The forests of the Osa Peninsula

by

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Nepenthes
Aarhus, Denmark 1998

Karsten Thomsen: The forests of the Osa Peninsula

1st edition

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Supported by Danida.

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Foreword

This text has been written for use by the Tropical Youth Center in Agua-buena in the Osa Peninsula.

It is based on information gathered from local people in the Osa during my field work from 1992 to 1995, in relation to a PhD project financed by Danida, Danish foreign aid, and from literature describing the results of other similar studies.

I am grateful to Richard Donovan for inspiring me to do the project, to Danida for financing the work, and to Leonidas Azofeifa, Rafael Barrantes, Eliecer Ortíz, Luís Quirós, Alfredo Quintero, don Augusto Rodriguez and Leonidas Serracín for providing local names and information.

Karsten Thomsen, Aarhus 1998

The giant forest

The rain forest of the Osa Peninsula is the largest remaining tract of forest on the Pacific coast of Central America, and probably of the rest of Latin America, too. The coasts of Ecuador and Colombia once had extensive forest covers, but only fragments remain today, and even these are threatened.

There are two reasons why so much of the Osa forests have been saved to this day: The topography of the area makes it difficult to colonize, and the Costa Rican governments have quite early chosen to protect the Osa forests through legislation.

Most of the Osa Peninsula is dissected by numerous steep ridges and deep gullies, and the rivers are water-rich and have been very difficult to pass until recent years when permanent bridges were constructed. Therefore, the peninsula was basically inaccessible by land until the late 1980es where a series of bridges were constructed. Still today, only the eastern and southern parts are easy to reach by car. Moreover, the declaration of the Corcovado National Park has protected some 50,000 hectares of forest since the mid-seventies, and an equivalent area of surrounding forests has received some protection through the establishment of the Golfo Dulce Forest Reserve, totalling some 67,000 hectares.

Thus, for the standards of the Pacific regions of Tropical America, the forests of the Osa are unusually large in terms of area alone. And in terms of individual sizes of the trees and lianas of the forest, they are even more impressive: The Osa forests seem to have larger trees than all other neotropical forests.

There are several ways to describe the size of a tree. The simplest is height. How high is the highest leaf above the ground? Another way of describing size is by thickness, or diameter. What is the direct distance from the surface of the bark on one side of the tree to that on the other side? From diameter and height, you can calculate other measures that are

descriptive of the tree's size. For example, the diameter allows you to calculate basal area, that is, the area of a horizontal transection of the trunk, like if you had cut the tree and examined the area of the cut surface. Counting just the number of trees per area tells little, since you do not know whether they are large of small. Summing up all diameters makes no sense, since you do not know how many trees the sum of diameters come from. But the basal area of trees may tell how much living wood there is per area in the forest. You can sum up the basal areas of many trees, for example all in one hectare, and get an idea of how massive the entire tree vegetation is.

Foresters will often describe the "commercial height" of a tree. This refers to the height of the part of the trunk that may serve as good timber. When you have this height and the diameter, you can estimate the volume of timber in the tree.

When botanists describe the tropical rain forest's structure, they often measure one hectare of forest and register all stems with a diameter of 10 centimeters or more, to be able to compare different sites. The number of stems, the basal area of stems, and the

How do you measure the height of a tree?

Measures of tree height are very hard to obtain in natural rain forest because usually you can't reach the top of the tree, except with the greatest difficulty.

Usually height is calculated indirectly from a combination of measures of 1) the angle under which you observe the base and the top of the tree from a given position, and 2) the horizontal distance from this position to the tree. In the Amazon, a friend and I discovered that it was much faster and just as accurate to substitute the measure of distance to the tree with a measure of the angle under which you view a pole of known length (6 meters at least), placed vertically next to the tree. For both calculation methods, you should observe from a distance in the size-order of the height of the tree. A closer position makes it difficult to decide what is the top of the tree, and then the angle measure will provide a less reliable basis for calculation. A farther position makes it difficult to see the tree. Binoculars are recommended to spot the tree. In most cases, kicking the stem will make the leaves of even large trees shiver enough to recognize the tree top.

1

height of the tallest tree are among the measures that are easy to compare from site to site.

In the mature forest in Aguabuena we made four square hectare plots of one hectare each. All four had trees of 60 meters height or more. The tallest tree was a Dilodendron costaricensis, locally known as iguano or cascarillo, with 67 meters. Other similar studies have found heights of 73 meters in Aguabuena, and 65 meters at Punta Llorona. I compared the Osa measures with reports on the highest trees in 29 other one-hectare plots made in rain forests from Mexico to Southern Brazil. These plots outside the Osa had an average of only 40 meters for the highest tree. Just one plot outside the Osa had a maximum tree height of more than 50 meters, namely 55 meters in Eastern Brazil. In contrast, the Osa plots had an average maximum height of 65 meters.

Tree heights in the neotropical rain forests are rarely measured, so we still do not have very firm evidence. But the information available so far shows that the canopy tops of the Osa may be more than 60 percent taller on the average than those of other neotropical forests.

Much more information is found on basal areas. I compared reports from 92 one-hectare plots in the neotropics and found that 10 plots in the Osa had an average basal area of 38.4 square meters whereas those outside the Osa averaged 28.8 square meters. In other words, the Osa forests had 33 percent more basal area per hectare than other neotropical forests.

This may seem less impressive than the extraordinary heights in the peninsula. But it is not: Since the Osa trees are bigger, there are fewer of them per hectare than in other forests. Therefore, each tree in the Osa has even more basal area than trees in the other regions, actually 67 percent more on the average.

All these figures tell us that the Osa trees are both much higher and thicker than in other forests in tropical America. This means that they are truly gigantic.

It also means that the forests contain lots and lots of valuable wood, a fact that makes it more difficult to protect the forests from felling.

Like the trees, the lianas in the Aguabuena forest seem to be unusually large. I found reports from 58 rain forest plots outside of the Osa Peninsula where lianas had been registered. In 17 of these plots, there had not even been found a single liana among stems of 10

centimeter diameter or more. The proportion of stems that were lianas was 58 percent larger in Aguabuena than in the other plots. However, a few plots had more lianas than the Aguabuena plots.

Unfortunately, there is much less information available on the climbing lifeforms than on trees and palms. For example, the sizes of the lianas is rarely reported. So far, we still have a quite incomplete picture of this lifeform. But the evidence so far indicates that the lianas may be just as much larger than in other regions, as are the trees.

How do you measure the diameter of a tree?

The best way to measure trunk diameter, or thickness, is to do it directly with an instrument looking like a ruler with two long arms that allows you to touch the bark at opposite sides at the same time and measure the distance between the touching points. The instrument is called a tree caliper, or pie de rey in Spanish.

A different and often faster method is to measure the tree's circumference with a measure tape, and then calculate diameter by dividing the circumference with pi (ca. 3.14159365). However, this will only give a correct result if the tree trunk has an entirely regular, cylindric shape. This is rarely the case, and the more irregular the trunk is, the more overestimated the diameter will be. An incorrect measure of diameter will provide even greater errors in calculations of basal area and volume of the tree.

With the caliper you can take one measure where the trunk is broadest and another where it is most narrow. Taking the average of the two measures ensures that you get a very good estimate of the true diameter.

Since the diameter of a tree normally varies with height, being largest close to the roots and decreasing upwards, it is almost always measured at “breast height” – where it is also easy work with a measure tape. Since breast height is not an exact figure, the convention is to measure 1.30 meters above the ground. Still, diameter is usually referred to as “diameter at breast height,” or “DBH.”

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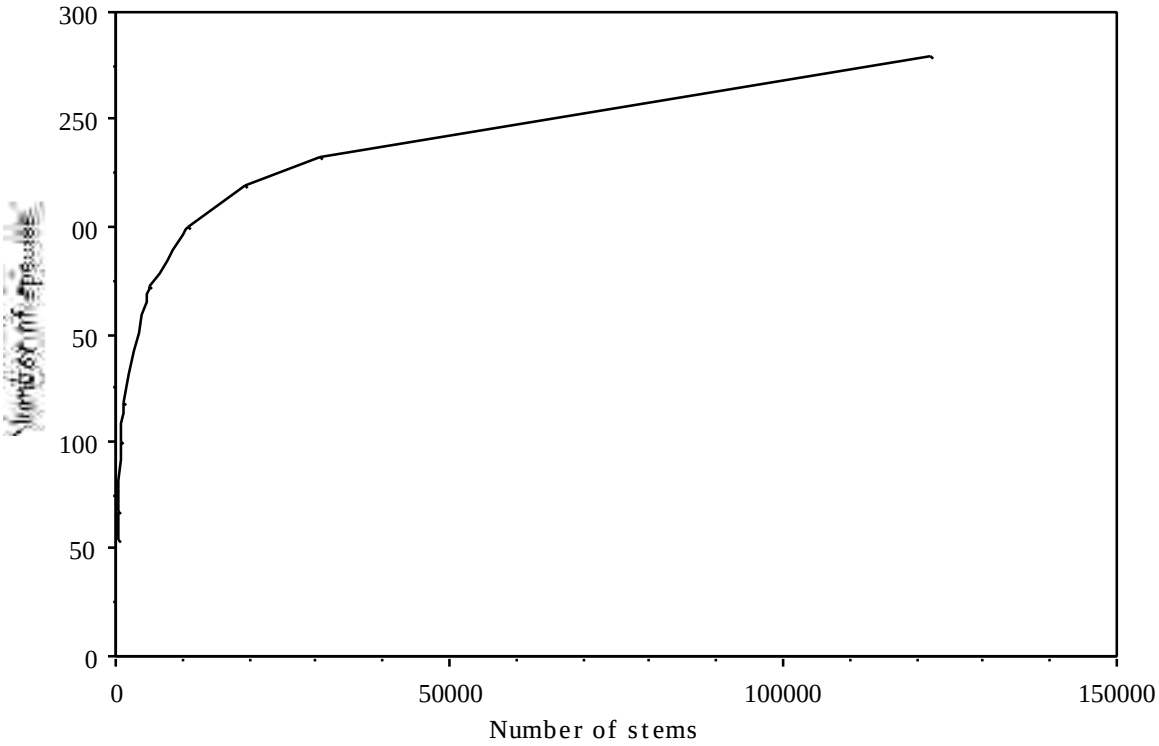
A wealth of species

All tropical rain forests are rich in species – much, much richer than the broadleaf and coniferous forests of temperate regions. But the forests of different tropical regions are not equally rich. The Asian island of Borneo and the Western part of Amazonia share the reputation of having the most diverse or species-rich forests in the world. For years it has been known that in these areas one may find more than 200 different woody species in a single hectare of forest. In recent years, numbers of 300 and even more have been encountered in one-hectare plots in Amazonian Peru and Ecuador. Although the forest of the Osa does not reach these impressive numbers of species, it turns out that it is still among the richest of forests in Latin America.

Only some forests in Western Amazonia and Pacific Colombia are more species-rich than the Osa forest, whereas all of Mexico and Central America north of the Osa, Northern South America, East Amazonia, and Coastal Brazil are poorer. But as we shall see below, it is not a simple matter to compare species richness in a fair way.

How do you measure richness of woody species? To measure and compare figures on numbers of species may be very deceptive. For example, the National Institute of Biodiversity in Costa Rica, INBio, on their internet-homepage (http://www.inbio.ac.cr/es/biod/Biod.html) illustrates the biological richness of the country by the number of tree species in Costa Rica with those of Colombia and Brazil, correcting for the great differences in national territory. INBio finds that for every 6 tree species in Brazil there are 35 in Colombia and 295 (!) in Costa Rica. This comparison, however, is completely misleading. You must compare only what is truly comparable, and in this case, you can only compare the forest diversity in Costa Rica, Colombia and Brazil by taking similar sizes of samples from the various countries, for example

The increase in number of tree species with increasing sample



choosing Brazilian and Colombian provinces of the same size as Costa Rica.

The figure from Panama (above) illustrates how the number of species increases as you include more and more trees – in this case up to 122.000 individual trees with diameter of 1 centimeter or more. Increasing your sample of trees, the number of species grows rapidly at first, but then you will get fewer and fewer additional species. This shows that in order to make sense, a measure of tree species richness must refer to a given number of trees.

The most common way of describing the species richness, or diversity, of tropical rain forests is to count all the species that you find among all the living stems of 10 cm diameter or more in one hectare of forest. This measure has to this day scored up to 307 species, a figure encountered in Cuyabeno, Ecuador. In Costa Rica, the highest count is 178 species, in one of our hectares in Aguabuena. This sounds as if the Osa forest is much less diverse than the Amazonian forests. But this is not so. It turns out that only a limited part of Amazonia is actually richer.

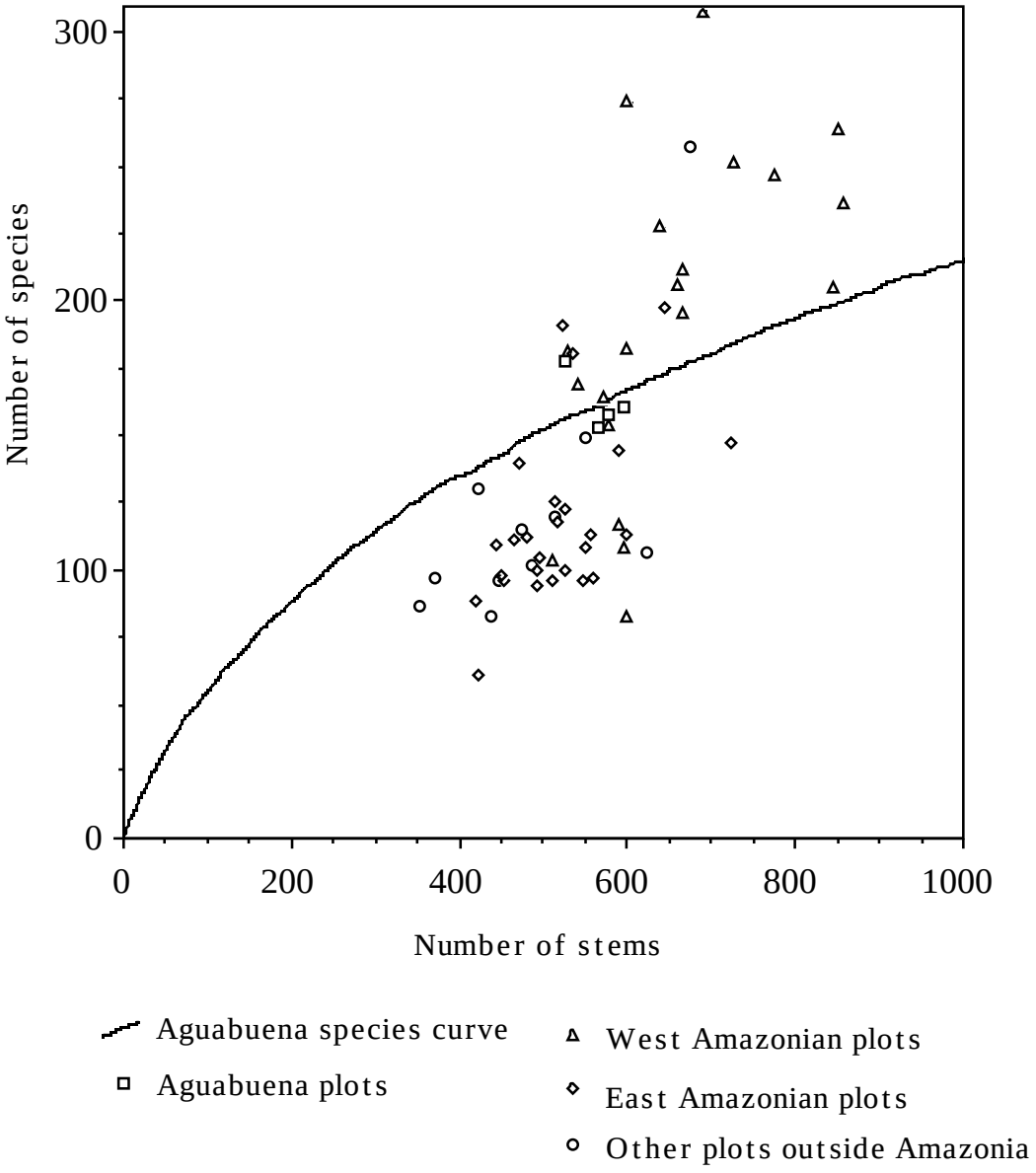
Comparing one-hectare plots has

among scientists for decades been an accepted way of evaluating the differences in species richness between different rain forest ares. But one must NOT rely on this alone. The reasons are several: 1) Stem density varies between regions, and the number of species are naturally a function of number of stems, NOT of the area as such. If you happen to expand the area of your sample plot without including additional trees, the number of species will obviously remain unchanged. In contrast, if you within your sample discover additional trees belonging to species not registered in the plot before, these will add to the number of species without changing the area of the plot. 2) The shape of the plot influences the diversity of the plot. The more compact the shape, the more uniform is the forest. The longer the plots is, the more variation is included. Many one-hectare plots are shaped as transects 10 meters wide and 1000 meters long. Recently, a study revealed that this shape includes 10 percent more species than a plot shaped like a square of 100 by 100 meters. Likewise, a plot of 20 by 500 meters includes 5 percent more species than the square. 3) The lifeforms included in the study also influence the number of species. Today, most studies include all stems, but until some 20 years ago it was common to include only free-standing trees and palms, and not lianas and climbers. Early studies did not even include palms. Generally, if you in a locality include lianas you will get higher number of species per number of stems than if you only registered free-standing stems, because lianas always belong to different species than the trees. In contrast, inclusion of palms is likely to lower the number of species per number of stems since palms are often very abundant in a given locality, but represented by few species.

Does this sound complicated? Possibly, but let us see how it works! Let us take a critical look at one seemingly rich Amazonian forest:

At the Juruá River there was reported 224 species in one hectare of rain forest, considerably more than in Aguabuena (153 to 178 species per hectare, average 162). But it turns out that the Brazilian plot was a 1000 meter transect. Considering that such a transect gives 10 percent higher diversity than a square, only 204 species would be expected in a square hectare. Further, the number of stems was very high, 849. The number of species per 500 stems would be no more than 164 at Juruá, almost

Species richnes in different neotropical rain forest regions



Number of species against stem density for 61 one-hectare plots in neotropical rain forest. The graph shows the average number of species as a function of number of stems in Aguabuena. Plots above the graph are more species-rich than the average for plots in Aguabuena, and plots below are poorer. Of 57 plots, only 18 are richer than the Aguabuena plots. Almost all of the richest plots are from Western Amazonia (triangles) which has also the highest stem density.

identical to the average in Aguabuena. Likewise, when we counted 849 stems in our Aguabuena plot, we found 199 species, close to the 204 at Juruá. This shows that the forest at Juruá is not richer, just denser than the Aguabuena forest.

The figure of species richness (page 9) shows the numbers of stems and species for the four Aguabuena plots and 57 other neotropical one-hectare plots where lianas are included. For transects, the number of species has been reduced to the equivalent number for a square plot.

The figure shows that most neotropical rain forests has fewer species than the Aguabuena plots, shown as squares. The graph shows the average number of species as a function of number of stems in Aguabuena. Plots above the graph are more species-rich than the average for plots in Aguabuena, and plots below are poorer. Of 57 plots, only 18 – less than one third – were richer than the Aguabuena plots. Almost all of the richest plots were from Western Amazonia (triangles) which has also the highest stem density. Hardly any other forests than the West Amazonian ones appear to be as rich as the Aguabuena forest.

If you want to tell how rich a forest is, and want to be truthful, you are faced with a challenge: In itself, it does not mean much to tell that there are so many thousands of different trees in Costa Rica or in the Osa Peninsula, because how do you compare such figures to those of other tropical areas? And if you will give an exact and meaningful figure from one locality, you must remember to tell how large an area you refer to, what shape your forest area has, how many stems there are and which lifeforms you include. Finally, you must realize that the diversity varies very much locally. Just one hectare is not necessarily representative – look for example at the four symbols for the Aguabuena plots. They are placed adjacent to one another in the forest and yet they vary greatly in density and diversity.

Species that are special

What does it mean that a species is rare? There is no universal criterion for describing rarity. But one can for example define woody plant species that occur with one or fewer individuals per hectare as rare. According to such a definition, 60.8 percent of the species in our four hectares in Aguabuena were rare – that is, they occurred with four or less individuals. These rare species made up 15.0 percent of all living stems. If we had looked at only one hectare, fewer rare species would be detected, since we would not register species rarer than one individual per hectare. On the average, we found 43.2 percent rare species per hectare, accounting for 12.4 percent of the individuals.

If we had made a much larger inventory than the four hectares of forest in Aguabuena, there would have been an even larger proportion of rare species – easily 80 percent – because every extension of the sample would include ever less frequent species.

It may seem as a paradox that it is so common to be rare, yet the vast majority of tree species in the world's rain forests are rare. This is a simple consequence of the huge number of tree species that are crowding in these the richest forests of Planet Earth.

Among the many species in a tropical rain forest region like the Osa Peninsula some will differ from the lot. But there are different ways to be different:

RARE species. When a plant species is said to be rare, it usually means that it occurs in low numbers, at least locally. A rare species may also have a rather limited distribution, but it does not need to be the case. The guapinol (Hymenaea courbaril) is an example of a species that is widespread, but locally rare in almost all of its huge range from Mexico to Coastal Brazil. It is often forgotten that widespread species may be rare and even threatened by extinction.

ENDEMIC species. When a species is endemic to a region, it means that it does not occur elsewhere. The term is used mainly when the region where the species occurs, is quite limited, for example an island, a country, or another well-defined area of land. To be endemic does not necessarily imply that the species is locally rare, or uncommon. The ajo (Caryocar costaricensis) is locally common in the Osa Peninsula, much more than for example guapinol. But where the guapinol is widespread, the ajo is only found in Costa Rica, Panama and Pacific Colombia – it is endemic to those countries.

It is never easy to be sure that a rain forest species is endemic, that is, not occurring elsewhere. An example of this is the Osa pulchra. This is a small tree which once it flowers can not be mistaken with any other species; its white flowers are unique in being trumpet-shaped and 35 centimeters long. It was long thought to be endemic to the northern part of the Osa. Yet recently it has been found as far away as Tortuguero at the Atlantic coast of Costa Rica.

NEW species. A species may be called 'new' when it has not yet gotten a scientific name by scientists called plant taxonomists (because they name 'taxa', or groups of plants). It takes long experience and much work to describe a species scientifically, because one has to describe enough of its distinctions from closely related species to make recognition possible for other specialists. A scientific description is only valid when it has been printed in a scientific publication.

A "new" plant species may be unknown to science, meaning that it is not familiar to any taxonomists; local people may or may not know the plant very well. This is a scientifically undescribed species. Even when a species is known by some taxonomists, it may remain undescribed as long as no taxonomist has acquired sufficient time and knowledge to describe the species.

Since publication takes time, a species may even be described, but still remain unpublished. In this latter case, the proposed scientific name may be used with the end-note "ined." meaning that it has not been published, or "nom. prov." meaning "provisional name."
An unidentified species may or may not be new. It will usually turn out to be identified as a described and well-known species, but the more efforts one has put into identification without being able to name the species, the larger the chance is that it is an undescribed species.

Species new to science

When you walk in the forest in Aguabuena, you can be fairly sure that about one in every twenty trees you see belongs to a species still to be described by science. The same is true for about one of every ten of the tree species.

The quantity of undescribed species is difficult to establish in a rain forest. This is what I did with the woody plants:

After having made the four-hectare plot in Aguabuena in 1992, I identified all the registered stems – it took years! The stems belonged to 291 different species. Yet not all of these species were possible to give a full name (see next page). It turned out that 19 (6.5% of the total) were new, that is, unpublished at that time (1992). Ten (3.4%) were still unpublished in 1998, and six (2.1%) still undescribed. Another 20 species (6.9%) could not be identified to the level of species, despite all efforts by consulted specialists. These unidentified species could either be already known scientifically, or new species. Confirmed new species accounted for 75 (3.3%) of the trees, and unidentified 43 (1.9%).

The figures above imply that when we made the plot in 1992, somewhere between 6.5 and 14.1 percent of all species must have been new, accounting for between 3.3 and 5.1 percent of all living stems of 10 centimeter diameter or more. This gives a basis for the rough estimates that of 10 percent of all woody species are new species and that 5 percent of all trees belong to new species.

The new and possibly new

(se lists next page)

List of new (unpublished or undescribed) and unidentified woody species in four hectares of forest in Aguabuena. For species published after 1992, author and year of publication is indicated. Collection numbers refer to botanical material deposited in herbaria in San José and Copenhagen.

Family	Species	Individuals	Coll. #
Unpublished when registered in 1992			
Annonaceae	Duguetia confusa Maas 1996	3	KT 169
Boraginaceae	Bourreria grandicalyx James S. Mill. & Sirot 1998	2	KT 380
Dichapethalaceae	Stephanopodium costaricense Prance 1995	1	KT 743
Elaeocarpaceae	Sloanea latistipula D. Smith ined.	2	KT 630
Elaeocarpaceae	Sloanea sulcata D. Smith ined.	1	KT 539
Lepidobothryaceae	Ruptiliocarpon caracolito Hammel & Zamora 1993	19	KT 953
Melastomataceae	Mouriri tuberculata Morley & Thomsen 1997	2	KT 297
Moraceae	Naucleopsis capirensis C. C. Berg 1996	1	KT 525
Myrsinaceae	Parathesis costaricensis Ricketson 1998	4	KT 876
Rubiaceae	Chomelia venulosa W. Burger & C. M. Taylor 1993	5	KT 895
Sapindaceae	Vouarana anomala Acev.-Rodr. 1997	3	KT 443
Sapotaceae	Pouteria costaricensis Penn., Sánchez & Jiménez ined.	1	KT 662
Sterculiaceae	Sterculia alleni E. Taylor ined.	15	KT 674
Total	13 species	37	
Undescribed, possibly unknown			
Annonaceae	Guatteria sp. nov.	1	KT 941
Burseraceae	Protium sp. nov.	7	KT 1286
Chrysobalanaceae	Licania sp. nov.	1	KT 834
Clusiaceae	Garcinia sp. nov.	1	KT 287
Lauraceae	Licaria sp. nov.	3	KT 1264
Sapotaceae	Sideroxylon sp. nov.	3	KT 555
Total	6 species	16	
Unidentified, possibly new			
Elaeocarpaceae	Sloanea sp.	12	KT 467
Flacourtiaceae	Casearia sp.	1	KT 735
Lauraceae	Beilschmiedia sp.	1	KT 610
Lauraceae	Lauraceae sp. 1	3	KT 774
Lauraceae	Lauraceae sp. 2	1	KT 503
Lauraceae	Lauraceae sp. 3	1	KT 634
Lauraceae	Licaria sp. 1	4	KT 747
Lauraceae	Licaria sp. 2	1	KT 791
Lauraceae	Pleurothyrium sp.	1	KT 567
Loganiaceae	Strychnos sp.	4	KT 414
Malpighiaceae	Mascagnia sp.	1	KT 825
Myrtaceae	Eugenia sp. 1	1	KT 378
Myrtaceae	Eugenia sp. 2	1	KT 783
Myrtaceae	Eugenia sp. 3	3	KT 702
Myrtaceae	Eugenia sp. 4	1	KT 231
Myrtaceae	Myrcia sp.	1	KT 701
Nyctaginaceae	Neea sp.	1	KT 369
Sapotaceae	Pouteria sp. 1	3	KT 468
Sapotaceae	Pouteria sp. 2	1	KT 758
Total	20 species	43	

The twisted trees

Scientific name: Aspidosperma myristicifolium
Family: Apocynaceae
Local names: care tigre, cara de tigre, costilla danto, cruácrie

In the forest, the care tigre may be found among the highest emergents. In Aguabuena, we measured one of 62 meters height. The trunk rises straight towards the sky. Nevertheless, a closer view reveals a very irregular stem: It is twisted and sculptured in an incredible pattern, braided by contorted ridges mixing with deep channels and furrows, much like a strangler fig, a matapalo. The care tigre is a genuine tree all right, but if a large trunk is cut, the transect of the stem looks very different from most trees: It does not appear like a round plate, but consists of meandering arms of varying thickness. Still, the stem is very strong because the wood is hard and rigid. Because of their strength and strange beauty, young stems are often used in open 'ranchos' to carry the roof.

The care tigre is closely related to the amargo (Aspidosperma spruceanum), a tree well-known in the Osa because of its good timber. Unlike its cousin species, the amargo tree has an ordinary shape.

Most trees in the Osa forests have ordinary shapes, that is, their stem i cylindrical and smooth. But an unusually high number is more or less twisted like the care tigre. This is particularly true for costilla danto (Lecointea amazonica), but also for a number of other trees, for example Bourreria sp. nov., Chomelia venulosa, Gloeospermum diversipetalum, Pouteria durlandii and Sloanea guianensis. Local people often give names to these oddly shaped trees that relate to their twistedness or sharp edges: trenzillo, filometoso, gambito, costilla danto, torcido etc. (nicknames translating roughly to 'braidlet', 'sharpling', 'buttressie', 'tapir's ribcase', 'twisty')

None of these twisted trees are closely related to each other. What has made so many mutually unrelated tree species in the Osa develop shapes like this, is a good question. Maybe the shape has no function but is neither an obstacle to survival. In any case, the twisted trees call upon our fascination.

Spiny usefulness

Scientific name: Astrocaryum standleyanum
Family: Arecaceae
Local names: pejibaye de montaña, tubuó

A number of the many palm trees in the Osa forests are locally called pejibaye de montaña. The name is appropriate. When you encounter a wild pejibaye palm, you will probably notice that it does look quite similar to to the true 'pejibaye' or peach palm (Bactris gasipaes), commonly grown in the lowlands of Costa Rica: The trunk is densely covered with long, black spines, the large leaves are split up in numerous strips pointing in many directions, and the ripe fruits are orange-colored. But pejibaye de montaña is much more stocky than the true peach palm, with a thicker stem and much larger and more rigid leaves, and the two palm species are only remotely related.

When you pass a very young pejibaye de montaña, pay much attention to the long, flat spines of the leaves. They are not only pointed, but also razor sharp, and will easily plunge two centimeters into your flesh.

In the Osa, people know this palm for good palm heart and for leaf fibers for hats. Elsewhere, the leaf fibers are a renowned resource. Fiber products have been exported from Ecuador as early as 1872. Still today, that country exports hats, hammocks and mats in small quantities to Peru and Japan. In Chocó, Colombia, baskets of leaf fibers are sold locally. In other regions, other species of Astrocaryum provide leaf fibers for similar commercial products.

As it is true for many palm species, virtually all parts of the pejibaye de montaña may serve some use. The rather scanty fruit pulp is reported to be sweet and edible, and widespread subsistence use includes exploitation of its edible fruits and palm heart. The beautiful and very hard wood may be used, for canes, fishing rods, ornamental boxes inlaying, and archery bows.

A few timber trees in the Osa are also called pejibaye, for example Maranthes panamensis and Licania hypoleuca – both relatives of the cultivated sonzapote fruit tree. This is not owed to the appearance of these trees, but to the smell of the fresh wood and bark which is reminder of the rather heavy smell of the boiled fruits of peach palm.

Mightiest of neotropical trees

Scientific name: Ceiba pentandra
Family: Bombacaceae
Local names: ceibo, ceiba

The ceibo tree is the largest of the many giant trees found in the Osa Peninsula and even in all of tropical Latin America. A ceibo of 80 meters height has been reported from Costa Rica. The ceiba's enormous buttresses, sometimes reaching 20 meters up on the trunk, give the reminder of a moonrocket. And the crown spreads like a half-sphere with horizontal branches themselves the size of huge trees. This makes the ceibo embraze a huge volume of the sky.

Let be that some conifers of Western North America may be taller and that California's redwood trees may be even thicker. But a large ceibo probably takes up more space than any other American tree, and certainly than any neoptropical one. Since it thrives on flat, moist land and is often left in the open pastures when the forest is turned into farmland, you may see the this giant tower over the landscape as a living monument of the disappeared forest.

To the Mayas the ceibo was a holy tree. Today, people in the Osa think that it may cause evil to fell it, and this is supposedly the reason why you may see this monumental tree so often.

The enormity of the ceibo implies that this tree may shape the landscape more than any other plant species in America. In Amazonia, the ceibos often stand close to the large rivers. In Ecuador, one such tree – La Torre ("The Tower") – became a tourist attraction with a wooden spiral staircase built up to a platform in 45 meters' height where the crown began spreading its huge branches over the forest. When the meandering river sometimes reach the roots of trees like this, it may fall into the river and block off many floating trunks and branches. These pile up as a damn and eventually the river is forced to change its course.

The ceibo is native to America, but cultivated in Asia for seed oil and seed fibre. The seed is surrounded by silky hairs called kapok, or ceiba in Spanish. Earlier in the century, it was used extensively for stuffing in mattresses, cushions and life jackets. So, the ceibo's silk may save the lives of drowning people! Today, however,

kapok fibres are of little commercial importance.

In several regions of Costa Rica, the seed oil of the ceibo is used for illumination and for soap-making. One more of the tree species in the Osa provides seed fibres that may be used like kapok: the balsa tree (Ochroma pyramidale), which belongs to the same family as the ceibo, the Bombacaceae.

Because ceibo trunks are so large, they have been used for making sea-going boats. The same is true for the second-largest tree of the Osa, the espavel (Anacardium excelsum).

Medicine for men and coatis

Scientific name: Trattinickia aspera
Family: Burseraceae
Local names: caraño, nundócrie

Like many other species of the Burseraceae (often called copalillos on the Osa), the caraño is a middle-sized tree with pinnate-compound leaves and a fragrant, transparent exudate – a resin – in the bark. Since the species is known only from southwestern Costa Rica and Panama, it is little studied, and local people's use of the species has only been investigated in the Osa so far.

In the Osa, the caraño tree is a source of medicine. Decoctions of the bark are taken against ulcers, stomach aches and for strengthening of the blood. The caraño resin is extracted from cuttings in the bark during 2-3 days in the dry season. This resin may be boiled and taken for coughs or applied on the forehead for headache. The Guaymie Indians use decoctions of caraño leaves for baths against epilepsy.

In San José, medicinal barks are sold on herb markets as caraño, but it is possible that these are from other Burseraceas, since this name is used in Central America for various other species of the family.

There has actually been registered use of this tree species outside the Osa. It is a surprising one, however, because it is not carried out by human beings: In Panama, coatis (Nasua narica) have been observed using the resin for grooming their fur, possibly to deter ectoparasites or to smell good!

Observing the animals' use of plants is a very new discipline in biology. But just as the registration of man's use of plants may help us identify valuable products in the large plant kingdom, so may the experience of wild animals give us clues. In Africa, gorillas and chimpanzees have been observed eating certain plants when they are sick. In this way, these creatures may unknowingly show us where to find new aspirines or other useful drugs!

A medicinal stairway

Scientific name: Bauhinia guianensis
Family: Caesalpinaceae
Local names: escalera de mono

The escalera de mono is probably the most famous liana in Costa Rica. It has gotten its name escalera de mono – and 'monkey ladder' in English – because of a peculiar shape of the stem. However, the fame of the liana is not owed to its shape, but to its medicinal properties.

Let us take the appearance first: The young stems are hanging abundantly in old, mature forest, looking like long, tiny stairs with regular, bulging steps. The characteristic stair-like shape develops because the growth occurs mainly on two sides creating a flat stem. The new growth layers are shorter than the older ones, causing the stem to shorten up and the middle to buckle out. The older escaleras become more contorted with many deep, narrow furrows, sometimes embedding the steps completely. Still, they are easily distinguished from all of the many other lianas of the forest by their fluted stems and smooth, light yellowish bark.

The escalera de mono is one of the largest lianas in the Osa. You may encounter stems of up to 30 cm diameter! In old, undisturbed forest, it is also the most frequent one: In Aguabuena, we found 50 lianas of 10 cm diameter or more in a four hectare inventory. Of these, 13 were escalera de mono. In secondary forest or forest that has been logged for timber, large lianas are rare, maybe because they are tangled with the crowns of many of the largest trees which are precisely the ones that often are cut down during logging. Probably, it takes the lianas too long time to grow thick to keep up with frequent logging. After all, the liana has to reach as high as the top of the canopy to get to the light and survive.

Wherever this conspicuous vine occurs in Latin America, people use it to treat kidney ailments. It also has a reputation in treatment of diarrhea, diabetes and body pains, or rheumatism, and for strengthening the blood. On markets in Managua and San José you may easily recognize the cut pieces of the young stems – the 'ladders' – which are sold for making medicinal infusions or, in

plain words, tea. The price in San José was 150 ¢/250 g in 1994.

In the Osa, escalera de mono is known to be used for kidneys and body pains.

Another vine in the Osa share the name escalera de mono and may even share the medicinal qualities of Bauhinia guianensis. That is Oxyrhynchus trinervius, which is, like Bauhinia, of a leguminous family, although not Caesalpinaceae, but the Fabaceae. Its stem looks a bit like that of Bauhinia, growing a contorted stem by shortening up during growth and by having light yellowish bark. Yet Oxyrhynchus does not develop the regular ladder-shape. Nevertheless, local people claim that it may be used in the same way as its famous name kin.

Diesel, perfume & precious medicine in one

Scientific name: Copaifera camibar
Family: Caesalpinaceae
Local names: camíbar, má beségere

This graceful tree is one of the rare wonders of the Osa. The stem is regular with very finely furrowed bark, and the foilage consists of tiny leaflets ordered in beautiful flat, horizontally layered mosaics towards the light. But the trees' most precious property is hidden deep in the stem: The heartwood contains a fragrant liquid with a color like amber. It is an oil-like resin called camibar which will ooze out of the tree if the wood is cut. This is probably the most valuable plant medicines of the Osa and the adjacent mainland.

Some people extract and sell the camibar at good prices – up to 15.000 colones a gallon (in 1994). It is said that you can buy it in every Costa Rican pharmacy, and that it is used on the umbilicus of all newborn infants in Costa Rica. In the Osa, the resin is used on skin wounds and cuts against inflammation. Among the Guaymie Indians, the women may drink a tea made of the resin to increase fertility.

Camibar resin, or balsam, is famous not only in Costa Rica, but in most of Latin America. Internationally, it is known by its Brazilian name copaiba. Both terms are used in the Scientific name of the Osa species Copaifera camibar, which is known only from a few areas outside of the Osa, in Venezuela and mainland Costa Rica. But a number of other Copaifera species are utilised in the same way all over tropical Latin America, for their resin. In Sirena en Corcovado has been found another species of camibar, Copaifera aromatica.

The copaiba resin from the various Copaiferas was introduced into Europe in the 16th century. It is used locally in treating bronchitis, catarrh of the pulmonary region, bladder and uterus, inflammations of the urinary tract, leucorrhea and gonorrhea. Its use is very frequent in the Amazon on all types of wounds, to obtain fast healing. It may be used against psoriasis, and even to treat sores from chronic gonorrhea.

Besides being used medicinally, the resin is employed commercially as a fixative in perfumery and as an ingredient in varnishes. It is often called an 'oil,' but it

contains no oil at all. It consists entirely of sesquiterpenes and copalic acid. Although fluid, it is chemically similar to the hard resin of guapinol (Hymenaea courbaril).

In the Osa, the traditional method of harvesting the precious camibar resin was to cut a large hole in the trunk and burn the base of the tree to make the resin run. This method is said to provide up to 50 liters, but it will only happen once, since the treatment kills the tree either immediately or within less than a year.

Today, the camibar tree has become rare in the Osa. Only in isolated places, like the watershed of the San Juan river, it is still abundant, being among the ten most dominant tree species.

In Amazonian Brazil, the copaiba resin has long been an important source of income from the forest. Also here, destructive extraction has made the tree scarce. Fortunately, better harvest techniques exist. Both in Brazil and Venezuela some wise extractors obtain the resin by drilling holes in the trunk. Usually two holes are drilled, one above the other, to the core of the trunk. After emptying the tree´s deposits, the hole is plugged with a wooden bung. This operation do not cause serious harm to the tree and can then be repeated later.

I tested the drilling method on one tree in the Osa, but hardly a single drop came out! Even plugging the hole and waiting several days gave little resin. I was told by locals that the moon's phase had to be right. Later I have read that in Guyana people extract at crescent moon.

Copaifera trees got a sudden worldwide publicity in the 1970es when Brazilians showed that the resin can be taken directly from the tree and run a diesel engine. Fossil oil had become expensive with the 'oil crisis', and copaiba was seen as a potential new source of energy. However, the trees can not produce nearly enough "oil" to our consumption. The world´s diesel engines would rapidly burn up all that fragrant medicine of each and every Copaifera tree!

A source of beer and stinking toes

Scientific name: Hymenaea courbaril
Family: Caesalpinaceae
Local names: guapinol, zácrie

The guapinol tree represents the most useful and the most vulnerable part of the Osa rain forest at one and the same time. The wood is one of the most precious timbers of the Osa, but all other parts of the tree provide equally valuable and useful products. The tragedy is that the tree gets hardly any offspring, so when the beautiful colosses are felled to be turned into timber, the forest looses one of its most useful trees.

The guapinol is an awesome sight in the forest. Superficially, its trunk may look like that of another large tree, the abundant vaco (Brosimum utile), having a thick, cylindrical bole, and smooth bark without epiphytes. But seeing the two together, you will sense the strength of the hard, slowly grown guapinol against the soft-wooded vaco: The vaco will often be damaged and visibly hollow at the base, and the whole trunk may be a bit curved from its own weight. The guapinol stands straight and has no irregularities nor buttresses. It leaps off the ground directly like a huge column.

The guapinol fruits are highly nutricious and good for the health. Some find their taste delicious, while others detest their smell. Most of the year, you may come across the fruits as large, woody, indehiscent pods under the tree, but they will then be empty or filled with useless, black dirt. This keeps most people that walk only occasionally in the forest unaware of the quality of the fruits. The good fruits fall very suddenly in the middle of the dry season. In five weeks, one of our trees in Aguabuena threw 364 kg of healthy fruits, and another one 606 kg. A number of fruits fails to develop fully on the tree because of insect attacks. These failed fruits are not able to let go of their branch as are the healthy fruits, and will therefore go on dropping down over the rest of the year, giving a poor impression of a truly marvellous fruit.

And how is the guapinol fruit? It differs from most other fruits of the forest in being dry and very well conserved. The edible part is a dry powder of sugar and starch surrounding the black seeds within

the hard, resinous shell that is shaped like a thick sausage, ca. 15 cm long. The powder has a quite heavy, papaya-like smell. Since some people find this disagreeable, it has gotten the English nickname 'stinking toe.' In spite of the smell, the taste is very rich and fruit-like. If you eat the powder of four pods, you will feel very full and quite thirsty!

You may also use the fruits for making cakes and cookies: simply substitute some of the sugar and wheat flour in a recipe, and you will get tasty things that have flavors very much like a mix of chocolate and fruit.

Even a kind of beer can be made: The dry pulp is used in some Central American countries to ferment a beerlike, tasty refreshment called pinol. The name guapinol' may come from Nahuatl cuahuitl-pinolli, meaning 'pinol tree'.

Usually the rain will begin before the guapinol has finished fruiting. But even after three, four weeks of fruit fall and many days of rain, you will still find undecayed, edible fruits under the tree. This is unique in this hot and humid climate. Most fruits contain a lot of water and/or oil, and therefore get rotten or moldy very rapidly, but the guapinol fruit is not only protected by being dry; also the resin of the hard shell protects the nutricious powder against molds and fungi, except when the fall from the tree has created tiny fissures in the shell. Then molds will destroy the fruit in few days.

All the above makes guapinol one of the few fruits that would be easy and worthwhile collecting for consumption and sale: The fruits are very light, 50-100 g each, and therefore easy to collect and carry out. You can store them almost indefinitely, transport them without damage. Furthermore, they already have a market, and could get an even larger one if introduced in snacks, bakery and softdrinks.

The resin is composed of the same chemical compounds as camibar resin and serves a long series of medicinal purposes. But where camibar is fluid, guapinol resin is hard and brittle. On the trunk, you can break it off like glass. From the soil at the base of the tree, you may also dig up several pounds of old resin, even many years after the tree has perished. Particularly the old resin is good for producing varnishes and lacquers. It is used commercially for this under the name 'South American Copal' or 'Demarara Copal.'

All parts of the tree contain resin, so even bark and leaves may be used as medicine. Guapinol resin is particularly reputed for treatment of kidney ailments, but also of respiratory problems, diarrhea and colic, and of wounds, skin irritations and vaginal infections. The resin is also burnt as incense – and the smoke is good for asthma and hysteria!

In Aguabuena we were lucky: Three

guapinol trees were found in a four hectare inventory of forest that apparently had never been logged. But all trees were old giants, measuring more than 90 cm diameter. The strange thing is that the ground under these trees are covered with seedlings once every year – but within a few months they all die from lack of light. One single young guapinol tree was encountered in the whole area, and after two years this one too died from lack of light. In the whole northern Osa Peninsula the guapinol is becoming very rare. Only in the Aguabuena and San Juan watersheds there are still good populations, but only of very large, old trees.

Like the guapinol, a number of other tree species have natural populations in mature forest that consist of large individuals and little offspring. In the Osa, this is true for trees like pilón (Hieronyma alchorneoides), lagartillo amarillo (Zanthoxylum ekmani) and balso (Ochroma pyrimidale). All these trees are dependent on very good light conditions to grow up. In the mature forest, there will only rarely be a natural tree fall gap large enough for these species to reach full height before regrowth has closed the forest opening again. But contrary to guapinol, the three others have tiny seeds that are easily dispersed to open areas. Therefore they are all abundant in pastures and regrown forests, or tacotal. The guapinol remains as a typical resident of the old forest – the heavy fruits rarely get far away from the parent tree.

The irony is that nobody considers Hymenaea courbaril a threatened species, because it is naturally widely distributed. From southern Brazil to Mexico you may find it in forested areas where there is at least a short dry period. But the guapinol is threatened, becoming scarce everywhere, for the same reasons as in the Osa. The wood is excellent, and there is hardly any natural regeneration to counter the logging. The seeds are plenty, and easy to germinate, so this is really one tree that would deserve a helping hand from people, planting it for the future!

A suicidal tree

Scientific name: Tachigalia versicolor
Family: Caesalpinaceae
Local names: reseco, alazán, tostado, bu tain

The reseco is the only tree in the world that is known to commit suicide. Why it does it, is still an enigma.

Reseco looks like many other rain forest trees. A smooth stem with straight, slender buttresses at the base. The most conspicuous feature is the bright orange color of the bark. The wood is good for timber, and since the tree grows rather large and tall, it is much sought by timbermen.

Among the many trees in the rain forest, it is a great achievement to grow up in the strong competition for light and become an emergent – for a tree in the Osa, this implies growing considerably taller than 45 meters – and then finally produce flowers and seeds in sufficient numbers to maintain a continuous supply of new treelets of the same species. Most tree species are designed to spend the major part of their long life cycle producing offspring, thereby ensuring the survival of the species. The reseco produces flowers and seeds just once in its lifetime. Then it dies. As absurd as it seems, the reseco reaches a favorable place in the sunlight, builds up a huge bole of wood, stocky branches and innumerous leaves in the midst of competition with the rain forests' countless different tree species, and then gives up everything!

This reproduction strategy makes the reseco a unique ecological mystery to scientists. What could possibly be the benefit of dying at the very peak of your vigor and dominance?

The mysterious fate of the reseco trees was discovered only after many years of study in the world's most intensively studied patch of rain forest – a 50 hectare plot in the Barra Colorado Island in the Panama Kanal. Here, every tree of more than one centimeter thickness is measured and mapped. In this way, scientists continuously scrutinize the development and fate of almost a quarter of a million individual trees.

One year, a number of large trees of an unknown species blossomed simultaneously. The scientists described it as a new

Tachigalia. During flowering, the trees lost their leaves. After nine monthts, no new leaves had appeared. The fruits were large, flat, green pods that had maintained photosyntesis. But the fruits became dry and ripe and flew off the trees, leaving them all to die.

A beetle unknown by the scientists appeared by numbers of tens of thousands, eating up the dying trees. From the trees' roots, the fruiting body of an unknown fungus popped up, ending its mycorrhizal coexistence with the Tachigalia. It turned out, however, that there were still many younger Tachigalia trees that had not flowered. None of these died.

An experienced tropical ecologist, Robin Foster from Chicago, studied the mysterious fate of the reseco trees in Panama. He had never seen anything like this quiet, ecological drama. No other dicotyledonous perennial plants in the world was known to do this. Monocotyledonous plants like palms and bamboos could do it, but not ordinary trees.

It turned out that every four years, a new cohort of the largest Tachigalia trees blossomed simultaneously, and the collective suicide was repeated. Why did they do it? How could they maintain a population in this way? The species was obviously successful, because it ranked as the 15th most common among some 300 tree species on the island.

The key had to be that the death of the trees improves survival of the offspring, one way or the other. The most obvious explanation seemed to be, that the mother trees used all of their accumulated energy to produce more seeds than competing species. This is what a bamboo will do. It may grow for 40 years and then dies in a cascade of flowers and seeds. But calculations showed that in this Tachigalia the amount of flowers and seeds were not substantially larger than in other trees.

Foster published an article describing the suicidal deaths of the Panamanian Tachigalias and suggested that their sacrifice of life provided extra light to their offspring, leaving a hole in the canopy that gave the new trees a good start. But soon counting revealed that nine of ten seedlings would germinate in the shade – and have just as good survival as those in the light.

The Tachigalia seeds turned out to have a high seed survival compared to most trees – 70 percent would germinate in the forest. Since fungi were considered to account for about 80 percent of deaths of all seeds and seedlings, Foster thought that Tachigalia seeds had to have a better natural resistance to fungi than other species. Now, his idea was this: The seeds inherit a rather efficient fungicide from their parents. The interval of four years between seed falls will in itself keep specialized

Tachigalia-attacking fungi at low numbers. But if each new crop of seed contains a slightly different variety of fungicide, it will further make it difficult for fungi to overpower the defences of the seeds. To ensure that the seed crops is different, there must be no genetic cross-over between the parent generations. One way to ensure this would be to die.

Foster speculated that Tachigalia versicolor really consists of a series of variants that are genetically separated and distinct, and that their flowering in simultaneous cohorts maintain their difference. At a high cost, the trees keep fungi at a distance from their seeds.

This theory depends on one detail: A cohort of flowering trees have to be of the same generation, to have germinated the same year so long before. The age of the trees can unfortunately not be checked, as they do not develop revealing annular rings in the wood like temperate trees. So if the trees always flower at, say, the age of 60 years, there might be 15 different cohorts in a locality. In Panama, this can only be checked in some 40 years' time.

To this day, Foster has not come up with an explanation that satisfies himself – the best answers to apparent enigmas in ecology usually turn out to be very simple. But Foster's best answer so far is not a simple explanation.

In the Osa, I saw the phenomenon of reseco suicides in 1993: Here and there, you would spot a large and conspicuous, pink crown – flowering for some months. The year after, the trees were dead. A herbal healer told me with a laugh that the broken branches of the dead trees smelled like 'pure shit.' Later, I learned that scientists in this tree have encountered scatole – a strongly smelling compound also occurring in human feces!

The only suicide tree in the world is still quite common in most regions of the Osa, being most frequent at altitudes below 300 meters. In Drake it is particularly common. But its timber is much appreciated, and once felled for timber, a reseco is sure to die leaving no offspring.

Fruits too delicious to get

Scientific name: Caryocar costaricensis
Family: Caryocaraceae
Local names: ajo, doboin crire

This giant tree is among the many species of the Osa that have this peninsula as the northern extreme of their distribution and Western Colombia as the southern extreme. Most of these species are considered endangered because of their limited natural range.
Ajo means garlic, and the ajo tree owes it name to a garlic-like smell from its yellow flowers when they at times cover the ground under the tree.

The tree itself is characterized by a thick, bulging stem, often one and a half meter thick, with a dark, slightly fissured bark. The leaves are characteristic too. Where a majority of rain forest trees has simple, alternate leaves with smooth margins, the ajo leaves are opposite and trifoliate with serrate margins and two large glands at the top of the petiole (the stalk of the leaf).

When you dig in the soil at the base of a large tree, you will find old shells with many slender and very hard spines. These are the almost imperishable remains of a hard shell surrounding the seed inside the fleshy green fruits.

When I went to the Osa, I was asked by a Caryocar specialist to pay attention to Caryocar costaricensis, because unlike the other nine known Caryocar species, nothing was known scientifically about the uses of this species which occurs in an area where few studies have been made of the uses of wild plants. Several of the other species provide edible seeds ('butter nuts' or 'pequia nuts') or fruit pulp, or both. The fruits of these species are collected from the wild in several South American countries, particularly Brazil. The fruit pulp is oil rich and a source of a fine vegetable oil.

Specialists consider the whole genus Caryocar to be of great utility for their fruits, and that – in the words of the great ethnobotanist Robert Schultes: "we may confidently expect that the future will see plantations of one or several species of Caryocar... for the betterment of life in the tropics in general."

So, how about the poorly described ajo in the Osa? I tried hard, but nobody knew of

the fruits. When finally the trees in my inventory began fruiting, I came across the explanation: When the fruits get ripe , you do not find a single good fruit below the tree. The monkeys eat them all. I spoke to a forest researcher from CATIE in Turrialba who tried unsuccessfully to get hold on seeds in the Osa for growth trials. He found none. Finally, he built a platform in a huge ajo in order to get to the fruits before the monkeys. Unluckily, all seeds on that particular tree happened to be attacked by insects.

Unlike what is the case in many other Latin American forest regions, only few Costa Ricans eat monkeys. This is a handicap for those who would like to collect and try the rich fruits of the Osa forests: little is left by the monkeys. After three years of study of the potential for collecting wild fruits in the Osa, I had to conclude that only in a few cases do the animals leave enough to make an effort worthwhile. This is the case with fruits of guapinol (Hymenaea coubaril) and caobilla (Carapa guianensis). But the forest's most delicious treats are not left for very long by our hairy cousins!

The tree of the yellow wax

Scientific name: Symphonia globulifera
Family: Clusiaceae
Local names: cerillo, trobó

The cerillo is one of the most common trees in the Osa and particularly so in Aguabuena. It is middle-sized and rarely gets taller than 40 meters or thicker than 70 cm. It is easily recognized in the forest by its irregular, soft, orange bark and conspicuous prop-roots of varying thickness sticking out from the stem up to some half a meter's height. When it flowers, you may see the bright red, round petals on the forest floor, and notice hummingbirds visiting the tree.

Even a slight damage to the bark or roots will reveal the waxlike, bright yellow latex that gives the tree its local name, which translates to 'little waxy' (cera = wax). Bees appreciate this similarity, too: often you will see them picking up the latex to use for their hives.

The copious, sticky latex must offer the tree a good protection, because everywhere in tropical Latin America it is used to prevent infections in ulcers and deep wounds. In Amazonian Brazil, the latex is taken orally by Ka'apor Indians as a contraceptive. It also serves a number of technical purposes in domestic use: making candles, torches, glue and shoe tar, and caulking of boats. It is reported to yield an amonia-soluble khaki dye used in Belize to give a rich brown color to leather, and the fresh latex may be used as brown skin paint that lasts for several days.

In the Osa, the latex is heated and applied against skin problems like 'carate' and fungi. It may also be applied onto the chest for 1-2 days against cough. It can be stored in free air.

The ripe, green fruits of cerillo are rich, much like a juicy, very sweet-acid plum, hence one of its English names: 'hog plum.' I have never had the good fortune of finding it ripe in the Osa, but in Amazonia we came across them once in one and a half years, and we could hardly stop eating.

A fruit against all evil

Scientific name: Merremia discoidesperma
Family: Convolvulariaceae
Local names: contraveneno, digué cøi

The contraveneno is the most expensive amulet you can buy in the streets of San José. It protects you against "snakebites, mothers-in-law and all other evil."

It is a fruit in the shape of a hard capsule, about 2.5 cm across and 1.7 cm high, with a cross-shaped depression on its top. When it is new, it is densely covered with very short, erect, shiny black hairs, giving the fruit a beautiful, velvet-like appearance. When you find the fruit in the forest, its fine black fur will often be dry and completely protected form dirt inside a thin, stiff, transparent membrane slightly larger than the fruit.

Once the fruit is peeled free of its paperlike membrane, the black hairs fall off quite easily, but the capsule itself is almost indestructable. Even in Northern Europe you may find this tropical fruit washed up on the beach after a long journey over the sea, for which reason it also has its legends attached at latitudes far from the tropics.

Few have seen the actual plant that produce the fruit, and even during 18 months of field work, I never succeeded in spotting it in the tree crowns, although I kept finding the fruits on the forest floor in two places.

Contraveneno is apparently among those lianas that climb to the highest parts of the forest canopy. When you find its peculiar fruit, keep it for good luck, or for selling it for a buck...

A number of other lianas from the Osa forests are sources of beautiful adorns that may be used for amulets or for necklaces and earrings. The large, dark, disk-shaped seeds of ojo de buey and ojo de venado (Mucuna species), and the smooth and shiny, grey seeds of the vine Caesalpina bonduc are examples of jewels from the forest that you may buy in the streets of San José.

Jewels from a tree

Scientific name: Ormosia paraensis
Family: Fabaceae
Local names: nene, má

The nene tree is only recognized by the best 'vaqueanos' (in the Osa a term for local people that have knowledge of the forest trees, mainly from working for timber logging companies). The tree is very anonymous in its appearance with a grey and rather smooth bark and no buttresses. But when people see the seeds under the tree, everyone will recognize it: The seeds are shiny beans, half red and half black, and a little more than one centimeter long. Because of their beauty and durability, these seeds are appreciated as amulets, and sold as such.

In San José you could buy nene seeds for 100 colones each in 1994. They are also sold as beads in earrings, bracelets and necklaces. But few people are aware that buying these seeds is buying jewels from a rain forest tree.

Actually, nene seeds in the Osa stem from at least two closely related species, Ormosia paraensis and coccinea, the latter having slightly smaller seeds than the former. In San José, you may also buy nene seeds that are only half as large as the usual ones. I have never seen these in the Osa, but a friend told me that he once came across one in the Osa that was more than twice the usual size. So keep an eye out. There may be more kinds of nene around. In the Atlantic Zone of Costa Rica, a new species was recently discovered. It has entirely black seeds.

Because of the value of the seeds, nene trees may provide a local forest owner with a stable income from his forest. Unfortunately, the tree is popular among the timbermen, too, and today the tree is not very common. You will mainly find it at altitudes above 300 meters height in remote places like Bajo San Juán. One more reason to protect the forest trees.

An endemic fence post

Scientific name: Caryodaphnopsis burgeri
Family: Lauraceae
Local names: cirrí, quira, sarnillo, urono mogare

The cirrí is a tree best recognized by its leaves. They are very similar to the leaves of the cinnamon tree, being opposite and glabrous and having three main nerves running from base to tip of each leaf. The underside is pale, much like the leaf of the avocado. The tree is middle-sized. In the Osa it is not uncommon, but it is not known outside of the Pacific side of Costa Rica. It is endemic to this region.

The cirrí is a very valuable timber, and particularly so for locals in the Osa. The reason is that in contrast to most timbers it do not perish in the ground, but may last as fence posts and poles in the soil for many years. In this respect, it is only surpassed by manú negro (Minquartia guianensis) which is even more renowned among farmers for its durability.

Such trees are examples of timbers that may not be worth a lot on World markets because the do not have a fashionable color. But locally they are in high demand because the serve specific purposes better than all other timbers. However, when trees are planted for timber, such local usefulness is rarely considered.

Cirrí belongs to the genus Caryodaphnopsis in the family Lauraceae which comprises many hundred tree species in Costa Rica. Most of them are very fragrant and typically have a smell of avocado (Persea americana), the family's most famous member. Actually, the wild ancestor of the avocado is also growing wild in the Osa!

The family Lauraceae comprises many species that are still not described by science. Until the last few decades even the whole genus Caryodaphnopsis was known only from Southeast Asia. Then somebody discovered a species in Central America, then another was found in Amazonian Peru, then a third in Coastal Ecuador, and so on until today, when about a dozen American species has been described. Locals always knew the cirrí for its special qualities. But scientists had a harder job realizing what particular kind of tree it is.

A unique little snail

Scientific name: Ruptiliocarpon caracolito
Family: Lepidothryaceae
Local names: caracolito, cedro caracolito, rugá chelerécrie

The caracolito has its name ('little snail') from the egg-shaped, 3 cm long fruit that dry and break up at maturity in a pattern reminding of a snailhouse. The Scientific name of the genus, Ruptiliocarpon, likewise refers to the way the fruit cracks open.

This tree is a living testimony of how poorly known the American rain forests are to this day. Although the tree is abundant, well-known among timbermen, and relatively easy to recognize in the forest, it has turned out as a great novelty and surprise to botanists.

The tree is middle-sized for Osa standards, usually not reaching heights of more than 45 meters or diameters of more than 80 centimeters. The stem has a surface bulging slightly like a muscular underarm. The bark is rather smooth with rows of tiny pieces of cork in the depressions between the 'muscles.' Cut off the outer, dry part of the bark, and you will see the illusion of muscles completed: the color is a mix of pink and red, marbled with light yellow, much reminder of raw meat with blood and fat. "How many pounds would you like today?" my informant asked me with a laugh, imitating a butcher selling meat.

The leaf appears indistinguishable from all the other tree leaves at first sight, being simple and glabrous with smooth margins and a little tip. But like most leaves, it does have distinctive features: Between the simple petiole (the stalk attaching the leaf to the branch) and the base of the leaf is a slightly swollen tissue called a pulvinus. This you find almost exclusively in the compound leaves of leguminous trees. Together with the broad, roundish shape of its leaf, this separates the caracolito from the innumerous other species in Central America.

When I came to the Osa in 1992, I was told by botanists about the caracolito tree that this was one new species that was so unique that they could not find any known botanical family where it fit in. Rutaceae, Meliaceae and Fabaceae had been tried, but

experts of these families assured that the characteristics of the caracolito made it too different to belong to any of them. The only logical solution would seem to be the creation of a new family, the ‘ Ruptiliocarpaceae.’ This would have Ruptiliocarpon caracolito, as the caracolito was to be baptized, as the only member.

Finally, a decisive piece of the puzzle was found when it was discovered that the tiny green flowers in the crown of each caracolito were all unisexual, that is, either male or female. Technically this is called a dioecious species. Each tree is either male or female. This uncommon feature led to a comparison with an African tree, Lepidobotrys staudtii which was found in 1950 and placed in its own family, the Lepidobotryaceae. It turned out that these two widely separated species shared so many features that the number of species in the family was doubled, from one to two!

Now, since such a unique tree species could be overlooked for so long, you would expect that it was quite uncommon and hard to find. Not so. Every ‘vaqueano’ you come across may show you the tree in a forest nearby. It is actually found in every region of the Osa forests, and is even among the most common and dominant trees. Overall, it is the 18th most dominant tree species in the Osa – among some 1.000 different tree species. Moreover, as the botanists have begun re-examining their collections in herbaria around the World, it turns out that the species has been collected in both Panama and several South American Countries, too.

The lack of botanical insight in the composition of the diverse Osa forests is also illustrated by another large, locally well-known tree, the sapotón. In size, this tree is comparable to the caracolito, yet it grows even taller and is much more conspicuous with woody fruits the size and shape of oranges. In recent years it was identified as Pouteria laevis, a species from the family Sapotaceae. This species was in 1990 known only from a few collections west of Manaus in the middle of the Amazon. An examination of forestry inventories in the Osa has now shown that the sapotón is even more abundant than the caracolito, being the 8th most dominant tree species in the peninsula.

So common and well-known to people who live and work in the forest, so unknown scientifically.

Bitter seeds of the forest

Scientific name: Carapa guianensis
Family: Meliaceae
Local names: caobilla, cedro macho, cedro bateo, bateo, rugá boló

The caobilla is one of the most dominant trees in mature forest everywhere in lowland Costa Rica. It belongs to the family of mahogany, the Meliaceae, which is reflected in its local name caobilla means 'little mahogany.' Caoba is the true mahogany, Swietenia macrophylla.

The caobilla is easily recognized by its very large, pinnate-compound leaves and large trunk with irregular orange-brown bark with circular, lighter scars left when large flakes of bark fall off. The fruit is a woody capsule the size of a small grape fruit. It usually contains between four and eight seeds of varying sizes. The seeds are large and cinnamon-brown with flat, angular surfaces. Often you will see then in great quantity under the tree.

The wood is not the best timber in the world, but "better than espavel" (Anacardium excelsum) as some put it. Still, because the tree grows large – in the Osa usually up to 55 m tall and one meter thick – it is among the most sought timbers. It is exported under the English trade name 'royal mahogany,' and the exporters keep very quiet about another famous trade name, 'crabwood.'

As so many other trees, the caobilla may also provide a number of other useful products than timber. The seeds contain a bitter, brown oil which is extracted in many countries and is known as andiroba oil, from the Brazilian name for caobilla.

Some botanists have received the information that caobilla seeds are eaten by the Awá-Coaiquer Indians in Ecuador, but hopefully that is a misunderstanding. Even agoutis in the forest hesitate to eat this seed! And no wonder: it tastes terribly, and contains terrible compounds, like "7 deacetoxy-7-ketogedunin" and "the furanoid tetranortriterpene andirobin (C27H32O7) 89."

The seed oil is not edible, but has both practical and medicinal uses. It is used by local people for lamp oil and gives a clear, smokeless flame. The oil is used as a mosquito repellent and on the the head to get rid of lice. Employed as a lotion, it is used for skin diseases. In Trinidad, it is mixed

with camphor and rubbed on the body if one has a severe cold. Industrially, andiroba oil is used for preserving furniture against insect damage and for soap-making. It gives a light-brown soap which will lather more freely if made with potash rather than caustic soda.

The caobilla has oil-producing relatives on other continents: Carapa procera and indica in Tropical Asia and Carapa grandiflora, native to Uganda in Africa. All produce a bitter seed oil.

The bark is also very bitter and may be used for tannins. Decoctions of the bark are used against fevers and intestinal worms, and for washing ulcers and other skin troubles. In Guyana, the bark decoction is taken to halt diarrhea and alleviate rheumatism.

Because of the usefulness of the seed oil, we examined how many seeds could be collected in the forest in Aguabuena. The seeds weigh almost 50 g on the average. It turned out that by daily collecting, one could get more than one ton of fresh seeds from one hectare of mature forest. This varied over the year from an average of almost 6 kg per day per hectare in March in the middle of the dry season, to less than half a kilo in May. Seeds could always be found. In steep gullies of the hilly terrain, seeds sometimes accumulate, making them easy to find.

In the Osa, a cooperative of former gold diggers at Dos Brazos de Río Rincón sells mosquito repellant made from caobilla oil and achiote, the red fat from Bixa orellana. This practise is also known in French Guiana. With the growing number of nature tourists in the Osa, it would probably be possible to sell several such products from this bitter oil – skin lotions, repellents, soaps, oil lamps, etcetera.

The largest of guabos

Scientific name: Inga alba
Family: Mimosaceae
Local names: guabo colorado, guabo ron-ron, cotoguó bucrie

The guabo colorado owes it name to the bright, light brick-red color of its bark. Since the bark of the guabo colorado always peels off in thin, long strips, the color remains fresh in contrast to that of most trees' bark which appears rather uniformly grey-brown-green due to tiny epiphytes (algae, lichens and mosses) growing on the bark. There are numerous different guabos in the Osa, and most are very hard to distinguish from one another. This one stands out, not only because of its conspicuous color, but also because it is the largest of the guabos. It is quite straight and tall and may reach 50 meters height and more than one meter diameter. No other of its many cousins can match this.

The guabos are known to everyone in the Osa, because their fruits are good to eat. The fruit, the guaba, is always a long legume with white, sweet and juicy pulp surrounding the seeds inside. These trees are often grown for their fruits (mainly Inga spectabilis) and for shadow, and you will often see several wild species of guabo growing in open pastures. None of the 36 different species of Inga registered in the forests of the Osa so far provides any useful product other than the fruit. Except for one, the guabo colorado.

This species has an edible fruit like all other guabos – in Brazil, the fruit is even sold on local markets. Also, the guabo colorado provides timber. The name guabo ron-ron refers to the wood's similarity with one of the finest timbers of the Osa, the ron-ron (Astronium graveolens).

In the Osa, guabo colorado is considered the only guabo with medicinal use. An extract of the bark is used against a skin affliction called carate. In French Guyana, Indians use bark decoctions against diarrhea and mouth blisters in children.

Finally, a black dye may be made from the bark. In Ecuador this colorant is used in some parts of Amazonia for painting gourds, bows and arrows sold for souvenirs.

Cow milk and bark cloth

Scientific name: Brosimum utile
Family: Moraceae
Local names: vaco, lechoso, tain guata

The Osa has some one thousand different tree species. A great number are very rare, and a few are very common. A single tree species is the far most dominant one in all of Northern Osa's species-rich forests: the vaco. The vaco has a cylindrical bole, and is usually among the thickest trees, but is rarely more than 50 meters tall. The base of the tree has thick visible roots, but no buttresses. The bark is smooth and reddish without epiphytes, and the leaves are simple and quite long, up to 30 cm. From every part of a vaco tree, thick, white latex will ooze out from cuts.

The vaco is both abundant and one of the largest trees of the forest. This means that the largest volume of wood of any single kind in the Osa is vaco wood. The reason for this dominance may in part be an effect of timber logging. The most precious timbers have been cut in the Osa for more than 40 years, and these are often hard and slow-grown trees. Not so with the vaco. It grows rapidly and produces soft wood of little value. Today, it is cut for making plywood.

Although it does not have very good timber, the vaco is a tree of many uses, the most famous one being – milk!

The latex has given this tree its local names, and also the English name 'cow milk tree.' It has great similarity with milk and also possesses some of the virtues of true milk. Paul Allen, an early explorer of the forests of Golfo Dulce, reported: "The fresh milk has been tried in coffee and can scarcely be distinguished from good cream, while chilled it can be whipped and flavoured with sugar and vanilla extract and served to unsuspecting humans. Dogs and cats, however, will not touch it. In Guyana, a kind of cheese is said to have been made from it."

How many of Allen's stories are true is hard to tell. But appparently the latex is both edible and nutritious. The explorer Alexander von Humboldt reported the use of the latex as part of the routine diet of slaves on the north coast of Venezuela. It may even serve as medicine. In the Osa, the white latex is taken for gastric acid and

ulcers. Likewise, the Indians of the upper Río Vaupés in Colombia eat the latex to correct indigestion. In Venezuela, the latex has been taken as a remedy for asthma. Costa Ricans are also said to employ it as an astringent to halt diarrhea.

The latex was formerly added as an adulterant to natural Hevea rubber, and also to chewing gum.

The fruit pulp is sweet and edible, and the seed may be eaten as emergency food, ground as flour for bread.

One final product may come from the vaco: cloth. The inner bark of the tree may be doubled and beaten into a soft tissue much like thick, soft paper. Such bark cloth was in former days used for clothes by indigenous peoples in many parts of Latin America. In more recent time, it has been used in rural areas as a kind of thin mattress, in the Osa called pastate. Also Boruca Indians have used it for bark clothes, called mastate. The Guaymie name tain guata means 'red bark cloth' and refers to the same quality of the vaco.

A number of other species found in the Osa, all relatives of the vaco, have been reported as sources of bark cloth: hule (Castilla tunu), chilamate espinoso (Poulsenia armata), higuerón (Ficus maxima) and quiubra (Pseudolmedia spuria). A few species from other families are sometimes called 'mastate' in the Osa, suggesting that they too have served for making cloth: Cordia lucidula from the family Boraginaceae, and Mortiniodendron anisophyllum from the Tiliaceae.

The first natural rubber

Scientific name: Castilla tunu
Family: Moraceae
Local names: hule, yos

The hule tree is quite common in secondary forest and other disturbed areas in the Osa. It is easy to recognize with long, soft, hanging branches and large, alternate leaves, all covered with soft hairs. The bark is brown and fissured, and filled with white latex, the hule, or rubber.

When Colombus came to America, he saw indians playing with rubber balls. This material came from Castilla trees and became the natural rubber of commerce. Rubber extraction led to overexploitation of hule trees in all of Latin America, because extraction required the killing of tree. To maintain rubber production, plantations were made, for example in the Atlantic Zone of Costa Rica and in Coastal Ecuador.

The salvation of the Castilla trees was the discovery of Pará rubber, which is extracted from Hevea brasiliensis. This tree is abundant in swampy parts of Amazonia, and latex can be extracted from it repeatedly without the tree dies. Today, Hevea is planted all over South East Asia and is almost the sole source of natural rubber.

Left in the forest is the original hule, once the World's only source of the prized rubber. A gold digger in Aguabuena showed me a far more humble, nowaday use: a little lump of hule latex was used to pic up tiny grains of gold from the stream where the gold was washed.

Candlenuts

Scientific name: Otoba novogranatensis
Family: Myristicaceae
Local names: bogamaní, fruta dorada

The bogamaní tree is closely related to trees known as fruta dorada ('golden fruit') in the Osa and elsewhere in Costa Rica. The bogamaní is distinguished by large, broad and hairless leaves with a pale underside and a reddish bark without fissures. Still, it shares so many important characters with the true fruta doradas that most people include it under this name. This is understandable, because although the bogamaní belongs to the genus Otoba, – not Virola, the genus of the frutas – and has a mature fruit that is not golden, but smooth and green, is shares with fruta doradas a rather unique crown structure reminder of that of a Christmas tree, reddish bark, red sap, good red timber, and an oil seed looking much like a nutmeg.

The seeds are rich in useful oil. They have been used for candles for a long time by small-farmers, and are therefore called candlenuts. The Kuna Indians in Panama pierce a dozen nuts on a string, each nut burning for five minutes.

The seeds are also collected for commercial extraction of the oil, particularly in Colombia. This product is called Otoba Fat, Otoba Butter or American Nutmeg Butter. It is mainly used for soap-making.

The name bogamaní stems from Chiriquí.

The golden fruit

Scientific name: Virola koschnyi
Family: Myristicaceae
Local names: fruta dorada, candelo, nibigara murúcrie, nibigara

Fruta dorada is one of the most abundant trees in the Osa. It belongs to the genus Virola which is represented by at least five species in the Osa, the most common one probably being Virola koschnyi.

The fruta dorada trees are very straigth-stemmed with slender buttresses and reddish, fissured bark. The branches are straight and horizontal and placed in whorls on the main stem. Such a pattern of the branches is almost unique to the family of the frutas, the Myristicaceae, and therefore called 'myristicaceous branching.' When you see a fruta dorada in the open you may notice that the branching is much like in a Christmas tree.

The fruit is a yellow capsule with two valves that open at maturity and expose a 1-2 cm long, egg-shaped seed covered by a plastic-like, red layer with a peculiar, braided shape.

The seed is rich in oil. This makes it popular among large birds like toucans. When you examine the seed, you will find that its shape is identical to the condiment seed nutmeg, and when cut, its coloration is also the same, being a mix of white and brown. This is no coincidence, since Virola species are almost identical to the nutmeg (Myristica fragrans) which comes from Indonesia and belongs to the same family, the Myristicaceae.

The fruta dorada is felled as a timber tree, but it is more renowned for a number of other uses in Latin America, mainly related to the oil which is called Virola fat or Ucuuba fat.

The seed contains so much oil that dry seeds have been used as candles, for example by Indians in Panama. The same kind of use is probably the reason for its local name candelo ('candle') in the Osa. The seed oil or fat has been used to make candles and soap in much of Latin America. The oil is traditionally separated from a paste of the dried seeds by boiling. The substance is scooped up from the surface, hardens and is separately melted down, sieved and made into candles which burns with a pleasant odour.

In Guatemala, the dried seeds were used

as a flavouring for chocolate and offered in markets for this purpose.

The oil is rather bitter and spicy. It may have a potential in cosmetics, since has been shown to contain a compound called isopropyl myristate which is used in cosmetic manufacture.

Supposedly the fruta doradas produce lots of seeds. Figures of 50 to 100 kg seeds per tree per year have been reported, and seeds contain 60 percent oil. But off course it is not easy to collect so many small seeds before they are eaten by wild birds or mammals. In Brazil, however, many of the trees grow close to the rivers near the mouth of the Amazon river. Here, the seeds tend to fall into the water and are collected from the water as they float downstream.

A red sap exudes when the bark is cut. This is a watery resin which may be dried into a powder and serve a number of very different purposes. In popular medicine it may be used to cure trush, a fungal infection of the tongue and the roof of the mouth. In Nicaragua, the resin is used as red pigment in paints. Perhaps most peculiarly, it may be used as a hallucinogenic snuff. This use is known among shamans of a number of Indian nations in Amazonia, but in the Seventies it also became popular among jetset North Americans and was known as 'business man's drug,' supposedly because the effect was rather swift.

The real chewing gum

Scientific name: Manilkara staminodella
Family: Sapotaceae
Local names: chicle, níspero chicle, nomóncrie cote

The chicle tree has a fascinating story. This huge forest tree has in its characteristic, rough bark a white latex which is the source of the original chewing gum. Today, most chewing gum is synthetic, but the latex of chicle trees has been used for chewing by the Aztecs and other people ever since.
The tree itself is majestic. The trunk is a conspicuous, straight column that reaches 60 meters above the jungle floor and often has no branches for more than 30 meters. It is clad in an unusual bark, rough and deeply furrowed where barks of most other rain forest trees are rather thin and smooth.

The wood of the chicle tree is even more unusual. It is beautifully dark red, hard, and very heavy. Even dry, it will sink in water. It is also extremely durable. A dead chicle giant may stand in the forest for years, and once fallen, it will last for decades. In Aguabuena, a 6 meter long and 140 cm thick log had been too heavy to drag out for the tractors. It was therefore left lying next to an old logging road. After more than 25 years, you could still cut one centimeter deep in the end of the log and find the wood red and undamaged by the hot and wet climate.

The wood was used in the construction of the Maya temples. I have been told that today it is not important commercially because it damages the timbermens saw.

About a century ago, it was thought that chicle latex could be a new source of natural rubber which was in great demand. But chicle did not work at all as rubber. Then, somebody was inspired by the habit of local Central Americans who simply chewed the latex for relaxation. Sugar was added, and soon European pharmacies sold chewing gum as a new, harmless pill for nervous people!

Today, chewing gum is used everywhere. If you could collect all the used pellets of chewing gum in the World during a whole year and put them in a straight line, they would reach around the Earth more than 40 times!

Synthetics have now substituted most of the original chewing gum, because natural trees can not provide nowhere near that

consumed amount and because labor costs by extracting natural chicle are high.

While chicle has been extracted throughout Central America, the largest concentration of high grade chicle is found in the Maya Bioregion in Guatemala. Though relatively expensive at US$1.70 per pound (1990-91), chicle is a high quality latex. Demand declined due to rising labour costs and cheaper synthetic and natural substitutes, leaving the industry nearly dormant in the early 1980es. It is said that chewing gum was also produced in Golfito near the Osa, but that the factory was closed in 1977.

With recent interest in natural sustainably produced products from tropical forests, the market for chicle has rebounded considerably. Virtually all buyers are Japanese.

The best species for chicle is Manilkara zapota, whereas Manilkara chicle and staminodella, the Osa species, provide lower quality. A number of unrelated tree species found in the Osa are among the many that have been used to adulterate the real chicle latex: vaco (Brosimum utile), lagartillo negro (Lacmellea panamensis), and quiubra (Pseudolmedia spuria).

The fruit is also very delicious, like marmalade. Commercially, it is known as sapodilla. Since it takes about 40 years for a chicle tree to produce fruits, it is not directly useful for cultivation. However, this problem has been overcome by taking branches from mature trees and grafting then on young stems, thereby creating a young tree for cultivation and harvest of sapodilla fruits. Although a native American species, the Manilkara zapota is grown as a fruit tree in Asian countries, like Thailand and Malaysia.

Bitter drops for your health

Scientific name: Simaba cedron
Family: Simaroubaceae
Local names: cedrón

In the dry season of the Osa (February to May), you may come across a wonderful fruit smell in the forest, like a very fragrant peach or apricot. If you find the source of the smell, you will see a fruit much like a slender peach, some seven centimeters long. You have most likely not found a good lunch, since the pulp may be fragrant, but it also perish very rapidly in the high temperatures. But a far more interesting and less perishable part of the fruit is just beneath the rather thin pulp: a large, egg-shaped seed with a shell a little like a mango seed. Break the shell open and taste the seed, and you will encounter one of the most bitter tastes you have ever known. Also, you have tasted a famous medicine.

The tree is very small for Osa standards. Usually, you find the tree being only some 10-12 meters tall, although it occasionally reaches more than 30 meters. Although it is a genuine tree, the cedrón looks almost like a palm: a slender, unbranched pole with a crown of pinnate leaves up to 1.5 meters long. When it flowers, it is also reminder of some palms since the inflorescence appears from the top of the tree as a huge fountain, more than a meter high, and consisting of large, green, fragrant flowers.

The cedrón seeds were one of the earliest American rain forest medicinals to reach European pharmacies. The seeds were exported to Europe already in the 16th Century and known in the pharmacopea under the Latin term semen cedronis.

Still today, you may buy it in Costa Rican pharmacies as an extract called gotas amargas, bitter drops.

As with other very bitter plants, the cedrón is used medicinally to fight fevers and snake bites. Also, it is powerful enough to kill off intestinal amoebas.

Almost all species of the cedrón family, Simaroubaceae, are bitter to some extent. Best known in the Osa is hombre grande (Quassia amara), another tree which provides a renowned bitter medicine. Other bitter cousins are the aceituno (Simarouba amara), and the shrubby Picramnia. Angostura bark

from Venezuela also comes from a Simaroubaceae tree. It is used in bitter tonic and drinks.

Bitter plants are often medicinal. Examples of species from other families in the Osa that are sources of bitter medicines are quina (Naucleopsis spp.), caobilla (Carapa guianensis), cedro amargo (Cedrela amarga) and amargo (Aspidosperma spruceanum).

The nuts that named a country

Scientific name: Sterculia alleni
Family: Sterculiaceaceae
Local names: panamá

The nuts of this tree, the panamá, have probably given name to Costa Rica's neighbour to the southeast, Panama, since people there used to eat a lot of the nuts.

There are three kinds of panamá trees in the Osa. The three kinds are species that look quite different from each other, but since the fruits are much same, they are not distinguished by name. The most common panamá has only recently been described by scientists as Sterculia alleni. It has a very smooth, light yellow bark and a peculiar mix of slender buttresses and stilt-like roots, making the tree look like it does not want to touch the ground. Often you can bend down and see air everywhere under the buttresses of even large trees. The leaves are wheel-shaped and entirely divided. This is called 'digitate leaves' since the parts of the leaves are reminding of fingers (digits) of a hand. The two other panamá trees are Sterculia apetala and Sterculia recordiana. Both of these have quite ordinary stems and only small buttresses. The leaves are undivided, but those of Sterculia apetala are lobed and look a lot like the leaves of chumico (Pourouma bicolor), whereas Sterculia recordiana has smooth leaves with hairy underside. The one encountered in Panama is probably Sterculia apetala.

In August-September you may come across numerous open pods on the ground, some 10 cm long, grey-green on the outside and pink inside. These pods contain handfuls of smooth, black seeds, some 2.5 cm long with a shape like bird eggs. You may eat the seeds raw, but traditionally they are eaten roasted.

When you eat panamá nuts raw, be sure to clean them carefully. The seeds and the inside of the pods are filled with tiny, needle-like hairs that are most irritating in the mouth. And do not eat too many! The raw nuts can give you a bad stomach ache if you eat to many at a time.