

A Befuddling Bahamian Borer

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In December 2013, I (RAH) received an interesting Email message from Claus Eckelmann, who works out of Barbados as the FAO (Food and Agriculture Organization of the United Nations) Forestry Officer for the Caribbean, informing me about a possible bark beetle outbreak in the pine forests of The Bahamas. I had worked with Claus in 2000 on a major bark beetle outbreak in the pine forests of Belize (Haack et al. 2000), and as a result of that consultation he was contacting me again. As it turned out, I was asked to travel to the island of Abaco in The Bahamas for a week in February 2014 and work with the local FAO forester Ariën Sikken to evaluate the pest problem as well as give a 2-day forest health short-course to the local forestry staff (<http://www.bahamas-forestry.com/>), most of whom work for the Bahamas National Trust (<http://www.bnt.bs/>).

The native pine species growing in the Bahamas is a variety of Caribbean pine (*Pinus caribaea* var. *bahamensis*). Currently there are about 180,000 ha of Caribbean pine forest in The Bahamas. This same variety

of Caribbean pine also occurs on the nearby Turks and Caicos Islands.

There are five major bark beetle (Coleoptera: Scolytinae) species that infest pines in the southeastern USA, including two species of *Dendroctonus* and three species of *Ips*. All three *Ips* species [*Ips avulsus* (Eichhoff), *Ips calligraphus* (Germar), and *Ips grandicollis* (Eichhoff)] are native to The Bahamas, but no *Dendroctonus* species are known to occur there. Before arriving in The Bahamas, I was expecting *Ips calligraphus* to be the principal bark beetle involved in the local outbreak on Abaco given that I had investigated two *I. calligraphus* outbreaks previously in the Caribbean -- both in the Dominican Republic (Haack 1998, Haack et al. 1989) and worked with this beetle in Florida during my Ph.D. program in the 1980s (Haack 1985, Haack et al. 1984a, 1984b, 1987a, 1987b, Slansky and Haack 1986).

After arriving in Abaco, I traveled with Ariën Sikken to visit some of the pine stands on the island. We set up two funnel traps on the day that I arrived and baited each with the two common *Ips* pheromones: ipsenol and ipsdienol (photo, p. 32). The funnel traps were placed in separate pine stands, several kilometers apart and suspended by ropes between pine trees with the collection cup approximately 1 m above ground. The collection cups were filled with soapy water as the killing agent.

As we looked over the pines, most of which were about 50 years old, the trunks of nearly every pine tree had several small circular exit holes (see photo), which are typical of bark beetles and many other borers (Solomon 1995). However, the needles in the crowns of these same trees were still green, indicating the trees were still alive and apparently healthy. Elsewhere in the stands, where there was some recent logging activity, we did find evidence of *Ips* galleries, exit holes, frass, and all life stages on the pine logging slash. As we debarked several of the standing and green-topped pine trees over the next few days (photo, p. 32), as well as a few that had been felled during the previous few days, we noted that under nearly every exit hole there was a single, elongate and irregular gallery, with loose frass that was constructed almost entirely in the thick outer bark, and seldom appeared to reach the inner bark and almost never the sapwood. These were not bark beetle galleries that are typically constructed at the interface of the inner bark (phloem) and sapwood and consist of a maternal egg gallery and several individual larval galleries (Solomon 1995). There was also evidence of woodpecker



Bob Haack talking with local foresters in Abaco, The Bahamas.

feeding on most pine trees, and it was clear that they had been preying on these same borers given that their feeding activity was restricted primarily to the outer bark. On only one occasion did we find a live insect in one of these galleries, and it was a larva (photo, p. 32). At first glance it looked like the larval stage of a longhorned beetle (Cerambycidae), but after returning it to the USA (in alcohol) and more careful inspection under a microscope by Toby Petrice and Steven Passoa the larva was clearly a caterpillar (Lepidoptera), with the crochet pattern on the prolegs being similar to members of moth families Cossidae and Sesiidae. Given that only a single larva was recovered, and subsequently placed in alcohol, we could not rear this individual to the adult stage to make a positive identification. Therefore, later we extracted a DNA sample from this larva and compared it with known lepidopteran species that had been entered into the Barcode of Life database. The DNA evidence suggested that the larva was a member of the genus *Givira* (Cossidae), which is reasonable given that there are species of *Givira* that develop in the outer bark of pines in nearby Florida (Heppner 2007, Tschinkel 2002).

As the title of this abstract implies, the identity of this borer is befuddling, although the recent DNA evidence is now directing us on a clearer path. Given that nearly every pine tree on Abaco had dozens of exit holes that led to galleries that were nearly



Healthy pines with many exit holes on the bark.



View from Hope Town Lighthouse, Elbow Cay, near Abaco, The Bahamas



Debarking recently felled pines to search for borers that might be infesting the pines.

completely contained within the outer bark, it appeared that there must have been a local “outbreak” of this borer in the recent past or alternatively that the galleries and exit holes are retained on the tree trunks for many years. In support of the latter hypothesis is the work by Tschinkel (2002) who reported that *Givira francesca* (Dyar) is a rare insect in Florida but because galleries and exit holes can be retained for decades until the damaged bark is eventually sloughed off, local populations of the moth can appear high. For example, of 800 galleries uncovered during debarking, only 3.8% had live *G. francesca* larvae (Tschinkel 2002). Ariën had continued to monitor the pine forests of Abaco looking for borers that could be responsible for the observed damage, however, as of December 2014, no other candidates had been recovered. In addition, frass from some of the old galleries was later sampled by Ariën and shipped to the USA to look for insect remains (which is now underway). In fact, the frass of many wood borers is very distinct and can be used in identification (Solomon 1977).

The two funnel traps were monitored weekly by Ariën for the next four weeks following my departure in late February 2014. Overall, for both traps combined, about 3200 *Ips* bark beetles were collected (pooling all 3 *Ips* species together, with most being *I. grandicollis*), 34 weevils (possibly species of *Hyllobius*), 114 trogossitid beetles (these predatory beetles were likely species of *Temnochila*, which are often now called *Temnoscheila*), 82 cerambycids that were likely *Acanthocinus obsoletus* (Olivier), and 4 cerambycids that were likely *Monochamus titillator* (Fabricius). Tentative identifications of the weevils and cerambycids were based on Turnbow and Thomas (2008) as well as electronic images sent to Michael C. Thomas (Florida Department of Agriculture, Gainesville, FL). Selected specimens have been stored in alcohol at the US Forest Service laboratory in East Lansing, MI. It is possible that some of the exit holes seen on

the bark of the standing live pine trees were made by some of the above insects, but it is more likely that these insects had developed in pine trees that had recently been cut.

There are also several exotic pests that are currently in The Bahamas or on nearby islands that are of local concern. One of the most serious threats to the pines of The Bahamas is a soft scale insect native to North America that is commonly called the pine tortoise scale [*Toumeyella parvicornis* (Cockerell) (Hemiptera: Coccidae)]. The pine tortoise scale was recently introduced into the Turks and Caicos Islands (first reported in 2005; Malumphy et al. 2012) and Puerto Rico (2009; Segarra-Carmona et al. 2010). The pine tortoise scale likely entered these islands on pine Christmas trees that were imported from the USA (Malumphy et al. 2012). In the Turks and Caicos Islands, the pine tortoise scale has caused widespread mortality of Caribbean pine (Green 2011, Malumphy et al. 2012, Sanchez 2012).

References

- Green SJCE. 2011. The Caribbean Pine (*Pinus caribaea* var. *bahamensis*): monitoring and ecology, in the Turks and Caicos Islands. M.S. Thesis, Imperial College London.
- Haack RA. 1985. Seasonal development and emergence-flight patterns of *Ips calligraphus* in Florida. *Florida Entomologist* 68: 658-667.
- Haack RA. 1998. Pine bark beetles on the heels of Hurricane Georges. *Newsletter of the Michigan Entomological Society* 43(4): 18-19.
- Haack RA, Foltz JL, Wilkinson RC. 1984a. Longevity and fecundity of *Ips calligraphus* (Coleoptera: Scolytidae) in relation to slash pine phloem thickness. *Annals of the Entomological Society America* 77: 657-662.
- Haack RA, Wilkinson RC, Foltz JL, Corneil JA. 1984b. Gallery construction and oviposition by *Ips calligraphus* (Coleoptera: Scolytidae) in relation to slash pine phloem thickness and temperature. *The Canadian Entomologist* 116: 625-632.
- Haack RA, Wilkinson RC, Foltz JL, Corneil JA. 1987a. Spatial attack pattern, reproduction, and brood development of *Ips calligraphus* (Coleoptera: Scolytidae) in relation to slash pine phloem thickness: A field study. *Environmental Entomology* 16: 428-436.
- Haack RA, Wilkinson RC, Foltz JL. 1987b. Plasticity in life-history traits of the bark beetle *Ips calligraphus* as influenced by phloem thickness. *Oecologia* 72: 32-38.
- Haack RA, Billings RF, Richter AM. 1989. Life history parameters of bark beetles (Coleoptera: Scolytidae) attacking West Indian pine in the Dominican Republic. *Florida Entomologist* 72: 591-603.
- Haack RA, Eckelmann CM, Green E. 2000. Southern pine beetle outbreak in Belize. *Newsletter of the Michigan Entomological Society* 45(3-4): 13-15.
- Heppner JB. 2007. *Lepidoptera of Florida. Part 1. Introduction and Catalog. Arthropods of Florida and Neighboring Land Areas. Vol. 17.*
- Florida Department of Agriculture & Consumer Services. Division of Plant Industry. Gainesville, FL. 670 pp.
- Malumphy C, Hamilton MA, Manco BN, Green PWC, Sanchez MD, Corcoran M, Salamanca E. 2012. *Toumeyella parvicornis* (Hemiptera: Coccidae), causing severe decline of *Pinus caribaea* var. *bahamensis* in the Turks and Caicos Islands. *Florida Entomologist* 95: 113-119.
- Sanchez M. 2012. Conservation genetics and biogeography of the Caribbean pine (*Pinus caribaea* var. *bahamensis*) in the Bahaman archipelago. PhD thesis, Birkbeck, University of London.
- Segarra-Carmona AE, Cabrera-Asencio I. 2010. *Toumeyella parvicornis* (Cockerell) (Hemiptera: Coccoidea: Coccidae): a new invasive pest of pine trees in Puerto Rico. *Journal of Agriculture of the University of Puerto Rico* 94 (1-2): 175-177.
- Slansky F, Haack RA. 1986. Age-specific flight behavior in relation to body weight and lipid content of *Ips calligraphus* (Coleoptera: Scolytidae) reared in slash pine bolts with thick or thin phloem. *Entomologia Experimentalis et Applicata* 40: 197-207.
- Solomon JD. 1977. Frass characteristics for identifying insect borers (Lepidoptera: Cossidae and Sesiidae; Coleoptera: Cerambycidae) in living hardwoods. *The Canadian Entomologist* 109: 295-303.
- Solomon JD. 1995. Guide to insect borers in North American broadleaf trees and shrubs. USDA Forest Service Agriculture Handbook AH-706.
- Tschinkel, W. R. 2002. The natural history of the arboreal ant, *Crematogaster ashmeadi*. *Journal of Insect Science* 2:12 (online) URL: <http://www.insectscience.org/2.12>.
- Turnbow RH, Thomas MC. 2008. An annotated checklist of the Coleoptera (Insecta) of the Bahamas. *Insecta Mundi* 0034: 1-64.



A cossid larva that was tunneling in the outer bark of the pines in Abaco, The Bahamas.



One of the baited funnel traps deployed in Abaco, The Bahamas.