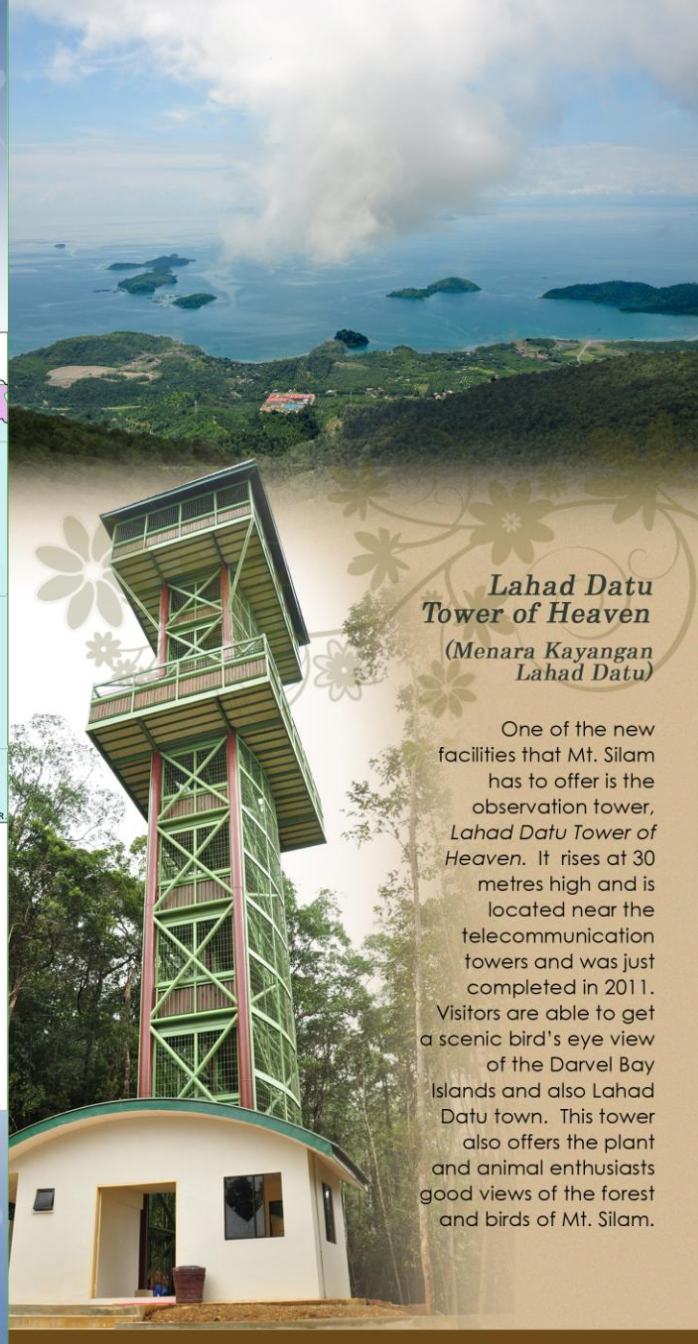
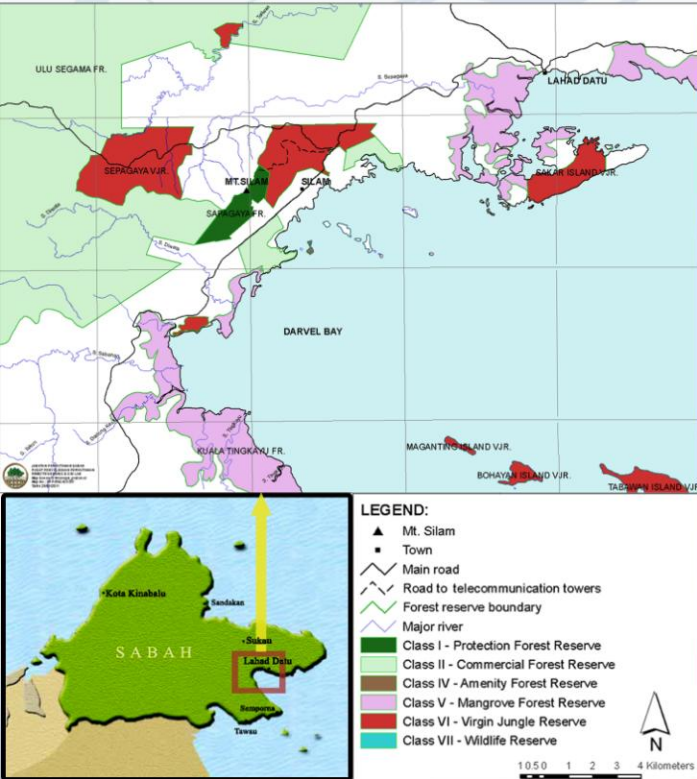


# Location Map of Mt. Silam



## Lahad Datu Tower of Heaven (Menara Kayangan Lahad Datu)

One of the new facilities that Mt. Silam has to offer is the observation tower, *Lahad Datu Tower of Heaven*. It rises at 30 metres high and is located near the telecommunication towers and was just completed in 2011. Visitors are able to get a scenic bird's eye view of the Darvel Bay Islands and also Lahad Datu town. This tower also offers the plant and animal enthusiasts good views of the forest and birds of Mt. Silam.

**SABAH FORESTRY DEPARTMENT**  
 Locked Bag 68, 90009  
 Sandakan Sabah MALAYSIA  
 Tel: 6089 242500 Fax: 6089 671303

At least 23 mammal species representing 15 families were documented from Mount Silam. Based on a scientific study, the most captured small mammal species was the Short-nosed Fruit Bat (*Cynopterus brachyotis*) and the most encountered large mammal was the Bearded Pig (*Sus barbatus*).

## Common Mammals



▲ The cute-looking *Slow Loris (Nycticebus coucang)* is a furry arboreal nocturnal primate with big brown eyes. It feeds on smaller animals, such as lizards and insects, or pulpy fruits. It is mainly solitary, occurs in lowlands up to 1,300 m a.s.l.

▼ The silence in the early morning of the forest is often broken by the rich whooping and gurgling calls of *Bornean Gibbons (Hylobates muelleri)* on the tree tops, proclaiming their territories. Interestingly, this species is only confined to Borneo, from the lowlands up to 1,500 m a.s.l.



▼ The *Sambar Deer* or 'Payau' (*Cervus unicolor*) is the largest forest deer that can be sighted in open areas of the forest, such as river banks and forest edges. It is more active at night, feeding on grasses, herbs, young leaves of woody plants and fallen fruits. It is usually solitary but groups of two or more are sometimes seen.



▲ The *Bearded Pig (Sus barbatus)* is commonly encountered in any of the lowland rain forests. It is mostly active at night but also sometimes during the day, especially in cool weather. Its diet includes fallen fruits and seeds, roots, herbs and other plant materials, earthworms and other small animals.

Insects are very important in the tropical rain forests because of their high diversity and abundance. Forest insects are significant as pollinators, seed dispersers, nutrient recyclers, decomposers and food source for other animals. As such, they are essential for the functioning of the forest ecosystem. On the other hand, some insects are pests in forestry, causing damages to living trees and also forest products. Among the potentials of insects that can contribute to the Sabah state economy are the use of insects in nature tourism, bioindicators in environmental studies and insect products, such as honey and beeswax. The forest at Mount Silam is also teeming with insect lives.

## Interesting Insects



▲ *Trithemis aurora*  
 Dragonflies are almost as conspicuous as butterflies. The gauzy-winged insects can be seen almost everywhere, flying in the sunshine but always more numerous and diverse near water.

▲ *Orthetrum glaucum*  
 Dragonflies are almost as conspicuous as butterflies. The gauzy-winged insects can be seen almost everywhere, flying in the sunshine but always more numerous and diverse near water.



▲ *The Giant Cicada, Pomponia merula*  
 Cicadas are also found in abundance at Mount Silam. The striking feature of cicadas is their 'singing'. The males produce a very shrill penetrating sound from specially developed organs at the base of the abdomen ventrally. The singing is apparently to attract the females, and also for territorial purposes. The Giant Cicada, *Pomponia merula* has been recorded at Silam.

▼ An unidentified Stick-like Mantis waiting patiently for their prey, normally smaller insects.

▼ *The Dead Leaf Mantis, Deroplatys denticata*



Beetles are characterized by their armour-like appearance. They are the most diverse group of insects with more than 400,000 species worldwide. However, they are seldom encountered because they don't normally occur in swarm (e.g. ants and termites) and they are generally not as glamorous as butterflies and moths. Many of them are very small, less than 1 cm and they often live in cryptic areas, such as inside the soil.

▼ *The Long-horned Beetle, Megopis sp.*

▼ *The Three-horned Beetle, Chalcosoma moellenkampi*



▲ The *Moon Moth, Actias selene* of the Saturniidae family is a spectacular moth that fascinates many people and was featured in 'The Lord of the Rings' movies as a messenger moth that bears good news and change for betterment. With a wing span of about 150 mm, this pale green moth has a pair of long trailing tails on the hind wings. In flight at night, it looks quite ethereal, and can be found in the morning resting quite openly on the tree trunk. Its distribution is quite widespread, found from India to Japan and then south into Nepal, Ceylon, Borneo, and other islands in eastern Asia.



▲ *The Geometridae Moth, Celerena signata* is a striking moth with bright yellow and greyish colours on its wings. Distributed in Peninsular Malaysia, Sumatra, Palawan and Borneo, it is a common lowland forest species which is also found in secondary forests and plantations.

▲ *Ambulyx canescens*  
 Hawk Moths of the family Sphingidae are among the best known moth groups because of their relative large size and their hawk-like appearance. They are stout-bodied, narrow-winged insects with exceedingly powerful flight. The larvae are also distinctive with a horn or appendage at the back. Some larvae bear striking resemblance to the head of a snake in both appearance and behaviour when alarmed.



▲ *The Great Egg-fly, Hypolimnas bolina* of the Nymphalidae family is a common butterfly at Mount Silam. It is velvety black in colour, shot with deep blue and white. The iridescent deep blue can be quite captivating, especially when it is reflected while flying under the morning sun. Hence, it is also known as the Blue Moon Butterfly.

▲ A few species of Wasp-like Moths, *Amata* spp. of the Arctiidae family have been recorded at Mount Silam. Some are endemic to Borneo and they are often seen foraging in the evening before sunset.



# MOUNT SILAM AND ITS NATURAL WONDERS





# Introduction

Mount Silam is located about 10 km from Lahad Datu town and is easily accessible by road on the Lahad Datu-Tawau highway. You will need to turn right and immediately on the left is a sealed road going uphill to the telecommunication towers at 620 m and from there, a forest trail to the summit. It is seated within the Sapagaya Forest Reserve which was gazetted as Class I Protection Forest Reserve in 2009 with an area of 698 ha. Prior to this, Mt. Silam and its surroundings were under stateland. Mt. Silam is an ultramafic coastal mountain facing the Darvel Bay, rising from sea level to 884 m a.s.l., making it the highest point in the Lahad Datu district.



Although there might be some variability both chemically and physically at different ultrabasic sites, generally the ultrabasic soils are dark-coloured and contain high concentration of magnesium, iron and other metals such as nickel, chromium and cobalt. They contain low silica levels and often are lacking in major plant nutrients such as nitrogen, phosphorus and potassium.

Good sealed road that leads to the telecommunication towers in Mt. Silam.

The ultrabasic soils can easily be recognized by the reddish brown colour and they contain high concentration of magnesium, iron and other metals such as nickel, chromium and cobalt.

The geology is based on ultrabasic intrusive igneous rocks of cretaceous to early tertiary age and mainly of serpentine, dunite and peridotite rocks. These rocks generally contain less than 44% silica (SiO<sub>2</sub>) content but high level of magnesium, iron, chromium and nickel and have weathered to produce regolith rich in such elements. Soils of the area have been broadly classified as Bidu Bidu Association, an ultrabasic soil, based on the mountainous landform and the parent material of the soil. This has resulted in the unique forest condition and tree species composition in ultrabasic site compared to other sites.

Many tree species found in this area are adapted to grow in ultramafic substrates, which are deficient in important nutrients for optimal growth and containing potentially high concentrations of some minerals which are toxic to plants. This drawback could be the reason why the forest stature is much shorter in comparison with other forests that grow on fertile soils. Moreover, the forest stature decreases, whilst the stem density increases, with increasing elevation.

Tree species from the families Dipterocarpaceae and Anacardiaceae are dominant groups of trees in the forest from lowland to upland forests but gradually become less important beyond 700 m a.s.l. Tree species that seem to be confined to higher elevation (700 m a.s.l.) are from the family Casuarinaceae, Epacridaceae, Escalloniaceae, Podocarpaceae, Rutaceae and Theaceae. Tree species from the family Euphorbiaceae, Myrtaceae and Sapotaceae are found throughout the three forest types at lower elevations.

The other interesting fact, yet intriguing, aspect of Mt. Silam is the presence of compression of vegetation zonation called the *Masserhebung effect* on this small ultramafic mountain. These typical forest characteristics of each forest formation, namely lowland, upland, lower montane and mossy forests, could only be found in higher elevations such as in Mt. Kinabalu and Mt. Trusmi. Scientists are still baffled by this observation and studies are still actively conducted to unravel such interesting natural phenomenon.

With an elevation range between 200–884 m altitudes, the forest in Mt. Silam can be classified into four general forest formations:

## Lowland ultramafic forest

Generally, this forest is confined to elevation from 200 to 330 m where forest of large stature with wide crown trees that could reach up to 50 m tall are found. Floristically, it is in some ways similar to lowland dipterocarp forest in Sabah and the family Dipterocarpaceae, comprising *Dipterocarpus lowii*, *Shorea atinivosa*, *S. kunstleri*, *S. laxa*, *S. multiflora*, *S. venulosa* and *Vatica mangachapoi*, with smaller trees of *Hopea nutans*, *Vatica micrantha* and *Shorea obscura* as the dominant group of trees. The family Anacardiaceae (the mango family) is also common.

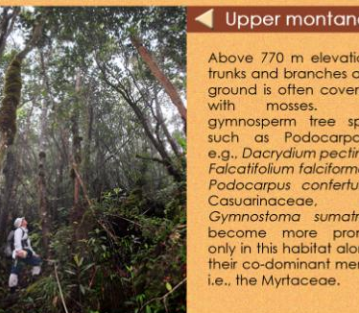


## Upland ultramafic forest

This forest is confined to elevation from 330 to 540 m where trees of medium stature could reach up to 35 m tall. The most dominant tree group is still the dipterocarps, followed by Anacardiaceae as the associates. In this forest, tree species that are well adapted to ultrabasic substrates or poor nutrient habitats, such as heath forest become more prominent.

## Lower montane ultramafic forest

This montane forest is confined to elevation from 540 to 770 m. The forest is relatively smaller than the lowland and upland forests. The co-dominant groups of trees that are commonly found in this forest are from the families Myrtaceae, Dipterocarpaceae, Euphorbiaceae, Anacardiaceae, Clusiaceae and Fagaceae (the oak family).



## Upper montane forest (Mossy forest)

Above 770 m elevation, the forest becomes stunted and the trunks and branches are mostly covered with thick mosses. The ground is often covered by thick humus layer and enveloped with mosses. The gymnosperm tree species, such as Podocarpaceae, e.g., *Dacrydium pectinatum*, *Falcatifolium falciforme*, and *Podocarpus confertus* and Casuarinaceae, e.g., *Gymnostoma sumatranum*, become more prominent only in this habitat alongside their co-dominant members, i.e., the Myrtaceae.

There has not been any detailed study on the plant diversity in Mt. Silam. Sporadic botanical collections in the area from 1955 up to 2006, recorded a total of 263 taxa derived from 71 families of vascular plants (data source from SAN database). Furthermore, Proctor *et al.*'s ecological work in the 1980's, recorded a total of 374 species of trees that have a diameter at breast height  $\geq 10$  cm in an area of 2.6 hectares. The forest in Mt. Silam is very species-rich, especially in terms of tree species. *Syzygium silamense* has been recorded to be endemic to Mt. Silam. Other plants that are noteworthy, include *Borneodendron aenigmaticum* (Euphorbiaceae), *Callophyllum sakarium* (Clusiaceae), *Pittosporum silamense* (Pittosporaceae), *Racemobambos paininii* (Gramineae), *Nepenthes macrovulgaris* (Nepenthaceae), *Corybas serpentinus* and *Porpax borneensis* (Orchidaceae), as they are endemic to ultramafic substrates and endemic to Sabah.

# Noteworthy Plants



'Bangkau-bangkau', *Borneodendron aenigmaticum* of the Euphorbiaceae family is a canopy tree that could attain 30 m tall and 70 cm in diameter. It is a monotypic genus and its name means "enigmatic Bornean tree". The bark when slashed produces red sap. The leaves are very thick and in whorls of three. The female flowers are borne on a stout and flattened stalk. The fruits are green, turning black when ripe, bilobed and compressed. The species is common in Mt. Silam and endemic to Sabah and is restricted to ultramafic substrate.

*Payena ferruginea* of the 'nyatoh' or Sapotaceae family is a tree reaching 35 m tall and 75 cm in diameter that produces white sap when the bark is slashed. The twigs and under surface of leaves and outer surface of inflorescences are covered with rusty brown hairs. The inflorescences are borne on the axis of the leaves and the fruits dry black, ovoid to ellipsoid. It is endemic to Borneo, and in Sabah, it has been recorded in the east coast. It thrives in primary lowland and hill mixed dipterocarp forests at altitudes to 450 m, sometimes occurring in fresh water swamp forest.

*Callophyllum sakarium* of the Clusiaceae family is a medium-sized tree with adult height of 12–24 m and 65 cm diameter. The leaves are obovate with rounded apices. The inflorescences are located at the terminal end while the fruits are small and ellipsoid. It is named after Sakar Island where the first collection of the species was made. Thus far, this species has been only recorded on ultramafic areas in southeast of Sabah, especially in Silam and the Darvel Bay islands. It prefers a habitat with well-drained ridges and slopes of ultramafic soils.

*Pittosporum silamense* of the Pittosporaceae family is a small tree with conspicuous bullate leaves on the upper side and persistently rusty hairy on the lower side and with recurved margins when the leaves are dry. The fruits are greenish to blue, turning black when ripe, almost rounded with an abrupt tip, and covered with rusty hairs. It is endemic to Sabah and found on ultramafic soil in the hill forest of Mt. Silam, to about 800 m in altitude.

'Keruing shal', *Dipterocarpus lowii* of the Dipterocarpaceae family is a large emergent tree reaching 55 m tall and 2 m in diameter with prominent buttresses. This species is diagnostic by having slightly flattened twigs; large, thick, leathery, corrugated, ovate or oblong-lanceolate leaves and lamellated fruiting calyx tube. It is found widespread in Borneo, frequently in mixed dipterocarp forest on low sedimentary hills on yellow sandy soils, up to 400 m in altitude. In many localities in Sabah, it occurs on ultrabasic rocks.



'Seraya kerangas', *Shorea venulosa* of the Dipterocarpaceae family is a large emergent tree, reaching 55 m tall and 1.3 m in diameter, often with cauliflower-shaped crown. The fruit bear 3 longer lobes, to 6 x 1.5 cm, the 2 shorter lobes are linear-lobed, to 3 x 0.5 cm and the nuts are narrowly ovoid, to 2 x 0.8 cm. It is endemic to Borneo and widespread in Sabah. Occurring on podsolis in heath forests, forest on ultrabasic rock, also in lower montane kerangas at 1000–1600 m in altitude.



*Schima wallichii* subsp. *monticola* is a representative of the tea, Theaceae family that has small to medium-sized tree, up to 35 m tall. The leaves are thick with 9–12 pairs of lateral veins. The flowers have petals that are white to finge pink on the outside surface. The fruits are rounded and depressed, to 2.5 cm across with silky hairs on the surface. It is widespread in Malaysia and in Sabah, it is normally found in dipterocarp or oak forests at 1400 to 1800 m, but also occur in heath forest at 500–700 m.

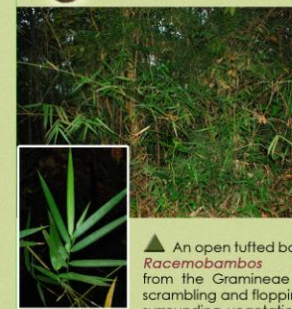


This beautiful *Rhododendron javanicum* ssp. *cladotrichum* is a terrestrial shrub reaching up to 2 m tall. The twigs are minutely hairy with pseudowhorled leaves that are smooth and minutely hairy along the midrib. The flowers are striking orange with pink throats. This species is thus far only known to occur on Mt. Silam in Sabah; the other collection is from Kalimantan.

*Syzygium bankense* of the Myrtaceae family may grow as a shrub or treelet with very small, shiny, narrowly ovate leaves, resembling leardrops. It is distributed in Sumatera to the Philippines and is a common species that grows in hill forest, lower montane forest, and ultramafic substrate.



This montane pitcher plant of the Nepenthaceae family, appears to be a rare epiphyte and was also recorded in Mt. Silam. It is a vigorous climbing plant with slender funnel-shaped, blotched with purple upper pitchers. It has a distinctive blunt boss at the base of its round lid. It is endemic to Borneo and grows on exposed ridges and mountain peaks in stunted montane forest.



An open tufted bamboo, *Racemobambos paininii* from the Gramineae family, scrambling and flopping over surrounding vegetation. The top culm sheath recessed towards the middle and auricles and bristles are not present. The leaf blades and sheaths are glabrous. The inflorescences are up to 10 cm long, bearing hairy spikelets. This species is named after Tan Sri Joseph Pairin Kilingan, Sabah's former Chief Minister. It is thus far recorded only in the east coast of Sabah.

*Corybas serpentinus* is a stunning tiny jewel orchid of the Orchidaceae family that has one single heart-shaped leaf with silvery-white veins. The flowers have long slender white petals and lateral sepals that are crimson or purple towards the base. It was first discovered by Dr Dransfield on Mt. Silam at 750 m and grows on thin rocky soils in moss under ultrabasic forest. It is endemic to Sabah.

The mango, Anacardiaceae family is represented by this common species, 'Kepala tundang', *Buchanania arborescens*. It is a medium-sized tree to 25 m tall and 30 cm diameter. The leaves are clustered. The flowers are creamy white, producing somewhat lens-shaped fruits that are red, tinged green. It is a widespread species occurring on various soil types.

This pitcher plant was first described from Mt. Silam in the 80's. The tubular upper pitcher is up to 23 cm in length while the ground pitcher is more oval and has a purplish hue. It has oblique mouth with smooth minutely toothed peristome. It is most commonly found in the foothills, roadside and summit trail of Mt. Silam and is apparently endemic to Sabah.

A climbing bamboo from the family Gramineae that is named after Darvel Bay from which this species is found to be common around ultrabasic substrates, such as areas around Silam and Darvel Bay islands. This species is also recorded in Samarinda, East Kalimantan. It thrives in open areas especially in forest or forest margins on soils derived from ultramafic rock, and primary forest on volcanic rock.

A terrestrial fern of the Lindsaeaceae family, *Odontosoria retusa* has short-creeping rhizomes. The leaf blade is triangular-shaped or oval-shaped. It occurs in Sabah, Sulawesi, the Philippines, Moluccas, New Guinea to the Solomon Islands. It is found in hill forest in open conditions and on extreme ultramafic substrate.

*Porpax borneensis* is a tiny orchid that grows on tree trunks or on rocks. The leaves are up to 1 cm long and 1.5 cm wide. The flowers are solitary, dark red; the petals are concave with pale yellow sepal tips. It is endemic to Sabah. It occurs in low primary hill forest on ultramafic substrate, often adpressed to rocks, 600–1000 m.

*Podocarpus confertus* is a tree species from the Podocarpaceae family that reaches up to 35 m tall. The adult leaves are narrow or linear-shaped. The pollen cones are solitary, stalkless, 3–4.5 cm long and the seed-bearing structure on a short stalk. It is endemic to Borneo and thrives in poor soils, such as ultrabasic soils.

'Sempilau bukit', *Gymnostoma sumatranum* of the Casuarinaceae family, reaches up to 20 m tall. The main branches are ascending and topped by softly bushy needle-shaped twigs. The flowers are unisexual. The fruit cones are ellipsoid and are usually solitary on the apices of the woody persistent twigs and bear wing-like seeds. It is found in Sumatra and Borneo. It is confined to hill, ridge and lower montane forests on ultramafic soils and in heath vegetation on sandstone, shale or acidic soils, at 600–1800 m.

A sedge of the Cyperaceae family, *Machaerina disticha* that has short-creeping rhizomes. The stems are slender, compressed-biconvex and 2-angled. It is rather widespread, occurring in Borneo, the Philippines, Sulawesi, Moluccas and Waigeo islands, near New Guinea. It is typically found in ultrabasic soil, but also on ledges and boulders in stream beds, periodically flooded riverine forests from low altitude to 1500 m.

A fern of the Lindsaeaceae family, *Odontosoria retusa* has short-creeping rhizomes. The leaf blade is triangular-shaped or oval-shaped. It occurs in Sabah, Sulawesi, the Philippines, Moluccas, New Guinea to the Solomon Islands. It is found in hill forest in open conditions and on extreme ultramafic substrate.

