THE SINHARAJA RAIN-FOREST, CEYLON

JOHN R. BAKER

BEFORE the Sinhalese first came to Ceylon, the whole of the south-west of the island (the low-country wet-zone) was probably covered by tropical rain-forest. The Sinhalese are accustomed to cut down virgin forest, grow a single crop on the *chena* so prepared, and thereafter leave it as waste land for an indefinite period. The result has been that there is little primeval forest left in regions where the population is fairly high, except for small patches in places which are not convenient for cultivation. Great areas of forest exist in the dry zone, on account of the population being relatively small there; but this forest is not rain-forest, and it is not certain that it is actually virgin forest, for the land may have been cultivated in the far-distant past, when the population was much greater and the innumerable tanks in use. The only considerable patch of virgin tropical rain-forest in the island is the Sinharaja Forest. The name means Lion King and is pronounced Singhā-rā-jā. Another considerable tract of evergreen forest exists in the neighbourhood of Adam's Peak, and is often spoken of as the "Wilderness"; but this is at too great an elevation to present the characters of a tropical rain-forest.

The Sinharaja is mentioned by certain authors. Thus Willis,[1] writing of the low-country wet-zone, says: "It was, there can be little doubt, once entirely, or almost entirely, covered with a sheet of dense forest, but of this only portions now remain, as for instance the Singha Raja forest to the south of Ratnapura." Of the same region Charawanamuttu [2] says: "The forests have for the most part been cleared for rubber cultivation. But here and there dense forests still exist—Sinha Raja forest between Sabaragamuwa and Western Provinces." Lewis [3] says: "Of the large forests still remaining, we have the Sinha Raja extending in a very broken form through the Pasdun Korale in the Kalutara District into the Kukulu Korale in Sabaragamuwa. . . ."

It is a strange fact that the Sinharaja Forest is not marked on any map that is known to me. I therefore decided to find exactly where it is and to make a general study of it. For this purpose I camped in its vicinity from the end of July to the beginning of September 1936, and visited nearly every part.

I wish to express my indebtedness to Mr. A. B. Lushington and Mr. W. M. McNeill (of the Forestry Department), Mr. R. F. Lushington, and Mr. N. J. Luddington (Government Agent of Sabaragamuwa), all of whom gave me very valuable advice. Mr. T. B. Worthington stayed with me during the first two nights at my forest camp, and helped to choose the site for the meteorological station. Mr. J. C. de Alwis Wickremesekera acted as my interpreter and did meteorological readings while I was away from the base camp on expeditions to explore the forest.

[1] Willis, J. C., 1907. 'Ceylon: A handbook for the resident and traveller.' Colombo.

[2] Charawanamuttu, V. E., 1930. 'The new school geography of Ceylon,' 2nd Edit. Colombo.

[3] Lewis, F., 1902. 'A descriptive catalogue of the more useful trees and flowering plants of the Western and Sabaragamuwa Provinces of Ceylon.' Colombo.

Geography

The locality has been well mapped from a topographical point of view, mostly by Ceylonese surveyors, but there is nothing in the official maps (not even in the vegetation map) to show that there is a large area of virgin rain-forest in this particular place. By the use of a compass and aneroid barometer it was not difficult to draw the outline of the forest in the 1-inch map sufficiently accurately to show where the forest is and to give some concept of its size.

The position of the forest in the island is shown in Fig. 1. On the coloured

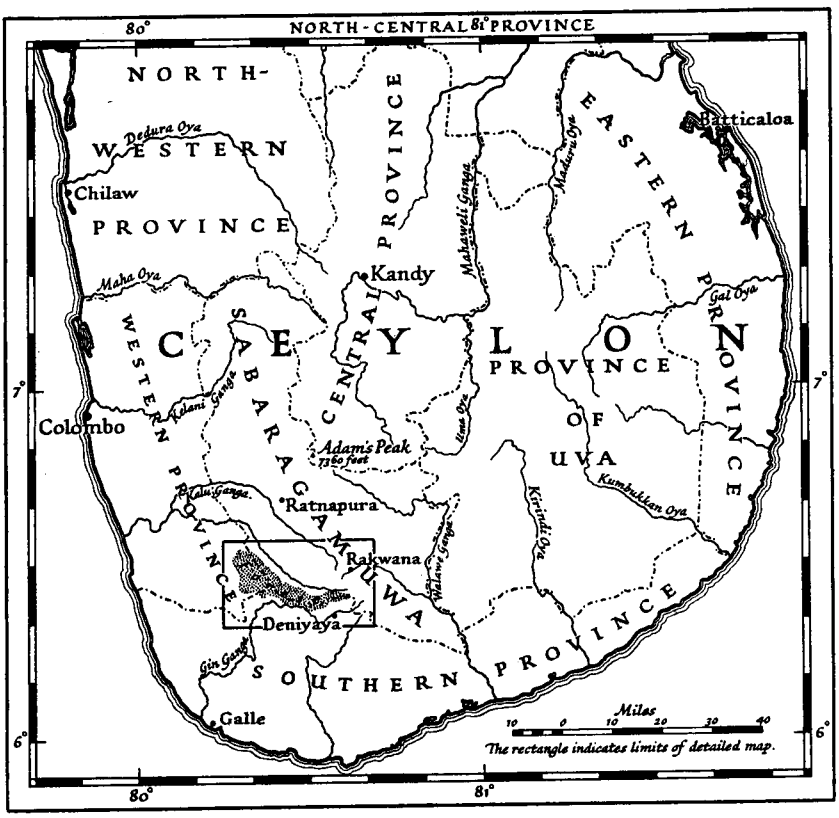


Fig. 1. Ceylon, showing position of Sinharaja Forest

map the continuous line represents the edge of the forest where I have seen it. I did not have time to visit its extreme ends, and the dotted lines indicate where the boundaries must be, according to information given by the natives. Many natives insist that the eastern end of the forest is the mountain called Gongala; but it must be so very narrow between the deserted coffee estates of this region that its limit is probably better indicated where I have put it on the map.

The Kalu Ganga and the Gin Ganga are fairly large rivers reaching the sea near the southern end of the west coast of Ceylon. The former has a southerly branch, the Kukulu Ganga. The forest is situated about the water-

shed between the latter and the Gin Ganga. It covers the southern edge of the parallel-ridge region of the Province of Sabaragamuwa, and extends also across the boundaries into the Southern and Western Provinces. The situation gives remoteness, for there are few villages within the forest, and it is never necessary for Government officers to travel through it. The passage of the Ceylonese surveyors some fifteen years ago is well remembered in the remote parts as a remarkable incursion from the outside world; and in some of the villages (*e.g.* Pitakele) the inhabitants insisted that no European had ever been there before myself.

The forest is south of Ratnapura and about 12 miles away at the nearest point. It is south-west of Rakwana and north-west of Deniyaya. It may be approached by motoring from Ratnapura past Kalawana to the ferry over the Koswatte River, whence one must walk. It is not difficult to obtain carriers. The forest is about 26 miles long and some 90 square miles in area. It extends from less than 300 feet above sea-level near Tiniyawala to 3838 feet at the summit of Mount Rupahinkanda, near its eastern end.

It is important not to confuse the Sinharaja Forest with the Sinharaja Forest Reserve. The latter is a very much smaller area of land, situated wholly in the Southern Province, and comprising a small part of the Sinharaja Forest together with a certain amount of *chena*. Other parts of the forest have received such names as "Delgodamukulana," etc., which simply mean the primeval forest (*mukulana*) of the particular locality named; but these are only local names for special parts of the Sinharaja. At certain places the local inhabitants will emphatically deny that the local forest is part of the Sinharaja, although it is obviously primeval forest and directly continuous with the rest. Natives of other parts will say that such places are certainly parts of the Sinharaja. The explanation is curious: the local natives are frightened that if they admit that their forest is a part of the Sinharaja, it will be claimed by the Government as a reserve, in which felling for *chena*-cultivation would be illegal.

Geology

The region of the Sinharaja agrees with much of the south-west part of Ceylon in that the rock is charnockite. This term indicates an igneous rock which was intruded into the Archaean gneisses and schists that compose the greater part of the island.[1] Dr. G. F. Claringbull identifies my specimen, taken from near the meteorological station, as norite. This is a basic charnockite consisting principally of plagioclase felspar, hypersthene, and magnetite. Thick slabs of mica (muscovite), some inches across, are found here and there in the ground. The soil is a dark brown, which contrasts with the reddish colour so frequent in the island.

Meteorology

The forest extends in altitude from under 300 to 3838 feet, and therefore there is a considerable difference in temperature in different parts. I put my meteorological station in the forest at a medium elevation, namely 1900 feet, near the watershed between the Kukulu Ganga and the Gin Ganga, at

[1] Coates, J. S., 1935. "The geology of Ceylon." *Ceylon Journ. Sci.*, B, 19, p. 101.

a place where the vegetation appeared to Mr. Worthington and me to be typical of a wide area. The situation was on ground sloping down to the north, about 1½ miles to the south of the village of Hapugoda (near Panapola). In order to avoid the possibility of proximity to the edge of the forest influencing the instruments, I put the station 400 yards from the edge at the closest place, although this entailed an hour and a half's difficult walking every day to get there and back twice from the camp. The readings were made every day during August. The instruments, most of which were kindly lent by the Oxford University Exploration Club, were the following: Maximum and minimum thermometers in a single-louvred screen (at the standard height of a Stevenson screen), attached to a tree; a grass minimum thermometer; a ground thermometer (with the bulb at 30 cm. below the surface of the ground); a katathermometer suspended from a wire between two trees (with the bulb 1 metre above the ground); a whirling hygrometer; a recording thermohygrograph (at the same height as the maximum and minimum thermometers, and protected only by a small piece of thatch directly above it); and a Zeiss "Helios" photo-electric cell. The arrangement of the station was in general the same as that of the forest meteorological station in a previous investigation in the rain-forest of the New Hebrides.[1]

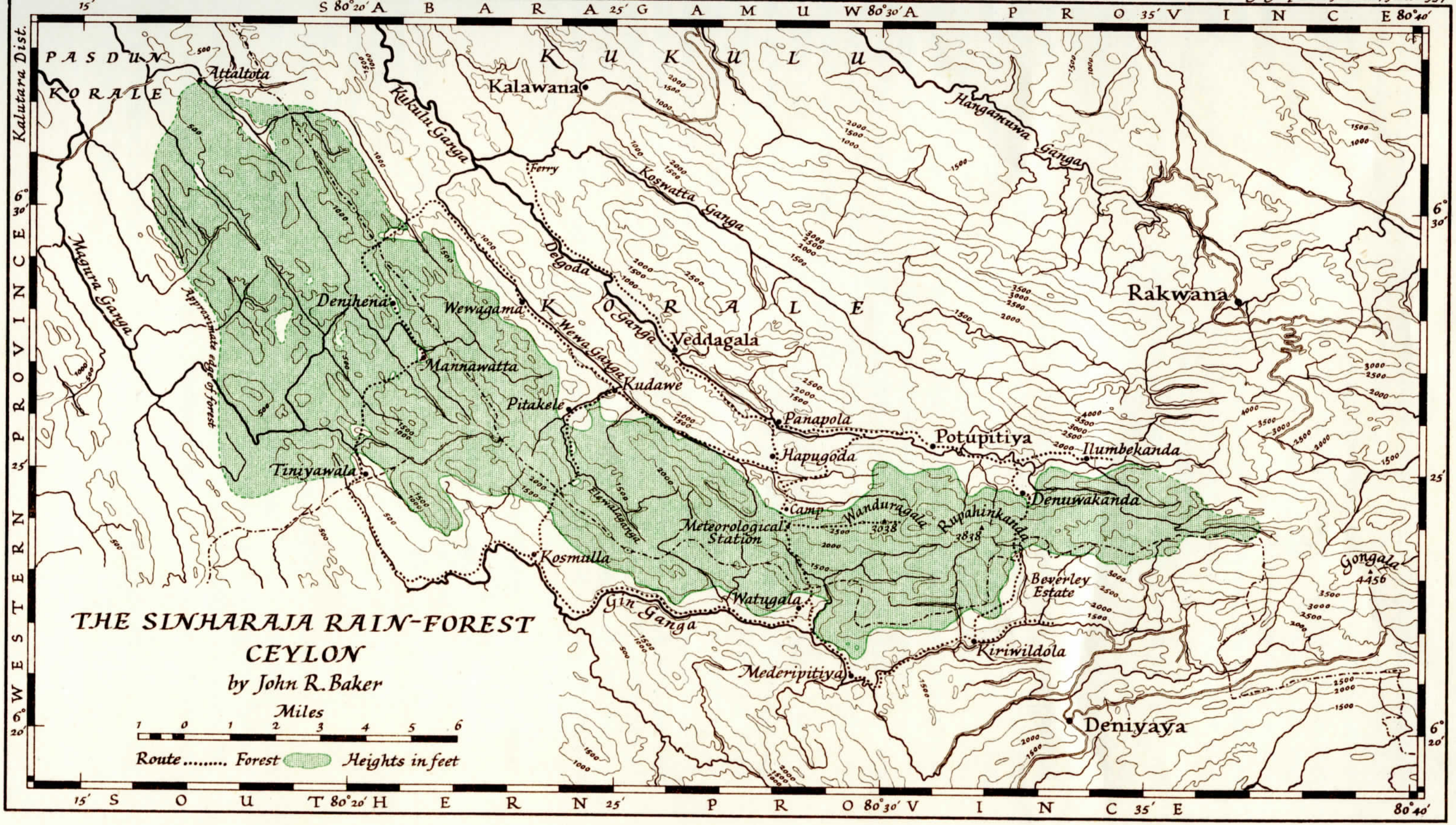
No previous information is available as to the climate of the Sinharaja, but Beverley Estate adjoins the forest near its eastern end, on the Gin Ganga side of the watershed, and Mr. J. L. Martin has most kindly put all his temperature and rainfall records at my disposal. I have made full use of them in what follows. Mr. Martin's station is at 2150 feet and of course not actually within the forest. He has records of daily maxima and minima from May 1934 to September 1936, and rainfall records for 1925–36 inclusive.

A full analysis of the available information is given in Appendices I–III. The following is a condensed account.

The mean monthly temperature at 2150 feet is at a minimum in January (22·9° C.=73·2° F.) and at a maximum (24·7° C.=76·5° F.) in April. It subsequently falls and rises to a high figure again, which is maintained from August to November. A difference of only 1·8° C. (3·2° F.) between the mean temperatures of the hottest and coldest months is a remarkably small one, even smaller than at Hog Harbour, New Hebrides, where it is 2·4° C. In the forest at 1900 feet in August, the thermometer rises to an average daily maximum of 24·6° C. (76·3° F.) and sinks to an average minimum of 20·6° C. (69·1° F.). The maximum is reached on the average at about 1.30 p.m., and the minimum about 6 a.m. The daily range of temperature in this forest in August was thus 4·0° C., which, remarkably enough, is only 0·1° C. different from that in the corresponding month (February) in the forest at Hog Harbour. It is clear that almost no heat is lost by radiation from the ground at night, for the grass minimum was on the average only 0·1° C. lower than the minimum within the screen. The ground maintains an extraordinarily unvarying temperature. The highest figure throughout the month was 21·8° C. and the lowest 21·6°.

The cooling power of the atmosphere was measured by katathermometer.

[1] Baker, J. R., and Harrisson, T. H., 1936. "The seasons in a tropical rain-forest (New Hebrides), Part 1, Meteorology." *Journ. Linn. Soc.*, Zool., vol. 39, p. 443.


THE SINHARAJA RAIN-FOREST
CEYLON
by John R. Baker
Miles
1 0 1 2 3 4 5 6
Route .... Forest Heights in feet
SABARAGAMUWA PROVINCE
SOUTHERN PROVINCE
WESTERN PROVINCE
Kalutara Dist.
PASDUN KORALE
KUKULU KORALE
Attaltota
Kalawana
Kukulu Ganga
Hangamuwa Ganga
Koswatta Ganga
Ferry
Delgoda O Ganga
Magura Ganga
Approximate edge of forest
Denihena
Wewagama
Wewa Ganga
Veddagala
Mannawatta
Kudawe
Pitakele
Panapola
Potupitiya
Ilumbekanda
Hapugoda
Tiniyawala
Camp
Wanduragala 3038
Rupahinkanda 3838
Denuwakanda
Meteorological Station
Kosmulla
Watugala
Gin Ganga
Beverley Estate
Kiriwildola
Mederipitiya
Gongala 4456
Rakwana
Deniyaya
15′
80°20′
25′
80°30′
35′
80°40′
6° 30′
25′
6° 20′

This is essentially an alcohol thermometer with a very large bulb and gradations only at 100° and 95° F. To use it one plunges the bulb in hot water, dries it, and measures with a stop-watch the time taken for the temperature to fall from 100° to 95°. One may also use the instrument wet, to simulate the surface of a perspiring mammal, by enclosing the bulb in a muslin bag and not drying after the immersion in hot water. The cooling power of the atmosphere at 2 p.m., by dry katathermometer, averages 6·7 millicalories per square centimetre per second. The wet katathermometer at the same time averages 15·0. The cooling power is thus much greater than at Hog Harbour, where the corresponding figures are 4·2 and 9·5. This is caused partly by the difference in altitude, but also partly by the much more open nature of the Sinharaja than the New Hebridean forest-undergrowth. It is worth while to point out that in rain-forests it is a waste of time to read the katathermometer more than once consecutively (after the instrument has first been warmed and allowed to sink to 95° F.). I arrived at this conclusion at Hog Harbour, and my experience in the Sinharaja reinforced it. I read the instrument twice daily, and found the means of the first readings (dry) to be 6·71 millicalories and of the second 6·69. A difference of 0·02 millicalories is completely insignificant. It is the absence of strong winds at a height of 1 metre in a rain-forest that makes the katathermometric readings so constant. The wet instrument is more sensitive to draughts, and here the means of the first and second readings were 14·8 and 15·1.

The total rainfall for the year averages 4054 mm. (159·6 inches). There is no dry season, for the least wet month (February) receives 189 mm. (7·45 inches). The rainfall rises to a peak (533 mm.=21·06 inches) in May, sinks till July, and rises to a second maximum in October and November. To obtain a figure indicating to what extent the rainfall of any place is seasonal, it is convenient to divide the mean daily rainfall of the wettest month by that of the driest. The result is the seasonal index of rainfall. In the table below, the seasonal index of the region of the Sinharaja is compared with that of other exceptionally unseasonal climates in various parts of the world. Differences in temperature and length of day are also shown.

	Seasonal index of rainfall.	*Difference between mean temperatures of hottest and coolest months* (° *C.*).	*Difference between longest and shortest days* (*mins.*).
San Juan, Porto Rico ..	2·1 (Nov./Mar.)	3·2 (Aug.–Feb.)	134
Pontianak, Borneo ..	2·3 (Nov./Aug.)	—	0
Sinharaja Forest	2·3 (May/Feb.)	1·8 (Apr.–Jan.)	44
Padang, Sumatra	2·5 (Nov./July)	—	7
Hog Harbour, New Hebrides	2·5 (Feb./Aug.)	2·4 (Jan.–July)	111

It is the occurrence of a high total rainfall and moderately high mean temperature for the year, combined with a low seasonal index of rainfall and a small difference between the temperatures of the hottest and coolest months, that produces, in the absence of human interference, the typical tropical rain-forest.

The relative humidity in the forest is on the average 93 per cent. throughout the night and falls to a minimum of 83 per cent. at about 4 p.m. The drying

power of the atmosphere is better expressed in terms of saturation deficit, *i.e.* the number of grams of water that one would have to add to a cubic metre of air, at the prevailing temperature and humidity, to saturate it.[1] The saturation deficit (see Appendix II) is low at all times, *i.e.* the atmosphere has little power of absorbing more moisture. It is not so low however as in the forest at Hog Harbour. From sunrise onwards it rises gradually to a maximum rather late in the afternoon, about 4 p.m., and then falls off rapidly. The particular biological significance of saturation deficit lies in its connection with the transpiration of vascular plants and the perspiration of mammals.

To get an impression of the amount of light filtering through the leaf-canopy, observations were made on fifteen days with a Zeiss "Helios" photographic photo-electric cell. The instrument was held facing vertically upwards towards the sky, away from any large tree trunk, and the proper exposure was determined for a plate of speed 29 on the Scheiner scale (a very fast plate). The sun was sometimes shining and sometimes obscured, but the exposure only varied from $\frac{1}{10}$ to about $\frac{1}{4}$ sec., the mean being $\frac{1}{6}$ sec. On nine days the instrument was held facing horizontally towards the east, also at 2 p.m., and the mean exposure for a plate of the same speed was $\frac{1}{45}$ sec. These figures give a strong indication of the darkness within the forest, which is largely the cause, in all probability, of the small amount of undergrowth.

Botany

The Sinharaja presents the characteristic features of a tropical rain-forest. The general aspect is well represented in Plate 1, which shows the edge where it abuts on a *chena*. Plate 3 is an illustration of the interior. The stems of the trees are remarkably straight and unbranching for a non-coniferous forest. The general height of the forest is about 115 feet, though here and there huge giants tower above this. Woody lianas are common, but not so abundant as in some tropical rain-forests. The undergrowth is scanty, and largely simply a nursery for the trees.

The majority of the trees are evergreen, but some of the giants are deciduous. Flowering and fruiting are said by the natives to be largely seasonal, and indeed many of the trees were bearing fruit during August. Most of the timbers studied showed well-marked growth-rings. The natives of the vicinity keep to regular seasons with some of their crops (*e.g.* rice), but yams (Dioscorea) are planted at any time. In the New Hebrides, where also the climate is remarkably unseasonal, the natives take great care to plant yams at one particular time of year.

By far the most striking phenomenon presented by the Sinharaja as a whole concerns the shape of the leaves. Nearly every plant has the tip of the leaf or leaflet drawn out into a point. The common monocotyledons mostly have such very narrow leaves that further narrowing to a special tip is not easily recognized, but in the dicotyledons it is most obvious. Of the 41 dicotyledons that are commonest in the forest, no fewer than 37 have the tips drawn out, and these 37 belong to more than 20 families and include trees, bushes, lianas,

[1] Nomograms for the rapid determination of saturation deficit are available. See Baker, J. R., 1936. "Nomograms for saturation deficiency." *Journ. Animal Ecol.*, vol. 5, p. 94.

and creepers. The leaves of 22 of these species are shown in Fig. 2. Drip-points to leaves are characteristic of plants of wet regions, and particularly of tropical rain-forests, but it is doubtful whether any forest can show the

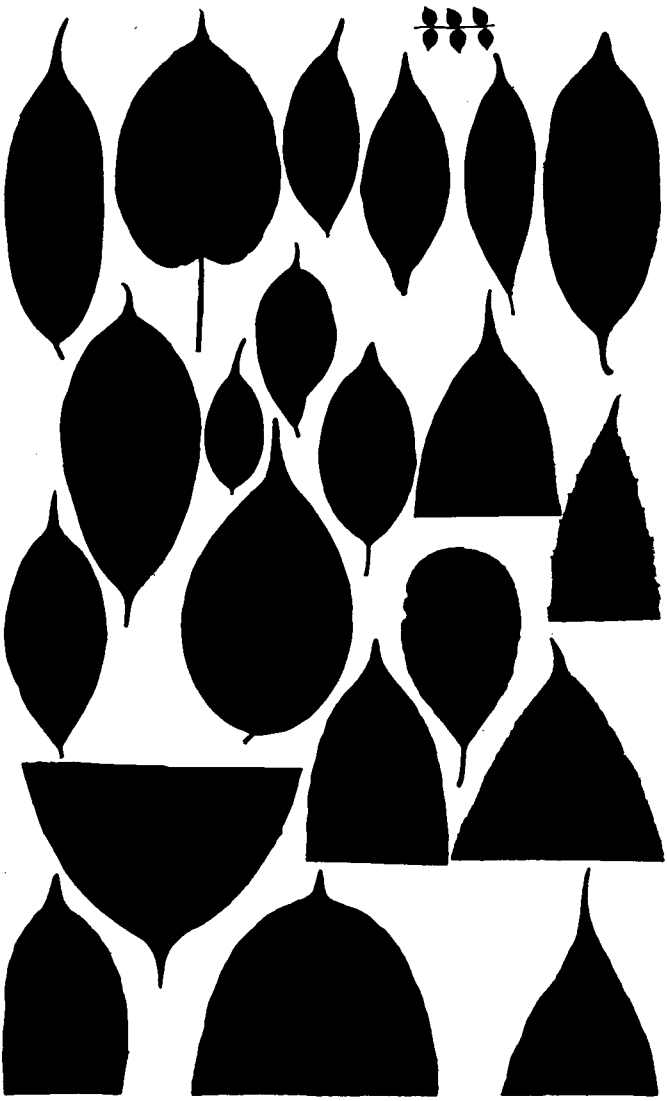


Fig. 2. Tendency to the formation of drip-points on leaves of dicotyledons

phenomenon more markedly than the Sinharaja. The effect is to allow water to run off rapidly, which must aid transpiration in an atmosphere of low saturation-deficit.[1]

[1] A fuller description of the botany of the Sinharaja Forest will be published in the *Kew Bulletin of Miscellaneous Information.*

Zoology

The black sub-species of the purple-faced leaf-monkey (*Kasi vetulus vetulus*) is common, and its cry is one of the most familiar sounds. It resembles "hă-hōō-hă-hōō-hă-hōō-hă-hōō," repeated rapidly. The impression is given that the "hă" sound represents an intake and the "hōō" an outlet of breath. If so, the animal must be breathing as fast as it can to produce the sound. Sometimes it is done in a snarly voice and sometimes so softly as to resemble the cooing of a pigeon. There is also an alarm sound resembling a very sudden "honk," and a shrill cry. The species is found in groups of two or three, or singly.

At dusk the small bat *Pipistrellus ceylonicus ceylonicus* leaves the forest to fly up and down in the clearings just outside. I did not find its daytime roost, but other species (*Rhinolophus beddomei sobrinus*, *Rh. rouxi rouxi*, *Hipposideros lankadiva*, and *Megaderma spasma ceylonense*) are obtainable in caves. The last-named, with its huge ears and nose-leaf, is a grotesque object even for a member of an order where monstrosity of appearance is common. I opened the stomachs of seven specimens, to find whether they might contain any evidence to support or discredit the name of "Ceylon vampire bat" for this species. There was no recognizable food in any, though there was some reddish fluid in one. If the food were blood, empty stomachs would often be found. Iodine gave no blue coloration, such as might be expected if the natives' story of a fruit diet were true. The very large sharp teeth support the view that the diet is different from that of ordinary insectivorous bats. It is conceivable that the teeth are used for killing small vertebrates, whose blood is subsequently sucked. Fruit-bats do not occur in the forest.

The wild pig, sambhur, and elephant represent the ungulates. I did not see any elephants, but their dung was plentiful, and one came across their paths and rubbing-places on trees. The sambhur is stated by the natives to retain his antlers for several years, and it is denied that there is any particular season for shedding them. It is claimed however that the birth of young is seasonal. The males are said to fight in December and January, and to cover the females in the latter month, the young being born in July. If this is true, the period of gestation is shorter than is usually supposed.[1] The wild pig is said to give birth to young in the same month as the sambhur.

The Carnivora are represented by the leopard and palm-civet. The former is abundant and fearless. I obtained a very young specimen of the palm-civet, *Paradoxurus zeylonensis*, on August 8. This indicates a somewhat earlier breeding season for the species than was thought. I brought this specimen home to England alive, and it makes a charming pet. I feed it chiefly upon bananas and apples, with an occasional scrap of meat or an egg. The bear does not occur. The local giant squirrel is the striking black and yellow sub-species (*Ratufa macroura melanochra*).

Birds are seldom seen as one walks through the forest, though probably plentiful enough in the canopy far above. The ornithologist would be attracted much more to the small woods of much-branched trees outside the forest, for in these it is far easier to see the birds. It is pleasant to record that the

[1] Phillips, W. W. A., 1935. 'Manual of the mammals of Ceylon.' Dulau, London.

hornbill (*Lophoceros griseus gingalensis*) is neither rare nor particularly afraid of mankind. One of the most familiar sounds of the forest is the loud cry of the barbet (probably *Cyanops flavifrons*). The jungle-fowl is said to lay in this district in April.

There are two common species of lizards in the forest, both dull-coloured. These are the Agamid, *Otocryptis wiegmanni* (Wagler), and the skink, *Lygosoma taprobanense*. The former has remarkably long legs for a lizard. It surprises one by jumping headlong into water when pursued. I discovered a convenient way of obtaining specimens of lizards. Approaching very slowly with a paper-covered volume poised ready to strike, one hits as instantaneously as possible, without making the slightest preparatory movement. The specimens are killed with little damage.

Poisonous snakes are unpleasantly common. They include the cobra, tic-polonga, and Ceylon pit-viper (*Trimeresurus trigonocephalus*). The harmless, brilliant green tree-snake (*Passerita mycterizans*) also occurs.

Insect life does not greatly obtrude itself upon one in the forest, with the exception of the incessant singing of the cicadas (*Purana tigrina*). One is not bitten by mosquitoes. In camp, just outside the forest, the only troublesome insect is the large "elephant-fly" (*Tabanus* sp.), which bites painfully. Tiger-beetles (*Cicindela discrepans*) are common on the ground in the forest. Brilliant fire-flies (*Luciola vespertina*) enliven the night in camp.

Two species of dragon-fly are common, especially near the streams. One of these, *Ceylonosticta hiliaris* (Selys), has the habit of jerking the tail up and down when sitting in a conspicuous place, and thus displaying its brilliant blue extremity. A similar display has been recorded in an Australian species (*Hemiphlebia mirabilis*[1]). Courtship has seldom been recorded in the dragon-flies, and therefore I was astounded to witness an elaborate form of it in another Sinharaja species, *Euphaea splendens* (Selys), which is abundant and striking in appearance. The body and wings are black, but the wings have brilliant green patches which show vividly in flight. The courtship proceeds as follows. One partner (presumably the female) is chased by the other, the course being irregular. Suddenly the male leaves her and she sails down to the water, just touches it, and instantaneously turns right round and comes straight back along her former path. The male approaches rapidly. As soon as they are nearly in collision, they both fly about two feet vertically upwards at great speed. The irregular chase now begins again, and is interrupted by the female once more sailing down to the water. The whole dance is repeated again and again, endlessly. Although I waited for perhaps ten minutes, I did not see copulation occur.

The abundance of land-leeches (*Haemadipsa zeylanica*, Moquin-Tandon) greatly detracts from the pleasure of studying the Sinharaja Forest. I found it best to wear thin breeches cut like "plus-fours," stockings, boots with the tongues sewn in right up to the top, and puttees. This clothing by no means prevents leeches from penetrating to the skin of one's legs, but it greatly reduces the annoyance. I did not find chemical methods of protection valuable, for chemicals are washed off every time one wades through a stream.

[1] Tillyard, R. J., 1912. "On some new and rare Agrionidae (Odonata)." *Proc. Linn. Soc. N.S.W.*, vol. 37, p. 404.

The leeches live upon the ground and attach themselves first to the feet. They do not ascend far above the knees, probably because they fall off if they succeed in drawing blood and become inactive fairly soon from evaporation if they do not. If a leech be put into a dry cardboard box it dies by evaporation within a day and hardens into a brittle mummy, retaining the natural shape. If placed in a closed glass tube with a little water, it will live for many days. On skin and also on glass, these leeches tend to ascend vertically, and it is therefore remarkable that they do not ascend plants. They are aware of the presence of human beings, and if one stays still, they loop along almost directly towards one at a surprising speed. It is amusing to place a leech on a table and to keep it there by always moving one's position when it has nearly reached the edge. Since leeches avoid open spaces, it is surprising to find that they are positively phototropic towards a fairly weak light. Thus, if a petrol lantern be placed on the ground during the night, it will attract the leeches in the neighbourhood; and this tropism overcomes the presumably olfactory one directing them towards a human being.

It is well known that these leeches are very sensitive to tobacco, and I decided to investigate the matter. I made up aqueous solutions of nicotine at various concentrations in the series 1, $^1/_2$, $^1/_4$, $^1/_8$, etc., per cent. (by volume), and put leeches into them for a period of five minutes. It should be remarked that they live indefinitely in water. At the end of five minutes I washed the leeches twice in water and left them for an hour in an atmosphere saturated with water-vapour. I then tested the apparently dead ones by noticing whether they gave even the slightest response to mechanical or chemical stimulation. If not, they were taken to be dead. Concentrations of nicotine down to 1/128 per cent. kill the leech, while the solution at 1/256 per cent. allows very slight contraction to be visible on stimulation. 1/512 per cent. solution does not kill in five minutes. It is curious that nicotine should be so potent that one part in 12,800 suffices to kill in five minutes, for it is not a particularly virulent cell poison. Its action in poisoning mammals is upon the nerves leading to the autonomic nerve ganglia. These nerves have no counterparts in leeches.[1]

Anthropology

The natives of the vicinity of the Sinharaja are Kandyan Sinhalese. All are Buddhists. The men wear the hair long, in a bun at the back of the head. Their usual clothing is a loin-cloth. When working in the sun they wear a broad-brimmed hat made of rattan. The women wear a cotton skirt and usually a tight sleeveless vest, not reaching to the top of the skirt. The houses (Plate 2) are of mud, plastered on to a rectangular wooden framework. There is no window. The interior is divided into rooms. The thatching is usually of coconut leaves. There are schools for the children in the neighbourhood (at Potupitiya and Panapola), but the children of the remote villages

[1] I wish to thank Mr. Malcolm Stewart, Captain N. D. Riley, and Mr. C. C. A. Monro for identifying my reptiles, insects, and leeches. My chief interest in the Sinharaja Forest is in the breeding seasons of animals in the little-varying climate, and I arranged for the periodical collection of animals with a view to the study of this subject. Sufficient time has not elapsed to enable me to report.

1. Edge of the Sinharaja Forest near Hapugoda exposed by recent felling

2. Typical house in the vicinity of the Sinharaja Forest

3. Interior of the Sinharaja Forest near Hapugoda

(*e.g.* Pitakele and Denihena) are not educated. The headmen receive the Kandyan titles, the lower grade being *arachchi* and the higher *korala*. The usual serious, unsmiling character of the Sinhalese is much in evidence, and I only once saw a Sinharaja native laugh loudly. This was when another native mistook some salt for sugar.

The local inhabitants, especially those of the district known as the Kukulu Korale, are regarded by the natives of the surrounding districts as foolish and willing to damage themselves if they can thereby hurt others. Their critics tell a story which illustrates this mentality. In selling the toffee-like substance called *jaggery*, the standard portion is two blocks, each maintaining the shape of the half-coconut in which it was prepared. The two blocks are placed together with their flat surfaces apposed, and bound round with leaves, a convenient package being thus produced. The Sinharaja native is supposed to have been paid for one of these packages, and then to have thought to himself, "I'll put three blocks in instead of two, because then it will be a more inconvenient package for the buyer to take away." I myself found them neither foolish nor vindictive, and was charmed by their interest in natural history. Although they themselves have so much knowledge of this subject, they could not understand my devoting all my time to it, and they were firmly of opinion that the meteorological instruments in the forest were placed there to detect buried treasure. They hold the forest itself in great veneration, and consider that any crime committed in it is particularly evil. The killing of animals and the eating of flesh are contrary to the precepts of Buddhism, but no exaggerated importance is generally attached to this; few natives however would transgress in the forest itself. For this reason pressure was brought to bear upon me not to place my camp actually within the forest. There is a tabu against any man entering the forest while his wife is menstruating.

The people are largely of the *goygama* and *jaggery* castes. On the march carriers of different caste do not refuse to eat together, and all join in conversation, apparently on terms of equality.

Conclusion

The Sinharaja presents the typical characters of a virgin tropical rain-forest. It is the only considerable area of such forest left in Ceylon, though formerly the whole of the low-country wet-zone must have been similarly clothed. It is remarkable for the straightness of the stems of the trees, which are branched only high above the ground, and for the almost universal development of drip-points to the leaves. The climate is equable, with some rain at all seasons; but most of the trees show seasonal phenomena in reproduction, and some of the largest are deciduous. It is greatly to be hoped that the forest will be preserved in its natural state as a record of the former condition of a large part of the island.

APPENDIX I

Means of daily meteorological observations in the Sinharaja Forest during August 1936. Figures for the corresponding month (February) at Hog Harbour, New Hebrides, are given for comparison.

	Sinharaja Forest, 1900 feet.	*Forest at Hog Harbour, 55 feet.*
Maximum temperature	24°6 C	26°7 C.
Minimum temperature	20·6	22·6
Daily range in temperature	4·0	4·1
Grass minimum temperature	20·5	—
Ground temperature	21·7	25·4
Relative humidity at 2 p.m.	85 %	90 %
Saturation deficit at 2 p.m. per cubic metre	3·2 g.	2·5 g.
Cooling power of atmosphere at 2 p.m., dry kata, milli-calories per sq. cm. per sec.	6·7	4·2
Cooling power of atmosphere at 2 p.m., wet kata, milli-calories per sq. cm. per sec.	15·0	9·5
Vertical light at 2 p.m., exposure for Sch. 29 plate in secs.	$^{1}/_{6}$	—
Horizontal light from the east at 2 p.m., exposure for Sch. 29 plate in secs.	$^{1}/_{45}$	—

APPENDIX II

Analysis of thermohygrograph records in the Sinharaja Forest during August 1936. The figures are the means of the daily records, corrected by repeated observations of the whirling hygrometer. The temperature does not reach the mean maximum given in Appendix I, because the maximum is reached at different times on different days.

	Temp. ° C.	*Rel. humidity.* %	*Sat. deficit.* *Grams per cu. metre.*
Midnight	21·0	93	1·3
2 a.m.	20·9	93	1·3
4 ,,	20·7	93	1·2
6 ,,	20·6	93	1·2
8 ,,	21·0	92	1·5
10 ,,	22·3	90	2·0
Midday	23·7	87	2·8
2 p.m.	23·9	85	3·2
4 ,,	23·4	83	3·6
6 ,,	22·3	92	1·6
8 ,,	21·3	93	1·3
10 ,,	21·0	93	1·3

APPENDIX III

Analysis of Mr. J. L. Martin's records at Beverley Estate (2150 feet), adjoining the Sinharaja Forest. The temperatures are the monthly means of the daily

maxima and minima from May 1934 till September 1936, inclusive. The rainfall is the decennial monthly mean, 1926–35.

	Mean temp. °C.	*Mean daily rainfall.* mm.
January	22·9	7·3
February	23·3	6·7
March	24·2	9·9
April	24·7	11·3
May	24·0	17·2
June	23·3	13·6
July	23·4	7·7
August	23·7	8·5
September ..	23·7	9·9
October	23·6	14·5
November ..	23·7	14·6
December ..	23·2	11·7

Mean total rainfall for the year, 4054 mm. (159·6 inches).