

Palynological study on a rock sequence at Bandar Tenggara, Johor

YAP SIEW FONG & UYOP SAID

Program Geologi, Pusat Pengajian Sains Sekitaran & Sumber Alam
Fakulti Sains & Teknologi, Universiti Kebangsaan Malaysia
43600 Bangi, Selangor D.E., Malaysia

Abstract: The identified palynomorph assemblage from a rock sequence exposed at Bandar Tenggara, Johor is interpreted to be Tertiary in age. It resembles the *Verrucatosporites usmensis* zone which is characterised by the presence of *Verrucatosporites usmensis*, *Spinizonocolpites baculatus*, *Alnipollenites* and *Psilatricolporites operculatus* of Late Eocene age. By the presence of fresh water algae *Pediastrum* sp., together with *Striatricolpites catatumbus*, *Stenochlaena* sp., *Laevigatosporites* sp. and *Deltoidosporas* sp. which were derived from freshwater swamp plant community, it shows that, the sediments were deposited in a freshwater swamp environment.

Abstrak: Himpunan palinomorf yang dikenal pasti dari jujukan batuan tersingkap di Bandar Tenggara, Johor ditafsir berusia Tertiar. Himpunan ini mempunyai persamaan dengan zon *Verrucatosporites usmensis* yang dicirikan dengan kehadiran *Verrucatosporites usmensis*, *Spinizonocolpites baculatus*, *Alnipollenites* dan *Psilatricolporites operculatus* berusia Eosen Akhir. Kehadiran alga air tawar *Pediastrum* sp. bersama-sama dengan *Striatricolpites catatumbus*, *Stenochlaena* sp., *Laevigatosporites* sp. dan *Deltoidospora* sp. yang dihasilkan oleh tumbuhan di kawasan paya air tawar menunjukkan sedimen telah diendapkan di sekitaran paya air tawar.

INTRODUCTION

Several outcrops of Tertiary sedimentary rocks are reported throughout Peninsular Malaysia. A palynological study was carried out on one particular outcrop at Bandar Tenggara, Johor of about 45 km to the southeast of Keluang, Johor (Fig. 1). The acquired palynological data were utilised in interpreting some geological aspects such as the age of the rock sequence and the climate during which the sediments were deposited.

The rock sequence of approximately 2 m thick consists predominantly of greyish colour of fine-grained sandstone and siltstone and it is very rich in plant fossils.

Ahmad Munif Koraini *et al.* (1994) reported that the palynomorph assemblage which was identified from the study area is dominated by *Discoidites borneensis*, *Pandanidites* sp., *Striatricolpites catatumbus*, *Striatricolporites minor*, *Clavapalmaeidites hamerzii*, *Marginipollis concinuus* and *Heterocalporites* spp. pollen which could have been sourced from the freshwater swamp plant community together with fresh water algae namely *Botryococcus* sp. and *Pediastrum* sp. which are present in abundance. Based on the palynomorph assemblage, they suggested that, the mudstone of the Layang-Layang Formation could had been deposited in a freshwater lacustrine environment and they also proposed that the tentative age for the Layang-Layang Formation could be Miocene. Uyop Said (2001) also reported that the presence of *Stenochlaena* sp. and *Pediastrum* sp. in the rock sequence at Bandar Tenggara is related to swampy fresh water environments.

MATERIAL AND METHOD

The rock sequence was measured and systematic sampling was carried out throughout the succession. A total of thirty-three samples were collected and they were processed according to the standard palynological

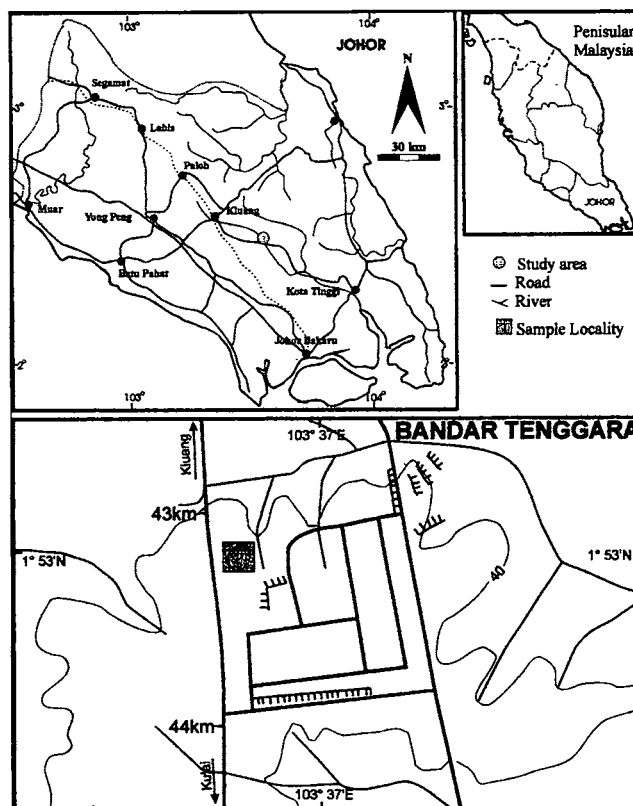


Figure 1. Map of the study area.

preparation techniques. The organic residues were mounted in a permanent medium of Canada balsam onto glass slides to be examined under transmitted light microscope. The palynomorphs were then identified by comparing with other palynomorphs which were recorded from other areas by previous workers.

RESULTS AND DISCUSSION

A total of twenty-five samples yielded palynomorphs at different stages of preservation. Only a few samples contain either badly-preserved palynomorphs or unidentifiable plant fragments. The total number of specimens of the palynomorphs varies from one sample to another. The observed palynomorph genera were assigned to *Verrucatosporites usmensis*, *Laevigatosporites nutidus*, *Monocolpopollenites* sp., *Foveotriletes margaritae*, *Psilatricolporites operculatus*, *Triporollenites* sp., *Stenochlaena palustris*, *Polypodiaceolsporites* sp., *Deltoidospora* sp., *Verrutricolporites rotunerporis*, *Quecoidites* sp., *Tsuga* sp., *Alnipollenites verus*, *Spinizonocolpites baculatus*, *Striatricolpites catatumbus*, *Proxapertites cursus*, *Foveotriletes palaequetrus*, *Ericipites*, *Nypa fruticans*, *Tetracolporopollenites lesquerexianus* and *Pistillipollenites megregorii* (Fig. 3 and 4).

The palynomorph assemblage from Bandar Tenggara is characterised by the dominance of *Verrucatosporites usmensis*, *Laevigatosporites nutidus*, *Monocolpopollenites* sp., *Foveotriletes margaritae*, *Quercoidites* sp., *Psilatricolporites operculatus* and *Triporollenites* sp. The less dominant species are *Polypodiaceolsporites* sp., *Deltoidospora* sp., *Verrutricolporites rotunerporis*, *Tsuga* sp., *Spinizonocolpites baculatus*, *Striatricolpites catatumbus*, *Proxapertites cursus*, *Alnipollenites verus*, *Foveotriletes palaequetrus*, *Ericipites* sp., *Nypa fruticans*, *Tetracolporopollenites lesquerexianus* and *Pistillipollenites megregorii*.

The identified palynomorph assemblage is compared with other lower Paleogene palynomorph assemblages which were recorded from various parts of the world by previous workers such as Germeraad *et al.* (1968), Traverse (1994), Hu & Sarjeant (1992) and Elsik (1993). Based on statistical study on the the palynomorph assemblage, it was identified that it contains approximately 85% of Palaeogene palynomorph species with some Neogene palynomorphs of *Laevigatosporites nutidus*, *Tetracolporopollenites* sp. and *Tsuga* sp. It shows a close resemblance to the *Verrucatosporites usmensis* zone of Late Eocene age (Fig. 2). The proposed age is supported by the presence of typically Palaeogene plant fossils

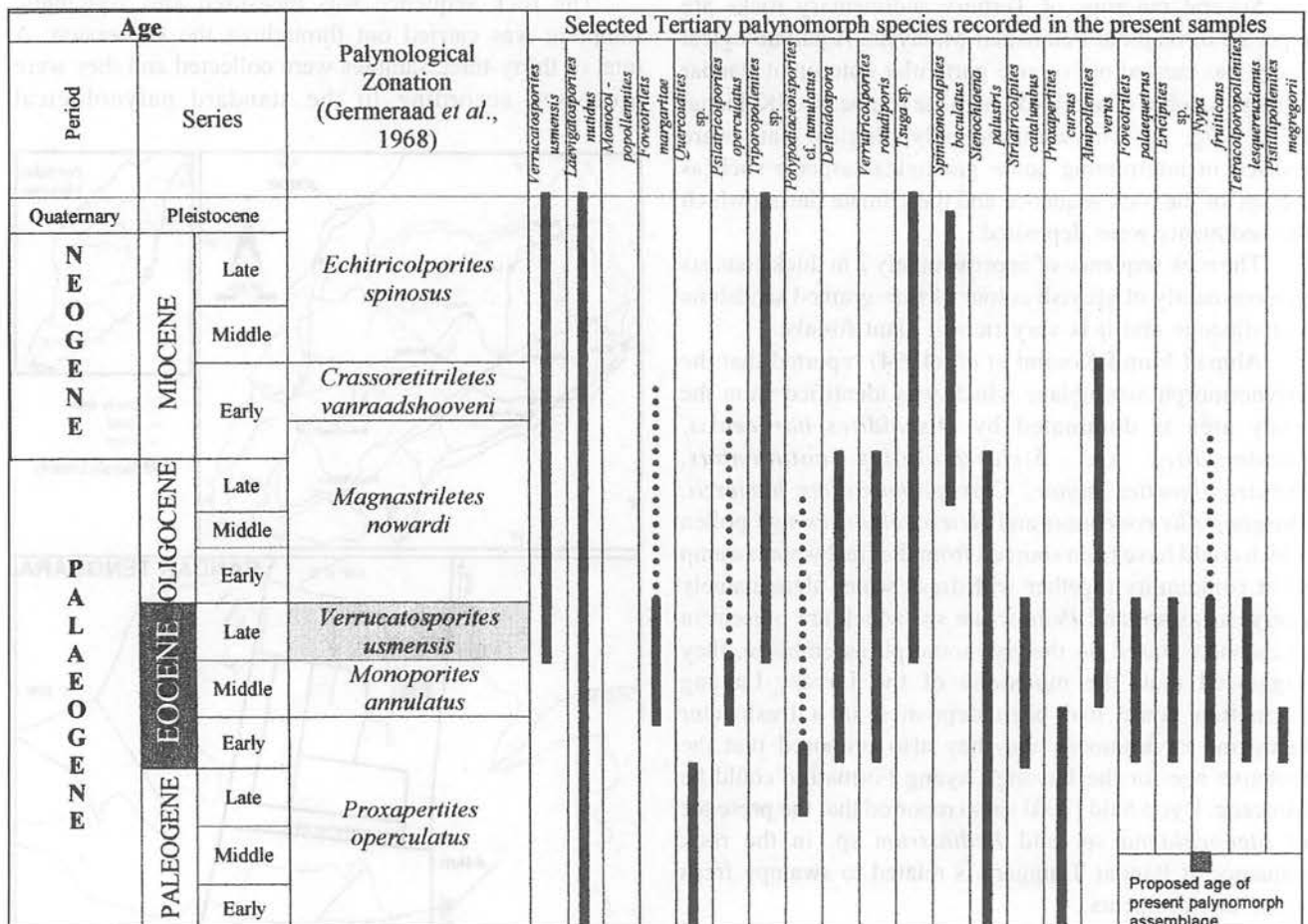


Figure 2. Stratigraphic range chart of some Tertiary palynomorphs showing the proposed age of the rock sequence at Bandar Tenggara, Johor.

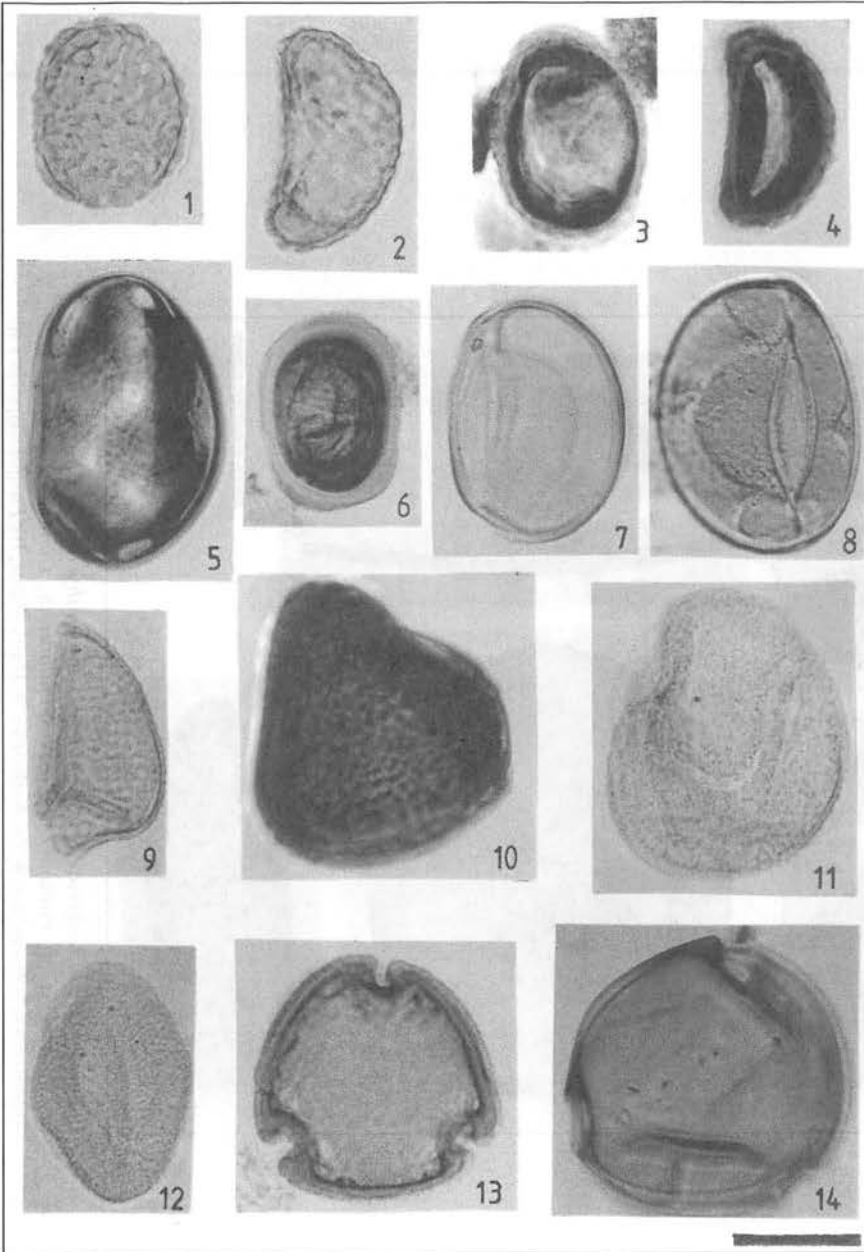


Figure 3. 1-4: *Verrucatosporites usmensis* Van Der Hammen, 1956, 5-7: *Laevigatosporites nitidus* Mamczar, 8: *Monocolpopollenites* sp. Thomson & Pflug, 9 - 10: *Foveotriletes margaritae* Van Der Hammen, 1954, 11-12: *Quercoidites* sp. Traverse, 13: *Psilatricolporites operculatus* Van Der Hammen et WYMSTRA, 1964, 14: *Triporopollenites* sp. (Scale bar = 40 µm).

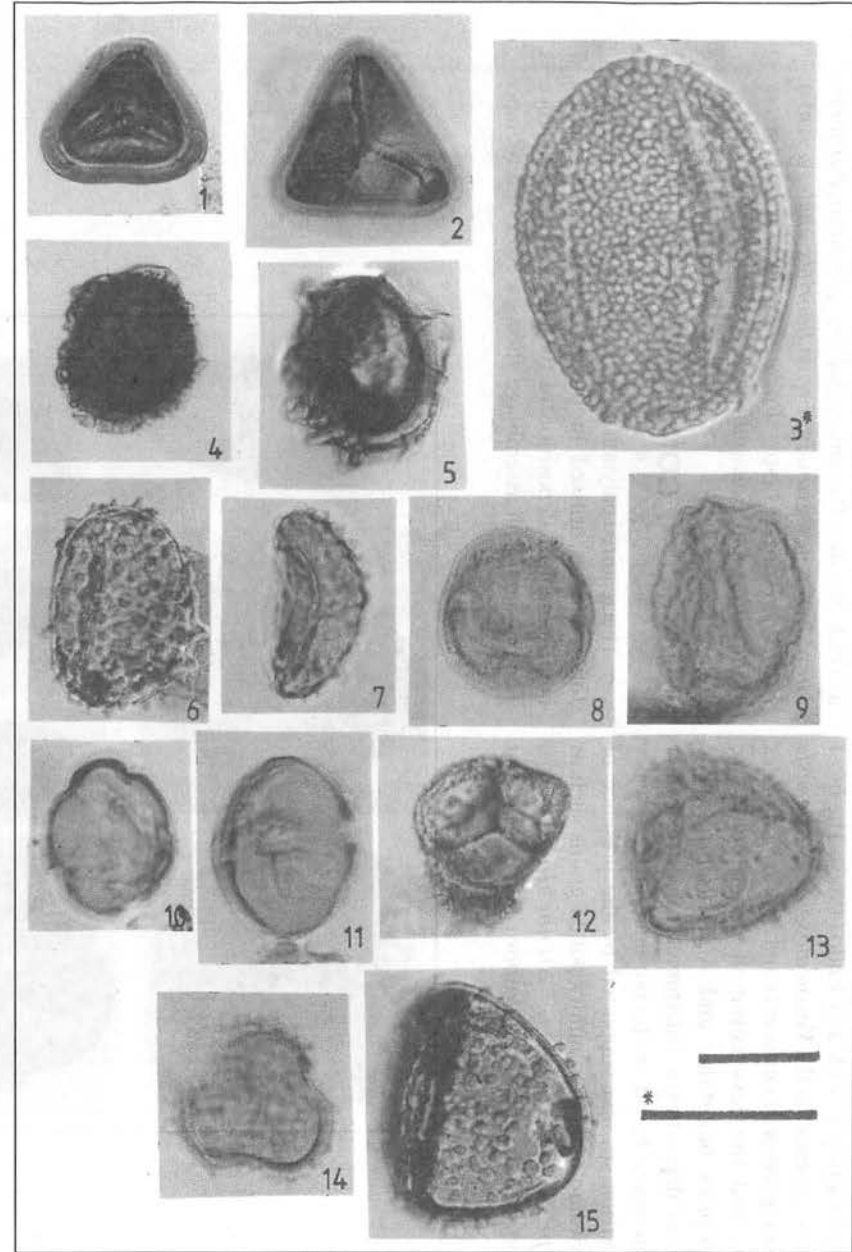


Figure 4. 1: *Polypodiaceoisporites* cf. *tumulatus* Partridge, 2: *Deltoidospora* sp. 3: *Verrutricolporites rotundiporis* Van Der Hammen et Wymstra 1964, 4: *Tsuga* sp., 5: *Spinizonocolpites baculatus* Muller 1968, 6-8: *Stenochlaena palustris* Beddom, 9: *Proxapertites cursus* Van Hoeken-Klinkenberg 1966, 10: *Alnipollenites verus* R. Potonié 1934, 11: *Tetracolporopollenites lesquereuxianus* Traverse, 12: *Eri cipites* sp. Traverse, 13: *Nypa fruticans* Thunberg, 14: *Foveotriletes palaequetrus* Partridge 15: *Pistillipollenites megregorii* Rouse (Scale bar = 40 µm).

Quercus cf. lanceaefolia Roxb. and *Fagus feroniae* Ung which were previously recorded by Endo (1966). The most common species present in the *Verrucatosporites usmensis* zone are *Verrucatosporites usmensis* and *Psilatricolporites operculatus* and the less common constituents are *Spinizonocolpites baculatus* and *Alnipollenites*. The environment of deposition is interpreted to be freshwater swamp environment based on the presence of fresh water algae *Pediastrum* sp. and supported by the presence of freshwater swamp plant community pollen grains such as *Striatricolpites catatumbus*, *Stenochlaena* sp., *Laevigatosporites* sp. and *Deltoidospora* sp. The present

samples are also rich in fungal spores which were identified as *Trichothyrites*, *Paramicrothallites spinalatus*, *Partilites*, *Microthyriacites grandis*, *Foveodiporites anklesvarensis*, *Fusiformisporites* sp., *Parmathyrites*, *Anatolinites*, *Multicellites* and *Cannanosporonites* (Fig. 5).

CONCLUSION

The acquired palynological data from Bandar Tenggara, Johor can be utilised in interpreting the age and the environment of deposition of the studied rock sequence. The palynomorph assemblage shows a close resemblance

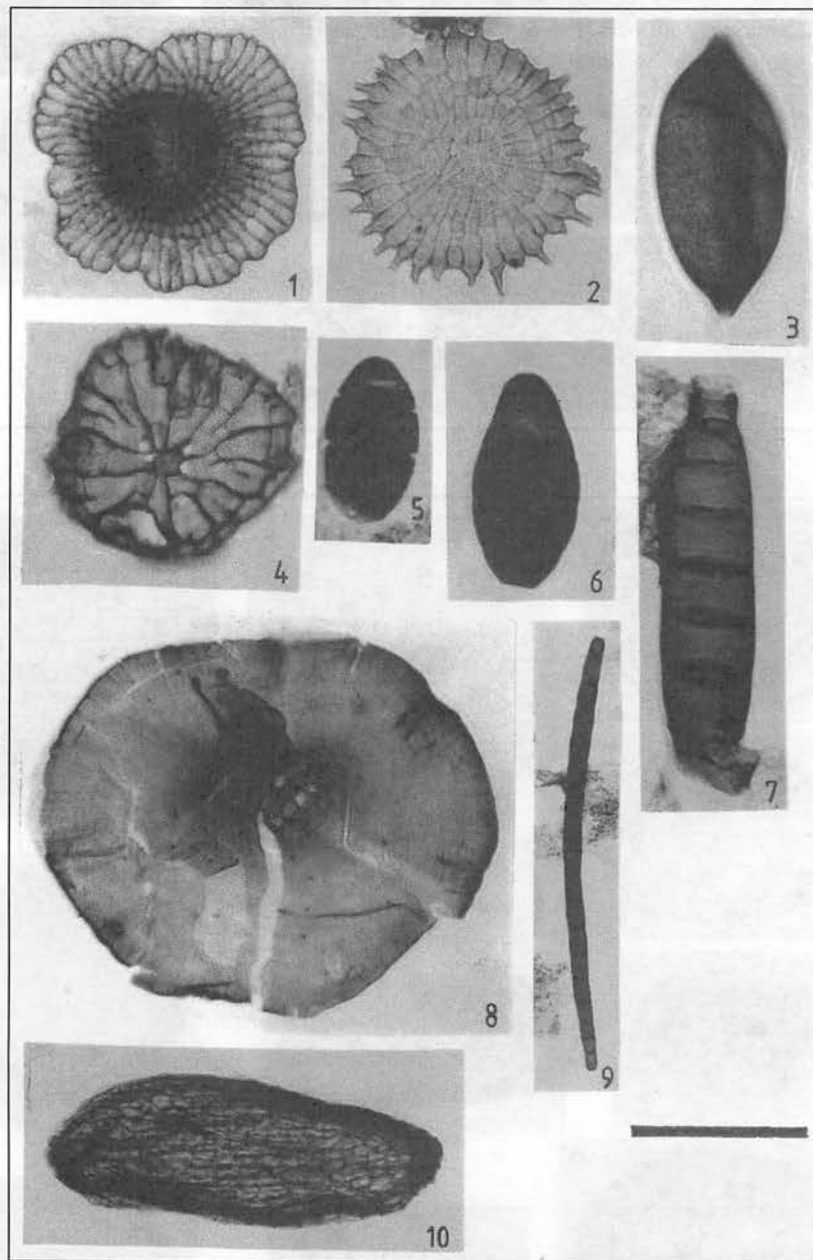


Figure 5. 1: *Microthyriacites grandis*, 2: *Parmathyrites*, 3: *Foveodiporites anklesvarensis*, 4: *Paramicrothallites spinalatus*, 5: *Cannanosporonites*, 6: *Anatolinites*, 7: *Partilites*, 8: *Trichothyrites*, 9: *Multicellites*, 10: *Fusiformisporites* sp. (Scale bar = 40 μ m).

with the Late Eocene *Verrucatosporites usmensis* zone. This assemblage is characterised by the dominance of *Verrucatosporites usmensis*, *Stenochlaena* sp., and *Arecipites* sp. The rock sequence is interpreted to be deposited in a freshwater swamp environment by the presence of fresh water algae.

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