

Trip Report
Chiapas, Mexico
June 7-15, 2010

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A new species of *Dendroctonus* bark beetle, tentatively given the scientific name *D. woodi**, has been found in southern Mexico and throughout much of the pine forests of Central America. A cooperative project between the USDA Forest Service, the Texas Forest Service, and El Colegio de la Frontera Sur ECOSUR was developed to study the new species. This species was initially implicated in the large bark beetle outbreak in Mountain Pine Ridge Forest Reserve in Belize in 2000, but subsequent investigations into its ecology suggest that it functions as a secondary pest and that the southern pine beetle (SPB), *D. frontalis*, was the primary cause of pine mortality. In addition to the determination of the ecological role of the new species, other objectives of the project were to examine the mating compatibility between SPB and *D. woodi*, document the cuticular hydrocarbons of both species throughout their ranges, and identify potential pheromones or other attractants for *D. woodi* that could be used in surveys and management.

I traveled to Chiapas in June 2010 to continue work on the project. I met with Brian Sullivan, SRS, Jorge Macías-Sámano, formerly with ECOSUR and now with Synergy Semiochemicals, and Alicia Niño and Benjamín Moreno Castillo, graduate students at ECOSUR. All have been heavily involved in working with the new species. The species description is almost ready for publication, and the project plans to publish a series of papers on the new species in conjunction with the description. The goal of the trip was to gather data further defining the ecological role of *D. woodi* to include in the planned publications. The specific objectives were:

1. Determine the sequence and height of arrival of attacking SPB and *D. woodi*;
2. Examine gallery length and shape of both species at various tree heights;
3. Calculate brood production at varying tree heights; and
4. Discover if the new species would attack stumps or downed pines.

*Though not officially published to date, I will use *D. woodi* as the scientific name in this report.



Benjamin, Jorge, and Alicia (L-R)



Brian “the Hatchet Man” Sullivan

Monday, June 7, was a travel day, and Brian, Jorge, and I arrived in Tapachula. On Tuesday we met at ECOSUR with Benjamin and Alicia to plan the experiments and gather the necessary equipment. We needed at least 56 funnel traps, and we examined the ones in storage to ensure they were still functional. After a late lunch highlighted by an (un)appetizer of fried cow lymph nodes, we loaded all the equipment into a pickup truck and minivan. The next morning we headed over the mountains to Lagos de Montebello National Park. Numerous bark beetle infestations had been detected in its pine forests throughout the past 5 years, and we had previously conducted trapping and other studies within the Park. We met with the Park staff and discussed the type of sites needed for our work. In the afternoon we went with Roberto, a Park employee, in search of active infestations. After examining a few inactive infestations, we finally found a spot with several trees with fresh attacks along the bole and a few trees with only pitch tubes near the crown. The infested trees were all *Pinus oocarpa*. We then hiked back to the Park headquarters, about a mile away.

That evening we checked in at Hotel Ensueño, a new establishment just outside of the Park. It had some cabanas and several more traditional rooms, plus a restaurant. It was convenient, saved gas (we didn't have to drive back and forth to Comitán), and had a cooler stocked with beverages, including Superior maxi. It did have a few drawbacks, such as intermittent power outages and the reception of only two TV stations. The main problem became apparent that evening when I went to bed. I suddenly felt as if I were at the World Cup, with sound of thousands of vuvuzelas reverberating in my ears. Since “ensueño” means dream or illusion, I figured I must be dreaming. I soon discovered that I was awake and under

bombardment by heat-seeking missiles, otherwise known as mosquitoes, which were making hair pinna turns around my ears. After slapping away at these malarial miscreants for a while, I decided that dying of smoke inhalation was preferable and lit the mosquito coil provided in the room.

The next morning we toted trapping supplies out to the active infestation. The plan was to establish a series of ladder traps on trees just coming under attack. The ladder traps consisted of frames designed to hold six funnel traps vertically. The objective was to determine which species attacked at various heights and the sequence of arrival. Roberto climbed the trees using a saddle he fashioned from ropes and attached a screw hook and pulley at a height of approximately 10 m. He initially declined use of the climbing belt Brian had brought, but later decided the belt facilitated his climbing. We fastened the funnel traps to the ladder and pulled them up so they were parallel with the tree bole, with the lowest trap cup near the ground. The traps were unbaited, as we wanted the odors released by attacking beetles to attract other beetles into the traps. We set up three reps within the infestation. The original plan was to check the traps every two hours. We quickly determined that would not be feasible and scaled collections back to twice a day, once around noon, and the second in the early evening.





Roberto setting the hook and pulley



Ladder traps in site 2

The next morning we searched for infestations with *P. maximinoi*, but we were unable to locate any active infestations. We were able to find another active infestation in *P. oocarpa* in the vicinity of the first site. We identified several pines that had fresh attacks on the lower bole or only attacks in or near the crown. After establishing one more set of ladder traps on a tree at site 1, we set up four more on trees at site 2, two on Friday and two on Saturday. We recorded the DBH and height of the study trees, and Brian began collecting data about the attack height and density on the boles. Another infestation was discovered near site one. There were numerous trees with fresh attacks along the entire bole, but just a single pine with pitch tubes only near the crown. We strung up a set of traps on this tree (site 3) on Sunday morning, for a final total of nine trees with a series of traps.

To test if either *Dendroctonus* species would attack stumps or downed material, we felled two uninfested pines near site 2. The standing stump was ca. 1.5 meters, and we slid old pine bolts under the felled trees to raise them slightly off the ground. The trees and stump were checked daily for signs of infestation. SPB and *D. woodi* attacks were not observed either on the

stumps or the felled tree. A *D. valens* attack occurred at the base of one stump. *Ips* beetles attacked one of the felled trees, and adults were collected for later identification.



High stump and felled tree



Alicia checking for attacking adults

On Sunday we also felled an infested tree for dissection. The tree was cut into 1 m bolts and taken to the Park headquarters where attacks on the bole were recorded. The bark was peeled and the gallery lengths measured. Any bark beetles in the galleries were collected for later identification. The attacks on the tree extended all the way into the crown. Primary and a few secondary branches were also infested. Beetles were attacking material down to 2.5 cm in diameter. The attacking beetles appeared to be SPB, but positive identification still waits.



Bark beetle attacks in small branches of *Pinus oocarpa*, Chiapas, Mexico. Photo by Brian Sullivan

Attacks on small diameter trees by SPB have been observed in the SE U.S., but are rare and the brood survival rate has been negligible. Further examinations are needed to determine if SPB can produce viable brood in the smaller branches in Mexico and to see if this behavior occurs throughout Central America. Bark beetle attacks in Central America often are initiated high on the bole, but this is the first time I have observed attacks throughout the crown and on small branches.

We were in the rainy season, and it rained daily. Fortunately, hard rains started around 8 pm, after the collections were finished. We did have some light rain during the daytime, but we were able to keep working. The weather also affected the power. The power at the hotel and the Park generally went out once a day, but was quickly restored. However, the power went off Saturday evening and was not restored until late Monday. We used candles at the hotel and restaurant. Though dining by candlelight is nice, I was wary of food preservation without refrigeration, but I avoided any major intestinal problems (no pollo salmonella). I also did my part to ensure that none of the cerveza went to waste.

Jorge had to leave on Saturday, and I left on Monday, June 14th, and traveled by bus back to Tapachula. I arrived at the bus station 10 minutes after the 9:30 bus should have departed, but the bus was late and I was able to take it instead of waiting 3.5 hours for the next one. The 6.5 hour ended up taking 9.5 hours. We had an unexplained lengthy stop at Motozintla, and then we ran into bad weather in the mountains. Visibility was about 10 m due to fog and heavy rain, and then the road was narrowed to one lane by a mudslide. We finally made it past the mudslide and out of the rain, but had mechanical trouble in Huehuetán. In Tapachula, I took a taxi from the bus station to the Hotel Don Miguel. As I had used an ATM in Comitán, I only had 200 peso notes for a 25 peso ride and the driver did not have change. He indicated that everything was OK, but I ran into the hotel to try to get change. After finally getting change, I went back to look for the taxi, but it had left. I heard someone calling my name. A security guard across the street was holding my wallet, which I had dropped in my frantic search for stray pesos. This incident demonstrates the quality and character of the people in Tapachula (and probably the mental capacity of yours truly). I flew home the next day.

Benjamin, Alicia, and Brian remained at the Park until June 20, continuing to collect the ladder traps twice daily. They also established a trapping study to test attractants for *D. woodi*. As spot growth and tree infestation were proceeding slowly, they arranged for Roberto and other

Park personnel to continue trap collections. Brian also noted an interesting attack pattern on one of the study trees. Only a small patch of the lower bole contained pitch tubes. Dissection of the area revealed several galleries and one adult beetle, probably *D. woodi*. No oviposition was evident. In addition, *D. woodi* were often found working in the resin in areas where the pitch tubes had been scraped away the previous day in a search for attacking beetles. These observations suggest *D. woodi* may be able to initiate “patch attacks” that may not necessarily kill the tree. The success and frequency of such attacks requires further investigation.

Based on observations of bark beetle activity in the southeastern U.S. and in Central America, several differences have been noted:

1. Attack height. As mentioned above, initial bark beetle attacks in Central America generally occur near the crown, and may extend into the crown and branches. Initial attacks in the SE U.S. are between 5-10 m.
2. Fading patterns. In the U.S., the foliage of trees infested by SPB fades uniformly, with the entire crown fading from green to yellow to red. This uniform fading also occurs in Central America, but other patterns also have been observed. On some infested trees, the older needles fade first; then the new growth. Sometimes the basal half of the new needles fades first. On a few infested trees, only parts of the crown faded initially, even though fresh attacks were present on the lower bole. In the SE U.S., uneven crown fading is characteristic of *Ips* bark beetle attack, primarily *I. avulsus*.
3. Infestation growth. In the U.S., active SPB infestations usually grow continuously, adding new trees daily or every other day. Low temperatures or extreme hot temperatures can affect this pattern. In Central America, spot growth often is more pulsed. Several trees may be attacked high on the bole, and then no more attacks observed for several days. Then a new group of newly attacked trees may be observed. Attacks on the lower bole also follow this intermittent pattern. More data are required to document this infestation pattern and determine if infestation growth is similar year-round.



Uneven fading pattern on infested *Pinus oocarpa* in Chiapas, Mexico

These differences may result from the species complex present. In the U.S., SPB has little competition on the lower bole. *Ips calligraphus* and *I. grandicollis* generally attack much later than SPB except near the collapse of extended outbreaks, and *D. terebrans* attacks are usually near the base of the tree. *Ips avulsus* colonizes the crown, and attacks come relatively soon after SPB. In Central America, competition with *D. woodi* on the lower bole may have pushed SPB attacks higher on the bole and into the crown, as *I. avulsus* is not present.

This trip was extremely productive, and the final results of the studies will be published and presented at upcoming scientific meetings.