

A Marine Turtle Action Plan for Montserrat

2023 - 2028



University
of Exeter



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Contributors in alphabetical order (organizations and then surnames): Ms. Ernestine Corbette, Mr. John Jeffers, Mr. Stephen Mendes, Dr Selvin Maloney, Mr. Alwyn Ponteen (Government of Montserrat); Dr. Peter Richardson, Mr. Amdeep Sanghera (Marine Conservation Society); Professor Brendan Godley, Dr. Nicola Weber, Dr. Sam Weber and Mr. Jack Wiggins (University of Exeter, Penryn Campus)



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EXECUTIVE SUMMARY

Overview

This action plan has been compiled as an output of the scientific research, stakeholder engagement, and community outreach that has been conducted through a Darwin Initiative grant (DPLUS106 2020 - 2023) awarded to the Government of Montserrat's Ministry of Agriculture, Lands, Housing and the Environment (MAHLE), University of Exeter (UoE) and Marine Conservation Society (MCS). It builds upon the routine monitoring carried out by the MAHLE, and on-island perceptions regarding the status of Montserrat's marine turtles. The plan identifies a series of SMART (specific, measurable, assignable, realistic, and time-related) action points and makes recommendations for future initiatives for which funding and support can be sought.

- Nest counts were conducted on accessible beaches over two years and indicate that Montserrat supports around 400 - 530 green turtle nests per year. This makes it a regionally-significant rookery for this species in the Eastern Caribbean. Smaller numbers of critically-endangered hawksbill were documented nesting and evidence was also found of small numbers of leatherback turtle nests.
- The majority of nesting occurs between August-September and during the 2021 and 2022 seasons, was found to be concentrated on five beaches: Woodlands Bay (30.4%), Bunkum Bay (22%), Rendezvous Bay (18.2%), Isles Bay (16.4%), and Fox's Bay (8.4%). These beaches are small and nest monitoring suggests several of these sites are vulnerable to coastal inundation, which is projected to worsen with climate-induced sea level rise.
- Montserrat has a tradition of artisanal use of turtles, but interview data suggest that this practice is becoming less common. Findings from the Community Voice Method (CVM) and stakeholder consultations did not support banning this practice, but did support legislative and management reforms including an extended closed season, size limits on green turtles captured, prohibition of take of nesting green turtle females and eggs, and prohibition of take of all other sea turtle species except green turtles, along with increasing the penalties for violations. It is recommended that the Turtles Act (2002) be updated through legislative amendments informed principally but not solely by the project's CVM stakeholder deliberation process.
- Limited nesting habitat availability and sensitivity of key sites to seawater inundation is assessed to be the greatest threat to Montserrat's turtles, and predicted to worsen under climate change. Protecting existing habitat will be key, including limiting sand removal on and around key beaches (and associated enforcement of this), preventing vegetation removal which contributes to shading and erosion limitation, and restricting development and hard engineering behind beaches which could increase light pollution and prevent inland beach expansion leading to coastal squeeze.
- The use of a hatchery/ies could be a useful marine turtle conservation tool in Montserrat, but improved husbandry/ welfare is key to hatching success alongside consideration of where these would most effectively be located.
- Satellite-tracking research revealed key inter-nesting inshore marine habitats for green turtles that warrant management and protection from potentially harmful anthropogenic activities. Stakeholder consultations also found support for protecting these inter-nesting sites through certain restrictions alongside awareness raising of "turtle-friendly" activities.

- A robust long-term monitoring plan is needed in order to track the status of the turtle populations and to enable adaptive management. Given the limited season and focus of nesting on a few key beaches close to settlements, monitoring can be achieved with limited capacity and drawing more on the volunteer sector by focusing on a small number of key nesting beaches. Regular data audits are needed to ensure data are reliable.

High Priority Actions

- 1** Systematic annual monitoring surveys and productivity assessments of in-situ and ex-situ clutches are continued.
- 2** Annual data audits to be conducted to check the integrity and quality of the data being collected.
- 3** Government of Montserrat to consider recommendations and amendments to legislation, including protection of critical sea turtle habitats.
- 4** Government of Montserrat to invest in increasing local capacity and participation in marine turtle monitoring and to use these on-island knowledge-based resources on a more consistent basis.
- 5** Establishment of a consistent community-based education focus to compliment the Action Plan Vision (below)



ACTION PLAN VISION

To safeguard the future of Montserrat's regionally-significant turtle population through effective monitoring and evidence-based conservation actions that respect local values and cultural traditions, promote turtle friendly behaviours and contribute to the Island's prosperity.

1. INTRODUCTION

1.1 Montserrat

The tropical, volcanic island of Montserrat is a United Kingdom Overseas Territory situated in the Eastern Caribbean, approximately 45km southwest of Antigua (Figure 1). The majority of the island's sandy beaches are located on the leeward western coast and are dominated by black volcanic sand (Figure 1). Rendezvous Bay is the island's only white calcareous sand beach and is located on the northwest coast of the island. Due to its relatively narrow coastal shelf and frequent exposure to tropical storms and hurricanes, Montserrat has a high-energy coastline that is highly susceptible to erosion (Martin et al., 2005). Between 1995 and 2010, multiple eruptions of the Soufrière Hills volcano severely affected many coastal and inshore habitats across the southern region of the island (Flower et al., 2020), including sea turtle nesting beaches. A significant quantum of unconsolidated volcanic material is still present on mountainous slopes which contributes to periodic siltation of marine habitat. Due to continued volcanic activity, a strictly controlled exclusion zone extends across approximately two-thirds of the island.

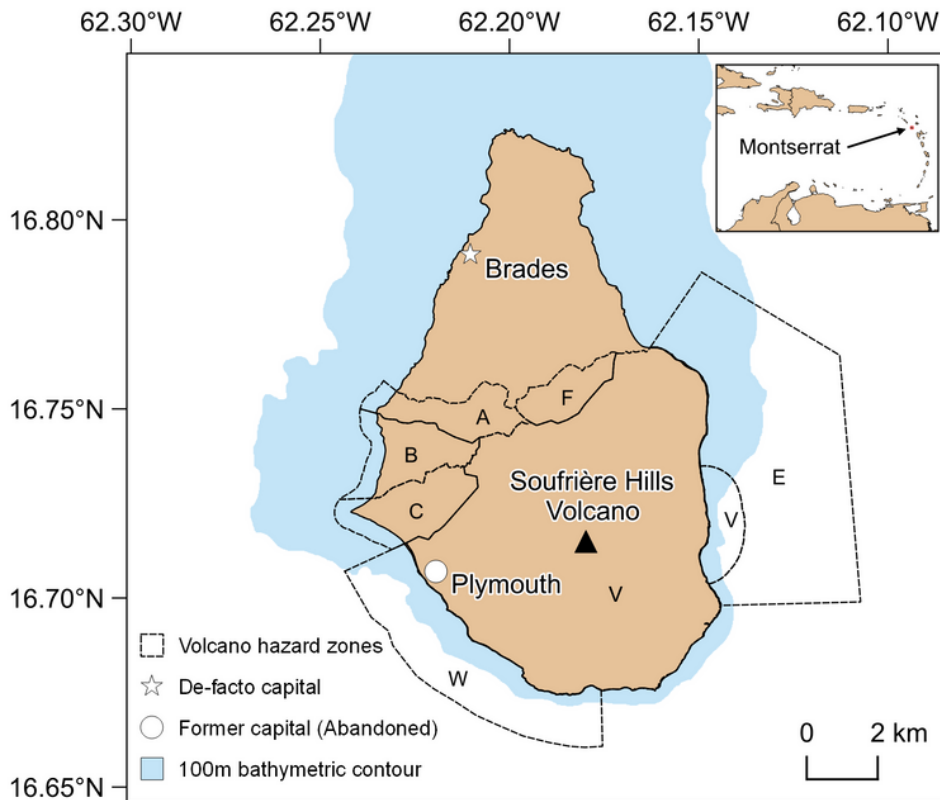


Figure 1. Main map depicts the UK Overseas Territory of Montserrat. The current population of ca. 5000 people reside in the north of the island. At hazard level 1 (as of 14 July 2023) volcano hazard zones A, B, C and F allow unrestricted public access, zone V allows controlled access (no public access), and maritime zones E and W allow daytime transit only. The inset map depicts the position of Montserrat (red box) in the northern portion of the Lesser Antilles chain within the Wider Caribbean Region.

1.2 Sea turtles in Montserrat

Four of the seven extant sea turtle species have been reported to nest on Montserrat. Nesting populations of green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*) turtles are considered modest yet regionally important on an Eastern Caribbean scale, whereas nesting by leatherback (*Dermochelys coriacea*) and loggerhead (*Caretta caretta*) turtles is sporadic (Meylan, 1983; Martin et al., 2005). Turtle nesting beaches in Montserrat are naturally poor (Martin et al., 2005) with suitable nesting areas limited due to the impacts of storm surges and high swells throughout the nesting period, which coincides with the Atlantic hurricane season. Montserrat's inshore waters host a variety of habitats, including seagrass beds and coral reefs (Gell & Watson, 2000) that support juvenile and adult green and hawksbill turtles (Martin et al., 2005). However, the abundance, spatiotemporal distribution, and habitat use of resident sea turtle populations in Montserrat have yet to be quantified.

Currently, Montserrat's Turtles Act (1951; revised 2002) legislates against any form of turtle harvesting (including eggs) during an annual closed season from 1 June to 30 September inclusive. During the open season (1 October – 30 May), any species of turtle can be captured, sold and bought as long as it weighs at least 20lbs (9.1 kg). However, there is currently no maximum size limit, and nesting turtles and their eggs can be legally taken from the beach during the open season. Offences against this act are liable to fines not exceeding XCD\$48 (Turtles Act 2002).

The MAHLE Fisheries and Ocean Governance Unit routinely carry out marine turtle monitoring in Montserrat. However, due to capacity limitations, the MAHLE has been unable to conduct comprehensive island-wide monitoring surveys. Additionally, community engagement necessary to review and update current practices and legislation that aligns with local values, cultural traditions and conservation requirements had yet to be carried out. Therefore, between 2020-2023, MAHLE in collaboration with UoE and MCS, implemented a comprehensive sea turtle monitoring program and extensive community engagement project, funded through the Darwin Plus Initiative, to attain the biological and social data required to update current monitoring and management practices and develop recommendations to amend legislation.

1.3 Project evidence

1.3.1 Biological research

All biological research was carried out in accordance with the Montserrat Turtle Monitoring Protocol 2022 (see Appendix 1).

Nesting numbers

During the timeframe of the project, a total of 858 monitoring surveys were completed across thirteen sea turtle nesting beaches. In total, 286 sea turtle nests were recorded (164 nests in 2021 and 122 in 2022) of which, 93% were green turtles and 7% were hawksbills. After adjusting for incomplete survey effort (2 days per beach per week = 28.5% coverage), we estimate that a minimum of 400-530 green turtle nests and 30-42 hawksbill nests were laid per year on the island's beaches across the two years of the study. Satellite tags deployed on nesting females in 2021 indicate that individual green turtles return to nest on average 6 times during a breeding season, while the single tagged hawksbill nested on 3 occasions. Combining these clutch frequencies with minimum nest counts we can infer that approximately 67-88 female green and 10-14 hawksbill turtles nested annually in Montserrat during the study. A single leatherback turtle nest was observed in August 2022, found exposed on the high-water mark at Woodlands Bay; however, no evidence of embryonic development was found. A failed leatherback nesting attempt was also observed on Bottomless Ghaut in July 2022 and 5 leatherback activities in May 2023 on Barton Bay during a spontaneous visit on a single day. There was no evidence of nesting by loggerhead turtles found during either the 2021 or 2022 nesting seasons.

Nesting seasonality and distributions

Successful nesting attempts were recorded on nine of the beaches surveyed (Figure 2), with 95% of nests concentrated at five key sites: Woodlands Bay (30.4%), Bunkum Bay (22%), Rendezvous Bay (18.2%), Isles Bay (16.4%), and Fox's Bay (8.4%). In 2021, monitoring ran from 26 July - 14 November and in 2022, from 6 June - 24 November inclusive. In both years, nesting peaked between the months of August and September (Figure 3), with 85% of the total nests observed being recorded during this period.

Throughout the duration of the project, 29 nesting green turtles and 3 nesting hawksbill turtles were identified and all tagged with PIT and/ or flipper tags with the exception of 3 green turtles that were only satellite tagged. The mean curved carapace length (CCL) and mean curved carapace width (CCW) of nesting green turtles were 110.0 ± 6.0 cm (mean \pm SD, range = 96 - 125 cm) and 100.2 ± 5.7 cm (mean \pm SD, range = 89 - 112.5), respectively. The mean CCL and CCW of nesting hawksbill turtles were 87.7 ± 2.1 cm (mean \pm SD, range = 84 - 88.4 cm) and 78.3 ± 1.65 (mean \pm SD, range = 76.7 - 79.7 cm), respectively.

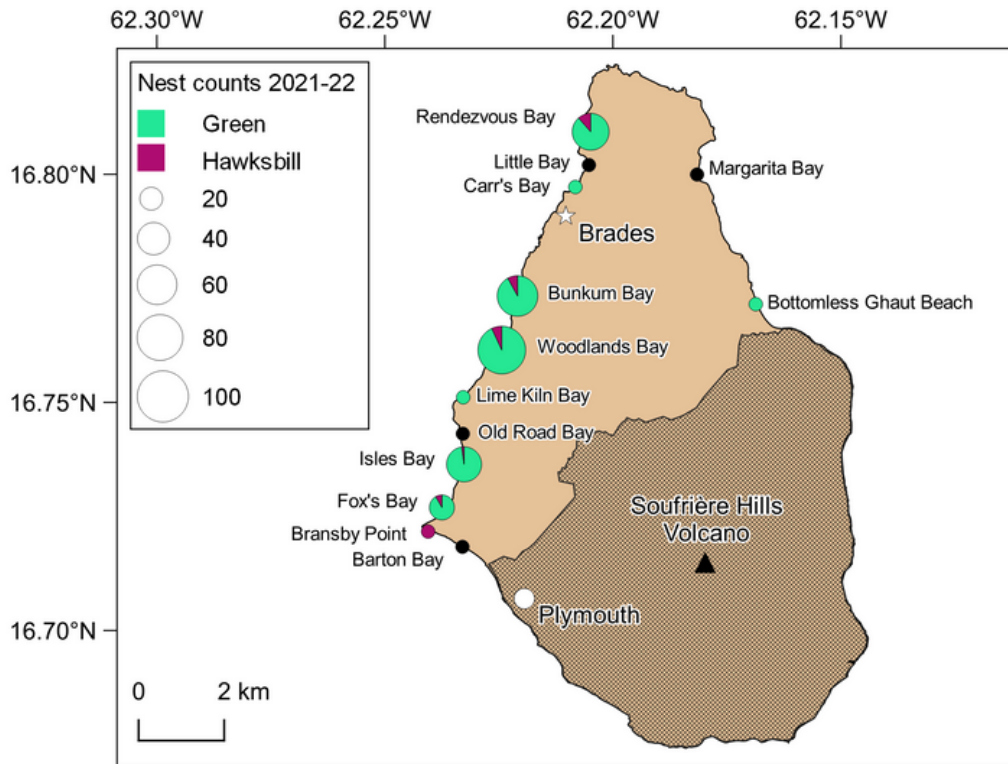


Figure 2. Distribution and abundance of marine turtle nests observed during monitoring surveys conducted throughout the 2021 and 2022 nesting seasons. Black dots represent monitored beaches where no nesting was recorded and the grey hashed area denotes the terrestrial extent of the volcano hazard zone V (no public access).

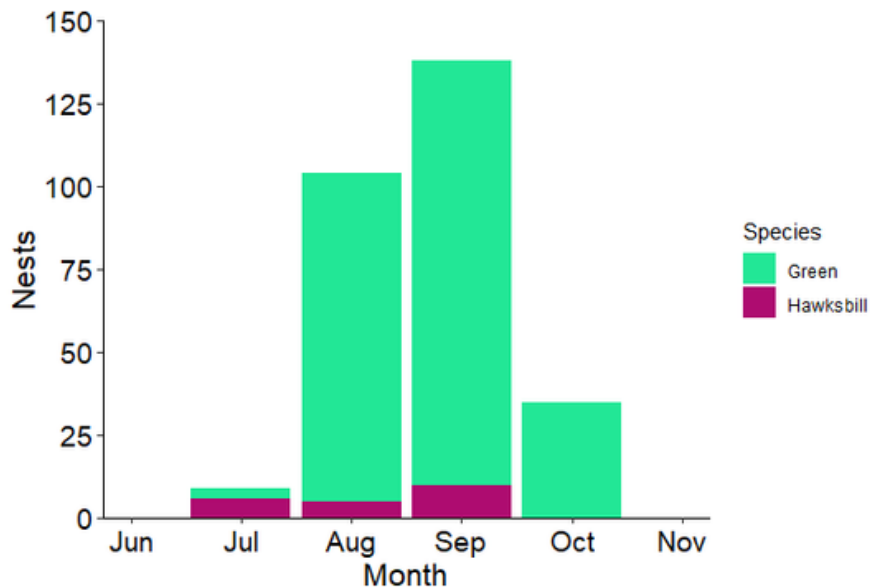


Figure 3. Monthly green and hawksbill turtle nest counts recorded during monitoring surveys conducted in 2021 and 2022.

Nest productivity

A preliminary investigation into the hatching and emergence success of in-situ and ex-situ clutches was conducted during the 2022 nesting season. A total of six clutches were monitored on Rendezvous Bay which had an average hatching success of 76.8% (Figure 4). A further 11 clutches were also monitored on Woodlands Bay, however six clutches failed to hatch due to extreme saltwater inundation and the remaining five clutches were lost to storm surges or other nesting turtles destroying the nests. To protect against losses from seawater inundation, the GoM established in 2007, a hatchery facility in Brades to which a subset of nests are relocated each year. Productivity assessments were completed for eight clutches translocated into the hatchery, yielding a mean hatching success of 36.8 % (Figure 4).

These preliminary results highlight that clutches relocated to the hatchery facility have significantly lower hatching success rates than in-situ clutches on Rendezvous Bay. However, the hatchery facility may yield greater hatching success rates than Woodlands Bay due to extreme nest inundation. This suggests the hatchery facility has the potential to be a useful conservation management tool, yet improved husbandry methods are needed to attain productivity rates similar to those observed at other nesting sites. Consideration should also be given to establishment of small-scale hatchery facilities closer to the key nesting beaches.



Figure 4. Hatching success (%) rates of turtle clutches relocated to the hatchery (n=8), and in situ clutches monitored on Rendezvous Bay (n=8) and Woodlands Bay (n=11) during the 2022 nesting season. Colored boxes indicate the interquartile range, the black line within the boxes highlight the median value, the whiskers display the range of values, and black dots indicate outliers. Note all monitored nests on Woodlands Bay either failed to hatch or were lost due to extreme inundation.

In-water movements and critical habitats

During the 2021 nesting season, nine nesting green turtles and one nesting hawksbill turtle were tagged with satellite transmitters to track their movements and identify critical inter-nesting habitats within Montserrat's waters. Inter-nesting home ranges and core use areas are defined as 95% and 50% utilization distributions (i.e., the smallest area in which turtles have a 95% and 50% probability of being located, respectively). Tracking data revealed green turtles had an inter-nesting home range that spanned the entire northwest coast of Montserrat covering an area of 18.34 km² and four inter-nesting core use areas which covered an area of 2.4 km (Figure 5A). Two of the tracked green turtles displayed residency in Montserrat's waters after nesting suggesting that adult turtles may be found around the island all year. The tagged hawksbill turtle also had an inter-nesting home range and core use area located along the western coast of Montserrat that covered 0.68 km and 0.05 km, respectively (Figure 5B).

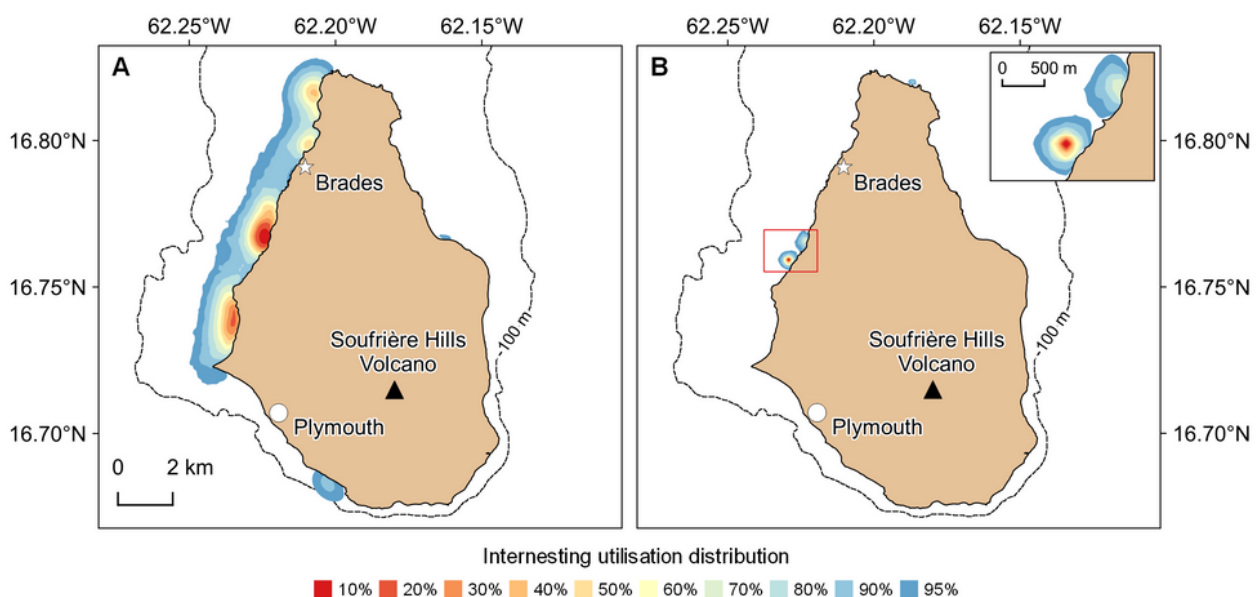


Figure 5. Inter-nesting utilization distributions inferred from satellite tracking for A) the nine nesting green turtles and B) the nesting hawksbill turtle tagged in Montserrat. The inset map displays an enlarged map of the inter-nesting core use area (red box) for the tagged hawksbill turtle.

1.3.2 Social science research

Key informant interviews

Eight key informant interviews were conducted to support understanding of the human dimensions of Montserrat's turtle fishery and its turtle conservation. Respondents were asked to evaluate levels of current take of sea turtles, their eggs, and their socio-economic and consumptive aspects. Respondents believed turtle fishing and taking of eggs have reduced significantly since the Soufrière Hills volcanic eruption. Turtle meat is still caught on a small scale by artisanal fishers and maintains a cultural value (particularly for the older generation and returning diaspora). There appears to be little to no interest in consuming turtle eggs, following sustained educational campaigns emphasizing the importance of protecting nesting females and their eggs on beaches. The younger generation shows very little interest in consuming turtle meat or their eggs, likely due to a combination of the introduction of easily accessible imported food, and an increased interest in turtle conservation across the island.

Community Voice Method stakeholder consultation

To ensure this action plan and legislative recommendations reflect the views and aspirations of the Montserrat community, the Community Voice Method (CVM) stakeholder engagement tool was employed. In August 2021, 28 filmed interviews were conducted that included 32 participants. Interviewees were sensitively asked about attitudes towards turtles and their conservation, marine management, conservation and life in Montserrat more generally. A clear theme arising from this filmed interview phase was that while the scale of the turtle fishery was seen as a fraction of its historical past, it still has social and cultural importance for sections of the Montserratian community and warranted community deliberation in determining conservation measures. A public consultation campaign was then carried out in July/ August 2022. This involved 10 screenings of the CVM documentaries (a 15 minute presentation on turtle ecology and conservation in the Wider Caribbean Region and Caribbean UKOTs followed by a 30-minute film contextualizing turtle conservation within Montserrat issues, and a shorter 10-minute film focusing on turtle fishery management and habitat conservation), with at least 190 people attending the events. Participants provided views on specific turtle fishery management and conservation measures that have informed legislative recommendations for proposed changes to the Turtles Act. The Montserratian diaspora were also able to watch the CVM film and provide feedback via an online survey on turtle management and conservation measures. Please see the resulting suggested amendments and recommendations for legislation relating to marine turtles in Montserrat in Appendices 2 & 3.

1.3.3 Additional Engagements

Tourism

A workshop on 'Turtle Watching' was held in June 2022 for representatives from the Department of Agriculture, Department of Environment, the Montserrat Tourism Division as well as local tour operators and other interested stakeholders. The consensus of the workshop was marine turtle watching tours should be conducted in Montserrat as an educational experience that provides the local community and tourists the opportunity to see and be inspired by marine turtles. It was agreed only trained individuals with an accreditation for turtle watching should be permitted to conduct turtle watching tours and generally agreed that such an accreditation scheme should be run by the Government of Montserrat. In 2022, 12 official nesting tours open to the public were conducted. The full report can be viewed in Appendix 4.

Outreach

The MAHLE regularly carries out engagement and outreach events, for example the bringing of hatchlings into schools. Throughout the project, the desire for such engagement was demonstrated through invitations to give presentations to summer schools and other youth groups. As a priority, school children and youth-orientated community groups should be given the opportunity to participate in turtle watching tours so that Montserrat's young people have the experience and the educational dividends. However, this does not need to be limited to the youth, with invitations also received to give presentations to other groups such as the Rotary and popular radio shows. Going forward, it would be effective to harness this interest and develop an engagement schedule each nesting season designed to engage all demographics.

2. THREATS

Table 1. Identified threats to sea turtles in Montserrat

| Threat | | Threat summary | Threat level |
|----------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| Climate change | Temperature Increase | Decline in the suitability of nesting sites, reduced nest productivity, increased female-biased sex ratios, loss of genetic diversity, changes in nesting phenology, reduced hatchling fitness, and increase in pathogens. | Unquantified (but potential to be high) |
| | Sea level rise | Reduction/loss of nesting areas, changes in patterns of sand accretion, inundation of nests, reduced nest productivity. | High |
| | Extreme weather events | Drowning and exposure of nests, reduced nesting habitat, and damage to in-water habitats. | High |
| Coastal development | Coastal development | Decline/ loss of nesting areas and in-water habitats, increased light pollution, increased noise pollution, displacement from critical habitats, and increased beach erosion. The need for permission through the Physical Planning Act mitigates against some of the risk as well as the Revised Physical Development Plan and the Montserrat Sustainable Development Plan that are currently being updated. | Medium |
| | Sand removal | Decline/ loss of nesting areas, degradation of in-water habitats. Beach sand removal is currently regulated by MALHE which should mitigate this threat if the current legislation continues to be enforced. | Low |
| Pollution | Plastic pollution | Injury/ death from entanglement or ingestion, toxin accumulation, habitat degradation, prevention of nesting and hatchling emergence. | Low |
| | Light pollution | Disorientation of hatchlings and nesting females, abandonment of nesting attempts, displacement from critical habitats. | Medium |
| | Water pollution (pesticide/sediment runoff, oil spills, sewage [land-based and at sea]) | Degradation of in-water habitats and nesting beaches, accumulation of toxins, reduced fecundity and nest productivity, and increase in pathogens. | Low |
| Tourism | Human disturbance on nesting beaches | Abandonment of nesting attempts, displacement from nesting sites due to 'turtle-watch' tourism mismanagement | Low |

| | | | |
|----------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| | In-water human disturbance | Vessel-strike; disturbance leading to displacement from critical habitats, interference with foraging. | Low |
| Invasive species | Invasive/ non-native flora | On land, invasive plants can encroach on nesting sites, reducing suitable nesting areas and decreasing nest productivity, as well as potentially introducing invasive pathogens. At sea, sargassum may provide habitat for hatchlings, however increasingly frequent inundations of this seaweed on beaches could reduce available nesting habitat and prevent hatchlings from reaching the sea. Increased monitoring of sargassum on nesting beaches is needed. | Low Medium |
| | Invasive/ non-native fauna | The invasive seagrass <i>Halophila stipulacea</i> has been recorded in Montserrat's waters with the potential to reduce viable green turtle foraging habitat, although turtles have been observed feeding on it. More research should be carried out on the potential impacts of this. | Low |
| | | Feral livestock and domestic animals are present in Montserrat and have potential to take turtle eggs and hatchlings, degrade habitats and introduce invasive pathogens. However, they are concentrated in the Exclusion Zone which does not support substantial nesting. No evidence of predation was observed during surveys. | Low |
| Maritime traffic | Pleasure and commercial vessels | Commercial, fishing and pleasure vessels all operate on narrow coastal shelf where foraging turtles are likely to be concentrated and may pose collision and displacement risk, particularly in areas where mating pairs aggregated Low | Low |
| Commercial and recreational fisheries | Fisheries bycatch | Mortality from entanglement in gill nets, particularly from netting in inter-nesting habitats during nesting season. | Medium |
| | Targeted fishing | Population decline from overexploitation. | Low |
| Illegal activities | Illegal harvest | Reduced productivity and recruitment, population decline/ extinction. | Low |

3. ACTION PLAN OBJECTIVES

- 1** Improve knowledge of the population status and threats to sea turtles in Montserrat.
- 2** Effectively manage critical sea turtle nesting and inter-nesting habitats, as well as review the need for hatchery use and associated husbandry requirements, to ensure the long-term viability of populations.
- 3** Update and amend legislation protecting sea turtles and their nesting habitats to try to align with conservation needs and local values, traditions, and cultural uses.
- 4** Increase local and regional awareness of the cultural, social, economic, and ecological importance of sea turtles and their value in Montserrat. Additionally, to ensure that evidence from this project can inform parallel initiatives such as marine spatial planning exercises.



Figure 6. Sea turtle tracks on Rendezvous Bay, Montserrat.

4. ACTION POINTS

The following action points are proposed based on the biological and social science research detailed above.

| Aim | Action Point | Target | Priority |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| <p>Systematic monitoring of key habitats and threats</p> | <p>Annual nest monitoring surveys should be conducted between the 1st of June and the 30th of November in accordance with the Montserrat Turtle Monitoring Protocol 2022 or adaptations thereof to reflect capacity availability (See Appendix 1). Monitoring surveys should be focused on the 5 key nesting beaches (Woodlands Bay, Bunkum Bay, Rendezvous Bay, Isles Bay and Fox's Bay) as these beaches comprise >95% of nesting. If local capacity is limited, monitoring should be concentrated on Woodlands Bay and Bunkum Bay as these beaches comprise >50% of nesting; this would likely provide sufficient data to evaluate long-term population trends and status.</p> | <p>Systematic monitoring surveys that encompass the entire nesting season and align with local capacity to be conducted for the next 5 years.</p> | <p>High</p> |
| | <p>Annual assessments of the productivity of in-situ and ex-situ clutches should be continued. This will provide a baseline of the natural productivity of key nesting beaches and help determine whether the hatchery facility is a viable conservation tool and can be effectively managed. No more than 15 clutches annually should be translocated to the hatchery facility before a viability assessment has been completed.</p> | <p>Annual productivity assessments of key nesting beaches and the hatchery facility to be conducted for the next 3 years. A hatchery viability assessment to be completed after 3 years.</p> | <p>High</p> |
| | <p>A shade net should be constructed above the hatchery facility to reduce sand temperatures within the hatchery and mitigate predation from seabirds and feral cats. Advice on construction and materials can be provided by the UoE team. Additionally, sand should be changed annually within the hatchery.</p> | <p>Adequate shading to be constructed above the hatchery within the next 2 years.</p> | <p>High</p> |
| | <p>Funding could be sought to investigate the feasibility of satellite hatchery facilities on/ closer to the beaches/ the natural habitat. Again, advice can be provided by the UoE team if wanted.</p> | <p>Submission of a grant application to a funding body in 2024 to facilitate the experiment.</p> | <p>Moderate</p> |

| Aim | Action Point | Target | Priority |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| | <p>The MAHLE should continue to invest in increasing local capacity for long-term sea turtle monitoring through annual training workshops, volunteering programs and seeking partnerships with local and international NGOs.</p> <p>An in-water monitoring program should be developed with guidance from local and external partners to assess the importance of Montserrat's inshore waters as foraging grounds for juvenile and adult turtles.</p> <p>Annual data audits, either internally or including external partners, should be conducted to check the integrity and quality of the data being collected.</p> <p>The MAHLE to invest in enforcement training (including in-situ) to support Fishery Officers' and Marine Police's capacity in applying updated Turtles Act legislation. Fisher engagement on new Turtles Act regulations to be implemented to support compliance, including the receiving of free measuring equipment.</p> <p>Marine turtle landings whether through intended or unintended catch should be recorded by the MAHLE Fisheries and Ocean Governance Unit to assess annual harvest and bycatch rates. Data collection should include species name, date & time of catch, location of catch, number of individuals caught, curved shell length of individual(s), and the type of fishing gear used. Consideration of a permitting system for turtle fishers so that take and compliance can be monitored.</p> | <p>An annual sea turtle monitoring workshop to be established within the next 3 years, and a volunteer training program to be established within the next 5 years.</p> <p>In-water monitoring program developed and implemented within the next 5 years.</p> <p>Annual data audits to be completed for the next 5 years.</p> <p>Training and awareness-raising to be carried out immediately after enactment of updated Turtles Act.</p> <p>Marine turtle landings are recorded throughout the next 5 years. Annual harvest and bycatch reports produced with an overall harvest and bycatch report conducted every 5 years.</p> | <p>High</p> <p>Moderate</p> <p>High</p> <p>High</p> <p>High</p> |
| <p>Effective management of sea turtle habitats</p> | <p>Sand removal should be prohibited on the 5 key nesting beaches identified (Woodlands, Bunkum Bay, Rendezvous Bay, Isles Bay, and Fox's Bay). This is already actioned in the Beach Protection Act (12.04) where it is not</p> | <p>These Acts continued to be enforced.</p> | <p>Low</p> |

| Aim | Action Point | Target | Priority |
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| | <p>lawful for any person to use a motor vehicle for the removal of sands from any part of any beach unless with a permit. Additionally the Physical Planning Act does not allow the mining of beach sand for development and the Conservation and Environmental Act explicitly prohibits the removal of sand from beaches known to be nesting sites of marine turtles unless a certificate of environment approval has been obtained from the MAHLE.</p> <p>Driving any vehicle on nesting beaches during the sea turtle nesting season should be prohibited without prior written permission from the MAHLE.</p> <p>Light pollution behind nesting beaches should be minimized, and current and future lighting installations adjacent to nesting beaches should conform to the sea turtle lighting guidelines available at: https://myfwc.com/wildlifehabitats/wildlife/sea-turtle/lighting/.</p> <p>Overstory vegetation behind nesting beaches should be appropriately maintained and not removed without permission from the MAHLE to help mitigate the impacts of climate change and coastal erosion.</p> <p>Dogs should always be kept on leads if on a nesting beach during the sea turtle nesting season (1 June – 30 November inclusive).</p> | <p>Associated legislation is considered to be incorporated into the Turtles Act and/ or Beach Protection Act within the next 5 years.</p> <p>Lights adjacent to nesting beaches are changed for turtle-friendly lights within the next 5 years. Associated legislation to be incorporated into the Physical Planning Act within the next 5 years.</p> <p>Associated legislation to be incorporated into the Beach Protection Act within the next 5 years.</p> <p>Associated legislation to be incorporated into the Turtles Act and/ or Beach Protection Act within the next 5 years.</p> | <p>Moderate</p> <p>Low</p> <p>Moderate</p> <p>Low</p> |

| Aim | Action Point | Target | Priority |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| | <p>Permanent turtle management zones described in legislation to encompass key nesting beaches and inter-nesting sites, including:</p> <ul style="list-style-type: none"> • Rendezvous Bay (nesting); • Bunkum/Woodlands (nesting and inter-nesting); • Old Road Bay and Isles Bay (nesting and inter-nesting); • Foxes Bay (nesting and inter-nesting) <p>These zones could regulate infrastructure development within the zones (e.g. requirements for set-backs from the vegetation line of nesting beaches; turtle-friendly lighting; waste Lights adjacent to nesting beaches are changed for turtle-friendly lights within the next 5 years. Associated legislation to be incorporated into the Physical Planning Act within the next 5 years. Associated legislation to be incorporated into the Beach Protection Act within the next 5 years. Associated legislation to be incorporated into the Turtles Act and/ or Beach Protection Act within the next 5 years. Associated legislation to be incorporated into the Turtles Act within the next 5 years. Low Moderate Low High High water management; beach vegetation protection etc.); seasonal restrictions on marine activity including setting of fishing nets close to nesting beaches during the nesting season and in inter-nesting habitat; seasonal speed restrictions on vessels navigating close to nesting beaches and through inter-nesting habitat).</p> | <p>Associated legislation to be incorporated into the Turtles Act within the next 5 years.</p> <p>Maintenance of beach signage and outreach and education campaigns</p> | <p>High</p> <p>High</p> |
| <p>Legal protection</p> | <p>The Government of Montserrat to consider the recommended amendments to the Turtles Act 2002 provided in the supplementary document 'Amendments and recommendations for the Turtles Act 2002'. These include:</p> <ul style="list-style-type: none"> • Prohibition of take/possession of nesting female turtles, turtle hatchlings and eggs. • Prohibition of take/possession of hawksbill, leatherback, and loggerhead turtles. | <p>Recommendations to be considered for incorporation into the Turtles Act within the next 5 years.</p> | <p>High</p> |

| Aim | Action Point | Target | Priority |
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| | <ul style="list-style-type: none"> Extended closed season from 1 May to 30 November inclusive to protect mating and nesting turtles. Prohibit capture/possession of any turtle larger than 30 inches CCL (76 cm). Prohibit capture/possession of any turtle smaller than 18 inches CCL (46cm). Increase penalty for violation against the act. <p>The Government of Montserrat to consider legislation that limits new development in coastal areas immediately adjacent to key sea turtle nesting and inter-nesting/foraging sites, either through the Physical Planning Act or protected area designations under the Conservation and Environmental Management Act (CEMA). Low lying, coastal areas are predicted to become more prone to flooding and less suitable for development under future sea level rise, so this action point could form part of a broader 'climate smart' land use strategy.</p> <p>Hawksbill, leatherback, loggerhead, olive ridley and Kemp's ridley turtles should be designated as protected species and green turtles as partially protected species under the Conservation and Environmental Management Act. Marine life is provided for in Part 17 of the CEMA, however regulations are yet to be drafted.</p> | <p>Key nesting beaches are given increased protected within the next 5 years.</p> <p>Sea turtle species to be considered and designated as protected species of fauna and marine conservation regulations to be prepared as prescribed in Part 17 of the CEMA (section 84 (2) (h)) within the next 5 years</p> | <p>Moderate</p> <p>High</p> |
| <p>Turtle friendly human activity</p> | <p>MAHLE to take the lead in exploring options for establishing a Turtle Watching Tour Guide accreditation scheme, with support and input as required from the University of Exeter team and other external partners.</p> <p>The MAHLE Fisheries and Ocean Governance Unit should continue conducting visits to schools and local community groups to educate children about sea turtle ecology and biology to facilitate education and awareness of wider marine conservation issues.</p> | <p>A Turtle Watching Tour Guide accreditation scheme and training program established within the next 5 years.</p> <p>The MAHLE Fisheries and Ocean Governance Unit to conduct annual workshops with schools and local community groups over the next 5 years.</p> | <p>Moderate</p> <p>Moderate</p> |

| Aim | Action Point | Target | Priority |
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| | <p>The MAHLE should seek collaborations with other governments and NGOs within the Wider Caribbean Region to help grow the regional network and benefit from additional access to funding, research opportunities and exchange programs to further local capacity. Data from Montserrat should also feed into regional assessment reports.</p> <p>Signage on key nesting beaches should be updated to incorporate scientifically accurate information to inform the local community and visitors about marine turtles and their conservation in Montserrat.</p> <p>The MAHLE should promote marine turtle conservation and education on the island through social media platforms by providing educational posts, frequent updates on nesting counts throughout the nesting season, and information regarding volunteering opportunities and community events.</p> | <p>The MAHLE to seek new collaborations and research opportunities during the next 5 years.</p> <p>All beach signage to be updated within the next 2 years.</p> <p>Social media plan created and posts designed to educate and engage the local community and visitors in marine turtle conservation in Montserrat.</p> | <p>Moderate</p> <p>Moderate</p> <p>Moderate</p> |

5. CONCLUDING REMARKS

This action plan will assist the Government of Montserrat to implement effective management and legislation that will safeguard and enhance the status of Montserrat’s sea turtle populations while respecting the values, cultures, and traditions of the local community, and will contribute to the prosperity of Montserrat through facilitating educational opportunities, improving ecotourism practices, and encouraging sustainable development.

6. REFERENCES

Flower, J., Ramdeen, R., Estep, A., Thomas, L. R., Francis, S., Goldberg, G., Johnson, A. E., McClintock, W., Mendes, S. R., Mengerink, K., O'Garro, M., Rogers, L., Zischka, U., & Lester, S. E. (2020). Marine Spatial Planning on the Caribbean island of Montserrat: Lessons for data-limited small islands. *Conservation Science and Practice*, 2(4). <https://doi.org/10.1111/csp2.158>.

Gell, F. & Watson, M. (2000). UK Overseas Territories in the Northeast Caribbean: Anguilla, British Virgin Islands, Montserrat. In: *Sea at the Millennium: an Environmental Evaluation: 615-626* (C. Sheppard, Ed.). Pergamon, Elsevier Science Ltd., United Kingdom.

Martin, C. S., Jeffers, J. & Godley, B. J. (2005). The status of marine turtles in Montserrat (Eastern Caribbean). *Animal Biodiversity and Conservation*, 28, 159-168.

Meylan, A. B. (1983). Marine turtles of the Leeward Islands, Lesser Antilles. *Atoll Research Bulletin*, 278: 1-46.

Legislation:

Conservation and Environmental Management Act (Montserrat Legislative Assembly), Chapter 12.03. Available at: <https://www.parliament.ms/documents/laws/12-03-conservation-and-environmental-management-act/> (Accessed: March 2023).

Physical Planning Act Updated 2016 (Montserrat Legislative Assembly), Chapter 8.03. Available at: <https://www.gov.ms/wp-content/uploads/2020/06/Physical-Planning-Act.pdf> (Accessed: March 2023).

Turtles Act Updated 2002 (Montserrat Legislative Assembly), Chapter 12.06. Available at: <https://www.parliament.ms/documents/laws/12-06-turtles-act/> (Accessed: March 2023).

