Team Turtle CQ: Community Marine Turtle Monitoring Program

2023/2024 Summary Report

September 2024

The following report was produced by Karl French in conjunction with FBA.

FBA works for our central Queensland community to grow a sustainable, productive and profitable Fitzroy region.

FBA acknowledges the First Nations of the lands and waters within the Fitzroy region where we learn and live, and pay our respects to them, their culture and Elders past and present.

The success of Team Turtle CQ (TTCQ) is due to the many hours of volunteer effort contributed by community members of the Capricorn and Curtis Coast areas – this report is dedicated to you!

Marine turtle specialist Karl French supported and trained the volunteers, reviewing all data entered into the BioCollect App utilised for the project. He has supplied the summarised data and analysis to inform this report.

TTCQ is coordinated by FBA. Staff have a key role in training and supporting volunteers.

Version Control

Version	Date	Author	Changes
V1	August 2024	Karl French	
V2	September 2024	Bethlea Bell	Edited and added summary parts of the report
V3	October 2024	Karl French	New information added from Woppa volunteers

Disclosure Statement

Contents

Introduction

TTCQ is a citizen science marine monitoring program developed in response to a gap analysis carried out by FBA into marine turtle distribution and abundance within the Fitzroy Region of Central Queensland in 2014. This analysis showed an opportunity to help develop a more complete picture of marine turtle populations and, importantly, build community capacity to monitor these vulnerable and endangered species, and provide guidance to land managers on threats and impacts affecting turtle nesting and habitat throughout the project's footprint.

Six of the world's seven marine turtle species are found within the region and three are regularly recorded nesting on the beaches by team members. Flatback turtles (*Natator depressus*) are the most common nesting species on mainland and inshore islands, with green (*Chelonia mydas*) and loggerhead turtles (*Caretta caretta*) occasionally being recorded.

The program was developed using a basic premise that members of the public who regularly walk beaches could report turtle nesting attempts and provide a location and photographs for a trained marine turtle specialist to identify species and nesting outcome. As the program has grown over the seasons volunteers have received more in-depth training and experienced volunteers now perform more specialised, authorised activities including installation of predator exclusion, nest relocation and gauging emergence success.

TTCQ continues to use the Atlas of Living Australia (ALA) mobile phone app BioCollect to record data electronically, and the verified data is subsequently provided to the Queensland Department of Environment, Science and Innovation's Queensland Turtle Conservation Project (QTCP) database. Data is either verified by experienced TTCQ volunteers on ground or through analysis of photographs provided.

This season was supported in-house by FBA and did not attract any external funding. The program continued with strong membership, community interest and action displayed in both principal locations - Capricorn Coast and Curtis Coast.

This report summarises the results of the 2023-24 TTCQ program.

Volunteer Training and Community Engagement

Team Turtle CQ

Pre-season TTCQ nesting training workshops were delivered in October 2023 on the Capricorn and Curtis Coasts. Training combines marine turtle biology and ecology education with on-beach practical monitoring skills. Volunteers learned to identify tracks of locally nesting species and differentiate false crawls and no lays from successful nesting. Training in data collection using the BioCollect survey was also covered, and updates to the app were highlighted. Volunteers were allocated to beaches to ensure coverage and new volunteers introduced to experienced members, to encourage mentoring by more experienced members of the TTCQ team.

In December 2023, an online Emergence training session was conducted for all volunteers. The training focused on techniques for monitoring hatchlings and emphasised the importance of aligning emergence data with initial nest surveys. This reinforced the need to work cooperatively together to ensure nests emergences were correctly recorded. As in previous seasons the training also provided information on potential nest impacts such as predation, tidal inundation and light disorientation.

Post-season wrap-up events were held in April 2024 to express thanks to the volunteers for their monitoring efforts, present the preliminary collated season data and distribute TTCQ shirts to those who'd volunteered for at least two seasons. An important feature of these events is allowing volunteers to share their valuable local knowledge, observations and insights from their monitoring experiences. It also allows crucial feedback which will help inform future adaptations to the program.

In May 2024, TTCQ were entered in the Queensland Landcare Awards and won the Highly Commended prize for the Greyhound Coastcare Award. This is a testament to the dedication of TTCQ volunteers over many years to improve outcomes for local nesting marine turtles.

***Figure 1**: Capricorn Coast nesting training October 2023*

***Figure 2**: Marine scientist Karl French explains species identification via tracks during nesting training, October 2023*

Queensland Turtle Conservation Program

The QTCP facilitates a marine turtle research and monitoring program at Mon Repos Conservation Park each nesting season. This program upskills volunteers in marine turtle research, education and monitoring activities, and offers the opportunity to work towards Department of Environment, Science and Innovation (DESI) authorisation to conduct more hands-on research and monitoring activities such as nest relocation and emergence success counts. FBA encourages and supports TTCQ volunteer applications for these placements, with seven members included at Mon Repos and associated index beaches on islands in the 2023–24 season.

The DESI QTCP have been conducting green turtle health studies in Port Curtis for several years. TTCQ volunteers have been invited to assist in the catching of green turtles as part of this research. This provides an opportunity to practice tagging and measuring, and to observe and assist with toxicology sampling and laparoscopies. These volunteers gained valuable local green turtle foraging knowledge and turtle handling experience. Involving volunteers in this research builds regional capability. At least seven TTCQ volunteers participated in the activities with the DESI research team.

Facing Island Census

Field trips provide TTCQ volunteers with invaluable hands-on experience in monitoring and data collection. This year two Facing Island field trips were led by FBA's contracted marine turtle specialist Karl French, supported by QTCP-experienced volunteers.

Settlement Bay Census – Nesting and Emergence.

TTCQ received funding from Gladstone Ports Corporation to conduct the first full census of turtle nesting at Settlement Bay, Facing Island. The nesting census was timed to coincide with the peak nesting period for the eastern Australian flatback turtle population. The census involved two weeks of nest success monitoring; recording of all nesting attempts, tagging, and measuring of observed adult turtles, clutch counts, egg measurements, and nest relocations as required. Clutches were mapped for subsequent emergence monitoring.

Emergence monitoring was timed to align with the projected emergence of the nests marked during the initial two-week nesting census based on a 50-day incubation period. Nests were excavated and emergence success calculated by counting hatched and unhatched eggs.

Settlement Bay - Nesting Census - 24 November–9 December 2023.

- Engaged six TTCQ Volunteers and one local TTCQ volunteer.

Settlement Bay - Emergence monitoring - Dates 13–27 January 2024

- Engaged four TTCQ volunteers and one local TTCQ volunteer.

The Settlement Bay census results are detailed in a separate report (French *et al.* 2024).

Community Interaction

FBA's TTCQ program aims to increase general community awareness and stewardship in relation to marine turtle conservation. TTCQ supported Team Hatchlings with their community education and spread awareness through conservations on beaches and social media.

Table 1 - Volunteer participation in TTCQ 2023-24 events

Location	Month	Total
Curtis Coast Nesting Training	October 2023	11
Capricorn Coast Nesting Training	October 2023	26
Facing Island Settlement Bay Census	November – December 2023	6
Facing Island Emergence Monitoring	January 2024	8
QTCP Mon Repo Placement	Seasonal	5
QTCP Island Placement (Wild Duck, Peak, Curtis, Heron, NorthWest, Wreck)	Seasonal	2
Online Emergence Training & General Catch Up	December 2023	13
Curtis Coast Feedback/Wrap Up	April 2024	11
Capricorn Coast Feedback/Wrap Up	April 2024	12
QTCP Port Curtis Threatened Species Operations (Gladstone Harbour rodeo and green turtle health study)	September 2023	7
TOTAL		**101**

Team Hatchlings

Team Hatchlings is the volunteer youth arm of TTCQ that works to share marine turtle conservation with the community. Team Hatchling engage others through interactive activities at events and by producing educational resources to promote positive behaviour change.

For the 2023 season, Team Hatchlings were funded through the Australian Government's Reef Trust and the Great Barrier Reef Foundation. A part-time Coordinator worked with the Hatchlings and TTCQ volunteers to facilitate activities and events.

The main focus was encouraging the community to minimise light shining on turtle nesting beaches, with events including Turtle Hour (lights off for turtles for an hour in October), an informative market stall and a letterbox drop of brochures suggesting easy ways to prevent light affecting turtles. The group prepared a float for Yeppoon's Pinefest Parade, winning the Champion Circular Use Float award. New educational resources supplemented and highlighted their work, including virtual reality imagery, the Ripple Effect podcast and a Front Line Video funded by the Great Barrier Reef Foundation.

***Figure 3**: Team Hatchlings educating the community with their award-winning float at Yeppoon's Pinefest, October 2023*

Project Partners

FBA maintains valuable positive relationships with project partners. On an annual basis, FBA meets with a TTCQ Stakeholder Group prior to the nesting season to coordinate and collaborate. Our Local Government partners, Gladstone Regional Council (GRC) and Livingstone Shire Council (LSC), work with FBA on beach signage, responsible beach behaviour, reducing light impacts on nesting and hatching turtles, fox control and Turtle Hour.

FBA liaises with Queensland Parks and Wildlife Service & Partnerships (QPWS&P) on nest predation and pest

animal controls, sharing monitoring data and local observations. A partnership with Gladstone Ports Corporation supports Facing Island census activities.

To assist with managing our volunteer base Capricorn Coast Landcare Group was co-opted on a part-time basis to support FBA with event planning, data entry, rostering and record keeping.

The Lendlease Springboard program on the Capricorn Coast regularly brought national and international Lendlease delegates to our region to work on local community projects. During the 2023–24 season the work of TTCQ and Team Hatchlings was a focus for data-gathering and suggestions, with financial support provided for new shirts for volunteers.

FBA continues to raise awareness of marine turtle conservation in the local community through conversations, communications, media opportunities and social media campaigns.

Turtle Monitoring

With increasing levels of experience among members of TTCQ there has been a greater capacity to perform more hands-on interactions with marine turtles, nests and eggs. As such, monitoring activity can be divided into two categories: the core activity of citizen science beach monitoring for tracks and nests and QTCP authorised activities (nest protection, nest relocation, emergence success and tagging/measuring of turtles). QTCP activities are an integral part of the census works on Facing Island but are increasingly becoming incorporated into the local citizen science monitoring.

TTCQ citizen science surveys are conducted by trained and registered volunteers on rosters to ensure maximum beach coverage. Beaches are walked (or accessed by vehicle or marine vessel where necessary) to survey for turtle tracks and nest attempts. Data is provided in one of three ways:

- For low density nesting areas, data is collected and then submitted via the BioCollect App. Photos of tracks and nests are uploaded, facilitating confirmation of species, nest success and habitat on the beach. Nest attempts are then verified by a QTCP experienced team member.
- For higher density nesting, data is submitted via the QTCP bulk nesting data sheet (or a variation thereof). This means that it is not possible to verify nesting success until either the nest emerges, it is predated or is located and counted by an authorised team member.
- Lack of turtle activity is recorded through the 'No Evidence' survey on BioCollect. This process has made it easier to identify which beaches had no nesting and to determine if this was a result of a lack of survey effort by volunteers or a genuine lack of nesting activity. This has been positive and it shows significant survey effort is being made across most accessible beaches on Capricorn and Curtis Coasts.

Over 30 nest activity reports were submitted through FBA's website by members of the public from Stanage Bay in the north to Tannum Sands in the south, validated through photographic evidence and uploaded to BioCollect.

Beach Coverage and Volunteers

There was a total of 1405 “No evidence surveys” entered to BioCollect between 14 October 2023 and 3 March 2024, covering 26 beaches. This, along with reported nesting, is the primary way to determine the level of coverage of beaches across the region.

The number of beaches surveyed by volunteers was on par with previous seasons, with around 45 beaches surveyed across the region. Coverage of beaches on the Capricorn and Curtis Coasts was reasonably thorough, with improved coverage of both Farnborough North and Lilley’s Beach. Facing Island (North) was again well covered for the entire season.

Areas with improved coverage include the Byfield area with QPWS&P Rangers and locals providing reports for Nine Mile Beach at Byfield. Data for Woppa (Great Keppel Island) was significantly improved, with a developing network of locals helping support the TTCQ volunteers to locate tracks and nests across the island.

Some beaches outside of the main population centres of the Capricorn and Curtis Coast remain relatively poorly covered due to either access issues or lack of local participation in the program.

- Alligator Bay at Stanage was incompletely surveyed again this season. Stanage was not a target of the program this season as census work on Facing Island took priority. Some data was collected during an FBA trip and a local resident supplied some data via the FBA website.
- Langham's Beach - no data was received from the landholder for this season. Nesting outcomes were reported to have been quite poor, with nests lost to erosion and tides.
- Beaches of Byfield – whilst an improvement was seen in reporting for Nine Mile beach there is still further opportunities for improved coverage including possible engagement of the Stockyard Point community.
- Kinka Beach and the beaches south of Keppel Sands appeared to be the main areas of the Capricorn Coast beaches not reported upon. Access to the beaches south of Keppel Sands is noted as being difficult.
- Keppel Bay Islands (apart from Woppa) reporting was limited. Woppa is monitored by TTCQ volunteers based on the Island. Access to other islands is generally limited to private vessels. There is potential to engage with Traditional Owners and Education Queensland to provide further coverage of Konomie.
- Lilley's Beach - whilst coverage has improved this is still a difficult beach to monitor due to restricted access (tidal/4WD) and heavy recreational 4WD activity obliterating nesting evidence. Several nests were only located this season following fox predation rather than initial observations of tracks and nesting.
- Wild Cattle Island (South) - no data was provided by island residents this season; the southern beach was reported to have significant erosion on the bank, thus reducing the opportunity for successful nesting.

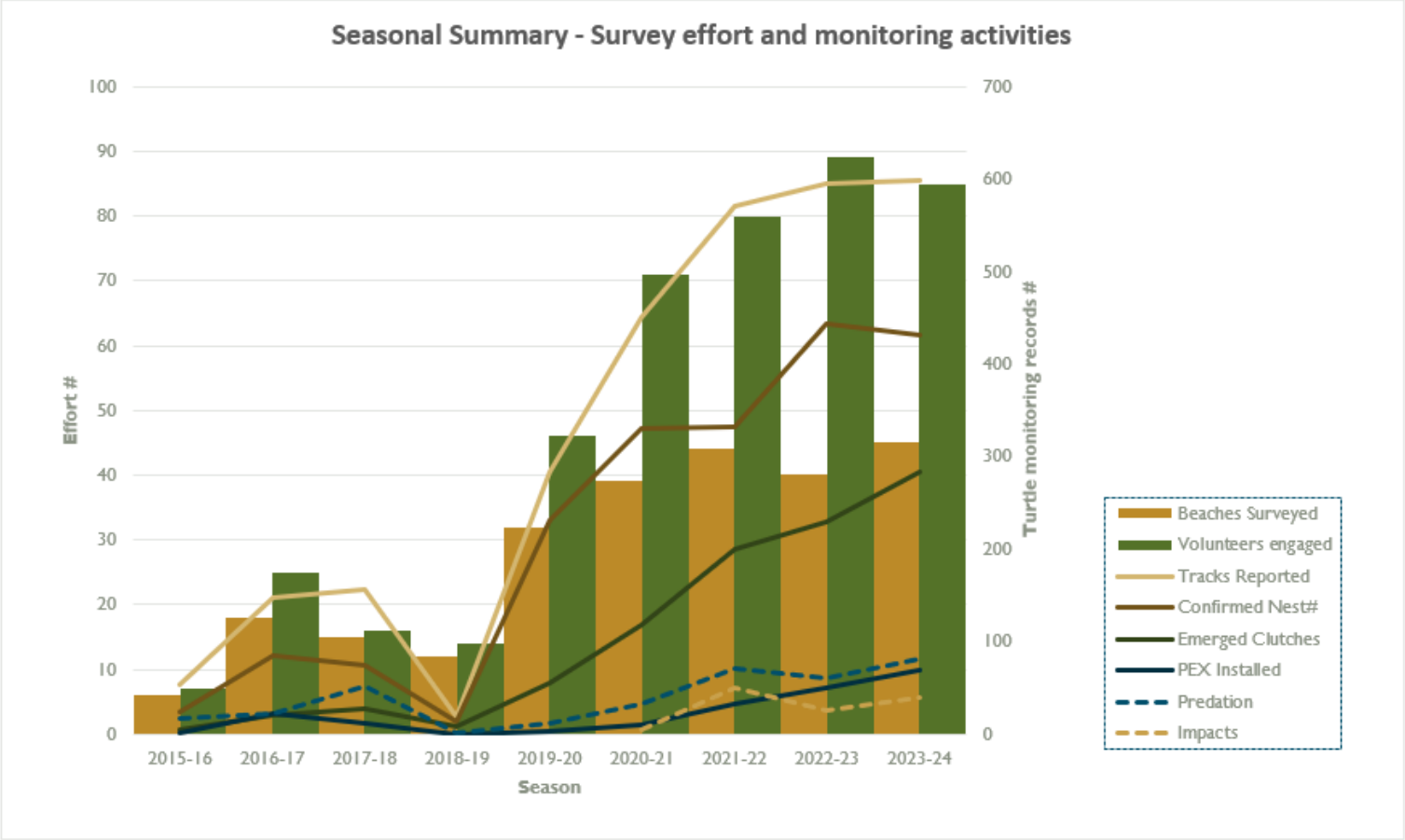
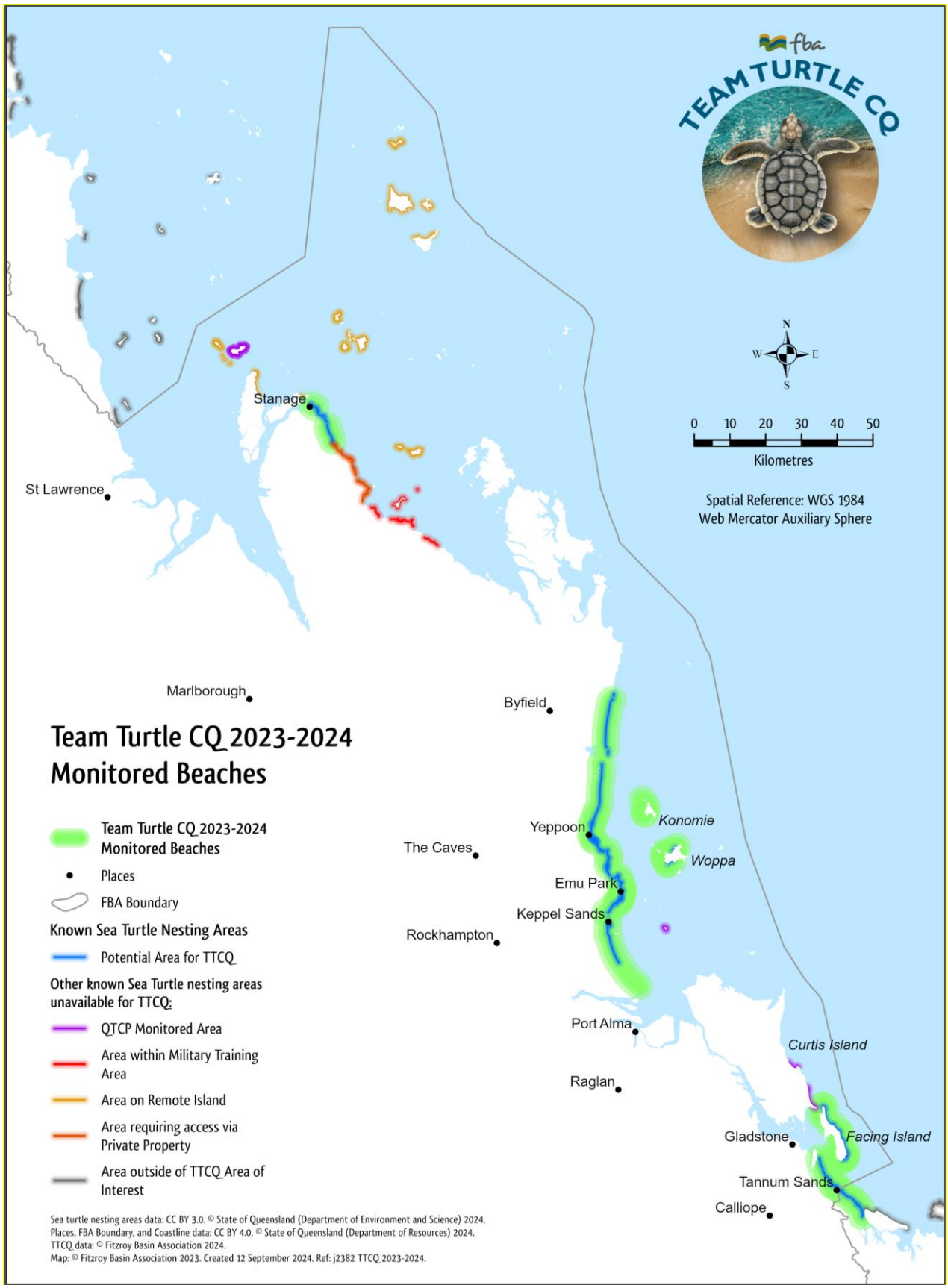


Figure 4: *Seasonal Summary Survey Effort & Monitoring activities since inception in 2015. (Note: 2018-19 season did not occur).*


TEAM TURTLE CQ
N
W
E
S
0 10 20 30 40 50
Kilometres
Spatial Reference: WGS 1984
Web Mercator Auxiliary Sphere
Stanage
St Lawrence
Marlborough
Byfield
Yeppoon
Konomie
Woppa
The Caves
Emu Park
Keppel Sands
Rockhampton
Port Alma
Curtis Island
Raglan
Gladstone
Facing Island
Tannum Sands
Calliope
Team Turtle CQ 2023-2024 Monitored Beaches
Team Turtle CQ 2023-2024 Monitored Beaches
Places
FBA Boundary
Known Sea Turtle Nesting Areas
Potential Area for TTCQ
Other known Sea Turtle nesting areas unavailable for TTCQ:
QTCP Monitored Area
Area within Military Training Area
Area on Remote Island
Area requiring access via Private Property
Area outside of TTCQ Area of Interest
Sea turtle nesting areas data: CC BY 3.0. © State of Queensland (Department of Environment and Science) 2024.
Places, FBA Boundary, and Coastline data: CC BY 4.0. © State of Queensland (Department of Resources) 2024.
TTCQ data: © Fitzroy Basin Association 2024.
Map: © Fitzroy Basin Association 2023. Created 12 September 2024. Ref: j2382 TTCQ 2023-2024.

General Observations

- Weather predictions for 2023-24 were for an El Nino weather event with drier than average conditions, few tropical cyclones and warmer than average temperatures.
- Early season saw significant rainfall across many parts of the region, resulting in cooler stabilised sand, allowing excavation and formation of egg chambers for nesting.
- There was an extended period of above average temperatures during early to mid-January during the peak incubation period.
- Regular rainfall during much of the nesting period resulted in ideal conditions for successful egg chamber excavation.
- Across much of the region strong winds resulted in significant wave run up on nests and foredune erosion especially when coupled with the January spring tides.
- Wave inundation and rainfall, coupled with elevated temperatures adversely affected incubation success.
- Rainfall and strong winds readily cover evidence of turtle activity. Windblown sand can remove tracks within a few hours of emergence, especially on long, exposed beaches such as Farnborough, Lilley's, Wild Cattle and Ocean Beach on Facing Island. This posed challenges for monitoring.
- Erosion banks on Wild Cattle South prevented turtles accessing dunes to lay.

Nesting Observations

Marine turtle nesting fluctuates seasonally. As such, surveys need to be conducted over many seasons to identify trends in nesting populations. TTCQ volunteers are unable to cover all beaches daily so there are areas where nest numbers recorded will be an underestimate. This is particularly true of Stanage Bay, Keppel Bay Islands, Facing Island, and localities such as Farnborough Beach North, Lilley's Beach, and Wild Cattle Island where access is difficult. The '*No evidence*' surveys from the Capricorn and Curtis Coasts allow us to quantify the survey effort from beaches in these locations and the reported figures are likely a true representation of nesting activity on those surveyed beaches.

Flatbacks were the predominant nesting species across the region. There were a small number of loggerhead nests reported for Wild Cattle North on the Curtis Coast (and unconfirmed nest attempts for Woppa) and green turtle nesting reported for Facing Island North and Nine Mile Beach, Byfield.
Observed flatback nesting commenced in mid-October across most locations surveyed and had ended by mid to late January. This is on a par with seasons prior to the 2022–23 season when nesting commenced two weeks later than normal.

- A total of 599 tracks were reported across the region - 589 flatbacks, 6 greens and 4 loggerheads for a total of 431 confirmed nests (around 72%). This data is displayed in greater detail in Tables 2 and 2a-e. Where data was unable to be verified through lack of photographic evidence or on ground verification those records have been omitted from this report.

- Of these 431 nests, 283 were recorded as emerged (some 66%) and emergence success counts were performed on 261 of these nests. On more isolated or exposed beaches emergences were not always recorded, and evidence is quickly lost. (See also Tables 2, 2a-e).

- Hatchling survivorship after emergence is extremely difficult to quantify with the protocols TTCQ employs and is not recorded.

Summary of Nest Impacts and Predation

Predation and impact data recording is valuable information for land managers in planning efforts to protect and enhance turtle nesting habitats within their jurisdiction. Data provided by TTCQ has helped rationalise and inform fox control programs for both Livingstone and Gladstone Regional Councils. A focus on gathering more focused impact data is very valuable for guiding local management decisions. Impact data that TTCQ can provide include predation (including predator species), erosion and flooding, human impacts, light, and heat impacts on nest incubation. Predation and impact data is recorded across the seasons in Figure 1 and across Tables 2, a-e for specific locations. It can be difficult to differentiate between late incubation predation and the natural scavenging of unhatched eggs post emergence. As such, only directly observed predation of incubating nests is reported as predation.

Where survey data is incomplete, records of nest impacts are naturally also incomplete. For Capricorn and Curtis Coast beaches, however, the impact data collected provides a valid picture on threats to turtle nesting in these areas.

Predation impacts were the highest reported since the TTCQ program commenced in 2012–13. A significant proportion of this resulted from an increase in goanna predation and scavenging of nests on the southern beaches of Facing Island. Goanna numbers have been increasing on the island in response to the control of feral dogs and impacts have been observed to be increasing across the past two seasons. Goannas are likely the major natural predator of nests on mainland islands without introduced predators such as pigs, dogs and foxes.

Woppa has seen an increase in goanna activity across the seasons, partially attributed to more thorough surveying of nesting activity on the island by TTCQ volunteers. It has been noted however that goannas are learning the turtle incubation cycle and are now finding nests within 1.5 weeks. It is conceivable that this increased activity will ultimately lead to greater nest predation as more goannas learn to target nests as has happened on Facing Island.

Fox predation was recorded from four locations on the Capricorn Coast - Farnborough North, Shelly's Beach, Emu Park and Zilzie Beach, with an unsuccessful attempt on a meshed nest on Fisherman's Beach, Emu Park. Fox predation was also reported on Curtis Coast beaches with one loggerhead nest predated on Wild Cattle North. Additionally, there was one unsuccessful attempt on Wild Cattle North and two attempts on nests on Lilley's Beach; the fox activity enabled location of these nests.

King tides in January inundated a small number of nests across the project footprint. Despite efforts by trained team members to relocate nests above tidal impact level four nests were lost on the Capricorn Coast and eight on Facing Island.

One nest from Farnborough Beach North was reported to have suffered compression from the impacts of being driven over by 4WD vehicles.

Light impacts are recognised as a significant impact on sea turtle nesting success and ocean finding behaviour for both adults and especially hatchlings emerging from nests. Sea turtles prefer dark beaches and there is anecdotal evidence this season that car headlights likely disturbed a nesting adult on Farnborough North. There were 12 observed light impacts reported this season. This is predominantly point-source light disorientation where an animal is disorientated by a locally bright light such as lights on a public amenity or beachside residence.

Heat impacts on incubating nests were reported from Capricorn and Curtis and Facing Island. Heat mortality is determined during emergence success digs and is based upon stages of development of the embryo.

The Recovery Plan for Marine Turtles in Australia (2017) states that at least 70% of nests need to successfully emerge for a marine turtle population to remain stable. Observed losses for 2023–24 ran to approximately 28% of the confirmed nests. This is close to the limits necessary to maintain a stable population.

Table 2 - TTCQ 2023-24 Summary of turtle activity by locality

Location	Tracks	Flatback Track	Green Track	Loggerhead Track	Total Laid (X)	Total Laid (?)	Total No Lay	Nests (max)	Nests (min)	Emerged Nests	Nest Success Counts	Predator Exclusion Device (PEX) installed	Nest Relocations	Total Predation	Total Impacts	No Evidence Surveys
Curtis	29	25	0	4	22	0	7	22	22	18	19	19	2	4	2	290
Facing	396	393	3	0	294	19	83	313	294	194	188	25	4	67	21	0
Capricorn	70	70	0	0	42	0	28	42	42	36	38	25	10	4	15	1112
Keppels	67	67	0	0	54	4	9	58	54	35	16	0	0	6	1	3
Stanage/Byfield	37	34	3	0	19	13	5	32	19	0	0	0	0	0	0	0
Totals	599	589	6	4	431	36	132	467	431	283	261	69	16	81	39	1405

Table 2a - Turtle Activity 2023-24 per beach surveyed – Stanage Bay/Byfield (NR – not recorded)

Beach	Number of Tracks reported	# of Tracks/sp.			Total Successful Nests	# of Nests/sp.			Number of Nests Emerged	PEX Installed	Number of Nest Relocations performed	Predation					Other Impacts				Number of Emergence Success Counts	Number of no evidence surveys (Oct-Mar)
		Flatback	Green	Logger		Flatback	Green	Logger				Unsuccessful	Goanna	Fox	Dog	Unidentified	Human Interference	Erosion/Flooding	Heat Impacts	Light Impacts		
Alligator Bay- Stanage	24	24			15	15			NR	0	0										0	0
Langham's Beach - Stanage	NR																					
Nine Mile - Byfield	13	10	3		4	4			NR	0	0										0	0
TOTALS	**37**	**34**	**3**	**0**	**19**	**19**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table 2b - Turtle Activity 2023-24 per beach surveyed – Keppel Bay Islands

Beach	Number of Tracks Reported	# of Tracks/sp.			Total successful Nests	# of Nests/sp.			Number of Nests Emerged	Predator Exclusion Device (PEX) Installed	Number of Nest Relocations performed	Predation					Other Impacts				Number of Emergence Success Counts	Number of no evidence surveys (Oct-Mar)
		Flatback	Green	Logger		Flatback	Green	Logger				Unsuccessful	Goanna	Fox	Dog	Unidentified	Human Interference	Erosion/Flooding	Heat Impacts	Light Impacts		
Konomie (Nth Keppel Island)	1	1			1	1			1	0	0										1	2
Woppa - Fisherman's Beach	4	4			4	4			3	0	0										2	
Woppa - Putney Beach	1	1			0				0	0	0										0	
Woppa - Leeke's Beach	36	36			29	29			18	0	0		4					1			0	
Woppa - Second Beach	4	4			4	4			3	0	0										3	
Woppa - Svendsens/Palm Beach	NR																					
Woppa - Butterfish Bay Beach	12	12			12	12			9	0	0		2								10	1
Woppa -Wreck Bay Beach	7	7			3	3			NR	0	0										0	
Woppa - Long Beach	1	1			1	1			1	0	0										0	
Woppa - Monkey Beach	1	1			0					0	0											
Other Keppel Group Islands	0																					0
TOTALS	**67**	**67**	**0**	**0**	**54**	**54**	**0**	**0**	**35**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**16**	**3**

Table 2c - Turtle Activity 2023-24 per beach surveyed – Capricorn Coast

Beach	Number of Tracks reported	# of Tracks/sp.			Total successful Nests	# of Nests/sp.			Number of Nests Emerged	Predator Exclusion Device (PEX) Installed	Number of Nest Relocations Performed	Predation					Other Impacts				Number of Emergence Success Counts	Number of no evidence surveys (Oct-Mar)
		Flatback	Green	Logger		Flatback	Green	Logger				Unsuccessful	Goanna	Fox	Dog	Unidentified	Human Interference	Erosion/Flooding	Heat Impacts	Light Impacts		
Farnborough North	11	11			8	8			7	2	4			1			1	1			7	64
Farnborough South	4	4			1	1			1	1	0										1	106
Barwell Ck Beach Bangalee	4	4			2	2			2	1	0										2	163
Yeppoon Main Beach	0																					1
Fisherman's Bay Wave Pt	0																					1
Cooee Bay Beach	0																					3
Lammermoor Beach North	2	2			2	2			1	2	1							1			2	151
Lammermoor Beach South	2	2			2	2			2	1	1							1		2	2	98
Kemp Beach	7	7			5	5			4	2	1								1	1	5	48
Mulambin Beach	1	1			1	1			0	0	0							1			0	23
Kinka Beach	0																					0
The Haven/Tanby Beach	7	7			4	4			4	3	0										4	41
Fisherman's Bch Emu Park	15	15			8	8			8	7	2	1								2	8	69
Emu Park Main Beach	6	6			2	2			2	1	0									1	2	104
Ladies Beach Emu Park	0																					31
Shelly's Beach Emu Park	6	6			3	3			2	2	1			1						2	2	101
Steps Beach	0																					1
Cocoanut Pt/Muskers Bch	0																					13
Zilzie Beach	5	5			4	4			3	3	0			1						1	3	94
TOTALS	**70**	**70**	**0**	**0**	**42**	**42**	**0**	**0**	**36**	**25**	**10**	**1**	**0**	**3**	**0**	**0**	**1**	**4**	**1**	**9**	**38**	**1112**

Table 2d - Turtle Activity 2023-24 per beach surveyed – Curtis Coast

Beach	Number of Tracks reported	# of tracks/sp.			Total successful Nests	# of nests/sp.			Number of Nests Emerged	Predator Exclusion Device (PEX) Installed	Number of Nest Relocations performed	Predation					Other Impacts				Number of Emergence Success Counts	Number of no evidence surveys (Oct-Mar)
		Flatback	Green	Logger		Flatback	Green	Logger				Unsuccessful	Goanna	Fox	Dog	Unidentified	Human Interference	Erosion/Flooding	Heat Impacts	Light Impacts		
Lillies Beach - Boyne Island	11	11			10	10			7	7	0	1				1					7	26
Canoe Point Tannum Sands	1	1			0																	71
Tannum Sands Main Beach	4	4			3	3			3	3	1									1	3	98
Wild Cattle Island North	13	9		4	9	6		3	8	9	1	1		1					1		9	95
Wild Cattle Island South	NR																					
Other	NR																					
TOTALS	**29**	**25**	**0**	**4**	**22**	**19**	**0**	**3**	**18**	**19**	**2**	**2**	**0**	**1**	**0**	**1**	**0**	**0**	**1**	**1**	**19**	**290**

Table 2e - Turtle Activity 2023-24 per beach surveyed – Facing Island

Beach(sector)	Number of Tracks reported	# of tracks/sp.			Total successful Nests	# of nests/sp.			Number of Nests Emerged	Predator Exclusion Device (PEX) Installed	Number of Nest Relocations Performed	Predation					Other Impacts				Number of Emergence Success Counts*	Number of No evidence surveys (Oct-Mar)
		Flatback	Green	Logger		Flatback	Green	Logger				Unsuccessful	Goanna	Fox	Dog	Unidentified	Human Interference	Erosion/Flooding	Heat Impacts	Light Impacts		
Oaks Beaches	0																					NR
Ocean Beach North	151	148	3		111	108	3		101	0	1		2						8		98	NR
Ocean Beach South	35	35			19	19			7	0	1										7	NR
East Point Beach	23	23			19	19			2	0	0		8					4			0	NR
Little Settlement (East)	18	18			8	8			4	0	0		3					2			3	NR
Settlement Bay (West)	168	168			136	136			79	25	2	4	50					2	3	2	79	NR
Gatcombe Heads	NR																					NR
Observation Point North	1	1			1	1			1	0	0										1	NR
TOTALS	**396**	**393**	**3**	**0**	**294**	**291**	**3**	**0**	**194**	**25**	**4**	**4**	**63**	**0**	**0**	**0**	**0**	**8**	**11**	**2**	**188**	**0**

Emergence Success

Adjunct to TTCQ activities, some QTCP trained volunteers have authority to excavate emerged nests to quantify incubation and emergence success and identify impacts from heat and inundation on incubating nests (see Tables 3 and 4). These counts are usually performed 48 hours after the nest has emerged. Where a nest had not emerged after an extended period following the due date, they were also excavated on the assumption that the nest had not incubated successfully. If the egg chamber had been compromised by a predator the counts are not valid, and the data is discounted due to the possibility of eggs having been removed or eaten. A high proportion of embryos in the latter stages of development indicate heat induced mortality resulting from elevated incubation temperatures. Flooding and prolonged inundation is usually signalled by early-stage embryo mortality.

Table 3 - Flatback turtle clutch size and emergence success
Comparisons for Facing Island, Capricorn Coast, Woppa and Curtis Coast beaches – 2023–24 season

	Facing Island		Capricorn Coast		Woppa		Curtis Coast	
	Number of Eggs	Emergence success %	Number of Eggs	Emergence success %	Number of Eggs	Emergence Success %	Number of Eggs	Emergence success %
Minimum	21	0	16	1.96	65	41.07	35	40.98
Maximum	74	100	70	98.36	59	100	69	100
Average	52.62	73.1	51.13	74.36	55.25	83.9	53.88	78.85
Nests Counted	186		38		16		16	

Table 4 - Average clutch size and percentages of emergence success
TTCQ locations (all seasons where reported)

	Facing Island			Capricorn Coast			Woppa			Curtis Coast		
	# of eggs	% Emerg	Count	# of eggs	% Emerg	Count	# of eggs	%Emerg	Count	# of eggs	% Emerg	Count
2016/17	53.24	72.44	18									
2017/18	53	86.2	10	49.75	77.28	12						
2019/20	53.83	81.36	6	49.84	78.6	25						
2020/21	53.28	89.89	53	50.6	82.65	30				54	94.14	6
2021/22	50.14	78.67	94	50.33	80.73	27	59.92	83.48	13	50.58	92.08	12
2022/23	52.50	83.55	221	54.20	88.32	40	55.4	84.68	12	56.6	46.18	7
2023/24	52.62	73.10	186	51.13	74.36	38	55.25	83.9	16	53.88	78.85	16
Count	7	7	7	6	6	6	3	3	3	4	4	4
Max.	53.83	89.89	221	54.2	88.32	40	59.92	84.68	16	56.6	94.14	16
Min.	50.14	72.44	6	49.75	74.36	12	55.25	83.48	12	50.58	46.18	6
Avg	52.67	82.02	67.00	50.94	81.52	26.80	57.66	84.08	12.50	53.73	77.47	8.33
Std Dev	1.1960	6.4982	87.7021	1.6595	4.8439	10.1127	2.6540	0.6089	2.0817	2.4664	22.1498	4.6458

Note: 2020-21 Capricorn Coast data included Woppa

Tagged Turtles

Tagging of marine turtles is an important means of estimating population size using a mark-recapture methodology. With several long-term QTCP monitoring programs operating within the TTCQ footprint it is likely that over time some tagged animals may be encountered, especially as volunteers gain more experience and participate in additional research activities. Indeed, one of the driving motivations behind the program is to investigate potential overspill and/or migration from established nesting beaches in response to development and disturbance.

Tagged turtles were reported from Facing Island with all recaptures being tagged in previous seasons at Facing Island, reinforcing the observations of high fidelity to nesting beaches. Several recaptures from initial QTCP tagging work on Facing Island in 1999-2000 were recorded. A total of 16 new animals were tagged by volunteers on Facing Island this season. One adult flatback was also tagged whilst nesting on the Capricorn Coast. Also recorded was a Peak Island flatback tagged in 2013 which had changed nesting colony to Fisherman's Beach, Emu Park.

Nest Protection

TTCQ volunteer observations play an important role in identifying predation as it occurs and sharing this information with the relevant stakeholders can ensure timely response for predator management. In addition to the direct control of feral predators such as foxes, pigs and dogs, turtle nests may be protected by installing predator exclusion devices (PEX) over incubating eggs.

Turtle nests are also vulnerable to tidal inundation and beach erosion. Nest relocation to higher ground protects nests from this threat. With authorisation volunteers can act upon predator activity or inundation threat and employ nest protection strategies as required.

Predator Exclusion Devices (PEX)

Nest protection methods adhere to protocols established by the QTCP and are selected based on predator type, ease of monitoring the protected nest and the level of public usage of the target beach. Predator exclusion devices include:

- 50mm plastic garden trellis mesh (approx. 1m^2) with every second bar removed over the egg chamber to facilitate emergence of the larger flatback hatchlings (this is less effective and can be compromised by foxes and dogs),
- Heavy duty plastic industrial barrier mesh (approx. 1m^2) with mesh spacing of approximately 75mm,
- Aluminium security screen mesh with spacings of approximately 85mm (1m^2) with fold down edges of 200mm.

Installation - the 1m^2 mesh is centred over the egg chamber with edges turned down to prevent tunnelling from the sides. The mesh is pegged down and buried to avoid detection. Due to concerns around hatchlings becoming entrapped in the mesh, nest protection can only be utilised on beaches which are surveyed daily by trained and authorised TTCQ volunteers.

A total of 69 predator exclusion devices were deployed this season.

- 29 on Facing Island (Settlement Bay) in response to goanna predation/scavenging (whilst the team was in attendance during the emergence census period).
- 19 on Curtis Coast Beaches
- 25 on Capricorn Coast beaches.

PEX devices were compromised on Facing Island with goannas burrowing under mesh and smaller goannas passing through the aluminium mesh. Use of the aluminium mesh does raise concerns over public safety and theft, so the mesh is buried approximately 200mm below the surface.

Fox control – den detection and trapping

Foxes are recognised as significant local predators of turtle nests, with some exhibiting learned behaviour to locate and predate multiple nests within a home range. Partnership continues with Livingstone Shire Council (LSC), Gladstone Regional Council (GRC) and QPWS&P across multiple tenures to suppress fox populations, thus reducing pressure along known turtle rookery sites and shorebird habitat.

Both Livingstone Shire and Gladstone Regional Council continued with fox den detection and fumigation activities prior to the 2023–24 turtle season. Additionally, both councils proactively targeted foxes that were active on turtle nesting beaches across the nesting season.

In October 2023 LSC spent ten days doing fox den detection and found 28 fox dens. They spent eight nights trapping and thermal shooting six foxes while another seven foxes were caught in cage traps.

Fox den detection was carried out across a total of 251Ha in Boyne Island, Tannum Sands and Agnes Water during September 2023 by GRC. In the TTCQ project area this included Lilley's Beach (co-funded by Boyne Smelter Limited) and Wild Cattle Island. The survey identified several inactive dens and evidence of recent fox activity across both areas, however no active dens were identified and fumigated. This marked the final year of den detection work funded by the Queensland Feral Pest Initiative.

Nest relocations

Relocation can be safely performed within two hours of laying and then again after a minimum of 14 days of incubation. Emergency relocations can be performed outside of these time frames however there must be **no** rotation of the eggs. Rotation of the egg after the formation of the blood vessels (that connect the developing embryo to the egg membrane) will kill the embryo. Only experienced volunteers with direct authorisation from the DESI may perform emergency relocations and they are permitted on a case-by-case basis.

Three emergency relocations were performed in response to erosion impacts on the Capricorn Coast. There were a further seven nests on the Capricorn Coast relocated to higher ground to avoid inundation or threat of compaction from vehicle traffic (Farnborough North). Two relocations were performed on Curtis Coast beaches and four relocations performed on Facing Island, all in response to inundation threats.

Heat and inundation adversely impacted several of the relocated nests this season and emergence success for relocated nests fell to 68.6%. The emergency relocations emergence success was only 20.4% however each nest would have been lost entirely without intervention.

Table 5 - Summary of Survey Effort and Monitoring Activities since 2015

(X – recorded but not quantified) Some volunteers reported more than once (if they covered several locations).

Season	Location	Beaches Surveyed	Vols engaged	Tracks Reported	Confirmed Nest	Emerged Clutches	Predation					Impacts			
							Unsuccessful	Goanna	Fox	Dog	Unidentified	Human	Flood	Heat	Light
2015-16	Capricorn Coast	3	4	10	5	2			1						
	Curtis Coast including Facing	2	CVA+3	5	3	1			1						
		1		39	16	2		15							
	Total	6	7	54	24	5	0	15	2	0	0	0	0	0	0
2016-17	Capricorn Coast including Byfield	7	16	23	15	11			4						
		1	1	4	NR	NR									
	Curtis Coast including Facing	3	1	10	3	NR			6						
		1	2	10	3	NR			6						
	Facing Island	4	2	97	62	20		18		6					
	Keppel Bay Islands	2	3	3	1	NR									
	Total	18	25	147	84	31	0	18	16	6	0	0	0	0	0
2017-18	Capricorn Coast	6	9	30	12	11			3						
	Curtis Coast	3	1	6	1	NR									
	Facing Island	5	5	95	59	13		46							
	Stanage Bay/Byfield	1	1	25	3	3			3						
	Total	15	16	156	75	27	0	46	6	0	0	0	0	0	0
2018-19	Capricorn Coast	8	10	13	10	8			1						
	Curtis Coast	2	2	1	Nil	NR									
	Stanage Bay/Byfield	1	1	3+	3+	1				X					
	Keppel Bay Islands	1	1	1	1	NR									
	Total	12	14	15	11	9	0	0	1	0	0	0	0	0	0
2019-20	Capricorn Coast	13	23	37	32	24			9						
	Curtis Coast	5	6	3	2	NR									
	Facing Island	5	3	103	82	6		X		X					
	Stanage Bay/Langham	2	4	123	107	26									
	Byfield	3	3	6	3	NR									
	Keppel Bay Islands	4	4	8	6	NR									
	Total	32	43	280	232	56	0	0	9	0	0	0	0	0	0
2020-21	Capricorn Coast	11	27	48	38	21			1				3		
	Curtis Coast	5	13	33	19	7			3	3			1		
	Facing Island	6	11	187	137	59		X		23					
	Stanage Bay/Langham	4	10	140	108	15									
	Byfield	1	2	2	1	NR									
	Keppel Bay Islands	12	8	41	27	16		1					1		
	Total	39	71	451	330	118	0	1	4	26	0	0	5	0	0

2021-22	Capricorn Coast	19	34	47	36	28	3	1		1	2	2	10		4
	Curtis Coast	6	14	37	27	15	1		13	1			7	1	2
	Facing Island	8	10	344	149	102	2	46					3		
	Stanage Bay/Langham	2	10	85	75	21				1			12		4
	Byfield		2												
	Keppel Bay Islands	9	10	57	45	33							5		
	Total	44	80	570	332	199	6	47	13	3	2	2	37	1	10
2022-23	Capricorn Coast	18	40	51	49	35	10		3		1	1	2		4
	Curtis Coast	5	15	18	9	4							2		
	Facing Island	6	17	430	324	144	6	37		4			10		X
	Stanage Bay/Langham	2	5	59	38	28							5		
	Byfield	1	1	1	0	0									
	Keppel Bay Islands	8	11	36	23	19							2		
	Total	40	89	595	443	230	16	37	3	4	1	1	21	0	4
2023-24	Capricorn Coast	19	41	70	42	36	1	0	3	0	0	1	4	1	9
	Curtis Coast	5	22	29	22	18	2	0	1	0	1	0	0	1	1
	Facing Island	8	10	396	294	194	4	63	0	0	0	0	8	3	2
	Stanage Bay/Langham	2	1	24	15	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	Byfield	1	1	13	4	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	Keppel Bay Islands	10	10	67	54	35	0	6	0	0	0	0	1	0	0
	Total	45	85	599	431	283	7	69	4	0	1	1	13	5	12

Feedback & Evaluation

An important part of the TTCQ program is obtaining feedback to provide guidance and recommendations on ways to improve the program. Many of these recommendations come from stakeholder engagement, annual post-season meetings and volunteer feedback at wrap-up events. This process of evaluation and continual improvement is now built into the program delivery of TTCQ and has become an ongoing, collaborative process.

Areas of focus identified prior to this season included:

- Improving data and data collection; for ease of reporting, accuracy and alignment to QTCP datasets
- Building volunteer capacity and opportunities
- Targeting recruitment of volunteers for specific monitoring locations
- Strengthening partnerships for delivery, including welcoming partnership with First Nations
- Continuing current threat reduction activities (predator related)
- Pursuing activities to mitigate against additional threats (e.g. light glow)

Improvements made against these focus criteria have been variable in part due to circumstances beyond the control of TTCQ and FBA. For example, whilst improvements were made in data collection requiring less input from project leads there have been reliability issues from the BioCollect data platform itself.

Data Collection and BioCollect

Data entered into the App was generally of good quality, with minimal requirements for edits. Reiterating the need for quality photos and reminding volunteers to check their entries during training and via the chats has helped improve data collection. The work of lead volunteers in each location has been invaluable for cross checking and confirming data on the ground. Data which cannot be verified, is incomplete or lacks photographic evidence, is not used in reporting.

BioCollect does have limitations (as a free App) that make it unwieldy to use at times, especially in terms of self-populating data fields and listing surveys by updated date rather than original survey date. This can make it difficult to edit surveys with data on nest impacts and emergences. Suggestions were made to investigate alternative platforms such as ARCGIS Survey 123 (although this is not a free App). FBA continues to consult with ALA, however, did spend significant time following up errors this season.

Assigned Beaches

In recent seasons due to an abundance of volunteers it has become necessary to assign volunteers to a "home" beach. Additional volunteers are now available to cover when people are unable to walk on their beach. As some beaches receive more activity than others it is encouraged that volunteers attend mentoring sessions on other beaches with experienced volunteers, especially to observe hands-on activities such as installation of nest protection, relocations and emergence counts. New volunteers are encouraged to spend time with a mentor to learn track identification and determine nesting outcome. This will require volunteers walking on the same beaches to communicate and build connections to enhance teamwork.

Training and Capacity Building

Several TTCQ volunteers were unsuccessful in gaining Mon Repos placements this season due to insufficient allocations for community monitoring groups by the Department. Pleasingly, the process employed by the Department has now changed to allow for community and land and sea ranger groups to have priority placements allocated. The interest shown by TTCQ volunteers in attending marine strandings training, QTCP Mon Repos placements and QTCP Port Curtis turtle health studies show a commitment to the TTCQ program and a desire to seek further experience and opportunities. FBA will continue to work with the Department to develop opportunities for more members of TTCQ to obtain authorisation, enabling greater interaction with turtles and their nests to help share the workload with the current authorised volunteers. Opportunities to participate in TTCQ census works and to receive additional training will be provided as available. This is somewhat dependent on funding and resources available within FBA.

Volunteer Coordination/Management

There has been significant volunteer commitment across the region with support provided by FBA, lead volunteers and a part-time Volunteer Coordinator for Capricorn Coast. Volunteers commended the use of the group chats to communicate, helping roster coverage across beaches and allowing team members to join others for mentoring opportunities. Feedback from volunteers is that hands-on training with experienced team members is very positive. Another area of strength noted was the positive public interactions from team members.

A Volunteer Coordinator role that covers the entire project would be ideal, ensuring that members know who is walking a particular beach (both am and pm), who to report impacts and emergences to for updating of BioCollect records and general problem-solving and connection. Volunteer coordination would also ensure no evidence surveys are entered so beaches are not missed.

Continued Engagement with Community and Stakeholders

It was identified that more signage and more community education could strengthen the message about turtle activity on beaches within the region. Signage could include a link to the TTCQ webpage, allowing the public to report a turtle nest, provide hints and tips on what to do when encountering a turtle and provide an opportunity for public donations to help fund facilitation of the program.

Permitted beach driving was discussed, and it was suggested that information be provided on wildlife using beaches (turtles and seabirds) in the information included when obtaining beach driving permits. Continued liaison with other interest groups utilising beaches is another avenue available to highlight responsible beach use.

Discussion also centered on a greater presence on social media. However, this needs to be of a subtle nature as too much public interest can lead to negative outcomes, with the community actively seeking out nests or hatchlings. Ideas were to publicise the first nest of the season, to promote turtle hour - the "lights out turtles about" messaging, and the release of the season report. Additionally, having a social media focus allows members of the public to report turtle activity that may not have been identified by TTCQ members and there was a notable increase in such reporting during the 2023–24 season.

Team Hatchlings volunteers noted the support TTCQ members provided to Team Hatchlings and the opportunities provided for education and engagement. TTCQ members have also been active delivering educational activities within the community and at events across the Curtis Coast as well.

Additional Actions taken by TTCQ Volunteers

Authorised volunteers have installed the greatest number of predator exclusion devices (PEX) since the commencement of the TTCQ program in 2015. Sixty-nine PEX were installed. Sixteen nests were relocated in response to potential tidal inundation and vehicle impacts. Predator control and PEX have reduced mainland predation to just five reported instances with seven unsuccessful attempts.

Several volunteers were trained in data collection to assess light disorientation on ocean finding behaviour for adult and hatchling turtles. Data collected will be provided to QTCP for analysis and inclusion in future reports.

Volunteers performed 261 emergence success counts from a total of 431 confirmed nests (approximately 61%). This data helps quantify incubation and emergence success and can be used to identify causes of mortality and infer sex ratios of hatchlings.

In addition to monitoring for TTCQ, volunteers are also becoming involved in other activities that benefit the environment and improve habitat for turtles. These include the Marine Strandings network, volunteer beach rehabilitation and revegetation, and marine debris clean-ups.

Light Pollution Management

Light pollution continues to be an issue within the region and one that impacts ocean finding behaviour of marine turtles and their hatchlings. Team Hatchlings plays an important role in spreading the message around turning lights out during the turtle season. However, impacts of light pollution on other species is poorly known or understood. It would be pre-emptive to investigate options to minimise skyglow effects through reducing incident light, installing shields and shrouds and switching lights off where possible. Additionally, developing buffer zones of vegetation along known nesting beaches could help reduce light impacts and help reduce sand temperature and reduce heat impacts through throwing shade onto beaches. FBA continues to encourage relevant stakeholders to mitigate against light pollution, create cooler nest locations, improve biodiversity and offer erosion protection.

Improvements Achieved Over the Past Season

The improvements made this past season are reflected throughout this and the Facing Island Census report, through the activities of Team Hatchlings and from the continued input from a growing core of dedicated TTCQ volunteers and mentors.

The data being collected is becoming increasingly rigorous, with greater scientific accuracy, hence it is of greater value to both local land managers and for input into the QTCP dataset.

Opportunities for volunteers less able to monitor beaches are identified and have included checking of data for completeness, designing and delivering of educational materials and presentations, and supporting Team Hatchlings.

The focus in the future will be to continue expanding and adapting activities, ensuring that the program retains its professionalism, its data quality and consistency, relevance for key stakeholders and community. The longevity of the program is considered critical to the positive impact that can be achieved for marine turtles along our region's coastlines.

Key Stakeholders and Opportunities for Partnerships

Livingstone Shire Council have been very proactive in promoting the TTCQ project, erecting beach signage, controlling predators and have expressed a willingness to alter park lighting to reduce impact on turtle behaviour. They have also installed monitoring cameras on beaches and fined people for beach driving offences.

Gladstone Regional Council (GRC) have also been responsive to working together with TTCQ to protect turtles on coastal beaches of the Curtis Coast. There has been a push from GRC for a seasonal closure of Lilley's Beach. Council have installed surveillance cameras and signage; speed limits posted and there has been an increased Queensland Police Department presence.

FBA and TTCQ have well established links with council conservation and environment departments and their pest management teams.

Gladstone Ports Corporation (GPC) funded a full 2-week census on Facing Island this season that involved two weeks of nest monitoring and two weeks of emergence monitoring. This was the first census of Facing Island marine turtle nesting to cover both nesting and emergence and a further three years of funding has been secured.

Continued liaison with the Department of Defence to manage predators within Shoalwater Bay Military Training area is recommended. Aerial surveys over this area in the 2020/21 season identified marine turtle nesting on beaches in the area with dog and pig activity identified as threats.

Ongoing work with QPWS&P for pest management and predator control on Wild Cattle Island and Byfield/Corio Bay and Shoalwater/Stanage Bay areas is also important.

Renewed engagement with the Port Curtis Coral Coast Trust, Woppaburra Traditional Custodians and Darumbal Traditional Custodians will build relationships in readiness to identify participation opportunities for First Nations and better capitalise on them.

References

Commonwealth of Australia. (2017). *Recovery plan for marine turtles in Australia*.

Fitzroy Basin Association (FBA). (2022). *Team Turtle CQ: FBA's community marine turtle monitoring program: 2021/2022 summary report*. Unpublished technical report. Fitzroy Basin Association.

Fitzroy Basin Association (FBA). (2023). *Team Turtle CQ: FBA's community marine turtle monitoring program: 2022/2023 summary report*. Unpublished technical report. Fitzroy Basin Association.

French, K., Thomas, T., Mitchell, P., Anderson, I., & Reilly, C. (2024). *Marine turtle nesting populations: Settlement Bay, Facing Island flatback turtle Natator depressus nesting study, 2023–24 breeding season*. Unpublished technical report to Fitzroy Basin Association.

Limpus, C. J. (2007). A biological review of Australian marine turtles. 5. Flatback turtle *Natator depressus* (Linnaeus). Queensland Environmental Protection Agency.

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