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A new record of *Sterculia megistophylla* fruit feeder

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An early instar

A caterpillar of the later instar

Sterculia megistophylla **of the family Sterculiaceae is an ornamental tree at the Rainforest Discovery Centre in Sepilok, Sabah. It is strikingly attractive because of its showy reddish fruits borne in clusters of five, forming a star shape. Details of this species in Sepilok are provided by Tan & Suzana (2011).**

It is not only visitors that are attracted to the striking and elegant fruits but some hairy caterpillars were also found on the fruits, feeding on the outer skin. Reared in plastic containers embedded with tissue at 29°C, the earlier instar of the caterpillars was mostly black dorsally and pale ventrally, with long white setae. The later instar was more colourful, with a reddish head and four yellow dorsal tufts. In captivity, the caterpillars devoured almost the whole ripening

batch of smaller fruits placed in the container. Pupation was about a week and the pupa was encapsulated in a loose silken cocoon weaved from its long setae. The emerged adults were *Orgyia basinigra* Heylaerts (*Lepidoptera*: *Lymantriidae*), based on Holloway (1999). The female moth is larger than the male, and the wing pattern differed. The female has a wing span of 42 mm and a body length of 22 mm compared to the male's wing span of 22 mm and body length of 11 mm. At the larval stage, the female grew up to 45 mm, almost double the size of the male.

Sterculia megistophylla is a new host plant record for *O. basinigra*. Other host plants are *Parashorea malaanonan* (Dipterocarpaceae), *Acacia mangium* and *Pueraria* (both Leguminosae), *Theobroma cacao* (Sterculiaceae), *Cinnamomum zeylanicum* (Lauraceae) and an unidentified Zingiberaceae (Chey 1996, Holloway 1999, Robinson *et al.* 2001). Chey (1996) noted that this species is the most common nursery defoliator of *Parashorea malaanonan* in Sook, Sabah. In this observation, however, *Orgyia basinigra* did not occur in high abundance, and thus is not considered a threat to *Sterculia megistophylla*. Other fruit feeders, such as rats and squirrels, cause more damage to its ornamental beauty.

A female adult of *Orgyia basinigra*

A male adult of *O. basinigra*

Damage caused by rodents is fairly substantial

A pupal case within a silk cocoon

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By Patahayah, M. (patahayah@frim.gov.my),
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A Mushroom Foray in Pasoh

with some world experts

Right to left: Roy, Brandon, Urmas, Bart and Kabir checking the field equipment.

Dr. Urmas Koljälg picking his first collection of resupinate Thelephoroid fungi beneath a fallen trunk.

"Everyone, let's say Boleetees!" and Celia's camera lens flashed. Celia is a freelance photographer who had flown from New York to Malaysia to capture moments in the Mycology Workshop 2012. This seven-day workshop and foray, held from 24 to 29 August in Pasoh Forest Reserve (FR), Negeri Sembilan, had 16 participants, both local and foreign, mostly from the United States.

The workshop facilitators: Dr. Roy Halling (The New York Botanical Garden, USA), Dr. Bart Buyck (National History Museum, France), Dr. Brandon Matheny (University of Tennessee, USA) and Dr. Urmas Koljälg (University of Tartu, Estonia).

Dr. Krista McGuire (Columbia University, USA) and Dr. Kabir Peay (Stanford University, USA), our collaborators on a National Science Foundation funded project, initiated the workshop.


The workshop and foray group

Early in the morning after breakfast, armed with baskets, knives, trowels and aluminium foil, the group marched towards the heart of Pasoh FR, exploring the 50-ha forest plot, nature trail, arboretum and canopy walk for mushrooms. Mushrooms are delicate fungal fruiting bodies and sharp eyes are needed to locate them as they can be hidden underneath the litter or between planks of buttress. If they are missed today, they may not be seen again tomorrow. Fruiting bodies of the agaric fungi, commonly called mushrooms, are fleshy and last for about 3–5 days. They are easily destroyed by rain or insects which feed on them. The group was therefore reminded to collect all mushrooms including the tiny ones.

The workshop was planned to coincide with one of the fungal fruiting seasons which generally take place between March to April and August to September each year. Unfortunately, on this occasion, mushroom collections were below expectations. Due to the unseasonal weather, mushrooms sprouted earlier this year between mid-July and mid-August. This foray was held close to the end of the season. On the third night however, it rained heavily, and hopes were raised. "We'll see them in the next two days" remarked Bart, the *Russula* expert. Mushrooms bloom when there is enough rain and the temperature warm enough. Urmas was however not so lucky with the corticoid fungi (fungi which form resupinate fruit bodies) as the rain was not heavy enough to drench the soil beneath fallen stems.


Dr. Roy Halling leading the group

Less than 20 collections were made daily but it was enough to keep us busy. Due to their delicate nature, all mushroom samples must be immediately characterised and this includes photographing, measuring and describing the form, shape and other special characters, including taste and odour. Mushroom description is a laborious task but reference materials such as illustrated characteristics of mushrooms and a glossary of terms were of tremendous help. We now understand what *adnate, lamellae, squammose, acrid,* etc. means. We also discovered how rapidly some mushrooms can change colour when touched or bruised.

During the nights, Roy spoke on *Boletes*, Bart on *Russula* and *Lactarius*, Brandon on Inocybaceae and Urmas on resupinate fungi. Their presentations were the highlights of each night.

In total, the group managed to make about 90 collections from multiple fungal groups and 20 of them were of the Thelephoroid fungi. Some collections were taken back to FRIM's Fungarium. And Celia flew back with a cache of fantastic shots of both mushrooms and people!


Yummy! Egg sandwiches for lunch


One should never miss an opportunity to photograph fungi in their natural habitats. It is important to note the original colour of the fungi before handling it.

This tiny yellowish brown *Chalciporus* sp. (Boletaceae) is an ectomycorrhizal fungus. It is edible but tastes acrid and is not eaten in Malaysia.

This bolete (*Boletus*, Boletaceae) has fruiting bodies that look like agaric fungi in shape and texture, but its underside has pores instead of gills and its spores are produced inside tubes.

This *Phylloporus* sp. turns from dark brown to orange where ammonia is applied on its cap while the surrounding tissue turns pink.

Clitopilus sp. grows on soil, has an odour which some people may describe as 'cucumber-like'.

"It looks like durian. That was why it is called *Durianella*." Dr. Roy Halling tries to figure out where he had collected this fungus. "Oh now I remember! It was found in Sungai Congkak, Selangor, a few years back."

When mature, the spores of this earthball fungus *Pisolithus aurantioscabrosus* are released by the rupture of its outer surface layer.

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Rafflesia blooms in Royal Belum

The 10-petaled *Rafflesia azlanii*

Tracking up to the slope near Sungai Gadong in the Royal Belum State Park of Perak, Malaysia (N5 37.042 E101 18.329), Azmi Bin Md Noh and Saad Bin Hashim were on their routine guide walk with a private tour along a *Rafflesia* trail. Since the discovery of the first *Rafflesia* species in Bengkulu, Sumatra in 1818, *Rafflesia* has never ceased to astound the botanical fraternity and the general public alike. This genus is holoparasitic, i.e., with no visible stems and leaves, yet astonishingly it produces the largest flower in the world. Flower diameter may be 100 times larger than those of other flowering plants. Inhabiting specialised localities in the tropical rainforests of Sumatra, Java, Borneo, Peninsular Malaysia, southern Thailand and the Philippines, it resides covertly in *Tetrastigma* (Vitaceae) and its flower is characterized by five petals (perigone lobes) which are reddish orange.

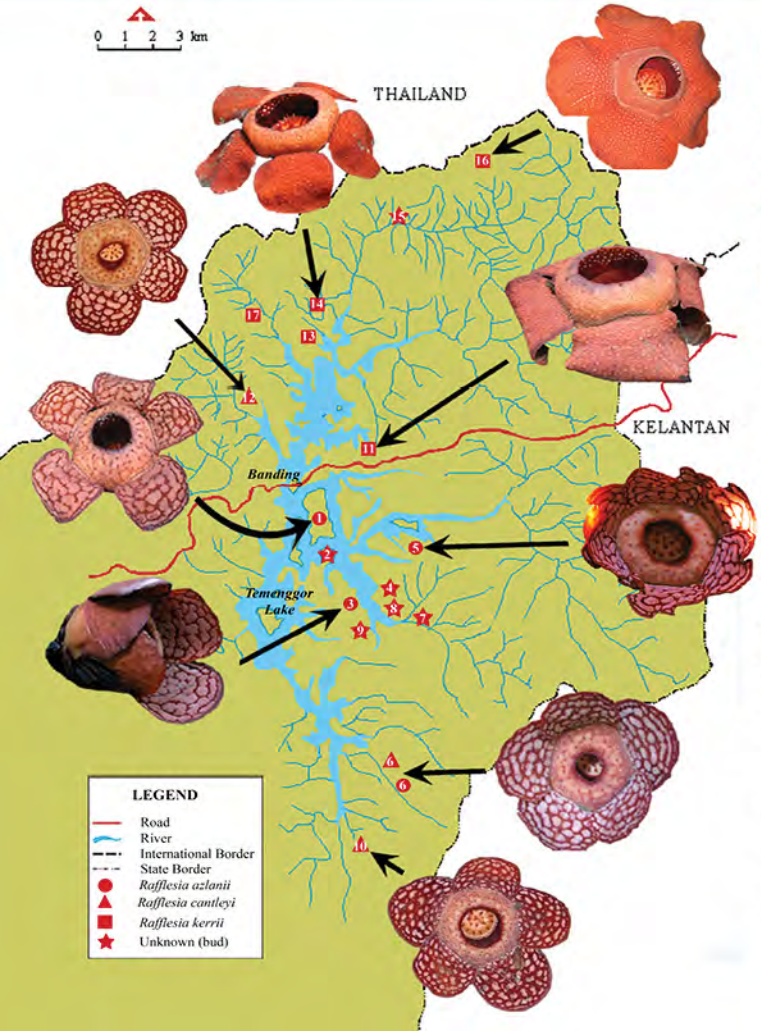
Hamidah, M.

Royal Belum Park and adjacent Temenggor FR.

Walking tours along the *Rafflesia* trail are a highlight in the immensely-rich Royal Belum Park. The sight of the forest floor strewn with floral buds and opened flowers and the sniff of air with the stench of rotting flesh is a memory etched in time. Cameras flash and a great chatter of amazement descend on the hushed quietness of the forest. The 24th of June 2012 was no different until Azmi and Saad stumbled upon one flower that they knew they had to verify with experts. To everyone's knowledge, species of *Rafflesia* have only 5 petals. Very rarely flowers with 6 petals are found and only exceptionally, those with 7 petals occur. This particular flower, a female *Rafflesia azlanii,* had 10 petals. This aberration is most likely a result of a very rare gene mutation. At 313 m a.s.l., the flower lasts only 5 days and to have this singular creation preserved in time, with the permission from Royal Belum State Park officer, Ms. Iylia Ainuddin, it was harvested on 26 June and carted to the Kepong Herbarium, Forest Research Institute Malaysia. Here the specimen, referenced FRI 76651; Siti-Munirah, M.Y., was pressed, dried, labeled and stored. With proper care, it should last for a long time.

Of the thirty-nine known species in Malesia (Sofiyanti, 2011), four species, *Rafflesia azlanii*, *R. cantleyi*, *R. kerrii* and *R. su-meiae* are found in Peninsular Malaysia. The forest in the Royal Belum Park and its adjacent Temenggor Forest Reserve (FR) is the only site in the peninsula where all three species occur and where *R. azlanii* is endemic.

Preservation of *Rafflesia azlanii*, courtesy of the State Park, at FRIM



Distribution of species around the Temenggor Lake

1 Pulau Besar
2 River (Sg.) Dok
3 Sg. Chuweh
4 Kiroi
5 Sg. Halong
6 Sg. Kenyer
7 Village (Kg.) Chiong
8 Sg. Tebang
9 Sg. Cap
10 Kelaweh
11 Sg. Ruok
12 Sg. Gadong
13 Sg. Tan Hain
14 Sg. Selantan
15 Sg. Kejar
16 Belum Lama
17 Sg. Kenarong

The common *Rafflesia* in Peninsular Malaysia

Rafflesia azlanii

Rafflesia cantleyi

Rafflesia kerrii

Rafflesia and Eco-Tourism in The Belum-Temenggor Forest Complex


With *R. cantleyi* in Sg. Gadong, Gerik


With *R. cantleyi* in Kg. Bongol, Gerik


An orang asli with *Rafflesia kerrii* at Sg. Kejar

The complex, comprising the Royal Belum State Park and the adjacent Temenggor FR, is an extensive area that, when collectively conserved, has a significant impact on conservation. Officially gazetted as a State Park in May 2007, Royal Belum covers some 117,500 ha of the total 300,000 ha of the Belum-Temenggor Complex. The protection of the Belum-Temenggor forest complex is particularly important to the conservation of the iconic *Rafflesia* because all three species are found here. Although occasional threats such as illegal harvesting are present, almost all species that occur there including their habitats are conserved. Permits and boats are required for entry and where populations of *Rafflesia* are found, they are additionally guarded eagle-eyed by the local communities. Harvesting of timber resources is however practiced in the Temenggor FR. Several *Rafflesia* populations in the State Park are being monitored.

In the past, most *Rafflesia* populations were often subjected to several claims and counter-claims of ownership by local *Orang Asli* and tourist agencies in and around Pulau Banding. In these last few years, eco-tourism in Belum-Temenggor has become more established and sustained. The *Rafflesia* populations in the Royal Belum State Park now belong to the Park.

Conducting guided tours along forest trails in the mega-rich tropical rain forests is a lucrative venture, particularly when the trails contain iconic species such as the *Rafflesia*. In Sabah and Sarawak, many such tours are available and the revenue generated significantly improves the livelihood of the local *Orang Asli* communities, in addition to reinforcing the impact of the role of conservation on income generation. In 1998, one patch of *Rafflesia* blooms was estimated to raise between RM100 and RM 800; if a site produces up to 10 blooms a year, a total of RM 8,000 can be generated annually. This is in addition to the average family income of about RM 600 per month (Nais & Wilcock, 1998).


With *Rafflesia kerrii* at Sg. Ruok

In the peninsula, *Rafflesia* tourism is catching up in Hulu Geroh, Royal Belum - Temenggor Lake and Lojing Highlands. These activities however need to be monitored by authorities as many blooms were badly trampled by indiscriminate visitors. Some populations in Pos Brooke and Royal Belum were destroyed due to business rivalry and jealousy and there are numerous incidents of vandalism and littering. Authorities should take appropriate measures to ensure that the "goose continues to lay its golden eggs".

Acknowledgements

Thanks are due to the Forest Department, National University of Malaysia (UKM), Royal Belum State Park with special thanks to my ex-supervisor the late Professor Kamarudin Mat-Salleh.

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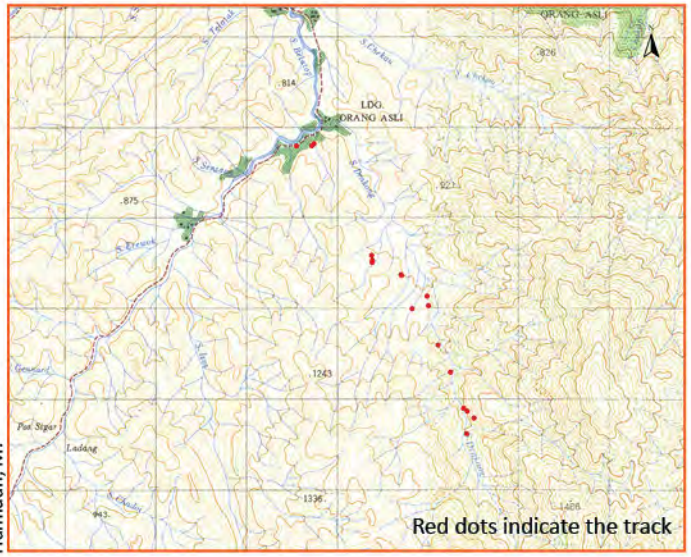
... to the Lojing Highlands in Kelantan

Lojing Highlands in South-west Kelantan is a refuge for *Rafflesia kerrii*, the largest species in Peninsular Malaysia. Having to depend on *Tetrastigma* vines for its existence, it is amazing that its flowers can grow to 110 cm in diameter.



Hamidah, M.

Red dots indicate the track

To get to Lojing Highlands you need to go to Cameron Highlands, where guided tours to the site are available. Up to 30 tourists visit the *Rafflesia* sites daily.

It is a 45-minute drive from Cameron Highlands to the Temiar village in Lojing.

Temiar villagers can be hired as guides.

The track begins along a dirt road that is no longer passable to vehicles. It is easy going and hardly an effort for adults and kids aged 6 and above.

It may be a little steep in the beginning...

after 20 mins you'll hit the ridge...


Bud of *R. kerrii*


Kamarudin, M.S.

From then on, it is a leisurely nature walk. A rustic bamboo bridge overhanging a small stream welcomes you in to the deeper heart of the forest.

There are many individuals of *Rafflesia kerrii* here and each flowers at a different time of the year. Because of this, there is a very good chance of seeing flower buds and opened flowers. Floral buds are cabbage-like.

You will be able to see and photograph at least one *Rafflesia* flower in full bloom. Seeing is really believing! And what does this amazing flower smell of? Until you meet the flower face-to-face you won't know!

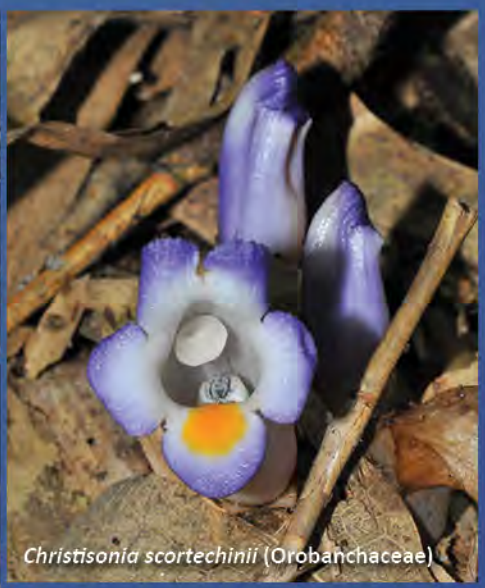
Since 2003, research into the distribution of *Rafflesia kerrii* at Lojing has been conducted by students of the late Professor Kamarudin Mat-Salleh from Universiti Kebangsaan Malaysia (UKM). Currently, the biology of the thriving *Rafflesia* population in this area is being monitored by a group of researchers including a student from Universiti Malaysia Kelantan (UMK) assisted by FRIM.

Data from this work is channeled to the Forest Department and Kelantan State Government in order to encourage the conservation of the population as well as the area's rich plant diversity. Resulting from this awareness, with efforts by the UMK research team, the state government, very recently in May 2011, announced the gazettement of a 440 ha area of land in Lojing Highlands for this purpose.

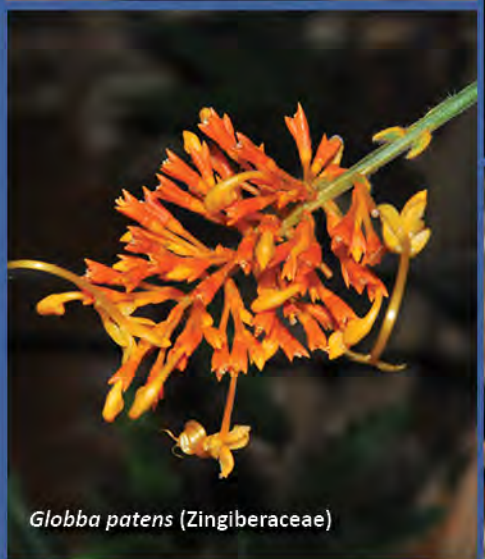
Apart from *Rafflesia*, you may be lucky enough to see ...


Medinella sp. (Melastomataceae)


Etlingera coccinea (Zingiberaceae)


Christisonia scortechinii (Orobanchaceae)


Kadsura scandens (Schisandraceae)


Globba patens (Zingiberaceae)


Phyllagathis rotundifolia (Melastomataceae)


Dichroa febrifuga (Hydrangeaceae)

Gunung Rapat, Perak, a Candidate for Conservation

By Rafidah, A.R. (rafidahar@frim.gov.my), Kiew, R., Saw, L.G., Imin, K. & Wilkie, P.

In 1991, the Malaysian Nature Society (MNS) conducted a survey of the Ipoh limestone hills. In their recommendations for conservation, Gunung (G.) Rapat was one of those singled out as being of premier importance for conservation (Davison, 1991, 1997). From the botanical viewpoint, it has a good representative flora of the Perak limestones, is home to several rare and endemic species, and its summit is unusual in being covered by leaf litter and supporting dipterocarps and small fan palms. The recommendations sought to halt quarrying, agriculture, temple and resort development.

In March 2011, we returned to assess the changes to the flora. The base is now replaced by housing estates. The summit dips into a rocky hollow filled with a thick layer of leaf litter that supports trees to 10 m tall and sparse undergrowth that includes the small fan-palm *Licuala kingiana* (Palmae), a species endemic to Perak. The species is often seen at the base of limestone hills; here is the first record of it residing on the summit. In addition, there are two very rare dipterocarps: the critically endangered *Hopea bilitonensis* and vulnerable *H. pierrei*. This is the first time *H. pierrei* has been found on limestone.

Other G. Rapat species restricted to limestone include the endangered *Paraboea* (Gesneriaceae) that grow on the exposed top of sheer cliff faces – *P. caerulescens* (Endangered) endemic to Perak limestone while *P. paniculata* grows on hills in Perak and Selangor. *Isonandra perakensis* var. *perakensis* (Sapotaceae) is known only from three hills in Perak, one of which is G. Rapat.

Habit and fruit of *Pandanus piniformis*

G. Rapat is a karst hill located 5 km south of Ipoh. It has several attractions: Sam Po Tong (Cave of Three Treasures), Kek Lok Tong (Cave of Great Happiness), Paradise Valley (a kilometer-long *wang*, i.e., an open space surrounded by towering limestone cliffs, probably formed by a roof collapsing), and the unique Minex Mirror Lake (the water surface is so still that the reflection of the hill is a perfect mirror image. The lake lies in a *wang* and is accessible through a tunnel that was blasted by the Minex iron mining company).

Jasminum cordatum (Oleaceae) is another species found only in Perak, Selangor and Peninsular Thailand. The rare endemic fern *Calciphilopteris alleniae* (Pteridaceae) and a good population of the endemic *Pandanus piniformis* (Pandanaceae) were sighted. We encountered fruit trees

The Ipoh microchirita, *Microchirita sericea*

Paraboea paniculata (top) and *P. caerulescens* (bottom) are both endangered species that grow on G. Rapat.

Hopea pierrei (Dipterocarpaceae)

Pistacia malayana (Anacardiaceae) and *Dimocarpus longan* var. *longan* (Sapindaceae). The latter is a new record for G. Rapat. In Peninsular Malaysia, it is very difficult to find this species in the wild and it was previously known only from G. Pondok (Perak), a hill that will eventually be quarried to the ground. The ghostly saprophyte *Burmannia championii* (Burmanniaceae) is rarely collected and is only known from limestones in Kelantan and Selangor (Batu Caves).

We were successful in finding at least four endemic and/or rare species restricted to the limestone such as *Microchirita sericea* and confirm that the upper craggy ridges and summit are in pristine condition. We support past recommendations that G. Rapat be given legal protection to protect its biodiversity, scenic and tourist values. Apart from rare endemics, 130 bird species were recorded including three that are associated with limestone ecosystems, namely, the blue whistling thrush, blue rock thrush, and the peregrine falcon (Wong, 2009). The 1991 expedition discovered evidence of kambing gurun (serow) (Davison, 1991). While G. Rapat is recognised as a valuable tourist venue, the scenic value of limestone hills is sadly not recognised. The permanent scarring of the sheer cliffs and towering karsts by quarrying is something that should be avoided.

Isonandra perakensis var. *perakensis* (Sapotaceae)

Dr. L.G. Saw identifies the fan palm *Licuala*

Using a safety rope to cross the top of the precipitous landslide – don't look down!

The attractive wild jasmine, *Jasminum cordatum* (Oleaceae)

Acknowledgements

We thank Mr. Liew from the Malaysian Karst Society for guiding us to the entrance of the climbing route.

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