

Tree Climbing as a Means of Studying Arboreal Ant Populations

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Introduction:

My group project was supposed to look at the ant diversity in the rainforest canopy. We intended to use tree climbing equipment to gain access to the upper levels of the trees. In preparation, we did some rock climbing and received some instruction from a professional tree care specialist. However, though his climbing method works well for his applications, it is less safe and requires more upper body strength than the method we decided on. We did not obtain our equipment until the end of the Spring semester. By that time, the stresses of the end of the semester prevented us from practicing with the new equipment.

When we arrived in Dominica, it became clear that ants were not as interesting to all of the group members as they had believed when we decided on the project. Still, two of our members attempted to understand the equipment so that it could be used in some other arboreal application. That attempt could only have gone worse if someone were seriously injured. After that bad experience, climbing using our equipment was written off in many people's minds, and we decided to accomplish arboreal research using aerial malaise traps. I, however, still believed it would be possible to gain access to the canopy using our equipment. I devoted myself to understanding the workings of our equipment in the hope that future researchers would be able to use this information to do valuable research in the rainforests of Dominica. In the process, I also performed a rudimentary implementation of the original group research idea. Presented here is my attempt to record the knowledge I gained about tree climbing and canopy research for those who will follow.

Methods:

A large fig tree was located near the Check Hall River on the property of the Springfield Center for Environmental Protection Teaching Research and Education. This tree had several large, horizontal branches over which a rope could be passed in order to ascend the tree and place traps. My traps consisted of Corning 15ml and 50ml plastic centrifuge tubes as well as black screwcap glass vials. They were baited with old lunch meat, tuna or fruit juice and placed on the tree without their caps so that ants would be able to gain access to the bait. Four traps were placed at six to seven meter intervals along the trunk of the tree from ground level to about 20m above ground level. These traps were changed at various time intervals ranging from four to fifteen hours. They were baited with turkey lunch meat, tuna or fruit juice. The traps were attached to the tree by wedging them beneath the epiphytic vines that were found on the trunk of the tree.

The Equipment

The following pieces of items were used in order to ascend the tree to place and change the traps:

- 1 lead-filled throw bag
- 1 150 foot 1/4 inch utility rope
- 2 50 foot 1/4 inch utility ropes
- 2 150 foot woven static climbing ropes.
- 1 safety helmet
- 1 tree climbing waist harness
- 2 ascenders with associated foot and safety straps
- 2 locking carabiners
- 1 figure 8 descender
- 1 or more partners

The throw bag is simply a lead-filled canvas bag with a ring on one end. When a utility line is tied to the ring and the bag is thrown, the line will follow the bag so that it is laid over the desired branch. The utility lines are used because they are much lighter and easier to place in the tree than the climbing rope. Once placed, they may be used to hoist the climbing rope into position.

The rope is a high quality woven static climbing rope. You will be climbing the rope itself, not the tree. Every effort should be made to keep the rope clean, though it is understood that they are being used in the field.

The safety helmet can prevent serious head injury in the event of an accident.

The harness is different than the one used by rock climbers. It has a wide strap that passes under the thighs so that you can comfortably sit in it. Several large rings provide places for attaching accessories. The two large rings that overlap in the front should always be used simultaneously when the descender or the safety straps from the ascenders are attached.

Rock climbing style carabiners are used in any application that requires the attachment of a piece of equipment to the harness.

You will be climbing using the red ascenders. These attach to the free end of the rope. Attached to the bottom of each ascender should be two straps. One will end in a stirrup and the other is safety strap. Attach the safety straps from both ascenders to a single carabiner. One ascender will go above the other on the rope. It worked well for me to keep the ascender attached to my right foot above the ascender attached to my left foot.

The two ascenders are not identical, but enantiomers. One is for the right hand and foot and the other is for the left hand and foot. You can determine which ascender is which by orienting them in front of you such that the finger grips are at the bottom and the open faces of both ascenders are facing you. In this arrangement, the ascender in your right hand should be attached to the rope above the ascender in your left hand.

Wear the stirrup of the upper, right ascender on your right foot and stirrup from the lower, left ascender on your left foot. The elastic straps should stretch around the backs of your feet. Adjust the leg straps so that your right foot's strap is 4-5 feet long, and your left foot's strap is 2-3 feet long. Taller climbers will want to have longer straps.

The opposite is true of shorter climbers.

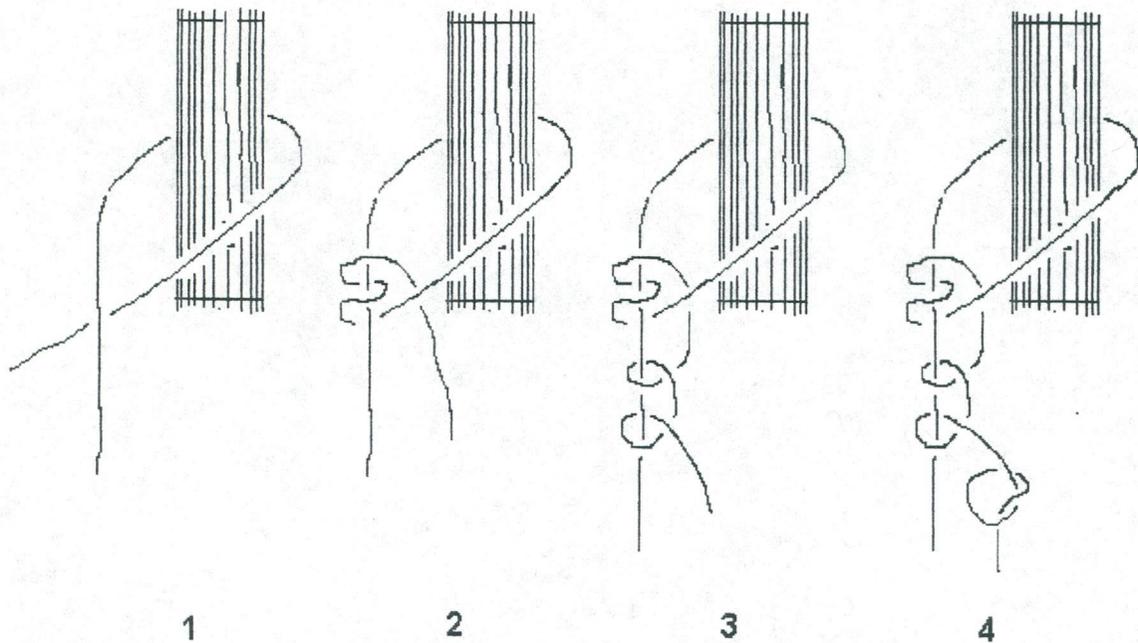
Though it would be possible to climb alone, this would not be wise or efficient. Having a partner on the ground ensures that someone will be there get help if the climber gets hurt. Also, many aspects of climbing are made much simpler if a partner is on the ground. Never climb alone. Finding a partner will obviously not be a problem if the equipment is used for a group project. However, a little more marketing was required for me to get partners to go with me to do my research. Once I started offering to teach the other members of my trip to climb, partners became much easier to find.

Positioning the Climbing Rope

Tie the throw bag to the 150 foot yellow utility line and throw the bag over a desirable branch in order to use the utility line as a lead to pull the climbing rope over the same branch. I came up with two throwing methods, both with mixed success. One method you can attempt is a baseball style overhand throw. This method provided me with good results for branches under 30 feet high. However, the amount of force and accuracy required to throw the bag over higher branches may be unrealistic for other researchers. One potential hazard when using this method is that the utility line may get pulled over the back of the throwing hand after the bag is released, resulting in serious abrasions. This was my experience especially when I held the bag so that the rope protruded from the from the pinky finger end of my hand.

Another method of propelling the bag into the tree that you can try involves a swinging motion. Grasp the line two to three feet from the throw bag and rotate the bag in a vertical circle such that the bag is ascending when in front of you and descending when behind. Release the line as the bag reaches the point in its upswing that will allow the bag to carry the line over the desired branch when released. This process requires some practice before any degree of proficiency is attained. A potential hazard of this method occurs just after the rope is released. If the rope is not cleanly released and remains in contact with the hand while the throw bag is traveling along its desired course, the friction between the hand and the rope can produce a considerable amount of heat. In my experience, the result was similar to cauterization.

Once you have the utility line over the desired branch, tie the end of the climbing rope to it and pull the other end of the utility line so that you hoist the climbing rope up over the branch and then back down to you. Tie off one end of the climbing rope to the trunk of a nearby tree using the knot seen in the following illustration.



Tighten the knot produced after step three. Then tie a pretzel knot as seen in step four for added safety.

Initially, I made several attempts to throw the bag over ideal branches. However, because of the high degree of accuracy required for this method, it proved to be more expedient to concentrate on getting the line over a lower, less ideal branch. This branch still needs to be higher than at least one other branch so that the climber can step off onto the lower branch and still be attached to something. From this higher vantage point you can throw the bag over a higher, more desirable branch. Have your partner attach the other climbing rope to the utility line and pull the rope up over the new branch while you are still in the tree. This allows you to stay in a position to repeat the throw if something goes wrong while the second climbing rope is being positioned. After the second rope is positioned, descend using the first rope. This process can be repeated until a climbing rope is placed over the most desirable branch.

Preparing to Climb

1. Place the ascenders on the rope as described in the equipment section.
2. Put the climbing harness on from behind. Wearing it across the middle of your hips, tighten the belt until it is snug, but not tight. Then pull the brown leg straps up between your legs and buckle them loosely in front.
3. Place the climbing helmet on your head and tighten the chinstrap.
4. Attach the carabiner attached to the safety loops from the ascenders to the two rings in the front of the harness. Lock the carabiner in place by turning the nut until it stops. Do not tighten it too much, or you will need pliers to open it again if it bears weight. You can make sure the carabiner is locked by squeezing the two long sides together. If the carabiner opens, it is not locked.

5. Place your right foot in the stirrup with the longer strap. This strap should be attached to the upper ascender. Place your left foot on the shorter strap attached to the lower ascender.
6. Make sure the blue descender is attached to one of the side rings of your harness by another carabiner. It is possible to descend by using the ascenders, but using the descender is a much more gratifying experience.

Climbing

The climbing process can best be described as stepping up the rope. You will not be directly climbing the tree, but the rope. You will sway and rotate some. Having a partner hold the rope tight as you climb will significantly reduce this motion. Another problem you will encounter is that all of the straps tend to get tangled. It will take some practice before you are able to avoid this problem.

To climb, stand holding the rope in front of you. Slide both ascenders up until they pull on your feet. The teeth on the ascenders allow you to slide them up the rope, but they dig in and hold their position when pulled down on by the foot strap. Once both straps are taut, lift your right foot about two feet in the air and simultaneously slide the upper ascender up so that you take up the slack. Then step onto the right stirrup with all of your weight, keeping your hands on the rope for balance. This step will take some of the slack out of the climbing rope. Next, keeping all your weight on your right foot, raise the lower ascender until it bumps into the upper ascender. As you raise the ascender, lift your left foot along with it. Your partner needs to be keeping the free end of the rope taut so that you will be able to slide the lower ascender without pulling up the climbing rope along with it. Now grasp the rope above the ascenders and step with all your weight onto the left stirrup. This step will probably also take slack out of the rope.

Slide the upper ascender up as far as you can while raising your right foot along with it. If you are placing any weight on the right stirrup, you will not be able to slide the ascender. Step onto the right stirrup. This step or one of the next two or three may be the one that lifts you off the ground. Don't panic as you start to sway around. Your partner will need to pull the rope tight to minimize your swaying as you climb. Try to focus on the rope and these ascenders and ignore the motion of the background scenery. Now, while raising your left foot, reach down and slide the lower ascender up until it touches the upper ascender. Step onto the left stirrup. Repeat this process until you have reached the desired height.

Try to keep your full weight alternating between your feet. Use your hands to keep yourself in an upright position. You should not feel like you are pulling yourself up the rope with your arms.

Getting Back to the Ground Alive

If you forget your descender or get tired of climbing before you reach a branch you can sit down on to change over to the descender, you can still get back down by means of the ascenders. Simply put your full weight on whichever stirrup is lower and then disengage the teeth of the ascender not bearing your weight by pressing down on the toothed part of the ascender from above. Slide this ascender down until you can take a good-sized step down, and then release the teeth back onto the rope. Repeat the process

with the other ascender and continue to step your way back down to the ground.

The easier and more enjoyable way to descend is by means of the blue figure 8 descender. While sitting on a branch, preferable near the trunk, detach the carabiner holding the descender from the side of your harness. Leave the carabiner attached to the descender and hold the two in front of you with the carabiner to the left. Hold the descender so that it is between you and the climbing rope. You may have to adjust your ascenders up or down to provide yourself a section of clear rope. Then pull some of your rope through the large hole on the right side of the descender. Pull the rope around the carabiner end of the descender. You should practice this part while on the ground, but if you get up there and can't remember how to do it, there is a picture printed on the descender. Place an extra turn around the top hook of the descender to provide extra friction. Now clip the descender to both of the front rings of your harness by its carabiner and lock the carabiner.

You can now safely detach both of the ascenders from the rope and allow them to hang from the safety straps attached to your harness. Remove the stirrups from your feet and allow them to hang as well. This is the best option I could devise for dealing with the ascenders when you are ready to go back down. It is important to attach the descender before removing the ascenders so that you are securely attached to the rope at all times. Once you are attached to the rope only by the descender, slide the descender up the rope so that it pulls up on your harness.

The descender works by causing friction with the rope as the rope loops through it. When you pull down on the rope below the descender, you increase the friction to the point that the rope cannot pass through the descender and you are held in place. To descend, grasp the rope above the descender and have your partner pull the rope tight below you. When you first place your weight on the descender, it may slip a little. For this reason, it is safer for your fingers if you keep them out of the way and allow your partner to provide the tension on the bottom end of the rope. With your hands above the descender and your partner pulling down on the rope from the ground, slide off of the branch you are sitting on. You will fall two or three feet as you pull the slack out of the rope. After you have stabilized, move your hands below the descender and pull down on the rope. Signal to your partner to stop pulling on the rope. You can now lower yourself down the rope using a hand under hand motion or by letting the rope slide through your fingers. As you descend, remember to make sure the ascenders do not get caught on anything.

Descending is always the most enjoyable and even exhilarating part of the climb. It is also probably the best time to perform any research because your hands are free. When you want to stop and work, simply have your partner pull the rope tight. You can then use your hands to perform whatever task is required.

Back on the Ground

Once you have lowered yourself back to the ground, detach the descender's carabiner from your harness. Remove the rope from the descender and immediately clip the descender back onto the side of your harness so that it will be there for the next climb. Then detach the carabiner holding the safety straps from your harness. Leave the straps connected to the carabiner so that all of the ascending equipment stays connected as a

single unit. Now you can remove the helmet and the harness.

If you intend to climb the same tree again, you may be tempted to leave the rope in the tree. However, this is not good for the rope. It is better to untie the rope and attach the end to a utility line. The climbing rope can then be pulled down from the other end while the utility line is hoisted up. You will need at least a 100 foot utility line. I only had two 50 foot lines, which I tied together. As the climbing rope comes down, its own weight will pull the end of the utility line with it if you fail to hold onto the end. When the climbing rope is down, untie it from the utility line and tie the two ends of the utility line together. The utility line then serves as a placeholder until the next climb.

What to Do if You Loose Your Grip on the Rope

First, do not panic. The safety straps will keep you from falling to your death. However, you will find that your feet are higher than your head. Take a deep breath and enjoy the view. It requires a lot of strength to pull yourself back up to a vertical position when you are hanging from the safety straps. Knowing that not all future climbers would be capable of that amount of exertion, I spent some time trying to find a better way to get out of this predicament. Depending on the positions of the ascenders when you fall, two different courses of action are needed.

The basic problem is that the safety straps are longer than the foot straps. They need to be as long as they are to allow the ascenders a full range of motion. You need to get one of your feet down lower so that you can step onto it. This will make it much easier to stand back up. If you fell while the upper ascender was much higher on the rope than the lower ascender, you should be able to reach to lower one. Disengage the teeth and slide it down the rope until your left foot is slightly below your body. Remember that the ascender will not move down if you are placing any weight on it. You should now be able to step onto the left stirrup and pull yourself back upright. Next, reach up and slide the upper ascender down the rope enough to allow you to step onto the right stirrup and continue the climb. If, after your fall, you do not want to continue, you can descend using the ascenders as previously described.

If you fell with the lower ascender just below the upper one, you will probably not be able to reach it to slide it down the rope. In this situation the same effect can be achieved by reaching for to buckle on the left leg strap and releasing it so that you increase the length of the strap until you can step onto the stirrup and stand up again as described for the other situation.

Notes for the Partner on the Ground

- Dirt on the rope can significantly reduce the life span of the rope, so try to keep the rope out of the mud and avoid stepping on it. You may want to consider taking a sheet with you to lay the rope on when you go out in the field to climb.
- As the climber is beginning to climb, you will need to kneel at your partner's feet and pull down on the rope so that it hangs as close to vertical as possible. As the climber takes the first few steps up the rope, the ground partner is very important in keeping the climber from swinging around more than necessary. Also, it is much easier for your partner to climb a vertical rope than a slanting one.
- When your partner is ready to come down, you are providing the tension that keeps

the climber from sliding down the rope out of control, so pull hard. Also, if your partner begins to fall down the rope at any other time while descending, a pull by you will arrest the fall.

Results:

Several ant species were observed on the tree during the course of the experiment. However, only two species of ants were attracted to the traps. The most common ant was identified using Bolton's Identification Guide to the Ant Genera of the World as belonging to the subfamily Cerapachyinae. One of the ground traps baited with tuna caught one ant of the genus *Odontomachus* (Formicidae: Ponerinae). Interestingly, this trap also attracted a fly (Diptera: Sarcophagidae) which oviposited in the tuna. Several maggots were observed in this trap. The Cerapachyine ants were observed at all heights and on all baits except for the traps placed at the highest level. No ants were ever trapped at 20m height. The fruit juice placed at the highest level had dried up by the time the trap was taken down.

In all, eight people besides myself climbed the tree. As previously mentioned, one who climbed before I did had trouble working out the system. She ended up hanging from the safety straps on the ascenders and had a difficult time getting back to a vertical position. Of the other seven climbers, three were males and four were females. All but one male and one female had successful climbs on the first try. The female who had problems was able to climb successfully later in the trip. Two of the other females enjoyed their climbs so much that they went up more than once. It appeared that the people who had trouble were trying to use more upper body strength and not trusting the foot straps to hold their full weight.

Discussion:*Issues for Future Climbers at Springfield*

I did not use all of the equipment available. There was a third static rope that was not used. Also, we had some pulleys for hoisting up equipment. I did not get around to deciphering how these worked. There are several extra carabiners and an extra throw bag. Also, we had two small saws that could be clipped to the harness in order to clear branches. An extra helmet and harness were available. I and all of the other climbers used the small harness. Also in our inventory were two pairs of gloves. Both pairs were too small for my hands. Apparently, the sizes are based on potbellied lumberjacks with small hands. One important future acquisition would be another set of ascenders and another descender. Also, it might be good to buy one new rope every year for safety purposes.

The Ants

My first thought as to why I did not observe the Cerapachyine ants at the highest level was that their colonies are on the ground and they simply do not forage that high up the tree. However, the dry fruit juice trap may indicate that the traps were becoming very hot due to direct sunlight. This might have been detrimental to ant foraging. Another possibility is that a hummingbird found the trap and drank most of the juice. If this was the case, the residue should have still been attractive to the ants. Both the hummingbirds and the ants present opportunities for future arboreal research.

Conclusion:

I hope the instructions provided in this paper are an aid to future researchers. Please become proficient with the equipment before you go to Dominica. There is not enough time once you arrive to learn to climb and also perform valuable research. Good luck and good climbing!