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NOTES ON SOME NEOGENE PLANTS FROM THE
ISLAND OF HEIGUN, YAMAGUTI PREF.,
WITH DESCRIPTION OF TWO NEW
SPECIES OF THE GENERA *CARPINUS*
AND *SAS AFRAS*

By

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With 3 Text-figures

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The island of Heigun is situated in the western part of the Inland Sea, to the north of the Geiyo Str. and about 20 km. southwest of Yanaizu, Yamaguti Pref. The materials which form the basis of this note were collected by the present writer in 1930, to which were added some specimens collected by Mr. T. ISIHARA, a teacher of Yanai Middle School, and sent to the writer for examination.

At this place, the writer wishes to express his cordial thanks to Assistant-Professor SABURÔ ÔISHI under whose direction the present work was carried on, and to Mr. T. ISIHARA, donor of a part of the material.

The foundation of the island is, according to H. SATÔ⁽¹⁾, granitic biotite gneiss. It is covered by a flow of two pyroxene andesite which is partly agglomeratic intercalating thin tuff layers. The tuff layers are chiefly exposed on the sea cliff of Nagasaki, on the southwestern coast of this island; from this tuff layers the fossil plants dealt with in this paper were derived.

The Heigun Plants comprise the following species, a majority of the specimens being impressions of leaves except *Carpinus heigunensis* sp. nov. which is named on a bracteole:

(1) H. SATÔ: Explanatory text to the geological map, Yanaizu Sheet, 1933, pp. 1-19.

Pinaceae

Pinus sp.

Salicaceae

Salix spp.

Juglandaceae

Cfr. *Juglans Sieboldiana* MAXIM.*Pterocarya rhoifolia* SIEB. et ZUCC.

Betulaceae

Alnus sp.*Carpinus heigunensis* sp. nov.*Carpinus* sp.*Ostrya japonica* SARG.

Ulmaceae

Zelkova serrata MAKINO*Ulmus* sp.

Lauraceae

Lindera glauca BLUMECfr. *Lindera umbellata* THUNB.*Sassafras Endoi* sp. nov.

Rosaceae

Rosa sp.*Prunus?* sp.

Leguminosae

Leguminosites sp.*Kaunkia floribunda* THAUNB.

Anacardiaceae

Rhus sp.

Aceraceae

Acer Nordenskijöldi NATH.*Acer pictum* THUNB.*Acer* spp.

Caprifoliaceae

Viburnum sp.Cfr. *Viburnum Wrighti* MIQ.

The above florule consists, setting aside three extinct forms, viz., *Carpinus heigunensis*, *Sassafras Endoi* and *Acer Nordenskijöldi*, mainly of deciduous trees with an intermixture of a few evergreen trees such as Pinaceae and Lauraceae. It consists also of the species

now living in the southern part of Honsyû and is allied to the elements of the montane forest zone of the Chûgoku mountainland. The specimens specifically indeterminable show also a close resemblance to the species living chiefly in southern Honsyû: *Alnus* sp. is comparable to *A. glutinosa* var. *obtusa* WINKL., *Ulmus* sp. to *U. japonica* SARG., *Rhus* sp. to *R. Toxicodendron* L. var. *vurgalis* PURSH. f. *radicans* ENGL., *Viburnum* sp. to *V. Carlesii* HEMSL. var. *bitchuense* NAKAI and *Rosa* sp. to *R. acicularis* LINDL.

In composition, the Heigun florule is nearly equivalent to those of Mogi⁽¹⁾, Amakusa⁽²⁾ and Omi⁽³⁾, hence upper Pliocene.

Description of Two New Species

Carpinus heigunensis sp. nov.

Text-fig. 1 (type-Specimen, Reg. No. 7821)

Bracteole stalked, the stalk being stout and more than 4 mm. long, inequilateral, deltoid, with convex base 13 mm. long, one of the other two sides straight, the length being 2.4 cm., the another side nearly straight or slightly convex in its upper half and concave in the lower half, with marked serration throughout the length.



Fig. 1.

Fig. 2.

Fig. 1. *Carpinus heigunensis* sp. nov. ×1.

Fig. 2. *Carpinus yedoensis* MAX. (living). ×1.

Principal veins three in number, nearly straight, radiating into the lamina from the top of stalk, one persisting to the tip, the other two ending in the serrate margin; the space of lamina filled up with fine meshes. Seed? oblong, 4 mm. long.

(1) A. G. NATHORST: Contribution à la Flore fossile du Japon. Kgl. Sv. Vet. Akad. Handl., Bd. 20, No. 2, 1882.

(2) R. FLORIN: Zur Kenntnis der jungtertiären Pflanzenwelt Japans. Ibid., Bd. 61, No. 1, 1920.

(3) E. KONNO: Cenozoic Floras from Central Sinano, Japan (in Japanese). (in HOMMA: Geology of Central Sinano, 1930).

The present specimen resembles the bracteole of *Carpinus yedoensis* MAX. living in the central and southern parts of Honsyû, Sikoku and Kyûsyû; however, the serrate margin of the latter species merges gradually, forming a gentle convex curve, towards the basal portion which is also serrated. A bracteole of *C. yedoensis* is shown in fig. 2 for comparison.

Many specimens have been reported under the generic name *Carpinus* from Tertiary rocks in several localities in Japan. They may be enumerated in the following:

<i>C. betulus</i> L. ?	Bracteole	Up. Pliocene of Sinano. ⁽¹⁾
<i>C. cordata</i> BLUME	Bracteole	Do. ⁽²⁾
„	Leaves	Do. ⁽³⁾
„	Bracteole	Pleistocene of Siobara. ⁽⁴⁾
<i>C. grandis</i> UNGER	sp. name only	Miocene of Oguni. ⁽⁵⁾
Cfr. <i>C. grandis</i> UNG.	Leaf	Otuti-mura. ⁽⁶⁾
<i>C. japonica</i> BLUME	Bracteole	Pleistocene of Siobara. ⁽⁷⁾
<i>C. laxiflora</i> BLUME	Leaves	Up. Pliocene of Amakusa. ⁽⁸⁾
<i>C. subcordata</i> Nath.	Leaves, bracteoles ?	Up. Pliocene of Mogi. ⁽⁹⁾ Pleistocene of Siobara. ⁽¹⁰⁾
<i>C. subjaponica</i> Nath.	Leaves, bracteoles	Pleistocene of Siobara. ⁽¹¹⁾
„	Bracteole	Pliocene of Abura, Hokkaidô ⁽¹²⁾
<i>C. subyedensis</i> KONNO	Leaves, bracteoles	Up. Pliocene of Sinano. ⁽¹³⁾
<i>C. stenophylla</i> Nath.	Leaves	Up. Pliocene of Mogi. ⁽¹⁴⁾
<i>C. yedoensis</i> MAXIM.	Bracteole	Up. Pliocene of Sinano. ⁽¹⁵⁾
<i>C. cfr. yedoensis</i> MAXIM.	Leaf	Pleistocene of Yokohama. ⁽¹⁶⁾

(1) S. ENDO: Cenozoic Plants. Supplement. (in Japanese) Iwanami's Geological and Palaeontological Series, 1933, p. 40, 2 in Fig. 9.

(2) S. ENDO: Ibid., p. 40.

(3) E. KONNO: Op. cit., 1930, Pl. I, Fig. 7; Pl. VIII, Figs. 9-10.

(4) S. ENDO: Op. cit., 1933, p. 40, 3 in Fig. 9.

(5) H. MORITA: On New Species of the Genera *Cinnamomum* and *Smilax* from the Miocene Deposits of Oguni-Mati, Uzen Province, Japan. Jap. Journ. Geol. Geogr., Vol. IX, Nos. 1-2, 1931, p. 2.

(6) A. G. NATHORST: Zur fossilen Flora Japans. Palaeont. Abh., Bd. 4, Ht. 3, 1888, p. 20, Pl. VII, Fig. 4.

(7) E. ENDO: Op. cit., 1933, p. 40, 4 in Fig. 9.

(8) R. FLORIN: Op. cit., 1920, p. 18, Pl. II, Figs. 2, 3.

(9) A. G. NATHORST: Op. cit., 1882, p. 39, Pl. II, Figs. 13-18, 20.

(10) S. ENDO: Cenozoic Plants. (in Japanese) Iwanami's Geological and Palaeontological Series, 1931, p. 28.

(11) A. G. NATHORST: Op. cit., 1888, p. 32, Pl. IX, Figs. 12-15.

(12) S. ÔISHI and K. HUZIOKA: Tertiary Plants from Abura, near Setana, Hokkaidô (in preparation).

(13) E. KONNO: Op. cit., 1930, Pl. I, Figs. 2-4; Pl. VII, Fig. 1.

(14) A. G. NATHORST: Op. cit., 1882, p. 41, Pl. III, Fig. 16.

(15) S. ENDO: Op. cit., 1933, p. 40, 2 in Fig. 9.

(16) A. G. NATHORST: Op. cit., 1888, p. 38, Pl. XIII, Fig. 12.

Sassafras Endoi sp. nov.

Text-fig. 3 (type specimen, Reg. No. 7823)

Leaf small, broadly oval in outline, decurrent below, 7.5 cm. long, 5.2 cm. broad, divided by deep narrow and acute sinus into three lobes to the midway; central lobe longer and broader than the lateral ones. Margin except the proximal part lightly and broadly undulat-

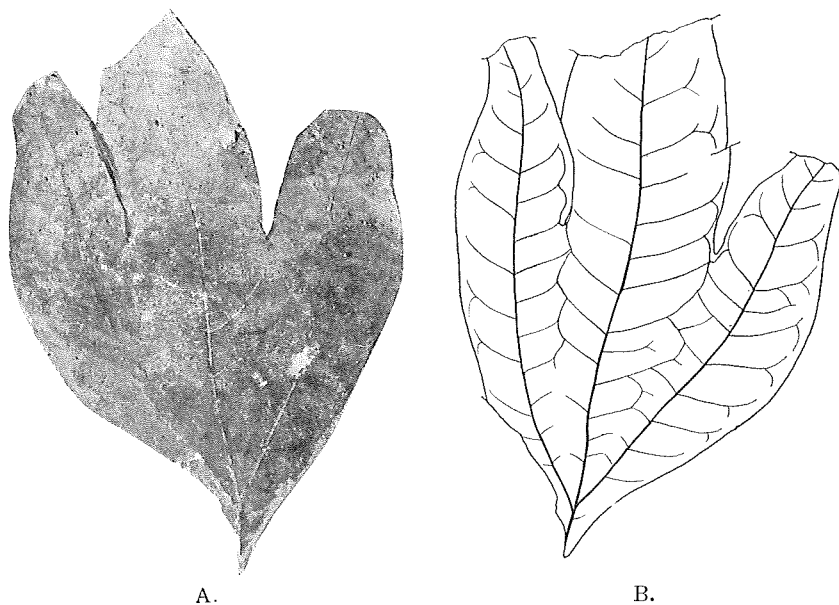


Fig. 3 (A-B). *Sassafras Endoi* sp. nov. $\times 1$.
B, a sketch of A, showing venation.

ing; tip of each lobe unknown; nervation indistinct, lateral veins almost of the same size as the midvein, making an angle of about 30° with the latter; secondary veins springing up from three primary ones at an angle of 45° – 55° and camptodromous at the margin; finer veins obscure.

Comparable species are *S. Yabei* ENDO and OKUTU,⁽¹⁾ recently described from the Lower Umoregi Beds (Pliocene) of Sendai, S.

(1) S. ENDO: and H. OKUTU: A Neogene Species of *Sassafras* from Japan. Proc. Imp. Acad. Tôkyô, Vol. XII, No. 2, 1936, pp. 47–49, Figs. 1–4.

variforium NIL.⁽¹⁾ from European Pliocene and *S. hesperia* BERRY⁽²⁾ from the Ratah Formation of North America; however, in the first one sinus is shallower and the lamina contracts below more rapidly, in the other two the lamina is more elongated and sinus deeper than in the present specimen. Another allied species is *S. sassafras* (L.) KARST. now living in North America. However, in the fossil specimen now at hand, the sinus is narrower and more acute and secondary veins at the lower part of the lamina are more oblique, than in the living species.

(1) A. STRAUS: Dikotyle Pflanzenreste aus dem Oberpliozän von Willershausen Kreis Osterode, Harz, 1. Jahrb. preuss. geol Landesanstalt, 51, 1930, p. 318, Pl. XLI, Figs. 7-9; Pl. XIV, Fig. 4.

(2) E. W. BERRY: A Revision of the Flora of the Ratah Formation. U. S. Geol. Surv. Prof. Paper, 154 (H), 1929, p. 259, Pl. LIX, Fig. 2.