



ASSESSMENT OF CONSERVATION STATUS OF *RAFFLESIA* IN WEST SUMATRA, INDONESIA

Final Report, June 2010

A Report to Rufford Small Grant (for Nature Conservation)



By
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Sumatera Barat, Indonesia
2010**

**ASSESSMENT OF CONSERVATION STATUS OF
RAFFLESIA IN WEST SUMATRA, INDONESIA**

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PREFACE

Rafflesia should be getting more attentions than the other plant because this plant is rare and has specific basic need to support their life. Limited areas of distribution, high buds mortality and specific host plant are the limited factors that threat the existence of the species. Degradation, habitat lost and negative effect of economic value of the species are the other problems that increased the risk of the extinction of the species. Famous as an icon of conservation, on the contrary *Rafflesia* is threatened by their rarity and uniqueness. *Rafflesia* eventually becomes extinct and effort to conserve the species is urgently needed.

Each species of *Rafflesia* exists in West Sumatra is threatened by various threats with different intensity. *R. arnoldii* R. Br. threatened by negative side effect of the tourism activities that triggered destruction of the habitat and buds population. *R. gadutensis* Meijer threatened by habitat degradation and land conversion, meanwhile *R. hasseltii* Suringar threatened by logging activity. The pressures for the species increasing continuously and the basic need of the species still not sufficient enough to establish management conservation plan.

Rafflesia Monitoring Team (RMT) Padang had been tried to gather some conservation aspect of *Rafflesia* in West Sumatra, identify the problems and invited participation of the local communities in *Rafflesia* conservation efforts. These activities expected become a first fundamental step to formulate an effective way to conserve *Rafflesia* in West Sumatra.

Padang, June 2010

Rafflesia Monitoring Team (RMT)

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ASSESSMENT OF CONSERVATION STATUS OF *RAFFLESIA* IN WEST SUMATRA, INDONESIA

Project Duration 2009-2010

SUMMARY

Assessment of the conservation status of *Rafflesia* in West Sumatra is the early step to conduct conservation effort on *Rafflesia* in West Sumatra. Previous study conducted by the foreign and local scientist focused work on taxonomy and ecology and no assessment had been done to assess the conservation status of *Rafflesia*. For last ten years, no up-dated taxonomy and ecological data of *Rafflesia* had published so that, these basic data must gathered and compiled to get the exact condition of the *Rafflesia* in the field. Scientific methodologies have been formulated to fulfil the need of these aims in mind. Questionnaires, poster and bulletin produced as media campaign and Focus Group Discussion conducted to establish network with the local communities in Batang Palupuh. A series of Conservation training conducted ten times for 13 participants from members of KCA-LH *Rafflesia* that expected can lead the young member of this working group to continue the conservation effort for *Rafflesia* in the future.

Three species of *Rafflesia* and 2 un-identified species found exist in West Sumatra in ten study areas with totally 15 active sites. 70% of these sites located outside of protected area. Based on the field data, *R. arnoldii* R. Br. and *R. hasseltii* Suringar categorized as Vulnerable (VU) and *R. gadutensis* Meijer categorized as Critically Endangered (CR). This result indicates the conservation actions for the species is urgently need to be done, and effective management plants must be formulated to reduce the risk of extinction of the species.

AIMS

The project is aimed to assess the conservation status of *Rafflesia* populations; monitoring the existence of the species and use the result of the project to propose management plan for conservation of the species in West Sumatra.

OBJECTIVES

- Accessing the distribution site of *Rafflesia* in West Sumatra to identify the status and existence of the species in their habitat
- Locating and mapping *Rafflesia* in West Sumatra to assess the condition of the population and to gather basic ecological information for the species concern
- Gathering local knowledge by develop social networks and public awareness campaign to encourage participation of the local people to participate in conservation activities
- Conducting education and conservation training for the young generation to increase their skill and knowledge in conservation views.

BACKGROUND AND JUSTIFICATION

Background information of *Rafflesia*

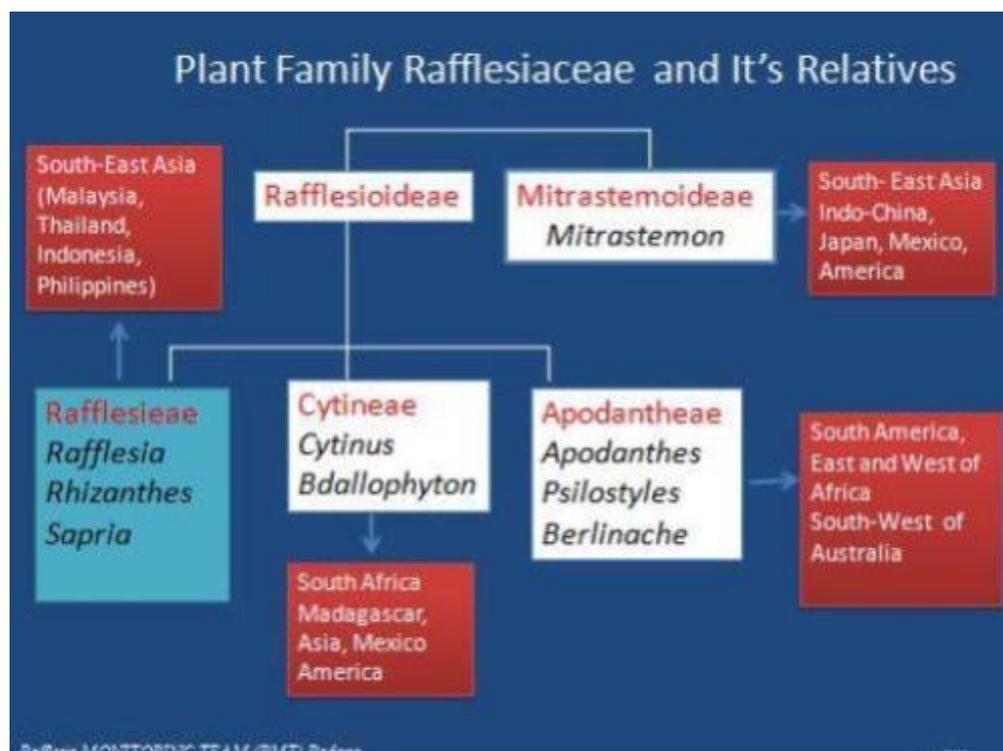
Known as the largest flower in the world, *Rafflesia* has become a charismatic symbol of conservation. It is gigantic, odd, exceptional, rare and mysterious. This species is one of the most threatened of plant considering their limited distribution, specific host plant, large sex imbalance, and the threat is increased by the rapid habitat lost as a result of tropical rain forest degradation.

Rafflesia is a holoparasitic plant genus with family Rafflesiaceae. This plant is rootless, without chlorophyll, dioecious (with unisexual individual) and live completely within their host plant. According to Meijer (1997) the non flowering parts of this plant normally live inside the tissue of the host plant as endophytic body growing like a thallus inside the woody stems and roots of species of *Tetrastigma* (vine plant



Tetrastigma sp.

family, Vitaceae). Flowers bud sessile, scales (bracts) in a series of 3 whorls of 5 scales, imbricate, white at first appearance, turning black or dark brown after exposure. *Perigone lobes* 5, imbricate, reddish with white warts, inserted around an annular, horizontal, central diagram which has a more or less round opening in the centre. Base of *perigone tube* and adjacent zone of diaphragm covered with variably shaped of *ramenta* inside. Central column at the apex widened into a disk, often with processes. Fruits berry like.



Distribution of Rafflesiaceae and its relatives (based on Nais, 2001)

After the work of Meijer (1997) and Nais (2001), 12 new species of *Rafflesia* have been published by several Botanists (IPNI, 2009). Totally 30 species of *Rafflesia* have been reported exist around the world since 2003. All the species *Rafflesia* and its distribution presented on the table below:

Table 1. Recognized species of *Rafflesia* around the world (after Meijer, 1997; Nais, 2001) and IPNI, 2009 (indicate by asterisk)

Sumatera	Java	Borneo	P. Malaysia	Thailand	Philippines
<i>R. arnoldii</i> <i>R. gadutensis</i> <i>R. hasseltii</i> <i>R. microphylora</i> <i>R. rochussenii</i> <i>R. patma</i> <i>R. bengkulensis*</i> <i>R. lawangensis*</i>	<i>R. patma</i> <i>R. rochussenii</i> <i>R. zollingeriana</i>	<i>R. arnoldii</i> <i>R. borneensis</i> <i>R. ciliata</i> <i>R. keithii</i> <i>R. pricei</i> <i>R. tengku-adlini</i> <i>R. tuan-mudae</i> <i>R. witkampii</i>	<i>R. hasseltii</i> <i>R. cantleyi</i> <i>R. kerii</i> <i>R. azlanii*</i>	<i>R. kerrii</i>	<i>R. manillana</i> <i>R. scandenbergiana</i> <i>R. baletei*</i> <i>R. banahao*</i> <i>R. banahowensis*</i> <i>R. leonardi*</i> <i>R. lobata*</i> <i>R. mira*</i> <i>R. panchoana*</i> <i>R. speciosa*</i>

Three species of *Rafflesia* found exist in West Sumatra that is *Rafflesia arnoldii* R. Br., *R. gadutensis* Meijer and *R. hasseltii* Suringar. The existence of this three species is reported by Meijer (1984; 1997) and Zuhud (1998) in several sites in West Sumatra. The famous one is Cagar Alam (Nature Reserve) Batang Palupuh for *Rafflesia arnoldii* R. Br. and Taman Hutan Raya (TAHURA) Bung Hatta for *R. gadutensis* Meijer.

The most spectacular *Rafflesia* in West Sumatra has been threatened in many cases. The main problem faced by *Rafflesia* is threatened by extinction, especially through the destruction and disturbance of its rain forest habitat, habitat fragmentation, land conversion, lack of understanding for conservation value of this species and unmanaged eco-tourism activities. This has given negative impact for the existence of this species in this region. Assessing the current status and the existence of the *Rafflesia* is urgently needed to improve our understanding and to conserve the species.

Some of biological and conservation aspects as key knowledge components for development of conservation strategy to this species are currently scarce and wanting. The conservation of the species also gets less attention than their ecotourism aspect, although in many cases the damage of its population is triggered by the tourism activities. Considering this situation, basic research to gather these important data is urgently needed.

This project focused work on accessing the current status and the existence of the population of *Rafflesia* in several sites that have been reported exists in West Sumatra. In the process we can identify potential threats and encourage participation of the local communities through education and social networking.

Geographic Condition

Sumatra is one of the largest Islands in Indonesian archipelago. This Island has 74% of land area in central and Southern, 40% in northern, the remaining area are mountainous, formed by the Barisan Range in Western Sumatra. Generally, such as another island in Indonesia, Sumatra has ever-wet or semi-wet climate, except the northern coastal trip of Sumatra (FAO, 2000).

West Sumatra lies in the middle of the western coast of Sumatra and has an area of 42,297.30 km². Geographic features include plains, mountainous volcanic highlands formed by Barisan mountain range that runs from north-west to south-east and an offshore Island archipelago called Mentawai Island. West Sumatra coastline faces the Indian Ocean and stretches 375 km from North Sumatra province in the north-west and to Bengkulu in the south-east (Anonymous, 2010).

Vegetation Condition

Sumatra lies in the West Malesia plant region along with Peninsular Malaysia, Borneo, Philippines and part of southern Thailand. Sumatra probably

has more than 10,000 species of higher plants, most of which are found in lowland forest (Whitmore, 1984).

Vegetation type varies in Sumatra Island. West Sumatra Province in central Sumatra has wide tropical rainforest with various ecosystems include lowland tropical rainforest, montane forest, peat swamp forest, freshwater swamps forest and mangrove ecosystem. Lowland and montane forest are larger than the other ecosystem in West Sumatra (Whitten, 1984).

Study about vegetation and physiography of Sumatra by Laumonier (1997) was highlighted the fact that intense deforestation actually taking place. The loss of biological diversity specific to low altitude ecosystem are critical. Current deforestation could have catastrophic ecological consequences for developing region such as Sumatra. Natural vegetation type has been reduced in area far more than others and that some vegetation type still has no protection. Montane forest have lost an average of one third of their natural area, whereas between two-thirds and fourth-fifth of lowland forest have disappeared.

Conditions have become worst in the last few years, moreover the political climate in Indonesia has forced people to infringe upon protected areas.

SOCIAL NETWORK AND PUBLIC AWARENESS CAMPAIGN

- Questionnaires distributed to the local communities
 - to gather information of new and suspected locations site of *Rafflesia*;
 - to gauge the local knowledge;
 - to identify the problems that faced by *Rafflesia* in their habitat.
- Poster and bulletin produced and used as media campaign for the conservation effort of *Rafflesia*
- Workshop and Focus Group Discussion (FGD) conducted for the local people in village that close to *Rafflesia* site.

- The final report of conservation status will be prepared and forwarded to the policy makers and stake holders in West Sumatra and Scientific authority of Indonesia.

EDUCATION AND CONSERVATION TRAINING

Education and conservation training conducting by:

- A series of regular training set up for the members of KCA-LH Rafflesia as a potential working group for *Rafflesia* conservation activities. Training will focused on biology, ecology and conservation aspects
- Visiting senior high school closest to *Rafflesia* site to discuss, share and learning with the student about the existence of *Rafflesia* in their region.

SCIENTIFIC METHOD

Our primary aim in the field is to assess the current conservation status and ecological requirements of the threatened of *Rafflesia* in the study sites. This will be complemented by broad-basic taxonomical surveys incorporating quantitative and qualitative components. Our scientific methodologies have been formulated with these aims in mind.

- Intensive fieldwork conducted at known *Rafflesia* sites and some of suspected locations from the previous works, utilizing current network of KCA-LH Rafflesia, government agencies for conservation and local villagers. The method is randomly searching in the existing site or previously known *Rafflesia* site.
- In the existing *Rafflesia* site, the species, site status, elevation, forest type, and land status compiled. Global Position System (GPS) coordinates recorded for each site.
- Maximum 0.25 ha plot will be erected at the active *Rafflesia* site, divided to 25 sub-plots measuring to 10m x 10m each. Buds, flower, fruits, and scars in any other conditions (life or die, good or damaged) counted, measured

and mapped. This data used as basic data for monitoring activity and potential reference in the future.

RESULT OF THE PROJECT

TAXONOMY AND ECOLOGY

Based on observation in the study site, Rafflesia Monitoring Team (RMT) found tree species of *Rafflesia*, these are *Rafflesia arnoldii* R. Br., *R. gadutensis* Meijer, *R. hasseltii* Suringar and two un-identified species exist in West Sumatra. Meijer (1997), Nais (2001) and Zuhud, *et al.* (1998) are used as references along the identification process. We also compare the field data with voucher (well-preserved) of wet specimen of *Rafflesia* that deposited in Herbarium Universitas Andalas (ANDA) as a comparative data. The description of these tree species are based on field data that compiled along February 2009 to May 2010.

Rafflesia arnoldii R. Br.

Rafflesia arnoldii R. Br., Trans. Linn. Soc. 13 (1821) 201; t. 22-26; Meijer, Flora Malesiana (I) 13 (1997): 1-42 (23); Nais, *Rafflesia of the World* (2001): 119. --- Type: *Raffles & Arnold s.n.* (K).

Synonym: *Rafflesia titan* Jack (Nais, 2001)

Vernacular name: Bunga *Rafflesia*,
Bunga Bangkai

Buds:

Size: varied, 2.5 – 34.7 cm in diameter.
Immature bud: dark brown at the first appearance, sometime white or pale brown at the top of the bud when exposure, bract brown to dark brown in color, imbricate. **Mature bud:** pale to strong sorrel in color, bract brown to dark brown usually released before the flower blooming.

Flower:

Smell: Cursed with a smell reminiscent of rotting carcass for several days after first day blooming.





Size: (55.0-) 65.0 – 81.0 cm in diameter when blooming. Strong sorrel-pinkish to reddish brown at the beginning of the blooming, turn to sorrel 3-4 days after blooming, and turn to pale sorrel to brown after 5-6 days. The color of the flower totally turn to dark brown-blackish before decomposed.

Perigone tube: 13.0 – 15.5 cm in high

Perigone lobes: 5 lobes, average 22.0 – 29.0 cm in high and 23.3 – 33.0 cm in

wide, strong sorrel to reddish brown in color, with numerous white warts up to 15 in radial and lateral direction, only occasionally interspersed with smaller warts, the white warts occupying slightly more space than the reddish brown background.

Diaphragm: 30.0 – 36.0 cm in diameter with *aperture* 14.0 – 21.0 cm at the centre, arise rather high at the end of flowering phase, the color of diaphragm sometimes paler than the color of perigone lobes, *upper surface* with c. 40 radial series of 4 or 5 white circular warts which are only a few mm in diameter, *lower surface (windows)*, with 5 or 6 (7) series of white rounded blotched rings.



Ramenta: all over the inner side of the flower tube, 1.0 – 15.0 mm long, with simple or forked branches.

Disk with raised rim: 5.0 – 5.5 cm in high and 17.0 – 17.5 cm in diameter with 45-55 *processi* at the upper surface, 2.2 – 3.8 cm in high.

Fruit: dark brown - black, 12.0 – 13.0 cm in high and 13.5 – 16 cm in diameter.

Specimen examined: *Rafflesia arnoldii* R.Br., Batang Palupuah, BaIa1; Bukit Air Dingin, BbIa1; Halaban, MaIa1.

Distribution: West Sumatra (Padang, Agam, Lima Puluh Kota, Pasaman), Bengkulu, Aceh and Borneo.

Notes: Three *R. arnoldii* R. Br. found blooming along the study in West Sumatra. Two of them in good condition and another one had broken, attacked by unidentified animal.



***Rafflesia gadutensis* Meijer**

Rafflesia gadutensis Meijer, Blumea 30 (1984) 211; Meijer, Flora Malesiana (I) 13 (1997): 1-42 (24); Nais, Rafflesia of the World (2001): 133. --- Type: Meijer 17003 (BO holo; MO), W. Sumatra.

Synonym: None.

Vernacular name: Cindawan harimau

Buds:

Size: varied, 2.5 – 16.5 cm in diameter.

Look like the same as bud of *R. arnoldii* R. Br. **Immature bud:** dark brown at the first appearance, sometime white or pale brown at the top of the bud when exposure, bract brown to dark brown in color, imbricate. **Mature bud:** pale to strong sorrel in color, bract brown to dark brown usually released before the flower blooming.

Flower:

Smell: Cursed with a smell reminiscent of rotting carcass for several days after first day blooming.

Size: (40.0-) 55.0 – 57.0 cm in diameter when blooming, pinkish to bright red at the beginning of the blooming, turn to reddish brown 3-4 days after blooming, and turn to pale brown after 5-6 days. The color of the flower totally turn to dark brown-blackish before decomposed.



Perigone tube: 8.0 – 10.0 cm in high

Perigone lobes: 5 lobes, average 10.5 –15.5 cm in high and 11.5 – 15.0 cm in wide, pinkish to bright red in color, with pale pink to white warts (blotches) up to 10 in radial and lateral direction, blotches 2.0 x 1.0 cm and sometimes bigger up to 5.0 x 1.0 cm broad, with bright red in the background.



Diaphragm: 17.5 cm in diameter with aperture 11.0 - 12.0 cm at the centre, arise rather high at the end of flowering phase, the color of diaphragm the perigone lobe, sometimes paler, upper surface with c. 40 radial series of 3 - 4 white circular warts which are only a few mm in diameter, lower surface (windows), with 5 concentric rings of white blotched, the 1(2) rings closest to perigone tube with flat crateriform or oval fringed apex, on stalks up to 6-7 mm long, make them like toadstool.



Ramenta: all over the inner side of the flower tube, up to 1.0 mm in wide and 6.0 - 9.0 (10.0) mm in long, lobed or branched with swollen head near the diaphragm, the other apices only swollen.

Disk with raised rim: 4.0 - 6.0 cm in high and 12.0 cm in diameter with 17-18



Processi at the upper surface, 3.0 - 3.5 cm in high.

Fruit: dark brown - black, 9.5 cm in high and 15.0 cm in diameter.

Specimen examined: *Rafflesia gadutensis* Meijer, Ulu Gadut, AaIa1; Tahura Bung Hatta, AaIIc2 and AbIc7.

Distribution: West Sumatra only (West Coast, Padang, Bukittinggi, Solok, Ulu Gadut, Tahura Bung Hatta)

Notes: Along the study RMT did not found any blooming of *R. gadutensis* Meijer. Data presented at this report based on data from previous work.

***Rafflesia hasseltii* Suringar**

Rafflesia hasseltii Suringar, acta Soc. Reg. Sc. Neerl. 25 Oct. 1879: 4-5; Meijer, Flora Malesiana (I) 13 (1997): 1-42 (25); Nais, Rafflesia of the World (2001): 136. *Type*: Suringar s.n. (L), Sumatra

Synonym: None.

Vernacular name: Tindawan Biring; Rafflesia merah putih (Zuhud *et al.*, 1998); Tindawan Muko Rimau

Buds:

Size: varied, 9.7 – 18.0 cm in diameter. *Immature bud:* not found. *Mature bud:* pink to dark red color, bract dark brown to blackish usually released before the flower blooming.

Flower:

Smell: Cursed with a smell reminiscent of rotting carcass for several days after first day blooming.

Size: 35.0 cm in diameter when blooming, bright red to dark red at the beginning of the blooming, and turn to pale sorrel to brown after 5-6 days. The color of the flower totally turn to dark brown-blackish before decomposed.

Perigone tube: 4.0 – 5.0 cm in high

Perigone lobes: 5 lobes average 9.0 – 11.0 cm in high and 11.0 – 13.0 cm in wide, bright red to dark red in color, with more than 5 whitish-pink blotches across; blotches large, ranging from 5 x 3 to 10 x 1 cm. The clear contrast between large snow blotches on bright red background easily distinguish this species from others.



Diaphragm: 17.0 cm in diameter with *aperture* 8.0 cm at the centre, arise rather high at the end of flowering phase, the color of *diaphragm* pale whitish to yellowish, with dark red zone near the rim of *aperture*, *upper surface* with c. 18 – 24 circular red warts which c. 1.0 in diameter, *lower surface* of *diaphragm* (windows) with 4 rings of toadstool-like compound *ramenta*, gradually become white blotches (*window*) on the lower parts of *diaphragm*.

Ramenta: all over the inner side of the flower tube, 2.0 – 10.0, linear with swollen apices



Disk: with raised rim: 2.0 cm in high and 6.7 cm in diameter, bright yellowish, with 15 -20 *Processi* at the upper part, 1.5 – 3.0 cm in high. *Processi* have some color with the disk, except in the apices dark brown in color.

Fruit: not found

Specimen examined: *Rafflesia hasseltii* Suringar. Sijunjung, RaIa

Distribution: Sumatra, Peninsular Malaysia and Borneo. Distribution of

this species in West Sumatra is in Muaro Labuah, Liki, Alahan Panjang, Sijunjung, and Limo Pulauh Kota.

Notes: At least three distribution sites for *R. hasseltii* Suringar had found along this study.

Un-identified species of *Rafflesia*

Along the survey, RMT found 2 un-identified species of *Rafflesia* in two new areas in West Sumatra. The information came from the local people near the study site. This species indicate as *Rafflesia* sp.1 and *Rafflesia* sp.2. Only immature and mature buds found and no remains of blooming flower that can be used as comparative data for identification. Identification of *Rafflesia* mostly based on the character of the blooming flowers, buds character looks-like the same for each species. It's impossible to identify *Rafflesia* without seeing the characters of the flowers.

***Rafflesia* sp.1 “Gala; Galla”**

Found in un-protected forest of Pesisir Selatan. Formerly informed by the local villagers and RMT conducted survey to this location on May 2009. It's difficult to access this area, because located on the hard cliff. At least 2 sites of *Rafflesia* found active in this study area.



Rafflesia sp.2 "Hala"

Found in un-protected Gumanti forest, Solok. Also informed by local villagers and RMT accessed this new study area on January 2010. Only one site found in this study area.



Tetrastigma

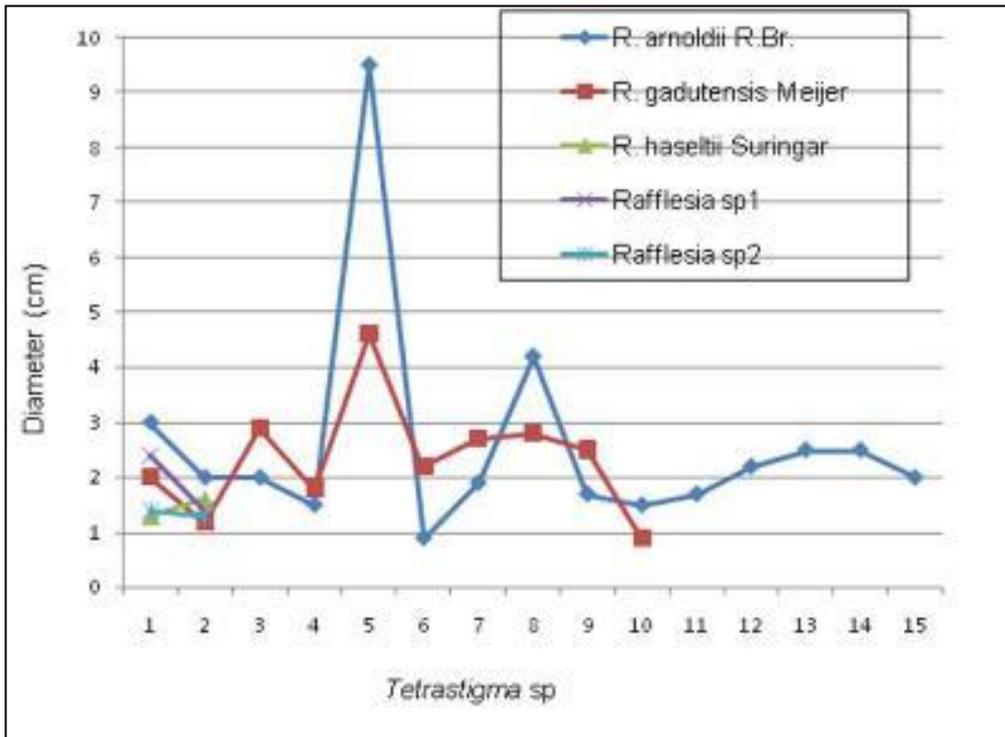
The host plants of *Rafflesia* are herbaceous or woody climbing vines that cannot free standing by their own to any appreciable height. They need another high plant to support them to reach the sun light in the forest canopy. Usually the

leaves of this plant not found, although the stem and root can be recognized in the forest.

The stem is woody, rather thick with rough surface, which are easily to broken or cracked, providing the suitable space for the seeds of



parasitic plant to establish. Their stem are climbing or hanging to the shrubs or tree with any kinds of tendrils.



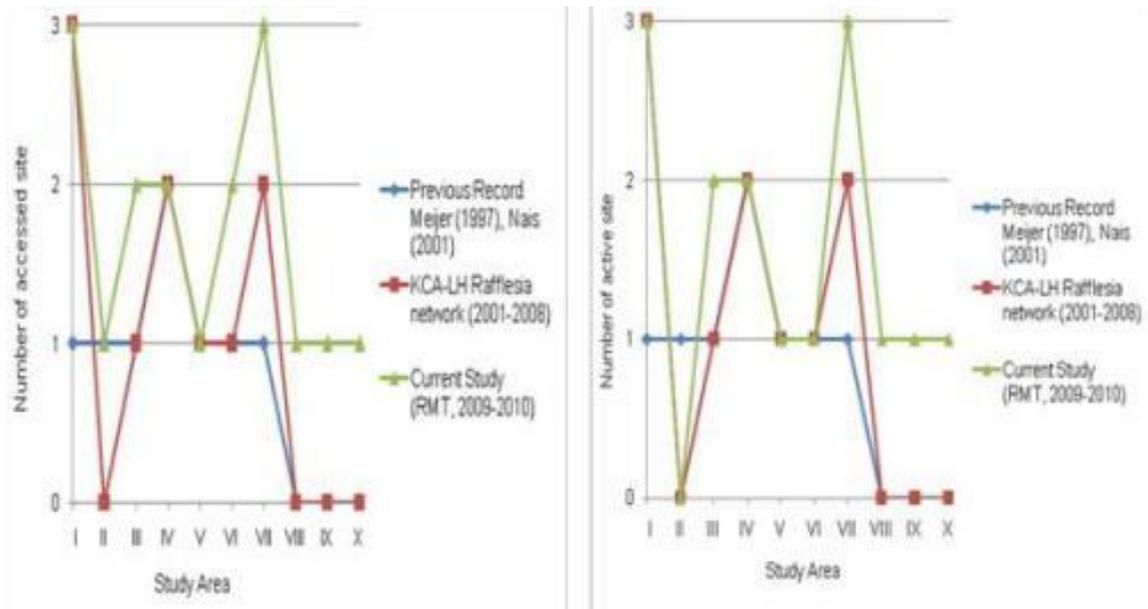
In the study sites, *Rafflesia* found infected and growing well at the young stems or roots of

Tetrastigma, which 1.0 - 4.5 cm in diameter, rarely found at the bigger one. Bud of *Rafflesia* that is growing on young stem of *Tetrastigma* look growing faster than the buds in old and big *Tetrastigma* stems. Sometime 2-6 immature buds infected a small stems of *Tetrastigma*, and usually 1 or 2 of them success to bloom if the condition suitable for them. As a holoparasitic plants, life continuity of *Rafflesia* depend on the condition of their host plants and the availability of water resources in their habitat. If the host plant die, damaged, broken, or failed to compete with the other plants, no doubt *Rafflesia* will also damaged or died. Status and existence of *Rafflesia* have high correlation with the condition of their host plants. The ecological requirements of host plants play a vital role in *Rafflesia* conservation.

CONSERVATION STATUS IN WEST SUMATRA

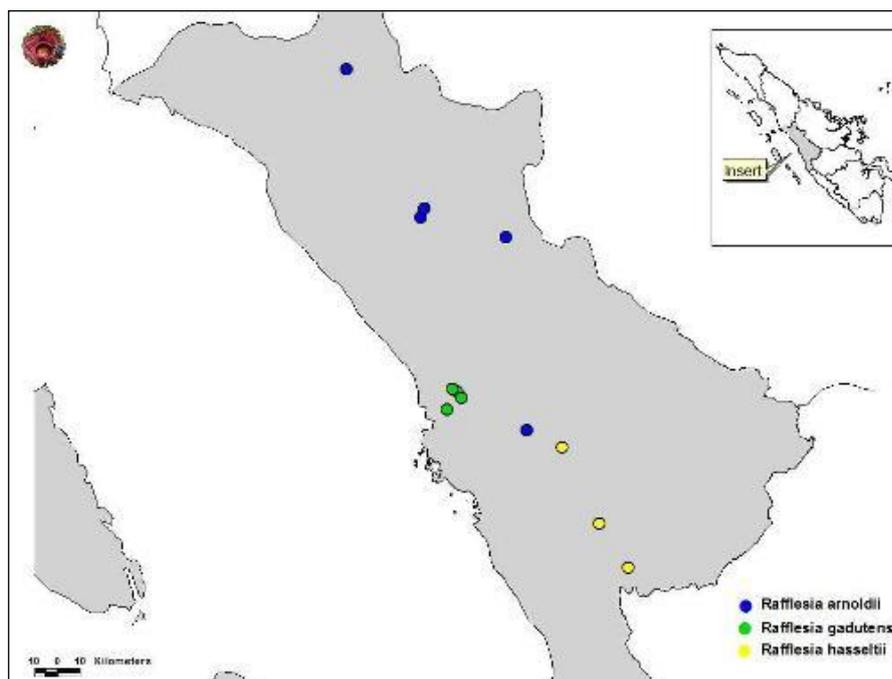
Distribution and Habitat Condition

Three new study areas found along this study, complementing 7 existed study areas proposed by Meijer (1997) and Nais (2001) are Batang Palupuh (I), Rimbo Panti (II), Tilatang Kamang - Bukittinggi (III), Padang - Ulu Gadut (IV), Rimbo

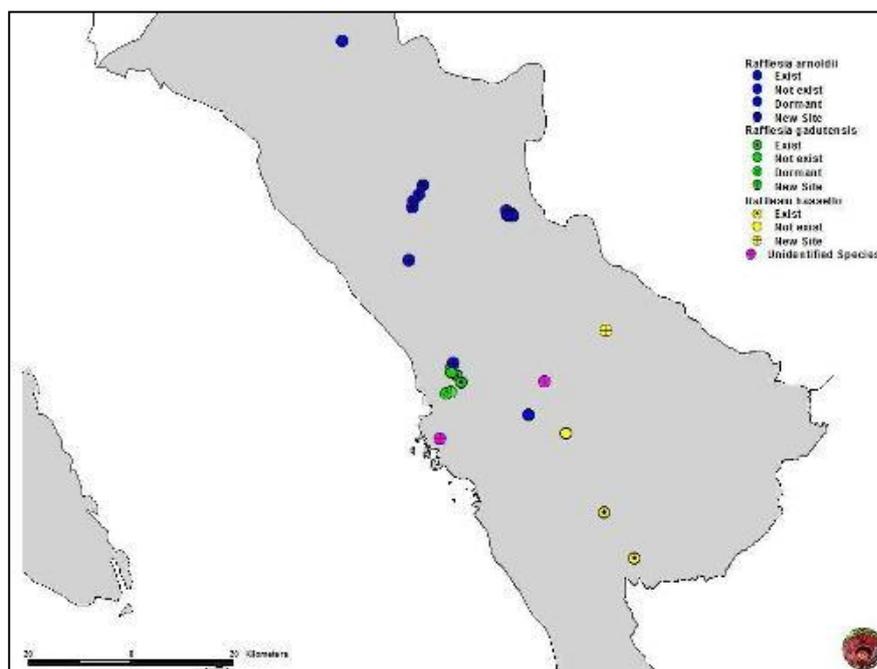


Data (V), Gunung Sago (VI), Alahan Panjang - Liki (VII) and newly recognized study area are Sijunjuang (VIII), Pesisir Selatan (IX) and Solok (X).

Study area I and VII have 3 active sites, study area III and IV have 2 active sites and the 5 other study areas only have 1 active site. In study area II (Rimbo Panti) did not find any flower, buds or scars of *Rafflesia* exist. Although some of good populations of un-infected *Tetrastigma* found abundant in the forest margin of Rimbo Panti. This study area categorized as a "dormant site". No blooming flower has ever been notified from this locate on since reported by Meijer on 1997.



Distribution of *Rafflesia* in West Sumatra from Previous Work



Distribution of *Rafflesia* in West Sumatra, RMT (2009-2010)

Table 2. Habitat Condition of *Rafflesia* in West Sumatra

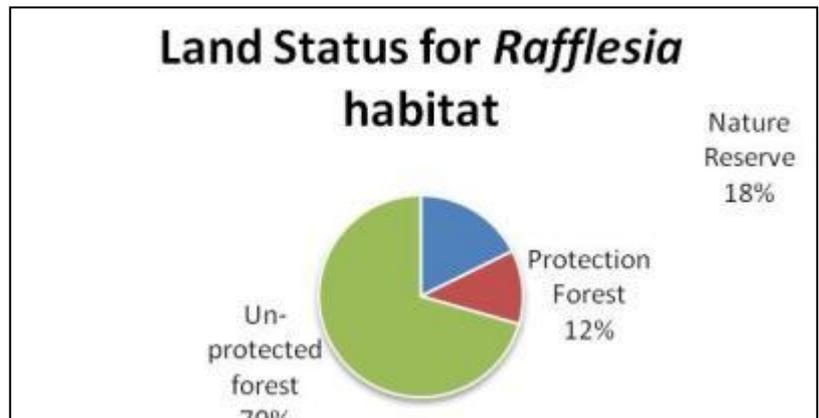
Species	Altitude (m)	Habitat	Forest Type	Common Plant Vegetations
<i>R. arnoldii</i> R. Br.	350 - 1100	on the slope inside the forest, moist.	old secondary rain forest	<i>Ficus</i> , <i>Coffea robusta</i> , <i>Artocarpus</i> , <i>Laportea</i> , <i>Lithocarpus</i> , <i>Eugenia</i> , <i>Omalanthus</i> and <i>Pandanus</i> . Zingiberaceae and Pteridophyte are abundance in the forest floor.
<i>R. gadutensis</i> Meijer	350 - 700	on the steep slopes, inside the forest, moist	old secondary rain forest	<i>Shorea</i> , <i>Dipterocarpus</i> , <i>Callophyllum</i> , <i>Artocarpus</i> , <i>Polyalthia</i> , <i>Antidesma</i> , <i>Pandanus</i> and rattan. Zingiberaceae and Araceae are common in the forest floor.
<i>R. hasseltii</i> Suringar	400 - 600	on the steep slopes, inside the forest, moist	disturbed old secondary forest	<i>Polyalthia</i> , <i>Artocarpus</i> , <i>Macaranga</i> , Burseraceae, Zingiberaceae and rattan

Typically *Rafflesia* needs the specific ecological condition to support their life. Commonly, *Rafflesia* grows in moist forest slopes that located near the stream inside the forest or near the forest margin. Most of *Rafflesia* success to bloom if located and grow near the stream. Condition of the forest, host plants and the

availability of water resource is a vital component to the existence of *Rafflesia* in their habitat.

Land Status and the Ownership of *Rafflesia* Habitat

Seventy percent of habitat *Rafflesia* in West Sumatra lies in un-protected forest, that usually managed and be a common property of the nearest community of local inhabitant, sometime be a property of a clan or family. The remaining 30% managed by the government as nature reserve and protected forest.



Social Economic Condition

Rafflesia in Indonesia called as “Bunga Patma Raksasa” but commonly the people mentioned *Rafflesia* as “Bunga Bangkai” referred to a smell reminiscent of rotting carcass of the flower when bloom. “Bunga Bangkai” also used by the locals to recognize *Amorphophallus titanum* (Titan Arum) belong to Aroids family. Both of these giant flower spread out rotting carcass odor when bloom. Not surprisingly if miss-interpretation often found from the peoples in recognizing these two species.

Vernacular name for *Rafflesia* in West Sumatra is “Cindawan Harimau” but only few people that living near the forest that familiar with this vernacular name. Sometime the local is afraid to get close to the blooming *Rafflesia* because of its vernacular name. “Harimau” in local minds still have high mystical influence.

Along the study only one person claimed *Rafflesia* was used as medicinal plants. No valid data or evidence about the utilizing of *Rafflesia* as a medicinal plant in this region. So, buds harvest for medicinal plant such as happen in Borneo and Peninsular Malaysia (Nais, 2001) apparently not found in West Sumatra.

In this region, the bloom of *Rafflesia* still become a fantastic attraction for tourism, local or International, especially for *R. arnoldii* R. Br. in Batang Palupuh. Local people gets deliver from touring guide to see the flower for hundreds visitors. Unfortunately, this attraction has negative side impact for the species and apparently ignored by the local management.

Status and Existence of the Species

Based on the data from intensive field survey along 2009-2010 and accumulative data on the distribution, characteristic of habitat and species of *Rafflesia* throughout West Sumatra, an outline of the conservation status of the species and the problems found are given below:

Table 3. The number of active sites of *Rafflesia* (as January, 2010) in protected and unprotected areas in West Sumatra

Species	Protected	Unprotected	Total
<i>Rafflesia arnoldii</i> R. Br.	2	4	6
<i>Rafflesia gadutensis</i> Meijer	1	1	2
<i>Rafflesia hasseltii</i> Suringar	1	4	5
<i>Rafflesia</i> sp.1		1	1
<i>Rafflesia</i> sp.2		1	1
Total	4	11	15

Rafflesia arnoldii R. Br.

The biggest flower in the world, *R. arnoldii* found in six active sites in West Sumatra, and 4 of 6 sites located outside of protected forest. Commonly the sites abutted with traditional coffee plantation in such a way the high quantities of coffee seedling often found abundance in several study sites. As long as, did not find any correlation between the high quantities of the coffee seedling with the decreasing of population of *Rafflesia* in these study site. This species threatened mainly by the un-managed tourism activities, neither in Cagar Alam Batang Palupuh that establish for conservation of *R. arnoldii* or in unprotected area.

Popular as a tourist icon, *R. arnoldii* will attract many peoples to see the blooms of the flower. Mostly the visitors only focus to see the flower and ignored the plant vegetation surrounding the flower, including *Tetrastigma* and immature buds of *Rafflesia*. Not surprisingly most of the immature buds broken and die after the blooming periods.

***Rafflesia gadutensis* Meijer**

West Sumatran endemic, *R. gadutensis* Meijer is the most threatened *Rafflesia* in the world, considering the species only found in the one single study area with 2 active sites, one of them is the "Type Locality" for the species. The type locality of *R. gadutensis* located outside of the protected area and threatens by local land conversion and logging activity. Some populations of *R. gadutensis* in that site had disappeared and population remains decreasing simultaneously. The populations are fragile and the species extremely sensitive for any treatment. Disturbance and habitat degradation in any level will increase the risk of extinction of the species. Unfortunately, the basic biological data of this species is not available, so that conservation strategy for the species cannot be formulated, yet. *R. gadutensis* is not as famous as *R. arnoldii*, so that tourism effect is not suffered this species at this time. But its conservation status and no up dated information about the species caused *R. gadutensis* keep on hunting by hobbyist and *Rafflesia* hunter for long time and its likely will be a potential threat in the future.

***Rafflesia hasseltii* Suringar**

Found in 5 study sites, 4 of them located outside of protected forest. The study sites are located near the logging area. It seems logging, legal or illegal has given negative impact for the existence of the species. Tourism activities apparently do not pressure the species, because the habitat is inside the forest that could not easy to accessed by visitors.

Rafflesia sp. 1 and *Rafflesia* sp. 2

Both of unidentified species of *Rafflesia* had found in 1 active site in different study areas with good condition of population. Based on observation in the field did not find any potential threat for the populations, because its location inside the forest and far enough from the local settlement. The blooms period of these species are still waiting to complete identification process.

Based on the field data and current knowledge about the problems that faced by *Rafflesia* in West Sumatra, we proposed the conservation status of the *Rafflesia* in West Sumatra based on IUCN 2001 criteria, as follows:

Table 4. The conservation status of *Rafflesia* in West Sumatra

Species	Status	Criteria
<i>Rafflesia arnoldii</i> R. Br.	Vulnerable	VU (B1ab(iii,v);D1)
<i>Rafflesia gadutensis</i> Meijer	Critically Endangered	CR (B1ab (iii,iv,v);D)
<i>Rafflesia hasseltii</i> Suringar	Vulnerable	VU (B1ab(iii,v);D1)
<i>Rafflesia</i> sp.1	Data Deficient	DD
<i>Rafflesia</i> sp.2	Data Deficient	DD

Conservation Recommendation

An effort to conserve *Rafflesia* in West Sumatra is urgently needed and must be done in the near future; considering the existence of the species in their habitat is threatened in many aspects and no effective management plan have been formulated to minimize the risk of the extinction of this species, especially from the tourism activities. Undeniable, a group of local communities have benefitted by the uniqueness of *Rafflesia* for long time and it's not possible to prohibit them to do the same thing in the future. In any cases, the economic values of the species become a potential threat that pressures the existence of the species in the field. Win-win solution management plan must be formulated to avoid frictions

between any parties who get benefit from the species to minimize the risk of species defacement as a result of beneficial competition.

The important steps that must be done for the near future:

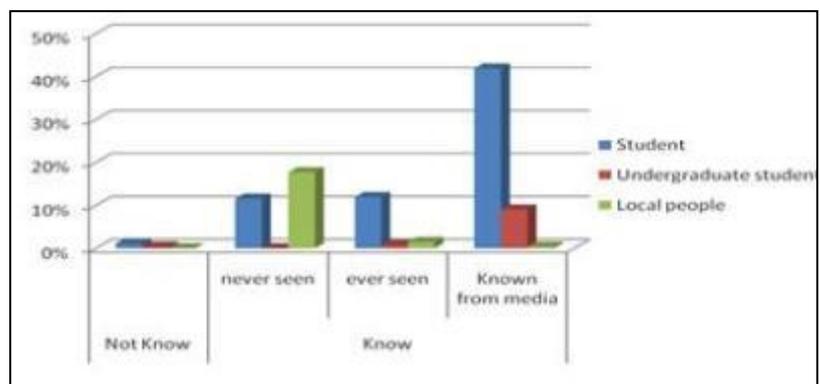
1. Gathering and completing the basic botanical and ecological information of the species that importantly needed to formulate and develop an effective management plan to conserve the species concern.
2. Establishing priority areas that potential to conserve *Rafflesia* in West Sumatra and engaging local participation, including land owners to take in part in *Rafflesia* conservation effort in their region.
3. Educate local communities to minimize the negative side effect of tourism activity through research and applicable methodology.
4. Distribute the existence and conservation status of *Rafflesia* to the related scientific and governmental institutions, local stake holders, in order to join for the conservation policy appointment of *Rafflesia*
5. Continuing to educate young generations and intellectuals to take in part in *Rafflesia* conservation effort in West Sumatra.

SOCIAL NETWORK AND PUBLIC AWARENESS CAMPAIGN

Questionnaires

Questionnaires produced and distributed to gather information from student and local people. Different responders are chosen to enrich knowledge and gather new idea to develop an effective conservation effort for *Rafflesia*. Questionnaires distributed to senior high school student and the local people that living nearest the study site and to undergraduate student in Padang.

Mostly responder known about *Rafflesia*, but surprisingly only few responders ever had seen the species directly, although they know this species exist in the study site. The reason for this is the opportunity to see the blooming flower is not available every time, and this rare opportunity exactly could not predict precisely. Interesting story comes from the local people that mostly consider the bloom *Rafflesia* has mystical power like beast predator, carnivores, blood sucker, snake eater, etc. This story spread from mouth to mouth and believed by the local peoples that living near the study site. It seems that the folk story about *Rafflesia* not influence young generations that have sufficient information about the plant from school books and media information such Newspapers and Poster.



Opinion of the responders about the existence of *Rafflesia*

Seventy percent student responders and 64% local responders agreed with idea to protect and conserve *Rafflesia* to ensure the status and existence of the species. Indirectly, local communities in the study site have become a guard for the species with any folklore about *Rafflesia*. No doubt, local wisdom must keep maintained, because the locals are the parties that know better than whosoever the conditions of *Rafflesia* in the study site.

Poster and Bulletin

Poster and bulletin produced as media campaign, especially to introduce *Rafflesia* as conservation icon that for long time had been ignored by the communities. Poster had distributed to local communities, environmental NGO, Student Organization of nature concern and science institutions in West Sumatra.

Bulletin produced as a media to communicate any recent issue and findings about *Rafflesia* and its conservation effort in West Sumatra. ssued two times a year and for a while only distribute to undergraduate students and groups of student organization of nature concern in Padang. This bulletin hoped will be able to become a media that active to promote conservation effort for *Rafflesia* in Indonesia, especially in West Sumatra.



	<i>Buletin</i> NATURAE <i>Rafflesia</i> MONITORING TEAM (RMT) PADANG	Edisi Mei 2009 Volume 1 Issue 1
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PROFIL

Buletin NATURAE

Dalam kegiatan berkaitan penelitian aplikatif dimana dapat bermanfaat bagi khalayak ramai, sebuah wadah berisi tulisan menjadi sesuatu yang berharga untuk berbagi informasi dan belajar bersama bagi pengembangan ilmu pengetahuan. Dari cerita masa lalu yang kurang terdengar lagi menyatakan pengetahuan yang disebarluaskan ke banyak pihak akan menambah pengetahuan lebih bagi penyebarnya, karena pengetahuan selalu berkembang.

Atas keinginan berbagi informasi dan belajar bersama, RMT Padang mencoba menyalurkannya dalam sebuah bulletin layaknya newsletter dengan nama *Buletin NATURAE*. Bulletin ini diharapkan memberi "warna" bagi meningkatkan kapasitas Team yang "haus dengan pengetahuan" dan berbagi informasi dengan berbagai kalangan.

Proses komunikasi ini diharapkan menjembatani proses pengembangan pengetahuan terutama bagi upaya pelestarian alam agar seisi alam bisa dinikmati generasi mendatang. Terima kasih pada pihak-pihak yang mau membaca komunikasi singkat ini. Semoga Bulletin ini dapat melanjutkan perjalanannya dari waktu ke waktu. Aasmün.....

Rafflesia MONITORING TEAM (RMT) Padang

Kata Rafflesia, kita langsung terba-



yang bunga berukuran besar, berbau busuk dengan warna merah menyala. Banyak pihak bilang bunga ini memakan apa yang masuk ke dalamnya sehingga disebut Bunga Bangkai.

Saat ini ada *Rafflesia* MONITORING TEAM yang disingkat RMT yang berkegiatan di Sumatera Barat dan memusatkan kegiatannya di Padang sehingga disebut juga RMT Padang. Bila dilihat siapa Anggota Teamnya dapat dikatakan kumpulan pendiri dan mahasiswa yang peduli dengan pendirian dan pelestarian *Rafflesia*. Berkeinginan melakukan pendirian *Rafflesia* di Sumatera, khususnya Sumatera Barat, mengingat semakin besarnya tekanan bagi spesies ini di habitatnya. Selain tujuan pendirian, RMT juga berupaya menemukan strategi-strategi pelestarian spesies ini dari kepunahan.

RMT awalnya diinisiasi beberapa tahun lalu dalam naungan KCA-LH *Rafflesia* FMIPA UNAND dan didukung Herbarium ANDA. Untuk memberikan ruang gerak lebih luwes dalam berkegiatan, Team dan Lembaga menjadikannya Perkumpulan yang tetap berhubungan dengan Lembaga. Pada kegiatannya, RMT didukung oleh ahli-ahli botani khususnya *Rafflesia* dari dalam dan luar negeri. Baru-baru ini, RMT mendapat dukungan dari Rufford Small Grants untuk melaksanakan kegiatannya. (Q)

Redaksi

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Workshop and Focus Group Discussion (FGD)



Workshop and Focus Group Discussion conducted in Batang Palupuh, nearest village to Cagar Alam Batang Palupuah that established by the Indonesia government to conserve *Rafflesia arnoldii* R. Br. and its habitat. This nature reserve famous as tourist destination and its activity have been given a negative impact to the existence of *Rafflesia* in this location. Initiated by several intensive meetings by the team and village stake holder, workshop in Batang Palupuah had conducted on January 27, 2010. This workshop focused to identify problems and

accommodate any ideas from the villagers in relation with *Rafflesia* tourism activities in this location. Hoped the result of this activity will be useful to complement any ideas to formulate an effective management plan for *Rafflesia*, especially in West Sumatra.

EDUCATION AND CONSERVATION TRAINING

Conservation Training for Student Organization of Nature Concern

A series of regular training set up once time a month adapted with the university lecture and regular activity of KCA-LH Rafflesia and conducted at the Base Camp of KCA-LH Rafflesia FMIPA Universitas Andalas Padang. Focused on Biology, Ecology and Conservation of *Rafflesia*, tens series of lecturer subject of the



training started on February 9, 2009 and finished on March 22, 2010. Thirteen trainees from members of KCA-LH Rafflesia attend this training. The series of the training hoped will give fundamental basic information about the *Rafflesia* and its conservation needs in West Sumatra.

School Visit

Two senior high schools are SMAN 1 Palupuh and SMAN 4 Bukittinggi that located nearest the study site visited to distribute questionnaires and socialized the activities of the team. Short presentation and discussion about status and conservation of *Rafflesia* has conducted along this visiting time.



School visit to SMAN 1 Batang Palupuah



School visit to SMAN 4 Bukittinggi

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To all the members of KCA-LH Rafflesia who was attending a series of training, thank you to give time between busy schedules of university lecturer.

Thank you to all the local villagers, field guide, and whomsoever that participated on RMT conservation activity that the name cannot possible to mentioned one by one in this report.

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