

Polybia plebeja, synonym: *Polybia diguetana*, Honey Wasps and their Nests

Aldea San Jose Se Raxtul, Municipio de Senahu, Departamento de Alta Verapaz, Guatemala



Photographs by Byron Pacay and Franklin Xol, March 4, 2025, Text: Nicholas Hellmuth

FLAAR Reports, FLAAR (USA) and FLAAR Mesoamerica (Guatemala), June 2025

Introduction to the Honey Wasp Nests of Las Delicias, Municipio de Senahu, Departamento de Alta Verapaz, Guatemala

On March 4, March 5 and March 6, 2025 the team of Byron, Franklin, Senaida and their helpful local Q'eqchi' Maya guides found lots of nests of honey wasps that both Norma Cho and Nicholas Hellmuth have each independently identified as *Polybia plebeja* (see final page for Hellmuth's documentation).

On March 4th the team had found my favorite golden wasps, *Polybia emaciata*. Their nest is made of mud, so they are not "paper wasps". This is a separate FLAAR Reports. There are conflicting statements as to whether or not this species of *Polybia* made honey, but in the meantime I have named it the Guatemalan Honey Wasp (in case we can find honey in their nests).

During these same days of March 2025, a lot more wasp nests were found, but often not close enough to document the coloration of individual wasps. Some may be *Polybia plebeja* but others may be a different species. March 5 and 6 are separate FLAAR Reports.



Fig. 1.

The first wasp nest we found was at about 10:30am. These wasps are so different that we devote a special separate FLAAR Reports to them.

So the present FLAAR Reports starts with the *Polybia plebeja* that are listed on the map as 11:00am.

Raxtul, 11:08am, Franklin Xol.

On our subsequent field trip a few weeks later, we visited San Jose Se Raxtul and photographed Panal 13a and Panal 13b, but both of these were different nests than we photographed on March 4th.

Fig. 2.



10:58am,
photo by Franklin Xol.



Fig. 3.



Fig. 4.

10:56am, March 4, 2025 (on the map as 11:00am). The maps are at the end of the FLAAR Reports.



Fig. 5.

10:58am, Raxtul, photo by Franklin Xol.

On the next page you can see the wasps more clearly.



Fig. 6.



Fig. 7.



Fig. 8.



Fig. 9.

This photo shows the pattern of the surface of the finished bottom of this wasp nest.

When wasps are hiking around the outside, they generally have their wings open diagonally.

10:58am, Raxtul, photo by Franklin Xol.

Fig. 10.



Wasps are completely crowded together at the upper middle.

The entry-exit opening is at the lower right—on the side, not on the bottom. And there is no tube—simply an open area.

10:58am, photo by Franklin Xol.



Fig. 11.



Fig. 12.

Byron is taking photos of this wasp nest. He is very close, but since these are honey wasps, they do not (normally) attack.



Fig. 13.

In the upper left background you can see another mountain range far in the distance. So the team is high on another parallel mountain, with a valley between the hilltop they are on and the parallel mountain range on the other side.

10:56am,
March 4, 2025.

Fig. 14.



This view allows you to see that the area around Senahu is high in the mountains.

10:54am. Photo by Franklin Xol.



Fig. 15.

12:50pm



This is another nest, at 12:50pm.

Photo by Franklin Xol, cropped and processed in RAW mode by Nicholas Hellmuth.

Fig. 16, a and b.



Wasp Nest photographed at
12:50pm.

The entry exit area seems to
be at the left side.

Photo by Franklin Xol.



Fig. 17.



Fig. 18.

**12:56pm,
March 4, 2025**

Shown on the map as
1:01pm.

What I estimate is the
entry-exit area looks
quite large.

Photo by Franklin Xol.



Fig. 19.



Fig. 20. Here you can see there is one yellow band around the very thin narrow lower part of the waist, and then only one noticeable band of yellow around the abdomen. But actually many have a faint yellow band (so a second band around the abdomen). This “second band” is not always visible.



Part of the outside of this nest has fallen off, probably when the local guide brought the nest to show it to the team.

Fig. 21, a and b



If you search for *Polybia plebeja* in Portal de Biodiversidad de Guatemala you get the Departamentos of Jalapa, Guatemala, Zacapa, Santa Rosa, Suchitepéquez, Sacatepéquez, Jutiapa, El Progreso, El Quiche, Escuintla, Peten. So, most of the country, from bosque seco to Peten rain forests.

If you search for the older name, *Polybia diguetana* (now a synonym) you only get the Departamento de Guatemala.

But, not one location for either species name is documented for Alta Verapaz. So the team at FLAAR Mesoamerica is assisting entomologists to document both this new location for *Polybia plebeja* and the nest size and shape (and interior layout).

Photos up to here are by Byron Pacay; following photos are by Franklin Xol.



Fig. 22.



Fig. 23.



Very wide entry-exit area.

What are the wasps doing on the leaf? Some may just be crossing over it to get to the other part of the nest. But are the other wasps harvesting plant parts to build their nest?

Fig. 24,
a and b.



This entrance exit is not perfectly round. And as typical of most such entrances, there are lots of wasps squeezed together trying to get out—yet they don't seem to squabble with each other for being “walked over” by other wasps that are also trying to exit.

You can see that this nest is still expanding. There is a honey comb visible at the bottom, that we show in the following photos.



Fig. 25.

It really helps when the research team does photography of each part of the nest. This super-helpful photo shows more closely what you could only estimate was there in the photo on the previous page.

What I do not understand is why are the wasps at the left and top and far right “closing over” this honeycomb? The cells need lots more height above them for the larvae to rise up?



Fig. 26.

The entry to this hive is totally different size (larger) and shape (oval/irregular) than entry-exit areas of other wasp species.

We have asked the same question in the caption to other views of the bottom of this nest, why are the cells being covered over? They do not seem the height of a finished cell.

Fig. 27.



These cells look very very shallow, yet across the top the wasps seem to be “covering them over”?



Fig. 28.

Closer view of the entry-exit.

This entry-exit “hole” does not go straight down. Is there a larger one elsewhere on this wasp nest?

You can see what was visible in the previous slide—the wasps at upper right and lower left are covering over the cells.

Photo by Franklin Xol, FLAAR Mesoamerica.



Fig. 29.

Amazing organization of the cells, in rows: you can see rows going across and rows going up diagonally.

But later in this report you will see other nests where the rows are wandering and size varies occasionally.

Fig. 30.



**1:16pm,
Small but
“complete” Wasp Nest**

Aldea San Jose Se Raxtul,
Senahu, March 4, 2025.

Photo by Franklin Xol.



Fig. 31.

Photo by Franklin Xol.

Fig. 32.



Photo by Franklin Xol.



Fig. 33.

Aldea San Jose Se Raxtul, Senahu,
March 4, 2025, 1:16pm.

Photo by Byron Pacay.



Fig. 34.

Notice that these wasps have only one wide band of yellow around their abdomen—around the middle. Plus another band around the thinner upper end of their abdomen, next to their “waist”.

All the photos on iNaturalist for *Polybia occidentalis* show three bands of yellow around their abdomen. Thus these wasps are unlikely to be *Polybia occidentalis*. Norma Cho has suggested these wasps are *Polybia plebeja*.

The wasps in the photographs on our pages show an abdomen with only one yellow band around the middle and a second yellow band at the far narrow end of the abdomen (near their waist, their petiole).

Aldea San Jose Se Raxtul, Senahu, March 4, 2025, 1:16pm. Photo by Byron Pacay.



Fig. 35.

1:16pm, photo by Franklin Xol.



Fig. 36.

1:31pm, photo by Franklin Xol.



Fig. 37.

1:16pm,
photo by Franklin Xol.



Fig. 38.

1:35pm, March 4, 2025

A swarm of *Polybia plebeja* wasps has landed on a *Bixa Orellana* plant, achiote.

Fortunately this swarm did not fly over to the face of photographer Franklin Xol.



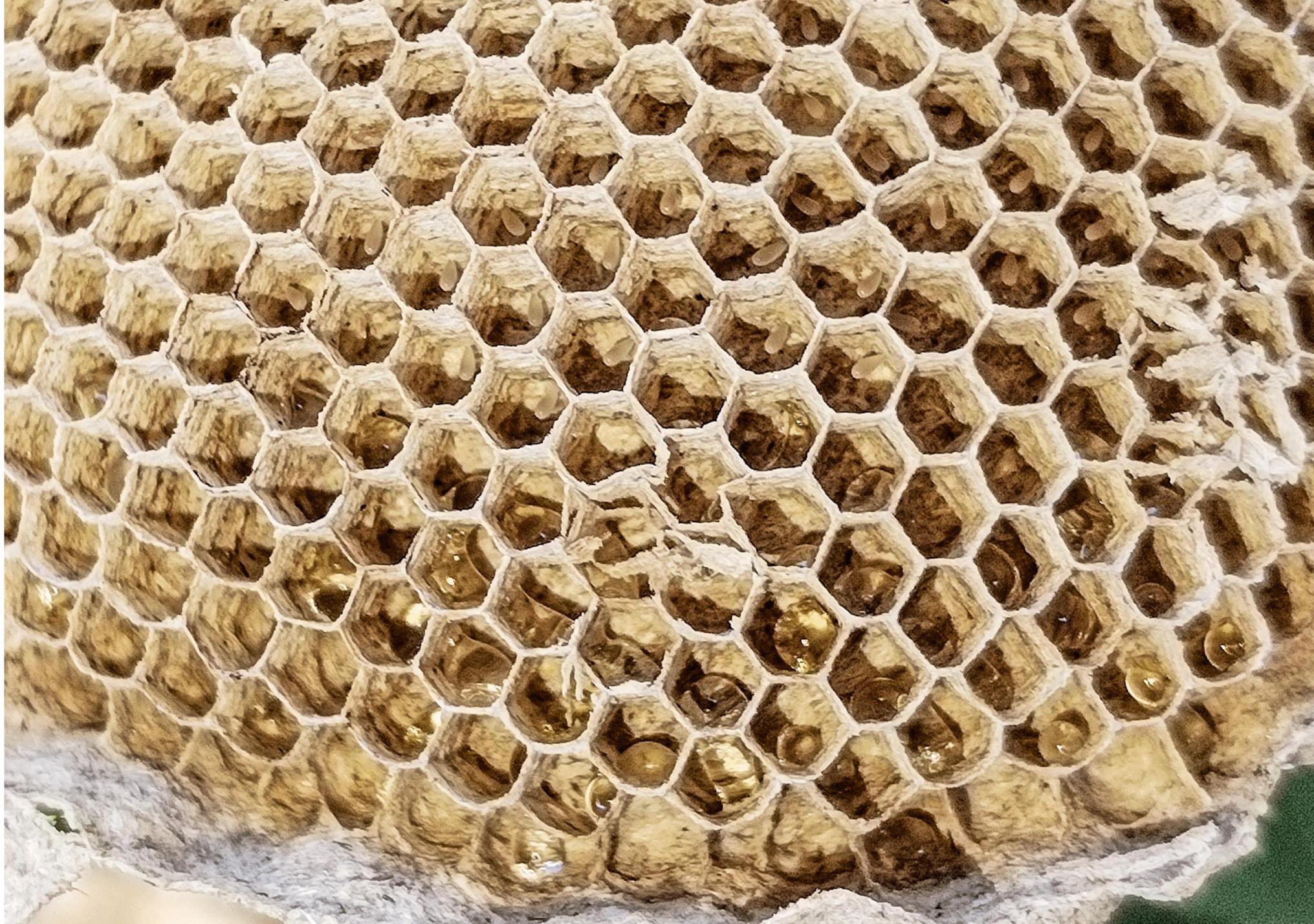
Fig. 39.

1:34pm

Lots of cells have honey which is why, even though this is a wasp nest, we call it a honeycomb.

Incredible engineering. And none of these wasps went to high school much less went to a university.

Fig. 40.



1:42pm, photo by
Franklin Xol.

You can see that
lots of these cells
have spheres of
honey colored
drops.



Fig. 41.

And again, you can see why I call these honey wasps.

As in many other nests, the honey is in spheres—it does not flatten out to fill the whole bottom. The structure and “liquidity” of this wasp honey definitely needs to be studied.

1:49pm, March 4, 2025, photo by Franklin Xol.



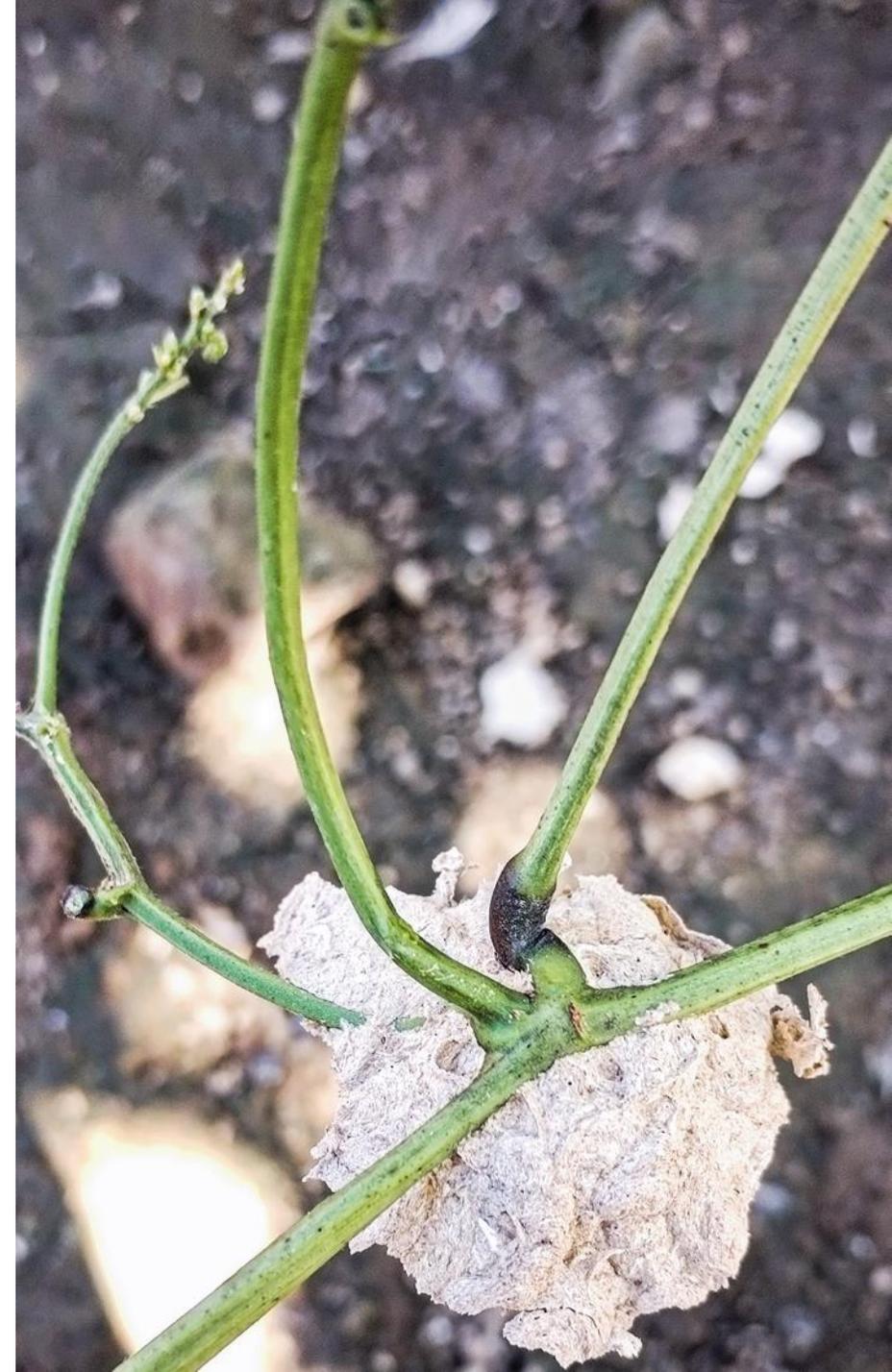
Fig. 42.

1:52pm.

Looking down at the top of a wasp nest. This was attached to lots of stems of this vine or bush. The wasp nest was just being started so was not very large.

Photo by Franklin Xol,

Fig. 43.



We always try to have two different photographers on each field trip, because each photographer has their own personal style. So when two different photographers photograph the same wasp nest you get some views from each one that are different than the other photographer.

This is the inside of the wasp nest hanging from a thin green plant part.

Raxtul, Senahu, 1:53pm, March 4, 2025, Franklin Xol.



Fig. 44.

Fig. 45.





Capture One software from Phase One digital camera company in Denmark has even better processing software, but most graphic designers and photographers around the world use the basic Adobe Photoshop or Adobe Lightroom.

RAW mode allows you to literally see inside the nest to see a layer not otherwise visible.



Fig. 46,a. This image is how it appears as a JPG.

Fig. 46,b. This image has “shadows removed” (so you can see inside).

3:48 to 3:51pm.



Fig. 47, a and b. Beautiful yellow-green wasp, that we have not often seen elsewhere. Would be super-helpful if a wasp entomologist could suggest at least what genus.

Not all the cells look like they are the identical height.





Fig. 48. Some cells have larvae who have grown quite tall. Other cells have blobs that are only a few millimeters high (not yet even full height. All the other cells have honey-colored material across the lower part of the cell.



Fig. 49, a.



Fig. 49, b.

These wasps have light yellow on thorax and legs and light green on their abdomen. Since these photos were in JPG, when you zoom in they are low quality but at least you can see that these wasps are completely different than all the others that we photographed.

Amazing precision of row after row after row of hexagonal cells. This is a view of the nest of the yellow-green wasp.

The entrance hole is the larger opening in the middle.

3:50pm, photo by Franklin Xol.



Fig. 50.

This was the last stop of March 4, 2025, 4:45pm to 5:07pm

4:51pm, photo by Franklin Xol. This nest is shown on the map as 4:48pm. This area is listed as Sillab Volcan in the daily notes.

The local guide wanted to show the team the insides of the nest (that the local people eat).

Lots of larvae, but all white colored around their outside. In other views we will see dark gray, showing a further growth of the future wasp.



Fig. 51.

Now you can see why we call this a honey wasp nest, because there is a golden sphere of actual honey still in the cell. Keep in mind that when a wasp nest falls down, some of these spheres of honey will drop out.

Note how high these hives are and how much higher the larvae stick up.

4:53pm, March 4, 2025, photo by Franklin Xol.



Fig. 52.

These honey combs (or “larvae combs”) are indeed horizontal, and parallel to each other.

4:58pm, March 4, 2025, photo by Franklin Xol.

Fig. 53.



Lots of fully wrapped larvae sticking up, high above the cell walls.

I am curious whether the brown material at the bottom of the empty cells has been studied? Are these hatching eggs starting to grow?

5:02pm, photo by Franklin Xol.



Fig. 54.

I estimate that the white objects are individual larvae and that the ones that have turned black are the following pupa stage.



Fig. 55.

5pm, March 4, 2025,
photo by Franklin Xol.



Fig. 56.



Pure white are larvae.

Light gray with white at the top mean the pupae are starting to form.

The ones with smaller white at the top and darker gray I estimate are pupae that are growing faster. So not all these wasps fly out on the same day.

5pm, March 4, 2025,
photo by Franklin Xol.

Fig. 58.



Local people harvest the wasp nests to eat the eggs, larvae and honey—and the panal itself.

This cross section is a good view of the inside of the center of this wasp nest. Lots of edible larvae, plus I see reflection from a few spheres of honey. Though I am not sure how many people want to eat the pupae?

Sometimes most of the species within a genus have similar nest structure. But in other general, lots of species have their own special structure.

And, I would estimate, that occasionally the wasps in one nest will be innovative—after all, that's evolution of the survivors.

Fig. 59.





Closeup from the previous photo. This is why we call these Honey Wasps.

The honey combs of this *Polybia plebeja* have the honey in spheres.

Would help to have a portable photo studio, with lighting, so you could photograph each area of cells.

4:57pm, March 4, 2025.

Fig. 61.



Another layer of honeycomb.

There are continuous diagonal rows going continuously up. Then there are also rows going horizontally. So this honeycomb is amazingly engineered—better than modern concrete constructions that collapse around the world in many countries.

But some rows meander a bit. Would be great to have a PhD student accomplish a 3D model based on “3D photography” of each panel of a nest, to show examples of perfectly geometric rows and examples of meandering rows (where some cells get a bit squeezed and are a millimeter smaller or larger on one or more sides).

4:46pm, photo by Byron Pacay.



Fig. 62.

This is a lower level of honeycombs after all the upper layers have been removed. Did this wasp nest hang on to the entire vertical stem? In addition to hanging on to a horizontal twig above?

There are honey spheres in many locations around the edge, some are more visible in the close-up crop shown on the following page.

Lots to study—would help to have a 3-D animated video to show the entire sequence—starting the nest, the queen laying her eggs, the eggs being cared for by (I assume) by the workers, then the larvae and then the pupa development stage

Photos in RAW format by Byron Pacay, 5:11pm, processed as RAW by Nicholas Hellmuth, then converted into a .png for this PowerPoint format (which allows showing photos are larger size than on a letter-size format).



Fig. 63.



Fig. 64. At least three spheres of honey-colored "liquid" around the edge. The upper half of all the larvae grow far out and above the cell.

Three rows of cells filled with what I estimate is honey at upper left.

Why is most of the honey in round spheres—instead of sinking down inside the hexagon?

Tall white larvae at center.

Another level of larvae, with many turning gray, which I estimate is because pupae have now developed from the larva stage.



Fig. 65



Closer view of the three rows of honey in the cells. Then, at the right, two rows of honey.

Endless number of websites say that “only bees make honey”. Other websites say that “only a few wasps make honey”. And most list only the Mexican Honey Wasp.

Our goal is to show that many different species of wasps make edible honey (available to Maya people for thousands of years). The ants and other insects that make honey-like food would be a completely separate research project.

Fig. 67.





Fig. 68, a. Rare view that shows the stinger on this wasp.



Fig. 68, b. Interesting that the weight of the abdomen does not result in the end being dragged over the surface of the nest. Clearly these wasps have a way to keep the stinger from scraping the ground.

Concluding Comments

Even if we are only estimating that many of these wasp nests are of *Polybia plebeja*, whichever species it is, our photos are the first for the Alta Verapaz area of Highland Guatemala.

Although the “cloud forests” are best known for the Quetzal bird area to the west/southwest, in fact, if you are driving at night from Cahabon towards Senahu, from the top of the mountains (where the dirt/mud road is) as you get close to Senahu you see miles of clouds covering all the valley areas—only the mountain tops rise out of the clouds. Senahu is “up in the mountains” but is surrounded by much higher mountains that are literally up in the cloud forest (albeit not the Quetzal cloud forest). Not many botanists or entomologists have initiated field work in these remote rural areas. But we have been doing field work between Senahu and Cahabon for over 12 years. This is why it was possible for the FLAAR Mesoamerica team to find several wasp species that are not yet in databases for Alta Verapaz.

The present FLAAR Reports is for the first honey wasp field trip—March 3, 4, 5 and 6. For the second field trip we had a drone pilot, Javier Archila, who also had a full-frame Sony camera with 200-600mm Sony lens. That field trip to the same areas of Alta Verapaz was March 17, 18, 19, 20, and then on March 21st, back to Guatemala City. There are FLAAR Reports in preparation to show all these locations where we found wasp nests plus photos.

Carpenter, Garcete and Freire (2012, Appendix 1) list eight species of genus *Polybia* for Guatemala:

Polybia diguetana du Buysson 1905, Departamento de Guatemala, abdomen has one noticeable yellow band and one faint band, plus wing design is similar to the wings of the Alta Verapaz wasps found by FLAAR Mesoamerica. The current (new) accepted name is *Polybia plebeja* de Saussure, 1867 (results when you ask Google for accepted name).

Polybia emaciata Lucas 1879, no presence on biodiversidad.gt. Has five yellow bands and yellow end of the tail.

Polybia flavitincta Fox 1898, biodiversidad.gt uses *Polybia mediamericana*, Chimaltenango, is “solid black”

Polybia occidentalis nigratella du Buysson 1905, Peten, Escuintla, Santa Rosa, and Jutiapa, has four yellow bands.

Polybia raui raui Bequaert 1933, no presence on biodiversidad.gt, mostly black.

Polybia rejecta (Fabricius 1798), Guatemala, Izabal, Peten, has golden wings and light-brown abdomen.

Polybia simillima Smith 1862, no presence on biodiversidad.gt, “black all over”

Polybia tinctipennis tinctipennis Fox 1898, no presence on biodiversidad.gt, black with unexpected design all across abdomen.

So, I conclude that the wasps of Aldea San Jose Se Raxtul, March 6, are definitely *Polybia plebeja*.

Wikipedia has a helpful bibliography on *Polybia occidentalis* (https://en.wikipedia.org/wiki/Polybia_occidentalis), so below I only add a chapter that helps know how many species of wasps were known in Guatemala in the previous decade.

CARPENTER, James Michael, GARCETE Battett, Bolivar Rafael and Joseph Aledander FREIRE

2012 Las Vespidae (Hymenoptera: Vespoidea) de Guatemala. Chapter, pages 269-279 in *Biodiversidad de Guatemala*, Volumen 2, Universidad del Valle de Guatemala.

Available as helpful download from ResearchGate and elsewhere.

Notes by the field trip team for the exploratory first visit to Senahu area of Alta Verapaz, Guatemala

Hour when each nest was photographed has been added by Nicholas Hellmuth.

Martes March 4, 2025

Se dio inicio de la expedicion a primera hora de la mañana aprovechando el dia para realizar una expedicion exsahusta en la busqueda de la avispa. Logramos conseguir el primer panal en la Aldea San Jose se Raxtul Senahu, seguimos buscando y fuimos encontrando las avispas amarillas cuyo panal esta laborado a base de tierra posiblemente de la especie *Agelaia areata*, con ubicación geografica en las cordenas: **15.488, -89.831**. The first wasp nest is shown on the map as photographed at 10:30am.

También encontramos la avispa de que produce miel, conocido como avispa de bala, que posiblemente sea de la especie *Polybia plebeja*, con ubicación geografica en las cordenas: **15.488, -89.831**. The second was nest is shown on the map as photographed at 11am.

Fuimos a la finca se Pom y encontramos la avispa de miel posiblemente de la especie *Polybia plebeja*, con ubicación geografica en las cordenas: **15°28'1.65"N, 89°53'46.23"W**. The third wasp nest is shown on the map as being photographed at 1:01pm.

Seguimos recorriendo nuevos lugares hasta llegar a Sillab Volcan, otro lugar donde tambien encontramos la avispa de miel posiblemente de la especie *Polybia plebeja*, con ubicación geografica en las cordenas: **15°28'1.65"N, 89°53'46.23"W**. This fourth wasp nest is shown on the map as being photographed at 4:48pm.

The Made-from-Mud Wasp Nest of *Polybia emaciata* is a separate FLAAR Reports



This is the first wasp nest the team found on March 4th, 2025. The nest is made from mud-like material, so not a “paper wasp nest” made from plant parts.

Plus these wasps are bright yellow and golden colors, so we have a separate FLAAR Reports on these *Polybia emaciata* wasps of the Municipio de Senahu, Departamento de Alta Verapaz, Guatemala.

It seems that these *Polybia emaciata* wasps will occasionally invade nests of other wasps, pull a pupa out of its cell, and fly it away to eat. We document this with photos from the field trip of March 19, 2025.

Fig. 69.

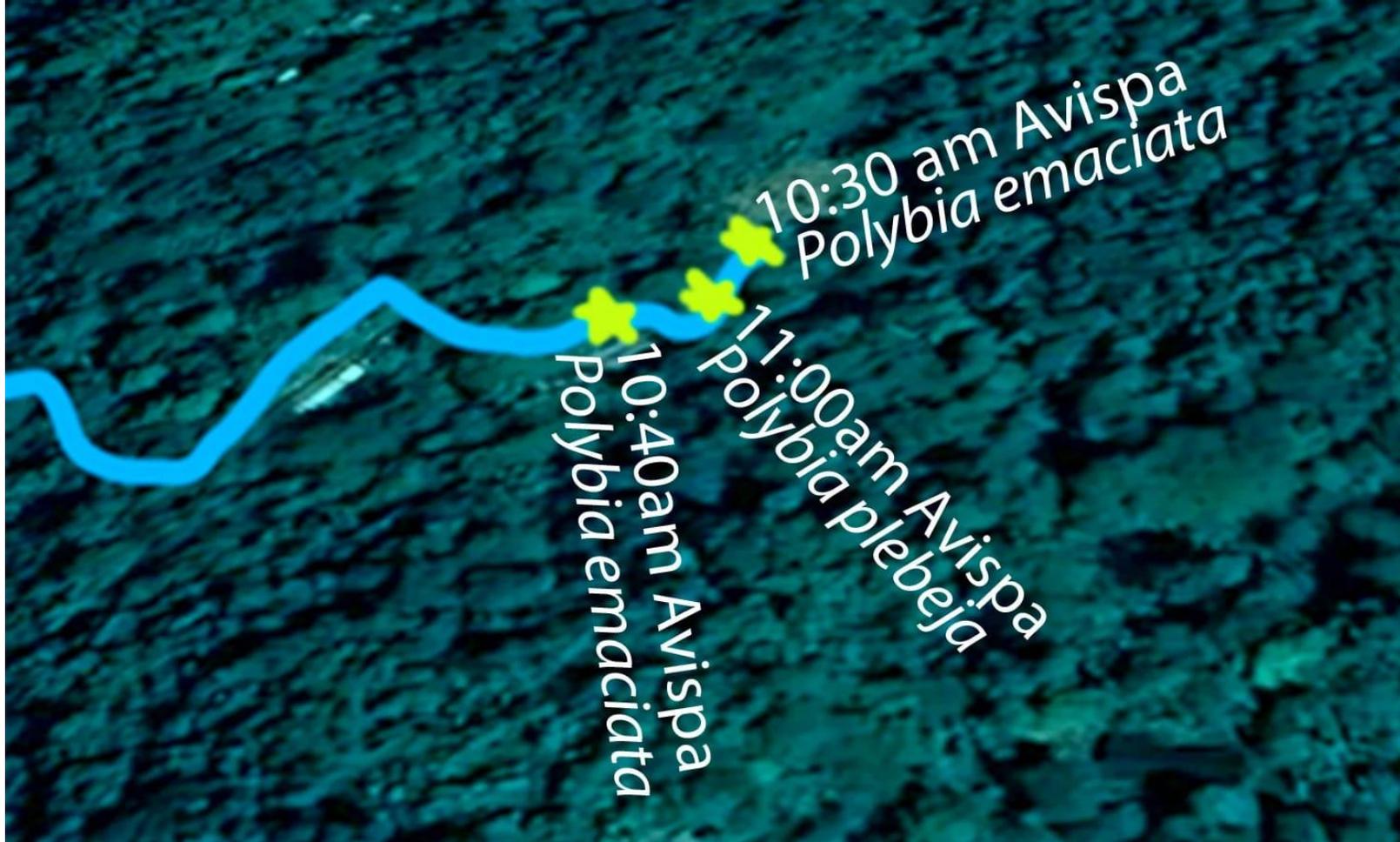


Fig. 70.

The hour and minutes placed on the map is an approximation, obviously the same wasp nest was photographed over many minutes. So 10:54 (for the previous photo) is the location for "11:00am". Plus, at the same "location" there may have been several nests photographed.

The *Polybia emaciata* nests are shown in a separate FLAAR Reports.

RECORRIDO DE SENAHÚ HACIA ALDEA SAN JOSE RAXTUL, ALDEA SILLAB VOLCAN Y FINCA SEPOM MARZO 4, 2025



Crop from the map of Byron Pacay with his text and route placed on top of Google Earth Pro satellite view.

These maps are to assist students who would like to accomplish a MA thesis or PhD dissertation on wasp nest structure differences among the various genera and species of this area of Guatemala. And these maps are for wasp entomologists who would like to accomplish more in-depth analysis of the life cycle of all these wasps. Be sure to go with local Q'eqchi' speaking guides.

Fig. 73.

RECORRIDO DEL CENTRO DE SENAHÚ HACIA ALDEA SAN JOSE SE RAXTUL, FINCA SEPOM Y ALDEA SILLAB VOLCAN MARZO 4, 2025



Drawing by Byron Pacay on Google Earth Pro satellite view.

The town of Senahu is down at the bottom. This is where we spent each night.

Fig. 75.

Aknowledgements

The itinerary of this field trip was organized by Senaida Ba and her husband Franklin Xol, since they both live in Senahu. Franklin is a Tuk Tuk driver when not working for FLAAR Mesoamerica, so for this field trip the team rented a Tuk Tuk and Franklin drove them. Byron Pacay assists on all field trips plus he is a good photographer with our Google Pixel 8 Pro. Byron also prepares the highway maps to show where and at what hour we stopped to photograph each wasp nest.

We sincerely appreciate the assistance of the Q'eqchi' Maya guides that told us which areas had wasp nests with edible honey.

Vivian Hurtado is research project manager for FLAAR Mesoamerica. She works from her home office and from the office of FLAAR Mesoamerica.

If you are a wasp entomologist, please contact Vivian Hurtado via email: flaar-mesoamerica@flaar.org You can write in English o en español. Please also include Sergio Jerez, botany-zoology@flaar.org