

The Harpy Eagle (*Harpia harpyja*) in the Infierno Native Community

By Renzo P. Piana

Introduction

Since 1996, research concerning the biology and behavior of the harpy eagle (*Harpia harpyja*) is being conducted in the Infierno Native Community (INC) (12°43'S; 69°13'W) located along the Tambopata River in the province of Tambopata, department of Madre de Dios, southeastern Peru.

During these four years, most of the field work has been spent in the search and observation of adult eagles and their chicks, in implementing along with the community, policies destined to protect the eagles and its habitat and in designing methods that will guarantee the sustainable management of the eagles' population in the INC.

Participation of local people has always been the cornerstone of this project. INC members are very aware that the proper management of their natural resources can be an important tool to improve their life conditions.

In 1997, and by communal agreement, the INC accorded to keep the forest around the nests free from logging, hunting and slash and burn agriculture. More recently they have selected the harpy eagle as the symbol of the community.

The INC, in association with the Peruvian company Rainforest Expeditions (RFE), is conducting ecotourism activities inside the communal territory. The management of some of the harpy eagle nests, under the strict supervision of researchers and community members, has created a

significant source of income for the local people and is an important step to guarantee the conservation of harpy eagles in this area.

Objectives

The objectives of this project are:

- To obtain data about the biology of the harpy eagle from the nests located in the Infierno Native Community.
- To obtain data about the ecological requirements of the harpy eagle population in the Infierno Native Community.
- To secure the Infierno Native Community involvement in the conservation of the harpy eagle and other raptors.
- To enhance the participation of the community members in the project.
- To implement, supervise and regulate the use of the harpy eagle nests in ecotourism activities.

Description of the project

Background

Year 1996

In February 1996, we were informed of at least one harpy eagle nest inside the Infierno Native Community. With the assistance of INC members and after several visits to the area, we located a harpy eagle nest (called Miguel) containing a 3 weeks old chick. Being the first harpy eagle

nest reported for Peru, we decided to set up a project aimed to collect biological data from this particular nest.

In April, members of the INC informed us that a man has found what he thought to be a harpy eagle chick. In his house we found a harpy eaglet (a male), still with some primaries growing on the wings. With the help of the man and two natives we located the nest (called “Escuela I” because its vicinity to the local school) and placed the bird on it. The next day we found the eaglet in a lower bush, almost six meters above from the ground. We decided to leave the chick there and keep a closer look to see if the parents were still feeding the eaglet. After two weeks the eaglet was found dead near the nest.

Successful attempts to feed the bird with some animals (i.e. armadillos, tinamous, etc.) were made so starvation was avoided. A closer examination of the carcass showed an extensive destruction of the bird’s breast that suggested a predatory attack.

In June 1996 we made a poster showing pictures of the eagles we were interested to study. These posters were provided to all the Infierno community households. We also asked them to contact us as soon as a suspected nest was detected. A reward was offered if the reports lead us to an active harpy eagle nest. It was emphasized that we only wanted to see the nest and that disturbance or handling of the birds must be avoided without exception.

Discussing with RFE directors, we agreed on the high potential of these nests for scientific and ecotourism activities. This matched perfectly with the community’s idea to develop ecotourism activities in its territory. The community and RFE decided to build an observation tower in front of Miguel nest. The tower was placed 35 meters away from the nesting tree. The members of the community and us strictly supervised the construction of the tower. To minimize disturbance around the nest site, the activities were conducted during periods when the adults were absent. The construction of the tower took eight days.

This tower was used as observation point and approximately 450 hours were spent on top of it. The tower constituted an ideal point to register the parents and chick's behavior, food supply and the different stages of the chick's development.

In August of 1996, we spent 15 days watching the behavior of the eagles around the Escuela I nest. The activities carried by male and female (they were carrying leafy branches to the nest) indicated that they have probably mated. On August 10, after climbing a nearby tree, we discovered an eight to ten days old chick in the nest.

To avoid disturbance during this period only scattered visits were made to this nesting site. Observations were made from the ground and less than one hour was spent in each visit. As time passed we took more time observing the nest from below. One and a half months later we decided to build an observation tower. The tower was placed 70 meters away from the nesting tree and was finished after 8 days of construction. Here, we spent more than 400 hours observing all nesting-related activities.

Year 1997

At this point, we were able to explain what we think was happening with the Escuela I nest. Comparing both Escuela I and Miguel nests, one can notice a big difference in the architecture of both trees. Miguel nest have a T-shaped central disposition of the main branches, present in almost all of the described harpy eagle nests (Rettig, 1996). In these nests, the main branches emerge from the center of the tree crown keeping an horizontal position and providing the chick with comfortable paths for his movements during the last three months of development, time in which he tends to walk and jump around the nest and branches.

In the Escuela I nest, the branches that support the nest rise in a steep angle. When the chick walks on these branches he is forced to climb, increasing the risk of a fall. At an early stage, when the chick's movement around the nest and branches starts, wings and tail feathers are not

completely grown. This makes equilibrium difficult to maintain and is impossible for the chick to fly or soar.

When these factors are linked with parents immaturity and a poor nest site selection, they result in a fatal combination that, in this particular case, led the Escuela nest's eagles to loose two consecutive chicks (Chebes, 1990; Rettig, 1978; Rettig, 1995).

During this time, besides the time spent in observations and samplings, an equal or even greater time was spent talking with the people, preparing workshops in the school for kids and adults, doing presentations during football games or communal meetings.

In June 1997, we were informed that another active harpy eagle nest has been discovered near the abandoned Escuela I nest, this was confirmed on July. This nest (called Escuela II) was located in a Brazil nut tree (*Bertholletia excelsa*), two hundred meters away from the Escuela I nest and was formed by the same couple.

The continuous observation of the Escuela II nest, especially the long post-fledging period have provided us with supplemental information about nesting activities, chick's development and behavior, hunting methods, etc. These observations indicate us that harpy eagles use the same nesting area for a long period of time and that they can tolerate some degree of human intervention in the forest.

Is important to highlight that after two failed breeding attempts, these eagles moved to a tree near the old nest site and successfully raised a chick. In this nest, horizontal branches allowed the chick to move safely until he was able to flight.

Methodology

Nests location

Local people spend most of their time in the forests. Indeed they are the ones who know the most about the forest composition and characteristics. Based on this, we planned to involve the members of the INC in the search of nests. For this, our first approach was to inform them what we were looking for. In order to raise their interest, we implemented the “reward approach”. The “reward approach” states that if an active harpy eagle nest is found the discoverer received an amount of money that is equivalent to a month of salary.

The person who finds what he thinks is a nest contacts the Project Coordinator, which is an elected member of the Community Board and he contacts the researchers. As soon as possible we visit the discoverer and agree with him on a date to visit the nest.

The purposes of this first visit are to confirm the existence of the nest, to determine the bird species to which the nest belongs and to estimate the age and the degree of activity of the nest. The presence of feeding remains (preys or cast) and feces around the nesting site are clear indicators of the degree of activity so as soon as we arrive to this nesting site a careful search is conducted around the base of the nest. If some evidence of activity is observed we climb a neighboring tree or the nesting tree to have a closer look at the nest and to see if a chick or egg is present.

The trees are climbed with basic rock-climbing equipment. This is composed by a pair of ascenders, a harness and a static rope. A nylon string is passed through the main branches with a slingshot. This is later used to pass the climbing rope. Ideally, the rope should pass around a branch that is situated over the nest to facilitate access and observation. Depending on the accessibility, weather conditions and density of the understory, the whole procedure can take several hours or even days.

If a harpy chick or egg is found the discoverer receives the reward, if not, we agree to visit the nest once a month until we can ensure that breeding activity is taking place.

Nest morphology and nesting requirements

In order to assess the nesting requirements of the species, the nesting trees are measured: diameter, total height, nest height and position, branches distribution and architecture are registered. A Global Positioning System (GPS) is used to register the position of each nest. Identification of tree species, if possible, is made in the field. If not, samples are collected and identified at La Molina University Herbarium (Mol).

Pictures are taken to document the nest position in the nesting tree, the architecture and disposition of the supporting branches. These photos are later used to make comparisons between nesting trees.

The area surrounding the nest is also evaluated. A square plot 100 m wide is established and all trees over 10 cm diameter above breast height (dbh) are identified with common names and measured (dbh, total height, position in the canopy).

- Diet composition

The prey remains (casts) that accumulate under the nest are very important to provide information about the eagle's diet composition and the nesting area ecology. These remains have the form of a furry ball and are composed by all those parts of the prey that the eagles are unable to digest (i.e. nails, feathers, hairs, etc.).

When monitoring active nests, the collections are conducted every four days. The casts are placed in sealed plastic bags. These are immediately marked with the name of the nest where the sample was collected and the date of collection. Each cast or bone remain is placed in independent bag. Usually the casts and bones are covered by debris so is important to look carefully under it. A little stick is used to avoid contact with insects or other animals that might

lie under the dead leaves. Old casts can be recognized because the hairs show evidence of termites. Nails and bones usually remain intact.

Due to the difficulty of observing prey deliveries from the forest floor, the collection of prey remains is an excellent method to identify prey, to establish diet composition, and feeding habits. A reference collection from a museum is later used to identify the remains. The nest, if accessible, should be climbed after the chick has fledged to look for bigger prey remains (i.e. craniums, femurs, etc.).

Craniums, mandibles and vertebrae are the bones most commonly found. Nails are usually inside the casts. Beaks and feathers had been the only remains collected from birds. All the feathers that have been collected, so far, have been always found mixed with hairs of mammalian prey.

Behavior

Direct observations from towers over the canopy are the best place to watch the adult eagles and eaglets. When towers are not available, first observations are made from the base of the nesting tree, after that, a neighboring tree is climbed. In this case the observer positions himself in a place where the nest can be entirely seen. Cutting of branches or modifications that would expose the observer are avoided. Binoculars (10x50) and a camera with a 300mm zoom are used to observe and register the behavior of the birds.

When using towers, a camouflage fabric, forming a blind is used to cover the observation platform. Observation starts before dawn and continues until sunset.

Results

Habitat

Traditionally, the harpy eagle has been described as a bird species that inhabits relatively undisturbed lowland neotropical forests (Peres, 1987). However, recent reports and investigations show that this species can also be found in areas where human activities have altered the forest structure and composition (Alvarez-Cordero & Ellis, 1994; Gochfeld et al, 1976; Haverschmidt, 1968; Hilty & Brown, 1986;) and even near human settlements (Piana, 1997 and this report).

In the INC, the nests called Escuela I and Escuela II (probably formed by the same couple) have been monitored since they were established. Both nests are located in an area inside the community where activities like slash and burn agriculture, cattle ranching, timber extraction, hunting and Brazil nuts collection are conducted periodically.

The road connecting the INC with the city of Puerto Maldonado (PEM) crosses this area and, at its closest point, is 90 m away from the Escuela II nest. Between April and September 1998, during the breeding season, this road was rebuilt and heavy machinery was operating daily. This disturbance did not impede the normal development and fledging of the eaglet.

Inside the INC, as in the rest of the lower tambopata river basin, stands of Brazil nut trees (*Bertholletia excelsa*) remain as patches of almost intact forest. Brazil nut trees are one of the biggest trees that grow in the tropical lowlands of southeast Peru. These stands are located in terra firme forest. Under Peruvian legislation, Brazil nut trees can not be felled, and given the fact that these trees grow close to each other, they can be found in high densities in what are called “castaños”.

The extraction of Brazil nuts is one of the most important extractive activities conducted by the people of the INC. The extraction takes place in the months of December and March.

Most of the community's castaños are located in areas far from the river. In general, these areas remain undisturbed during most of the year being frequented by people during the Brazil nut collection season and even during these months the human presence is rather spaced.

These conditions (scarce human presence, no logging activities, a big variety of wildlife species and big emergent trees) combined in one area may provide ideal nesting habitat for harpy eagles.

Nesting sites

•Escuela I and Escuela II nests

These two nests (which we think were formed by the same couple) are located inside a Brazil nut tree stand, two kilometers away from the center of the Infierno Community.

Due to its vicinity with the INC most populated area activities like hunting and logging were conducted in a regular basis. The INC agreed to protect this nesting site and logging is not performed any more. However, the road connecting Puerto Maldonado with the INC was repaired during the latest stages of the Escuela II nesting cycle. As a consequence, heavy machinery operated for two months 100 m away from the nest. Some logging took place without the authorization of the INC. This was later stopped at the INC's request.

The nest site can be described as secondary forest, heavily modified by human activities. The area is located in at a higher elevation and the forest floor remains inundated during the rainy seasons as a consequence of poor drainage. This nesting area constitutes one of the few patches of forest that remains in this sector. The fact that the area is inside the INC has contributed to its conservation. Two kilometers further north, the communal territory ends and from this point to Puerto Maldonado the deforestation of the area due to slash and burn agriculture and cattle raising has wiped out the forest cover.

The area around the Escuela I nest are very similar to those described for the Escuela II nest. However, due to its greater distance with the road to Puerto Maldonado, human impact is reduced.

Is interesting to notice that although the Escuela I nest is in a more quiet area, this did not stop the parents to move to a more disturbed area.

•Miguel nest

Miguel nest is located in a Brazil nut tree stand at 330 meters above sea level (masl). The nesting tree is a dead Brazil nut tree. Situated on the top of a small hill, this tree is the tallest in the area (aprox. 50 m) and from its top, all the surrounding forest can be observed. Due to the fact that this is a dead tree, no crown is present, thus the nest surface is permanently exposed to sun radiation and rain.

The area surrounding this tree is very peculiar. The surrounding forest can be classified as Hilly Forest Class I (Malleux, 1975), with an inclination between 0 to 15 degrees, where tall, primary forest with almost no understory exists. To the West, at 500 m from the nest, is located a medium size palm swamp (where *Mauritia flexuosa* palm trees predominate). This particular formation is the main habitat for some macaws species and during the palms' fruiting period (around December), several species of birds and mammals visit the palm swamp in their search for food. At the east and south, lowland forest predominates. This area is temporarily flooded during the rainy season.

The breeding area selected by this pair of eagles can be described as an ecotone. This means that the nesting site is surrounded by different forest types providing several alternatives regarding prey availability.

•Gallito nest

The Gallito nest is situated in a patch of forest that is near (ca 1km) to some areas that have been used for slash and burn agriculture. However, the clearings are not as big as those near the Escuela I and Escuela II nest. This nesting site is predominantly secondary forest with small abandoned slash and burn fields and primary forest still remaining at the southernmost part. This

area does not support human settlements at the moment. Only one family lives one and a half kilometers from the nest, at the river border.

The Gallito nest is situated in a *Ficus spp.* tree, at one side of a trail periodically used by community members to collect Brazil nuts, palm leaves for thatch, hunting and fishing. Human presence in this part of the forest is scarce except during those periods when Brazil nuts are collected (December-April).

The forest surrounding the area can be classified as Alluvial Forest Class II, where tree species as oje (*Ficus spp.*) and cetico (*Cecropia spp.*) predominates (Malleux, 1975). This area has been denuded of valuable timber species like mahogany and cedar. The Gallito nest is positioned in the main ramification of the tree crown, and is supported by several horizontal branches. The tree presents a dense crown that protects the nest from direct sunlight and rain.

Finally, as an illustration, it can be said that if we use a scale that measures human activity and alterations in the forest surrounding the nests, the forest around Gallito nest would be in the middle of the scale. In this same scale, the forest around the Escuela I and II nests would be placed in the extreme that represents the most disturbed forest while the forest around Miguel nest would be the located in the extreme that represents the less disturbed one.

Behavior

The harpy eagle has been described as a timid species that favors relatively undisturbed lowland forest well away from human settlements (Hilty & Brown, 1986), however some of the active nests discovered in the INC are close (ca. 1 km) to human settlements.

In general harpies are discreet birds whose habits help to conceal them. In fact, most encounters with harpies in its natural habitat are casual and involve one specimen (Small, 1997). The most

effective way to document the behavior of this species (like in most of neotropical raptors) is observing active nests (Whitaker & Burham, 1991)

Harpy eagles inhabit the upper part of the canopy and is there where they spend most of their life. Although big in size, they are very difficult to see mainly because it's coloration (gray from below), its discretion when perched and the height in the canopy where these birds usually stand.

Harpy eagles are rarely seen flying in circles above the canopy. Observations made in the CNI from platforms near active nests indicate that adult birds prefer to fly between the tree crowns at the upper level of the canopy and perch on unexposed branches. Some birds have been observed crossing the Tambopata river indicating that the river (130 m wide) does not act as a border in the eagles' territories and that these overlap.

•Feeding of the chick

Observations of feeding behavior in the Miguel nest suggests that all the feeding is done by the female. During the first weeks, the male delivers partially consumed prey items to the nest surface and is the female which after taking possession of the kill, feeds the chick. During this early period, the female take some meat with her beak and feeds the chick..

At one month and a half, the chick is able to stand up, walk around the nest and to use his claws and beak to eat by himself, but the mother will keep on feeding him. The chick will consume more food by his own as he grows but until he reaches six to seven months the mother will continue to give him some tidbits.

Feathers start emerging when the chick is six weeks old. At two and a half months, he walks around the nest, venturing also to the branches that support the nest.

At this point, the female reassumes hunting, leaving the chick unattended for the whole day. At three and a half months old, the chick will remain unattended for three to four days. She returns

bringing partially consumed (although sometimes entire) prey. She lands over the nest, give the chick some tidbits and then she lets the chick take possession of the kill. The chick mantles and vocalizes (chirp- chirp-chirp, etc.) heavily.

At four and a half months, the chick starts developing an aggressive behavior towards the female. Every time the female brings food to the nest, she leaves it over the nest and then perches on a lateral branch. At this age, the chick exercises vigorously his wings and his flight muscles, beating his wings, jumping from branch to branch and doing vertical flights over the nest surface.

At six months (here we start using the term juvenile), the juvenile starts making his first flights around the nesting area. He flies directly to the crown of the neighboring trees trying to stay at the same level of the nest. The juvenile spends most of the day perched in adjacent trees playing with branches, fruits and exercising his beak and claws. He has been observed eating some green leaves, probably to hydrate himself.

As time passes, the movements of the juvenile start increasing in frequency and distance. At ten months, the juvenile spends most of the time perched in the branches of the nesting tree or in a favorite perch vocalizing constantly (food begging call). As soon as the chick sees the mother he flies to the nest and waits there until she approaches. At this period most of the food provided by the mother is deposited over the nest. The chick starts eating in the nest but after a while he takes the food to a favorite perch and reassumes feeding.

Is not very clear when the chick starts hunting but, at ten months old, definitively, the chick supplement his diet with captures he makes by its own. At ten months old, the juvenile at Escuela II nest (a male) was observed successfully hunting a medium sized bird (probably a chachalaca) near the nest. Later on, same bird was observed receiving food from his mother when he was 16 months.

- **Vocalization**

Adult harpies are not vocal birds and most of the vocalizations are heard in areas near the nest. We have been able to register two types of vocalizations. One type resembles a wailing whistle, and is usually accompanied by high-pitched “squacks”. This generally occurs when one of the birds delivers food to the nest or when food is passed from one bird to the other inside the nest or in a particular branch. A different vocalization is emitted when a raptor or vulture fly over the nest, or when an observer climbs a neighboring tree or tower. This vocalization is a high pitched, long “wheee” that seems to be an alarm call or a warning signal.

On the contrary the chick is very vocal. One of his vocalizations is a low “chirp-chirp”, which is usually heard when the chick is fed by his mother. The most common vocalization, a sharp repetitive “whiiii”, can be assumed to be the food begging call, and is accompanied by a characteristic contraction of the neck and an upside-down movement of the folded wings. This is usually heard when the chick is perched on a favorite branch or over the nest and even when the chick is eating. Observations made in the Escuela II nest revealed that the food-call is still performed by the eaglet even though he is very capable of hunting (17 months old).

Reproduction

- **Breeding area**

Harpy eagles, as most raptors, select a territory where they carry out most of their activities, from hunting and feeding to mating and raising their chick. This territory is called “breeding area” and can be described as the area where a couple of harpy eagles construct one or more nests during a certain period of time and mate. Thiollay (1989), estimated this area in 10000 ha. He used used this data to recommend the minimum extension that protected areas should have to ensure the presence of a healthy population of harpy eagles. Recent studies carried by Alvarez-Cordero (1996), indicate that the extension of this area varies. Breeding areas used by harpy eagles in the area of Darien (Panama), have an average extension of 2300 ha, while in Venezuela, the breeding area of a pair of harpies was estimated in 6400 ha.

In the INC, we have been able to find four active nest (Miguel, Escuela I and II and Gallito nests) that define three breeding areas. The average distance between these nests was estimated to be 7,4 km. Thus, the average breeding area required for a pair of eagles in the INC was estimated in 4300 ha.

- **Diet**

Harpy eagles are a carnivore species that feed on animals that they capture. It has not been reported feeding on carrion although sometimes they keep on feeding in decomposed prey. The chicks have been observed feeding on green leaves that the parents deliver to the nest as nesting material. Juveniles had also been observed eating green leaves from the surrounding trees.

In the INC, harpies' diet is constituted by a wide variety of animals. The species has been reported capturing and consuming arboreal mammals (kinkajous, porcupines, sloths, howler monkeys, anteaters, etc.), terrestrial mammals (armadillos) and medium sized birds (macaws, amazonas, chachalacas, toucans, etc.). This wide variety of preys can led us to think on harpies as opportunistic predators, preying on every suitable animal and hunting in every strata of the forest. A more detailed analysis of the prey remains (casts, bones, hairs, etc.) collected in the INC, showed that the up to 85 % of the prey were arboreal mammals (nocturnal and diurnal). These were identified as sloths, anteaters, kinkajous and porcupines, which are mostly nocturnal. This might suggest that harpies capture some of their prey when they become active near nightfall, when potential prey are returning to their roosting places or when they are sleeping .

It is worthy to mention that only a small number of prey remains (less than 5 %) showed traces of monkeys. This is because the forest surrounding the INC has been depleted of big monkeys (red howler and spider) populations as a result of hunting. This is particularly true in the areas surrounding the Escuela I, Escuela II and Gallito nests.

- **Hunting techniques**

The juvenile at the Escuela II nest was observed hunting birds 70 m away from the nesting tree at 11 months old. The juvenile was perched in a lateral branch, near the nest when he dived into the crown of a fruiting tree that, at that moment, was being foraged by several bird species (i.e. toucanets, pigeons, trogons, chachalacas, etc.), capturing what seemed to be a medium sized chachalaca. Two days before, the chick was observed feeding on a Cuvier's toucan (*Ramphastos cuvierii*) that he had captured.

It seems that harpies remain perched in the canopy, observing the surroundings until some suitable prey passes at range. Then, the bird launches toward the prey, with strong wing beats, concealed by the canopy foliage and maneuvering between the branches to remain unseen. Then, when close to their target, she folds the wings and extends the talons, grabbing the prey near the head and in the back. Neil Rettig's video (1977) of a harpy capturing a staged sloth shows this approach very clear. Is possible that, if aware of the approaching eagle, the potential prey may attempt to escape, originating a short persecution between the canopy branches.

The procedures above described will explain the capture of arboreal prey but are not suited for the capture of terrestrial birds and mammals. Harpies use a different approach when hunting terrestrial prey. Perhaps the explanation may lie in one remain found under the feeding perch of the Escuela II chick. This was the complete exoskeleton of a Southern naked-tailed armadillo (*Cabassous unicinctus*) that presented a nail puncture in the back. It seems that the armadillo was feeding in the forest understory, digging for ants or termites. These movements must have called the attention of the harpy, who was perched in a branch over the armadillo. Then, after locating the potential prey, the harpy dived and captured the unaware armadillo.

Is possible that harpies favor forest edges as hunting areas but the species can be found in a wide variety of forest types so surely they also hunt in a diversity of forest types. The reports of harpy eagles hunting in forest edges can be related to the relative advantage to observe this kind of events from rivers or creeks, something that is almost impossible inside mature forest.

Discussion

The harpy eagle is a neotropical bird species that is rapidly disappearing from Mexico and Central America, mainly as a consequence of the generalized modification of the forests, illegal hunting and nests destruction (The Peregrine Fund, 1993). However, findings in the INC indicate that the species is more adapted to use disturbed forests than it was previously thought.

Harpy eagles seem to tolerate a certain degree of habitat modification. These does not means that they prefer secondary forests but at least they are adapted to use them as well. On the same token, nesting sites are easy to find in secondary forest mostly because local people continuously roam through these areas to hunt and/or extract non timber and timber products. The risk of increased contact between this eagle species and humans may render the eagles more vulnerable in these areas. Is urgent to implement measures to corroborate this information and, based on this hypothesis, environmental education should be considered as an important tool to guarantee the eagles survival near human settlements.

The prey remains collected inside the INC nesting sites (most of them located in disturbed forest) show that, in the INC, primates are less than 5 % of the harpies diet. On the contrary, sloths, tamanduas, porcupines and kinkajous are the prey items that predominate. Studies carried out by CI biologists in the lower Tambopata basin (Loja et al, 1998) and our own observations show that big monkey populations (red howler and spider) are particularly low in these areas as a result of human pressure (hunting).

Looking at the biology of the more abundant prey items we find that these species are arboreal, solitary (not being able to use anti predatory warning systems that are common in monkey troops and very effective against harpies as we been able to witness), nocturnal and abundant in disturbed forest, forest edges and even forest patches (characteristics that are typical of the Infierno Native Community and surrounding areas (Lower Tambopata basin and river borders).

We used to think on harpy eagles as specialized monkey eaters, but catching monkeys in disturbed or pristine forests might prove difficult to capture even for harpies (not only because their less abundance but also because of their behavior).

It seems clear that harpies spend their energies (trade off) in prey items that are easier to catch and more abundant in their breeding area. The fact that most of the prey registered from the nests in the INC were nocturnal mammals (although some of them also active during daylight) indicate that harpies catch them during the early morning, when they are returning to their roosting sites, at the end of the day when they become more active or while they are sleeping. Thus, harpies are not only able to use degraded forests but they are also able to modify their hunting strategies to match different preys anti-predatory strategies.

If non-primate preys are abundant, harpy eagles will still be able to establish in disturbed forest. Particularly in areas where logging is very selective (with almost null mechanization) and where patches of forest remain between small slash and burn fields. This does not mean that harpies tolerate any kind of human disturbances and habitat alterations. On the contrary, this species have a threshold point which is important to determine in order to establish habitat management policies in forested areas near human settlement where harpies are still present.

Harpy eagles can change their food habits depending on the habitat they use. Undoubtedly, there is a close link between habitat and prey species availability. The effects of slash and burn agriculture in the mammal population of the INC (particularly those species that constitutes the main prey item of harpy eagles) should be studied in more detail. Our preliminary observations indicate that harpy eagles can perfectly adapt to changes in forest composition and prey availability by feeding in animal species that predominate in disturbed forests. Harpies are well adapted to use this changes in their own advantage. A comparison between preys remains collected in different forests types and subject to different land uses may prove very useful to assess the versatility of the species and how they respond to habitats under different land uses.

Harpy eagles seem to be a raptor species highly specialized in catching arboreal mammals (not only primates), although they can be opportunistic predators if they need to. All these evidence reveals the versatility of harpies to adapt and use degraded forest (including changing prey preferences) and may evidence that what we thought to be a very timid, specialized bird might, may be willing, as other predators, to change when facing disturbances.

Different approaches should be used to protect this species and to design the most suitable procedures and policies that will guarantee the eagle conservation in particular areas. Preliminary studies tell us that even though the species population has been diminishing in some places, it is also more abundant in modified habitats than we previously thought. Due that the human pressure over the neotropical forest and its resources will increase in the near future, is urgent to establish the species minimum requirements in order to implement those programs that will help to preserve this species and its habitat.

Since 1996, the Project for the Investigation of the Harpy Eagle in the Infierno Native Community has been researching about the biology of this species and has incorporated a new approach in its efforts to preserve the harpy eagles and its habitat. Aware of the local people's necessities, and considering that one of the best ways to secure the eagles population in the area is involving local people, we have designed a management plan aimed to use a limited number of harpies active nests for ecotourism. In this way, the community and its members receive an important income, and they are the most interested in conserving the eagles. The permanent presence of the members of the project makes possible the collection of biological data and information related to the presence of tourists and its impacts. (Piana, 1997 and this report).

Ecotourism, if carefully controlled, can serve as an important tool to preserve the eagles by controlling illegal hunting, removal of chicks, nests destruction, uncontrolled logging, etc. and can help to turn local people and the public opinion into the conservation of wildlife by approaching people to this species and its natural habitat.

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