Geospatial Technology: Fun for All Ages!

Dr Karen Joyce
James Cook University / She Maps

karen.joyce@jcu.edu.au

SheMaps

@kejoyce2 / @SheMapsau

www.shemaps.com

JAMES COOK UNIVERSITY AUSTRALIA

TropWATER

SHE MAPS

Google

scientist

All | Images | News | Videos | Books | More | Settings | Tools

cartoon | quote | lab | top | famous | biology | chemistry | physics | electrical | microbiology | astronomy | india | lab coat





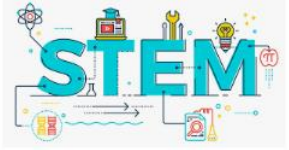












How Do We Close The STEM Education Gap ...
globaldigitalcitizen.org

Focus on STEM | ASE
ase.org.uk

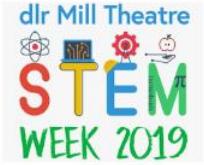
New Product Focus: STEM Starter Kit - C ...
cnascientific.com

Next Roll Call STEM Themed | De La ...
delasalle.vic.edu.au

VAST | STEM Volunteering | Staffordshire
vast.org.uk

Klinsky STEM
sites.google.com

STEM Teacher Conference - UOW
uow.edu.au



STEM Week 2019 - dlr Mill Theatre ...
milltheatre.ie

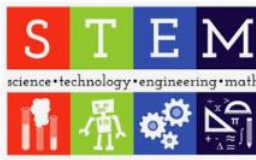
STEM Education Problem in Underserved ...
medium.com

STEM
invention-j.walsall.sch.uk

Homeschool STEM Club (Childr...
iplks.org

Rewiring STEM education | symmetry magazine
symmetrymagazine.org

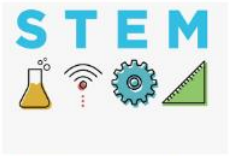
STEM Education at Good Shepherd School ...
gsschoolnyc.org



Lively STEM Club @ Gracemere Library
rockhamptonregion.qld.gov.au

STEM education – The Eagle Eye
smchseagleeye.com

STEM Camp 2018 Registration - Indiana ...
iun.edu



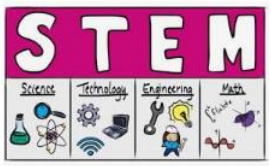
Aviation-Themed Stem Education Progra...
avserve.org.au

STEM – My First Lab
myfirstlab.com

STEM skills ...
oecdskillsandwork.wordpress.com

STEM Education and Skills Development
enterrasolutions.com

STEM is the Future. So, Where are our ...
socialscholar.net



STEM - We know what it stands for, but ...
caspa.edu.au

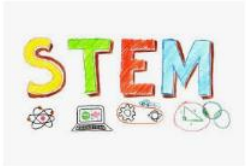
STEM Education Organizati...
facebook.com

Putting the T back in STEM | CIO
cio.com

Foundation Announces Major Investmen...
ibiobq.org

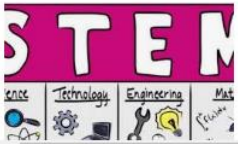
STEM It Up
campinquire.com

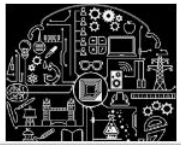
Collins English-Portuguese...
collinsdictionary.com

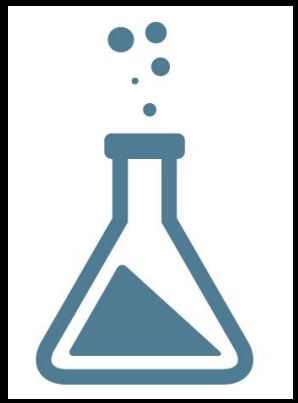


A tailored approach to STEM learning ...
teachermagazine.com.au

What Is "STEM Education"?
nc3t.com

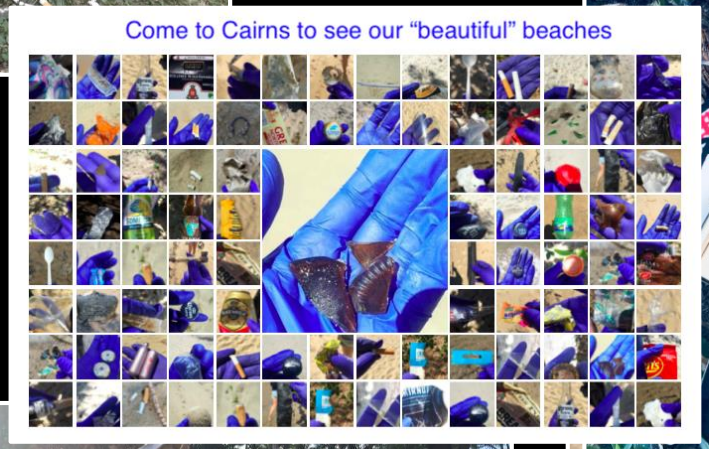


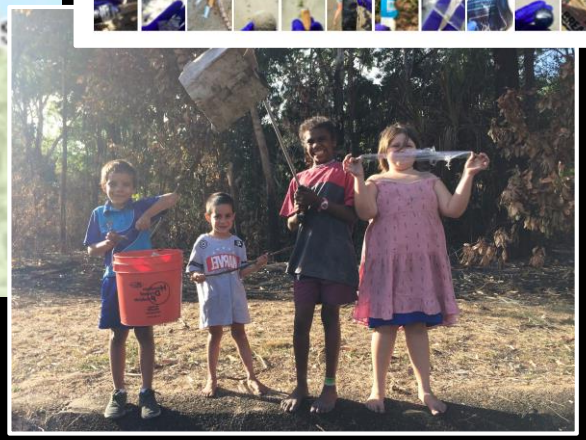




#nolabcoat

LITTER MAPPING





Who is looking after our Beaches?

This project aimed to identify if Palm Cove beach had a higher litter density when compared to a nearby beach, Yorkey's Knob, which isn't heavily used by tourists. A secondary aim was to see if the distribution of litter on the beaches varied and where any litter cleanup efforts should be targeted.

Introduction:

Many tourists who holiday in Cairns are attracted to the region for its beautiful beaches and nature based tourism activities (1). Tourism can result in an increase in litter (2) and litter can lead to a decline in tourist numbers and a reduction in economic activity in beachside locations (3).

With 25 restaurants, 20+ hotels and resorts (4), and many of the local population employed in the hospitality industry (5), the economy in Palm Cove is heavily dependant on maintaining its popularity with tourists. To remain a popular destination, it is vital that Palm Cove maintains a clean beach and a green image.

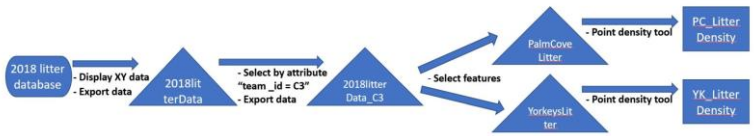
Hypothesis:

With significantly more beach-front development and previous research showing tourism can lead to an increase in litter, we expect Palm Cove beach to have a higher density of litter than the beach at Yorkey's Knob. At each beach we expect the majority of litter to be found close to the 'flags' as this is generally the busiest area of the beach.

Method:

We completed 11 hours of litter collection along the beachfront at Palm Cove and Yorkey's Knob. At each beach we covered the area from the water's edge to the esplanade footpath. The Epicollect 5 app was used to geotag and categorize the litter in situ.

Data analysis was conducted in ArcMap 10.4. The flowchart below shows the process from importing the dataset through to conducting density analysis on our data.



In addition, the Draw tool was used to create Polygons of our 2 survey areas and the Calculate Geometry tool was used to calculate the size of the area surveyed.

Figure 1. Aerial map of Palm Cove showing rubbish density along the foreshore and the flagged area

Figure 2. Aerial map of Yorkeys Knob showing rubbish density along the foreshore and the flagged area.

Results:

Palm Cove had the greatest amount of litter with 635 pieces found in a 3.5 hectare survey area. At Yorkey's Knob we surveyed a larger area of 5.3 hectares but found only 400 pieces of litter. In total we surveyed 8.8 hectares and recorded 1035 pieces of litter. This supports our primary hypotheses that the beach at Palm Cove, with its high number of tourists and beachfront development, would have more litter.

Map Legend

- Flagged area
- Litter location and density
  - High density (61 piece of litter/m^2)
  - Low density (1 piece of litter/m^2)

Spatial analysis of litter location and density revealed a tendency for litter density to increase towards the northern half of each beach (Fig. 1 & 2). This litter distribution was likely due to the popularity of the public infrastructure (a fishing jetty at Palm Cove and rock wall with seating at Yorkey's Knob) that is located at the northern end of each beach. The northern end of the beach at Yorkey's Knob is also where the main beach entrance and carpark are located.

Our secondary hypotheses, that litter density would be highest around the swimming flags, was not supported by our research. Although the area where the swimming flags are located is very popular with beach users, our analysis did not show a high density of litter in these locations. This may be due to the presence of Surf Lifesavers at these locations who were observed picking up litter in this area.

Conclusion:

Based on the data collected, we found that Palm Cove beach had significantly more litter than Yorkey's Knob beach. Previous research (2) has shown that tourism can lead to an increase in litter and the results of our research support this. Cairns Council and local business in Palm Cove should be proactive in ensuring litter is regularly removed as the popularity of a holiday destination can be influenced by its cleanliness (5).

Litter density was highest around public infrastructure and beach entrances. Although the flagged swimming area at the beach is very popular with beach users only a small amount of litter was found around these areas. This would suggest that future beach clean-ups should focus on beach entrances and areas with built infrastructure rather than the sandy beach area.

References:

1. Coghlan, A. and Prideaux, B. (2009) Reef Tourism: An analysis of the competitiveness of the Great Barrier Reef tourism destination and a comparison with other reef tourism destinations. Reef and Rainforest Research Centre Limited, Cairns.
2. GhulamRabbany, M., Afrin, S., Rahman, A., Islam, F., Hoque, F., (2013). Environmental effects of tourism. *American Journal of Environment, Energy and Power Research, 1(7), 117-130. Retrieved from http://www.ajeepr.com/AJEEPR_Vol.%201,%20No.%208,%20September%202013/ENVIRONMENTAL.pdf*
3. Krelling, A. P., Williams, A. T., Turra, A. (2017). Differences in perception and reaction of tourist groups to beach marine debris that can influence a loss of tourism revenue in coastal areas, *Marine Policy, 85, 87-99, https://doi.org/10.1016/j.marpol.2017.08.021.*
4. Australian Bureau of Statistics (2018). 2016 Census QuickStats: Palm Cove. Retrieved from http://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC32277?opendocument
5. Tourism Palm Cove Cairns - Great Barrier Reef (2018). Palm Cove Restaurants. Retrieved from http://tourismpalmcove.com/palm-cove-restaurants/

Dave Wilkinson, Sandra R Gustafsson & Merinda Walters

Spatial and social trends in relation to litter distribution at the Esplanade Lagoon

Holly Farnan[1], Shania Bolen[2], and Tobias Oftebro[3]

1- holly.farnan@my.jcu.edu.au 2- shania.bolen@my.jcu.edu.au 3 - tobias.oftebro@my.jcu.edu.au

James Cook University, Cairns

Introduction

Each year, millions of pieces of litter pollute the Great Barrier Reef, smothering coral, entangling wildlife and being ingested by marine animals. Cigarettes have been found to have a severe impact on marine ecosystems. Once a cigarette butt falls into the ocean, it can take up to five years to break down. Around 7 billion cigarette butts are littered in Australia each year with 28% of litter in coastal areas consisting of cigarette butts (2). This is an avoidable problem that we can all improve by simply taking responsibility for where our rubbish ends up and informing the public of the negative effects that littering behavior produces near marine environments (1).

Aims & Methods

- This study aims to identify the spatial and social distribution of litter around the Esplanade Lagoon near the Great Barrier Reef in Cairns, Australia. When looking at litter distribution in relation to bins in public areas and cigarette butt litter in relation to disposal options: It was predicted that there would be both spatial and social trends evident in the both litter type and distribution.
- Litter type, count, size, degradation level, and GPS location were recorded using the EpiCollect5 app. Collection took place over 9 hours and 22 minutes within a total area of 21,334 square meters, while a distance of 8,752 meters was walked. Data was then imported and spatially analyzed using the Geographic Information System software ArcMap 10.4 (Figure 1).

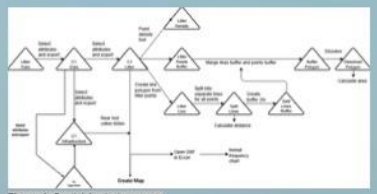


Figure 1: Spatial Analysis process

Results

- 584 total litter pieces.
- High litter abundance in areas of existing litter (Litter Density shown in Figure 2).
- Shown as a clustered distribution in Figure 3 & 4, there was a higher frequency of rubbish closer to the bins, with over 120 pieces alone 0-10m from the bin.
- 35% of litter pieces were cigarette butts followed by small plastics, 28%, with 168 total pieces (Figure 5).
- High density of cigarette butts within a close proximity to rubbish bins (Figure 6).

Figure 2: Litter Density at the Esplanade Lagoon, Cairns

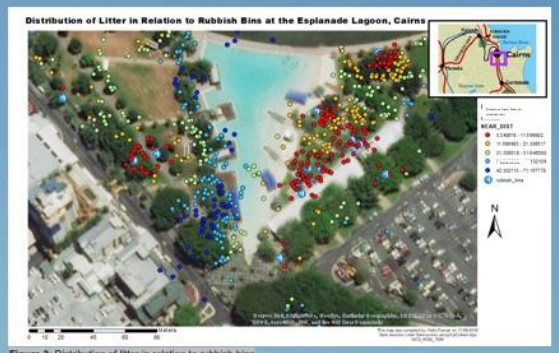


Figure 3: Distribution of litter in relation to rubbish bins

Figure 4: Distribution of litter in relation to rubbish bins

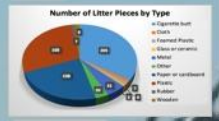


Figure 5: Litter Type

Figure 6: Distribution of cigarette butts in relation to rubbish bins

Discussion

- Results obtained from our investigation of distribution of litter in relation to bin location support our prediction. Figure 3 shows that most of the litter was found in close proximity to rubbish bins. It was also observed that the bins had "No-Smoking" signs on them. These signs could deter smokers from properly disposing of their cigarette butts and explain why there was such a high density of cigarette butts around bins.
- These trends comply with the same spatial and social litter relationship trends as previous research by the Environmental Protection Agency (EPA). In 2017, the EPA concluded that cigarette litter is found more often in areas where cigarette butt litter already exists, where it is assumed the city will pick it up, and when there are no ashtrays or appropriate disposal options (3).
- The knowledge of council workers picking up litter in the area would also lead people to think that if they don't dispose of their litter, others will do it for them.
- Previous research also states that butts are less likely to be littered when an ashtray is within 5-6 meters and when no previous butt litter is in sight (3).

Recommendations

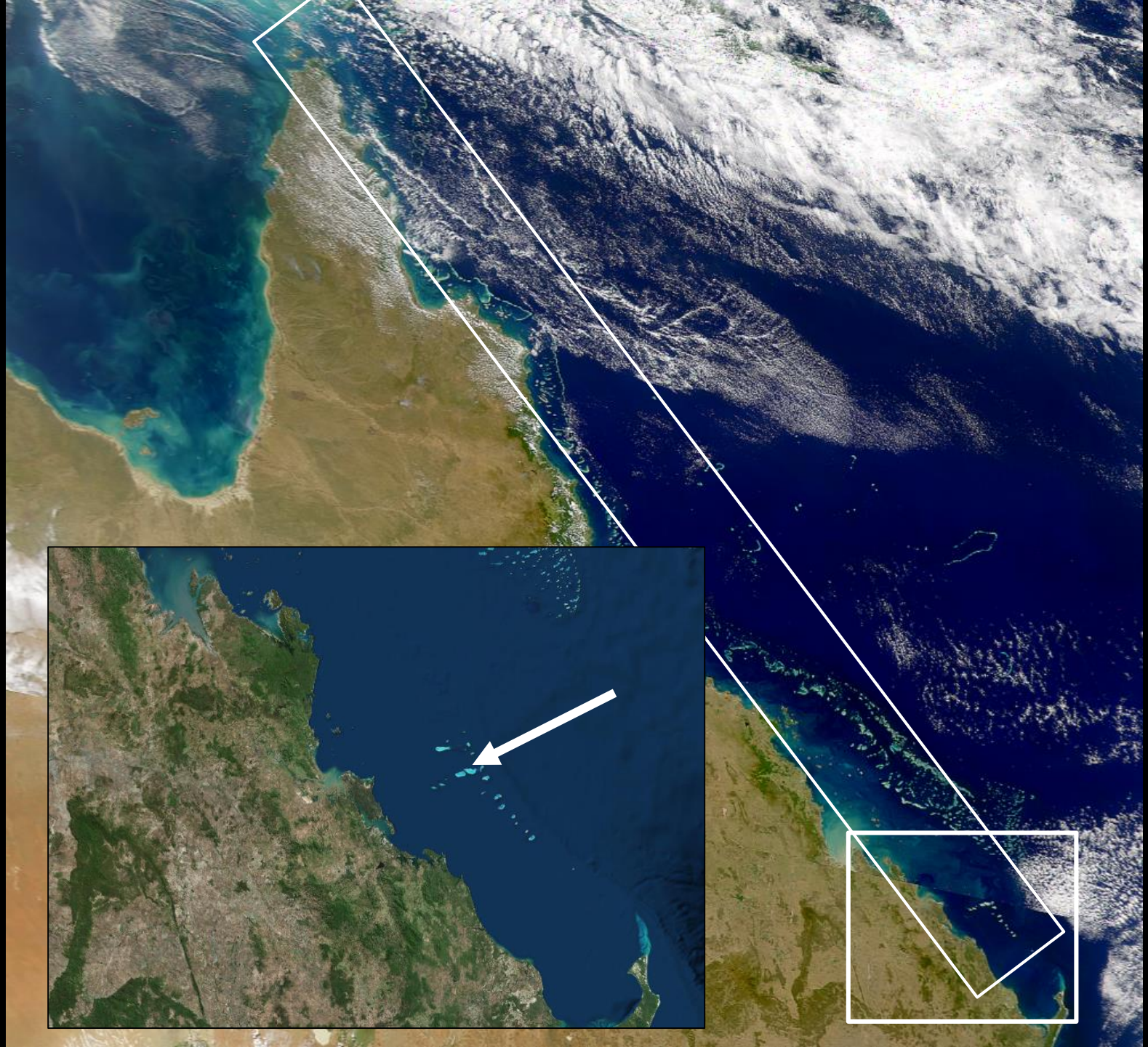
- Placing more ash trays in congregating areas such as near picnic tables and BBQ areas.
- Placing ash trays on top of all bins, as no-smoking signs may scare potential trash bin throwing
- Placing more bins on the West side of the lagoon, where a higher number of litter was found further from bins (Figure 2).
- Providing better tools to Cairns Regional Council to pick up micro/small pieces of litter more efficiently and possible higher regulations of quality of work
- Implementing fines for littering in the area.

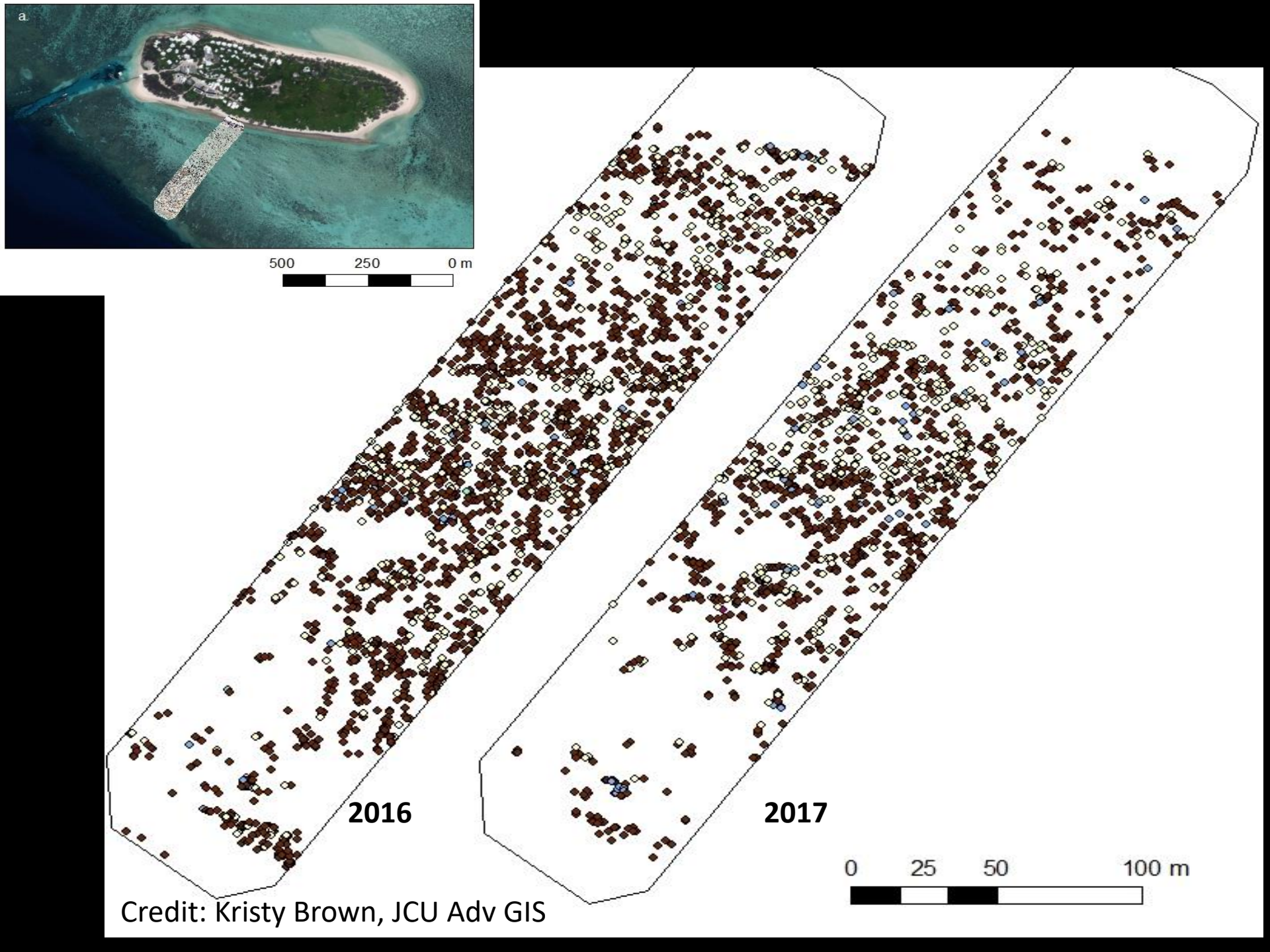
References:

1-"Litter pollution." *Herbert River Express* [Queensland, Australia], 17 Aug. 2011, p. 4. Retrieved from Newsbank.

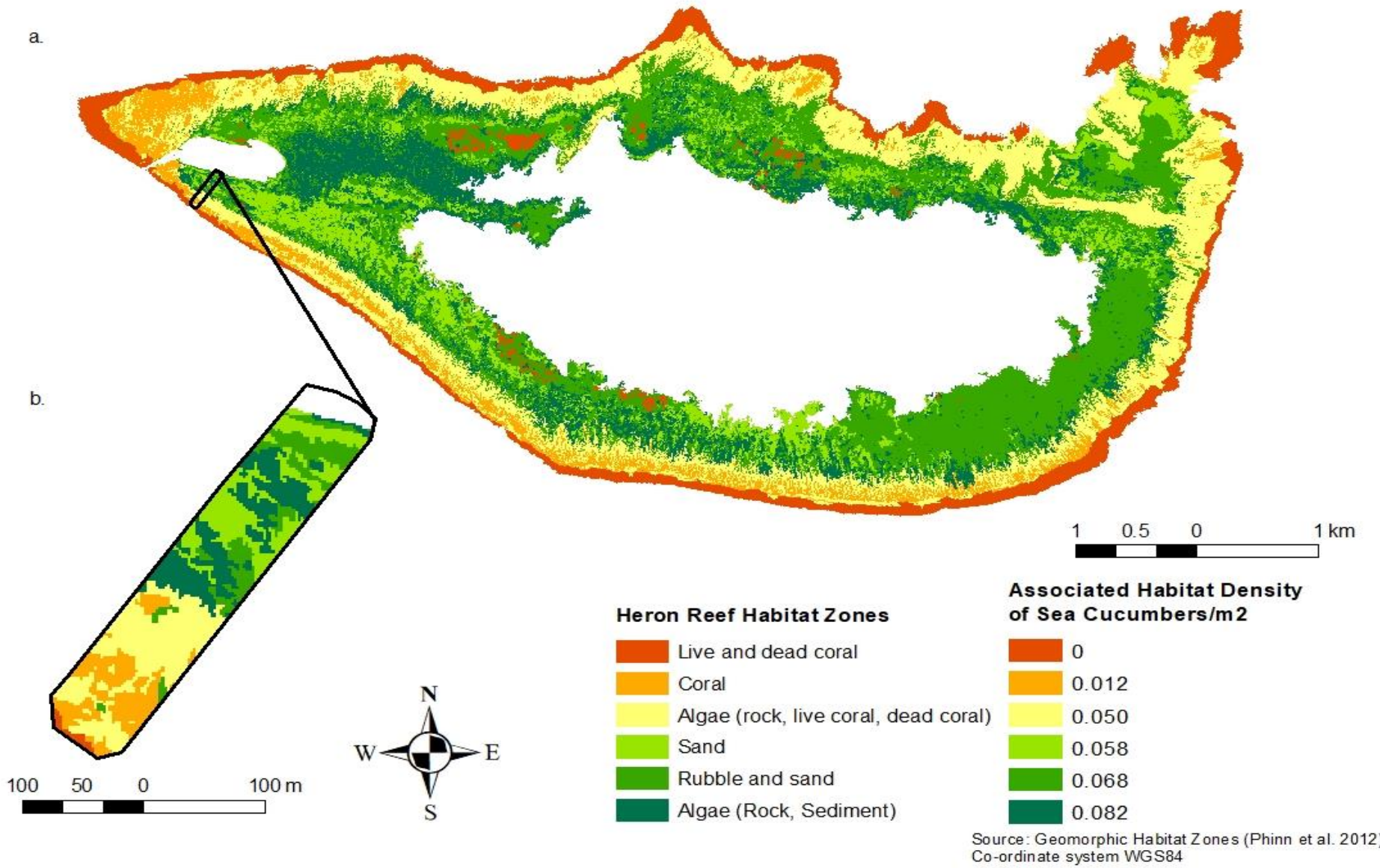
2- Schneider, J. E. "Tobacco Litter Costs and Public Policy: a Framework and Methodology for Considering the Use of Fees to Offset Abatement Costs." Tobacco Control, BMJ Publishing Group Ltd, 1 May 2011.

3-Fallone, Christina, and Spence, Bonita . "Qualitative Research of Cigarette Disposal Behavior." *NSW Environmental Protection Agency* , Hall&Partners, 2017.





Credit: Kristy Brown, JCU Adv GIS



Credit: Kristy Brown

Mapping *Holothuria ssp*. Spatial Dynamics on Heron Reef, GBR Using Aerial Drone Imagery

Katy Baker
School of Science and Engineering, James Cook University, Townsville QLD, AUSTRALIA

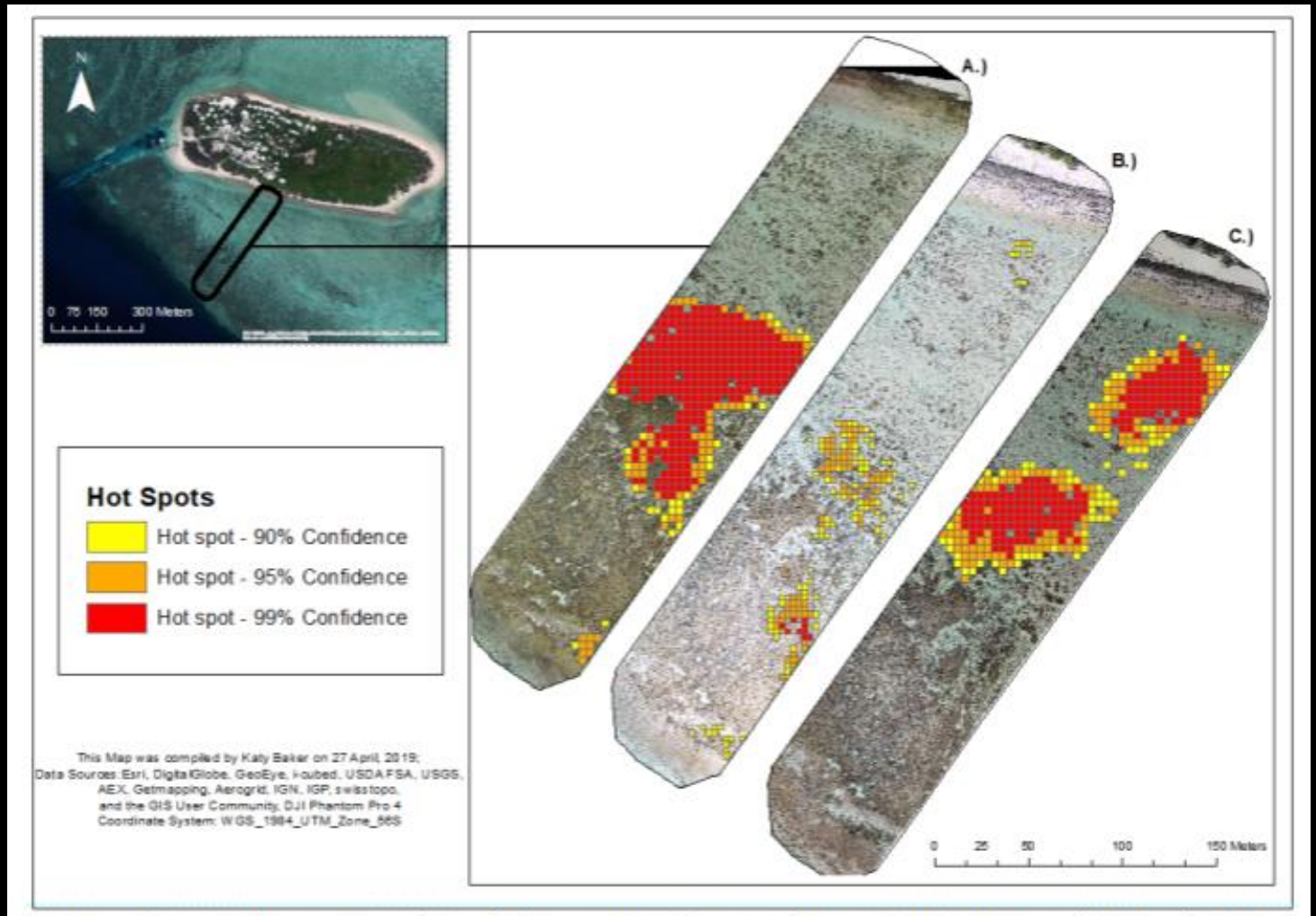
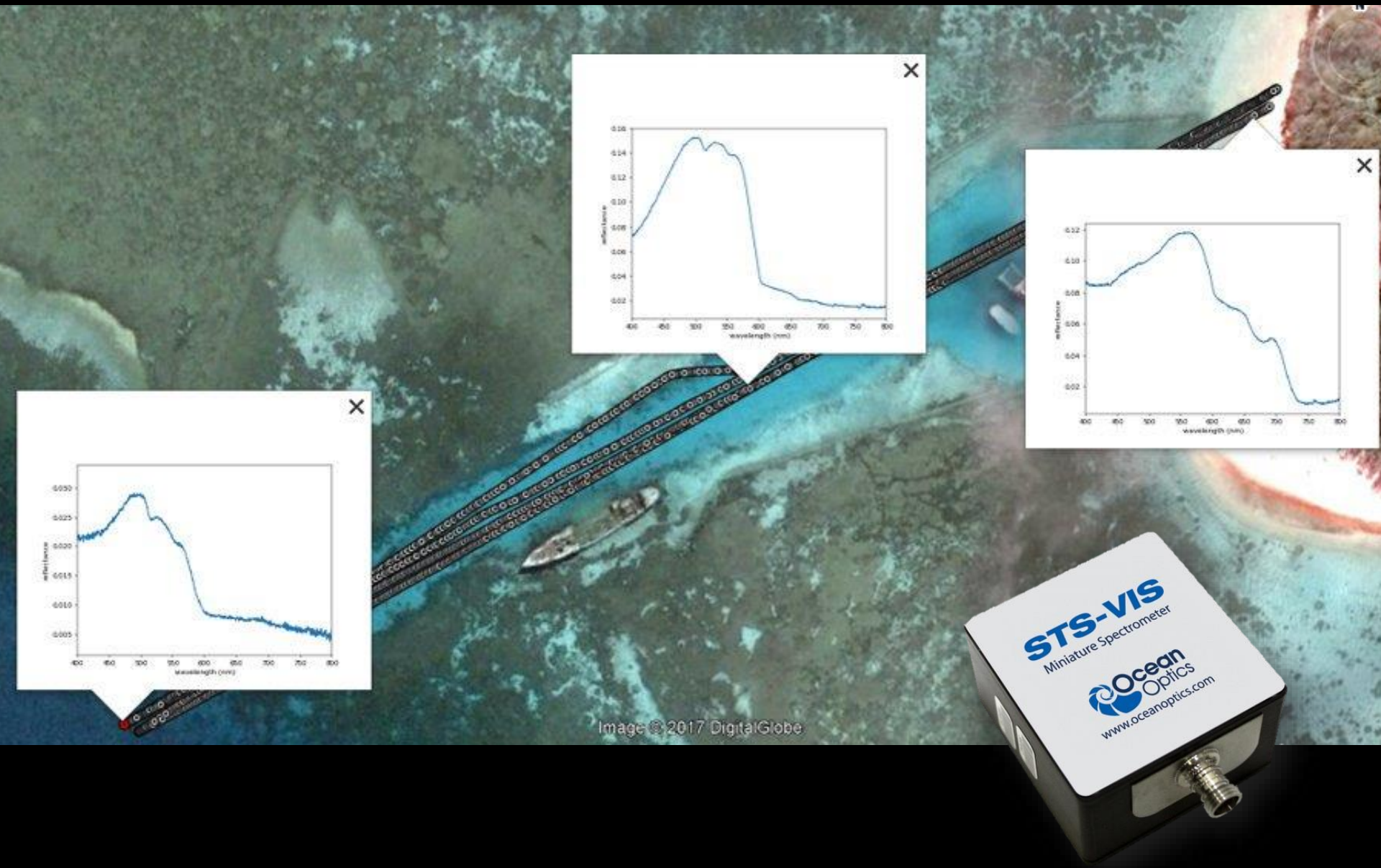
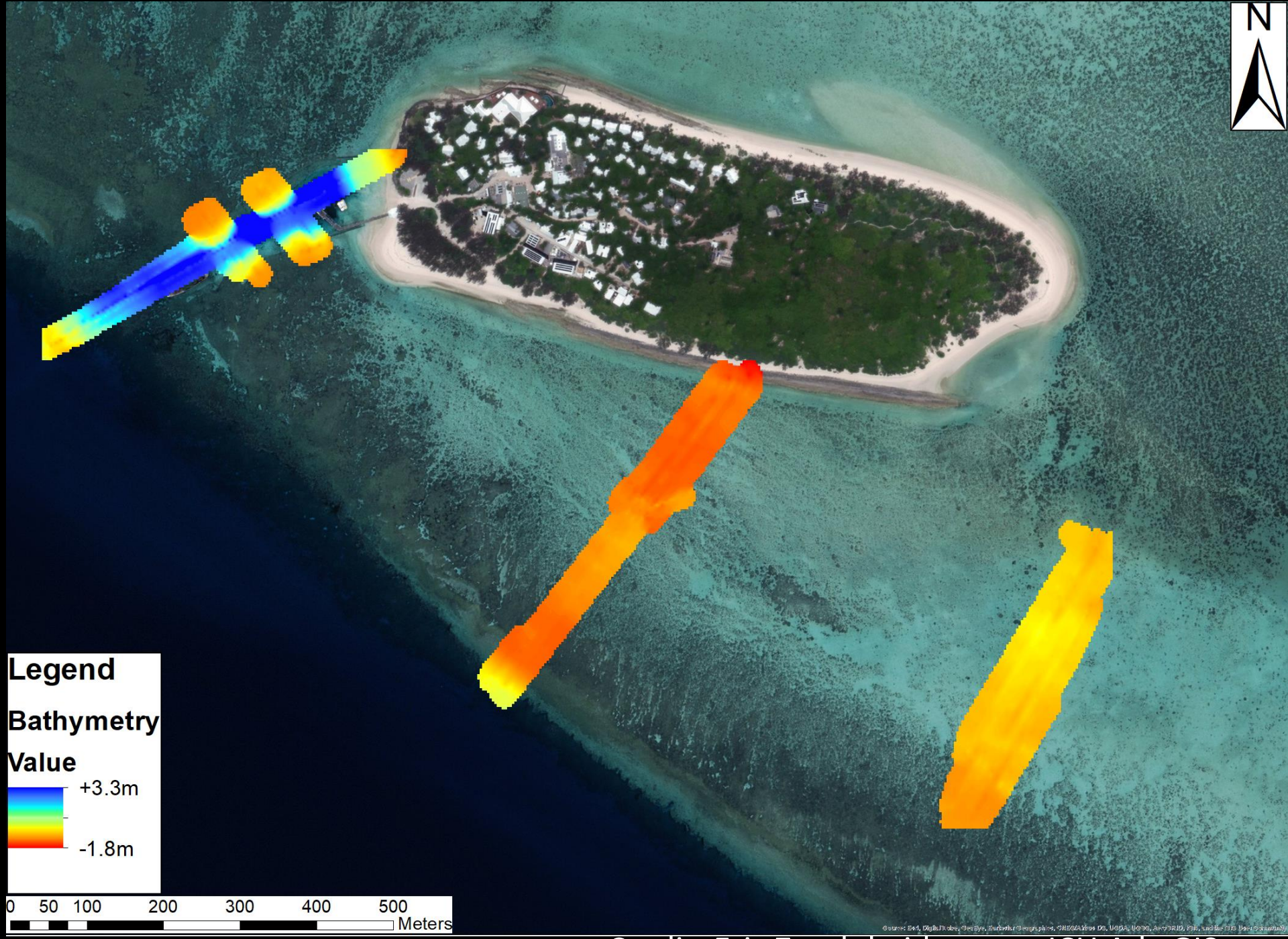


Figure 5. Optimised Hotspot Analysis of the sea cucumber population in 2016, 2017 and 2019. A.) 2016 hotspot analysis reveals a large hotspot of 99% confidence in the middle of the study area. B.) 2017

LIGHT AND WATER DEPTH





Credit: Eric Zurek-haidamous, JCU Adv GIS

Green sea turtle (*Chelonia mydas*) migration in northern Australia: Determining speed and sinuosity in relation to distance from breeding ground

Claire E. Barr

EV3502 Advanced Geographic Information Systems
James Cook University

Abstract. *Marine sea turtles have long been known to migrate towards their nesting beaches, with Raine island in Australia being considered the largest green sea turtle (Chelonia mydas) rookery in the world. During the 2017 nesting season, satellite transmitters were attached to sixteen green sea turtles (Chelonia mydas) whilst nesting*

it passed through sea grass beds surrounding the Torres Strait islands.

While it was found that seagrass beds deterred turtles on their migration path, reef shoals may have been used as navigational markers in *C. mydas* post-nesting migrations. Turtles in the GBR became more direct in their movements when following a stretch of reef (Fig. 3A, Fig. 4), which is shown by their low sinuosity measure. Similarly, Torres Strait turtle 45770 (Fig. 3B) followed a stretch of ribbon reefs for one third of its total migration

(Turtle 40730 in Fig. 3C), where the coast was used extensively.

A significant portion of both Gulf migrations (Fig. 3C) were undertaken in open water, with a surprising level of navigational accuracy held towards their foraging grounds. This is confirmed by the low measures of sinuosity calculated in these stretches and that both turtles found Mornington Island after swimming long open ocean stretches, with one turtle continuing for another 150km to its foraging ground.

Table 1. *Chelonia mydas*. Post-nesting migration distance, duration, and average speed of satellite tagged turtles found nesting on Raine Island, Australia.

Turtle Ref. No.	Distance *(km)*	Duration *(d)*	Speed *(km hr)*	Sinuosity
45778	315.9	8	1.88	1.13
40755	441.0	12	1.86	1.20
45797	346.2	13	1.52	1.29
45770	335.5	7	2.32	1.28
45788	1,103.0	23	2.87	1.09
40730	1,016.1	11	2.15	1.09

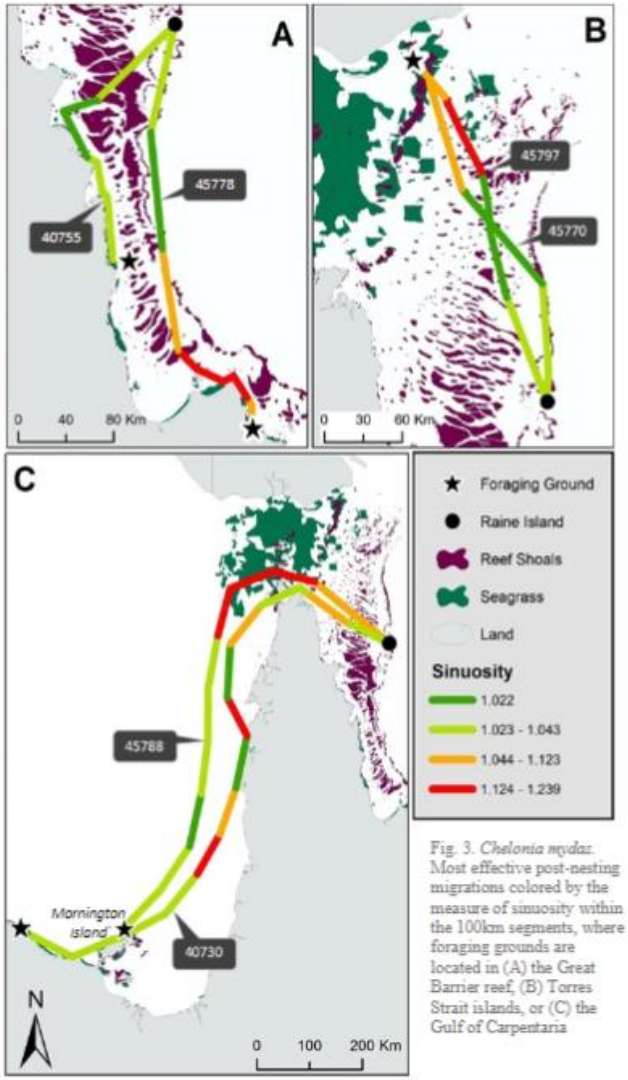
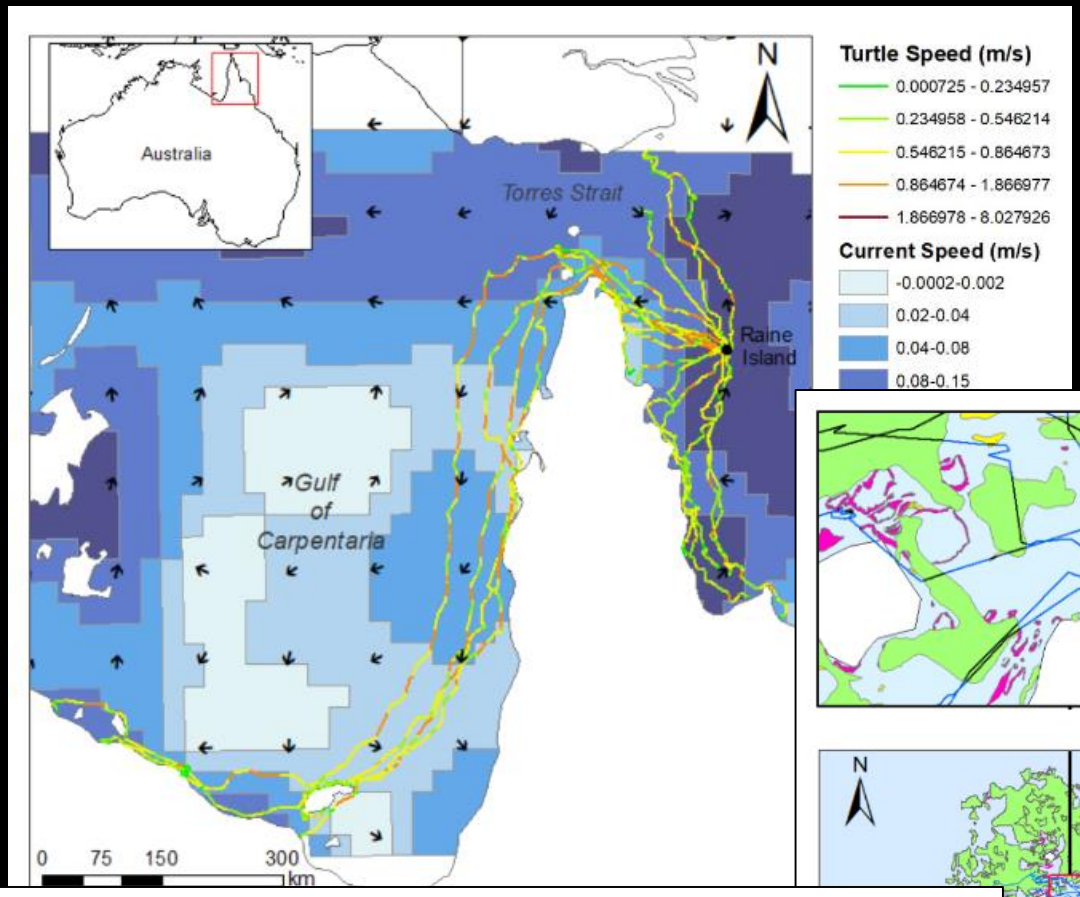
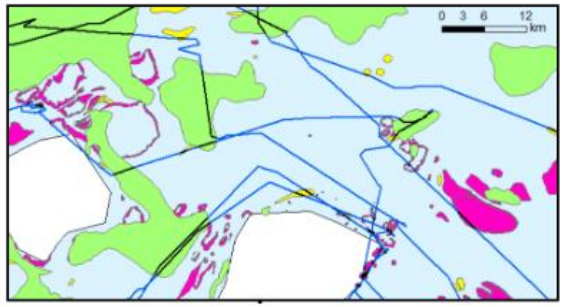
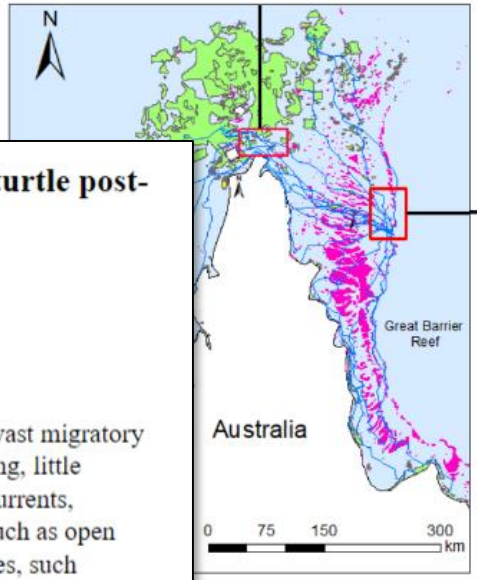
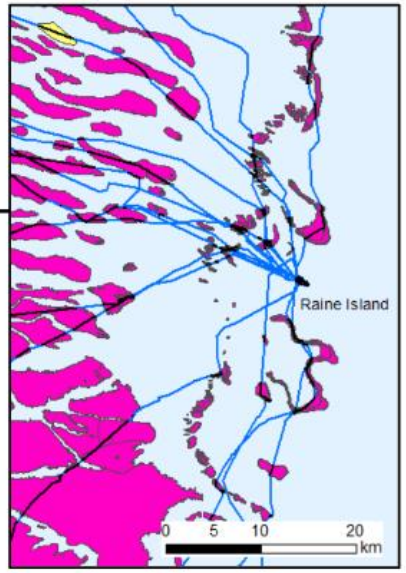


Fig. 3. *Chelonia mydas*. Most effective post-nesting migrations colored by the measure of sinuosity within the 100km segments, where foraging grounds are located in (A) the Great Barrier reef, (B) Torres Strait islands, or (C) the Gulf of Carpentaria









Influence of sea surface currents and habitat presence on green turtle post-nesting migration from Raine Island, Australia

Abstract

The Green turtle, *Chelonia mydas,* is an endangered marine species famous for traveling vast migratory distances to nesting and foraging grounds. While many studies focus on green turtle nesting, little information is reported on how physical oceanographic movements, such as sea surface currents, influence green turtle speed during post-nesting migration over specific marine habitats such as open water, shoal, seagrass meadows and coral reefs. Given the endangered status of this species, such information can be pertinent to conservation strategies and aid in the protection of other migratory marine

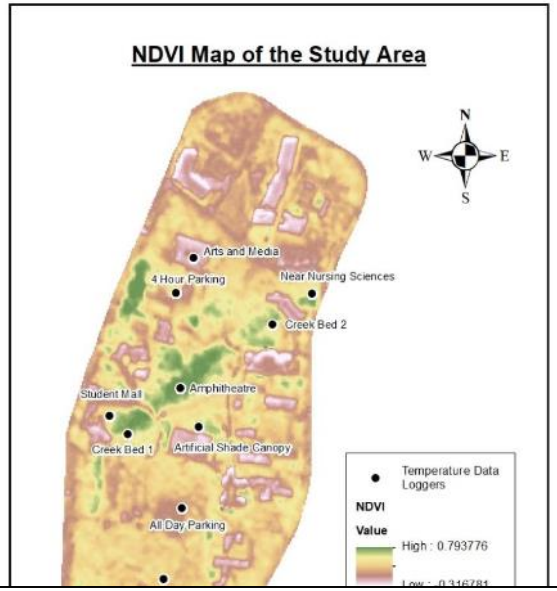
Fig. 3. Map detailing green turtle migration routes over open water, shoal, seagrass and reef habitats originating from Raine Island, Australia in 2018.

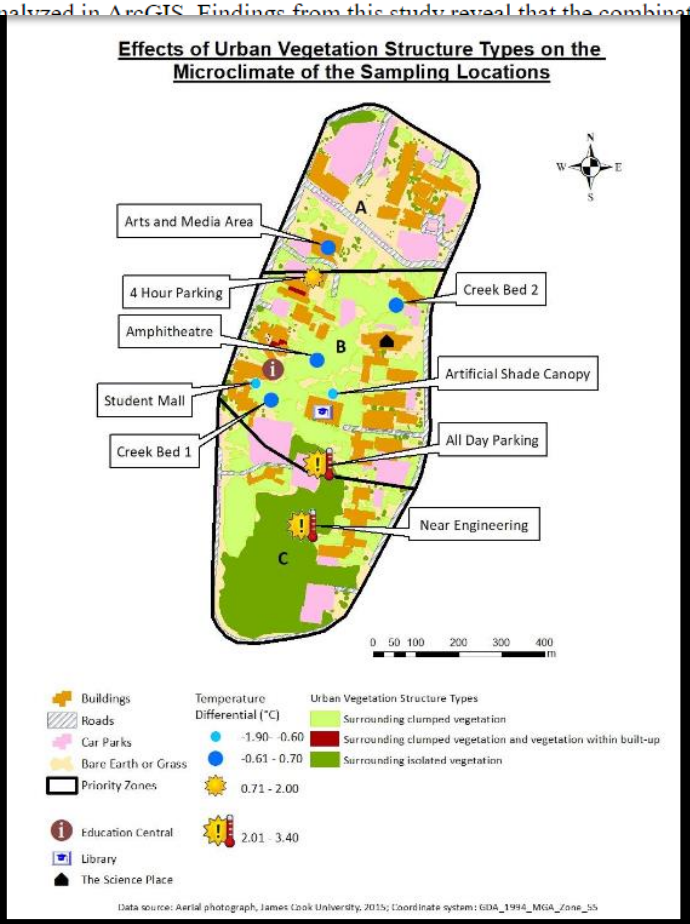
Mapping Thermal Comfort as an Ecosystem Service in a University Setting

By Malaika Mathew Chawla

Abstract

Increasingly, urban planners are recognizing the importance of integrating ecosystem services into landscape design and decision making. However, there still remains gaps in understanding how to best use urban greenery for its services of providing shade and thermal comfort. This study assesses the effectiveness of specific urban vegetation structure types on the microclimate of a university campus in the humid tropics of Australia. For a fine-scale analysis of thermal comfort, temperature loggers are deployed at representative sites and evaluated for the daytime hours. For a coarse-scale analysis, Landsat-8 thermal imagery and PlanetScope multispectral imagery is processed and analyzed in ArcGIS. Findings from this study reveal that the combination of surrounding clumped





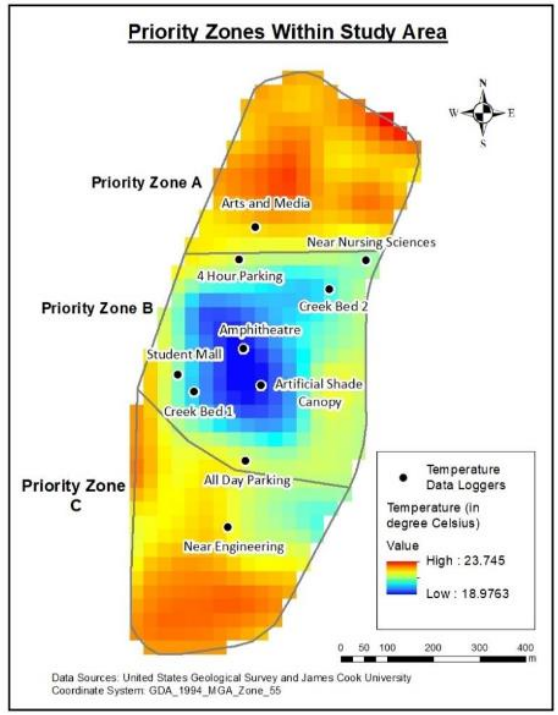
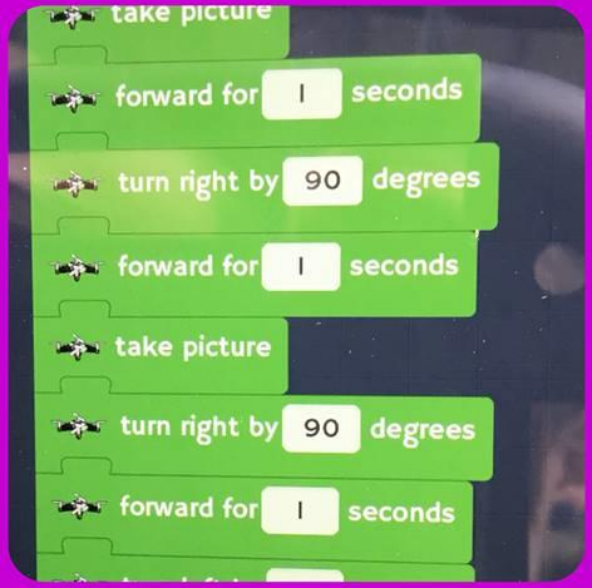


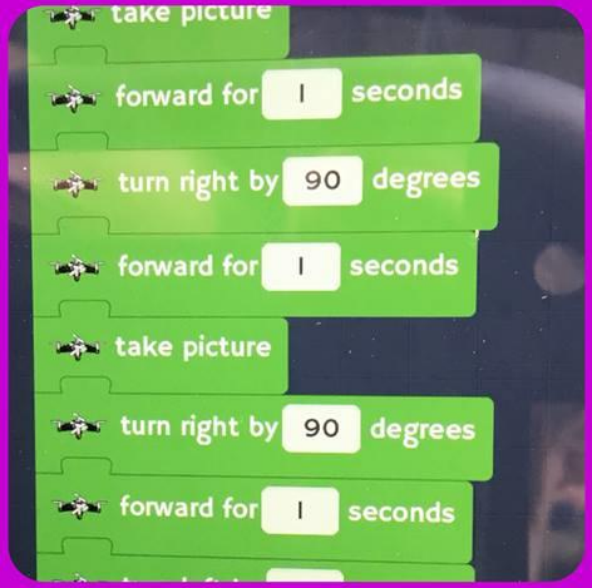
Figure 6: Land surface temperatures of the study area retrieved from Landsat-8 thermal infrared sensor data

ons in NDVI

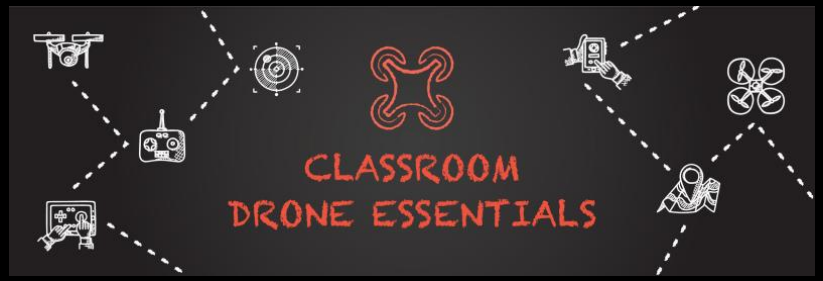
STEM by Stealth...


NEW YORK


take picture
forward for 1 seconds
turn right by 90 degrees
forward for 1 seconds
take picture
turn right by 90 degrees
forward for 1 seconds


take picture
forward for 1 seconds
turn right by 90 degrees
forward for 1 seconds
take picture
turn right by 90 degrees
forward for 1 seconds


Parrot
LiPO RECHARGEABLE BATTERY
GBA679707



CLASSROOM DRONES TEACHER PD

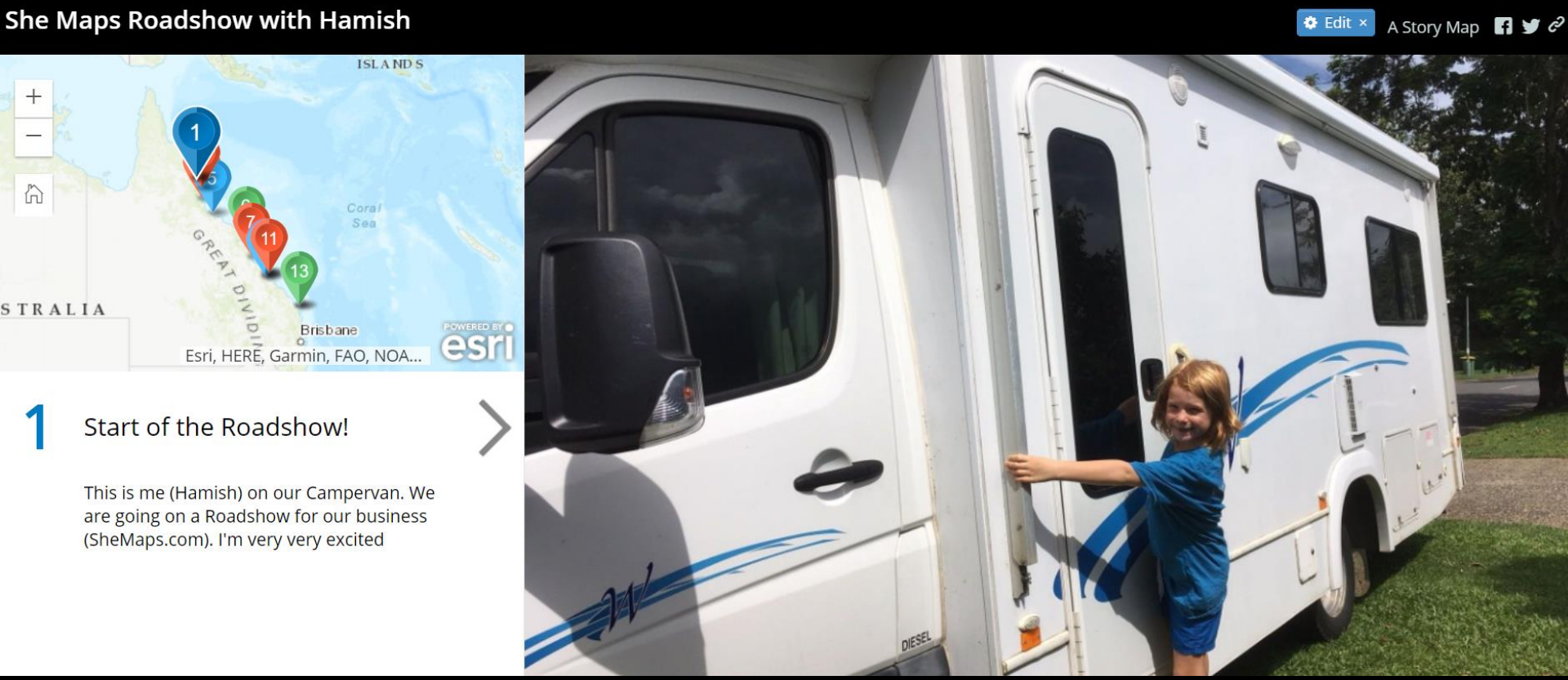
THE SURVEYORS' TRUST
Collective investment in knowledge

SHE MAPS

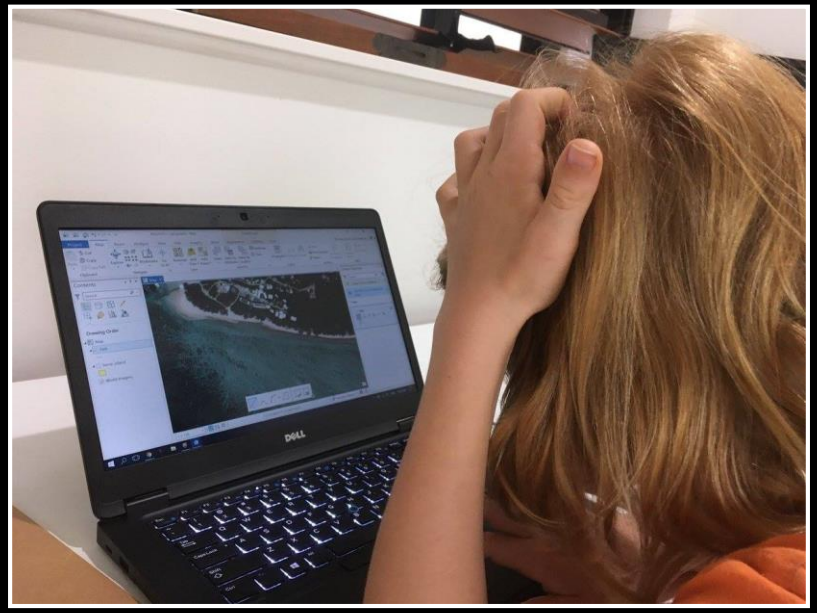
FREE FOR QLD TEACHERS


NASA

TELLING STORIES WITH MAPS



MAPPING BASICS



MAP MY SCHOOL TEACHER PD

FREE FOR QLD TEACHERS

Michelle Geary You have no idea how apprehensive I was of my ability to even do this myself after the first session but now I am really excited to see where we can apply it.

Like · Reply · 4d 1

Botta Tricia
18 April at 23:24

Thank you for the opportunity. Really enjoyed learning how to use this program. Here is my first attempt. Needs work but definitely not too bad for a first go. Quite amazing how much shade we lost because of Cyclone Debbie. Even with our shade structures we still have very little shade in comparison to the size of the school.

She Maps

Duke UNIVERSITY

UNIVERSITY of TASMANIA AUSTRALIA

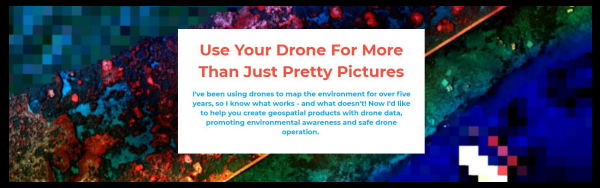
UNIVERSITY OF MARYLAND 18 56

We Robotics

Getting Started:	Welcome | Understanding the Jargon
Mission Planning:	Know your workflow | Where can I fly? | Which drone should I buy? | Mission planning apps | Effective flight planning
Field Survey	Do I need field survey? | Accuracy and Ground control | Calibration and Validation
Data Pre-Processing	What is pre-processing? | Pre-processing software | Creating your orthomosaic and 3D model
Information Extraction:	What is a GIS? | Understanding the GIS Interface | Data Display and Quality Check | Incorporating Additional Data Analysing Data and Creating Information | Communicating with Maps
Troubleshooting	FAQs | Ask the Expert calls

SheMaps @kejoyce2 / @SheMapsau
karen.joyce@jcu.edu.au

HOMEWORK



SHE Maps

Drone Mapping Course

education.shemaps.com/dronemapping

SHE Maps

THE SURVEYORS' TRUST
Collective investment in knowledge

Please share our FREE teacher PD courses!

education.shemaps.com/qld

CAIRNS

From Drones to Maps on the Great Barrier Reef

Monday 22 May 6pm

JAMES COOK UNIVERSITY AUSTRALIA

TESS

Twenty Years of Fashion Changes in Mapping the Great Barrier Reef

Wednesday 22 May 4pm