>
</tr>
</tbody>
</table>

**Occurrence:** — Common in sandstones of Domerio-Toarcian Shinatani formation at Shinatani in Omi-machi, Niigata Pref. and rare in black shales of Liassic “Tsuchizawa formation” at Kuruma in Kitaotari-mura, Nagano Pref. (Prov. of Shinano.)

*Mytilus (Falcimylilus) striacapillatus* HAYAMI subsp.

Plate 24. Figures 1 and 2.

There are two similar specimens to the preceding species, which are bro-
ken and secondarily deformed. If compared with typical *stricapillatus*, this form has a more elongated hinge-margin and a more gently curved ventral one.

**Occurrence:**—Rare in sandstones of the Middle Liassic Negoya formation at Neiridani in Kurobe National Forest, Toyama Pref.

*Mytilus (Falcimytilus) heranirus*  
**HAYAMI.** new species.

Plate 24, Figures 3 and 4.

**Description:**—Shell medium for genus, subtriangular, mytiliform, weakly carinate, not strongly inflated; test thin; hinge-line nearly straight, very long, occupying more than two-thirds of shell-length; anterior margin straight, forming an umbonal angle of about 50 degrees with hinge-line; umbo terminal and pointed; anterior carination becoming obscure towards ventral side, leaving a narrow anterior area in its front, which is scarcely defined from anterior slope; the greatest convexity lying close to anterior margin and posterior area well flattened; surface smooth except for fine concentric lines of growth. Internally, umbalonal and dysodont teeth absent; ligament borne by an internal ridge which runs subparallel to hinge-margin.

<table>
<thead>
<tr>
<th>Measurement in mm.</th>
<th>Length</th>
<th>Height</th>
<th>Thickness</th>
</tr>
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<tbody>
<tr>
<td>Holotype (MM 2723) Right valve</td>
<td>49.0</td>
<td>42.5</td>
<td>9.5</td>
</tr>
<tr>
<td>Paratype (MM 2724) Right valve</td>
<td>43.0+</td>
<td>31.0+</td>
<td>4.5+</td>
</tr>
</tbody>
</table>

**Observation and Comparison:**—The tribal name in Konayashi's manuscript is applied in the specific denomination. The holotype (Fig. 4) is possibly more or less compressed secondarily, while the paratype (Fig. 3) is slightly broken in postero-dorsal area.

Judging from the terminal umbo, distinct carination and edentulous hinge-area, this species may be referred to subgenus *Falcimytilus* Cox. The subtriangular outline, narrow anterior area and long hinge-margin are distinguishing characters of this species. *Mytilus mirabilis* Leptius var. *timorensis* Krumberc (1923) from the middle Liassic *Mytilus*-bank of Timor is somewhat similar to this, but in that variety the hinge-margin is much shorter and the anterior margin deeply sinuated. Shell-convexity is very strong in *timorensis*, but rather weak in the present species. *Mytilus (Falcimytilus) sublaevis* Sowerby (1823, **Vol. 5**; Morris and Lycefl, 1853) from the Bathonian in England also resembles to this in the triangular outline. In the British species, however, the antero-ventral margin is more or less sinuated, while it is nearly straight in this species.

This species differs from the preceding *stricapillatus* in the more trigonal outline, elongated hinge-line and absence of radial capillae on the surface.

**Occurrence:**—Common in black shales of Liassic "Tsuchizawa formation" at Tsuchizawa and Kuruma in Kitaotari-mura, Nagano Pref. (Prov. of Shinano).

*Mytilus (Falcimytilus) heranirus*  
**HAYAMI** subsp.

Plate 24. Figure 5.

There are two large right valves which are fairly similar to the preceding species. But the shell is more
strongly inflated with a sharp anterior carination than in typical hermatinus. The anterior margin is almost straight in hermatinus, but fairly sigmoidal in this form. On the other hand, this form is somewhat similar to Mytilus (Fallenmytilus) sufragarenensis Cox in the strong carina and broad anterior slope before it, but the anterior margin is more abruptly sinuated below the umbo than in that species.

*Occurrence:*—Rare in black shales of lower (?) Liassic Kitamatadani formation of Kurumagawa group at Kitamatadani in Onahama-machi, Toyama Pref.

**Mytilus (Fallenmytilus) sp. indet.**

*Plate 21, Figures 6 and 7.*

Only two internal moulds are given. Shell medium, crescentic in outline, strongly inflated, almost as long as high (MM 2733, 12.0 mm. long, 13.0 mm. thick); hinge-margin rather short, convex, passing gradually into posterior margin without any angulation; antero-ventral margin gently sinuated; carination very weak; anterior area small, ill-defined from anterior slope of shell body in internal mould; umbo terminal, pointed; internal ridge running subparallel and close to hinge-margin; umbonal and dysodont teeth absent.

This form resembles Mytilus mirabilis LEPESUS var. timorensis KRUMBECK (1923) in the general outline and strong shell-convexity. But judging from the growth-lines of *timorensis*, that variety seems more trigonal than this form.

*Occurrence:*—Sandstone of Negoyama formation at Neiridani.

**Family Ostreidae LAMARCK**

**Genus Ostrea LINNÉ, 1758.**

**Type species:**—Ostrea edulis LINNÉ, Recent.

"Ostrea" sp. indet.

*Plate 24, Figure 8.*

Represented by an internal mould of a left valve. Shell large, inequilateral, vertically elongated, strongly convex, thick (MM 2742, 41.0 mm. long, 15.5 mm. high, 13.0 mm. thick); ligament area wide, striated, provided with a large deep opisthocline acute-triangular central pit, which is bordered on each by a convexity; adductor monomyarian, located slightly posteriorly to center; inner surface irregularly folded, lacking any radial plications.

Judging from the irregular outline and ligament structure, this is safely placed in the wide sense of "Ostrea". DOUVILLE (1904) established genus Liostrea on the basis of *Ostrea sublamellosa* DUNKER. The genus has been said to be distinguished from *Ostrea* (s.s.) by being more equivalent and by lacking radial ribs on the left valve. The name has been hitherto applied for the greater part of Jurassic non-coiled "Ostrea" by most authors. The present form belongs probably also to Liostrea. But the specific determination is impossible at present, because the right valve and the exterior of the left valve of this form are as yet unknown.

*Occurrence:*—Procured from a sandstone of Domerio-Toarcian Shinatani formation at Shinatani.

"Ostrea" sp. indet.

*Plate 24, Figure 9.*

There are several smaller *Ostrea*-like shells which were collected from the Kuruma group at various localities. It
is difficult to say, however, which is most typical as a species, because its outline is very variable.

The illustrated specimen is an internal mould of a right valve. Shell small, pyriform, fairly convex in early stage but later it becomes concave; ligament area narrow, having a nearly aclinic obtuse-trigonal central pit bordered on each side by a weak convexity; adductor single, circular, posterior to center; inner surface smooth.

This form resembles "Ostrea" sp. (Nakazawa 1955) from the Carnic Nabae group in the pyriform outline and the reversing of shell-convexity in the middle stage, but the central pit is wider than in the Carnic form.

**Occurrence:** —The illustrated specimen procured from the Liassic "Tsuchizawa formation" at Tsuchizawa in Kitaotari-mura.

Family *Pteriidae* MECK

Genus *Pteria* SCOPOLI, 1777.

(=*Avicula* BRUGUIERE, 1791)

**Type species:** —*Mytilus hirundo* LINNE, Recent.

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**Explanation of Plate 23**

*Volcella bakerelloides* HAYAMI, new species. ................................................................. p. 156

Fig. 1. Right valve (MM 2719) x1, holotype. Loc. black shale of Lower Hettangian Niranohama formation at Niranohama in Utatsu-mura, Miyage Prefecture (Province of Rikuzen).

Fig. 2. Left valve (MM 2730) x1, paratype. Loc. ditto.

Fig. 3. Internal mould of a left valve (MM 2721) x1, paratype. Loc. ditto.

*Volcella* sp. indet. .................................................................................................................. p. 158

Fig. 4. Clay cast from the external mould of a left valve (MM 2722) x1, Loc. black shale of Toarcian (?) Shinatani formation at the upper stream of Teradani in Kurobe National Forest, Toyama Pref.

*Arcoptytilus dairensis* KOBAYASHI and HAYAMI, new species. ........................................ p. 158

Fig. 5. Left valve (MM 2734) x1, holotype. Loc. fine sandstone at the lower stream of Daira River in Asahi-machi, Toyama Pref. KOBAYASHI coll.

Fig. 6. Left valve (MM 2735) x1, Loc. the same as fig. 4.

*Arcoptytilus* sp. indet. ............................................................................................................. p. 158

Fig. 7. Left valve (MM 2736) x1, Loc. sandstone of Toarcian Shinatani formation at Shinatani in Omi-machi, Niigata Pref.

*Mytilus* (*Falcomytilus*) *stricapillatus* HAYAMI, new species. ........................................ p. 159

Fig. 8. Left valve (MM 2728) x2, paratype. Loc. black shale of Liassic "Tsuchizawa formation" at Kuruma in Kitaotari-mura, Nagano Pref. (Prov. of Shinano).

Fig. 9. Bivalved specimen (MM 2726) x1, holotype. Loc. the same as fig. 7.

Fig. 10. Left valve (MM 2729) x1, Loc. ditto.

Fig. 11. Internal mould of a right valve (MM 2727) x1, paratype. Loc. ditto.

*Oxytoma* (?) sp. indet. ........................................................................................................... p. 163

Fig. 12. Left valve (MM 2740) x1.5, Loc. fine sandstone of Domerio-Toarcian Shinatani formation at the upper stream of Kanayama-dani, in Omi-machi, Niigata Pref.

Fig. 13. Left valve (MM 2741) x1.5, Loc. ditto.

All illustrated specimens are kept in the Geological Institute, University of Tokyo.

Photo by UEKI.
Pteria (s. l.) kitakamiensis

HAYAMI. new species.

Plate 24, Figures 10 and 11.

?1904. Gerrillia trigona YOKOHAMA, Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 18, Art. 6, p. 12, pl. 2, fig. 8 (non fig. 7)

Description:—Shell highly inequivalve, trigonal, pteriform, compressed; test thin; left valve moderately inflated but right one is nearly flat; hinge-margin straight, almost as long as whole shell-length; anterior margin long, almost straight, forming an angle of 40 degrees or so with hinge-margin; ventral margin short, abruptly curved; posterior one slightly sinuated in dorsal half, forming a small pointed posterior auricle; anterior wing large, elongated along anterior margin, defined from shell-body by an obscure groove in right valve; umbo fairly protruded above hinge-line in left valve, but not in right; surface marked with more or less fluctuated concentric lamellae; inner surface of left valve undulated by some broad radial plications; hinge and ligament structures unknown.

<table>
<thead>
<tr>
<th>Measurement in mm.</th>
<th>Holotype (MM 2737) Right external mould</th>
<th>Paratype (MM 2738) Left internal mould</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>38.5</td>
<td>26.0+</td>
</tr>
<tr>
<td>Height</td>
<td>24.0</td>
<td>21.5+</td>
</tr>
<tr>
<td>Thickness</td>
<td>1.5</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Observation and Comparison:—Six specimens are at hand, but all are more or less broken or deformed secondarily. Though the hinge structure is unknown, the present species is referable to Pteria (s. l.) in view of the general outline and horizontal ridge along hinge-margin. The ridge appears in Gerrillia praecursor QUENSTEDT (HEALEY, 1908) and several species of the Bakevelliliidae, but more commonly in Mesozoic “Pteria”.

This species is so similar to the specimen of Gerrillia trigona YOKOHAMA (1904, p. 12, pl. 2, fig. 8, non fig. 7) in the trigonal outline and concentric lamellae, that the specimen possibly is conspecific with this. But the specific name, trigona, is applied to the form as represented by the other type specimen (fig. 7) which has an explicit ligament structure of Bakevellia-type. The writer designated already it as the lectotype of Bakevellia trigona (YOKOHAMA) (HAYAMI, 1957, p. 51, pl. 2, fig. 2).

Occurrence:—Rare in black shales of lower Hettangian Nirinohama formation at Nirinohama.

Genus Oxytoma MEEK. 1864.

Type species:—Avicula inequivalvis SOWERBY (1818, Vol. 3, p. 78, pl. 241, fig. 2, non fig. 3), Middle Jurassic (=Avicula munsteri BRONN in Goldfuss, 1836.)

Oxytoma (?) sp. indet.

Plate 21, Figures 12 and 13.

Several ill-preserved left valves are at hand. Shell small, prosocline, convex; hinge long, straight with a pointed posterior auricle, below which posterior margin is fairly sinuated; umbo more or less rising above hinge-margin, located at about a third of shell-length from front; surface sculptured with about 15 radial ribs of a single order of prominence.

Nothing is known of the hinge-structure and the right valve. Judging from the general outline and ornamentation...
tation, this seems a member of *Oxytoma*, but the specific identification is deferred until sufficient material will be procured.

*Occurrence:*—Rare in fine sandstone of the Lower Shinatani formation (Domerio-Toarcian) at the upper stream of Kanayamadani in Omi-machi, Niigata Pref.

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Explanation of Plate 24

*Mytilus (Falcimylitus) stricapillatus* HAYAMI subsp. .................................................. p. 159

Fig. 1. Internal mould of a left valve (MM 2731) ×1. Loc. sandstone of Middle Liassic Negoya formation at Neiridani in Kurobe National Forest, Toyama Pref.

Fig. 2. Internal mould of a right valve (MM 2732) ×1. Loc. ditto.

*Mytilus (Falcimylitus) heraunirus* HAYAMI, new species. ........................................ p. 160

Fig. 3. Right valve (MM 2723) ×1.5, holotype. Loc. black shale of Liassic “Tsuchizawa formation” at Kuruma in Kitagata-mura, Nagano Pref. KOBAISHI coll.

Fig. 4. Right valve (MM 2724) ×1. paratype. Loc. ditto.

*Mytilus (Falcimylitus) heraunirus* HAYAMI subsp. .................................................. p. 160

Fig. 5. Left valve (MM 2730) ×1. Loc. black shale of Lower (?) Liassic Kitamatahadi formation at the upper stream of Kitamatahadi in Kurobe National Forest

*Mytilus (Falcimylitus) sp. indet.* ................................................................. p. 161

Fig. 6. Internal mould of a right valve (MM 2733) ×1. Loc. the same as fig. 1.

Fig. 7. Internal mould of a left valve (MM 2725) ×1. Loc. ditto.

*Ostrea* a sp. indet. ................................................................. p. 161

Fig. 8. Gypsum cast from the internal mould of a left valve (MM 2742) ×1. Loc. sandstone of Toarcian (?) Shinatani formation at Shinatani in Omi-machi, Niigata Pref.

*Ostrea* b sp. indet. ................................................................. p. 161

Fig. 9. Internal mould of a right valve (MM 2743) ×1. Loc. black shale of Liassic “Tsuchizawa formation” at Tsuchizawa in Kitaotari-mura.

*Pteria* (s.l.) kitakamiensis HAYAMI, new species. ........................................ p. 163

Fig. 10. Internal mould of a left valve (MM 2738) ×1, paratype. Loc. black shale of Lower Hettangian Niranobama formation at Niranobama in Utatsu-mura, Miyagi Pref.

Fig. 11. External mould of a right valve (MM 2737) ×1, holotype. Loc. ditto.

All illustrated specimens are kept in the Geological Institute, University of Tokyo.

Photo. by UEKI
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