

# Coffee Berry Borer

## 101

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**SHAC**

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# Agenda

- CBB Basics
- Binder
- CBB Integrated Pest Management Recommendations
- CBB Areawide Program funding
- SHAC *Beauveria* subsidy program
- HDOA *Beauveria* subsidy program

# Coffee Berry Borer

- Endemic to Africa
- Found in nearly every coffee growing region around the world
- Worst coffee insect pests in the world

## Host plant:

- Coffee is the main host of CBB





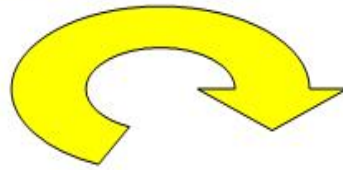
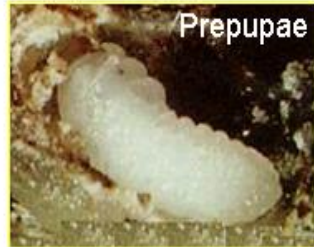


# Life cycle



## Coffee Berry Borer

*Hypothenemus hampei*



The female lays 30 – 120 eggs.  
Average of 74 eggs.  
Development from egg to  
adult is 25 to 60 days.

Warmer temperatures speed  
up development.

# Biology

## Reproduction:

- Ratio of female:male is 10 to 1
- Brothers and sisters mate inside the berry
- Female leaves the berry in which it is born, then looks for new berries to start the reproductive cycle again
- Males cannot fly (nonfunctional wings)



# Behavior

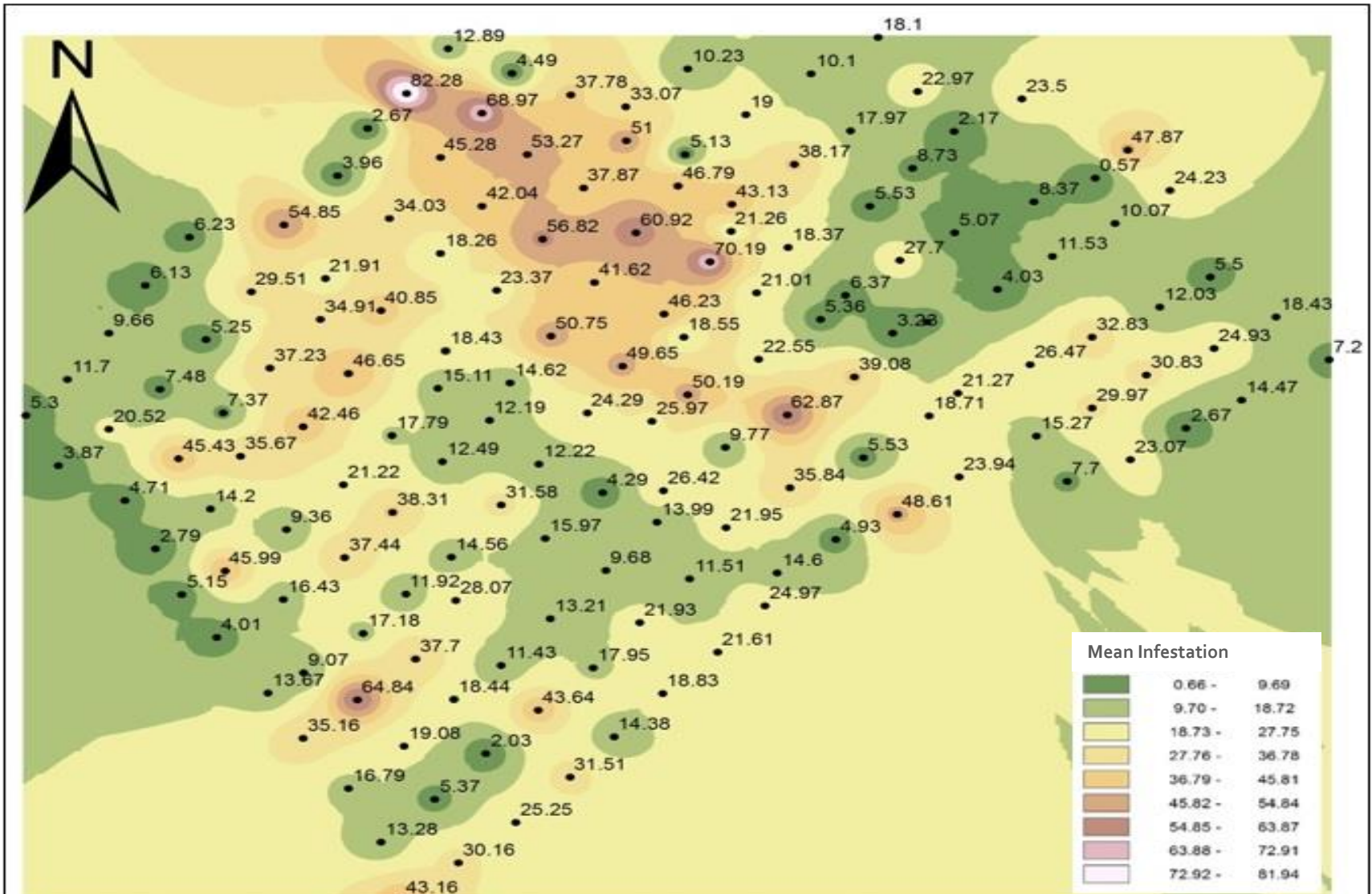
## Aggregation:

- CBB tend to accumulate in “hot spots”
  - Under shade trees
  - Surrounding berries and raisins
  - Near founding females
- Females are attracted to:
  - Waste produced by other females
  - Alcoholic substances from the waste





# CBB infestation



(Pulakkatu-thodi, 2015)

# Movement

- CBB have poor flight abilities
- Wind-aided
- Human-aided
  - Infested cherry, raisins, parchment & green bean
  - Hitch hiking on clothing, shoes, supplies, equipment, etc.
  - Vehicles
  - Plants and soil









HAWAIIAN ISLANDS

Pacific Ocean

Nov./Dec. 2016



Hawaiian terrain map

# CBB IPM and record keeping binder

- One binder per farm
- CBB ID Card
- Draft 2016 CBB IPM Recommendations Document
- Copy of farm record log
- [hawaiicoffee.weebly.com](http://hawaiicoffee.weebly.com) and FB card
- Copy of 30 trees sampling worksheet

# CBB management



- CBB IPM recommendations
  - Current protocols found at [hawaiicoffee.weebly.com](http://hawaiicoffee.weebly.com)
  - March 2016 CBB Summit and follow-up meetings
  - Continuously evolving
  - General recommendations
  - [www.ctahr.hawaii.edu/oc/freepubs/pdf/IP-33.pdf](http://www.ctahr.hawaii.edu/oc/freepubs/pdf/IP-33.pdf)
  - [www.ctahr.hawaii.edu/oc/freepubs/pdf/IP-33\\_Spanish.pdf](http://www.ctahr.hawaii.edu/oc/freepubs/pdf/IP-33_Spanish.pdf)

# Major steps of CBB IPM

1. Field sanitation
  - a) Strip picking
  - b) Pruning
2. Field monitoring
  - a) Record keeping
  - b) Monitoring
3. CBB control
  - a) *Beauveria bassiana*
  - b) Other products approved for coffee
  - c) Biocontrol
4. Harvesting
  - a) Pre, main and post-harvest



# Why IPM? Because...

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# 1. Field sanitation



- ❖ The most important CBB control measure
- ❖ Purpose: Remove next season's colonizers by "strip picking" coffee and reducing CBB breeding sites



# CBB adds up quickly!

- 1 female lays 33 eggs
- 10:1 female to male
- 1 generation turnover within a month
  - 1 month 30
  - 2 months 900
  - 3 months 27,000
  - 4 months 810,000
  - 5 months 24,300,000

**Seasonal harvest - strip pick and destroy ALL mature green to ripe, over-ripe and raisin cherry at the end of the harvest season**



Float in water



Before



After

# How to kill CBB in infested berries and raisins

- Collect infested berries and raisins in a container and seal
- Pile and tarp
- Double bag, seal completely & leave in direct sun for at least 2 weeks
- Bury under at least 6 inches of compact soil
- Freeze small quantities for at least 48 hours
- Heat internal parchment to at least 122°F for 25 minutes or longer

# Pruning

- Improve and/or maintain tree health and production
- Opens the canopy and allows light and spray applications to penetrate to the center of the verticals





Stump pruning large block areas is the only pruning method known to reduce CBB infestation and damage levels, and cut costs



# 2. Field monitoring

- Protect your investment – your crop
- CBB activity increases:
  - Following rain events
  - In the afternoon to early evening
  - With maturing coffee
- Importance of recordkeeping
  - Understand and manage your farm efficiently and effectively
  - Make sound financial decisions
  - Understand and control CBB on your farm

# Revised thirty trees sampling method for CBB monitoring

- Determine when to begin spraying
- Begin monitoring as early as 30 days after first flowering
  - Record this date
- Lower CBB damage levels at the beginning of the season can lead to lower CBB damage levels overall

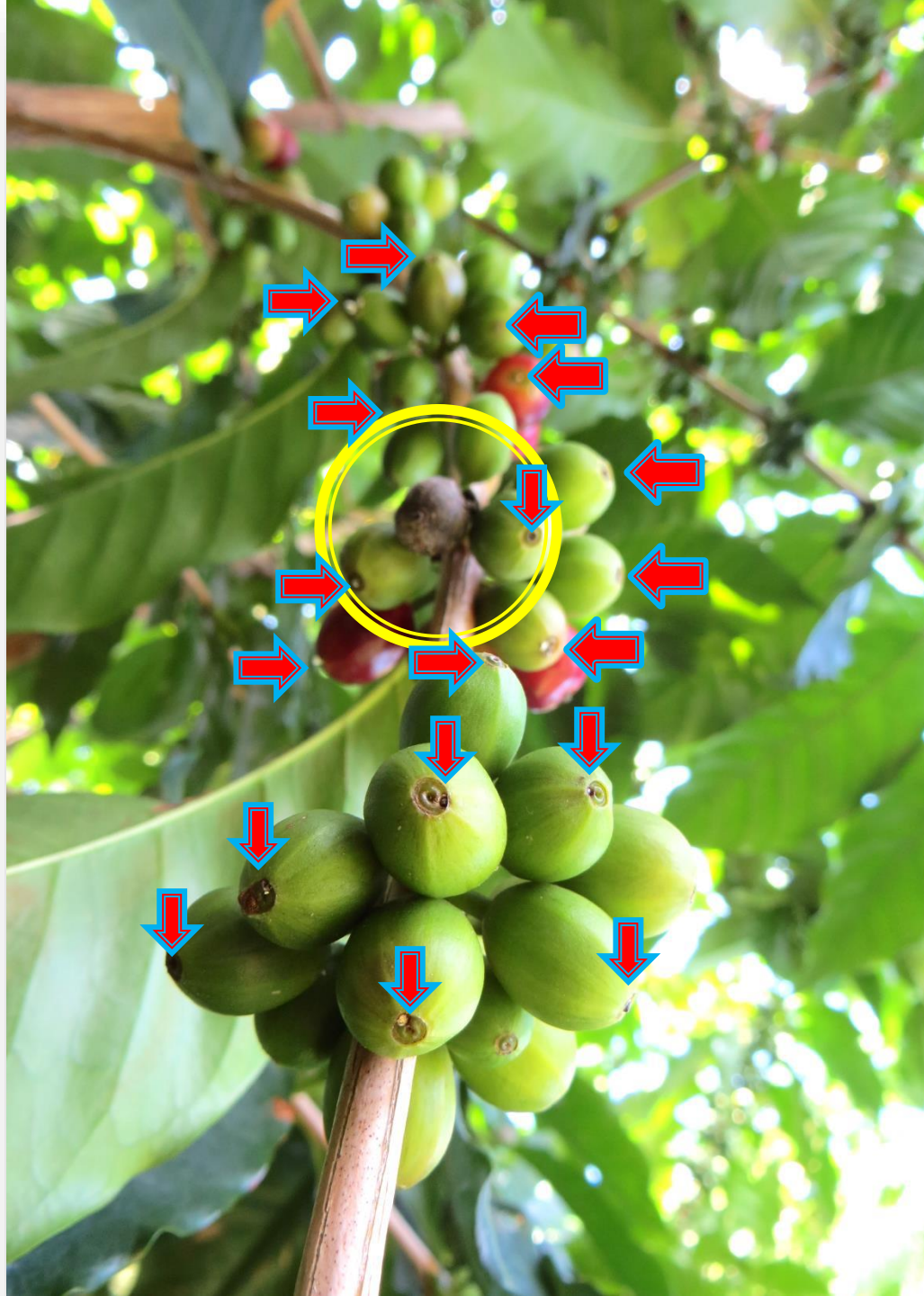
## Thirty Trees Sampling Worksheet: Percent Infestation by CBB

Date: \_\_\_\_\_ Farm: \_\_\_\_\_

Plot # or ID: \_\_\_\_\_ Evaluator: \_\_\_\_\_

Branch	Column A: # of Green Berries	Column B: # of Infested Berries	Column C: Notes
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
<b>Total</b>	Total # Column A:	Total # Column B:	

Tree#	# of Green Berries	# of Infested Berries	Notes:
1	99	5	
2	120	2	
3	56	0	
4	94	4	
5	88	0	
6	75	3	
7	105	29	Hotspot
8	63	0	
9	65	4	
10	78	3	
11	95	7	
12	77	4	
13	46	0	
14	70	1	
15	110	18	Hotspot
16	86	13	Hotspot
17	76	3	
18	61	0	



# Can you spot the cherry or cherries with CBB in the bean?



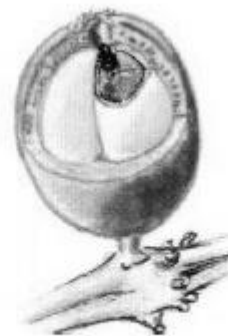
Berries must be collected and dissected!



A



B



C



D

# Traps

- Monitoring tool only
- Help to detect mass movement
- Low early detection effectiveness in field

# Trap servicing

- ~5 traps per acre
- Unscented soapy water
- 3:1 methanol:ethanol
- Monitor at least every 2 weeks
- Service every 4 weeks or as needed





Video was played



# 3. CBB Control

- Biopesticide - *Beauveria bassiana* strain GHA
  - Rate: 1 qt. (BotaniGard ES, Mycotrol ESO) or 1 lb. (BotaniGard WP, Mycotrol WPO) per acre mixed in at least 30 gal. of water
  - Plus surfactant (ex: Silwet L-77 or Widespread Max, NuFilm, etc.)
  - Direct and indirect contact
- BotaniGard MAXX (*B. bassiana* + pyrethrins)
  - Not yet tested in Hawaii

# *Beauveria* spray recommendations

- Spray to wet, but avoid runoff
- Spray at least monthly or as sampling warrants
- Persistence best with high humidity and low sun UV
- Label is the law



# Best bang for your buck

- Time sprays with weather that promote *Beauveria* persistence and CBB position (A/B) that provides best kill rate
- Spray vetted, coffee-approved pesticides when CBB are in the A/B position



# Other products:

- Pyrethrin (ex: Pyronyl Crop Spray, Evergreen)
  - Early season knockdown – direct contact only
  - Rate: 16 fl. oz/100 gal. water
  - PBO and Japan
- Protectants and repellents such as:
  - Surround WP



# Biocontrol

- Flat bark beetles
  - *Cathartus quadricollis*
  - *Leptophloeus* sp.
- Predators of CBB eggs, larvae and pupae in drying cherry and raisins
- Raised on cracked corn and cornmeal



# *Cathartus quadricollis*

Video was played – additional FBB information can be found [here](#).



Found in drying coffee berries



# 4. Pre, main and post-harvest



- Pre-harvest strip pick
  - Pick and process or destroy all berries, including mature green to ripe, over-ripe and raisin coffee from an early flowering
  - Would not typically warrant harvesting because of inferior quality coffee and quantity
  - Highly infested by CBB

# Main harvests

- Pick all ripe, over-ripe and raisin cherry during each harvest
- Harvest every 2-3 weeks
- Continue monitoring and if needed, spray through harvest



**Avoid dropping berries on the ground**



# Post-harvest

- Contain and kill CBB in the wet mill
- Reduce transport of CBB to other fields, farms or locations
- Contain and kill CBB in the dry mill

# 5. Shipping

- Follow all inter-island HDOA quarantine regulations
  - [hdoa.hawaii.gov/wp-content/uploads/2012/12/4-72-HAR-2012.pdf](http://hdoa.hawaii.gov/wp-content/uploads/2012/12/4-72-HAR-2012.pdf)
- Interisland quarantine on all unroasted coffee, coffee plants and plant parts, propagative coffee materials, used supplies and machinery from the Big Island and Oahu (Maui pending) to non-CBB infested islands.
- HDOA inspection, quarantine and/or valid permit required
- CBB can chew through plastic bags including Grainpro and double Ziplocs, but not through foil bags

# CBB Areawide funding and research

- Currently in the final year of first Areawide Program funding (2013-2018)
- Applying for 4 more years of funding from USDA - to 2021
- Funding to also help Puerto Rico's coffee growers
- Learn about CBB research in the 2016 CBB Summit and Conference Proceedings
  - [www.ctahr.hawaii.edu/oc/freepubs/pdf/CBB\\_Summit\\_2016\\_Proceedings.pdf](http://www.ctahr.hawaii.edu/oc/freepubs/pdf/CBB_Summit_2016_Proceedings.pdf)

# CBB information

Kona Extension Coffee Website: [hawaiicoffee.weebly.com/](http://hawaiicoffee.weebly.com/)

CTAHR: [www.ctahr.hawaii.edu/site/cbb.aspx](http://www.ctahr.hawaii.edu/site/cbb.aspx)

HDOA: [hdoa.hawaii.gov/pi/ppc/coffee-berry-borer-information-page/](http://hdoa.hawaii.gov/pi/ppc/coffee-berry-borer-information-page/)

SHAC: [deadcbb.com](http://deadcbb.com)

Controlling the Coffee Berry Borer Video on YouTube (Mar. 2012)

English: [www.youtube.com/watch?v=kWNWScDGAA8](http://www.youtube.com/watch?v=kWNWScDGAA8)

Spanish: [www.youtube.com/watch?v=CTOg68TIXCw](http://www.youtube.com/watch?v=CTOg68TIXCw)

# *Beauveria* subsidy programs

- Two programs and coordinators
  - HDOA – Gwen Hicks
  - SHAC – Suzanne Shriner
- [hawaiicoffee.weebly.com/cbb-subsidy-program-info.html](http://hawaiicoffee.weebly.com/cbb-subsidy-program-info.html)



# Mahalo!

Gina Bagarino  
Jen Burt  
Rob Curtiss  
Stuart Nakamoto  
Suzanne Shriner  
Gwen Hicks

CBB Areawide Team  
of program leaders,  
researchers,  
technicians,  
extension agents,  
specialists,  
entomologists & staff



# Q&A from coffee farmers and processors

- The following (2) slides represent questions that arose during and after the Jan. 9 presentation on Maui. The answers are a combination of ideas from the presenter and coffee producers present.
- These answers are NOT guarantees and SHOULD NOT be used as a guarantee to prevent CBB from being introduced to a farm or location that currently does not have CBB. Rather, answers may be regarded as possibilities to slowing the spread of CBB.
- There may also be other options as well as scenarios to consider.

# Q1. What do I do if I have a coffee farm on Maui, but don't have CBB?

- [Learn](#) as much as you can about CBB and how farmers are currently farming with CBB.
- Reduce your risk of transporting CBB to your farm or others' farms.
  - Avoid sharing using coffee equipment, bags, baskets and tools.
  - Provide pickers with supplies from the farm and ask them not to bring their own.
  - Remind pickers to change into clean clothing and footwear when coming from another farm.
- [Teach](#) (visitors, friends, neighbors, pickers, farmers, etc.) others about CBB, how to identify signs of CBB, and what they can do to reduce the risk of transporting CBB to uninfested areas of Maui, Molokai, Lanai and Kauai.
- Monitor your coffee cherry (and green berries), parchment and green bean for [signs of CBB](#). Catch an infestation as early as possible for best control. Report any new potential sightings of CBB in coffee berries. [Contacts](#) are on page 11: Appendix 1.

## Q2. I buy from or mill coffee for farmers. How do I reduce my risk of introducing CBB to my farm, which is also at the same site as my mill?

- Processors are at a high risk of introducing CBB to their farm and others. Farmers who transport cherry and unroasted coffee are also high risk for spreading CBB.
  - Contain cherry in tightly sealed containers or line burlap bags with impermeable bags and secure shut. This could reduce the chance of CBB escaping and entering or re-entering a farm.
  - Disinfest burlap bags with [cold](#) or [heat](#).
  - If possible, screen (insect screen) your wet mill and dry mill processing area to deter the escape of CBB to the field.
- Communicate with your fellow farmers to treat and contain CBB in parchment and green bean prior to arrival on a non-infested farm.
  - i.e. Treatment might include freezing in GrainPro bags. Do not re-freeze.
- Select a rendezvous point to pick up coffee which could reduce the chance of CBB hitchhikers entering the farm from the other farmer's vehicle.
- Monitor your coffee cherry (and green berries), parchment and green bean for signs of CBB. Catch an infestation as early as possible for best control. Report any new potential sightings of CBB in coffee berries. [Contacts](#) are on page 11: Appendix 1.