

Japanese contribution to the Cenozoic marine *Bivalvia* paleontology of Sakhalin and Kurile Islands

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A brief synopsis of paleontological research on Cenozoic marine *Bivalvia* and biostratigraphy of Sakhalin and Kurile Islands. A full bibliographical index of Japanese papers containing descriptions and/or illustrations of Cenozoic *Bivalvia* of Sakhalin and Kurile Islands is provided.

Вклад японских исследований по палеонтологии кайнозойских морских *Bivalvia* Сахалина и Курильских островов

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Дан краткий очерк исследований по палеонтологии кайнозойских морских *Bivalvia* Сахалина и Курильских островов. Приведен полный библиографический указатель японских работ, содержащих описания и/или изображения кайнозойских *Bivalvia* Сахалина и Курильских островов.

Cenozoic (Paleogene and Neogene) deposits show a widest development in Sakhalin [Geology of the USSR, 1970]. They are associated with most promising oil, gas and coal deposits, hence a large

number of relevant publications by Russian and Japanese geologists. However, a known political tension in the relations between Russia and Japan, later between the USSR and Japan, complexity of geopolitical and ideological problems, joint linguistic difficulties have resulted in a fact that paleontological studies of Cenozoic marine bivalve molluscs of Sakhalin and Kurile islands so far retaining primary importance for Cenozoic stratigraphy of the Northern part of the Pacific belt [Gladenkov, 1988] were independently conducted by the Russian and Japanese experts.

Various understanding by Russian and Japanese researchers of taxonomic status of different species of *Bivalvia*, their abundance, geochronological distribution and actual stratigraphic importance may be named as one of the basic reasons of origination of large amount of local stratigraphical schemes for various areas of Sakhalin (south-west, north-west, south-east and north-east areas, Schmidt Peninsula and South Sakhalin).

The Russian authors often practically completely ignored the previous studies made by the Japanese geologists, and the priority of the latter in substantiation of various stratigraphic subdivisions of Sakhalin and Kurile islands was basically lost as judged, for instance, from Stratigraphic Dictionaries of the USSR [1956, 1982]. Except Uwatoko's [1937a] Kurasi Formation, the names of most stratigraphic units introduced by the Japanese experts are simply ignored in these dictionaries. Perhaps Shtempel's publication of 1941 containing a synoptic scheme of stratigraphy of the upper part of Tertiary section of the West coal-bearing field of Sakhalin (Aleksandrovska coal-bearing mine) with correlation between this scheme and the scheme of Yabe and Shimizu [1924] may be quoted among scarce exceptions to this tendency. However, Shtempel's scheme [1941] was subjected to severe criticism by Smekhov [1945]. The latter [Smekhov, 1944] also introduced some Uwatoko's [1937a] stratigraphic names in Russian literature.

After the defeat of Russia in the Russian - Japanese war of 1904-1905, the south part of Sakhalin was dispossessed into the ownership of Japan and the geological investigations here were organized exclusively by the Japanese researchers. However, the latter attracted constant interest towards the northern part of the island as well. In 1918 and 1919, under support of industrial and military circles of Japan and resulting from illegal transactions with emigrant Russian entrepreneurs, two Japanese geological expeditions to the north-eastern coast of Sakhalin and one to the north western coast were successfully executed. In April 1920, North Sakhalin was occupied by Japan. According to the provisions of the Soviet-

Japanese Convention of 1925, Japan withdrew its troops from North Sakhalin but in the same year a considerable territory of north-eastern part of the island was granted as concession to Japan.

The most important amount of work was made by Japanese geologists in the south part of Sakhalin. Considerations were proposed on interrelation between rock of Cretaceous and Cenozoic ages [Saito, 1931; Kurosawa, 1932; Inai, 1938], efforts made to divide the Tertiary section into stratigraphic complexes to substantiate their age and make comparison with analogous formations of North Sakhalin and Japan [Morita, 1933; Murayama, 1933; Kawasaki, 1934a, b, 1935; Watase, 1936; Sakakura, 1937; Sasa, 1937; Sasa, Nishida, 1937]. Most valuable in this respect are contributions by Uwatoko [1936, 1937a, b, 1938a, b, 1947] who presented a most valid stratigraphic scheme of Cenozoic of South Sakhalin. The latter scheme to large extent was utilized by the geological expedition provided by the Far Eastern Geological Service under the responsibility of A.A. Kapitsa in 1946-1951 and by geologists of the All-Union Oil geological-exploration Institute in St. Petersburg (at that time Leningrad). According to Uwatoko's scheme (see Table), Tertiary section was subdivided into four series: Naibuchi Series (Naibuchi Formation = Nizhneduy Suite according to Russian authors), Maoka Series (Arakay Suite), Honto Series (Hocchourei, Tokonbo and Noda Formations, and Naihoru Formation = Verkhneduy Suite) and Shiritori Series (Kurasi Formation = Kurasi Suite, Maruyama and Chinnai Formations; both = Maruyama Suite). Naibuchi and Maoka Series are referred to Paleogene, the rest to Neogene. According to Arkhipova et al. [1992], the first Russian stratigraphic scheme for Cenozoic of south Sakhalin was published in 1948 [Smekhov, 1948] only.

After the defeat of Japan in the Second World War, Sakhalin and the whole of the Kurile Islands (the status of so called North territories still remaining object of controversy) were transferred to Russia, and systematic Japanese geological research efforts in this area were discontinued. However, almost half a century of investigations resulted in the accumulation by the Japanese researchers of important paleontologic material on Cenozoic marine *Bivalvia* of Sakhalin and Kurile Islands, including that of great biostratigraphic value, e.g. *Ciliatocardium asagaiense* (Makiyama), *Fortipecten takahashii* (Yokoyama) and some *Nuculanidae* [Kafanov and Savizky, in press].

Despite the availability of spacious reviews published [Makiyama, 1934; Takeda, 1953; Makiyama, 1959], this prolific information urgently needed for the revision of Cenozoic marine *Bivalvia* of the Russian Far

East has not yet been adequately summarized; data on Sakhalin and Kurile molluscs are particularly missing in Check-lists of Hatai and Nisiyama [1952], Masuda and Noda [1976], and in Slodkewitsch's (1938) monograph. All the foregoing proves the need for a critical check-list of *Bivalvia* species introduced by Japanese paleontologists for Cenozoic marine deposits of Sakhalin and Kurile Islands. We shall engage in this research in the near future and in the present paper we give a complete bibliography of Japanese papers provided with described and/or illustrated specimens of marine Cenozoic *Bivalvia* from Sakhalin and Kurile Islands. This is all the more important since a great portion of the Russian stock of Japanese paleontological literature was destroyed by the fire in the Library of the USSR Academy of Sciences in Leningrad in February 1989.

Table

Uwatoko's (1937a) stratigraphic scheme (from lower to upper)

Naibuchi Series = Nizhneduy and Krasnopoliev Suites

Type; Naibuti (Naiba) coal-field, Kawakami (Sinogorsk) coal-field

Lithofacies; alternation of sandstone and shale with coal beds

Maoka Series

Nishisakutan Formation = Takaraday Suite

Type; Nishisakutan River (north to Uglegorsk)

Lithofacies; dark gray or black shale, sandy shale

Arakai Pyroclastics = Arakay Suite

Type; Arakai-sawa, Maoka-cho (near Kholmsk)

Lithofacies; andesite lava, tuff breccia, sandstone

Honto Series

Hacchourei Hard Shale = Kholmsk Suite

Type; Hacchourei Pass (between Nevel'sk and Ogon'ki)

Lithofacies; hard shale, tuff, tuffaceous sandstone

Tokonbo Alternation of Sandstone and Shale = Nevel'sk Suite

Type; Tokonbo-sawa (near Nevel'sk), Ushini-zawa,

Wakkanai River

Lithofacies; tuffaceous sandstone and shale

Noda Pyroclastics = Chekhov Suite

Type; Noda Town (=Chekhov)

Lithofacies; tuff breccia, tuff

Naihoru Coal-Bearing Bed = Verkhneduy and Aushi Suites

Type; Naihoru coal-field (near Gornozavodsk)

Lithofacies; sandstone and shale

Shiritoru Series

Kurasi Hard Shale = Kurasi Suite  
 Type; Kurasi coal-field (near Novosibirskoe)  
 Lithofacies; hard shale  
 Maruyama Sandy Shale = Maruyama Suite  
 Type; Maruyama (Bereznyaki)  
 Lithofacies; tuffaceous or diatomaceous sandy shale  
 Chinnai Sandstone = Maruyama Suite?  
 Type; Cliffs along Raichishi Lake (Ainskoe Lake)  
 Lithofacies; soft sandstone

### Check-list bibliography

- Fujie, Tsutomu. 1958 (March). Illustrated Cenozoic fossils. 26. Takikawa-Honbetsu fossil fauna and distribution of *Patinopecten* (*F.*) *takahashii* Yokoyama // The Cenozoic Research (The Bulletin of the Association for the Geological Collaboration in Japan). N 26. P. 34-38 (597-601), pl. 25. (In Japanese, title translated).
- Fujie, Tsutomu. 1962. On the myarian pelecypods of Japan. Part 2. Geological and geographical distribution of fossil and Recent species, genus *Mya* // Journal of the Faculty of Science, Hokkaido University. Ser. 4 (Geology and Mineralogy). V. 11, N 3. P. 399-429.
- Fujie, Tsutomu, Matsui, Masaru and Uozumi, Satoru. 1964. Fossils from Hokkaido. Geological Education Association of Hokkaido, 99 p., pls. 3-62. (In Japanese, title translated).
- Kanehara, Kinji. 1937 (November 30). On *Cardium* (*Cerastoderma*) *shinjiense* Yokoyama, with description of a new species, *C. uyemurai* // Venus, The Japanese Journal of Malacology. V. 7, N 4. P. 173-178. (In Japanese, English abstract).
- Kurosawa, Mamoru. 1942 (March 30). Paleontology of South Sakhalin [Karafto-no koseibutukai]. Sakhalin Series [Karafto-sosho], 8. Toyohara: Karafto Government Office [Karafto-cho]. 121 p. (In Japanese, title translated).
- Makiyama, Jiro. 1934. The Asagaian *Mollusca* of Yotukura and Matchgar // Memoirs of the College of Science, Kyoto Imperial University, Ser. B. (Geology and Mineralogy). V. 10, N. 2, Art. 6. P. 121-167, pls. 3-7.
- Makiyama, Jiro. 1959 [December 15]. Matajiro Yokoyama's Tertiary fossils from various localities in Japan. Part III. // Palaeontological Society of Japan Special Papers. N. 5. P. 1-4, pls. 58-84.
- Masuda, Koichiro. 1967 (December 31). *Dosinia kaneharai* Yokoyama and its related species // Saito Ho-on Kai Museum, Research Bulletin. N. 36. P. 19-31, pls. 1-2.
- Nagao, Takumi and Huzioka, Kazuo. 1941 (March 30). Fossil *Acila* from Hokkaido and Karahuto (Saghalin) // Journal of the Faculty of Science, Hokkaido Imperial University. Ser. 4 (Geology and Mineralogy), V. 6, N 2. P. 113-141, pls. 29-31 (1-3).

- Nagao, Takumi and Inoue, Takesi. 1941 (March 30). Myarian fossils from the Cenozoic deposits of Hokkaido and Karahuto // Ibid. V. 6, N 2. P. 143-158, pls. 32-34 (1-3).
- Noda, Hiroshi. 1962 (March). *Serripes* (*Mollusca*) from Japan and Saghalien // The Science Reports of the Tohoku University, Sendai. 2nd ser. (Geology). Spec. vol. N 5. (Prof. Enzo Kon'no Memorial Volume). P. 219-232, pls. 36-39.
- Noda, Hiroshi. 1966 (October 10). The Cenozoic *Arcidae* of Japan // Ibid. V. 38, N 1. P. 1-161, pls. 1-14.
- Nomura, Shichihei. 1933 (September 10). Fossil *Mollusca* from the Island of Paramushiru, Chichima (Kurile Islands) // Japanese Journal of Geology and Geography, the Japan Academy, Tokyo. V. 11, N 1-2. P. 1-10, pl. 1.
- Ogasawara, Kenshiro. 1986 (March 25). Paleoenvironmental significance of the late Cenozoic "Astarte" (*Bivalvia*) in the Northern Pacific region // Faunal Characteristics of Japanese Cenozoic Molluscs / Eds. Hiroshi Noda, Tamio Kotaka, Masuda Koichiro, Junji Itoigawa and Kiyotaka Chinzei. Mizunami: Mizunami Fossil Museum. P. 183-198, pls. 21-22. (In Japanese, English abstract).
- Ose, Tomowo. 1934 (March). On *Pecten* (*Pseudamussium*) *peckhami* Gabb in the Japanese Empire // The Journal of the Geological Society of Japan, Tokyo. V. 41, N 486. P. 125-130. (In Japanese, title translated).
- Takeda, Hidezo. 1953 (December). The Poronai Formation (Oligocene Tertiary) of Hokkaido and South Sakhalin and its fossil fauna. Sapporo: Geological Section, the Hokkaido Association of Coal Mining Technologists. P. 1-103, pls. 1-13. (Studies on Coal Geology, N 3).
- Yabe, Hisakatsu and Hatai, Katora. 1940 (August 28). A note on *Pecten* (*Fortipecten*, subgen. nov.) *takahashii* Yokoyama and its bearing on the Neogene deposits of Japan // The Science Reports of the Tohoku Imperial University, Sendai. 2nd ser. (Geology). V. 21, N 2. P. 147-160, pls. 34-35.
- Yokoyama, Matajiro. 1929 (December 12). Molluscan Fossil from Karafto // Journal of the Faculty of Science, University of Tokyo. Sect. 2 (Geology, Mineralogy, Geography and Geophysics). V. 2, pt 9. P. 369-398, pls. 71-76.
- Yokoyama, Matajiro. 1930 (July 25). Tertiary *Mollusca* from South Karafto // Ibid. V. 2, pt 10. P. 407-418, pls. 77-80.
- Yokoyama, Matajiro. 1931 (June 30). Neogene Shells from Karafto and the Hokkaido // Ibid. V. 3, pt 4. P. 185-196, pl. 11.
- Yokoyama, Matajiro. 1932 (March 27). Neogene shells from South Karafto // Reports of the Imperial Geological Survey of Japan. N 111. P. 1-15, pls. 1-4.

### References

- Arkhipova A.D., Brutman N.Ya., Zhidkova L.S., Ivan'shina L.P., Kafanov A.I., Korobkov A.I., Kuznetzova V.N., Moiseeva A.I., Popova L.A., Pronina I.G., Remizovsky V.I., Runeva N.P., Savizky V.O., Saifnikov B.A., Utkina A.I., Shainyan S.Kh., Schmidt O.I. 1992 [issued December 3, 1994]. Reference Section of Paleogene-Neogene Deposits of

- South-East Sakhalin (Makarov Section). St.-Petersburg: All-Russia Petroleum Scientific-Research Geological-Exploration Institute (VNIGRI), 358 p., 68 pls. (In Russian).
- Geology of the USSR. V. 33. Sakhalin Island. A geological description / Ed. V.N. Vereshchagin with the assistance of Kovtunovich. Moscow: Nedra. 1970. 432 p. (In Russian).
- Gladenkov Yu.B. 1988. Marine Neogene Stratigraphy of the Northern Part of the Pacific Belt (Review of the stratigraphical schemes for the Far East of the USSR, North America and Japan) // Transactions of the Geological Institute of Academy of Sciences of the USSR. V. 428. P. 1-212. (In Russian).
- Hatai K., Nisiyama S. 1952. Check list of Japanese Tertiary marine *Mollusca* // The Science Repots of the Tohoku University, Sendai. Ser. 2 (Geology). Spec. vol. 3. P. 1-464.
- Inai Y. 1938. Geology of the Toyohara-Maoka district on South Sakhalin // Journal of the Geological Society of Japan. V. 45, N 536. P. 385-391. (In Japanese).
- Kawasaki M. 1934a. On the Dr. H. Yabe's new views on the Tertiary stratigraphy of South Sakhalin // Koyu [Friends in Mining]. V. 5, N 9. P. 1-10. (In Japanese).
- Kawasaki M. 1934b. Naibuchi-Kawakami coalfield // [Karafuto Coal Field, Report] (Toyohara). N. 1. P. 1-63. (In Japanese).
- Kawasaki M. 1935. Geology of the northern part of the west coast, South Sakhalin // Ibid. N 2. P. 1-64. (In Japanese).
- Kurosawa M. 1932. On the contact of Cretaceous and Tertiary deposits on South Sakhalin // Koyu [Friends in Mining]. V. 3, N 3. P. 3-16. (In Japanese).
- Masuda K., Noda H. 1976. Check list and bibliography of the Tertiary and Quaternary *Mollusca* of Japan, 1950-1974. Saito Ho-on Kai, Sendai. 494 p.
- Morita Ch. 1933. Geology of the upper part of the Naibuti River basin on South Sakhalin // Journal of Geography. V. 45, N 529. P. 118-125. (In Japanese).
- Murayama K. 1933. Results of the geological investigations in the upper stream of the Doro River and Minami-Nayoshi // Karafuto yuden tishitsu tyosa hokoku (Toyohara) [Report on oil-geology of Karafuto]. N 2. P. 66-73. (In Japanese).
- Saito F. 1931. Preliminary account on the Toyohara-Maoka geological investigations on South Sakhalin // Journal of Geography. V. 43, N 512. P. 573-586. (In Japanese).
- Sakakura K. 1937. Paleogeography of the western part of the Noto Peninsula // The Journal of the Geological Society of Japan. V. 44, N 525. P. 607-610. (In Japanese).
- Sasa Ya. 1937. Neogene stratigraphy of the northeastern South Sakhalin // Ibid. V. 44, N 525. P. 610-616. (In Japanese).
- Sasa Ya., Nishida S. 1937. Results of the geological investigations in the Tirie-Asase district // Karafuto yuden tishitsu tyosa hokoku (Toyohara) [Report on oil-geology of Karafuto]. N 4. P. 3-73. (In Japanese).
- Shtempel' B.M. 1941. Correlation of the strata of the Aleksandrovsk coal-bearing mine on Sakhalin // Materials on geology and minerals of the Far East Region. Fasc. 1-2 (70). P. 135-143. (In Russian).
- Slodkewitsch W.S. 1938. Tertiary *Pelecypoda* from the Far East. Moscow, Leningrad: Nauka. Pt 1. 508 p. (Paleontology of USSR; V. 10, pt. 3, fasc. 18). (In Russian); Pt 2. 275 p., 106 pls. (Paleontology of USSR; V. 10, pt 3, fasc. 19). (In English and Russian).
- Smekhov E.M. 1944. Referat on the K. Uwatoko's (1937) paper "Stratigraphy of South Sakhalin" // Izvestiya Akademii Nauk SSSR. Seriya geologicheskaya [Proceedings of the Academy of Sciences of the USSR. Geological series]. N. 6. P. 89-93. (In Russian).
- Smekhov E.M. 1945. Referat on the B.M. Shtempel's paper "Correlation of the strata of the Aleksandrovsk coal-bearing mine on Sakhalin" // Ibid. N 2. P. 157-158. (In Russian).
- Smekhov E. M. 1948. Tertiary deposits of South Sakhalin // Ibid. N 6. P. 125-130. (In Russian).
- Stratigraphic Dictionary of the U.S.S.R. / Ed. B.K. Likharev. Moscow: "Gosgeoltekhizdat". 1956. 1283 p. (In Russian).
- Stratigraphic Dictionary of the U.S.S.R. Paleogene, Neogene, Quaternary / Ed. L.V. Mironova. Leningrad: Nedra. 1982. 608 p. (In Russian).
- Uwatoko K. 1936. Oil-bearing deposits of South Sakhalin // Karafuto kogyokai-shi [Journal of the Karafuto Association of Mining]. V. 7, N 11. P. 524-537.
- Uwatoko K. 1937a. Stratigraphy of South Sakhalin // The Journal of the Geological Society of Japan. V. 44, N 530. P. 1030-1052. (In Japanese).
- Uwatoko K. 1937b. Stratigraphy of South Sakhalin // International Geological Congress: Theses of Communications. Session 17. V. 5. Moscow: Nauka. P. 230-231. (In Russian).
- Uwatoko K. 1938a. Oil-bearing deposits of South Sakhalin // Karafuto yuden tishitsu tyosa hokoku (Toyohara) [Report on oil-geology of Karafuto]. N 5. P. 5-28. (In Japanese).
- Uwatoko K. 1938b. Stratigraphy of South Sakhalin // Karafuto kogyokai-shi [Journal of the Karafuto Association for Mining]. V. 9, N 11. P. 647-669. (In Japanese).
- Uwatoko K. 1947. Explanatory transactions to the geological map of South Sakhalin in the scale 1:500000, 1939 // Translated from Japanese under the edition of A.A. Kapitsa. Khabarovsk. (In Russian).
- Watase S. 1936. Geology of the central part of the western sea cliff of South Sakhalin // The Journal of the Geological Society of Japan. V. 43, N 513. P. 468-471. (In Japanese).
- Yabe H., Shimizu S. 1924. Stratigraphical sequence of the lower Tertiary and upper Cretaceous deposits of Russian Saghalin // Japanese Journal of Geology and Geography, the Japan Academy. V. 3, N 1. P. 1-12.