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ดอกไม้ที่ใหญ่ที่สุดในประเทศไทย

RAFFLESIA KERRII MEIJER.

RAFFLESIA KERRII MEIJER.

THAILAND'S LARGEST FLOWER



สตีเฟน เอลเลียต

Stephen Elliott

ABSTRACT

With flowers more than 70 cm in diameter, *Rafflesia kerrii* Meijer is Thailand's largest flower. It was first collected by A.F.G. Kerr in 1927 and described by Willem Meijer in 1984. In 1984, I studied fresh specimens from southern Thailand and was able to confirm its status as a distinct species. Here I present a description of the plant in greater detail than previously reported. It is distinguished from other rafflesias by having very small warts on the perigone lobes. It is parasitic on the roots of lianas including *Tetrastigma leucostaphylum* (Dennst.) Alston ex. Mabblerly (Vitaceae) and *T. papillosum* (Bl.) Planch. Flowers are unisexual and pollination is probably carried out by flies. The means of seed dispersal is unknown. *R. kerrii* is confined to the southern Tenasserim Hills in the provinces of Chumpon, Ranong and Surat Thani. Its status is "vulnerable" according to IUCN

Red Data Book criteria. Threats to its survival include habitat destruction and over-collection. I suggest that *R. kerrii* be promoted as a tourist attraction, to provide an economic incentive for local people to protect the species.

บทคัดย่อ

Rafflesia Kerrii เป็นดอกไม้ที่ใหญ่ที่สุดในประเทศไทย มีเส้นผ่าศูนย์กลางมากกว่า 70 เซนติเมตร เอ เอฟ จี เคอร์รี่ เป็นท่านแรกที่พบและ วิลเลียม ไมเจอร์ (MEIJER, 1984) เป็นผู้บรรยายลักษณะของดอกไม้ชนิดนี้ ข้าพเจ้าได้ศึกษาดอกแรฟเฟิลเซียสดจากภาคใต้ของประเทศไทย และยืนยันได้ว่าเป็นชนิดใหม่ มีลักษณะแตกต่างจากดอกแรฟเฟิลเซียอื่นๆ ที่มีตุ่มเล็กๆที่เพริโกนโลบ (perigone lobe) มันเป็นพืชปรสิตของรากไม้ประเภทเถาวัลย์ซึ่งรวมทั้ง

Tetrastigma leucostaphylum (Dennst.) Alston ex. Mabblerly (Vitaceae) และ **T. papillosum** (Bl.) Planch. (NIYOMDHAM & KUBAT, 1987) เป็นดอกไม้ที่มีเพศเดียว อาจมีแมลงที่ชอบตอมซากสัตว์ช่วยในการผสมพันธุ์ ยัง

ไม่ทราบกลไกในการกระจายของเมล็ด *R. kerrii* กระจาย อยู่เฉพาะทางใต้ของเทือกเขา Tenasserim ได้จังหวัดชุมพร ระนอง และสุราษฎร์ธานีในหนังสือ IUCN Red Data Book ระบุว่าพืชชนิดนี้เสี่ยงต่อการสูญพันธุ์ (vulnerable) เนื่องจากการทำลายแหล่งที่อยู่ และมีการเก็บมากเกินไป ข้อเสนอให้ใช้พืชชนิดนี้ เป็นสิ่งดึงดูดนักท่องเที่ยว เพื่อนำ รายได้สู่ชาวบ้าน เป็นการชักนำให้ชาวบ้าน ช่วยในการ อนุรักษ์พืชชนิดนี้

INTRODUCTION

The genus *Rafflesia* must surely rank as the most extraordinary in the plant kingdom. Not only does it contain the world's largest flower *Rafflesia arnoldii* R.Br., but all species exhibit a highly specialized, parasitic way of life. They possess no green leaves or stem and for most of the time, they exist as microscopic filaments inside the roots of tropical lianas, from which they absorb nutriment. From time to time however, they develop buds which burst through the bark of the host's roots, grow to a large size and open to become the world's largest flowers. For a short time, the foul-smelling flowers attract insects, which are thought to carry out pollination, but within a few days of opening, the flowers shrivel and turn black. Thirteen species of *Rafflesia* have been described from Sumatra, Java, Borneo, the Philippines, W. Malaysia and Thailand. The first botanist to document the existence of a *Rafflesia* sp. in Thailand was Dr. A.F.G. Kerr who collected specimens from southern Thailand in 1927 and 1929. For many years, his specimens laid ignored in herbaria, until in 1981 Dr. Willem

Meijer examined some of them in the British Museum and realized that they were of an undescribed species, which he named *Rafflesia kerrii* (MEIJER, 1984), but because Kerr's specimens were poorly preserved, Dr. Meijer was unable to write a complete description of the new species.

METHODS

In 1989, I obtained fresh buds from villagers in southern Thailand, who had collected them for medicinal purposes. Here I present observations based on those buds, which complete the description of the species and discuss conservation measures which may be necessary to save the species from extinction. Technical terms for bud and flower parts in the description below are indicated in Figures 1&2.

RESULTS

Description

R. kerrii flowers are unisexual. One female bud grew on the same host root as several males. Whether this indicates a single monoecious *R. kerrii* individual or several dioecious ones could not be determined. Initially, buds develop beneath the bark of the host liana's roots. The bark stretches and thickens as the bud grows, until the bud attains a circumference of 14-15 cm when the root bark ruptures. At this stage, the bud is completely enclosed by 15 scales. The ruptured host bark tissue continues to grow, forming a woody cupula around

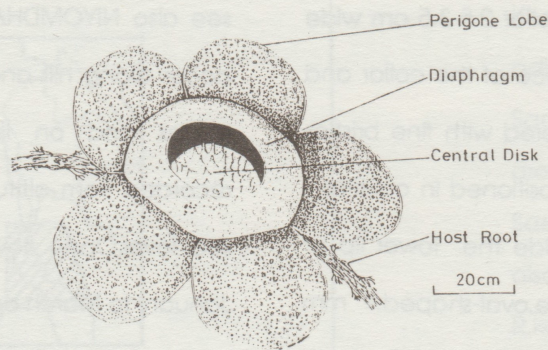


Figure 1. An open flower of *Rafflesia kerrii* Meijer.

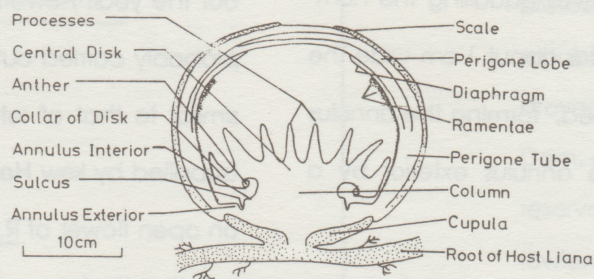


Figure 2. Cross section through a male bud of *Rafflesia kerrii* Meijer.

the developing bud, base. The cupula is about half to two thirds the diameter of the whole bud. Buds are completely enclosed by scales up to a circumference of about 16 cm. As the buds grow larger, the scales are pushed apart to reveal the pink lower surface of the perigone lobes. The perigone lobes have a white edge and are covered with light red warts, 2-4 mm across, spaced 5-10 mm apart. In *R. kerrii* the warts are the smallest, relative to red background, of any *Rafflesia* species. The upper surface of the diaphragm could not be separated from the perigone lobes. However, Kerr noted in his diary (22/1/29)(supplied by Kew Gardens, London) that the upper surface is yellowish with lighter small spots. On the under surface of the diaphragm are 7-9 concentric rings of white dots, more than in any

other species of *Rafflesia*. Towards the outer edge of the diaphragm, the white dots become raised slightly on red stalks and they are replaced fairly abruptly by a dense mat of branched ramentae, up to 5 mm long and 1.5 mm wide. Towards where the diaphragm joins the inner wall of the perigone tube the ramentae become progressively more reduced in size and unbranched until, on the inner wall of the perigone tube itself, there are only small densely packed warts, occurring right down to the base. Beneath the diaphragm, a disk and central column are covered in a thick layer of wax. In the largest bud examined, the central disk was 17-18 cm in diameter, slightly larger than previously reported for open flowers (MEIJER, 1984). The number of processes on the upper surface of the central disk varied

form 27 to 44. The disk has a collar 2.5-3.5 cm wide encircling its rim. The under surface of the collar and the column of males are covered with fine bristles 3-4 mm long. The anthers are positioned in cavities 1 cm wide and 1.2 cm long inside the lower lip of the collar. Each anther is white, oval-shaped, 9 mm long by 6 mm wide with a single, central pore. Beneath the central disk, the dark orange column is deeply grooved, the number of grooves equalling the number of anthers + 1. Grooves are about 1 cm wide. The base of the column is widened, forming the annulus interior, separated from the annulus exterior by a sulcus, 3 mm wide.

The female bud was similar to males except that there were no anthers or anther cavities and the grooves and ridges on the column were much reduced. On the underside of the central disk, very short, soft, white hairs replaced the bristles found in males. The ovary was positioned at the base of the column. The diameter of the ovary was approximately one third that of the whole bud. The white ovary tissue consisted of irregularly-shaped small cavities and thick septa, to which numerous ovules were attached. After a flower has opened and decayed, the cupula shrinks to become a circular woody scar 3-3.5 cm in diameter.

Ecology

Reported hosts of *R. kerrii* include the large lianas, *Tetrastigma eucostaphylum* (Dennst.) Alston ex Mabberley (Vitaceae) (MEIJER, pers. comm.) and *T. papillosum* (Bl.) Planch. (Niyomdham et al. 1955 (BKF),

see also NIYOMDHAM & KUBAT (1987), both of which occur along hill and lowland dipterocarp forest edges and on limestone hills. *R. kerrii* has been recorded from altitudes of 200 m to 1,600 m above sea level. Open flowers have been reported from January to March but there have been so few reports of the species, it is not yet possible to determine whether flowering is seasonal or continuous throughout the year. Flowers are unisexual and pollination is probably carried out by flies, attracted by an odour, similar to that of rotting meat. In his diary (22/1/29 (supplied by Kew Herbarium, London) Kerr noted that an open flower of *R. kerrii* had a "faint offensive smell" and that the bases of old flowers were "swarming with maggots". He suggested that flies, visiting the flowers, deposit their eggs inside. All *R. kerrii* buds I examined emitted a strong, sweet smell. However, chemical changes may occur to produce a noxious smell when the buds open. The fruit and seeds of *R. kerrii* have never been described and how the seeds are dispersed is unknown. For other *Rafflesia* spp., deer, pigs or even elephants may trample on the fruit and carry the seeds on their feet. Ants or termites have also been proposed as seed dispersal agents. Ground squirrels have been observed to eat *R. arnoldii* fruits and they may transfer seeds to a *Tetrastigma* by their claws (MEIJER, 1985).

Distribution and Status

R. kerrii has a narrow and rapidly shrinking distribution. It is largely confined to the southern

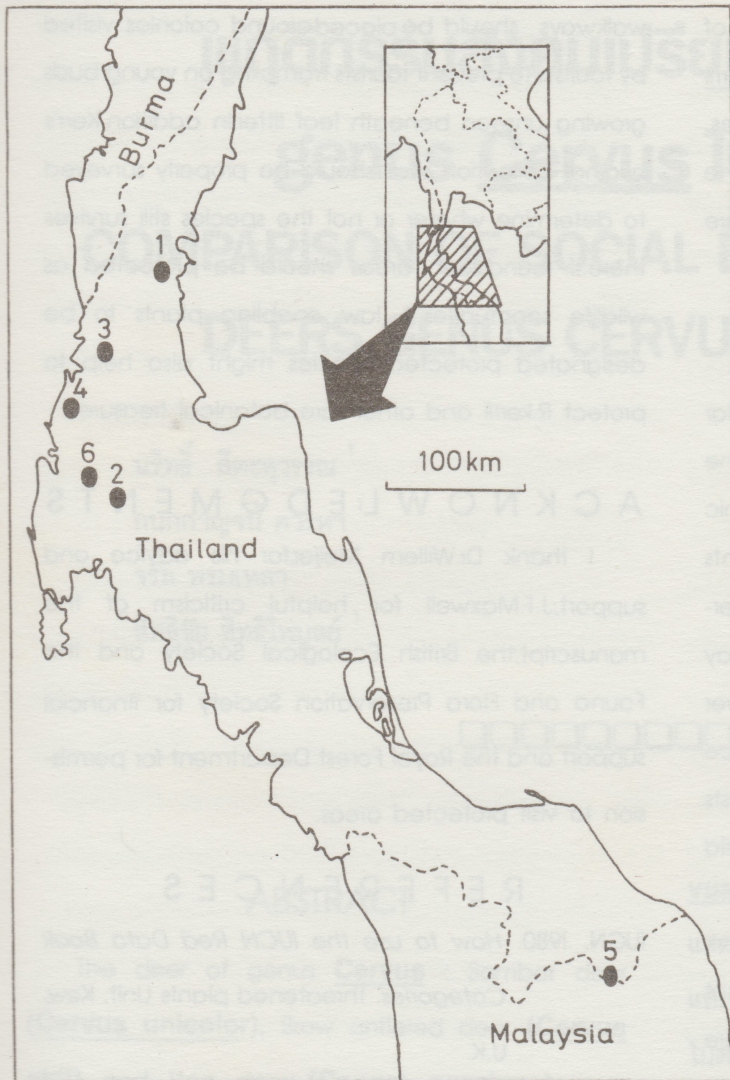


Figure 3. Records of *Rafflesia kerrii* Meijer.

1) Chumphon Province Kerr 2/2/27; 2) Surat Thani Province Kerr 20/3/27; 3) Ranong Province Kerr 22/1/29; 4) Ranong Province Kerr 3/2/29; Niyomdham 17/3/87 (see NIYOMDHAM & KUBAT, 1987); 5) Thai-Malaysian border, Witkamp 1935 and 6) Surat Thani Province Smitinand 6/3/76; Somthop 1978; Meijer 27/5/83 and Elliott 14/3/88.

Tenasserim Hills in peninsula Thailand in the Provinces of Chumphon, Ranong and Surat Thani (Fig.3), although a male *Rafflesia* bud, collected by Witkamp in 1935 on the Thai Malaysian border, was probably also *R. kerrii*. Two of Kerr's four original collection sites are not within protected areas and survival of the species at these sites is therefore doubtful. Most recent reports of the species are from

Khao Sok National Park and the adjoining Khlong Nakha Wildlife Sanctuary. These two protected areas are contiguous with Khlong Saeng Wildlife Sanctuary which also contains suitable habitat for *R. kerrii*. The total area protected amounts to 2,281 km². However, even though these areas are officially protected, large areas of habitat suitable for *R. kerrii* have been destroyed within them. The Chiew Larn Dam, completed in 1986, created a reservoir which flooded 165 km² of lowland evergreen forest within Khao Sok National Park and Khlong Saeng Wildlife Sanctuary. WANG-HONGSA (1989) reported that around the Chiew Larn Dam all forest up to an altitude of 98.5 m had been cut and burnt. Around the middle of the reservoir about 44% of the forest had been destroyed, but around the upper, northern end of the reservoir forest remained relatively unharmed. *R. kerrii* is also threatened by over-collection. Local people cut the flowers because

they believe they have medicinal properties. They are boiled and the resulting decoction is drunk as a general tonic, cure for fever or back ache and as a sexual stimulant for old men. Buds are sometimes sold at traditional medicine stalls at local markets for 80-120 baht depending on size. Most, if not all, colonies of *R. kerrii* accessible from Khao Sok National Park headquarters have already been destroyed. On the

basis of its narrow distribution, continuing loss of habitat and over-collection by local people R. kerrii satisfies the criteria of a vulnerable species, according to the Red Data Book categories of the International Union for the Conservation of Nature (IUCN, 1980).

CONCLUSIONS

As Thailand's largest and most spectacular flower, R. kerrii is a national treasure, worthy of the strictest protection. There are also sound economic reasons to protect the species. In a survey by students of the Department of Biology, Chiang Mai University, 558 tourists were asked how much they would pay for a guided day trip to see "Thailand's largest flower (70 cm in diameter)" in the forest. The average price suggested was 450 baht, similar to the sum tourists were prepared to pay to see a herd of wild elephants. Development of R. kerrii as a tourist attraction would not only raise funds for conservation work within the remaining areas of R. kerrii's habitat, but also persuade local villagers that the plant is more valuable left growing in the forest than cut for its dubious medicinal properties. I therefore suggest that R. kerrii be promoted as a tourist attraction in the following way. Colonies of R. kerrii should be mapped to determine the status of the plant. Colonies should be visited regularly by local guides, employed by the Royal Forest Department to measure bud growth rate and predict when open flowers will be available for tourists to see. When buds are about to open, the guides could inform tourists staying at guesthouses nearby and negotiate a price for a day's trek to see and photograph the flower. In this way, local people would be given a considerable financial incentive not to cut the plant and even to protect colonies against vandals. Raised wooden

walkways should be placed around colonies visited by tourists to prevent tourists trampling on young buds growing unseen beneath leaf litter. In addition, Kerr's original collection sites should be properly surveyed to determine whether or not the species still survives there. If found, such areas should be protected as wildlife sanctuaries. A law enabling plants to be designated protected species might also help to protect R. kerrii and other rare botanical treasures.

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