



Creekwatch

BI-ANNUAL REPORT

January – June 2021

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Overview

Creekwatch is a citizen science and community awareness program established by Townsville City Council in 2003. The program encourages community members to be actively involved in long-term monitoring activities and to become custodians of waterways in the Townsville City Council (TCC) area. Regular activities include macroinvertebrate sampling, fish surveys, and water quality monitoring across various waterways in Townsville.

OzFish Unlimited has been running the Creekwatch program for TCC since early 2021. During this time the OzFish project team have been implementing weekly monitoring of waterways around Townsville. A core group of volunteers have assisted with the weekly monitoring activities, which have focussed primarily on macroinvertebrate and fish sampling activities. A total of 21 sites have been monitored for macroinvertebrates and 12 sites monitored for fish.

This report details the results of the program for the period January – June 2021. We also present here the relevant targets for the period July – December 2021.

General Background on Townsville waterways

The Townsville region is located in the coastal dry tropics of northern QLD. TCC encompasses three river basins (Ross, Black and upper Haughton Rivers), with four smaller sub-catchments also located in the region (Black, Bohle, Ross and Haughton Rivers). A very small portion of the upper Burdekin catchment (~20 km²) is also within TCC area near Paluma and Paluma Dam.

The region contains a mixture of waterways in the southern wet tropics (Bluewater Creek and waterways further north-west, and Mount Elliott) and dry tropics (Ross, Bohle and upper Haughton catchments). A large portion of the waterways of TCC are < 100 m a.s.l. (which is where the majority of Creekwatch events occur), however, some of the headwater streams are at elevations >1 000 m a.s.l. (e.g. Mount Elliott and Paluma range). The western portion (~150 km²) of the [Bowling Green Bay Wetlands](#)—an internationally recognised wetland habitat—is located at the eastern limit of TCC.

Creekwatch activities are concentrated on waterways that are largely ephemeral (e.g. Sachs Creek; Louisa Creek; Stuart Creek; Mundy Creek), but the program also encompasses palustrine wetlands (Town Common), constructed lacustrine habitat (Idalia Lakes; upper Ross River) and wet tropics streams that may retain year-round baseline flow (Rollingstone Creek; Crystal Creek; Alligator Creek). The ecology of the waterways is influenced primarily by the biophysical characteristics mentioned above, and the region thus contains a diverse array of aquatic flora and fauna.



Figure 1 - Townsville City Council area (outlined in blue), with major sub-catchments (Ross, Bohle, Black and Haughton) outlined in pink. Map is from the QLD Gov Department of Environment and Science [Wetland Mapping System](#).

Current Monitoring Sites

Creekwatch activities are presently undertaken at 14 streams/creeks/ivers across the Townsville region (Table 1). These systems are monitored weekly (Wednesday mornings) on a rotational basis. Some systems, such as Crystal Creek or the Middle Ross River, have been monitored as part of the school-based Creekwatch activities, outside of the regular Wednesday morning sessions. Each site is currently being monitored quarterly, with the exception of Gustav Creek (Magnetic Island) which will be monitored bi-annually. Monitoring activities have included macro-invertebrate sampling, fish surveys and water quality monitoring. The data collected from each site is recorded and stored on the OzFish database.

Target – we will aim to monitor the locations and sites as presented in Table 1 for the period July – December 2021.

Table 1 - Creekwatch sites and associated monitoring frequency

Location	Number of Sites	Monitored
Middle Ross River	3	Quarterly
Upper Ross River	3	Quarterly
Louisa Creek	2	Quarterly
Idalia Lakes	3	Quarterly
Town Common	2	Quarterly
Stuart Creek	1	Quarterly
Alligator Creek	2	Quarterly
Sachs Creek	3	Quarterly
Bluewater Creek	2	Quarterly
Bohle River	2	Quarterly
Rollingstone Creek	2	Quarterly
Crystal Creek	2	Quarterly
Mundy Creek	2	Quarterly
Magnetic Island	2	Bi-Annually

Biological Monitoring Targets and Status

Macroinvertebrate sampling and fish surveys have been conducted at locations across TCC between January and June 2021, with the exception of Alligator Creek and Magnetic Island, which were not monitored due to logistical reasons. A total of 21 individual sites have been monitored for macroinvertebrates and 12 sites monitored for fish. The sites will continue to be monitored from July to December 2021, according to the schedule in Table 1.

Macroinvertebrates

Macroinvertebrates are widely used to indicate the biological health of water bodies. Pollutants and other anthropogenic pressures influence the diversity of macroinvertebrates found in a system, as different species have different levels of pollution sensitivity—known as a SIGNAL 2 score. Macroinvertebrate sampling is a regular Creekwatch activity and was conducted at every site during the January to June 2021 period.

Macroinvertebrates were collected, sorted, and identified on-site. Volunteers used handheld kick nets to collect samples from the edge of waterways. These samples were then transferred into

plastic sorting trays where volunteers spent approximately 20 minutes sorting samples. During sorting, macroinvertebrates were located and removed from the sorting tray using pipettes and forceps, before being placed into ice cube trays for closer examination. Volunteers then identified the macroinvertebrates using ID charts, with further confirmation provided by OzFish staff.



Figure 2 - Volunteers sorting Macroinvertebrates at Black Weir, Ross River

A Macroinvertebrate Monitoring Datasheet was used to record which animals were present at each site. From here, a diversity score (Macro DIV score) was calculated according to the equation:

$$\text{Macro DIV} = \frac{\text{Sum of Sensitivity Scores}}{\text{Taxa Richness}}$$

Median diversity (DIV Score) across all sites was 4.1 (range = 2.16 – 5.80). Highest diversity (Macro DIV Score = 5.8) was observed in the Middle Ross River at the Riverside Gardens Community Centre site (Table 2). The site with the lowest diversity (Macro DIV Score = 2.16) was on Stuart Creek at the Secura Lifestyle Magnetic Gateway caravan park.

Table 2 – Summary of macroinvertebrate sampling

Date	Location	Site	Macro DIV Score	Additional Notes
23/03/2021	Ross River	Black Weir	4.1	
31/03/2021	Louisa Creek	1	3.4	Saw many tilapia, some barra and turtles
7/04/2021	Idalia Lakes	Bottom lake	2.6	
7/04/2021	Idalia Lakes	Middle lake	4.4	
7/04/2021	Idalia Lakes	Top lake	2.5	
21/04/2021	Middle Ross	Gleesons	3.3	Very choked with salvinia
21/04/2021	Middle Ross	Comm Hall	5.8	Observed tilapia and small/juvenile fish
28/04/2021	Upper Ross	Apex Park	4	
28/04/2021	Upper Ross	Boat Ramp	4.18	
5/05/2021	Town Common	Site 1	4.5	Very large weed chokes. Poor connectivity
5/05/2021	Town Common	Bird Hide	3.4	Very large weed chokes. Poor connectivity
12/05/2021	Stuart Creek	Caravan Park	2.16	Limited access to sampling sites
18/05/2021	Crystal Creek	School	3.5	
19/05/2021	Sachs Creek	Bridge	4	Caught 12 Red Claw Crayfish
19/05/2021	Sachs Creek	Causeway	4.4	Caught 6 Red Claw Crayfish
19/05/2021	Sachs Creek	Park	4.1	Water was clear and running but starting to slow
2/06/2021	Bluewater Creek	Wil Win Park	4.1	
2/06/2021	Bluewater Creek	Caravan Park	4.5	Sighted YoY mangrove jack
5/06/2021	Mundy Creek	Landcare Site	3.3	Sampled late afternoon, caught high numbers of invasive fish
16/06/2021	Rollingstone Creek	Bridge	4.4	
16/06/2021	Rollingstone Creek	Park	4.8	Sighted YoY mangrove jack

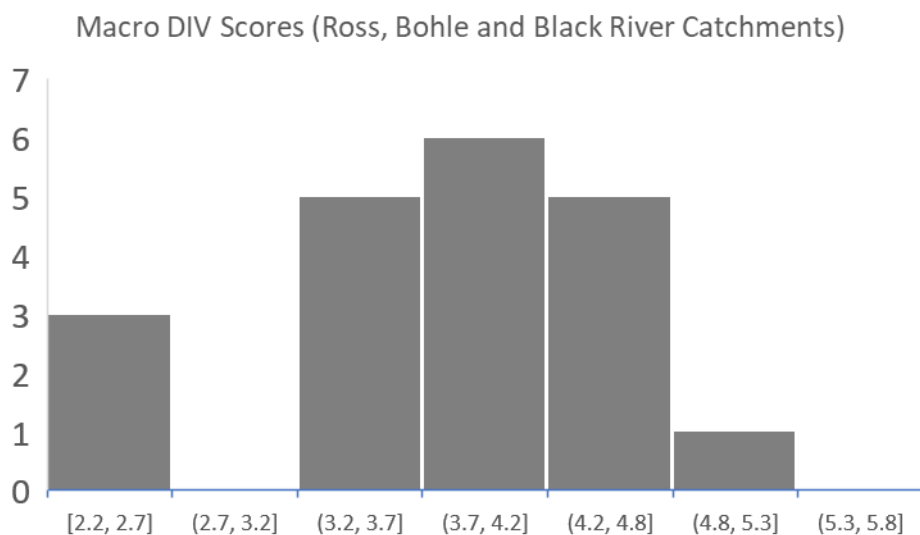


Figure 3 – Histogram of Macro DIV Scores for all locations sampled (January to June 2021)

Fish

Fish surveys have been completed at 12 sites for the Creekwatch program over the past six months, using a combination of box traps, dip nets and underwater video. The methods for each technique at each location are: *box traps* – bait and set for 30-45 min; *dip nets* – dip net scoops around creek edges and underwater vegetation for 10 min; *underwater video* – deploy two or more unbaited underwater video units for 10 min.

A total of 275 fish from 15 species were encountered across the 12 locations sampled (median site richness = 4.5; see Table 3). Underwater video was generally the most successful method for detecting species presence at locations, followed by fish traps and dip nets, respectively. A combination of different sampling methods frequently yielded the best results (i.e. species were sometimes recorded on underwater video but were not sampled in dip nets or box traps, and *vice versa*). No method used was universally more successful than others as each has its own inherent limitations: *box traps* – relies on the tendency of individual fish to enter the trap and remain there; *dip nets* – can only be conducted at the edge of creeks and streams, initial dip net scoops may scare individuals away from the vicinity of the sample location; *underwater video* – relies on sufficient clarity of water to identify species on the video footage. There are other methods that may be used to survey freshwater and estuarine fish and these are discussed further below.



Figure 4 - Creewatch volunteers and OzFish Project Officer Ellie Sales at Sachs Creek retrieving box traps

There is increasing interest in the health of the fish fauna in waterways of Townsville. To provide some context for the results obtained in fish survey results presented in this report for Creekwatch, we provide here a brief summary from contemporary fish surveys in the region (i.e., completed within the past two years).

A Fish Index was recently included in the [Dry Tropics Partnership for Healthy Waters \(DTPHW\) Report Card](#). A total of 33 species from 22 locations were sampled in shallow freshwater systems using backpack electrofishing to generate a Fish Index for the DTPHW Report Card. The results from these surveys indicate that fish species richness can be characterised as moderate and good for the Ross/Bohle and Black River basins, respectively.

Recent [fish surveys undertaken by OzFish Unlimited](#) across TCC for the Communities Environment Program encountered >1 000 fish from 60 species across 12 locations in shallow freshwater and estuarine systems, using a combination of cast-net and dip net. Median site species richness was 8 and 9 species per location for the OzFish and DTPHW fish surveys, respectively.

The median species richness for each site from the Creekwatch fish survey results ($N = 4.5$) is substantially lower than reported from contemporary surveys ($N = 8 - 9$). The methodology used is different for each set of fish surveys (DTPHW, OzFish, Creekwatch), and thus it is difficult to directly compare the results. Nevertheless, the differences in observed species richness for the three aforementioned surveys can be directly attributed to equipment used and survey effort.

Target

The present plan for the remainder of 2021 is to continue sampling fish at locations as per the schedule presented in Table 1, and using the same methodology as was used in the first half of 2021. However, it would be worth discussing the merits of changes to sampling effort and equipment used. Based on the results of contemporary fish surveys, it may reasonably be surmised that an increase in fish sampling effort at Creekwatch sampling locations would result in increased detection of species. This, in turn, would improve our capacity to conduct comparative data analysis (e.g. presence/absence, rarefaction) for waterways and catchments and would present the opportunity to incorporate the results in regional waterway health report cards. A range of further methods are available to improve fish sampling effort for Creekwatch (eDNA, fyke net, seine net, baited underwater video, backpack electrofishing), and it would be worth discussing the potential to incorporate one or more of these into the Creekwatch fish monitoring activities in the future.

Table 3 – Summary of fish sampling results for Creekwatch. *N* Obs = the total number of fish observed across all locations sampled; TRAP = box trap; UWV = underwater video; VIS OBS = visual observation

Fish Species	Common Name	<i>N</i> Obs (TOTAL)	TRAP	DIP NET	UWV	VIS OBS
<i>Ambassis agrammus</i>	Sailfin glassfish	8	4	-	4	-
<i>Amniataba percooides</i>	Banded grunter	2	-	-	2	-
<i>Craterocephalus stercusmuscarum</i>	Fly-specked hardyhead	26	2	17	7	-
<i>Gambusia holbrooki</i>	Mosquito fish	117	10*	6	1	-
<i>Gerres filamentosus</i>	Thread-finned silverbidy	1	-	-	1	-
<i>Glossamia aprion</i>	Mouth almighty	3	3	-	-	-
<i>Hypseleotris compressa</i>	Empire gudgeon	48	30	15	3	-
<i>Kuhlia rupestris</i>	Jungle perch	1	-	-	1	-
<i>Lates calcarifer</i>	Barramundi	1	-	-	-	1
<i>Leiopotherapon unicolor</i>	Spangled perch	1	-	-	1	-
<i>Lutjanus argentimaculatus</i>	Mangrove Jack	4	-	-	2	2
<i>Melanotaenia splendida</i>	Eastern rainbowfish	39	9	22	8	-
<i>Neosilurus hyrtlui</i>	Hyrtl's tandan	1	-	-	1	-
<i>Oreochromis mossambicus</i>	Mozambique tilapia	21	6*	-	4	1
<i>Xiphophorus maculatus</i>	Platy	2	2	-	-	-
	ABUNDANCE	275	50	60	35	4
	RICHNESS	15	8	4	12	3

* At one location (upper Mundy Creek), 100 mosquito fish and 15 tilapia were sampled in box traps. These have been removed from the comparative analysis to reduce overall bias in the results

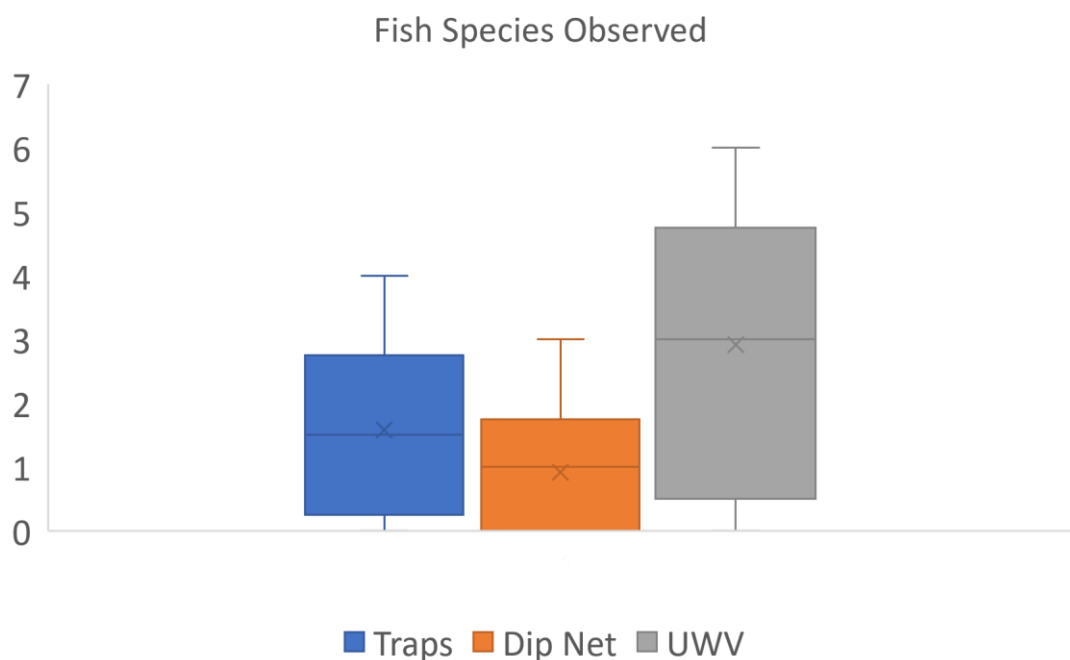


Figure 5 – Boxplot of fish species observed using different sampling methods (January to June 2021). UWV = underwater video

Water Quality Monitoring Targets and Status

Water quality monitoring has been limited over this monitoring period due to equipment and logistical issues, which have been discussed with the Creek to Coral project team at TCC. The water quality multi-parameter probe required servicing and recalibration and has only recently been returned. Water quality monitoring will be more extensively incorporated into activities in the second half of 2021, and will be conducted at locations according to the sampling schedule presented in Table 1.

Lab-based Sample Collection

No lab water quality samples were collected for the Creekwatch program. As per the previous section on basic water quality testing, this has also been discussed with the Creek to Coral team at TCC. Sample collection and lab-based testing for nutrients was intended to form a core part of Creekwatch activities for 2021, however further discussions are required to refine the aims and to logistically coordinate data collection for this component of the project. We expect that these discussions will take place in August 2021 and this, in turn, will form the basis for ongoing sample collection and analysis in the second half of 2021.

School Involvement

We currently have five schools directly involved in the program (listed below). Most of these schools are visited on a monthly or quarterly basis (depending on the school's preference). Each of these five schools are wanting to expand their visits and the scope of the program over the next six months and we look forward to working with them to achieve this. Feedback from the schools on Creekwatch monitoring activities in the first half of 2021 has been overwhelmingly positive and we are aiming to incorporate more schools ($N = 5$) into the program in the second half of 2021 and beyond. While we do aim to take Creekwatch to more schools, any expansion in the number of schools visited is contingent upon any changes to number of visits and scope of monitoring conducted with existing schools that are already engaged.

St Benedict's Catholic School – *25th March, 2nd September*

Ignatius Park College – *6th May, 22nd June*

Mutarnee State School – *18th May, 24th August*

Ryan Catholic College - *22nd June, 13th July, 8th August, 7th September*

Riverside Adventist College – *27th July, 31st August*



Figure 6 - A student from Ignatius Park College sampling Macroinvertebrates in Louisa Creek

Community Involvement

The response from the community regarding OzFish running the Creekwatch program has been positive. Volunteers and schools who had participated in the past were eager to be involved again, with new volunteers showing interest as well. We currently have a group of regular volunteers who attend Creekwatch every Wednesday morning (an average of 5 volunteers each week). Having volunteers who consistently participate is very encouraging and is a testament to the past and present success of the program. We will aim to increase the number of volunteers regularly engaged from an average of 5 per week to an average of 7 per week in the second half of 2021.

OzFish have established a Facebook page for Creekwatch, which is predominantly used to share information on upcoming events and activities. This platform is also useful to showcase the program, share information and connect with potential volunteers. In addition, a [project landing page](#) on the OzFish website has been developed, with an easy-to-use online expressions of interest form. These platforms have been used successfully to promote the program to the general public, schools, and community groups, and encourage volunteers to participate in our regular monitoring days and community events.

Outside of the regular monitoring days and schools visits, Creekwatch has been involved in/made commitments to attend events including:

- World Environment Day event at Mundy Creek on 5th June
- Our Townsville event on 6th June
- DTPHW meetings and report card launch (various dates)
- National Tree Planting Day at The Burrow Pits on 8th August
- Under 8's day at St Benedict's School on 2nd September



Figure 7 - Kids sorting macroinvertebrates at Mundy Creek during the World Environment Day Event (left), and OzFish project officer Ellie Sales at the Our Townsville Event in June 2021

We will continue to seek opportunities to attend events around Townsville to showcase the work that we're doing with Creekwatch, and to encourage new volunteers to become involved on an as-needs basis in the second half of 2021.

July 2021 – December 2021 Direction / Potential Opportunities

There are a range of opportunities for adaptive management and improvement of the Creekwatch program. The primary focus of Creekwatch in the first half of 2021 has been on basic fish and macroinvertebrate sampling, and there are opportunities to develop the methodology for these, and to further incorporate additional elements/activities into the Creekwatch program. A short summary of potential further activities for Creekwatch is presented below. All of these activities would require an increase in activity at the sampling locations and would require further discussion between OzFish and TCC's Creek to Coral team prior to implementation.

- Implement litter sweeps at each site (general urban waste/litter is common at many Creekwatch sampling sites, and litter collection could become a core Creekwatch activity)
- Habitat assessments at sampling sites (the condition of aquatic and riparian habitat at the sampling locations is a major influence on the ecology of the waterways, yet there is currently no quantitative information collected on waterway condition. Any assessment of habitat conditions would require an evaluation of data collection methods and a consensus on data collection approach by the project team)
- Conduct habitat improvement activities (based on the results of habitat assessments at project sites, habitat improvement activities can be identified, prioritised, and implemented; there is the potential to partner with TCC Reef Assist Team, however this would require further discussion)
- Improve fish sampling methods (fish sampling methods are likely not capturing the diversity of species at each location sampled due to the methods and level of effort currently being used); this could be improved (and the data from this program could then be incorporated into regional waterway health report cards) through implementing some of the following:
 - o Further training of volunteers with dip-netting techniques
 - o Implement regular UWV monitoring (where suitable)
 - o Improve box trap design and use (e.g. explore alternative trap designs)
 - o Further train volunteers and staff in fish ID
 - o Incorporate eDNA, seine net, backpack electrofishing or other monitoring techniques into fish sampling activities
- Organise school holiday events for September school holidays and April school holidays
- Alteration to sampling effort (the Creekwatch program currently encompasses a broad and diverse range of sites across TCC, however, there are clear limitations with the data collection methods and, hence, the potential for broad use of this data in waterway health assessments and monitoring programs. There is the potential to improve our understanding of spatial and temporal variability in aquatic flora and fauna (and water quality) at sample locations through alterations to sampling effort; i.e., improved temporal resolution of data

collection through a reduction in the number of sites and increase in effort at selected locations)

- Greater school involvement on Tuesdays to allow more frequent rotation of sites
- Increase in water quality monitoring effort at sampling sites (improved resolution of water quality monitoring at sampling locations to gain a more holistic understanding of temporal variability in physico-chemical water quality parameters)
- Further promotion of the program to encourage more volunteers to join (to encourage more people to become involved in Creekwatch and to become stewards of their local waterways, it is imperative that the OzFish team are able to communicate the program and its objectives more broadly within the community through traditional media sources)
- Goal to have regular volunteers (as per the previous point, an increase in the core number of volunteers and the promotion of the program to residents who may not have been involved before will require further communication to the community through traditional and social media)
- Develop new Creekwatch Schools Guide (potential improvements to be made to the Creekwatch Schools Guide; assess for areas of improvement/development and potential redundancy)
- Develop new Creekwatch Guide for macro, fish sampling etc. (as per the previous point))
- Develop the Adopt a Creek Program (further assessment for the concept of 'Adopt A Creek', as a means to improve stewardship of local waterways)

MAPS OF CREEKWATCH SAMPLING LOCATIONS



Figure 8 - Creekwatch sample locations in the southern wet tropics (Crystal Creek, Rollingstone Creek and Bluewater Creek)

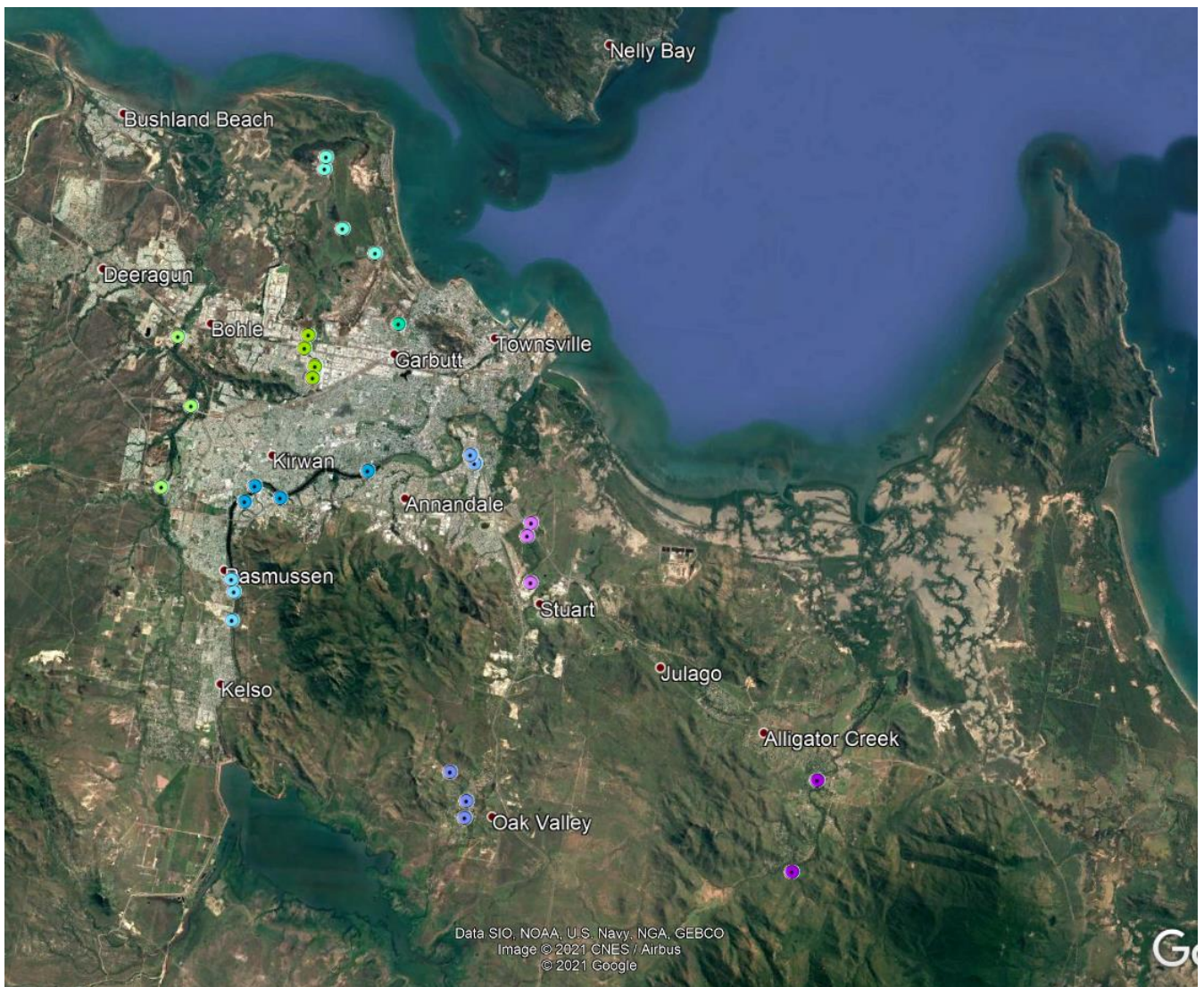


Figure 9 - Creekwatch sample locations in the coastal dry tropics for the Bohle River, upper and lower Ross River, Town Common, Mundy Creek, Idalia Lakes, Sachs Creek, Stuart Creek and Alligator Creek