

Envirotalk



GOVERNMENT OF BERMUDA

Department of Environment and Natural Resources

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TO PROTECT BERMUDA'S ENVIRONMENT AND RESPONSIBLY MANAGE ITS NATURAL RESOURCES

WELCOME

to our summer edition of Envirotalk.

In this issue –

- What's that bee? Wildlife Ecologist **Mark Outerbridge** talks about of elusive leafcutter bee; *Megachile pruina pruina*.
- Drones and fire, fire and drones. GIS Mapping Analyst **Mandy Shailer** helps us learn about the use of drones in conservation management and how they are helping with the Devonshire Marsh fire.
- Biodiversity Officer **Alison Copeland** lets us know its viewing time for the Bermuda Fireworm's mating ritual.
- Learn all about Bermuda's baitfish from Marine Resource Officer **Joanna Pitt** and **Dr. Robbie Smith** from the Natural History Museum.
- **Environmental Calendar.** Check to see what environmental events are happening at this time.
- See the **Planting Calendar** to get a head start on what to plant this Summer.

Please contact:

Envirotalk mailing list: envirotalk@gov.bm to be placed on the mailing list or for suggestions for future articles.

WHAT'S THAT BEE?

Many residents are aware that the honey bee *Apis mellifera* inhabits Bermuda. This important pollinator was deliberately introduced in the early 17th century and is well regarded by many because of the delicious honey it produces from local wild flowers. However, many readers may be surprised to learn that another bee lives on Bermuda; the leafcutter bee *Megachile pruina pruina*. This rare cavity nesting species is considered to be native to our islands.



Bermuda's leafcutter bee
(photo by Mark Outerbridge)

The genus *Megachile* is found virtually everywhere there are flowering plants; however most species are tropical in origin. On the American continent *Megachile* ranges from Alaska to southern Chile and Argentina, as well as on islands throughout the Caribbean. The sub-species *Megachile pruina pruina* occurs in the southeastern U.S.A. and ranges from North Carolina to Florida through to Texas.

The first confirmed record of a leafcutter bee on Bermuda occurred in May 1913 (location unknown). Anecdotal information suggested their presence around Gamma Island in the Great Sound during the 1970s and 1980s, but by 1990 it was reported that leafcutter bees could only be found on Nonsuch Island. However, more recent observations have revealed that Cooper's Island and Southampton Island (both are adjacent to Nonsuch Island) also serve as foraging and nesting areas.

Very little is known about the biology and ecology of leafcutter bees on Bermuda, or the threats they face. Leafcutter bees look similar to honeybees, but they have broader heads and larger mandibles (for cutting leaves). They carry pollen within stiff hairs on the underside of their abdomens, rather than in pollen baskets on their legs (like honey bees do), which can give leafcutter bees a yellow-orange appearance.

Unlike the honey bee, which is a very social insect and lives in large, well-organized colonies, leafcutter bees predominantly lead solitary lives. After mating, adult females will select a suitably sized cavity within the limestone rock and line it with cut pieces of leaf to help prevent desiccation of eggs and larvae within the nest. They typically divide a long cavity into several cells, each containing a single egg along with a mixture of pollen and nectar, which will be used as a food source for the developing larvae.

The sex of each bee is determined by whether or not the egg is fertilized; unfertilized eggs produce male offspring whereas fertilized eggs produce females (the same is true for honey bees).

Another characteristic which sets leafcutter bees apart from honey bees is that they do not produce honey. They will forage nectar from flowers for immediate consumption but they will not store it for future use.

Leafcutter bees historically nested in drystone walls on the main islands of Bermuda so it may be likely that there are some locations where leafcutter bees are still active. Nesting on Bermuda has been observed in June but the duration of the nesting season is unknown. The easiest way to determine if one lives in your neighbourhood is to look for semi-circular incisions along the edges of leaves of plants which Bermuda's leafcutter bees use to line their nests. These include roses, Jamaica dogwood, Virginia creeper, peach, burr bush and wax myrtle. The cuts look different from other insect damage on leaves, as they are oblong (rather than round), have very smooth edges and are always along the margins of the leaf not in the middle.



Peach tree leaves showing the tell-tale signs that a leafcutter bee has harvested pieces to line its nest with (photo by Tommy Sinclair)

The Department of Environment and Natural Resources would like to hear from anyone who suspects that they have seen a leafcutter bee. Please contact us by email (environment@gov.bm) and include a close up photograph of the bee (if possible) as well as a description of why you think it is a leafcutter.



A recovery plan has been created for Bermuda's leafcutter bees which can be read by visiting <https://environment.bm/protected-species>.

*Mark Outerbridge
Wildlife Ecologist*

BEYOND THE FIRE: AERIAL SURVEYS OF DEVONSHIRE MARSH



Figure 1 Devonshire Marsh two days after the fire. Photo by Alison Copeland

The luck of the Irish was not abundant in Devonshire Marsh this past St Patrick's Day.

- On Saturday, March 17th, an intense fire raced across approximately 30 acres of the dense marsh land, leaving behind a blackened and seemingly dead landscape.

- Thanks to the extraordinary efforts of the Bermuda Fire Service, the fire was contained to the marsh area. Neighboring businesses and residences were spared and no people were injured. However, three Bermuda Audubon Society nature reserves were extensively damaged: Winifred Gibbons, Freer Cox and Firefly.

As the GIS Mapping Analyst for the Department of Environment and Natural Resources (DENR), this unfortunate incident presented an exciting new opportunity for me. I decided to map the extent of the fire damage and monitor its re-growth, using a drone!

Flying Drones in Bermuda



Figure 2 DJI Phantom 3 Advanced drone

The Bermuda Civil Aviation Authority (BCAA) is responsible for the regulation and safety oversight of aviation in Bermuda (www.bcaa.bm). It is important for anyone planning to fly a drone in Bermuda, both recreationally and for work, to consult the BCAA website and familiarize themselves with the laws and safety regulations pertaining to drones.

With the help of the BCAA, DENR has written a Drone Operating Procedures document, which details our flight preparations procedures, as well as safety measures in the event of an emergency. Our drone operators are familiar with the Rules of the Air, as set out in the Air Navigation (Overseas Territories) Order 2013.

Mission over Devonshire Marsh

My first aerial survey was flown over Devonshire Marsh on March 19th, just two days after the fire, using a DJI Phantom 3 Advanced drone. With an application called Pix4D Capture, I was able to plan the survey in advance, by selecting the area to fly over and specifying the parameters of the flight. I was able to specify the height and pattern of the flight, as well as the intervals at which I wanted photos taken along the flight path. The photo interval is particularly important for creating accurate maps from the aerial photos. There needs to be a certain level of overlap in all of the images to successfully convert them into a geometrically corrected aerial photo map, known as an orthophoto.

With the flight height set to 250ft, this particular mission took about 13 minutes to complete and resulted in 168 photos of the burn area. Once the drone was safely landed and the images downloaded, it was time to create a map.

From Drone to Map

ESRI Ltd, the leading provider of Geographic Information System (GIS) software in the world, has created an application called Drone2Map. As the name suggests, this program takes your drone-captured imagery and turns them into geometrically correct 2D and 3D imagery products, such as orthophotos.

GIS refers to the system of computer hardware and software used to collect, manage and analyze geographic information. The power of GIS is in the ability to layer various types of datasets together. With Drone2Map you can convert images taken from a drone into a single orthophoto layer, which can then be overlaid with other datasets within the GIS. You can take measurements from the image and run various type of analysis.

Following the Devonshire Marsh fire, the first measurement I did from the orthophoto was a calculation of the total area that was burned. Normally, to make this kind of estimation, would have involved time consuming field work to identify the extent of the burned area. With the orthophoto we can see the entire area in one view and easily identify the burn edges. With GIS you can then simply trace that edge to measure the total area burned. What might have taken hours of field work simply took minutes.



Figure 3 Orthophoto of Devonshire Marsh after the fire, with the Bermuda Audubon Society properties overlaid

Monitoring Re-Growth

To monitor the recovery of the marsh, I aimed to repeat the aerial survey every week. With weather playing a role, I managed to repeat the flight seven times, roughly every ten days. We also went into the marsh on foot to get a closer look at what was happening on the ground following the fire.

Looking at the aerial photos from the first three flights, there does not appear to be much significant change. From a distance the burnt area of the marsh appeared to remain very brown and dead. However, at ground level we could see signs of life. Shoots of ferns and grasses were already pushing through the burnt peat and debris.

It was not until the fourth flight, over a month after the fire, that we saw a sudden explosion of bright green in the aerial photos. As those new shoots began to grow, they initially pointed straight up towards the sky, making them difficult to see in the aerial photos. Eventually, those new growths matured and began to spread their leaves horizontally, making them visible in the aerial photos.



Figure 4 Aerial photos of Devonshire Marsh showing the regrowth after the fire

Just four months after the fire, the marsh appears to have almost made a full recovery. The grasses and ferns have become tall and thick, while the burnt leaves of the taller trees are being replaced with new growth. More flights over the marsh are planned, however some recent technical difficulty with the drone controller has meant that we are grounded for now.



The Devonshire Marsh fire presented a great opportunity to use drone technology for habitat monitoring and DENR will undoubtedly continue to make more use of the drone in conservation management.

Mandy Shailer
GIS Mapping Analyst

IT'S FIREWORM VIEWING TIME

The mating ritual of the Bermuda Fireworm (*Odontosyllis enopla*) or “glow worm” is the stuff of Bermudian legends. Many an apprehensive visitor has been dragged down to the seashore in the dark by their hosts to witness the spectacle. The event happens every month in the summer on the third night after the full moon, beginning promptly 56 minutes after sunset.

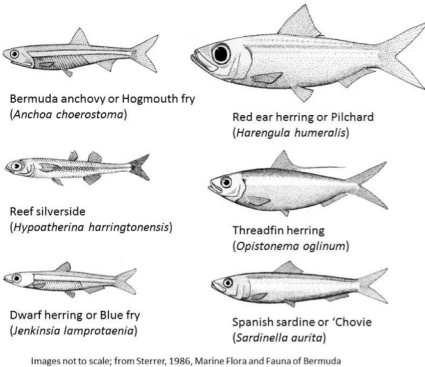
The female worms appear first, swimming up from the bottom of muddy bays to make circles at the sea surface. The ladies begin to give off an intense green glow as they do this, like little marine fireflies. All this glowing, while a magical spectacle for human observers, is designed to attract the attention of the male fireworms at the bottom of the bay. Careful observers will see the small male worm shoot up to the surface to meet and mate with a circling female. Don't blink or you will miss it!

Fireworms can be observed from the bridge at Ferry Point Park, in Flatts Inlet and sometimes in Hamilton Harbour. Both the Bermuda Underwater Exploration Institute and Bermuda Zoological Society offer 'glow worm cruises', consult their websites for details.

Sunset times can be found through the Bermuda Weather Service at this link (www.weather.bm). Full moons this summer will occur on July 27th, August 26th and September 24th.

Alison Copeland
Biodiversity Officer

FOLLOWING FRY AND STALKING SARDINES



Small fishes play an important role in the food chain, providing food for larger fishes and waterbirds, but they are also exploited by recreational and commercial fishers for bait. It is increasingly recognized that these species need to be managed in a way that accounts for all of these functions. With this in mind, the Marine Resources Section

of DENR and the Bermuda Aquarium Museum and Zoo, in partnership with the Bermuda Zoological Society, Bermuda Institute of Ocean Sciences (BIOS) and Murdoch Marine, obtained a grant from the Darwin Plus funding initiative of the UK's Department of Environment, Food and Rural Affairs (DEFRA) to conduct a study of Bermuda's baitfish populations.

There are six species of small baitfishes in Bermuda. The Reef silverside, Dwarf herring (Blue fry) and endemic Bermuda anchovy (Hogmouth fry) are of similar size and often form multi-species schools, but there is very little information about their life cycles. Other species are the Redear herring (locally called pilchards), Threadfin herring and Spanish sardine (locally called 'chovies).

Commercial baitfish catches have declined over the past 25 years, but it is unclear whether this indicates declining populations or changes in fishing practices. Current management measures restrict the length and depth of commercial haul nets, while recreational fishers may only use a cast net that is less than 8 feet in diameter. In addition, net fishing of any kind is prohibited in four inshore bays – Coot Pond, Whalebone Bay and Shelly Bay in the east end, and Somerset Long Bay in the west end.

Since April of 2017, Marine Resources Officer Dr. Joanna Pitt, BAMZ Museum Curator Dr. Robbie Smith, project technician Jirani Welch and Dr. Thaddeus Murdoch, of Murdoch Marine, have been observing and sampling baitfish around the island in order to monitor seasonal changes in their patterns of abundance, and to track the growth and spawning cycles of the various species. Bait schools seem to be present in inshore bays throughout the year but the types of species and the size of schools are quite variable. In addition, some patterns observed in 2017 seem a bit different in 2018. An aerial drone is being used to survey the distribution of baitfish schools around Bermuda this summer.

Dr. Gretchen Goodbody-Gringley, of BIOS, has used population genetics to demonstrate mixing of fish from around the Bermuda platform, but has shown that our local populations receive minimal input of larvae from elsewhere. This means that, while we need to make sure that Bermuda's baitfish populations are not depleted below levels that can be self-sustaining, we do not need to worry about the numbers of fish in a particular bay.

In the coming months, we will be interviewing those commercial fishers who catch bait to sell, and surveying other commercial fishers, as well

as recreational fishers, to find out which types of bait they use, how much they catch themselves and whether they buy bait. We will also be exploring attitudes towards alternative baits.

Understanding the distribution of baitfish populations around Bermuda, and their seasonal cycles, would allow for more precisely directed management measures for these species. However, incorporating information on fishing practices and fishers' opinions into the discussion at an early stage will be key. The data acquired during this project will be used to improve the current baitfish management plan and put in place any additional measures needed to sustain baitfish populations for generations to come.

Dr. Joanna Pitt, Marine Resources Officer, and Dr. Robbie Smith, Natural History Museum



ENVIRONMENTAL CALENDAR

June 2018

June 5th: World Environment Day.

June 5th, marks the opening of the UN Conference on the human Environment (Stockholm 1972) which led to the establishment of the United Nations Environment Programme (UNEP).

<http://worldenvironmentday.global/>

<http://www.un.org/en/events/environmentday/>

June 8th: World Oceans Day.

Has been unofficially celebrated every 8 June since its original proposal in 1992 by Canada at the Earth Summit in Rio de Janeiro, Brazil; was officially recognized by the United Nations in 2008.

Theme for 2018: encouraging solutions to plastic pollution and preventing marine litter for a healthier ocean and a better future.

<http://www.worldoceansday.org/>

<http://www.worldoceansday.org/plastic-pollution-resources>

June 9th: Coral Triangle Day

Held every June 9th, Coral Triangle Day was created to help celebrate one of the largest marine biodiversity habitats. Find out more here:

http://wwf.panda.org/knowledge_hub/where_we_work/coraltriangle/events/coraltriangleday/

June 15th: Global Wind Day

It helps keep your kite flying, makes summers cooler and enables you to create energy. Find out more about Global Wind Day here: <https://globalwindday.org/>

June 16th: World Sea Turtle Day

Plastic is becoming the number 1 killer in our oceans and turtle species are becoming threatened with extinction. Read up on turtle species. <https://www.wwf.org.uk/updates/world-sea-turtle-day>

June 17th: World Day to Combat Desertification and Drought

The World Day to Combat Desertification and Drought is observed every year to promote public awareness of international efforts to combat desertification. The theme for 2018 is “Land has true value – invest in it” <https://www.unccd.int/actions/17-june-world-day-combat-desertification> and <http://www.un.org/en/events/desertificationday/>

July 2018

July 11th: World Population Day

The theme for 2018 is “Family Planning is a Human Right” and marks the 50th anniversary of the 1968 International Conference on Human Rights, where family planning was globally affirmed to be a human right.

<http://www.un.org/en/events/populationday/>

July 29th: Global Tiger Day

Want to end the tiger trade and double the world’s tiger population by 2022? Check out the information on how you can help protect tigers and other large endangered cats. <http://tigerday.panda.org/>

August 2018

August 10th: World Lion Day

World Lion Day aims to raise awareness for Lions everywhere. Learn more about Lions and other big cats here: <https://bigcatrescue.org/>.

August 12th: World Elephant Day

Learn about Asian and African elephants and how to help them. <http://worldelephantday.org/>

August 19th: World Orangutan Day

Orangutans and other species are victims of deforestation and other forestry industries. Find out how you can help orangutans by visiting: <http://www.worldorangutanevents.org/international-orangutan-day.php>

August 22nd: National Honey Bee Day

Are you aware of the bee crisis? In 2009 beekeepers in the US decided to promote and educate the public on beekeeping. <https://www.awarenessdays.com/us/awareness-days-calendar/national-honey-bee-day-2018/>

PLANTING CALENDAR – WHAT TO PLANT IN THE SUMMER...

VEGETABLES

June

Beans, Cucumber, Squash, Tomato

July

Beans, Carrots, Tomato

August

Beans, Broccoli, Brussel sprouts, Cabbage, Carrots, Kale, Leeks, Mustard Greens, Pepper, Radish, Rutabaga, Tomato

FLOWERS

June

Amaranthus, balsam, calendula, celosia, coreopsis, cosmos, gaillardia, gazania, globe amaranth, hollyhock, marigold, portulaca, rudbeckia, vinca and zinnia

July

Celosia, cosmos, gazania, globe amaranth, impatiens, marigold, salvia, snow-on-the-mountain, vinca and zinnia

August

Celosia, cosmos, gazania, globe amaranth, impatiens, marigold, salvia, snow-on-the-mountain, vinca and zinnia

ON HER MAJESTY'S SERVICE



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