

Observation of the Short-tailed Pygmy-Tyrants' (*Myiornis ecaudatis*) nesting behavior in the Madre de Dios region, Peru

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Abstract

The Amazon Rainforest is known as one of the world's most diverse places for birds. Although bird diversity is well documented throughout the region, little is known about their habits and living requirements. A crucial aspect of their life is to procreate and raise a new generation to ensure the continuous existence of their species. With the current threats to the forest such as deforestation and habitat degradation, reporting detailed information of nesting behavior is key to understand how these changes might affect the avian community as a whole. This is an observation of three nesting attempts of a Short-tailed Pygmy-Tyrant couple at Finca Las Piedras, a field site for biological research in the Peruvian rainforest. Three nests have been found, all located at the edge between the selectively logged forest and a more open area, suggesting a possible preference for more open areas. Although all three nests were not successful, information about the nest construction and incubation period could be gathered. The enclosed, hanging nest was built by the female only, which also took care of the eggs during the incubation. This is a new report of an Amazonian bird species behavior.

Introduction

Peru has the second largest number of bird species in the world, coming after Colombia. Most of the 1800 known species have been identified and summarized in the book *Aves de Peru* (Schulenberg, 2007) including the species name, appearance, call, and distribution in the region. But still, little is known about the life habits of most of these species, including nesting behavior. Nesting behavior is important to study because it is a crucial part of the birds' life and the only way in which they can procreate and ensure the next generation of their species. Therefore, every species has its very unique requirements that are needed to be successful, especially in the tropics where, because of the high diversity, the species evolved very differently from each other to use niches and thereby prevent competition. Requirements for a successful nest start at the right habitat

and a suitable nesting site. Going over to available nesting material, low pressure of predation and a sufficient amount of food. Humans have a large impact on the birds lives as well. High rates of deforestation are occurring in the Madre de Dios region especially since the pavement of the interoceanic highway, providing easier access to the remote inside of the rainforest. This results in a huge loss of primary forest due to logging, ranching, gold mining and plantation creation (Goodman, 2014). This again results in a loss of habitat, changes in landscape and climate conditions. And since every species needs specific conditions to be able to procreate these human impacts could threaten their existences. The required nesting material, host plant or hiding spot as well as food sources could be destroyed by human input, thereby threatening the overall

biodiversity of the forest.

The objective of this project was to learn more about the nesting behavior of the birds living in the forest of Finca Las Piedras. Including all valuable information about, nesting site location and habitat of the species, shape, size, and material of the nest, as well as the division of labor between the male and the female bird and behavior patterns during the different stages of the nest. To that aim, we conducted a series of bird surveys in the forest, forest edge and open areas for three months. 15 different birds were found to be nesting in the study area. From them, the Short-tailed Pygmy-Tyrants' nesting attempts are reported, given that the most data was recorded about them. The present study represents the first record of Short-tailed Pygmy-Tyrant nesting behavior for the Peruvian Amazon, and the first report on nest construction and incubation period for this species.

Methods

Study site

This study was conducted at Finca Las Piedras, a field site for biological research, located in the Peruvian part of the Amazon basin, in the Madre de Dios region. Madre de Dios is one of the most biodiverse places in the world with some primary forest fragments remaining. Since the forest is mostly untouched, this is an ideal place to study the native structures of animals and plants life cycles. The STPTs were living and nesting in an edge habitat between a native food forest and a selectively logged forest, with a forest opening nearby.

Weather and season

The whole observation time lasted from August 2nd to October 7th. This period of time lays within the dry season, which is defined by high temperatures and very little

rainfall. The recorded temperatures during the observation time ranged from min. 15°C at night to max. 34,5°C during the day. There have been 9 rainfalls with 42mm in total.

Nest observation

We went around the field site and into the forest looking for nests with the aid of binoculars. We went off trail and followed the birds' calls, which led us to the nest's location. Once the nest was found, the nearest tree was marked with a colored band and a GPS mark was created to be able to find its' specific location again. The exact species of the birds found was identified and since two of the nests were located close to a human trail, the trail was diverted, to not disturb the birds as people walk by. From that moment on the nest was observed with the aid of binoculars and cameras to find out more about the bird's behavior, quantity of nest visits and time spent at the nest. A timer was used to measure the duration of perches, nest stays and visit intervals. If possible, we stayed at the nest during the whole day at the first three day of a new nesting stadium (construction, incubation, hatching). After that, specific observation times have been set up, in which the birds were the most active. At all times, we tried to stay at least 5 meters away from the nest, moving slowly and quietly making sure to not disturb the birds.

The total observation time of all three nests have been 202h31min. If the bird was not observed in the evening when it went to sleep, the nest was checked at night to see if the bird is there. Therefor we looked with binoculars and flashlight, just for a short moment to not bother the bird and could see the bird fluffed up as a ball, sleeping in the nest. A camera trap was set up which turned out to not to be useful as it did not capture all of the birds' visits, probably because of their small size. As the construction of the nest was



Figure 1. Short-tailed Pygmy-Tyrant adult

completed, the nest was checked regularly to capture the moment in which the eggs were laid as well as the quantity of eggs. Therefore, we carefully chose a point of time during the day when the birds were not around and looked inside the nest with a small camera which showed us the interior of the nest. As soon as incubation started, we stopped checking the nest with the camera to not disturb the birds. This method was used again as the time of hatching came closer, to capture the exact time of the chicks hatching. When the nests were abandoned, they were taken to gather data, including measurements of size, shape and building material as well as size and color of eggs.

The division of labor was hard to identify since the observed species was monomorphic, what means that both birds have the same appearance. Nevertheless, at the last nesting attempt we were able to tell apart the two birds what provided us with information about their individual behavior.

The Short-tailed Pygmy-Tyrant (Myiornis ecaudatis)

We observed three nesting attempts of the Short-tailed Pygmy-Tyrant (*Myiornis ecaudatus*), one of the smallest birds on earth (Merlin Bird ID, 2021) and the smallest

member of the Tyrannidae family (McNail & Martinez, 1966). This species, which we will refer to as STPT, is uncommon but widespread in Amazonia and can be found in Peru, Columbia, Ecuador, Brazil, and Bolivia up to an elevation of 1000m (Schulenberg, 2007). It usually inhabits humid forests, forest openings and forest edges (Schulenberg, 2007). Although their nests are found at a height of 1,5 - 3m above the ground, the birds spend most of their time in the midstory and subcanopy (Begazo, 2021), several meters higher. Because of their small size (reaching only 6.5 cm in length) and their camouflaging appearance, the birds can be very hard to spot in the rainforest. STPTs are sexually monomorphic, which means that both, the male and female bird share the same appearance (Fig. 1). The head is grey with a white eye-ring and loral line and a black beak. The back is olive-green, and the throat and underparts are unmarked whitish grey, the wing- and tail-feathers are black with yellow-green edges, and as the name says, the tail is very short (Begazo, 2021).

We could identify three different calls. One is a faint insect-like chirp that sounds almost like a cricket. The other one is a simple high “peep”, often combined several after each other in varying quantities and

intensities. The third one is a quiet “chirp” that is mostly used in the moment the birds fly away after perching close to each other. The birds have an audible wingbeat that sounds like a large bumblebee or Cicada. The STPT feeds on insects that are picked off the air or a leaf while flying a small loop. After returning to the branch, the prey is eaten and the beak cleaned on the branch.

Results

Discovery of nests

We found and observed 3 nests of the same pair of Short-tailed Pygmy-Tyrants (Fig.1). The first one was found on August 2nd, 2021, when we followed a STPT pair through the forest. As we saw one bird return over and over again to the same branch, we discovered the nest, which would have been impossible to find without the bird leading us there, because it was so perfectly camouflaged in the understory of the forest. Unfortunately, the nest has been destroyed seven days later when it was still in construction. The reason of the destruction is unknown. Only a little nesting material was hanging from the branch, almost like at the

day the nest was discovered. All the progress the birds had made was destroyed. No birds were seen or heard this afternoon and also in the next days the birds did not return to this place. The remaining rest of the nest that was hanging from the branch and laying on the ground was collected later and used to analyze the building material.

The second one was found on August 17th, eight days after the first nest had been destroyed. This nest made it to incubation stage, which began on August 31st and ended with the destruction of the eggs on September 5th. Because the birds have not been seen the whole day, we looked inside the nest with a small camera. One egg was missing, and the second remaining egg was broken, the shell had a hole and there were some ants feeding on it. We do not know the reason of the destruction, but it is unlikely that it has been a bigger animal, because the nest was not changed or destroyed, and the camera trap did not capture any bigger animal near the nest.

The third nest was found seven days after the last one has been abandoned, on September 11th. Again, the calls of the birds were leading to the nest, which was still in

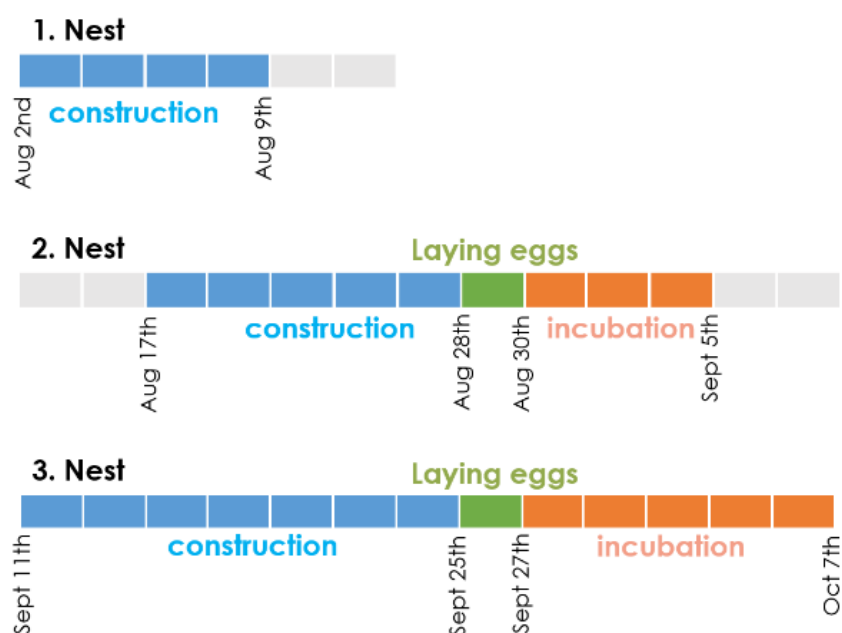


Figure 2: Nesting behavior time distribution.

the early stages of construction, but the birds must have worked on it for a few days already. This nesting attempt made it to incubation stage as well. For unknown reasons the nest has been abandoned on October 7th, 10 days after the incubation began. The birds did not come to incubate during the day anymore, no bird came to sleep at night and when looking with the camera inside, we could see ants walking on the eggs, which did not seem to be damaged.

Nest site location

All three nests were located in edge habitat near a native food forest and the selectively logged lowland Amazonian rainforest of Finca Las Piedras, in Madre de Dios, Peru. The first nest was located about 10 meters inside the selectively logged forest (12°22'70.8" S, 69°11'28.2" W), while the other two were right at the edge, directly next to a human trail, which has been diverted to not disturb the birds. The second and third nest were both located in a distance of approximately 30m in different directions away from the first one.

The second nest was hanging from a thin branch (diameter of 3mm) of the host plant, which was a 2,60m high *Rinorea viridifolia* (Violaceae). The two closest trees were *Cecropia* (Urticaceae) at a distance of 2,00m away from the host plant, which were responsible for a lot of dry leaves that were hanging in the host plant, camouflaging the nest even more. The nest was hanging in a height of 1,57m above the ground (the others were hanging in a height of 2,80m) and the preferred perch branches around it were in a distance of 39 - 77cm to the nest, all very thin. The birds favorite perch place was in front of the entrance approximately 40cm lower and in a distance of 70 cm to the nest, a dead vine of a Kudzú plant (*Pueraria phaseoloides*, Fabaceae), which was the dominating

vegetation in the forest opening next to the nesting site.

All three nesting sites looked very similar. The vegetation was not very dense around and contained many plants with thin branches, which are the preferred perch branches of this species.

Construction of nests

The STPT builds its' nest over a period of at least 15 days. The exact number of constructing days is unknown since all three nests have been started before discovery. In the morning, between 05:30am and 07:00am, the birds could be heard chirping for about an hour. They were somewhere around but did not come near the nest and couldn't be seen. In the time between 07:00am and 12:00pm the birds were most active coming to the nest on a regular basis (Fig.2). We could observe them making several visits in an interval of 4 - 6min between the visits within a time period of 10 to 30 minutes (sometimes up to 90min). Then they left the site for a break that lasted for approximately 20 to 60 minutes before coming again to continue the construction (Fig.2). The time spent at the nest per visit got longer the more advanced the nest was. While in the beginning the time spent at the nest to add a new piece of material never exceeded 4s, visits in the more advanced stages could last for 15s up to 4min. Moreover, the amount of visits per day decreased the more advanced the nest was. In the early stages of construction, the birds made up to 65 visits a day, while later when the nest was almost completed the number of visits reduced to 10 visits per day. In the afternoon from 12:00pm to 17:00pm the birds never appeared near the nest (Fig.2). On some of the days the birds came to the nesting site 1 to 4 times a day just to check if everything is all right, without bringing new nesting material.

Typically, the constructing bird arrived with the building material in its beak, which was sometimes even bigger than the bird itself. It first perched on a thin branch (0,3 - 0,7mm diameter) nearby (in a distance of 0,2 - 2,0m to the nest) before flying to the nest. Then, it would swing around the host branch and nest to weave in the new material. Before leaving the site, it perched again on a branch nearby. Later, when the nest was already strong enough to hold a bird, it continued building from the inside. Therefore it was including the new pieces of nesting material by shuffling with its feet on the ground of the nest or weaving it in with its' beak. During that, you could see the nest shaking, but the bird inside was hardly seen. Before finishing the interior of the nest, the bird brought bigger pieces that were added on the outside of the nest for better camouflage.

Sometimes, when the bird was not sure how to add a piece of material, it needed 2 - 3 attempts to integrate it. After the attempt it would return to perch on a branch with the piece of material still in its' beak, before trying again. Mostly one bird came alone, but at 14% of the visits both birds appeared together. A standard visit of one bird lasted less than one minute, the bird came, perched on a branch near the nest, flew to the nest and added the material, perched on a branch again and then left, completely quiet except the audible wingbeat. Two-bird visits mostly lasted longer (up to 6 min) and both birds made more perches around the nest. The second bird was perching on nearby branches, chirping occasionally. Because both birds have the same appearance, it was hard to tell if both or only one of the partners were building. We first thought that both

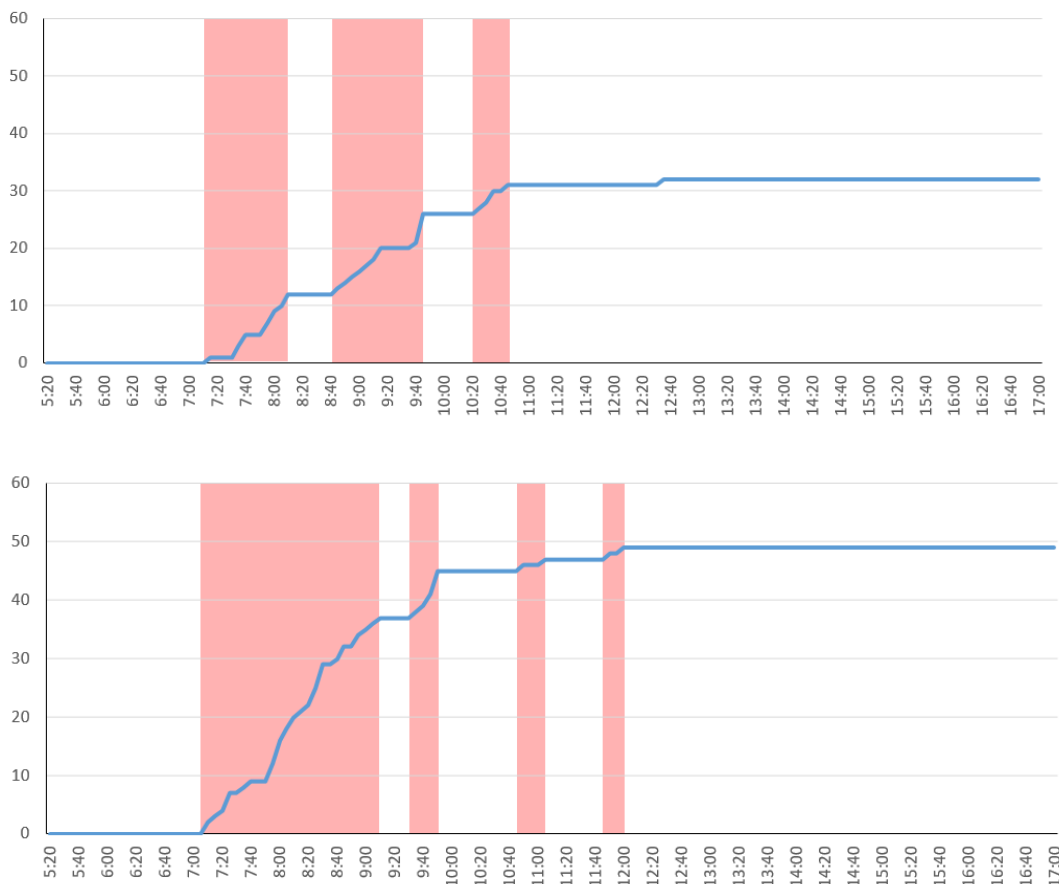


Figure 3: Accumulation curve of number of visits during construction. Red bars highlight the most active times. 1, Sept 13th. 2, Sept 14th

birds were working because it would be a lot of hard work for one small bird alone and sometimes the birds were coming with new material in very short intervals. However, after a lot of observation time, we were able to tell the birds apart. Surprisingly only one bird appeared with building material, while the second one just perched nearby, chirping.

There have never been seen two birds at the same time bringing building material. It is most likely that the building bird is the female, because the same bird has later been observed, sleeping in the nest at night, incubating during the day and staying inside the nest during a period of time when an egg was laid. When the building bird was flying to the nest, the other bird sometimes flew directly behind the first one, but did not land on the nest, just returned to a branch. During the time at the nest the bird did not make any sounds, despite the audible wingbeat that could be heard when the bird was flying. Only if its partner was around too, perching near the nest or a few meters higher in nearby trees, they would both occasionally chirp while perching. When the construction was almost finished the wingbeats of the flying birds were a lot quieter.

On September 20th the construction of the third nest was completed and the same bird that has been building before, now came to sleep in the nest at night, entering the nest at about 17:25pm. Within the next five days, until the first egg was laid, there were almost no visits during the day, the bird came just at night to sleep.

Nest & egg description

The overall shape of the 25cm high nest (Fig. 4) could be described as longish, oval, hanging, like a house with a peaked roof. The housing part was located in the middle of the whole construction, with a width of 6,5cm and a height of 14cm (not

measured the loose hanging pieces of material at the bottom, just from the attachment point to the bottom of the housing part) and had an entrance, with a diameter of 3cm, on the bottom-side with jetting out pieces of material over it. The cardinal direction that the entrances were facing were East-by-Southeast at the first, Southeast at the second and North-to-Northeast at the third nest.

The nest consisted of dead, dry plant material, what gave it a brown color. No fresh, green plant materials were used. Fibers, most likely the roots of lianas or ferns as well as spiders web, were woven together on the inside and at the attachment point. Bigger pieces of plant material were camouflaging the nest on the outside. The pieces used on the outside were parts of grass culms (*Cyperaceae*), Bamboo leaves (*Poaceae*), Pashaquilla leaflets (*Jaqueshubera*, *Fabaceae*), Pashaco leaflets (*Schizolobium*, *Fabaceae*), Kudzú vines (*Pueraria phaseoloides*,



Figure 4: Nest of the Short-tailed Pygmy-Tyrant

Fabaceae), Para-Para leafs (*Abuta grandifolia*, *Menispermaceae*) and Balsawood bark and small leafs (*Ochroma pyramidale*, *Bromacaceae*). To soften the interior the birds used parachutes of liana seeds as well as the seed fluff of Balsawood seeds (*Ochroma pyramidale*, *Bromacaceae*).

The egg (Fig.5) had the oval shape of a standard chicken egg and an off-white color with a touch of beige. It was 15mm long and 10mm wide with a 5mm wide belt of dots. The narrow band of coffee brown dots was located around the widest part of the egg. The dots were different sized, but all small and in different distances to each other. Most of the dots were within this belt, but few scattered dots were spread over the entire egg.

Incubation

The female lays two eggs, with two days in between the first and the second one. The eggs were laid in the morning hours and in the day before the second egg was laid there was no activity of the birds near the nest during, one just came to sleep in the nest at night. At the second nesting attempt the birds did a cleaning day on the day when the second egg was laid. There were a lot of ants scuttling around on the nest, probably attracted by the smell of the new eggs. The same bird that was also constructing before did many flights to the nest, picking ants off the nest while flying and returned to a nearby branch or sometimes entered the nest for about 7 seconds and cleaned from inside. At the third nesting attempt a cleaning day was not necessary because there were no ants on the nest. After the second egg was laid the female started incubating, with no assistance from the male. During the day the bird staid in the nest for approximately two and a half hours per day. The STPT appeared to incubate more in the morning hours than in the afternoon with varying lengths of the

incubation bouts (Fig.2). Of the total 8 - 9 visits per day, up to two have been long incubation bouts with a length of 50 minutes between 06:00am and 09:00am in the morning. 3 to 6 medium visits with a length of 10 to 40 minutes occurred between 05:30am and 12:30pm. The amount depended on the amount of long visits in the morning. On a day with two long morning incubation bouts there were only fewer medium visits than on days without a long visit. In the afternoon the incubating bird appeared only for short times at the nest (Fig.4). It stayed for less than 10 minutes inside 2 to 5 times a day between 10:00am and 16:30. A typical incubation visit was similar to the construction visits. The bird first perched on a branch near the nest, usually facing away from the nest, looking around. Then it would enter the nest and repeat the same behavior after leaving the nest.



Figure 5: Egg of the Short-tailed Pygmy-Tyrant.

Sometimes the bird was perching on different branches before or after being in the nest. Inside the nest the bird was sitting still, looking around, sometimes leaning out to see better what is going on outside. From time to time, it would move the eggs by jiggling with its' head at the bottom of the nest. On hot days the STPT was perching with its' beak open after leaving the nest. This behavior is

used by birds to cool themselves down in extreme heat.

Between 15:30pm and 16:45pm the female appeared to remain on the nest through the night and left the nest again on the next morning at about 05:25am (Fig.6). At this time the male was around too chirping a lot, using both the “peep” and the “insect-like call”. One could hear a lot of calls throughout the whole morning until approximately 08:30am, most of them done by the male which was perching in the trees around the nest in a radius of 5 - 20 meters. Later in the day the birds did some occasional chirps, but remarkably less than in the morning. The female never did any chirps while being inside the nest. Sometimes the male also came together with the female to

perch on the branches near the nest. It was chirping and after a while it left again while the female was inside the nest, incubating. During the whole incubation time the wingbeats of both birds were very quiet, sometimes not audible.

The STPT always left the nesting site with loud wingbeats and as quickly as possible when it got scared. For example, by people walking along the trail, monkeys climbing in near trees or a cuckoo that once landed on the branch directly next to the nest. Thereby one egg fell out of the nest, probably in the moment the cuckoo landed and the STPT left the nest quickly and scared. The cuckoo did not seem to notice the nest, it was just perching and looking around for a few minutes and then left again. We later found

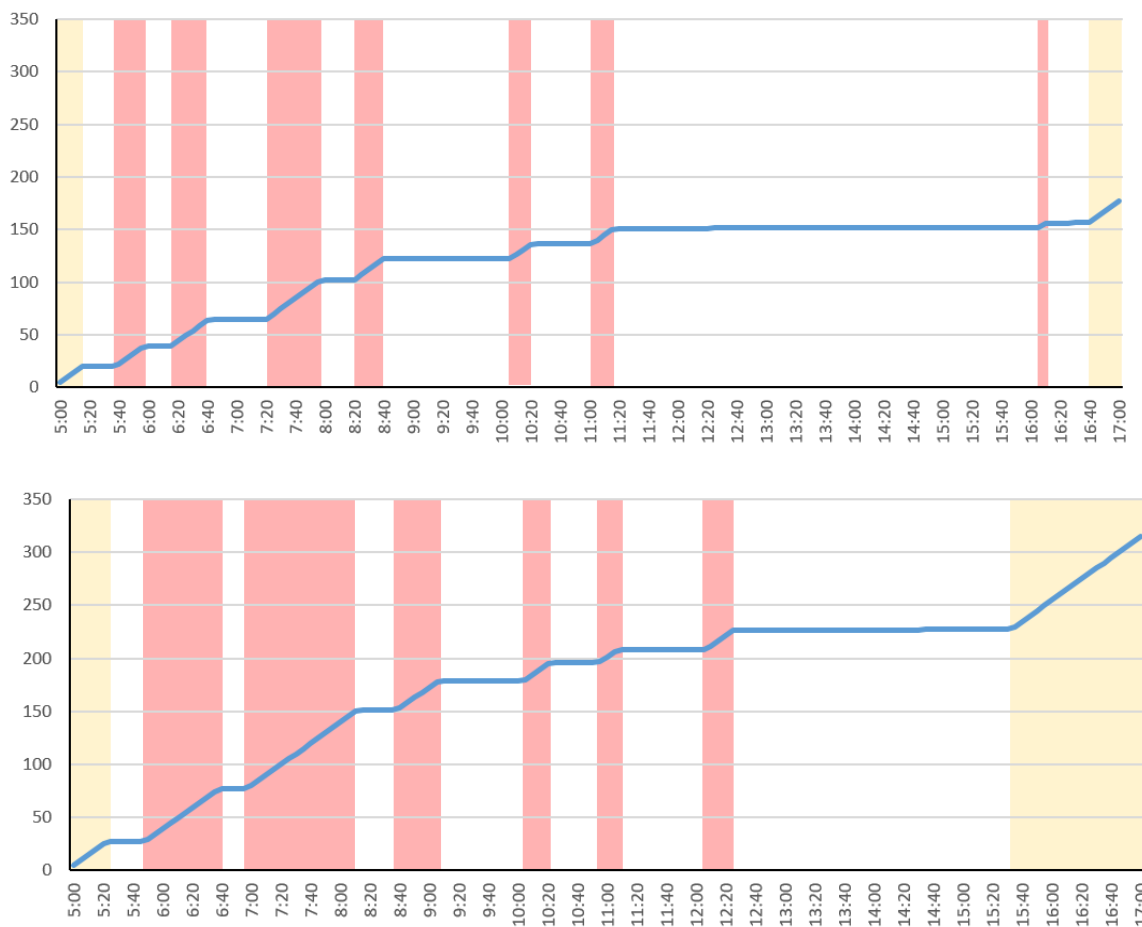


Figure 6: Accumulation curve of number of minutes spent inside the nest during incubation. Red bars highlight the incubation bouts. Yellow bars highlight the time the bird slept in the nest at night. 1, Sept 28th. 2, Sept 29th

the egg on the ground. It was not broken, so we decided to give it another chance and put it back inside the nest.

The eggs of the last nest were laid exactly one month after the ones of the nesting attempt before. At the described, third one the birds seemed to care much better for their eggs than before. At the second one the bird did not come to sleep in the nest after laying the first egg. The total incubation time during the day was less, approximately one hour per day, as well as the number of visits that were less than 6 per day. The bird also came later to sleep at night and stayed away longer in the morning. The reason for the better care at the next nest is unknown but could be the upcoming rainy season. While during the second nesting attempt there was no rainfall, two were recorded during the third one. Rain often entails colder temperatures that have to be balanced through more incubation time.

Discussion

There are many unanswered questions about birds' behavior and living requirements in the Amazon. Even about some of the most famous and conspicuous species, such as the macaws, main information about their habits and habitat requirements are still missing. So, it is little surprising that there has been done only one study (McNail & Martinez, 1966) about the Short-tailed Pygmy-Tyrants nesting behavior before. It is one of the smallest birds on earth, which is, besides that, very well camouflaged by the green color of its plumage. An untrained eye can hardly spot it or will most likely mistake it as a bigger insect e.g., a Cicada which has a similar size and an audible wingbeat as well. Even the quiet chirps remind more of an insect than of a bird. The nest as well is impossible to find unless the birds are leading your attention there.

Even though all of the observed nesting attempts failed, the gathered information is very valuable, because this is the first record of nesting Short-tailed Pygmy-Tyrants including information about the construction and incubation. In the only jet existing publication from R. McNail and A. Martinez of the year 1966 in Venezuela (McNail & Martinez, 1966) the nest was found when the two chicks were already big and about to fledge, so there could not be gathered information about the behavior of the birds before this late stage of the nest.

Observations that correlate with the Venezuelan article are the clutch size, which have been two eggs/ chicks in all cases as well as the assumption that the female is the one incubating. In Venezuela the birds were collected as samples and an incubation patch was found on the belly of the female bird. While the same size of the nests was measured, the nesting material seemed to differ. In case of the Venezuelan nest the Pygmy-Tyrants used green mosses for construction, which was not the case here. Neither fresh and green material, nor mosses were used.

I was truly surprised when we found out, that the female was doing all the work alone. It is a lot of work, especially for such a small bird. A lot of energy is required to fly up to 65 times per day to the nest, bringing new nesting material and doing acrobatic swings around the nest to weave in the new pieces. As well as producing and laying eggs and staying in the nest for incubation during hot days. Not forgetting, that the bird has to spend more energy on finding enough food for all these strains. During all the time of construction, laying eggs and incubation the male was just joining some of the females' visits and even then, it was just chirping and perching nearby, but never helping.

Thinking about the reasons of why all the nesting attempts failed, is leading to a huge amount of threats a nest has to stand. Like observed, not much is needed, and an egg is falling out of the nest just because a cuckoo is landing on a close branch, not even with bad intensions. Monkeys climbing in the trees nearby could accidently break or move the host branch resulting in a broken nest or eggs. Toucans on the scout for eggs and chicks could have destroyed the first nest. And the eggs of the second one could have been eaten by a small snake, mouse, or opossum. The latter has been captured by the camera trap in these nights climbing up a branch near the nest. An accident caused by the birds themselves could have damaged the eggs as well which have then been eaten by the ants. There are many other dangers, which can make a nest fail. Environmental conditions like cold, rain and storm, parasites, and diseases, human or a shortage of available food could be reasons for a failing nest. As well as abandoning because of infertility of the eggs, which occurs mainly at the end of the breeding season and could have been the reason of the third to fail. Another possible reason for the third nest to fail could have been wrong temperatures during the incubation. The highest temperatures recorded during that period were 34,5°C and the incubating bird sometimes perched with its' beak open after leaving the nest, a behavior birds use to cool themselves down in times of extreme heat. So, if the eggs got too hot in one moment, that could have influenced their development in a negative way.

Thinking about a non-disturbing way of observation is important to allow the birds to act in their natural way, without their behavior being influenced by the human presence. During the observations we always stayed in a distance of at least 5 meters to the

nest and the human trail next to the nesting site was diverted to not disturb the birds. Over time the birds got used to our presence and were not bothered about us speaking quietly or moving a little, e.g., to take pictures. Nevertheless, they did get scared by talking people on a trail approximately 6 meters away. Natural colored clothes, which hide some of ones' actual size, were an important factor too. While the birds were usually relaxed about our presence near the nest, they were obviously nervous on a day one did not wear camouflaging clothes. Thinking about nest predators is important at this point too since many of them like the Toucans or Aracaris are very curious animals and might observe us people during the day. And when the humans leave, they might come to check out the place and see if there is anything interesting to find. In this way the observing people could reveal the location of the nest, and thereby seriously endangering the success of the nest.

Further research is needed to complete the storyline of the Short-tailed Pygmy-Tyrants, preferably longtime studies. It takes time until nests are found, and months can pass, if the first nesting attempts fail, until a nest is successful. I would suggest observing the nest for three full days, from 5am to 5pm, at every new stadium (construction, incubation, hatching and fledging). The data from these days seemed to me the most valuable. After this, observations during the most active times of the day are sufficient to see if the first observed patterns continue or change. Therefore, a team of at least three people sharing the observations would be optimal. Especially during the full day observations, a smaller amount of observing people can be very exhausting to the one or two remaining. The availability of technical equipment could support and ease the observations noticeably.

A camera trap could replace an observer, giving information about the time and length of visits. For this study, camera traps were available, but turned out to be useless, since they did not record when a bird was there. They were just too small and fast. Another type of camera trap with a more sensitive trigger could work out for this species. A data logger, a small chip that can be placed inside the nest can help during the incubation period, since it records the incubation bouts through temperature changes.

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Literature Cited

- Schulenberg T., Stoltz D., Lane D., O'Neill J. & Parker T. (2007). *Aves de Peru (Birds of Peru)*, for Princeton University Press
- Goodman S. (2014). The Role of NGOs in Mitigating the Impact of the Interoceanic Highway
- McNail R. and Martinez A. (1966). Notes on the nesting of the Short-tailed Pygmy-Tyrant (*Myiornis ecaudatus*) in northeastern Venezuela, for

Departamento de Biología, Universidad de Oriente, Cumaná, Sucre, Venezuela
 Begazo A. (2021). Peru Aves (Short-tailed Pygmy-Tyrant (*Myiornis ecaudatus*), CORBIDI, Lima, Peru.

Available at www.peruaves.org

Merlin Bird ID (2021). Peru: Amazon, Short-tailed Pygmy-Tyrant (*Myiornis ecaudatus*), The Cornell Lab of Ornithologie. Cornell University.

Available at www.merlin.allaboutbirds.org