stone by Japanese geologists), schalstein, sandstone and slate. The hornstone contains numerous radiolarian remains, This complex may represent a part of the Palaeozoic Chichibu formation, which, as a whole, is considered to be marine in origin. The contents of petrified wood in the Chichibu formation as in the present case, is hence an exceptional instance.

A Cycadean Trunk from Hokkaidō.

By

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The trunks of *Cycadeoidea* and the fructifications known as *Williamsonia* are the paleobotanical objects, which not only excellently show their own minute morphological and anatomical characters, but pour the light on the origin and development of those big branches of the ancestral tree of the Vegetable Kingdom, which form now the majority of plants on the earth. The origin and development in the past of the Angiospermic flower, most simply expressed now in the class *Ranales*¹⁾ was fully understood by the study of the structure of *Williamsonia*. In the meantime the anatomical structure of the cycadeoidean stems, as being more conservative, leads us to the earlier ancestry of this group.

Owing to their peculiarity the fossil trunks of *Bennetitales*, mostly known as *Cycadeoidea*, have attracted the attention of people already in ancient times. Probably the most ancient paleontological object found by men and kept under considera-

1) **Arber** and **Parkin**, On the Origin of Angiosperms: Journal of Linnaean Society, vol. XXXVIII, p. 29.

tion, was a trunk of *Cycadeoidea*, refound more recently in the funeral sanctuary¹⁾ of Etruscs in Italy and described in 1867 as *Cycadeoidea etrusca* Capp. et Solms²⁾ Some stems were described while under the wrong impression already in the middle of the 18th. century, but it is only in 1827 when Buckland³⁾ described some stems as *Cycadeoidea*, which name was gradually came into general-use. In 1868 Carruthers and Williamson have described the reproductive organs of *Cycadeoidea*, pouring the light on the true nature of this group. This was followed by other numerous investigations which led to the introduction of the separate class *Bennettitales*, which together with *Cycadales* composes the order *Cycadophyta*.

Though the cycadean trunks are not absent in the Lower Jurassic and even in the Triassic, however the Upper Jurassic and Lower Cretaceous are the strata mainly yielding such fossils. *Cycadeoideae* were found until now in England, France, Belgium, Italy, Germany, Poland and Ukraina (Galicia). Several specimens have been reported from Russia by Eichwald⁴⁾ in Lethaea Rossica, as found in the Palaeozoic of Orenburg Province, but those are surely only fern-stems. Some fossils of this kind as mentioned

1) As an interesting parallel may be mentioned a fact told by Prof. V. D Laskareff of Odessa University. During the archaeological excavations near the ancient Greek settlement Olvia on the Dnieper, a Jurassic ammonite was found in a tomb with the skeleton of its possessor, who evidently tried to take it to the Kingdom of Shadows. Neither ammonites nor Jurassic beds are found in vicinity, and the precious shell has undoubtedly been brought by the settler as a souvenir of a distant native country which he abandoned. The surface of the shell was found polished probably by its proprietor who used to rub tenderly his treasure with fingers.

2) **Capellini e Solms-Laubach**, I Tronchi di Bennettitee dei Musei Italiani: Mem. Reale Accad. delle Sci. delle Istituto di Bologna, ser. V, vol. 2, 1892, p. 161-215, pl. I-V.

3) **Buckland**, On the *Cycadeoideae*, a Family of Fossil Plant found in the Oolite Quarries of the Isle of Portland: Trans. of Geological Society, vol. II., p. 395, 1828.

4) **Eichwald**, Lethaea Rossica, Période Ancienne, 1860, p. 217.

by Oldham and Morris¹⁾ have been found in India, where the numerous leaves of *Cycadophyta* and the fructifications *Williamsonia* are represented in both Upper and Lower Jurassic, being found somewhere in close association. Seward²⁾ too has reported from India a cycadean trunk, associated with the fronds of *Ptilophyllum cutchense*.

An impression of *Williamsonia* was recently reported from the vicinity of Vladivostok in Russia;³⁾ other specimens in this country still unpublished were collected by Prof. A. Borisiak in the Mesozoic of Crimea and by Prof. M. Noinsky in the Upper Jurassic of the Volga region.

Williamsonia was found with other plant fossils in an islet opposite Kesenuma, Province of Rikuzen, North Japan; but no traces of the cycadeoidean stems were observed before in Japan. However the occurrence of leaves of *Nilssonia* and *Yezonia*, described by M. Stopes⁴⁾ from the Upper Cretaceous of Hokkaidō, has already shown the probability of the presence there of cycadean trunks too.

The most numerous and well-preserved stems of *Cycadeoidea* have been obtained in America since 1860, when Tyson has reported the discovery of this plant in the Potomac Formation of Maryland. The trunks found there were studied by Fontain, Ward and others.

But such trunks are represented still more abundantly in Black

1) Oldham and Morris, Fossil Flora of the Rajmahal Series in the Rajmahal Hills. Fossil Flora of Gondwana System, vol. I, pt. 1.; Palaeontologia Indica, Series II, 1863.

2) Seward, Catalogue of Mesozoic Plants in Department of Geology, British Museum (Natural History), part I, 1900.

3) Kryshstofovich, On the flower of *Williamsonia* sp., found near Vladivostok, and some other fossil plants from the Maritime Province of Asiatic Russia: Journal of the Geological Society of Tōkyō, vol. XXVI, 1919

4) Stopes and Fujii, Studies on the Structure and Affinities of Cretaceous Plants: Philosophical Transactions, vol. CCL-B. 247, 1909.

Hills (South Dakota and Wyoming) in beds of the Lower Cretaceous or the Upper Jurassic. The American *Cycadeoideae* range from the Triassic just to the Potomac or even to the Pre-Laramie (as *C. mirabilis* Lesq. from Golden, Colorado).

In the valuable and voluminous work on the *Cycadophyta*, Wieland¹⁾ enumerated all the trunks from different countries; and thus pointed to the vast areas, from where no specimens have still come, including a great space in Asia.

The discovery of the *Cycadeoidea* in North Japan should be laid as the first step to fill up these gaps. The specimen which I am going to describe was found on the Yubeot river, near the Takikawa village, Sorachi-gōri, Province of Ishikari. We have no detailed statement about the locality, which is said to lie only about one km. to the south of the confluence of the rivers, Uriu and Ishikari; *i. e.* about 10 km. to the north of the Takikawa village. The Yubeot is a left tributary of the Ishikari, pouring into one of its old river-beds, at a place a little over 50 km. to the north of the Bibai coal mines.

No detail is known about the exact location and geological characteristics of the fossil-bearing rock. Mesozoic strata are not shown on this creek in a new geological map of Hokkaidō, compiled in 1908 by Prof. Y. Ōinoue of Sapporo, in the scale of 1:800,000. They are found only on the south of the railway line, running eastward from the Takikawa station. Great difficulty is felt by field geologists in Hokkaidō in distinguishing the Tertiary rocks from the Cretaceous, in case when fossils are wanting.

I am in disposition only of a photograph of this trunk reduced one-third and those of its few sections, which are not sufficient for any complete investigation. Nevertheless, the first

1) Wieland, American Fossil Cycads, Wash., 1906. Publ. by the Carnegie Institute.

finding of *Cycadeoidea* in such a distance from the known localities, as well as some external features well expressed in this specimen, leads me to give to this *Cycadeoidea* a new specific name *C. ezoana*.

CYCADEOIDEA EZOANA n. sp.

Diagnosis : truncus simplex, cylindricus, magnitudine mediocris, cm. 27 longus et cm. 18 crassus, foliorum cicatricibus rhombeis, spiraliter dispositis ad axem trunci oblique sub angulo 70° inclinatis, series duorum ordinum formantibus, seriebus ab dextro sub angulo 50° ad axem trunci et ab sinistro sub angulo 40° orientibus; angulo cicatricium superiore cum inferiore equaliter angulato non arcuato; lateribus cicatricium concavis; foliorum basibus residuis trunci superficiei attingentibus, non immersis eodem ipso trunci superficiem glabram formantibus.

Trunk (fig. 2) of medium size, about 27 cm. in height and 18 cm. in longer diameter (probably slightly compressed); leaf scars spirally arranged around the trunk in two orders of rows; the more perfect spiral rows, running from right to left, are making an angle about 50° with the axis of trunk; the less perfect rows, running from left to right are making an angle only about 40° . The leaf scars are rhombic, being slightly inclined to the axis of trunk, their longer diagonal and the axis of trunk making an angle of about 70° . The upper corners of the scars are just as sharp as the lower ones, not arcuate. The sides of the rhombs are concave, the longer axis attaining 22 mm. and the shorter one 12 mm. The leaf bases are not submerged but entirely fill the gaps, making the surface of the trunk fairly smooth.

No trace of reproductive organs is seen on the photograph.

The sections, of which I received only the microphotographs, in scale of probably a little over 100 times, represent the internal

structure of the vegetative parts of the plant and are shown in figs. 2-5. Nothing is stated about the parts of the trunk, from which the sections were taken. They are therefore less valuable than they should be. Fig. 2 represents a longitudinal section (radial or probably somewhat oblique), showing the xylem (?) mainly composed of scalariform tracheids. Fig. 3 is a transversal section of the medullar parenchyma with secretory sacks; fig. 4 is the same, showing a large cavity (?) in the center. Fig. 5 represents a transversal section of the bundle, in which the medullar tissue, a zone of xylem and a cambium are seen, while the supposed phloem part is entirely destroyed.

As stated above, the figures are insufficient to represent the structure of the stem. A series of slides should be cut from different parts of the fossil, in order to study the anatomy of the stem itself, as well as of basal parts of the petioles embedded in the cortical zone. Besides attempts should be made to find fructifications between the leaf-scars.

The present *Cycadeoidea* of Hokkaidō has some features allied to those of *Cycadeoidea Bibbinsii* Ward, one of the numerous cycads of the Iron Ore Bed of the Potomac Group in Maryland, found between Baltimore and Washington and described by Lester F. Ward.¹⁾

The exact localities of the trunks found there are not confirmed. Probably they belong mostly to the Patuxent and Patapsco Series, *i. e.* the lowermost and uppermost parts of the Potomac Formation; but in some cases the trunks seem to be found transferred into the Postpliocene deposits.

1) **L. F. Ward**, Status of the Mesozoic Floras of the United States: Mon. U. S. G. S., vol. XLVIII, parts 1 & 2, pp. 456-470, pl. LXXXIII, fig. 3; LXXXIV, fig. 3; LXXXV; LXXXVII, row 1, figs. 2, 4, 6, 7; row 2, figs. 1, 2, 4, 8-11; row 5, figs. 12, 15; LXXXIX, row 1, fig. 5; row 2, figs. 2, 5, 6; CI-CIV.

The discovery of the cycadean stem in Hokkaidō must be of service for age determination of the strata from which it was taken out; but a more detailed study of it must be done before further conclusions. The whole succession of the Cretaceous beds in Hokkaidō was determined until now by study of their fauna. The study of their flora will be interesting as well as necessary for parallelization and full understanding of physical conditions of that period.

The specimen here described is in possession of Mr. Tozuta, schoolmaster of a middle-school in Sapporo. All the photographs were received from Prof. K. Jimbō, to whom they were sent by Prof. Ōinoue.

Prof. Jimbō has told me, that a fragment of stem, resembling that of a *Cycadeoidea*, was found in the Province of Awaji and kept by a man living there. According to the photographs which I have seen, the stem is of a broadly cylindric form, slightly compressed. Its height is about 9 inches, the longer diameter 9 inches, and the shorter one 7 inches. The shape of the leaf-scars seems to be same as in *Cycadeoidea exoana*, however it is not easy to discern the minute features on the reduced photograph which I possess. This specimen seems to be well preserved and worth a detailed study.

We should add here, that in Maryland all bulky materials of cycadean trunks were chiefly obtained from farmers, who found and kept them as curiosities often during a century. Only a few were actually found by geologists in their original position. Just the contrary was the case with the Black Hills, where the numerous trunks were collected *in situ*. Probably in Japan too, the cycadean stems were found also by curious eyes of ordinary people; and I hope such collections may further be hunted out for scientific studies.

Prof. A. Nathorst of Stockholm paid a great attention to my information of the present discovery and wrote in his letter to me: "....still more interesting is what you mention of the *Cycadeoidea* from Hokkaidō. The locality, where it has been found, ought to be explored thoroughly; for where one specimen has been preserved, there will no doubt be many more. It would be worth while to start a special expedition for this purpose, and the university or geological institute ought to give the necessary means, for this discovery is of great importance."

It would be really desirable that the advice of the venerable scholar would be fulfilled, and persons connected with the study of the geology of Hokkaidō should pay a special attention to the question, both by making personal researches and by raising public interest to this remarkable object.

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