**151. On the Genus *Swedenborgia* Nathorst and its
Occurrence in the Nariwa Bed, Okayama
Pref., Japan.**

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The genus *Swedenborgia* was instituted by Nathorst¹⁾ in 1876 for some lax oval strobili from Palsjö bearing small cone-scales with a long stalk and arranged spirally around a slender axis. The monotypic species *S. cryptomerioides* Nath.²⁾ was later described also by Saporta³⁾ and Antevs⁴⁾ from Palsjö and Muehlstein respectively. Nathorst compared the strobili with those of *Cryptomeria* and mentioned the presence of a single seed as an essential distinguishing character of this genus, though Harris⁵⁾ who described, besides *S. cryptomerioides*, two more species, *S. major* and *S. minor*, from the basal Liassic (or Rhaeto-Liassic) bed of eastern Greenland, mentioned that each cone-scale bears five seeds. Harris⁶⁾ showed a restoration of a cone-scale of *S. cryptomerioides* seen from above and below, and stated that the lower surface is concave with a small outgrowth from the stalk projecting into the base of the concavity, while the upper surface, which is convex, bears five small upgrowths (seed-bearing? by Harris) at the base of each of the five lobes into which the distal portion of a scale is divided. Harris' supposition that *Swedenborgia* is five-seeded seems to be natural judging from his restoration. The foliage is not known. However, Harris states, "there is evidence of association for suggesting that it may belong to certain narrow-leaved species of *Podozamites* of the *P. schenki*-*P. agardhianus* group."

The Japanese specimens now at hand are not sufficient to add any biological evidence as to the nature of these strobili, but the occurrence of this genus in far eastern Asia is somewhat notable as it has not yet been recorded outside Europe; its occurrence is very rare and it is a plant very interesting from the palaeobotanical point of view. The Japanese specimens comprise two distinct forms, namely, *S. cryptomerioides* Nath. and *S. major* Harris. They occurred at Hinabata (Loc. No. 44) in the Nariwa district in association with the following species⁷⁾:

1) A. G. Nathorst: Bidrag till Sveriges Fossila Flora. I. Kgl. Svensk. Vet.-Akad. Handl., XIV, No. 3, 1876, p. 65.

2) A. G. Nathorst: Ibid., p. 66, Pl. XVI, figs. 6-12. Beitrage zur fossilen Flora Schwedens, 1878, p. 30, Pl. XVI, figs. 6-12.

3) M. de Saporta: Plantes Jurassiques, T. III, 1884, p. 528, Pl. CXCVIII, figs. 1-4.

4) E. Antevs: Die liassische Flora des Hoersandsteins. Kgl. Svensk. Vet.-Akad. Handl., Bd. LIX, No. 8, p. 48, Pl. V, figs. 31-37.

5) T. M. Harris: The Fossil Flora of Scoresby Sound, East Greenland. Pt. 4. Med. om Grønland, Bd. CXII, No. 1, 1935, p. 107.

6) T. M. Harris: Ibid., Pl. XIX, figs. 5, 6.

7) Species from Loc. No. 44 in the Nariwa district have been described in Ôishi's The Rhaetic Plants from the Nariwa District. Journ. Fac. Sci., Hokkaidô Imp. Univ., Ser. IV, Vol. I, Nos. 3-4, 1932.

Marattiopsis Muensteri (Goepp.), *Todites Williamsoni* (Brongn.), *Cladophlebis haiburnensis* (L. and H.), *C. gigantea* Ôishi, *C. bitchuensis* Ôishi, *C. nebbensis* (Brongn.), *C. Raciborskii* Zeill., *C. Raciborskii* Zeill. forma *integra* Ôishi and Takahasi, *C. pseudodelicatula* Ôishi, *Clathropteris obovata* Ôishi, *Sphenopteris gracilis* Ôishi, *Pterophyllum Jaegeri* Brongn., *Nilssonia orientalis* (Heer), *Ginkgoites sibirica* (Heer), *Baiera paucipartita* Nath., *Pityophyllum* (*Pityocladus*) *longifolium* (Nath.), *Podozamites lanceolatus* (L. and H.).

The plant bed belongs to the Nariwa Series which approximately corresponds in age to the Rhaetic, though its upper part may be basal Liassic. The description follows.

Figs. 1-3. *Swedenborgia cryptomerioides* Nath. $\times 1$.

Fig. 4. *S. major* Harris. $\times 1$.

(S, seeds; P, *Podozamites* leaf).

Swedenborgia cryptomerioides Nathorst

Figs. 1-3.

Fig. 1 shows a lax strobili 3.5 cm long with small cone-scales 1.2 cm long, bearing a short stalk arranged spirally around a slender axis 1.5 mm thick. The cone-scale is expanded distally and divided palmately into five almost equal rigid lobes 3 mm long and apically sharply pointed. There is no trace of seeds. The preservation of this specimen is somewhat unsatisfactory.

Fig. 2 shows two cone-scales at least 1.2 cm long. They may have arisen from a common axis, but there is no indication of it. The upgrowths as were observed by Harris are not seen. The cone-scale in fig. 3 is specially interesting as it occurred in close association with seeds which show close agreement in size and form with those figured from Palsjö by Nathorst¹⁾ who supposed that they belonged to *Swedenborgia cryptomerioides*. Similar seeds were also found in association with *S. cryptomerioides* in Greenland.²⁾ Therefore, it should be strongly emphasized that the seeds are of *Swedenborgia*. At the same time it is nearly certain that the Japanese specimens now at hand are specifically identical with those from Sweden and Greenland called under the name *S. cryptomerioides*. The surface of the expanded part of the

1) A. G. Nathorst: Op. cit., 1876 and 1878.

2) T. M. Harris: Op. cit., 1935.

cone-scale is convex. Therefore, it is presumable that this is the upper surface. The upgrowth can not be seen. The seed is oval and flat, 6 mm and 2 mm broad, the one end concave, while the other bluntly pointed, with delicate marginal wing 0.5 mm wide. Harris states, "the wing ceases just below the apex leaving a notch which is occupied by the projecting micropyle," but such detail can not be made out in the present specimens.

The senior author¹⁾ formerly described a fossil from Suimyô in the Nariwa district which he thought to be a leaf-sheath of an Equisetalean plant, under the name *Phyllothea* sp. Though it is fragmentary, the specimen resembles the distal portion of cone-scale of *Swedenborgia*; it is probable that this *Phyllothea* sp. represents an imperfect cone-scale of this interesting genus now under discussion. The general shape and size of the supposed leaf-sheath show that it is a type close to *S. cryptomerioides*.

Swedenborgia major Harris

Fig. 4.

Fig. 4 shows a cone-scale of *Swedenborgia* lacking the stalk. The principal part of the cone-scale is very narrow in this specimen, but the lobes five in number are 7–8 mm long and curved. A seed is seen in an intimate relation to the lobes. It is similar in form to that in fig. 3, but differs slightly from it in being shorter (4 mm long and 2 mm broad). The marginal wing is 0.5 mm wide as in the preceding specimen. The base is evidently concave and the apex seems to be rounded. More details are not available. As far as the present specimen is concerned the seed in this differs little from that associated with *S. cryptomerioides*. It is also the same in the Greenland specimens, as mentioned by Harris.²⁾

1) S. Ôishi: The Rhaetic Plants from the Nariwa District, Prov. Bitchû (Okayama Prefecture), Japan. Journ. Fac. Sci., Hokkaidô Imp. Univ., Ser. IV, Vol. I, Nos. 3–4, 1932, p. 267, Pl. II, fig. 10.

2) T. M. Harris: Op. cit., 1935, p. 109.