

Tambopata Newsletter

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Explorer's Inn Newsletter is produced by the Resident Naturalist volunteers at Explorer's Inn. More information about the Resident Naturalist Program including some of the volunteers' tasks and duties and a short introduction of the people who are currently partaking in this program can be found on the final page.

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Recent Sightings, the pick of the best



Photo: G. Bareham

Jaguar (*Panthera onca*)

This majestic animal, emblematic of the Amazon and normally very rarely sighted at Explorers Inn has been seen on several occasions recently, the majority of sightings being of what we believe to be the same male along the banks of the Tambopata river, however there has also been two sightings of a mother and juvenile in the area.



Photo: Camera Trap

Red-brocket deer (*Mazama americana*)

This distinctive forest deer is the largest brocket deer species and has

been sighted early in the morning by guests walking to the lake, once during a night walk and also was captured twice in our camera traps. The deer's diet consists of fruit and foliage but like many rainforest animals it also has a taste for salty clay found at forest clay-licks or to use the Quechua name collpas, where this picture was taken.



Photo: J. Brodie

Spectacled owl (*Pulsatrix perspicillata*)

This large and striking bird which grows to about half a meter tall was spotted on Capirona trail where it glared with apparent disdain at the lucky onlookers, ruffling up its head feathers to make itself more intimidating. The bird requires mature, healthy rainforest to provide sufficient large tree holes and its food of small mammals, large insects and other birds (including reportedly smaller owls) it is therefore threatened by deforestation even where the forest is allowed to regrow after cutting or is selectively logged.



Neotropical river otter (*Lontra longicaudis*)

Little is known of this highly elusive, shy and smaller relative of the Giant river otters. They live in small clear water streams, deep in the forest such and it was in such habitat that they have been spotted recently, a single individual in a stream on Panchita trail and two on the stream crossing on New Colpita trail and two more at the mouth of a stream at Collpa Chunchu the location of the camping trip. Before this it had been a very long time since sightings of these otters had been reported.

The Wonderful World of Butterflies

The Tambopata Reserve Zone is renowned for butterflies. The area holds the world record for the number of species with an impressive total of over 1200. During a stay at Explorers Inn it is difficult not to come across some of these species, either around the lodge itself or out walking on one of the trails. As butterflies have six legs, a head, thorax, abdomen and a pair of antennae they are classed as insects. Butterflies and moths belong to the family Lepidoptera which accounts for one tenth of all known animals on the planet. There are approximately 140,000 species in this order and only 20,000 of them are butterflies (Smart, P. 1985).

Butterflies are generally diurnal, with brightly coloured wings and club shaped antennae. Moths on the other hand are usually nocturnal, with dull colouration and tapered antennae. This is a useful guide to distinguishing between the two but there are many exceptions. The *Urania* moth is one such exception that can often be seen around the lodge. It is diurnal with beautiful green coloured wings, which means this moth is easy to mistake for a butterfly.



Urania moth

The bright colouration in butterflies is often used in courtship displays or territorial disputes. In some species their colours are used to advertise to predators that the butterfly is poisonous or unpalatable to eat. A predator such as a bird which eats this butterfly will remember from the pattern that the species is distasteful and will leave it alone in future.

Other species which do not have the same poisonous body fluids often adopt the same pattern as an unpalatable species and as a result are often protected from predators in the same way. This is known as Batesian mimicry. There are also cases where two unpalatable species adopt the same design and colouration known as Mullerian mimicry. In this case it is thought that the 2 species benefit because predators only need to learn the pattern is unpalatable once rather than twice.



A Metalmark butterfly seen on Laguna Chica trail

Where two species look the same to the human eye the butterflies often use their ability to see UV light to distinguish between species. Some species have UV reflecting areas on their wings which helps with their identification (Alcock, J. 2005).

One of the most striking butterflies seen in the area is the beautiful blue Morpho which can have a wing span up to 200mm. There are about 80 species of these butterflies and several are commonly seen on trails or around the lodge.



Morpho butterfly

Other butterflies may lack the beautiful colours of the morphos but still deserve some attention. The large Owl butterfly can reach the same size as the Morphos, although it is a dull blue or brown on the upperside of the wing. However, when sitting with wings closed, the underside shows a large eye spot (ocelli). This fake eye is used to startle predators or draw attention to an area that can be damaged without affecting the butterfly's survival. Owl butterflies can often be seen on trunks or branches of trees on the sides of the trails.



Owl butterfly on Main Trail

Transparent butterflies are also common on the trails. There are several species, some of which are fully transparent and other which are partly coloured and partly transparent. The transparency makes them very difficult to spot to predators. They fly close to the forest floor and are often disturbed by walkers along the trails, making them easier to detect.



Transparent butterfly

Butterflies have no jaws and use a proboscis to suck up food in liquid form. When the proboscis is not in use it can be clearly seen curled up under the head of the butterfly. Mostly they feed on nectar although they can also be found drinking the fluids from rotting fruits and sap from damaged trees. A more unsavoury habit is to feed on the juices of rotting carrion, excrement or urine and even human sweat.

On sunny days it is also common to find groups of butterflies in muddy areas siphoning from puddles. This happens often around the lodge or down by the muddy areas near the port. It is mainly males which exhibit this behaviour and it is thought they obtain important minerals possibly for sperm production.



A variety of butterflies siphoning mud by the port

While walking around the trails it is also possible to see caterpillars or pupae if you look closely. Butterflies lay their eggs, sometimes singly, sometimes in batches on or very near the food source for the caterpillars. Caterpillars are very fussy about their food and often only eat one species of plant. They can be very well camouflaged, some even look like bird droppings. Others are covered in hairs which can cause stinging and itch if touched, these are known as urticating caterpillars and it is not advisable to try picking them up!



Urticating caterpillars and a well camouflaged pupa

Caterpillars go through several moults until they reach their full size and their final moult reveals a pupa. These pupae are also often brilliantly camouflaged to look like leaves, as you can see from the photo above, so they can be difficult to find. Other caterpillars make a cocoon out of leaves fastened with silk as extra protection for their pupa inside.

A little patience and some knowledge of the lives of butterflies can help increase your chances of seeing some of the most beautiful butterflies in the world during your stay at Explorers Inn. SAS

References

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All photos by Shelley Steven

Cordyceps fungi, the enemy within

Fungi are rife in the rainforest, the hot and humid conditions create the perfect environment in which they can thrive. For the most part these hoards of fungal species are engaged in the “traditional” fungal tasks of decomposition and plant disease. Indeed many rainforest trees and all orchid species are almost completely reliant on symbiotic relationships with a group of fungi, the mycorrhizae, for nutrient acquisition. The fungi grow into the plants roots and provide it with nutrients gained from the fungi’s decomposition activities in exchange for the plants photosynthetically produced sugars. Fungal species are thus an integral part of the rainforest ecosystem and have evolved many intimate relationships with a multitude of its other inhabitants. Some of the closest of these relationships and certainly some of the most bizarre are those formed between the entomopathogenic Cordyceps fungi and their insect prey.

Occurring all over the world but being particularly prevalent in the tropical rainforests, a typical Cordyceps species is a specialist parasitic hunter of single insect species or several very closely related species. The fungus starts its lifecycle like all fungi as an airborne spore. This spore attaches itself to the outer surface of its insect host, where it germinates. The germinated spore enters the host through its breathing holes or spiracles and once inside the body cavity it grows filaments throughout the insect and starts to digest and absorb its non-vital organs. The fungi can thus develop to a reproductive stage without killing its host.

Once the fungi has reached this level of maturity it turns to mind control, extending filaments into the insects brain, from which it releases chemicals which alter the insects thought processes and elicit strange behaviours beneficial to the fungi. In ants the Cordyceps causes infected individuals to climb high up on to exposed vegetation and then attach themselves to this with their vice like jaws. This will be the unfortunate ant’s final act, as the fungus then proceeds to kill it by digesting and consuming its brain and other vital organs. Soon after its grizzly but inevitable demise, fruiting bodies of the Cordyceps fungus sprout from the gaps in the exoskeleton at the joints. The mature bodies produce spore capsules which burst on release, showering the surrounding area with millions of tiny infectious spores which are aided in their wind distribution by the elevated position of the dead host.



Victims of infection by fungi of the genus *Cordyceps*, mature fruiting bodies erupt from their joints as they unwittingly act as vectors for the next fungal generation. T-B; Grasshopper (J. Brodie), ant (Y. Lee) and moth (J. Brodie)

Depending on the species it takes *Cordyceps* only 4-10 days after initial infection with just one of these spores to kill a host, so once just a few individuals of an insect species are infected the fungus can rapidly reach epidemic proportions. In ants this can easily wipe out an entire colony. Due to the seriousness of this threat individual members of ant colonies regularly check one another for signs of infection, killing and removing

suspect individuals from the vicinity of the colony.

Such infections can obviously have severe consequences on the host species` populations, however these are usually so large and widely distributed that it is highly unlikely that all individuals will become infected and the species made extinct. Indeed this would be as disastrous for the specialist Cordyceps species as for the insects as it would find itself hostless, unable to reproduce and also go extinct. Thus Cordyceps species don't often cause extinction but keep insect populations in check, the risk of a population decimating Cordyceps epidemic being much greater for insect species with larger and denser populations. In this way Cordyceps species stop single insect species from becoming too dominant and abundant in rainforest ecosystems and in doing so help preserve one the most fascinating and characteristic features of tropical rainforests, unrivalled vastness of insect biodiversity. JAB

The Tapir



On my Facebook profile I have a photo (top) of a very friendly young tapir called Isobel which was a pet at a lodge in the Brazilian Amazon. It was amazing to be able to get so close to such a normally elusive and shy creature, rarely seen in the wild. Isobel, being a pet, was neither elusive or shy, but was still nevertheless a remarkable creature. Since I put this photo up I have had quite a few responses from people asking just what that animal is "with its eyes too far down its head." It illustrated how people (who don't come from tapir country) are generally unaware of them, especially considering that they are the largest native land mammal in the New World.

A tapir is a large, browsing animal, roughly the shape of an over-sized pig but with a short, prehensile trunk. Adults reach around 6.5 feet (2 meters) in length and 330-550 pounds (150-250 kg) in weight. They have a lifespan of around 25 to 30 years. Although tapirs were once widespread, only four species have endured into the modern world: three from Central and the warmer parts of South America and one from South-east Asia. Their closest relatives are the other odd-toed ungulates: horses and rhinoceroses.



A baby tapir

The species we have here is the Brazilian or Lowland tapir. All tapirs have oval ears, rounded, protruding rumps with stubby tails, and splayed, hoofed toes, with four toes on the front feet and three on the hind feet, which help them walk on muddy and soft ground. Baby tapirs have striped-and-spotted coats for camouflage. Females give birth to a single calf after a gestation period of 13 months, which then remains in intermittent contact with its mother for around seven months, becoming increasingly independent .

In the forest around the lodge there are lots of signs of tapir activity especially around the salt licks which they regularly visit. This is evident by the many footprints found. They favour waterside habitats such as river edges and swamps. But they are all-terrain animals that travel widely through the forest including areas far from water and they can negotiate almost vertical, slippery hillsides.



Tapirs near a water source will swim, sink to the bottom and walk along the riverbed to feed, and have been known to submerge themselves under water to allow small fish to pick parasites off their bulky bodies. Along with fresh water

lounging, tapirs often wallow in mud pits, which also helps to keep them cool and free of insects.

I was once in a canoe on a lake in Manu National Park. It was a beautiful clear day. Suddenly we heard a crashing of vegetation at the lakeside, then out came a tapir which, oblivious of our presence jumped straight into the water, heading for the other side. What is interesting when they swim is that the only thing that is exposed above the surface of the water is their snout. The rest of the body is completely submerged. When it reached the other side, it shook itself like a dog then crashed back into the vegetation and disappeared. We were so lucky to have seen that, especially considering that tapirs are largely nocturnal and very shy. It illustrated how at home they are in the water. The aforementioned Isobel used to regularly disappear off for long periods into the river the lodge stood in. When she returned (to be fed in the kitchen) she would climb the wooden steps back up to the lodge which were as steep as the ones at Explorers Inn with no problem at all. They are very strong and fast moving creatures when they want to be, considering their size and cumbersome appearance. When alarmed they run for the nearest water, plunge in and swim beneath the surface. They can flatten everything in their path in a desperate rush.

The snout or proboscis of the tapir is a very interesting and highly flexible structure, able to move in all directions, allowing the animals to grab foliage that would otherwise be out of reach. They will spend many of their waking hours foraging along well-worn trails, snouts to the ground in search of food. They are estimated to eat around 40 kilograms (85 pounds) of vegetation in one day. The lowland tapir particularly favours the fruits of the aguaje palm which is abundant here.

Adult tapirs are large enough that they have few natural predators, and the thick skin on the backs of their necks helps to protect them from most threats. Even a jaguar would have difficulty taking an adult, it being twice its weight. Predictably, humans are by far their major predator. Hunting for meat and hides has substantially reduced their numbers and habitat loss has resulted in the conservation watch-listing of all four species: the Brazilian Tapir is classified as lower risk, near threatened. Tapir meat is much prized and they are easily hunted with dogs and imitated calls. (Tapirs emit a high pitched whistle). Such a large and bulky animal provides a lot of meat which is why they are scarce or completely gone from over-hunted regions. Hunting for tapir meat is increasing as the wild-meat industry develops, with tapir meat now frequently sold in city markets throughout South America. In Paraguay and Argentina tapirs are hunted for their hides, which are commonly used in Paraguay to make sandals that are sold to tourists as souvenirs. In Colombia the species is listed as endangered due to over-hunting.



Finally, the closest we have got recently to actually seeing a tapir has been this ghostly image captured at night on a remote camera on one of the trails close to the lodge. GB

Ref. L.H. Emmons. Neotropical Rainforest Animals 2nd ed (1997)

For Queen and Colony, a remarkable success story

Ants are everywhere, or at least almost everywhere. With the exception of the two poles, they have colonised every terrestrial environment on the planet. However it is here in the rainforest, that ants truly thrive; they comprise about ten percent of all animal biomass in the Amazon and about fifty percent of all insect biomass. Ants demonstrate some of the most sophisticated examples of social behaviour known in the animal kingdom; they are hunter gatherers, farmers and fantastic architects. They herd cattle (more about this later), wage wars and even take slaves.



Leafcutter ants are the masters of task specialisation. Major workers carry

cut leaves whilst minor workers sit on the leaves to defend the majors from parasitic flies. Photo: J. Brodie.

Why are ants so successful? And what factors have enabled them to become so dominant and abundant? One of the most likely reasons for the success of ants is the colony. Unlike their winged relatives wasps and bees, all species of ant can exist only in colonies. Depending on the species, ant colonies can range in size from several dozen to several million individuals. They consist of one or a few queens, sterile female workers and relatively idle males, whose only job is to leave the nest and mate.

The queen, a highly specialised female, carries out reproduction for the whole colony, whilst the remaining tasks of colony maintenance, brood care and foraging are all taken on by her workers. This may seem like an unfair, feudalistic relationship, which at first glance makes little evolutionary sense. Natural selection is a process, through which fitter individuals have improved survival, enabling them to reproduce and pass on their genes to the next generation. Worker ants giving up their reproductive rights seem evolutionarily counterproductive, if the ultimate goal of all living organisms is to reproduce. Why would workers forego reproduction only to expend all their efforts on raising the offspring of the queen?

The bizarre reproductive arrangement found in ants, does of course have an evolutionary foundation. The entire concept of an ant colony works only because the colony is a sisterhood and the extreme act of reproductive altruism is only possible because it is directed towards family. Related individuals share some of the same genes and the more closely related they are the more genes they have in common. This means that an individual can gain genetic benefits indirectly from the reproduction of close relatives, as some of their shared genes will be passed on to the next generation. This may make helping relatives reproduce genetically worthwhile.

The process of gaining genetic benefits by helping relatives is termed kin selection and is especially prevalent in ants, because ants have a genetic system known as haplodiploidy, where family members are related to each other asymmetrically. Unlike humans who are related to their parents and to their full siblings by 50% (having half of their genetic information in common), female ants are related to their daughters by 50% but to their sisters by up to 75%. This means that a worker can pass on more genes through the survival of her sisters than from reproducing herself. This is why workers opt to give up reproduction, and instead raise their sisters (the daughters of a mother queen). Kin selection is also behind the many examples of cooperation found in ant colonies, as workers are often sisters from a single queen mother and so benefit from helping each other.



Ants of the genus *Monomorium* herd their aphid cattle in a remarkable symbiosis. Photo: A. Wild.

Whilst the queen specialises in laying eggs, the workers are freed from reproductive duties, which allow them to concentrate on other tasks. Work in the colony is divided between different groups of workers, with different castes of workers often being morphologically specialised, allowing them to take on tasks which are most fitting to their size and morphology. This leads to exceptional colony efficiency.

The leafcutter ants are the masters of task specialisation and show the greatest size difference between castes of workers in the ant world. Huge major workers cut leaves and carry them to the nest, whilst tiny minor workers work inside the nest, chewing the leaves and using them as a substrate upon which to cultivate a fungus, which will feed the colony. The minor workers weed the fungus gardens regularly to remove other fungi. Task division is even extended to rubbish disposal. Rubbish such as the bodies of dead ants is deposited in a cache by the colony, where it is collected by special rubbish workers who take it to a rubbish dumping site. The workers which tend the dump are treated as untouchables. If they try to enter the nest, they are attacked by the rest of the colony thus preventing the spread of disease. The rubbish workers' genetic fitness does not suffer, despite their lowly existence on the dump. Although they will never mate or reproduce, their genes will be passed on through the survival of their siblings.

Leafcutters are not the only farmers in the ant world. Many ant species are cattle herders, their cattle being aphids, caterpillars and mealybugs. The ants build shelters for their cattle and herd them from one feeding site to another. They milk the cattle by stroking them, stimulating them to produce honeydew, a sugary substance which the ants consume. In return, the ants provide protection for their cattle.

Behaviours, such as farming, seem to parallel those found in human societies, only unlike human societies, ants have no central organisation. Ants have no leaders and yet a frequent sight in the rainforest is the marching columns of army ants, which hunt together in extremely organised raids, consuming all animal life in their path. The rigor and organisation of our human armies would not be possible without a hierarchy of leaders issuing orders lower down and organising ranks, yet ants maintain order because each ant follows a simple set of rules in

response to certain stimuli.



Army ants like *Eciton burchelli* march for miles in self organised columns in search of insect prey. Photo: Y. Lee.

The concept of a cooperative colony is a fragile one and one which can easily be exploited. A colony will be a large target for social parasitism and abuse of the system for many species that wish to take advantage of its cooperation. Slave making ant species such as those of the genus *Polyergus*, raid the nests of other ants species, stealing their eggs and raising them in their own colony. The stolen eggs will eventually become workers that will act as slaves, performing all the usual foraging and brood rearing tasks for the slave making colony, but receiving none of the genetic benefits of helping kin. A number of ant species and even some species of butterflies are known for sneaking into ant nests and being fed or having their young raised by a host ant colony.

In general however, such scenarios are uncommon, as ants have evolved very powerful recognition systems which enable them to recognise other species and even other colonies of the same species. Recognition is based on chemical cues present on the ants' surfaces, and helps to maintain colony integrity, something which is vital for kin selection to work. Invaders who are identified will feel the wrath of the whole colony, which will defend the nest at all costs (death does not after all result in reproductive loss to a worker). It is this willingness to serve the colony and the incredibly efficient and seemingly endless toil that ants are so famous for, which makes ants the successful creatures they are today. A colony of ants working together can surpass the productivity of any solitary animal. Whether they are in the treetops or the soil, from the temperate forests of the sub arctic to the depths of the Amazon rainforests, ants cooperate, dominate and conquer all other species. YRL