Triassic Fossils from the Kitakami Massif, Northeast Japan: Part 1, Pelecypods and Brachiopods of the Osawa and the Fukkoshi Formations

Murata Masafumi
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Masafumi Murata*

Abstract

Five species of invertebrate fossils are described from the Osawa and Fukkoshi formations, among which is included one new species of *Leptoconodria*.

INTRODUCTION AND ACKNOWLEDGMENT

The Kitakami Massif, Northeast Japan, is divided geologically into the northern and the southern parts by the Hayachine-Goyozan Tectonic Zone. Little is known of the Triassic stratigraphy and paleontology of the northern part of the Kitakami Massif, except for the Late Triassic conodonts that have been recorded from several localities in this area by Murata and Sugimoto (1971) and Murata and Nagai (1972). On the other hand, the Triassic System of the southern part of the Kitakami Massif has been accepted as one of the standard type sections in Japan. Since the first discovery of Triassic molluscs by Naumann (1881), our knowledge on the stratigraphy and paleontology of the Triassic sediments in this area has increased remarkably. Particularly, the Middle and Upper Triassic formations and their faunas have been studied biostratigraphically and paleontologically in considerable detail. However, the Lower Triassic formations have remained almost untouched.

In 1970, several specimens of a marine ichthyosaurid reptile were found by Drs. K. Nakazawa, K. Ishii, Y. Bando and the present writer, from the Lower Triassic Osawa Formation in the southern part of the Kitakami Massif. The ichthyosaurid reptile is now being studied paleontologically by Dr. Tokio Shikama and the present writer. Taking this opportunity, the writer has made a detailed stratigraphical study of the Lower Triassic formations of this area in collaboration with N. Nishiwaki, S. Shimoyama and K. Kamada. They collected a large number of specimens of the Lower Triassic pelecypods, brachiopods, cephalopods and plant fossils from many localities. Among them, the cephalopods and plant fossils are being studied by Dr. Y. Bando and Dr. E. Kon'no respectively, and will be treated separately as Parts 2 and 3.

In the present article, the writer describes the result of a paleontological study on the pelecypods and brachiopods from the Lower Triassic Osawa and the Fukkoshi formations. As the result, two species of pelecypods distributed among two genera and three species of brachiopods represented by two genera were distinguished.

Before going further, the writer offers his cordial thanks to Professor Kotora Hatai of the Institute of Geology and Paleontology, Tohoku University, for his kind help and advice during the course of the present study. He is indebted to Professor Keiji Nakazawa of the Kyoto University, Associate Professor Ken-ichi Ishii of the Osaka City University, and

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Associate Professor Yuji Bando of the Kagawa University for their suggestions on the Triassic stratigraphy and paleontology. For encouragement, collaboration in the field and support, the writer wishes to thank Messrs. Niichi Nishiwaki of the Kyoto University, Shoichi Shimoyama and Kotaro Kamada of the Hirosaki University.

NOTE ON THE STRATIGRAPHY OF THE OSAWA AND THE FUKKOSHI FORMATIONS

In general, the Mesozoic formations in the southern part of the Kitakami Massif comprise two major synclinal structures, each plunging southward with the axes trending in N-S to NNE-SSW directions. They are named the Karakuwa-Oshika Syncline in the east, and the Motoyoshi-Ishinomaki Syncline in the west, and are separated by the Kesennuma-Okatsu Anticline. The Early to Middle Triassic Inai Group rests on the Late Permian Toyoma Formation with unconformity, and is distributed along the synclinal structures. The Inai Group has rather uniform lithologic facies, and is covered with distinct clino-unconformity by the Late Triassic Saragai Group or the Early Jurassic formations. The succession of the Inai Group is as follows:—

\[
\text{Saragai Group} \quad \text{Early Jurassic formations} \\
\hspace{1cm} \text{Cline-unconformity} \\
\text{Rifu Formation} \\
\text{Isatomae Formation} \\
\text{Fukkoshi Formation} \\
\text{Osawa Formation} \\
\text{Hiraiso Formation} \\
\hspace{1cm} \text{Unconformity} \\
\text{Toyoma Formation}
\]

The Hiraiso Formation consists of thick conglomerate and/or an alternation of sandstone and conglomerate in the lower part, and an alternation of calcareous sandstone and shale in the middle and upper parts. Thin beds of acidic tuff are intercalated locally in the lower part in the Karakuwa and Toyoma areas. The lithologic facies of the Osawa Formation gradually changes upwards from the Hiraiso Formation, and is composed of a thin alternation of shale and calcareous fine grained sandstone. The Fukkoshi Formation consists of thick bedded or massive sandstone intercalated with thin laminated shale and lenticular pebbly conglomerate. According to Ichikawa (1951) and Onuki and Bando (1956), the Fukkoshi Formation changes laterally to the lower part of the Isatomae Formation. The Isatomae Formation is a thick formation of thin laminated sandy shale. The Rifu Formation is similar lithologically to the Isatomae Formation, and some of their ammonoid faunas overlap. However, the Rifu Formation is separated from the Isatomae Formation by stratigraphic position and by being composed of younger sediments.

The detailed lithologic successions of the fossil localities of the present article are shown in Fig. 2. They are distributed in the three areas of, Motoyoshi, Utatsu and Okatsu, and the first area includes the type sections of the Osawa and the Fukkoshi formations. The lithologic facies of the Osawa and Fukkoshi formations is rather uniform, but vary in thickness with area.
FOSSIL RECORDS AND GEOLOGICAL AGE OF THE OSAWA AND FUKKOSHI FORMATIONS

Rather poor faunas of the Osawa and the Fukkoshi formations were recorded by Shiida (1940), Inai and Takahashi (1940), Ichikawa (1951), Onuki and Bando (1959) and Onuki (1969) from several localities. However, most of the previous records were only lists, except for some ammonites described by Bando (1964, 1968, 1970) and a conularid by Sugiyama (1942).

From the upper part of the Osawa Formation at the type section exposed along the sea coast at Osawa, Motoyoshi-cho, Motoyoshi-gun, Miyagi Prefecture, Ichikawa (1951) listed:

"Ophiceras" sp.  Eumorphotis aff. telleri (Bittner)
"Senodiscus" spp.  Posidonia spp.
Prohungaritoid ammonite  Nuculopsis (Palaeonucula) sp.
Pseudoharpoceroid ammonite
Fig. 2. Columnar sections of the Osawa and the Fukkoshi formations.
From the same locality, Bando (1968, 1970) described:

*Mesoceras* spp.  *Eustelmingites* sp.

"*Ophiceras*" ? sp. was also listed by Inai and Takahashi (1940) and Ichikawa (1951) from this formation in the Okatsu area. Bando (1964) described *Subcolumbites cf. perrinismithi* (Arthaber) from the Utatsu area. Besides, *Conulariopsis quadrata* Sugiyama was reported by Sugiyama (1942) from the Okatsu area.

Onuki and Bando (1959) and Onuki (1969) collected and recorded some pectinid pelecypods from Senmatsu, Fujisawa-cho, Higashi-Iwai-gun, Iwate Prefecture, however, they were revised and referred to the Permian aviculopectinids by the present writer (1969).

### Table 1. Occurrence of pelecypods and brachiopods from the Osawa and the Fukkoshi formations.

<table>
<thead>
<tr>
<th>Formation</th>
<th>Osawa F.</th>
<th>Fukkoshi F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genus and species</td>
<td>Hikado</td>
<td>Osaka</td>
</tr>
<tr>
<td><em>Proneulina</em> sp.</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td><em>Leptochondria</em> ? hataii</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td><em>Liusta</em> sp.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Oribiculoidea</em> cf. <em>sibirica</em></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Oribiculoidea</em> sp.</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

The fauna of pelecypods and brachiopods of the Osawa Formation and their localities are listed in Table 1. As shown in Fig. 2, these faunas are from the lower to upper parts of the Osawa Formation. Among them, *Leptochondria* ? *hataii* n. sp. is a characteristic element of this formation, and ranges up to the Fukkoshi Formation. *Oribiculoidea* sp. was also collected from the upper part of the Hiraiso Formation.

According to the recent study on the ammonites by Bando (1972, MS,) the Osawa Formation includes the *Columbites parisiianus* Zone in the lower and middle parts, and the *Arnaucocelitites* sp. Zone in the upper. He listed the following faunas:–

**Columbites parisiianus** Zone

*Hyatt and Smith*  
*C. parisiianus* sp.  
*Subcolumbites* *perrinismithi* (Arthaber)  
*S. parisiianus* sp.  
*Eophyllites* cf. *evolutus* (Renz and Renz)  
*Plenites* sp.  
*Pseudosagoceras* ? sp.

**Arnaucocelitites** sp. Zone

*Arnaucocelitites* sp.  
*Nordophiceras* cf. *pilatum* (Hyatt and Smith)  
*N. parisiianus* sp.  
*Leiophyllites* sp.

Bando correlates the Osawa Formation with the Late Scythian Columbian-Prohungaritan of Spath (1930).
FUKKOSHI FORMATION

Only two fossil localities can be referred to the Fukkoshi Formation. Ichikawa (1951) listed from this formation at Oyubi, Kitakami-cho, Mono-gun, Miyagi Prefecture: -

*Spiriferina* sp. (cf. *S. fragilis* Schlotheim)
*Spiriferina* sp. (cf. *S. stracheyi* Salter)
*Spiriferina* sp.
*Terebratula* sp.
"Pteria" spp.
*Palaeoneilo?* sp.
*Isocrinus* sp.

Another locality of the fauna of the Fukkoshi Formation is at Konori, Onagawa-cho, Oshika-gun, Miyagi Prefecture. From this locality Bando (1968) described: -

*Danubites* aff. *ambika* Diener
*Leiophyllites* aff. *pitamaha* (Diener)
*L. aff. pradyumna* Diener
*L. sp.*

Besides, *Gymnites* cf. *watanabei* (Mojsisovics) recorded by Hachiya (1901) and *Hollandites* sp. and *Balatonites* cf. *kitakamicus* (Diener) both reported by Shimizu (1930) were added to the fauna of the Fukkoshi Formation by Onuki and Bando (1959), but unfortunately the exact localities of these ammonites are not known.

As shown in Table 1, *Leptochondria? hataii* n. sp. is the only species of the Fukkoshi Formation, treated in this article.

According to Bando (1968), the ammonite fauna of the Fukkoshi Formation is correlated with the Latest Scythian or the Prohungaritan of Spath (1930).

SYSTEMATIC DESCRIPTION

Phylum Mollusca
Class Bivalvia Linnaeus, 1758
Subclass Pteriomorpha Beurlen, 1944
Order Pterioida Newell, 1965
Suborder Pteriina Newell, 1965
Superfamily Ambonychiacea S.A. Miller, 1877
Family Myalinidae Frech, 1891
Genus *Promyalina* Kittl, 1904
*Promyalina* sp.
Pl. 29, fig. 14

Remarks: - A single poorly preserved rather small, internal mold of the left valve is at hand. It somewhat resembles *Promyalina vetusta* (Benecke) and some species of the Early Triassic *Promyalina*. This specimen lacks a cardinal tooth, but may be referred to this genus by its shell outline.

Repository: - IGPS* coll. cat. no. 92660.

Horizon and Locality: - Lower part of the Osawa Formation, *Columbites parissonianus* Zone, Late Scythian, at Hikado, Motoyoshi-cho, Motoyoshi-gun, Miyagi Prefecture.

* Abbreviation for the Institute of Geology and Paleontology, Tohoku University, Sendai, Japan.
Superfamily Pectinacea Rafinesque, 1815
Family Aviculopectinidae Meek and Hayden, 1864
Subfamily Aviculopectininae Meek and Hayden, 1864
Genus Leptochoendra Bittner, 1891
Leptochoendra? hataii Murata, n. sp.
Pl. 29, figs. 1–13

Description: – Shell small, ovate, prosoclone beaks sharp, narrow, slightly protruded in left valve; left valve gently convex; right valve more flattened; umbonal angle about 100 degrees; hinge margin nearly half of shell length; anterior auricle equal to or slightly shorter than posterior; posterior auricle of both valves broad, indistinctly delimited; anterior auricle obtuse, rather distinctly differentiated in left valve, well defined with subauricular notch in right valve but flattened by compression.

Surface of left valve with numerous fine radial costae of different strengths, classified into two orders. First order costae rounded and more than 20 in number, intercalated with second order costae of regularly, and finer costae elevated on ventral margin of shell. Right valve with fine growth lines and very weak fine ribs.

The measurements of this new species are given in Table 2.

Table 2. Measurements of Leptochoendra? hataii Murata, n. sp.

<table>
<thead>
<tr>
<th>Specimen Reg. No.</th>
<th>Length mm</th>
<th>Height mm</th>
<th>Hinge length mm</th>
<th>Convexity mm</th>
<th>Umbonal angle degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>92661 RV</td>
<td>13.5±</td>
<td>12.8+</td>
<td>10.5</td>
<td>1.0±</td>
<td>110</td>
</tr>
<tr>
<td>92662 LV</td>
<td>13.1±</td>
<td>12.5+</td>
<td>8.5+</td>
<td>1.7</td>
<td>115</td>
</tr>
<tr>
<td>92663 RV</td>
<td>12+</td>
<td>13.6+</td>
<td>10.5+</td>
<td>1.1?</td>
<td>105</td>
</tr>
<tr>
<td>LV</td>
<td>14.5+</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>92664 LV</td>
<td>13.5±</td>
<td>13.1</td>
<td>9.8+</td>
<td>1.8</td>
<td>95</td>
</tr>
<tr>
<td>92667 LV</td>
<td>14.5±</td>
<td>16.6</td>
<td>12.3+</td>
<td>2.1</td>
<td>105</td>
</tr>
<tr>
<td>92668 RV</td>
<td>13.5–</td>
<td>15.8</td>
<td>?</td>
<td>0.8±</td>
<td>98</td>
</tr>
<tr>
<td>92670 LV</td>
<td>20.1</td>
<td>24.2</td>
<td>?</td>
<td>2.4</td>
<td>?</td>
</tr>
</tbody>
</table>

RV—right valve, LV—left valve.

Remarks: – This species is based on more than 20 specimens with both valves, most of which are molds and more or less compressed. The generic position of this species is a little doubtful, because it shows some similarity with Posidonia Bronn (1828) in outline. However, the character of the auricle is like that of Leptochoendra Bittner (1891) rather than Posidonia. This form could not be identified with any known species of Leptochoendra and Posidonia.

This species is named in honor of Dr. Kotora Hatai, Professor of the Tohoku University in recognition of his paleontological works.


Horizon and Locality: – Abundant in the Osawa Formation, Columbites parisianus and Arnaucalciates sp. Zones, Late Scythian, and rare in the Fukkoshi Formation, Prohungaritan, Latest Scythian. Sixteen specimens, including the holotype and 9 paratypes were found from the lower part of the Osawa Formation at Hikado, Motoyoshi-cho, Motoyoshi-gun, Miyagi Prefecture. Seven specimens are from the middle and upper parts of the Osawa Formation at Osawa, Motoyoshi-cho, and Tatezaki, Utatsu-cho, Motoyoshi-gun, and two are from the Fukkoshi Formation at Konori, Onagawa-cho, Oshika-gun, Miyagi Prefecture.
Phylum Brachiopoda
Class Inarticulata Huxley, 1869
Order Lingulida Waagen, 1885
Superfamily Lingulacea Menke, 1828
Family Lingulidae Menke, 1828
Genus Lingula Bruguère, 1797
Lingula sp.
Pl. 29, figs. 15a, b

Description: – Elongate oval in outline, lateral margins slightly convex; length of valve about twice maximum width, 7.1 mm in length, 3.7 mm in width; anterior margin rounded; beak pointed in pedicle valve; valve gently convex, lessening in convexity anteriorly; ornamented by fine growth lines; in pedicle valve internally a pair of narrow blade-like ridges diverge slightly, extend anteriorly about half length of shell.

Remarks: – Only a single pedicle valve is at hand. The present form shows some similarity with Lingula tenuissima described from the Muschelkalk and Keuper in Germany by Bronn (1856), and L. cf. tenuissima recorded by Bittner (1899) from the Ussuri Gulf, but the details are different.

Repository: – IGPS coll. cat. no. 92671.

Horizon and Locality: – From the middle part of the Osawa Formation, Columbites parisuanus Zone, Late Scythian, at Tatezaki, Utatsu-cho, Motoyoshi-gun, Miyagi Prefecture.

Order Acrotretida Kuhn, 1949
Suborder Acrotretidina Kuhn, 1949
Superfamily Discinacea Gray, 1840
Family Discinidae Gray, 1840
Subfamily Orbiculoideinae Schuchert and LeVene, 1929
Genus Orbiculoidea d’Orbigny, 1847
Orbiculoidea cf. sibirica Moisseiev, 1947
Pl. 29, figs. 16, 17


Remarks: – Two considerably compressed specimens in the present collection are to be identical with Orbiculoidea sibirica Moisseiev reported by Dagys (1965), although the original description of Moisseiev (1947) was not seen. Shell subcircular in outline, about 14–15 mm in length, 13–12 mm in width; brachial valve conical, apex submarginal; pedicle valve probably flattened, with narrow pedicle track; both valves ornamented by fine concentric growth lines developed to fila.

Repository: – IGPS coll. cat. nos. 92672, 92673.

Horizon and Locality: – From the middle part of the Osawa Formation, Columbites parisuanus Zone, Late Scythian, at Tatezaki, Utatsu-cho, Motoyoshi-gun, Miyagi Prefecture.

Orbiculoidea sp.
Pl. 29, figs. 18, 19

Remarks: – Two brachial valves of this form are at hand. Brachial valve subconical, about 8 mm in length, 7 mm in width; nearly 1 mm in height, apex pointed, submarginal about one-fourth of length posteriorly; surface ornamented by fine concentric growth lines.

The present specimens appear as if some patellate gastropods, however, the former has a phosphatic shell.
Triassic Fossils from the Kitakami Massif, Northeast Japan

Repository: — IGPS coll. cat. nos. 72674, 92675.
Horizon and Locality: — From the middle part of the Osawa Formation, *Columbites parisiuanus* Zone, Late Scythian, at Tatezaki, Utatsu-cho, Motoyoshi-gun, Miyagi Prefecture.

REFERENCES


Plate 29


1a, b-External mold, × 2, and gum-type, × 3, of right valve, holotype, IGPS coll. cat. no. 92661.
2a, b-External mold, × 2, and gum-type, × 3, of left valve, paratype, IGPS coll. cat. no. 92662.
3, 4-Fragmental right and left valves, × 2, paratype, IGPS coll. cat. no. 92663.
5-External mold of a rather complete right valve, × 2, paratype, IGPS coll. cat. no. 92664.
6–9-Internal molds of fragmental left valves, × 2, paratypes, IGPS coll. cat. nos. 92665, 92666.
10-Left valve, × 1.5, paratype, IGPS coll. cat. no. 92667.
11a, b-Internal and external molds of a right valve, × 1.5, paratype, IGPS coll. cat. no. 92668.
12a, b-Internal and external molds of a fragmental right valve, × 1, IGPS coll. cat. no. 92670.
13-Internal mold of a fragmental left valve, × 2, paratype, IGPS coll. cat. no. 92669.

*Horizon and Locality:* 1–11, 13; Lower part of the Osawa Formation at Hikado, Motoyoshi-cho, Motoyoshi-gun, Miyagi Prefecture.
12; Middle part of the Osawa Formation at Tatezaki, Utatsu-cho, Motoyoshi-gun, Miyagi Prefecture.

Fig. 14. *Promyodina* sp.

Internal mold of a left valve, × 2, IGPS coll. cat. no. 92660.

*Horizon and Locality:* Lower part of the Osawa Formation at Hikado, Motoyoshi-cho, Motoyoshi-gun, Miyagi Prefecture.

Figs. 15a, b. *Lingula* sp.

External and internal molds of a pedicle valve, × 3, IGPS coll. cat. no. 92671.

*Horizon and Locality:* Middle part of the Osawa Formation at Tatezaki, Utatsu-cho, Motoyoshi-gun, Miyagi Prefecture.

Figs. 16, 17. *Orbiculoidea* cf. *sibirica* Moisseev

16-Brachial valve, × 1.5, IGPS coll. cat. no. 92672.
17-Fragmental pedicle valve, × 1.5, IGPS coll. cat. no. 92673.

*Horizon and Locality:* Middle part of the Osawa Formation at Tatezaki Utatsu-cho, Motoyoshi-gun, Miyagi Prefecture.

Figs. 18, 19. *Orbiculoidea* sp.

Two brachial valves, × 3, IGPS coll. cat. nos. 92674, 92675.

*Horizon and Locality:* Same as figs. 16, 17.
K. Kumagai and S. Ohtomo photo