

Mitsuo SUZUKI* & Makoto NISHIDA** : *Chionanthus mesozoica*
sp. nov., a dicotyledonous wood from the Lower Cretaceous
of Choshi, Chiba Prefecture, with references to
comparison with recent *Chionanthus****

鈴木三男*・西田 誠** : 銚子産下部白亜紀ヒトツバタゴ属材化石,
及び現生種との比較***

(Plates IV-VI)

Inubo-saki district of Choshi, Chiba Prefecture, is well known in occurrence of various petrified woods from the Lower Cretaceous system which is analogized with Aptian or Miyako series by Yamashita et al. (1957). The junior author described some thirty species from the locality (Nishida 1960, 1965, 1966, 1967 and 1973). All of the described species belong to gymnosperms except for one dicotyledonous wood belonging to *Tetracentronites*, a homoxylous non-pored wood. Pored wood has never found in the locality.

In 1966, Mr. Nihei Takagi who was a member of Choshi Marine Laboratory of Chiba University kindly gave us a small piece of petrified wood which was collected by him at the sea shore of Toriake-ura, near Inubo-saki. As he found it in the gravels on the rocky sea shore, it is not sure that from what strata the specimen has been derived.

The most part of the specimen is black in colour and silicified. But small brown calcified parts are mounted here and there in the specimen. Those calcified parts are the same quality with calcified woods which was derived exactly from Cretaceous strata of the locality. The present specimen, hence, would be believed to be derived from the Cretaceous. The specimen is a pored wood which very closely resembles recent *Chionanthus*

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*** Contributions from the Laboratory of Phylogenetic Botany, Chiba University, No. 60. Supported by a Grant in Aid of Scientific Research of Ministry of Education, No. 854154. 千葉大学系統植物学研究室業績第 60, 文部省科学研究費第 854154 による研究の一部である.

(Oleaceae), distributing in Japan, Middle region of China and North America, and this finding from the Mesozoic era would be the first in the world as well as in Japan and adjacent lands.

***Chionanthus mesozoica* sp. nov.**

Material. The specimen No. 6672 (holotype) is a piece of well-preserved silicified twig with pith, black in colour, and 6 cm long and 3 cm and 2 cm in long and short diameters respectively.

Locality. Toriake-ura, near Inubo-saki, Choshi, Chiba Prefecture.

Horizon. Lower Cretaceous: Aptian or Miyako series.

Description. Ring porous wood. Growth rings fairly distinct, and 0.3-2 mm in width. Transition from the early to the late wood very abrupt. In the early wood, large pores arranged in one or two tangential rows interrupted by multiseriate bands of small pores. Large pores almost solitary, circular or oval in outline, thick-walled, up to 210μ in maximum diameter. In the late wood, small pores arranged in flame-like pattern which often branches. Small pores solitary, two to several in multiple or clustered, and angular to slightly rounded, thin-walled, about 50μ and 30μ in radial and tangential diameters respectively. Vessel segments $170-330\mu$ in length; intervessel pits alternate, moderately spaced, circular with small oblique apertures. Perforation plates exclusively simple, almost transverse in large pores and oblique in small pores. Tyloses frequently present and spiral thickenings invisible. Tracheids vasicentric and abundant, composing pore zone in the early wood and the flame-like pattern in the late wood together with vessels, square or polygonal in transverse section and about 15μ in diameter, bordered pits on the lateral wall circular; spiral thickenings present. Fibers constitute the ground mass of the late wood, polygonal in transverse section, fairly thick-walled, and about 15μ in diameter. Parenchyma marginal and diffuse, scanty, and rarely crystalliferous. Rays almost homogenous, 1-3 (mostly 2) cells and $7-35\mu$ (mostly 20μ) in width, and $20-250\mu$ (average 125μ) in height; short uniseriate marginal extensions rarely present; cells of multiseriate parts round or polygonal in tangential section; marginal cells round or triangular in tangential section and square to procumbent in radial section; crystalliferous elements invisible; pits on vertical walls very small and abundant; ray-vessel pits very small and horizontal elongated.

Affinity. As described above, the present specimen very closely resembles *Chionanthus* in having uni- or biseriate tangential bands of large pores in the early wood, exhibiting the flame-like arrangement of small pores in the late wood and having spiral thickenings on the walls of tracheids. Genus *Chionanthus* consists of two recent species, *C. retusus* Lindl. et Paxt. in East Asia and *C. virginicus* L. in North America. Though we have some information about the wood of *Chionanthus*, those are not always enough to compare with the present fossil. Hence, the present authors would like to describe the recent two species precisely and compare them with the present fossil.

***Chionanthus retusus* Lindl. et Paxt.**

The present description has been based on the wood specimens which has been deposited in Institute of Forest Botany, Faculty of Agriculture, University of Tokyo (TOFOW No. 3506 and No. 11321), and checked up on the report of Yamabayashi (1938).

Description. Ring porous wood. Growth rings fairly distinct. Transition from the early to the late wood abrupt to very abrupt. In the early wood, large pores arranged uniseriately in a more or less continuous tangential band which is interrupted by multiseriate bands of small pores. Large pores almost solitary, circular or oval in outline, thick-walled, and up to 210μ in maximum diameter. In the late wood, small pores arranged in flame-like pattern which often branches and forms networks by fusion

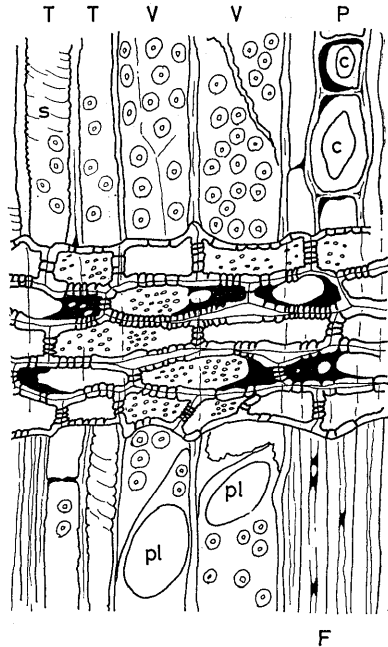


Fig. 1. Radial section ($\times 300$) of *Chionanthus mesozoica* sp. nov., showing spiral thickenings (s) in tracheids, two simple perforation plates (pl) in vessels, crystals (c) in parenchyma cells, and very small, horizontally elongated pits on radial walls of ray cells.

T: tracheid, V: vessel, P: parenchyma strand, F: fiber.

of branches. Small pores solitary, two to several in multiple or clustered, and angular to slightly rounded, thin-walled, about 50μ and 40μ in radial and tangential diameters respectively. Vessel segments $150-370\mu$ long ($120-450\mu$ by Yamabayashi 1938); intervessel pits alternate, moderately spaced, circular and about 6μ in diameter, with small circular apertures. Perforation plates exclusively simple, almost transverse in large pores and oblique in small pores. Spiral thickenings fairly distinct (absent by Yamabayashi 1938). Tracheids vasicentric and abundant, composing pore zone in the early wood and the flame-like pattern in the late wood together with vessels; more or less tangentially flattened square or polygonal in transverse section, and about 15μ and 20μ in radial and tangential diameters respectively, bordered pits on the lateral wall circular; spiral thickenings very distinct. Fibers constitute the ground mass of the late wood, polygonal in transverse section and about 15μ in diameter, fairly thick-walled, and pits rarely present. Parenchyma marginal and diffuse, scanty, and about 10μ and 20μ in radial and tangential diameters respectively, and $40-100\mu$ long; crystalliferous elements absent. Rays almost homogeneous, 1-4 (mostly 3) cells and $6-40\mu$ in width, and $25-250\mu$ in height ($35-350\mu$ by Yamabayashi 1938); short uniseriate marginal extensions rarely present; cells of multiseriate parts oval in tangential section; marginal cells upright to procumbent in radial section; crystalliferous elements absent; pits on vertical walls very small and abundant; ray-vessel pits abundant, very small and horizontally elongated.

***Chionanthus virginicus* L.**

The present description has been based on the observation of a wood specimen which has been presented to Institute of Forest Botany, Faculty of Agriculture, University of Tokyo from Smithsonian Institution, U. S. A. (USw No. 9819), and has been checked up on the reports of Sax and Abbe (1932) and Record (1942).

Description. Ring porous wood. Growth rings distinct. Transition from the early to the late wood abrupt. In the early wood, large pores arranged in one or two tangential rows interrupted very frequently by multiseriate bands of small pores. Large pores almost solitary, circular, oval or angular in outline, thick-walled, up to 150μ in maximum diameter. In the late wood, small pores arranged in flame-like pattern which often branches. Small pores two to several in multiple, clustered or rarely soli-

tary, angular in outline, and thin-walled, about 40 and 30 μ in radial and tangential diameters respectively. Vessel segments 160-450 μ long; intervessel pits alternate, slightly spaced, circular and about 7 μ in diameter, with small oblique apertures. Perforation plates exclusively simple, slightly oblique in large pores and oblique in small pores. Spiral thickenings faintly visible. Tracheids vasicentric and abundant, composing pore zone in the early wood and the flame-like pattern in the late wood together with vessels, more or less tangentially flattened square or polygonal in outline and about 20 μ in diameter; bordered pits on the lateral walls circular; spiral thickenings distinct. Fibers constitute the ground mass of the late wood, polygonal in outline, about 15 μ in diameter, fairly thick-walled, and pits rarely present. Parenchyma marginal and diffuse, scanty, and about 10 and 20 μ in radial and tangential diameters respectively and 70-150 μ long; crystalliferous elements absent. Rays homogeneous or heterogeneous, 1-3 (mostly 1 or 2) cells, rarely up to 5 cells (Sax and Abbe 1932) and 10-35 μ (average 23 μ) in width, and 70-470 μ (average 210 μ) in height; short uniseriate marginal extensions often present; cells of multiseriate parts round or slightly angular in tangential section; marginal cells upright to procumbent in radial section; crystalliferous elements absent; pits on vertical walls very small and abundant; ray-vessel pits abundant, very small and horizontally elongated.

As above mentioned, the present fossil very closely resembles recent species of *Chionanthus*, in having uni- or biseriately arranged large pores in the early wood and the flame-like or somewhat net work-like pattern of small pore arrangement in the late wood. But it differs from the recent species in several minor features. The maximum diameter of pores of both the present fossil and *C. retusus* is larger (210 μ) than that of *C. virginicus* (150 μ). Tangential bands of large pores are more often interrupted by multiseriate bands of small pores in *C. virginicus*, while those of the present fossil and *C. retusus* are less often interrupted (see Pl. IV, A. Pl. V, A and Pl. VI, A). Rays are mostly biseriate in the present fossil, while triseriate in *C. retusus*, and uni- or biseriate in *C. virginicus*. Short marginal uniseriate extensions of rays are often present in *C. virginicus*, while they are rare in the present fossil and *C. retusus*. Crystalliferous elements have never been observed in recent species but in the present fossil. More-

over the spiral thickenings are observed only in tracheids of the present fossil, but they are observed in vessels and tracheids in the recent species. But the occurrence of spiral thickenings on vessel walls in the fossil specimen would depend on the condition of preservation of specimen.

Thus, the present fossil seems to be a member of *Chionanthus* and apparently more resembles *C. retusus* than *C. virginicus*, but differs from the former in the presence of crystalliferous elements in wood parenchyma and in width of rays. The present authors, hence, have been led to the conclusion that the present fossil would be a new species which belongs to *Chionanthus*, presumably closely related to *C. retusus*.

The authors were indebted to Prof. Dr. Ken Shimaji, Institute of Forest Botany, Faculty of Agriculture, University of Tokyo, and Ex-Prof. Dr. Shunji Watari, Faculty of Sciences, Chiba University who gave many precious advices and criticisms in the course of study. We wish to express our thanks to Prof. Dr. Satoru Kurata for his kindness in giving permission to see wood collection of the Faculty of Agriculture, University of Tokyo. Gratitude is also due to Mr. Nihei Takagi for his kindness in giving us the material.

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1966年、千葉大学銚子臨海研究分室の高木仁平氏が、銚子市犬吠崎に近い西明浦海岸から下部白亜紀層に由来すると思われる珪化木の破片を採集した。この珪化木は環孔材で、春材では大型の道管が1-2層、環状に配列し、その道管の環には小型の道管

群が挿入されており、夏材では小型の道管が火炎状に配列している。これはモクセイ科のヒトツバタゴ属の特徴である。ヒトツバタゴ属は、日本、朝鮮、台湾及び中国と、北米に各1種、計2種現存するが、これらについての材構造の記載は不十分な報告しか見あたらないので、これら2種の材構造を記載した上で、本化石との比較を行なった。その結果、基本的な形質においては現生種と一致したが、いくつかの形質において相違が認められ、北米の種よりも、東亜の種であるヒトツバタゴ、*Chionanthus retusus* Lindl. et Paxt. に共通する形質が多いことが明らかになった。以上のことから、本化石はヒトツバタゴ属の新種で、ヒトツバタゴに近縁な種であると考えた。ヒトツバタゴ属の材化石は今までにいかなる時代からも報告がなく、特に中生代からモクセイ科の材が出たことは興味深い。

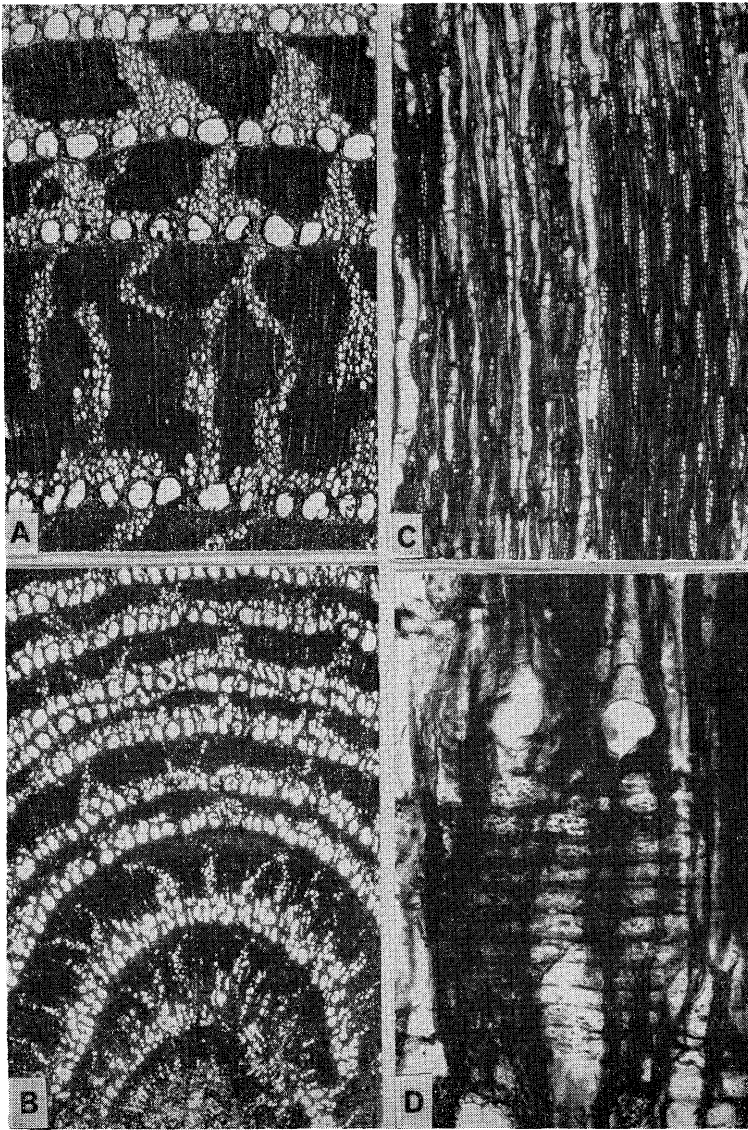
Explanation of Plates IV-VI

- Pl. IV. *Chionanthus mesozoica* sp. nov.: A, cross section ($\times 20$). B, cross section including the pith (below) ($\times 20$). C, tangential section ($\times 50$). D, radial section showing simple perforation plates in vessels and a part of ray with ray-vessel pits ($\times 240$).
- Pl. V. *Chionanthus retusus* Lindl. et Paxt.: A, cross section ($\times 20$). B, cross section including the pith (below) ($\times 20$). C, tangential section ($\times 50$). D, tangential section showing vessels (v), tracheids (t), parenchyma strands (p) and a ray (r) ($\times 320$). E, radial section showing simple perforation plates in vessels and spiral thickenings (s) in vessels and tracheids ($\times 320$).
- Pl. VI. *Chionanthus virginicus* L.: A, cross section ($\times 20$). B, tangential section ($\times 50$). C, tangential section showing vessels (v), tracheids (t), parenchyma strand (p) and rays (r) ($\times 320$). D, radial section showing a simple perforation plate and spiral thickenings (s) in vessels ($\times 320$).

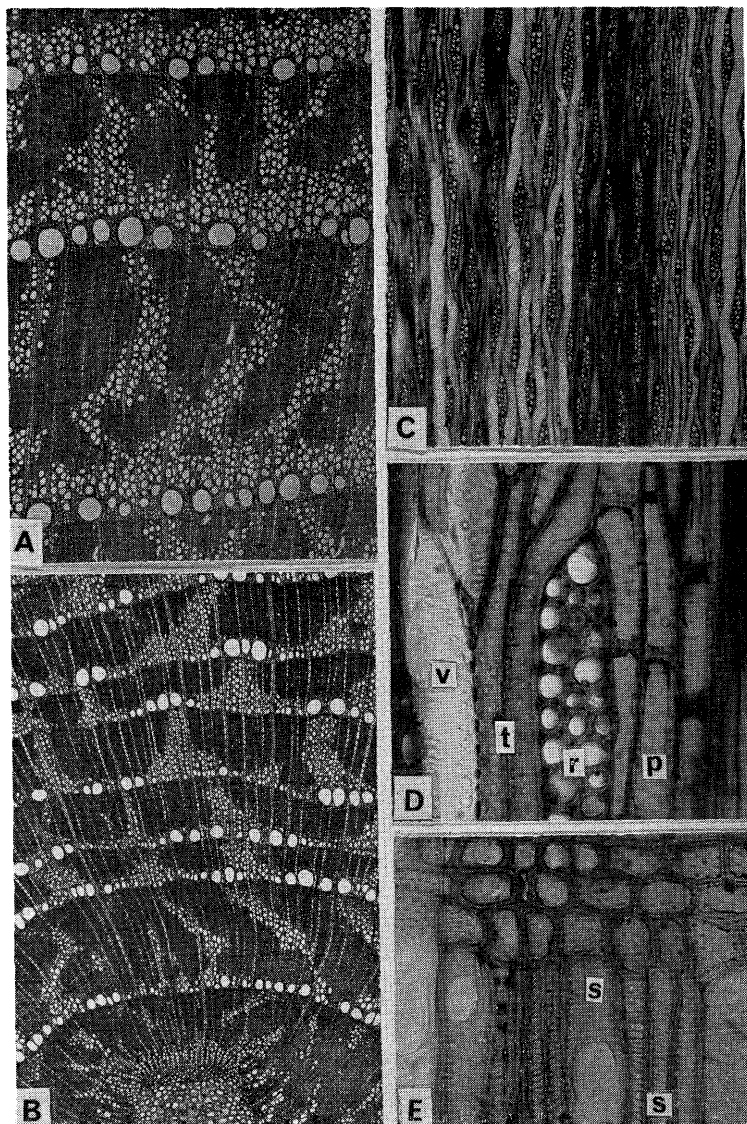
○高等植物分布資料 (83) Materials for the distribution of vascular plants in Japan (83)

○エッチェウミセバヤ *Sedum ettyuense* Tomita (本誌 48: 138, 1973) の自生地は局限されているため、植物保護の立場から、地名の公表を避けていたが、熊野川水系多目的ダムの建設計画が具体化し、近い将来、自生地の大部分が水没する可能性が高くなったので、ここに自生地を明記しておく。富山県神通川支流、熊野川水系の手出上流から長瀬下流に及ぶ溪谷の岩壁である。ダム工事が始められると完全に絶滅すると思われるので、今のうちに採集し、栽培して残していただきたいと希望する。

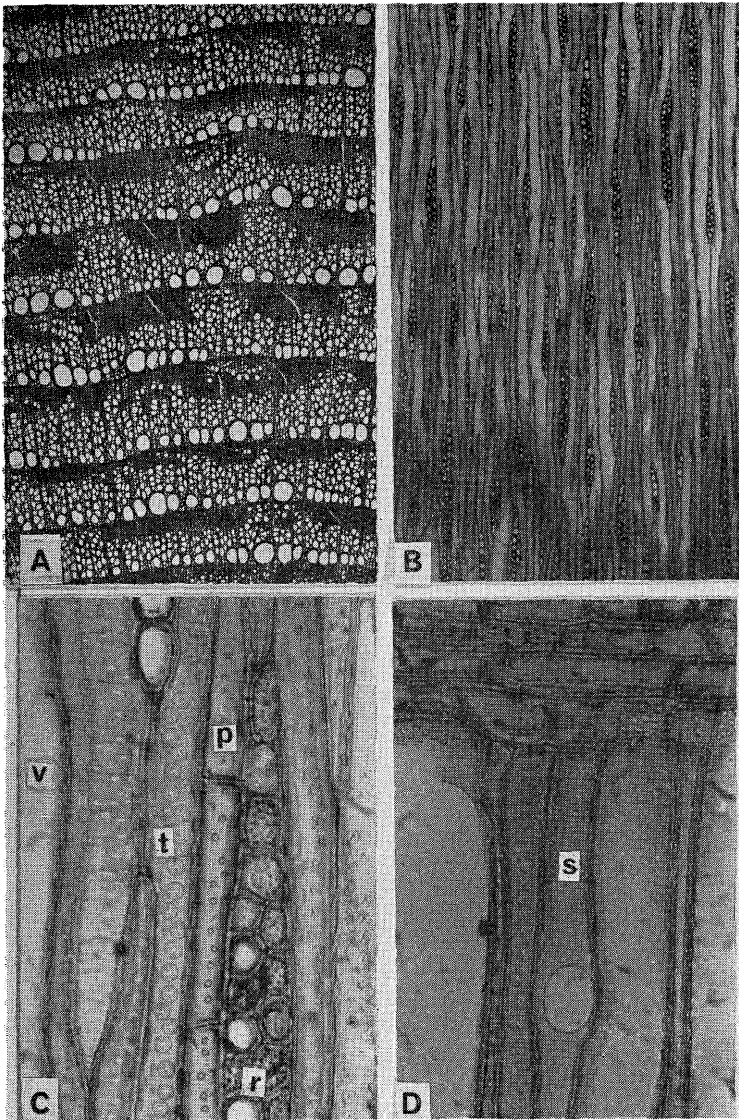
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M. SUZUKI & M. NISHIDA: *Chionanthus* from L. Cretaceous



M. SUZUKI & M. NISHIDA: *Chionanthus* from L. Cretaceous



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