

Molluscan Fossils from the Muro Group in the Southern Part of the Kii Peninsula, Central Japan. Part 1.

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(Received Dec. 1, 1965)

Abstract

Molluscan fossils have been newly recognized from the Muro group, which is an upper member of the strata of uncertain age in the southern part of the Kii Peninsula, Wakayama Pref., Central Japan and is unconformably overlain by the middle Miocene Tanabe or Kumano group. From the evidence of the molluscan fossils, although most of them are indetermined specifically, it is inferred that the upper part of the Muro group is upper Oligocene or lowermost Miocene and is thought to be a correlative of the Poronai formation of Hokkaido.

I Introduction and Acknowledgements.

In the southern part of the Kii Peninsula are found the thick sedimentary strata of sandstone and shale. They have hitherto been called Muro or Higashi-Muro group and is unconformably overlain by the middle Miocene Tanabe or Kumano group on the south. Up to date, little geological and palaeontological references about them have appeared, although they have been provisionally assigned to Palaeogene in age.

Geological studies of the Muro group have been carried on by T. HARATA and T. TOKUOKA at Kyoto University during the last five years and the palaeontological investigations have been carried on contemporaneously by the writer under the cooperation of the above-mentioned two gentlemen. The results have been partly published already (T. HARATA, T. TOKUOKA and E. MATSUMOTO, 1963. T. HARATA, 1964).

The purpose of this paper is to present the fossil evidences found in the Muro group, some of which are reliable for the dating.

These materials were chiefly obtained in the course of the geological excursion of the Upper Mantle Project held in the summer of 1964.

The writer wished to express his thanks to Professors S. MATSUSHITA and K. NAKAZAWA of Kyoto University for their kind encouragement and guidance given

throughout the study. Acknowledgements are also due Dr. A. MIZUNO, on the staff of Geological Survey of Japan, for his guidance and advices. He wishes also to express his gratitude to Messers. T. HARATA and T. TOKUOKA at Kyoto University, for their co-operation.

II Geological Note.

Excellent and almost continuous exposure of the Muro group are observed on the road which extends from Kukawa, Ohto-Mura, Nishi-Muro-Gun, through Kōgawa and Uchikoshi, to Chikatsuyu, Nishi-Muro-Gun and molluscan fossils were collected at the localities found along the route.

The stratigraphical succession and geological structure of the rocks found there were made clear by T. TOKUOKA. According to him, they are considered to be a flysch type deposit chiefly consisting of sandstone and shale and are folded into an isoclinal anticline and syncline, whose axial planes strike ENE and dip steeply towards NNW, but they show a gently feature for the Muro group, since few indications of shearing and minor folding are found.

The following lithological successions are given by T. TOKUOKA in descending order.

	Thickness in meter	Lithology
Southern flank of the syncline	800	Massive shale and shale-rich alternation, 5 to 20 cm thick in a unit stratum with occasional intercalation of conglomerate layers, 1 to 50 m thick in a unit layer. Molluscan fossils are found in the shale, rarely in the sandstone.
	1800+	Sandstone-rich alternation.
Northern flank of the anticline	1000	Alternation of sandstone and shale, 5 to 10 cm thick in a unit stratum.
	1100	Massive sandstone and sandstone-rich alternation.
	750	Shale and shale-rich alternation.
	1500	Massive sandstone and sandstone-rich alternation with intercalation of conglomerate layers.
	unknown	Shale with intercalated sandstone.

The total thickness is approximately 4000 m.

III Molluscan Fossils of the Muro Group

Occurrence of the following molluscan fossils was reported by T. HARATA, T. TOKUOKA and E. MATSUMOTO (1963) from the so-called Ukekawa-Muro subgroup, upper part of the Muro group, found at Binda Kushimoto-cho, Wakayama Pref.

Venericardia (Cyclocardia) tokunagai YOKOYAMA

Costacallista cfr. *shikokuensis* KATTO

Portlandia (Portlandella) sp.

In addition to them, *Acila (Acila) elongata* NAGAO et HUZIOKA was found from a detached sandstone raid on the coast of Ōheji.

They are indicative of a late Oligocene to earliest Miocene and it is inferred that the upper part of the Muro group can be assigned to upper Oligocene or lowermost Miocene in age.

The present molluscan fossils of the Muro group have been collected from the following five localities.

Loc. 1. On the road along River Maenokawa, a branch of River Hikigawa, at a point 800 m west of Kukawa, Ohto-mura, Nishi-Muro-gun, Wakayama Pref.

Loc. 2. On the road along River Maenokawa, a branch of River Hikigawa, at a point 300 m north of Tani-no-guchi, Ohto-mura, Nishi-Muro-gun, Wakayama Pref.

Loc. 3. On the road along River Maenokawa, a branch of River Hikigawa, at a point 500-m above the junction of River Kumanogawa, Hikigawa-cho, Nishi-Muro-gun, Wakayama Pref., with the Maenokawa.

Loc. 4. On the road along River Hikigawa, at a point 400 m above the junction of River Maenokawa, Hikigawa-cho, Nishi-Muro-gun, Wakayama Pref., with the former.

Table 1: List of the molluscan fossils from the Muro group.

	Loc. 1	Loc. 2	Loc. 3	Loc. 4	Loc. 5
Gastropoda <i>Turritella</i> sp.				×	
Pelecypoda <i>Portlandia (Portlandella) watasei</i> KANEHARA		×			
<i>Acila (Truncacila)</i> sp. α		×		×	
<i>Acila (Truncacila)</i> sp. β					×
<i>Clinocardium?</i> sp.		×			
<i>Costacallista?</i> sp.	×		×		

Of those, *Portlandia (Portlandella) watasei* KANEHARA is somewhat dominant in the Loc. 2, but the others are represented by one or two individuals.

Loc. 5. On the road along River Hikigawa, at a point 3200 m to the north-northeast of Hirase, Ohto-mura, Nishi-Muro-gun, Wakayama Pref.

The strata including the Loc. 1 to 4 are considered to be the upper horizon of the group and are regarded as being equivalent to the Ukekawa-Muro group and the Loc. 5 is thought to be in a horizon stratigraphically below the former.

The Muro group is poor in its molluscan content and unfortunately almost all the specimens are found either as external or internal moulds.

The list of the molluscan fossils is given in the Table 1.

IV Description of Species

Class Pelecypoda

Family Nuculanidae

Genus *Portlandia* MÖRCH, 1857

Subgenus *Portlandella* STEWART, 1930

Portlandia (Portlandella) watasei KANEHARA

Plate 11, figs. 1-10

1937. *Yoldia (Yoldia) watasei*, KANEHARA; Jap. Jour. Geol. Geogr., Vol. 14, Nos. 3-4, pl. 158, p. 15, figs. 5-9.
1951. *Yoldia laudabilis*, MINATO and UOZUMI; Shinseidai-no-Kenkyu, No. 8, p. 10, pl. 11, figs. 94 a, b, 96
1951. *Yoldia watasei*, MINATO and UOZUMI; Shinseidai-no-Kenkyu, No. 8, p. 10, pl. 11, figs. 92 a, b, 93, 95
1953. *Yoldia watasei*, TAKEDA; Studies on Coal Geology, No. 3, p. 71, pl. 6, figs. 3, 6
1954. *Portlandia (Portlandella) watasei*, HAYASAKA and UOZUMI; Jour. Fac. Sci., Hok. Univ., Ser. 4, Vol. 8, No. 4, p. 396 (no fig)
1954. *Portlandia (Portlandella) watasei*, MIZUNO; Shinseidai-no-Kenkyu, No. 20, Pl. 1, figs. 3a, b, 5.
- 1954 *Portlandia (Portlandella)* sp., MIZUNO; Shinseidai-no-Kenkyu, No. 20, p. 2, pl. 1, fig. 4
1955. *Portlandia watasei*, HIRAYAMA; Sci. Rep. TKD., Sec. C, Vol. 14, No. 29, p. 82, pl. 1, fig. 18
1955. *Portlandia (Portlandella) watasei*, UOZUMI; Shinseidai-no-Kenkyu, No. 22, p. 30, pl. 23, figs. 184a, b (no descr.)
1957. *Portlandia watasei*, MATSUI; Jour. Geol. Soc. Japan, vol. 63, No. 740, pl. 8, fig. 7 (no descr.)
1957. *Portlandia (Portlandella) watasei*, UOZUMI; Jour. Fac. Sci., Hok. Univ., Ser. 4, Vol. 7, No. 4, p. 563, pl. 3, figs 4, 4a, 6, 6a, 7, 7a, 8, 12

The materials on hand include six complete internal moulds of left valves, a single internal mould of right valve and several ill-preserved specimens from a single locality.

Description: Shell medium, rather inflated, inequilateral; antero-dorsal border short slightly arched, passing smoothly into ventral border, postero-dorsal border long passing into ventral border forming subtruncate posterior end. The ventral border long, broadly rounded. Beak situated at anterior one-third of the whole shell. Surface ornamented with rugose, rather irregularly arranged concentric growth line.

Dimensions: (in mm.)

	Length	Height	Thickness
Reg. NO. J.C.100056 (left valve)	28	17	6
Reg. NO. J.C.100057 (left valve)	29	19	5.5
Reg. NO. J.C.100058 (left valve)	ca. 29	15	6
Reg. NO. J.C.100059 (left valve)	26	17	6
Reg. NO. J.C.100060 (left valve)	24	14	5
Reg. NO. J.C.100061 (right valve)	ca. 24.5	14.5	5

Remarks: *Portlandia watasei* is frequent in the upper Oligocene Poronai formation in Central and East Hokkaido and was described originally by KANEHARA (1937) as a new species under the generic name of *Yoldia*. After careful investigation of the specimens obtained from the Poronai formation, S. UOZUMI (1957) discriminated strictly the present species from the allied form. The very closely allied form also occurs in the upper Oligocene of Western North America and is named as *Yoldia olympiana* CLARK. The present specimens obtained from the Muro group coincide with that of Poronai formation, but the former is more smaller than the latter and exhibit more or less variation in the outline of the shell probably caused by the result of subsequent deformation.

Occurrence and horizon: On the road along River Maenokawa, a branch of River Hikigawa, at a point 300 m north of Tani-no-guchi, Ohto-mura, Nishimuro-gun, Wakayama Pref. (Loc. 2). Upper horizon of the Muro group.

Repository: U. K. Reg. No. J.C. 100056—J.C.100065.

Family Nuculidae

Genus *Acila* H. ADAMS et A. ADAMS, 1858

Subgenus *Truncacila* (SCHENCK, MS.) GRANT et GALE, 1931

Acila (Truncacila) sp. α

Pl. 11, fig. 12.

A single strongly deformed specimen with both valves and a fragmental specimen were collected from two localities. They can be assigned to subgenus *Truncacila* from the outline of shell, but it is not possible to determine their precise specific name for the subsequent deformation,

Occurrence and horizon: On the road along River Maenokawa, a branch of River Hikigawa, at a point 300 m north Tani-no-guchi, Ohto-mura, Nishimuro-gun, Wakayama Pref. (Loc. 2) and on the road along River Hikigawa, at a point 400 m above the junction of River Maenokawa, Hikigawa-cho, Nishi-muro-gun, Wakayama Pref. (Loc. 4) with the former. Upper horizon of the Muro group.

Repository: U.K. Reg. No. J.C. 100066.

Acila (Truncacila) sp. β

Pl. 11, fig. 15.

A single outer mould of right valve was collected. It is very minute in size, about 3 mm large, and may be a young form. It is not possible to determine its specific name since the specimen is very minute.

Occurrence and horizon: On the road along River Hikigawa, at a point 3200 m to the north northeast of Hirase, Ohto-mura, Nishi-muro-gun, Wakayama Pref. (Loc. 5). Upper horizon of the Muro group.

Repository: U.K. Reg. No. J.C. 100067.

Family Laevicardiinae

Genus *Clinocardium* KEEN, 1936

Clinocardium? sp.

Pl. 11, fig. 14.

A single right valve, which is somewhat assignable to genus *Clinocardium*, was collected.

Description: Shell minute in size, strongly inflated, almost as high as long, almost circular; anterior and posterior borders regularly rounded in equal; ventral boader well rounded. Beak prosogyrous, situated at about central part of the shell. Surface of the shell ornamented with radial ribs; the ribs about twenty-five in number, rather narrow with rounded top, separated by narrower interspaces.

Dimensions: (in mm.)

	Length	Height	Thickness
Reg. NO. J.C. 100068 (right valve)	6	5	2

Remarks: In general outline the present specimen is very closely allied to *Clinocardium decoratum* (GREWINGK) figured by J. ARAI and S. KANNO, which was reported from the lower Miocene rocks of Chichibu Basin, Saitama Pref., but the former has much smaller shell than the latter,

Occurrence and horizon: On the road along River Maenokawa, a branch of River Hikigawa, at a point 300 m north of Tani-no-guchi, Ohto-mura, Nishi-muro-gun, Wakayama Pref. (Loc. 2), Upper horizon of the Muro group,

Repository: U. K. Reg. NO. J. C. 100068

Family Veneridae

Subfamily Pitarinae

Genus *Costacallista* PALMER, 1927

Costacallista? sp.

Pl. 11, fig. 16.

A single ill-preserved left valve and other fragmental specimens were collected from two localities.

Description: Shell small, trigonal oval, compressed, inequilateral; antero-dorsal border rather long, nearly straight passing into long, well rounded ventral border forming subtruncate anterior end, postero-dorsal border short, well rounded passing smoothly into the ventral border. Beak small, situated at posterior two-third of the whole shell. Surface ornamented with concentric fine ribs, being separated by broad, flat interstices.

Dimensions : (in mm.)

	Length	Height	Thickness
Reg. NO.J.C. 100069 (left valve)	10	65	?

Remarks: It is very questionable that the present specimen belongs to genus *Costacallista* or not, but as far as the outline of the shell and the surface ornamentation is concerned, it appears to belong to the genus *Costacallista*.

The present specimen is somewhat akin to *Costacallista shikokuensis* KATTO, which was recorded from the upper Oligocene Misaki formation in Southwest Shikoku, but the former has smaller shell and more posterior position of the beak than the latter. The both are different in this respect.

Occurrence and horizon: On the road along River Maenokawa, a branch of River Hikigawa, at a point 800 m west of Kukawa, Ohto-mura, Nishi-muro-gun, Wakayama Pref. (Loc. 1). Upper horizon of the Muro group.

Repository: U. K. Reg. NO. J. C. 100069

Class Gastropoda

Family Turritellidae

Genus *Turritella* LAMARCK, 1799*Turritella* sp.

Pl. 11, fig. 13.

A single external mould was collected. It is not possible to determine its precise specific name since the specimen is too much fragmental.

Occurrence and horizon: On the road along River Hikigawa, at a point 400 m above the junction of River Maenokawa, Hikigawa-cho, Nishi-muro-gun, Wakayama Pref., with the former (Loc. 4). Upper horizon of the Muro group.

Repository: U. K. Reg. NO. J. C. 100070

V Correlation and Age

The upper horizon of the Muro group, which is found in the present district and includes Loc. 1 to 4, yields *Turritella* sp. *Portlandia* (*Portlandella*) *watasei* KANEHARA, *Acila* (*Truncacila*) sp. α , *Clinocardium*? sp. and *Costacallista*? sp. Of those, *Portlandia* (*Portlandella*) *watasei* KANEHARA, which is frequent in the upper Oligocene Poronai and its equivalents in Central and East Hokkaido, is indicative of a late Oligocene to earliest Miocene in age. Namely the upper horizon of the Muro group found there can be assignable to upper Oligocene or lowermost Miocene in age. In addition to it, in the molluscan contents and lithology, it is of a resemblance to the so-called Ukekawa-Muro subgroup, upper part of the Muro group, which is found in Binda, Kushimoto-cho, Wakayama Pref., and yields *Venericardia* (*Cyclocardia*) *tokunagai* YOKOYAMA, *Costacallista* cfr. *shikokuensis* KATTO and *Portlandia* (*Portlandella*) sp.

The rock yielded an *Acila* (*Truncacila*) sp. β is thought to be a horizon stratigraphically below the former.

VI Summary

In the southern part of the Kii Peninsula are found unfossiliferous thick strata of sandstone and shale, known as the Muro group, which is thought to be a flysch type deposit and is flexed into isoclinal folding under the middle Miocene Tanabe or Kumano group of gentle structural features. The palaeontological refernces to it have

appeared only little up to date, although the Muro group has been provisionally assigned to Palaeogene in age.

A few molluscan fossils, however, are found in the Muro group. From the molluscan fossil evidence the upper part of it can be correlated with the Poronai formation in Hokkaido. Namely, it can be placed in the upper Oligocene or the lowermost Miocene in age.

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Explanation of Plate 11

(All figures in natural size unless otherwise stated)

- Figs. 1-10. *Portlandia* (*Portlandella*) *watasei* KANEHARAP. 372
 Internal mould. Loc. 2, north of Tani-no-guchi, Ohto-mura, Nishi-muro-gun, Wakayama Pref.
- Fig. 11. Pelecypoda gen. et sp. indet.
 Internal mould. Loc. 2, north of Tani-no-guchi, Ohto-mura, Nishi-muro-gun, Wakayama Pref.
- Fig. 12. *Acila* (*Truncacila*) sp. α p. 373
 Internal mould. Loc. 2, north of Tani-no-guchi, Ohto-mura, Nishi-muro-gun, Wakayama Pref.
- Fig. 13. *Turritella* sp.P. 376
 Rubber model of external mould. Loc. 4, Hikigawa-cho, Nishi-muro-gun, Wakayama Pref.
- Fig. 14. *Clinocardium*? sp.P. 374
 Internal mould. Loc. 2, north of Tani-no-guchi, Ohto-mura, Nishi-muro-gun, Wakayama Pref.
- Fig. 15. *Acila* (*Truncacila*) sp. β P. 474
 External mould. Loc. 5, north northeast of Hirase, Ohto-mura, Nishi-muro-gun, Wakayama Pref.
- Fig. 16. *Costacallista*? sp.P. 375
 Internal mould. Loc. 1, west of Kukawa, Ohto-mura, Nishi-muro-gun, Wakayama Pref.
- All illustrated specimens are kept in the Geological and Mineralogical Institute, Faculty of Science, Kyoto University



1



2



3



4



5



6



7



8



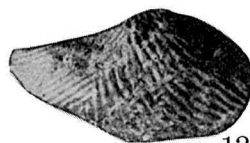
9×2



11×2



10×2



12×2



13×2



14×4



15×4



16×2