| 玉柄 | データの詳細が表示できます。見出し、詳細が表示されます。
| --- | --- |
| 他 | データの詳細が表示できます。見出し、詳細が表示されます。
| 他 | データの詳細が表示できます。見出し、詳細が表示されます。
| 他 | データの詳細が表示できます。見出し、詳細が表示されます。
| 他 | データの詳細が表示できます。見出し、詳細が表示されます。
| 他 | データの詳細が表示できます。見出し、詳細が表示されます。

**Description:** See Krutzsch (1970).

**Dimensions:** 14 X 35 µm in size, exine 1 µm thick, length/width ratio = ~2.5 (Krutetzsch, 1970); present specimen: 14 X 34 µm in size, width/length ratio = 0.412.

**Occurrence:** Akkeshi Formation in Akkeshi area (AKK-11).

**Previous records:** Pliocene, Germany (Krutetzsch, 1970).

**Remarks:** This is a longer type of *Cycadopites* and comparable with *Cycadopites sculptigracilis* Krutzsch notwithstanding its bad preservation.

**Botanical affinity:** Cycadaceae.

**Genus:** *Ephedripites* Bolkhovitina 1953 ex Potonie 1958.

**Type species:** *Ephedripites mediolobatus* Bolkhovitina 1953.

**Subgenus:** *Ephedripites* (*Distachyapites*) Krutzsch 1961.

**Type species:** *Ephedripites* (*Distachyapites*) *eocenipites* (Wodehouse 1931) Krutzsch 1961.

(133) *Ephedripites* (*Distachyapites*) cf. *fusiformis* (Shakmundes) Krutzsch

Pl. 23, fig. 2.

1965 *Ephedra fusiformis* Shakmundes, Trudy VNIGRI, 239, p. 222, pl. 3, figs. 1–6.

**Description:** See Shakmundes (1965) and Krutzsch (1970).

**Dimensions:** Ca. 37–55 µm in size, 4–6 (? 7) ribs, wall 3/4–ca. 1.5 µm thick (Krutetzsch, 1970); present specimen: 15 X 35 µm in size, wall 0.5 µm thick, laevigate, width/length ratio = 0.429.

**Occurrence:** Akkeshi Formation in Akkeshi area (AKK-05).

**Previous records:** Middle Oligocene, western Siberian lowland (USSR) (Shakmundes, 1965); Maastrichtian, Far East/USSR (Bratzeva, 1965); Late Eocene-Early Miocene, Middle Europe (Krutetzsch, 1970).

**Remarks:** The grain from the Akkeshi Formation is more or less smaller in size, but seems to be identified with *Ephedripites* (*Distachyapites*) *fusiformis*
(Shakmundes) Krutzsch.

**Botanical affinity:** Ephedraceae.

**Subgenus:** *Ephedripites (Ephedripites)* Krutzsch 1961.

**Type species:** *Ephedripites (Ephedripites) mediolobatus* Bolkhovitina 1953.

(134) *Ephedripites (Ephedripites) angustus* n. sp.

Pl. 23, figs. 20–24.

Description: Polyplicate pollen grains. Outline long-elliptical with one somewhat pointed corner and the other somewhat rounded corner in equatorial view. Ridges slender, 7–9 in number, running parallel from pole to pole. Exine smooth, 0.5 ± μm thick.

**Dimension:** 8.5–12.5 μm in width and 25–30 μm in length, width/length ratio = 0.283–0.446.

**Occurrence:** Akkeshi Formation in Akkeshi area (AKK-05, AKK-10, and AKK-11).

**Holotype:** Pl. 23, fig. 23; 7 X 27 μm in size, ribs 8–9 in number, width/length ratio = 0.333; Akkeshi Formation in Akkeshi area (AKK-05); slide No. GN 5502.

**Name derivation:** *angustus* (lat.) = narrow.

**Comparison:** *Ephedripites (E.) angustus* differs from the other species in its small size, narrow width, and number of the fine ridges. The grains are comparable to those of *Ephedripites (E.) viesenensis* Krutzsch in form and number of ribs.

**Botanical affinity:** Ephedraceae.

(135) *Ephedripites (Ephedripites) cf. dafengshanensis* Zhu & Wu

Pl. 23, figs. 18, 19.

1985 *Ephedripites (Ephedripites) dafengshanensis* Zhu & Wu, Zhu et al., Petroleum Industry Press, pp. 94–95, pl. 34, figs. 2–5, 10; pl. 60, figs. 7a–b.

**Description:** See Zhu et al. (1985).

**Dimensions:** 35–45 μm X 12–15 μm in size (holotype 39 X 15 μm in size); ribs 10–12 in number, 1.5 μm ± wide; exine ca. 1.5 μm thick; length/width ratio = 2.4–3.6 (Zhu et al., 1985); present specimens: 12–19 μm in width and 42–44.5 μm in length, ribs 8–9 in number, width/length ratio = 0.286–0.427.
Occurrence: Hamanaka-Oborogawa Formation in Akkeshi area (AKK-07).  
Previous record: Tertiary, Qaidam Basin (Qinghai, China) (Zhu et al., 1985).  
Remarksd: The grains seem identical to Ephedripites (E.) dafengshanensis Zhu et Wu, notwithstanding they have smaller number of ribs than those of it.  
Botanical affinity: Ephedraceae.

(136) Ephedripites (Ephedripites) robustus n. sp.  
Pl. 23, figs. 15, 16.

Description: Polyplicate pollen grains. Amb elliptical in equatorial view. Ribs 8 in number, running parallel from pole to pole, 2 – 3 μm wide. Exine thin ca. 0.5 μm thick, smooth.  
Dimensions: 15 – 17 μm in width and 25 – 29 μm in length, width/length ratio = 0.586 – 0.6.  
Occurrence: Akkeshi Formation in Akkeshi and Choboshi areas (AKK-12 and CHO-01).  
Holotype: Pl. 23, fig. 16; 17 X 29 μm in size; ribs 8 in number, 3 μm wide; width/length ratio = 0.586; Akkeshi Formation in Choboshi area (CHO-01); slide No. GN 5726.  
Name derivation: robustus (lat.) = powerful, hard, firm, solid.  
Comparison: These new specimens are closely similar to Ephedripites (Ephedripites) chaloneri Brenner, E. (E.) ambonoides Brenner, and E. (E.) crassoides Krutzsch, but differ from E. (E.) chaloneri in having more or less smaller numbers and thinner width of ribs, from E. (E.) ambonoides in being much smaller in size and possessing larger numbers of ribs, and from E. (E.) crassoides in being smaller in size and having smaller numbers of ribs.  
Botanical affinity: Ephedraceae.

(137) Ephedripites (Ephedripites) viesenensis Krutzsch  
Pl. 23, fig. 17.

1961 Ephedripites (Ephedripites) viesenensis Krutzsch, Geologie, Jrg. 10, Beih. 32, p. 21, pl. 2, figs. 1–5, text-fig. 3.  
1985 Ephedripites (Ephedripites) viesenensis Krutzsch, Yu et al., Geol. Publ. House, p. 124, pl. 29, figs. 9–14.  
1985 Ephedripites (Ephedripites) viesenensis Krutzsch, Zhu et al., Petroleum Industry
Description: See Krutzsch (1961).

Dimensions: Ca. 25 μm in size, ribs 12–14 in number, wall ca. 1 μm thick (Krutzsch, 1961); 25–35 X 12–20 μm in size, ribs 10–14 in number (Song et al., 1981); 28–33 X 13–15 μm in size, exine 1–1.5 μm thick, ribs 8–10 in number, 1.5 μm wide (Yu et al., 1985); 27–29 X 10–15 μm in size; ribs 8–12 in number, 1–2 μm wide; exine 1 μm thick (Zhu et al., 1985); present specimen: 16 X 29 μm in size; ribs 10 (?) in number, 1 μm wide; width/length ratio = 0.552.

Occurrence: Akkeshi Formation in Akkeshi area (AKK-05).

Previous records: Early Palaeocene, Germany (Krutzsch, 1961); Lower Middle Cretaceous, Jiangxi (China) (Yu et al., 1985); Palaeocene-Pliocene, Quinghai (China) (Zhu et al., 1985).

Remarks: In general morphological characters the grain seems to be identified with Ephedripites (E.) viesenensis Krutzsch.

Botanical affinity: Ephedraceae.

(138) Ephedripites (Ephedripites) sp.
Pl. 30, fig. 3.

Description: Polyplicate pollen grain. Outline broad-elliptical in equatorial view. Ridges 7 in number on the hemisurface of the grain. Exine thin, 0.5–1 μm thick, smooth.

Dimensions: 13 X 20 μm in size, width/length ratio = 0.65.

Occurrence: Akkeshi Formation in Ochiishi area (OCH-06).

Remarks: Only one specimen was observed. This is similar to Ephedripites (E.) chaloneri Brenner from the Middle Cretaceous of Peru and E. (E.) sphaericus Han from the Middle Cretaceous of Jiangxi (China), but differs from E. (E.) chaloneri in size of grain and number of ribs and from E. (E.) sphaericus in size of grain, width and number of ribs.

Botanical affinity: Ephedraceae.

Type species: Ephedripites (Spiralipites) praeclarus (Chlonova 1961) Krutzsch 1970.

(139) Ephedripites (Spiralipites) ellipsoideus (Takahashi) Takahashi
Pl. 23, figs. 25–29; pl. 24, fig. 1.


**Description**: See Takahashi (1964, 1988).

**Dimensions**: Ca. 32–39 μm in size (holotype: ca. 39 X 17 μm in size), 0.5–0.6 μm wide between ribs (Takahashi, 1964); 35–37.4 μm X 18–18.5 μm in size, less than 1 μm wide between ribs (Takahashi & Shimono, 1982); 28.9–40.5 μm in length and 12.7–15.5 μm in width, less than 1 μm wide between ribs (Takahashi, 1988); 34 X 17 μm in size, ribs 2.5–4 μm wide (Takahashi & Sugiyama, 1990); present specimens: 14–20 μm in width and 29–40 μm in length; ribs 5–9–(11 ?) in number, 1.5–4 μm wide; width/length ratio = 0.411–0.517.

**Occurrence**: Akkeshi Formation in Akkeshi and Ochiishi areas (AKK –05, AKK –10, AKK –11, AKK –12, and OCH –08).

**Previous records**: Campanian, Yubari coal-field, Hokkaido (Japan) (Takahashi, 1964); Maastrichtian, Hida (Japan) (Takahashi & Shimono, 1982); Coniacian, Futaba (Japan) (Takahashi, 1988); Santonian, Taneichi (Japan) (Takahashi & Sugiyama, 1990).

**Remarks**: Hitherto, this species has appeared restrictedly in the Coniacian to Maastrichtian of Hokkaido, Northeast Japan, and central Japan.

**Botanical affinity**: Ephedraceae.

(140) *Ephedripites (Spiralipites) kulandyensis* Bolkhovitian n. comb.

Pl. 24, fig. 2.

1961 *Schizaea kulandyensis* Bolkhovitina, Trudy Geol. Inst., Acad. Sci. USSR, 40, pl. 31, pl. 6, figs. 3a–k.

**Description**: See Bolkhovitina (1961).

**Dimensions**: 12–15 μm in width and 25–28 μm in length; rib 1.5–2 μm wide (Bolkhovitina, 1961); present specimen: 16 X 29 μm in size; ribs 8–9 in number on one side, 2 μm wide; width/length ratio = 0.552.

**Occurrence**: Akkeshi Formation in Akkeshi area (AKK –12).
Previous records: Albian-Cenomanian and Campanian, Kazakhstan (USSR); Albian-Turonian, near north Aral sea (USSR) (Bolkhovitina, 1961).

Remarks: Only one specimen was found. In general morphological characters this grain seems to be referred to Schizaea kulandyensis Bolkhovitina.

Botanical affinity: Ephedraceae.

(141) Ephedripites (Spiralipites) sp.
Pl. 23, fig. 30.

Description: Polyplicate pollen grain. Outline long-elliptical in equatorial view. Ridges 16 in number, 1 μm wide, running parallel on one side and closely each on both sides. Exine thin, 0.5 μm thick, smooth.

Dimensions: 14 X 34 μm in size, width/length ratio = 0.412.

Occurrence: Akkeshi Formation in Ochiishi area (OCH-06).

Remarks: The single specimen was observed. The form and ribs of the exine distinguish it from the other species.

Botanical affinity: Ephedraceae.


Type species: Inaperturopollenites dubius (Potonié & Venitz 1934) Thomson & Pflug 1953.

(142) Inaperturopollenites dubius (Potonié & Venitz) Thomson & Pflug
Pl. 21, figs. 14–16, 22.

1953 Inaperturopollenites dubius (Potonié & Venitz 1934) Thomson & Pflug, Palaeontographica, B, 94, p. 65, pl. 4, fig. 89; pl. 5, figs. 1–13.
1964 Inaperturopollenites pseudodubius Takahashi, Mem, Fac. Sci., Kyushu Univ., Ser. D, Geol., vol. 14, no. 3, p. 222, pl. 33, figs. 16–24; pl. 41, fig. 5.
1979 Inaperturopollenites pseudodubius Takahashi, Takahashi & Kim, Palaeontographica, B, 170, Lfg. 1–3, p. 33, pl. 7, figs. 3, 5–8, 10–13; pl. 8, fig. 8.
1981 Inaperturopollenites dubius (Pot. & Ven.) Thomson, Song et al., Geol. Publ. House,
Description: See Potonie & Venitz (1934) and Thomson & Pflug (1953).


Occurrence: Ramanaka-Oborogawa, Akkeshi, and Tokotan Formations in Akkeshi and Ochiishi areas (AKK-05, AKK-07, AKK-09, AKK-10, AKK-11, AKK12, OCH-02, OCH-03, OCH-04, OCH-05, OCH-08, and OCH-09).

Previous records: Cretaceous to Tertiary of Europe and East Asia (Japan, Korea, China etc.).

Botanical affinity: Taxodiaceae-Cupressaceae.

(143) Inaperturopollenites laevigatus Takahashi
Pl. 21, figs. 9–13; pl. 30, fig. 5.

1957 Inaperturopollenites laevigatus Takahashi, Mem. Fac. Sci., Kyushu Univ., Ser. D, Geol., vol. 5, no. 4, pp. 216–217, pl. 38, fig. 18; pl. 39, fig. 16.
1979 Inaperturopollenites laevigatus Takahashi, Takahashi & Kim, Palaeontographica, B, 170, p. 33, pl. 7, figs. 14–18.
1987 Inaperturopollenites laevigatus Takahashi, Schrank, Cretaceous Research, 8, p. 34, fig. 3 (b).
1988 Inaperturopollenites laevigatus Takahashi, Bull. Fac. Liberal Arts, Nagasaki


**Description** See Takahashi (1957).

**Dimensions:** Present specimens: 22–36 μm in diameter, exine 0.5 or less–1 μm thick.

**Occurrence:** Hamanaka-Oborogawa, Akkeshi, and Tokotan Formations in Akkeshi and Ochiishi areas (AKK-05, AKK-07, AKK-09, AKK-10, AKK-11, AKK-12, OCH-02, OCH-03, OCH-04, OCH-05, OCH-06, OCH-08, OCH-09, and OCH-13).

**Previous records:** Upper Cretaceous to/or Tertiary of East Asia, Africa, and Middle Europe.

**Botanical affinity:** Taxodiaceae-Cupressaceae.

(144) *Inaperturopollenites parviundulatus* Takahashi
Pl. 30, fig. 4.


**Description:** See Takahashi (1964).

**Dimensions:** 20–25 μm in diameter (holotype: ca. 22 μm in diameter) (Takahashi, 1964); present specimen: 18–22 μm in diameter; exine thin, somewhat undulate; pentagonal in form.

**Occurrence:** Akkeshi Formation in Akkeshi area (AKK-05).

**Previous records:** Maastrichtian, Yubari coal-field, Hokkaido (Japan) (Takahashi, 1964).

**Remarks:** The single specimen was observed. This is comparable with *Inaperturopollenites parviundulatus* (1964) from the Maastrichtian Upper Hako-buchi Group by its shape and undulate exine.

**Botanical affinity:** ? Taxodiaceae-Cupressace.

(145) *Inaperturopollenites parvus* Takahashi
Pl. 21, figs. 18–21; pl. 30, fig. 6.

1979 *Inaperturopollenites parvus* Takahashi, Takahashi & Kim, Palaeontographica, B, 170, Lfg. 1–3, p. 33, pl. 8, figs. 9–14.


**Description**: See Takahashi (1963).

**Dimensions**: Ca. 14.4–21 μm in diameter, exine 0.7 μm ± thick (Takahashi, 1963); 14.4–24 μm in diameter, exine 0.6–1 μm thick (Takahashi & Kim, 1979); 18–23 μm in diameter, exine ca. 1 μm thick (Yu et al., 1985); 14.5–20 μm in diameter (Takahashi & Jux, 1986); 16.3–19.2 μm in diameter, exine 0.5–0.7 μm thick (Takahashi, 1988); 15–17 μm in diameter, exine 0.5 μm thick, smooth (Takahashi & Sugiyama, 1990); present specimens: 11–20 μm in diameter, exine less than 1 μm thick.

**Occurrence**: Ramanaka-Oborogawa, Akkeshi, and Tokotan Formations in Akkeshi and Ochiishi areas (AKK-05, AKK-07, AKK-09, AKK-10, AKK-11, AKK-12, OCH-03, OCH-04, OCH-06, OCH-09, and OCH-10).

**Previous records**: Upper and/or Middle Cretaceous to/or Tertiary of Middle Europe and East Asia (Japan, Korea, China).

**Botanical affinity**: Taxodiaceae-Cupressaceae.

**Genus**: *Monosulcites* Cookson 1947 ex Couper 1953.

**Type species**: *Monosulcites minimus* Cookson 1947.

(146) *Monosulcites* sp.

Pl. 23, fig. 11.

**Description**: Monosulcate pollen grain. Amb broad-elliptical with rounded apices in distal polar view. Sulcus distinct, more or less curved, largely opened (8 μm wide) in the middle of the grain and closed at both apices. Exine thin, 0.5 μm thick, smooth.
Dimensions: 21 X 34 μm in size, width/length ratio = 0.618.

Occurrence: Tokotan Formation in Ochiishi area (OCH-04).

Remarks: Only one specimen was observed

Botanical affinity: Probably Ginkgoaceae.

Type species: Phyllocladidites mawsonii Cookson 1947.

(147) Phyllocladidites mawsonii Cookson

Pl. 29, figs. 1, 2.


Description: See Cookson (1947).

Dimensions: 21-45 μm X 24-45 μm (average length about 30 μm and average width approximately 32 μm), exine 2.5-4 μm thick (Cookson, 1947); total breadth of grain 27.5-39 μm, breadth of central body 24-39 μm, length of central body 28.5-30 μm, length of bladders 17.5-27.5 μm, breadth of bladders 8.5-11.5 μm, exine 1.5 μm thick (Takahashi & Shimono, 1982); overall breadth 28.8 μm, breadth of central body 38.8 μm, length of central body 37.3 μm, breadth of bladders 11.6 μm, length of bladders 29.5 μm (Takahashi, 1988); width of central body 26-29 μm, length of central body 32-36 μm, width of bladders 5-9 μm, length of bladders 12-27 μm, exine 1-2 μm thick, chagre­nate or finely punctate; present specimens: width of central body 34-39 μm, length of central body 34-42 μm, width of bladders 6-13 μm, length of bladders 13-23 μm, exine 2 μm thick.

Occurrence: Akkeshi and Tokotan Formations in Ochiishi area (OCH-05 and OCH-06).

Previous records: Cretaceous and Tertiary, south hemisphere (Cookson, 1947;
Palynologic study of the Akkeshi and Tokotan Formations


Remarks: This species seems to occur restrictedly in Upper Cretaceous of Japan.

Botanical affinity: Phyllocadus.

(148) Phyllocladidites ovatus Takahashi
Pl. 28, fig. 6 (cf.), 10a–b (cf.); pl. 29, figs. 3, 4.

1988 Phyllocladidites ovatus Takahashi, Bull. Fac. Liberal Arts, Nagasaki Univ., Nat. Sci., vol. 28, no. 2, p. 117, pl. 14, fig. 4; pl. 17, fig. 4, pl. 18, fig. 3.
1990 Phyllocladidites cf. ovatus Takahashi, Takahashi & Sugiyama, Bull. Fac. Liberal Arts, Nagasaki Univ., Nat. Sci., vol. 30, no. 2, pp. 267–268, pl. 69, fig. 6; pl. 70, figs. 7a–b; pl. 75, figs. 5–6.

Description: See Takahashi (1988).

Dimensions: Overall breadth 34.7 μm, breadth of central body 29.2–34.7 μm, length of central body 33.4–41 μm, height of central body 25.2 μm, breadth of bladders 5.5–9 μm, length of bladders 16.8–36.1 μm, height of bladders 19 μm, exine 1–1.5 μm thick, finely punctate to rugulate (Takahashi, 1988); width of central body 22–35 μm, length of central body 35–40 μm, width of sacci 6–16 μm, length of sacci 16–32 μm, exine 1.5 μm thick; present specimens: width of central body 27–31 μm, length of central body 33–37 μm, width of bladders 7–10 μm, length of bladders 22–35 μm.

Occurrence: Akkeshi and Tokotan Formation in Akkeshi and Ochiishi areas (AKK–05, AKK–12, OCH–05, and OCH–06).

Previous records: Coniacian, Futaba (Japan) (Takahashi, 1988); Santonian, Taneichi (Japan) (Takahashi & Sugiyama, 1990).

Remarks: In size, shape, and ornamentation these grains seem identical to Phyllocladidites ovatus Takahashi.

Botanical affinity: Phyllocladus.

(149) Phyllocladidites sp.
Pl. 28, figs. 9a–b.

Description: Bisaccate pollen grain. Outline elliptical in polar view. Sacci extremely small. Body of the grain ellipsoidal, with a furrow. Exine 1 μm thick, finely punctate (?); furrow smooth (?).
Dimensions: Width of central body: 16.5 μm
Length of central body: 24 μm.
Width of sacci: 3–3.5 μm.
Length of sacci: 7 μm.

Occurrence: Tokotan Formation in Ochiishi area (OCH-10).

Remarks: The author cannot find a species comparable with the grain with extremely small sacci.

Botanical affinity: Phyllocladus.

(150) Phyllocladidites sp.
Pl. 29, figs. 6a–b.

Description: Bisaccate pollen grain. Outline elliptical in polar view. Sacci small, smooth (?), secondary folded. Body of the grain ellipsoidal, with a wide furrow with smooth ornament. Exine thin, smooth (?).

Dimensions: Width of central body: 24 μm.
Length of central body: 24 μm.
Width of sacci: 14 μm.
Length of sacci: 24 μm.

Occurrence: Akkeshi Formation in Akkeshi area (AKK-05).

Remarks: The single specimen was observed. Belonging to the genus Phyllocladidites is questionable, because this grain is not well preserved.


Type species: Piceapollis praemarianus Krutzsch 1971.

(151) Piceapollis minutus n. sp.
Pl. 27, figs. 2–5; pl. 28, figs. 3a–b.

Description: Bisaccate, piceoid pollen grains. Outline subcircular in polar view and oval in lateral view. Sacci aequisaccate, finely reticulate. Central body subcircular in polar and lateral views, finely punctate; cap intrarugulate, 3–5 μm thick. Distal furrow between sacci smooth (?), narrow; ventral root of sacci concave.

Dimensions: Overall height: 54 μm.
Width of central body: 37–45 μm.
Length of central body: 32–44 μm.
Height of central body: 35 μm.
Width of sacci: 17–25 μm.
Length of sacci: 25–27 μm.
Height of sacci: 18 μm.

Occurrence: Akkeshi Formation in Akkeshi and Ochiishi areas (AKK-09, AKK-10, and OCH-06).

Holotype: Pl. 27, fig. 5; overall width of grain 45 μm; overall height of grain 54 μm; width of central body 45 μm; height of central body 35 μm; width of bladders 20–25 μm; height of bladders 18 μm; Akkeshi Formation in Ochiishi area (OCH-06); slide No. GN 5647.

Name derivation: minutus (lat.) = small, little, minute.

Comparison: The present specimens are a kind of the smallest pollen grains of Piceapollis. The author cannot find any comparable form of Piceapollis.

Botanical affinity: Pinaceae, Picea.

(152) Piceapollis cf. sacculiferoides Krutzsch
Pl. 27, fig. 8; pl. 28, fig. 2.


Description: See Krutzsch (1971).

Dimensions: Overall width of grain 77 μm; overall height of grain 65 μm; height of central body (~50 μm); width of central body ~75 μm; width of bladders ~35–40 μm; depth of bladders 50 μm (Krutzhc, 1971); 70–80 μm in size (Nagy, 1985); overall width of grains 87–92 μm; width of central body 78–83 μm; height of central body 47–56 μm; depth of sacci 50–70 μm; height of sacci 33–43 μm (Takahashi & Jux, 1986); present specimens: overall width of grains 75–88 μm; overall height of grains 48–65 μm; width of central body 75–80 μm; height of central body 34–52 μm; width of sacci in lateral view 33–37 μm; height of sacci 20–22 μm; cap 4 μm thick.

Occurrence: Akkeshi Formation in Akkeshi area (AKK-05, AKK-09).

Previous records: Middle-Late Tertiary, Germany (Krutzhc, 1971; Takahashi & Jux, 1986); Neogene, Hungary and Czechoslovakia (Krutzhc, 1971; Nagy, 1985).
Remarks: Thiergart (1938, 1938) used the genus *Piceapollenites* without generic diagnosis. Potonié (1958) reversed *Piceapollenites* as a synonym of *Piceaepollenites* which was instituted by him (1931) with his original short hand symbols. However, nevertheless, Nagy (1985) introduced *Piceapollenites* and newly combined *Piceapollenites sacculiferoides* (W. Kr.). Krutzsch considers *Piceapollenites* as a junior synonym of *Pityosporites*, because the type of *Piceapollenites*, *P. alatus*, shows a pinoid rather than piceoid form.

Botanical affinity: Pinaceae, *Picea*.

(153) *Piceapolis* sp.  
Pl. 27, figs. 6, 7.

Description: Bisaccate pollen grains. Outline circular to subcircular in lateral view. Sacci aequisaccate (?), finely reticulate. Central body oblate in lateral view, finely punctate (?). Distal furrow between sacci very narrow.

Dimensions: Overall width of grains 55 μm.  
Overall height of grains 39–46 μm.  
Width of central body 37–53 μm.  
Height of central body 20–37 μm.  
Width of bladders 28–35 μm.  
Height of bladders in lateral view 18–19 μm.

Occurrence: Akkeshi and Tokotan Formations in Akkeshi and Ochiishi areas (AKK–12, and OCH–03).

Remarks: Two specimens were observed. These grains are comparable with *Piceapolis minutus*, but differ in having oblate shape in lateral view.

Botanical affinity: Pinaceae, *Picea*.

Genus: *Pityosporites* Seward 1914.  
Type species: *Pityosporites antarcticus* Seward 1914.

(154) *Pityosporites alatipollenites* (Rouse) Takahashi & Sugiyama  
Pl. 24, figs. 6–10.

1959 *Pinus alatipollenites* Rouse, Micropaleontology, vol. 5, no. 3, p. 314, pl. 1, fig. 7.  
Description: See Rouse (1959).

Dimensions: Overall length-range 60 - 85 μm, range of bladder diameter 20 - 40 μm, range of body length 45 - 65 μm (Rouse, 1959); overall width of grains 55.4 - 78 μm, overall length of grains 34 - 48.7 μm, overall height of grains 32.3 - 40 μm, width of central body 37 - 61 μm, length of central body 30 - 47 μm, height of central body 24.6 - 30 μm, width of bladders 21 - 40 μm, length of bladders 28 - 43 μm, height of bladders 25.4 - 33.8 μm, width of bladders in lateral view 15.4 - 27 μm; cap 1.5 - 2 μm thick, intrabaculate; present specimens: overall width of grains 57 - 77 μm, overall length of grains 33 - 40 μm, overall height of grains 29 - 37 μm, width of central body 32 - 55 μm, length of central body 27 - 35 μm, height of central body 18 - 20 μm, width of sacci 25 μm, length of sacci 33 - 40 μm, height of sacci 23 - 35 μm, width of sacci in lateral view 21 - 32 μm; cap 1.5 - 4 μm thick.

Occurrence: Hamanaka-Oborogawa, Akkeshi, and Tokotan Formations in Akkeshi and Ochiishi areas (AKK-07, OCH-02, OCH-05, OCH-09 and OCH-13).

Previous records: Upper Jurassic, British Columbia (Canada) (Rouse, 1959); Santonian, Taneichi (Japan) (Takahashi & Sugiyama, 1990).

Remarks: These grains show a fairly close similarity to Pityosporites alatipollenites (Rouse) Takahashi & Sugiyama.

Botanical affinity: Pinaceae, Pinus.

(155) Pityosporites aliformis Takahashi

Pl. 25, figs. 1, 2.


Description: See Takahashi (1964).

Dimensions: 73 - 85 μm in size, longest diameter of bladders 40 - 50 μm; cap less than 2 μm thick, intrarugulate (Takahashi, 1964); overall breadth of grains 60 - 75 μm, breadth of central body 42.8 - 46 μm, length of central body 33 - 45 μm, breadth of bladders 20.1 - 25.7 μm, length of bladders 31.5 - 44.7 μm (Takahashi, 1988); overall width of grain 85 μm, overall length of grain 55 μm,
width of central body 64 μm, length of central body 49 μm, width of bladders 22 μm, length of bladders 51 μm, cap 2 μm thick, intrabaculate (Takahashi & Sugiyama, 1990); present specimens: overall width of grains 77–85 μm, overall length of grains 42–45 μm, width of central body 50–56 μm, length of central body 40 μm, width of bladders 40 μm, length of bladders 34–45 μm, cap 3 μm thick.

**Occurrence:** Tokotan Formation in Ochiishi area (OCH–04 and OCH–10).

**Previous records:** Campanian, Yubari coal-field, Hokkaido (Japan) (Takahashi, 1964); Coniacian-Santonian, Futaba (Japan) (Takahashi, 1988); Santonian, Taneichi (Japan) (Takahashi & Sugiyama, 1990).

**Remarks:** *Pityosporites aliformis* Takahashi is a species occurring in the upper Upper Cretaceous of Japan. The present specimens seem to be referred to *Pityosporites aliformis*.

**Botanical affinity:** Pinaceae, *Pinus*.

(156) *Pityosporites cretaceus* Takahashi & Sugiyama

Pl. 25, fig. 7.


**Description:** See Takahashi & Sugiyama (1990).

**Dimensions:** Overall width of grains 62–76 μm, overall length of grains 44–48 overall length of grains 40–50 μm, width of central body 47–58 μm, length of central body 44–47 μm, height of central body 22–37 μm, width of sacci 30–34 μm, length of sacci 39–45 μm, height of sacci 25–42 μm, width of sacci in lateral view 22–30 (Takahashi & Sugiyama, 1990); present specimen: overall width of grain 68 μm, overall length of grain 40 μm, width of central body 50 μm, length of central body 24 μm, width of sacci 21 μm, length of sacci 44 μm.

**Occurrence:** Tokotan Formation in Ochiishi area (OCH–04).

**Previous record:** Santonian, Taneichi (Japan) (Takahashi & Sugiyama, 1990).

**Remarks:** In morphological characters the grain cannot be distinguished from *Pityosporites cretaceus* Takahashi & Sugiyama from the Santonian Uge Member of the Taneichi Formation, northeast Japan.

**Botanical affinity:** Pinaceae, *Pinus*.

(157) *Pityosporites cf. insignis* (Naumova ex Bolkhovitina) Krutzsch

Pl. 28, fig. 5.


1984 *Pityosporites insignis* (Naumova ex Bolkhovitina 1953) Krutzsch 1971, Mohr Palaeontographica, B, 191, p. 56, pl. 6, figs. 5.1-5.3.

1984 *Pityosporites insignis* (Naumova 1937 ex Bolkhovitina 1953) Krutzsch 1971, Kirchner, Palaeontographica, B, 192, pp. 98-99, pl. 3, fig. 3.

1986 *Pityosporites insignis* (Naumova ex Bolkhovitina) Krutzsch, Takahashi & Jux, Bull. Fac. Liberal Arts, Nagasaki Univ., Nat. Sci., vol. 26, no. 2, pp. 91-92, pl. 17, fig. 3; pl. 20, fig. 3.

**Description:** See Bolkhovitina (1953) and Krutzsch (1971)

**Dimensions:** Overall width of grain 49—(53)—58.5 μm, height of grain 43—(45.5)—49.5 μm, height of bladders 30.5—(32.5)—37.5 μm (Chlonova, 1960); overall width of grain~65 μm, overall height of grain 45 μm, width of central body 42 μm, length of central body 45 μm, width of sacci in lateral view 26—28 μm, length of sacci 37—39 μm (Krutzsch, 1971); total breadth of grain 48—65 μm, breadth of central body 31—42 μm, length of central body 31—41 μm, length of bladders 28—42 μm, breadth of bladders 21.5—25 μm, height of central body 28—32 μm, height of bladders 31—33 μm, breadth of bladders in lateral view 25—26 μm, cap thin, 1.2 μm thick (Takahashi & Shimono, 1982); overall size ca. 65 μm (Mohr, 1984); overall width 50—71 μm, width of central body 35—49 μm, length of central body 38—62 μm, height of central body 25—43 μm, width of sacci in lateral view 32—42 μm, length of sacci 31—45 μm, height of sacci 23—29 μm, width of sacci 20—30 μm (Takahashi & Jux, 1986); present specimen: overall width 53 μm, width of central body 48 μm, length of central body 53 μm, width of sacci 16—18 μm, length of sacci 43 μm; cap 3.5 μm thick; distal furrow between sacci 15 μm wide.

**Occurrence:** Akkeshi Formation in Akkeshi area (AKK-05).

**Previous records:** Upper Cretaceous-Pliocene (Krutzsch, 1971); Maastrichtian, Hida (Japan) (Takahashi & Shimono, 1982).

**Remarks:** Only one specimen was observed. This can be compared fairly
with *Pityosporites insignis* (Naumova ex Bolkhovitina) Krutzsch in general morphological characters.

**Botanical affinity:** Pinaceae, *Pinus*.

(158) *Pityosporites cf. labdacus* (Potonié) Thomson & Pflug

Pl. 27, fig. 1.

1951 *Abiespollenites labdacus minor* R. Potonie,  *Palaeontographica, B*, 91, pl. 20, fig. 22.

**Description:** See Potonié (1931) and Thomson & Pflug (1953).

**Dimensions:** 72 μm in size (Potonié, 1931); ± 75 μm in size (Potonié, 1951); 45–100 μm in size (Thomson & Pflug, 1953); overall width of grain 69 μm, overall height of grain 46 μm, width of central body 48 μm, length of central body 47 μm, width of bladders ~30–35 μm, length of bladders 40–45 μm (Krustzsch, 1971); overall width of grain 58–86 μm, width of central body 41–46 μm, length of central body 38–65 μm, height of central body 37–56 μm, length of sacci 37–56 μm, width of sacci in lateral view 38 μm, height of sacci 20 μm, width of sacci 26–37 μm (Takahashi & Jux, 1986); present specimen: overall width of grain 54 μm, overall length of grain 43 μm, width of central body 47 μm, length of central body 43 μm, width of sacci 27 μm, length of sacci 41 μm; cap 3 μm thick.

**Occurrence:** Tokotan Formation in Ochiishi area (OCH–04).

**Previous records:** Tertiary, Europe (Krustzsch, 1971).

**Remarks:** A single specimen was encountered which is undoubtedly *Pityosporites labdacus* (Potonié) Thomson & Pflug.

**Botanical affinity:** Pinaceae, *Pinus*. 
1957 *Pinus minutus* Zaklinskaja, Trudy Geol. Inst., Acad. Sci. USSR, 6. p. 155, pl. 14, fig. 4, text-fig. 17.


1984 *Pityosporites minutus* (Zaklinskaja 1957) Krutzsch 1971, Kirchner, Palaeontographica, B, 192, p. 99, pl. 3, fig. 4.


**Description:** See Zaklinskaja (1957) and Krutzsch (1971).

**Dimensions:** Overall width of grain 45–50 μm, width of central body 30–35 μm, height of central body 25 μm, length of central body 27 μm, width of saccus 20 μm, length of saccus 23 μm; cap 3 μm thick (Zaklinskaja, 1957); overall width of grain 45–50 μm, overall height of grain up to 30 μm, height of central body 27 μm, width of central body 30–35 μm, width of sacci up to 15 μm, height of sacci up to 20 μm (Krutzsch, 1971); 55–60 μm in size (Mohr, 1984); 45 μm (Kirchner, 1984); overall width of grain 41–51 μm, width of central body 28–44 μm, length of central body 24–32 μm, height of central body 18–30 μm, width of sacci 13–30 μm, length of sacci 26–40 μm, height of sacci 20–32 μm, width of sacci in lateral view 14–17 μm; cap 1.5–3 μm thick (Takahashi & Jux, 1986); overall width of grain 46–55 μm, overall height of grain 31–38 μm, width of central body 37–40 μm, height of central body 25–30 μm, height of sacci 23–31 μm, width of sacci in lateral view 16–21 μm, cap 2–4 μm thick (Takahashi & Sugiyama, 1990); present specimens: overall of grain 48–50 μm, overall length of grain 29 μm, overall height of grain 34 μm, width of central body 30–40 μm, length of central body 24 μm, height of central body 27 μm, width of sacci 14–20 μm, height of sacci 17 μm, length of sacci 29 μm, width of sacci in lateral view 28 μm.

**Occurrence:** Akkeshi Formation in Akkeshi and Ochiishi areas (AKK–10 and OCH–08).
**Previous records:** Oligocene, Pavlodar Irtysh basin (USSR) (Zaklinskaja, 1957); Palaeocene, West Europe; Miocene to Plio-Pleistocene, Middle Europe (Krutzsch, 1971); Pliocene, Rhine land (W. Germany) (Mohr, 1984); late Oligocene, upper Bavarian folded molasse (W. Germany) (Kirchner, 1984); late Oligocene, St. Augustin (W. Germany) (Takahashi & Jux, 1986); Santonian, Taneichi (Japan) (Takahashi & Sugiyama, 1990).

**Remarks:** This species occurs probably in Tertiary of Europe and Upper Cretaceous of Japan.

**Botanical affinity:** Pinaceae, *Pinus*.

(160) *Pityosporites pristinipollinius* (Traverse) Krutzsch
Pl. 24, fig. 11.

1971 *Pityosporites pristinipollinius* (Traverse) Krutzsch, Atlas, Lfg. VI, p. 72, pl. 11, figs. 1–11.

**Description:** See Traverse (1955) and Krutzsch (1971).

**Dimensions:** Overall size ca. 65 \(\mu m\) by 94 \(\mu m\), body ca. 53 \(\mu m\) by 70 \(\mu m\), bladders ca. 32 \(\mu m\) by 44 \(\mu m\) (Traverse, 1955); overall width of grain 45–50 \(\mu m\), height of grain up to 30 \(\mu m\), body 27 \(\mu m\), width of central body 30–35 \(\mu m\), width of sacci up to 15 \(\mu m\), width of sacci in lateral view up to 20 \(\mu m\) (Krutzsch, 1971); overall width of grain 80–95 \(\mu m\), length of central body 26–57 \(\mu m\), width of central body 48–69 \(\mu m\), height of central body 31–45 \(\mu m\), length of sacci 33–58 \(\mu m\), width of sacci in lateral view 41–57 \(\mu m\), height of sacci 33–38 \(\mu m\), width of sacci 22–41 \(\mu m\) (Takahashi & Jux, 1986); present specimen: overall width of grain 93 \(\mu m\), overall height of grain 52 \(\mu m\), width of central body 70 \(\mu m\), height of central body 45 \(\mu m\), height of sacci 30 \(\mu m\), width of in lateral view 40 \(\mu m\); cap 3 \(\mu m\) thick.

**Occurrence:** Akkeshi Formation in Ochiishi area (OCH – 06).

**Previous records:** Late Oligocene, Brandon (USA) (Traverse, 1955); Palaeocene-Miocene, Europe (Krutzsch, 1971; Nagy, 1985; Takahashi & Jux, 1986).

**Remarks:** In general morphological characters the single specimen cannot be distinguished from *Pityosporites pristinipollinius* (Traverse) Krutzsch.

**Botanical affinity:** Pinaceae, *Pinus*. 

---

288 K. Takahashi
(161) *Pityosporites scopulipites* (Wodehouse) Krutzsch

Pl. 26, figs. 3, 12.


1986 *Pityosporites scopulipites* (Wodehouse) Krutzsch, Takahashi & Jux, Bull. Fac. Liberal Arts, Nagasaki Univ., Nat. Sci., vol. 26, no. 2, pp. 96–97, pl. 12, fig. 13; pl. 15, figs. 7–8; pl. 16, figs. 2–4; pl. 18, fig. 10 (cf.).


Description: See Wodehouse (1933) and Krutzsch (1971).

Dimensions: 54–60 μm in diameter (Wodehouse, 1933); overall width of grain 57 μm, overall height of grain 37 μm, height of central body up to 25 μm, width of central body up to 40 μm, width of sacci 24–27 μm, height of sacci up to 25 μm (Krutzsch, 1971); overall width of grain 47–78 μm, width of central body 35–58 μm, length of central body 27–47 μm, height of central body 16–44 μm, length of sacci 24–46 μm, height of sacci 24–46 μm, width of sacci in lateral view 16–33 μm, width of sacci 18–32 μm; cap 1.5–2 μm thick (Takahashi & Jux, 1986); overall breadth 52.6 μm, breadth of central body 43.8 μm, length of central body 35 μm, breadth of bladders 25.4 μm, length of bladders 38.4 μm; proximal cap ca. 3 μm thick, intrarugulate (Takahashi, 1988); overall width of grain 56–56.3 μm, overall height of grain 40–42.5 μm, width of central body 46–47.5 μm, height of central body 26.3–32 μm, height of sacci 25.4–32 μm, width of sacci in lateral view 21.3–25 μm; cap 1 μm thick (Takahashi & Sugiyama, 1990); present specimens: overall width of grain 60–70 μm, overall length of grain 42–45 μm, width of central body 45–60 μm, length of central body 39–45 μm, width of sacci 38 μm, length of sacci 38–41 μm; cap 2–4 μm thick.

Occurrence: Akkeshi Formation in Akkeshi and Ochiishi areas (AKK–05 and OCH–06).


Remarks: This species appears probably from the Eocene to Miocene of USA.
and Germany and from the Upper Cretaceous of Japan.  

**Botanical affinity:** Pinaceae, *Pinus.*

(162) *Pityosporites siegburgensis* Takahashi & Jux  
Pl. 26, figs. 1 (cf.), 5–9; pl. 28, fig. 4.


**Description:** See Takahashi & Jux (1986).  
**Dimensions:** Overall width of grain 40–46 μm, overall height of grain 38 μm, width of central body 24 (?)–47 μm, length of central body 36–55 μm, height of central body 20–30 μm, length of sacci 32–52 μm, width of sacci 12–31 μm, exine 1.5–4 μm thick (Takahashi & Jux, 1986); overall breadth 59.8 μm, breadth of central body 37.3 μm, length of central body 45.2 μm, breadth of bladders 26.5 μm, length of bladders 40.3 μm, proximal cap 1.3 μm thick, intrabaculate (Takahashi, 1988); overall width of grain 36–48.5 μm, overall length of grain 37–44 μm, overall height of grain 33.8 μm, width of central body 32–43.8 μm, length of central body 33.8–45 μm, height of central body 26.2 μm, width of sacci 12.3–23 μm, length of sacci 31.5–40.7 μm, height of sacci 21.5 μm, width of saccus in lateral view 11.5 μm, exine 1.5–3.5 μm thick; present specimens: overall width of grain 25–44 μm, overall length of grain 40–47 μm, overall height of grain 30 μm, width of central body 13–44 μm, length of central body 40–44 μm, height of central body 20 μm, width of bladders 16–25 μm, length of bladders 34–40 μm, height of bladders 10 μm, width of bladders in lateral view 41 μm; cap 1–3 μm thick.  

**Occurrence:** Akkeshi and Tokotan Formations in Akkeshi and Ochiishi areas (AKK-05, AKK-09, AKK-12, OCH-03, OCH-04, OCH-06, and OCH-09).  

**Previous records:** Late Oligocene, St. Augustin (Germany) (Takahashi & Jux, 1986); Coniacian, Futaba (Japan) (Takahashi, 1988); Santonian, Taneichi (Japan) (Takahashi & Sugiyama, 1990).  

**Remarks:** This species is probably a species of the Tertiary of Europe and of the Upper Cretaceous of Japan.
Botanical affinity: Pinaceae, *Pinus*.

(163) *Pityosporites* sp. a

Pl. 26, fig. 2.

Description: Bisaccate, pinoid pollen grain. Outline suboblate in lateral view. Sacci very small, finely reticulate (?). Central body finely punctate (?); exine thin. Distal furrow between sacci moderately wide, smooth.

Dimensions:
- Overall width of grain: 36 \( \mu m \).
- Overall height of grain: 30 \( \mu m \).
- Width of central body: 29 \( \mu m \).
- Height of central body: 25 \( \mu m \).
- Width of sacci in lateral view: 19 \( \mu m \).
- Height of sacci: 8 \( \mu m \).

Occurrence: Akkeshi Formation in Akkeshi area (AKK-09).

Remarks: A single specimen was observed. This is a small form of *Pityosporites*.

Botanical affinity: Pinaceae, *Pinus*.

(164) *Pityosporites* sp. b

Pl. 26, fig. 11.

Description: Bisaccate, pinoid pollen grain. Outline subcircular to subquadr- rate in polar view. Sacci small, very finely reticulate (?). Central body char- genate (?); exine thin. Distal furrow between sacci relatively narrow, char- genate.

Dimensions:
- Overall width of grain: 32 \( \mu m \).
- Overall length of grain: 32 \( \mu m \).
- Width of central body: 32 \( \mu m \).
- Length of central body: 32 \( \mu m \).
- Width of bladders: 15 \( \mu m \).
- Length of bladders: 31 \( \mu m \).

Occurrence: Akkeshi Formation in Ochiishi area (OCH-06).

Remarks: A single specimen which is imperfect in preservation was observed. This is somewhat similar to *Pityosporites* sp. a, but cannot be identified specifically.

Botanical affinity: Pinaceae, *Pinus*. 
(165) *Pityosporites* sp. c
Pl. 26, figs. 4, 10, 13.

**Description:** Bis acc te, pinoid pollen grains. Outline subcircular in polar view and suboblate in lateral view. Sacci finely reticulate (?); exine finely punctate, 1–2 μm thick. Distal furrow between sacci narrow, smooth (?).

**Dimensions:** Overall width of grain: 40–49 μm.
Overall length of grain: 37–45 μm.
Overall height of grain: 34 μm.
Width of central body: 36–38 μm.
Length of central body: 37–45 μm.
Height of central body: 18 μm.
Width of bladders: 22–41 μm.
Length of bladders: 31–33 μm.
Height of bladders: 15–25 μm.
Width of bladders in lateral view: 34 μm.

**Occurrence:** Hamanaka-Oborogawa, Akkeshi, and Tokotan Formations in Akkeshi and Ochiishi areas (AKK-07, AKK-10, and OCH-03).

**Remarks:** Three specimens were found, which could not be identified specifically.

**Botanical affinity:** Pinaceae, *Pinus*.

**Genus:** *Pristinuspollenites* B. D. Tschudy 1973.

**Type species:** *Pristinuspollenites microsaccus* (Couper 1958) B. D. Tschudy 1973.

(166) *Pristinuspollenites microsaccus* (Couper) B. D. Tschudy
Pl. 28, figs. 7a−b; pl. 29, figs. 5a−b.

1958 *Pteruchipollenites microsaccus* Couper, Palaeontographica, B, 103, Lfg. 4–6, p. 151, pl. 26, figs. 13–14.
1962 *Alisporites cf. A. microsaccus* (Couper) Pocock, Palaeontographica, B, 111, Lfg. 1–3, p. 61, pl. 9, figs. 138–139.
1973 *Pristinuspollenites microsaccus* (Couper 1958) B. D. Tschudy, Geol. Surv. Prof. Paper, 770, pp. 17–18, pl. 7, figs. 4−6; tab. no. 82.
Description: See Couper (1958) and B. D. Tschudy (1973).
Dimensions: Length of body 55–(60)–78 μm, breadth of body 30–(48)–58 μm, length of bladder 53–(60)–75 μm, breadth of bladder 18–(25)–30 μm, overall breadth 35–(55)–68 μm, ratio length to breadth of body 1.0–(1.33)–1.9; exine of proximal cap around 1 μm thick (Couper, 1958); length of bladders 45–(67)–90 μm, length of central body 50–(70)–92 μm, breadth of bladders 20–(33)–45 μm, total breadth of grain 45–(69)–88 μm, height of central body ± 50 μm, breadth of central body 33–(57)–70 μm, diameter of elements of bladder reticulate ±1.5 μm, width of distal furrow 3–(7)–15 μm (Pocock, 1962); central body 33–38 μm, air sacs 8–12 μm high and 30 μm wide, grain size 33–40 μm; proximal cap 1 μm thick, scabrate (Burger, 1966); length of central body 37–56 μm, breadth of central body 30–46 μm, length of sacchi 25–46 μm, breadth of sacchi 7–13 μm, total breadth of grain 30–46 μm (B. D. Tschudy, 1973); width of central body 43–67 μm, length of central body 55–74 μm, width of sacchi 7–25 μm, length of sacchi 27–55 μm; exine 1.3–2.5 μm thick, intrarugulate or intrabaculate; length/width ratio: 0.97–1.52 (Takahashi & Sugiyama, 1990); present specimens: overall width of grain 43–45 μm, overall length of grain 49–53 μm, width of central body 43 μm, length of central body 49–53 μm, width of sacchi 7–16 μm, width of sacchi 24–39 μm.
Occurrence: Akkeshi and Tokotan Formations in Ochiishi area (OCH–06 and OCH–10).
Previous records: Jurassic (Bathonian), British Isles (Couper, 1958); upper Jurassic-Lower Cretaceous, W. Canada plains (Pocock, 1962); Jurassic (higher upper Malm)-Wealden, the E. Netherlands (Burger, 1966); upper Campanian, North-central Montana (USA) (B. D. Tschudy, 1973); Santonian, Taneichi (Japan) (Takahashi & Sugiyama, 1990).
Remarks: Two specimens from Ochiishi are identified with Pristinuspollenites microsaccus (Couper) B. D. Tschudy (1973) in spite of their small size of the grain.
Botanical affinity: Pteridospermae (??).

Genus: Psophosphaera Naumova 1937 ex Bolkhovitina 1953.
Type species: Psophosphaera tenuis Naumova ex Bolkhovitina 1953.

(167) Psophosphaera aggereloides (Maljavkina) Chlonova
Pl. 21, figs. 24, 25; pl. 22, figs. 2, 3, 5–7.
1949 Bullulina aggereloides f. glabrescens Maljavkina, Trudy VNIGRI, no. 33, p. 133, pl. 49, fig. 7.


Description: See Maljavkina (1949) and Chlonova (1960).

Dimensions: 0.06 mm. in diameter; exine thin, finely sporadically punctate-almost laevigate (Maljavkina, 1949); 40–(50.5)–66 μm in diameter; exine very thin, laevigate (Chlonova, 1960); 41–58 μm X 30–51 μm in diameter; exine thin, laevigate, with crumpling folds (Takahashi & Shimono, 1982); 48–55 μm X 36–45 μm in diameter; exine less than 1 μm thick, laevigate, diagenetically crumpled (Takahashi & Jux, 1989); 45–52.9 μm X 41–50.6 μm in diameter; exine 0.5 μm thick, smooth (Takahashi & Sugiyama, 1990); present specimens: 36–56 μm in diameter; exine 0.5–1 μm thick.

Occurrence: Hamanaka-Oborogawa, Akkeshi, and Tokotan Formations in Akkeshi and Ochiishi areas (AKK-05, AKK-07, AKK-11, OCH-03, OCH-06 and OCH-09).

Previous records: Albian-Cenomanian, western Siberia (USSR) (Maljavkina, 1949); Cenomanian-early Paleogene, Chulymo-Eniseisk basin (USSR) (Chlonova, 1960); Maastrichtian, Hida (Japan) (Takahashi & Shimono, 1982); late Eocene-early Oligocene, Fayum Oasis (Egypt) (Takahashi & Jux, 1989); Santonian, Taneichi (Japan) (Takahashi & Sugiyama, 1990).

Remarks: This species appears in the Upper Cretaceous of Japan. In some foreign countries the species occurs in the Cretaceous to Palaeogene.

Botanical affinity: Larix or Pseudotsuga.

(168) Psophosphaera pseudotsugoides Krutzsch
   Pl. 22, figs. 1a–b, 4, 9.

1971 Psophosphaera pseudotsugoides Krutzsch, Atras, Lfg. VI, p. 192, pl. 61, figs. 1–6.


**Description:** See Krutzsch (1971).

**Dimensions:** 70–80 µm (sometimes ca. 110–120 µm) in size; exine more than 1 µm (up to 1.5 µm) thick, laevigate to punctate (Krutzsch, 1971); 55–63 µm (rarely 140 µm) in diameter; exine 1–2 µm thick (Takahashi & Jux, 1986); 77.6–87 µm in diameter; exine 1.8 µm thick (Takahashi, 1988); 77 µm in diameter; exine 1.5 µm thick (Takahashi & Jux, 1988); 61.7–102 µm X 49.4–87 µm in diameter; exine 2–2.5 µm thick (Takahashi & Sugiyama, 1990); present specimens: 64–78 µm in diameter; exine 2–3 µm thick.

**Occurrence:** Akkeshi and Tokotan Formations in Akkeshi and Ochiishi areas (AKK–05, AKK–10, AKK–11, OCH–09 and OCH–10).

**Previous records:** Oligocene-Pliocene, Germany (Krutzsch, 1971); late Oligocene, St. Augustin (W. Germany) (Takahashi & Jux, 1986); Coniacian, Futaba (Japan) (Takahashi, 1988); middle Tertiary, Jos Plateau (Nigeria) (Takahashi & Jux, 1989); Santonian, Taneichi (Japan) (Takahashi & Sugiyama, 1990).

**Remarks:** This species is rather a common species in the Tertiary of Middle Europe and appears sometimes in the Upper Cretaceous of Japan.

**Botanical affinity:** *Larix* or *Pseudotsuga*.

---

(169) *Psophosphaera* sp.

Pl. 22, fig. 8.

**Description:** Inaperturate pollen grain with subcircular outline. Exine 3 µm thick, two layered, laevigate; endexine 0.5 µm thick.

**Dimensions:** 43 X 36 µm in diameter.

**Occurrence:** Tokotan Formation in Ochiishi area (OCH–04).

**Remarks:** The single specimen is similar to *Inaperturopollenites dubius* (Pot. & Ven.) Thomson & Pflug and *I. hiatus* (Pot.) Thomson & Pflug in general morphology, but differs from *I. dubius* in having thicker and laevigate exine and from *I. hiatus* in possessing thicker exine and no opening of exine.
Botanical affinity: *Larix* (?) or *Pseudotsuga* (?)

**Genus:** Rossipollis Krutzsch 1970.
**Type species:** *Rossipollis reticulatus* (Ross 1949) Krutzsch (1970).

(170) *Rossipollis minor* n. sp.
Pl. 25, figs. 10, 11.

**Description:** Small, longisulcoid pollen grains with subcircular outline. Exine thin, two layered, 1 µm thick, finely punctate; ectexine twice as thick as endexine. The sulcus-like structure extends only little beyond the equator onto the other face and is developed as a very narrow groove or ditch.

**Dimensions:** 11–13 µm X 12–16 µm in diameter.

**Occurrence:** Akkeshi and Tokotan Formations in Ochiishi area (OCH - 03 and OCH - 06).

**Holotype:** Pl. 25, fig. 10; 16 X 13 µm in diameter; exine two layered, 1 µm thick, finely punctate; ectexine twice as thick as endexine; Tokotan Formation in Ochiishi area (OCH - 03); slide No. GN 5613.

**Name derivation:** *minor* (lat.) = less, smaller.

**Comparison:** The author cannot find a species identifiable with the present form of *Rossipollis*. *Rossipollis reticulatus* (Ross 1949) Krutzsch (1970) and *R. bisulcus* (Martinova 1960) Krutzsch (1970) have large size and thick exine.

**Botanical affinity:** Possibly gymnospermous.

(171) *Rossipollis* sp.
Pl. 25, figs. 12a–b.

**Description:** Small, longisulcoid pollen grain. Outline subcircular in equatorial view. Exine thin, 1 µm thick, smooth; ectexine as thick as endexine. The sulcus extends only little beyond (?) the equator onto the other face and is developed as a very narrow furrow (colpus).

**Dimensions:** 11 X 11 µm in diameter.

**Occurrence:** Tokotan Formation in Ochiishi area (OCH - 03).

**Remarks:** Only one specimen was found. This differs from *Rossipollis minor* n. sp. in having smooth exine.

**Botanical affinity:** Possibly gymnospermous.

Palynologic study of the Akkeshi and Tokotan Formations 297

Type species: *Sciadopityspollenites serratus* (Potoniè & Venitz 1934) Thiergart 1937.

(172) *Sciadopityspollenites* sp.
Pl. 21, fig. 17.

Description: Inaperturate pollen grain with circular outline. Exine ornamented with small warts; warts 1 μm high. These warts are rather uniform in size, each with a slightly uneven, rounded surface. Their outline circular to polygonal or elongate.

Dimensions: 19.5 X 21.5 μm in diameter.

Occurrence: Tokotan Formation in Ochiishi area (OCH-02).

Remarks: The present specimen is a small form of *Sciadopityspollenites*. The author cannot find a comparable species.

Botanical affinity: Taxodiaceae, *Sciadopitys*.


Type species: *Vitreisporites signatus* Leschik 1955.

(173) *Vitreisporites pallidus* (Reissinger) Nilsson
Pl. 24, fig. 4.

1958 *Caytonipollenites pallidus* (Reissinger) Couper, Palaeontographica, B, 103, Fig. 4–6, p. 150, pl. 26, figs. 12–13.
1962 *Vitreisporites pallidus* (Reissinger) Nilsson, Pocock, Palaeontographica, B, 111, Fig. 1–3, pp. 58–59, pl. 9, figs. 134, 135.
1969 *Vitreisporites pallidus* (Reissinger) Brenner, Habib, Micropaleontology, vol. 15, no. 1, pl. 2, fig. 11.
1973 *Vitreisporites pallidus* (Reissinger) Nilsson 1958, B. D. Tschudy, Geol. Surv. Prof. Pager 770, pp. 18–19, pl. 8, figs. 1–2; tabl. 1, no. 53.
Description: Reissinger (1958) and Nilsson (1958).

Dimensions: 18 - 34 μm in length (Reissinger, 1950); size range 20 - 38 μm (Couper, 1958); size range 25 - 30 μm (Nilsson, 1958); length of body 12 - (17) - 21 μm, breadth of bladders 6 - (11) - 13 μm, total breadth of grain 21 - (30) - 42 μm, length of bladders 9 - (15) - 19 μm, ratio length to breadth of body 1.2 - (1.7) - 2.6 (Pokock, 1962); grain size 22 - 29 μm, central body 10 - 15 μm, air sacs 10 μm in height and 10 - 13 μm in width (Burger, 1966); overall breadth 21 - (25) - 33 μm, corpus breadth 7 - (9) - 10 μm, corpus length 10 - (13) - 15 μm, saccus breadth 11 - (13) - 17 μm, saccus length 10 - (14) - 18 μm (Kemp, 1970); 25 - 40 μm in overall length (Miki, 1972); total breadth of grain 25 - 38 μm, length of bladders 11 - 21 μm, breadth of bladders 7.5 - 16 μm, length of central body 14 - 21 μm, breadth of central body 7 - 16 μm (B. D. Tschudy, 1973); total width of grain 2 - 40 μm, breadth of central body 6 - 18 μm, length of central body 12 - 25 μm, breadth of bladders 7 - 18 μm, length of bladders 12 - 25 μm (Srivastava, 1975); 45 μm in size (Norvick & Burger, 1976); overall breadth of grain 25 μm, breadth of central body 11.6 μm, length of central body 16 μm, breadth of bladders 10.4 μm, length of bladders 16 μm (Takahashi, 1988); overall breadth of grain 38 - 49 μm, overall length of grain 17 - 30 μm, breadth of central body 8 - 15 μm, length of central body 16.5 - 27 μm, breadth of bladders 15 - 20 μm, length of bladders 23 - 30 μm (Takahashi & Sugiyama, 1990); present specimen: overall width of grain 31 μm, overall length of grain 17 μm, width of central body 20 μm, length of central body 17 μm, width of bladders 15 μm, length of bladders 16 μm; cap 1.5 μm.

Occurrence: Akkeshi Formation in Ochiishi area (OCH-08).

Previous records: Lower Jurassic-Eocene, Europe; Cretaceous, USA and Canada; Triassic and Cretaceous, Australia; Cenomanian-lower Campanian, Japan.

Remarks: Vitreisporites pallidus (Reissinger) Nilsson is a species occurring widely in the Mesozoic of the world.

Botanical affinity: Caytoniales, Caytonanthus.
(174) Bisaccate pollen (? Phyllocladidites)
Pl. 28, fig. 8.

**Remarks:** Whether this specimen is a bisaccate pollen grain or not, is unexplained.

**Dimensions:**
- Central body 23 X 21 \( \mu m \).
- Bladders ..........5 X 9 \( \mu m \).
- Cap...................1.5 \( \mu m \) thick.

**Occurrence:** Tokotan Formation in Ochiishi area (OCH-10).

**Botanical affinity:** Unknown.

(175) Indeterminable bisaccate pollen
Pl. 28, fig. 1.

**Remarks:** The present specimen is probably a bisaccate pollen grain which is not well in preservation.

**Dimensions:**
- Central body 91 X 45 \( \mu m \).
- Bladders ......41 X 83 \( \mu m \).
- Cap...............3 \( \mu m \) thick.

**Occurrence:** Tokotan Formation in Ochiishi area (OCH-04).

**Botanical affinity:** Pinaceae (?).

(176) Indeterminable coniferous pollen?
Pl. 24, figs. 5a—b.

**Description:** Bisaccate pollen grain (?). Outline somewhat quadrate in lateral view. Sacci small, granulate and echinate. Central body granulate and echinate; exine thin. Distal furrow between sacci narrow, granulate.

**Dimensions:**
- Overall width of grain: 29 \( \mu m \).
- Overall height of grain: 25 \( \mu m \).
- Width of central body: 22 \( \mu m \).
- Height of central body: 19 \( \mu m \).
- Width of bladder: 14 \( \mu m \).
- Height of bladder: 16 \( \mu m \).

**Occurrence:** Tokotan Formation in Ochiishi area (OCH-03).

**Remarks:** The present specimen is different from the genera Pityosporites and Phyllocladidites, because central body and sacci of the grain possess granulate-echinate sculptures.
Botanical affinity: Coniferous pollen (?).

C) Angiospermous pollen grains:
Type species: *Aquilapollenites quadrilobus* Rouse 1957.

(177) *Aquilapollenites latialatus* Takahashi
Pl. 34, figs. 1a–b.


Description: See Takahashi & Shimono (1982).
Dimensions: Length of the polar axis 36.5 – 43 μm; length of the proximal polar projection 7 – 13 μm; length of the distal polar projection 7 – 9 μm; equatorial diameter 40 – 50 μm; length of the equatorial projections 15 – 20 μm; breadth of the proximal projection 11.5 – 17.5 μm; breadth of the distal polar projection 11 – 14 μm; breadth of the equatorial projections 19 – 25 μm; length of polar axis (a)/breadth of equatorial projection (b) = 1.72 – 2.11 (Takahashi & Shimono, 1982); present specimen: length of the polar axis 35 μm; equatorial diameter 40 μm; length of the proximal polar projection 10 μm; length of the distal polar projection 9 μm; length of the equatorial projection 15 μm; width of the proximal polar projection 16 μm; width of the distal polar projection 12.5 μm; width of the equatorial projection 16 μm; a/b = 2.18.

Previous records: Maastrichtian, Hida (Japan) (Takahashi & Shimono, 1982).
Remarks: In all morphological characters the present specimen coincides with *Aquilapollenites latialatus* Takahashi from the Maastrichtian Miyadani-Gawa Formation of Hida (central Japan).
Botanical affinity: Unknown.

(178) *Aquilapollenites melior* Takahashi & Shimono
Pl. 31, figs. 2a–b; pl. 35, figs. 3a–c.


Description: See Takahashi & Shimono (1982).
Dimensions: Length of the polar axis 32 – 36.7 \( \mu m \); length of the proximal polar projection 10.5 – 11 \( \mu m \); length of the distal polar projection 10 – 14 \( \mu m \); equatorial diameter 38 – 48 \( \mu m \); length of the equatorial projections 15.5 – 17 \( \mu m \); breadth of the polar projections 11 – 16 \( \mu m \); breadth of the equatorial projections 11 – 13 \( \mu m \); \( a/b = 2.82 - 2.91 \) (Takahashi & Shimono, 1982); present specimens: length of the polar axis 32 \( \mu m \); equatorial diameter 33 – 45 \( \mu m \); length of the proximal polar projection 10 \( \mu m \); length of the distal polar projection 16 \( \mu m \); length of the equatorial projections 13 – 20 \( \mu m \); width of the polar projections 12 – 13 \( \mu m \); width of the equatorial projections 12 \( \mu m \); \( a/b = 2.666. \)

Occurrence: Akkeshi and Tokotan Formations in Ochiishi area (OCH – 02 and OCH – 06).

Previous records: Maastrichtian, Hida (Japan) (Takahashi & Shimono, 1982).

Remarks: Two present specimens are more or less not well in preservation. They are identifiable with *Aquilapollenites melior* Takahashi & Shimono from the Maastrichtian Miyadani-Gawa Formation of Hida (central Japan) in all morphological characteristics.

Botanical affinity: Unknown.

(179) *Aquilapollenites melioratus* Takahashi

Pl. 32, figs. 1a – c.


Description: See Takahashi & Shimono (1982).

Dimensions: Length of the polar axis 27.5 – 30.5 \( \mu m \); equatorial diameter 34 \( \mu m \); length of the proximal polar projection 8 – 12 \( \mu m \); length of the distal polar projection 6 – 11 \( \mu m \); length of the equatorial projections 10.5 – 14.5 \( \mu m \); breadth of the polar projections 12.5 – 16.5 \( \mu m \); breadth of the equatorial projections 10 – 12 \( \mu m \); \( a/b = 2.55 - 2.75 \) (Takahashi & Shimono, 1982); present specimen (polar view): equatorial diameter 32 X 23 \( \mu m \) (length of side 37 \( \mu m \)); length of the equatorial projections 13 – 15 \( \mu m \); width of the polar projection 15 \( \mu m \); width of the equatorial projection 10 \( \mu m \).

Occurrence: Akkeshi Formation in Ochiishi area (OCH – 09).

Previous records: Maastrichtian, Hida (Japan) (Takahashi & Shimono, 1982).

Remarks: A single specimen which shows a polar view was found. This is
closely similar to *Aquilapollenites melioratus* Takahashi from the Maastrichtian Miyadani-Gawa Formation of Hida (central Japan) in morphological characters.

**Botanical affinity:** Unknown.

(180) *Aquilapollenites nemuroensis* n. sp.

Pl. 31, figs. 4, 5.

**Description:** Pollen grains with three equatorially situated apical projections and with one projection on each apocolpium; subisopolar; one polar projection relatively short, rounded at apex; the other polar projection broader at its base and tapered towards the apex.

Tricolpate; colpi meridional, across the apices of equatorial projections, extending full length of equatorial projections on either side; exine tectate, echinate and granulate; endexinous thickenings short, well-developed at and near the base of equatorial projections; ornamentation very finely infrareticulate; spinules acuminate, scatteringly distributed at proximal polar projection, somewhat densely distributed at the apices of equatorial projections; granules and spinules somewhat densely distributed on equatorial regions of central body and equatorial projections; spinules 0.5 – 1.5 μm high; distal polar projection smooth.

**Dimensions:** Length of the polar projection 33 μm; length of the proximal polar projection 10 μm; length of the distal polar projection 10 μm; length of the equatorial projections 8–15 μm; equatorial diameter 28–38 μm; width of the proximal polar projection 10–13 μm; width of the distal polar projection 20 μm at base; width of the equatorial projections 9–10 μm; a/b = 2.2.

**Occurrence:** Akkeshi and Tokotan Formations in Ochiishi area (OCH – 05 and OCH – 09).

**Holotype:** Pl. 31, figs. 4a–c; length of the polar axis 33 μm; length of the proximal polar projection 10 μm; length of the distal polar projection 10 μm; length of the equatorial projections 8–11 μm; equatorial diameter 37 μm; width of the proximal polar projection 13 μm; width of the distal polar projection 20 μm at base; width of the equatorial projections 9–10 μm; a/b = 2.2; Tokotan Formation in Ochiishi area (OCH – 05); slide No. GN 5637.

**Name derivation:** From Nemuro City.

**Comparisons:** The new specimens are similar to *Aquilapollenites parvus* Takahashi (1970), but differs in being larger in size and having the smooth polar projection.
Botanical affinity: Unknown.

(181) *Aquilapollenites parvus* Takahashi
Pl. 30, figs. 18a–b (cf.); pl. 32, figs. 5, 7;
pl. 35, figs. 8a–c.


Description: See Takahashi (1970).

Dimensions: Polar axis 24.5–29 \( \mu \text{m} \); equatorial axis 9–11 \( \mu \text{m} \); distance from the center of polar axis to the tips of equatorial protrusions 13–19 \( \mu \text{m} \); breadth of equatorial protrusions 9.4–12 \( \mu \text{m} \) (Takahashi, 1970); present specimens: length of the polar axis 23–27 \( \mu \text{m} \); length of the proximal polar projection 6–8 \( \mu \text{m} \); length of the distal polar projection 7–11 \( \mu \text{m} \); length of the equatorial projections 11–13 \( \mu \text{m} \); equatorial diameter 25–36 \( \mu \text{m} \); width of the proximal polar projection 11–13 \( \mu \text{m} \); width of the distal polar projection 12 \( \mu \text{m} \); width of the equatorial projections 11–12 \( \mu \text{m} \); \( a/b = 2.08–2.27 \).

Occurrence: Akkeshi and Tokotan Formations in Akkeshi and Ochiishi areas (Akk-05, Akk-12, and OCH-05).

Previous records: Maastrichtian (\(?\)), Nishibetsu (borehole No. SK 1,983.0 m in depth) (eastern Hokkaido), Japan (Takahashi, 1970).

Remarks: In general morphological characters the present specimens are referable to *Aquilapollenites parvus* Takahashi from the Maastrichtian (\(?\)) sediments of the borehole No. SK at Nishibetsu (eastern Hokkaido).

Botanical affinity: Unknown.

(182) *Aquilapollenites pseudoaucellatus* Takahashi & Shimono
Pl. 30, figs. 19a–c (cf.); pl. 31, figs. 1a–b.


Description: See Takahashi & Shimono (1982).

Dimensions: Length of the polar axis 44–52 \( \mu \text{m} \); length of the proximal polar
projection 14.5–18 μm; length of the distal polar projection 11–16 μm; equatorial diameter 47–65 μm; length of the equatorial projections 15–24 μm; breadth of the proximal polar projection 17.7–25 μm; breadth of the distal polar projection 15–20 μm; breadth of the equatorial projections 20–21 μm; a/b = 2.14–2.65 (Takahashi & Shimono, 1982); present specimens: length of the polar axis 43–50 μm; length of the proximal polar projection 16 μm; length of the distal polar projection 10–11 μm; length of the equatorial projections 20 μm; equatorial diameter 55 μm; width of the proximal polar projection 17–23 μm; width of the distal polar projection 13–22 (μm); a/b = 2.17 + a – 3.307.

**Occurrence:** Akkeshi and Tokotan Formations in Ochiishi area (OCR – 05 and OCR–06).

**Previous record:** Maastrichtian, Hida (central Japan) (Takahashi & Shimono, 1982).

**Remarks:** One specimen (pl. 30, figs. 19 a–c) is not well in preservation. However, the present specimens are assignable to *Aquilapollenites pseudoaucellatus* Takahashi & Shimono from the Maastrichtian Miyadani-Gawa Formation of Hida (central Japan) by their size, shape, and ornamentation.

**Botanical affinity:** Unknown.

(183) *Aquilapollenites quadrinus* Takahashi

Pl. 33, figs. 1, 2.


**Description:** See Takahashi (1964).

**Dimensions:** Polar axis 47 μm long; length of equatorial projections ca. 19 μm; width of equatorial projections ca. 13.5 μm; distance from the tip of equatorial projection to polar axis ca. 27.5 μm; half-colpi ca. 16 μm long (Takahashi, 1964); length of polar axis 58 μm; length of polar projections 20 μm; length of equatorial projections 25 μm; breadth of polar projections 14 μm; breadth of equatorial projections 22 μm; a/b = 2.64 (Takahashi & Shimono, 1982); present specimens: length of polar axis 43–49 μm; length of proximal polar projection 15–19 μm; length of distal polar projection 19–22 μm; length of equatorial projections 15–20 μm; equatorial diameter 38 (+)–47 μm; width
of proximal polar projection 16–17 \( \mu m \); width of distal polar projection 17–18 \( \mu m \) at base (9 \( \mu m \) in middle part); width of equatorial projections 15 \( \mu m \) at base; \( a/b = 2.866–3.266 \).

**Occurrence:** Akkeshi Formation in Ochiishi area (OCH–06 and OCH–08).

**Previous records:** Maastrichtian, Yubari coal-field (Hokkaido, Japan) (Takahashi, 1964); Maastrichtian, Hida (Japan) (Takahashi & Shimono, 1982).

**Remarks:** Hitherto, this species occurred only in the Maastrichtian formations of Japan.

**Botanical affinity:** Unknown.

**(184) Aquilapollenites** sp.

*Pl. 32, fig. 2.*

**Description:** Pollen grain with three equatorial projections and with a barrel-form of polar body. Isopolar (?); polar projection broad-ellipsoidal in equatorial view. Equatorial projections well-developed, but not well in preservation, with rounded apex, slender.

Tricolpate; colpi extending full length of equatorial projections and for a short distance to poles of body; exine two-layered; axillary endexinous costae as much as 3 \( \mu m \) thick in the thickest part, extending three-fourths the distance to free ends of equatorial projecitons and for a short distance to poles of polar projections; ectexine tectate, with spinules.

**Dimensions:** Length of polar axis: 37 \( \mu m \).

Length of proximal polar projection: 20 \( \mu m \).

Length of distal polar projection: 10 \( \mu m (?) \).

Length of equatorial projections: 25 \( \mu m \).

Width of proximal polar projection: 25 \( \mu m \).

Width of distal polar projection: 25 \( \mu m (?) \).

Width of equatorial projections: 14 \( \mu m \).

\( a/b = 2.64 \).

**Occurrence:** Akkeshi Formation in Akkeshi area (AKK–09).

**Remarks:** Only one specimen with a barrel-shape of the pollen body was found. This is not well in preservation, therefore this is described as *Aquilapollenites* sp.

**Botanical affinity:** Unknown.

**(185) ? Aquilapollenites** sp. a

*Pl. 31, figs. 3a–b.*
Remarks: The present specimen is probably *Aquilapollenites* pollen grain, but the author cannot give a description of the specimen owing to its very bad preservation.

Dimensions: Length of polar axis: 28 \( \mu m \).
- Length of equatorial projection: 23 \( \mu m \).
- Equatorial diameter: 43 \( \mu m \).
- Width of polar body: 22 \( \mu m \).

Occurrence: Tokotan Formation in Ochiishi area (OCH-02).

Botanical affinity: Unknown.

(186) ? *Aquilapollenites* sp. b
Pl. 34, figs. 2a–c.

Description: The pollen grain with three (?) equatorial projections and with one polar projection on each apocolpium. Heteropolar; proximal polar projection short; distal polar projection well-developed; equatorial projections meridional. Tricolpate; colpi extending full length of equatorial projections and for a short part of polar projections; exine two-layered; axillary endexinous costae not so thick; ectexine 1 \( \mu m \), striate.

Dimensions: Length of polar axis: 42 \( \mu m \).
- Length of proximal polar projection: 10 \( \mu m \).
- Length of distal polar projection: 20 \( \mu m \).
- Width of proximal polar projection: 19 \( \mu m \).
- Width of distal polar projection: 24 \( \mu m \).
- Width of equatorial projections: 14 \( \mu m \).
- \( a/b = 3.0 \).

Occurrence: Tokotan Formation in Ochiishi area (OCH-10).

Remarks: A single specimen which is not well in preservation was observed, but could not be identified specifically.

Botanical affinity: Unknown.

Genus: *Arecipites* Wodehouse 1933.
Type species: *Arecipites punctatus* Wodehouse 1933.

(187) *Arecipites monosulcoides* Krutzsch
Pl. 30, figs. 13, 15 (cf.).


**Description:** See Krutzsch (1970).

**Dimensions:** Ca. 25–32 μm, exine 1/2–3/4 μm (Krutzsch, 1970); 25.0 μm X 14.2 μm in size, lumina of reticulum ca. 1 μm, muri less than 0.7 μm high (Takahashi & Jux, 1982); present specimens: 23–31 μm X 13–17 μm in size, muri 0.5 μm high, width/length ratio: 0.548–0.565.

**Occurrence:** Akkeshi Formation in Ochiishi area (OCH-06).

**Previous records:** Miocene-early Pleistocene, middle Europe (Krutzsch, 1970); Palaeogene, Bergish Land (Germany) (Takahashi & Jux, 1982).

**Remarks:** This is one of Tertiary species of *Arecipites* in Europe, but appears in the Upper Cretaceous of Japan.

**Botanical affinity:** Palmae.

---

(188) *Arecipites pflugii* (Takahashi) Krutzsch

Pl. 30, figs. 14a–b.


1979 *Arecipites pflugii* (Takahashi) Krutzsch, Takahashi & Kim, Palaeontographica, B, 170, p. 35, pl. 8, figs. 23, 28, 29.


**Description:** See Takahashi (1961).

**Dimensions:** 18.5–34.5 μm in size, lumina of reticulum 1–3 μm in diameter, colpus less than 2 μm wide (Takahashi, 1961); 18–27 μm X 11.8–19.5 μm in size, exine 0.7 μm thick, lumina of reticulum until 1 μm in diameter, muri until 1.2 μm high (Takahashi & Kim, 1979); 35 X 19 μm in size, exine 1 μm thick, lumina of reticulum 1–3 μm in diameter, width/length ratio: 0.543 (Takahashi & Sugiyama, 1990); present specimen: 22 X 10 μm, lumina of reticulum less than 2 μm in diameter, muri baculate-partially tectate, W/L = 0.455.

**Occurrence:** Akkeshi Formation in Ochiishi area (OCH-09).

**Previous records:** Palaeogene, West Japan (Takahashi, 1961); Campanian, Yubari coal-field (Hokkaido, Japan) (Takahashi, 1964); early Miocene, Changgi
(Korea) (Takahashi & Kim, 1979); Santonian, Taneichi (Japan) (Takahashi & Sugiyama, 1990).

Remarks: The only specimen detected reveals all the characteristic features of *Arecipites pflugii* (Takahashi) Krutzsch.


Type species: *Betulaepollenites microexcelsus* (Potonié 1931) Potonié 1934.

(189) *Betulaepollenites minutulus* Takahashi

Pl. 45, figs. 10, 25–27.


Description: See Takahashi (1964).

Dimensions: 16.8–21.7 μm in size (Takahashi, 1964); 16 μm in equatorial diameter (Takahashi, 1988); present specimens: 17–21 μm in equatorial diameter.

Occurrence: Ramanaka-Oborogawa and Tokotan Formations in Akkeshi and Ochiishi areas (AKK-07, OCR-02, OCR-03, and OCR-05).

Previous records: Maastrichtian, Yubari coal-field (Rokkaido, Japan) (Takahashi, 1964); Coniacian, Futaba (Japan) (Takahashi, 1988).

Remarks: This species is one of Upper Cretaceous pollen grains of Japan.

Botanical affinity: Betulaceae, *Betula*.

(190) *Betulaepollenites normalis* Takahashi

Pl. 15, figs. 21–24, 28a–b.


Description: See Takahashi (1964).

Dimensions: Ca. 22–34 μm in size, exine up to 1.5 μm thick (Takahashi, 1964); present specimens: 20–26 μm in equatorial diameter, exine 0.5–1 μm thick.

Occurrence: Akkeshi and Tokotan Formations in Ochiishi area (OCH-03, OCH-04, OCH-05, OCH-09, and OCH-10).
**Previous records:** Campanian and Maastrichtian, Yubari coal-field (Hokkaido, Japan) (Takahashi, 1964).

**Remarks:** This is Upper Cretaceous pollen grains of Japan.

**Botanical affinity:** Betulaceae, *Betula*.

**Genus:** *Callistopollenites* Srivastava 1969.

**Type species:** *Callistopollenites radiatostriatus* (Mtchedlishvili 1961) Srivastava 1969.

(191) *Callistopollenites comis* Srivastava

Pl. 38, figs. 2, 9, 10.


**Description:** See Srivastava (1969).

**Dimensions:** 20 – 26 μm in equatorial diameter (holotype: 24.0 μm), sexine about 1 μm thick (Srivastava, 1969); present specimens: 19 – 22 μm X 24 – 27 μm in equatorial diameter, exine striate, muri baculate-tectate 1 μm thick.

**Occurrence:** Akkeshi Formation in Akkeshi and Choboshi areas (AKK – 10, AKK – 11, and CHO – 01).

**Previous records:** Maastrichtian, Drumheller (Alberta, Canada) (Srivastava, 1969).

**Remarks:** This is one of Maastrichtian pollen grains together with *Callistopollenites radiatostriatus* (Mtchedlishvili) Srivastava and *C. tumidoporus* Srivastava.

**Botanical affinity:** Unknown.

(192) *Callistopollenites radiatostriatus* (Mtchedlishvili) Srivastava

Pl. 38, figs. 3 – 8, 11, 12.

1961 *Tricolporites radiatostriatus* Mtchedlishvili, Trudy VNIGRI, no. 177, pp. 249 – 250, pl. 81, figs. 1a – g, 2a – b.

1965 *Tricolporo-pollenites radiatostriatus* (Mtchedlishvili) Bratzeva, Trudy Geol. Inst., Acad. Sci. USSR, 129, pp. 26 – 27, pl. 10, figs. 4 – 8; pl. 11, figs. 1 – 7; pl. 12, figs. 1 – 6 (p.p.).


fig. 20.


**Description:** See Mtchedlishvili in Samoilovitch & Mtchedlishvili (1961) and Srivastava (1969).

**Dimensions:** 23.8–35.4 μm in diameter, exine 2.2–2.7 μm thick (Mtchedlishvili, 1961); 25–47 μm in diameter, exine 2–2.5 μm thick (Bratzeva, 1965); polar axis 30.4–36.0 μm, equatorial axis 28.8–36.8 μm (Srivastava, 1969); 38 X 33.5 μm in equatorial diameter, muri 1.7 μm high (Takahashi & Shimono, 1982); 36 X 32 μm in diameter; muri baculate, 1 μm high (Takahashi & Sugiyama, 1990); present specimens: 28–32 μm X 22–28 μm in diameter, muri up to 4 μm high.

**Occurrence:** Akkeshi and Tokotan Formations in Akkeshi, Ochiishi, and Choboshi areas (AKK-05, AKK-12, OCH-03, OCH-04, and CHO-01).

**Previous records:** Maastrichtian, western Siberian lowland (USSR) (Mtchedlishvili, 1961); Maastrichtian, Far East (USSR) (Bratzeva, 1965); Maastrichtian, Drumheller (Alberta, Canada) (Srivastava, 1969); Maastrichtian, Hida (Japan) (Takahashi & Shimono, 1982); Santonian, Taneichi (Japan) (Takahashi & Sugiyama, 1990).

**Remarks:** This species is a nice indicator of Maastrichtian time.

**Botanical affinity:** Unknown.


**Type species:** *Cranwellia striata* (Couper 1953) Srivastava 1966.

(193) *Cranwellia striata* (Couper) Srivastava

Pl. 37, figs. 8, 9.

1957 *Elytranthe striatus* Couper, Rouse, Canadian Jour. Bot., vol. 35, p. 369, pl. 3, fig. 64.


**Description:** See Couper (1953) and Srivastava (1966).

**Dimensions:** 23 – (26) – 31 μm in equatorial diameter, exine 1 – 1.5 μm thick (Couper, 1953); 20 – 33 μm in diameter (mean 26.5 μm) (Chlonova, 1960); 15 – 34 μm in diameter (mean 24 μm) in size, exine 1 – 1.5 μm thick (Chlonova, 1961); 32 μm in equatorial diameter (Srivastava, 1966); 30 μm in diameter (Sung & Lee, 1976) 37.5 μm in diameter (Sung et al., 1978); 30 – 51 μm in diameter, exine 1.5 μm thick(Song et al., 1981); 21.5 – 31 μm in equatorial diameter,

21 – 28 μm X 17–25 μm (equatorial diameter X polar axis) (Takahashi & Shimono, 1982); 21 – 32.5 μm in diameter, exine 1 – 1.5 μm thick (Yu et al., 1985); 25 – 45 μm in diameter, exine 1.5 μm thick (Song et al., 1986); 15 – 34 μm in size, exine 1.5 – 1.7 μm thick (Krassilov et al., 1988); present specimens: 21 – 26 μm X 21–29 μm in equatorial diameter.

**Occurrence:** Akkeshi and Tokotan Formations in Ochiishi area (OCH – 03 and OCH – 06).

**Previous records:** Lower Oligocene-upper Miocene, New Zealand (Couper, 1953); Danian-Lower Palaeogene, Chulymo-Eniseisk (USSR) (Chlonova, 1960); Upper Eocene-Upper Pliocene, New Zealand (Couper, 1960); upper Upper Cretaceous, western Siberian lowland (USSR) (Chlonova, 1961); Santonian, western Canada (Rouse, 1957); Maastrichtian, Scollard (Alberta, Canada) (Srivastava, 1966); Upper Cretaceous, Yunnan (China) (Sung & Lee, 1976); Oligocene, Bohai region (China) (Sung et al., 1978); Lower Cretaceous-Eocene, Jiangsu (Song et al., 1981); Maastrichtian, Hida (Japan) (Takahashi & Shimono, 1982); Middle Cretaceous, Jiangxi (China) (Yu et al., 1985); Uppermost Cretaceous-Eocene, Guangdong (China) (Song et al., 1986); Santonian-Palaeogene, Lesser
Kuril Islands (USSR) (Krassilov et al., 1988).

Remarks: Cranwellia striata (Couper) Srivastava seems to occur only in Maastrichtian time in Japan.

Botanical affinity: Loranthaceae.

(194) Cranwellia sp.
Pl. 36, fig. 12.

Description: Isopolar (?); tricolpate pollen grain (?); grain size 23 μm in diameter and 10 μm high in lateral view. Exine thin, finely striate.

Occurrence: Akkeshi Formation in Akkeshi area (AKK-11).

Remarks: A single specimen was observed. This is much lower in its height. Accordingly this cannot be identified with the already described species of Cranwellia.

Botanical affinity: Loranthaceae (?).


Type species: Cupuliferoidaepollenites liblarensis (Thomson 1950) Potonié 1960.

(195) Cupuliferoidaepollenites cf. ditis (Takahashi) Takahashi
Pl. 39, figs 6, 7.

1979 Cupuliferoidaepollenites ditis (Takahashi) Takahashi, Takahashi & Kim, Palaeontographica, B, 170, p. 37, pl. 9, figs. 1–2.

Description: See Takahashi (1957) and Takahashi & Kim (1979).

Dimensions: 15–47 μm in size (holotype 31.1 X 19.2 μm in size), width/length
Palynologic study of the Akkeshi and Tokatan Formations

ratio: 0.4–0.8 (Takahashi, 1957); 25–30.7 μm X 16–20.2 μm in size, exine thin (Takahashi & Kim, 1979); 20.3 X 14.3 μm in size, exine thin, 0.7 μm in the polar area, width/length ratio: 0.7 (Takahashi, 1988); 29 X 16 μm in size, exine 0.7 μm in the polar area, width/length ratio: 0.55 (Takahashi & Sugiyama, 1990); present specimens: 29–33 μm X 16–18 μm in size, exine 0.5–1 μm thick, width/length ratio: 0.545–0.552.

Occurrence: Tokotan Formation in Ochiishi area (OCH-02 and OCH-03).

Previous records: Palaeogene and Miocene, Japan (Takahashi, 1957, 1961); Maastrichtian and Eocene, Yubari coal-field (Hokkaido, Japan) (Takahashi, 1964); early and middle Miocene, Korea (Takahashi & Kim, 1979); Coniacian, Futaba (Japan) (Takahashi, 1988); Santonian, Taneichi (Japan) (Takahashi & Sugiyama, 1990).

Remarks: This species occurs abundantly in the Palaeogene of Japan and some in the Upper Cretaceous and Miocene of Japan and/or Korea.

Botanical affinity: Cupuliferae.

(196) Cupuliferoidaepollenites facetus (Takahashi) Takahashi
P. 39, figs. 11, 12, 15 (cf.), 16; pl. 40, figs. 10, 11.

1979 ? Cupuliferoidaepollenites facetus (Takahashi) Takahashi, Takahashi & Kim, Palaeontographica, B, 170, p. 37, pl. 9, fig. 6.

Description: See Takahashi (1961).

Dimensions: ?1–27 μm in size, exine less than 1 μm thick, width/length ratio: 0.8–0.95 (Takahashi, 1961); 23 X 17.8 μm in size, exine thin, 0.6 μm thick (Takahashi & Kim, 1979); 16.5–23 μm X 15–18.5 μm in size, exine thin, width/length ratio: 0.8–0.9 (Takahashi & Shimono, 1982); present specimens: 15–20 μm X 12–20 μm in size, exine up to 1 μm thick, width/length ratio: 0.8–1.0.

Occurrence: Akkeshi and Tokotan Formations in Akkeshi and Ochiishi areas (AKK-05, AKK-12, OCH-02, OCH-03, and OCH-09).

Previous records: Palaeogene, west Japan (Takahashi, 1961); early Miocene, Changgri (Korea) (Takahashi & Kim, 1979); Maastrichtian, Hida (Japan) (Takahashi & Shimono, 1982).
Remarks: The present specimens are referable undoubtedly to Cupuliferoidae-pollenites facetus (Takahashi) Takahashi, because width/length ratio of the grains is more than 0.8.

Botanical affinity: Unknown.

(197) Cupuliferoidae-pollenites fallax (Potonie) Potonié
Pl. 39, figs. 13, 14.

1951 *Cupuliferoidae pollenites fallax* Potonié, Palaeontographica, B, 91, pl. 20, fig. 66.
1979 *Cupuliferoidae pollenites fallax* (Potonié) Takahashi, Takahashi & Kim, Palaeontographica, B, 170, p. 38, pl. 9, figs. 2 (?), 22–23.
Description: See Potonie (1934) and Thomson & Pflug (1953).

Dimensions: 12–14 μm in size (Potonie, 1934); 13 μm in size (Potonie, 1951); 10–18 μm in size (Thomson & Pflug, 1953); 12–18 μm in size (Krutzhc & Vanhoorn, 1977); 11–13.5 μm X 6.7–8.2 μm in size; exine thin, 0.3–0.6 μm thick (Takahashi & Kim, 1979); 7.4 X 13.3 μm, width/length ratio: ca. 0.6 (Thiele-Pfeiffer, 1980); 11.7–14.4 μm X 5.0–7.7 μm in size, width/length ratio: 0.4–0.5 (Takahashi & Jux, 1982); 14 X 17 μm in size (Mohr, 1984); 12 μm in size (Kirchner, 1984); 10–17 μm in size (Nagy, 1985); 10–18 μm X 5–8 μm in size, width/length ratio: 0.4–0.5 (Takahashi & Jux, 1986); 11.4–18 μm X 6.6–11 μm in size, width/length ratio: 0.42–0.76 (Takahashi, 1988); 16 X 10 μm in size, width/length ratio: 0.625 (Takahashi & Jux, 1989); 16.5–19 μm X 9–11 μm in size (SEM: 12.8–15 μm X 7.3–10 μm in size) (Takahashi & Sugiyama, 1990); present specimens: 15–16 μm X 8–10.5 μm in size, width/length ratio: 0.533–0.656.

Occurrence: Akkeshi and Tokotan Formations in Akkeshi and Ochiishi areas (AKK-11, OCH-02, and OCH-04).


Remarks: This species occurs widely in the Tertiary of Europe and in the Tertiary and Upper Cretaceous of Japan.

Botanical affinity: Regarding its botanical relationship, Leguminosae, Cupuliferoidae and other herbs are mentioned (Potonie, 1934; Thomson & Pflug, 1953; Nagy, 1985).

(198) Cupuliferoidaepollenites weylandii (Takahashi) Takahashi

Pl. 39, figs. 8–10.


1979 Cupuliferoidaepollenites weylandii (Takahashi) Takahashi, Takahashi & Kim, Palaeontographica, B, 170, Lfg. 1–3, p. 37, pl. 9. fig. 9.

Description: See Takahashi (1961).

Dimensions: 19.2–27.7 μm in size (holotype 21.7 μm), exine up to 1 μm thick,
width/length ratio: 0.5—0.7 (Takahashi, 1961); 19.2—21.3 μm X 13.2—14 μm in size, exine 0.6 μm thick (Takahashi & Kim, 1979); present specimens: 20—24 μm X 13—14 μm in size; exine thin, 0.5 μm thick; width/length ratio: 0.542—0.65.

**Occurrence:** Akkeshi and Tokotan Formations in Akkeshi and Ochiishi areas (AKK—09, AKK—11, and OCH—03).

**Previous records:** Palaeogene, west Japan (Takahashi, 1961); Campanian, Yubari coal-field (Hokkaido, Japan) (Takahashi, 1964); middle Miocene, Yonil (Korea) (Takahashi & Kim, 1979).

**Remarks:** *Cupuliferaidaepollenites weylandii* (Takahashi) Takahashi is discriminated from *C. facetus* (Takahashi) Takahashi by its slender grain and from *C. fallax* (Potonie) Potonie by larger size of the grain.

**Botanical affinity:** ? Cupuliferae.

**Genus:** *Cupuliferoipollenites* Potonie 1951 ex Potonie 1960.

**Type species:** *Cupuliferoipollenites pusillus* (Potonie 1934) Potonie 1960.

(199) *Cupuliferoipollenites cf. fusus* (Potonie) Takahashi & Jux

Pl. 42, figs. 16, 18a—b.

1931 *Pollenites fusus* Potonie, Z. Braunkohle, H. 16, 30, Jg., p. 332, pl. 1, fig. 13.


1953 *Tricolpopollenites cingulum* (Potonie) Thomson & Pflug *fusus* (Potonie) Thomson & Pflug, Palaeontographica, B, 94, p. 100, pl. 12, figs. 15—27.


**Description:** See Potonie (1931) and Takahashi & Jux (1982).

**Dimensions:** Ca. 24 μm in size (Potonie, 1931); 22—28 μm in size, width/length ratio: ca. 0.5—0.6 (Thomson & Pflug, 1953); 21.3—23.7 μm X 13.5—18.0 μm in size, width/length ratio: 0.63—0.75, exine 1.2—1.3 μm thick (Takahashi & Jux, 1982); 22—29 μm X 13—17 μm in size, exine ca. 1 μm thick, width/length ratio: 0.52—0.68 (Takahashi & Jux, 1986); present specimens: 22—26 μm X 11—16 μm in size, exine 0.5 μm thick, width/length ratio: 0.5—0.615.

**Occurrence:** Akkeshi Formation in Akkeshi and Ochiishi areas (AKK—05 and
OCH-09).


Remarks: Cupuliferopollenites fusus (Potonie) Takahashi & Jux differs from C. pusillus (Potonie) by larger size.

Botanical affinity: Fagaceae, Castanopsis.

(200) Cupuliferopollenites pusillus (Potonie) Potonie
Pl. 42, figs. 21, 29.

1951 Cupuliferopollenites pusillus Potonie, Palaeontographica, B, 91, pl. 20, fig. 69.
1953 Tricolpopollenites cingulum (Potonie) Thomson & Pflug pusillus (Potonie) Thomson & Pflug, Palaeontographica, B, 94, p. 100, pl. 12, figs. 28-41.
1960 Cupuliferopollenites pusillus (Potonie) Potonie, Beih. Geol. Jb., 39, p. 98, pl. 6, fig. 111.

Description: See Potonie (1934, 1960).

Dimensions: 15-22 μm in size (Potonie, 1934); 18-22 μm in size, width/length ratio: 0.6-0.8 (Thomson & Pflug, 1953); 11.5 X 17 μm in size, exine ca. 1.5 μm thick, width/length ratio: 0.6-0.7 (Thiele-Pfeiffer, 1980); 15.0-20.5 μm X 9.0-12.2 μm in size, width/length ratio: 0.6, exine 0.7-1.0 μm thick (Takahashi & Jux, 1982); 17-20 μm X 11-13 μm in size, exine 1.2-1.5 μm thick (Mohr, 1984); 15-20 μm X 9-13 μm in size, exine thin, width/length ratio: 0.65-0.67 (Takahashi & Jux, 1986); present specimens 15-18 μm X 10-11 μm in size, width/length
ratio: 0.611–0.667.

**Occurrence:** Akkeshi Formation in Ochiishi area (OCH-06 and OCH-09).


**Remarks:** This species is smaller than *Cupuliferoipollenites fusus* (Potonie) Takahashi & Jux.

**Botanical affinity:** Fagaceae, *Castanea*. Besides, *Castanopsis, Lithocarpus* and *Pasania* are considered.

(201) *Cupuliferoipollenites* sp.

Pl. 42, fig. 20.

**Description:** Tricolporate pollen grain. Amb elliptical with somewhat pointed poles in equatorial view. Three colpi slender, running from pole to pole. Exine thin, smooth. Equatorial pores extending meridionally, ca. 4 μm long.

**Dimensions:** 20 X 10 μm in size, width/length ratio: 0.5.

**Occurrence:** Akkeshi Formation in Ochiishi area (OCH-06).

**Remarks:** A single specimen was observed. This is similar to *Cupuliferoipollenites pusillus* (Potonie) Potonie, but differs in possessing meridionally extended pores and in being somewhat slender in shape.

**Botanical affinity:** ? Fagaceae.

**Genus:** *Cyrillaceaepollenites* Mürriger & Pflug 1951 ex Potonié 1960.

**Type species:** *Cyrillaceaepollenites megaexactus* (Potonie 1931) Potonie 1960.

(202) *Cyrillaceaepollenites exactus* (Potonie) Potonie

Pl. 42, figs. 24–27.


