38. Stratigraphic Position of the Corals in the Ichinotani Formation (Carboniferous), Fukuji District, Hida Massif, Central Japan

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The Ichinotani formation is a thick limestone formation developed in the Fukuji district, Kamitakara village, Yoshiki county, Gifu prefecture. The junior writer who worked out its stratigraphy and fusulinid fauna could distinguished it in five fusulinid zones, viz., *Triticites*-, *Fusulina*-, *Fusulinella*-, *Profusulinella*-, and *Millerella* zones, and collected numerous corals from various horizons. The stratigraphic relation of these corals to the fusulinid zones is treated in this article.

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Stratigraphic position of the corals. Four or five coral faunae are distinguishable in the Ichinotani formation, the oldest of which is from the lower part of the *Millerella* zone (*M. kanmerai* zone). The lower limit of this 25 m thick zone is in fault contact with the Gotlandian. Corals are found in its black impure limestone facies which intercalates thin black shale and siliceous bands. Besides *Linoproductus*, other large unidentified productids, *Millerella*, and plectogyroid foraminifera, this zone yielded the following corals.

- Lithostrotion asiatica* Yabe and Hayasaka
- L. heptagonale* Kamei and Igô (MS)
- Caninia juddi* (Thomson) var. *minatoi* Kamei and Igô (MS)
- Neokoninckophyllum hidense* Kamei and Igô (MS)
- Clisiophyllum* (*Clisaxophyllum*) sp.
- Dibunophyllum* sp.
- Koninckophyllum ichinotaniense* Kamei and Igô (MS)
- Rhodophyllum*? aff. *yokoyamai* Minato
- Palaeosmilia murchisoni* Edwards and Haime
- P.* sp.
- Kueichouphyllum yabei* Minato
- Heterocaninia yûi* Kamei and Igô
- Hexaphyllia* sp.
- Syringopora* cfr. *ramulosa* Goldfuss
- S.* (*Keichoupora*) sp.

Minato and Kato (1957) studied the coral fauna and reported: *Lonsdaleia* aff. *duplicata duplicata* (Martin), *L.* sp., *Rhodophyllum*?

minatoi Kato (MS), *Neokoninckophyllum gracile nipponense* Kato (MS), *Arachnolasma cylindricum* Yü, *Dibunophyllum* sp., *Palaeosmilia* cfr. *murchisoni* Edwards and Haime, *Heterocaninia* sp., *Hexaphyllia* sp., *Syringopora* sp.

They assumed that the coral fauna is divisible into two distinct zones, *Neokoninckophyllum gracile nipponense* zone in the higher position and *Siphonodendron hidense* zone in the lower. All of the writers' materials are from the same stratigraphic horizon, separation of which into two is practically difficult in field; the view of Minato and Kato is questionable even though they based it on the occurrence of *Neokoninckophyllum* and other corals of younger type in association.

This coral fauna corresponds to those of the Onimaru formation of the Kitakami massif, the Shangssuan series of South China, and the Upper Visean of Europe on the following reasons: 1) *Lithostrotion asiatica*, originally from the Shangssuan series of Hunan province, is common throughout the zone of *Yuanophyllum* of the Lower Carboniferous of China. 2) *Lithostrotion heptagonale*, a massive form, is intimately related to certain species from the Shangssuan and also from Great Britain. 3) *Caninia juddi* var. *minatoi* closely resembles *C. juddi* which ranges from D1 to E1 of England (Hill, 1938). 4) *Kueichouphyllum yabei*, an important member of the Ichinotani fauna, also characterizes the Onimaru series. 5) *Heterocaninia yûi* closely resembles *H. tholusitabulata* which is common in the Shangssuan. 6) *Hexaphyllia* sp. is an ally of *H. mirabilis* (Duncan) confined to the Visean of Europe. 7) *Clisiophyllum* (*Clisaxophyllum*) sp. more or less approaches the Chinese *C. yengtzensense* (Yoh). 8) Fusulinids are allied with those from the Upper Chesterian of North America (Igô, 1957).

The next younger *Millerella bigemmicula*-*Pseudostaffella kanumai* zone yielded only poorly preserved *Lophophyllidium* sp.; fusulinid fauna shows its Lower Pennsylvanian age (Igô, 1957).

Another rich coral fauna in the black limestone with scattered specimens of *Profusulinella* is full of *Chaetetes* stocks, with *Dorlodotia fujimotoi* Igô (MS), *Geyrophyllum carbonarium* Igô (MS) in association. *Caninia pseudoyohi* Igô (MS) from the *Profusulinella* limestone of Mizuboradani valley may occupy a slightly higher stratigraphic position. The coral fauna of the *Profusulinella* zone does not contain any survivals from that of the lower zone.

Dorlodotia fujimotoi is more or less related to certain species of *Lithostrotionella* and *Thysanophyllum* from the Nagaiwa formation of the Kitakami massif and other lower Middle Carboniferous rocks, so far as internal structure is concerned. *Geyrophyllum carbonarium* is the oldest form known of the genus. The unnamed species of *Chaetetes*

closely resembles, if not conspecific with, *C. nagaiwaensis* Minato which is the most characteristic species of the Nagaiwa. The Nagaiwa formation and this limestone are similar in fusulinid fauna.

The next younger prolific coral fauna occurs in the upper part of the zone of *Fusulinella*; it comprises:

Caninia sp. A.

C. sp. B.

Cystiphora manchurica Yabe and Hayasaka

C. manchurica forma *kikkawai* Yabe and Hayasaka

Arachnastraea molleri (Stuckenberg)

Huangia japonica Igô (MS)

Koninckocaninia flexuosa var. *sugiyamai* Igô (MS)

K. flexuosa var. *ogurai* Igô (MS)

Chaetetes spp.

Huangia japonica and two unidentified species of *Caninia* occur in a horizon immediately below that of the others mentioned above. Two new varieties of *Koninckocaninia* are characteristic to this zone and closely related to *K. flexuosa* Dobrolyubova which is restricted to C_2^3 at Stshurova in the Moscow Basin. *Arachnastraea molleri* once reported by Kamei (1952) may be from this horizon; it was first described from the Podolsk horizon of the Moscow Basin and then from the Penchi series of South Manchuria. *Cystiphora manchurica* and forma *kikkawai* occur in the Penchi series, and related forms are recorded from the Podolsk and Myatshcovo horizons of Soviet Russia. Minato (1955) reported *C. manchurica* forma *kikkawai* from the Ichinotani formation, thereby claiming its early Permian age; in the writers' collection, there are in abundance advanced forms of *Fusulinella* in association with these corals. *Huangia japonica*, dominant over unnamed species of *Chaetetes* is somewhat related to certain species of "*Corwenia*" from the Middle Carboniferous Weinigian of China. These paleontological evidences allow the correlation of this fauna to the Moscovian, and the common occurrence of *Cystiphora*, *Arachnastraea*, and *Koninckocaninia* certainly indicates a direct faunal connection by the water way then existed between Japan and the Ural Geosyncline via South Manchuria. The present writers agree well with Minato concerning this paleogeographic condition during the Middle Carboniferous age. At the same time, importance of *Caninia* and *Huangia* can not be ignored in the relation to the Weinigian coral fauna of South China.

The succeeding *Fusulina* zone and *Triticites* zone yield corals very rarely; only *Lonsdaleoides*? sp., "*Campophyllum*"? sp., and *Chaetetes* spp. have been found in the former, and several unidentified caninids and *Chaetetes* sp. in the latter.

The stratigraphic distribution of these corals from the Ichinotani formation is shown in the annexed table.

Species	0 100%									
	M	P	F	F _n	T					
<i>Caninia juddi</i> var. <i>minatoi</i> Kamei and Igô (MS) . . .	*									
<i>C. pseudoyohi</i> Igô (MS)		*								
<i>C. sp. A</i>			*							
<i>C. sp. B</i>			*							
" <i>Campophyllum</i> "? spp.				*	*					
<i>Lithostrotion asiatica</i> Yabe and Hayasaka	*									
<i>Lith. heptagonale</i> Kamei and Igô (MS)	*									
<i>Dorlodotia fujimotoi</i> Igô (MS)		*								
<i>Cystipora manchurica</i> Yabe and Hayasaka				*						
<i>Cyst. manchurica</i> forma <i>kikkawai</i> Yabe and Hayasaka				*	*					
<i>Arachnastraea molleri</i> (Stuckenber)				*						
<i>Neokoninckophyllum hidense</i> Kamei and Igô (MS) . . .	*									
<i>Geyrophylllum carbonarium</i> Igô (MS)		*								
<i>Dibunophyllum</i> sp.	*									
<i>Koninckophyllum ichinotaniense</i> Kamei and Igô (MS) . .	*									
<i>Koninckocaninia flexuosa</i> var. <i>sugiyamai</i> Igô (MS) . . .				*						
<i>K. flexuosa</i> var. <i>ogurai</i> Igô (MS)				*						
<i>Rhodophyllum</i> ? aff. <i>yokoyamai</i> Minato	*									
<i>Clisiophyllum</i> (<i>Clisaxophyllum</i>) sp.	*									
<i>Huangia japonica</i> Igô (MS)				*	*					
<i>Lonsdaleoides</i> ? sp.					*					
<i>Lophophyllidium</i> sp.	*									
<i>Palaeosmilina murchisoni</i> Edwards and Haime	*									
<i>P. sp.</i>	*									
<i>Kueichouphyllum yabei</i> Minato	*									
<i>Heterocaninia yûi</i> Kamei and Igô	*									
<i>Hexaphyllia</i> sp.	*									
<i>Syringopora</i> cfr. <i>ramulosa</i> Goldfuss	*									
<i>S. (Kueichoupora)</i> sp.	*									
<i>Chaetetes</i> spp.		*	*	*	*	*	*	*	*	*

M: Zone of *Millerella*; P: Zone of *Profusulinella*; F: Zone of *Fusulinella*; F_n: Zone of *Fusulina*; T: Zone of *Triticites*

All species cited above in MS nom are described in another paper to be published in near future.

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