University of Glasgow Exploration Society

Cyprus Turtlewatch 2008

Expedition Report

Edited by Sofie Rogers and Fiona Torrance

Contents

Front cover pictures courtesy of Sofie Rogers and Gillian Carfrae.

Foreword

Throughout the summer of 2008 from June until September, Glasgow University student volunteers participated in active conservation and research work onto the loggerhead and green turtle populations nesting on the Akrotiri peninsula. This was the 11th year that the expedition was organised through the Exploration Society in conjunction with Turtlewatch RAF Akrotiri. Without this support network in Cyprus this work could not be accomplished. The expedition gained valuable knowledge and long term data, with 30 nests in the 2008 season. It was possible to carry out research into nest incubation temperatures and hatchling locomotion, which was supported by the MOD Cyprus Wildlife Section. It is hoped that the data collected will benefit the long term project and the survival of these species, and that the experience and knowledge gained was beneficial to all expedition members and will be used to improve further expeditions.

Sofie Rogers

Acknowledgements

Sponsorship: Firstly, we would like to extend our appreciation to all those that contributed funding to the Expedition; The Carnegie Trust, Glasgow Natural History Society and the University Court. For a full breakdown of finances see Appendix C. Thanks also to the Stanley Foundation ltd for donating a thermos flask.

In Glasgow: Thanks to Prof. Roger Downie and Dr. Stewart White and for all their help and support with the preparation of the expedition. Thanks to Dr. Joanna Smith for help with preparation of the prospectus and applications for funding. We would also like to thank Dr. Isabell Coombs for acting as a liaison officer between Glasgow University and RAF Akrotiri. We would also like to thank all the local businesses and companies that generously provided raffle prizes. Thanks also to Bar-One Ltd. for our t-shirts and hoodies. Last but certainly not least thanks to all the long-suffering friends and families that bought t-shirts, tickets, and who came along to all the fundraising events.

In Cyprus: Special thanks to Chief tech Clive Burt, Turtlewatch Akrotiri Co-ordinator. He is an invaluable mentor who provided support and experience and without his help this project would not be such a success. Thanks also to the Burt family for making us feel welcome in their house and looking after us while we were in Cyprus. Thanks go to the deputy co-ordinator Sgt Erin Bridger who helped out with excavations and provided support. Thanks also to the SBA environment department, and in particular Dr Ian Davidson-Watts, who acted as an umbrella group for all 4 of the SBA Turtlewatch teams who help to take action for, and enforce, turtle-friendly measures. Thanks to Chief tech Andy Shaw for dealing with finances while in Cyprus. Thanks to OIC officer Emma Powell who is the current Officer in Charge. Also thanks to Station Commander Group Captain John Bessel for allowing Turtlewatch to work and stay on RAF Akrotiri and for providing food, accommodation and a vehicle. Thanks to Mr. Derick Bell for organising accommodation for us.

Introduction

In the Mediterranean, there are two species of sea turtle that nest along the coasts of Greece, Libya, Israel, Turkey and Cyprus. Green turtles (*Chelonia mydas*) are classified as endangered in the world by the IUCN (International Union for Conservation of Nature) and loggerhead turtles (*Caretta caretta*) are classed as vulnerable. In order to lay, female adult turtles return to the beaches they were born on (natal) beaches, although no one is sure how or why they do this [1,2].

Figure 1: Green female after nesting. Photo courtesy of Sofie Rogers

Figure 2: Loggerhead female after nesting. Photo courtesy of Doug Walker

These (and other) marine species are becoming increasingly pressurised by man's influence on the world. Fishing and pollution are destroying their marine habitat while sound and glare from lights has the effect of either disturbing adults trying to nest or confusing hatchlings attempting to get to the sea[4]. In Cyprus, hatchlings are also at risk from predation both during

development and after hatching. On their way to the sea, they can face predation from foxes, seagulls and other predators, and as a result, many lose their lives on their perilous journey.

Another emerging threat to turtles is global warming. Rising temperatures not only mean changes to their food supply and habitat, but also affect hatchling development. As turtles rely on environmental sex determination, the temperature of the nest affects the ratio of males and females in the nest (above 29.5^{o}C results in mostly females, below results in males) [5]. If temperatures continue to rise, then a severe female biased sex ratio will result and female turtles will find it increasingly difficult to locate any males[5].

In Cyprus, *C. caretta* lay throughout the summer (end of May till the beginning of August) whereas *C. mydas* have a shorter season, laying from just the end of June till August. Weather patterns and the trophic status of the individual cause differences in laying times. The two species nesting at Akrotiri have slightly different laying and development strategies. *C. mydas* (which tend to mainly lay on the North side of Cyprus), can take as many as 4 hours to lay a nest of up to 250 eggs. On the other hand, *C. caretta* (more common at Akrotiri) may take just an hour to dig and lay a nest, which is reflected in the number of eggs they lay (around 50-150). Incubation times vary from 43-63 days (with *C. mydas* having slightly shorter average durations than *C. caretta*) and hatch from the end of July till the end of September (Turtlewatch data unpublished).

The sea turtle conservation programme, Turtlewatch at RAF Akrotiri, has been running since 1991 and Glasgow University has been involved since 1997. The main turtle nesting beaches are situated a few kilometres outside the base behind Akrotiri village and are located within the Sovereign Base Area (land which is occupied and run under the jurisdiction of the MOD in Cyprus).

The main aim of the project was to monitor and conserve the local turtle populations. The expedition also had two other aims. These were to educate

the local community on the plight of turtles and also to give students the opportunity to carry out valuable conservation work. Details of how these were carried out are provided in the methodology.

The expedition was run by two student leaders (Fiona Torrance and Sofie Rogers) who were both highly experienced in the project so they could inform other students on the correct procedures for monitoring and hatchling handling. Before the students arrived, a beach clean up was organised involving the local community so that the beaches were clean (and safe) for turtles to lay on. These beaches were monitored throughout the season to ensue that this stayed the case throughout.

Methods

As the nesting season takes place over 4 months, three groups of students were rotated. This also allowed the greatest number of students to participate, the total being 18 undergraduates. These students were there for about five weeks each while the leaders stayed for the duration of the season to allow consistent working practices.

As the majority of turtle activity occurs at night, students were present at the beaches from about 10pm-6am. Patrols along the lengths of all the beaches were carried out every 2 hours. During patrols at the beginning of the season, students searched for evidence of turtle activity, which consisted of tracks left by a turtle that had previously laid or a turtle that was currently laying. False crawls, where no nest has been laid, were also recorded. When a nest was found, the nest chamber was located and a protective cage (which allowed enough space for the hatchlings to escape) was placed on top to prevent predation from foxes. When possible, a temperature data logger (TDL) was inserted into the nest as near to the middle of the clutch as possible, in order to record the incubation temperature. A sign displaying a nest number and advice in both English and Greek was placed next to the nest to warn beach users not to disturb the nest area. During all patrols, students used red light filters on their torches so as not to disturb the turtles. From the date that the nest was laid, combined with previous years of data, the expedition leaders could estimate when the nest was due to hatch.

Later in the season, when the nests were beginning to hatch, patrols changed to every hour in frequency and students searched for evidence of hatchling emergence. When hatchlings were found, the students helped to guide them to the sea so that other anthropogenic lights did not disorientate them. This was also done to ensure minimum beach predation and allow an approximate count of hatchlings. Nests with TDL inside had string nets placed over them when they were due to hatch. This was done as part of a 4th year Honours project by Sofie Rogers. These nests were checked at hourly intervals. When

hatchlings were retained by the net after hatching, they were weighed (g), measured (mm) (right flipper length and width, head length and width, shell length and width) and their locomotive capabilities (speed $m.s^{-1}$) were tested by “racing” them on a 2m runway and timing their effort. Their speed capability was then related to the nest incubation temperature.

Figure 3: Timing a loggerhead hatchling on the runway. Picture courtesy of Katie Baker

Once evidence of hatching was found, the nest was excavated 10 days after first emergence for loggerhead nests and three days after for green nests to comply with local legislation. Nest excavations were often made public for educational purposes.

During excavations, the nest chamber was dug out by hand and any stranded hatchlings found were released. These were carried out mid-afternoon so that the hatchlings could avoid fish feeding at dusk and scorching mid-day sand temperatures. The nest contents including the numbers of infertile, early and late stage development, hatched and dead hatchlings were all examined and recorded to add to the existing long-term data set.

Evaluation of Turtlewatch 2008

The 2008 season was generally very successful, with 30 nests laid in total throughout the season. The nests were disbursed on coves 1, 4 and 5 with one nest on Arabs beach on base. This total figure included seven nests from green turtles. This is excellent news for the project, as this is the highest number of green nests ever recorded at Akrotiri. It is possible that due to increased levels of human disturbances on Episkopi beaches, green turtles are moving slightly further around the coast to Akrotiri where the level of human disturbance is much lower. It is also possible that the turtles were in better physical condition than in previous years. The definitive explanation is unknown and is likely to be a combination of many factors, but we hope that this trend in green turtle arrivals will continue in the 2009 season. Figures 1 and 2 illustrate the total nesting data for both species for the 2008 season.

Figure 4: Loggerhead nesting data, total egg count and average nest success rate for 2008

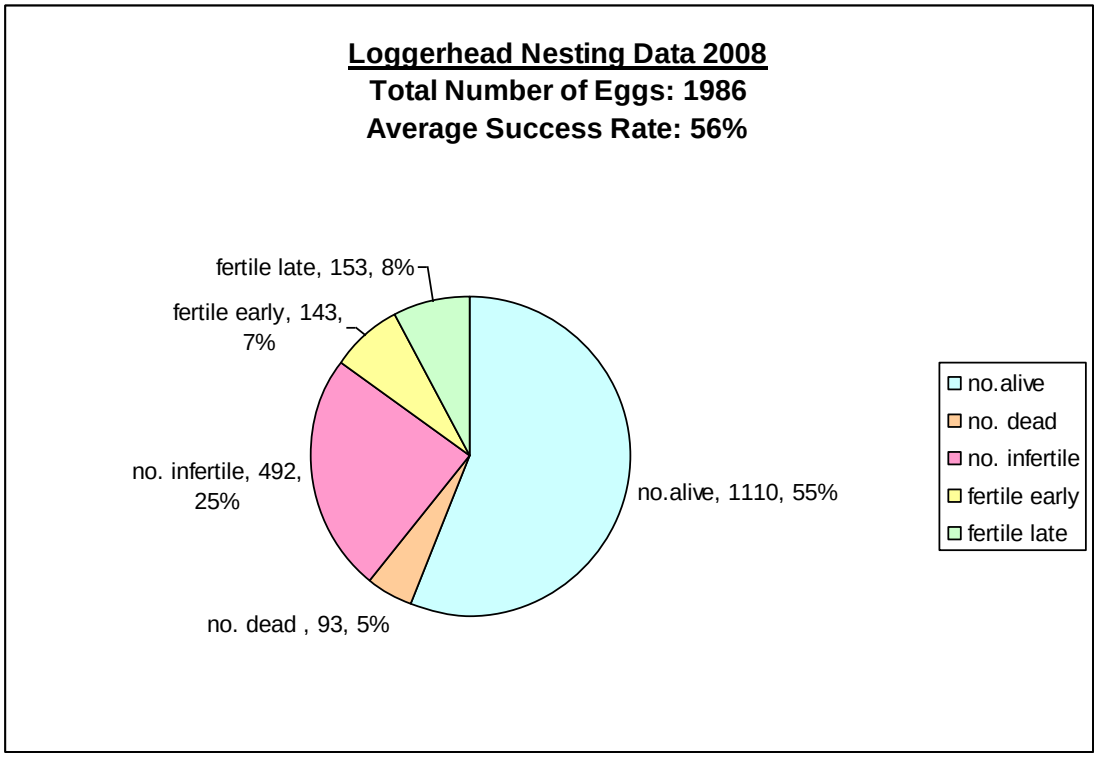
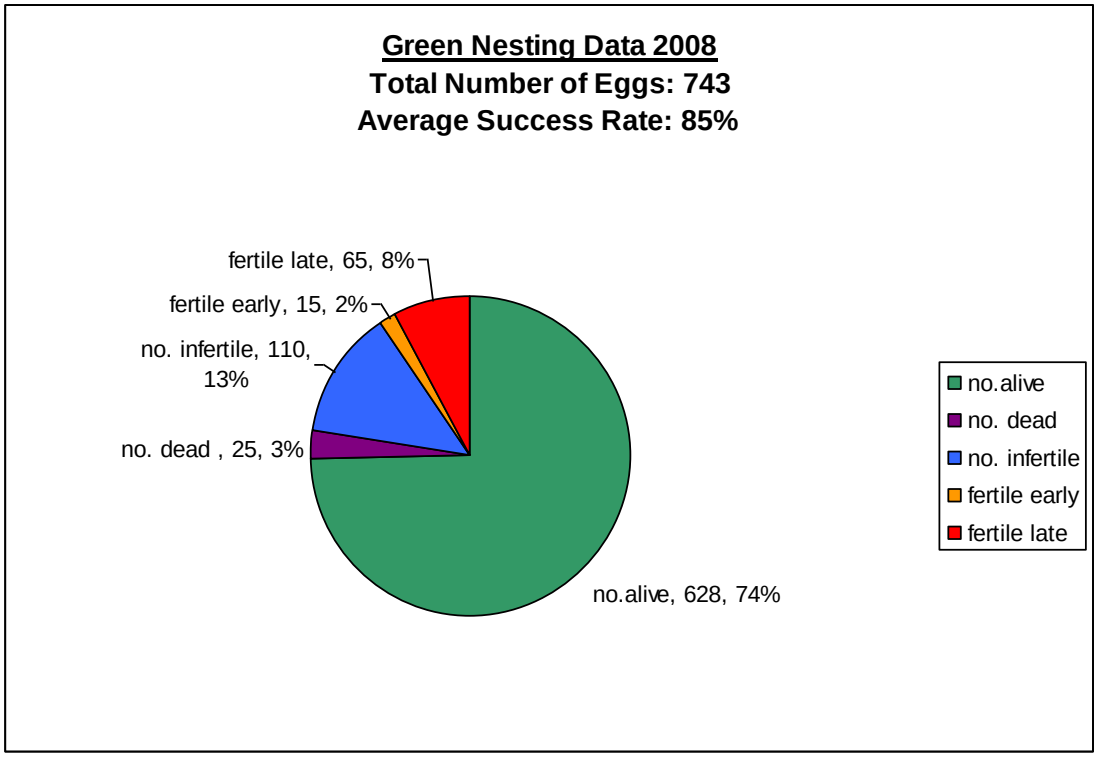


Figure 5: Green nesting data, total egg count and average nest success rate for 2008



Green nests typically had very high hatching success rates (85%) with an average incubation duration of 48 days. The low nesting success rate of the loggerheads (56%), in comparison with previous years, may have been a reflection of the two predated and three waterlogged (and subsequently unsuccessful) nests. Loggerheads had an average incubation duration of 43.7 days. This is the shortest incubation period ever exhibited by the species at Akrotiri (Turtlewatch data, unpublished), however the reasons for this are not known. Climate change can be speculated upon as the reason, as warmer temperatures equate to faster incubation times[4].

As in previous years, nightly patrols were conducted every two hours from approximately 10pm-6am throughout the laying season. It may be beneficial for the 2009 season to increase the number of patrols in order to observe more turtles, in addition to starting at an earlier time. We would also suggest that it would be beneficial to have more powerful red-light torches in 2009 to make tracks and observation of the turtles easier with minimum disturbance.

When a nest was predicted to hatch, Turtlewatch volunteers slept by the nest and the nest was checked at hourly intervals to try and observe hatchling emergence. We feel that this was an effective method for spotting hatchling tracks.

The results for the 4th year Honours project by Sofie Rogers concluded that nest incubation temperature has a highly significant effect on hatchling speed, and also that hatchling size is influenced by nest temperature. There was also a potential relationship between incubation temperature and hatchling size, although a larger number of hatchlings and nests would be required to firmly establish this. In green hatchlings there is a significantly positive correlation between hatchling head length and flipper length. It was also discovered that hatchling weight and right flipper length have a significant effect on speed. Further research and analysis conducted in 2009 will allow further distinction of these relationships, as well as providing a larger data set for statistical analysis.

Because turtles have temperature dependant sex determination, putting TDL in the nests also allowed estimations of the sex ratio of the nests. It is known that nests that have an average mean nest temperature during the middle third of the incubation period of over 29^{o}C produce hatchlings that are all female, while those nests below this temperature produce hatchlings that are male[1, 6]. As most of the nests recorded temperatures of higher than 29^{o}C, it is therefore thought that there is a female biased sex ratio for the Akrotiri population. However, further research is needed to confirm this.

Study nests with nets over them were checked every hour in order to ensure minimum stress was experienced by the hatchlings. Nets were removed during daylight hours in order not to trap any hatchlings that emerged, unusually, during daylight hours. We feel that placing nets over all cages may be a practice which could be beneficial for the 2009 season as it allows volunteers the chance to more accurately count the number of hatchlings.

A practice that we did not feel was beneficial in any way was the introduction of a new policy concerning the excavation of loggerhead nests. As a trial in the 2008 season, nest excavations of loggerhead nests were postponed from 3 days after first natural hatchling emergence to 10 days, in compliance with local legislation. This resulted in a higher mortality rate of hatchlings trapped in the nest with very few remaining alive. An example of this was nest 3 on cove 5 (see 2008 nest data in Appendix) from which 49 dead hatchlings were extracted. This was caused by a large rock which had fallen and covered the top of the nest, effectively trapping the hatchlings. Hatchlings absorb their yolk sacs before they emerge from their shells and use this as their food source for the two week period post emergence, which they spend continuously swimming to avoid predators in shallow coastal waters [8]. Leaving trapped hatchlings in the nest for 10 days meant that when we excavated the nests we found seriously emaciated and dehydrated hatchlings. This drastically affects their locomotive capabilities, in both the terrestrial and aquatic environments [8].

Figure 6: Loggerhead hatchling with skin infection on its head and top of the flipper. Picture courtesy of Sofie Rogers

Skin infections, sores and shell abnormalities were also more prevalent in all trapped hatchlings which had remained in the nests for 10 days. Leaving egg and shell remains in the sand also attracts bacteria and many Dipteran larvae,

which can further increase the prevalence of skin infections and mortality rate of trapped hatchlings [3, 7].

We feel that this trial was not beneficial in any conservation sense and inconsistent with the practices of previous years, and would thus recommend that the period for nest excavations of loggerheads be returned to 3 days for the 2009 season.

The following section outlines some recommendations that could be implemented in the 2009 season. It is hoped that further research will aid in the conservation of this species and its habitat.

Recommendations for 2009

1. Habitat determination studies including data on the following:
    - Vegetation studies
    - Sand temperature profiles
    - GPS of nest locations
    - Gradient of beaches
    - People disturbance level indexes
    - Levels of artificial lighting

2. Tagging of nesting females which would allow measurements from the females (including curved carapace and flipper length) to be taken. This could be accomplished using PIT tags injected subcutaneously in the shoulder or flipper. This would also allow data to be collected on beach selection by females, number of nests laid, inter and intra-season remigration etc.

3. Facilitate the implementation of post mortems on washed up turtles for information on toxicology, cause of death, general health of the turtle, age, sex etc.

4. Satellite tracking of individual turtles to enable the determination of their migratory patterns and important feeding areas. This project could be run in conjunction with funding from the MOD Cyprus Wildlife Section.

5. Studies of ghost crab populations and their interactions with turtles. This would include behavioural studies and measuring the diameter of burrows to determine the size of a crab, and therefore estimate its age. Feeding behaviour studies could also easily be implemented by placing food traps on beaches to determine attraction time and food preference.

6. Placing TDL in the top, middle and bottom of nests, with control nests constructed (using ping pong balls injected with water to closely resemble egg parameters), for the 2009 season will allow us to ascertain rates of metabolic

heating and create nest temperature profiles and relate this to hatchling locomotion capabilities (repeat of Sofie Rogers dissertation).

7. Observing hatchling dispersal patterns using a ring divided into equal segments. This would allow volunteers to count either the number of tracks, or the number of hatchlings, in each segment of the ring to determine the orientation and dispersal patterns of emergent hatchlings.

8. Facilitate filming of the turtles with cameras, red torches and nightvision/infrared lights. This would allow less intrusive and more accurate monitoring of nesting and hatching behaviours.

9. Sex determination by dissection.

- This would involve taking expired late stage development embryos and placing them in a fixative (100% ethanol). They would then be taken back to Glasgow University for histological investigation of their gonads.
- This would allow the determination of a sex ratio for nests/species but requires a CITES license

10. Collect basic nest parameter measurements from the nests on the Akrotiri beaches. This is already partially accomplished by the collection of excavated eggs and the calculation of the hatching success rate. However it would also be beneficial to measure nest depth to study how it is correlated with temperature and species.

11. We recommend that nests laid below, or just above, the high tide line be relocated to try and prevent water logging and subsequent hatchling mortality. There may be some negative effects of this move (including a greater rate of infestation by fly larvae and altered nest parameters). However we reason these risks to be minimal in comparison to the elevation in nesting success rate of a nest that would otherwise have been completely or only partially

successful. Monitoring of these nests would be essential in order to establish more conclusive results about the effects of relocation on turtle nests.

12. Continue to build on the relationships founded with Akrotiri Environmental Centre and local fishermen

13. Involve locals in nightly beach patrols. This activity is already established, but could easily be expanded to include several night visits per week on a more regular basis.

Appendices

Appendix A: Location

The beaches which were monitored are situated a few kilometres away from Akrotiri village, situated within the Western Sovereign Base Area in the south of Cyprus. This year, as in previous years, we were fortunate enough to be allowed to stay on the base at RAF Akrotiri. Accommodation was provided in temporary stay blocks within the base. These comprised of twin rooms with shared toilet and shower facilities. As the group was comprised of both males and females, separate blocks were provided which were situated around 2 minutes from each other.

Appendix B: Personnel (18 members)

Expedition leaders: Sofie Rogers and Fiona Torrance

Sofie and Fiona had collectively spent 18 weeks in Cyprus in previous years and so were able to pass on their extensive knowledge to the other students taking part for the first time. Both were qualified first aiders and held full UK driving licences. Both have a keen interest in conservation and so they chose to study a degree in zoology. Fiona has now graduated and Sofie is in her 4th year and both hope to be able to use this experience as a foothold towards gaining a job involving animals and the environment. By taking on the role as expedition leader, both were able to build on their leadership and organisational skills and they both thoroughly enjoyed the experience. Sofie hopes to further her CV, knowledge, and leadership skills while passing on her passion for turtles, by taking on this challenging role again in summer 2009.

The groups were split up in such a way as to ensure an adequate number of drivers were present each month; there were at least 3 drivers in each group. The groups incorporated a variety of students from different academic years and backgrounds allowing the more advanced students to pass on their knowledge and experiences.

Group 1

Rhona Cairns

A 21 year old 3rd year Marine and Freshwater Biology student from Wishaw, Scotland. She feels that Turtlewatch 2008 benefited her as it allowed her to gain first hand research and conservation experience in the field which she hopes will help her future career. She holds a full UK drivers license and so was able to take on some of the driving.

Ellie Easton

A 20 year old 3rd year Marine and Freshwater Biology student. As a PADI advanced open water Nitrox diver she has always had an interest in marine life and especially in turtles. She feels she gained invaluable conservation experience from Turtlewatch 2008. She hopes to apply this to her future career while meeting new people with similar interests at the same time.

Francesca Kenny

An 18 year old 1st year Biology student from Brighton. She is hoping to study Zoology and felt that Turtlewatch was a great learning experience that will help her in her pursuit of a career in conservation.

Sophia Punteney

An 18 year old 1st year Biology student hoping to study Zoology. She feels that she benefited from Turtlewatch 2008 as she hopes to pursue a career abroad doing conservation and research and feels the experience that the expedition provided will be invaluable. She also feels that her personal skills benefited from the trip.

Janan Toraman

A 21 year old 3rd year Marine and Freshwater Biology student. She really enjoyed experiencing the practical applications of conservation and meeting new people. Jan was also a driver for this month.

Group 2

Elliot Hay

A 21 year old 4th year Zoology student from Kilwinning, Ayrshire. He enjoyed doing volunteer conservation work on the Turtlewatch expedition that helped him gain experience and increase his employability. He also was a driver for the expedition team.

Iona McLachlan

A 20 year old 3rd year Zoology student from Largs, Ayrshire. She was excited about the opportunity of doing prolonged field work that she experienced by joining Turtlewatch 2008 and hopes that the experience will aid her future career.

David Smith

A 21 year old 3rd year Accountancy student from Shetland with 4 years lifeguarding experience, and a full UK driving licence. He is passionate about conservation and enjoyed improving his teamwork skills, whilst meeting new people.

Douglas Walker

A 22 year old 3rd year Zoology student from Glasgow. He holds a full UK driving licence and so was able to drive for this group. He was interested in Cyprus Turtlewatch as he enjoys the practical application side of conservation and feels it benefited his knowledge and his future career.

Jenny Wilson

A 21 year old 3rd year Zoology student from the Scottish Borders. She holds a full UK drivers licence, First Aid certificate and scuba diving qualifications. She feels that the expedition was beneficial to her as it gave her further experience in conservation work.

Group 3

Stuart Bailey

A 19 year old 2nd year Biology student hoping to study either Zoology or Marine Biology in the future. He feels that this trip aided his employment opportunities and he enjoyed it as he is passionate about conservation issues.

Katie Baker

An 19 year old 1st year Biology student from Nottingham. She is hoping to study Zoology and holds a full UK drivers licence and has completed Gold Duke of Edinburgh. Katie showed great leadership potential through her organisation and motivational attitude and will join Sofie as leader for the Turtlewatch expedition 2009.

Gillian Carfrae

A 23 year old 4th year zoology student from Glasgow, she enjoyed taking part in practical conservation and meeting new people. She hopes that this experience helped her employability and she hopes to get a job involving animals. Gillian was a driver for this month of the expedition.

Sarah Gordon

A 17 year old 1st year Biology student from Glasgow. She is hoping to study Zoology and feels that the Turtlewatch experience benefited her understanding of her degree and helped her career. She is also passionate about conservation and feels that this expedition offered a challenge and the opportunity to meet new people.

Eilidh Perston

A 17 year old 1st year Biomedical Science student from Falkirk. She enjoyed gaining experience from Turtlewatch that will help her with her degree and increase her employment opportunities. She holds a First Aid certificate and Junior Lifesaving certificate.

Sarah Sanders

A 20 year old 3rd year zoology student from Glasgow, Sarah is very interested in conservation and wanted to gain practical experience in field work in order to improve her employability prospects.

Appendix C: 2008 Loggerhead Nesting Data

See Page 22

Nest No.	Cove	Incubation Period	Alive	Dead	Infertile	Fertile Early	Fertile Late	Total # Eggs	Released by TW	Success rate%
1	1	63	18	2	125	4	1	150	0	12%
2	4	61	86	5	2	0	0	93	0	92%
3	5	53	35	49	2	8	37	131	3	27%
4	1	53	93	1	43	9	3	149	1	62%
5	4	57	27	1	53	4	10	95	1	28%
6	4	55	20	4	47	10	7	88	0	23%
7	1	54	52	0	41	1	1	95	0	55%
10	4	55	123	1	13	3	4	144	3	85%
11	4	51	79	2	5	3	7	96	0	82%
12	4	51	51	2	10	3	6	72	0	71%
13	OFL	56	32	2	5	3	2	44	Interference	73%
14	5	NK	0	0	17	48	27	92	0 water logged	0%
15	1	51	72	2	35	2	4	113	0	64%
16	4	54	74	1	12	5	6	98	0	76%
17	1	46	86	5	24	6	8	129	0	67%
19	4	47	74	4	4	0	1	83	1	89%
21	5	NK	0	0	17	9	6	32	0 water logged	0%
23	4	55	53	3	5	6	5	72	0	74%
24	1	56	39	2	4	3	4	51	1	76%
25	4	51	20	0	13	1	1	35	0	57%
27	5	NK	25	0	8	1	2	36	0	69%
28	4	53	31	1	6	12	1	51	0	61%
29	4	51	19	3	3	2	10	39	Interference	49%
		Totals	1110	93	492	143	153	1986	9	56%

Appendix D: 2008 Green Nesting Data

Nest No.	Cove	Alive	Dead	Infertile	Fertile Early	Fertile Late	Total # Eggs	Released by TW	Success rate%
8	1	39	0	47	2	15	103	3	38%
9	1	86	2	7	0	3	98	10	88%
18	1	98	3	9	0	4	114	42	86%
20	1	67	14	36	7	9	133	2	50%
22	1	111	2	1	0	14	128	7	87%
26	1	117	2	3	4	15	141	7	83%
30	1	110	2	7	2	5	126	3	87%
	Totals	628	25	110	15	65	743	72	85%

Appendix E: Finances

Income

Source	
Previous balance	£1000
Personal contributions	£6300
Trust funds	
Carnegie Trust	£2000
University court	£900
Glasgow Natural History Society	£500
Fundraising Events	
T-shirts and hoodies	£313
Bake Sales	£396
Band Night	£400
Total	£11809

Expenditure

Flights	£4500
Flight changes	£82
Insurance	£518
Food	£3600
Petrol	£1400
Pre expedition cost (first-aid course, printing postage and extra baggage)	£400
Report costs	£200
Equipment	£500
Accommodation	£200
Total	£11400
Balance (for use in turtlewatch 2008)	£409

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