MEMOIRS OF THE COLLEGE OF SCIENCE, UNIVERSITY OF KYOTO, SERIES B,
Vol. XX, No. 1, Article 4, 1951

On *Quercus* subgen. *Lepidobalanus* of Japan, Korea and North China

By

Siro KITAMURA and **Tomiya HORIKAWA**

Department of Botany, University of Kyoto

(Received Jun. 20, 1951)

The deciduous oaks (*Lepidobalanus*) are important forest trees in the north temperate regions. In Eastern Asia, they are used for Chacoal (*Q. acutissima, Q. phillyraeoides* etc.), furnitures (*Q. mongolica* var. *grosse-serrata*) and tanning materials (*Q. dentata* etc.). The classification of them has lately been complicated by the publication of some interspecific hybrids as species. We here propose a revision based upon ecological observations and upon herbarium works consulting dried specimens and a few fossils. Recently E. C. BARNETT (1944) enumerated 47 species from Eastern Asia. His work is a comprehensive and useful one. But some of the species enumerated in his work are in reality interspecific hybrids or subspecies of polytypic species. The fossils of *Quercus* from the Cretaceous period have already been reported. In Japan, several fossils of living *Quercus* are reported, namely, *Q. acutissima* and *variabilis* from the lower Pleiocene epoch and *Q. serrata* and *Q. mongolica* var. *grosseserrata* from the upper Pleiocene epoch. Dr. LIOU (1936) published an interesting work on this genus. He described many new species and hybrids from China. He considers that this group is now in course of rapid evolution and is differentiating many new species. We consider that the species of *Lepidobalanus* are rather bradytelic and many of them have not changed since the Pleiocene epoch.

1 Folia sempervirentia, parva coriacea 3.5-6 cm. longa. Maturatis fructus biennis. Sect. **Ilex** ..... *Q. phillyraeoides.*
Folia decidua, majora plus quam 7 cm. longa, chartacea 2.

2 Folia lanceolata, petiolata. Squamae cupulae reflexae. Maturatio fructus biennis. Sect. **Cerris** 3.
Folia obovata petiolata vel sessilia. Maturatio fructus annua. Sect. **Prinus** syn. *Diversipilosae, Dentatae.* 4.

3 Folia adulta subtus glabrata. Cortex non suberosus. *Q. acutissima.*
Folia adulta subtus pilis stellatis canescentia. Cortex suberosus. ..... *Q. variabilis.*

4 Folia subsessilia, lamina basi auriculato-cordata 5.

Folia distincte petiolata, lamina basi rotundata vel cuneata squamae cupulae imbricatae ..... 6.

5 Folia subutus dense stellato-tomentosa, squamae cupulae elongatae reflexae ..... *Q. dentata.*
Folia subtus parce pilosa, squamae cupulae imbricatae dorso tuberculato-gibbosae ..... *Q. mongolica.*

6 Folia subtus pilis stellatis et pilis sericeis praeditae, parva 7–10cm. longa, tenuiter chartacea ..... *Q. serrata.*
Folia subtus pilis stellatis albo-canescentia, magna 15–20cm. longa crasse chartacea ..... *Q. aliena.*

1 **Quercus acutissima** CARR. in Journ. Linn. Soc. VI, 33 (1861).

Q. serrata (non THUNB.) REHDER et WILSON in SARGENT, Pl. Wilson. III 2, 217 (1916), BARNETT in Proc. Bot. Soc. Edinb. 34, 162 (1944). var. *septentrionalis* LIOU in Contr. Inst. Bot. Nat. Acad. Peip. IV, 12 (1936).

Nom. jap. *Kunugi.* Nom. chin. antiquum *Li* 櫟 (Shiking B.C.500). *Tso* 柞 (Shi-king. Tsi-min-yao-shu. circ. 500).

Distr. Nepal, Sikkim, Bohtan, Assam, Upper Burma, Udawn, Laos, Kwantung, Hupeh, Hunan, Szechuan, Kuichau, Chekiang, Kiangsu, Hopei, Shantung, Shansi, Formosa, Manchuria, Korea, Kiushiu, Shikoku, Honshiu (Northwards to Ugo and Rikuchu). Fossils. Honshiu, near Seto, Pleiocene : near Kyoto and Shiobara, lower Pleistocene.

The utilization of *Q. acutissima* in North China began ealier than 500 A.D. It has been cultivated not only for its timber but also for several other purposes ; its leaves are food for silk worms (*Saturinia*), and its acons for pigs, while its cupules are used for dying black. *Q. Chenii* NAKAI of Middle China has not as yet been found in Japan and Korea.

2 **Quercus variabilis** BLUME, Mus. Bot. Lugd.-Bat. I, 297 (1850). var. *brevipetiolata* NAKAI in Tokyo Bot. Mag. XL, 165 (1926). var. *Bungeana* LIOU, l. c. 11 (1936). Nom. Jap. *Abemaki.*

Distr. S. E. Tibet, Hupeh, Hunan, Yunnan, Kui-chau, Szechuan, Hopeh, Shantung, Manchuria, Korea, Formosa, Kiushiu, Shikoku, Honshiu (wild and cultivated, northwards to Uzen). Fossils. Honshiu, near Seto, lower Pleiocene.

3 **Quercus dentata** THUNB. in Nov. Act. Reg. Soc. Sci. Upsal. IV, 33, 38 (1783). var. *grandifolia* KOIDZUMI in Tokyo Bot. Mag. XXVI, 161 (1912). f. *latisquama* UYEKI in Journ. Chosen Nat. Hist. Soc. 17, 51 (1934). Nom. jap. *Kashiwa.* Nom. chin. antiquum *Hu* 槲 (Tu-king-pentsao A. D. 1062).

Distr. Yunnan, Szechuan, Formosa, Hupeh, Shensi (Shian !), Shansi, Chekiang, Kiangsu (Kiangpu-hsien !), Hopeh, Shantung, Manchuria, Ussuri, Korea, Shikoku, Kiushiu, Honshiu, Hokkaido, Southern Kuriles.

f. **pinnatifida** (MATSUM.). var. *pinnatifida* MATSUM. in Tokyo Bot. Mag.

V, 9 (1891). Nom. jap. *Hagoromo-gashiwa.* Culta. f. **pinnatiloba** (MAKINO). var. *pinnatiloba.* MAKINO in Journ. Jap. Bot. V. 46. Nom. jap. *Howo-gashiwa.* Culta. f. **laciniata** (MAKINO). var. *laciniata* MAKINO, l. c. 47. Nom. jap. *Kujaku-gashiwa.* Culta.

var. **fallax** NAKAI in Tokyo Bot. Mag. XXXI, 3 (1917). Folia subtus pilis simplicibus brevibus praedita. Distr. Korea sept.

4 **Quercus mongolica** FISHER ex TURCZ. in Bull. Soc. Nat. Mosc. XI, 101 (1838) nom. nud., XXVII, 409 (1854). LEDEB., Fl. Ross. III, 2, 589 (1850). *Q. kirinensis* NAKAI in Journ. Jap. Bot. XV, 524 (1939).

Distr. Ussuri, Amur, Manchuria, Mongolia, Hopeh, Shantung, Shensi (Shian!), Korea, Saghalien, Hokkaido, Southern Kuriles. Honshiu. f. **dolichophylla** (UYEKI). var. *dolichohylla* UYEKI in Acta Phytotax. Geobot. I, 255 (1933). Distr. Korea.

var. **liaotungensis** (KOIDZ.) NAKAI in Tokyo Bot. Mag. XXIX, 58 (1915). *Q. wutaishanica* MEY. in Fremdlandische Wald und Parkbaüme für Europa, 504. (1906). *Q. liaotungensis* KOIDZ. in Tokyo Bot. Mag. XXVI, 166 (1912).

Distr. Kansu, Honan, Szechuan, Shansi, Hopeh, Manchuria, Korea. Usually found above 1000 m. This is a well-marked geographical race with smaller leaves and acorns.

var. **grosseserrata** REHDER et WILSON in Sargent, Pl. Wils. III, 2, 231 (1916). *Q. crispula* BLUME, Mus. Bot. Lugd. Bat. I, 298 (1850). *Q. grosseserrata* BL. (1850). *Q. crispula* var. *sachalinensis* KOIDZ. (1912). Q. crispula var. *manchurica* KOIDZ. (1912). *Q. grosseserrta* var. *crispula* NAKAI (1949). *Q. mongolica* var. *laciniata* NAKAI (1931). Nom. jap. *Mizunara.* Distr. South Saghalien, Southern Kuriles, Hokkaido, Honshiu, Kiushiu, Shikoku, Quelpaert, Korea, Manchuria. Fossils. Honshiu, near Akashi, upper Pleiocene : Shiobara, Pleistocene. In southern Japan, var. *grosseserrata* is usually found above 500 m. In Japan var. *mongolica* with round dentate leaves is rarely found. While var. *grosseserrata* with acute dentate leaves is common.

f. **longifolia** (NAKAI). *Q. grosseserrata* var. *crispula* f. *longifolia* NAKAI in Journ. Jap. Bot. XXIII, 98 (1949). Distr. Honshiu. f. **macrocarpa** (NAKAI). *Q. g.* var. *macrocarpa* NAKAI, l. c. Distr. Honshiu.

var. **undulatifolia** (NAKAI) comb. nov. *Q. mongolica* var. *liaotungensis* f. *undulatifolia* NAKAI in Tokyo Bot. Mag. XXIX. 58(1915). *f. funebris* NAKAI, l. c. *Q. Keizo-Kishimai* YANAGIDA nom. nud. in Journ. Soc. For. XV, 305 (1933). Foliis minorobis 6-9 cm. longis crebro acute serratis, fructibus minoribus. Nom. jap. *Miyama-nara.* Distr. Honshiu (mt. Hakkoda, mt. Himegami, mt. Yakeishi, mt. Higami, mt. Taihei, mt. Asahi, mt. Chokai, mt. Tateyama, Ose.), Kiushiu (mt. Kirishima), Querpaert.

Usually growing above 1000 m. This is also a well-marked geographical race with smaller leaves and acorns, and is distinguished from var.

liaotungensis by its acutely dentate leaves.

5 **Quercus aliena** BLUME, Museo Bot. Lugd.-Bat. I, 298 (1850). f. *monstrosa* UYEKI in Acta Phytotax. Geobot. I, 255 (1932). var. *acuticarpa* UYEKI. l. c. var. *heterophylla* UYEKI, l. c. var. *rubripes* NAKAI in Tokyo Bot. Mag. XXXI, 4 (1917).

Distr. Sikkim, Assam, Upper Burma, Indochina, Thailand, Szechuan, Hupeh, Chekiang, Kansu, Kiangusu, Hoanan, Hopei, Manchuria, Korea, Kiushiu. Shikoku, Honshiu (northwards to Uzen).

var. **acutidentata** MAXIM. apud WENZIG in Jahrb. Bot. Gart. Berlin IV, 219 (1886). *Q. acutidentata* KOIDZ. in Tokyo Bot. Mag. XL, 339 (1926). Nom. jap. *Tsukushi-ohnara.* Foliis subcoriaceis acute serratis. Distr. Yunnan, Szechuan, Hupeh, Hunan, Honan, Hopeh, Formosa, South Manchuria, Korea, Kiushiu, Honshiu (northwards to Rikuchu).

var. *pellucida* BLUME, l. c. Nom. jap. *Aonaragashiwa.* Foliis subtus glabratis. Distr. Honshiu, Kiangsu, Honan, Hopeh, Shansi.

The vicarious species of *Q. aliena* in Middle and South China is *Q. Fabri* HANCE, which has smaller acorns, shorter petioles and larger hairs on the underside of leaves. *Q. Fabri* has not yet been found in Japan and Korea.

6 **Quercus serrata** MURRAY, Syst. Veg. ed. 14, 858 (1784), THUNB., Fl. Jap. 176 (1784). KOIDZUMI in Tokyo Bot. Mag. XXXIX, 313 (1925). *Q. glandulifera* BL. l. c. 325. REHDER in Journ. Arnold. Arb. XVIII, 274 (1937), XIX, 284 (1938). *Q. neo-Stuxbergii* KOIDZUMI, l. c. XXIV, 166 (1912). *Q. neo-glandulifera* NAKAI in Tokyo Bot. Mag. XXXVI, 62 (1922). Nom. jap. *Konara.*

Distr. Korea, Kiushiu, Shikoku, Honshiu, Hokkaido. Fossils. Honshiu, Shiobara, Pleistocene.

f. **pinnata** (KOIDZ.). *Q. neo-Stuxbergii* var. *pinnata* KOIDZ. in Acta Phytotax. Geobot. I, 24 (1932). Nom. jap. *Hagoromo-aonora.* Culta. f. **pinnatifida** (KOIDZ.). *Q. neo-Stuxbergii* v. *pinnatifida* KOIDZ., l. c. 25. Nom. jap. *Tareha-hagoromo-aonara.* Culta. f. **dependens** NAKAI in Bull. Nat. Mus. 27, 27 (1949). Nom. jap. *Shidare-konara.* Distr. Honshiu. f. **longicarpa** (UYEKI). *Q. serrata* var. *longicarpa* UYEKI in Acta Phytotax. Geobot. I, 256 (1932). Nom. jap. *Nagami-konara.* Distr. Korea.

var. **brevipetiolata** NAKAI in Tokyo Bot. Mag. XL, 165 (1926). Nom. jap. *Taiwan-konara.* Foliis brevissime petiolatis. Distr. Szechuan, Kiangsi, Chekiang (Hang-chao !), Honan, Hupeh, Shantung, Korea, Kiushiu, Shikoku, Honshiu.

var. **donarium** (NAKAI). *Q. donarium* NAKAI in Tokyo Bot. Mag. XXIX, 60 (1915). Nom. jap. *Terihakonara.* Foliis angustioribus chartaceis, supra lucidis. Distr. Korea, Kiushiu, Honshiu.

var. **pseudo-variabilis** NAKAI, l. c. XLIII, 450 (1929). Lamina oblonga 14-16 cm. longa 5.8-7.3 cm. lata basi rotundato-cordata minute serrata. Nom. jap. *Maruba-konara.* Distr. Shikoku.

Q. serrata is the commonest oak in Japan. It usually grows on dry sunny hills, and resists drought and acid soil. Var. *serrata* has not as yet been found in China. This is represented in China by var. brevipetiolata. Var. donarinm is growing side by side with var. *serrata*.

7 **Quercus phillyraeoides** A. GRAY in Mem. Am. Acad. n. s. VI, 406 (1859). Nom. jap. *Ubame-gashi*.

Distr. Szechuan, Kuichau, Fukien, Hupeh, Liukiu, Shikoku, Kiushiu, Honshiu (Bingo, Bizen, Harima, Awaji, Kii, Mikawa, Izu).

f. **Wrightii** MAKINO in Zissaiengei XXV, 20 (1939). *Q. Wrightii* NAKAI (1924). var. *Wrightii* MASAMUNE (1940). Nom. jap. *Shimaubamegashi*. Distr. Honshiu, Shikoku, Kiushiu. f. **crispa** (MATSUM.). *Q. phillyraeoides* var. *crispa* MATSUM. in Tokyo Bot. Mag. V, 57 (1891). Nom. jap. *Chirimen-gashi*. Culta. f. **subcrispa** (MAKINO). *Q. phillyraeoides* var. *subcrispa* MAKINO in Journ. Jap. Bot. VI, 10 (1929). Nom. jap. *Fukure-ubame*. Culta.

Hybrids

In the genus *Quercus*, natural hybrids between generally recognized distinct species are not uncommon. We find sometimes a few individuals of intermediate forms of two markedly different species in regions where individuals of the two species are abundant. Intersectional hybrids are very rare. In Sect. *Dentatae*, hybrids between all the four species, namely, *Q. dentata*, *Q. aliena*, *Q. mongolica* and *Q. serrata* have been reported in 6 combinations. Among them *Q. dentata* hybridizes more freely than others.

1 **Quercus aliena** × **dentata** : **Q. Mc Cormickii** CARR. in Journ. Linn. Soc. VI, 32(1861). *Q. dentata* var. × *Mc Cormickii* SKAN in Journ. Linn. Soc. XXVI, 511 (1899). *Q. fangshanensis* LIOU in Contr. Inst. Bot. Nat. Acad. Peip. IV, 7. Pl. IV. (1936). *Q. koreana* NAKAI, Fl. Sylv. Kor. III, 30 pro syn. Q. *Mc Cormickii* var. *koreana* NAKAI, l.c. pl. XVII (1917). *Q. alienoides* UYEKI in Acta Phytotax. Geobot. I, 253 fig. 4 (1932). *Q. alienoides* var. *longissima* UYEKI in Journ. Chosen Nat. Hist. Soc. 51, pl. 6 fig 2 (1934). Nom. jap. *Chosenkonara*. Distr. North China, South Manchuria, Korea, Kiushiu, Shikoku, Honshiu.

2 **Quercus aliena** × **serrata** : **Q. urticaefolia** BLUME, Mus. Bot. Lugd. Bat. I, 296 (1850) pro spec. *Q. major* NAKAI, Fl. Sylv. Kor. III 28 pl. 15 (1917). *Q. serrata* var. *latifolia* KOIDZUMI in Acta Phytotax. Geobot. IX, 74 (1940). *Q. major* var. *latifolia* UYEKI in Journ. Chosen Nat. Hist. Soc. 17, 51 pl. 6 fig. 2 (1934). Nom. jap. *Ohba-konara*. Distr. Korea, Kiushiu, Shikoku, Honshiu. Very rarely. f. **dependens** NAKAI in Bull. Nat. Mus. 27, 27 (1949) Distr. Honshiu.

3 **Quercus aliena** × **mongolica** : **Q. paucilepis** Uyeki in Acta Phytotax. Geobot. I, 254 fig. 3 (1932). *Q pontungensis* Uyeki, l. c. fig. 2. Nom. jap. *Mongorinara-modoki.* Distr. Korea.

Q. aliena × **mongolica** var. **grosseserrata** Hybrida nova. Nom. jap. *Nara-mizugashiwa.* Distr. Honshiu. Yechizen, Sabae (15 sept. 1935 Z. Tashiro in Herb. Univ. Kyoto). Tango Tamba, Ohmi.

4 **Quercus dentata** × **mongolica** : **Q. nipponica** var. **coreana** (Nakai). *Q. anguste-lepidota* Nakai var. *coreana* Nakai, Fl. Sylv. Kor. III 31, pl. XIX (1917). *Q. anguste-lepidota* f. *brevisqamosa* Uyeki in Journ. Chosen Nat. Hist. Soc.17, 52 (1934). *Q. mongolico-detata* et *dentato-mongolica* Nakai in Tokyo Bot. Mag. XL, 164 (1926). *Q. pseudo-dentata* Uyeki in Acta Phytotax. Geobot. I, 254 fig. 5. (1932). *Q. mongolico-dentata* var. *longifolia* Uyeki l. c. 17, 51 pl. 6 - 3 (1934). Nom. jap. *Kashiwa-modoki.* Distr. Korea.

Q. dentata × **mongolica** var. **grosseserrata** : **Q. nipponica** Koidz. in Tokyo Bot. Mag. XXVI. 161 (1912). *Q. anguste-lepidota* Nakai, l. c. (1917). Nom. jap. *Hosoba-gashiwa.* Distr. Honshiu, Hokkaido.

Q. dentata × **mongolica** var. **liaotungensis** : **Q. nipponica** var. **hopeiensis** (Liou). *Q. hopeiensis* Liou in Contr. Inst. Bot. Nat. Acad. Peip. IV, 8 pl. VI (1936). Distr. Hopei.

5 **Quercus mongolica** × **serrata** : **Q. serratoides** Uyeki in Acta Phytotax. Geobot. I, 253 fig. 1 (1932). *Q. serratoides* var. *ovata* Uyeki in Journ. Chosen 52 (1934). *Q. crispuloides* Uyeki, l. c. 52 pl. 6 fig. 1 (1934). Distr. Korea.

Q. mongolica var. **grosseserrata** × **serrata** Hybrida nova. Nom. jap. *Mizu-konara.* Distr. Honshiu. Ohmi. Kiushiu.

6 **Quercus dentata** × **serrata** : **Q. takatorensis** Makino in Journ. Jap. Bot. IV, 1 (1927). Nom. jap. *Kogashiwa.* Distr. Honshiu : Sagami, Izu, Tango, Sado, Rikuchiu. Kiushiu : Satsuma, Ohsumi.

7 **Quercus acutissima** × **variabilis** : Nakai in Journ. Jap. Bot. XIX, 368 (1943). Distr. South Manchuria : Anto. Honshiu : Iwami.