PALYNOLOGY OF TÖGI NDRAWA CAVE,COASTAL AREA OF NIAS ISLAND, NORTH SUMATERA

By :

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ABSTRACT

Environmental study of the Tögi Ndrawa Cave by means of pollen analysis has been carried out. The interpretation is made based on the occurring pollen types as guide, the resulted pollen spectra, and curves exhibited in the pollen diagram. Combined evidences obtained from the palynological, geological and archaeologi cal studies provide the basis for the interpretation of plant ecology of shore and further the vegetational history of the marine area. In the meantime, plant ecology itself is concerned not only with plant communities but also the interaction among the plants involved, and their environmental factors.

Keyword: Environmental, Pollen Analysis, Tögi Ndrawa Cave

SARI

Studi lingkungan GuaTögi Ndrawa, Pulau Nias, telah dilakukan dengan menggunakan analisis polen. Interpretasi ini berdasarkan hadirnya jenis polen sebagai petunjuk dalam membentuk diagram polen. Hasil studi palinologi, geologi dan arkeologi telah menghasilkan interpretasi dasar mengenai ekologi tumbuhan pantai kemudian sejarah tumbuhan yang pernah tumbuh didaerah laut dangkal. Pada zaman ini, ekologi tumbuhan tidak hanya tergantung komunitas tumbuhan tetapi justru tergantung pada interaksi diantara komunitas tumbuhan dan faktor lingkungannya.

Kata Kunci: Lingkungan, Analisis polen, Gua Tögi Ndrawa

INTRODUCTION

Modern pollen analyses was intended to make stratigraphical correlations possible and used pollen grains as guide fossils through pollen spectra and exhibited the curves in the pollen diagram. Pollen rains in biological interest are value for pollen statistics which include tree pollen, shrub pollen and grass pollen in setting as an proper pollen diagram. Composition and distribution related between this pollen flora distribution of present day forests and tree pollen contents of the superficial layers developed at the early stage.

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Pollen limits may sometimes advantageously to correlations in pollen diagrams at the other hand, some curves run through the whole diagrams with a lower or an upper limit or both.

These correlations mean as exclusively pollen-statistical and supplement by evidence derived from other branches of science such as palaeoclimatology, geochronology, other geological disciplines and also archeology. Paleoclimatology is sometimes inseparable in geological disciplines and climatological points of view such as in bog investigations. A combined ten pollen samples was collected at coastal area of Tögi Ndrawa Cave in stratigraphical and paleoclimatological sequences and to adopt the division of the post-glacial period into climatic phases. The study area as shown in figure 1 and for the pollen samples location as shown in figure 3. For geology and archaeology correlations may be with interglacial epochs and their substages as well as with the consecutive stages of the postglacial period which provide an introduction of exact geochronological time-scale into vegetation history. Further it is established with eustatic changes of sealevel. Contemporaneously a consequence take place at the eustatic changes of sea level and isostatic movements. Aims of vegetation ecology define an area of research with a body of knowledge and techniques which presents a modern summary of vegetation science.

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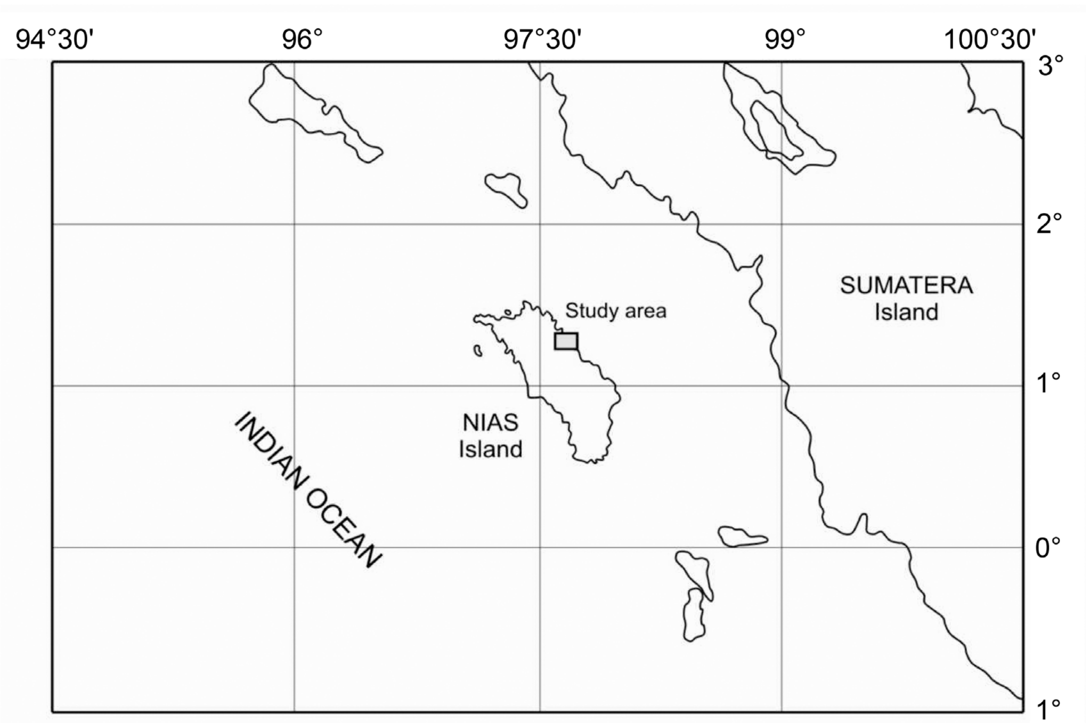


Figure 1. Pollen study of Tögi Ndrawa Cave,Nias Island

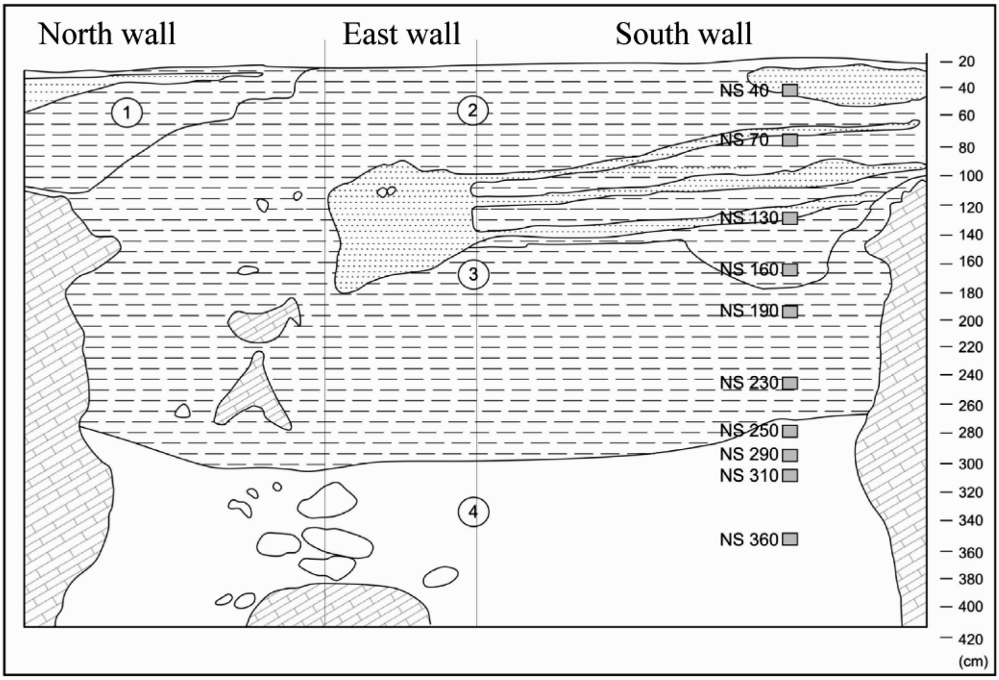


Figure 2. Pollen samples of Tögi Ndrawa Cave,Nias Island
Explanation : 1. Brown grayish sandy clay. 2. Brown grayish sandy clay intercalated with charcoal 3. Sandy clay whitish brown 4. Dense Brown sandy clay

climatological points of view such as in bog investigations. A combined stratigrafical and paleo-climatological investigations.Since that, at least so far as extra-mediterranian Europe is concerned, to adopt the division of the post-glacial period into climatic phases. For geology and archaeology correlations may be made with interglacial epochs and their substages as well as with the consecutive stages of the postglacial period which provide an introducing of exact geochronological time-scale into vegetation history. Further it is established with eustatic changes of sealevel. Contemporaneously a consequence take place at the eustatic changes of sea level and take place at the eustatic and isostatic movements. Aims of vegetation ecology define an area of research with a body of knowledge and techniques which presents a modern summary of vegetation science. A community is not equivalent to the flora of an area but refers to a list of species or to the plant taxa occurring in that area. Vegetation ecology is concerned not only with identifying the plant communities on an area but also with determining how they are related to one another and to the environmental factors (Mueller-Dombois and Ellenberg, 1974). Groups of plants form communities may be considered subdivision of a vegetation cover interdependence, which implies that communities are intergrated entities.They show obvious spatial changes and may distinguish a different community. Changes may be caused by spatial changes in species composition,in height of plants, in growth form of plants and responses other vegetation in turn changes in environment. Vegetation parameters involved changes based on form part of definition, description and interpretation of the community.

GEOGRAPHIC BACKGROUND

Systematic Group

Systematic classification of plant communities was used Flora of Java v.1,2 and3 by Backer and Bakhuizen (1963), based on ecological amplitudes. Consequently after Linnaean system of plant taxonomy, as an artificial system that works almost species usually have wider exclusively with floristic criteria. These criteria relate to character or differential species and to species with restricted ecological amplitudes that at the same time shows a high degree of presence within the area of study. Dominant species usually have wider ecological amplitudes, communities were larger in size and had more heterogenous environment.

Environmental Principles

Many authors emphasized the relations of plant communities to their habitants. They made environmental relations the basis of their vegetation. They also developed systems for classifying vegetation by environment. Vegetation since became an important branch of ecology around the turn of the century. This understanding led to definition of ecology as known and interpreted in all English speaking countries. This understanding led to the definition of ecology as known and interpreted in all English speaking countries. This trend seems to lead in direction of environmental criteria for characteristic plant communities is more common, and efforts are made to arrive at a synthesis of floristic and ecological vegetation treatments (Ager, 1963). Particular emphasis is given to detailed ecological investigations of single community. Along with this contrast to this,modern investigators work inductively and use experts there occurred an important change in methods during the last decades. The earlier authors worked mainly deductively and drew their ecological and even physiological conclusions from comparative observations in the field, without attempting in support them by experimentation. In contrast to this, modern investigators work inductively and use experiments to increase the accuracy of their conclusions.

Statistical Work

Devising an objective approach to recognizing or defining plant communities has con cerned investigators, particularly in regions where self evident communities are either rare or absent. Kershaw (1964) concerned primarily with the quantitative investiga tion of small vegetation patterns. Larger self-evident communities are more or less accepted as providing objective entities for more detailed studies. Questions of major interest include the mathematical ansalysis of positive and negative associations between species and the detection of variations in departure from randomness in small area and plant assemblages.

Area and Historical Relation

Studies of the ecology and dynamics of vegetation are meaningful only in relation to well defined, limited geographic areas.The results are applicable only to these same areas. Vegetation was studied over broad geographic segments of the earths surface recognize in addition to environmental and successional variations among plant com munities.This is the study of floristic and historic geobotany according to Walter and Straka, 1970. Information increased when plant communities rose, but at the other hand desirability of geographic representation by vegetation mapping developed from forestry, agriculture and watershed management.

Discriptive notes

Vegetation science was primarily concerned with the description of unusual landscapes and their vegetation. The character of the landscapes is strongly influenced by such out standing vegetation types as tropical rain forest (Polhaupessy, 2006).

This character influenced such distinct life-form differences as shown between deciduous and ever green forests. Vegetation features are obvious, they received much attention by naturalists and geographers. Efforts were directed to simplifying vegetation description in order to vegetation science the pioneers did no their efforts to mere description and field analysis of plant communities. Discriptions of vegetation and plant communities through plant life forms and dominated species are by no means a thing of the past time.

Cartographic and applied System

A great utility of vegetation maps is being appreciated more in nearly all parts of the world. The preparation of vegetation map has been compiled by Küchler 1967. Beyond the scope of this methodological introduction to discuss practical, the appli cations of vegetation with a tradition of bridging the gap between the basic and applied approach for research. Interest in the actual field environments forms a natural link to the applied sciences of forestry, agriculture and wildlife management.

A SYNTHESIS OF ECOSYSTEM

Ecological system was known by Tansley in 1935 at the same sense for terrestrial com munities with their habitats. He expressed the view can not be considered separately from their specific environments in any fundamental treatment, as both organisms and environment form a functional system in nature, named an ecosystem. Since the second World War the significance and potential of this concept has been more fully realized in ecology. The biogeocoenosis concept from a vegetation systematic point of view has the advantage of defining a specific unit of plant synecological research. In this sence an ecosystem can be defined in various ways. The only requirement is that the major components, living organisms and an amenable environment are present and operate to gether in some sort of functional stability. We may now look at the ecosystem from the general structural definition and from its functional and typological aspects. Forest ecosystem can used the strata component as a general structural definition. These strata consist as tree layer, shrub layer, herb layer and moss or lichen layer. Beneath the vegetation are the litter and humus layer. Important components are the microfauna and flora in the soil, litter and humus. Different components can be studied, as to their struc tur ecosystem classificational composition, functional activity and interaction. Vegetation ecologist give particular attention to vegetation component and is equally concer ned with those aspects of the environment that influence behavior of the vegetation itself. It is important to suggests the ecosystem concept which provides theorethical basis in this study. Quantitative parameter function are worthed in pollen analysis of the forest ecosystem. This procces designed and emphasizes the functional similarity in different ecosystems and at the other hand in recognizing the diversity of any ecosys tem that present a lot of type problems which is worthy to do the job by consideration. Since this the ecosystem concept cannot replace established vegetation and plant community concepts. These are needed to define particular ecosystems in space and time.This ecosystem concept,led to the emphasis of giving equal attention to all of the ecosystem major components in field studies.Three different approaches to distinguished ecosystem classification such are the combined approach, the independent approach and the functional approach.

The combined approach aims are based on a synthesis of vegetation and environ ment (Marr, 1967) suggests an concept depending on the emphasis, ecosystem boun daries may either be determined by plant community boundaries. The independent ap proach considers the individual components of the ecosystem as a separate entities and evaluates them independently. Subsequently they are combined on the basis of maps and profiles.In this way the ecosystems are established The first approach has been found useful in forest and site evaluation studies, particularly for basic ecological research serving applied ends, where the ecosystem components can be employed as indicators of the more hidden site factors. In correlation of plant communities to their environment is built into the established units and the components can not be evaluated independently. It is allowed for an objective correlation of the various ecosystem components since the variations are established .The approach is particularly useful in basic vegetation studies that start from the broader or more general aspects and then extend to the more specific ones by a process of successive approximations.

POLLEN EXTRACTS

For washing pollen samples of Tögi Ndrawa Cave need Calgon or NaHCO3 for deflocculation. HCl remove calcites while KOH remove organics. Heavy liquid solution to 2.35 was added to remove pollen grains from the samples, rinse several times in distilled water, after that store the ten samples residue in 70% alcohol which is ready to make slides for determination.

Pollen analysis in this paper was combined by Erdtman, G and Wodehouse, R.P.,1954, Kummel, Bernhard and David Raup., 1965, and Moore, P.D., J.A.Webb and M.E. Collinson., 1991 (Table 1).

POLLEN ANALYSIS

Based on the pollen diagram of Tögi Ndrawa Cave (Figure 3), with fruitfull pollen grains must be excepted for this analysis. This paper used Backer, and Bakhuizen van den Brink (1963) Flora of Java.v1, v2, v3; while age of the ten pollen samples was used by Carbon Dating of Forestrier, *et all* (2004).

- Sample Nias 40, sandy clay,consists pollen such as, *Casuarina equisetifolia*, Palmae, *Calamus javensis*, *Salacca edulis, Araucaria cuminghumii* (Figure 4a), *Canthium dicoccum, Celtis tetranda, Schoutenia* sp, *Ilex javanica,* Gramineae, *Retitricolporate-pollenites, Acrostichum aureum Asplenium* sp, *Monoletesporites, Triletesporites, Verrucatosporites,* and fungal spores. The presence of trees such as, *Casuarina equisetifolia* mostly on calcareous beach, *Araucaria cuminghumii, Calamus javensis*, *Canthium dicoccum, Celtis tetranda, Ilex javanica,* Palmae, *Schoutenia* sp (Figure 4e, f) they are in the forest while *Salacca edulis* cultivated for ediblefruits. The trees, shrub and Pteridophytes spores such as *Monolete sporites (*Figure6a*), Triletesporites (*Figure 6b*)* and *Verrucatosporites (*Figure 6c*),* which suggests sample Nias 40, as forest area. Using Carbon Dating, the age of pollen sample Nias 40 suggests as 850 ± 90BP
- Nias 70, sandy clay, consists of *Canthium dicocum, Campnosperma* sp*, Macaranga javanica, Caesalpinia* sp, *Monoletesporites, Triletesporites* and *Verrucatosporites*. This sample reflect the environment of reparian peat swamp with the presence of trees such as *Canthium dicocum, Campnosperma* sp*, Macaranga javanica* and *Caesalpinia* sp as shrub, while the Pteridophytes spores *Monoletesporites*

Table 1. Pollen of Tögi Ndrawa Cave, Nias Island.

No:	Name of Plant / Pollen Species	Family:	Habitat:
1	*Podocarpus neriifolius* D.Don.	Podocarpaceae	Java,Humid mixed forest,at 2600m cultivated as an ornamental tree (5.00-35.00 m)
2	*Araucaria cuninghamii* D.Don.	Araucariaceae	New Guinea and Australia tree up to 40 m,while Java cultivated and rarely flowering.
3	*Acacia tomentosa* (Roxb.)Willd	Mimosasae	As enormous trees or erect shrubs,cultivated for fire wood along roads,rice fields and unriggeble soils
4	*Barringtonia spicata*(Bl)	Barringtoniaceae	Tree 3.00-8.00me-ter in Java,dry areas,deciduous forest, watersides.
5	*Casuarina equisetifolia* J.R&G.Forst	Casuarinaceae	Near and on calcareousbeach,not culltivated. Tree 10.00-15.00 m
6	*Calamus javensis* Bl.	Palmae	Up to 15meter W.C. Java forest 5.00-14.00 m
7	*Nipa fruticans*Wurmb.	Palmae	Thick stem,short rhizome Φ Up to 45 cm swampy saline soils along shore.
8	*Oncosperma filamentosum*(Bl)	Palmae	StemΦ1025cm,aculeate,pricles several stemed up to 25m near sea shore(150)m saltwater swamp, denudated rocks.
9	*Pinanga javana* (Bl.)	Palmae	Growing in clumps Φ2.00-6.00m,above600 m,humid forest and teak forest.
10	*Salaca edulis* (Reinw)	Palmae	Tall up to 800m shady, tall stemed,cultivated for the ediblefruits inJava.
11	Undifferentiated	Palmae	--
12	*Calophyllum grandiflorum* J.J.S.	Guttiferae	10.00-25.00m humid forest,stem at300-700 m. a.s.l
13	*Canthium dicoccum* T&B	Rubiaceae	Fruit several together,leaves elliptic,glossy above,tree10.00-30.00m, forest.
14	*Celtis tetramda* Roxb	Ullmaceae	Tree 15.00-35.00m high, Java Forest 500m up to 1450m.
15	*Cryptomeria japonica* D.Don.	Taxodiaceae	Tree, bark red-brown 10.00-60.00 m in china nor rarely cultivated at lower altitudes & lower mountains areas.
16	*Diptrocarpus* sp	Dipterocarpaceae	Trees,often tall grew at 900-1200 m occasion ally humid forest.
17	*Campnosperma* sp	Anacardiaceae	Tree,peatswamp or fresh water swamp
18	*Eucalyptus globules* Labill.	Myrtaceae	Tree, bark smooth and very pale ,3.00-20. 00 m cultivated from Australia
19	*Ficus benyamina* L.	Moraceae	Tree up to 35 m, forest 5-1400 m
20	*Sonneratia caseolaris* (L.)Engl.	Sonneratiaceae	5.00 - 15.00m Java,mangrove along tidal creeks in less saltwater of mangrove forest
21	*Ilex javanica* K&V	Aquifoliaceae	Tree 5.00-40.00m,forest at 1-2400 m
22	*Ixora blumei* Z&M	Rubiaceae	Tree6.00-10.00m,in C Java up to 8oo m

Table 1. *(Continued)*

23	*Mangifera* sp L.	Anacardiaceae	Tree , from Sumatera and Kalimantan
24	*Macaranga javanica* (Bl)M.A	Euphorbiaceae	Tree,12.00-24.00. Ja-va,10-100m,primary and secondary forest.
25	*Caffea Arabica*.L.	Rubiaceae	Shaggy shrub, 2.00-3.00 m, cultivated in Java, native from Abysginia.
26	*Caesalpinia pulcherima* (L.)	Caesalpiniaceae	Erect shrub, 2.00-4.00 m native unknown, in Java cultivated
27	*Chenopodium album* L.	Chenopodiaceae	Very old leaves,dullpa-le green,erect Nonfited. 0,50-2.50 m.In Java at 1100-2800m.agricultural f ields and gardens.
28	*Schoutenia sp*	Tiliaceae	Trees, (10-25)m, dry and humid areas,below 900m cultivated.
29	Undiferentiated	Solanaceae	Trees,shrubs,herbs
30	*Typha angustifolia L.*	Typhaceae	Swampylocalities,watersides,along brackish Water cultivated as ornamental.
31	Undiferentiated	Pandanaceae	Trees,shrubs,herbs,cree ping or climbing,with aeral roots and fruit a drupe(hard stone like seed and juicy flesh olive,cherry and plum)
32	*Strobilanthus* sp	Acanthaceae	Forest,extremely varia-ble,1.50-4.00m high shrubs,flowering with intervals 5 -9years. Forest at 8.00-1700m.5 -7 species.
33	*Ageratum conyzoides*	Compositae	Widely distributed, agricultural fields, waste places,grassy fields ,road sides etc.
34	*Coreopsis tincitoria*	Compositae	Herbs and shrubs
35	*Eupatorium japonicum*	Compositae	Herbs and shrubs
36	*Solidago decurrens*	Compositae	Herbs with rhizomes, stem branched only in the flowering part.
37	*Vernonia* sp	Compositae	Herbs or sometimes trees.
38	undiferentiated	Cyperaceae	Growing in marshy places
39	undiferentiated	Gramineae	Wild,humid or swamp, sunny ground,ancient cultivation such as *coix lacryma-jobi* L. type, grasses , etc.
40	Pteridophyte spores 40 *Acrostichum aureum* 41.*Asplenium* 42.*Pteris* 43 *Monoletesporites* sp 44.*Triletesporites* 45.*Verrucatosporites* 46*Echitriletesporites* 47.*Echinatesporites* 48*Verrutriletesporites*		
49	Fungal spores		Freshwater
50	Algae		Freshwater
51	Dinoflagellates (*Hystrichospheridium*)		Marine

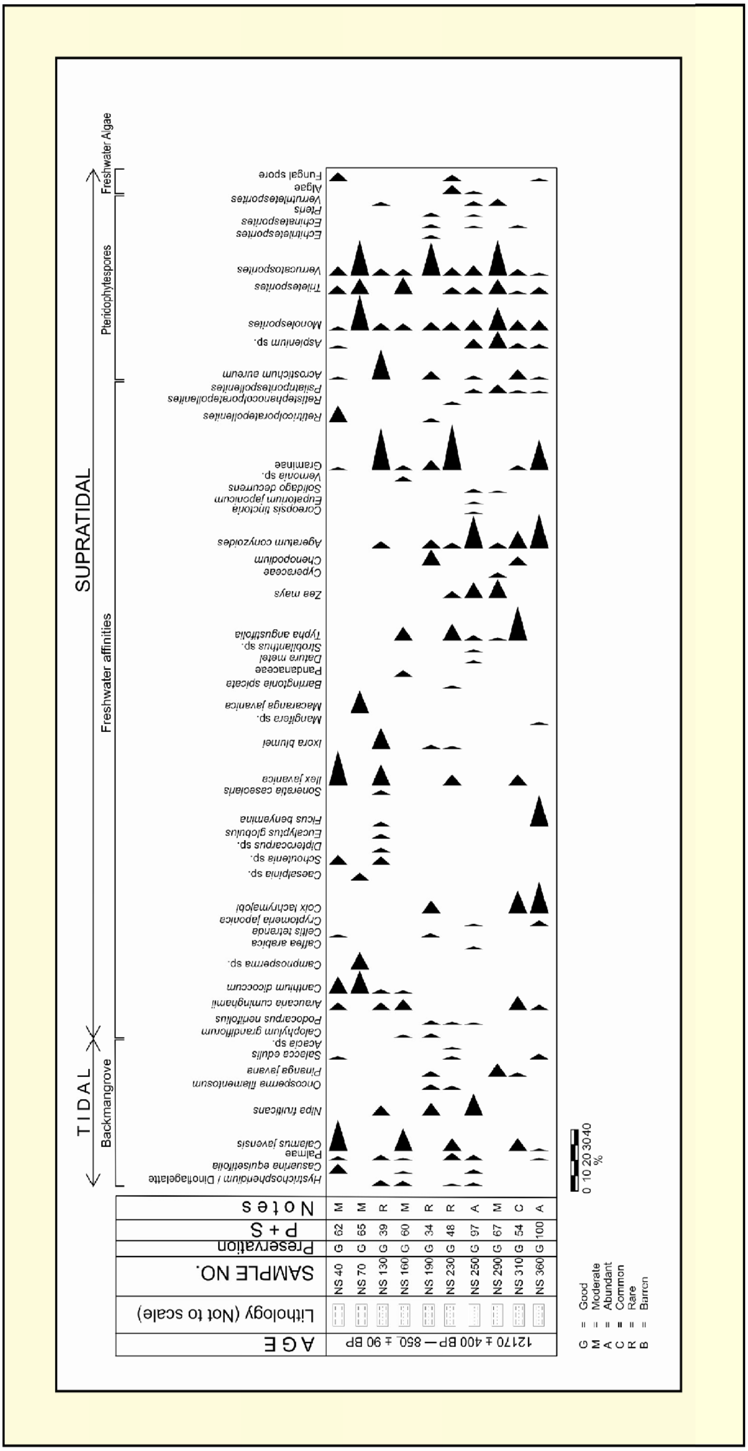


Figure 3. Pollen diagram of Tögi Ndrawa Cave

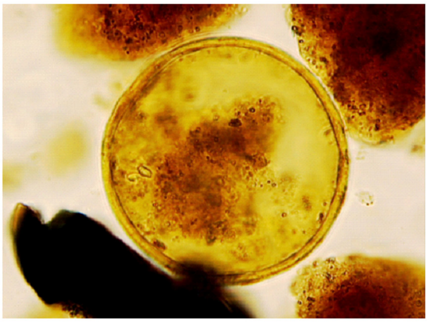
*(*Figure6a*), Triletesporites (*Figure 6b*)* and *Verrucatosporites (*Figure 6c*),* they reflect more for an open area. Carbon Dating suggests the age for this sample as 1330±80BP.

- Nias **130**, sandy clay wich contain *Hystrichospheridium* (Dinoflagellate), Palmae, *Nipa fruticans, Auracaria cuminghamii, Canthium dicoccum, Schoutenia* sp, *Dipterocarpus* sp, *Eucalyptus globules, Ficus benyamina, Sonneratia caseolaris, Ilex javanica, Ixora blumei, Ageratum conizoides,* Gramineae, *Acrostichum aureum, Monoletesporites* and *Verrucatosporites.* This pollen sample contain *Hystrichosperidium* (Dinoflagellate) and *Nypa fructicans* which suggests for marine influence. At the other hand this part of Nias 130 where the tree pollen grains suggests for a forming of stable ground within the big trees such as *Auracaria cuminghamii, Canthium dicoccum, Schoutenia* sp, *Dipterocarpus* sp, *Eucalyptus globules, Ficus benyamina, Sonneratia caseolaris (*Figure 4b*), Ilex javanica* and *Ixora blume. S*urround this grass field, the pteridophyte spores are, *Acrostichum aureum, Monoletesporites* and *Verrucato sporites.* Carbon dating suggests the age of this sample as 1540 ±90BP.
- Nias **160**, sandy clay,within pollen,spores and *Hystrichospheridium* (Dinoflagellate). *Casuarina equisetifolia,* Palmae, *Calamus javensis, Calophylum grandiflorum, Araucaria cuminghamii, Canthium dicoccum,* Pandanaceae, *Typha angustifolia, Vernonia* sp, Gramineae, *Monoletesporites, Triletsporites* and *Verrucatosporites.*
- Pollen grains in this sample show beach environment based on the presence of *Hystrichospheridium* (Dinoflagellate) while, *Casuarina equisetifolia* and *Calophyllum grandiflorum* suggests for peat swamp. Palmae (Figure 4e, f), *Calamus javensis, Auracaria cuminghamii* (Figure 4a)*, Canthium dicoccum,* Pandanaceae*, Typha angustifolia, Vernonia* sp, Gramineae (Figure 5b), *Monoletesporites, Triletesporites* and *Verrucatosporites* reconstruct the freshwater swamp. Carbon dating suggests the age of sample Nias 160, as 3540 ±100BP.
- Nias **190**, sandy clay, which consists of *Nipa fruticans*, *Oncosperma filamentosum, Pinanga javana, Calophyllum grandiflorum, Podocarpus neriifolius, Celtis tetranda, Ixora blumei, Chenopodium, Ageratum conyzoides* Gramineae, *Retitricolporate pollenites, Acrostichum aureum, Monoletesporites* and *Verrucatesporites, Echitrilete sporites, Echinatesporites, Pteris, Coix lachrymajobi.* This sample 190 consist the depth for slightly salt water area.based on the pollen grains such as *Nipa fruticans* and *Oncosperma filamentosum,* where they grew mostly on saline soils. This plants community consist of *Pinanga javana, Calophyllum grandiflorum, Podocarpus neriifolius, Celtis tetranda, Ixora blumei*. *Chenopodium (*Figure 5a), *Nipa fruticans, Oncosperma filamentosum, Ageratum conyzoides,* Gramineae *Retitricolporatepollenites, Acrostichum aureum, Monoletesporites. Verrucatesporites, Echitriletesporites, Echinatesporites, Pteris, Coix lachrymajobi* suggests for open area. Carbon dating suggests the age of sample Nias 190, as 3540 ±100BP.
- Nias **230**, sandy clay, contain *Hystrichospheridium* (Dinoflagellate), Palmae and *Calamus javensis, Oncosperma filamentosum, Salacca edulis, Acacia* sp, *Podocarpus* neriifolius, Ilex javanica, Ixora blumei, Barringtonia spicata, Typha angustifolia, Agera*tum conyzoides*, Graminae*, Retistephanocolporatepollenites,*

Monoletesporites, Triletesporites, Verrucatosporites. Sample Nias 230, based on the dinoflagellate and pollen grains such as *Hystrichospheridium, Oncosperma filamentosum,* suggests for salt water swamp or saline soils along shore. Palmae, *Calamus javensis* and *Salacca edulis* are Palms. *Acacia* sp are known as fire wood. *Podocarpus neriifolius* cultivated tree, *Ilex javanica, Ixora blumei,* mostly in the forest. *Barringtonia spicata (*Figure 4c*)* in deciduous forest, *Typha angustifolia* in swampy localities *Ageratum conyzoides (*Figure 5c), Gramineae, *Retistephanocolporatepollenites, Monoletesporites, Triletesporites* and *Verrucato sporites* in grassy fields. This sample reconstruct more for backmangrove. Carbon dating suggests the age of sample Nias 230, as 7890±120BP.

- Nias **250**, sandy clay,with dinoflagellate such as *Hystrichospheridium*, pollen and spores *Casuarina equisetifoila,* Palmae, *Nipa fruticans, Podocarpus neriifolius, Caffea arabica, Cryptomeria japonica, Datura metel, Strobilanthus* sp, *Typha angustifolia,* Ageratum conyzoides, Coreopsis tinctona, Eupatorium japonicum, Solidago decurrens, *sporites, Triletesporites, Verrucatosporites, Echinatesporites, Pteris, Verrutriletesporites* and Algae. Sample Nias 250 based on dinoflagellate such as *Hystrichospheridium* and pollen *Nipa fruticans* consist for the saline soils along shore, while *Casuarina equisetifolia,* Palmae and *Podocarpus neriifolius,* suggests for mixed forest and *Cryptomeria japonica* as tree with red-brown bark grew at the lower altitudes areas included shrubs such as *Caffea arabica, Datura metel, Strobilanthus* sp and *Typha angustifolia.* The herbs were *Ageratum conyzoides, Coreopsis tinctona (*Figure 5d*), Eupatorium japonicum, Solidagodecurrens,*Gramineae, *Psilatriporitespollenites* while the Pterido phytes spores present such as *Acrostichum aureum, Asplenium* sp (Figure 5f) *Verrutriletesporites* and freshwater Algae. Carbon dating suggests the age of sample Nias 250, as 8590 ±140BP.
- Nias 290, sandy clay, consists of *Pinanga javana, Typha angustifolia,* and Cyperacea. *Ageratum conyzoides, Solidago decurrens, Psilatriporitespollenites, Asplenium* sp. sp, *Monoletesporites, Triletesporites, Verrucatosporites* and *Verrutriletesporites.* This sample of Nias 290, *Pinanga javana* tree, grow above of 600 meter in humid forest. *Typha angustifolia,* Cyperaceae, *Ageratum conyzoides, Solidago decurrens*, *Psilatriporitespollenites,* as shrubs or herbs. Gramineae as grass family while Pteridophyts such as *Monoletesporites (*Figure 6a*), Triletesporites (*Figure 6b*), Verrucatosporites* (Figure 5e) and *Verrutriletesporites.* This Nias pollen and spores of sample 290 reflect more to an open area with a lot of shrubs, grass and herbs within the scattered of *Pinanga javana* trees. Carbon Dating suggests an age of 9180 ±150 BP for this Nias sample.
- Nias 310, sandy clay, contained *Calamus javensis, Pinanga javana, Araucaria cuminghamii, Ilex javanica, Typha angustifolia, Chenopodium, Ageratum conyzoides,* Gramineae *Psilatriporitespollenites, Acrostichum aureum, Asplenium* sp, *Monoletesporites, Trilete-sporites, Verrucatosporites, Echinatesporites* and *Coix lachrymajobi.* The pollen and spores of this sample contain such as *Calamus javensis* and *Pinanga javana,* as Palmae, *Araucaria cuminghamii,* of Araucariaceae cultivated in Java*, Ilex javanica,* Aquifoliaceaea as tree. Shrubs are *Typha angustifolia* and *Chenopodium* at the other hand, herbs are *Acrostichum aureum,Asp-*

POLLEN PHOTOS. I (1000x)

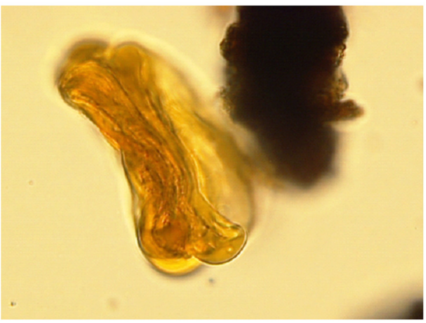


[a]

Araucaria cuninghamii

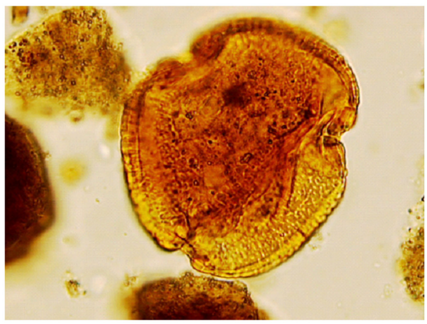
[b]

Sonneratia caseolaris



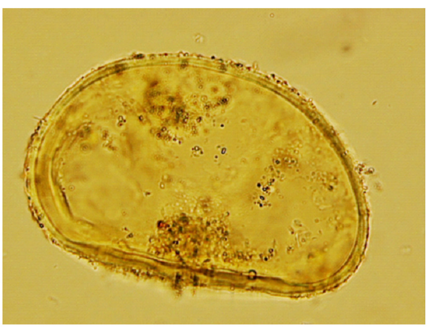
[c]

Barringtonia spicata (Bl.)



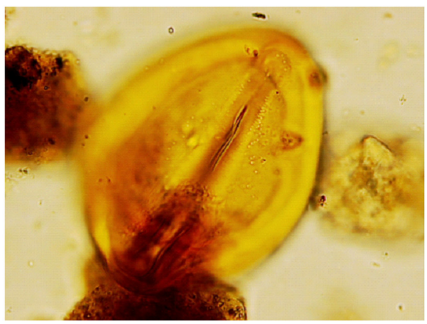
[d]

Schoutenia sp.



[e]

Palmae

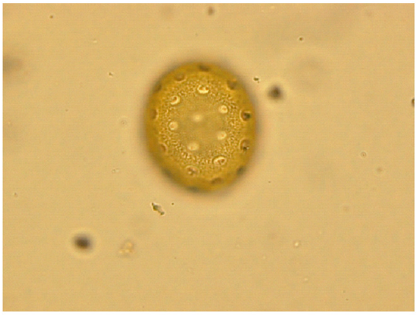


[f]

Palmae

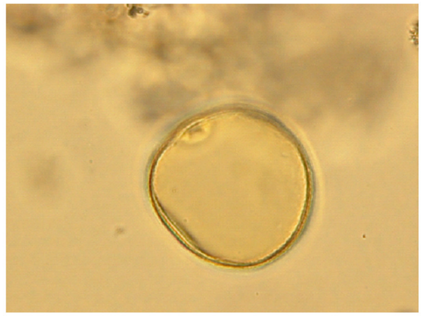
Figure 4

POLLEN PHOTOS. II (1000x)



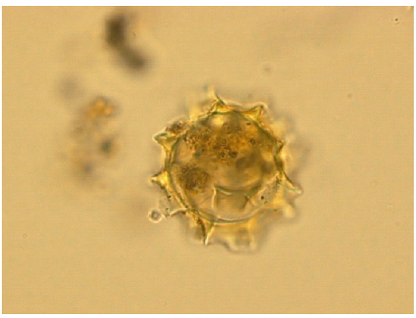
[a]

Chenopodium album.L.



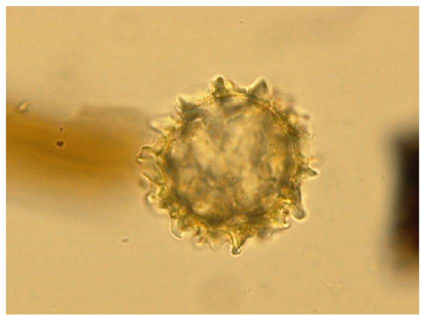
[b]

Gramineae



[c]

Ageratum conyzoides

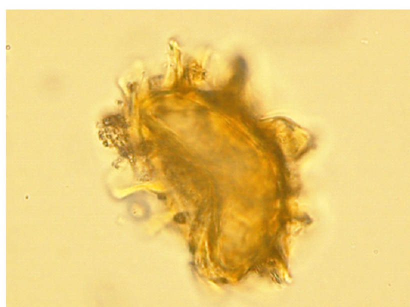


[d]

Coreopsis tinetoria

[e]

Verrucatesporites

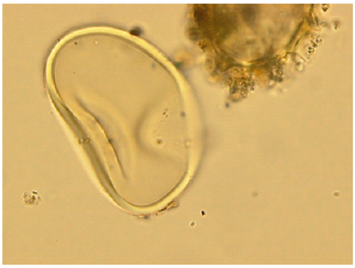


[f]

Asplenium sp.

Figure 5

POLLEN PHOTOS. III (1000x)

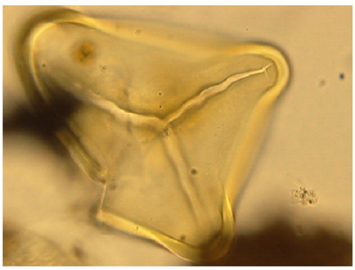


[a]

Monoletesporites

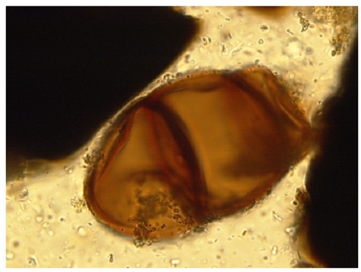
[b]

Triletesporites



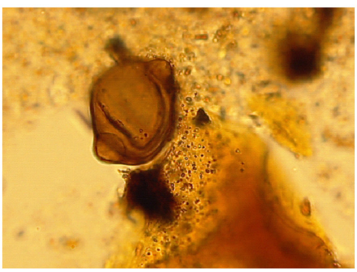
[c]

Triletesporites



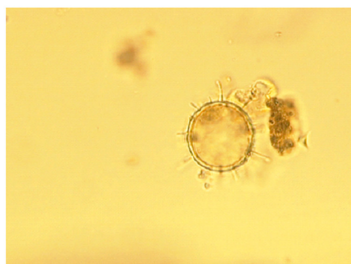
[d]

Fungal spore



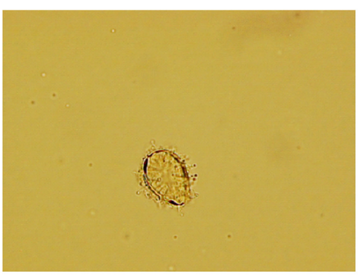
[e]

Fungal spore



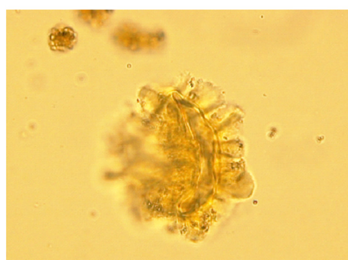
[f]

Dinoflagellatte



[g]

Dinoflagellatte



[h]

Dinoflagellatte

Figure 6

lenium sp (Figure 5f) *Ageratum conyzoides, Coix lachrymajobi,* Gramineae and *Psilatriporitespollenites.* Pteridophytes such as *Monoletesporites, Triletesporites, Verrucatosporites* and *Verrutriletesporites.* Pollen grains of sample Nias 310, reflects for an forest within palm trees and the present of *Araucaria cuminghamii* trees. *Typha angustifolia* and *Chenopodium* (Figure 5a) as shrubs, while *Acrostichum aureum, Asplenium* sp (Figure 5f) *Ageratum conyzoides, Coix lachrymajobi,* Gramineae, *Psilatriporitespollenites* present as an open area which reconstruct slightly humid forest .Carbon dating suggests an age of 9540±210 BP for sample Nias 310.

- Nias 360,sandy clay, which contain Palmae, *Calamus javensis, Salaca edulis, Araucaria cuminghamii, Cryptomeria japonica, Ficus benyamina, Mangifera* sp, *Ageratumconyzoides,* Gramineae, *Psilatriporitespollenites, Acrostichum aureum, Asplenium* sp, *Monoletesporites, Triletesporites, Verrucatosporites, Coix lachrymajobi* and Fungal spores.Pollen and spores of Nias 360 clay sample, such as *Calamus javensis, Salaca edulis,* as Palmae, *Araucaria cuminghamii* of Araucariaceae grew in Sumatera Island and cultivated in Java, *Cryptomeria japonica, Ficus benyamina, Mangifera* sp as trees mainly from Sumatera Island which grew in humid forest, while *Ageratum conyzoides,* Gramineae, *Psilatriporitespollenites, Acrostichum aureum, Asplenium* sp, *Monoletesporites, Triletesporites, Verrucatosporites, Coix lachrymajobi* and Fungal spores (Figure 6d, e) present which conclude the environment of Nias 360 sample as humid forest.Carbon dating suggests an age of 11010 ±250BP for this sample.

DISCUSSION

Fossil pollen of Tögi Ndrawa Cave were preserved in good condition while Forestrier, *et all* (2005), collected 10 samples for pollen analysis and they want to know the environment while at the other hand the age was done by Carbon dating. Palynological evidence for the history of vegetation and climate of this Cave of Nias Island, used diagnostic pollen or pollen index for environment interpretation.The main differences in the pollen record of Tögi Ndrawa Cave show pollen trees, shrubs and grasses. Succesion of a characteristic feature within the abundant occurrence of Gramineae pollen suggesting widespread grass dominated swamp associated with both mangrove swamps and freshwater lakes, and also the possibility of widespread grass dominated savanna on well drained soils. This suggests that the climate was more seasonal than that exper ienced in the region today. This paper review Quaternary palynological evidence for the history of vegetation and climate. Datas is available from Tögi Ndrawa Cave which suggests an open area for this region within dominated trees surround the area. This suggests for more strongly seasonal than that experienced in the region today and the presence of widespread open vegetation, rather than forest which the occurrence of ver tebrates in this area. Data is available from cores collected from lake and swamp sedi ments from the mountains of Sumatera provide relatively detailed histories of montane vegetation and Holocene climatic amelioration.

Based on the first information for contributions with focused on the Quaternary, includes background of reviews on geology and plant biogeography, also on the climate dynamics, show an area of increasing importance in understanding of global climate change. Secondly presents new research on Quaternary environmental change in the southeast Asia-Pacific region, with the aim of establishing a detailed chronostratigraphy for the Quaternary of Nias Island. Palynology was used primarily to reconstruct past vegetation where at sample 130, 160, 190, 230 and 250 concists dinoflagellate such as *Hystrichospheridium* which suggests for marine environment. The palynomorph assemblages from Nias Island by pollen of trees, herbs, fern spores and Gramineae dominating with the predominance are of grasses and some other pollen types which change caused of global climate. Deposition on a fluvial plain is suggested in these regions, possibly with grass dominated savanna growing on well drained areas. The predominance of Graminae which suggests are pollen in all formation, suggests the presence of widespread grass-dominated swamps, and possibly the presence of savanna on well drained areas. These assemblages suggests both freshwater swamp forest and grass-dominated swamps within the floodplain, and possibly a mosaic of rain forest and grass-dominated savanna on well-drained areas, probably considerably more moist .

Nias Island show abundantly represented pollen in the Tögi Ndrawa Cave, simply reflects the higher altitude of the Cave since pollen of the regrowth forest which are often common close to the main assemblage changes.

CONCLUSION

With the presence of dinoflagellate, pollen, pteridophytes spores and fungal spores from the Tögi Ndrawa Cave samples, where they are in good preservation, and conclude for a good interpretation of the environment in this study. Based on the pollen grains of Tögi Ndrawa Cave, which found in this work, suggests that the ten pollen samples show an open humid forest within sea water where dinoflagellate be a life, while at the other hand for the age of this pollen work, was used by carbon dating.

Acknowledgement :

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