WELCOME

to our winter edition of Envirotalk.

In this issue –

- Dr. Mark Outerbridge discusses the threat litter poses to our endangered **Bermuda Skink.**

- Dr. Robbie Smith highlights the discovery and naming of a **new species of Beardfish** from Bermuda's deep waters.

- The Marine Conservation Section provides an encouraging update at the end of the first year of the **Seagrass Restoration Project** at the Ireland Island Lagoon and at cages around Bermuda.

- Dr. Joanna Pitt explains the significance of 2021 as the start of the **United Nations Decade of Ocean Science for Sustainable Development**, and associated work being done internationally and locally to tackle marine debris from the fishing industry.

- Also See:
    - Our **News & Notices** for reminders and upcoming events
    - The **Planting Calendar** to get a head start on what to plant this winter.

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

EVERY LITTER BIT HURTS

We are fortunate to live on such a beautiful island. Bermuda has 296 kilometers of coastline[1], including all of the rocky nearshore islands and islets, much of which commands sweeping views of the Atlantic Ocean. There are a number of publically accessible locations which make for idyllic places to enjoy the scenery, and it seems that some folk take the opportunity to appreciate a beverage or two at the same time. Unfortunately not everyone carries their empty bottles with them when they leave. Instead of being disposed of responsibly in a trash can, many bottles end up getting tossed to the side and left in the environment.

Not only is litter an eyesore but discarded empty bottles, especially glass bottles, can be lethal to wildlife. This is particularly true for Bermuda's endemic skinks. Bottles which are left lying on the ground are capable of catching insects and small animals, particularly if the opening is facing uphill so that the top is in a higher position than the bottom. Residual liquid at the bottom of a bottle (i.e. soda or beer) attracts insects, which in turn attracts lizards and skinks to feed upon them. Once inside a bottle, the trapped animals find it difficult, if not impossible, to climb out and will quickly die from heat exposure. Reptiles are ectothermic ('cold-blooded') which means that they find it much harder to regulate their body temperatures than we can as endothermic ('warm-blooded') organisms. This makes them especially vulnerable to lethal litter.

Live mature Bermuda Skink (Photo: Gerardo Garcia)

The Bermuda skink (or rock lizard) is one of our island endemics, a unique creature found here and nowhere else on earth. Research indicates they may have been living here for two million years[2], yet sadly this reptile is so rare now that it has been listed as Critically Endangered under the Bermuda Protected Species Act (2003). These days skinks are only found living in rocky coastal areas, mostly along our southern shoreline. The majority of the known sub-populations are small in size and isolated from each other. Local research has shown that the probability of detecting a skink in the wild was positively influenced by the presence of seabirds (such as longtails and cahows) and coastal habitat where prickly pear cacti and salt tolerant shrubs (such as sea ox-eye) grow[3]. Our skinks are secretive creatures and hide under rocky ledges and inside thickets of coastal vegetation. Unfortunately, what I am finding is that this natural vegetation is also where many of the empty glass bottles are being deliberately hidden. Perhaps this is done to make the litter less unsightly but, whatever the reason, it increases the chances of skinks encountering the bottles.

This past August I visited West Whale Bay Park in Southampton, an area where skinks have been reported in the past, to see if I could find empty bottles along the coastline. An intern and a volunteer (Miguel Mejias and Luke Foster) helped me to survey a small area of land overlooking the ocean (shown below in red). The vegetation consisted of dense clumps of sea ox-eye with scattered prickly pear cacti, and the total area measured approximately 10 meters by 17 meters. After a relatively brief period we

managed to collect 127 empty beverage containers (122 glass bottles, three plastic bottles, and two aluminum cans). Only six had caps in place; the rest were uncapped. Some of the bottles looked as if they had been recently left there; others had clearly been lying in the undergrowth for many years. The contents of these containers were closely examined and we discovered that seven bottles contained the remains of wildlife including at least nine skinks, two anole lizards, one mouse, and one land crab. We also found dead pill bugs (aka roly-polys), cockroaches, and the dry pupal cases of flies.

Two bottles each contained the skeletons of three skinks, which illustrates something local conservationists have suspected for years, that a decomposing skink acts as bait attracting additional skinks into the bottle. Bermuda skinks are opportunistic feeders and will scavenge upon dead animals such as fish and longtail chicks that die in their nests, so a rotting skink will certainly catch the attention of another skink.

The location in West Whale Bay Park where 127 empty beverage containers were collected in which the remains of nine Bermuda skinks were found.

What really troubled me the most about this exercise was the fact that the place superficially looked pristine, but hidden in the undergrowth were so many silent killers. Another worrisome aspect was how many bottles we found in such a small area; nearly one bottle per square meter. Unfortunately this is not the first time that bottles have been found with skink bones inside them. I have encountered the same thing at three other coastal locations and students have reported it at a fifth[4] and sixth[5]. The greatest number of skinks I have counted from a single bottle was eight, however I once found a bottle that contained the bones of 14 different anole lizards. For those of you who may be wondering, individuals can be identified by counting the number of left (or right) dentary jaw bones and skinks can be differentiated from anole lizards by looking at the shape of the teeth under a low-powered microscope. A more detailed examination of all the skink jaw bones I have collected over the past few

years has revealed that skinks from all age classes (hatchlings, juveniles, and adults) are caught and die inside discarded glass bottles.

This mature skink died after becoming trapped in a bottle

Bermuda's skinks are affected by a number of threats, but the most preventable is death from litter. Please be a part of the solution, not the pollution. You can help by turning empty bottles upside down, and flatten empty aluminum cans by stomping on them, when you find them discarded in the environment (or better yet, take them away and put them in a trash can!) Encourage others to do the same.

Coastal areas covered with rocky outcrops, sea ox-eye, and prickly pears are typical habitats for Bermuda's endemic skinks.

References:

[1], Meyer, E.L., Matzke, M.J., and Williams, S.J. 2015. Remote sensing of intertidal habitats predicts West Indian topsnail population expansion but reveals scale-dependent bias. Journal of Coastal Conservation 19(2) DOI:10.1007/s11852-014-0371-7

[2], Olson, S.L, Hearty, P.J., and Pregill, G.K. 2006. Geological constraints on evolution and survival in endemic reptiles on Bermuda. Journal of Herpetology. 40(3):394-398.

[3], Turner, H., Griffiths, R.A., Outerbridge, M.E., and Garcia, G. 2021. Dynamic occupancy modelling to determine the status of a critically endangered lizard. Oryx (in print).

[4], Wingate, R. 1998. A comparison of demography and morphological variation in two insular populations of the Bermuda rock lizard *Eumeces longirostris*. BSc thesis. University of Wales, Swansea.

[5], Turner, H.S. 2018. Population status and conservation of the critically endangered Bermuda skink. PhD thesis. University of Kent, UK.

By Dr Mark Outerbridge, Senior Biodiversity Officer

NEW BERMUDA BEARDFISH SPECIES REVEALED AND NAMED FOR PIONEERING FEMALE ICHTHYOLOGIST AND CONSERVATIONIST, GLORIA HOLLISTER

Dr. Terry C. Grande, Loyola University Chicago and Dr. Mark V. H. Wilson, University of Alberta and Loyola University Chicago recently published a description of a beardfish species, *Polymixia hollisterae*, living on Bermuda's deep slope, in the journal *Ichthyology & Herpetology*.

The fish is a new species of the spiny-rayed fish genus *Polymixia*. It was initially identified as *Polymixia lowei* but careful re-assessment of the bones in the fin structures and new genetic data have revealed it to be distinct. The only other known specimen was caught in the Gulf of Mexico. Species of *Polymixia* have been called 'living fossils' because of their unusual retention of primitive features, and because *Polymixia* is the last survivor of a Cretaceous radiation of polymixiiform fishes, over 65 million years ago.

The new species of the fish genus *Polymixia* in Bermuda is named in honor of Gloria Elaine Hollister (1900–1988) for her landmark contributions to deep-sea research and ichthyology. She was a key member of William Beebe's Bathysphere Expeditions, on Nonsuch Island, in the 1930s which set world records for deep-sea descent and biological observations off Bermuda. Gloria set a record herself for deepest descent by a woman, which stood for decades. Hollister also described new species of fishes and she perfected a method for clearing fish specimens and staining their bones, allowing study of the skeleton through transparent flesh, a method still widely used with slight modification today. She was active in tropical jungle exploration in Guyana with Beebe, did pioneering work for the Red Cross Blood Bank during WWII, and was an advocate of land conservation with the Nature Conservancy.

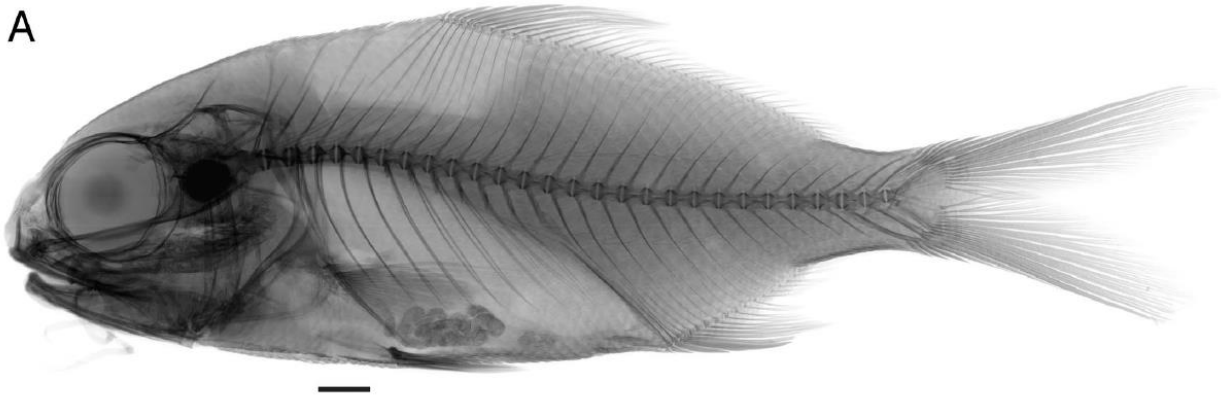
Dr. Grande and Dr. Wilson came to the Museum in 2018 to study the unusual fish, which had been caught in 1997 on a deep line off Eastern Blue Cut in 550 m (280 fathoms, 1600 feet) of water by Craig Soares and Richard Allen, who donated it to BAMZ. Another species of beardfish, *P. lowei,* has been

caught several times on the deep slope off the South Shore and a single specimen of *P. nobilis* was caught on the slope of Challenger Bank by Bobby Doe in 1973. Dr. Wilson shared with me that his mother was born here and spent much of her early life in Bermuda and is a distant relative of Mr. Doe. There are only 10 species of *Polymixia* known globally so it is remarkable we have three here.

Tim Noyes and Dr. Leo Blanco-Bercial from BIOS commented on the discovery: “This new species documentation is very relevant to the new Darwin Plus project ‘Assessing the mobile fish biodiversity of Bermuda’s deep seas’. The project will be utilizing environmental DNA as one way of detecting deep-sea fishes. Having both taxonomic and genetic identification of a species are invaluable to maximizing the power of eDNA meta-barcoding, since these voucher specimens serve as a reference with which to validate the eDNA detections. These tools will help us more clearly understand the patterns of fish diversity on Bermuda’s deep reefs and the slope of our seamount.”

Dr. Tammy Warren, Senior Marine Resources Officer, added: “We need a clearer picture of the diversity of fishes in our deep water so that we can be more confident of our conservation and management strategies. This new information is relevant to the Bermuda Ocean Prosperity Programme, where good data on fish distribution patterns, including the work done by Tim and Leo, will help us formulate our new Marine Spatial Plan.”

The type specimen of *Polymixia hollisterae*, a new species found in Bermuda



An x-ray reveals the skeleton of the fish, used to distinguish it from the other species in Bermuda.

Images from Grande and Wilson, 2021

The paper is available as open access at:
https://meridian.allenpress.com/copeia/article/109/2/567/467982/A-New-Cryptic-Species-of-Polymixia-Teleostei

Dr. Robbie Smith, Curator of the Natural History Museum

SEAGRASS RESTORATION PROJECT - UPDATE

With all the recent focus on taking action to fight climate change, the Department of Environment and Natural Resources' Marine Conservation Section thinks it is very fitting to provide an update on efforts to restore and preserve areas of seagrass around Bermuda.

Seagrass meadows capture and retain carbon above ground in the leaves and below ground in the horizontal stems and roots, as well as in the sediment below the meadows. The amount of organic carbon stored by seagrasses, on an areal basis, is comparable to terrestrial forests.

If you read the Autumn 2020 edition of Envirotalk you may remember the article – "The Lagoon – A Seagrass Conservation Project" which talked about how the Department in collaboration with the West End Development Corporation (WEDCO), the property owner, initiated a seagrass conservation project in The Lagoon, Ireland Island in September 2020.

In November 2021, a year after conducting the initial baseline surveys for seagrass, the Marine Conservation Section re-surveyed the Lagoon. While the seagrass in the Lagoon has to grow a lot more to become the dense meadow it was in 2017 before the turtles began to feed on it, it is beginning to recover now the turtle grazing pressure has been removed. Our surveys show that the seagrass is still sparse throughout the Lagoon, but in some areas where there were a few shoots of seagrass in 2020,

particularly manatee grass, the seagrass has grown and developed into much denser patches which is extremely encouraging (Figure 1a, b, c, d, e and f).

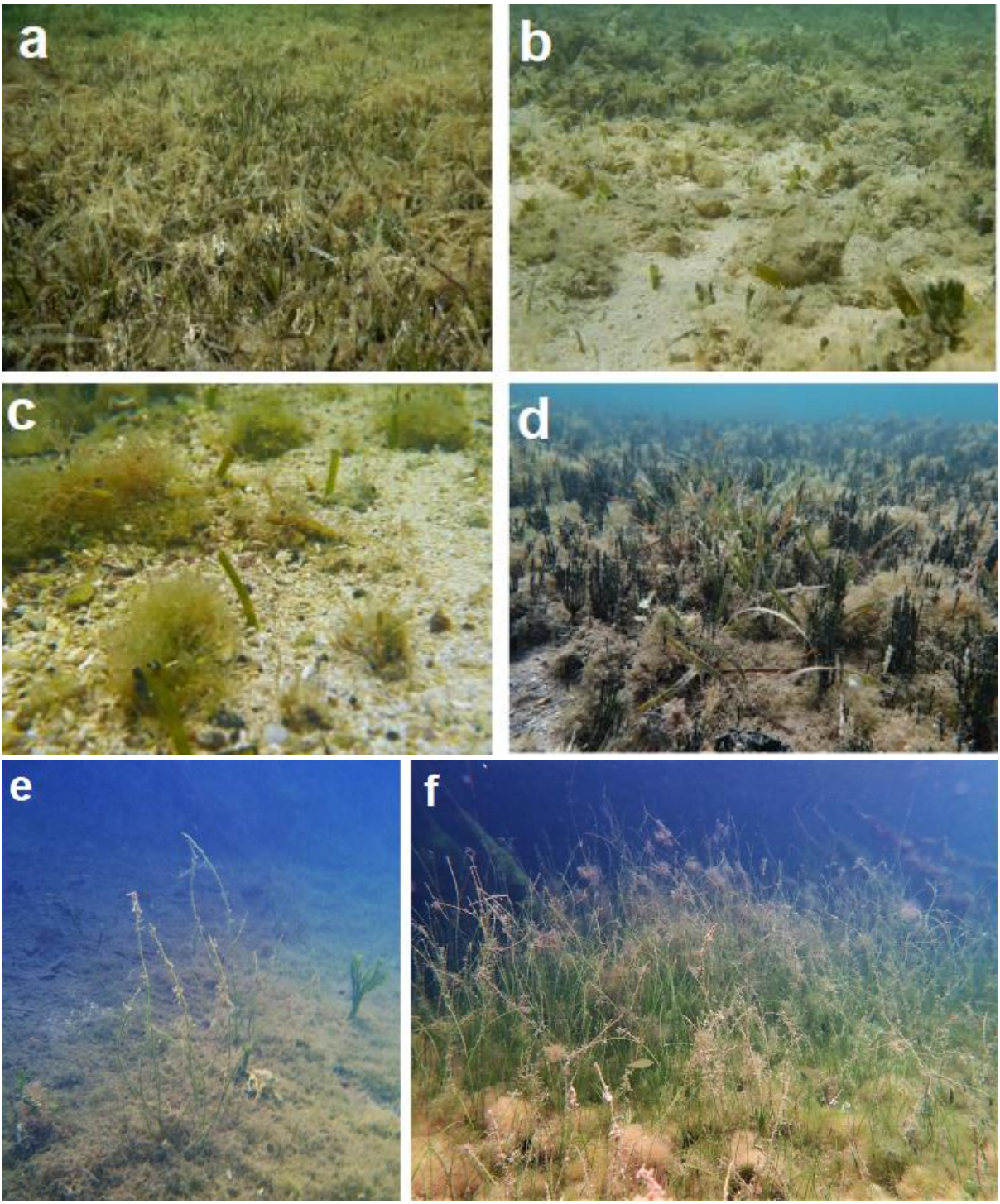


Figure 1. a. Dense turtle grass in the Lagoon in 2017. Photo credit: Annie Glasspool, b. and c. Grazed turtle grass in the Lagoon in 2019 and 2020, respectively. d. Recovering turtle grass in 2021, approximately a year after the green turtles we relocated from the Lagoon. e. Manatee grass 2020 and f. same patch of manatee grass in 2021.

In addition to protecting the few shoots of seagrass remaining in The Lagoon, the Department of Environment and Natural Resources, in the summer of 2020, created six other seagrass restoration areas by placing large mesh seagrass restoration cages over areas of seagrass habitat that were struggling to survive intensive grazing by green turtles (Figure 2a, b and c). The cages protect the seagrass from further grazing. This allows the seagrasses to regenerate, albeit slowly, and with time some of the essential ecosystem functions they provide will be restored. Even with the cages the turtles are always able to graze around the inside edges (Figure 3). Once the seagrass leaves are long enough, turtles are able to feed on them through the top of the cage, but this still allows enough seagrass to provide shelter for other organisms.

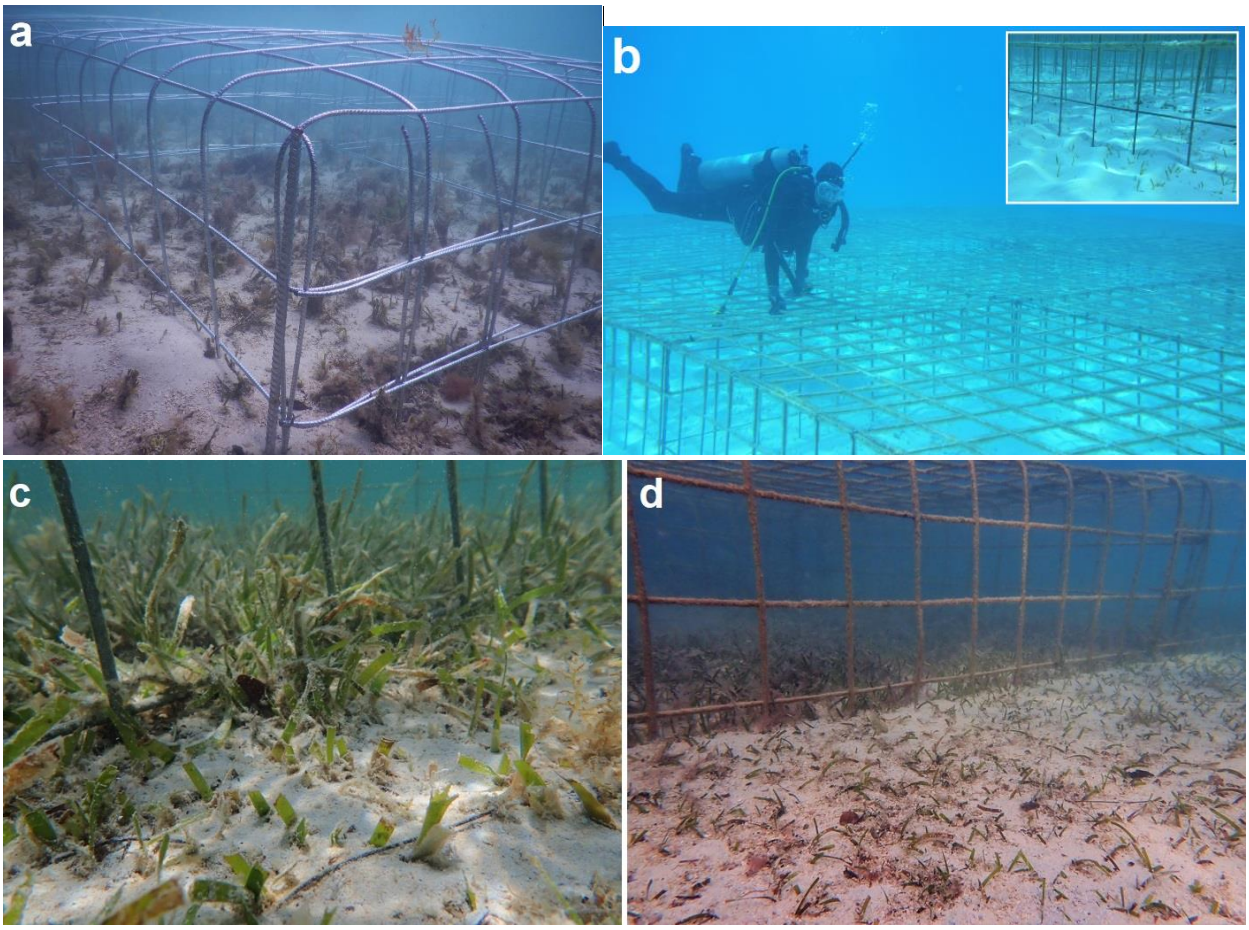


Figure 2. Newly installed cages covering grazed seagrass at a. Theta Island (inshore), January 2021, and b. near Chub Heads (offshore) April 2021. c. and d. grazed seagrass outside the cages at Hawkin's Island and east of Rushy Island, Spanish Point, respectively.

Figure 3. Green turtles have grazed the inside edge of the seagrass in the cages.

Eventually, when the balance of Bermuda's marine ecosystem is restored to where we have healthy populations of turtle predators, especially sharks, the seagrasses in these caged areas will grow out from under the cages to independently colonize seabed areas that are environmentally suitable for seagrasses.

The Bermuda Government funded the initial seagrass restoration cages that were deployed in 2020. The project was able to increase its original goal of covering 225m^2 of remnant seagrass habitat with cages to 2640m^2 thanks to the generosity of private individuals and Somers Isle Shipping, a collaboration with the Climatewise's Bermuda Seagrass Project and its partners PWC, SailGP and BF&M, and fiduciary services provided by the Bermuda Zoological Society. While the total area proposed for caging may sound like a lot, it is approximately 0.02% of the estimated area of seagrass growing on the Bermuda Platform in 2004 (Murdoch et. al 2007)!!

As of 23 November 2021, the area of seagrass habitat that has been covered by seagrass restoration cages is 1950 m^2. The cages are now spread across 21 locations, 4 offshore and 17 inshore (Figure 4). The majority of cages have been delivered free of charge to the sites by Bermuda Marine Services' barge (Figure 5).

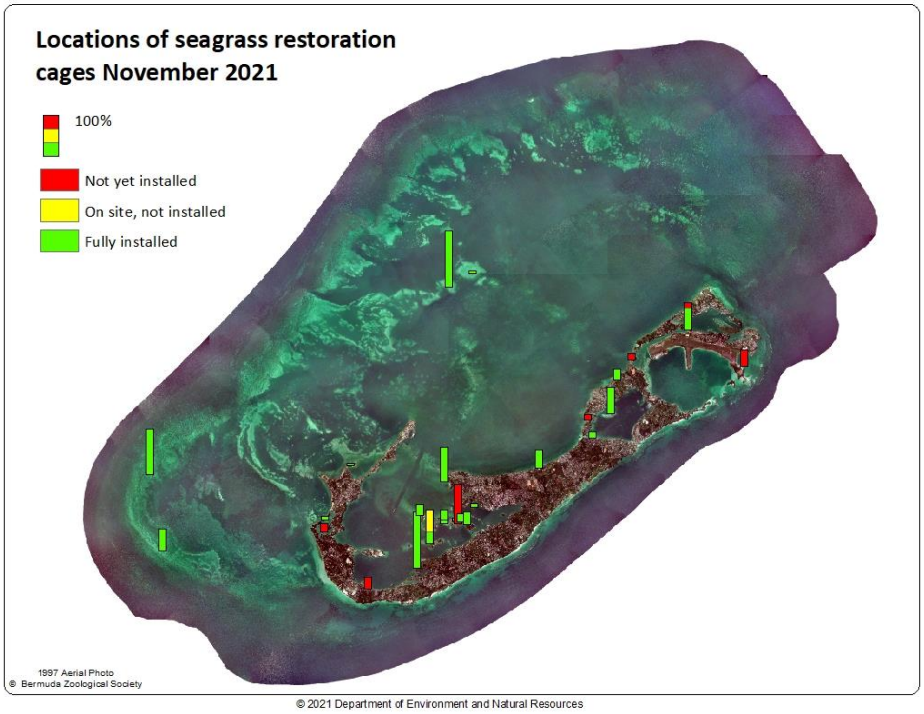


Figure 4. Locations of deployed and future seagrass restoration cages.

Approximately 240 volunteer hours have been invested in the project. Over 90 volunteers, including private individuals, staff from PWC, SailGP and HSBC, students from WaterStart, BUEI EcoSchools, Impact Mentoring Academy, Bermuda Zoological Society Summer Camp and Warwick Academy, have volunteered to build seagrass restoration cages (Figure 6). Others have helped load the barge or install cages. The Department of Environment and Natural Resources is extremely grateful to everyone who supports the Seagrass Restoration Project.

Figure 5. Bermuda Marine Services barge delivering cages. Figure 6. PwC volunteers building seagrass restoration cages.

All the caged restoration areas are monitored, with more in depth monitoring at 7 locations, 3 offshore and 4 inshore. Data collected include seagrass canopy height, percent cover of seagrass, indications of grazing, and sediment height. Also fish species, abundance and size are recorded along with species and abundance of invertebrates such as snails and lobsters. Sediment samples are collected to determine changes in carbon content as the seagrass recovers.

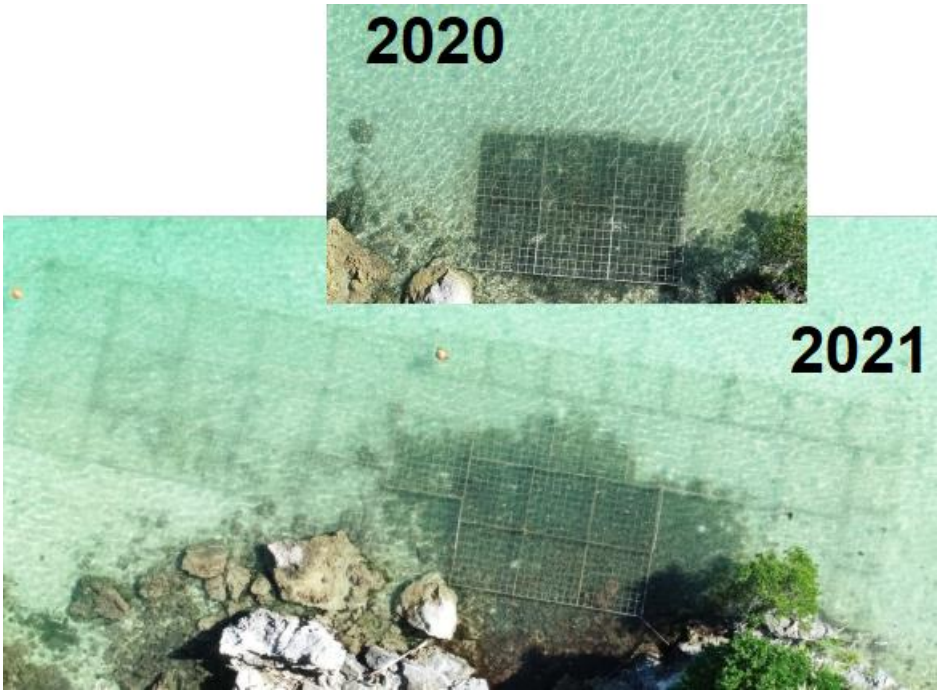


Figure 7. Expansion of seagrass (dark area) protected by cages between August 2020 and August 2021.

So far, there have been mixed results with some areas recovering more quickly than others but this is not unexpected because seagrasses, particularly turtle grass, are slow growing and can take 5 years or longer to fully recover (Figure 7). The seagrass habitat at some of the restoration areas was severely degraded – the turtle grass leaves were very narrow and had been grazed to less than 1cm long. The horizontal stems (rhizomes) were exposed because the seagrass meadow could no longer perform one of its functions which is to hold the sediment in place. These areas are likely to take much longer to regenerate.

At some locations the seagrass is recovering equally well inside and outside the seagrass restoration cages (Figure 8). Anecdotally, there are noticeably fewer turtles around Bermuda than there were 5 years ago. Most likely because there is so little seagrass left for them to eat. In locations where there are still some remnants of seagrass habitat surviving and currently no turtles frequenting that particular area to eat it, the seagrass is beginning to recover whether it is protected by cages, or not. However, new juvenile green turtles will continue to arrive on the Bermuda Platform as a result of successful conservation efforts on nesting beaches to our south and be looking for seagrass to eat. It is just a question of whether the newly arrived green turtles will stay and eat every last blade of seagrass they can find or leave quickly because seagrass is difficult to find. As we do not know the answer to this, for the foreseeable future the seagrass restoration cages are still necessary to ensure the preservation of small areas of seagrass for the multitude of other creatures, such as fish, lobsters, seahorses and juvenile queen conch, who utilize seagrass habitat in one or more stages of their life cycle (Figure 9). When the balance in our marine ecosystem is restored and the green turtles and seagrass can co-exist the seagrass restoration cages can be removed.

Figure 8. Seagrass, in the absence of green turtles, growing equally well inside and outside the cages at Theta Island November 2021. See figure 2a. for "before" photo.

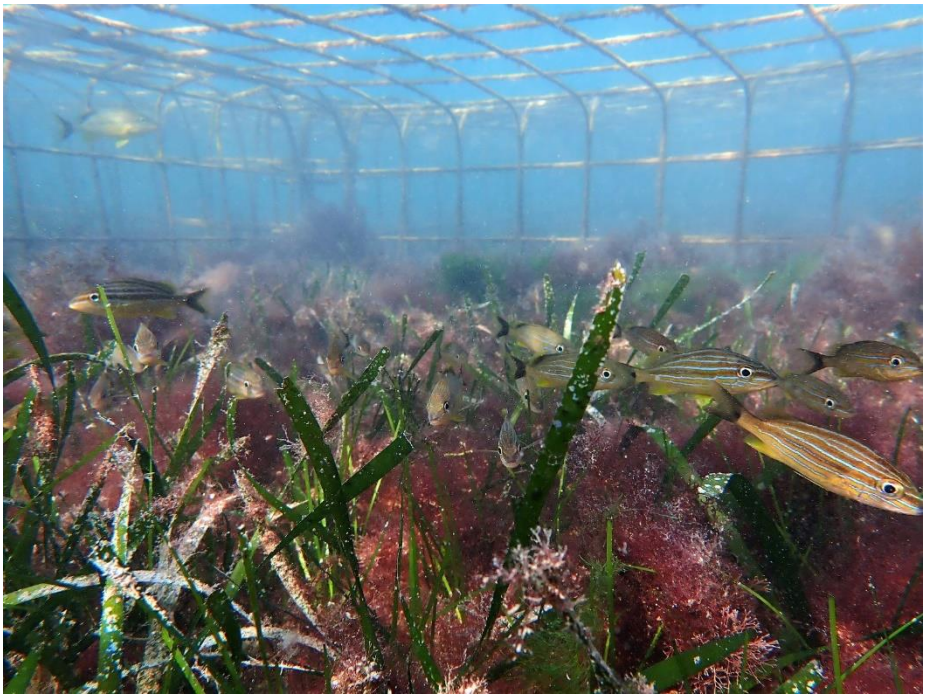


Figure 9. Juvenile grunts frequenting the restored and protected seagrass at Hinson's Island. November 2021. The cages were installed in March 2021.

The seagrass protected by the cages has provided an opportunity for studies by three students. Andreas Ratteray, a Bermudian research intern with the BIOS's Bermuda Program, is studying fishes, in the seagrass habitat inside and around certain cages and evaluating the suitability of using environmental DNA of the fishes, found on seagrass blades, as a measure of fishes using the seagrass cages. Zoe Hasselkaus, another Bermuda Program summer intern, was also recording fishes in seagrass cages, and adjacent areas, as baseline for monitoring changes in fish abundance as the seagrass recovers. Elizabeth Mack, a Dalhousie University student who is taking the BIOS Marine Biology and Oceanographic Research course, is determining factors that may influence seagrass growth and recovery under the cages.

On a global scale, Bermuda's seagrass restoration efforts are not going to have a huge impact in fighting climate change, but every little bit helps. Our seagrass meadows are extremely important locally, particularly if you like to eat local fish and lobsters, snorkel or dive over healthy vibrant coral reefs and swim in clear, clean seawater. The UN has declared 2021-2030 the Decade on Ecosystem Restoration and is calling "for the protection and revival of ecosystems all around the world, for the benefit of people and nature. It aims to halt the degradation of ecosystems, and restore them to achieve global goals. Only with healthy ecosystems can we enhance people's livelihoods, counteract climate change, and stop the collapse of biodiversity." Seagrass restoration on the Bermuda Platform is a step toward achieving this goal.

By the Marine Conservation Section

CREATING THE OCEAN WE WANT: THE OCEAN DECADE, 2021-2030

If you're reading this, you probably already understand that a healthy ocean, with its varied habitats and vibrant diversity, is essential to the survival of both nature and humanity. Yet the First World Ocean Assessment released by the United Nations (UN) in 2016 reported serious declines in ocean health and noted that urgent action, on a global scale, is needed to protect ocean ecosystems and support the ocean's essential roles as a climate stabiliser, carbon sink and provider of sustenance to 3.2 billion people. However, we can only protect and conserve what we understand. Therefore, in December 2017, the UN General Assembly proclaimed 2021 to 2030 the **"Decade of Ocean Science for Sustainable Development"** to help create momentum for change.

Bermuda's marine environment is but a part of the inter-connected global ocean, and all jurisdictions - large and small – must be able to observe, conserve, and sustainably use their part of the ocean and its resources. Ocean science must respond to the needs of society, and the pressing need right now is to find solutions for equitably developing the blue economy while conserving natural resources and working to mitigate the impacts of a changing climate. This is ***the science we need for the ocean we want.***

The Ocean Decade is a framework that focuses on developing the global capacity to generate, share and apply knowledge that directly contributes to better human interactions with the oceans. It aims to bring together science and research with policymakers, civil society, culture, and business to explore the extraordinary potential of the ocean, and to deliver innovative solutions for sustainable ocean stewardship. Ultimately, this will contribute towards achieving the **UN Sustainable Development Goals**, and other relevant global legal and policy agendas.

Ten Key Challenges outline the most urgent priorities for the Ocean Decade, and form a framework for the design and implementation of various initiatives that will be carried out at the global, regional, national and local levels. These Challenges address issues such as pollution, conservation, food security, alternative energy, climate change resilience, ocean mapping and the sharing of information (Figure 1).

Figure 1. Visualising the Ten Key Ocean Challenges.

Each Challenge will contribute to the achievement of one or more of the seven **Ocean Decade Outcomes**. These desired Outcomes view the ocean as part of the larger earth system, stretching from the coast to the open sea, and from the ocean surface to the deep ocean seabed. Transformation is central to the idea of the Ocean Decade, which aims to move past "business as usual" and towards the "**Ocean We Want**" (Figure 2).

Figure 2. Visualising the Ocean We Want.

The Ocean We Want is:

- ***An inspiring and engaging ocean***, where society understands and values the ocean
- ***A predicted ocean***, where society has the capacity to understand current and future ocean conditions
- ***A clean ocean***, where sources of pollution are identified and removed
- ***A sustainably harvested and productive ocean***, ensuring the provision of food supply
- ***A healthy and resilient ocean***, where marine ecosystems are mapped and protected
- ***A safe ocean***, where people are protected from ocean hazards
- ***An accessible and transparent ocean***, with open access to data, information and technologies

The **2030 Sustainable Development Agenda** is a global plan of action for people, the planet and prosperity, with **17 Sustainable Development Goals (SDGs)**. The SDGs give direction to global development and aim to achieve win-win co-operation in order to end poverty, improve health and education, and reduce inequality, while working to preserve our environment. The Outcomes of the Ocean Decade feed into the SDGs that are both directly and indirectly related to the sustainable development of the ocean. In particular, **Goal 14 – Life Below Water** aims to conserve and sustainably use the oceans, seas and marine resources for sustainable development. However, the Ocean Decade Outcomes also emphasize the role of a healthy and well-managed ocean in food security (**SDG 2** – Zero Hunger), affordable and clean energy (**SDG 7)**, varied livelihoods **(SDG 8** - decent work and economic growth) and mitigating the impacts of climate change (**SDG 13** – Climate Action), amongst other things.

Globally, various governments and non-governmental organisations are sponsoring initiatives to promote the Ocean Decade and support activities that will move the world towards the desired Outcomes. In particular, the German Federal Ministry of Education and Research, in partnership with the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the UN Educational, Scientific and Cultural Organisation, are sponsoring a series of **Ocean Decade Laboratories** that focus on each of the Ocean Decade Outcomes.

The Ocean Decade Laboratories are taking place between July 2021 and June 2022. The most recent, held November 17 – 19, focused on *a clean ocean*. As part of this event, the **Global Ghost Gear Initiative** (GGGI) and the **Gulf and Caribbean Fisheries Institute** (GCFI), as hosts of the regional node of the **UN Environment Program's Global Program on Marine Litter**, held an online workshop on abandoned, lost and discarded fishing gear (ALDFG). Anyone who has ever done a beach clean up in Bermuda will have encountered ALDFG such as ropes, netting, trap funnels or octopus pots – see Envirotalk issue 85 #2 from this past summer for examples. Depending upon the location, between a quarter and a half of all marine debris can trace its source to the fishing industry.

For this recent workshop, participants from around the wider Caribbean and Western Atlantic, including representatives from DENR and the Bermuda Marine Debris Taskforce, met virtually to discuss the causes and impacts of ALDFG, as well as strategies to mitigate its negative effects on the marine environment. Topics included proper marking of fishing gear so that lost and discarded gear can be traced back to its source, modifications and deployment practices that can reduce the risk of gear loss, as well as the potential for recycling and upcycling fishing gear that has reached the end of its useful life.

DENR personnel shared information about how we manage our local lobster trap inventory, the rules about gear marking that aim to reduce the risk of trap loss, and how the design has been adapted to ensure that any trap that might be lost will break open over time to reduce the impact of ghost fishing.

Participants representing the Bermuda Marine Debris Taskforce noted our challenges with drifting Fish Aggregating Devices (dFADs) that are used by international fishing fleets. These structures, often assembled from other end-of-life fishing gear, are designed to attract pelagic fishes such as tunas and are fitted with a GPS transmitter so that fishing vessels can find them as they drift around the high seas (Figure 3). But when the transmitter battery dies, or the dFAD drifts into waters where the associated fishing vessel cannot or will not follow, these structures become part of the pool of marine debris in our oceans. Over time, they break apart, often entangling fish and other marine life, or snagging on reefs and other structures as they drift into shallower waters.

Researchers are tracing dFADs back to their owners using identifying marks on the GPS transmitters, and Bermuda is contributing data to this project. If you happen to find something that appears to be a transmitter, please report it to DENR by emailing fisheries@gov.bm or to the Marine Debris Taskforce via their facebook page (see link below). It is hoped that documenting the impact of these items will encourage more responsible practices in the future. An alternative approach is for fishers to use moored FADS (mFADs) within their own exclusive economic zones, as these are easier to monitor and maintain.

Figure 3. A) Old fishing nets that were part of a dFAD that got tangled on reefs off Somerset and had to be removed by DENR fisheries wardens. B) A satellite tracker used to monitor the position of a dFAD.

Abandoned, lost and discarded fishing gear (ALDFG) is indeed a global problem. To understand and beat this particular source of marine pollution, and achieve the clean ocean we want, we must work together to 1) document the prevalence of ALDFG and its impacts; 2) share strategies to reduce gear loss and mitigate the impacts of ALDFG; 3) work together to promote more responsible handling of fishing gear, particularly gear that has reached the end of its useful life; and 4) ensure that resources are available to allow fishers everywhere to follow best practices for gear handling and disposal.

Use these links to find out more about the Sustainable Development Goals, the Ocean Decade and the Ocean Decade Laboratories, as well as the Global Ghost Gear Initiative, the Gulf and Caribbean Fisheries Institute, the Bermuda Marine Debris Taskforce and ALDFG in the Caribbean and Western Atlantic:

- https://sdgs.un.org/goals
- https://www.oceandecade.org
- https://www.oceandecade-conference.com
- https://www.ghostgear.org/
- https://www.gcfi.org
- https://www.facebook.com/bermudataskforce/
- http://proceedings.gcfi.org/wp-content/uploads/2015/01/gcfi_62-5.pdf

Dr. Joanna Pitt, Marine Resources Officer

News & Notices

Spearfishing statistics reminder

Recreational spear fishers are reminded that spearfishing statistics should be submitted monthly using the online portal at www.fisheries.gov.bm. There should be an entry for each date / location that you fished, and a "No fishing" entry for the final day of any month in which you did not fish. Please call 293-5600 or email fisheries@gov.bm if you are having difficulties accessing the portal.

Lobster Diving Reminder

Now that lobster season is underway, recreational lobster divers are reminded that they should fly a standard red and white dive flag when they are diving for lobsters, and must avoid diving in the vicinity of commercial lobster traps. Catch statistics must be reported using the online portal at www.fisheries.gov.bm, and a report of "No fishing" should be submitted for any month in which there was no lobster diving activity.

Keeping lobster catch statistics up to date through the season helps improve accuracy, particularly when it comes to reporting locations, and avoids a rush or complications as the reporting deadline of April 30th approaches. Please call 293-5600 or email fisheries@gov.bm if you are having difficulties accessing the portal.

Planting Calendar – What to plant in the winter…

VEGETABLES

December
Beans, Beets, Broccoli, Brussels Sprouts, Cabbage, Carrots, Cauliflower, Celery, Chard, Chives, Kale, Leeks, Lettuce, Mustard Greens, Onions, Potatoes, Radish, Rutabaga, Spinach, Squash, Strawberry, Tomato, Turnip.

January
Beans, Beets, Broccoli, Brussells Sprouts, Cabbage, Carrots, Cassava, Cauliflower, Celery, Chard, Christophine, Kale, Leeks, Lettuce, Mustard Greens, Potatoes, Radish, Rutabaga, Spinach, Squash, Tomato, Turnip.

February
Beans, Beets, Broccoli, Cabbage, Carrots, Cassava, Cauliflower, Celery, Chard, Christophine, Corn, Cucumber, Kale, Leeks, Lettuce, Mustard Greens, Potatoes, Pumpkin, Radish, Rutabaga, Spinach, Squash, Sweet Potato, Tomato, Turnip.

FLOWERS

December
Ageratum, antirrhinum (snapdragon), aster, aubrieta, begonia, bells of ireland, candytuft, carnation, centaurea, chrysanthemum, cineraria, dahlia, dianthus, geranium, gerbera, gypsophila, impatiens, larkspur, lathyrus, nasturtium, nicotiana, pansy, petunia, phlox, rudbeckia, salpiglossis, salvia, statice, snow-on-the-mountain, spider flower/cleome, star-of-the-veldt, stock, sweet william, verbena and viola.

January
Agratum, antirrhinum, aster, aubrieta, begonia, bells of ireland, candytuft, carnation, centaurea, chrysanthemum, cinerariam, dahlia, dianthus, geranium, gerbera, gypsophila, impatiens, larkspur, lathyrus, nasturtium, nicotiana, pansy, petunia, phlox, rudbeckia, salpiglossis, salvia, statice, snow-on-the-mountain, spider flower/cleome, star-of-the-veldt, stock, sweet william, verbena and viola.

February
Acrolinium, ageratum, alyssum, antirrhinum, aster, aubrieta, baby blue eyes, bachelor's buttons, bird's eyes, blanket flower, begonia, bells of ireland, calendula, candytuft, carnation, centaurea, chrysanthemum, cineraria, coreopsis, dahlia, Africa daisy, dianthus, forget-me-not, geranium, gerbera, globe amaranth, globe gilia, godetia, gypsophila, hollyhock, impatiens, larkspur, lathyrus, marigold (African), marigold (French), nasturatium, nicotiana, pansy, petunia, phlox, phlox (annual), red tassel flower, rose everlasting, rudbeckia, salpiglossis, salvia, scabiosa, statice, snow-on-the- mountain, spider flower (cleome), star-of-the-veldt, stock, sweet pea, sweet william, verbena and viola.

GOVERNMENT OF BERMUDA
Department of Environment and Natural Resources

ON HER MAJESTY'S SERVICE

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