University of Glasgow Exploration Society

Cyprus Turtlewatch 2009

Expedition Report


Edited by Katie Baker

Contents

Foreword

Throughout the summer of 2009 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 12th year that the Turtlewatch expedition was organised through the Glasgow University Exploration Society in conjunction with RAF Akrotiri. Without this support network in Cyprus this work could not be accomplished. The expedition gained valuable knowledge and long term data, with a record of 54 nests laid in the 2009 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 knowledge and experience gained by the expedition members was beneficial. All of the research and feedback will be used to improve further expeditions.

Katie Baker

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, The British Chelonian Group, and the University Court. For a full breakdown of finances see Appendix C.

In Glasgow: Thanks to Prof. Roger Downie and Dr. Stewart White and for all their help and support with the preparation of the expedition. We would also like to thank Dr. Isobell Coombs for acting as a liaison officer between Glasgow University and RAF Akrotiri. We offer our thanks to all of 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 of the families and friends 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 more than welcome in their house and looking after us while we were in Cyprus. Thanks go to the deputy co-ordinator Sgt Tom McCowan who helped out with excavations and provided support. Thanks also to the SBA environment department who help to take action for, and enforce, turtle-friendly measures in relation to our research. Thanks to O I/C Flight Lieutenant Crise Davies 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 transportation.

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].

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 September) 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 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 as many as 250 eggs. On the other hand, *C. caretta* (more common on the South side of Cyprus) may take just an hour to dig and lay a nest and this is reflected in the number of eggs they lay (around 50-150). Incubation times vary from 44-60 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 by the military in Cyprus).

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

- To educate the local community on the plight of turtles
- 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 (Katie Baker 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 so safe) for turtles to lay on. These beaches were monitored throughout the season to ensue that this stayed the case throughout.

Methodology

As the nesting season takes place over roughly 3 months, three groups of students were rotated. This allowed the greatest number of students to participate. These students were in Cyprus 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 9pm-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. Where a turtle was found in the process of laying a nest, a temperature data logger (TDL) was dropped into the nest with the eggs before the female began to cover it up. The TDL was dropped into the nest while the turtle was in her laying 'trance' and so the procedure was able to be carried out with the least possible disturbance. 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 aid in the prevention of predation from foxes. 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. If hatchlings were found, the students helped to guide them to the sea so that other lights did not disorientate them. This was also done to ensure minimum beach predation. Once evidence of hatching was found, the nest was excavated 10 days after first emergence for nests of both turtle species 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 number of infertile, early and late stage development, hatched and dead hatchlings were all recorded to add to the existing long-term data set.

Evaluation of Turtlewatch 2009

The 2009 season was the most successful year that the project has ever had, with 54 nests laid in total throughout the season. The nests were disbursed on all of the coves that Turtlewatch patrols, including the beaches on base. This total figure included five nests from green turtles. This is excellent news for the project, as the expectation was for there to be no green nests. This is due to the supposed two year cycle of the green turtles, where the females lay for one season every two years. 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. We hope to see an even greater number of green turtle arrivals in the 2010 season.

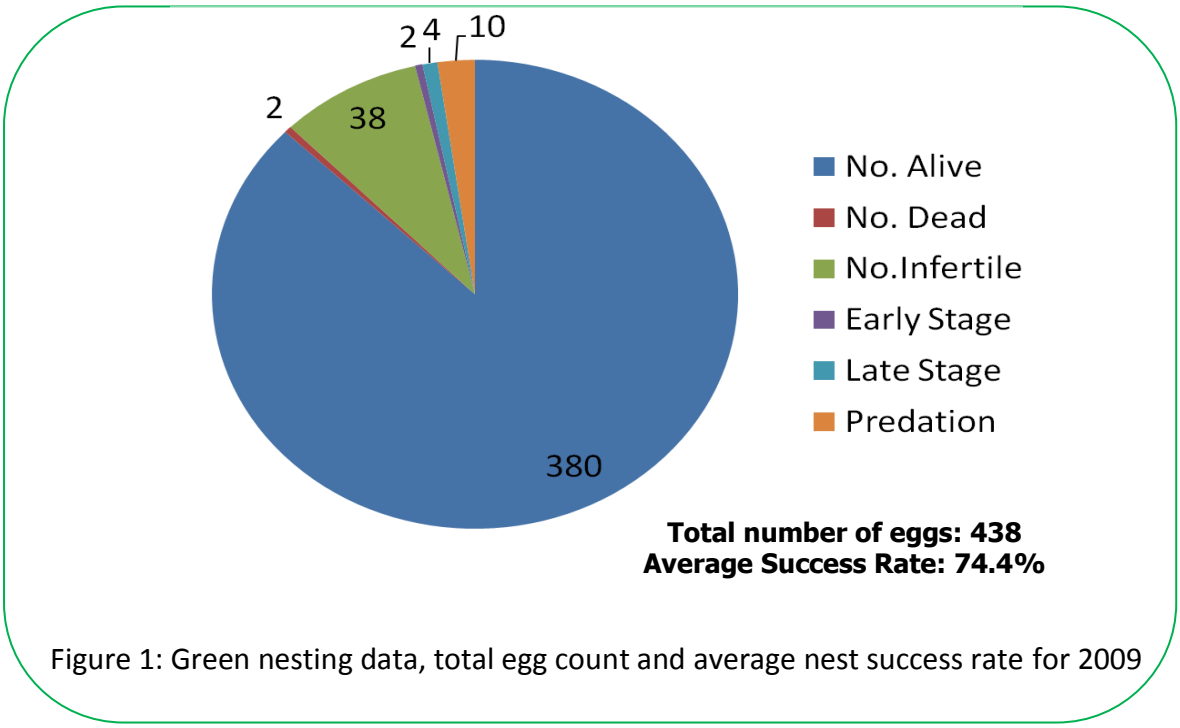

Figure 1: Green nesting data, total egg count and average nest success rate for 2009

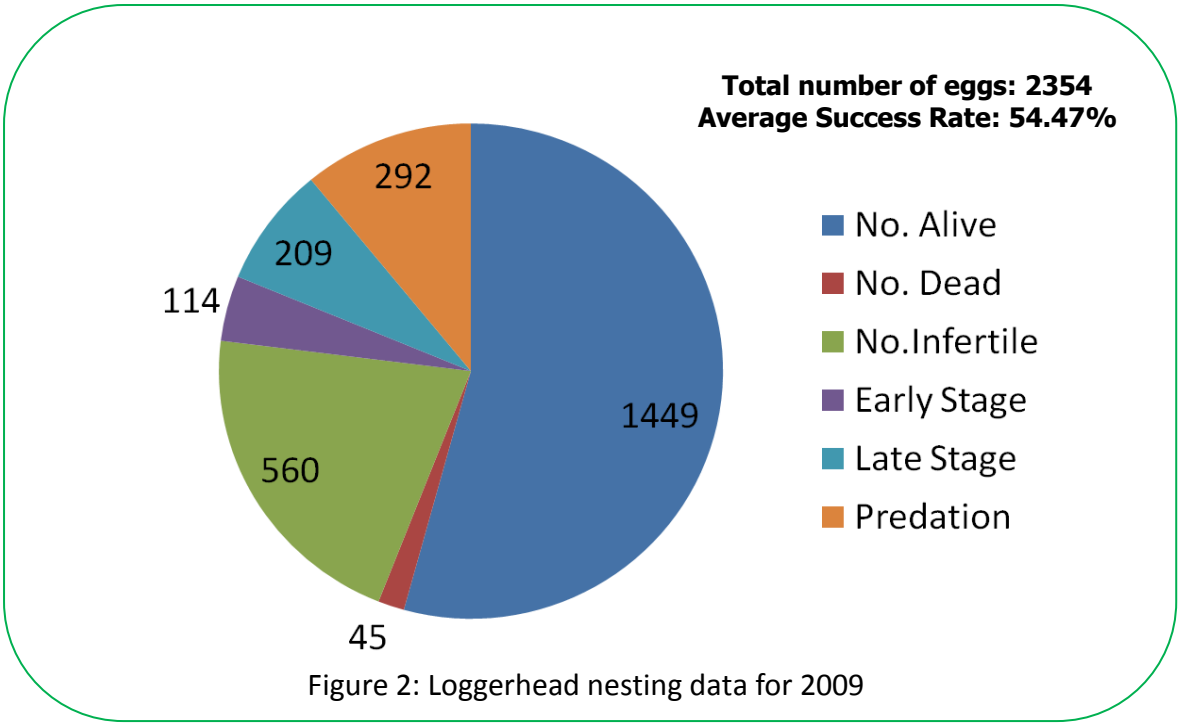

Figure 2: Loggerhead nesting data for 2009

As shown in Figure 1, green nests typically had very high hatching success rates (74%). The low nesting success rate of the loggerheads (54%), in comparison with previous years, may have been a reflection of the high rate of predation that occurred this past season and the waterlogged (and subsequently unsuccessful) nests (shown in Figure 2).

Year	Number of Nests		Mean Hatchling Success Rate (%)		Mean Incubation Peroid (Days)		Mean Clutch Size	
	Green	Logger	Green	Logger	Green	Logger	Green	Logger
2009	5	49	74	49	51.4	51.1	89	54
2008	7	23	85	56	44	43.7	106	73
2007	0	33	-	69	-	53.3	-	69
2006	3	24	83	69	53	54.5	95	75
2005	0	10	-	40	-	55.6	-	82
2004	2	18	92	64	53.5	50.6	122	94
2003	1	4	76	19	48	58	97	65
2002	0	23	-	64	-	52.7	-	79
2001	3	22	82	62	50.6	49.2	123	87
2000	6	9	94	84	52.3	51.7	100	81
1999	5	10	83	77	62	57.6	115	69

The table above shows the overall increase in nest numbers from 1999 to 2009. It also shows the fluctuations in mean hatchling success rate and the mean incubation period in both loggerhead and green nests. The 2009 season had the lowest success rate for green hatchlings that has been recorded since 1999. This could be due to the increased rate of predation that was encountered. Another worrying factor is that the mean clutch size recorded for the 2009 season was the lowest for both species in the decade

that they have been recorded. This lower clutch size could be due to the age of the females which laid nests, where younger, smaller females will lay nests with a lower clutch size. However other unknown factors could be affecting this number and so this will need to be closely monitored in the 2010 season, and the factors that could cause such a decline considered.

Temperature Data Logger Results

Where a TDL was dropped into a nest, the aim was to place the TDL as close to the middle of the dlutch as possible in order to record the intra-nest temperatures and to create a nest temperature profile for each nest. In some nests, three TDL's were used to create temperature profiles for the bottom, middle, and top of the clutch. In total, temperature profiles were extracted from 11 nests. Of those, 4 nests had three temperature profiles created for them.

This project observed a range of nest temperatures from 24.5-30.5^{o}C to 31-34.5^{o}C. This results recorded are in accordance with the results gained from northern Cyprus where the mean temperatures ranged from 29.5^{o}C to 33.2^{o}C[5]. The critical pivot of 29^{o}C was surpassed in the middle of the incubation period by six of the eleven nests which had temperature profiles. In these six nests it is likely that all of the hatchlings that survived were female[5].

There are several factors which can affect individual nest temperatures which include; beach albedo, levels of solar radiation, periodic water inundations, dimensions of a nest cavity, sand particle size, and atmospheric temperatures[1&5]. Nest depth can be crucial in buffering the effects of these factors so therefore, for the 2010 season, it is a recommended that these factors be explored and the nest depth to be recorded. If these two features are analysed, then some conclusions can be drawn as to which of the factors have an effect on each of the nesting beaches.

Ghost Crab Data

Unfortunately, due to continuous human predation, this study could not effectively be carried out. In the two weeks prior to human activity, when the 2009 team first arrived, roughly 50-80 crabs were being counted during patrols on the selected beach site. Human activity began just as the team decided that there was a sufficient population to begin collecting specific data, such as weight, carapace length, etc. This project will recommence in the 2010 season.

Recommendations for 2010

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 2010 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 for next year 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. However, some nests with temperature data loggers (TDL) inside had string nets placed over them when they were due to hatch. This was done as a continuation of the Honours project for Sofie Rogers, which was undertaken in the 2008 season. When hatchlings were retained by the net after hatching, they were weighed, measured, and their locomotive capabilities were tested by "racing" them on a runway. Their speed capability was then related to the nest incubation temperature. Nests with nets over them were still checked every hour in order to ensure minimum stress was experienced by the hatchlings. Nets were removed during daylight hours. This procedure will continue into the 2010 season.

A practice that we did not feel was beneficial in any way was the continuation of the policy regarding the excavation of loggerhead nests. The nest excavations of both Green and Loggerhead nests were postponed from 3 days after first natural hatchling emergence to 10 days. Hatchlings absorb their yolk sacs before they emerge from their shells and use this as their food source for the two -week period, 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 some nests we found seriously emaciated and dehydrated hatchlings. This drastically affects their locomotive capabilities, in both the terrestrial and aquatic environments [8].

Skin infections and sores were also more prevalent on most of the trapped hatchlings which had remained in the nests for 10 days. Leaving egg remains in the sand also attracts bacteria and many Dipteran larvae, which further increases the mortality rate of trapped hatchlings [3, 7]. We feel that this policy is 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 both species be reduced for the 2010 season.

The following section outlines some recommendations that could be implemented in the 2010 season. It is hoped that further research will aid in the conservation of this species and its habitat.

Project Recommendations

1. Habitat determination studies including data on the following:
    - Extensive vegetation studies
    - Sand temperature profiles
    - Nest temperature profiles
    - GPS of nest locations
    - Gradient of beaches

2. Tagging of nesting females which would allow measurements from the females (including carapace and flipper length) to be taken while a tag was attached to a hind flipper. This could also be accomplished using PIT tags. This would also allow data to be collected on beach selection by females, number of nests laid 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. In depth 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. This would include the possibility of incorporating a 4th year student to oversee this project and writing their dissertation on the subject.

5. Observing hatchling dispersal patterns with the possibility of a 4th year dissertation.

6. Facilitate filming of the turtles with cameras and red-light/infrared lights.

7. Sex determination by dissection.
    - This would involve taking late stage development embryos and placing them in a preservative. They would then be taken back to Glasgow University for dissection of their gonads.
    - This would allow the determination of a sex ratio for nests/species but requires a CITES license.

8. 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.

9. 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.

10. Continue to build on the relationships founded with Akrotiri Environmental Centre and local fishermen. This will also help us to involve more locals in nightly patrols. This activity is already established, but could easily be expanded to include several visits per week.

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 Katie Baker

Katie and Sofie had collectively spent 23 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 qualifies 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. Sofie has now graduated and Katie is in her 3rd 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. Katie hopes to further her field skills and leadership skills while passing on her love for turtles and their conservation, by taking on this role again in summer 2010.

The groups were split up in such a way 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.

Group 1

Nicola Guthrie

A 19 years old 2nd year Zoology student at Glasgow University. This was her first expedition and she feels that she has gained invaluable experience from her time in Cyprus. She hopes to apply this to her future career while meeting new people with similar interests at the same time.

Judith Gillies

A 20 year old 3rd year Zoology student from Largs. She really enjoyed experiencing the practical applications of conservation and meeting new people. She believes that she has gained a lot of knowledge which she can transfer into other situations.

Rebecca Watson

A 20 year old 3rd year Zoology student. She feels that her personal skills benefited from the expedition. She also hopes to pursue a career in active conservation and research and feels the experience of the expedition was invaluable.

Alexandra Stuart is 19 and a 3rd year zoology student. She was extremely excited to be involved in the expedition as she has a keen interest in animal research and conservation. She feels that she has learnt new research skills which will benefit her in any future career.

Jenny Wilson

A 21 year old and in her final year of her Zoology degree. She is originally from the Scottish Borders. She holds a full UK drivers licence, First Aid certificate and scuba diving qualifications. She feels that the expedition was her final chance to gain some experience before she graduated.

Group 2

Doug Walker

A 23 years old Radiography 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.

Laura Allan

A 20 year old 3rd year studying Zoology at Glasgow University. This expedition was her first expedition and she found the experience very fulfilling. She enjoyed working as part of a team and found the challenges of performing conservation work in a foreign country exciting.

Gillian Carfrae

A 23 year old Zoology graduate who returned to the expedition as a research assistant. She was a valued team member and enjoyed taking part in practical conservation and meeting new people. Gillian was a driver for this month of the expedition.

Sarah Gordon

An 18 years old 2nd year student, studying biology. She plans to complete a degree in Zoology. She feels that Turtlewatch 2009 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.

Laura Kelly

A 19 year old Virology student at Glagow University. She is passionate about conservation and feels that this expedition offered a challenge and the opportunity to meet new people.

Rachel Ladd

A 21 year old 3rd year Zoology student. She learnt during the course of the expedition about practical conservation and enjoyed meeting new, like minded, people. She hopes to use the knowledge she gained on the expedition to further her career in conservation.

Group 3

Nikki MacArthur

A 20 year old 1st year Biology student hoping to study either Zoology or Freshwater and Marine Biology in the future. He feels that this trip aided his employment opportunities and he enjoyed it as he is passionate about conservation and sustainable development issues.

Francesca Kenny

A 19 year old 2nd 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. She is a returning team member and so found it very exciting to be able to pass on her knowledge to other members of the team.

Aaron Marshall

A 19 year old and 1st year Marine and Freshwater Biology student. He found the expedition to be an extremely rewarding experience and enjoyed learning new team-working and practical skills.

Alexandra Davies

An 18 year old 1st year Marine and Freshwater Biology student. It is because of her interest in this subject that she became involved with Turtlewatch. She gained experience and knowledge of general practical research skills while on the expedition.

Kirsty Garland

A 21 year old 3rd year Zoology student. This was her first expedition and she found it to be a fantastically rewarding experience. She developed her team working skills and also gained other useful life skills and practical experience. She also holds a UK drivers licence and so was one of the drivers in this group.

Appendix C: Finances

Income

Source	
Personal contributions	£6300
Trust funds	
Carnegie Trust	£2000
University court	£1400
Glasgow Natural History Society	£700
British Chelonian Group	£500
Fundraising Events	
T-shirts and hoodies	£503
Bake Sales	£390
Band Night/Ceilidh	£520
Total	£12313

Expenditure

Flights	£5300
Flight changes	£100
Insurance	£550
Field First Aid Course	£150
Food	£3400
Petrol	£1500
Pre-expedition cost (first-aid course, printing postage and extra baggage)	£400
Report costs	£200
Equipment	£500
Accommodation	£200
Total	£12300

Balance (for use in Turtlewatch 2010)	£13

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